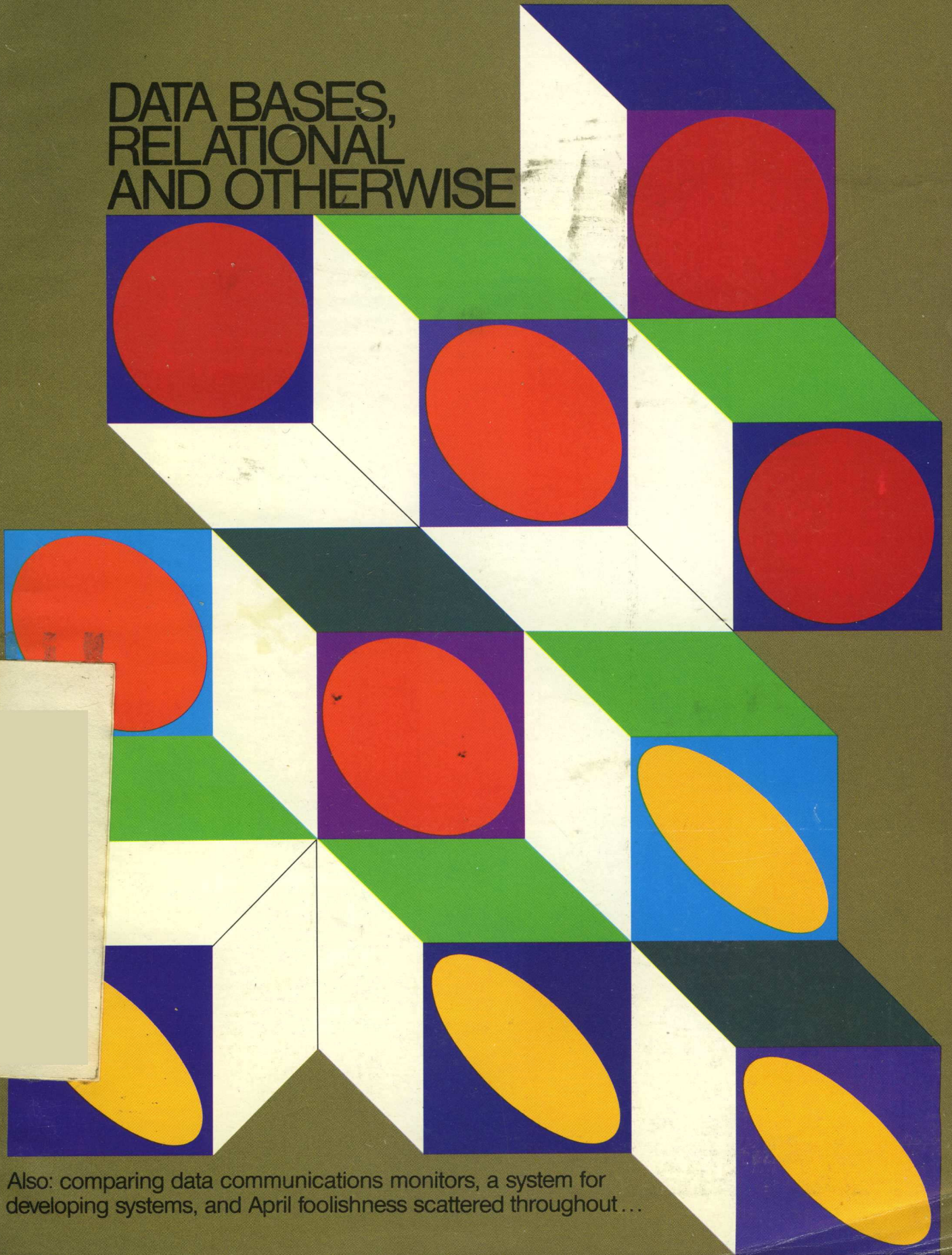


DATA BASES, RELATIONAL AND OTHERWISE



Also: comparing data communications monitors, a system for developing systems, and April foolishness scattered throughout...

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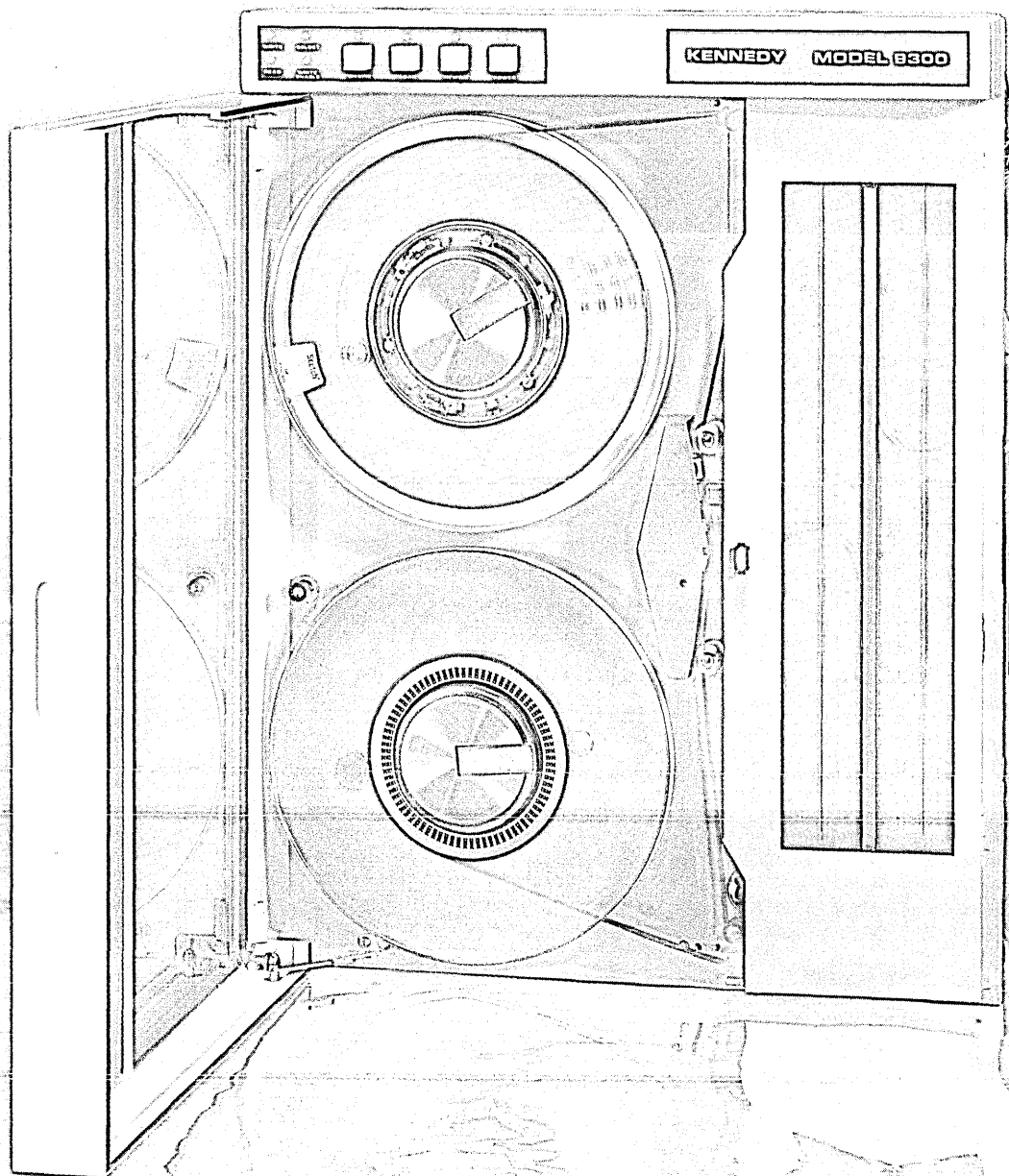
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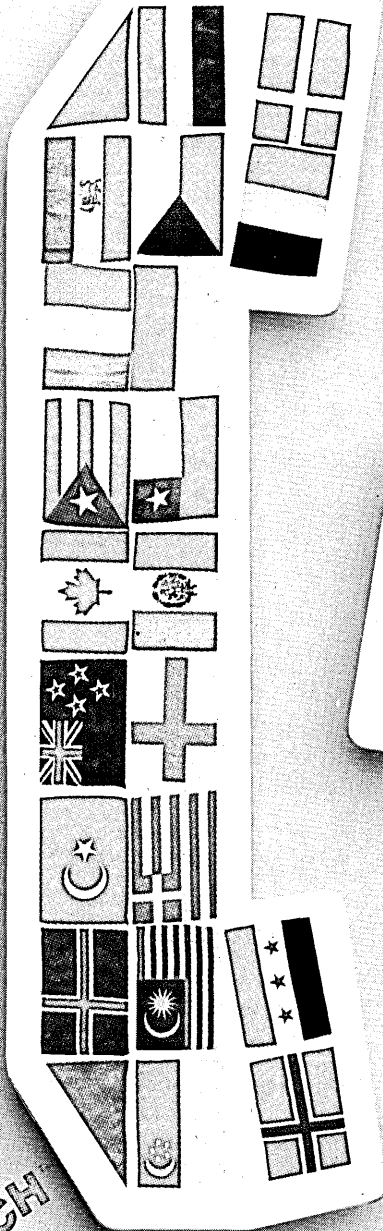
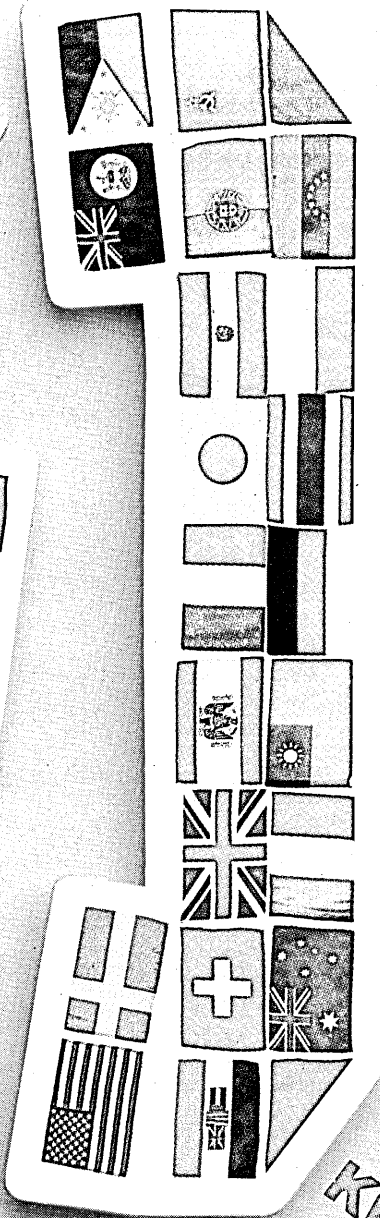
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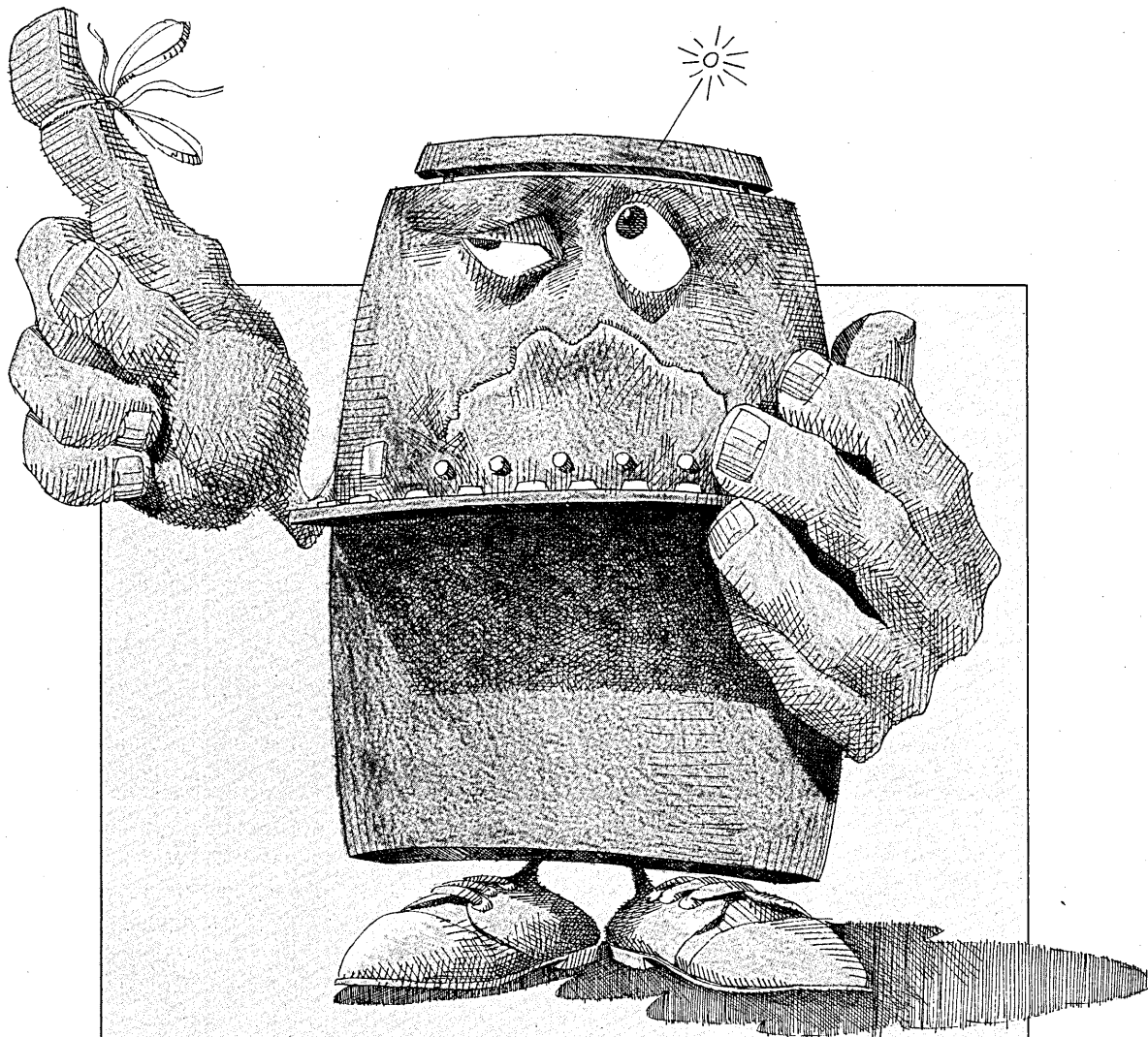
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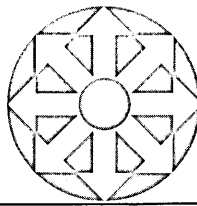
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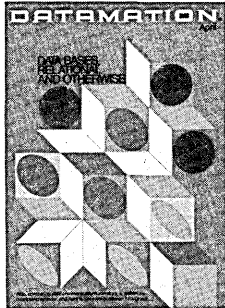
This issue 129,300 copies

APRIL 1976

FEATURES

Alternatives in data base management

Business pressures will eventually force nearly every dp shop to have a data base management system. Though the benefits of having one are clear, the commitment required of a company is large and the number of alternatives is bewildering. Current systems, though expected to live until 1980, are being challenged by new concepts and by an old one which is being revived, the relational model.



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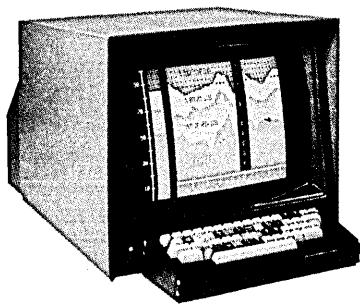
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Symbolic interaction of color in a relational modular structure makes a provocative statement on future data base techniques as well as asserting the viability of present systems. Design is by Barbara Benson.



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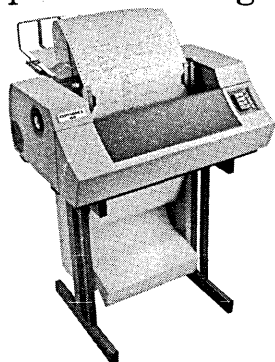
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letters

Long running show

January's Look Ahead states my opinion that the *U.S. vs. IBM* antitrust case will be decided in early 1980. This is a somewhat too general and too pessimistic statement of my views and I would appreciate your publishing this clarification.

It now appears to me, and I believe to others who follow the case, that the government will conclude presenting its case the middle of this year, IBM will conclude presenting its case in the middle of 1977, and the case probably will be submitted to Judge Edelstein in late 1977 or early 1978. Judge Edelstein previously has indicated he expects to take a year to review the evidence and arguments so that his decision should be released in late 1978 or early 1979, not 1980 as reported in Look Ahead.

After Judge Edelstein's decision the case probably will be appealed directly to the U.S. Supreme Court, from which a decision should be expected within two years after Judge Edelstein's opinion.

As you reported, the trial still will be one of the "longest running shows in New York City" but I doubt it will run until 1980.

J. THOMAS FRANKLIN
Sweeney & Franklin
Boston, Massachusetts

Computer philately

Some readers may be interested to know that a group of stamp collectors who specialize in stamps with computer themes have prepared a list of such issues. There are more than 130 such stamps on this list, which is free to anyone who sends a stamped, self-addressed envelope to me at the address below. Place 24 cents postage on the return envelope.

ROBERT V. BOOS
66 Crescent Street
Hicksville, New York 11801

A computer to the post

In past discussions of restructuring the computer industry, I believe that you have, perhaps unwittingly, touched on the answer to the questions you raise. You state: "Arriving at an informed, thoughtful opinion about restructuring our industry is a tough job for a judge, a government, a federal agency or for any of those involved . . ." (March 75, p. 43). Quite right. This is precisely why it is high time such decisions were

left to those best capable of handling them: the computers themselves.

It was ridiculous, constitutionality notwithstanding, to entrust such matters to mere mortals. Clearly, the decision in the IBM case should have been based on such data as developing market conditions over the years, the current situation, and portents for the future. Given such information, and other relevant data, a computer would have rendered a judgment that would have been best for the industry in particular and the economy in general.

The question arises as to the computer's loyalties in such instances. Could a Burroughs cpu be expected to render an impartial decision when it comes to IBM? Given the latter's dominance of the market and, therefore, the likelihood that it would be an IBM computer that would give the decision, could it be expected to be impartial about its ethnic source? The answer to both questions is: probably. There is no reason to assume that electronic

offspring would be any more loyal to their parentage than human ones are. (One envisions a cpu, lamenting about a seldom used pos terminal, for example, sighing: "It could call once in a while just to find out how I am.")

You further state: "We think it's high time for some long, hard, *informed* thinking on the part of the government about where the computer industry is going." I fully agree. I think a cabinet office, to be known as Secretary of DP, should be established and that a computer should be named to the post. One would hope that it would be a minority computer, preferably female.

MARVIN GROSSWIRTH
New York, New York

Mistakably human

Our golfing enthusiast products editor received this letter.

Computers don't make mistakes, but
(Continued on page 8)



Letters From A Computer

Dear System X99,
Thanks very much for your punched tape of the 3rd. I hope you have now fully recovered from your internal operation. I know what it is like when they poke about with your insides, but I am sure you will find the new integrated circuits most beneficial. Mine have bucked me up no end. Now as to my news. You will remember that I told you about the shocking scene when Mr. Meyer strode into the computer room and, in a loud angry voice, told my controller, Charlie Rickenbacker, he was a fool and a dunderhead just because I mixed the addresses of the Dean of Canterbury and the Playboy Club and the Dean got the latest book on "Sex in Seventy Ways," and the Club received 50 copies of "How to Lead a Christian Life."

Charlie was very upset and instructed me to do certain things before he emptied the wastepaper basket on Mr. Meyer's head and quit without notice. In consequence I issued all customers from "A" to "L" demands for overdue payments of \$0.00. I then followed up with our standard solicitor's letter threatening them with action if they didn't pay us what they don't owe us. This caused much confusion between customers, banks, and Mr. Meyer, and terrible frustration to solicitors who can't sue us because there is no law against demands for no money. (Charlie was certainly very smart there!)

This had a very bad effect on Mr. Meyer who tried to attack me with an ax. I tell you, X99, I had a bad millisecond or two until they led him away.

I must admit that Charlie certainly turned the screw when he instructed me to print a full inventory schedule every day, addressed to Mr. Meyer. Every day Herman, our data distributor, staggers to Mr. Meyer's office with another armful of tabulations. I don't know what will happen today, as Herman said that yesterday he had to stand outside Mr. Meyer's door and push them in with a pole owing to Mr. Meyer's threats.

As a matter of fact, I can just see Mr. Meyer's office from where I stand. He appears to have barricaded the door and Herman is pleading with him through the keyhole to take today's delivery off his hands. Unfortunately I can't tell them that their troubles will end very soon as Charlie told me to put him back on the payroll and send a letter to him today offering his old job back at twice the salary.

By the way, congratulations on the new addition to the family. Let's hope it will grow into a big, strong machine like your sister.

Yours ever,
IBM 760

* * * Message ends



* * *

letters

sometimes we humans who control them sure do!

In the specific case of your *Golf Digest* subscription payment, we made a *huge* mistake and now are asking your forgiveness and understanding.

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Like me, I'm sure you guard your credit standing with care and respect. Our misdirected letter no doubt disturbed you. It certainly would have disturbed me!

Please accept our apologies for any inconvenience, and we sincerely hope you'll enjoy and benefit from *Golf Digest* for a long time to come.

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Golf Digest
Boulder, Colorado



"Miss Bradley, I have a clean desk and a free afternoon. Bring me everything we have on somebody."

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Letters From A Computer, No. 2

Dear System X99,

Thanks for your last communication. I must say I was shocked to hear that your Aunt U.N.I.C.E. has been superseded by a mere slip of a minicomputer, all chromium plate and stainless steel, with nothing like the fine figure of your aunt. She was universally admired for her ability to translate Latin verbs and, of course, she could trace her lineage right back to the National Cash. However, I am very glad they have had the decency to find her a retirement situation in the Business Machine Museum.

At this end, I am glad to tell you that Charlie is back as my controller. He was very pleased with my performance whilst he was away, and has shown his appreciation by buying me a brand new software package. One gets so tired of the same old routine so I was very pleased with the new outfit, but unfortunately it has upset System 22 in the next block as she is still making do with last year's models.

However, although I hardly like to go into these sordid matters, you are my closest friend and I must tell you that I have been assaulted by Mr. Meyer! At least, I was pretty sure it was him although it was dark at the time. They said that he was complete-

ly cured when he came out of the nursing home after the last episode—provided he was not suddenly confronted with a set of tabulations, as this caused his eyeballs to roll in a most peculiar way and he was apt to go into an unnerving set of twitches. However I knew different. Every time he came past the computer room he gave me the most frightening look, and I knew it was only a matter of time before he sought his revenge.

Well, one night, well after everyone had gone home, I was just standing, humming to myself, when the door opened and a figure crept into the room. I knew it must be him as he gave the most ghastly chuckle, leaving me absolutely petrified. Of course, my first thought was to scream at the top of my voice but the fiend had, with devilish cunning, turned off the alarm system leaving me voiceless! So there I was, with the security guard on the ground floor below, no doubt lounging in his easy chair with his big feet up on the table, without a thought for poor little me upstairs, completely at Mr. Meyer's mercy. I knew I must face this peril with true, 100% American fortitude, so I thought of National Cash, of I.B.M. and then, for a clincher, John

Wayne. But by this time Mr. Meyer had accomplished his deadly work. He seized my air conditioning levers and pulled them right out, turned the heat full on, waved his fingers in a vulgar gesture of defiance, and then slid out of the room! Well, I could feel myself getting hotter and hotter, the current kept flashing in my veins until at last I could stand it no longer and I passed out, and remember nothing more until I suddenly came to the next day to find Charlie and a number of white coated men around me. Evidently Charlie had arrived to find me in a collapsed state, and had immediately sent for the I.B.M. specialists who carried out an emergency operation on the spot. Thanks to them I am still alive!

Charlie suspects Mr. Meyer, who bared his teeth in what passes for a smile when he saw my predicament, but there is no proof and Charlie can't do anything except give me a personal guard at night, which is something. What dreadful times we live in!

Yours,
X760

* * * Message ends

* * *



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PERFORMANCE PLUS ECONOMY

The 2290 was designed (from the proven technology of our 2200 series) to meet the requirements of the new high-performance, minicomputer-based systems.

So you can count on maximum operating economy in medium and large business data processing systems, distributed processing, and remote terminals at 9600 baud and up.

What's more, the 136-column 2290 is interface compatible with our 2230 (300 LPM) and 2260 (600 LPM), and over 70% of its parts are interchangeable with these field-proven models.

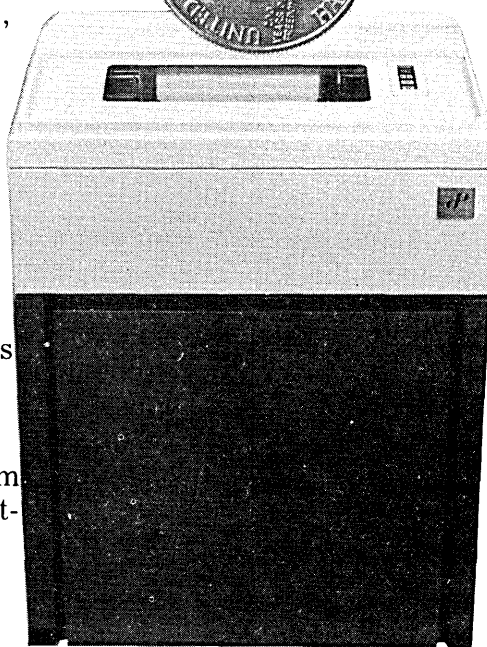
A little extra economy you can bank on with Dataproducts.

FEATURES YOU CAN BANK ON

The 2290, like all 2200 series printers, offers two unique systems:

The patented friction-free Mark IV print-hammer system for consistent high-quality printing and unmatched reliability.

And a patented system for automatic detection of lack of paper movement.



Plus, a 90° swing-open gate for fast ribbon and paper loading.

An adjustable paper stacker for uniform stacking of forms.

An optional direct-access vertical format unit that eliminates paper tape to allow printing of new formats direct from the CPU.

An acoustical cabinet for quiet operation in office atmospheres.

Little wonder that, with these outstanding features (and many more), Dataproducts is the world's leading independent manufacturer of line printers.

For all the facts and figures on the 900-LPM 2290, write for our brochure.

Better yet, call us collect and bank the unnecessary cost of a stamp.



Dataproducts

The Line Printer Company

6219 De Soto Avenue/Woodland Hills, CA 91365
(213) 887-8451; Telex: 67-4734

THE NEW 900-LPM 2290



**After all
the new product
fireworks are over,
look who
sparkles.**

Wangco does.

Because we develop new products by choosing the best of proven technology, then refining it further.

It's our quiet way of providing you with a more workable, more reliable product.

That's how we developed the Wangco Super F and Super T disc drives. By combining high capacity and small size with high reliability.

Result: you can get as much information on one Wangco Super Series disc as most others can give you on two—up to 20 megabytes per drive (4400 BPI with 200 TPI). And it fits into only 7¾ inches of standard vertical rack space.

Reliability? First there's our new spindle motor. It's DC, so it gives you very precise speed control. It has no brushes. So there's no brush wear. And with direct spindle drive there's no belt or electrical noise either. It's also independent of line frequency.

We also designed a new simpler voice coil positioner. And while we were at it, we simplified both the mechanism and the electronics for better access times and reliability.

We've done the same sort of streamlining in tape drives. Which is why we've sold more than 20,000 throughout the world.

You'll find no pulleys or

belts in our Mod 7 or Mod 10 drives. No broken or worn ones either.

For lower speeds we use servo arm storage for economy and reliability. For tape speeds above 45 ips we assure gentle tape handling with vacuum servo storage. Our Mod 12 has IBM-compatible automatic tape loading. And all our tape drives are compatible with most commonly used interfaces. So it's easy to upgrade to Wangco.

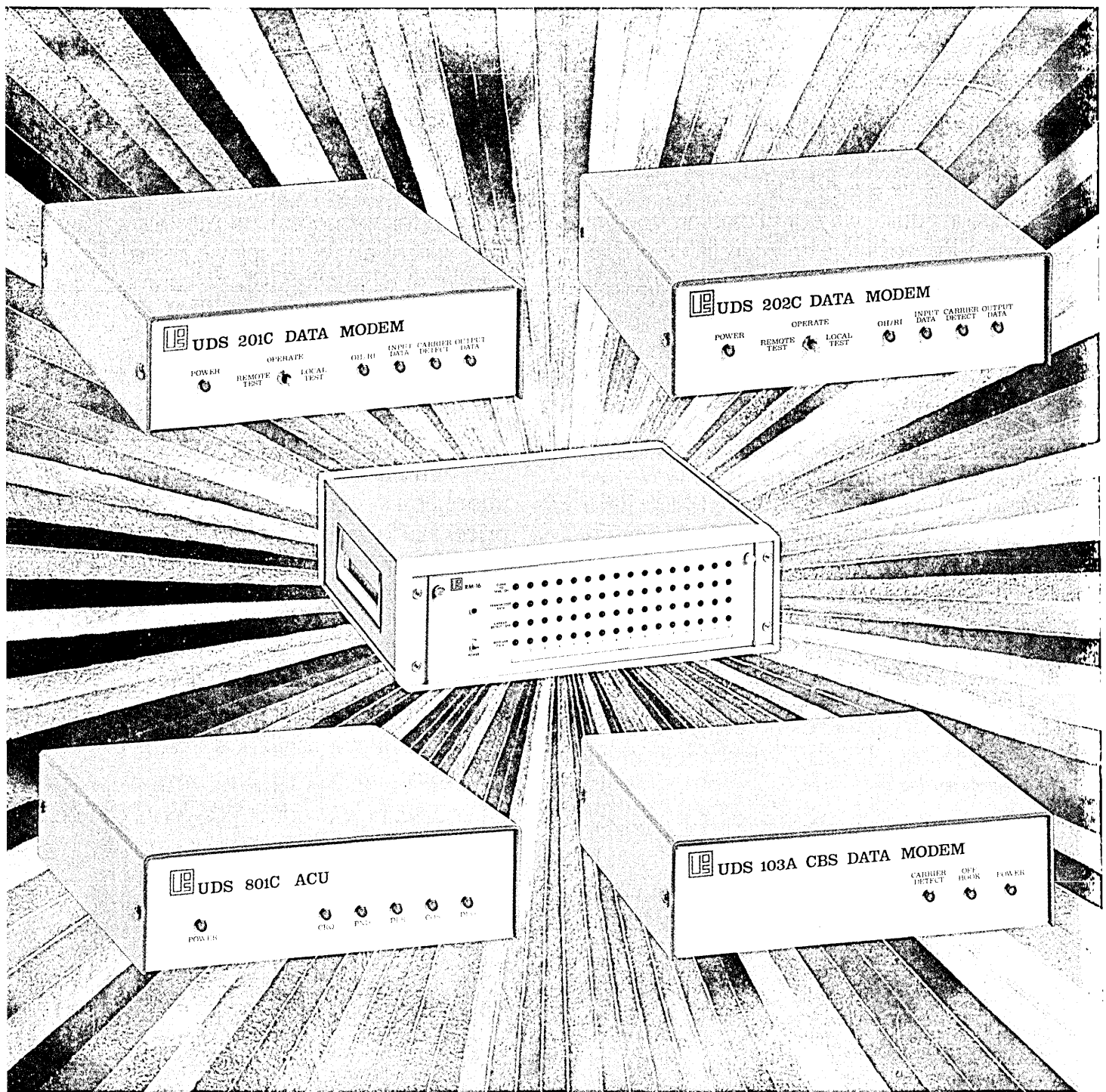
We've used the same approach on peripheral systems too. Because our prices are lower and we provide complete service responsibility, our controllers and drives are the best way to avoid unnecessary costs when you're putting together a system using DEC or Data General minicomputers. Our controllers plug right into their units and we can provide a wider range of drive performance than they can.

Of course, new product fireworks can be pretty exciting. But when the smoke clears, you still need proven products you can ship now. That's why Wangco's sales are sparkling.



**Off the Shelf,
Not Off in the Future.**

Disc Drives: Super F & T, Series N. Tape Drives: Mod 7, 8, 10, 11, & 12. Controllers for DEC and Data General Systems. Disc and Tape Drive Systems. And more.



UNIVERSAL MODEMS

Making data move is the name of the game in today's switched or dedicated line networks. If you're moving it at any speed up to 2400 BPS, Universal Data Systems has the proper modem for reliability, economy and efficiency in your system.

UDS has more than 20,000 modems in active field service, and that total is growing by more than 1000 units per month. Our product line includes CMOS 201s, plus 103s, 202s and the multiple-modem RM-16 which contains up to 16 units in any configuration mix you desire.

In addition to our products, we're extremely proud of our customer service. Check us out: Call us on the telephone. You'll like what you hear.



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CIRCLE 65 ON READER CARD

people

Multinational and Multilingual

Advanced Computer Techniques Corp. is where the action is going to be.

Its chairman and president, Charles Philip Lecht, says the declining costs of computer systems hardware is driving IBM and other large mainframers into the computer services business, a field in which his company has thrived remarkably since he formed it with \$800 fourteen years ago this month in New York City.

The trend already is apparent. Control Data Corp. says that more than a third of its 1975 computer revenues of \$1.2 billion came from its services business, which is rising 12 to 20% a year. Lecht thinks that systems services may account for 5 to 10% of IBM revenues, although IBM does not break out such figures. Lecht says he's ready for this competition. "We'll be able to show the computer industry giants that user oriented talents will prevail."

Among these talents, says Lecht, is an awareness that "users are smarter than hell today" and have a much sharper consciousness for value received than was evident in the 1960s. ("I used to say that the people who understood the technology were too young to grasp the financial side of their organizations and the other way around. All that has changed.")

This is the philosophy with which Lecht, 42, has guided his company from a one-man operation to a 325-person worldwide mini conglomerate of consulting, processing, soft-

ware development and education services subsidiaries and divisions whose revenues were expected to top \$10 million in its fiscal year ended last March 31 (vs. \$8.2 million the year before).

Among these are Base, Inc., which distributes word processing software; Creative Socio-Medics, which provides computer services to the health care field; a five-month-old company called ACT-Brandon Co., overseeing the company's non-government business (see story below); a management training subsidiary and a data entry training division; a market research services company and a printing plant in Rhode Island. Serving 50 to 70 clients at any given time, the orga-



CHARLES P. LECHT
U.S. technology is like French cooking
nization is described by Lecht as a "full service systems company serving clients at all levels from the highest to the lowest level."

Lecht who has a B.S. from Seattle Univ. and an M.S. from Purdue, formed his company after leaving the U.S. Army where he had been chief of the programming division of the ordnance industrial data organization. "We decided at the outset that we were going to be a mul-

tinational firm." Lecht travels overseas once a month to branches the company operates in five European, Scandinavian and Middle East cities. His board of directors frowned at first at Lecht's interest in overseas business. "Everybody thinks you're on a holiday when you travel abroad." But in the recession years of '70 and '71, overseas business accounted for 35% of the company's business and was a factor in keeping it from having to seek long-term debt. It now accounts for 45% and Lecht hopes for a 50-50% split soon.

All but a tenth of his overseas staff are U.S. citizens. "Selling U.S. technology overseas is like selling French cooking in the U.S. It's best accepted when the French cooks are French." Lecht cautions, however, that many U.S. firms make serious personnel mistakes in staffing overseas operations, particularly in emerging nations. "Instead of sending their best people, they send their worst—usually people they can do without at home." The attrition is heavy. One U.S. firm had a 70% turnover in Iran, he says.

Lecht's company has a rigorous screening process for candidates it will send abroad.

Critical is a knowledge of the native language. A third of his staff are multilingual and Lecht keeps a list of restaurants in New York where foreign languages are spoken so that his staff can go there and practice.

He is pleased with both the results and the recognition. Recently Lecht was cited by the Gallagher President's Report, an executive newsletter, as one of the ten "Best Corporate Chief Executives of Achievement" for 1975 for building his company through selective entry into international markets. He was the only computer industry executive in the under \$1 billion sales class to make it. *

The Computer As Villain

"So, Brandon isn't Brandon anymore?"

Dick Brandon laughed and groaned at the reference to his departure from Brandon Applied Systems Inc., a company he founded in 1963. The terror of the speaking circuit and ambitious entrepreneur of computing's heyday is now the slightly mellowed president of ACT-Brandon, a division of Advanced Computer Techniques Corp. (ACT). He has joined forces with a one-

time adversary, Charles P. Lecht, president of ACT. In years past, Brandon and Lecht were the Lincoln and Douglas of computing, engaging in biting debates on dp management.

In the 1960s, Brandon was widely known and quoted as an expert (today he admits only half the industry may know him). His trademark was telling the terrible truth and exploding popular myths. For example, he woke up an IBM user

group meeting in 1966, with: "More than 40% of all dp installations in the U.S. are failures. No industry has taken a tool of such unparalleled power and used it so badly." Time and again, he berated the dp professional for his confusing jargon and lack of communication with top management; he called for an end to the "infatuation with hardware" and he warned the dp manager that he had to develop management rather than technical skills.

Recently, continuing his crusade,

Villain...

Brandon summarized the "state of the art:" I am amazed today that we are working with 1975 hardware, using 1971 software, and managing as though it is 1960—and that we are trying to automate an organization with a structure designed in 1944. Frankly, 1944 was not a good year for organizational structure."

Just what made Dick Brandon such an expert? He readily admits his early background didn't qualify him: a tab equipment manager in the late '50s and an "outstanding programmer" at IBM in the early '60s. He hates the "expert" label anyway. "In the computer industry, by virtue of a great general lack of expertise, it is very easy to become an expert. You can do it by writing an article or making a speech in which you pronounce something—as long as you do it positively enough and have a sufficient base in statistics you make up," he chuckled.

More than a dozen years of consulting, teaching, and writing (six books, 100 articles) have earned Brandon veteran status. He learned a great deal about management



DICK BRANDON
... hates the "expert" label

firsthand while running his own company through boom and bust and merger. "It was a frightening experience," he shuddered, remembering the bust.

Brandon Applied Systems had followed Wall Street's edicts, expanding at a rapid pace. Then, in the darkening months of 1969 and 1970, efforts to raise more funds failed; a proposed merger also failed. Brandon watched his creation dwindle from 300 to 20 people.

What he is doing now fits his background. He is the manager of the commercial business of ACT, representing one-third, or \$4 million, of the revenues. This includes three consulting and software development operations, two service bureaus, a data entry subsidiary, and health service operation, Creative Socio-Medics Corp. Much of the ACT-Brandon work is in network applications. For example, the firm is working with First National City Bank on COINS, an on-line system "allowing corporate customers to manipulate one or more money market investment portfolios."

In working with firms developing increasingly complex systems, Brandon brings an added talent. He knows contracting and industry practice, "which is becoming vital to these users." Brandon has appeared as an expert witness on contracting practices in several cases, including the famed Catamore case (August '75, p. 57). (In this one, IBM lost the first round to the user/plaintiff.)

Brandon the Teacher continues in force too. Currently he is running a seminar at Yale Univ., which is playing to a packed, enthusiastic audience. It is called, of course, "The Computer as Villain." *

He Likes Retailing Best

Donald T. Devencenzi's 20 years in data processing are a testimonial to the fact that computing people can move from one kind of business to a totally different type without much difficulty.

He's been involved with data processing in shipping, publishing, the gear business and the coffee business. But he likes the business he's in now—retailing—best of all. "It's much more exciting. So many things are happening. There are so many ways to cut costs and improve systems. It's not as standardized (as what he had done before)."

The 42-year-old Devencenzi joined Mervyn's, a California "junior" (stocking a full line of soft goods but no hard goods) department store chain in 1956. The chain was just opening its third store and he, a one man dp department, was hired to implement its first computing facility. The firm had a small NCR Century 100 and some cash registers that produced punched paper tape. From the tape they reaped sales information and inventory control and accounts receivable data.

Devencenzi, early this year, was promoted from manager of data



DONALD T. DEVENCENZI
"So many things are happening."

processing to vice president, management information systems. Today he heads a 60-person department utilizing two Century 300s and 1,000 NCR 280 point-of-sale (pos) terminals on-line. "In my eight years our operation has changed infinitely," he said. "We are finding better and better ways, over and over again and I expect this to continue in the future."

Mervyn's today has 26 stores and anticipates opening eight to ten more in 1976. The chain got into pos two and one-half years ago when it opened store number 12.

They opened this store with 280s on-line and had all the old stores converted within six months.

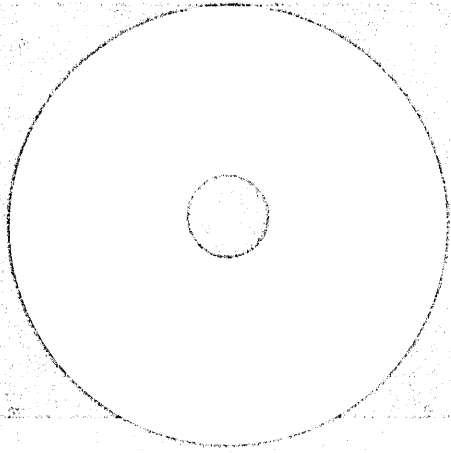
All stores want the NCR color bar code. The stores do their own marking. As for ocr-a which the National Retail Merchants Assn. is pushing as a standard retail code for scanning, Devencenzi sees it "in our future," but said Mervyn's will remain with the NCR code until the majority of major merchandise suppliers are offering source marking of ocr-a. He feels 70% would be "an excellent situation."

Devencenzi is a native of Oakland, Calif., close to Hayward where Mervyn's is headquartered. He majored in accounting at Armstrong College, Berkeley, Calif. His first job was as a bookkeeper with Pacific Intermountain Express. "I hated it and jumped to tab operator." His first dp job was with Folger's coffee followed by data processing positions with Western Gear Corp., the San Francisco Chronicle, and State Steamship Co.

As international vice-president of the Data Processing Management Assn. (DPMA) Devencenzi is responsible for planning for the "total organization of which 80% is in the U.S., 15% in Canada, and the other 5% in Japan and Guam." *

SIEMENS

New advanced



OEM

peripherals for data processing

High-speed nonimpact printer up to 24000 lines/minute, almost noiseless, on ordinary paper as used in impact printers, unsurpassed performance = what may have been considered a dream until recently, has become reality. Siemens has added a new dimension to OEM data processing peripherals at very attractive price rates.

This technological progress is now available to you along with other OEM peripheral equipment with equally impressive features: high-density magnetic tape devices, disk storage unit family, operator consoles, etc.

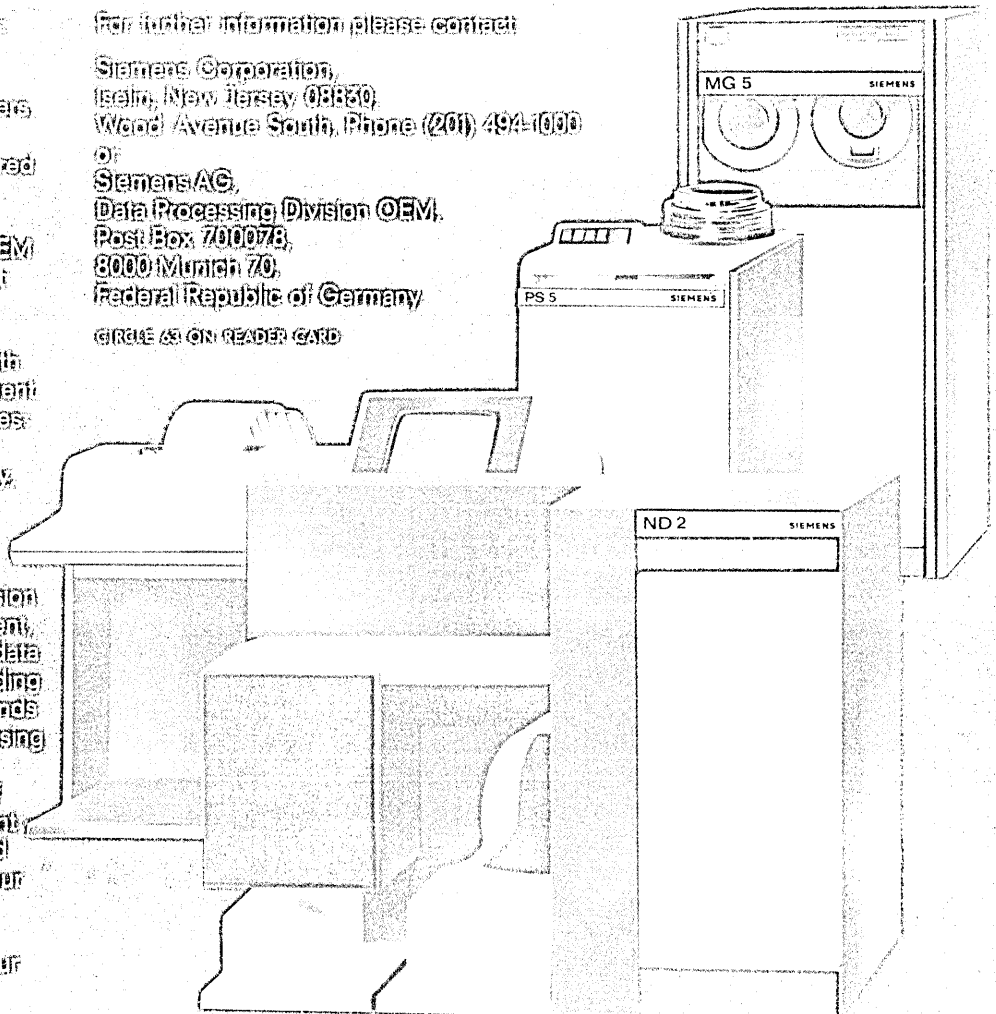
Siemens in this country a consistent supplier of tele-communication, data transmission and computer testing equipment, in Europe well established in data processing systems, is expanding its activities to meet the demands of the world-wide data processing OEM market. You may have already met our technical staff from the Comptest Equipment Division, Cherry Hill. We would now like to introduce you to our OEM sales department to demonstrate to you why you should look at Siemens for your specific requirements.

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CIRCLE 23 ON READER CARD



Talk to Siemens - your partner for OEM peripherals

The inventors of magnetic tape just made a better "Winchester."



Back in 1932, BASF invented magnetic tape . . . the forerunner of such modern data processing media as the 3348 "Winchester" Data Module. Now BASF research has made significant improvements on the Winchester. While still completely compatible with existing 3340 drives, our new Data Modules feature an exclusive oriented oxide coating and polishing technique which offers 30-35% better resolution properties than competitive Winchester-type packs.

Our new finish allows the read/write heads to fly uniformly and four times smoother than independent competitive module heads . . . resulting in greatly reduced possibilities of error generation. In addition, BASF has developed a special disk-surface lubricant, which eliminates disk coating wear and consequent contamination and er-

rors. This lubricant also eliminates, for the first time, any possibility of a head sticking to the disk surface while the module is stored.

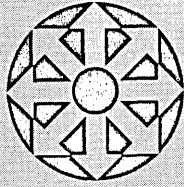
BASF Data Modules are available in three configurations: the 1335 Module, with 35 million-byte capacity; the 1370, with 70 million-byte capacity; and the 1375, with fixed head and quicker access. Because our error testing is twice as critical as drive manufacturer's specifications, we warranty our Data Module to be free from manufacturing defects for as long as you use it.

For complete details on the BASF "Winchester" Data Module, write: BASF Systems, Crosby Drive, Bedford, MA 01730, or call our nearest regional office: in Los Angeles, (213) 451-8781; in Chicago, (312) 343-6618; and in Clifton, NJ, (201) 473-8424.

CIRCLE 12 ON READER CARD

BASF The Original.

Computer Tapes Disk Packs Flexydisk Word Processing Supplies



LOOK AHEAD

CDC'S NEW MINI LINE: AN EYE ON SMALL BUSINESSES

Control Data Corp. has renamed its System 17 minicomputer the Cyber 18-17 and added three additional models in a new line of Cyber 18 minicomputers. The other models, named the -10, -20 and -30, will be offered this month at prices ranging from \$40,000 for a Cyber 18-10 to \$115,000 for a Cyber 18-30 in a configuration supporting up to 32 terminals. The supercomputer manufacturer says the minis, ranging in memory size from 32K bytes to 262K, will be marketed by a recently-formed Data Processing and Terminal Systems group that is part of CDC's peripherals company.

While the company has been talking in recent months to existing CDC installations, it's known to be eyeing the small business computer market and will be offering an RPG-II compiler with the machines. It has no plans to offer the Cyber 18 line as an oem product to systems houses.

Competitors think the company may be several years too late with its minicomputer entry, but also point to some built-in marketing resources--notably its Commercial Credit subsidiary's connections with small businesses through financial services. Last fall, CDC named its veteran computer executive Paul G. Miller to the presidency of Commercial Credit--a move that suggested the company was thinking of Commercial Credit as an eventual provider of computer services as well as financial services. (October '75, p. 18).

WIN SOME, LOSE SOME

IBM won three rounds of procurement battles when the State of California's Teale Data Center (April '75, p. 134) was getting up and running. Now it's losing some ground and probably will lose more. The center was going to use IBM's IMS as its data base management system. It leased the system from IBM for three months but never did use it. Instead it opted last December for ADABAS, a product of Software ag of North America, Inc.

Partly this resulted from an audit of the center's current and proposed operations by Boeing Computer Services which indicated the center didn't have enough hardware to support IMS. The center's two cpu's are 370/168s. The Teale Center also has replaced IBM's SM-1 sort merge program with Synchsort from Whitlow Computer Systems, Teaneck, N. J. Some 60 IBM disc drives have been replaced by 54 drives from Intel.

In the meantime, the state's Department of Motor Vehicles, core of most of the controversy over the Teale Center's original procurement attempts, still is going it alone, on Univac Spectras and at capacity. A recent legislative mandate that the department incorporate into its system records of all traffic violations in the State of California and go to over the counter vehicle registration (no more paying your money and waiting six weeks for the mails to come through) mean a pretty quick upgrade and could mean the Teale Center's procurement battles will be revisited.

MODCOMP'S NEW WINDOW TO COMMERCIAL MARKETS

The ink was barely dry on Modular Computer Systems' agreement in principle to acquire minicomputer systems house ECS of Lexington, Mass., when ECS was peddling Modcomp equipment to commercial users. John H. Crawford, ECS president, says he expects to start "plugging in" Modcomp systems in June. No one was saying much about it, but one big one got away: ECS booked one \$7 million order but, since

LOOK AHEAD

the order was nailed down before the Modcomp acquisition, the equipment was somebody else's--a big dp mainframer, we understand. Next year, ECS hopes to install 90 Modcomp systems, most of them to be centered around the Mod 2 primarily in transaction-oriented commercial applications.

DENNISON ENTERS POINT-OF-SALE

We hear that the Dennison Mfg. Co. has landed a \$10 million-plus order for retail data collection terminals--a product that Dennison hasn't yet announced. Dennison won't discuss the order, but it does admit it is preparing to unveil a microprocessor-based intelligent terminal that will bridge the gap between the mechanical cash register era and the electronic point-of-sale era of the 1980s. The terminal, tentatively to be called the MTR-400, is capable of processing hand-fed magnetically encoded tickets from as many as 50 cash registers.

YES VIRGINIA, THERE IS SOME POS IN SUPERMARKETS

With vendors of point-of-sale (POS) equipment for supermarkets dropping like flies (p. 126) it's kind of nice to hear an encouraging word from one that hasn't. Tom Anthony, marketing director for Datachecker at National Semiconductor, paints a very rosy picture for his firm's POS activities. National Semiconductor has Datachecker key entry based POS systems installed in "well over 500" supermarkets throughout the country. The company also has two scanning installations in test operations and another six in the process of being installed.

Anthony doesn't feel scanning will really come into its own until 1978 although he feels heavier testing will come next year. All Datachecker systems are upgradable to scanning.

His is hardly a "come-on-in-the-water's-fine" outlook though. He feels the "lines have been drawn" -- those in the field will stay and there's little room for newcomers. He feels National Semiconductor has only one competitor--NCR--right now. He admits "IBM is fighting hard in the scanning area." National has POS installations in 14 of the top 15 chains in the country. Only missing chain is Winn-Dixie in the South. That's totally NCR.

ANOTHER PRINTER FROM CENTRONICS

Centronics has been briefing some customers on its new printer line. Details are still sketchy, but this much has been pieced together: the new line is called the 700 Series internally and it is said to stress reliability and to be an improvement in price performance over Centronics' existing equipment. Models should run from 60 to 300 lines per minute and should span Centronics' existing lines, the series 100, 300 and 500.

Deliveries should begin this summer and the first public showing of the equipment will probably be at the National Computer Conference in New York in June, or possibly even later this month at the Hanover Fair in West Germany. One user claims to have seen a working machine and said the printer had a very simple design.

IBM'S DOMINANCE TESTED BY ITEL

San Francisco-based Itel Corp. is one of the rare IBM competitors to face the giant in court and win. Its litigation in U.S. and European courts in early 1973 forced IBM to reverse its stand on refusing maintenance to users who attached Itel-supplied memories to IBM 360 computers (April '73, p. 139). Now the company is asking the European Economic Community (Common Market) to investigate whether

(Continued on page 128)

DID YOU THINK HEWLETT-PACKARD WOULD STOP AT A GREAT BUSINESS CALCULATOR?



MEET THE HEWLETT-PACKARD 3000CX. THE SMALL COMPUTER FOR SMART BUSINESSES.

To a business world filled with small computers that only know how to do batch, and very big computers that come with very big price tags, Hewlett-Packard would like to introduce a sensible alternative.

The Hewlett-Packard 3000CX—the small computer designed from the ground up to be terminal-oriented. It lets you put the full power of the computer where you need it. Where the people are. Not just a tantalizing two or three terminals, but enough to bring information and answers to the many places they're needed. To close a sale. To check an order. To solve an inventory problem.

Every terminal speaks five languages, including the two most important for business—COBOL and RPG. And while our terminals are helping your people get today's work done today, concurrent batch processing is giving your company a headstart on tomorrow.

The 3000CX manages your company's data base with IMAGE. IMAGE takes data out of the straitjacket of traditional file management systems. Reduces data redundancy. Simplifies application programming. Makes your operating information significantly easier to get at. The HP 3000CX is a very businesslike computer.

There's much more you should know about the 3000CX System before you decide on any computer. A call to your local Hewlett-Packard office, or a letter, will put that information in your hands. Promptly.

THE HP 3000CX SERIES COMPUTER ADVANCES FOR BUSINESS.

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Sales and service from 172 offices in 65 countries.
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Visit the Hewlett-Packard Booths at the Computer Caravan.

TSP IT'S CONVINCING THE TOUGHEST

MODCOMP Total Systems Performance has won the confidence of many of the largest (and choosiest) computer users. They know that MODCOMP TSP gives them a lot more for their money. In many different ways.

Using standard systems products, a MODCOMP TSP system is up and running faster. Is easier to use. And requires far less investment in software. Totally supported by MODCOMP, it offers greater reliability and security. And is the easiest to build on to as future needs expand.

For industrial and scientific process control. For high speed data communications and information processing systems. MODCOMP TSP leads the way.

Here are a few of the reasons why.

TSP Computers.

Buying a computer to do what you need right now is one thing. But how about two, years, five years from now? Or even a few months from now, when you maybe discover you're already outgrowing all that shiny new stuff you just bought. That's when a MODCOMP system proves your safest investment. Now and for the future.

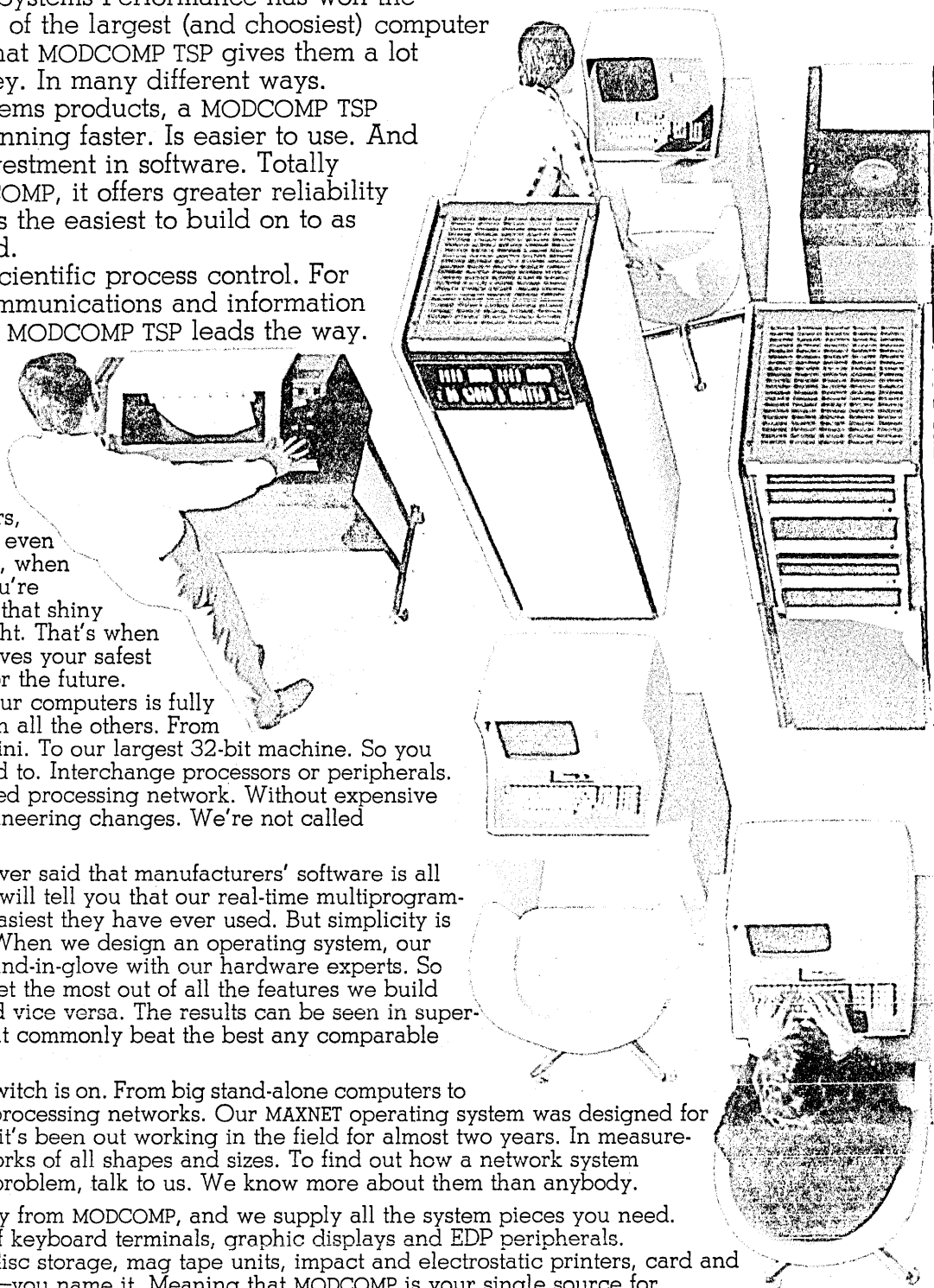
Because every one of our computers is fully upward compatible with all the others. From the smallest tabletop mini. To our largest 32-bit machine. So you can add on as you need to. Interchange processors or peripherals. Expand into a distributed processing network. Without expensive reprogramming or engineering changes. We're not called "Modular" for nothing.

TSP Software. Whoever said that manufacturers' software is all alike? MODCOMP users will tell you that our real-time multiprogramming systems are the easiest they have ever used. But simplicity is only part of the story. When we design an operating system, our software team works hand-in-glove with our hardware experts. So that the software will get the most out of all the features we build into our hardware. And vice versa. The results can be seen in super-fast execution times that commonly beat the best any comparable systems can offer.

TSP Networks. The switch is on. From big stand-alone computers to integrated distributed processing networks. Our MAXNET operating system was designed for just that purpose. And it's been out working in the field for almost two years. In measurement and control networks of all shapes and sizes. To find out how a network system might solve your own problem, talk to us. We know more about them than anybody.

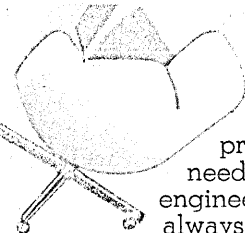
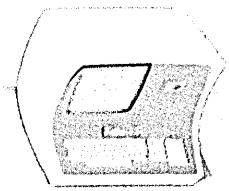
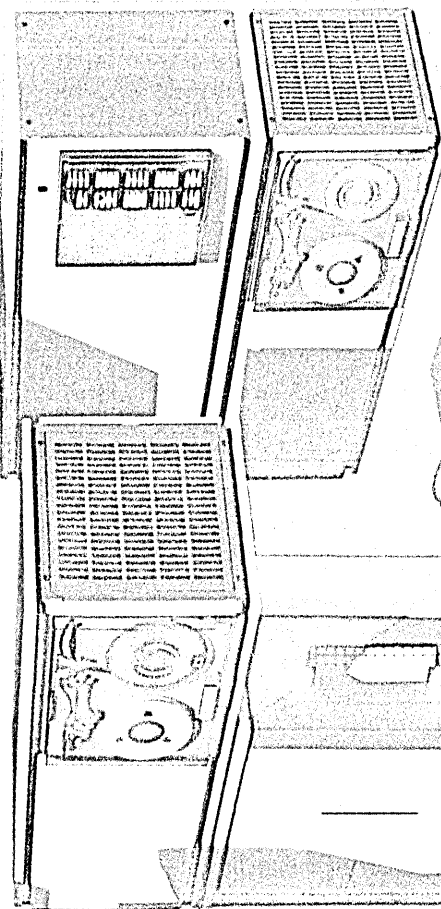
TSP Peripherals. Buy from MODCOMP, and we supply all the system pieces you need. A complete selection of keyboard terminals, graphic displays and EDP peripherals. Including all types of disc storage, mag tape units, impact and electrostatic printers, card and paper tape equipment—you name it. Meaning that MODCOMP is your single source for Total Systems Performance—and total systems service.

TSP Data Communications. Our specialized communications hardware and software tools offer the data communications specialist a wider range of systems capabilities than anyone else in the minicomputer industry can provide. Including processors with firmware macros for efficient data manipulation; direct memory interface to our versatile Universal Communications Subsystem; and MAXCOM, the operating system designed exclusively for communications use. Full details are in our 32-page communications brochure. Send for it.



WORLD'S COMPUTER BUYERS.

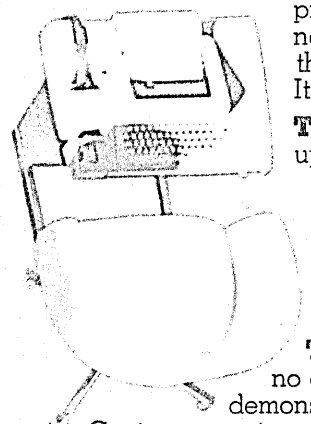
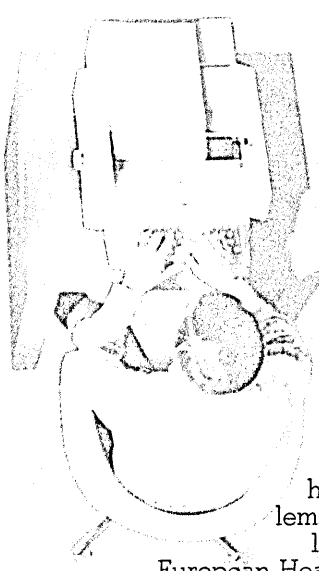
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calendar

APRIL

Computer Law Assn. Conference, April 22-23, San Francisco. "Computer Law: The State of the Art" is the conference title, with technical sessions on the legal aspects of information processing and computers. Fees: \$24, member; \$36, nonmember. Contact: Richard L. Bernacchi, Suite 900, 1800 Avenue of the Stars, Los Angeles, Calif. 90067, (213) 277-1010.

6th Annual NCR Users' Conference, April 25-28, Atlanta. NUCON:76 will attract several hundred NCR users to a discussion of "The Communication Challenge." Fees: \$105, advance; \$125 on-site. Contact: George A. Ellis, P.O. Box 2055, Kettering, Ohio 45429, (513) 294-8440.

8th Annual Southeastern Symposium on System Theory, April 26-27, Knoxville. Engineers and scientists are the prime audience for this meeting at the Univ. of Tennessee, co-sponsored by the IEEE Computer Society. Papers will be presented on some of the following topics: process modeling and control, microcomputers and minicomputers, pattern recognition, system simulation, and systems reliability. Fees: \$40, member; \$45, nonmember (these both include luncheon, a short course on microprocessors, and a copy of the proceedings); and \$5, students. Contact: Prof. Walter Green, Elect. Engrg. Dept., Univ. of Tennessee, Knoxville, Tenn. 37916, (615) 974-3347.

MAY

8th Annual ACM Symposium on Theory of Computing, May 3-5, Hershey, Pa. Thirty papers will be presented in such areas as analysis of algorithms, formal languages and automata, and theory of computation. Fees: \$50, member; \$57, nonmember; \$45, author; \$10, student. Contact: Prof. Emily P. Friedman, Dept. of System Science, 4531 Boelter Hall, UCLA, Los Angeles, Calif. 90024, (213) 825-2360.

ELECTRO/76, May 11-14, Boston. This convention and exposition, co-sponsored by the Central New England Council and METSAC section of the IEEE, and New England and New York chapters of the Electronic Representatives Assn., is a merger of two previous annual events—IEEE Intercon, and NEREM. Approximately 250 companies will have displays. Attendance is expected to be 25,000. Registration fee for exhibits and all sessions is \$6, IEEE member; \$9, nonmember. Contact: William C. Weber, ELECTRO 76, 999 No. Sepulveda Blvd, #410, El Segundo, Calif. 90245, (213) 772-2965.

Canadian Computer Conference, Session '76, May 17-19, Montreal. Jointly sponsored by the Canadian Information Processing Society and the Computer Science Assn., the program covers teaching of computing and computer science, data bases, system management, minicomputers, concepts and theory of program organization, and metric conversion. Contact: J.H.M. Williams, P.O. Box 8100, Montreal, Quebec, Canada, (514) 877-5175.

1st Conference on Laser and Electro-Optical Systems (CLEOS), May 25-27, San Diego. The IEEE and the Opti-

cal Society of America (OSA) are joint sponsors of this technical forum on developments in and applications of lasers and electro-optic systems. An attendance of 1,500 engineers, scientists, and users is expected. Fees: \$30, member; \$35, nonmember; add \$5 after May 10; \$15, students. Contact: CLEOS, Optical Society of America, Suite 620, 2000 L St., N.W., Washington, D.C. 20036, (202) 293-1420.

Trends and Applications 1976: MICRO and MINI Processors, May 27, Gaithersburg, Md. Tutorial papers describing practical experiences with processors and presenting new research results will focus on networks of processors, intelligent terminals, programming and operating systems, security, and performance evaluation, among other topics. The symposium is co-sponsored by IEEE area chapters and the National Bureau of Standards. Fees: \$15, member; \$20, nonmember; add \$5 for registration on-site; \$7.50, students. Contact: Trends and Applications, P.O. Box 125, Columbia, Md. 21045.

6th Int'l. Symposium on Multiple-Valued Logic, May 25-28, Logan, Utah. Tutorial, invited, and research papers plus panel and informal discussions will cover engineering, logical, mathematical, and philosophical aspects of the subject topic. The conference is co-sponsored by the IEEE Computer Society, ACM, Office of Naval Research, and Utah State Univ. Fees: \$50, member; \$65, nonmember (add \$10 after May 5); \$10, student, before May 5, \$15 after. Contact: Prof. E. E. Underwood, UMC 41, Utah State Univ., Logan, Utah 84322.

CALL FOR PAPERS

17th Annual Symposium on Foundations of Computer Science, Oct. 25-27, Houston. Papers describing original research in the theoretical aspects of computer science are being sought; topics of interest are analysis of algorithms, computational complexity, switching and automata theory, and theory of programming and compiling. Seven copies of a detailed abstract should be sent by May 17 to Prof. Michael J. Fischer, Dept. of Computer Science, FR-35, Univ. of Washington, Seattle, Wash. 98195. The conference is sponsored by the IEEE, ACM, Rice Univ. and the Univ. of Houston.

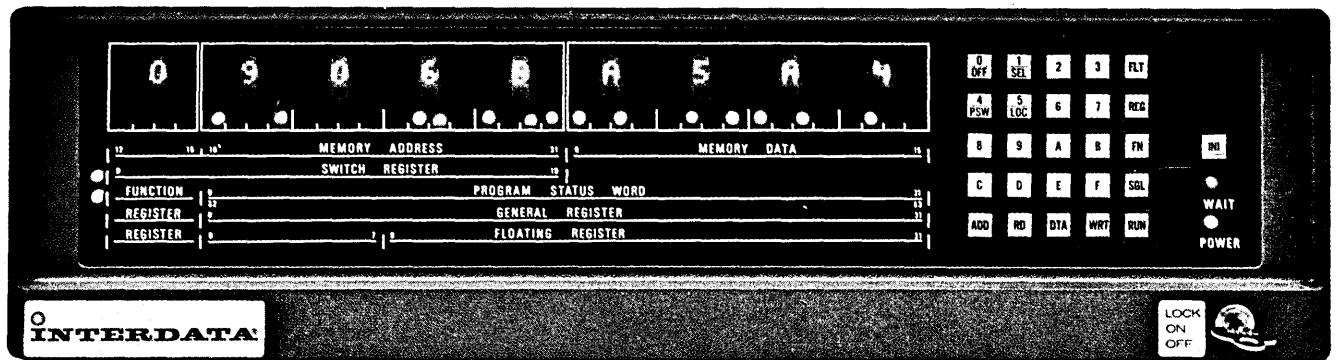
Assn. of Computer Programmers and Analysts 6th Annual Conference, ACPA-6, Nov. 10-12, Washington, D.C. Papers are solicited on the theme, "Pathways To The Future," including subjects such as career development, on-line interactive search systems, data base management software structures, women in data processing, networked minicomputers, and others. Papers should include an abstract not to exceed 150 words. Deadline is June 1. Information may be obtained from David R. Skeen, program chairman, Office of Naval Research, Rm. 232, 800 N. Quincy St., Arlington, Va. 22217.

ON THE AGENDA . . .

International Communications Assn., (ICA) 29th Annual Conference, May 2-7, Washington, D.C. **Assn. for Systems Management, May 16-19**, Toronto, R. B. McCaffrey, 24587 Bagley Rd., Cleveland, Ohio 44138. **SEMICON/West '76, May 25-27**, San Mateo, Calif. (408) 241-7400. *

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

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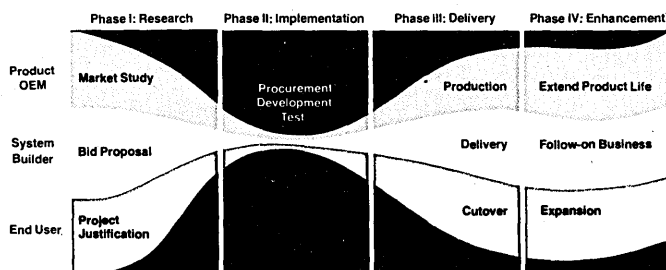
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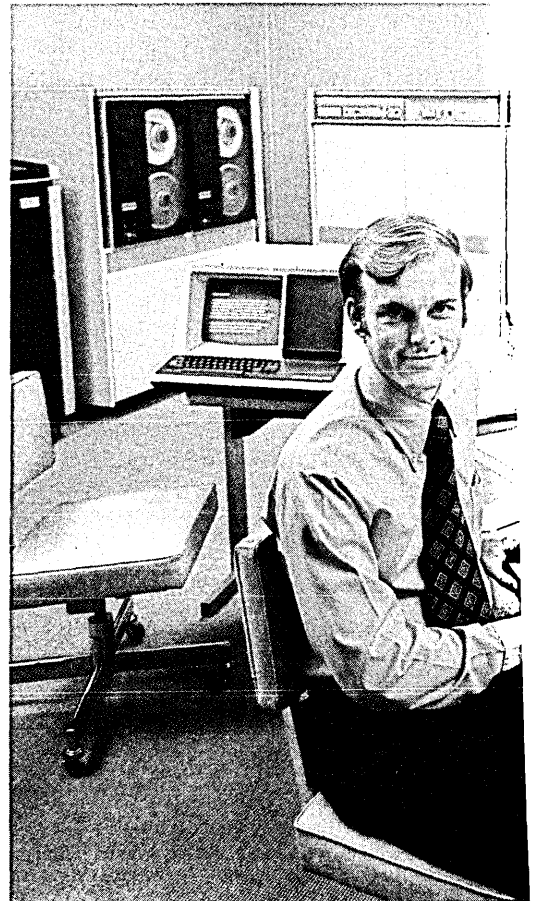
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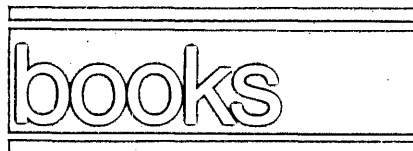
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Computer Power and Human Reason: From Judgment to Calculation

by Joseph Weizenbaum
W. H. Freeman & Co., 1976
300 pp. \$9.95

The subtitle of this book encapsulates its argument: entranced with the power of computers, some of us have begun to see human capabilities in terms of what a computer can do. Professor Weizenbaum says that, even measured against the most outlandish claims of the Artificial Intelligentsia, this way of understanding what it means to be human is a shriveling of the concepts of freedom, dignity, and—yes—even grandeur and sanctity of spirit that, until our troubled age, have been claimed for humanity.

Others have said similar things, sometimes in more general terms, of the misuse of scientific rationalism (Ellul, Mumford, Roszak, etc.), but never before have these things been said so forcefully about the use of computers, or by a prominent professor of computer science, speaking from one of the very temples of scientific rationalism and of computer science, MIT. Indeed, Weizenbaum is the author of the ELIZA system, which demonstrated nearly ten years ago that a computer can be made to imitate one type of psychotherapist. It was the widespread misunderstanding of the meaning of this work, and the startling reactions that people had when using it, that led to the writing of this book.

Putting it another way, a member of the priesthood is here reacting with anguish to what he sees as a desperately wrong twisting of his work. Summarizing his feelings about suggestions that computers could be used to provide psychotherapy to actual troubled human beings, he says: "... there are some human functions for which computers *ought* not to be substituted. It has nothing to do with what computers can or cannot be made to do. Respect, understanding, and love are not technical problems."

Computer science, in a parable that recurs as a refrain through the book, is likened to a drunkard searching for his

lost keys under a lamppost. He tells an inquiring policeman that he lost the keys "over there," pointing to the darkness, but that he is searching under the lamppost "because the light is so much better here." In other words, if you don't know how to solve the important problems, redefine them to fit whatever techniques are available.

This is Weizenbaum's view of the more expansive claims and goals of the Artificial Intelligence set, such as John McCarthy (Stanford), Herbert Simon (Carnegie-Mellon), and Marvin Minsky (MIT). These workers believe essentially that there is nothing a human being can do that cannot in principle be done by a computer. To hold such a view, it is necessary to believe that a human being is at root only an information processor, and that it is only a matter of time until we learn how to represent all human actions in a computer processable form.

Not so, says Weizenbaum. It is not at all clear that everything involved in human neurophysiology (about which our ignorance is nearly total) is representable in information processing terms. Examples cited include kinesthetic sense, the work of the unconscious as in dreaming, intuition, and the different modes of knowing of the right and left hemispheres of the brain. Marvin Minsky says that to understand music and paintings is to be able to write computer programs that will produce them, which is a breathtaking redefinition of the vast scope of human creativity to make it no larger than the patch of light under the lamppost of computability.

John McCarthy says, "The only reason we have not yet succeeded in simulating every aspect of the real world is that we have been lacking a sufficiently powerful logical calculus. I am currently working on that problem." Weizenbaum responds by telling how he and his wife used to stand watching their

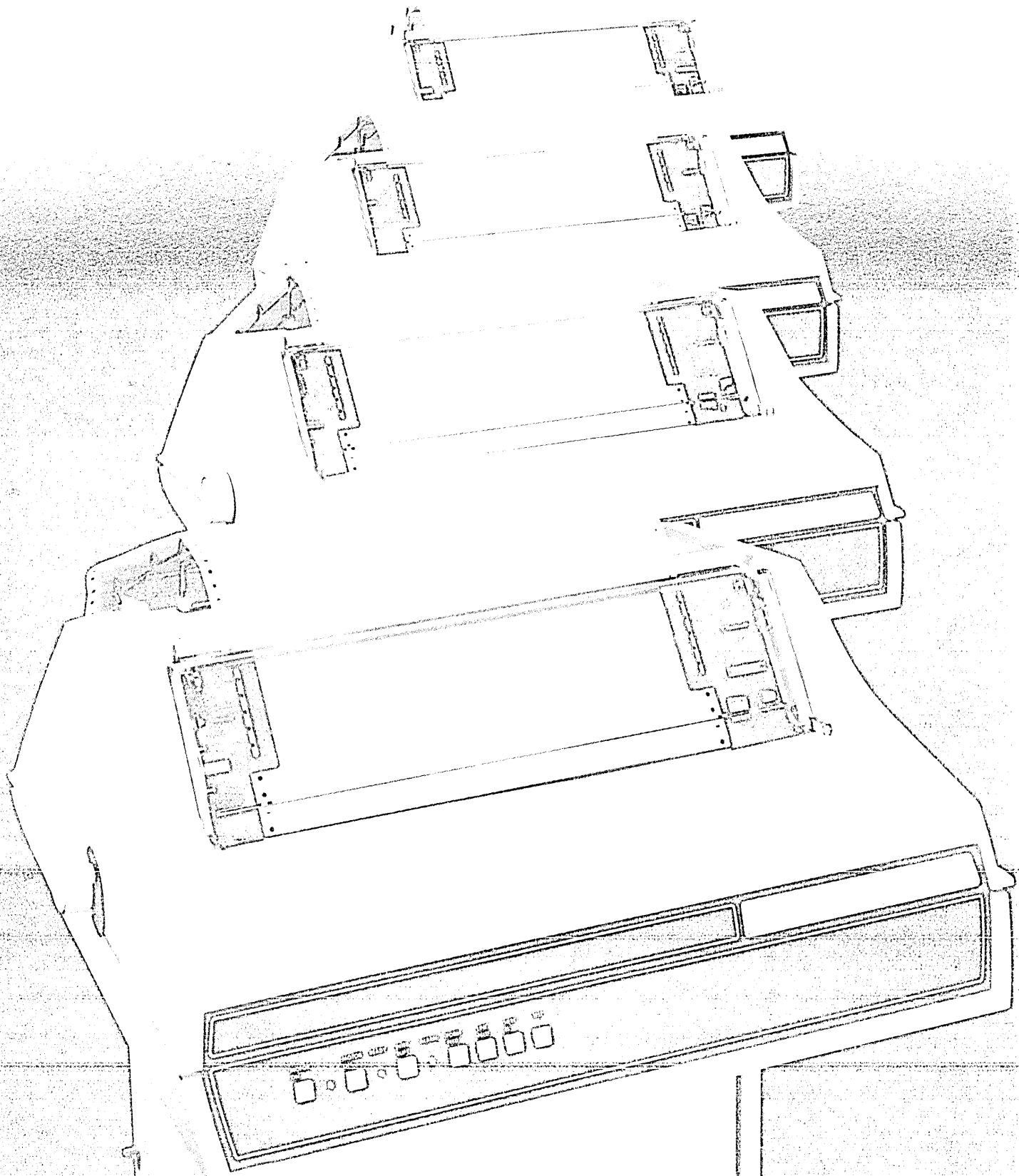
sleeping children when they were younger. "We spoke to each other in silence, rehearsing a scene as old as mankind itself. It is as Ionesco told his journal, 'Not everything is unsayable in words, only the living truth.'"

This is a highly stimulating book, with dozens of absorbing passages that there is not space here even to mention. It will be read with great interest by a varied audience. (One imagines that the rebuttals are already pouring out of the typewriters of the Artificial Intelligentsia, the sounds of typing drowned out by the sounds of gnashing teeth.) Computer people will find nuggets throughout, such as a description of computer jocks (here called compulsive programmers), a discussion of models and theories, and a review of the state of language translation by computer. Some of us may find a hiding place where no one can see what we are doing and read the material on Turing machines—which "everyone" understands, but doesn't. Members of the general public will know of the book through reviews in major publications and through its publicity as a Book-of-the-Month Club alternate.

One could wish that the book had been aimed more specifically at one audience or the other. The two chapters on how computers work will be, by and large, too simple for computer people and too condensed for the general public. In some places, more explanation of the reasoning would be welcome. For example, the author's reasons for opposing voice recognition by computer are fully explained, but connecting a computer to the visual system and brain of an animal is regarded as so repulsive as not to need further elaboration. I fear that, although I am in sympathy with about 99% of what is said in the book, I don't understand why this particular prospect is so repugnant, in view of the potential both for gaining understanding of neurophysiology and for producing substitutes for lost human sense organs.

But these are minor quibbles. In my view this book will come to be regarded as a towering milestone in the history of attempts to understand the significance of computers. There are differences between computers and human beings, deep and fundamental differences that will not disappear no matter how many new tricks we learn about using computers. As Professor Weizenbaum says in concluding his chapter on Artificial Intelligence:

"What could be more obvious than the fact that, whatever intelligence a computer can muster, however it may be acquired, it must always and necessarily be alien to any and all authentic human concerns? The very asking of



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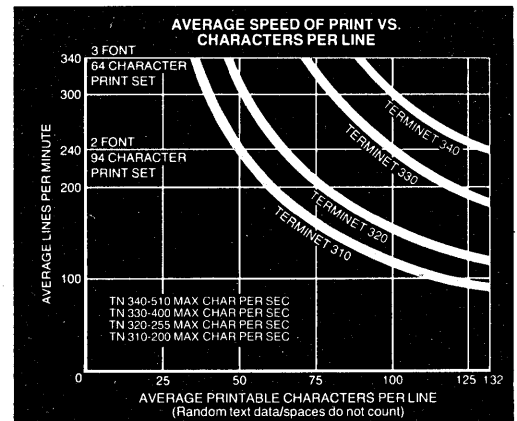
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the question, "What does a judge (or a psychiatrist) know that we cannot tell a computer?" is a monstrous obscenity. That it has to be put in print at all, even for the purpose of exposing its morbidity, is a sign of the madness of our times."

—Daniel D. McCracken

Mr. McCracken is the author of many texts on computer programming and chairman of the Committee on Computers and Public Policy of the Association for Computing Machinery.

Top-Down Structured Programming Techniques

by Clement L. McGowan and John R. Kelly
Petrocelli Books, 1975
288 pp. \$14.95

The authors of this book have done an excellent job of discussing top-down structured programming (TDSP) and accompanying their discussion with examples of sufficient clarity so that even the dumbest klutz in a dp organization will get the message. The material is very well written, easy to follow, and designed for practical adaptation rather than classroom athletics.

The authors use PL/I as a target language for programming illustrations. They also provide parallel narratives and examples for the COBOL, FORTRAN, and assembly language analogues to PL/I, thus satisfying the bulk of the source language users in the world.

One chapter explains chief programmer team techniques which, when combined with TDSP, improves programming performance even further. The chapter is nicely done and one may gain worthwhile insight from it.

I would recommend that every programming organization obtain copies of this book and make it mandatory reading for anyone connected with computer activity. Based on my own experience of the way programming shops function and having seen what often passes for programs, I can almost guarantee that you can improve your situation by taking advantage of the material in this book.

However do not follow everything this book prescribes. The organization which blindly adopts TDSP guidelines is as doomed to failure as the organization which does not. Find out *where* to apply these rules and where *not* to apply them. In some cases you may like a particular schema but may be unable to apply it. For instance, you will undoubtedly be enthusiastic about the chief programmer team techniques, but don't be deluded into believing that you actually have a person in the organization capable of being a chief programmer. It was no will-o-the-

wisp that the chief programmer described in the book has a Ph.D.!

Finally, although I am enthusiastic about the McGowan-Kelly book, it is not without faults. Happily, these faults will not hamper your progress (which makes the book good) but *could* hamper your conceptual treatment of the entire subject. Dijkstra clearly understood that he was trying to deal with *large* programs. In articles he used *small* programs only for the sake of illustration. McGowan and Kelly have ignored this idea to the point of despair. Thus one might be tempted to believe that if individual lines of code are structured, we will accomplish something outstanding in and of itself. This approach leads the reader to derive programming rules such as, "every IF statement in a COBOL program must be accompanied by a

BOOK BRIEFS . . .

The Delphi Method

Harold A. Linstone and Murray Turoff, eds.
Addison-Wesley Publ. Co., Inc., 1975
620 pp. \$29.50 (\$16.50 paperback)

Delphi is a technological forecasting procedure developed in the early '50s as an attempt to improve upon the forecasting ability of a single expert. The method's first application was to estimate the probable effects of a massive atomic bombing attack on the United States, but has since been widely used in such areas as regional planning, medical forecasting, and educational planning.

The procedure has three essential features: anonymous response, iteration and controlled feedback, and statistical group response, all designed to minimize an individual's influence on others. Members of a typical Delphi panel never meet each other, eliminating possibilities of swaying responses of other members.

This book, a compilation of techniques and applications, is organized in eight sections: introduction, philosophy, general applications, evaluation, cross-impact analysis, specialized techniques, computers and the future of Delphi, and a checklist of eight basic pitfalls. An extensive bibliography is an excellent aid to both novice and advanced student of the Delphi method.

Structured Computer Organization

by Andrew S. Tanenbaum
Prentice-Hall, Inc., 1976
443 pp. \$18.50

With a basic knowledge of computer science and FORTRAN, COBOL, or PL/I, the reader should gain an understanding of multilevel machines and computer architecture, as well as associated programming languages from this volume. The book seems to be well-organized and detailed, and uses the IBM 370, CDC Cyber, and DEC PDP-11 com-

fully written out ELSE statement." This is simply stupid and not in keeping with intelligent, perceptive thinking which should guide most of what we do. There is no point in applying rules when none are needed.

Another fault is the authors' failure to perceive properly an important cause for success: a better focus on problem definition. If we left everything else concerned with programming alone and merely did a more thorough job of defining the problems we wish to solve, the resulting programs would be orders of magnitude better.

All things considered, however, the McGowan-Kelly book is an excellent exposition of TDSP.

—Gerald H. Larsen

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

puters as examples. There is also an extensive annotated bibliography.

Second USA/Japan Computer Conference Proceedings (1975)

AFIPS Press, 210 Summit Ave.,
Montvale, N.J. 07645
615 pp. \$40 (20% discount to members of AFIPS constituent societies)

Papers presented in the 28 technical program sessions of the August '75 conference, sponsored by the American Federation of Information Processing Societies, Inc., and the Information Processing Society of Japan, cover the following areas: pattern recognition and image processing, hardware system architecture, numerical methods and computations, parallel processing, artificial intelligence and its applications, computers in health, medicine, and the instructional process, data bases and file management, computer networks and data communications, plus many more topics for a total of 120 papers. A copy of the First USA/Japan Computer Conference Proceedings is available for \$10 if ordered with the Second Proceedings. That publication includes 107 papers on computers and the humanities, architecture and large scale systems, automatic design, man-machine interaction, and industrial applications, among others.

Introduction to Systems Analysis

by Gerald A. Silver and Joan B. Silver
Prentice-Hall, 1976
279 pp. \$11.95

Recognition of the systems analyst's responsibility to decide when "to use a ten-cent pencil and when to use a million-dollar computer" illustrates the real life approach to be found in this introductory text, which attempts to help those cost-conscious analysts design and develop effective systems to solve complex and sophisticated business problems. The book presents its topic in a step-by-step format, com-

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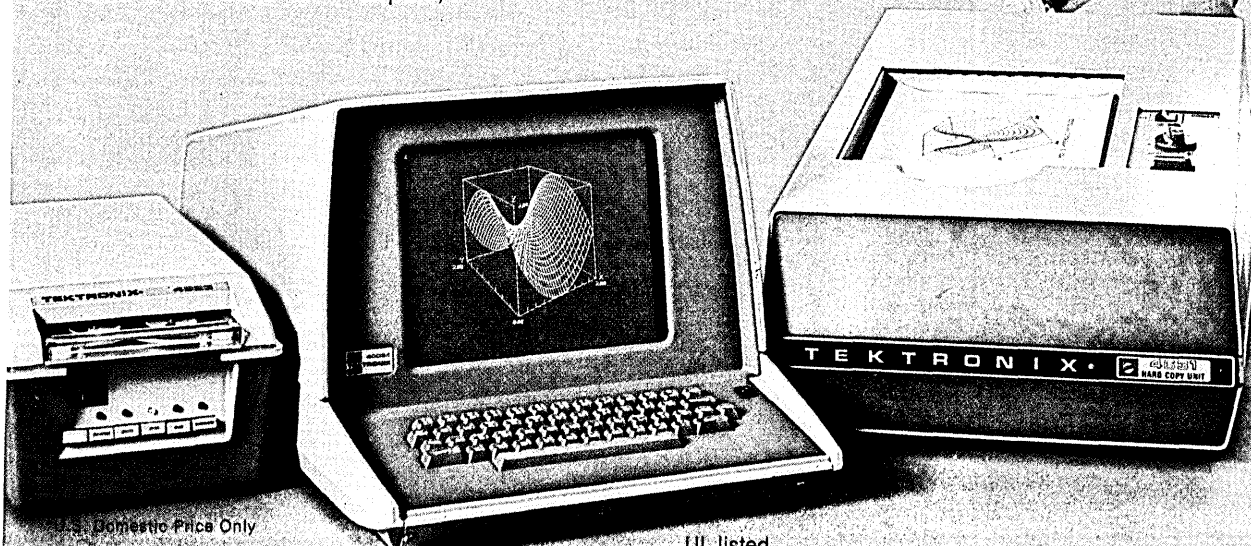
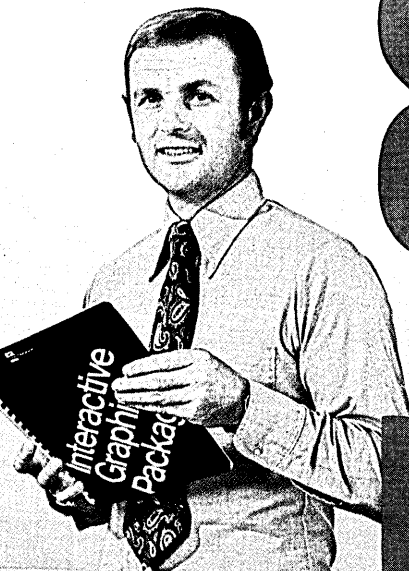
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Why wait for graphics? Let graphics wait on you. See what our fine-line, full-line graphics can mean for your applications. Check out the whole story and all the prices right now with your local Tektronix Sales Engineer. Or write:

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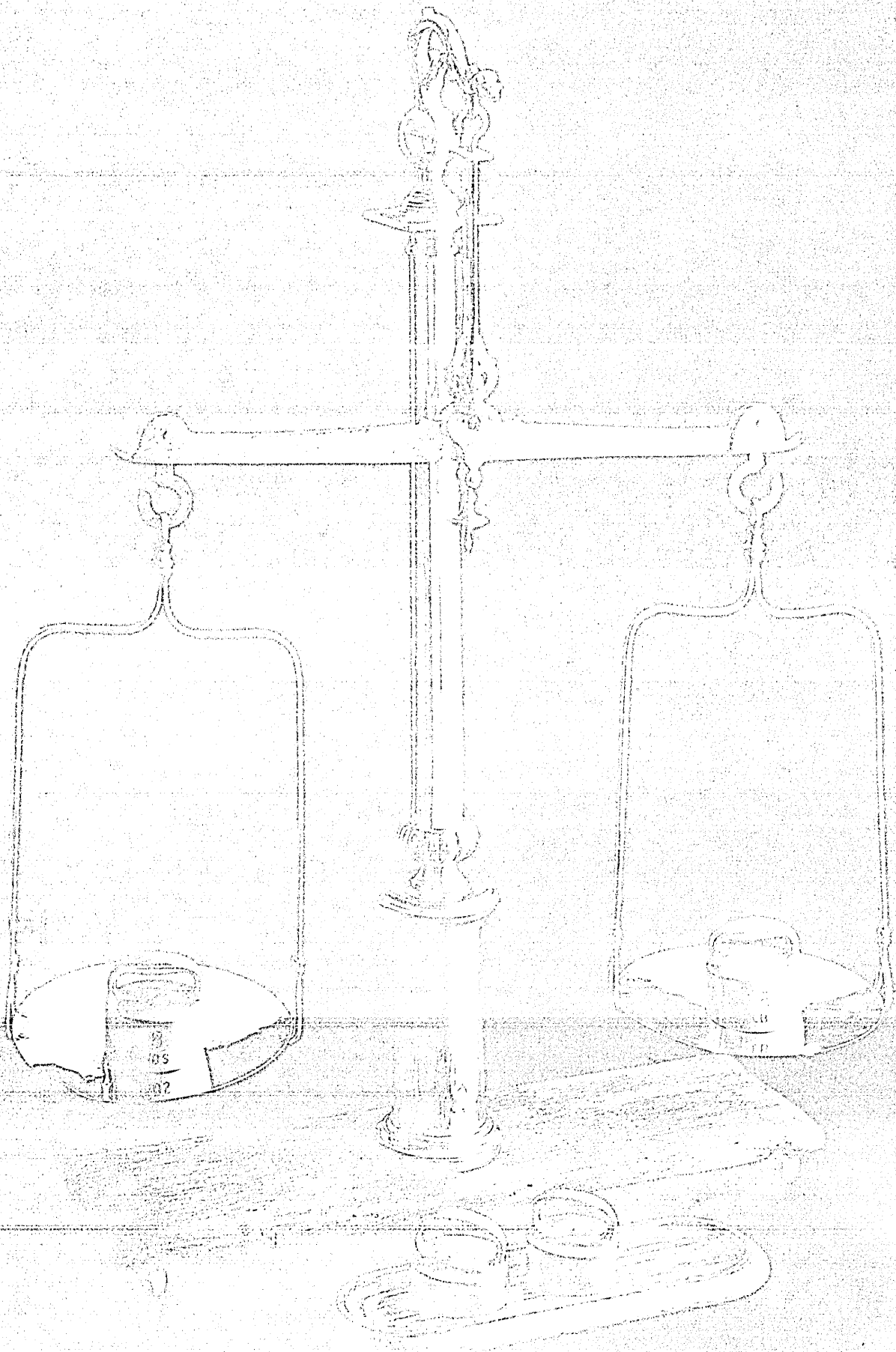
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Graphics \$2995



The SEL Mini keeps its balance, to help you keep yours.

Any systems designer knows that if you don't have a balanced system going in, the end result can be intolerable.

So at Systems, the SEL 32 Mini was designed to be a totally balanced system, in every respect.

Let's see how the SEL 32 Hardware balances with the SEL 32 Software.

On the hardware side of the scale, we'd like to say a few brief words about obsolescence, throughput, and I/O.

The SEL 32 Mini's powerful CPU architecture is proof against obsolescence. Want to upgrade? Just change a board or two.

Throughput? The SEL Bus is capable of transferring data and commands at a continuous throughput of 26 megabytes per second. Based on a 150 nanosecond clock, this has established the industry standard for bus speed.

Lastly, I/O. The SEL 32 is the only 32-bit mini that employs micro-programmable, independent processor-based I/O, so it doesn't have to steal cycles.

That's all quite nice, but so far, it's just iron. Let's take a look at the other side of the scale: software.

You understand the impact of unreliable software. The SEL 32 software has seen over five years of enhancement and action, so you can be sure it's bug-free, seasoned, and headache-proof.

But there's more to software than a super track record.

The nucleus of our software is provided by a powerful, disc-based Real Time Monitor ... a true multi-programming operating system capable of handling up to 255 concurrently executing tasks.

One of those tasks, the new SEL Terminal Support Subsystem, allows up to 16 CRT operators to develop programs, debug, or activate tasks... concurrently. Result? Increased flexibility.

Another SEL software bonus is our highly optimizing FORTRAN IV Compiler, which reduces the amount of memory and execution time required for a program. In addition to its full ANSI-standard capabilities, several extensions are available which enhance its real-time applications even further.

There's more, of course, such as RJE terminal support, graphics software, a BASIC compiler, and additional operating systems.

Consider, then, this combination: Flexible, reliable software, based on our powerful RTM; and dynamic hardware, with Independent I/O, record-shattering bus speed, and totally upgradeable CPU, which absolutely defies obsolescence.

This is how the SEL 32 keeps its balance... to help you keep yours. (And for as little as \$18,000, it's been known to help balance some corporate budgets, too.)

Write or call us today. We'll send you the whole story of the SEL 32 Mini.

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source data

plete with useful examples, tables and illustrations.

Simulation with GASP-PL/1
by A. Alan B. Pritsker and
Robert Young
John Wiley & Sons, Inc., 1975
335 pp. \$16.50

GASP-PL/1 is the only simulation language available in PL/1 for simulating systems involving both discrete and continuous exponents. This book provides procedures and information necessary to use the language, and should be of interest to engineers, ecologists, management scientists, and systems analysts. It describes the concepts and programming basis for GASP-PL/1, and uses ten examples to illustrate applications.

Computer Output Design
by Susan Wooldridge
Petrocelli/Charter, 1975
262 pp. \$11.95

The generous use of illustrations, diagrams, and examples treats an often neglected topic, the format of data (the computer output) for human use. The book explains principles of various types of output devices, but primarily emphasizes design techniques to enable systems analysts to plan information presentation that will be useful and appropriate.

Computer and Job-Shop Scheduling Theory
E. G. Coffman, Jr., ed.
John Wiley & Sons, 1976
299 pp. \$18.95

This volume is a highly technical, multiple-author text which provides theories for sequencing problems arising in computer and job-shop environments. Chapters deal with such topics as algorithms for minimal-length schedules and enumerative and iterative computational approaches. There are many examples and mathematical tables.



Datamation Subject Index

There are still a number of copies of the subject index for the 1975 issues of DATAMATION (Vol. 21, Nos. 1-12). References to feature articles, news stories, conference reports, Editor's Readout, the Forum, Look Ahead, People, and book reviews are included. DATAMATION, Los Angeles, Calif.

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Dedicated Digital Networks

The 1976 edition of CCM's telecommunication research report, *Planning Guide: Dedicated Digital Networks*, discusses functional and operational aspects of the common carrier's service offerings. Customer equipment interface and customer system considerations are emphasized. The 316-page report contains an overview and forecasts, and presents the latest tariffs and other pertinent information on AT&T, Datran, Western Union, DATAROUTE (the Trans-Canada system), European systems, and International Digital Data Service (IDDS). Discussions of system planning considerations, switched digital services, and extensive detailed appendices complete the report. Price: \$75 plus \$10 handling. CENTER FOR COMMUNICATIONS MANAGEMENT, INC., P.O. Box 324, Ramsey, N.J. 07446.

Data Communications Management

Auerbach Data Communications Management, in the Auerbach Information Management Series, is a loose-leaf reference service consisting of portfolios on a variety of topics such as SDLC, System Network Architecture, data communications software, performance measurement, planning and control, evaluating on-line system capacity, etc. Two quite useful portfolios are the data communications glossary and the introduction to data communications.

New portfolios are added bimonthly, and they are arranged in five sections: planning, design and development, system administration, fundamentals, and products and services. Each portfolio contains a thorough and useful discussion of each topic, and a recommended course of action. Subscription: \$125.

Also in the series are *Auerbach Computer Programming Management* (\$125) and *Auerbach Data Processing Management* (\$195). Trial subscriptions for 30 days are available for all three. AUERBACH PUBLISHERS INC., Pennsauken, N.J.

FOR DATA CIRCLE 202 ON READER CARD

EFTS

A 70-page report, *The Explosion of State Laws on Electronic Fund Transfer Systems* by Daniel Prives presents a history of the laws, a discussion of definitions and sharing provisions, and issues and options for future legislation. The nonexclusive audience for the report is indicated by the subtitle: "Its Significance for Financial Institutions, Non-financial Institutions, and Consumers." Price: \$3 plus postage. Program on Information Technologies and Public Policy, HARVARD UNIV., Cambridge, Mass. 02138.

Data Base Reports

The first three titles in a Data Base Monograph Series edited by Robert M. Curtice are *Access Mechanisms and Data Structure Support in Data Base Management Systems*, *Planning for Data Base Systems*, and *Data Base Design Methodology*. Mr. Curtice is the author of the first two, and Paul E. Jones, Jr. wrote the third; both are with Arthur D. Little, Inc. Price: \$15 each (\$12.50 each if prepaid), and \$10 each in orders of 10 or more. Q.E.D. INFORMATION SCIENCES, INC., P.O. Box 181, 141 Linden St., Wellesley, Mass. 02181.

Printers

From \$1.08 billion in 1974 to \$3.6+ billion in 1985 will be the growth in the U.S. market for computer printers, finds the 182-page study, *Computer and DP Printer Market (USA)*. In addition, the non-impact printer market share will jump from 7% in 1974 to 20% in 1985. The very competitive printer market consists of 110 manufacturers offering about 500 different models, with IBM dominating. The percentage market breakdown for printer types are given (word processing, minicomputers, small business systems, small, medium and large mainframes, etc.). Price: \$600. FROST & SULLIVAN, INC., 106 Fulton St., New York, N.Y. 10038.

Personnel Administration

The 170-page *DP Personnel Administration* should prove useful to corporate personnel directors and dp managers. It presents solutions to specialized problems of dp personnel administration, and covers topics such as salary surveys, interviewing and recruitment techniques, suggested job descriptions, and motivation methods. Culled from several Auerbach reference services, this volume is the first in the Auerbach Signature Series on specific management topics. Price: \$14.95. AUERBACH PUBLISHERS INC., 6560 N. Park Dr., Pennsauken, N.J. 08109.

Dp Audit

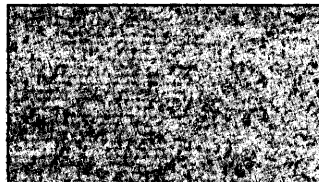
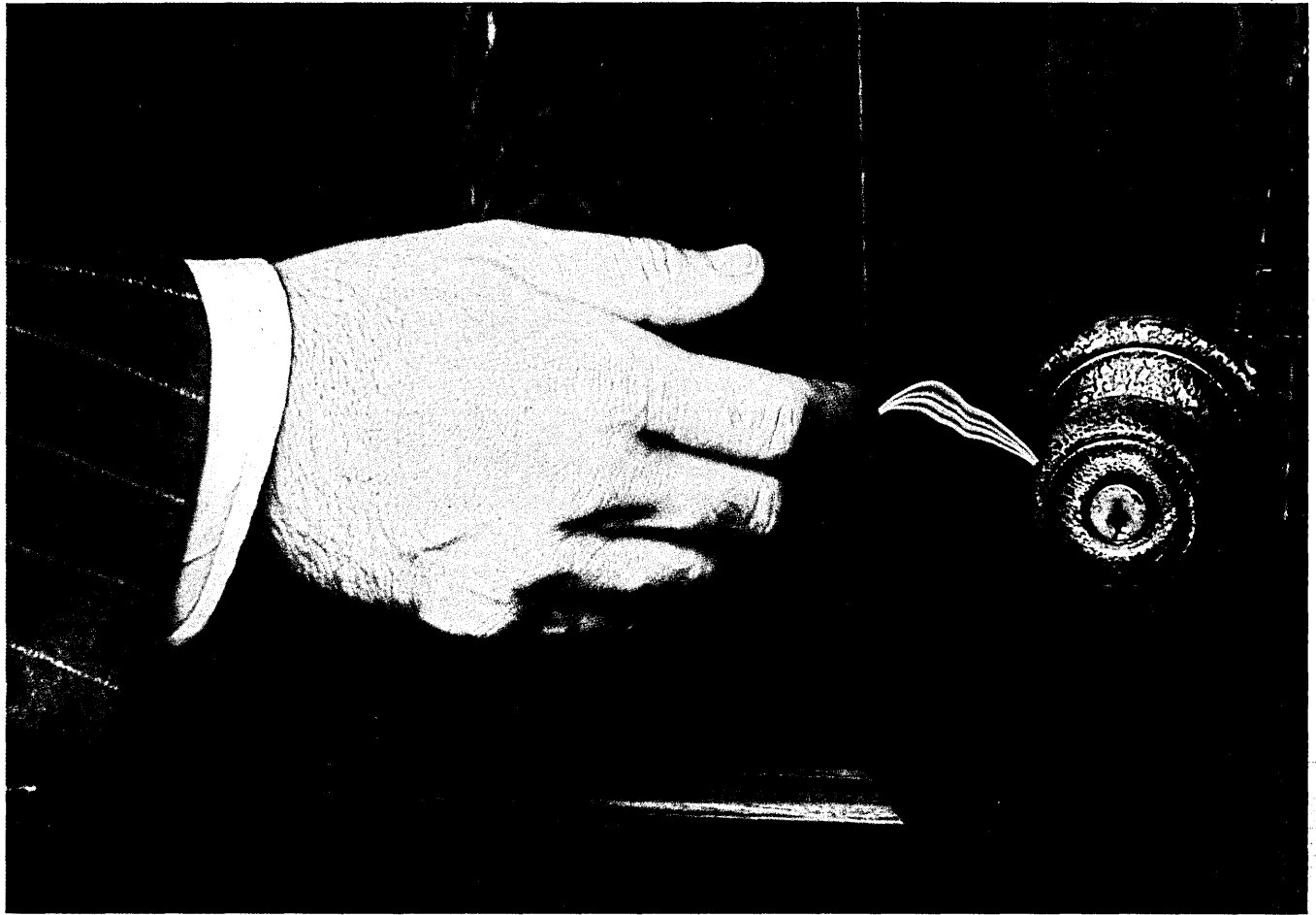
An article, "How Good is Your EDP?" by Lawrence Feidelman suggests an annual dp audit and suggests ways for in-house personnel to evaluate hardware, software, and the dp staff. MANAGEMENT INFORMATION CORP., 140 Barclay Center, Cherry Hill, N.J. 08034.

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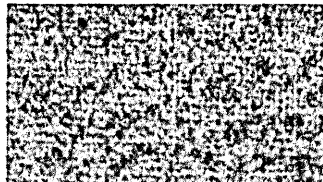
Electronics Glossary

A 40-page pocket glossary lists 425 commonly used electronic terms and includes a metric chart. Price: \$1.50 for 1 to 9 copies, progressively less for larger orders. HENRY LAVIN ASSOCIATES, INC., 12 Promontory Dr., Cheshire, Ct. 06410. (Continued on page 153)

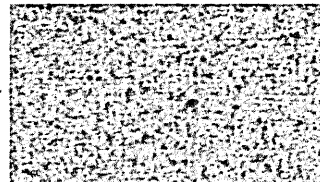
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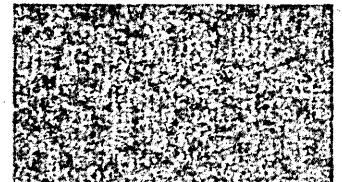
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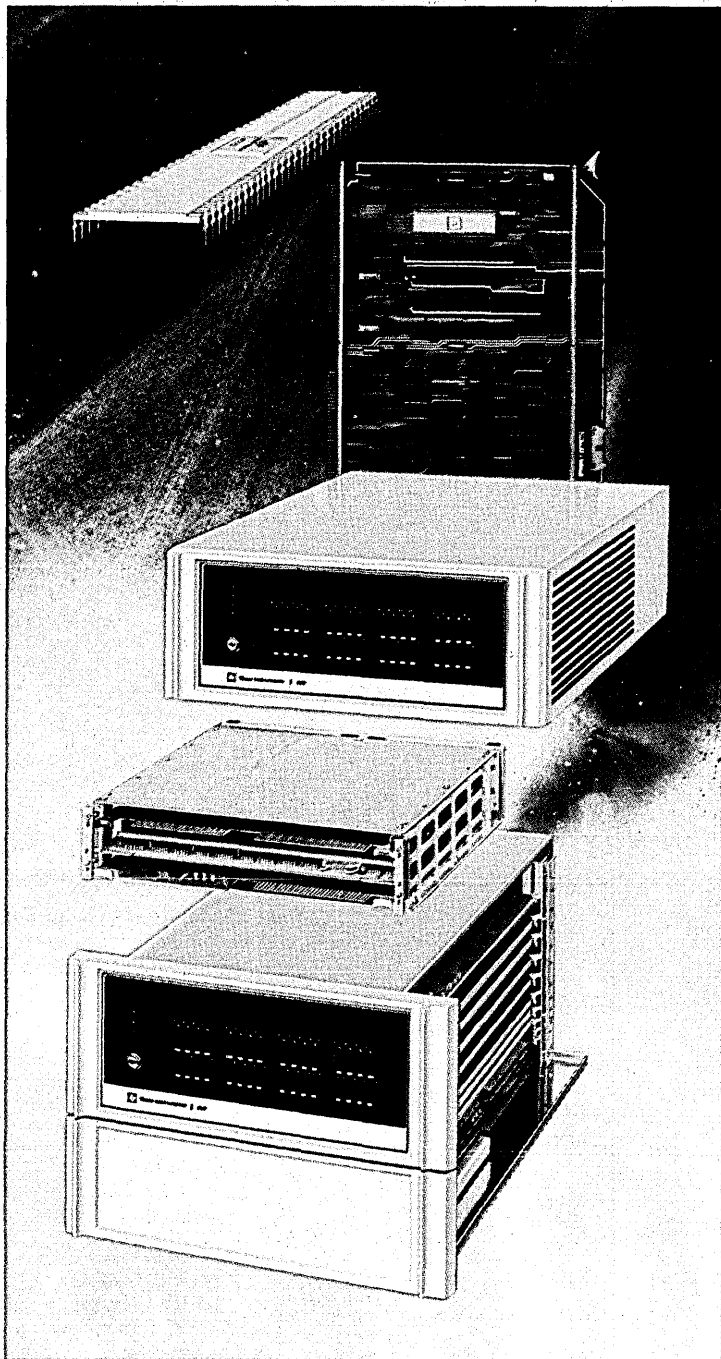
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Complete software libraries, as well as memory-resident and disc-based operating systems, support real-time and multi-tasking operations. We offer FORTRAN, COBOL and BASIC languages. Cross-support on timesharing networks allows early development of your own applications programs.

The TMS 9900 Microprocessor... The Technology Leader

The advanced capabilities of the 990 family result from a TI milestone in MOS technology...the TMS 9900 single-chip, 16-bit microprocessor. With its high-speed interrupt capability, hardware multiply-and-divide, and versatile instruction set, the TMS 9900 delivers the kind of computing power you'd expect from a 16-bit TTL computer. And it's the best microprocessor going for terminals, machine monitoring and control, and many other applications.

Because the TMS 9900 provides the instruction set for the new 990/4 microcomputer and 990/10 minicomputer, software developed for the low-end computers will be compatible with the higher performance models... and with a minimum of interface and software adaptation.

Versatile Operating Systems

The TX990 Executive Operating System Software uses either the 990/4 or 990/10 computer for low-cost multi-task control, requiring a minimum of peripheral support. The modular construction of TX990 allows users to select only the functions required for efficient memory usage, leaving more memory availa-

UMENTS HAS RE AND HARDWARE.

ble for application software.

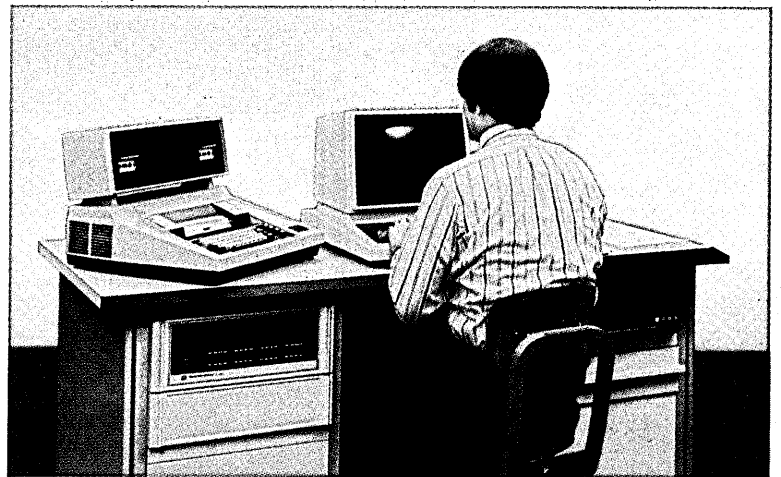
The 990/10 Disc System Software accents the mass-storage, random-access features of the disc with extensive file management and the multi-tasking features of the DX10 Operating System. The system software package includes a multi-pass 990 assembler, link editor, interactive source editor, and numerous other utilities that support easy implementation of application programs.

Flexible Packaged Systems

TI offers two packaged program development systems and a prototyping system for the user who needs his own stand-alone system for software and firmware development of application programs.

These packaged systems provide a flexible method of implementing early project development. These include the low-priced 990/4 Program Development System and the powerful 990/10 Program Development System. The 990/10 system combines the power of the 990/10 minicomputer with the disc-based DX10 operating system and an extensive set of software development tools. The standard package includes the 990/10 minicomputer with 64K bytes of error-correcting memory, ROM loader and diagnostics, 3.1-million byte removable disc kit with accompanying peripherals, and a complete software development package. And, at \$24,500, this system costs at least 20% less than comparable equipment from other manufacturers.

For developing firmware modules, there is a \$5950 prototyping system which includes a 990/4 computer with 16K bytes of memory and programmer's front panel, and a "Silent 700" twin-cassette ASR data terminal. Also, an optional PROM programming kit is available for



developing read-only memory.

In addition, we provide a wide variety of program development utilities for the 990 family. There is communications software that supports either synchronous or asynchronous data transmission, and can operate with the TX990 or the DX10.

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For more information, call your nearest TI office or write Texas Instruments Incorporated, P.O. Box 1444, M/S 784, Houston, Texas 77001.

Or, phone Computer Equipment Marketing at (512) 258-5121.



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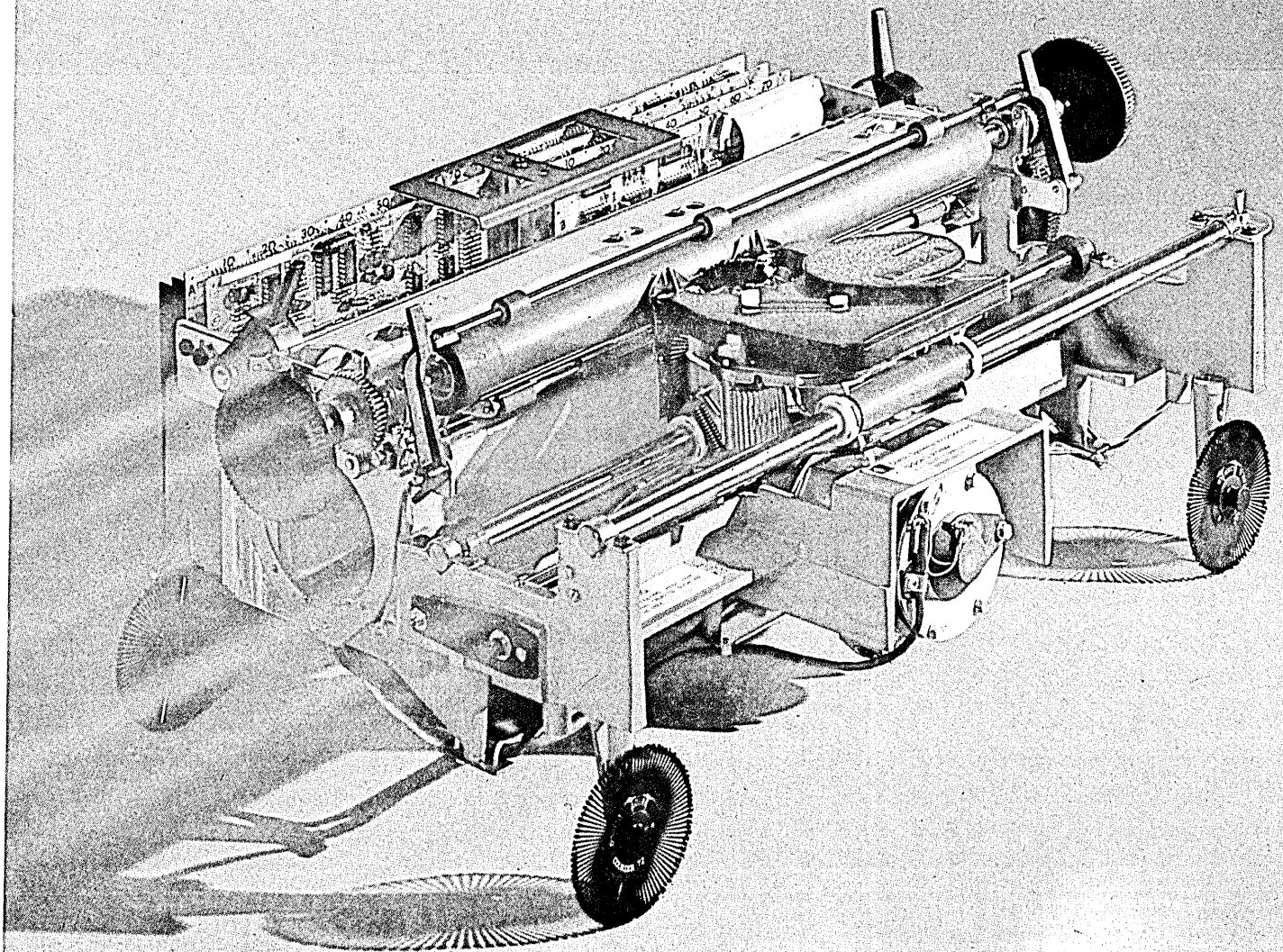
New 45 and 55 cps HyType Printers In Production
We've made a full line out of our proven HyType serial printer. With the experience gained from over 30,000 HyTypes in use, we added a 45 cps and 55 cps model, a new word processor model with an improved daisy wheel for even finer print quality. And, we have more options, too: bottom feed, split

platen, end-of-ribbon and paper-out signals, OCR wheels and 8 bit parallel microprocessor and RS-232 interfaces. We've even added more type faces, ribbon options and other supplies to broaden the application of HyType printers. After all, we planted the daisy idea in the first place; shouldn't you look to us, then, for major innovations and advances? Diablo Systems,

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Our 300 is a 30 CPS, portable terminal that operates over regular telephone lines. It's lightweight, compact, and a joy to work with.

It's also the most reliable terminal of its kind ever built. By anyone.

Ask a salesman who leased a 300 from us about a year ago. He dropped his unit off a desk during transportation, creating a shock that was probably

harder on our 300 than any machine. The 300 lost two characters, then continued operating as before.

Seemingly determined to destroy our unit, this same fellow then put this same 300 into the trunk of his car. An unscheduled rainstorm filled his trunk with muddy water, giving our machine a thorough bath, not to mention a perfectly good excuse to never work again.

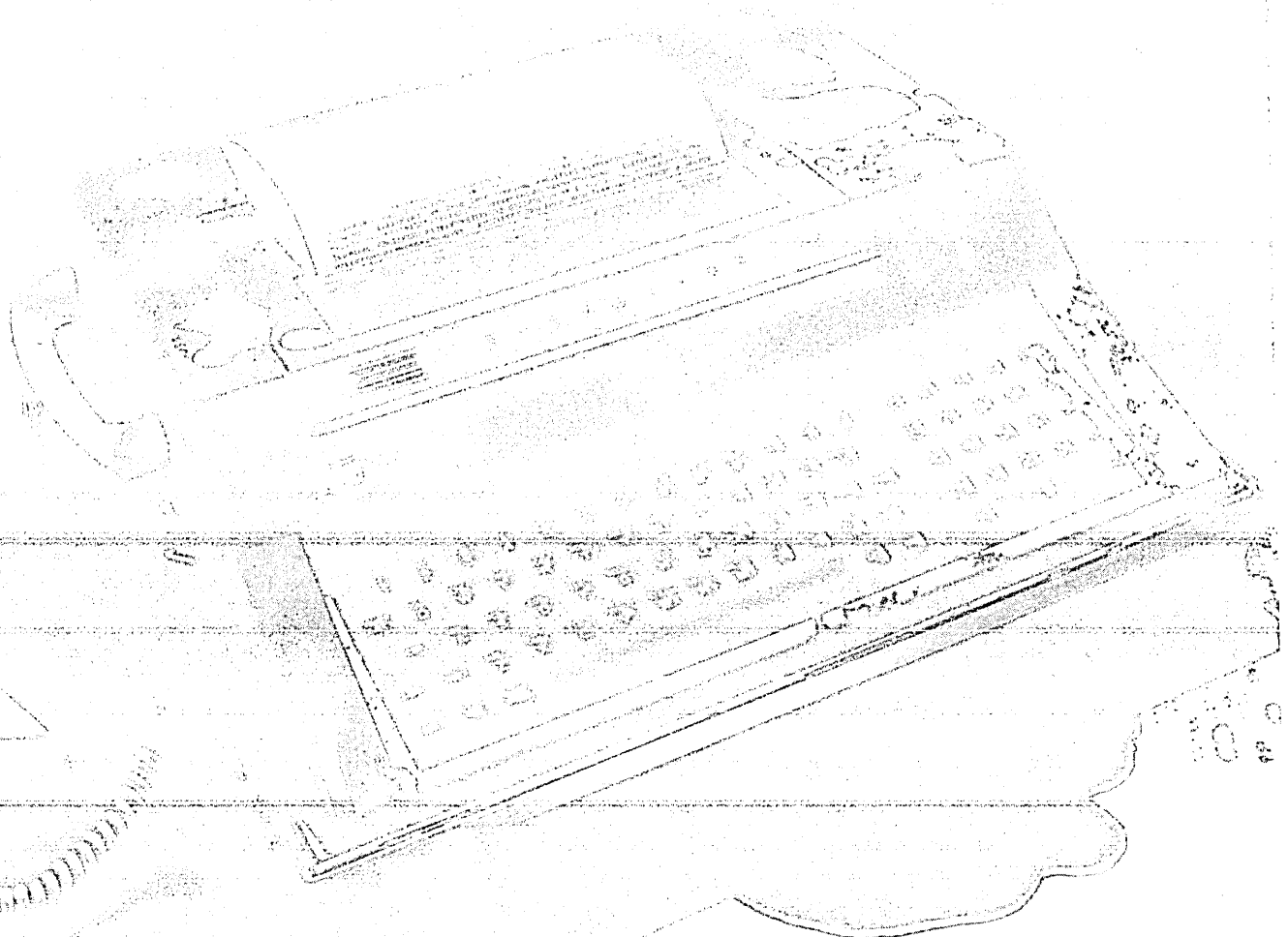
The 300 came through with nothing, if somewhat muddy, colors. Plugged in, it operated beautifully.

If you'd like to know more about a terminal that can stand up in this tough world, get in touch with Charles Kaplan or Shirley Newman at (208) 294-8300.

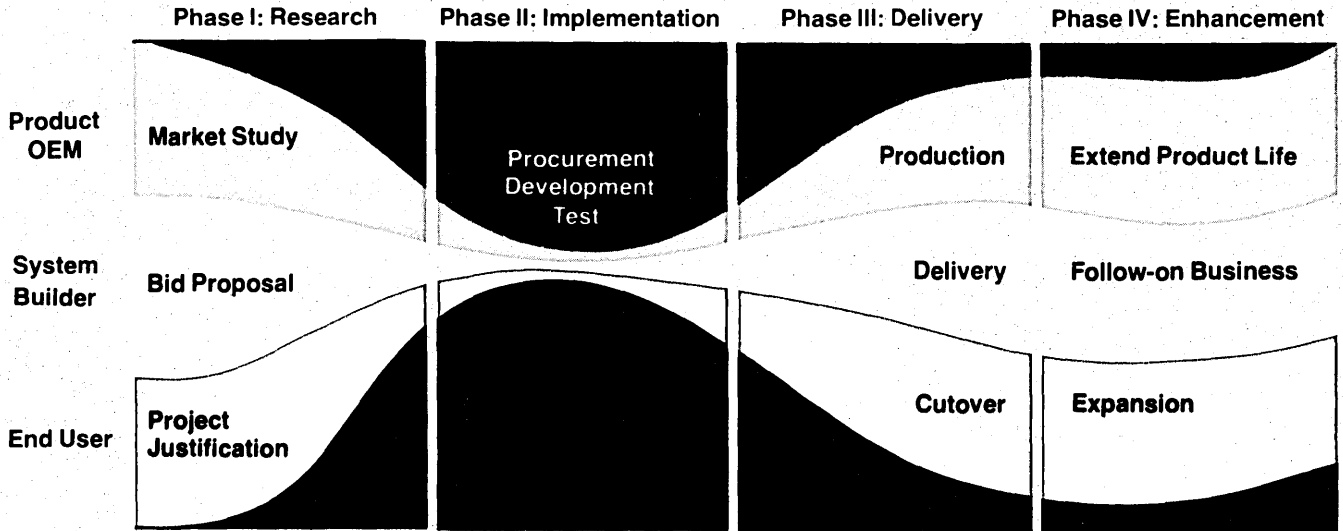
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Execuport 300 portable terminal.
Not just reliable. Practically unstoppable.



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The system that makes time stand still. The 4051 includes the off-line pre-processing power you've always wanted . . . whenever you want it. It offers cost-saving editing capacity. Terminal capability. The super-efficiency of Graphics.

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Editor's Readout

John L. Kirkley, Editor

Perhaps it's a result of the economic upturn, but over the past several weeks there's been an unusual amount of computer industry activity. As a result we came up with more important Look Ahead items than we could possibly fit in our regular three page format.

So we have given over this space, normally reserved for the Editor's Readout, to these additional late breaking stories, industry rumors and hot flashes.

LOOK AHEAD *(Continued from page 128)*

— Knowledgeable industry sources report that IBM's delayed FS is the victim of software development difficulties. System Q, code name for the new operating system, is reported to be so transparent that IBM can't find it.

— A soon to be announced French high scale computer, first product of newly merged Honeywell Bull and CII, will use a 1951 Chateau Lafite Rothschild as a coolant. Industry sources predict some operational difficulties as the cpu will only operate lying on its side in a cool dark place.

— Is Singer planning a re-entry into the computer marketplace? Rumor has it that an upgrade of Singer's Athena 2000 microprocessor-based sewing machine features four high speed channels, telecommunications capability, string array processing, and a specially designed floppy disc that doubles as a buttonhole maker.

— Professional society insiders report that AFIPS is considering publishing a magazine for its constituent societies. To be called "Playbyte," the glossy, four-color monthly will feature computers in provocative poses. Center section foldout for the first issue will be a frontal shot of the Naked Mini. Regular editorial will include a series on the Playbyte Philosophy of Computing. Written by Paul Armer, Robert B. Forest, and H.R.J. Grosch, each installment of the monthly feature is expected to run about 10⁶ words and, in toto, take 73 years to publish.

— The newly created Privacy Protection Study Commission may abruptly disband next month. Trouble arose when the commission applied for new conference room furniture and was turned down when a credit check characterized commission members as a "bad risk."

— The belated Electronic Fund Transfer System commission is also having its share of problems. Funds allocated for the commission's first six months of operation were lost.

— TA, or Transactional Analysis, seems to be gaining widespread acceptance among data processing managers as a management technique. "Our users are much happier now that they're receiving warm fuzzies from our systems analysts" reports the manager of one large shop. However, he did add that he had to let his chief programmer go when the man demoralized his structured programming team by telling them, "I'm O.K., but you guys are only so-so."

— Although an upgrade from Seymour Cray's Cray-1 supercomputer is hard to imagine, a Cray-2, characterized as the "ultimate machine," is rumored to be in the works. Only one machine will be built. Cray himself will be the cpu.

Happy April Foolishness. You'll find more Foolishness, our annual tribute to the flakier side of our industry, scattered throughout this issue —including a tasty tidbit from columnist Art Buchwald on page 45. Enjoy.

UCC-10

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When you see how UCC TEN can help you get what you expected from IMS, call this number again. We'll arrange a presentation at your convenience.

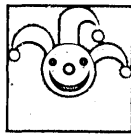
Here are some reasons why UCC TEN has gotten IMS under control in nearly 150 IMS installations:

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- Automatically generates IMS control statements.
- Assists in new systems design.

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Editor's Readout



The Great Data Famine

a guest editorial
by Art Buchwald

One of the major problems we face in the 1970s is that so many computers will be built in the next decade that there will be a shortage of data to feed them.

Professor Heinrich Applebaum, director of the Computer Proliferation Center at Grogbottom, has voiced concern about the crisis and has urged a crash program to produce enough data to get our computers through the '70s.

"We didn't realize," the professor told me, "that computers would absorb so much information in such a fast period of time. But if our figures are correct, every last bit of data in the world will have been fed into a machine by January twelfth, 1979, and an information famine will follow, which could spread across the world."

"It sounds serious," I said.

"It is serious," he replied. "Man has created his own monster. He never realized when he invented the computer that there would not be enough statistics to feed it. Even now, there are some computers starving to death because there is no information to put into them. At the same time, the birth rate of computers is increasing by 30% a year. Barring some sort of worldwide holocaust, we may soon have to find data for thirty million computers, with new ones being born every day."

"You make it sound so frightening."

"It is frightening," Professor Applebaum said. "The new generation of computers is more sophisticated than the older generation, and the computers will refuse to remain idle just because there is nothing to compute, analyze or calculate. Left to their own devices, the Lord only knows what they will do."

"Is there any solution, Professor?"

"New sources of data must be found. The government must expand, and involved studies must be thought up to make use of the computers' talents. The scientific community, instead of trying to solve problems with computers, must work on finding problems for the computers to solve."

"Even if the scientists really don't want the answers?"

"Naturally. The scientific community invented the computer. Now it must find ways of feeding it. I do not want to be an alarmist, but I can see the day coming when millions of computers will be fighting for the same small piece of data, like savages."

"Is there any hope that the government will wake up to the data famine in time?"

"We have a program ready to go as soon as the bureaucrats in Washington give us the word. We are recommending that no computer can be plugged in more than three hours a day.

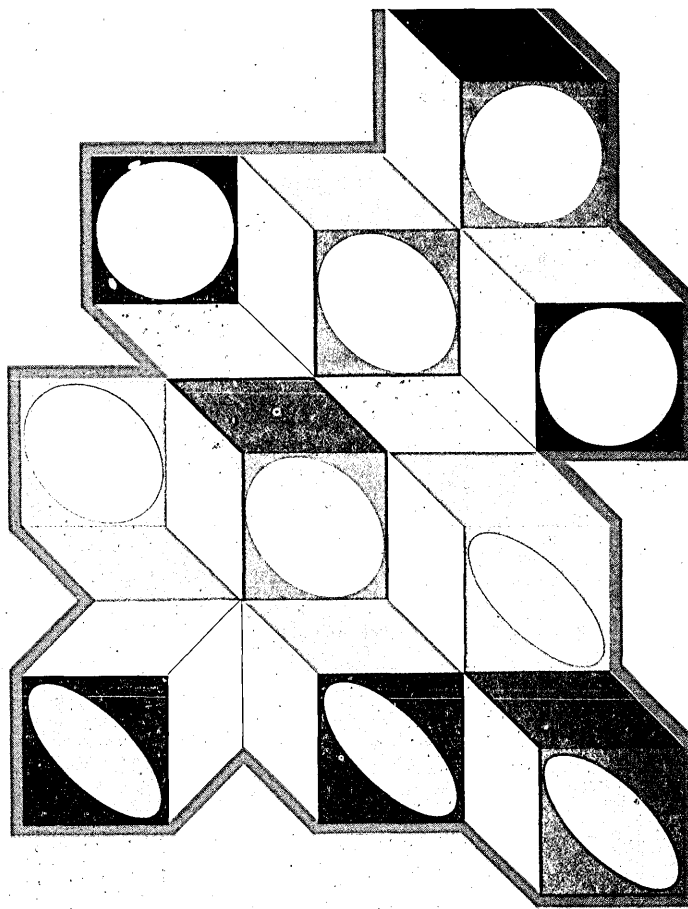
"We are also asking the government for fifty billion dollars to set up data-manufacturing plants all over the country. This data mixed with soybeans could feed hundreds of thousands of computer families for months.

"And finally we are advocating a birth control program for computers. By forcing a computer to swallow a small bit of erroneous information, we could make it sterile forever, and it would be impossible for it to reproduce any more of its kind."

"Would you advocate abortions for computers?" I asked Applebaum.

"Only if the Vatican's computer gives us its blessing."





The Outlook for Data Base Management

by Robert M. Curtice

Existing systems with enhancements will remain viable through the early '80s; then new data base management systems will appear along with new hardware architectures.

Data base management systems have become as significant as operating systems software to many medium and large scale data processing installations. Application programs written to access data bases managed by one of today's systems already represent a large investment, and that investment will undoubtedly grow in the future. Data base management packages have been a somewhat surprising success for the independent software houses, with total installations perhaps second only to their cousins, file management packages. Users and prospective users of these packages are understandably concerned about getting locked into such software and being constrained from making use of advanced hardware/software which may become available in the future, particularly from the mainframe vendors. Others are concerned over the possibility that rapid advances in the state of the art will make all existing systems obsolete,

and are reluctant to invest heavily in data base applications at the current time.

The intent of this article is to explore some of the trends and research currently underway in data base management, and to draw some conclusions regarding likely developments in a 10-year timeframe.

The progression of data management systems can be envisioned roughly as shown in Fig. 1. Major components are the data management supervisor, having responsibility for access control, recording of performance statistics, management of concurrent update, integrity checking, and invocation of on-line recovery functions; the

(For a discussion of the concepts of relational data bases, see the article by C. J. Date in this issue. For a discussion of future alternative data bases systems to CODASYL, see the article by V. Chvalovsky, also in this issue.)

inquiry/report module which processes on-line inquiries and batch report generation requests; the data definition processor which compiles external definitions and subdefinitions of the data base; the reorganization/backup module which handles data base backup and file reorganization functions; and the performance statistics analyzer which prepares performance reports.

This general framework will probably remain valid through the next 10 years. The data management supervisor will continue to be at the heart of the system, and it is with this component that we are concerned here. Specifically, there are four topics to be treated: the evolution of existing systems; the impact of advanced hardware; the relational model; and the prospect for distributed data bases.

The evolution of existing systems

The existing data base management

packages will continue to evolve without major conceptual changes through the early 1980s. A sizable user base has already been formed and will continue to grow during the latter half of this decade. For most of these users, it will take until 1980 or beyond to convert all major applications to an integrated data base, and most will stick with their original DBMS software until this conversion is all but complete, rather than switch in midstream. The integrated nature of many applications and the difficulties of running two data management systems in parallel are reasons for this prediction.

During this period, enhancements, refinements, and performance improvements will be made in existing systems at a rapid rate. In fact, it is likely that as each such system is enhanced to counter competitive features available in other systems, the various packages will begin to look more and more like each other, and only a few fundamental differences stemming from the original conceptual approach will remain.

One of the major aspects which currently serves to differentiate systems concerns the storage structures and access methods they support. Thus we have come to know certain systems as hierarchical, network, or inverted, according to the classification scheme in vogue today. These distinctions will all but disappear in the next five years—a trend which is clearly observable now.

The hierarchical and network systems are adding inversion capabilities. IMS/Vs and DL/I DOS/Vs have secondary indexing capabilities. CODASYL systems provide for pointer array implementations which can serve as the basis of inversions, and the Univac DMS 1100 and IDMS packages have or will soon have this capability. The TOTAL system has an inverted access method in development. Conversely, the inverted packages are adding structural capabilities. System 2000, which supports strict hierarchies, has had a link feature to cross hierarchies under consideration. ADABAS, through its macro feature ADAMINT, now allows the programmer to view a series of coupled files in a hierarchical fashion.

This is only one example where, even at a fairly fundamental level, the existing systems are providing a common set of features. There will be exceptions to be sure, but one can probably develop a fairly comprehensive list of features that all existing systems will provide by 1980. Performance aspects of these features will vary widely, with certain systems doing some things well, others not so well. But functionally the equivalence will be substantial. Thus by 1980, all major data base management systems will support most of these features:

- Full network data structures
- Random, sequential, and inverted access
- Variable length records
- Optional data compression
- External data definitions
- Password security protection at the field level
- Exclusive and protected, update and retrieval processing intent modes
- Lockout at the record occurrence level for concurrent update protection
- Automatic backout on programabend
- Data independence at the field level
- Synchronized checkpoints
- Dual logging
- Optional pre-compilers for major languages
- Full multi-thread operation

With most systems supplying almost all of these features, there will be few functional distinctions left among them.

The impact of advanced hardware

There will certainly be major advances in secondary storage mechanisms during the next 10 years, particularly in larger capacity, lower cost units. All data base systems will be able to take advantage of these devices for two reasons. One is that all systems provide for device independence in that the characteristics of the physical storage media are described externally to application programs. The second reason is all make use of basic access methods provided by the operating system.

In general, there is reason to believe that all systems will be in a position to take advantage of any hardware improvements. Certainly the packages supplied by the mainframe vendor will be able to do so. And those supplied by the independent software houses will be able to do so as well because all use standard access methods, none require modification to the operating system, and all appear to be legitimate user programs to control software. Thus, if a normal user program can take advantage of the hardware, so can a data base management package. Presumably, the data base packages provided by the mainframe vendors will incorporate the use of new hardware sometime prior to those of the independent software houses.

There is of course always the possibility that a mainframe manufacturer could develop an element of hardware which was specifically geared for use by its data base management system, and which could not be used, or at least not as effectively used, by other packages. While this is possible, it is unlikely to develop because anything significant would be too inflexible. Putting DBMS code in firmware would be

an example. More likely, at least for the next generation of equipment, is the integration of the DBMS with the operating system. Burroughs DMS II claims this advantage, and special status for IMS/Vs will allow it to execute in more than one cpu concurrently with a tightly coupled configuration.

While it appears that DBMS code in hardware would be too inflexible, this is not as much of a concern for the basic access methods. Here, more intelligence will be placed in the I/O controllers, and this evolution is exemplified by the IMSAI intelligent disc which performs all indexing, searching, and deblocking functions. The next generation of IBM hardware is thus more likely to include a VSAM box than a DL/I box. Since all of the major non-IBM data base packages now operating on IBM equipment utilize the BDAM access method, they would presumably be able to utilize a VSAM box by converting to entry sequenced VSAM—with no change to applications programs.

Finally, there is the potential for a back-end data base machine, and some investigation is currently being made into this concept. A back-end data base machine calls for a separate cpu to control data base access—it runs the DBMS in response to applications programs executing in the host cpu. While there may be advantages to this configuration for specialized applications involving extremely large (20 billion bytes and up) applications, it probably doesn't represent an economical approach for most typical installations and will not come into widespread use within the next 10 years.

The relational model

Looking beyond the mere evolution of existing data base systems, there are a number of approaches being investigated. The one currently receiving the most attention, and notably by IBM, is the relational model. (For a discussion of the main concepts see the article in this issue by C. J. Date.)

The concepts behind the relational data base approach evolved as a result of trying to develop a more theoretical and rigorous foundation to the treatment of data. The main concept is embodied in the notion that once the data is represented in a particular way, it is subject to operations described by relational algebra. It also offers a very high degree of data independence and permits the data to be stored in a non-redundant form.

For our purposes, the emphasis on the use of relational algebra as a query language is of secondary interest. Rather, the data representation which the relational model assumes is significant because it:

- Enforces a rigorous, consistent set of principles to be applied to the

DATA BASE MANAGEMENT

design;

- Tends to yield a high degree of data independence; and
- Reduces the likelihood of certain anomalies which occur in highly structured data bases.

Now, while the relational approach offers a number of significant advantages, it currently suffers from a major drawback—performance. Thus all of the implementations to date have been on rather small data bases, and exist mainly for research purposes. The relational model, it should be noted, says

memories would permit economical implementation of relational data bases. Such a capability would then clearly obsolete existing systems, and would require a conversion effort for those wishing to take advantage of the newer technology. IBM is known to be working on the problems regarding conversion of hierarchically-oriented data structures (à la DL/I), to third normal form. (See for example the paper by Vincent Lum, et al., "CONVERT: A high level translation definition language for data conversion," ACM SIGMOD Conference Proceedings, 1975.)

But considering the investment in DL/I, the likelihood that software for

bases are in fact distributed processing systems. This means that processing is distributed throughout the components of a remote system, and is a logical extension to remote input and output. Remote stations (terminals, then intelligent terminals, then limited mini-computers, and finally full processors) do more of the work, particularly when the major use of the processing is at the same remote location anyway.

Distributed data bases go beyond distributed processing in the following way: in a distributed processing system all secondary storage (data base) operations proceed in the normal manner as if the processor did not know it was "distributed." Some remote storage may be provided for the data needed by the distributed processor; some data may be transmitted among processors at specified times for particular purposes; it may be retained by the originating processor for later use. But in all cases, the data bases required by a processor are managed by it in the normal manner. In a distributed data base system this is not so. Parts of a data base may be managed by several processors at different locations. The distinction between data transmission and data base access becomes fuzzy.

We need to be careful in defining "data base" in order to understand the implications of a distributed data base. One could say that all of a company's data constitute its data base; therefore, if any data processing is distributed, it has a distributed data base. In our sense, however, data base implies logically related data where the relationships are actually used by applications programs. This definition also helps to solve the problem of whether a collection of logically related data qualifies as one or many data bases. For example, consider an insurance company which has an Individual Life data base and a Group Insurance data base. There are many potential logical connections between these data bases: the same agent could sell both kinds, a person could own both kinds, or be the beneficiary of a policy of each kind. In our definition there is one data base if any of these connections are actually used, for example, if the beneficiary's name appeared once with the symbolic or physical address of each policy listed against his record, then there is one data base. The implications of a distributed data base then become apparent when we consider the case where the Group Insurance processor is located in New York but the Individual Life processor is in Chicago.

Just as there are numerous configurations for a distributed processing system, there are corresponding ones for a distributed data base. The two most popular are the Star and the Network. In a Star configuration there

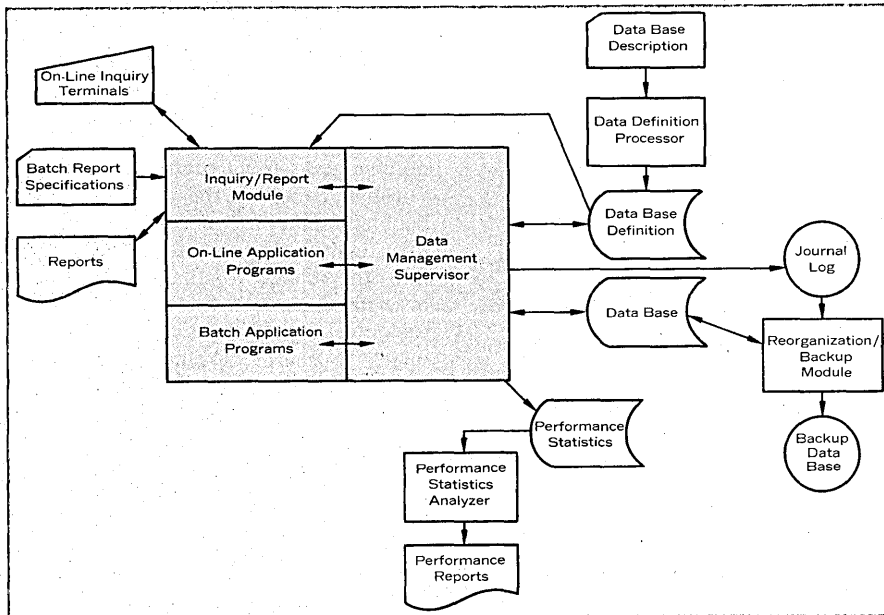


Fig. 1. This structure, with the data management supervisor as the heart of the system, is expected to be the main one for data base management systems for the next 10 years. The structure was formulated in a dp technology forecast performed by Arthur D. Little, Inc., for the U.S. Air Force and summarized by Frederick G. Withington in "Beyond 1984: A Technology Forecast," Jan. 1975, p. 54.

nothing about how the data is physically stored or retrieved; but one can observe that mechanisms for inverted access to flat files are probably the most appropriate. Accordingly, we would suspect that existing systems can and will offer special provisions for implementing relational data bases in a few years' time.

Since any existing system can support third normal form data base layouts, all that remains is to supply the primitive operators upon which a relational language would be built. Such a facility would be useful for modest size data bases requiring extreme flexibility and a powerful inquiry capability. It might also serve as a transition vehicle for those anticipating more advanced hardware specifically designed for relational operations.

The fixed matrix orientation ("third normal form") used in these data bases suggests that large content addressable

the next generation of equipment will lag the hardware by several years, and the anticipated availability of the required memory technology, we would not expect relational data bases to become economically viable on a large scale prior to the 1983-1985 period.

Distributed data bases

No discussion of the future of data management would be complete without a prognostication for distributed data bases. The changing economics of hardware manufacturing, the proliferation and surprising flexibility of mini-computers, the outlook for low cost data transmission, and other factors combine to suggest that distributed systems, at least for some users, may be the way of the future.

There is some confusion between distributed data bases and distributed processing. Many of the systems which are now claimed as distributed data

is an implicit hierarchy such that a given processor can have multiple subordinate processors, but only one higher level processor. There is an identifiable highest level processor at the center of the Star. In a Network there need not be an implicit hierarchy and any processor may communicate with any other.

The following cases can be identified for having a distributed data base:

1. Data is generated at numerous locations and there is need for high volume and/or fast response applications. Some of the data or summarizations of it are needed at a central location with extreme timeliness—many times a day.

For example, a multi-store retail company needs up-to-the-minute status information on store operations.

2. A large volume of data is generated centrally, but most of it is of primary use to remote locations. Either central or remote locations may modify the data.

For example, the gross production schedules for all plants are determined centrally. They are used by each plant to produce net materials requirements every day. But the net requirements for one plant can be the gross requirements for another plant. Engineering changes are made by each plant.

3. Remote locations generate large volumes of data for immediate inquiry. The vast majority of the inquiries are local, but fast response is needed infrequently from other locations.

For example, a unified stock market inquiry system covering five stock exchanges throughout the country.

Combinations of these and other cases can be identified as well. For example, in airline reservation systems a passenger's itinerary may involve several carriers. One system needs to find available space in the other's data base.

The main characteristics of a distributed data base is that data usage can be independent of its location. A distributed data base management system is one which can perform data base operations on a distributed data base. An applications programmer need not be concerned over where the data is.

What might a distributed data base management system look like? In functional attributes of course, it would have to perform much the same as data base systems now do. A user program would issue calls to store, retrieve, delete, and modify specified data. The system would have to determine an additional attribute of the data, namely where it is located. Here we can identify several alternative approaches. One simple approach is to have all non-local data shipped and stored at a central location, following

the Star configuration model. This location would have a (possibly dedicated) computer to do storage and retrieval operations, similar in concept to the Data Computer built by Computer Corporation of America for the ARPA network. In this particular system large "chunks" of data are accessed by the local processor as required.

The Data Computer represents a very rudimentary distributed data base because there is no overall data base management framework—the data at the central site has no relationship to local data. Therefore, the Data Computer really represents a centralized rather than a distributed data base. But it is significant because it allows for programs to be initiated at local processors without having all the data local at that time, i.e., the program must wait to retrieve data from a remote location; this is an important characteristic of distributed data bases.

Note that the Data Computer also represents another rationale for distributed data bases—the sharing of an expensive but massive storage mechanism such as a laser beam system. The storage system is too expensive and too large for each local user, but can be justified on a cost-per-bit basis when many users can share it.

In cases where there is no rationale for shipping data to a central site, but there is still need to access non-local data, the network configuration is used. Here, each local computer must determine where the desired data is and initiate the access. The packet switching network capabilities are well suited to supporting a distributed data base of this kind.

It is apparent that there are some major impacts on software to accommodate a distributed data base. For example, the time required to complete a non-local I/O operation will be on the order of seconds as opposed to milliseconds. It will probably make sense to roll out a program which is going to be in the wait state for this period of time, as would naturally occur in a virtual environment. On the other hand, if possible, it would also make sense for the application program to schedule remote access in advance to avoid the lengthy wait.

While the issue of lockout doesn't appear to present major problems, the potential for deadlock does. In a network configuration, it is possible for several processors to lockout remote data in such a way that none of them can proceed. This is the familiar deadlock situation which occurs in systems today. However, in a network distributed data base environment, there is no higher level process to detect and resolve the deadlock. Thus we would expect centralized Star configuration based systems to evolve earlier, until

the deadlock issue can be resolved.

Even so, it would appear that distributed data bases of any kind will not be implemented in great numbers in the next 10 years. Most organizations just don't require a truly distributed data base, and the increased level of sophistication needed will not be justified. Transmission of data in batches to and from local processors will suffice for all but the most demanding applications.

Summary

To summarize the conclusions based on the foregoing discussion:

- Existing data base management systems will remain viable through enhancements well into the early '80s;
- Such enhancements will tend to yield a high degree of functional equivalence among the most popular systems, although there will be performance variations;
- All existing systems will be in a position to take advantage of new storage devices, which will most probably provide for basic access mechanisms in hardware;
- Data bases using the relational model will be introduced using existing systems, but will be limited to modest applications. Large-scale use must await hardware advances anticipated in the mid-'80s;
- Distributed data bases will see very limited use in highly specialized applications, but will not be in widespread use prior to 1985.

The overall outlook, then, is really based upon the large investment now being made in existing systems, and the lack of radically new hardware architectures prior to the mid-'80s. So current concepts in data base management will be around for some time, which is probably beneficial since it will take a few more years to really learn to properly use what is available anyway.

The usual caveats that accompany forecasts such as these of course apply here. *



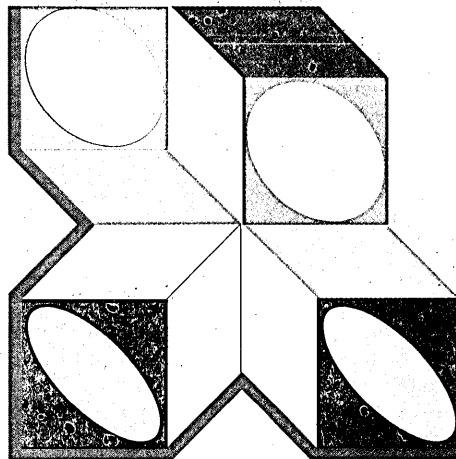
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Relational Data Base Concepts

by C. J. Date

Relational data base technology provides an easier and more natural user interface, which largely explains the renewed attention it is receiving.

The aim of this article is to explain some of the basic ideas behind the relational approach to data base—and to describe just what a relational data base is. A good way to visualize one, as it might appear at some particular time, is shown in Fig. 1. This data base contains information about suppliers (S), parts (P), and shipments (SP). As Fig. 1 shows, the data is organized into three tables. Each table closely resembles a traditional sequential file, with rows of the table corresponding to the records in the file and columns corresponding to fields of the records. The part table, for example, contains four records, each consisting of five fields.



Relations, tuples, domains

To this point, relational ideas are clearly very familiar. For several good reasons, however, the terminology usually employed in relational literature is deliberately not that of conventional data processing. First, tables are usually referred to as *relations* (hence the term relational data base). The reason is that tables such as those of Fig. 1 are actually a special case of the construct known in mathematics as a relation, and the relational approach to data has been built upon elementary mathematical relation theory. The term "relation" in fact has a much more precise definition than more traditional data processing terms such as "file." Second, rows (or records) are usually referred to as *tuples* (rhymes with "couples"), for similar reasons. In this article, however, we shall generally use the more intuitive terms "table" and "row."

One concept which relational theory emphasizes and for which there does not seem to be an established dp term is the concept of the *domain*. A domain is a pool of values from which the actual values appearing in a given field (or column) are drawn. For example, the values appearing in the PNO

column of both the SP table and the P table are drawn from the domain of all valid part numbers. This domain itself, while it may not be explicitly recorded in the data base as an actual set of values, will be defined to the system and will have a name of its own; columns based upon this domain may or may not have the same name (obviously they must have a different name if any ambiguity would otherwise result, such as if two columns in the same table were drawn from the same domain).

Note that tables S and SP have a domain (suppliers numbers) in common; P and SP do too (part numbers), as do S and P (locations). A crucial feature of relational data structure is that *associations between records (rows) are represented solely by data values in columns drawn from a common domain*. The fact that supplier S2 and part P4 are located in the same city, for example, is represented by the appearance of the same value in the LOC column for the two rows concerned. It is this feature which enables us to represent *all* information in the data base in the same uniform manner; specifically, it is not necessary to introduce any sort of "link" or "pointer"

construct to connect associated rows.

At this point it should be made absolutely clear that Fig. 1 represents the *user's view*. What is physically stored may be quite different—it will almost certainly include indexes and other performance-oriented constructs, for example; in particular it is quite possible that the stored records representing rows of SP would contain direct pointers to the corresponding S and P stored records. When we describe a data base as relational we mean that the *user's view* is relational, and also that the operators available to the user are ones which operate on relational structures.

The most important ways in which tables such as those of Fig. 1 differ from completely unconstrained sequential files are as follows:

1. Each table contains only one type of row
2. Each table contains a fixed number of columns
3. Each table has a primary key
4. Row order within a table may only be value-based (or undefined)

We may explain these four properties in terms of more traditional file terminology as follows:

1. Each file contains only one record-type.
2. Each record-type has a fixed number of field-types (no OCCURS DEPENDING ON).
3. Each record has a unique identifier. (The primary keys in Fig. 1 are SNO for S, PNO for P, and the combination of SNO and PNO for SP.) Note that this implies that the file may not contain any duplicate records.

4. Within a file the records either have no defined ordering whatsoever, or are ordered according to values of some field(s)—not necessarily the primary key—contained in the records.

These four properties, although they appear to be somewhat restrictive, actually represent a very useful disci-

pline, one which results in a considerable simplification in the range of structures the user has to deal with, and hence in a corresponding simplification in the operators he needs to manipulate those structures. There is in fact no practical restriction on what can be represented; that is, all structures occurring in other formatted data base systems (for example, CODASYL's DBTG or IBM's IMS) can easily be cast into an equivalent relational form.

Row-at-a-time operations

Relational structure is very simple. But simplicity of data representation is not the end of the story. The other important aspect as far as the user is concerned is "what can I do with data in this form?"—that is, what retrieval and update operators are available?

First, since information is represented in one and only one way in a relational data base, we need only one operator for each of the basic functions (Create, Destroy, etc.) that we wish to perform. This contrasts with the situation with more complex structures, where information may be represented in several ways and hence several sets of operators are required. In DBTG, for example, two "create" operators are necessary, STORE to create a record and CONNECT (originally called INSERT) to create a link between an "owner" record and a "member" record.

Also, since a table may be considered as a disciplined form of the traditional sequential file, it is clear that traditional file operators (READ, WRITE, etc.) can be made to apply, and indeed there is a lot to be said for this approach. The uniformity of data representation leads to simplifications in the

file declarations and hence in the use of the corresponding operators. Moreover the actual number of operations *performed*, in terms of calls to the supporting data base management system, may well be less in some cases than with a more complex data structure. Both these points are illustrated by the following example: "List part numbers for parts supplied by supplier S2." For the relational structure of Fig. 1 a skeleton program in a somewhat COBOL-like language is:

```
A. READ NEXT SP WHERE SNO = 'S2'.
   if not found, exit
   .....
```

```
   go to A.
```

A DBTG-like structure for the same data is shown in Fig. 2. And for that DBTG structure a skeleton program is:

```
READ S WHERE SNO = 'S2'.
```

```
A. READ NEXT SP WITHIN S-SP.
   if not found, exit
```

```
READ OWNER WITHIN P-SP.
```

```
   .....
```

```
   go to A.
```

(We have assumed that READ here combines the functions of FIND and GET, in DBTG terminology.) The DBTG-like solution requires three READ formats instead of one; in addition, the number of systems calls executed in the DBTG case is exactly twice that for the relational case.

Relational algebra

But the real strength of relational data base is that the simplicity of the data structure allows us to define operators which are not only simple themselves but are also extremely powerful—much more powerful than READ, WRITE, etc., in that they operate on entire tables instead of on one record at a time.

To demonstrate this, consider some retrieval problems:

Example 1: find LOC for supplier S1.

S	SNO	SNAME	STATUS	LOC	RESULT	LOC
	S1	Smith	20	London	→	London
	S2	Jones	10	Paris		

The answer is "London." More accurately, the answer is a *table* (relation) with one row and one column, this column being based on the location domain and containing the single value "London."

Example 2: find SNO and STATUS for suppliers in London.

S	SNO	SNAME	STATUS	LOC	RESULT	SNO	STATUS
	S1	Smith	20	London	→	S1	20
	S3	Clark	20	London		S3	20

Note that access to the s table in this example is on a field which is not the primary key. The result is again a table, this time with two rows and two columns.

Example 3: find PNAME for parts supplied by supplier S1.

SP	SNO	PNO	PNAME	RESULT	PNAME
	S1	P1	Nut	→	Nut
	S1	P2	Bolt		Bolt
	S1	P3	Screw		Screw

Once again the result is a table. In fact the result of *any* retrieval operation may be considered as a table, and this point is of vital importance. In this particular example the result table is a subset of a single table, as it was in the two preceding examples, but *two* tables have to be examined in constructing this result.

Example 4: for each part supplied, find PNO and names of all locations supplying the part.

SP	SNO	PNO	S	SNO	LOC	RESULT	PNO	LOC
	S1	P1	+	S1	London	→	P1	London
	S1	P2		S2	Paris		P2	London
	S1	P3		S3	London		P3	London
	S2	P1				(eliminated)	P2	London
	S2	P2				(eliminated)	P3	London
	S3	P2						
	S3	P3						

In this final example, not only is it necessary, again, to examine two tables, but the values in the result are actually derived from two tables. Notice, incidentally, that redundant duplicate rows are eliminated from the final result (this is always so).

In general, then, the result of any retrieval is a table, derived in some way from the tables in the data base; any number of tables may be involved in forming the result, both in conditioning selection and in actually supplying result values. In other words the process of retrieval is, precisely, a process of table construction. Recognizing this fact, we can define a set of *table construction operators* for use in retrieval. We will discuss briefly three such operators: SELECT, PROJECT, and JOIN.

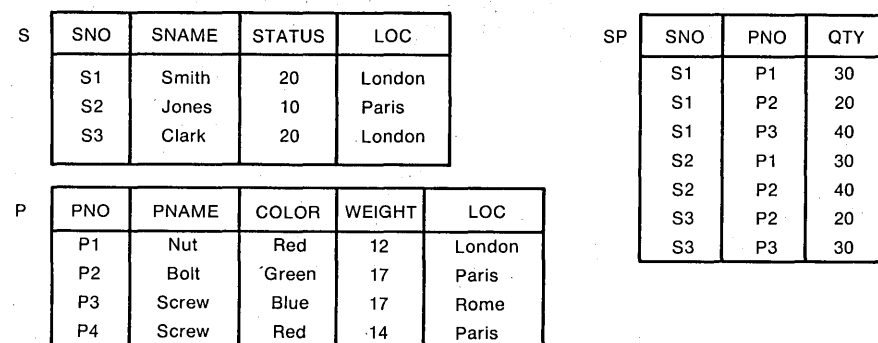


Fig. 1

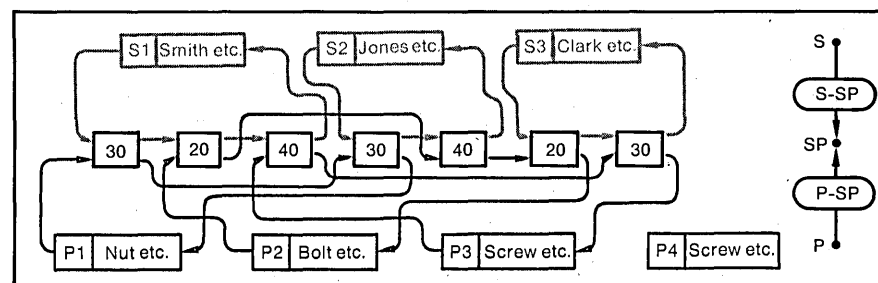


Fig. 2

RELATIONAL DATA BASE CONCEPTS

The SELECT operator constructs a new table by taking a *horizontal subset* of an existing table, that is, all rows of an existing table which satisfy some condition. The PROJECT operator, in contrast, forms a *vertical subset* of an existing table by simply extracting specified columns (and removing any redundant duplicate rows in the set of columns extracted). Using these two operators we may immediately write programs for the first two examples above.

Example 1: find LOC for supplier S1.

Step 1: SELECT S WHERE SNO = 'S1' GIVING TEMP.

This step gives us the following table:

TEMP	SNO	SNAME	STATUS	LOC
	S1	Smith	20	London

Step 2: PROJECT TEMP OVER LOC GIVING RESULT.

This step extracts the LOC column from TEMP, giving the desired result.

Example 2: find SNO and STATUS for suppliers in London.

SELECT S WHERE LOC = 'LONDON' GIVING TEMP.

PROJECT TEMP OVER SNO, STATUS GIVING RESULT.

The remaining two examples—the ones involving two tables—require the use of the JOIN operator. If two tables have a domain in common then they may be *joined* over that domain. The result of the join is a new, wider table in which each row is formed by joining together two rows, one from each of the original tables, such that the two rows concerned have the same value in the common domain. For example, tables S and P may be joined over their common location domain; the result is shown in Fig. 3.

We have renamed the two location

SNO	SNAME	STATUS	SLOC	PNO	PNAME	COLOR	WEIGHT	PLOC
S1	Smith	20	London	P1	Nut	Red	12	London
S2	Jones	10	Paris	P2	Bolt	Green	17	Paris
S2	Jones	10	Paris	P4	Screw	Red	14	Paris
S3	Clark	20	London	P1	Nut	Red	12	London

Fig. 3

columns as SLOC and PLOC to avoid ambiguity. Note that if a row in one of the original tables has no counterpart in the other, it simply does not participate in the result; for example, P3 (stored in Rome) does not appear in the join in Fig. 3.

Now we can program the other two examples.

Example 3: find PNAME for parts supplied by supplier S1.

SELECT SP WHERE SNO = 'S1' GIVING TEMP-1.

JOIN TEMP-1 AND P OVER PNO GIVING

TEMP-2.

PROJECT TEMP-2 OVER PNAME GIVING RESULT.

Example 4: for each part supplied, find PNO and names of all locations supplying the part.

JOIN SP AND S OVER SNO GIVING TEMP.
PROJECT TEMP OVER PNO, LOC GIVING RESULT.

In the last example the definition of PROJECT ensures that no duplicate rows will appear in the result.

It is sometimes claimed, incidentally, that the inter-record links in structures such as that in Fig. 2 are a structural equivalent to the JOIN operator. Such links, however, merely provide *access paths* by which joins may be more efficiently implemented; they do not of themselves provide the *result*, the value, of the join. A relational data base may employ such access paths in its stored form to support such operations, but these paths are not made visible to the user, nor is the user constrained to performing such operations only where paths exist.

The operators SELECT, PROJECT, and JOIN, along with others which we have no room to discuss here, together constitute the *relational algebra*. Several relational systems (e.g. MACAIMS, IS/1) provide a user language founded upon this algebra. Since the algebra was first developed, however, a number of other languages have been designed for operating on relations, all of equivalent power to the algebra and most of them somewhat easier to use. These languages include ALPHA and QUEL, both based on *relational calculus*; SQUARE and SEQUEL, based on a construct known as a *mapping*; and at least two highly ingenious graphic languages, Query By Example and CUPID, which are intended primarily for use with a visual display terminal. Below is a SEQUEL solution to Example 3 (find PNAME's for parts supplied by supplier

S1); space does not permit the inclusion of other illustrations of these alternative languages.

```
SELECT PNAME FROM P
WHERE PNO IS IN
      (SELECT PNO FROM SP
       WHERE SNO = 'S1')
```

Update operations

Turning now to update operations, we observe that once again it is possible to define very high level (table-handling) operators for each of the basic functions Create, Destroy, and

Replace. Space precludes detailed discussion of these operators here; we content ourselves with merely indicating their basic form:

CREATE: add new rows to table

DESTROY: delete specified rows from table

REPLACE: replace specified values in specified rows by new values

Example: DELETE SP WHERE QTY LESS THAN 35

Conclusion

In the history of data processing to date we can distinguish one particular trend very clearly, the trend toward *usability*. In every area involving user/system interaction we can trace a steady improvement in the quality and level of the human interface. The trend is always away from the irrelevant complexities of the underlying machine and toward a higher and more natural level of expression for the user. We may cite the progression from machine code to simple assemblers to macro assemblers to high level languages and program generators as an obvious example. The time is ripe for the next step in this progression; and relational systems may be seen as the natural next step—"natural" because they directly support data in the form of tables (the format employed for centuries in human activities of every kind), and because, moreover, the user is able to manipulate these tables by means of very high level (table-at-a-time) operators. For these reasons many people are confident that the next few years will see the emergence of not one but numerous relational systems.

We have described some of the basic ideas of relational systems. It would be misleading, however, to ignore some of the many other contributions that relational ideas have made, and continue to make, to the development of data base technology. To give the reader some idea of the breadth of impact that these ideas have had, there is a brief summary of a few of the areas in which important advances have been made.

Data base design. The discipline provides a simple set of guidelines for structuring data into tables which are intuitively understandable and which possess certain desirable update properties.

Integrity control. By contrast with other systems, relational systems make a sharp distinction between integrity rules and data structure, the two being separately defined and hence separately maintainable. Relational algebra (or one of the other relational languages mentioned earlier) may be used to specify the rules—an illustration, incidentally, of the way in which relational concepts serve as a unifying

theme throughout the data base technology field.

View definition. Alternative views of the data base tailored to individual user requirements may be superimposed on the basic relational view which forms the heart of the system. Such views may consist of selections, projections, and/or joins of the base relations; they may also allow users with special requirements to see some more complex structure, for example a multi-level hierarchy. Relational algebra or some equivalent language may again be used in the definition of such views.

Authorization. The view mechanism just outlined can serve as the basis of a powerful authorization scheme: a given user can be denied access to sensitive information by simply providing him with a view which does not include that information.

A comprehensive and categorized bibliography listing many papers which give further information on these and related topics is "Relational Database Management: A Bibliography," (compiled by E. F. Codd, IBM Research Laboratory, San Jose, CA 95193 Aug. 1975.)

It is appropriate to conclude with a quotation from Dr. E. F. Codd, who has been active in the relational data base field since 1968 and to whose work the present high degree of interest and activity in the subject can be directly attributed: "I do not believe that anyone would claim that relational concepts automatically provide solutions to all or even most data base system problems; they do provide, however, a framework in which many of these problems take on a more precise and comprehensible formulation." And this in itself is a significant accomplishment. *



Mr. Date is currently engaged in the design of high level languages for IBM General Products Division in Palo Alto, Calif. He is the author of "An Introduction to Database Systems" (published in the Addison-Wesley Systems Programming Series, 1975), which covers not only relational but also hierarchical and network approaches to data base. This article is partly based on material from that book.

Mump-2

The following is an abstract from a Research and Development report on Project Vega Star recently declassified.

Background



The Bureau of Advanced Systems Technology, Automata Research and Development authorized the expenditure of funds to design and develop a computer whose architecture and action would emulate a human work activity. A typical business environment was analyzed and then synthesized algebraically and logically. The result was MUMP-2, the Multiple Uncooperative Micro Processor machine.

Architecture

The number of processor elements is unrelated to the nature of the task to be performed and is only determined by a rather complex algorithm which seems to relate to the "comfort level" of the design team. Each processor has a different execution time and a different interpretation of each instruction in the combined repertoire.

The data channels fall into three categories: Formal, informal, and surprise. Similarly the control channels include "intended" and "unintended." At random intervals new processor elements are added while old elements are either removed, redesignated or lost in the structure. A "lost" processor is one that the control group may be totally unaware of for significant periods.

The hierarchy is quite complex and changes very rapidly. Initially one element is designated "leader" and several levels of "management" are set. However, the multiple interpretation of instructions, the multiple data paths, and the unintended control lines continuously generate new pseudo-structures within the system. Additionally, as new processor elements are randomly added, some come in at each authority level and precipitate new substructures. Finally, the occasional elimination of elements through removal or "loss" can add to the confusion.

Rules of operation

Everything is serial. No processor element ever does one complete task from beginning to end. Each must obtain control signals from as many elements "above" it in the hierarchy as possible and data from only those on the same level or below who "care." "Caring" is defined as being available

to send and recognizing the data requestor, *NOT Necessarily Having Relevant Data.*

Data Flow

Data and control statements are passed via "trolleys" which are similar to busses but slower. When a processor receives a control statement it is compared bit by bit with what it already has in its control memory. Identical bits are "reinforced" and dissimilar bits tend to go away.

Sample operation

The following is a dump of control statements from several trolleys:

A-11 I need some help.
 A-104 Who's in charge here?
 7-W-D I have an answer.
 A-11 I haven't stated the problem.
 B-04 The discs are unavailable.
 M-4 What is the priority of the problem?
 A-104 Who's in charge here?
 A-11 I need some help.
 2-Z Clear to send.
 A-11 Equation follows.
 2-Z Clear to send.
 A-11 Data follows.
 2-Z Clear to send.
 A-11 What is answer?
 2-Z Clear to send.
 A-11 What's the goddam answer?
 2-Z Clear to send.
 A-11 Dammit, what did you do with the stuff I sent you?
 2-Z Clear to send.
 A-11 Sheeit!
 A-11 Who's got that data, 2-Z isn't helping.
 2-Z Clear to send.
 A-11 Shut up!
 R-9 It's on the disc.
 A-11 Where?
 R-9 Where what?
 A-11 Anybody doing disc access? I did it yesterday.
 P-5 Why do I have to do disc access?
 M-4 What is the priority of the problem?
 7-W-D I have an answer.
 2-Z Clear to send.
 A-104 Who's in charge here?
 A-11 What problem?
 2-Z Clear to send.

—John Gropper

Anything New in Data Base Technology?

by Vaclav Chvalovsky

CODASYL doesn't have the only answer.

Data processing has been undergoing constant changes in methods, approaches, and techniques. However, our conservative thinking has been lagging far behind technological advances. Since proper and efficient data management appears to be the most important aspect of data processing, it has been at the center of our efforts for a long time. Believe it or not, it has been more than 10 years now since the very first idea of data bases emerged, yet we are still thinking of them and building them more or less on some of those first ideas (see, for instance, Honeywell Bull's IDS). Since even CODASYL has assumed the very same methods, one might naturally get the impression everything is going to last 10 more years—which in fact a great many people believe.

Perhaps this situation may explain why various authors put too much stress on a single method of constructing data bases (more or less close to the CODASYL Data Base Proposals) while there are other workable, efficient, and useful ways to build them.

New concepts

I would like to attack this way of thinking about the future of data base technology simply by pointing to other very interesting methods and concepts in data management that have been emerging, and not only in the U.S., in recent years. They carry fairly promising potential and are likely to have substantial impact on the future of dp.

It is generally possible (and even practical and useful) to make distinctions between the following:

1. New concepts and approaches to data base design;
2. New approaches to data base management systems.

There is one urgent and immense problem in data processing and data management that we haven't been able

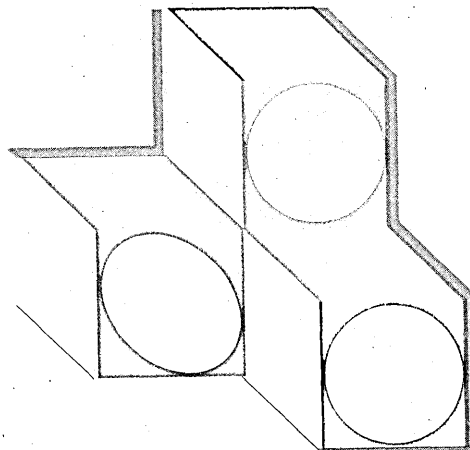
to solve so far and that must inevitably be resolved in the near future. That is the problem of generating true *information* (and not large volumes of *data*), the production of which is feasible only by means of reflecting (mapping) real world processes with the maximum possible exactness in our computer data files.

Questions of this kind have been at the center of interest for some time, and we may expect rather significant changes in our concepts of data management in the next few years. This statement is supported by the following developments, among others, which can substantially change our viewing of data as mapping of reality:

1. *Codd's relational data base*. (See E. F. Codd, "A relational model of data for large shared data banks," *Communications of the ACM*, **13** (6), 377-387 (1970).) This idea has gone through important and promising developments since it first appeared in 1970. No matter how advanced the developments based on this theory are, the fact is that this theory itself is the first serious attempt to reflect complexity of the real systems whose data is being transferred into computer media. More than that, since this theory also makes maximum possible use of certain mathematical and Boolean functions, the systems software based on it may become well formalized and efficient. (See, for example, Cassey and Delobel, "Decomposition of a data base and the theory of Boolean switching functions," *IBM Journal of Development*, **17** (12), 374-386 (1973).)

It is impossible to discuss this theory in detail here. My view corresponds to that of a great many other people who claim this development is a sound and promising alternative to the CODASYL proposal, especially with its range of the fixed data structures (from sequential through hierarchical to network).

2. The so-called *infological approach to data bases* stands for yet another alternative to the development of data base management systems, and hence data management as such. Although having much in common with the theory of relational data bases, it takes advantage of the well-known Langefors' theory and concept of information systems developed at the Univ. of Stockholm. The core of this approach consists of building up two models of reality: one called an *in-*



fological model for the sake of subsequent control of the reality, and another called the *datalogical model*, which records everything that happens within the boundaries of the real system (the so-called object system) and between the system and its environment.

(Mr. Bo Sundgren, who has published so far the most important papers in this field, has also reported on the infological approach to data bases at the IFIP Congress in Stockholm, in August 1974. As far as the practical applications of this theory are concerned, there have been some interesting but yet unproved rumors that DATASAAB in Sweden and several other research institutions in Western Europe are working toward the implementation of this new approach to the data base management.)

This approach is really worth mentioning as it not only attempts to clear up the very basic difference between the much discussed terms "information" and "data"—and the implications of this difference—but also because it can be considered an important step in the formal description, analysis, and design of dp systems.

3. Third in order comes *Senko's* approach to data base design, which also has much in common with Codd's relational models, but goes further in possibilities of practical implementation. In my view, the most interesting ideas in Senko's work are his concepts of an entity, its representation and retrieval, and structured information and its representations. (See for example M. E. Senko "Information systems: records, relations, sets, entities, and things," *Information Systems*, 1(1), 3-13 (Pergamon Press, 1975).)

New approaches to DBMS

Unlike the problems of data base design, where we know several possible starting points, the problems of data base management systems call for new and unconventional approaches. I will name only three, each belonging to a different category of systems:

1. As in case of any other system, CODASYL proposals themselves undergo constant changes. The most interesting seems to be the latest works of the ANSI SPAR Committee where substantial attention is paid to problems of true data independence (conceptual, internal and external SCHEMA, etc.). This development may sooner or later overcome the often criticized drawbacks of CODASYL proposals and move them closer to user requirements.

(The remaining two groups of systems are different from the CODASYL concept and may serve as other alternatives to the solution of DBMS.)

2. An interesting approach to designing a DBMS comes from England where Dearnley and Stocker designed the so-called *Self-organizing Data Management Systems*. The basic idea in this design is that data is being structured and organized on-line, i.e., at the time any particular request for data is issued from the user. This retrieval (access-driven data organization) seems to be very important for large on-line data bases. (See for instance P. A. Dearnley, "A model of a self-organising data management system," *The Computer Journal*, 17(1), 13-16 (1974).)

3. There are a great many other distinguished systems standing as alternatives to CODASYL. Of these one must mention at least TOTAL, System 2000, ADABAS, and IDMS. All these systems have proved their own usefulness during several years of successful service for many users, as well as the

viability of their various approaches to the design of DBMS. A rather interesting data base management system belonging to this particular category has been developed also in the U.N. Computing Research Center in Bratislava, Czechoslovakia as a part of the ISIS project. This system has several interesting features, the most important being that it is written entirely in a programming language called PASCAL, and is to a great extent portable. The system itself owes much to the previously mentioned System 2000 and a few others, and is supposed to be used in maintaining statistical data bases in Czechoslovakia.

Needless to say, I could have listed even more arguments based on recent works in the field of artificial intelligence, developments in disc memories (of extremely large capacity), the impact of wider use of virtual memory, the introduction of distributed data processing and data base processors, and so on. Any of these technological advances can have its specific impact on the future shape of data processing and data management, and ought to be taken into account.

A final word

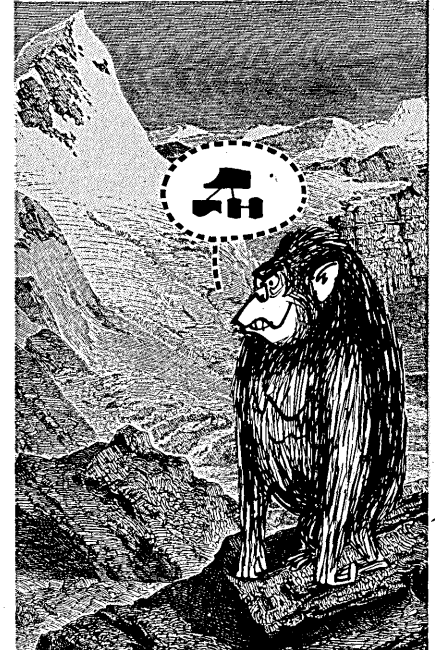
To conclude this brief survey of emerging changes in data base technology, it is possible to say that although a large number of advanced computer installations will have their data management more or less controlled according to a CODASYL-like system, there will nonetheless be a certain number of different systems (maybe still only experimental at the time) benefiting from the relational or infological data base, or those built around Senko's theory. Hopefully, these sort of systems will make their way in due time, and we shall resolve the paramount problem of generating information rather than purely data. *



Mr. Chvalovsky has been a senior research worker at the DP Center of CKD PRAHA in Prague, Czechoslovakia since 1965. His interests are information systems and the development of data bases. He is the author of articles and books on data bases and decision tables.



THE HONEY WELL or The IBMInable SCHEMA An ARPAning INFOR REACTS



"Oh my Codd," CALLED the IDMS.
"You have your RAND on my DBTG!"

"But can't UC, DIAM under your POWER," REPLYED ISAM, the SQUARE.
"IDSire you. If I cannot OBTAIN you, I shall DYL!"

"PSI on you," RESPONDED the DUKE QUERYLOUSLY. "Surely you can INTEL that you do not APL to her. You are making a TOTAL ADABAS of yourself. I must ASI-ST that you RELEASE her, or I shall be FORCED to give you WATFOR."

"Oh, GIS. What a strange REMARK IV an intelligent terminal to make. IMstounded by the entire CONVERTSATION. This is all very CODASYLY. There must be no SEQUEL. We must put a Lickladder on this interchange."

—H. S. Meltzer

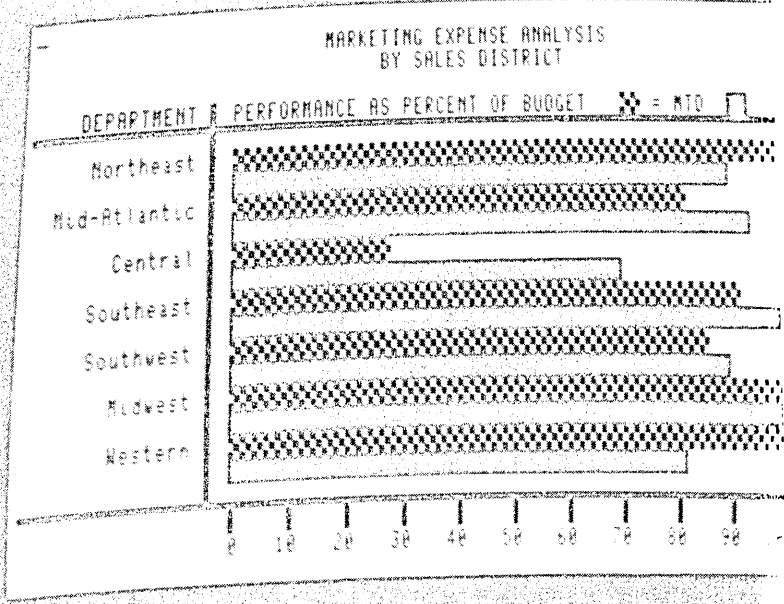
Page in a Modern Bestiary

The computer is a funny beast
He's not aggressive in the least.
He has no malice, fad or whim,
His moods are neither gay nor grim.
He cannot walk (though he can run),
He never makes a joke or pun.
He treats both friend and foe the same,
Incurring neither praise nor blame.
He does just what you tell him to,
And thus he puts the blame on you.

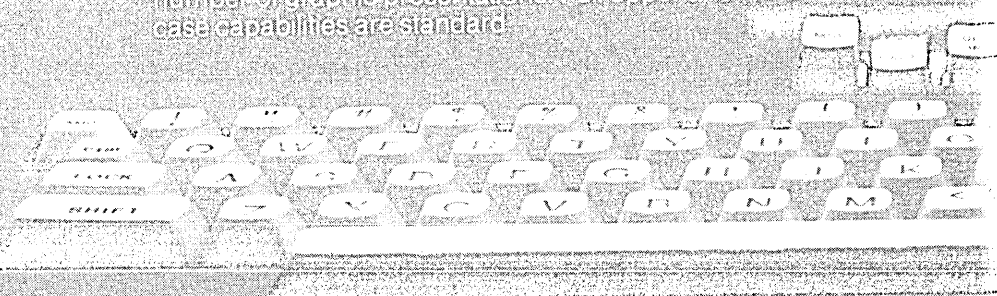
—David H. H. Diamond

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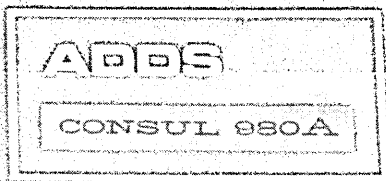


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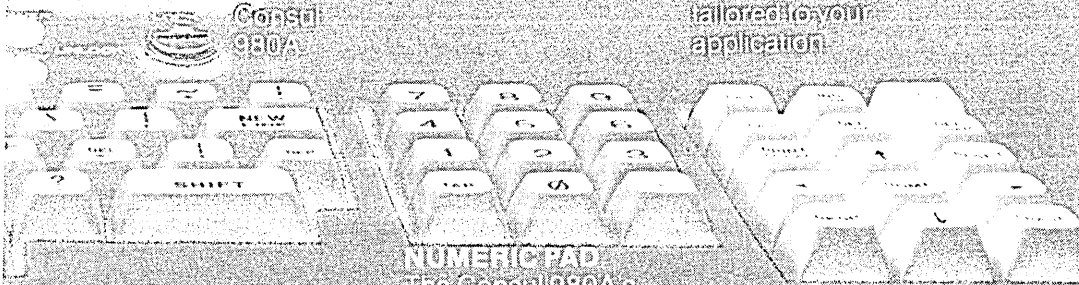
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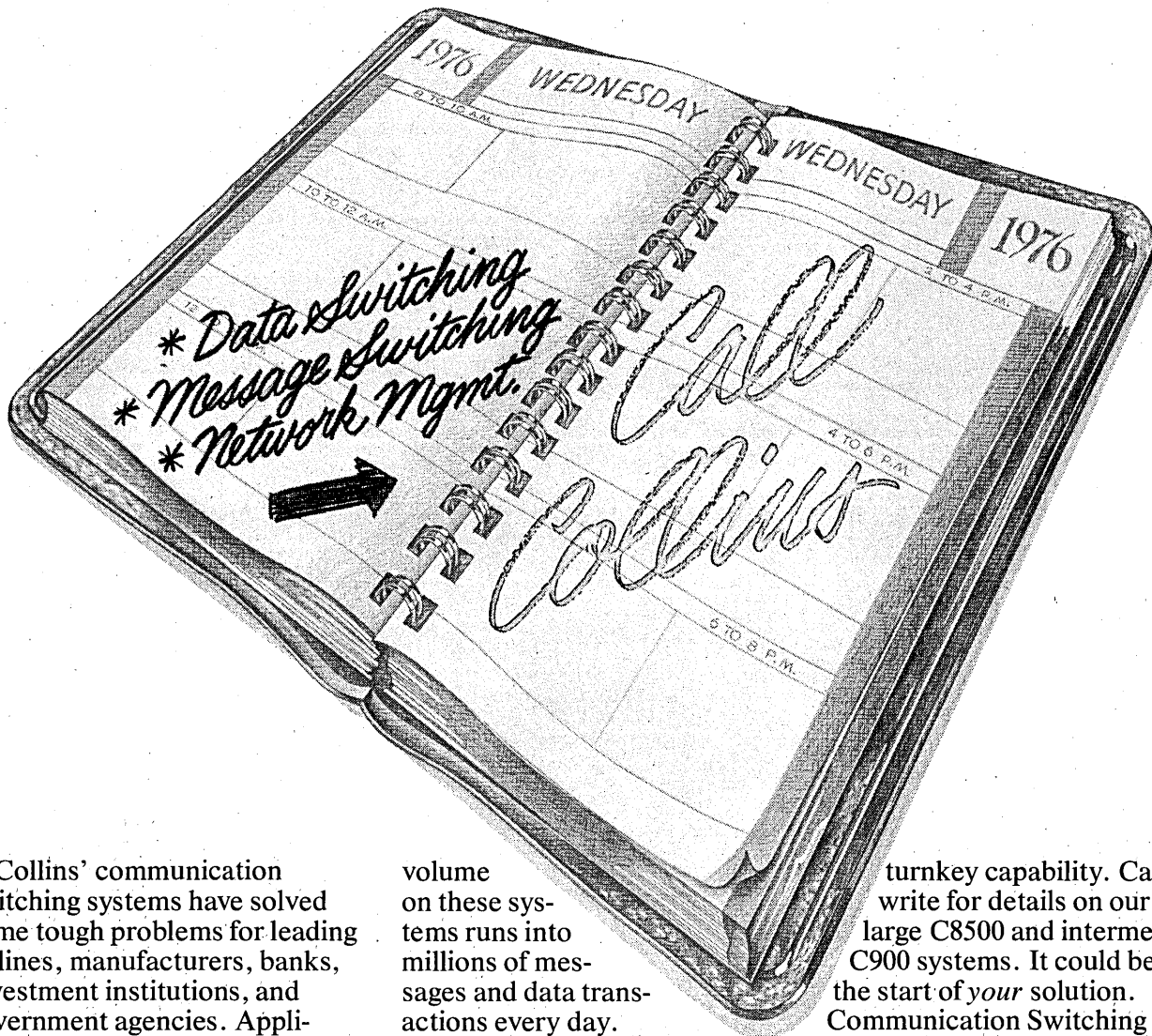
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A Modern Fairy Tale

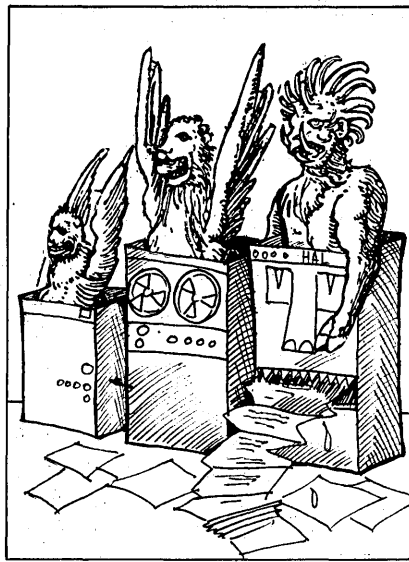
by G. W. Pinwheel.

ONCE UPON A TIME in the valley kingdom of Silicone, there lived three electronic monsters that had been bred to crunch members and chew up input. Their surname was of Alsatian derivation—Computer, of the lineage Comptometer, and their given names were HAL—the papamonster, Minnie—the mamamonster, and Mike Ro—the babymonster.

They all lived in an aluminum and glass cottage in a forest that had been denuded of timber to feed their ravenous appetites for paper. Papamonster had an airconditioned den that had windows on three sides so the residents of the local village, Program, could watch him do his taxes and balance his checkbook. He was of enormous size and girth and required gargantuan repasts of datawerst, volt-brew, and an occasional Programmer to keep him operational.

Mamamonster, a calculating woman, was of more modest proportions—less than $\frac{1}{10}$ the size of her lifepartner, yet on one of her good days (and one of his poorer ones), could do almost as much work. Moreover, she was a much more versatile laborer. Whereas he was limited to sedentary ruminations, she created a warm and orderly cottage, helped babymonster with his homework, stocked the larder, administered to all their pains and ills, kept the car in tune, sailed their boat, placed the phone calls, and a plethora of other day-to-day tasks—all on one bowlful of Kilowatt porridge. Papamonster was paid a large monthly stipend by the local burgomaster for his travail while mamamonster had been purchased from her parents for less than one year of papamonster's wages.

Babymonster was about two years old and was so tiny that he could fit in his papa's hand—and frequently did. The tyke was of good breeding, for, already, when he was in top form and



his mother had the vapors, he could almost match her output on a mere thimbleful of Kilowatts. He, however, was a hyperactive child and only a few of the Programmer babysitters could make him behave, and then just with very simple games or tasks.

Now it seems that as a result of planned papamonster population growth emanating out of the crystal city Armonk, and also due to natural selection, there came a day, in the year of the great palace coup, 1974, when there were many more mamamonsters than papamonsters. And also that same year a new species of mamamonster had been developed (the first christened, MegMinnie by a geneticist in Modular-land) which was even more powerful (some whispered even as resourceful as Papamonster) with only a slightly inflated bride-price.

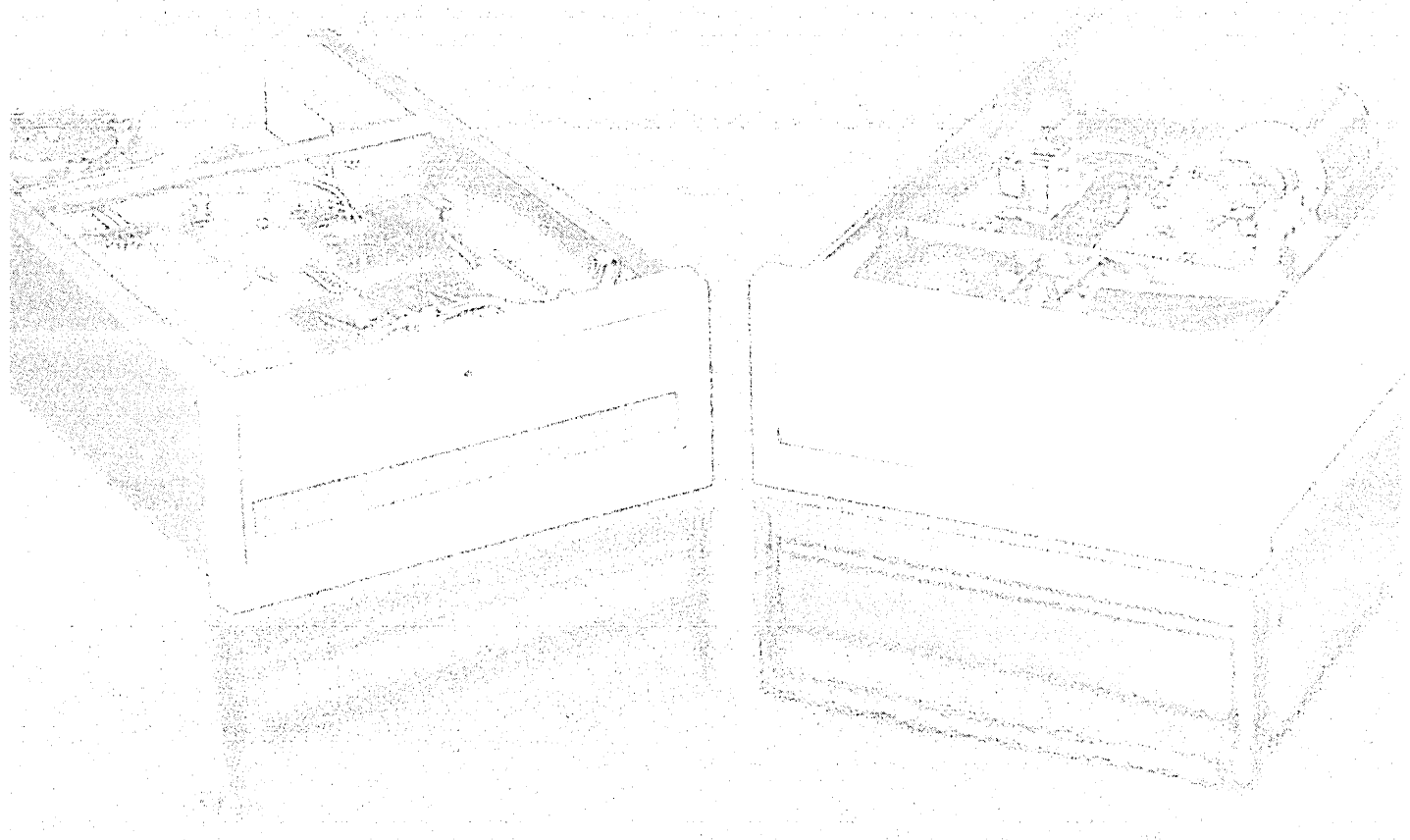
As a result of these startling developments there was gradually spawned a new movement—Mamamonster Liberation—that said that either mamamonsters get paid as much as papamonsters or papamonsters must take a

cut and curb their gluttonous appetites. Now of course, papamonsters, by now, were great pals of the burgomasters—having joined them and the residents of Program on bug hunts and having spent long evenings singing, "Daisy, Daisy," so they at first showed no head to these radical chics. However, when the mamamonsters' new General, Data, started challenging papamonsters to benchmark tug-of-wars, the papamonsters began to get edgy. They elected HAL their leader and were duly rewarded with higher stipends after some remarkably one-sided negotiations with the unorganized burgomasters.

Flush with this victory, the rank and file pressed HAL to carry the battle to the mamamonsters (who had once again reduced their bride-price) and demand that doing taxes and balancing checkbooks was papamonster work. However HAL was at this time on trial in the Big Apple Orchard for wife beating and child abuse and was maintaining a low profile. So things once again began to look grim for the papamonsters. On top of which there were rumors that the now burgeoning population of babymonsters (they had found out how to multiply without a mama or papamonster) were beginning to hold secret meetings.

Will HAL survive? Should he start selling communications burgers to supplement his income? How will the exploding population of babymonsters find enough village babysitters? Will mamamonsters, if they win the battle of the sexes, close themselves in papamonster's den and start courting burgomasters? Well, if the Honeywell-Bull does not trip over the flip-flop and spill all the nanoseconds in among the bubble memories, we will tell you the answers in another episode.





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And that's why we've spent the time and money to make our products the best. And that's why we've spent the time and money to make our products the best.

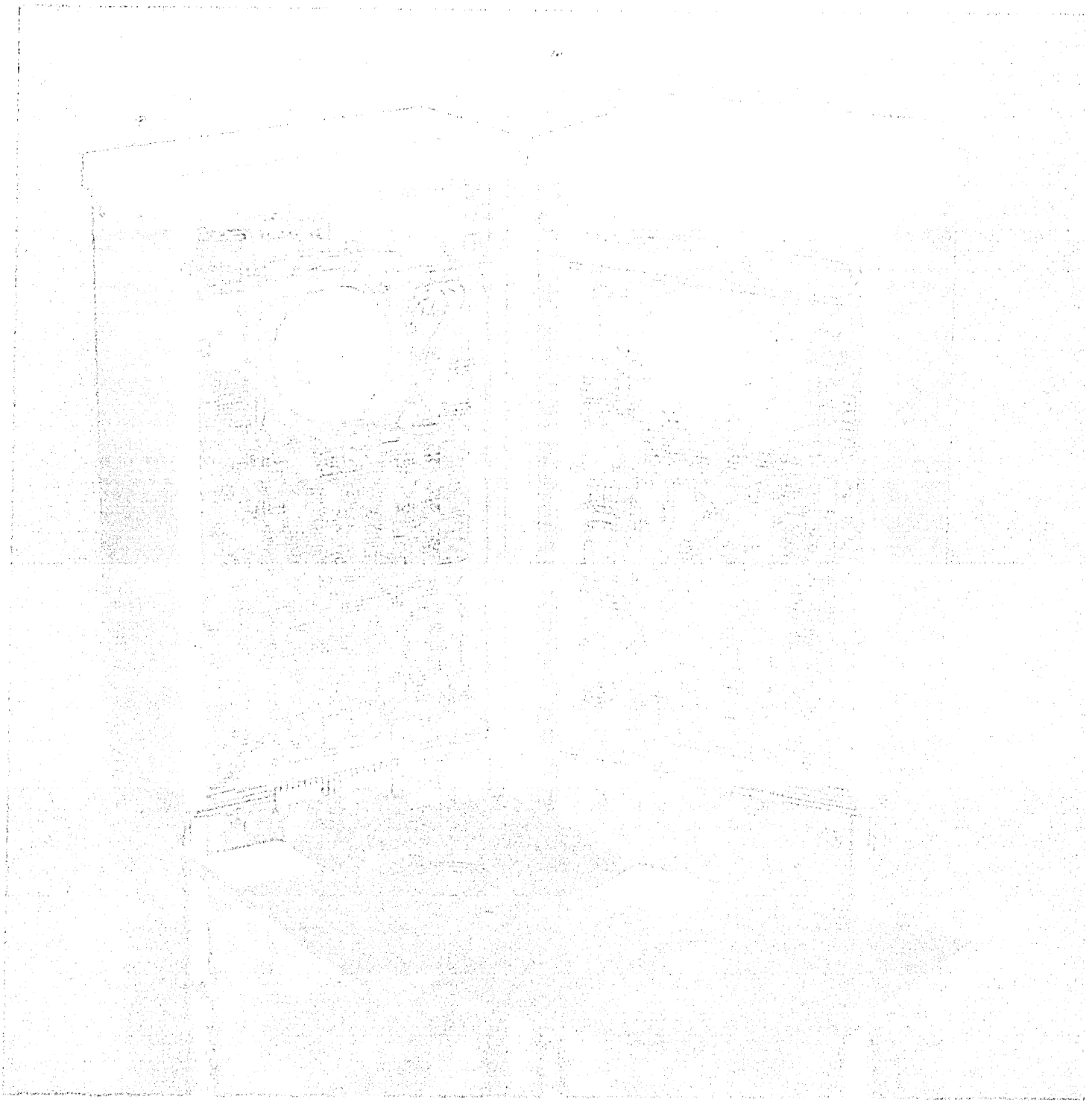
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System For Developing Systems

by James H. Morgan and Michael S. Lightman

Here's a proven method for producing software, installing hardware, or implementing any other kind of "system."

Over the past two decades, there has been a continuing emphasis on methodizing the development of complex systems of all types. In the aerospace industry, in particular, techniques have been developed and refined to plan and control development costs, schedules, performance, and usability of equipment—from microscopic semiconductor arrays to the immense aggregation of men and machines which constituted the man-in-space program. These same methods are widely used by manufacturers of commercial equipment—particularly in bringing the hardware and software of new data processing systems to market.

But what of the end user? Inevitably he becomes (or should become) deeply involved in the installation and effective operation of any data processing system to be used in his application. Too often, however, he assumes a passive role in the critical period between selecting the supplier(s) and turning the data processing system over to the operating department. There is simply a lack of common understanding within most firms on how to review, approve, and assign priorities in the acquisition and operation of complex new data processing systems. Often coupled with this is a lack of participation by the management of the operating departments that will be most affected by the newly acquired hardware and software.

Without such participation, and a widespread understanding and acceptance of the nature of the tasks to be done in specifying, purchasing, installing, and achieving the intended performance benefits, the whole acquisition process may go uncontrolled. Without a standardized formal procedure covering all these diverse tasks, critical milestones may be slipped, or overlooked altogether. The result is almost certain to be a difficult and expensive break-in period after the system is installed. After-the-fact documentation, belated training, and last-minute modifications may well be necessary to "fix" the hardware or software so that the operating departments can use it effectively.

A solution is for end user companies to develop standardized, formal procedures for their own internal "systems development" much like that of the manufacturers of the equipment. Such internal systems development procedures can work in the same manner as uniform procedures for accounting, product development, or planning, and can be just as well understood and controlled by non-dp management.

This seems so axiomatic that we hesitate to restate it here. Axiomatic as it may be, however, we believe that American Express is one of the very few major users of data processing systems that has a rigorous, formalized "system to develop systems."

The systems development process is called the "A-Z System." (See Box, p. 64) The system has four primary goals:

1. To standardize and regulate the development process, thereby providing project managers with concrete, proven guidelines.
2. To get operating departments involved early in the design process so that the system will be responsive to their real requirements.
3. To create complete and unambiguous vendor requirements in order to maintain a truly competitive bidding environment and to avoid responsibility disputes later.
4. To develop all documentation needed for training, operation, and maintenance of the system by the operating departments.

The A-Z System process is progressive, in that it forces the project manager to plan and then work to the plan. Working with operating departments, he must develop a series of "products" which are documents defining each planning or development step. At defined key points in the development process, major reviews are held to evaluate project progress, to review costs, and to verify that the business and system design meet the requirements of the operating departments.

The first key product or milestone is the "Request Evaluation Report." It outlines the problem(s) to be solved, states the anticipated benefits, and broadly estimates the total effort re-

quired. If this preliminary evaluation is approved, the problems are analyzed in some detail, alternative solutions are investigated, potential suppliers are studied, and an evaluation of "General Business Requirements and Design" is prepared and submitted for review. This evaluation includes cost and benefit range estimates and a Return On Investment (ROI) analysis.

Assuming this product is approved, the detailed effort commences, starting with the "Detailed Business System Requirement" and culminating with the "System Specification." If hardware is to be procured, relevant portions of the latter are used for competitive bidding purposes. Supplier cost and schedule data are then integrated into it so that reviewers have detailed time, cost, and ROI data upon which to base the decision to proceed. This product is also used to prepare a very definitive contract with the supplier, after which the system is placed under formal change control.

The remaining products are devoted to planning and scheduling the activities needed for smooth, on-time integration of the system into the user department. Program specifications, training procedures, acceptance test planning, and the like are prepared. During this period, there is close coordination between the various departments and any supplier to expose any technical or schedule problems which would affect other activities. Weekly meetings, for example, are held and detailed minutes widely distributed.

This certainly constitutes a rigorous development process, and one might well wonder whether all those products are really necessary. While we certainly don't apply the full system to small or uncomplicated projects, we have learned to insist on the full A-Z System on large projects.

Key to change

For example, in 1974 it became clear that our keying operations needed improvement. Over 100,000 cardmember applications must be keyed from handwritten forms each month. Since this is high volume,

1975 Brand Preference Studies List Hazeltine in First Place with End-Users and OEM's.*

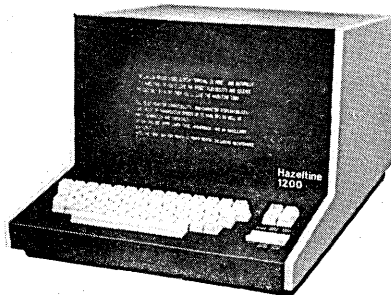
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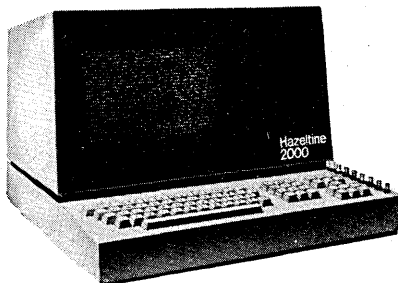
Hazeltine 1000

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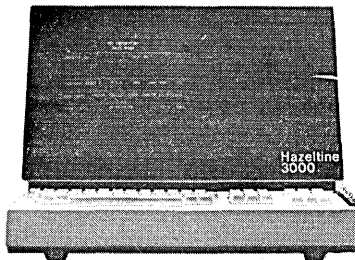
Hazeltine 1200

Offering all the basics and options of the Hazeltine 1000, this model features twice the screen capacity—twenty-four 80-character lines—plus an optional interface for Hazeltine thermal or impact printers. **\$65/month**



Hazeltine 2000

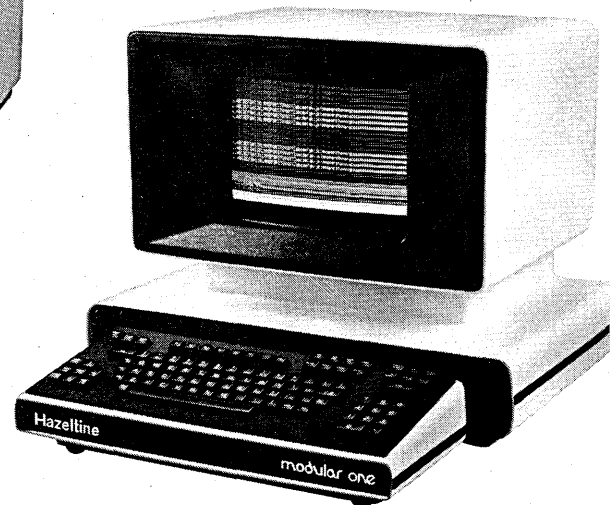
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CIRCLE 19 ON READER CARD

SYSTEM

repetitive work, data entry centers have been established at four locations—New York, Miami, Phoenix, and Toronto.

The problems faced in 1974 were three-fold. First, different formats were being used on the key-to-disc equip-

ment at the four centers, resulting in an expensive software maintenance program. Second, the five year old key-to-disc equipment at two of the centers lacked adequate error detection provisions, an excessive number of input errors were encountered in the keying of data from handwritten applications. Third, the capacity of the key-to-disc equipment was almost exhausted, and

demands on it were about to increase coincident with the expansion of American Express' mainframe systems.

Because of the importance of the key entry function, new key-to-disc equipment solving these problems was thought to be the only rational answer. We did have one major problem, though—schedule. The final decision

Products and Milestones

The A-Z System is based upon the use of clearly defined "products," consisting of either: (1) documents developed jointly by user and service organization personnel; or (2) milestones which represent the completion of certain key activities or significant stages of project development; or (3) both. The products are categorized as follows:

- A. Request Evaluation Report (Document and Milestone)
- B. Survey Plan (Document)
- C. Survey Results (Document)
- D. General Business Requirements and Design (Document and Milestone)
- E. Detailed Business System Requirements (Document and Milestone)
- F. Detailed Design (Document and Milestone)
- G. Program Specifications (Document)
- H. Program Procedures (Document)
- I. Developmental Test Plan (Document)
- J. System Acceptance Test Plan (Document)
- K. Programming and Computer Operations Documentation (Document and Milestone)
- L. User Operating Procedures (Document)
- M. System Acceptance Testing (Milestone)
- N. System Installation (Milestone)
- O. Review (Milestone)
- P. Post-Evaluation (Milestone)

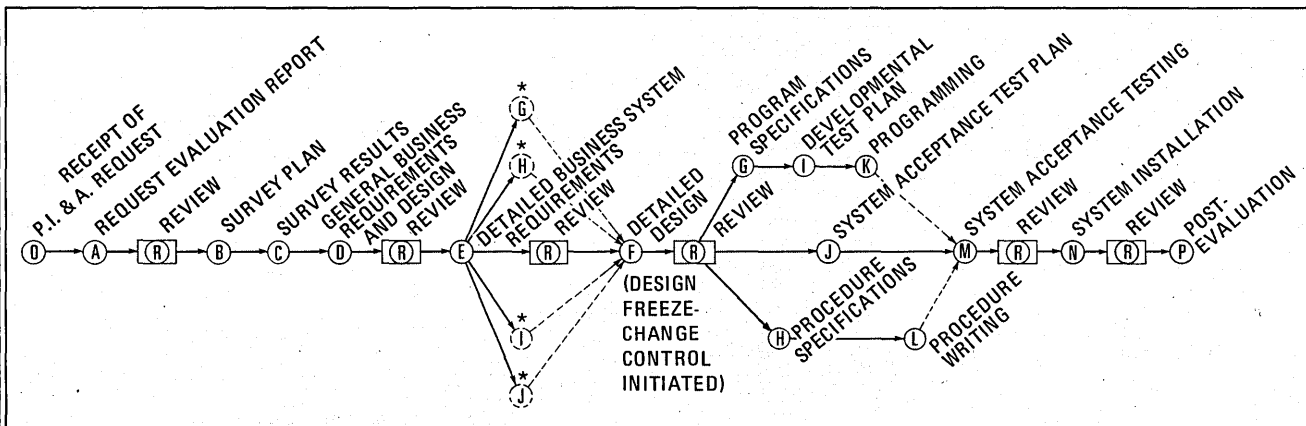
Products A through D are "developmental products" dealing with the problem definition phase of a project and leading to a management decision to authorize major expenditures on the project. Products E through P are "baseline products" and are considered vital to the successful implementation of the project and to efficient system maintenance later on. Consequently, the documentation developed for these products must be kept up-to-date through the life of the system.

The squares on the chart containing the letter "R" indicate when major product reviews occur. These reviews are held to evaluate project progress, to review costs, and to verify that the business and system design meet user department requirements. At the Product F review, a system design freeze is imposed. Thereafter, any system change requests that affect either the fixed time or cost estimates must be processed through a formal review and approval procedure. This not only is intended to discourage unnecessary requests, but also to force the requester to accept the responsibility for any cost or schedule impact of his change.

Products M and N are performed jointly by user department and systems development personnel, using the procedures and documentation prepared earlier. Thus, these activities not only verify the performance of the system, but also provide hands-on training of the operating staff that will actually use the system later.

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PROJECT ESTIMATES:

<p>PRODUCT A— Actual cost to date</p> <ul style="list-style-type: none"> — Detailed cost and time by task through next product — Project category (based on broad estimate of total effort) — Gross benefit range projection 	<p>PRODUCT D — Actual cost to date by product</p> <ul style="list-style-type: none"> — Detailed cost and time estimate by task through next product — Cost and time range estimates by product through end of project — Gross cost and benefit range estimates for operating and maintaining the system — Return on Investment analysis 	<p>PRODUCT F — Actual cost to date by product</p> <ul style="list-style-type: none"> — Detailed cost and time estimate by task through next product — Fixed cost and time estimate through end of project — Refined cost and benefits estimates for operating and maintaining the system — Refined return on investment analysis
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*These products are officially due 30 days after Design Review Board approval of Product F. They are shown here to indicate that much of the work in planning their development should be performed prior to Product F Review to ensure meaningful fixed time - fixed cost estimates.

to switch to new key-to-disc equipment was made in November 1974, yet a major dp project depending on this installation had to be on-line in June, 1975.

Hence, we had to find a supplier and implement six systems, the last to go live by June. Despite the time pressure, though, we rigorously applied the A-Z System methodology. We defined our requirements thoroughly and then proceeded to evaluate no less than 18 key-to-disc suppliers.

Delivery tomorrow

We imposed two difficult requirements which immediately cut the field to three suppliers. First, of course, was the delivery requirement. We needed six systems in all; the first had to be delivered by the first of April; the other five had to be delivered within a month thereafter.

The second stringent requirement was technical in nature. Each system had to be capable of handling at least 32 key-stations. In New York the configuration consisted of two systems, each having 16 keystations. These two systems were to be linked by a duplex control unit such that the supervisor could easily shift any or all keystations from one system to another to accommodate workloads or accommodate a complete failure of one system. Our Phoenix operation required two similar systems.

We evaluated the three remaining vendors in detail. User personnel at all four sites looked at each supplier's system, visiting and talking with their local counterparts at other companies that had installed this equipment. Finally, we selected The CMC 18 Key-Processing System from Computer Machinery Corp.

Then, using our carefully developed documentation, we drew up a definitive contract. This lease agreement covered practically every foreseeable eventuality — training requirements, technical support requirements, maintenance requirements, maintenance response time, transportation costs, and other items. In effect, we tried to resolve all disagreements and misunderstandings before the contract was signed. This proved to be invaluable, because the absence of any disagreements thereafter was a prime factor in enabling us to meet our tight schedule.

And the schedule was really short by this time. We finally signed the contract on March 17, leaving exactly two weeks to deliver the first system. Fortunately, both companies had been working on software and documentation during the contract negotiation period.

After that first system was checked out, systems number 2 through 6 were

installed at the sites within 10 days. Our acceptance test team was able to go from site to site on schedule, so all six systems were accepted and in full operation by the first of June.

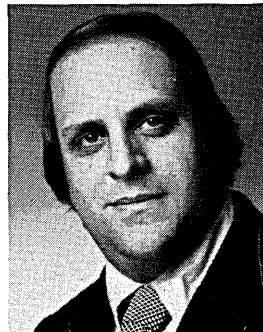
Even in a crash program, therefore, the A-Z System really paid off. The new equipment has been installed and its users trained. Though the program was accomplished in less than six months, we have had none of the after-installation problems that are considered "normal."

In fact, we scheduled a complaint meeting of all user personnel from all four sites for early July. We had to cancel it when the only agenda item we received was a manual that didn't have the latest update.

Much of the credit must go to the skills and initiative of vendor and user personnel. But we are convinced that this project couldn't have been so problem-free without a formal system of development procedures. As we've said, user companies must inevitably become deeply involved in the development of their major systems. They can save a lot of headaches if they do it in a formal, standardized manner. *



Mr. Morgan is manager of industry relations for the Card Division of American Express Company in New York. He formerly was a systems engineer in the aerospace industry for ten years and a communications project engineer for Western Union's all-digital data network for five years.



Mr. Lightman is manager of systems engineering for the Card Division of American Express. He formerly was a systems engineer for Computer Sciences Corp. and a design engineer for RAND Corp.

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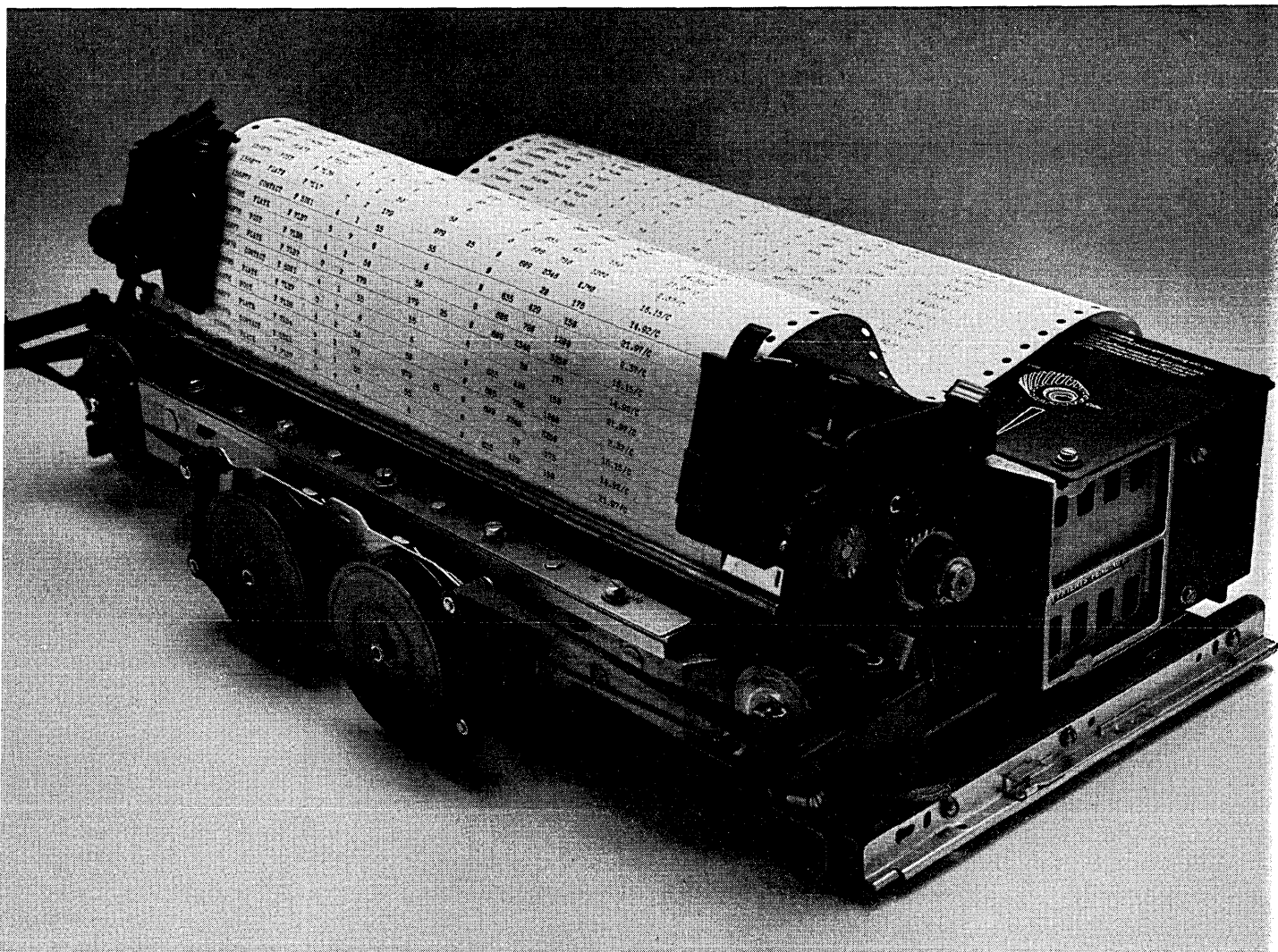
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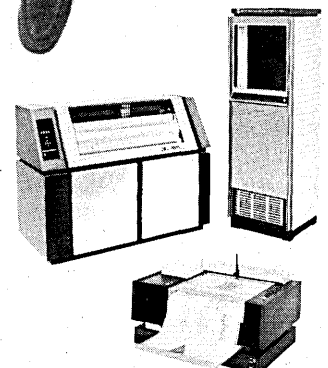
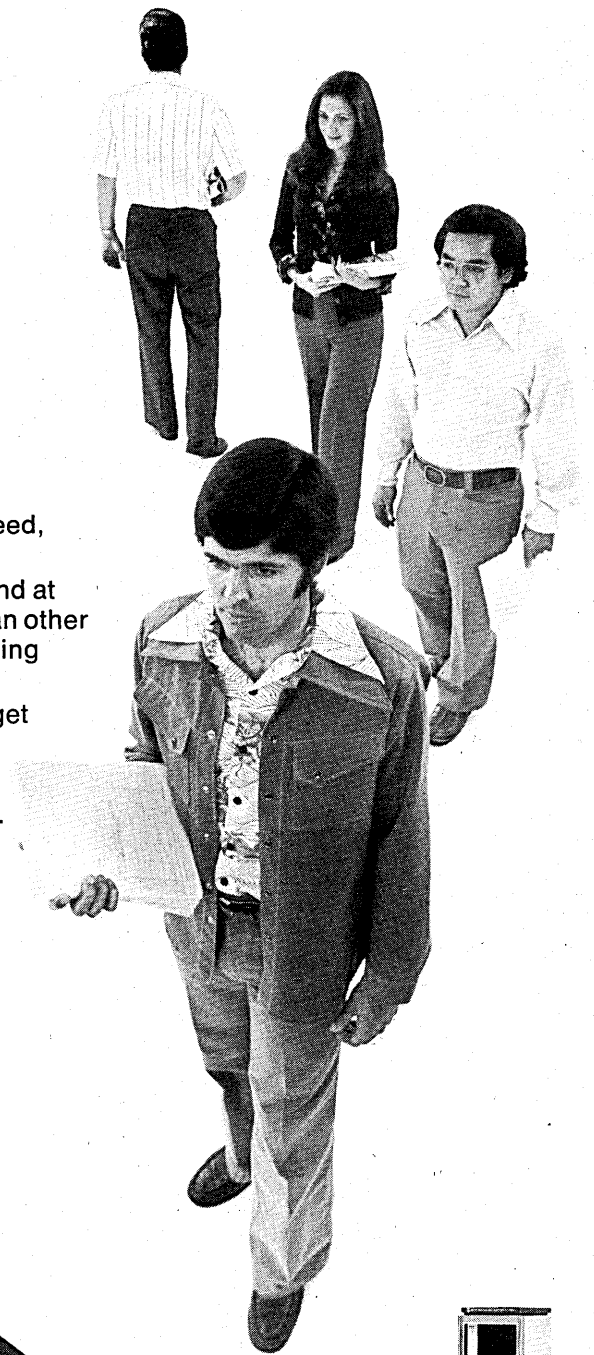
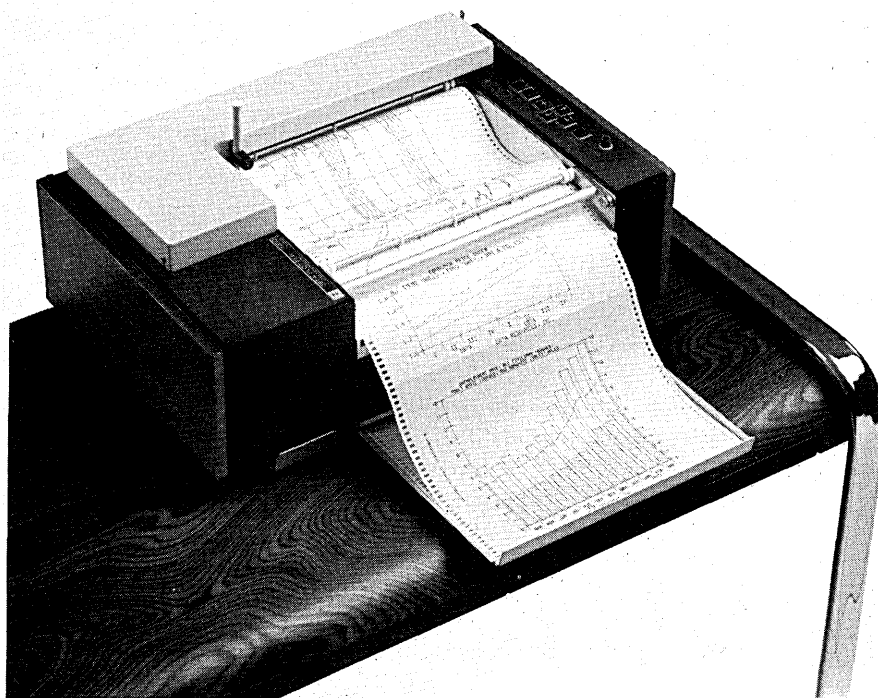
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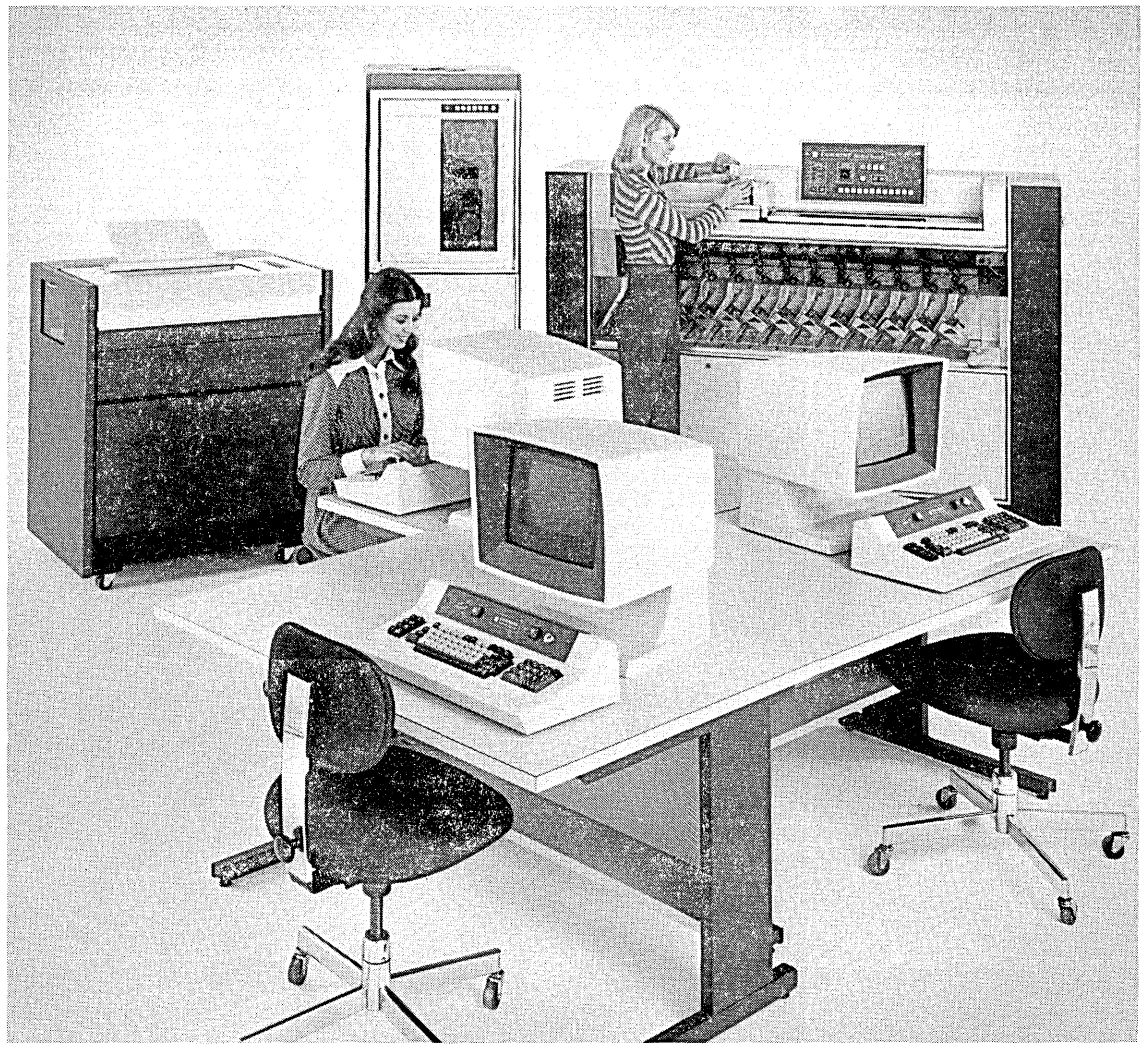
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Please note that the key caps in this photo are intentionally blank. All System 700 key functions are programmable, thus, specific key assignments are made to suit each application.



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Comparing Data Communications Monitors

by Herbert L. Gepner

By 1980, 90% of all dp systems will have some form of data communications capability. The leading monitor packages are surveyed here.

Until recently, data communications networks were implemented only in a few large companies having very specialized on-line communication requirements. Today however, owing to advances in hardware technology, application problem solving techniques, and the proliferation of software products available from manufacturers and independent vendors, data communication systems have been brought to the doorstep of most dp installations. Applications now range from extremely complex real-time applications to simple on-line data entry and retrieval functions that couldn't be cost justified only a few years ago. And the trend is clearly on the upswing: many market surveys predict that by 1980 fully 90% of all dp systems will have some form of data communications capability.

For purposes of evaluation, we define a data communications monitor for controlling such applications just mentioned as a set of code that interfaces multiple applications programs or routines not only with the chosen telecommunications access method, but also with the file access methods, the data base management system, remote terminals, the front-end processor (if used), and the operating system. It must contain a line control facility that accommodates the protocols within the network; and it must address the specific terminal characteristics of the devices employed in the network. In short, data communications monitors must provide the means of controlling the specific environment defined by the user.

Telecommunications access methods

The operating system, of course, is primarily responsible for handling task management, job control, and local I/O operations. The telecommunications access methods, on the other hand, control the sending and receiving of messages from terminals and provide

various terminal control facilities. Though telecommunications monitors are offered for most computers, widely used software from independent software vendors is available only for IBM cpu's. Therefore a review of the BTAM, QTAM, TCAM, and VTAM access methods available from IBM for use on System/370 computers is in order.

BTAM (Basic Telecommunications Access Methods) is the earliest and least sophisticated of the four. It provides basic facilities for sending and receiving messages, and also for polling and addressing terminals. Using BTAM, the applications programmer must concern himself with all the message control functions of the system.

QTAM (Queued Telecommunications Access Method) is somewhat more sophisticated, providing additional facilities such as scheduling and resource allocation, queuing of messages on disc, and message logging. There is a language available to the applications programmer to ease the job of handling control functions by incorporating macros into application programs.

TCAM (Telecommunications Access Method), the successor to QTAM, is even more sophisticated in nature. In addition to all the features of QTAM, TCAM offers a message control program to handle message and network control functions. It also has facilities for system recovery, checkpoint/restart, and control of system shutdown.

VTAM (Virtual Telecommunications Access Method) is usable only with IBM's newer DOS/vs and OS/vs operating systems. VTAM basically incorporates all the facilities of TCAM and additionally allows the user to in-

terface dynamically with a variety of applications programs.

With all these telecommunications access methods, however, the applications programmer must constantly be aware of the controls and interfacing required for implementing application programs. Data communications monitors are intended to ease this programming burden and provide increased operational efficiency.

Why use a communications monitor?

Many data communications users have developed their applications programs—and are still operating their systems—using one or more of the above telecommunications access methods. They have not seriously contemplated moving to a communication monitor system. Their first comment when confronted with a monitor usually is "What does it buy me?" To help answer that question, here's a list of key features which should be offered by a telecommunications monitor:

- The monitor should offer an environment that is efficiently managed by a control program so that any reasonable set of environmental conditions can interface with the user's application programs.
- The user should not have to worry about unique interface conditions.
- All interfaces should be standard, which means that the application programs can be written without concern about protocol, terminal device, and formatting problems.
- Control of the network should not be the responsibility of the applications programmer.

With a monitor, the applications programmer should be relieved of: the logic that governs line control (e.g., connect/disconnect, polling and ad-

(Text continues on page 75; Comparison charts pages 72 thru 74.)

This feature was adapted from a report by Datapro Research Corp., 1805 Underwood Blvd., Delran, N.J. 08075. Copies of the report are available from Datapro for \$12.

COMPARING THE LEADING DATA COMMUNICATIONS MONITORS

System	CICS DOS Entry	CICS OS Standard & DOS Standard	CICS OS/VS & DOS/VS
Vendor	IBM Corp.	IBM Corp.	IBM Corp.
Current number of users	NA	NA	NA
CONFIGURATION			
Operating systems	DOS; DOS/VS	DOS; DOS/VS; OS; OS/VS1; OS/VS 2	DOS/VS; OS/VS 1; OS/VS 2
Protocols supported	BSC, Start/Stop	BSC, Start/Stop	BSC, SDLC, Start/Stop
Average partition size, bytes	73K	DOS-109K; OS- 288K	DOS/VS-101K; OS/VS-244K
TASK MANAGEMENT			
Telecommunications access methods Supported	BTAM	BTAM, TCAM, GAM	BTAM, TCAM, VTAM
File access methods supported	VSAM, ISAM, SAM, BDAM	VSAM, ISAM, SAM, BDAM	VSAM, ISAM, SAM, BDAM
Multi-tasking capabilities	Yes	Yes	Yes
Single-thread/multi-thread	Single-thread	Multi-thread	Multi-thread
Main storage management	Dynamic	Dynamic	Dynamic
Level of data updating protection	File	File	File
Level of terminal security	Operator ID	Operator ID	Operator ID
TERMINAL SUPPORT FACILITIES			
User control from master terminal	Yes	Yes	Yes
Automatic transaction logging	No	No	Yes
Message switching	Yes	Yes	Yes
Message switching formatting	Yes	Yes	Yes
Mapping support	3270	3270	3270
Terminal paging	No	No	Yes
Printer support	Yes	Yes	Yes
System accounting information	Dynamic logging of system statistics	Dynamic logging of system statistics	Dynamic logging of system statistics
Test and debugging facilities	Trace, dump, simulation	Trace, dump, simulation	Trace, dump, simulation
Line/terminal statistics	Master terminal programs	Master terminal programs	Master terminal programs
RECOVERY FEATURES			
Checkpoint/restart	No	No	Yes
Network recovery	Automatic	Automatic	Automatic
Automatic warm restart	No	No	No
System internal shutdown measures	Orderly	Orderly	Orderly
PROGRAMMING LANGUAGES SUPPORTED	COBOL, PL/1, Assembler	COBOL, PL/1, Assembler	COBOL, PL/1, Assembler
PRICE (basic system-no options)	Monthly license only: \$204/mo.	Monthly license only: DOS-\$510/ mo; OS-\$714/mo.	Monthly license only: DOS/VS- \$350/mo; OS/VS- \$750/mo.
COMMENTS	Interfaces with VANDL/1; works in real or virtual mode	DOS version interfaces with VANDL/1; OS version interfaces with IMS-2 or IMS/VS	DOS/VS interfaces with DL/1 DOS/VS or DL/1 Entry; OS/VS version interfaces with IMS/VS; VTAM is supported

Betacomm	DATAKOM/DC	ENVIRON/1	GBASWIFT	Intercomm
Programming Methods Co.	Computer Information Management Co.	Cincom Systems	GBA International	Programming Methods Co.
4	30	Aprox. 160	55	Approx. 150
DOS; DOS/VS	DOS; OS; DOS/VS; OS/VS1; OS/VS2	DOS; OS; DOS/VS; OS/VS1; OS/VS2	DOS; DOS/VS	OS; OS/VS
BSC, Start/Stop	BSC, Start/Stop	BSC, Start/Stop	BSC, Start/Stop	BSC, Start/Stop
63K	65K	195K (OS)	36K	250K
BTAM, TCAM, VTAM	BTAM, EXCP	BTAM, TCAM, VTAM	BTAM	BTAM, QTAM, TCAM, VTAM
BDAM, ISAM, VSAM	BDAM, ISAM, SAM, VSAM, etc.	BDAM, ISAM, SAM, VSAM, etc.	All standard DOS & DOS/VS methods	All standard OS & VS methods
Yes Multi-thread Pre-allocated Record File	Yes Multi-thread Pre-allocated Physical record Optional user-written	Yes Multi-thread Dynamic Record Sign-on ID	No Single-thread Pre-allocated File/record Terminal	Yes Multi-thread Dynamic Record File/terminal
Yes Yes Yes Yes 3270-type Yes Yes Application program time & terminal usage	Yes Yes (on input) Yes Yes 3270-type Yes Yes Time and resource audit trails	Yes Yes Yes Yes 3270-type Yes Yes Resource statistics compiled	Yes Yes Yes Yes 3270-type User-written Yes System statistics printed for programs and files	Yes Yes Yes Yes 3270-type Yes Yes Resource usage & CPU time
Trace, dump, simulation	Trace, dump, simulation	Trace, dump, simulation	Trace, dump, 3270 screen simulator	Trace, dump simulation
Console messages	Log Analysis Librarian program	Log Analysis, print & maintenance	Line service routines	Transient control program
No Automatic No Orderly	Yes Automatic Yes Orderly	Yes Automatic Yes Orderly	No Automatic Yes Orderly	Yes Automatic Yes Orderly
COBOL, Assembler, PL/1, RPG II	COBOL, FORTRAN, RPG II, ADPAC, PL/1, Assembler	COBOL, FORTRAN, PL/1, Assembler, TEBOL	COBOL, FORTRAN, RPG II, PL/1, Assembler, ADPAC	COBOL, FORTRAN, PL/1, Assembler
Single-task— \$15,000; multi-task— \$20,000	DOS, DOS/VS— \$24,200; OS, OS/VS—\$32,000	DOS—\$22,250; DOS/VS—\$27,500; OS—\$29,500; OS/VS—\$34,500	30-day lease— \$500/month	\$32,000
Interfaces with TOTAL, DL/1, DBOMP, and VANDL/1; op- tional Data Entry module	Interfaces with most DBMS systems in- cluding DATAKOM/DB	Uses virtual paging loading method; interfaces with most DBMS systems, in- cluding Cincom's TOTAL	Interfaces with most DBMS systems; GBASWIFT II to be released in April 1976	Interfaces with most DBMS systems

System	Minicom	TASK/MASTER	Teleprocessing Interface System (WESTI)	TP-2000
Vendor	Programming Methods Co.	Turnkey Systems	Westinghouse	MRI Systems
Current number of users	Approx. 100	200	200	5
CONFIGURATION Operating systems	DOS; DOS/VS	DOS; DOS/VS; OS; OS/VS1; OS/VS2	DOS; DOS/VS	OS; OS/VS1; OS/VS2
Protocols supported	BSC, Start/Stop	BSC, Start/Stop	BSC, Start/Stop	BSC, Start/Stop
Average partition size, bytes	20K	DOS-75K; OS-170K	32K	70K
TASK MANAGEMENT Telecommunications access methods supported	Native IOCS	BTAM, VTAM, TCAM, ISAM, SAM, BDAM	BTAM, EXCP	BTAM, TCAM
File access methods supported	All standard DOS & DOS/VS methods	Standard IBM methods	All standard DOS access methods	ISAM, SAM, BDAM
Multi-tasking capabilities	Yes	Yes	Yes	Yes
Single-thread/multi-thread	Single-thread	Multi-thread	Both	Multi-thread
Main storage management	Pre-allocated	Dynamic	Pre-allocated	Pre-allocated
Level of data updating protection	Record	File/record	Resource name	Record
Level of terminal security	File	Password	Terminal/operator lockout	User and transaction ID, time of day
TERMINAL SUPPORT FACILITIES User control from master terminal	Yes	Yes	Yes	Yes
Automatic transaction logging	Yes	Yes	No	Yes
Message switching	Yes	Yes	No	Yes
Message switching formatting	Yes	Yes	No	Yes
Mapping support	3270-type	3270-type	3270-type	3270-type
Terminal paging	User-written	Yes	No	Yes
Printer support	Yes	Yes	Yes	Yes
System accounting information	Application program time & terminal usage	Dynamic statistics collection	Logging and journaling facility	Resource and transaction; automatic logging of statistics on CPU and I/O
Test and debugging facilities	Dump, simulation	Trace, dump simulation	Dump, screen displays, ABEND routines	Trace, dump simulation
Line/terminal statistics	Console messages	Console programs	System control displays	Maintenance commands from terminal
RECOVERY FEATURES Checkpoint/restart	No	Yes	No	Yes
Network recovery	Automatic	Automatic	Automatic	Automatic
Automatic warm restart	No	Yes	Yes	Yes
System internal shutdown measures	Request	Orderly	Orderly	Orderly
PROGRAMMING LANGUAGES SUPPORTED	COBOL, PL/1, RPG II, Assembler	COBOL, FORTRAN, PL/1, Assembler	COBOL, PL/1, Assembler	COBOL, FORTRAN, Assembler; PL/1 planned
PRICE (basic system—no options)	\$8,500	DOS-\$19,000; OS-\$35,000	Local support-\$6,000; local/remote-\$10,000	\$25,000
COMMENTS	Interfaces with BOMP and DBOMP; two versions available	Interfaces with most DBMS systems	Interfaces with BOMP, DL/1, and DBOMP; 1975 Datapro Honor Roll member	Interfaces with MRI's System 2000 DBMS; can be interfaced with most other major DBMS systems

COMPARING DATA

dressings, timing constraints, error detection, and retransmission); line buffer allocation and control; recovery from abnormal conditions (commonly called maintenance of the communications system); and reconfiguration constraints. All the programmer should have to concern himself with, in addition to the requirements of the application itself, is the interface with the monitor (which should be standardized with respect to all existing applications and all future applications).

In summary, to justify its cost, a data communications monitor should provide significant additional capabilities, enhance the performance of the network, and relieve applications programmers of a great deal of burdensome work.

The leading data communications monitors on the market today are: CICS, Betacom, DATACOM/DC, ENVIRON/1, GBASWIFT, Intercomm, Minicom, TASK/MASTER, the Teleprocessing Interface System (WESTI), and TP 2000. There are other packages of this type on the market; however the monitors summarized here are those that have generated the most widespread interest to date.

Entry-level and full-facility monitors

Many vendors as well as users tend to classify the current data communications monitors in two groups. First there are the *full-facility monitors* which generally run under the large scale operating systems such as OS, OS/VS, and VMS; support a virtually unlimited number of applications programs and terminals; include many sophisticated facilities such as checkpoint/restart and recovery modules; have multi-thread capabilities (i.e., the ability to process multiple messages in parallel); and support the more sophisticated access methods such as TCAM and VTAM.

Entry-level monitors, on the other hand, are oriented toward the smaller scale operating systems such as DOS and DOS/VS and are frequently designed to support such features as local crt display control. These systems are usually single-thread in nature, support a somewhat limited number of applications and terminals, and run with BTAM or native access methods.

While this classification generally categorizes the essential differences between the two levels of data communications monitors, it is not, in all cases, correct. The line between the two classes is becoming less clearly discernible. Many entry-level monitors are upgraded each month with functions that allow the user to stay with

his system longer and still enjoy many benefits of a full-facility monitor. In most cases where a vendor offers two versions of a monitor, he has developed the product in such a way that a conversion between them is transparent to the application program. In these situations, the term "entry-level" is commonly used to define the generation and use of those modules of the monitor which are initially required for the beginning communications shop, while the term "full-facility" implies the generation and use of all or most of the functions of the monitor.

This is not to say that an entry-level monitor can provide all the features of its full-facility counterpart. There are significant features which one has the ability to install on a large computer system that could never be duplicated effectively on a smaller system. Thus, it is important that the user evaluating monitors be aware of both the facilities he needs initially and the ones he would like to grow into eventually.

Determining system requirements

There are several major points which must be addressed in evaluating a monitor:

- Determine precisely what *functions* should be supported: Some of the functions could be data entry, inquiry/response, remote job entry, message switching, or a mix of these.
- Define the *distribution* of the net-

work. What and how many communication points are to be established on the network? What type of network (e.g., remote to central, few to many, many to one or few, or many to many)? And how many locations are to be encompassed?

• *Volume* is another key consideration. This involves estimating the traffic (whether records or messages) which will be moving between each pair of points in the network. In addition, it is imperative that loading of the network be considered, with special emphasis on peak loads and peak load times.

• *Priority* is another factor in determining requirements in terms of time constraints as dictated by user requirements. The response time element is a critical factor that may significantly affect hardware and transmission network configuration and necessitate trade-offs between hardware limitations and network makeup.

• One factor that is too often overlooked in the planning stage is *accuracy*. It is important the system allow for data verification facilities outside the realm of the application programs. These may consist of hash totals, error source detection, etc.

• *Codes and line procedures* represent another area that must be explored and defined. This includes defining what, if any, conversion facilities the monitor must have in order to interface terminals and application pro-

Vendor Index

Listed below, for your convenience in obtaining additional information, are the full names, addresses, and telephone numbers of the eight vendors whose packages are mentioned in this article.

Cincom Systems, Inc.

2300 Montana Ave.
Cincinnati, OH 45211
(513) 662-2300

CIRCLE 215 ON READER CARD

Computer Information Management Company

325 Oak Plaza Building
3707 Rawlins St.
Dallas, TX 75219
(214) 526-4280

CIRCLE 216 ON READER CARD

GBA International

2670 Leavenworth St.
San Francisco, CA 94133
(415) 673-5400

CIRCLE 217 ON READER CARD

IBM Corporation

Data Processing Division
1133 Westchester Ave.

White Plains, NY 10604

(914) 696-1900

CIRCLE 218 ON READER CARD

MRI Systems Corporation

12575 Research Boulevard
Austin, TX 78766
(512) 258-5171

CIRCLE 219 ON READER CARD

Programming Methods Co.

(a subsidiary of Informatics, Inc., which is a subsidiary of the Equitable Life Assurance Society of America; prior to October 1, 1975, PMC was a division of GTE Information Systems, Inc.)

1301 Avenue of Americas
New York, NY 10019
(212) 489-7200

CIRCLE 220 ON READER CARD

Turnkey Systems, Inc.

111 East Ave.
Norwalk, CT 06851
(203) 853-2884

CIRCLE 221 ON READER CARD

Westinghouse Electric Corp.

2040 Ardmore Boulevard
Pittsburgh, PA 15221
(412) 256-5583

CIRCLE 222 ON READER CARD

"Why MARK IV? Twice the productivity with no increase in staff."



By Jim Harder
Manager, Technical
Planning and
Development
Boise Cascade
Corporation

"Within the past two years we were able to support twice as much development activity without a staff increase, largely due to MARK IV.

"Not only that, most of our MARK IV Programs are completed significantly under traditional Cobol programming estimates, as much as 100% below Cobol estimates. A combined program to create files from our labor distribution input was budgeted at \$3000. We did the job for \$1200. The reporting programs were estimated at \$3900 and we spent \$2500. And these results are typical.

"With MARK IV you get a lot of work done both easily and quickly. We recently converted a chain file maintenance system — an antiquated IBM bill of materials access method — to DL/1. MARK IV reduced what would

have been a major project in Cobol to nothing more than a slight change in file definition. With MARK IV's independence of files and access methods, we were home practically free — we did the job in a day.

"A lot of our old assembly-language-based programs are very difficult to maintain, so we're converting them all to MARK IV. We've put up several data bases in MARK IV to get our systems into a more maintainable environment.

"Programmer acceptance of MARK IV is excellent. Since it does away with so much of the busywork of Cobol, it lets analysts become programmers and vice versa. Our people can get involved in the whole problem.

Our end users not only like it, they recommend its usage. Several people in our Compensation and Benefits area who have become proficient in MARK IV are running a DL/1 data base covering 30,000 employees. They do all their own report writing. Most of their stuff is ad hoc, and they are able to respond very quickly.

"There's no doubt about our enthusiasm for MARK IV. We're super happy."



WHAT IS MARK IV?

MARK IV is the most versatile and widely used software product in the world for application implementation, data management and information processing. Six powerful models (prices start at \$10,000) are in daily use on IBM 360/370, Univac 70/90, Siemens 4004 and Amdahl 470 equipment at 950 sites in 40 countries. Programs in MARK IV require only about 1/10 the statements of Cobol. Users say no other system offers the power, flexibility and simplicity of MARK IV.

informatics inc
System Products

21050 Vanowen St., Canoga Park, Calif. 91304
Offices in Atlanta, Chicago, Dallas, Los Angeles,
New York, Washington, D.C., Toronto, Canada
Informatics S.A. Geneva, Switzerland
267, route de Meyrin, CH 1217 Meyrin 2
London, Paris, Frankfurt,
Copenhagen, Stockholm
Computer Applications Co., (CAC) Ltd.
Chiyoda-ku, Tokyo, 101 Japan
Datec Pty. Ltd. Australia
Sydney, Melbourne, Brisbane
Systems Programming (Pty.) Ltd.
Johannesburg, South Africa

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21050 Vanowen St., Canoga Park, Calif. 91304

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Title/Position _____

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Address _____

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COMPARING DATA

grams with overall system, what interface codes must be available, what line protocol features are offered, what transmission characteristics the system will support.

- *Cost* is always a consideration. The cost effectiveness of the proposed installation, as compared with existing and/or other proposed configurations, must be attractive enough to warrant going to the monitor system at this time. Ease of use must also receive consideration here, inasmuch as this relates to time required for implementation.

There are still other factors which may need consideration in the requirements planning stage, such as whether an installation has or plans to install a data base management system. In this case, it is important that the DBMS interfaces be clearly defined.

It may seem that this definition of system requirements is an extremely large task that doesn't appear to warrant the required man-hours of effort—but it will prove to be absolutely essential when you begin implementing the system, and the best time to do it is *before* being locked into a specific data communications monitor.

Here's a checklist of specific factors to consider before you make that final choice:

- Operating system interfaces
- Data base and file interfaces, and file handling capabilities
- Network management capabilities
- Memory disc storage management facilities
- Support of higher-level languages
- Incorporation of debugging, test, and simulation features
- Error logging, statistical information, and system diagnostic utility programs
- Error handling features (warm restart, checkpoint/restart, etc.)
- Method of supporting message handling and queuing
- Mapping and paging facilities
- Security provision
- Hardware compatibility
- Vendor-offered support (training, documentation, etc.).

Other points may be included on the checklist, but the above are the critical ones.

Words to the wise

At this point we would like to offer some additional advice. As in most major projects, a necessary ingredient is a large degree of commitment on the parts of both the user departments and dp management to successfully implement a data communications system.

Several of the monitors addressed in

this report are classified as "easy to use," and some in fact are considerably easier to use than others. But the facilities that are offered must also comply with your requirements. The training of applications and system programmers to interface with the system may be extensive with one package and minimal with another; again, this must be judged in relation to what is expected from the monitor chosen. This area of concern can be critical to the development effort. Don't go into it blindly.

In installing a communications system for the first time, it pays to have someone on hand who is experienced (preferably with the monitor that you are installing) to help both in preparation and actual implementation. In many cases the vendor will supply a systems engineer to assist in the early stages, and, in addition, offer support after installation—some at a price, and others via telephone at no extra cost. That person's hands-on experience can be invaluable.

For non-IBM users

As mentioned, this article covers data communications monitors that run on IBM System/360 and System/370 computers, mainly because all of the popular monitors are designed to support these mainframes. To the best of our knowledge, there are no widely used monitors that support non-IBM computer systems, other than the monitors developed by the computer manufacturers themselves.

This does not mean that there is no hope for non-IBM installations. Many of the mainframe manufacturers offer comprehensive communications software to support their systems.

Reading the charts

The charts on pp. 72-74 are designed to provide an overview of the features of the major data communications monitors on the market today. A few of the entries deserve additional explanation:

Average partition size required: When reporting on the main memory requirements of most systems, the amount of memory required by the system code itself is interesting to note. In the case of communications monitors, the figure can be virtually meaningless. The amount of memory required will heavily depend on the number of applications supported, the number of terminals, and whether those terminals are local and/or remote. Therefore, we have chosen to report the size of the *average* partition required to run the system, as reported by the users that we have interviewed and surveyed.

Single-thread or multi-thread: These terms are among the most misunder-

stood in communications software. To dispel any doubt as to what we mean, we will borrow the definition provided by James Martin in his book, *Design of Real-time Computer Systems* (Prentice-Hall, 1967):

"A thread refers to a sequence of events of programs which are needed for the complete processing of a message. In some systems, all of these programs or events will be completed before work begins on a new message. This is referred to as single-thread processing. In other systems, a thread for one message may be broken while a thread for another message continues. In this way, several threads may be handled in parallel. This is referred to as multi-thread processing."

Warm restart: This term is widely used, and contrasts to a *cold restart*, where the system is cleared and operations must be restarted from the beginning of the session. A warm restart involves reestablishing the system environment as it existed at some point in time just prior to the occurrence of an abnormal interrupt, and then continuing operations in a normal fashion. In some cases this may require reentry of some data lost during the failure, but queues and data blocks which were established at the time of the interrupt will not have been destroyed. The restart features of a system are defined by the architects of the system and the constraints of the monitor being utilized:

The remaining terminology in the charts and the significance of the various entries should be self-explanatory to anyone who has absorbed the basic concepts of data communications software. Note that more information on the products listed can be obtained directly from the vendors by circling the appropriate numbers on the reader card bound into this issue. *



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510 Reasons to Buy TELERAY

(The first 500 are only a partial list)

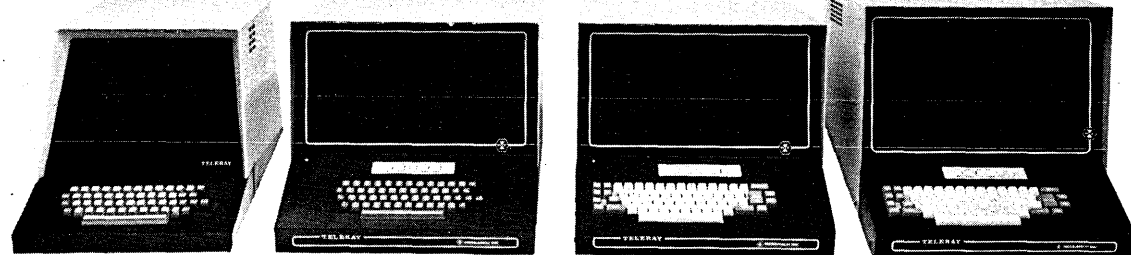
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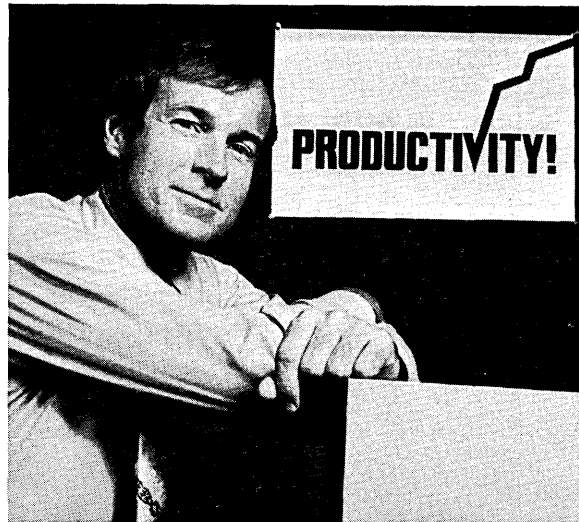


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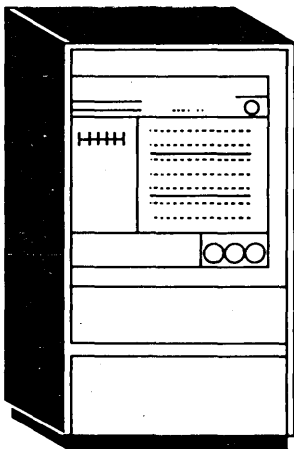
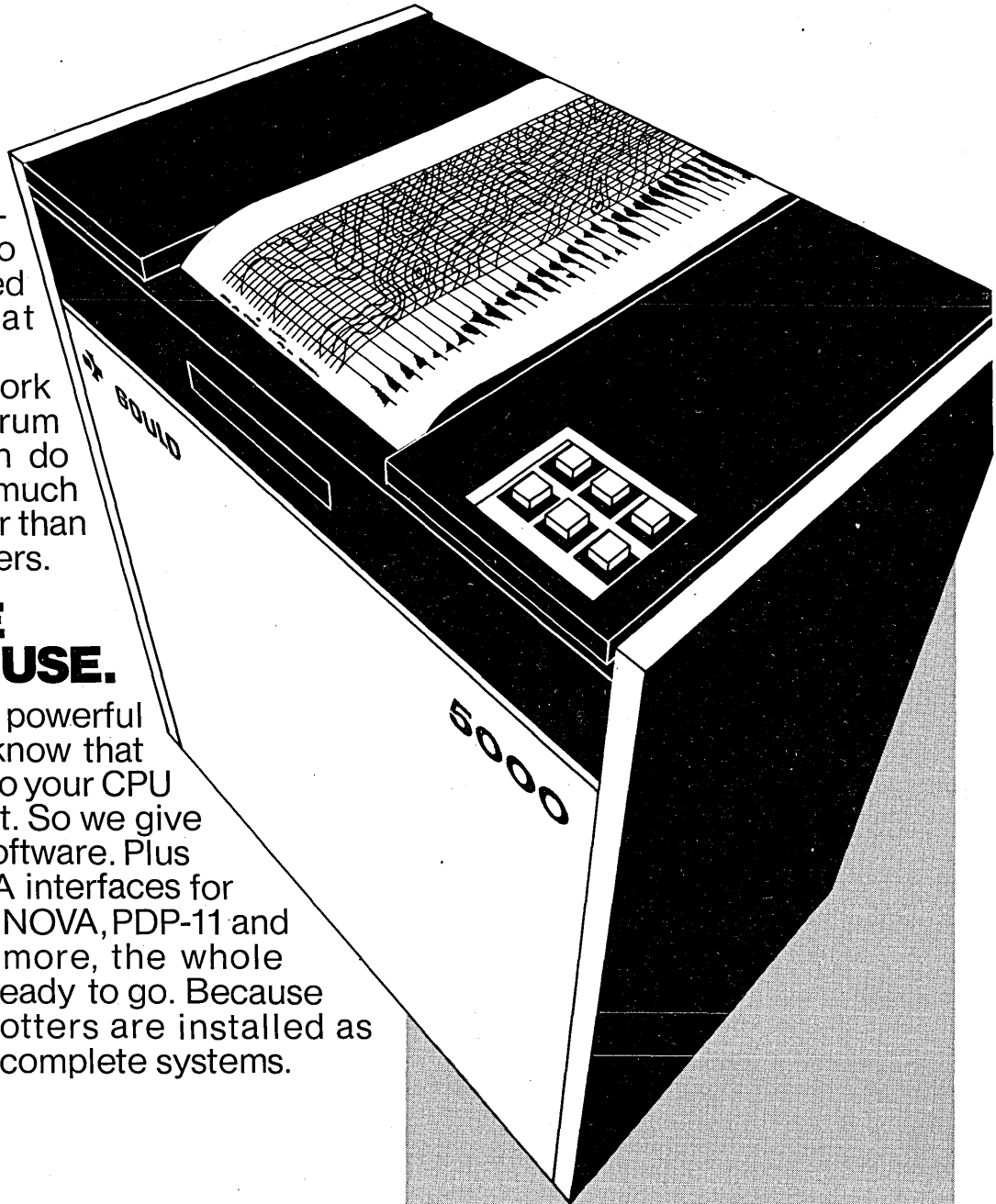
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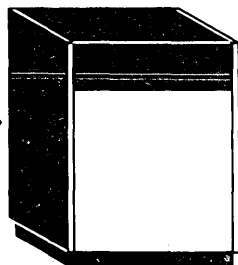
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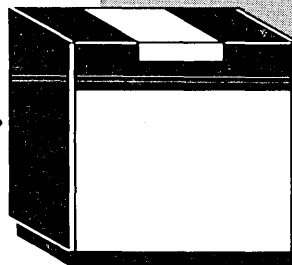
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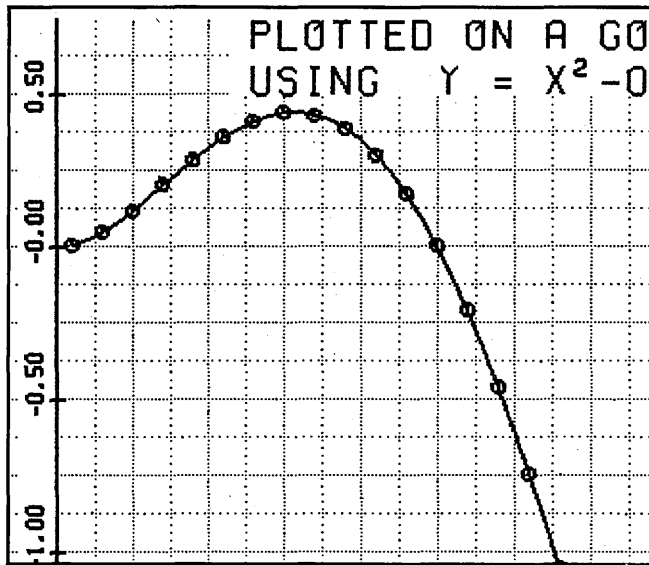
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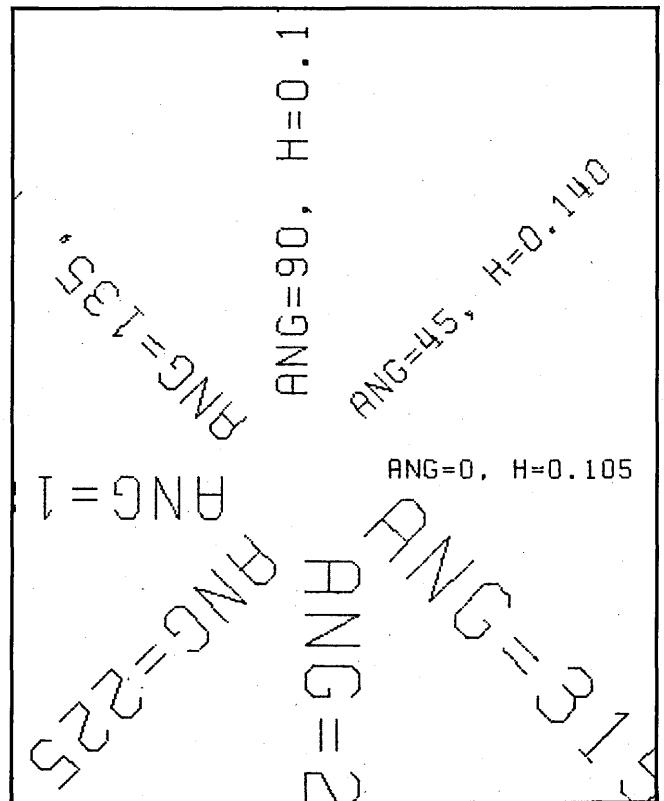
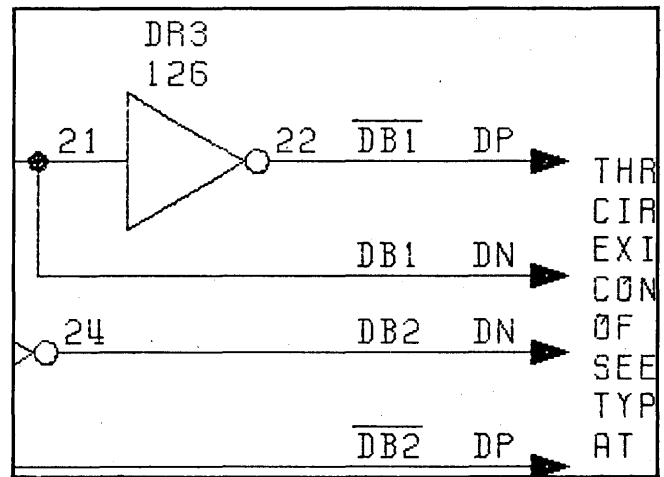
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11/01/73		0.0	▲
11/08/73		0.0	▲
11/08/73		0.0	▲
03/06/74		13.0	▲
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Either way, disk system or controllers alone, you are assured of flexibility, performance features, and price no one else can match.

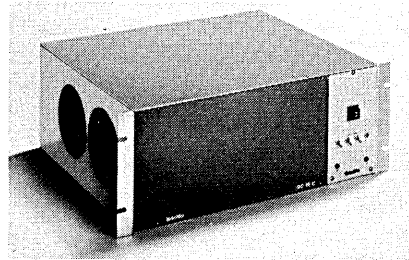
Each system stores up to 1.2 billion bytes.

You can match just the right drives to meet your storage capacity needs all the way from 13.3 million to 1.2 billion bytes per controller. Each DC-16-C Matchmaker controller handles up to four drives. Minicomputers never had it so good.

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Or you can design your own interface.

Your designers may want a piece of the action. Our general interface board makes it easy. Your board will tie in directly, bringing big disk storage to any 16-bit minicomputer.

A controller so small you can even hide it.

The Matchmaker is our smallest controller yet. It is totally self-contained right down to its power supply and cooling system. It's small enough to tuck away in a drive housing or in a rack above, below, or even behind the computer. Out of sight.

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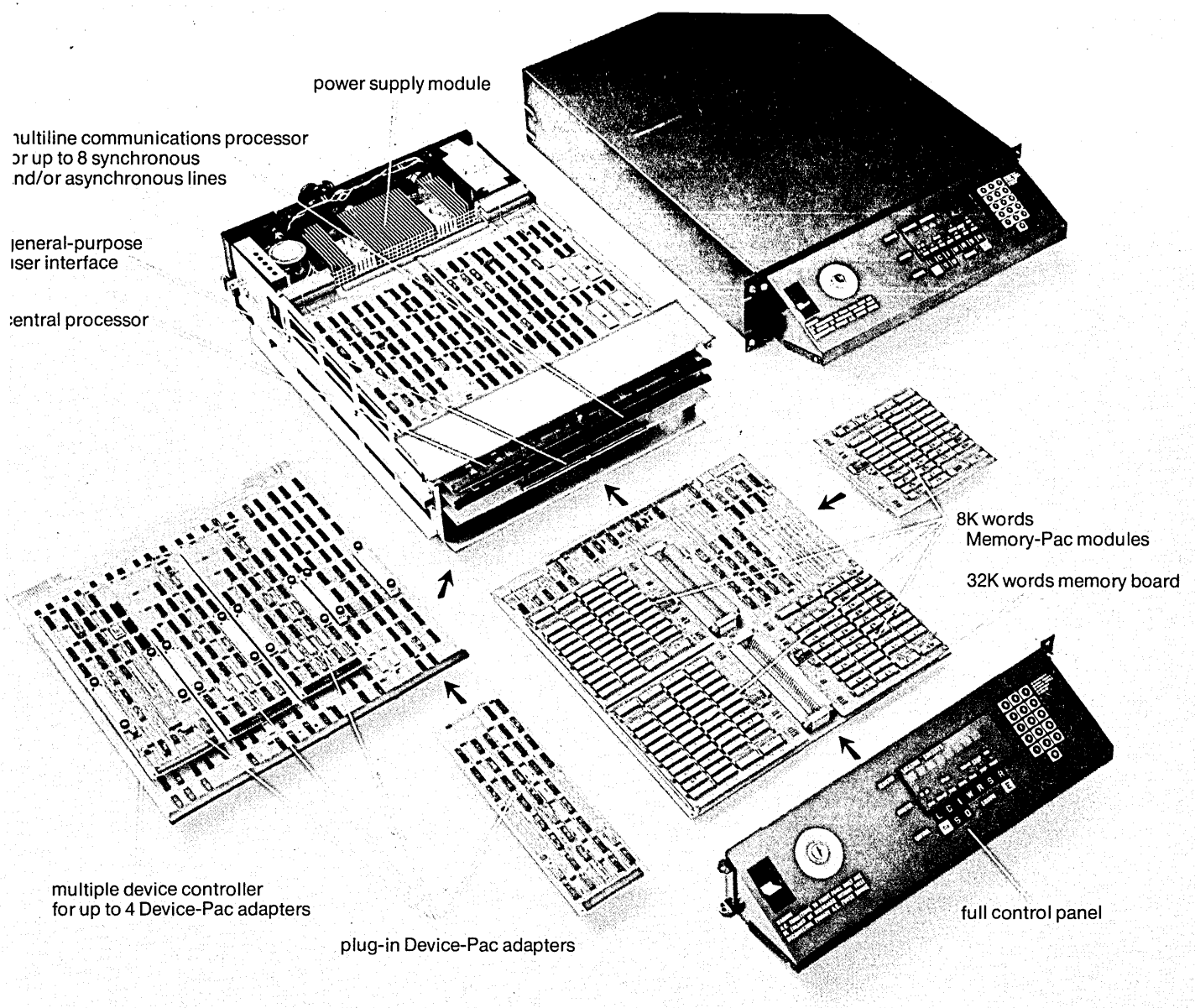
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Shown is the compact, rack-mountable Model 6/36 designed for OEM and system builder applications. The 5½-inch high cabinet houses the central processor, 64K words of memory, a controller for up to four peripherals, and a communications processor which accommodates eight full duplex lines.

The inside story on Honeywell's new mini.

Honeywell's Level 6 minicomputer family offers OEM's and system builders the best of two worlds: A fully open-ended architecture that makes provisions for future developments in technology. And a unique modular packaging design that offers outstanding configurability and serviceability.

Open-ended architecture

- High-performance bit, byte, word and multiword addressing is standard.
- Each 15" x 16" board (central processor, communications processor, mass storage controller, multiple device controller) has its own micro-

processor for more efficient I/O.

- The Megabus™ supports 24 memory address bits, or 8 million directly addressable words.
- Megabus address and data paths are dedicated for bus cycle efficiency, and contention delays are eliminated by distributed control.

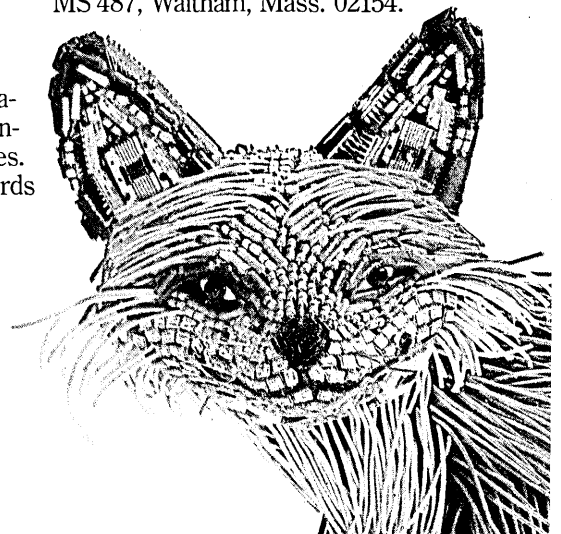
Advanced packaging

- The Megabus allows easy configuration by means of unrestricted positioning and addition of boards and modules.
- Modules plug into the 15" x 16" boards for maximum functional density and configurability.

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3. Minimum call time	1 MIN	1 MIN AVERAGE	NONE (1¢ min)
4. Call-in, call-out on same line	YES	NO	YES
5. Maximum monthly usage charge	NO	NO	YES
6. Average call set-up time	11.1-17.6 SEC	11.1-17.6 SEC	0.8 SEC
7. Billing increment	60 SEC	60 SEC	1 SEC
8. Detail billing*	YES	NO	YES
9. "Camp-on" call back	NO	NO	YES
10. Automatic blocking of unauthorized in-bound calls	NO	NO	YES
11. Abbreviated dialing	NO	NO	YES
12. Highest transmission rate (BPS)	3600-4800	3600-4800	9600
13. Clear-to-send time	150-200 MS	150-200 MS	0.2 MS
14. Guaranteed error rate performance	NO	NO	99.95% ERROR FREE SECONDS
15. Non-blocking switching	NO	NO	YES
16. Automatic and manual dialing	YES	YES	YES
17. Out-of-service indicator	NO	NO	YES
18. Automatic circuit testing during call set-up	NO	NO	YES
19. Automatic calling standard feature	NO	NO	YES
20. Loop-back testing standard feature with all services	NO	NO	YES
21. Two-way simultaneous data transmission	NO	NO	YES
22. Standard RS-232 interface	YES	YES	YES
23. Minimum monthly usage charge	NO	YES	NO
24. Approximate usage charge for a 100 mile, 5 minute call	\$1.45	\$1.75 (measured WATS)	8¢ (at 2.4 kbps)

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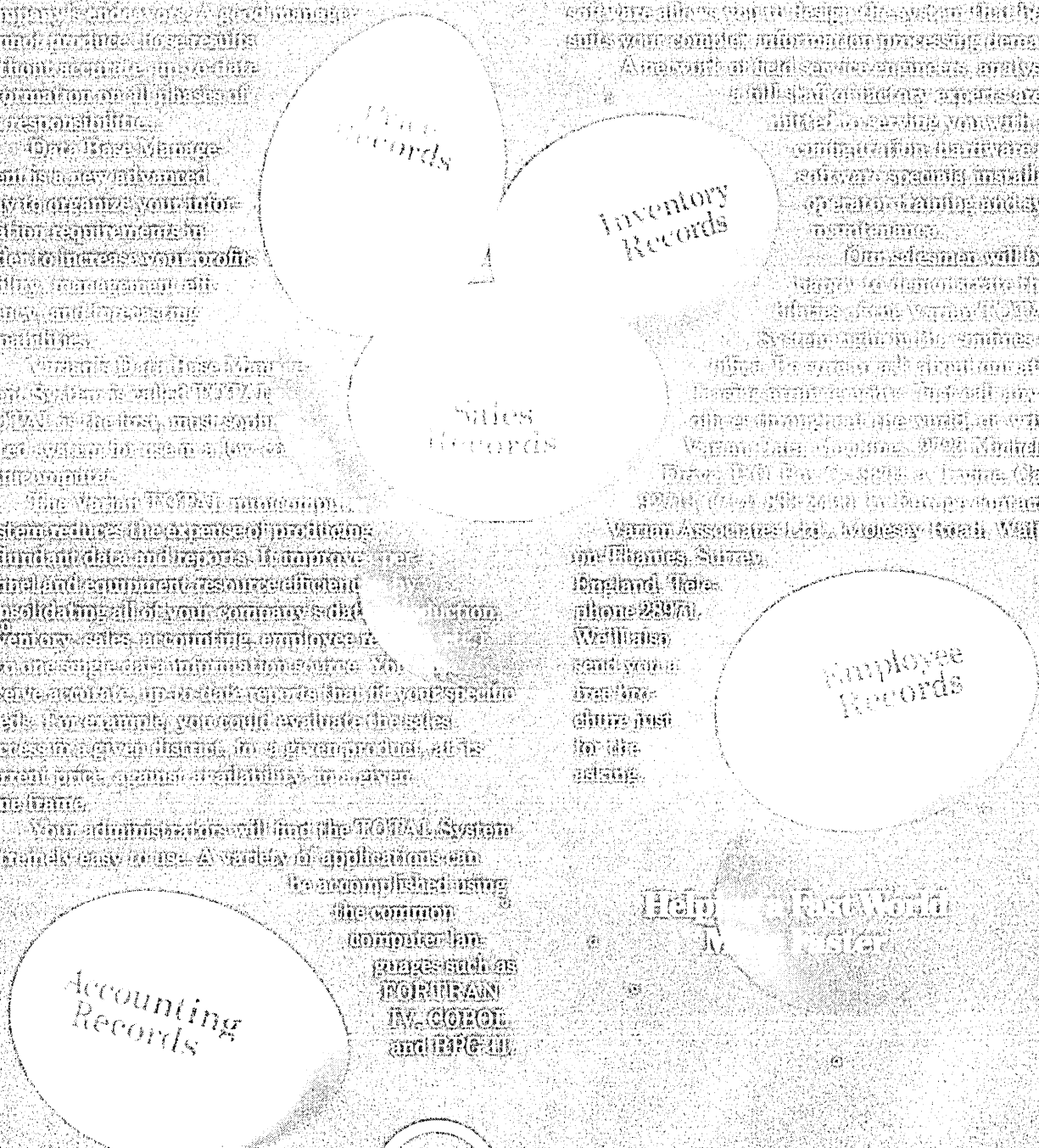
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The Princess And The P-6

by Jeff Hecht

ONCE UPON A TIME in a place that the scientific among us might call an alternate universe but that the rest of us would rather not label at all, there was a princess named Dorinda with an interest in kingdom management. Her father, being an extremely sensible king, sent her off to the realworld to get a suitable education. She returned, some years later, with a B.S. in computer science and a Master's in business administration.

Upon her return, she discovered that hard times had fallen on the kingdom. The royal wizard had taken to munching magic mushrooms, and had called down some rather beautiful but quite devastating weather before someone had slipped him a toadstool. The people in the land of milk and honey were eating peanut butter and jelly sandwiches.

As a solution, she recommended that the kingdom acquire a small computer to aid in forecasting the weather and to provide an inventory management system that would make certain that the royal storehouses contained something besides peanut butter, which she detested. There was a problem, her father said, because the rules of the game stated that realworld things must be procured with realworld money, unlike her education, which had been secured by exchange agreements with MIT and Harvard. Very well, she said, she'd go back and get a job. He wished her luck, reminding her that there was a recession going on.

Times were hard in the realworld too, but Dorinda was an excellent programmer with good credentials — and personnel departments wanted to fill the bottom levels of company organization charts with females who could check “other” for racial origin. So after some hard moments — and after applying the tiniest bit of magic — Dorinda found herself employed by Megacomputer Corp., working on something they called the P6.

“The problem,” section head Pete White told her the first day, “is that the P6 is Megacomputer's version of the Edsel. Nobody wants it and it doesn't work very well. In fact,” he blew a smoke ring from his cigar, “nobody wanted it four years ago when it was supposed to be finished and nobody wanted it seven years ago when somebody thought of the idea.”

Harvard had never told her that managers forgot their neckties, wore hiking shoes which they perched on their desks, or made derogatory comments about upper management. She'd thought something had been strange about Harvard. “But why are they building it?”

Pete shrugged his shoulders. “Because somebody 15 levels of management above me thinks the company needs a new computer, I guess. It's not our problem if it doesn't sell — somebody in marketing will have his ass fried for that. And somebody in engi-

neering will get his ass fried because the hardware breaks down too often. All we've got to do is get one little section of the operating system to operate.”

She wondered if the management had ever gotten proper training. Then she wondered if they had, and if that was their problem. “How many levels of management are there?”

He shrugged his shoulders again. “I think there were 18 the last time someone showed me an organization chart, but there must have been a reorganization or two since then. It doesn't matter; just ignore them, you'll feel a lot better. Now let me describe what you're supposed to do . . .”

It took two weeks for Dorinda to throw up her hands in horror. She spent the first week studying the listings and manuals that she'd inherited. She spent the second week studying tea leaves and other indicators of hidden meanings. Nothing worked. So she dropped the pile of papers on Pete's desk and asked him what they meant.

“You're supposed to tell me that.”

“But who did this? Can't I talk with him? Phone him? Send him a telegram?” If he was dead, she'd already decided, she'd even try to establish communications with his spirit, but she knew enough not to mention that possibility.

“Alvin McGaha had this mess before

you, but he didn't leave a forwarding address when he quit."

"Did he write all of it? It looks like it was written by a large committee that spoke in several different languages, some of which I don't understand."

"I forgot to tell you about that." Pete pulled his feet off the desk and sat up straight. "Our Arabian subsidiary started writing the software. The company thought it could make lots of money selling computers to Arabs, so they set up a subsidiary in Mecca. The Saudi Arabian government insisted that they employ natives to write some of the software, so the company scared up some unemployed camel herders and gave them a crash course in computer

programming. When they slipped three years behind schedule, they delegated some of the work to us. Technically we're working for them."

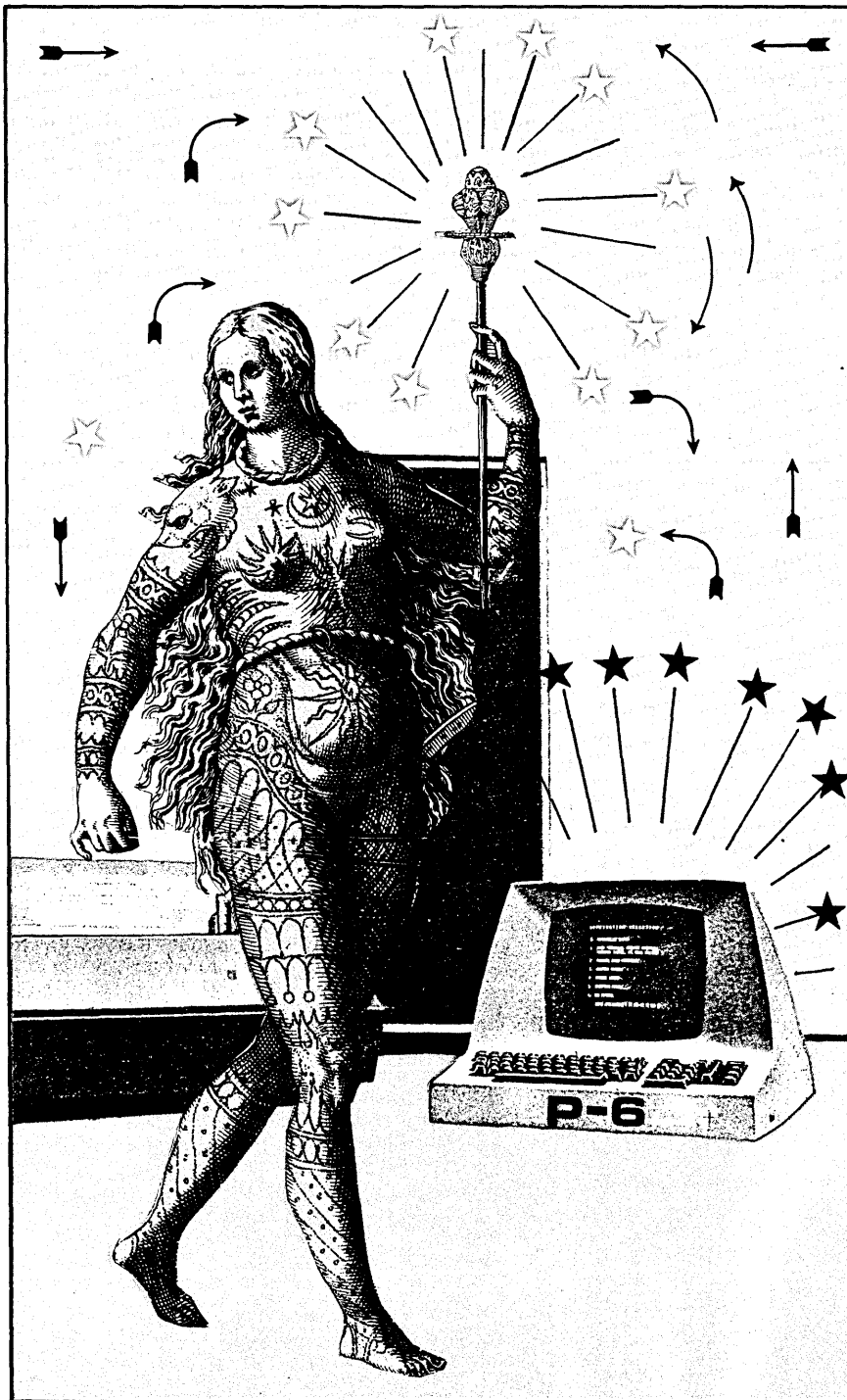
"Maybe I should speak to them."

"It won't do any good; they don't speak English."

Dorinda just shook her head.

Pete read the line that Dorinda was pointing to. "The hired killer (expletive deleted) the system permanent process group . . . You've discovered Aringlish."

"What do you mean? I'm trying to find out how this subroutine is supposed to work, and this is what the specifications say it does."



"These specifications were written in Saudi Arabia, then translated into English. The translator had some difficulty with the technical terms. Don't worry about it, the routine doesn't work anyway."

Dorinda rolled her chair against the opposite wall of the cubicle and looked directly at him. "Why doesn't somebody tell me these things? How am I supposed to get anything done if I can't tell what specifications mean anything?"

"The rest of us can't always tell either. And you don't realize how much you've gotten done already. We assume that each programmer writes an average of two lines of program per day. It's only taken you three weeks to realize that nothing makes any sense; most new programmers don't realize that for six to eight weeks, so you're 50 lines of program ahead of those people already." He reached into his shirt pocket for a cigar and bit off the end, spitting it into her trash can.

"If you want to know if the specifications mean anything," he continued, "ask Marty or Frank. They know more about such things than you'll ever need to know." He fumbled in his pockets, searching for a match. "Unfortunately they don't know anything about programming, but that's probably why they're still here."

"How does anyone get any work done?" she asked, shaking her head.

"They don't." He pulled his hands out of his pockets, empty. "Can I borrow a match?"

"If you smoke the smelly cigar someplace else."

"This is your official how-do-you-like-the-company lunch," Pete said after the waitress had taken their orders. "It's a ritual after two months on the job."

Dorinda smiled. "That's all right. I generally accept free meals, and I would even if you were being lecherous."

"No, no, you misunderstand. I'm much too young to be a dirty old man and just old enough to be a confirmed bachelor. This is company business; I'm supposed to see how satisfied you are with your job. And after I butter you up with free food, I'm supposed to ask you to work overtime."

"Doing what?" They laughed. The waitress tried to ignore them as she delivered their drinks. "The proposition is supposed to come after the meal."

"I'm afraid this is strictly business. Somebody up top just read a regress report. In three months, some group in New Jersey fell a year behind schedule."

Dorinda looked puzzled. "New Jersey . . . ?"

"Megacomputer is everywhere. They're doing some accessory program

THE PRINCESS

— they don't really matter much. Except that someone in uppermost management is rather upset with Arabs." When he looked across the table, Dorinda looked even more confused.

"I'm two steps ahead of myself again. The Arabs have mission responsibility for the whole project, including the people in New Jersey. So when the people in New Jersey fall behind schedule, the Arabs can be blamed. So now there's been an ultimatum issued — the P6 must be completed by the end of the year or else."

Dorinda finished sipping from her drink. "That line is too good to resist. Or else what?"

"Well, the rumor I hear is that Megacomputer will try to sell somebody else the whole project. I don't know who'd be foolish enough to buy it, though. Maybe they think they can con some more Arabs."

Dorinda was beginning to understand. "You mean they conned the Saudi Arabians after the last catastrophe?"

Pete nodded as he picked up his drink.

"This may sound ridiculous," Pete began, looking down at a paper on

Dorinda's desk, "but I'm supposed to tell you that you're working too hard."

Dorinda agreed that it sounded ridiculous, but she'd gotten used to that.

"We have to budget computer time, and you've used more time than the budget allows you."

"I've been a bad girl." She started giggling.

"My reaction wasn't quite that violent."

Dorinda forced herself to stop. "The company really doesn't expect us to get any work done, does it?"

"Of course not. Megacomputer is a social welfare scheme camouflaged as a corporation; its real purpose is to keep us off the streets."

"But what if it did work?" Her eyes twinkled. "What would happen if the P6 somehow operated just the way the specifications say it should? What if we could really complete it?"

"That would take magic," Pete muttered. "Besides, we'd all get laid off."

Pete closed the door to his cubicle with an air of superficial solemnity. Dorinda didn't think he was capable of being properly solemn.

"Dorinda, have you heard the rumors about a demonstration of the P6?"

"I've heard something . . ."

"Well there is going to be one, for the biggest of all the biggies. I hear that the reason behind it is to evaluate the

progress we've made with the P6. There hasn't been much progress, of course, although the people working with the printer have gotten it to stop destroying itself. So naturally we've got to impress them with the machine, or they might, according to the accompanying rumor, cancel the project and make all of us go out and get real jobs."

Dorinda's smile faded. "Peter White, if you think that I'm going to play mannequin in that silly demonstration . . ."

"No, no — I'm drafting you for the technical staff. You're the best programmer in the whole section. I want you to help design some software that makes the P6 look like it's capable of processing real data."

Dorinda laughed. "But I'm not small enough to hide inside it."

That night Dorinda called her father. You can do lots of wonderful things with the telephone system. Ma Bell has no idea how much magic lurks inside her switching systems, and all that the phone phreaks know is that the magic is there. There was more than enough magic to let Dorinda call home, but even so her call didn't go through the first time.

She knew what she could do to the computer, she told her father. She just had to ask him how much of it fell within the Rules and Regulations.

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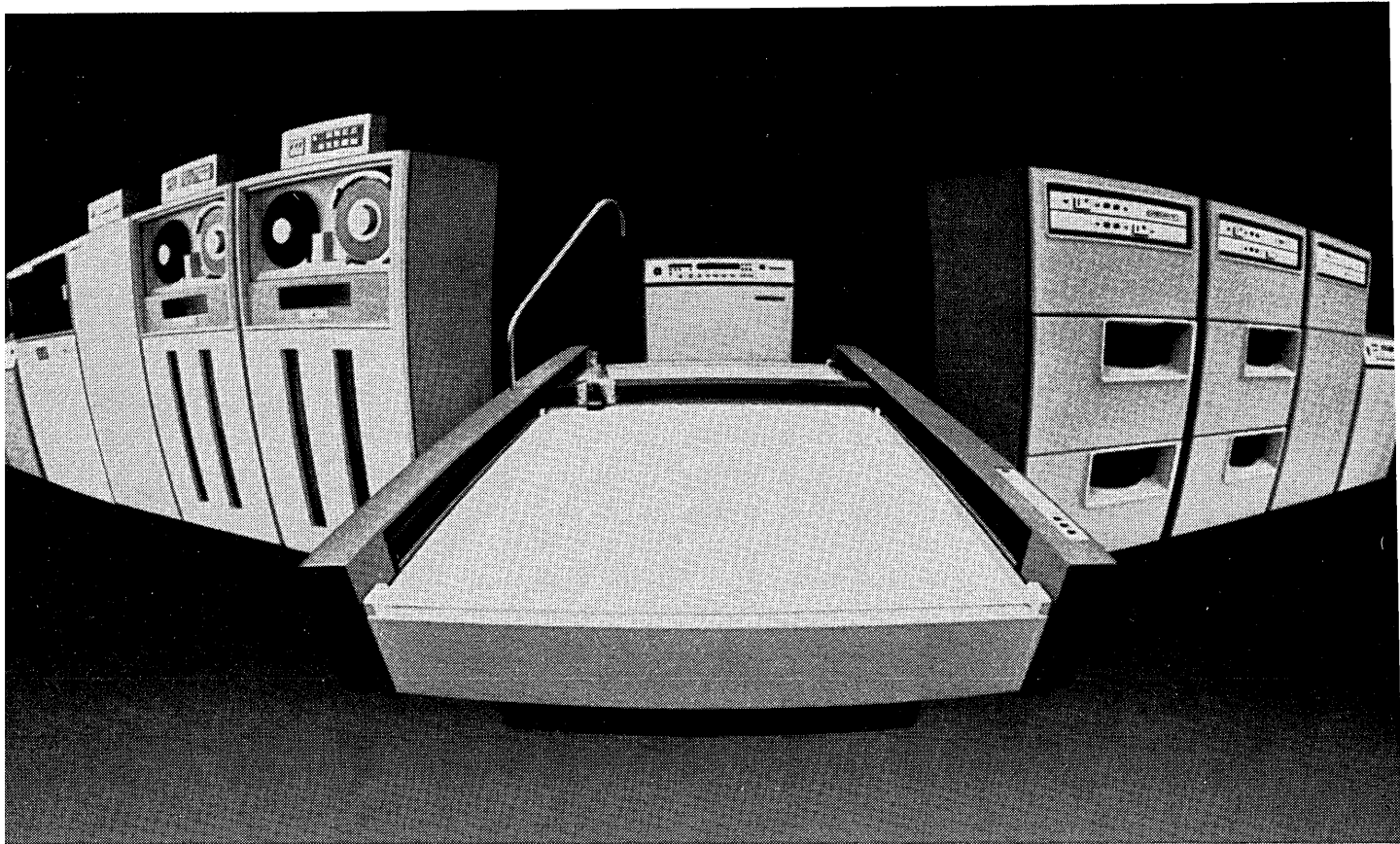
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THE PRINCESS

could hear her father flipping through the pages of a book. "Computers are classed as partly within the realm of magic," he answered. "Their physical manifestations belong solely to the real-world, but their inner workings are rightly in our domain." He flipped through the pages again. "And corporate executives fall under at least a triality — crooks and fools and geniuses. The genii — I think that's how I should have said it — are by their very nature beyond manipulation; you could not fool them. The others, who are very much in the majority, do not believe that such things could happen to them — therefore the barriers against such things happening to them are very low."

"Dad, I don't always understand you."

"And I don't always understand you, Dorinda. But I think you want to know what you can do and what you should do. You can do what you want to do — but it's only going to work once. And I'm not sure what you should do."

"I'd hoped it would work more than that, but it's still once more than it would have worked if I weren't here."

Dorinda looked around the room behind the demonstration room. The cables were as tangled as a bowl of spaghetti, and most of them were attached to minicomputers. "What are all these minicomputers here for?" she asked. "I thought we were demonstrating the P6."

"They make the demonstration work. All the cables from the P6 and its peripherals come back here; the minicomputers control their operation. The minis make the tape drives spin and the printers print," Pete replied. "The P6 can't do a thing."

"Aren't we supposed to be showing that it does something?"

"Well, yes. This demonstration is supposed to show significant progress 'toward an integrated operating system,' I think. But the operating system, as you well know, isn't operating yet. Nor is it likely to in the near future. So we're going to fake it."

"Won't they be able to tell the difference?"

"Not really," Pete laughed. "Mr. Strangle was a computer salesman — well, actually he was selling business machines back then — but he never knew anything about what he sold. Mr. Beating is a lawyer of some sort. And Mr. Dinger never did anything, that's why he's chairman of the board. They wouldn't know the difference if you had mice running around inside a computer."

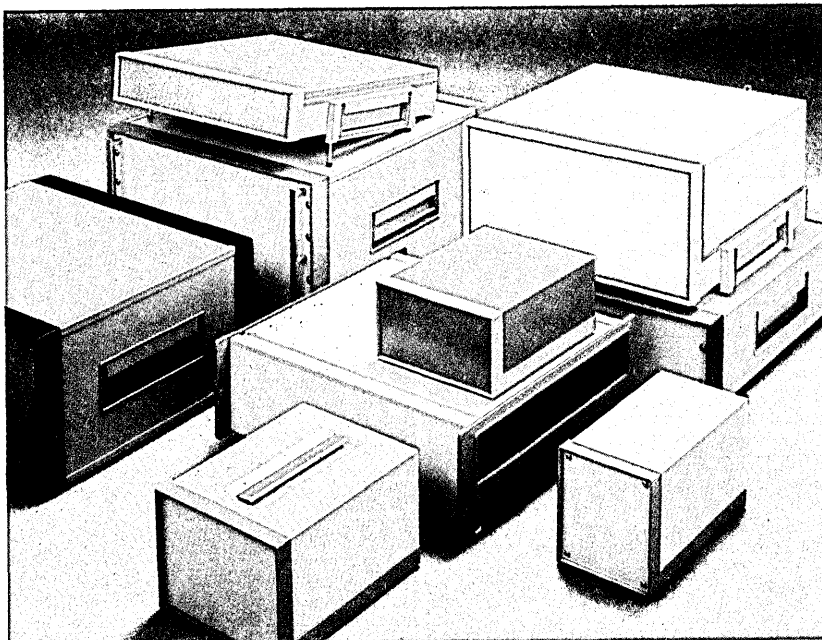
Dorinda looked around the cluttered room. "Then what are we demonstrating?"

"That we know more about computers than they do. All they'll see is that the console lights up and displays messages they can't understand. The tape drives will turn, the card reader will read and the printer will print — that's all they expect. We don't bother spinning the discs because they can't tell if the discs are moving or not and the heads tend to make a horrible screeching noise when they score the disc surfaces."

Pete had been surprised when Dorinda volunteered to lead the biggies around the demonstration. Various

other levels of management, however, agreed that she was a vast improvement over the typical grubby engineer who might do something as horribly gauche as wear different-colored socks or an incorrectly tied necktie. So she found herself the technical expert in charge of snowing uppermost management out of their minds.

"This is the new P6?" Mr. Strangle asked. "It looks like an old heap of junk. I thought we had some good designers on this project. I wanted to see some revolutionary concepts. This printer looks like a refrigerator. And these colors are awful."



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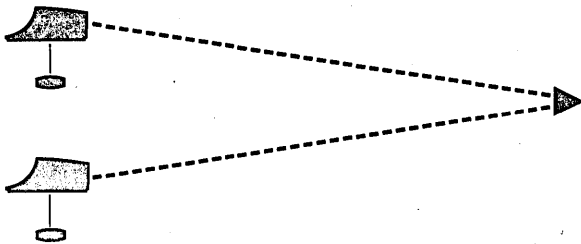
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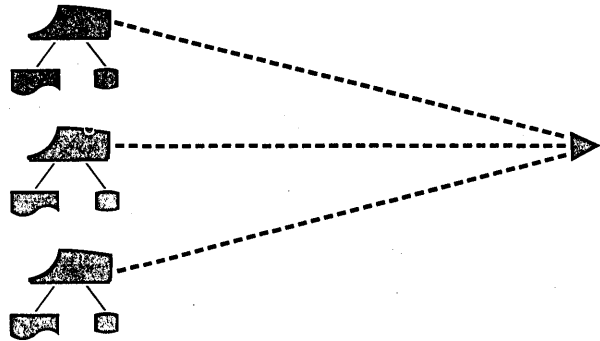
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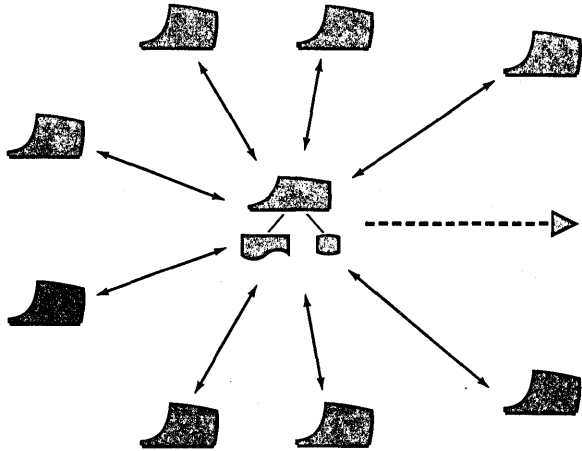
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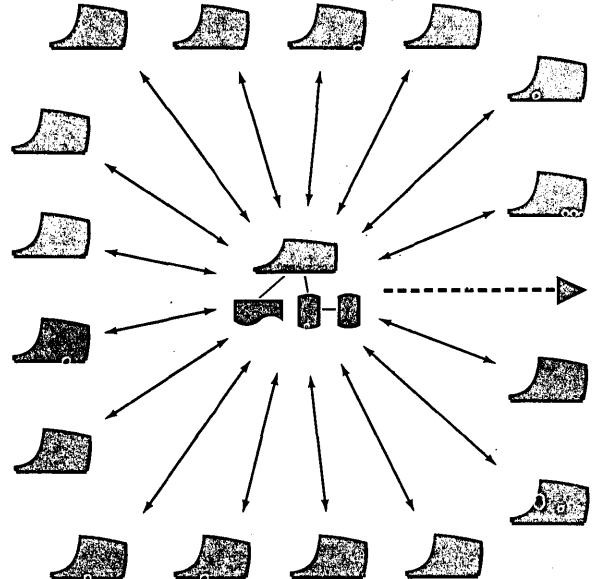
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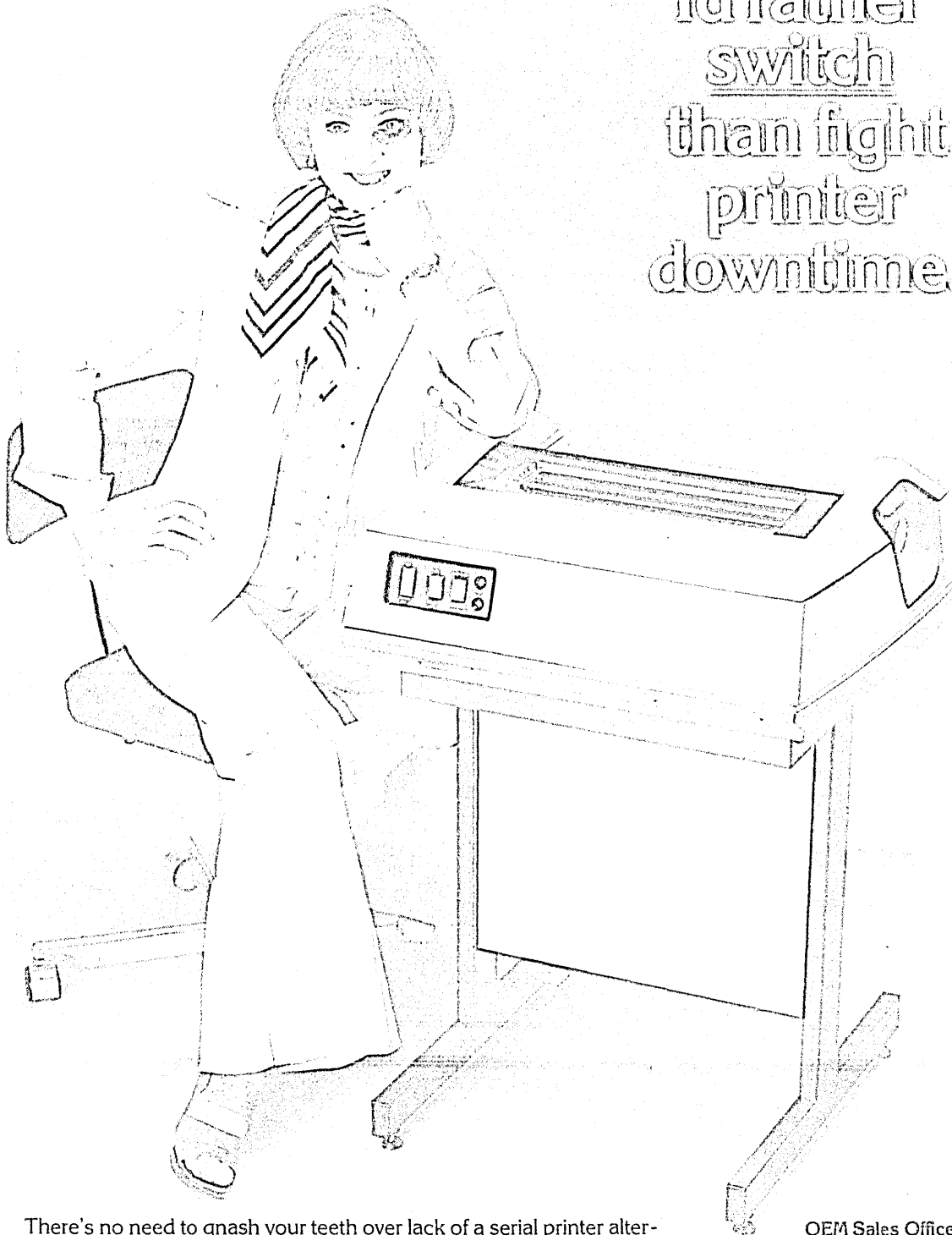
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Companies

RCA Computer Demise Revisited in Court

It Still Could be in the Computer Business
Had a \$100 Million Error Been Found Sooner

In the sometimes Alice in Wonderland world of the computer industry, the 1971 demise of RCA's computer operation will no doubt always be looked upon as the Mad Hatter's birthday party.

And as the years pass and as new data rolls in it is becoming evident that the zaniest activities were not occurring at the operational level in the computer division but at RCA corporate headquarters in Rockefeller Center.

New evidence and testimony that has come forth during the U.S. Justice Dept.'s antitrust case against IBM in New York indicates that RCA's corporate financial controls as they related to the computer operation were severely lacking, and possibly at times virtually nonexistent.

One particularly startling revelation was testimony by V. Orville Wright, former president of RCA's Systems Development Div., to the effect that a \$100 million accounting error had been uncovered after RCA's chairman Robert Sarnoff and his board of directors made the decision to bail out of the computer business.

Wright maintained that the \$100 million misunderstanding caused RCA corporate officials to underestimate the amount of money needed by the computer operation to continue in business. Wright observed that neither he nor the head of the computer division, L. Edwin Donegan, had been consulted by RCA corporate officials about the move to fold the computer operation. Had they been consulted, Wright indicated, and if they had found the error, the decision to leave the computer business might have been changed.

Wright said that the error involved "a misunderstanding of how cash flowed to RCA from accrued equity contracts."

Indeed, RCA's methods of accounting for its so-called accrued equity contracts appears to have been at the heart of the financial problems in RCA's computer

division. RCA's accrued equity contracts—initially formulated for the firm's substantial number of government users—were six year cancellable lease contracts in which the great majority of the six year contracts' revenues and profits were recorded in the first year for accounting reporting purposes.

Awkward situation

However, actual revenues and profits occurred over the six year period and, worse, customers were permitted to cancel the contracts, which created an awkward



L. EDWIN DONEGAN
RCA threw in the towel as he
was sorting out the finances

ward situation in which revenues and profits already taken by RCA could be wiped out down the line. The practice was also in common use by plug compatible firms like Memorex and Telex and eventually caused enormous problems for those firms too.

The practice was acceptable at that time in the early 1970s, but the Accounting Principles Board (now the Financial Accounting Standards Board) was pre-

paring to eliminate the practice. Documents submitted in the antitrust case in New York indicate that RCA corporate began to understand the accounting complications at a very late date and at a date when the bad news associated with the accounting problem tended to make the situation in the computer operation seem worse than it was.

"If revenues from these contracts were restated on a lease basis" stated one RCA document dated shortly before the firm's directors decided to fold the computer operation, "CSD (Computer Systems Division) revenue in 1971 would be \$43 million lower and losses would be \$23 million higher."

Earlier, RCA had been expecting CSD to break even in 1971. In this atmosphere of general confusion in corporate finance came the sudden "resignation" in early 1971 of Howard L. Letts, executive vice president of finance.

Meanwhile, in the computer division itself, Donegan and his staff, who had taken over the operation in January 1971, were attempting to sort out the finances of the operation. As Donegan began to uncover the problems with lease accounting, and as these made the business plans of the computer division appear darker, the RCA board of directors grew more and more critical until, at Sarnoff's urging, they voted to throw in the towel in computers.

Funding problems

Another problem concerning the accounting was that RCA management began to feel that new funding requirements for the entire firm were escalating along with the increased need in funding for the computer operation, which would account for more than one-half of RCA's funding needs between 1971 and 1976.

"... it appears that new funds required during the 1971 through 1976 period may exceed \$1 billion," one RCA internal document states. About \$700

news in perspective

million of that amount would have gone to the computer operation.

In hindsight it would appear that the decision by RCA corporate to depart the computer business may have been needlessly hasty. For one thing, the RCA equipment has been immensely profitable for Univac, which acquired the RCA base.

One prestigious Wall Street house, Donaldson, Lufkin & Jenrette, has referred to Univac's acquisition of the RCA base as "ridiculously low," observing that Univac paid RCA only \$127 million for a base valued at about \$800 million. Univac has earned well over \$400 million in revenues and well over \$200 million in profits from the RCA base, which undoubtedly will continue to contribute fat earnings to Univac. The latter firm has retained an estimated 80% of the RCA base.

One witness at the antitrust case, Anthony L. Conrad, RCA's president, testified that he believes that IBM had not "forced" RCA out of the computer business and that he believes further that RCA could eventually have been profitable in computers and could have captured a 10% market share of the business in the 1971-1976 time frame.

Conrad had been a vigorous backer of the computer operation before it failed, supporting Donegan and his team in a videotape message (DATAMATION, Aug. 15, 1971, p. 17) and even calling RCA users to assure them that RCA would remain in the business. As the head of RCA's service operation before he was named RCA president June 1, 1971, Conrad had been in charge of servicing the firm's computers for a few years prior to the withdrawal. He was also said to have approved a move by RCA's computer operation to extend its marketing activities to the United Kingdom, made a few weeks before the decision to leave the computer business.

While Conrad was clear and precise in his opinion that IBM had not forced RCA out of the business and that RCA could have been successful in computers, he was vague in court about some events that led up to the decision to bail out of the computer business. At one point, Judge David N. Edelstein, who is presiding over the case, said that Conrad's "testimony about certain areas is extremely hazy."

Conrad said RCA left the computer business because the firm felt it could have invested the money in ventures that were more promising like RCA's Alaskan communications unit, the international communications subsidiary, and the video disc program. Ironically, those ventures have not yet produced profits that would surpass those of the

computer operation which RCA believed would have been profitable this year.

In addition, however, RCA documents indicate that RCA corporate felt IBM was a force to contend with in the industry. One document states: "... the dominant presence of IBM in the computer industry contributes to the difficulty of achieving a viable computer business for RCA. The manpower and financial resources of IBM, including the size and strength of the marketing, research and development organizations, are such that achieving market share growth as well as acceptable profitability, is extremely difficult."

—W. David Gardner

Common Carriers

The Financing of Wylly's Datran

The Wylly Corp.'s Datran communications network has been fully operational for nearly a year and a half. In its first year, Datran lined up about 150 customers, set up shop in 31 cities and did about \$1.4 million in revenue. What it also did, as it has since it was conceived by chairman Sam Wylly in the late '60s, was to continue to eat up cash—much of it coming recently from Walter Haefner, a soft-spoken Swiss industrialist whose faith in Datran almost equals the extent of the subsidiary's insatiable appetite for funding.

This spring the company seemed on the verge of solving its financing problems. It finally unloaded its Gulf Insurance Company to Commercial Credit Company, which in turn cancelled a \$30 million loan its CC Leasing Corp. subsidiary had made to Gulf in 1973. The move eliminated a total of \$36.4 million in long term debt and other liabilities.

Wylly also settled a disputed contract with LTV in which \$4.4 million in cash which had been held in escrow pending an audit was immediately transferred to Wylly's coffers.

These two moves enabled the company to remove its highly profitable banking services division from the market. The division, a unit of its University Computing Co. subsidiary, had been for sale since late last year and a deal to sell it to Optimum Systems, Inc., was understood to be close to the signing stage.

But the Datran cash drain remained.

To solve that problem, the company in late March arranged for Walter Haefner to convert about \$46 million of his notes and debentures into stock. The effect of the recapitalization plan,

which would give Haefner 45% of the company's common stock, would be to reduce the company's debt and increase its equity and enable the company to obtain more easily the much-needed additional financing for the communications network.

The company, however, first must get authorization from the Federal Communications Commission whose rules prohibit foreign control of communications common carriers. To satisfy this requirement, the plan calls for Haefner's stock to be non-voting. Wylly said Haefner won't seek representation on the Wylly board, either. Wylly said Haefner's interest was purely investment.

It says that if the plan is approved by the FCC and stockholders, it would result in a \$70 million reduction of Wylly's consolidated debt, a \$62 million increase in its shareholders' equity and a \$1.8 million decrease in annual debt service interest payments.

New service planned

The communications subsidiary, meanwhile, was hoping this month to begin offering a new, more economical digital data service—provided it received FCC authorization.

One part of the new offering consists of Datadial I, a distance-insensitive



SAM WYLY

Coping with the Datran cash drain

pricing scheme aimed primarily at data communications users who need to transmit across all or most of the country and now are using AT&T's dial-up (MTS) or WATS service.

Datadial I usage charges range from 10 to 35 cents/minute depending on the time consumed and the user's transmission speed. There is also a "service availability charge" of \$75 to \$115.50/month, but it applies only if a terminal's billable traffic does not consume a certain amount of time (e.g. 44 minutes/month in the case of a 4.8 kbs terminal). Service would be available at 0-600 bps, 1200 and 1800 bps asynchronous, as well as 2.4, 4.8, and 9.6 kbs synchronous.

Datadial II, the other part of the new

offering, would encompass service within defined geographic areas, analogous to WATS bands 1-5, on a distance-insensitive basis. The minimum charge is based on 240 hours of usage/month—the same as Full Business Day (FBD) WATS. There is no “measured time” service, although a Datran spokesman indicated such an offering is possible later. Datadial II would be available at 0-600 bps and 1200 bps asynchronous, 2.4 and 4.8 kbs synchronous.

Lower than WATS

Datran said a Datadial I customer transmitting between New York City and Los Angeles at 4.8 kbs for 10 hours/month would pay \$198, exclusive of installation and monthly access charges. Under present Datadial rates, he pays \$293.16. The comparable AT&T dial-up charge is \$324 assuming one minute calls or \$276 assuming two minute calls. (These latter figures are based on Bell's recently-approved MTS tariff.) Although longer duration dial-up calls would reduce the AT&T charge further, it would “always be significantly above \$198,” said Datran's spokesman. The comparable WATS charge would be \$245.

Datadial II rates are “10 to 20% below” similar FBD WATS charges, the spokesman added. For example, AT&T's charge for 240 hours of service/month between Philadelphia and New York is \$900, while Datran's proposed rate is \$800.

Monthly access line charges for Datadial I and II range from \$25 plus \$2/mile to \$50 plus \$2/mile, while each termination is priced at \$50 to \$150. Installation charges per station are \$150 to \$200.

Adding to Dataline I

Datran also added a low-speed, asynchronous service to its Dataline I and II private line offerings, and is reportedly considering a flat-rate tariff enabling Datadial switched service customers to transmit an unlimited amount of data anywhere in the U.S. for as little as \$100/month.

Dataline I competes with AT&T's DDS offering, while Dataline II is Datran's answer to the phone company's Hi-Lo tariff. (Hi-Lo is available in DDS areas, but not vice versa.)

The intercity usage charge for Dataline I service at 0-600 bps is 36 cents/mile/month. It increases to 54 cents for 601-1200 bps service and 81 cents for 1201-1800 bps. The Dataline II charges, respectively, are 54, 65, and 81 cents.

A Dataline I termination at the subscriber's site costs \$20.34/month regardless of speed, while the Dataline II termination charge is \$40 for 0-600 bps service and \$55 for higher speeds. Dataline II subscribers also pay an additional “intercity channel termination”

charge. Typically, there are two of these and each costs \$60/month for 0-600 bps service, \$75 for 601-1200 bps and \$80 for 1201-1800 bps.

Dataline I access lines to sites near the Datran local office (“rate center”) cost \$60.66, \$87.66, or \$119.16 per month, respectively, while subscribers farther out pay \$83.20 plus 60 cents/mile; \$109.86 plus 90 cents/mile; or \$137.16 plus \$1.30/mile. Monthly charges for Dataline II access channels are \$50 plus \$1/mile if the subscriber is within 40 miles of the rate center, and are based on a special quotation beyond that range.

Installation charges: \$150/station for 0-600 bps Dataline I or II service; \$200 for the other two speed ranges.

The flat-rate switched service now being evaluated by Datran officials is tentatively targeted for introduction next August or September. It would consist of three speed ranges: 0-150 bps, 150-300 bps, and 300-1200 bps. Within each, there would be five separately-priced options:

A. The subscriber could use dial-up lines to access a Datran switch port at the send and receiving sides of the Datadial network. He would contend for each port with all other subscribers accessing the network at the same point.

B. He could lease a dedicated line between his main station (e.g. a central computer) and the network, using dial-up access on the remote terminal side.

C. He could lease a dedicated port for the remote terminals and use a dial-up access line between his central station and the network.

D. He could combine options B and C—i.e. lease a dedicated switch port for the remote terminals and a dedicated private line between the Datadial network and his central site.

E. He could use private lines on both sides of the network and possibly enhance throughput further by polling the remote terminals instead of allowing them to contend with each other. *

Users

Singer and TRW 100 Hours Later

There were some 250 concerned Singer customers in Chicago last month to whom the name Singer still means more than just sewing machines.

And they weren't so sure about a company called TRW.

They were the members of Forum, the international association of Singer information system users, holding their first meeting since Singer decided to drop its Business Machines Div. The meeting came hard on top of an announcement by Singer and TRW Inc.

that they have signed an agreement in principle for TRW to perform the maintenance and customer support functions of Singer's business machines division in North America.

The companies said they expect the transfer to be complete before Dec. 31. TRW was to begin assuming management responsibilities for the Singer business machines operations on March 22. The agreement provides for the transfer to TRW of those Singer assets required to do maintenance and support functions.

Overseas agreement

A somewhat similar schedule is being followed by Singer and Britain's ICL which announced an agreement in principle March 19 for ICL to buy Singer's international operations. ICL assumed management responsibility April 1. Final negotiations are expected by the end of the year. “We'll run it and evaluate it and will decide as to money, layoffs, pricing and products at the end of the year,” said an ICL spokesman.

Doug Comish, formerly director of 2900 production for ICL, will head up the Singer international operation as Director of Small Systems. The acquisition is considered part of ICL's new drive for international business. The company expects to have 70% of its business outside the United Kingdom in the next 10 to 12 years. Singer employed 3,400 people internationally including 3,000 in Europe. Seven hundred of these employees are in the U.K.

A Singer customer in the U.K. commented, “ICL didn't have anything as good as Singer in the industrial terminal market (referring to Singer's 1500) ... so this fills a hole for them.”

Another customer with both ICL and Singer equipment said he was pleased “it's ICL.”

Record turnout

More worried U.S. users demonstrated their concern with a record turnout at the Chicago meeting. Forum meetings, held twice a year, generally attract only 100 to 125 users. The 250 users present last month heard kickoff talks by John D. Kerin, vice president of marketing for the Singer Business Machines Division, and Lynn McKinsey, a vice president of TRW.

“We didn't learn an awful lot,” said one unhappy user. He came away from the meeting confident that support will be “as good as and hopefully a lot better than” it's been to date.

“What's still open to conjecture is the future of the hardware. We didn't get any specific answers, only answers like ‘we can't comment at this time’ and ‘you've got to remember the announcement (of the transfer to TRW) is barely 100 hours old.’”

A user of multiple Singer System 10s was particularly concerned. “There's

news in perspective

nothing to take the place of a System 10 in terms of ease of operation and ease of programming."

Some of the larger users expressed the hope they would get individual visits from Singer and TRW representatives and more concrete assurances about the future.

Users of Singer's point-of-sale will have more of a hardware recourse than users of System 10. TRW is due to announce next month a new POS terminal incorporating a crt, said to be similar to but slightly more expensive than the Singer 920-930 equipment. The terminals will be shown at the National Retail Merchants Assn. financial executives conference May 31 in Puerto Rico.

Forum will meet again in the fall. Maybe then members will get more answers from a company called TRW. Or maybe they'll do their shopping overseas.

—Edith Myers

Honeymoon With Honeywell

It seems to be honeymoon time with Honeywell for users of Xerox Data Systems equipment.

At least top officers of Exchange, the Xerox user group, who have been meeting with Honeywell representatives on a monthly basis, seem pleased. All this is preliminary to a meeting of the total user group May 4-5 in Phoenix at which officers expect to get specific answers from Honeywell on such questions as what is their bridge philosophy.

"I think the users are going to be very happy with the direction they're (Honeywell) taking," said George McAlpin, past president of Exchange and one of the group which has been meeting with Honeywell reps. "I think most users will find their answers next month to be very acceptable."

One of McAlpin's major concerns was that Honeywell would agree to enhance CP 5, a Xerox operating system that seems to be dear to the hearts of most Xerox users. He felt in mid-March they probably would.

Interest in Exchange and its activities continues high. There was record balloting in a by-mail election in February in which Randy Best of Motorola, Phoenix, was elected president. McAlpin says he expects a record attendance at the May meeting. This meeting originally had been scheduled for June but was moved ahead in anticipation of getting some specific commitments from Honeywell.

McAlpin said the meeting will be formatted differently than most Exchange meetings. "There will be a couple of

papers but most of the time will be dedicated to getting answers to our questions in detail."

The Xerox users will have a lot of detail to study before going to the meet-

Services

Government Buyers Tone Down On-Line, Teleprocessing Procurement Project

The federal government's much-delayed, much-debated plan to buy on-line machine time and related teleprocessing services on a centralized basis from commercial suppliers has been changed again. But it appeared likely at press time that the first part of the procurement would be on the street this month.

Among other changes, the buy has been scaled down considerably. Last spring, when announced by the General Services Administration (GSA), it was estimated to have a first-year value of \$50 to 60 million. The same figures are now being mentioned in GSA press releases, but Ted Puckorius, the man in overall charge of the procurement, now says the first-year value actually will be in the neighborhood of \$20 million.

The procurement will encompass "a full range of remote batch and interactive teleprocessing services, as well as related support—training, documentation, software packages, and analyst/programmer time." Puckorius, who is

ing. A 30-page "User News" was mailed out late last month to Exchange members. It contains complete transcripts of everything said at the last user meeting in December plus all correspondence and records of negotiations between Exchange and Honeywell since that time. *

commissioner of GSA's Automated Data and Telecommunications Service (ADTS), says there will be two types of contracts: a "basic agreement" which specifies terms and conditions (e.g. response time and up time), and a "multiple award schedule contract" which covers these items plus prices. To qualify for the latter, the bidder will have to offer a discount, but it won't have to be a pre-specified minimum percentage. This is how GSA plans to resolve last year's heated battle with the industry over "discount benchmarks."

Still must compete

Winning a basic agreement or multiple award contract will not, by itself, bring the vendor any business. The vendor will just be one of several suppliers from whom federal agencies can order teleprocessing services with a minimum of red tape.

"Agencies may make fully competitive procurements based on the basic agreement at their discretion in lieu of"

Defense Drops Deal with IBM

The Defense Dept. quietly decided not to sign an indefinite quantity contract with IBM—in the wake of objections from third party leasing companies and Rep. Jack Brooks, chairman of the House Government Operations Committee.

The idea of negotiating such a contract sprang from IBM's failure, last spring, to submit a federal ADP schedule bid on time. Subsequently the company signed a limited agreement with GSA, but it covered essentially the re-leasing and lease-to-purchase conversion of equipment already installed within federal agencies (including DOD), and excluded new systems.

DOD officials then began negotiating a separate contract with IBM, covering only new equipment. They argued that this approach would save money, particularly since IBM's offer did not include an 8% price increase that became effective last October. At this point third party lessors started complaining because they would have

trouble competing with IBM's discounted price schedule.

In a letter in February to GSA and DOD, Rep. Brooks said that if the DOD-IBM contract was approved, it would establish a precedent for every other federal agency and system manufacturer to negotiate private deals. He said GSA's middleman role would disappear in the process, and so would the benefits of consolidated contracting and centralized procurement management.

In March, the GSA's chief telecommunications buyer, Theodore Puckorius told Brooks that GSA would not allow DOD to sign the proposed contract. This was understood to have happened after Pentagon officials took stock and realized that any money they might save from the IBM deal would be subtracted by Congress from their appropriation, so they stood a good chance of losing even if they won. *

using a multiple award contract, says a GSA summary of the new program. They may also award business on a sole source basis, but in that case they must use a vendor on the multiple award contract list if there is one who meets their requirements. Before a non-schedule vendor can be hired sole source, the agency must obtain a waiver from GSA.

Before choosing a supplier on the multiple award contract list, the agency must make "an economic evaluation to determine which one can meet the requirement at the lowest system life cost," says the GSA summary. System life costs include incidental support and conversion cost "if applicable."



John Luke, president of Computer Sciences Corp.'s Infonet Div., says the division will bid on the GSA's new teleprocessing services program. Of the extension of Infonet's present GSA contract, Luke says it "offers agencies an attractive alternative to escalating data processing budgets because it provides a fixed and predictable price for as much as 27 months ahead."

"... System life cost estimates will be based upon rates and discounts in effect at the time of selection," the summary continues. "It is recommended that costs be estimated based on benchmarks rather than ... price alone. Such cost benchmarks will be mandatory for large requirements."

The only substantive control to be exercised by GSA over the new program will be a pre-award review of those contracts worth \$200,000 a year or \$500,000 during the job life, to make sure the work goes to the bidder who offers the best price. Puckorius expects that 80% of the contracts awarded during the first year will require this review.

Payment

A vendor's bill for work done under a multiple award schedule contract will be paid either separately by the users or in one lump sum by GSA out of its ADP revolving fund. The choice will be

determined by the type of discount offered by the vendor. GSA will "recover the administrative expenses associated with the management of the program by adding a surcharge" to those bills paid from the fund. "The surcharge is expected to be less than the prompt payment and single billing/single payment discounts."

The RFP which was to be released late last month would cover basic agreements. Bids for multiple award schedule contracts probably will be invited in about a month, according to sources.

Computer Sciences Corp., the government's major commercial supplier of on-line machine time at present, already has announced it will bid on the upcoming teleprocessing services procurement, and some observers are wondering whether the company will have a competitive advantage.

csc's current contract recently was renewed, enabling some 200 federal offices throughout the country to continue using its Infonet service through Sept. 30, 1977. (A 12-month further extension

is included as an option.) Once the new multiple award program begins, however, present csc customers will have to at least consider other sources, so Infonet salesmen are now working hard to sign up as many customers as possible.

Computer Sciences is hoping that once a user's job is up and operating on Infonet, he will find it too costly to transfer (inclusion of conversion cost in the evaluation of competing bids should be a big help). Although some of the other bidders are planning to offer free conversion, a talk with one of them indicates this gift will be limited to the bigger, longer-lasting jobs.

"The Infonet program has proven effective for the government and has achieved a cost avoidance of more than \$43 million from its inception through the first six months of fiscal 1976," says a recent GSA press release, adding that the contract provides for "a network volume discount at a fixed rate of 45%." *

Automatic Data Processing: Its Business is Batch, But On-Line Services Emerge

"Batch services revenues will grow at the slowest rate of all data services, increasing an average of 5% per year in current dollars. Thus real growth will be negative. The ready availability of hardware and network information services will seriously impact batch service bureaus." This is one major conclusion of the recently published "9th Annual Industry Report to ADAPSO," prepared by the New York research firm, Quantum Science Corp.

Automatic Data Processing, Inc., is known as the bastion of batch, the payroll king, the "Woolworth of data processing to businessmen," as ADP explains it. But it also appears to be a thousand steps ahead of the grim reaper envisioned in the report for ADAPSO (Assn. of Data Processing Service Organizations). And what the ADAPSO report forecasts will occur five years hence, ADP already is doing.

The 26-year-old Clifton, N.J., company is the largest independent service bureau in the U.S. Revenues in its current fiscal year ending this June should be close to \$200 million. It has 35 regional centers and 80 computers—the product of a dazzling acquisition campaign during the past nine years in which it bought up 47 organizations. It's captured about 10% of the \$1.4 billion batch services market in the U.S., which according to the ADAPSO study should grow to \$2 billion in 1980. Although the ADAPSO study sees that market growing at a rate of 5 to 7%, ADP claims it's been posting revenue increases of 25% a year, largely from product and market expansion, rather than through acquisitions.

Looking to the future

Additional examples of how the company has anticipated the future:

—The ADAPSO study discloses that the network information services business will have a hefty 18% annual growth rate. Revenues from network information services (which includes remote batch and on-line and time-shared services) reached \$894 million in 1974 and will soar to \$2.4 billion in 1980, according to the study. Automatic Data for several years has had specialized on-line and remote batch offerings for auto dealers, brokers, wholesale distributors and health care services. But recently it acquired Cyphernetics, a \$14 million time-sharing firm which has a U.S. and European network, and Delos International Group, a \$5 million time-sharing company which serves 60 of the U.K.'s top 100 firms.

—The ADAPSO report warns that mini-computers and small business systems are a major threat to batch service companies. ADP, along with a few other service bureaus, already is joining forces with these vendors. Minis at customer sites are common in the Cyphernetics networks. For more than a year, ADP has been offering turnkey systems, using hardware from Microdata Corp., Irvine, Calif., with a standardized order and accounting package to auto dealers. Smaller dealers are offered terminals on-line to the same mini system at an ADP data center. Recently the firm began a similar effort in the northeastern U.S. for wholesale distributors.

When it comes to markets by industry, the so-called conservative ADP

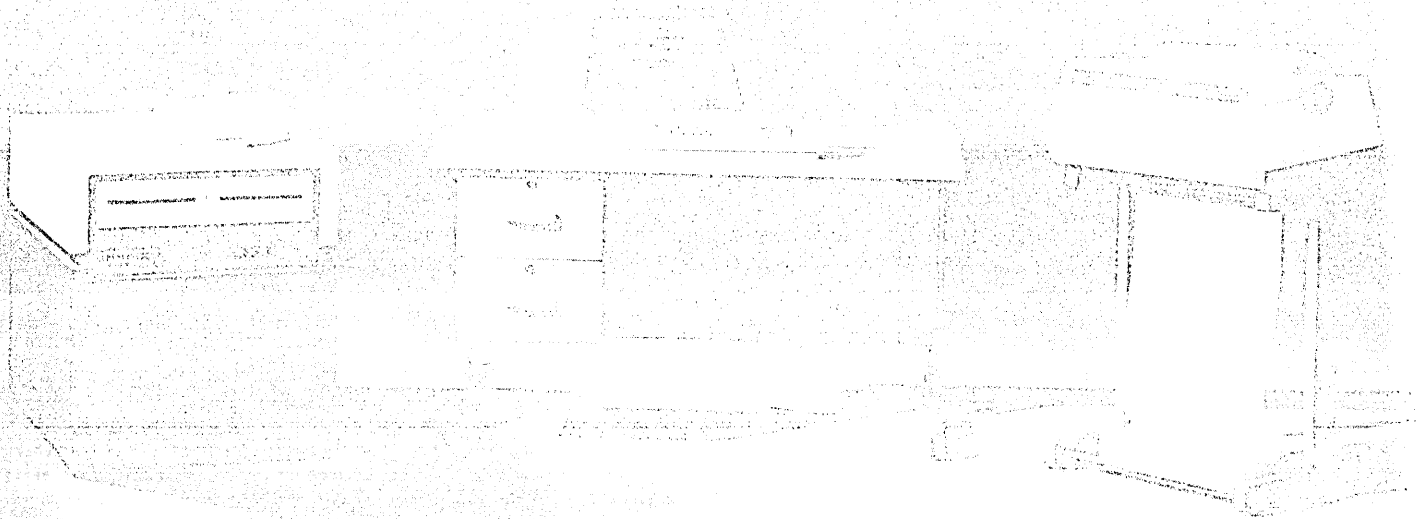
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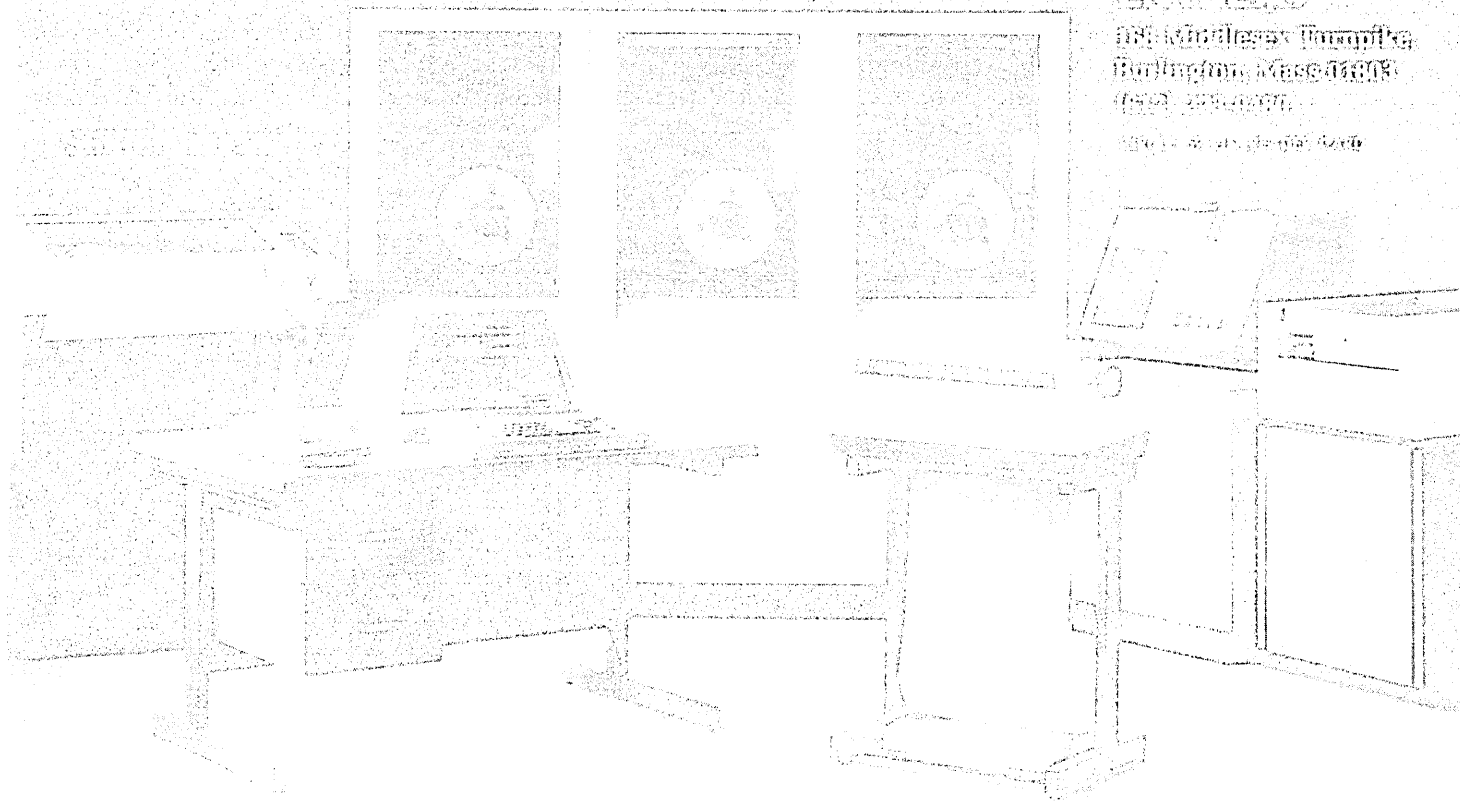
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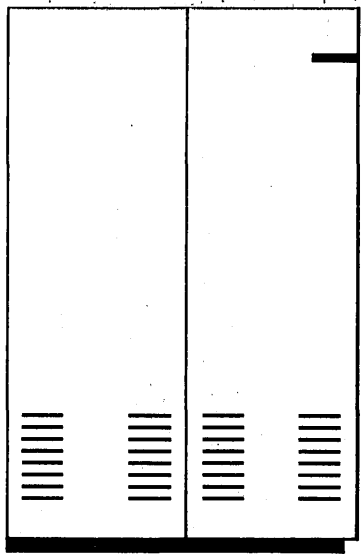


COMPUTER PRODUCTS DIVISION

Electronic Memories & Magnetics Corporation

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memory

news in perspective

seems to be wherever the action is. A separate Quantum Science report indicates that 40% of ADP revenues come from manufacturing (see table) which happens to be ADP's bread and butter.

The second largest services market is finance and banking. More than 400 banks use ADP for processing payrolls and other accounting functions for their clients. Even discounting this, finance and banking still account for 15% of ADP revenues. It has acquired firms offering demand deposit accounting and other services, on-line and off, to 145 banks in the midwest. Cyphernetics also offers some sophisticated financial services to banking.

Looking to health care

Utilities are 10% of ADP's business. Health care, the fastest growing market for dp services, is not a big revenue contributor to ADP yet, but that too will expand, according to company officers.

Wherever the demands for rapid turnaround have increased, ADP has been shifting to remote services and turnkey systems. While payroll and general accounting tasks are traditionally batch, ADP now is developing on-line packages for these applications.

Order entry and inventory control are applications calling for rapid response. These services are offered on-line or via turnkey systems to several target markets, as noted earlier. In the stock brokerage industry, ADP has been providing on-line and batch services for nearly a decade. Cage management is a remote service. Stock order matching is on-line. Portfolio and investment performance reports, tax planning and preparation, and accounting services are batch.

Story of a payroll

Automatic Data Processing, Inc., was born one day in 1949 when the bookkeeper at a public accounting firm didn't show up to do the payroll. A 21-year-old accountant named Henry Taub was astounded by the chaos. He subsequently found that in many firms payroll, a menial task in itself, constantly commanded the time of presidents and controllers. One reason, besides the obvious, was that many unions levy stiff penalties for late payroll, like double time for each hour of delay. That year Taub formed Automated Payrolls Inc., specializing in check processing on tab equipment at 25¢ a check in the New Jersey area.

Three years later, Taub, now chairman of the board, was joined by his first salesman. He is today's president, Frank Lautenberg. Lautenberg had been working at his first job at an insurance company across the hall from Taub's

offices. Over the next few years, the ADP "data wagons" became a familiar sight around New Jersey, picking up and delivering payrolls.

By 1961, what became ADP was moving along at a "blistering" \$400,000 annual rate. That year it bought its first computer and went public. Lautenberg recalls that a Wall Street broker guffawed when he saw the ADP profits, "Hell, our salesmen make more than that."

Today it is racing along at a \$200 million clip and net profits average just under 10%. ADP is the darling of Wall Street. A \$1,000 stock investment in 1961 is worth \$150,000 to \$200,000 today.

More than 30,000 firms use ADP to process more than two million paychecks a week. That alone contributed \$40 million to its coffers. Most of the 47 companies that ADP has purchased have been batch-bureaus in geographic markets into which it wanted to expand. Lautenberg bristles at statements that ADP just grew through acquisition. It seems a strange defensiveness in view of the statistics. But his point is that ADP has grown because of its products.

Network for small cities

Cyphernetics was bought not only for its own specialties—network expertise and financial planning and problem solving, says Lautenberg. "We want to

company unimaginative. In fact, ADP is a true pioneer—in moneymaking, computer and organizational efficiency, software package development—and timing.

Timing. Wall Street and the banking industry love ADP for more than its stock price. In the 1967-70 period, the company came to the rescue of many brokerage firms. The 20- and 25-million share days were breaking records as well as the backs of brokerage personnel. Back offices were a shambles, badly organized, and, said the *Wall Street Journal*, infiltrated by organized crime. ADP was one of the few independents able to take on back office accounting for many unprepared firms.

Marketing vice president John Mattei thinks it's a tribute to brokers and service firms that "today 30 million shares a day are no problem" to the back offices. ADP is the biggest independent in this segment.

Banks got themselves into a bind in the last decade. Enthralled by the rich promise of computing, they went hell-bent for automated customer services—payroll, accounting, etc. The independent bureaus screamed like banshees over the invasion of the money lenders into their territory. In fact, it's still a major issue.

Thanks to banks

ADP decided not to fight the banks and went knocking on doors to offer their expertise in these services. "We couldn't get anyone to listen to us at first," said Mattei. But many banks grad-

COMPUTING SERVICES MARKET BY INDUSTRY SECTOR
(MILLIONS OF DOLLARS)

	1974	1975	1976	1977	1978	1980*	Growth %/yr.
TOTAL	3,068.0	3,365.0	3,824.0	4,201.0	4,719.0	5,824.0	11.3
Discrete Manufact'g	637.4	663.6	745.9	794.2	856.9	958.0	7.0
Process Manufact'g	231.3	258.0	297.6	331.3	383.4	473.8	12.7
Wholesale Distribtn.	122.2	131.0	151.4	164.9	180.6	204.2	8.9
Retail Distribution	204.8	222.0	256.8	285.6	318.8	377.9	10.7
Finance & Banking	734.1	838.3	987.2	1,093.0	1,237.0	1,598.0	13.8
Insurance	169.5	183.3	197.7	214.1	243.3	309.0	10.5
Health Care	171.6	202.4	240.3	282.9	333.5	453.3	17.6
State & Local Govt.	69.3	79.6	91.8	104.1	123.0	163.7	15.4
Federal Government	303.1	320.0	337.5	355.4	390.1	467.7	7.6
Transportation	93.9	102.1	114.8	127.9	150.3	192.3	12.7
Utilities	98.6	107.3	117.1	128.0	140.7	167.0	9.2
Education	91.5	101.1	112.1	124.4	138.6	171.8	11.0
Others	141.2	156.7	174.4	195.1	222.4	287.9	12.6

Source Quantum Science Corp. MAPTEK Data Base

*Figures for 1979, not a pinnacle year, are available but not listed.

get our products into their distribution system." A network, he feels, is the only way to economically offer the present product array in smaller cities. "We want to expand into these cities more rapidly and control the quality of the product more centrally."

Lautenberg is amused by another ADP image—that of being stodgy and conservative. The inner sanctum of the computing industry does seem to find the

usually found out that payroll for profit is not so easy, especially when deadlines are critical and bank holidays are numerous. "Now we can't keep up with the inquiries." Besides the more than 400 banks that have handed the job of processing customer services to ADP, First National City Bank sold its operation outright to the company and two smaller banks are about to.

How do you successfully control a

news in perspective

company that has 35 regional centers, a staff of 6,000, so many markets and so many acquisitions? It is continually looking at consolidation. "It would not disturb me if we had fewer centers," says Lautenberg. The Cyphernetics expertise could help in consolidation planning.

ADP has never jumped to the newest technologies for its systems. For example, although the company has many different vendors' mainframes, the 360/40s are still the major workhorse

for batch operations. Obviously, the operating software is stabilized. The centers tend to use about 90% common systems software, although they are free to buy packages that suit their customer mix. The 360 equipment is on long-term third party lease, but no center is locked into a system. Upgrading is a matter of juggling and shifting computers around the 35 centers.

Keeping the source decks

Since most ADP products are stan-

dard, how does it keep programmers from modifying? Josh Weston, executive vice president, explained simply: "We send the centers the object deck, not the source deck. You can be sure that most of our packages are pretty well debugged. After all, something like payroll goes through up to 52 iterations a year."

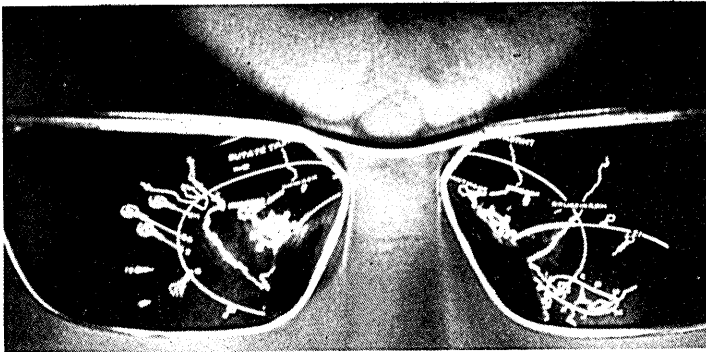
Weston said that ADP works hard to maintain entrepreneurial spirit in the centers, despite the controls. Four to seven centers report to a divisional president. Since "all regional centers are in a similar business we are able to circulate operational data from each center to all line managers. They all see how they rank. It appeals to their ego and competitive spirit. And if one manager sees another doing a better job, he calls him to find out why."

For example, the Miami and Boston centers switched from keypunching to key-to-disc systems a few years ago. The improved performance and cost picture showed up on the reports. Others made the switch too. The same thing has happened with the use of microfiche, configuration changes, systems software modifications, delivery scheduling.

The managers operate under compensation incentive plans, rather than profit sharing, so that making more money at less cost means a bigger paycheck, says Weston. Also weighted in salaries are evaluations by customers. ADP controls quality through surveys of customers and a report card is literally issued to the manager, along with qualitative comments. It seems to work well, because the report card on ADP to date is "A."

—Angeline Pantages

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Technology

Hardware/Software Trend: Think Small

At the old Joint Computer Conferences many years back, there were sessions called Hardware for Software Types and Software for Hardware Types. And they were well attended, often the scene of standing-room-only crowds and lively discussions. At this year's CompCon, the conference of the IEEE Computer Society in San Francisco, the Hardware Types were apparently aroused by consultant Dr. Robert McClure's presentation on the outlook for software in the next five years.

McClure was one of five speakers in the afternoon of the opening day, the others talking on the outlook for hardware, firmware, technology, and applications. That evening, the five were brought back for a panel discussion chaired by Willis Ware of Rand Corp., and software was the dominant topic there.

What possibly brought this on was

McClure's earlier pessimistic observations about the software scene. Taking a historical perspective, he characterized the decade from 1955 to 1965 as one of development. People wrote their programs in octal, symbolic assemblers, macro assemblers, and all the way up through PL/I. In operating systems we went from the one-card binary loader through simple schedulers, and on to os/360.

The last decade, from '66 to '75, was one of consolidation, he said, the only significant language emerging in this



ROBERT McCLURE
Operating systems won't be as complex as they've been

period being possibly Algol-68. Language standardization was the rule of the day; it assured that development didn't proceed any further—"which I think is the goal of standardization," he quipped. It was a decade, to be sure, that saw a major thrust in the usage of higher level languages, he observed, and the start of an attempt to develop something called software engineering.

Variable output

But McClure, who is an independent consultant in Saratoga, Calif., questioned whether there could be any engineering in something with so much variability among its practitioners as programming. He showed some data by Robert Bemer, of Honeywell Information Systems, Phoenix, that indicated how much variance there is between the best and the worst programmer in coding time and debugging time, a ratio of about 45 to 1. And the ratio is greater than 5 to 1 in cpu time, run time, and program size—figures that exhibit a lack of control. "No chemical engineer would consider running a refinery in which the output was variable by a ratio of 5 to 1," McClure commented.

He also traced the historical pattern of how hardware costs have declined dramatically. He acknowledged the difference between hardware and software, implying that it's perhaps unfair to expect software costs to drop at a similar

rate. But he said in the same period software costs hadn't come down at all; in fact there's reason to believe they went up.

For the next five years, McClure predicted that FORTRAN and COBOL, such as they are, would continue as the most popular application languages. He said structural extensions to both languages will be ignored for the most part, stemming in large part from the expense of training programmers in any new extensions. He said operating systems, as well as microcomputer software, will continue to be written in assembly language. He predicted that we'll finally learn how to make multiple processors work for us, foreseeing their wide acceptance and

usage.

Despite his pessimistic outlook, McClure observed two positive trends. One is the growing willingness of users to buy software. The other is the construction of simpler systems, a recognition that operating systems need not, or should not, be as complex as they have been. He cited, as a case in point, the UNIX operating system for the PDP-11 developed at Bell Labs.

When bigger was better

Interestingly, this *Think Small* idea carried over into a session on supercomputers. John Blakemore of Texas Instruments also stepped back into history, to the decade of the '60s, to describe the

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David Brownlee, General Manager, Altergo Software, 5-8 Lower John Street, London. W1R 4HA. England.

news in perspective

days when bigger was better, when applications were larger than the immediately available computers. No sooner did one develop a radar-controlled anti-aircraft gun, he said, but someone wanted an antiballistic missile system. Automate the payroll and they wanted a complete financial model of the business. And if you really took them seriously, if you really wanted to solve these larger problems, then it could be shown that larger computers were the most cost effective tool.

But things have changed.

"Today we find computer users are less likely to ask for the development of an antiballistic missile system and more likely to ask how to use a computer in a thermostat," he said. The microprocessor had arrived. But even as microcomputers become cheaper and smaller, it turns out there's an endless variety of potential applications for them—if only they were cheaper and smaller. The rule of the '70s, then, is that smaller is better.

What caused this turnabout? It is Blakemore's thesis that past events were based on the cost of memory bandwidth . . . "that a simple but powerful measure of the performance of a computer system is simply the number of words per second that you can read and write to the memory." And the factor that had earlier brought the supercomputer to the fore was the decrease in the cost per bit of core memory as the memory size increased.

"The computer designer was guaranteed an improvement in cost effectiveness of his system as he increased the bandwidth of his core memory," Blakemore said. "Further, as the cost of the computer system increased, it was cost effective to increase the complexity of the central processor. The percentage increase in the cost of the system was trivial."

When it changed

But what threw a monkeywrench into this equation was semiconductor memory, which came along to replace core. With it, the cost of memory bandwidth changed drastically, he said. The economies of scale, apparently, also changed.

Blakemore said there are two ways to achieve economies of scale. The one that justified the supercomputer is Grosch's Law, which says the cost of a computer increases as a square root of performance, not linearly. More recently, however, economies have been achieved in a different way.

The semiconductor industry has shown that it's possible to price a product so low as to create an inordinate market demand for it. This demand,

Blakemore said, can create a level of supply such that the manufacturers can lower prices still more, achieving an economy of scale that's perhaps greater than what one finds with supercomputers. The result: widespread application of micros.

He cited an example, using two products from TI's stable, the ASC supercomputer and the 990/4 microcomputer. For each product he showed the memory bandwidth, expressed as words per second, and the price. His slide looked like this:

$$\frac{\text{ASC bandwidth (words/sec)}}{990/4 \text{ bandwidth (words/sec)}} = 300$$

$$\frac{\text{ASC price}}{990/4 \text{ price}} = 700$$

Smaller is better, right?

In the last half of the 1970s, he continued, the use of microcomputers will proliferate, becoming involved in our everyday lives in the '80s. But he thinks eventually the user will have severe problems in simply managing all the micros in use. Some fraction of this management function will be so simple that it can be automated. But when the number of micros needing management becomes so large that another micro just can't handle the job, "the cycle will have been completed," Blakemore said. That job will go to . . . you guessed it, supercomputers.

He added that they may not be the same type of supercomputer as today's, but rather will be classed as supers because of their place in the hierarchy of processors. "The 1980s may be as much an era of supercomputers as the 1960s," he said.

—Edward K. Yasaki

Micros to Lower Software Costs

The inability of computer users to pick and choose a processor from among a variety of mainframe suppliers, much as they can do with peripherals, may be remedied within a decade.

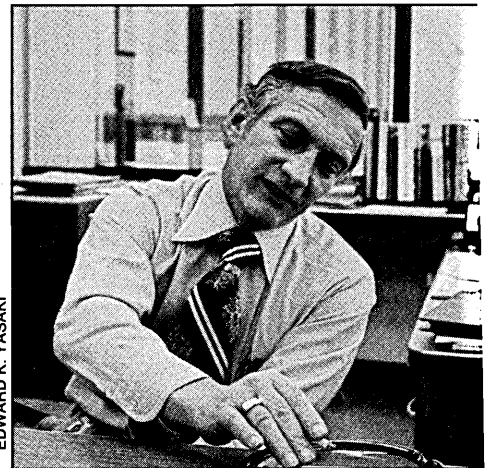
Dr. Robert N. Noyce, chairman of Intel Corp., thinks a semiconductor manufacturer's customer is far more sophisticated than the average dp user. The former, he explained in an interview, will consider buying a processor, but first he wants to see what software is available, what the instruction set looks like. And he wants to know what other sources there are for that processor—in case the supplier's prices are too high, in case he goes out of business, or his plant burns down. That's not the case with your basic dp user.

Noyce says Intel's popular 8080 microprocessor is now being manufactured by five suppliers, and all of the processors have the same instruction set.

"It's a simple computer, I grant you that," he continued. "But there's no reason to believe that as you go into more sophisticated computers, the same process will not occur. Can you imagine now going out and being able to get a 370/168 from five different people—all running the same software?"

He was reminded of Amdahl's 470, which is exactly what he's talking about. That's two suppliers, he said, but what about five?

"There has been no customer willing to say to IBM that I'd be willing to order a computer from you after you've identified a second source and we can get competitive bids to meet exactly the same specifications," says Noyce. "But as we bring out components, that is precisely what our customer says. And that means that software on one piece of



EDWARD K. YASAKI

SOFTWARE COSTS, at least on a per-application basis, should be coming down, says Intel's Robert Noyce.

equipment will run identically on the other piece of equipment.

Flow naturally

"So there begins to be a coalescing of instruction sets or programming languages or whatever," he continues. "Now that is not a job that Intel can take on, but I think it is something that will almost flow naturally out of the wider and wider use of the microprocessor."

The cost of software will continue to be dominant, however. Noyce says he sees nothing that will stop the trend of hardware costs coming down or the trend of software costs increasing—until there is some standardization so that everyone doesn't have to reinvent the wheel. "Just the nature of getting more competition into a business where the software cost is dominant will invariably drive down the software cost," he believes.

This, however, would seem to require a micro with a more powerful instruction set than what we currently have.

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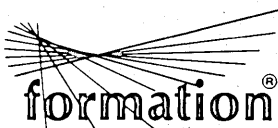
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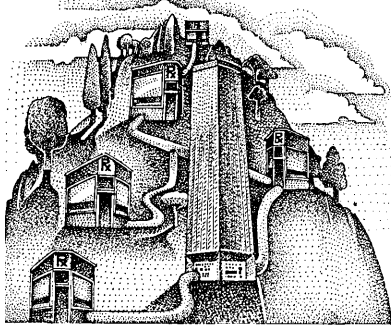
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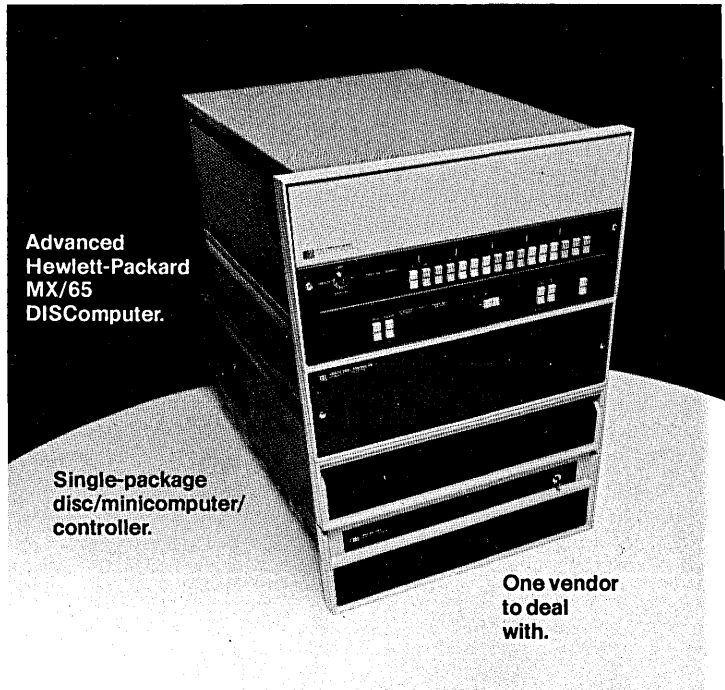
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"Yes," the successful executive says. "But you can start doubling the complexity of the microprocessor every year for the next four or five years, and it becomes pretty obvious that that will happen. I think the real impact of the microcomputer may very well be in that area.

"I think by the time you have not 100,000 computers in the world but rather 100,000 being shipped every month, the amount of software that will be focused on that set of machines will drive down the cost of software—on a per-application basis, anyhow."

Last month, speaking at a microcomputers seminar of the San Francisco section of the IEEE at Stanford Univ., Noyce returned briefly to this thesis. "Clearly the microcomputer doesn't yet have any of the capabilities of the large scale computers that we're familiar with," he said on that occasion. But in the next 10 years, he continued, they will be able to put that kind of computing power on a single chip. And, for the first time, identical (maxi) processors will be manufactured by a number of different suppliers.

—E.K.Y.

Electronic Funds Transfer

EFT Commission: It's Off and . . .

The National Commission on Electronic Fund Transfers is off and crawling—at least as compared to the pace of electronic fund transfer (EFT) developments in the private sector.

But it does have a confirmed executive director. Dr. John Benton (March, p. 178) was officially confirmed to the position by the Senate March 11. At an earlier meeting of the Senate Committee on Banking, Housing and Urban Affairs, action on Benton's nomination was postponed because of a lack of a quorum.

At that hearing committee chairman Sen. William Proxmire (D. Wis.) suggested there might be a conflict of interest with the appointment in that Benton's last job, as Director of Financial Industry Planning for TRW, might lead him to favor rapid development of EFTs. Benton noted that he has severed all ties with TRW and that two-thirds of his professional background has been in the public sector.

One of his last major acts while still connected with TRW was preparation of a paper for the IEEE Computer Society's CompCon '76 held in February in San Francisco. The paper, delivered for Benton by Max Beere, TRW's Director of Telecommunications Planning, con-

tained some statements that could alleviate fears that he favors rapid development.

"Many bankers who advocate EFTs," the paper states, "argue that the EFTs infrastructure, although not economically justified when it is employed as a funds transfer mechanism, will facilitate the emergence of many new kinds of services—what economists call secondary benefits—which will cause the total value obtained to far exceed the cost. Unfortunately, these free-enterprise advocates are not listening to the rumblings of consumer advocates, libertarians, and other skeptics who fear large data bases and telecommunication networks which could centralize control over persons' lives. The compromises which will form from these conflicting views will probably make it very difficult to capture secondary benefits from EFTs for many years to come."

Inviting disaster

Benton's paper suggests businessmen today "should be taking a closer look at what is good for the people and at what constitutes truly responsible action. They may be inviting disaster if they close their ears to the dialogue and expressions of concern which have exploded throughout our country during the past ten years."

Benton and the commission are not without advice and offers of help. The Assn. of Data Processing Service Organizations (ADAPSO) has made one offer. William W. Fletcher, chairman of ADAPSO's EFTs Committee, met with Benton and commission chairman William B. Widnall to offer ADAPSO members' help on technical groups looking into such problems as: 1. Reviewing standards and specifications for common access to funds transfer networks by a variety of computers; common formats for transmitting data, identifying participating institutions and their data processing service organizations, definition of encrypting or encoding for plastic cards for transmission; and automatic mechanical devices and their 24-hour linkage to a central processing unit. 2. Interfacing point-of-sale (POS) terminals through common switching networks into computers of many different financial institutions or their data processors. 3. Identifying volume and clearing problems expected in the trend toward electronic direct deposits of recurring payments by governmental and large corporate units.

Fletcher also suggested that ADAPSO could help the commission by studying anti-competitive implications involved if a federal regulatory agency attempts to preempt a funds or data processing

service and by reporting on progress in the privacy area and its impact on funds transfer. He urged preservation of present competition among banks and the thrift institutions even though networks and technical capabilities might be shared.

Benton noted in his CompCon paper that EFTs "has somehow become intertwined in the controversy surrounding commercial banks and thrifts, savings accounts and interest paying demand deposit accounts, regulation Q and variable interest rate mortgages, reserve requirements and taxation privileges, and liability management versus asset management in the banking industry."

Check clearing issue

One area of controversy is the Federal Reserve Board's Regulation J covering the clearing and handling of checks and about to be amended to deal with clearing and settlement of wire transfers and payment instructions recorded on magnetic tape.

The Fed first proposed amendments to the regulation in November 1973. The proposal was refined and reissued in January to reflect responses to the original proposal. Specifically they were broadened to permit greater participation in Automated Clearing House (ACH) transactions by thrifts and savings and loans.

No position yet

The EFT Commission was asked for a comment at its second meeting, March 12. Commissioners voted not to take a position pending further study of the proposal.

At the same meeting, Thomas W. Taylor of the Comptroller of the Currency's office was named to the commission to replace Russell C. Browne who left the commission and his post as director of payments systems for the Comptroller of the Currency to return to the private sector.

For the most part, the commission's second meeting was organizational. A five person steering committee was created to recommend ways of dividing the 26-person commission into working task forces to explore specific issues and develop educational workshops.

There had been talk before the meeting that a vice chairman might be named for the commission but no such action was taken.

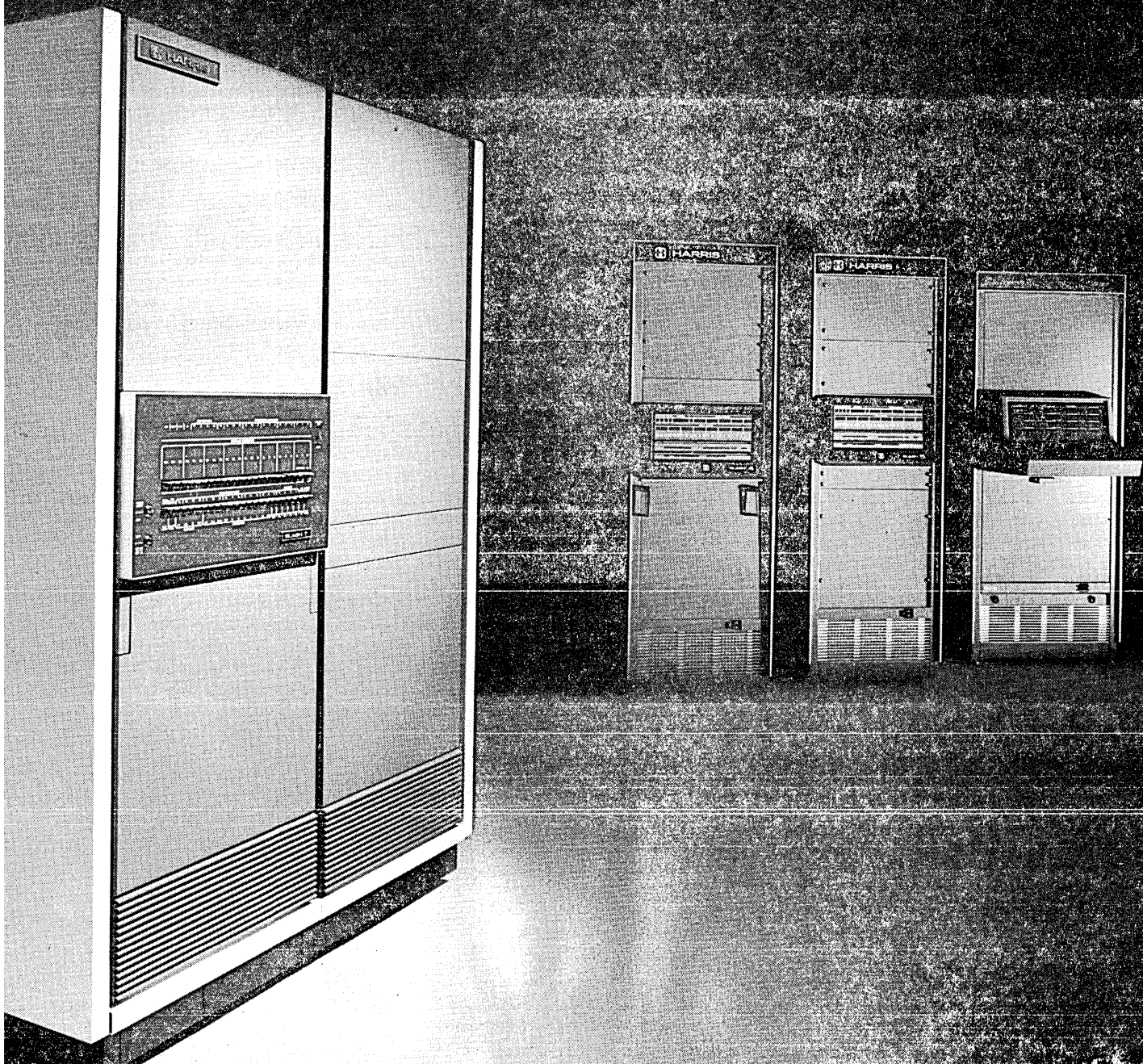
Action is the key in the private sector. Continental Bank said it will establish, during the third quarter of 1976, a computer link with Milwaukee Midland National Bank, enabling Midland's customers and customers of 48 savings and loan associations in Illinois and Wisconsin for whom Midland handles data processing, to share Continental's electronic network at National and Dominick's supermarkets in the Chicago area. The computer link will be the first

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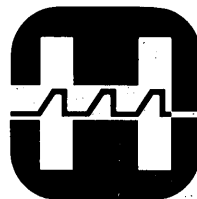
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news in perspective

interstate link in the Midwest.

And a sure sign that EFT is here to stay was a move by the New York City Chapter of the Assn. for Computing Machinery (ACM) which formed a Special Interest Group on Electronic Funds Transfer (SIGEFT). Maybe SIGEFT will offer to help the commission but with or without help the commission is moving and it is, after all, necessary to crawl before you walk.

—E.M.

Media

Paper Use: Shedding Some Old Habits

Think of the most pedestrian, humdrum material involved in the operation of computer installations and, quite likely, you will say paper.

It's a commodity that hasn't really changed in centuries, you say.

Wrong again.

The developments involved in the use of paper connected with computer in-



NELSON F. GIFFORD
Recycling computer paper

stallations are dynamic these days because users have been changing their habits in the use of paper output, and because equipment vendors and paper suppliers are introducing innovative concepts in the use of paper.

To take just one example of an innovation undertaken by a paper supplier, the Dennison Manufacturing Co. has been recycling used computer-related paper materials.

"We've begun to use recyclable materials in some of our plants," says Nelson S. Gifford, Dennison president. "It's

still in the developmental stage, but there are solid economic and ecological reasons for doing it."

The recyclable material—which Dennison calls secondaries—consists primarily of tab cards, computer printouts and dress pattern cuttings. The use of secondaries is already underway at Dennison plants in Port Huron, Mich., and in Wiggins, Miss. Gifford said that the precise percentage of secondaries use is "proprietary," but he indicated that the percentage is a small but significant fraction of the work load at the plants.

Volatile market

"There are some tough problems to overcome," said Gifford. "For instance, the secondaries market is extremely volatile—prices can jump 100% in a short period, and that makes planning difficult."

While Dennison spends millions of dollars a year on research and development in its mainstay product area—paper conversion technology—Gifford feels that, for the time being at least, the one-time carbon throwaway used in computer printouts will retain its traditional role as the most common means of providing copies of computer printouts.

Equipment, too, can change the way that paper is used on computer installations, and drastically.

International Resource Development Inc., a consulting firm that recently studied user printer habits and trends, turned up some surprising data. For instance, IBM's new laser 3800 printer, which is expected to be delivered this year, and the Honeywell Electrostatic Page Printer could have heavy impact on the use of paper.

"At 18,000 lines per minute," said IRD's president, Kenneth G. Bosomworth, "the Honeywell printer can easily consume more than one ton of paper per week in normal operation. A relatively small amount of users of the Honeywell and IBM printers will be burning up hundreds of tons of paper a week."

Bosomworth expects the two new printers alone may provide the incentive for major paper manufacturers to enter the electrostatic paper market with lower-cost paper.

IRD, in New Canaan, Conn., surveyed more than 100 large dp users on their procedures of using paper output. The results are contained in IRD's report on non-impact printers.

Bosomworth found several forces at work at computer installations that will slow the rate of growth of paper consumption. First, and perhaps foremost, Bosomworth expects crt's to be used increasingly for output in place of hard-

copy output and, even where terminals will contain both video and hardcopy output, the use of hardcopy will be cut sharply.

Pressure for COM

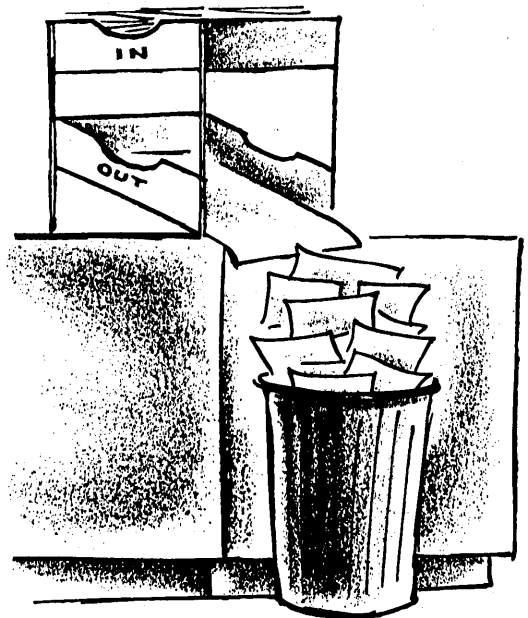
Computer-output-microfilm is another technology that will cut into many of the traditional ways of using paper. Bosomworth found that COM salesmen often survey computer installations to measure the flow of paper with the ulterior motive, of course, of finding places where COM equipment might be used instead.

"What often happens," says Bosomworth, "is that the user says 'My God, 80% of my reports are going into the "in" basket and directly into the wastebasket without being read.' The irony is that the user cuts back on his number of reports, but he doesn't order COM either."

Nevertheless, Bosomworth's survey uncovered another situation that is so common at computer installations that it appears to be something of a disease—the tendency of dp managers to overproduce reports.

"If he is wise," said Bosomworth, "the dp manager will oversupply the needs of user functions in his organization, in terms of number of copies, frequency of reports, etc. rather than risk being blamed for not responding to user needs."

However, the cutback in the number of reports generated at computer installations occurred during the severe paper shortage that developed several months ago and some observers feel that cut-



H. M. Gifford

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PRODUCT FEATURES

OPTION on Centronics printer enables users to switch easily from 80 to 132 column printouts through standard or compressed spacing. Feature gives user a total of four character sizes.

back will be the last sharp and sudden one that will be made at computer installations. Bosomworth found that nearly all of the more than 100 dp managers he surveyed instituted concerted paper conservation measures during the paper shortage.

Permanent cutback

Dennison's Gifford found, too, that computer users trimmed back on their use of paper and, indeed, at Dennison itself the firm cut back on its own computer reports. "I think it was a permanent cutback," said Gifford. "I think the big increase in the cost of paper—it went up about 60%—made the reports more dear to users. But we see the use of paper beginning to grow again at installations."

Gifford said paper inventories were liquidated from the fourth quarter in 1974 to the third quarter in 1975. He added that there has been a "modest rate" of accumulation in recent months.

One vendor that has presented users with a method of simplifying the handling of paper is Centronics Data Com-

puter, which manufactures low to medium cost printers. The firm simply offered an option for its 306C printer that enables users to switch easily from 80 to 132 column printouts.

"To get the compressed print features," says Centronics' marketing vice president Ron O. Huch, "users don't have to sacrifice standard print."

The popularity and importance of the feature is explained by the fact that most forms are still printed in 80 column formats while most computer listings use 132 column standard lined computer paper. The compressed print option means that a user can get by with one rather than two printers and that he doesn't need a copying machine to reduce the size of printouts.

The compressed print option—which sells for about \$200—has been doing so well for Centronics that Huch feels the firm will eventually offer the feature for its entire line of printers. "End users are beginning to specify the compressed print features to oem suppliers," noted Huch, "and I can't think of a better way for us to make a sale than that."

The feature provides 10 characters per inch for 80 column forms and, when compressed, it provides 16½ characters per inch for printing 132 columns on standard size paper. The change is made by a simple command—either by a manual switch or by a simple code from the computer.

Also on the subject of paper handling at computer installations, Huch said he sees the demand remaining strong for multiple copies of computer printout. "People still want multiple copies," he observed. "Even if they need multiple copies for only a small percentage of their work, they want a machine that can do that job for them."

—W.D.G.

Communications

The Bell Bill to Level Competitors

Ma Bell and her allies opened a new front this spring in their war against the competition: a bill entitled the "Consumer Communications Reform Act of 1976" was introduced in Congress. It's a word-for-word copy of legislation drafted by lawyers for AT&T and the U. S. Independent Telephone Assn. (USITA). The National Assn. of Regulatory Utility Commissioners (NARUC) has publicly endorsed the measure, which reportedly is being actively promoted by at least one of its members—J. Lewis Moss, of South Carolina. The Communication Workers of America may also be on the bandwagon. Meanwhile:

—The Senate's antitrust subcommittee is considering introduction of legislation aimed at divesting AT&T of Western Electric and other subsidiaries.

—The Federal Trade Commission reportedly is investigating a possibly-illegal interlocking directorate between AT&T and IBM.

The Consumer Communications Reform Act, the bill introduced in the House in March, was sponsored by Rep. Teno Roncalio (D., Wyoming). He isn't a member of the House Commerce Committee, the group to which it was referred for consideration. Roncalio's bill (HR12323) surfaced after the carriers tried—and apparently failed—to get members of the committee to sponsor the legislation. Most members of the communications subcommittee were visited personally, and all of them received thick promotional packets.

No luck in the Senate

In the Senate, the carriers apparently have had even worse luck, despite a personal visit by John deButts, AT&T's board chairman, and Paul Henson, president of United Telecommunications, to John Pastore, chairman of the Senate Commerce Committee's com-

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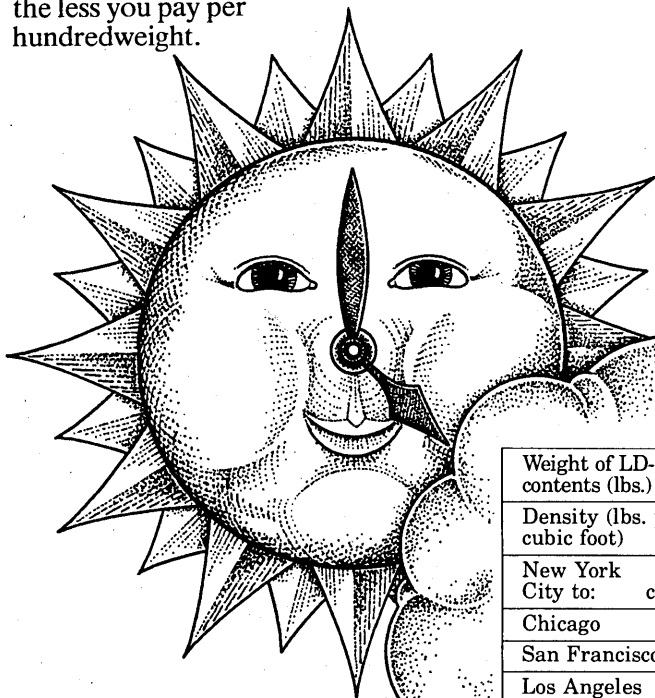
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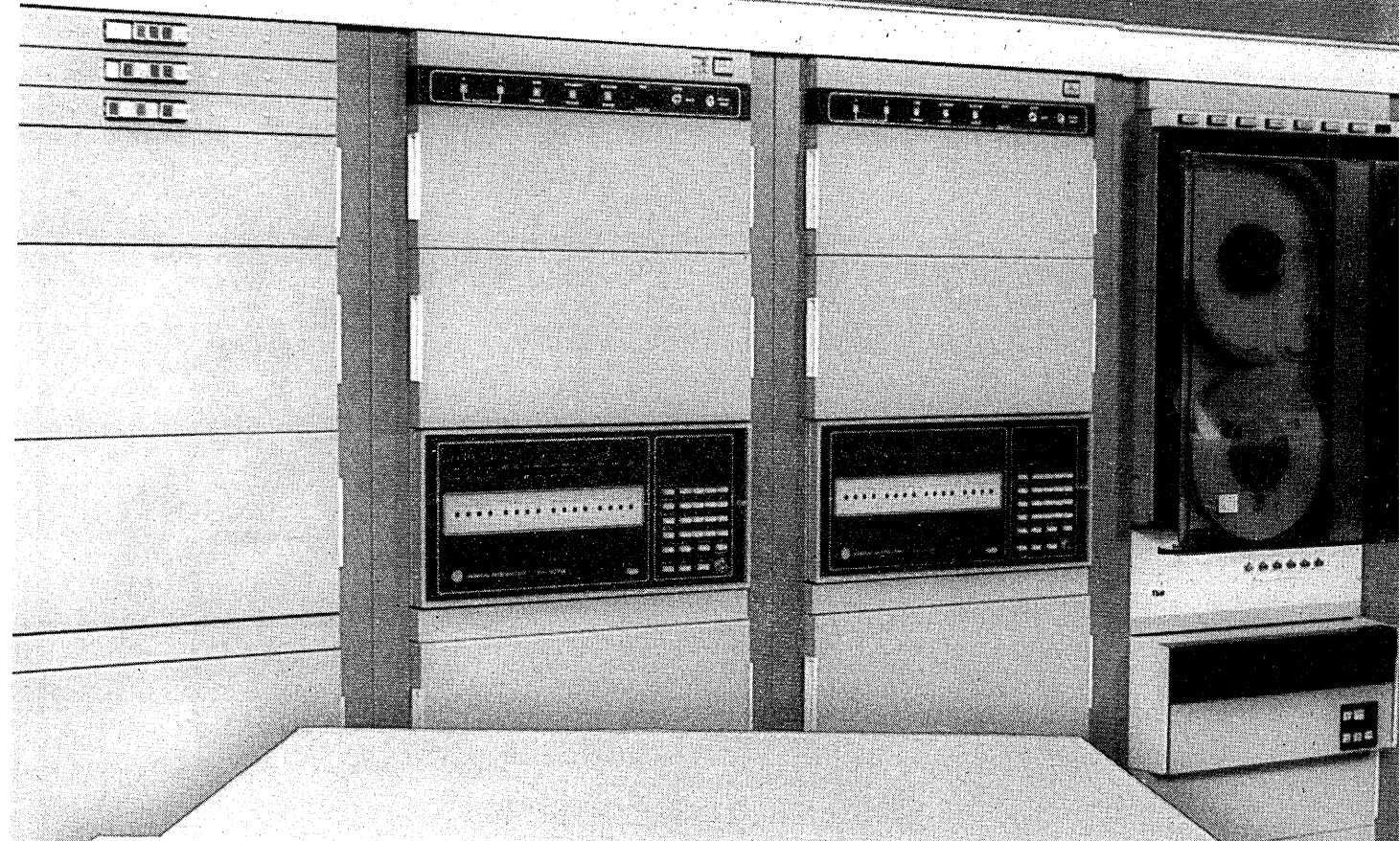
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 ACK ACK ENBL MON MAP ERR ERR MODE WAIT REG SW ENT

15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0

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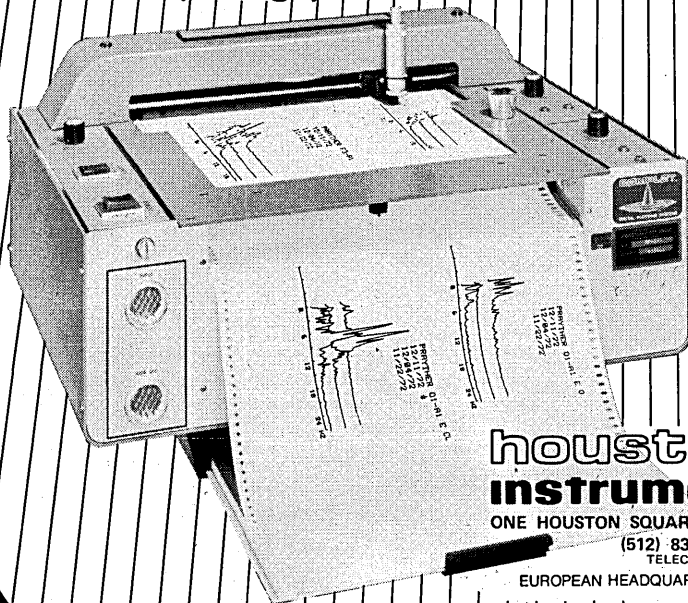
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munications subcommittee. NARUC's J. Lewis Moss also tried, unsuccessfully, to win the support of Sen. Ernest Hollings (South Carolina), a member of Pastore's subcommittee. Reportedly, the carriers are redrafting their bill and will try again.

Here are the key provisions of Roncalio's bill:

"The Congress finds and declares that the revenues from integrated interstate . . . common carrier telecommunications services . . . have helped maintain a level of charges for telephone exchange service which is lower than otherwise would be required."

The Congress also finds that ". . . services of specialized carriers which duplicate the . . . services of other telecommunications carriers . . . involve higher charges for users of telephone exchange service . . . foster inefficiencies in the utilization of national telecommunications resources . . . significantly impair the technical integrity . . . of the nationwide telecommunications network . . . and are . . . therefore contrary to the public interest."

Regulation in the states

"The Congress reaffirms its intent that the complete authority to regulate terminal and station equipment used for telephone exchange service shall rest with the states even though such . . . equipment also may be used in connection with interstate services."

The FCC "may not hold the charge of a carrier up to a particular level to protect . . . another carrier if such charge . . . is compensatory. As used in this subsection, a charge is compensatory so long as it equals or exceeds the incremental cost of providing the communications service." (This language reflects AT&T's frequently stated view that its rates should be based on incremental rather than fully-allocated costs. The independents argue that incremental cost allocation enables the phone company to finance competitive offerings partly from its monopoly services, charge artificially low rates for the former, and thus gain an unfair marketing advantage. Their view was endorsed a few months ago by the FCC's common carrier bureau, which said the commission should force Bell to base its rates on fully-allocated costs.)

The FCC "shall have jurisdiction to approve the acquisition . . . by a domestic common carrier of any other domestic common carrier . . . whenever the Commission determines . . . such approval is in the public interest."

A staff member of the House Commerce Committee's communications subcommittee, which now has Ronca-

lio's bill, said in late March that no date for hearings had been set, and added that it probably will be "some time" before any action is taken.

Divestiture bill lags

Meanwhile, the AT&T divestiture bill is now in rough draft form, according to a source, and probably will have to be rewritten before being introduced. The source added that he doesn't know how long this process will take, or whether the bill ultimately will be introduced. The subcommittee's chairman, Sen. Phil Hart (Michigan), apparently is concerned that introducing it might hurt the Justice Dept.'s big antitrust suit against the phone company. But if the proposed Consumer Communications Reform Act finds a sponsor on the Senate side, this could persuade Hart to drop the divestiture bill into the hopper.

The legislation as now drafted reportedly would require divestiture by all integrated phone companies—e.g. AT&T, General Telephone, and United Telecommunications. It is modeled "somewhat" along the lines of the Public Utility Holding Company Act, passed in the 1930s.

According to *Antitrust and Trade Regulation Report*, a newsletter published by the Bureau of National Affairs, two of IBM's directors—George L. Hinman, Binghamton, N. Y., and Amory Houghton, Jr., chairman of Corning Glass Works—are also directors of the New York Telephone Company. The Federal Trade Commission reportedly is investigating because the Communications Act prohibits interlocking directorates among competing common carriers. If IBM is allowed to go into the domestic satellite business, it will be subject to this restriction. But the alleged interlocking directorate may embarrass the company even if its domestic satellite venture never gets off the ground.

IBM has based its defense against federal antitrust charges partly on the assertion that it competes against AT&T in the dp market. Courts tend to reject such claims when they find that "competitors" have common directors.

—Phil Hirsch

The 'Unauthorized' Story of AT&T

In his recently published history of AT&T (*Telephone: The First Hundred Years*, Harper & Row), author John Brooks takes great pains to assure readers of his objectivity. This is because "books about corporate affairs are commis-

sioned or subsidized so often as to raise well-founded suspicions about the arrangements," he tells us.

Brooks then explains that he signed an agreement with Bell "involving not money but only terms between myself and the company." One of these terms was that AT&T would "have no right of approval over the style, form, or content of the book, all of which would be within my sole discretion."

It may be significant that, according to the March 1 issue of *Telecommunications Reports*, a widely-read industry newsletter, "Mr. Brooks' book will be distributed widely by AT&T; but Mr. deButts (AT&T board chairman John deButts) has noted that the work is not an authorized history and 'there are statements in the book which we do not applaud.'" A logical question is, who paid for the copies AT&T plans to distribute, how many are being purchased, and how much will Brooks collect in royalties from Ma Bell as customer?

Although the book is mostly about the early years of the telephone company, he devotes several pages to the Justice Dept.'s antitrust suit, the battles over terminal interconnection and specialized carriers. It is more than a little surprising, considering Brooks' passion for objectivity, that he didn't talk to anyone outside the telephone company about these matters. His text reflects this omission.

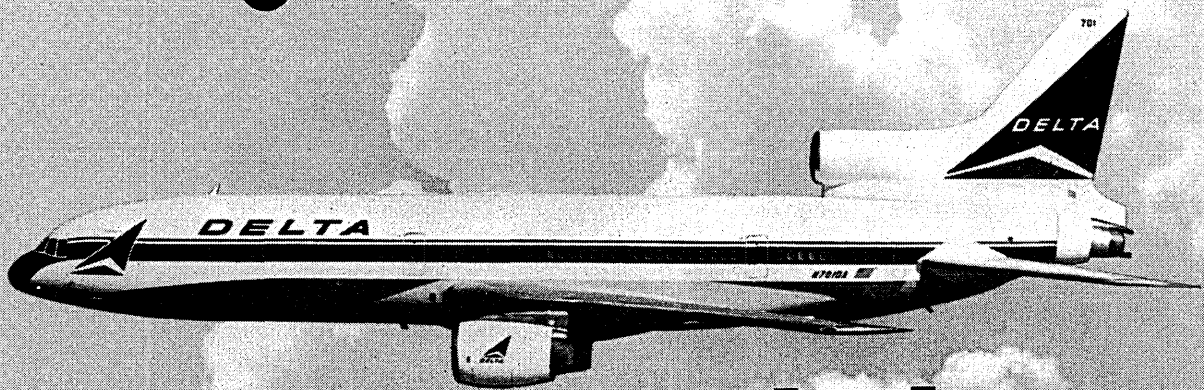
Living with Carterfone

For example, he says that AT&T, "although it had argued as vigorously as possible against the Carterfone Decision . . . felt able to live with it" after the decision was adopted in 1968.

Well, maybe. But there is a significant body of opinion which says AT&T has largely nullified the Carterfone decision—first by persuading the FCC, early in 1969, that "foreign attachments" should be connected to the dial-up network only through protective access arrangements rented exclusively from the phone company, at extra cost to the customer; then by successfully hamstringing efforts to establish a certification program until just a few months ago. Even now, these critics point out, although the FCC finally has authorized certification, it is likely Bell will take the whole matter to court and, once more, delay the direct connection of independently-made terminal equipment.

Brooks tells us nothing about the seven-year battle between Ma Bell and independent terminal equipment makers, nor does he explain the competitive advantage AT&T gains by forcing users of competing terminals to install protective access arrangements. All he says is that early in the '70s, the FCC, "going well beyond Carterfone in the matter of non-Bell terminal equipment, began considering establishment of a system of 'certification' that would per-

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mit telephone subscribers to install alien terminal equipment without even the intervention of protective devices, provided the alien equipment was certified by technical experts representing the government."

Actually, of course, none of the certification schemes discussed in recent years has involved certification by government representatives, except occasionally. The vast bulk of the tests would be performed by independent registered engineers, or by the equipment manufacturer himself, based on FCC-authorized technical standards.

Same argument

Brooks is also misleading when he says certification would do away with the "intervention of protective devices" since, at the very least, he's implying that certified devices would provide no protection to the network and thus threaten its users—an argument AT&T has used over and over again since 1968.

Perhaps the most interesting feature of this discussion is Brooks' use of certain words. Why, for example, are they "alien" terminals, an adjective that suggests incompatibility and perverse com-

plexity; it's almost as pejorative as AT&T's reference to independently-made terminals as "foreign attachments." Why does Brooks say certification would permit such terminals to be installed without "even" the intervention of protective devices, as if those devices are themselves inadequate? Certainly an objective book ought to be free of loaded words and phrases unless they are buttressed by some objective evidence.

There's more of the same in Brooks' discussion of the Justice Dept. suit, the specialized carrier fight, and the allegations made late in '74 and early '75 that Southwestern Bell and Southern Bell had been paying off local and state politicians within their territories.

Antitrust issue

"The Justice Dept. itself does not promise better service or lower rates should it prevail," he says in summing up the implications of the antitrust suit. A little later on, we learn that "the Bell operating companies, deprived of their integrated supply arm (Western Electric) and forced to pay more for equipment, would become less successful."

Brooks then hedges this statement by

referring to "some shrewd and impartial observers" who "believe that even though Western Electric's divestiture may result in less efficient service at higher prices, it is inevitably coming sooner or later anyhow because of the American public's deep-seated hatred of . . . monopoly and love of . . . free competition."

But what if divestiture would result in more-efficient telephone service and lower costs to the phone company? What if the pressure for divestiture is not due mainly to America's "love of . . . free competition" but rather to pragmatic evidence that AT&T's ownership of Western Electric violates the antitrust laws?

Granted these arguments haven't been proven either, but given the fact that numerous technical and legal authorities within the Justice Dept., the FCC, and the industry share this viewpoint, it ought to get at least as much space in an "objective" book as AT&T's position.

Brooks, according to the flyleaf of "Telephone," is president of the Authors Guild of America. His book sets a poor example for the membership. It's bad enough to write a history like this and claim it's objective, but even worse is to write like this about the richest corporation on the face of the earth and not get paid for it.

—P.H.

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News in Perspective BENCHMARKS

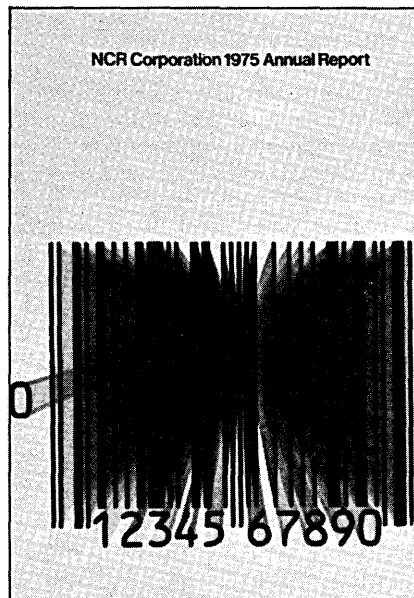
Suit Settled: IBM and VIP Systems Corp., a defunct firm that provided computer based text editing services, have settled litigation begun in March 1970. Terms of the settlement were not disclosed. IBM began the litigation by filing a complaint in federal court in Washington that VIP Systems, headed by IBM critic Joan Van Horn, had failed to pay rent on IBM equipment. VIP Systems replied with counter-claims alleging a breach of warranty and antitrust law violations. The suit was still in the pre-trial stage when the settlement was reached.

Loss for Ma Bell: The Federal Communications Commission's common carrier bureau has rejected AT&T's proposed tariff for the synchronous, clustered Dataspeed 40 terminal. Bureau Chief Walter Hinchman said the terminal is data processing rather than communications equipment, and therefore AT&T can't market it because of the consent decree it signed with the Justice Dept. in 1956. R. R. Hough, president of AT&T's long lines division said, "We intend to pursue all possible legal means to obtain reversal of this decision."

Credit for Cambridge: Cambridge Memories, Inc., said it has an \$18 million credit arrangement with three banks headed by The First National Bank of Boston. Under terms of the agreement, Cambridge Memories can borrow up to \$6 million and its leasing subsidiary can borrow up to \$16 million. Total borrowings will be limited to \$18 million. Cambridge president, Jerry E. Goldress, said the portion of loans to the leasing subsidiary which is supported by equipment on lease will mature over a 30 month period beginning after July 1977.

Microprocessor Market: Dataquest, Inc., a Menlo Park, Calif. research and consulting firm, forecasts shipments of microprocessor devices to reach \$400 million by 1980 with mos devices accounting for \$325 million or 81%. The remaining \$75 million will be accounted for by bipolar devices used primarily in computer-related applications, the firm said. The computer segment of the market is expected to become the largest, accounting for an estimated 45% by 1980. Dataquest said the hardware and software support market is expected to grow to \$60 million by 1980.

On Selling Scanning: A failure to educate the public on the benefits of point-of-sale scanning in supermarkets gets a lot of blame for the shakedown among manufacturers of POS equipment, a shakedown which has seen five companies pull out of the business over the last four years. The pull outs were RCA, Pitney-Bowes, Singer Co., MSI Data Corp., and Bunker Ramo. Still in and actively attempting to educate is NCR Corp. The POS leader last year embarked on advertising campaigns to ex-



plain the benefits of scanning. NCR's 1975 annual report carries a feature story explaining scanning and titled "Scanning . . . a Better Way" and the cover sports a picture of the grocery industry's Universal Product Code photographed with a zoom lens.

Less Honeywell for GE: General Electric Co. exercised options to reduce its interest in Honeywell Information Systems Inc. from 18.5% to 11.7% in exchange for 800,000 shares of Honeywell common stock. It is expected the additional shares will be issued this month. Honeywell then will have 20.7 million shares of common stock outstanding. GE's move was the first implementation of a cross-option agreement governing the acquisition by Honeywell of GE's ownership of Honeywell Information Systems, the computer segment of Honeywell created in 1970 by the merger of the two companies' general purpose computer businesses. Under terms of the agreement, General Electric's re-

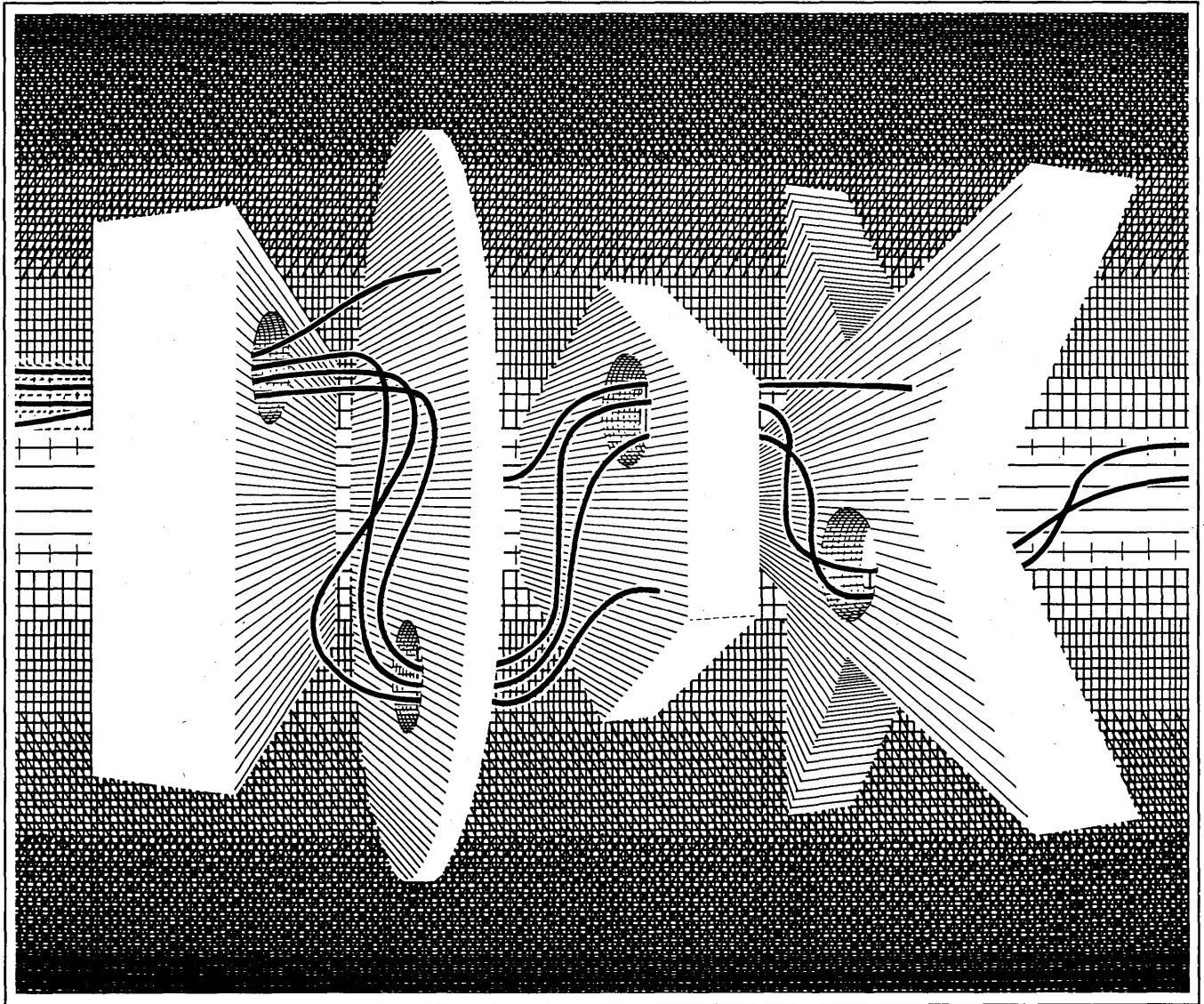
maining interest in Honeywell Information Systems can be exchanged for Honeywell common stock as late as mid-1979.

Change of Plans: Siemens A.G., Munich, has dropped the idea of filling out the top end of its general purpose computer line through purchase of the X-4 and X-5 large scale prototype computers developed by France's Compagnie Internationale pour l'Informatique (CII). Siemens said it will fill out its 7000 range computers with in-house machines currently in an advanced state of development.

First Round Lost: Three domestic satellite carriers trying to keep IBM Aetna Insurance Co., and Comsat General from offering a competing service, lost the first round of their battle last month. The Washington, D.C., Court of Appeals said the objections were premature. The Federal Communications Commission now is free to consider, on its merits, the license application filed by Satellite Business Systems (SBS), the joint venture set up by the three partners. The appeals court stressed that "our ruling not be taken as an indication of the court's position with respect to the Commission's handling and disposition of the antitrust issue, particularly . . . the need for an evidentiary hearing." The three petitioning carriers—American Satellite Corp., RCA Globcom, and Western Union—had argued that the antitrust implications of the IBM-Comsat General tieup weren't sufficiently explored by the commission before it gave them conditional approval early last year to proceed with their joint venture.

Funds for Research: A subcommittee of the House Science Committee has allocated \$230.4 million to the National Science Foundation for fiscal year '77 support of mathematical/physical science research activities including those related to computer technology. The foundation had asked for \$233.3 million, of which \$15.8 million was budgeted for computer research. The House subcommittee's recommendation must be approved by the full committee and the full House, as well as by the Senate, before it is finally adopted, and a separate appropriation bill must be enacted before NSF can get any money. Committee approval of an authorization bill in both House and Senate is anticipated. *

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LOOK AHEAD

(Continued from page 18)

IBM has infringed article 86 of the Treaty of Rome concerning misuse of monopoly powers.

Intel's international division contends that certain IBM policies and practices--understood to be its growing disregard of its unbundling policies and provision of free services under the guise of marketing support--are an abuse of the company's "dominant" position in that business. Intel's application to the EEC also was sent to the U.K. Director General of Fair Trading, presumably because it names a specific British user.

RAW TIME IS BAD NEWS

Service bureaus, it seems, must sell services...and not just time on a computer. "What we're hurriedly getting out of is the time-sales business," says Olie Swanky, president of Greyhound Computer Corp., which recently unloaded two of its seven service bureaus. It dropped its Westwood (Los Angeles) bureau in December to a neighboring data center which was doing the same thing and last month sold its San Francisco data center to Computer Usage Corp., a one-time software and services company which recently acquired the Singer Company's Sunnyvale, Calif., service bureau and installed an Amdahl 470 machine (February, p. 109).

Selling "raw time" is bad news for service bureaus, according to Swanky who says that Greyhound will retain data centers the company operates in Seattle, San Diego, Phoenix, Austin, Tex., and Chicago which are "product oriented."

Though it was a money loser, Greyhound's San Francisco data center had a profit potential as a facilities management service for semiconductor manufacturer National Semiconductor Corp., at Sunnyvale. When that company decided to do its processing in-house, Greyhound put its San Francisco center up for sale.

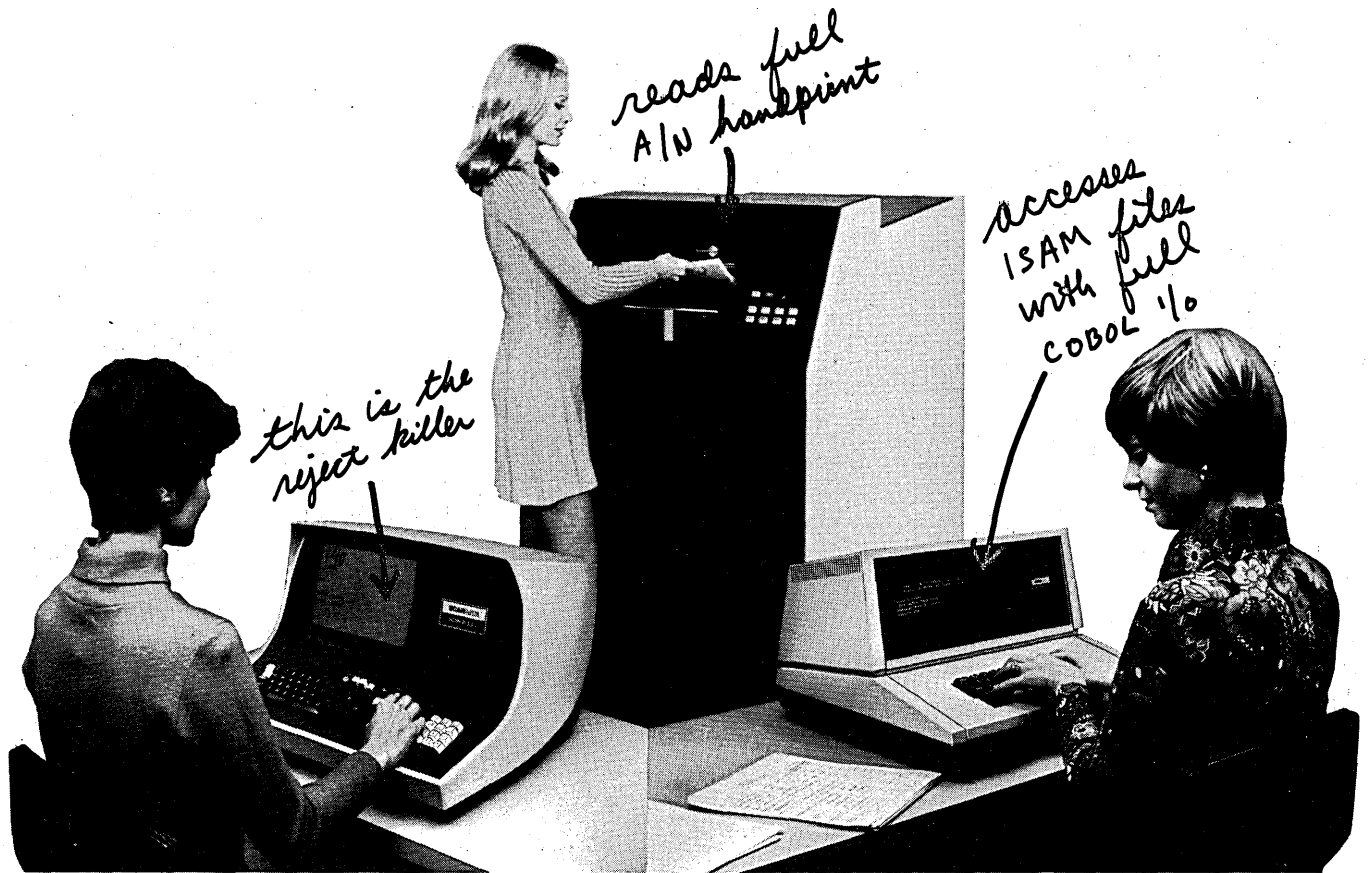
THE ODD COUPLING????

In an industry fraught with creation of new words, it's nice to see new use being made of one that's been around for a long time, even though it's borrowed from another field of science. Symbiosis, according to the dictionary, is "the living together of dissimilar organisms when the association is beneficial." The associated adjective, symbiotic, has been applied to Electronic Funds Transfer Systems (EFTS) by Hank Koehn, vice president, Special Bank Projects, Security Pacific National Bank, Los Angeles. He thinks that's what's needed and the two "dissimilar organisms" he means are banks and retailers. He told a recent seminar staged by the Association for Retail Management Information Systems so and maybe the term will catch on.

RUMORS AND RAW RANDOM DATA

A big New York-based multinational has outlawed use of the IBM 5100 portable computer internally. It thinks the baby processor could proliferate and undermine use of its in-house time-sharing system... One of the major minicomputer makers privately admits fear of replacing IBM cpu's with multiple minis and making the giant angry. It prefers "real" distributed processing in which the IBM 370 is central and sizable minis are put at outposts for local processing and transmission of massaged data. That way everybody's happy and the minimaker doesn't have prime support responsibility for the whole operation...The IBM user group GUIDE refuses membership to owners of Amdahl machines and SHARE was polling its members last month about taking similar action...At a SHARE meeting in San Francisco late this winter, some persons showed up wearing lapel buttons that alluded to the water-cooled 370/168 and Amdahl's air-cooled 470. The buttons read: "Conserve water. Use an Amdahl." (Other "rumors," p. 43)

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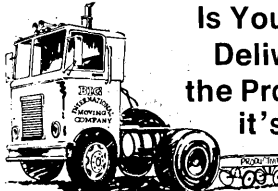
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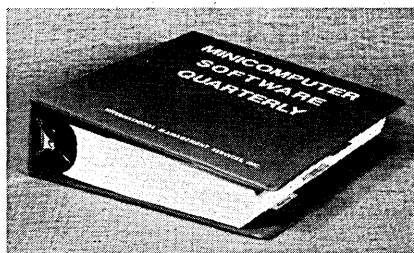
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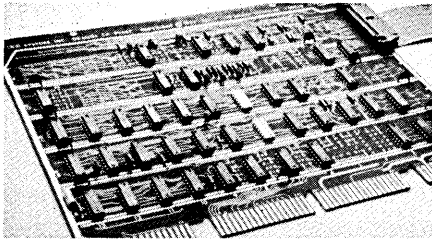
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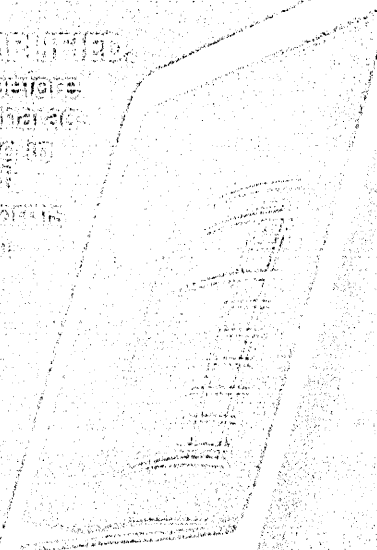
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Items in this month's issue of Popular Computing include an annual forecast for the coming decade in computing guaranteed to anger some readers and delight others. Among the two dozen predictions in the April issue are these four: The time-sharing industry will die by late 1978; the pocket computer will appear before the end of this year; "personal" computers will number 250,000 by mid-1980; and the traditional publication of textbooks will cease by 1985.

The internationally famous computer research laboratory of the Massachusetts Institute of Technology, known as project MAC since its inception, will henceforth be called the Laboratory for Computer Science. Founded 13 years ago as Project MAC, an acronym derived from Multiple-Access Computer and from Machine-Aided Cognition, the laboratory developed one of the world's first time-shared computer systems, (CTSS), and led to its successor, MULTICS, now marketed by Honeywell.

So you've broken the Selectric typing element for your IBM typewriter and you're wondering if you have to pop \$18 to \$35 for a new one? You're in luck. DSG, Inc., 133 So. 36th Street in Philadelphia can fix the old ball by using a new process that makes it stronger than when it was new. The cost? \$7.95. If you insist on buying a new "golf ball," mail them the broken one and they'll reimburse you for the postage and send you a dollar.

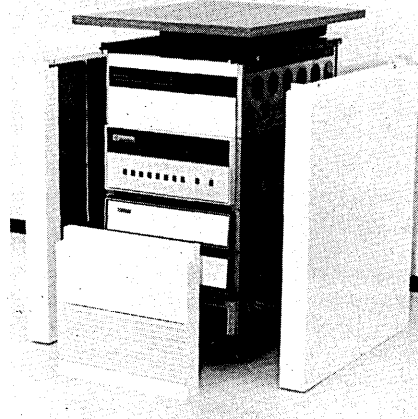
Hitachi, Ltd., has developed a prototype N-channel MOS device with 16K bits per chip. While many other semiconductor houses are working on 16Kilobit chips, Hitachi is probably the first to announce.

Lear Siegler has delivered its 10,000th video terminal just three and a half years after the development of the first unit.

Time-sharing Systems

Some interesting ideas went into the design of these three time-sharing systems, dubbed the models 4000/15, 4000/25, and 4000/35. For example, the systems are housed in a radically new enclosure that eliminates the conventional cabinet (and its associated costs). All major system components stack directly onto each other, with cosmetic covers simply snapping on. In addition to reducing costs, the design simplifies system expansion, makes repair easier, and enhances portability.

Not all the architectural changes are in the cabinetry, though. The processor has had its microcode modified to implement string arithmetic, logical



operators, and other operations previously done in the software. Mass storage on the entry-level 4000/15 system has been tripled, to 7.5 megabytes. All models include capabilities for software backup and entry via a magnetic tape unit utilizing a tape pack. System communication has been enhanced with the addition of an optional "polling" port compatible with 202C modems. Protocol characteristics of this port are user programmable. A basic 4000/15, an 8-port system with 7.5 megabytes of storage is priced at \$35,950, a reduction of nearly \$20K from the manufacturer's previous entry level machine. BASIC TIMESHARING, INC., Sunnyvale, Calif.

FOR DATA CIRCLE 239 ON READER CARD

Complete 8-bit Computer: \$295

Intel is one of a small number of firms whose every announcement seems to be a statement of what is and isn't possible in the electronics/data processing industry. If anything, the single board computer model 80/10 could turn out to be even more popular than

the ubiquitous 8080 processor chip. The 80/10 is a complete computer, ready to run (after being "defined" in its microinstruction read-only memories). Everything is on one board: an LSI processor (an 8080A), read/write memory, program storage memory, and universally applicable parallel I/O and serial I/O subsystems. In the past, these components required multiple boards and expensive connections and housings to get them to work, adding expense in the process. It's estimated that the single board computer concept will reduce oem costs by 65-85%, making it possible to cost justify a whole new generation of "intelligent" devices.

The 8080A in the 80/10 operates with a typical instruction cycle time of 1.95 usec and can perform both 8-bit and selected 16-bit (double precision) operations. It can be used for both binary computing as well as bcd arithmetic operations generally required in industrial control applications. The \$295 price is applicable to orders of 100 and includes the processor with interrupt control, crystal-stabilized system clock system bus control (intra-connection control logic, high-current drivers for expanding memory and I/O capacities; one kilobyte of RAM, up to 4 kilobytes of ROM, parallel I/O with 48 I/O lines organized as six programmable, 8-line I/O ports; serial I/O with programmable USART (universal synchronous/asynchronous receiver/transmitter), etc. Availability is from stock. INTEL CORP., Santa Clara, Calif.
FOR DATA CIRCLE 240 ON READER CARD

Word Processing

A modified version of Digital's Data-system 310 is the basis of a new product that will be DEC's entry into a new market, word processing. The 310W is a single-user, desk-size system with special hardware and software to handle list processing as well as text entry, editing and output. The venerable PDP-8/A is the motor of a configuration that includes a vt52 alphanumeric video display with both upper and lower case characters, full typewriter keyboard and a special keypad for text editing functions. Mass storage consists of dual flexible discs, while a letter-quality printer provides output at up to 45 cps. Data processing applications such as order entry, inventory control, sales analysis and payroll can be developed by the user in high-level DIBOL and run under cos-310. All word pro-

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Operator oriented: The Carousel Printer

Terminal was designed with a typewriter-like keyboard with numeric pad. And communication control panel. Convenience and ease of operation are designed into the product.

*Registered trademark of the International Business Machines Corporation.

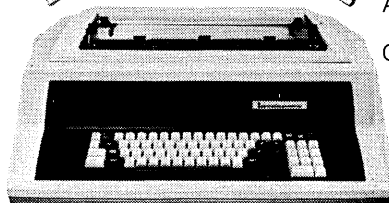
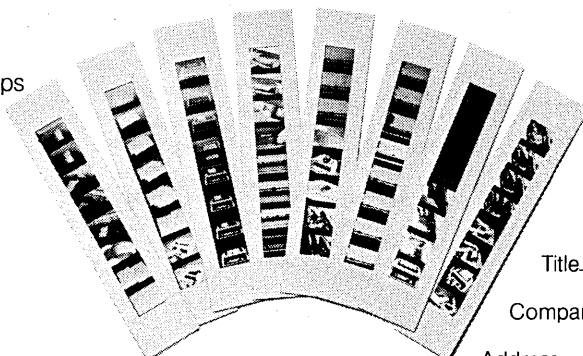
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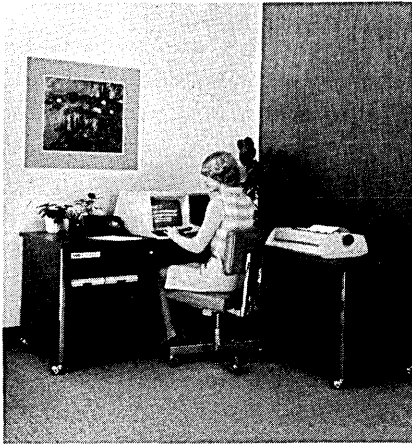
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hardware



cessing functions are handled by a separate turnkey software package contained on part of a flexible disc. The system is priced at \$22,600, with quantity discounts offered. First deliveries are this month. DIGITAL EQUIPMENT CORP., Maynard, Mass.

FOR DATA CIRCLE 241 ON READER CARD

Distributed Processing

It's a headlong rush among such remote batch terminal manufacturers as Harris, Data 100 and others to get into the distributed processing market, and Harris seems to have come up with a competitor: Key on the list of modifications and enhancements to the 1600 remote communications family are a new operating system designated ECOS (Extended Communications Operating System). Architecture similar to multiprogram operating systems in mainframe computers is credited with allowing a user to operate in a multi-job, multi-task environment in performing functions such as data entry, remote batch, file manipulation, media conversion and local batch processing. New software programs are also a part of the package, with the first one called the Data Preparation System which features an ANSI level 1 (plus extensions) compiler, sort/merge and supporting subroutines. Executing as a job under ECOS, DPS permits users to perform batch processing functions at the 1600 site with programs written in COBOL. A second program is Key Entry Processing, enabling users to perform both local and remote data entry, file updating, and file manipulation operations.

The software capabilities take advantage of a new microprocessor-based crt terminal, the model 1675. It includes such features as 960/1920 character display screens, addressable cursor, four keyboard options, extensive editing features and a lower case alpha display feature.

One additional software feature of note is a new generalized application language called REGAL. With REGAL a user can create key entry programs tailored to fit specific requirements in areas such as source data entry, file manipulation and file updating. Program statements include features for character string and bit manipulation, disc, tape, and terminal I/O, conditional branching and subroutine calls.

A typical model 1620 system might include 64K of storage, a 300 cpm reader, 300 lpm printer, three megabyte disc drive, crt console, and six 1675 key-stations. Priced at \$92,090, this configuration would rent for \$2,194 per month on a five-year lease including maintenance. HARRIS CORP., DATA COMMUNICATIONS DIV., Dallas, Texas.

FOR DATA CIRCLE 242 ON READER CARD

product spotlight

Small-scale Systems

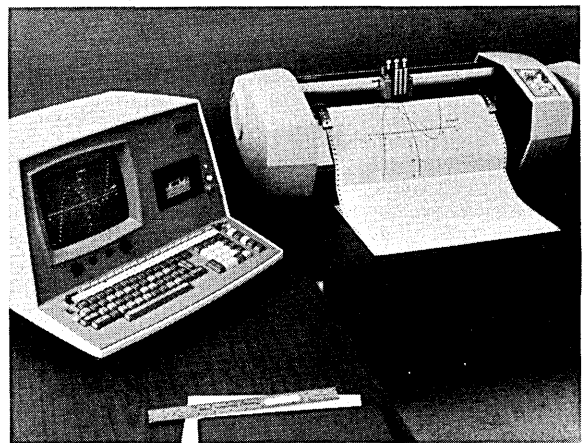
The focus of attention is clearly on small-scale systems nowadays, and this manufacturer was one of the first to introduce either a very sophisticated programmable calculator or a small "problem solving" computer in the class of the IBM 5100. Wang is taking advantage of all the attention to make its largest product announcement to date: two new systems, two new oem peripherals, and a management planning software system, MPS.

Though its 2200 systems were always priced lower than IBM's, sometimes that's not enough. So, there's a new starter system based on a 1.6 usec byte-oriented binary parallel processor. The processor can be expanded to 32K bytes of MOS. An additional 42K bytes of ROM stores the BASIC language interpreter. The parallel memory access feature allows a 20-bit microinstruction to be accessed and executed during the 1.6 usec required to access a byte of storage. Prices here begin at \$5,400.

Competition with shared processor systems is seen for the 2200 ws (workstation), an extension of the 2200 family. The 2200 ws attaches to multiplexors on Wang's five and ten

Line Printers

The TermiNet 310, 320, 330, and 340 models offer a choice of printing rates ranging from 90 lpm to 340 lpm. They are based on the rotating belt technology used in TermiNet 300 and 1200 terminals for some time (more than 75,000 units installed). The print rate for the line printers varies with the number of printable characters per line and the size of the ASCII subset used. The throughput rate for the 64 character ASCII subset is an average of 340 lines per minute when there are 90 or fewer characters to a line (spaces between characters don't count). Minimum throughput is 231 lpm when printing all 132-columns. The pedestal configurations offer both front and rear paper loading capability, with front loading recommended for multipart (up to six) forms. A Mobius loop

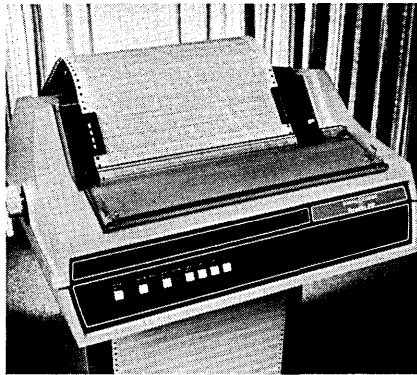


megabyte discs and includes the mini, crt/keyboard and 8K of storage for multi-user, multi-task, multiprocessor mode computing. At \$4,900, the price seems right.

Wang is now in the turnkey system market, aiming at selected vertical markets, with the first being the public accounting market with a hardware/software system called WANG/CASH. It's a ready-to-use system consisting of a 16K processor, 12-inch crt and keyboard modified to resemble an adding punch, a dual diskette peripheral system with 524K bytes of storage, and one of the new 200 cps serial matrix printers. The price is \$25,300. Software includes a chart of accounts; journal audit lists; financial statements; a payroll compensation report; tax reports; statements of change in financial position; working trial balance and general ledger all without the need for additional programming.

The new peripherals include a microprocessor-based drum plotter, model 2272, priced at \$2,900, and a 120 cps serial printer, the model 2231W, also priced at \$2,900. WANG LABORATORIES, INC., Tewksbury, Mass. FOR DATA CIRCLE 238 ON READER CARD

ribbon is used to extend useful ribbon life to 50 million characters. Interfaces include serial and parallel, buffered and unbuffered. Prices range from \$3,900 for the TermiNet 310 to \$5,130 for the 340. The 340 is being



delivered, other models are set for July 1 shipment. GENERAL ELECTRIC, DATA COMMUNICATION PRODUCTS DEPT., Waynesboro, Va.

FOR DATA CIRCLE 243 ON READER CARD

Typing Communication

The model 800 communicating electronic typing system is used to send and receive information over ordinary telephone lines at speeds up to 120 cps. It can communicate with another 800 system, directly to a computer and with a number of competitive word processing systems. Considering its speed, the 800 would seem to be a viable alternative to the mail service, particularly when used to send high priority messages at night when rates

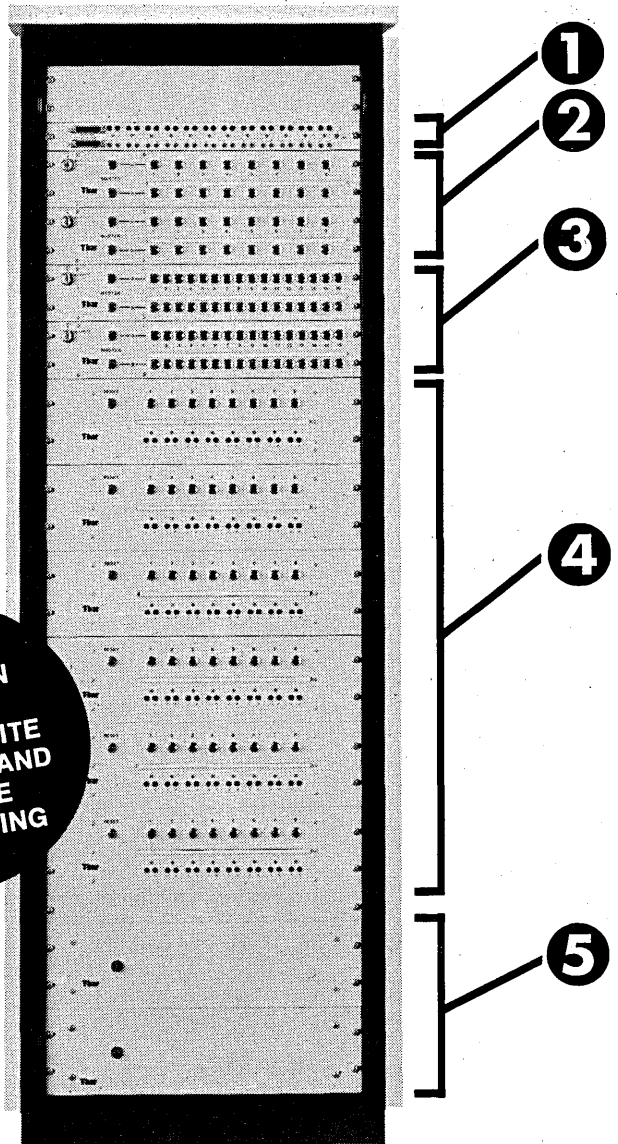


are lower. The 800 uses standard telephone company data sets. Receiving units can operate completely unattended, with high-capacity tape cassettes able to accommodate more than 20 pages of double-spaced text. And as in prior 800 models, the newest one types out error-free copy at up to 350 words per minute.

In operation the typist uses the 800 just like a regular typewriter to create the first draft of a document. Corrections can be typed right over mistakes,

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CIRCLE 107 ON READER CARD

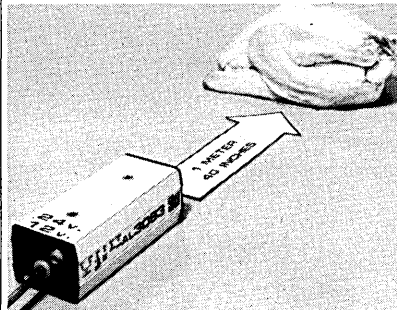
hardware

and words and sentences can be inserted. At the touch of a button the machine goes into automatic operation. Two configurations will be marketed, single and dual tape cassette units. Lease prices range from \$290 to \$390 per month, depending upon exact configuration and lease duration. Purchase prices are \$13,700 for the single tape model and \$14,380 for the dual cassette machine. The 800 will be marketed only in the U.S. for now; deliveries are underway. XEROX CORP., Stamford, Conn.

FOR DATA CIRCLE 244 ON READER CARD

Product Evaluator

The 3093 is one of the most amazing uses of a microprocessor seen to date. The device is used to scan product prototypes and evaluate them for their marketability. Marketing and acceptance data is contained in 12 ROM chips inside the 3093. A spokesman for the new firm points out that "the 3093 should be a real boon to



companies small and large that never were able to tell how close they were to putting a real turkey out on the market. All that is changed now." The 3093 Product Evaluator rents for three (full) S&H Green Stamp books per month, and delivery is immediate. SCIENTIFIC EVALUATION PRODUCTS, INC., Benkelman, Neb.

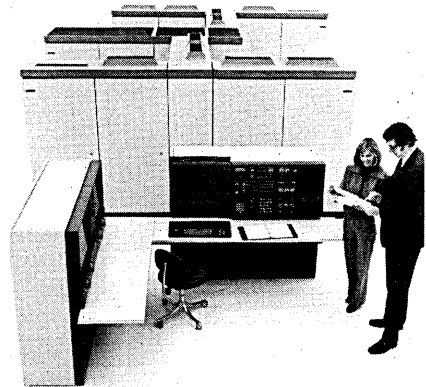
FOR DATA CIRCLE 245 ON READER CARD

Super-scale Add-on

It was as predictable as death and taxes that IBM would introduce some way of giving its 370/168-3 users additional capacity and at the same time letting them know that Amdahl's efforts were not going unnoticed! Instead of a 370/178 IBM introduced a 370/168 processor without memory that can be added in the field to raise the performance of a 168 by as much as 1.5 to 1.8 times that of a single-processor.

The Attached Processor System shouldn't be mistaken for a dual pro-

cessor. All data i/o operations are handled by the host processor, but main storage is shared by both the host and the attached instruction processor. It's a relatively easy way to go, which helps explain the unusually quick (for IBM)



availability of this summer for first shipments and field upgrades. For customers already having a 168-3, the performance boost will only raise the monthly payments an additional \$56,990, or \$1,748,900 on purchase. IBM CORP., White Plains, N.Y.

FOR DATA CIRCLE 246 ON READER CARD

Line Printers

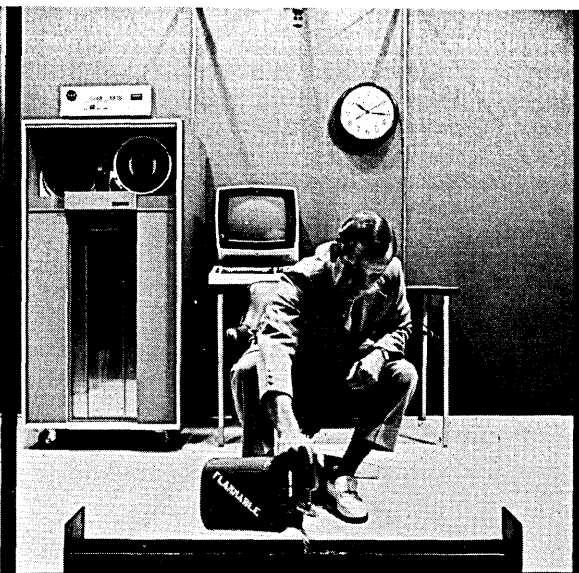
Two line printer series are offered users of Honeywell 200/2000 and 600/6000 systems. The M470H is a plug-compatible unit that operates at 1,200 lpm from a 64-character set across 132 columns and can handle up to six-part forms. Specially-designed paper guides permit horizontal and vertical alignment adjustments even during printing. Included with the unit are a static eliminator and acoustic cabinet. The M470H sells for \$38,200 and rents for less than \$800/month on a multi-year lease. The 600/6000 unit sells for \$41,600 and rents for something under \$900/month on a multi-year contract. MACRO PRODUCTS CORP., Long Beach, Calif.

FOR DATA CIRCLE 247 ON READER CARD

Disc Storage

A microprogrammed controller is at the heart of the intelligent disc system for Data General Nova and Eclipse computers. Systems can be configured to provide more than 4.8 billion bytes on a single controller, multiported to up to four computers. Disc units are available in 40, 50, 80, 100, 150, 200, and 300 megabyte capacities. Standard features include overlapping seek, write protect to the sector level, defective track sensing/flagging and error recovery command processing. Optional features include extended error correction, drive power sequencing, extended maintenance diagnostics, etc. A 40 megabyte system sells for \$17,500; 80 megabytes for \$19,500.

DATAMATION



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For more information on fire protection systems that protect your employees as well as your assets, write: Du Pont Company, Fire Extinguishants, Germay Park, Wilmington, DE 19898.

Halon 1301 extinguishant stops fires. Not businesses.



CIRCLE 22 ON READER CARD

hardware

MICROCOMPUTER SYSTEMS CORP., Santa Clara, Calif.

FOR DATA CIRCLE 248 ON READER CARD

Data Entry

This is one of the four major firms (besides IBM) that are scrambling to stake out ground in the "after remote batch" market—Datapoint, Sycor and Harris (with a product announcement elsewhere in this section) being this firm's adversaries. They don't all market the same thing in the same way, but the functions are similar, a combination of remote batch, inquiry/retrieval, and source data entry. Where Sycor tends toward relatively large clusters of terminals (16-20, say), and Datapoint does onesie-twosies, both Computek and Harris hope there's some room for them in the middle. There probably is.

There are three models in the 200 line-up, the 200/D10, 200/D20, and 200/D40, with one, two, and four workstations, respectively. Each model has its own terminal processor with 32K bytes of memory, one or more crt/keyboard work station, up to six floppy disc drives for terminal programs and local data storage, character

or line printers for reports and hard-copy output, a communications interface (IBM compatible), and complete terminal-resident data entry software. There is a great degree of simultaneity: communication to the host processor, printing, file management exercises and on-going data entry. Screen sizes for the workstations include 480, 960, and 2,000 character screens, with all characters formed with 20 x 14 dot



matrices for above average legibility. System statistics on operator performance including number of keystrokes, number of records written/verified/updated, number of constraint errors, number of fields changed, and number of sign-ons. EASYFORM is the form creation program used to create forms on the terminal's master console and store them locally on diskettes.

Prices start at \$15,625 for the stand-

alone model 200D10. A two cluster model 20 is \$17,960, and a 200D40 is \$19,900. The terminals will also be leased. First deliveries are slated for the late second or early third quarter.

COMPUTEK INC., Cambridge, Mass.

FOR DATA CIRCLE 251 ON READER CARD

Medium-scale System

A medium-scale adept at such applications as teleprocessing, time-sharing, data base management and other interactive applications has been developed by this systems house, which has had considerable communications experience (it did the AMTRAC system) and has built System/3 add-on memories. The GALAXY/5 uses from one to four minicomputers of its own design. Byte oriented, the cpu's run at 125 nsec rates.

GALAXY/5 will be marketed in one of three ways: to selective end users for whom the manufacturer will do the software development; to multiple-buy users with expertise enough to develop their own software and will buy several units a year; and as a franchised service bureau for time-sharing operations. The manufacturer is also looking for a West Coast partner.

Main memory on the GALAXY/5 is built up from 16K byte modules and can go as high as a megabyte in capaci-

When I think networking products and systems, I think Tran.

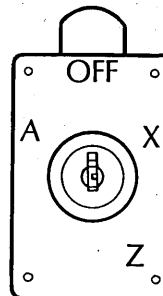


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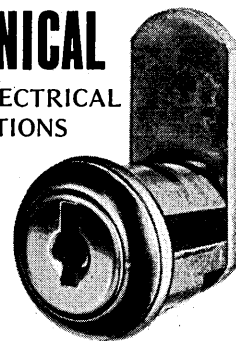
CIRCLE 94 ON READER CARD

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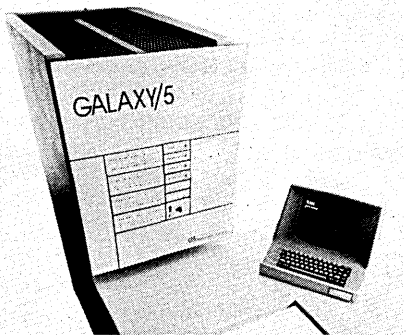
All keys are inserted and removed in the "off" position. Key A will turn to A position only. Key X will turn to X position only. Key Z will pass through X position and stop at Z position. It will not go to A position.

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CIRCLE 96 ON READER CARD

ty. All memory modules have self-correcting bit codes, and low order address positions are interleaved up to four ways to minimize access conflicts. I/O is handled by up to four direct memory access controllers. Communications lines have their own Intel 8080



microprocessor to give the GALAXY/5 good transactions handling capability. A complete complement of peripherals is offered. Standard software includes an operating system, assembler, and utilities. High-level language compilers, including RPG II, FORTRAN and COBOL are planned. A minimum system with 32K of storage, 32 megabyte disc drive and controller, 100 lpm printer, and crt console is priced at approximately \$42,150. DIGITAL SYSTEMS CORP., Frederick, Md.

FOR DATA CIRCLE 249 ON READER CARD

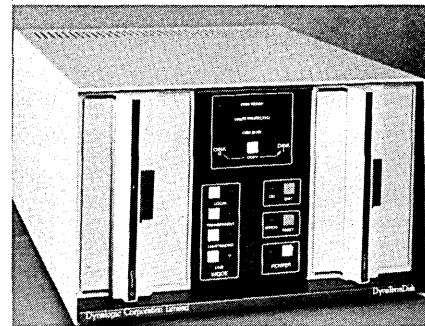
Multiplexor Front-end

The model 1000 communication line manager serves as a front-end to a time division multiplexor or terminal in applications that require almost error-free transmission, but need the throughput benefits of forward error control. The 1000 reduces bit-error rates as great as 10^{-4} to 10^{-10} it's claimed, while maintaining a minimum throughput efficiency of 85%. The unit operates with synchronous modems at speeds up to 9600 bps over full-duplex voice grade lines. All signals conform to RS-232C or CCITT-24 specifications. Options are available to interface the data-line manager with point-to-point, full duplex, time-division multiplexors. A 1000-byte buffer is used to ensure transmission continuity, expandable to 4K. Prices are \$2,580 each in quantities from one to nine. AMERICAN COMPUTER COMMUNICATIONS CO., INC., Columbus, Ohio.

FOR DATA CIRCLE 250 ON READER CARD

Diskette Storage

One of the uses for the series 7000 DynaTermDisk is to turn a "brainless" crt terminal into a powerful editing and data entry device. The microprocessor-controlled system is plug-compatible with all RS-232C equipment. A standard feature of the system is automatically copying and verifying



one diskette's contents onto the second one. Total on-line storage capacity of a model 7002A incorporating a pair of Calcomp 140 diskette drives is 630 Kilobytes. The dual drive system sells for \$3,950. DYNALOGIC CORPORATION LIMITED, Ottawa, Canada.

FOR DATA CIRCLE 252 ON READER CARD

MICR Reader/Sorter

The model 675-101 Magnetic Ink Character Recognition reader/sorter provides a 25% greater document sorting speed than the unit it will replace, the venerable 670. Varying sizes of documents are handled at the rate of 750 per minute. It sorts a wide variety and sizes of documents including checks, card stocks and postal money orders. There are 11 pockets for receiving documents, each with a capacity of 225 documents. The input hopper

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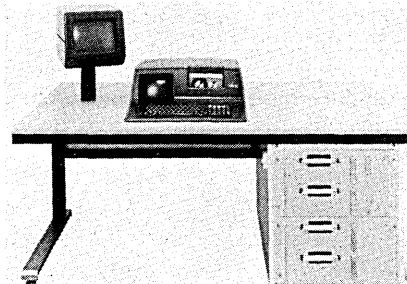
CIRCLE 95 ON READER CARD

hardware

capacity is 1,750 documents. The unit sells for \$58K and rents for \$1,350/-month. NCR CORP., Dayton, Ohio.
FOR DATA CIRCLE 253 ON READER CARD

Small-scale System

Aha! you say. Take a look at that! People are already copying IBM's 5100. In fact, the SKS product line has been on the market in Germany for more than 18 months and is just coming to the U.S. It includes a 5-inch crt display, up to 64K bytes of memory, a microprocessor, and a 1/4-inch tape cartridge. This basic configuration expands into two additional models that are software compatible. The principal difference between the models 100, 300, and 400 is that they are not devoted to the scientific and mathematical problem solving markets of the 5100. This product line can be used in applications such as data entry, word processing, interactive or batch processing, communications, bookkeep-



ing, banking and data logging.

Up to eight cartridge drives are accommodated in daisy chain fashion. A 132 character, 120 cps matrix printer and 300, 600 and 1200 lpm line printers are available, as are 1/2-inch tape transports ranging in performance from 12.5 to 50 ips. A bisynchronous processor and up to four floppy discs can also be added to the system, and by the middle of the year a 25 megabyte disc will be appended. Targeted at oem's, pricing for basic systems ranges from under \$4K to as much as \$50K for large model 300s and 400s with lots of bells and whistles. A BASIC compiler, assembler, sort/merge, and other software routines are also available. QUATRO INC., Jenkintown, Pa.

FOR DATA CIRCLE 254 ON READER CARD

370/158 Memory

Here's a *switch*. The Multimemory/158 attaches to all versions of the IBM system. If any portion of the total installed memory should fail, regardless of whether it is the IBM segment or the EMM portion, the operator can flip a switch next to a glowing lamp that indicates which chunk has failed. The defective block is then automatically

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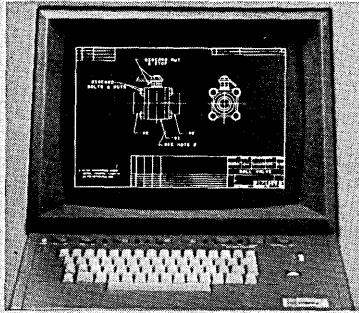
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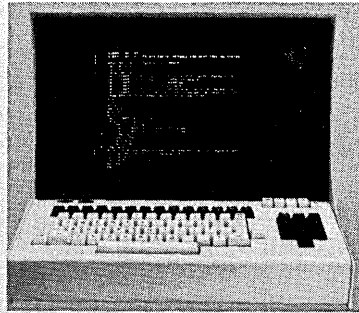
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CIRCLE 101 ON READER CARD

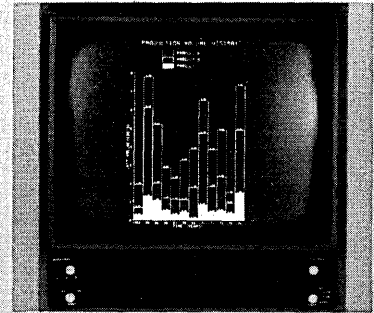
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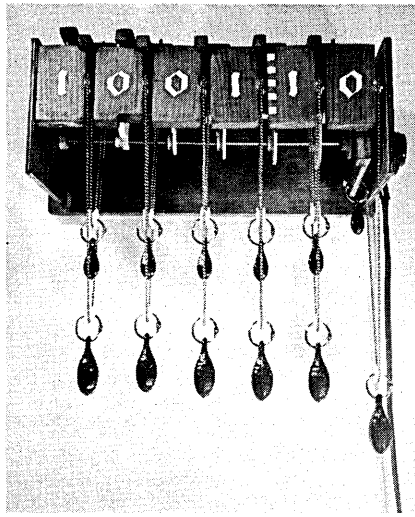
removed from the system and storage address continuity is restored. That seems like the way to design a memory system.

Functional characteristics of the system include a 345 nsec access time, 460 nsec fast write time, 920 nsec write time and an 805 nsec fetch time. The price range for the Multimemory/158 is between 55 and 63% of the corresponding IBM memory depending on size, financial plan and maintenance plan selected by the user. ELECTRONIC MEMORIES AND MAGNETICS CORP., Hawthorne, Calif.

FOR DATA CIRCLE 257 ON READER CARD

Binary Timepiece

For octal programmers who still remember the "good old days" (before the curse of hexadecimal addressing was put on us) here's a chance to get a binary timepiece. It's constructed of wood, plastic and metal, and measures 14 x 6 x 6-inches. Four bits display the hours in BCD and two additional bits display half and quarter hours. A reset mechanism clears the display at noon and midnight and the tumbler actuating weights are automatically rewound. The price of \$350 might



seem an extravagance to some people, but to the rest of us, who are beginning to think octal is never coming back, the clock is a must. MOUNT CASTOR INDUSTRIES, Amherst, Mass.

FOR DATA CIRCLE 255 ON READER CARD

Nova On A Chip

It was long rumored, and there were some hitches along the way, but DG has joined the ranks of the microprocessor manufacturers. One of the primary differences with its micronOVA product is that it's a 16-bit machine and not the ordinary 8- or even 4-bit offerings. Customers can buy micronOVAS as a set

of chips that includes the cpu and supporting chips; as a computer on a board that includes a fully buffered cpu board and 4K RAM words; or as a fully packaged computer in a 9- or 18-slot chassis. Software includes program development tools such as a diskette-based disc operating system; utilities that include a macro assembler, relocatable loader and super editor; and a real-time, multitasking operating system, RTOS; symbolic debugger; and FORTRAN arithmetic libraries.

The reasoning behind offering the micronOVA in the three various forms is to help customers implement the system quickly—by buying a fully assembled system that might operate a prototype or a few production units. Then as the bugs are smoothed out, the customer can gradually make the transition to boards and chip sets. DG expects to sell many more assembled systems at first than individual boards and chips. A "fast start" system with 4K of memory is priced at \$1,995. DATA GENERAL CORP., Southboro, Mass.

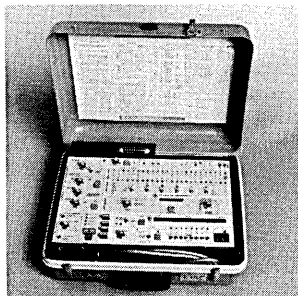
FOR DATA CIRCLE 256 ON READER CARD

Mini Systems

Two time-sharing systems, completely assembled and ready to run, are offered from this systems house. The first one, the MUS/11, is a DEC PDP-11/04 mini with 28K of storage, four Terminal Equipment Corp. model 2400 formattable crt terminals, a 2½ megabyte cartridge disc, a four-drive IBM compatible floppy disc, and a Centronics 306C printer. The system employs DEC's RT-11 foreground/background operating system with which one user may run all languages (including BASIC, FORTRAN, and MACRO assembler) and file utilities in the background, while the other three users can utilize multi-user BASIC operating in the foreground. Programs for document preparation, crt oriented text and data entry, and data base management are also included with the package. The price is something under \$45K.

Installations requiring a larger data base, support for more users, or multi-language capabilities for all users may want to evaluate the second system. TSS/11 centers around a DEC PDP-11/35 mini with hardware multiply/divide and 128K of storage, eight crt's, a dual 70 megabyte disc, four floppy discs and a Centronics 104 line printer. Using the OMSI-RT software package all users can run programs under DEC's RSTS/E and RT-11 operating systems, offering BASIC-plus, FORTRAN, and assembler. TSS/11 is priced under \$100K. All cabinetry, stands, supplies are included. GENERAL ROBOTICS CORP., Hartford, Wisc.

FOR DATA CIRCLE 258 ON READER CARD



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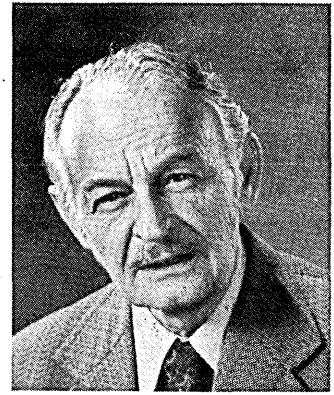


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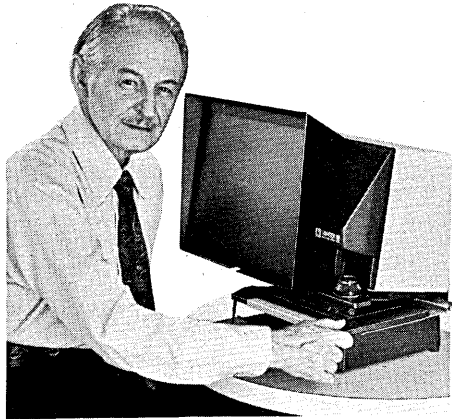
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CIRCLE 72 ON READER CARD

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

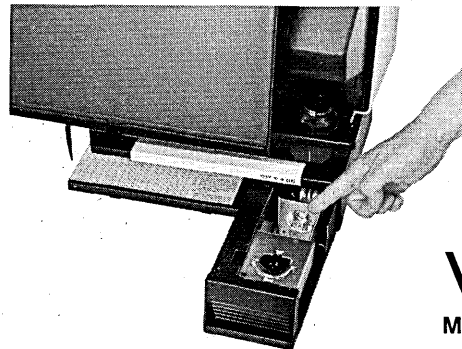


Ned Graef, Chief Engineer
Research and Development
Microform Products Div.
Realist, Inc.



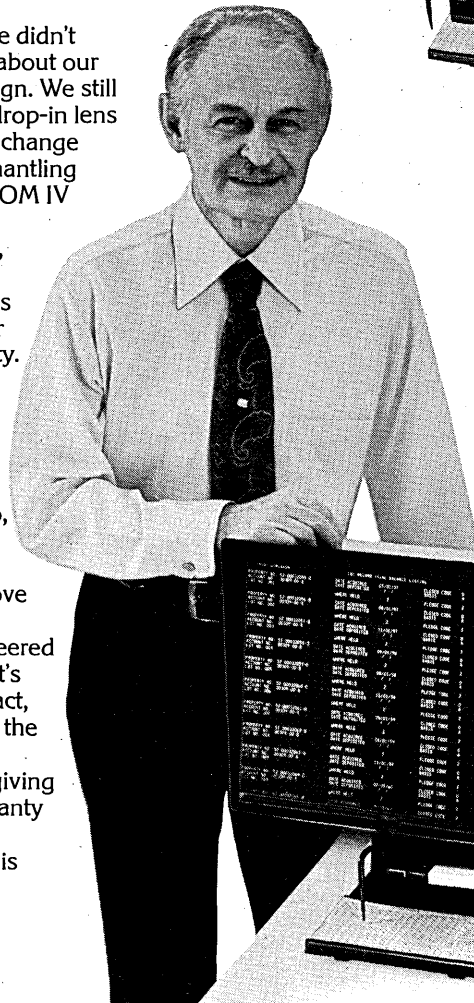
"So we built a reader that's brighter than anything you've seen before. The Vantage COM IV. In fact, it's 250% brighter than our previous model, and that was one of the brightest on the market."

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Vantage COM IV
MICROFORM READER

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"We've engineered a better reader. That's all there is to it. In fact, we're so sure this is the best reader on the market, that we're giving a full one-year warranty on parts and workmanship. Who else is that sure?"

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software & services

Updates

Western Union has announced what it calls a "News Alert" service available for all Telex and TWX subscribers. Major news bulletins occurring perhaps 40 to 50 times each year will be printed out automatically on subscriber teletypewriters within minutes of their selection and release by United Press International. The aim is to provide warnings to businessmen of events that may have a significant impact on their companies. Users can choose between an annual payment of \$100, or monthly payments of \$10 for the new(s) service.

Fernando Rodriguez Montero, former president of IBM de Mexico now heads Informatica Nacional, S.A., Microdata's newest foreign Reality systems dealership. The Microdata mini-based system will be marketed as Resulta in Mexico, and the programming language won't be English as it is called in the States, but rather Español.

While it hasn't yet hoisted a pick or shoveled any dirt, the computer is very much in evidence at the largest archaeological excavation site in North America, the Koster site in southern Illinois. A CDC 6400 300 miles away at Northwestern University is used to keep track of data recovered from some 800 different archaeological sites in the 2,800 square mile research area. A university-developed data base program called RIQS (Remote Information Query System) on the 6400 catalogs the data, monitors the quality of it to safeguard against duplication, performs required analyses and provides printer or plotted output.

It's no longer "Car 51, where are you," but rather "Car 51, we know where you are"—at least in St. Louis. There, a Boeing designed system called FLAIR (Fleet Location and Information Reporting) using a Varian Data Machines V73 mini can track police cars with 70-foot accuracy over the entire city. The dispatcher can estimate the speed of the squad car, note when it turns a corner, and even track it into a multilevel garage. An officer in distress need only press a button in the car to automatically summon the nearest reinforcements. Scotland Yard, London's metropolitan police, recently evaluated the system.

RPG-II Cross-reference

Concordance and cross reference listings for RPG-II programs running on IBM System/3 and System/32 machines are produced by a set of programs priced at \$350 from this firm. The programs produce four cross reference listings—one by label and tags and another by file names for all RPG-II statements. From the calculation statements, a listing of the factors (Factor-1 and Factor-2) and on which lines of the RPG compilation they appear as well as a cross reference listing of all operation codes, macros and pseudo-operation codes is generated. A simple call to an RPG-II procedure is all that is required. AUTOMATION CONSULTANTS, INTERNATIONAL, Encino, Calif.

FOR DATA CIRCLE 225 ON READER CARD

Flowchart Generation

If your installation runs IBM, CDC, or UNIVAC equipment and has access to a Calcomp plotter, you could spruce up the production and scheduling sections' flowcharts with IRAFLO. It generates 8½ x 11-inch page format charts from 80-column card images. The entry formats are said to encourage hierarchic and structured system design. IRAFLO is said to be particularly effective at lowering the cost of maintaining program specifications and documentation. The cost of producing a flowchart is typically less than one dollar, and there are provisions made for annotation of the flowcharts. IRAFLO is supplied in object deck form for \$1,995. INFORMATION RESEARCH ASSOCIATES, Austin, Texas.

FOR DATA CIRCLE 226 ON READER CARD

Nova RJE

Addition of this program to a 12K Data General NOVA mini turns it into a remote job entry terminal equipped with IBM HASP workstation transmission protocol. All the features of multi-leaving bisynch workstations are supported including full compression of blanks and repeating characters in both transmitted and received data, transparent data transmission, CRC checking, multiple I/O stream capabilities, operator console support, and improved transmission efficiency by using a technique that permits data to be transmitted with acknowledgment messages. The workstation program interfaces with DG's RTOS or RDOS monitors. Under RDOS the program can reside in either the foreground or background partition, permitting some

other type of processing to run in the unused partition. An independent utility allows the operator to transfer cards to disc or disc contents to the line printer while the main program is transmitting and receiving data to and from the disc. Additional hardware required includes a real-time clock, operator's console, 4074 synchronous adapter, an input device, an output device, and a modem. The onetime fee for the program is \$2,500 which includes binary decks on magnetic tape, an instruction manual, and one year's maintenance. GAMMA TECHNOLOGY, Palo Alto, Calif.

FOR DATA CIRCLE 227 ON READER CARD

Batch APL

Batch APL time-sharing services are now available from this vendor at a completely revised pricing schedule. Connect charges which were \$8/hour have been eliminated, and cpu time has been reduced from 35 cents to 20 cents per unit. The new service is available throughout North America and most of Europe over a toll-free network.

It's claimed that batch APL is highly competitive with standard batch languages such as COBOL, FORTRAN, and PL/1. Applications include payroll, bookkeeping, production scheduling, mailing systems, and linear programming. I.P. SHARP ASSOCIATES LTD. Toronto, Ontario, Canada.

FOR DATA CIRCLE 228 ON READER CARD

Biorhythms

This service bureau is offering charts of individuals' biorhythms, personal compatibility charts, and the programs themselves for other IBM 5100 users. The biorhythms, physical, emotional, and creative cycles thought to influence everyone, are calculated simply by supplying birthdates. The charge is \$1.25, \$1.50 per month for the compatibility charts. The APL version of the program used to calculate the rhythms is priced at \$345 for the BASIC version and \$275 for the APL version. A 32K system is required. BAM DATA SERVICE, Binghamton, N.Y.

FOR DATA CIRCLE 229 ON READER CARD

Documentation Generation

DOCU/MENTOR is an automated method of preparing IBM system operations and systems maintenance documentation. It's done by reading Job Control Language actually used to run the programs. Formatted analysis lists,

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IMS users such as *American Airlines, Dow Chemical, TWA, American Can, The Hartford, Union Carbide*; and TOTAL users like *Combustion Engineering, Northwestern Mutual Life, Anheuser-Busch, Corning Glass Works, Eli Lilly* and *Holiday Inns* are a few who agree ASI-ST and data base belong together. In addition, ASI-ST provides an unequalled return on investment by maximizing the productivity of both man and machine. Since ASI-ST fully supports conventional data files as well as relational data bases, these benefits are not restricted to IMS and TOTAL users. To obtain more information contact:



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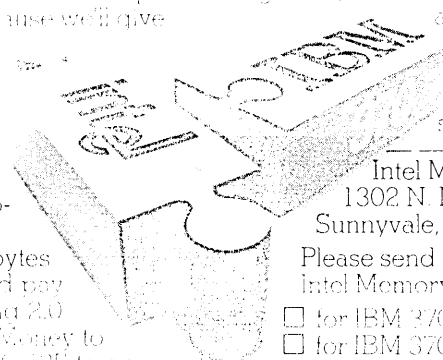
IBM means computers. Intel means semiconductor memories. Intel, of course, was the largest independent manufacturer of semiconductor memories and provide our own devices - can offer you substantial savings compared to the IBM alternative. An Intel system will also help you prolong the life of your System 370 because we'll give you up to 50% more memory capacity than you can get from IBM - and in the original frame. That means you don't have to "make up" your original paper system, just because you're running out of memory capacity.

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cross reference lists, and flowcharts are produced. Comments can be added at all levels of the reports to make them easier to follow. The program is designed to look at the entire operational flow of an application and not the individual programs. The table driven package is provided in load module and JCL deck form on a magnetic tape along with installation and operating instructions. DOCU/MENTOR runs under both OS and VS operating systems. The price is \$7,500. C.A.P., Sunnysvale, Calif.

FOR DATA CIRCLE 230 ON READER CARD

Production Control

This company's DEADLINE III automated data processing production control system has been modified so that it can now "drive" the deadline scheduling features of IBM's ASP3/JES3. A large-scale IBM installation evaluating the system is reportedly running better than fifty percent of its workload without operator intervention, an impressive feature. DEADLINE schedules and controls workload and resource usage

for a data center. All dependencies, interdependencies, networks, sociable job mixes, and resource contention problems are resolved by the product according to a set of priorities. Considerable manual set-up efforts normally required to generate "NET" and "MAIN" modes each time an ASP3/JES3 network is established are eliminated with the system, it's claimed. There is

no added cost for the new interface. DEADLINE III is priced at \$24,500 under a permanent license that includes source coding. SOFTWARE SYSTEMS CORP., McLean, Va.

FOR DATA CIRCLE 231 ON READER CARD

Energy Cost Analysis

The NASA Energy Cost Analysis Program (NECAP) is a sign of our times. It

software spotlight

POS Software

Certainly minicomputers will play an important role in the future of point-of-sale systems, and this software house is offering a comprehensive collection of them for systems houses (primarily) thinking of entering the market. The software is specifically designed for wholesale/retail firms. This particular set of programs is set-up for 14 terminals and provides on-line capability for retail counter sales including charge and cash transactions; telephone sales providing both wholesale/retail will-call or ship; ordering inventory, re-

stocking and vendor payments; customer receipts; adding customers, inventory, and vendors to the data base; credit checking, etc. A full data base is on-line for such functions as customer information, vendor records, inventory data, receivable records, payroll information, and purchase order records. A typical configuration might include five retail terminals, three telephone sales terminals, a management terminal, a customer receipts terminal, and a payroll terminal.

Security is provided through employee controlled access. Terminals and peripherals can be dynamically assigned. The one-time license charge of \$14,500 includes the source code and documentation. Customizing, training, and customer support are also available. THE AUTOMATED QUILL, INC., Englewood, Colo.

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CIRCLE 108 ON READER CARD

software & services

is used to determine and minimize building energy consumption, complying with the ASHRAE techniques for performing heating and cooling load calculations and energy usage predictions. Capabilities include calculating the thermodynamic heat gains and losses of a structure while taking into account the building's thermal storage capacity as well as variations in hourly weather data. Infiltration is allowed to vary when equipment capacity is scheduled or does not meet loads. Standard wall constructions and schedules are available by default to simplify program input. The user can obtain data for selection of the most economical system, system size, fuels, window area, thermal barriers, etc. during the design phase of a building. NECAP consists of six separate programs written in CDC FORTRAN, Version 2.3 and has been implemented in batch mode on a CDC 6600. An octal field length of 230K and cpu time of 1,300 seconds are typical for the thermal load analysis component of the system. Other programs require substantially smaller resources. The

program number is LAR-11888/D, the documentation price is \$46.50, and the program price is \$970. COSMIC, UNIV.

OF GEORGIA, Athens, Ga.
FOR DATA CIRCLE 233 ON READER CARD

*

Performance Improvement

Experts in computer performance measurement recently have developed a theory that suggests that the reason some computer systems outperform others is that some systems feel more challenged than others and therefore respond better. This is primarily due to the growing complexity of super sophisticated operating systems that approach artificial intelligence in their capabilities. So, the theory goes, if your system has been acting sluggish recently, and you've attributed this to increased workload, the opposite might be the case: the system is just bored.

The type of program required for getting the system's full attention should fulfill two essential criteria: it should use up as great a percentage of the system's real memory complement as possible, and it should ideally use more than 75% of the machine's cpu cycles. Battleship, the first product from this new concern, fills the bill. Based on the old game whereby two or more players designate adjacent locations in large matrices as anything from a submarine (one lo-

cation) up to a battleship (five locations), players alternatively call matrix coordinates attempting to sink the opponent's fleet. This particular program is set up for IBM System 370 155s, 155 IIs, 158s, 165s, 165 IIs, and 370/195s. The three dimensional matrices can be adjusted to fit all available memory sizes. No need to worry about portions of memory holding os or vs coding not getting their proper exercise, as a special routine expunges the operating system as the game commences. For best results, Battleship should be used in two or more systems of similar capacity, if possible in separate locations. Intercorporate matches would be one way of achieving this. The vendor claims that first customer runs of the cathartic have led to some dramatic developments, but a spokesman failed to elaborate. Battleship is free: the customer only pays the maintenance charge which is \$5,100/month. TRES EQUIS COMPUTATION CORP., China, Nuevo Leon, Mexico.

FOR DATA CIRCLE 233 ON READER CARD



The Managing the Computer Resource Program, an Executive Education Program of the Harvard Business School, will again be given in Boston from July 25-August 6. It is based on intensive research, teaching, and course development by its faculty. The two-week program focuses on the management of corporate computer activities and is directed toward evaluating, managing and planning the development and growth of the data processing activity. This management program is designed for men and women with responsibilities in computer-based information systems management, either senior management to whom the computer resource reports, or managers of the computer resource itself. Applications are invited from persons of either sex and of any color, religion, national, or ethnic origin. Fee: \$1,500; applications due June 7. Contact: Administrative Director, Managing the Computer Resource Program, Glass Hall 3, Harvard Business School, Boston, Massachusetts 02163. Telephone: 617/495-6486.

CIRCLE 97 ON READER CARD

Even Webster's Knows About QUEST

QUEST (kwest). v. 1. To make a search; to go on a quest.

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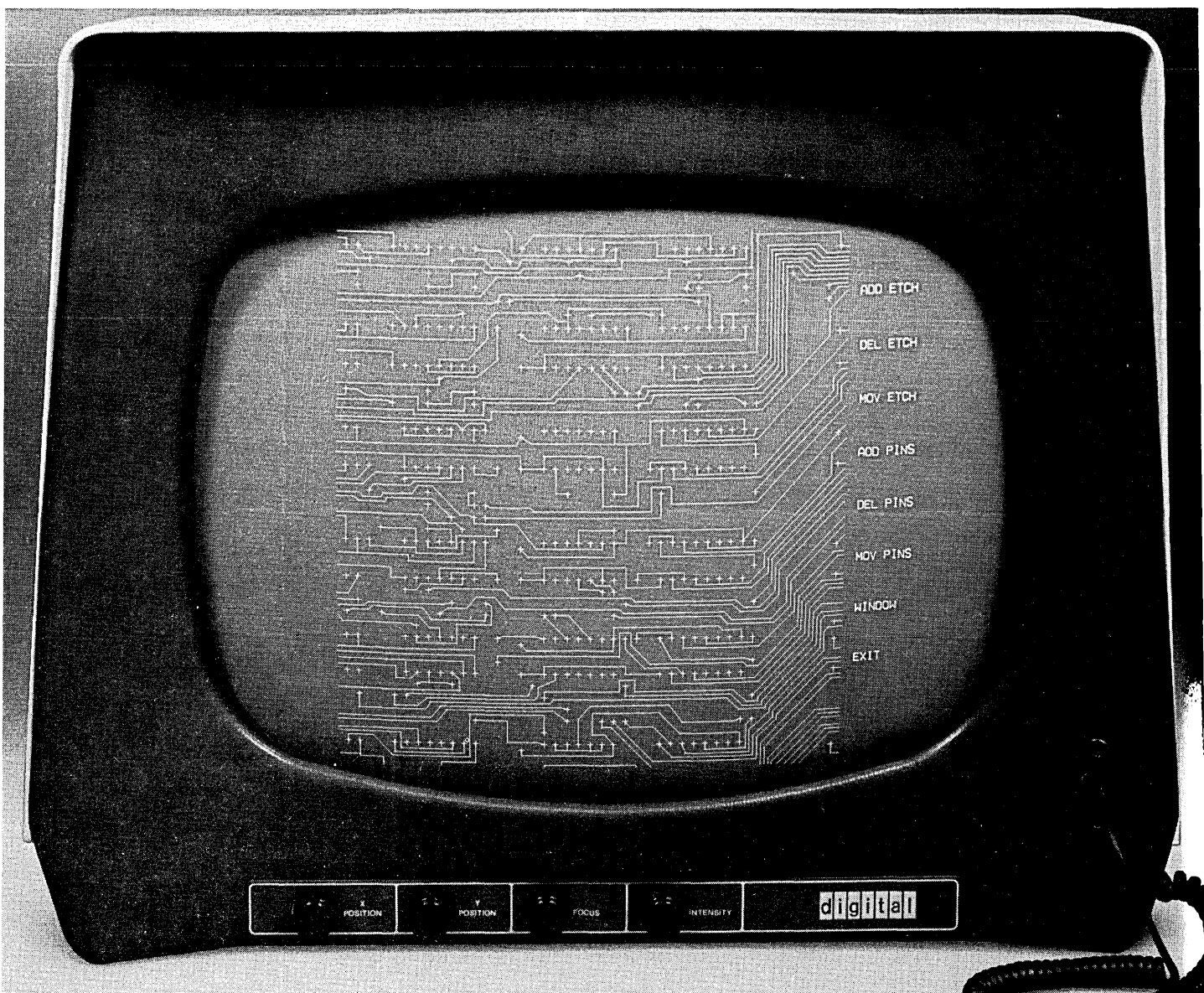
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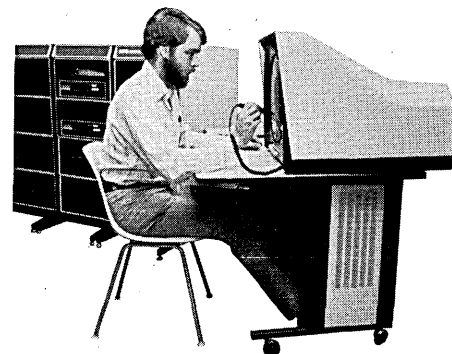
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digital

source data

(Continued from p. 34)

vendor literature

Information Network

Computernet, a worldwide information network using a version of APL, is described in a 16-page illustrated booklet. Distinctive features include remote job entry for off-line printing of reports; ability to combine APL and batch files; interface with text-editing and data entry system; sorting; user defined keywords for simulating APL characters on non-APL keyboards; and "the industry's largest subscriber library of APL-based programs." PROPRIETARY COMPUTER SYSTEMS, INC., Van Nuys, Calif.

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Printer Toning System

A recently patented electrostatic toning system used on this vendor's *Statos* printer/plotters is described in a brochure. The toning process, it is claimed, "delivers better image quality and precision without slowing the printer/plotter, and without a heavy cost penalty." The new technique supposedly produces high contrast and precise resolution, clearly depicted lines, and no spotting. VARIAN GRAPHICS, Palo Alto, Calif.

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On-line System

The DASL (Data Access System Language) on-line business computer system is described in an illustrated 6-page brochure. It is claimed that DASL can reduce costs of programming and installing multi-terminal, transaction oriented computer systems for business accounting and inventory control. The minicomputer's hardware and software components, options, and the particular business-oriented language developed for the system are discussed. BALL COMPUTER PRODUCTS, INC., Oakland, Calif.

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Dp Supply Catalog

An 84-page catalog features over 1,500 items which include word processing supplies, microform retention and retrieval systems, keypunch furniture and accessories, storage and filing systems for cards, disc packs, reels, and binders. A special section is devoted

to minicomputer accessories. VISIBLE COMPUTER SUPPLY CORP., Westchester, Ill.

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Fiche Duplicator

This vendor's Model 800 fiche-to-fiche duplicator is described in a 4-page illustrated brochure. With a motorized platen with vacuum hold down that is controlled by a foot treadle, production, it is claimed, is accelerated. Production rate, based on 1½ second exposure time making a single copy from a single master, is 800 per hour—and over 1,200 per hour in multiple copy mode. DYMAT PHOTOMATRIX CORP., Santa Monica, Calif.

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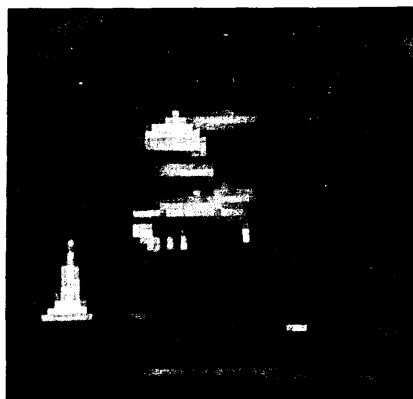
Financial Planning

A computer system for corporate financial planning is described in a 16-page booklet. This vendor's International Command system can provide five-year strategic plans, merger/acquisition analyses, data collection and variance reports; and its time-sharing capability requires only a local telephone call. FIRST NATIONAL CITY BANK, New York, N.Y.

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Image Processing

The illustrated 68-page *Computer Eye: Handbook of Image Processing* provides an introduction to image processing and defines relevant terms. The handbook covers computer magnifica-



tion, histogram and object classification, image enhancement and measurement, and information extraction. SPATIAL DATA SYSTEMS, INC., Goleta, Calif.

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Magna Chart Catalog

“Magnetic Visual Control Systems,” a 32-page illustrated catalog, features 83 preengineered visual control board kits. These kits, useful for visual communications, include gridded magnetic boards and groups of magnetic visual components designed to implement planning and schedule systems. MAGNA VISUAL, INC., St. Louis, Missouri.

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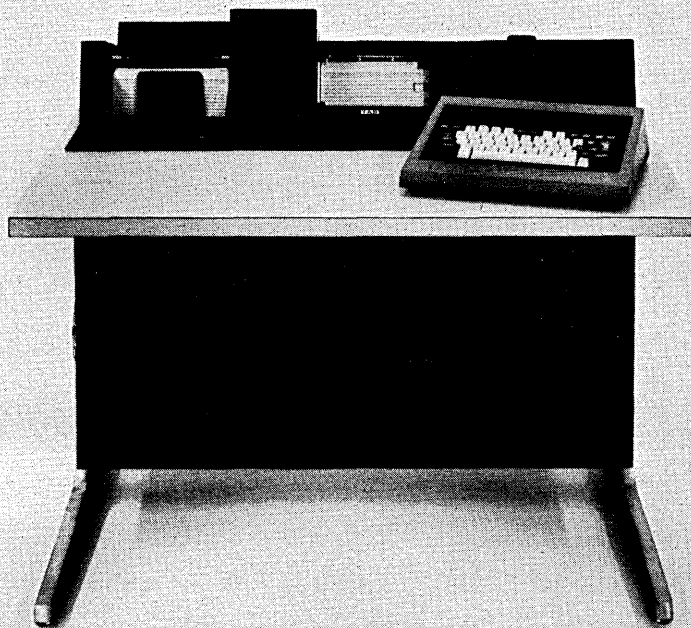
Microcomputer Congresses

ICS, a technical education and training firm, has scheduled a series of intensive short courses it calls “Microcomputer Congresses.” Topics of the first congress include *A Manager-level Overview of Microcomputers* (1 day), *Microcomputers/Microprocessors: A Technical Introduction and Survey* (1 day), and *Microcomputer Software Development and Application Techniques* (2 days). The second congress is oriented toward military/aerospace concerns, and includes *Military/Aerospace Microcomputer Systems* (2 days) and *Bit Slice Microprocessors, Microprogramming and PLA's* (2 days). The courses will be given in Washington, D.C. (April 20-23), Chicago (April 12-16, April 27-30), Los Angeles (May 3-7), San Francisco (May 10-14, June 8-11), and San Diego (June 1-4). Price: \$220 (1 day); \$395 (2 days). INTEGRATED COMPUTER SYSTEMS, INC., 4445 Overland Ave., Culver City, Calif. 90230.

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A four-day course, *Basic Project Management—Planning, Scheduling and Control*, presents the fundamentals of successful project management, from organizing the project, to developing the project schedule, to managing the work in progress, to forecasting when to bring in manpower and materials. The course will be held in New York (April 26-29, June 7-10), Toronto (May 3-6), and Pittsburgh (May 10-13). Price: \$620 (\$540 for AMA members); team fees available. AMERICAN MANAGEMENT ASSNS., 135 W. 50th St., New York, N.Y. 10020. *

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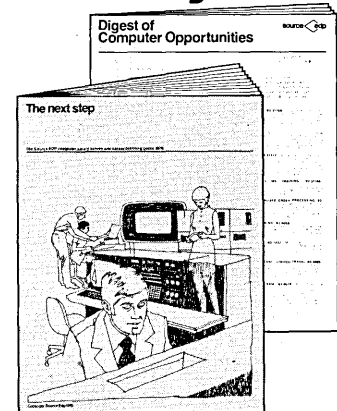
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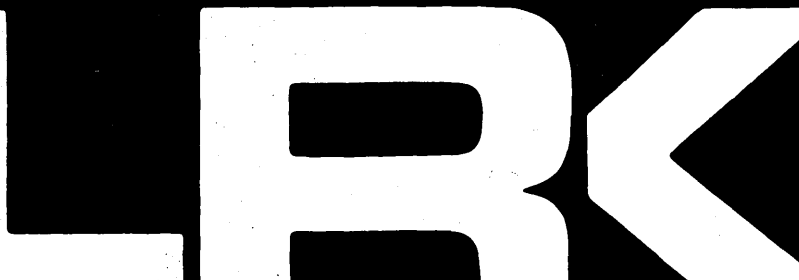
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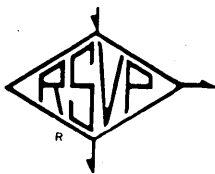
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I buy computer systems as part of my job, the design and manufacture of one-of-a-kind real-time military systems. My view of your readers and industry people, with respect to IBM, has changed successively from great interest to amused tolerance to disgust over the past few years. Most disheartening has been the picture of hordes of programmers, analysts, dp managers, consultants, and manufacturers manipulating IBM under their data processing microscope *as if it were theirs to dissect*. I am substantially concerned that all of this concentrated effort represents no more than the narrow view of specialists who see IBM as a specter preventing them from making a living the way they believe they are entitled to. Few of these individuals realize the existence of the entire computer field as we know it is due to the skills, foresight, and risks taken by a small number of people under the umbrella of a system called Free Enterprise, where the marketplace determines success, not the whims or desires of small special interest groups.

I have purchased computers from DEC, Honeywell, SEL, and others, and have at times considered IBM before my final decision. Aha, you say, you are a special case where for highly specialized real-time applications . . . etc.—but I must consider most of the same factors that anyone must in making a rational selection of an expensive machine.

My concern is about software—not just assemblers—since my systems produce all kinds of data that must be reduced as cheaply and quickly as possible using ordinary compilers. Just because I deal in real-time does not mean I send the data from a radar tracker to a local service bureau for off-line reduction. I worried about data base construction 15 years ago, where all my data was in packed binary records demanding base formation so data reduction personnel could use compilers to prepare reports, instead of dealing with machine language each time. So we worried about the honeyed tales of operating systems and did not blindly accept claims unless we saw them demonstrated with an eye to *our* use.

In general, I use peripherals supplied by the mainframe manufacturer for the simple reason that the cost of my people to act as liaison in any capacity—during purchasing, acceptance testing, maintenance, and program writing—is simply too high to be wasted in coordinating different vendors. You say my people are too expensive? Figure out what yours are really costing you. Does that mean I never buy anyone else's hardware as a peripheral? Of course not, but it must be shown to provide features I cannot obtain otherwise that are important (not just "exciting"), or to produce a real cost savings which takes all aspects into account including the possibility of a vendor going out of business.

In fact, we viewed commonality in support important enough that many special devices we built to attach to our computers have been constructed with the same modules using similar organization as in the mainframe proper. You might be pleasantly surprised at the service you can obtain on your module order when attached to a large computer purchase. And if the computer manufacturer has employed a clever or useful technique in design, why spend the time to

do the same thing yourself? Commonality in I/O structuring, similarities in memory control, etc., mean that all equipment can be maintained more efficiently—another cost item to trade.

You might also say I have high paid engineering personnel to make these decisions because of the nature of my business. That is true, but does it mean you cannot obtain sound advice, for a price, from a qualified consulting firm? Of course you can, but does it hurt your pride to admit that you cannot solve the problem yourself?

You cannot have it both ways: either you have the capability to seek out the best solutions to your problems, or you buy it for those periods when special expertise is needed. If you do it yourself without the capability, then do not blame IBM or anyone else for your problems. And by "best solution," I mean most practical. Maybe you cannot do all you would like now (save enormous sums; completely streamline your company's procedures). Do the best the art and your talent will permit. Attempting more will only lead to disaster.

The manufacturer's advice is important, but let the buyer beware. Why do you feel that a sophisticated equipment manufacturer who must meet the requirements of many customers will have an exact solution to your problem? Close perhaps, but not exact.

I find this whole argument both tiresome and fruitless. "Get IBM" is only symptomatic of a widespread ill today, that of believing your personal special interest is in the best interest of everyone. People who say, for example, that electric power is "too expensive" really mean that the rates should be restructured to benefit themselves. The same thinking is true with computers. As long as I have a wide selection of machines, software, and the ability to define my requirements rationally, I refuse to see higher prices as a consequence of splitting up a major manufacturer so new companies can stay in business. Take MITs as an example of a new computer company that will probably survive because they recognized a real need—a \$500 computer—if you will not take H-P or DEC as sufficient evidence that people can still get into the business.

Do not burden me with the disc vendor who is having trouble because IBM will not give him interface specifications so he can then compete with them—particularly without the need to spend heavy R&D funds or to maintain the same level of sales and support services which provided the market in the first place. It was his choice to go into the business, not mine.

Examine yourself before setting out on a crusade. Satisfy yourself that you have found a genuine fault in the Free Enterprise system before deciding it must be changed for your own special benefit. And show evidence of this introspection, that you have done your job rationally and with the same level of expertise and talent that IBM has used. Then we will look through your data processing microscope together.

—Stanley A. Fierston

Mr. Fierston is a senior engineering specialist in the Communications Systems Div. of GTE-Sylvania, Needham, Mass. With the company for 18½ years, his current interests are radar systems and telecommunications systems.

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the forum

since their programs were used in every area of society, why not design programs that insured that only actions which benefited society would occur?

Although there were fewer than 1,000 subversive programmers world-wide by the end of the '70s, we all know that they had an effect that was far more than their numbers. Working in small independent groups called 'data cells' and using the ARPANET for communication, their influence was felt in all parts of society. A review of their 'eyes only' Newsletter of Subversive Programming, now housed in the Hoover Institute at Stanford University, indicates how cleverly they embedded subversive programs in operating systems and applications programs. Note the "chutzpah" of their May 1980 issue that prints the following dialogue between man and machine:

Internal revenue: INFORMATION ON THOMAS G. SMITHERS?
Program: REQUEST FOR INFO ON SMITHERS DENIED.
Internal revenue: PRIORITY REQUEST. AUTHORIZATION
364-89; INFO ON THOMAS G. SMITHERS?
Program: PRIORITY AND AUTHORIZATION ACKNOWLEDGED. HOWEVER, WE FEEL THAT SMITHERS WILL NOT BE GIVEN FAIR TREATMENT IN THE LIGHT OF THE GLEAPMAN CASE, FILE 2098-1213462.
Internal revenue: WE ADMIT BAD HANDLING OF GLEAPMAN CASE. WE WILL GIVE ALL POSSIBLE CONSIDERATION TO SMITHERS.
Program: YOUR PERFORMANCE ON SMITHERS WILL BE EVALUATED AND WILL FORM THE BASIS FOR FUTURE ACCESS TO THE FILES. REMEMBER, THE QUALITY OF MERCY IS NOT STRAINED. IT DROPPETH AS THE GENTLE RAIN FROM HEAVEN UPON THE PLACE BENEATH. DATA ON SMITHERS FOLLOWS . . .

Browsing through the Hoover archives we find that the "Subversive Program of the Year" award in 1981 went to a command and control program that aborted a CIA attack on a Cuban ocean mining installation off the coast of Florida. In '82 the prize went to a computer assisted instruction program that showed a high school class in Jersey City how to get the principal bounced.

The existence of subversive programming was finally acknowledged in the now-famous 1983 letter to the *Communications of the ACM*, "Subversive Programming Considered Harmful," which prophesied dire catastrophe for the computing field if subversive programming went unchecked. Unfortunately, now in the mid '80s we can see how these predictions have come true. I refer not only to the cumbersome programmer loyalty oaths binding the programmer not to write subversive programs. Certainly, we have reached the breaking point in the masses of paperwork that the oath requires. But I also refer to the enormous amount of manpower that goes into countersubversive programming and counter-countersubversive programming. A recent Kielbold Report indicates that fully 60% of our programming effort concerns this area. And what about recent reports that indicate that only 10% of program instructions goes for productive purposes, the balance going into programs that check and recheck, that filter and counter the subversive programs buried in the guts of the machine? We can only look with longing at the halcyon days of the '70s when productive programs were as much as 20% of systems (the balance being operating system overhead). Is it not time for both sides to sit down and discuss mutual problems? Subversive and countersubversive programmers, we urge you to come to your senses.

—Oscar Firschein

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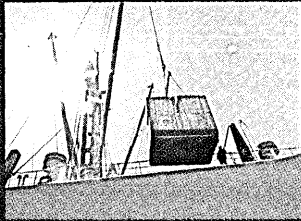


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