DATAMATION® 76

July

ELECTRONIC BANKING

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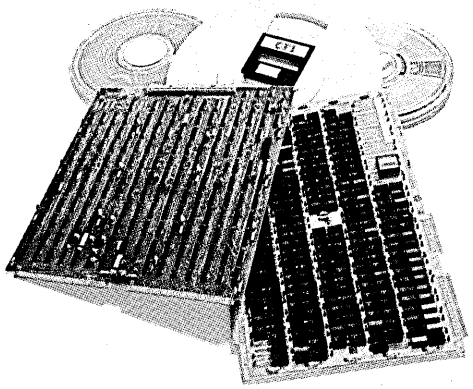

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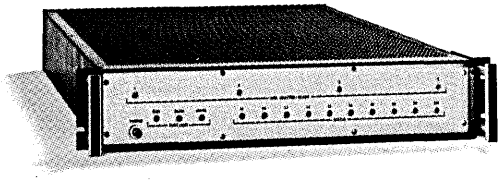

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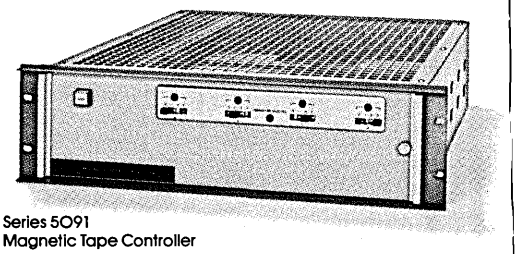

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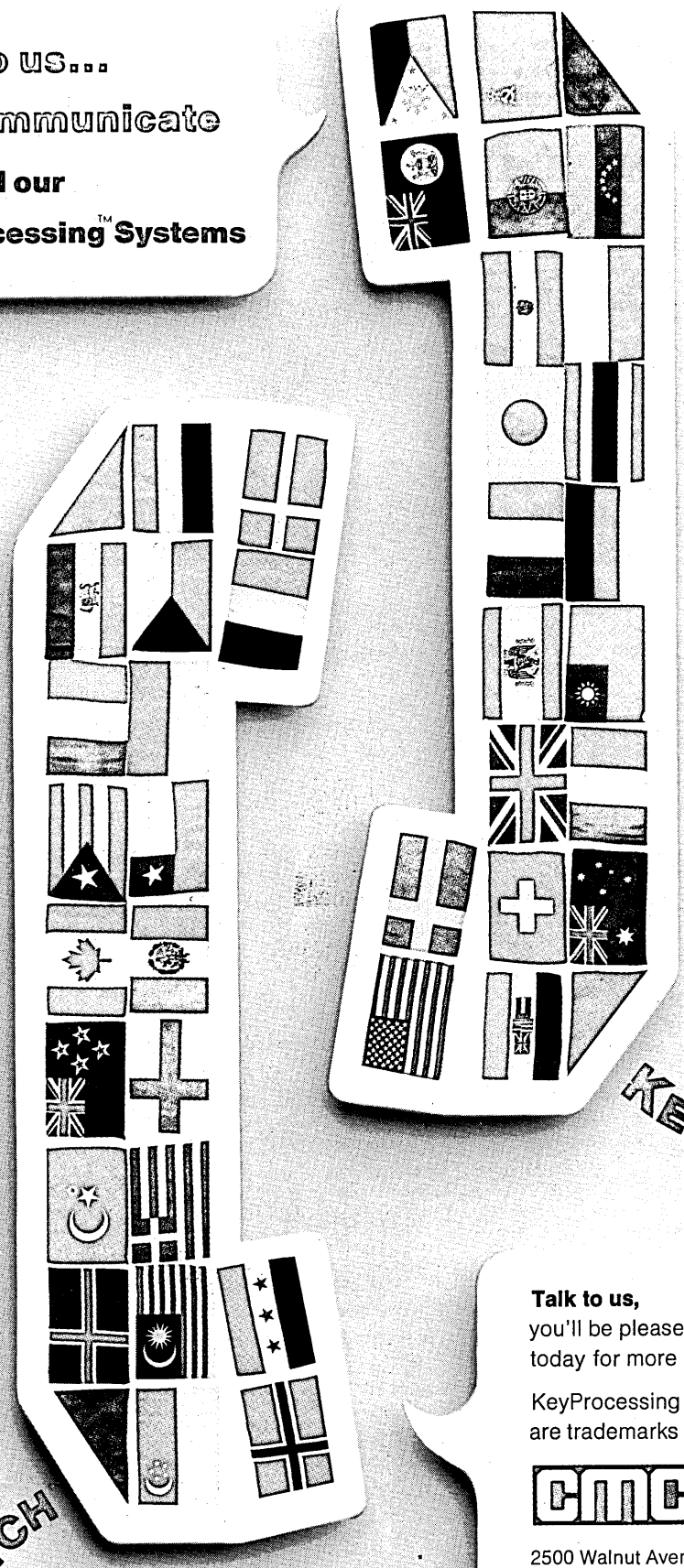

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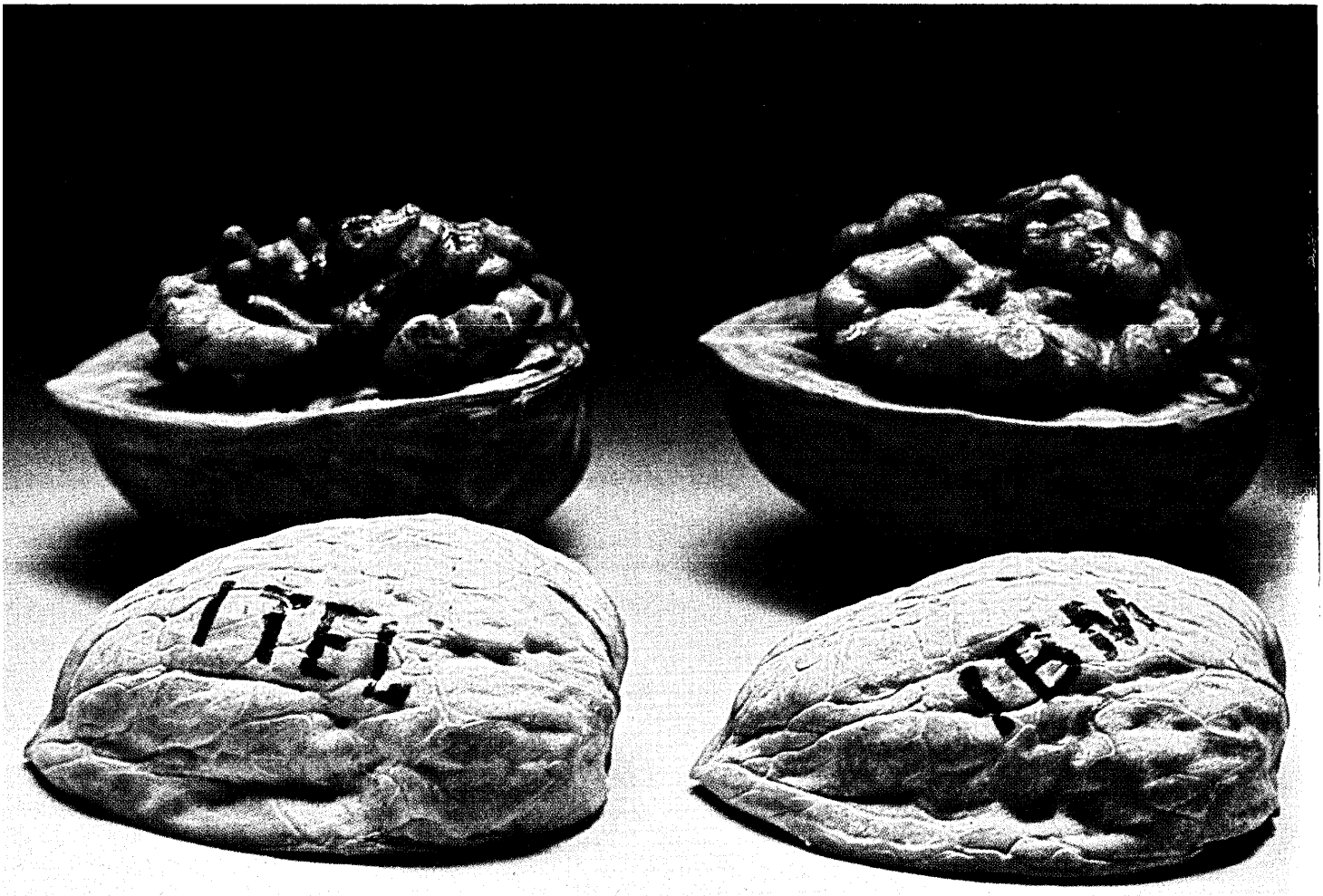

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DATAMATION 76®

VOLUME 22 NUMBER 7 This issue 121,866 copies JULY 1976

FEATURES

Electronic Banking
In spite of their stodgy, conservative images, banks are now showing the way for transaction oriented dp applications. Different styles still lead U.S. banks to distribute processing while the Europeans continue to centralize, but similar basic needs are bringing both sides together in global networks —replacing labor, paper, and mechanics with electronics.

NEWS IN PERSPECTIVE

DEPARTMENTS

ABOUT THE COVER
We borrowed Uncle Sam from nostalgia and plugged him into banking. It's his year! Design and photography by Barbara Benson.

DATAMATION

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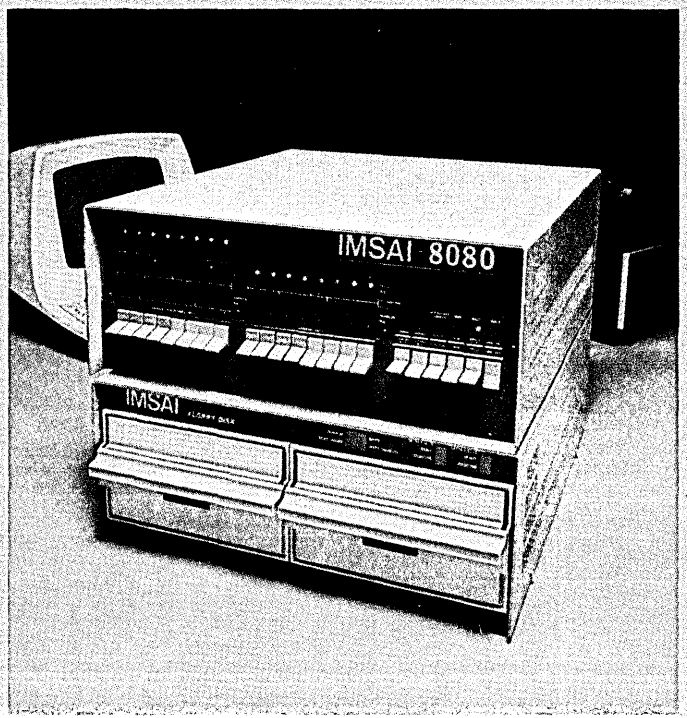

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letters

Older than you think

Dick Heiser's article on the first World Altair Computer Convention ("Hobbyists off on a Weekend," May, p. 201) referred to a certain book as having been "printed in August 1974 for the computer hobbyist, a breed that didn't even exist then. . . ." It did exist, and much further back than 1974.

This August marks the tenth anniversary of the *Amateur Computer Society Newsletter*, which seems to be the oldest computer-hobby publication in the world. Also, back in the Sixties, the Tesla Research Foundation offered analog and digital computer kits; their DI-TR5 digital computer cost $365 in kit form, $440 assembled, used germanium-transistor NAND logic and diode OR gates, had two registers and 15 instructions. I/O was via switches and lamps. The company didn't last long, and has vanished without a trace.

The British *Wireless World* magazine carried a five-part construction article on building a small computer, in late 1967.

Microcomputer kits were first available in early 1974, the Scelbi 8H in March and *Radio-Electronics* Mark 8 in June. The January 1975 *Popular Electronics* introduced the MITS Altair 8800, the best-known and most widely sold hobby computer.

By August 1974 there were three microcomputer kits (third was the RGS 008A), and several dozen built-from-scratch amateur computers had been in operation for some years.

However, Dick has the year right as far as the hobby *microcomputer* explosion goes; 1974 marks the beginning of what now amounts to over 30 computer kits and at least seventy computer clubs.

STEPHEN B. GRAY
Amateur Computer Society
Darien, Connecticut

"If memory serves me right . . ."

Much as I appreciate DATAMATION's new interest in historical articles I am constantly irked by the apparent inattention to the rudiments of the historian's craft. Inaccurate information from second and third-hand sources, once printed in DATAMATION, takes on an authority which tends to erase more precise pictures of our short past.

The most recent case occurs in the otherwise fine article by David N. Freeman, "IBM and Multiprocessing" (March, p. 92). In an authoritative-looking table, Freeman lists "IBM Multiprocessors prior to System/360." The second entry lists SABRE as a 1958 system, without saying whether the system was operational or simply publicized then. According to my recollection, no 7090s existed in the world in 1958, and the SABRE system was certainly not operational in any effective sense until several years later. If memory serves me right, the first 7090s went to BMEWS (which also had some sort of multiprocessing), and the next ones went to Project Mercury.

The Mercury Project never got the publicity of systems such as SABRE, partly because IBM had been stung on SABRE—making promises in public that couldn't be fulfilled (on time, anyway), and partly because of fear that something might happen to the astronaut that could be blamed on IBM.

But the Mercury system, designed in 1958 and up and running in 1960 with loosely coupled multiprocessing and full multiprogramming, was a great success. Not only did it serve its mission, but its operating system was used as the core of many other 7090 systems working on-line. People trained on Mercury went in several directions. Some went to bail out SABRE, some went to Houston to found the Gemini and later Apollo missions, and others went, ultimately, to the OS/360 project.

All in all, the people of Project Mercury had a tremendous influence on operating system developments, both multiprocessing and whatever. Perhaps some of the others will write you giving more of the story, but I felt it was about time somebody gave a little historical recognition to those forgotten heroes of Project Mercury.

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

A spokesman from IBM Data Processing Division informs us that the first customer for the SABRE system was American Airlines, and the year was 1962. The first 7090s were shipped to Sylvania Corp. in November 1959 and to the Army Materiel Command at Redstone Arsenal in May 1960.

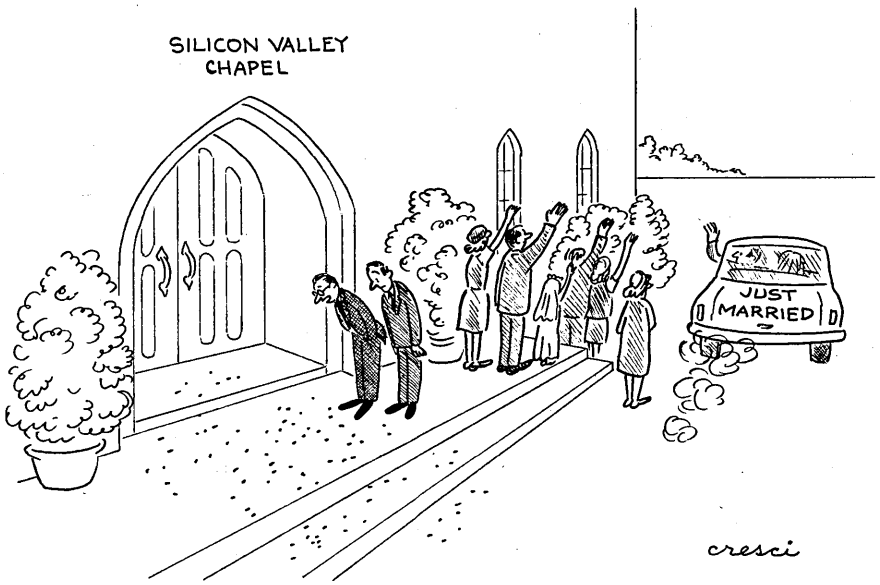
Is ADABAS relational?

I read and appreciated two fine data base texts recently, C. J. Date's *An Introduction to Database Systems* [reviewed July 1975, p. 27] and James Martin's *Computer Data Base Concepts* [reviewed January 1976, p. 27]. Then along came Date's article, "Relational Data Base Concepts" (April p. 50). . . .

Relational data bases, they say, are the wave of the future. Yet the existence of a nearly relational and operationally efficient DBMS, ADABAS, remains unnoticed by these authors. Either ADABAS literature has been cunningly shielded from them, particularly from Date, or other reasons prevail for their refusal to acknowledge, in their texts or in the article, that ADABAS today is a close kin to a relational data base system.

To be sure, ADABAS does not demand flat files, but the reason is that recognized operating efficiencies permit this compromise. Nevertheless, applying Date's test of properties that define a relational data base, ADABAS comes closest to the relational structure than any other widely-used and operational DBMS. Not even an honorable mention by these authors. . . .

Robert M. Curtice's article, also in the April issue (p. 46), says that we must wait until 1983-1985 for the realization of an economically viable rela-



"Gosh, that's not rice. They're ICs."

letters

tional data base. While no claim is made for an academically pure implementation of the relational data base in ADABAS, I know that current ADABAS users are not waiting for the Second Coming.

LEON GAINEN
Director and Senior Consultant
Management Database Systems
San Pedro, California

ADABAS and other commercially available data bases can be used, we are told, to build a relational system, but are not in themselves relational systems.

Data base correction

I wish to correct an error in Mr. Chvalovsky's article "Anything New in Database Technology?" (April, p. 54). Near the end of the article Mr. Chvalovsky refers to IDMS as an alternative to CODASYL data base management systems. In actuality, IDMS *is* a CODASYL system, and as such is the only DBMS of its kind running on IBM hardware.

HARVEY DUHON
Systems Analyst
Clemson University
Clemson, South Carolina

APL vs. COBOL

I read with extreme amusement the article by Bill Inmon, "An Example of Structured Design" (March, p. 82). Inadvertently, this article provided entertainment for thousands of programmers around the country, those who know APL and wouldn't write a program in COBOL if their professional careers depended on it—which fortunately, is not the case. (Grace Hopper, please take note.)

I admire the quoted yield of 11 lines of code per hour. That's quite an achievement in COBOL. I wonder if the author realizes that in APL an average programmer can probably produce five times that yield, and that each line is probably five times as powerful in addition. Furthermore, 31,000 lines of COBOL coding would be between 1,500 and 6,000 lines in APL; the median module size would probably be half a page; and using APL would have saved probably 50% of the total development cost!

Keep those amusing articles coming!

WILLIAM B. LURIE
Tamarac, Florida

An encryption moral

This regards the discussion of encryption standards and techniques and, in particular, Professor Hellman's reply to Robert Decker in the Letters department, May 76, page 8.

Professor Hellman's proposed technique for breaking the crypto system depends on a known, plain text block. It should come as no news that it is strictly bad form to make available any plain text in such a way that it can be associated with the encrypted text. Is this the moral: If you have information deserving of protection by encryption, look well to all your security precautions lest some error in procedure make your safeguards vulnerable to attack; especially, if your information is worth 12 hours of time on a Megachip machine?

LLOYD D. UMBAUGH
LTC, USA
Director, Office of
Data Systems
Defense Supply Agency
Mechanicsburg, Pennsylvania

Software is also writing

There is one aspect of software development that is not sufficiently regarded. Everyone working in the area of software design spends virtually all his time on some aspect of expository writing. He is thinking about writing to be done, or is writing or rewriting a paper. At other times he is trying to understand papers others have written. An unrecognized problem then is poor expository writing or poor methods used in expository writing.

Everyone agrees that communication is difficult. However, project management seldom attacks the problem with a true do or die attitude. In large projects, it may actually be true that survival is involved; and a mere pretense of attacking the enemy is not good enough.

Management could start with a few cardinal rules as listed below. I also suggest that if management does not modify or add to this list, there has not been a sufficient effort.

1. Don't start a project without publishing a set of regulations about expository writing.

2. Don't tolerate bad writing. Do whatever is necessary to judge papers; and have bad papers improved by the author or by someone else.

3. Try out the rule that the abstract of a paper consists of the dozen *most important* statements that can be made about the subject. This gives a valuable overview to the readers.

4. Instruct writers to list important points at appropriate places in their papers. Information given in this forthright way is often more clear than the same information scattered throughout paragraphs of discussion.

5. Maintain a library of short, definitive, approved papers on various aspects of software. This library can prevent costly reinvention in the software field, in the same way that hardware records prevent reinvention of hardware components.

6. Don't concentrate entirely on paper efforts that serve only the interests of managers. Try to find means that help the rank and file, including anything that can be done to reduce the amount of writing.

CHARLES R. WILLIS
Jenkintown, Pennsylvania

Calculator in transit

There definitely is a limit to how far the fantastic pocket calculators can go: right up to the Soviet border, but not beyond!

I sent a low cost model to a doctor friend in the USSR, thinking it would be a generous and useful gift. Two months later a battered and clumsily retied package came back to my home with two words: "Forbidden. Refused." A Soviet post office seal showed where the package had been opened, the calculator inspected (and presumably played with), and the package resealed.

Presumably the gift was a too impressive witness to the American way of life! Well, I am lucky to get it back at all. The price was cut in half on that model while it was in transit.

JAMES E. OBERG
Dickinson, Texas

"I can hardly wait"

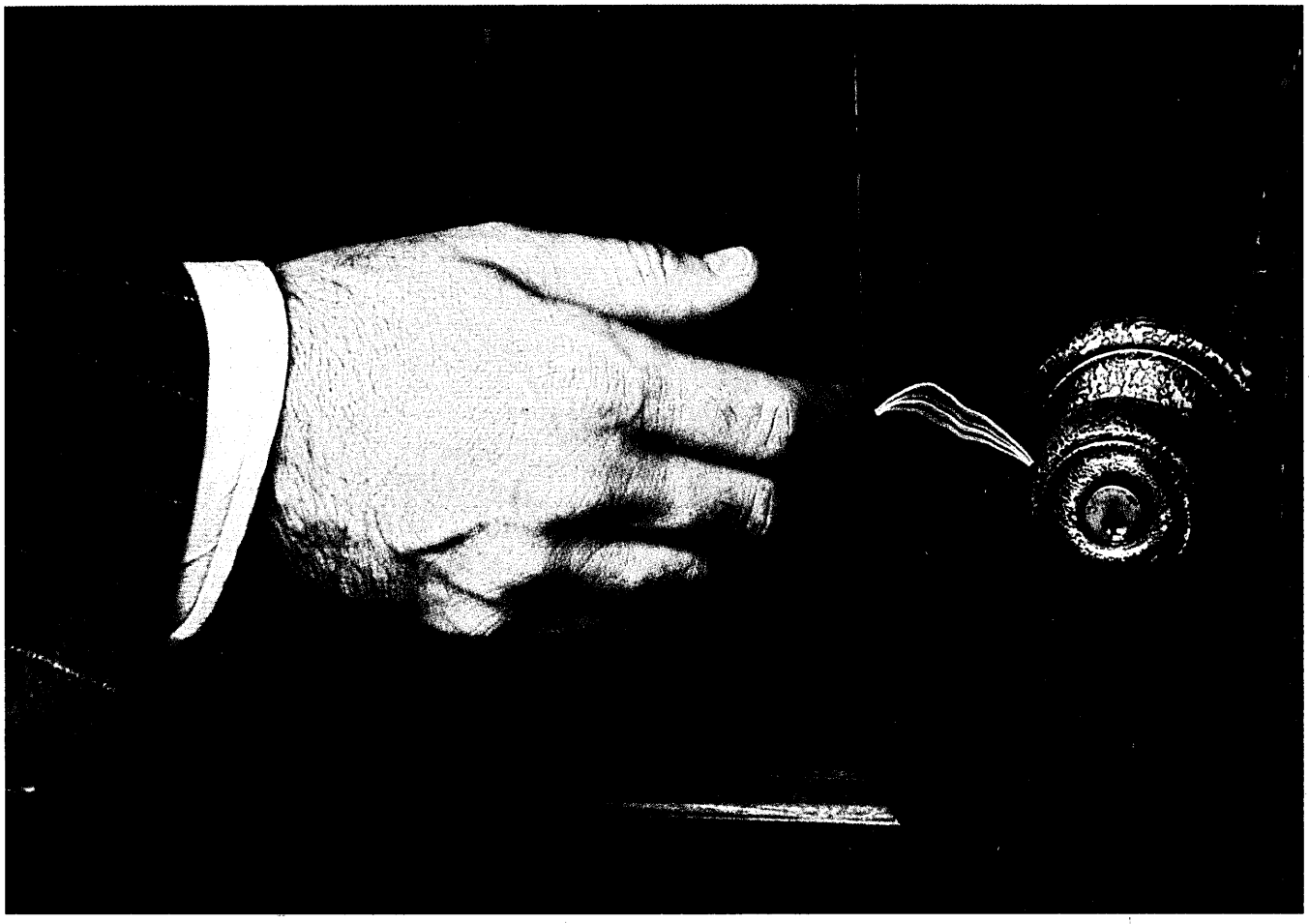
HIPO, Structured Programming, Top-Down Programming! My, my, my! What "new" technique will be "discovered" next? The rapidity with which these fundamental approaches are being "invented" literally astounds me, but then I am easily impressed.

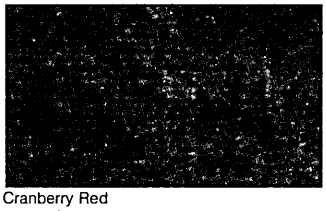
Top-Down Programming and HIPO have been in use for at least 15 years that I know of. One of the more popular names in use when I entered the field was the "black box approach." Starting at the top and "functionalizing" is definitely not a "new" technique. The best programmers have used this style of programming for years because that's what constitutes "good programming technique." It is also the only logical avenue to use in the development of any system.

I suspect that the next gigantic step forward in the evolution of data processing development will be the "discovery" that you can design a successful "user-oriented" system by actually including the ideas, needs and desires of the *user*! Gentlemen, I can hardly wait!

JOE KING
Chief, Systems and Programming
The Alaska Railroad
Anchorage, Alaska

NO MORE SHOCKS. PERIOD!

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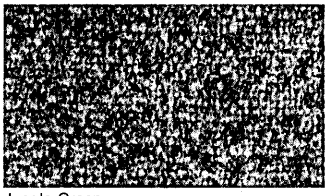
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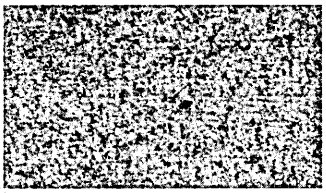
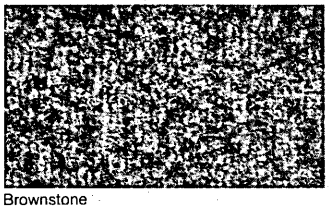

Aztec Gold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Now, someone has finally come up with a true anti-static mat and matting product. Proven in test after test to reduce the level of static charges below the 3000-volt level...the shock cut-off point for most people. The first carpet-top, vinyl-back, anti-static mats and matting ever offered. And they're made only by Crown. Stat-Zap mats and matting. No more shocks. No more sparks. No more equipment malfunctions caused by electro-static build-up. Fulfilling a real need in many applications. Wide choice, too: 8 mat sizes, 3 rolled matting widths, 4 decorator colors... all with a full 5-year limited wear warranty. Send for more information. And learn how you can stop static shocks.

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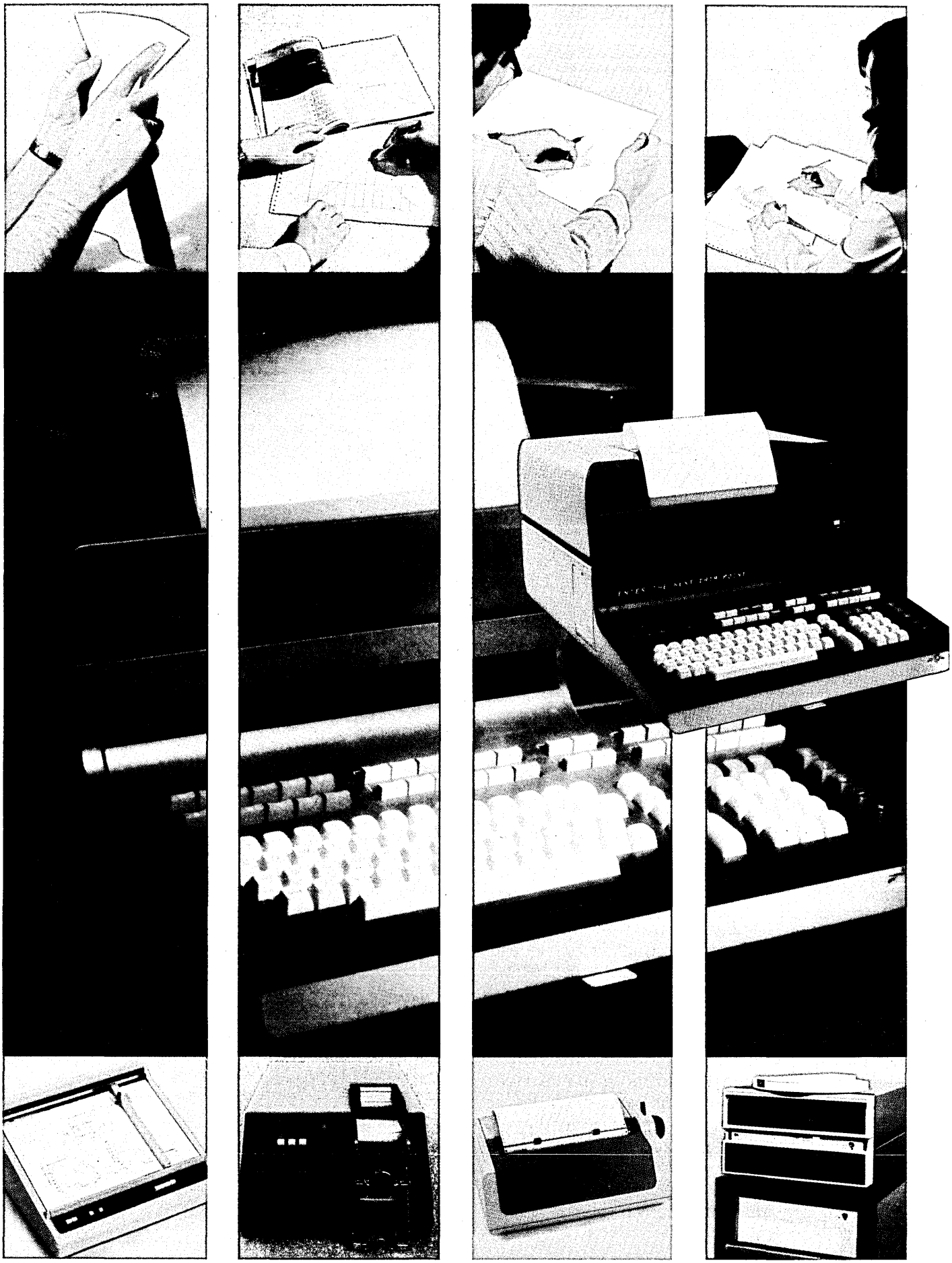

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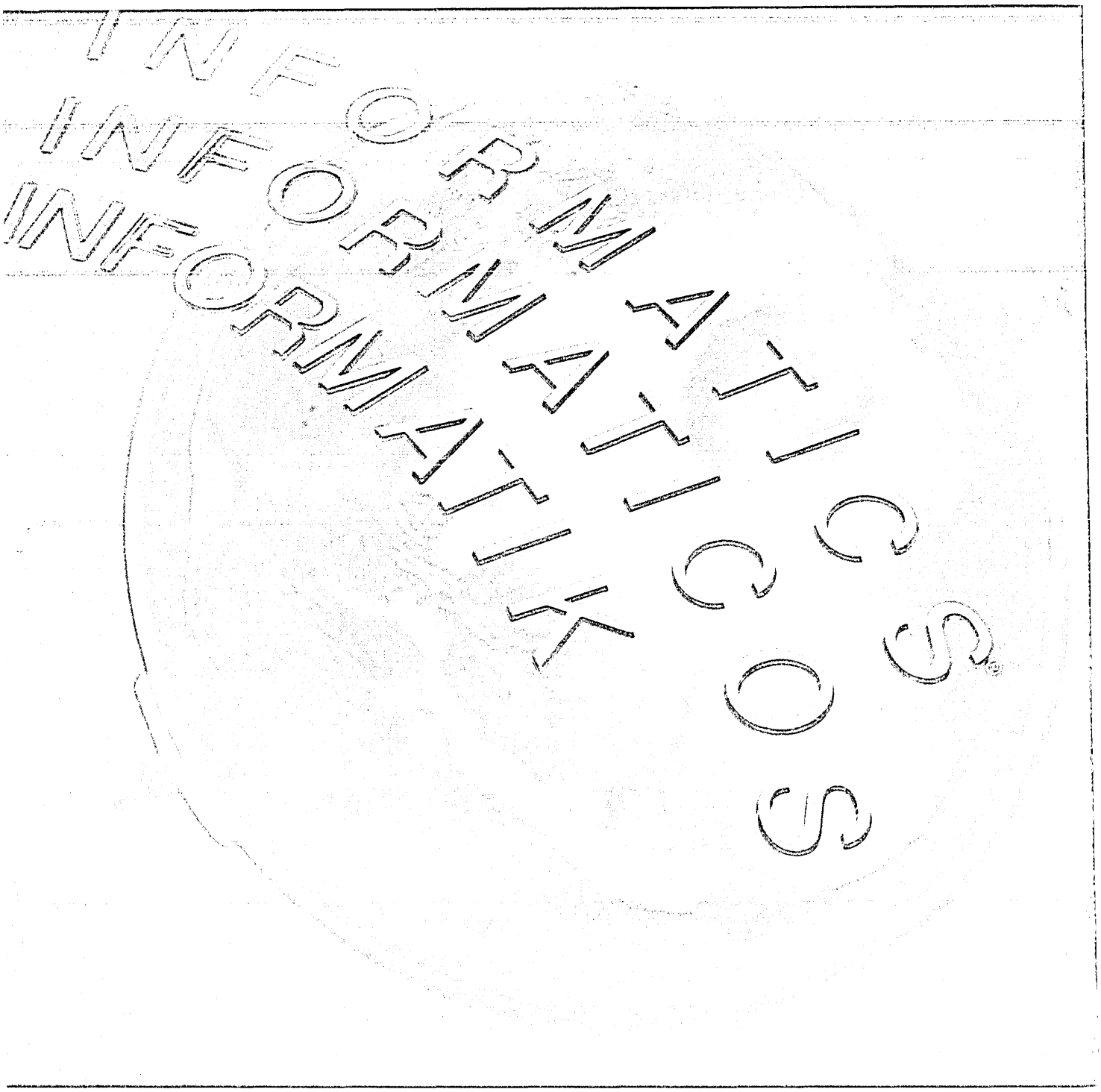

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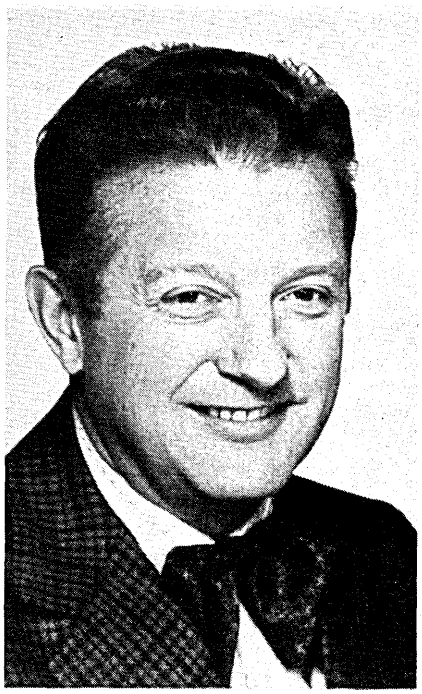
One More Professional Move

"I had one more professional move left and this was the time to make it," says Dr. Ottis Rechard who left Washington State Univ. in midwinter to become director of computing services and professor of mathematics at the Univ. of Denver. He had been at Washington State for 20 years; for the past seven as Chairman of the Computer Science Dept. And while he says



DR. OTTIS RECHARD
Looks longingly at state tax base

"I wanted new challenges," associates at Washington State said he simply was tired of an increasingly fruitless search for funding.

"When he first came here, funding was quite good," says an associate. "Gradually it became worse and worse. I think he felt a new person coming in could exert a little more leverage with the administration. He used to be able to hire and transfer people in the computing department. Now it's primarily civil service and there are no salary increases on the basis of merit."

Says Dr. Rechard, who was the first director of the computer science program at the National Science Foundation and remains an NSF consultant, "I think universities are always looking for new money. But the money hasn't really grown over the years as the level of interest has increased. It hasn't been good for students who want support for their work."

Dr. Rechard came to Washington State in 1956 at a time when IBM was providing generous educational grants. The university had an IBM 650 which it replaced with a 709 and in 1966 it acquired a 360/67, which was supplemented with a 360/65 last March. In those 20 years, he developed computing from a campus unit to one serving other educational institutions and the Washington state government.

He received his B.A. in mathematics from the Univ. of Wyoming, and his M.A. and Ph.D. from the Univ. of Wisconsin. He taught at Wisconsin and the Univ. of Ohio before going in 1951 to the Los Alamos Scientific Laboratory for five years where he still is a consultant. "In those days," says the 52-year-old professor, "you either started at the AEC or in the aerospace industry. I was an AEC monster."

He's been active in the American Mathematical Society, Mathematical Assn. of America, Society for Industrial and Applied Mathematics and the Assn. for Computing Machinery. "He's the original Christian, seeing no evil in anybody, tells a joke well and is an excellent poker player," says former Washington State associate Bill Walden. He's also a very persuasive person who once called Walden at 11:30 p.m. to talk him out of leaving the university.

At the Univ. of Denver, a privately-run school of about 8,000 students, Dr. Rechard will try to integrate the computing and academic programs and bring a more up-to-date systems approach to administration. "It's the place I now want to be," says Rechard who was born in Laramie, Wyo.

He says one of his reasons for leaving Washington State was that "public higher education has been subjected in recent years to stultifying controls at various levels of state government." Nevertheless, at the Burroughs B 6700-based Univ. of Denver, "I find myself looking longingly at the state tax base." ❄

A Believer In Certification

The newest member of the Certification Council for the Certificate in Data Processing (CDP), testing arm of the Institute for Certification of Computer Professionals (ICCP), is a strong believer in certification of data processing professionals.

"It (certification) establishes standards, creates a stable environment, and helps keep garbage out of the field," says Janis Miller, 29, second vice president in charge of data processing for Standard Security Life Insurance Co. of New York.

Miller sat for the CDP exam herself last year. "I think of myself as doing a good job—meaning that I certainly measure up to, and I hope exceed, the standard for acceptable performance of others performing the same functions elsewhere. If I feel this way, then I want to measure myself against a recognized, credible standard," she explained.

She describes her duties at Standard Security Life as "running the gamut from dp management to technical backup, structuring the shop, liaison with top management and setting up systems." Hers, she says, is a "medium sized shop" with 20 people, using IBM 360/30s, 360/65s on a time-shared basis and some minis.

Although she feels her main expertise is in data processing management, Miller currently is working on the hardware section of the five part CDP exam. "Much of it," she said, "is outdated." She's revamping it and adding things. She estimates her work on behalf of the council takes about two hours a week, including time spent reading "to keep up-to-date." She said the five members of the council are in "constant communication" with each other.

JANIS MILLER
"not just a dp person"

Miller said the management part of the exam has been revamped over the past couple of years to reflect the fact that "the data processing manager is not just a dp person. He's first a manager. We've put the emphasis in proper perspective."

people

She also feels strongly that any data processing person "has got to know the applications side; has got to know the business he's in." The council, she said, is "thinking about" ways to measure this knowledge either through the CDP exam or the registered programmer exam.

Miller feels she knows her business —insurance. "But if anyone involved in insurance tells you it's interesting, he's lying." She's quick to add that she likes her job because it offers the chance to attack a wide variety of data processing applications.

A native of Chicago, Miller got into data processing while still a senior in high school. The city had a special program whereby gifted high school seniors could enroll in college in one of three programs—chemistry, advanced mathematics, or data processing. She chose data processing because "I was lured by the mystique of computers." She received a special certificate in computer science from the Illinois Institute of Technology, then went on to major in mathematics at the Univ. of Illinois.

After college she worked at CNA Insurance in Chicago in a "user capacity. I was a stat clerk. I compiled reports and related them to systems analysts."

Her move to New York in 1966 she describes as "a move of the heart, not a career move. There was this guy who worked for GE Computers who was transferred to New Jersey. After nine months without him, and many, many phone calls, I moved East and got married." The "guy," her husband Rock Miller, is now an accomplished muralist.

Miller commutes by train from her home in East Orange, N.J., to her job in Manhattan. Besides her job and her work for the certification council, she is interested in ecology, history, dancing, theater, cooking, good conversation and her young daughter who, at the age of eight, already is a member of a professional dance troupe. Miller intends to "expose" her daughter to computers but she doesn't see her ever going into data processing so its unlikely she'll ever sit for the CDP exam. ❋

From Computer to Computer to...

"I wanted to spread my wings," said Ron Murr when asked about his new company, ROM Systems, in Westminster, Calif.

Murr left Datum Inc., Anaheim, to start his new venture. He had been director-engineering of the Computer Products Div. and principal designer of the company's Enhancer (April 1975, p. 17) minicomputer line. He had been with Datum five years.

His new company, Murr said, will put together mini-based systems on a customer basis. They will be microprogrammable and will emulate other computers, particularly older cpu's that are hard to get.

ROM won't do any manufacturing, Murr said. They'll use Manufacturing Inc., which is right next door, for things like printed circuit boards and another nearby firm, Concept Development Corp., for memory. "We'll just put the systems together and get them out the back door." He said he already has "several contracts in negotiation." In some cases, he said, customers "will be able to pick up manufacturing rights to our systems later on."

His firm is three people strong right now and he doesn't want to get any bigger than seven.

Murr, 41, is a native of Los Angeles. He attended Sherry Griswald Foundation in Inglewood, Calif., and did a stint in the navy as an electrician before getting into the computer industry, as so many others did, via IBM. At IBM he worked on the 632 computer which he describes as "one of the first small business computers."

From IBM, he went to Beckman Instruments' Systems division where he worked on the 420, a computer he said was much like Scientific Data Systems' 900 series which was introduced just shortly before the Beckman machine. "We were just a little too late."

RONALD O. MURR
He likes his name

Murr's next job was with Raytheon Computer where he designed a computer for the Times Mirror Press, a photocomposition computer which he says is still being used to produce all of the phone books in Los Angeles.

Then came Microdata where he designed the first microprogrammable minicomputer and next, California Data Processors which produced minicomputers which emulate the PDP-11, was sued by Digital Equipment Corp. (the suit has been settled), was acquired by Data 100, and has since been moved to Minneapolis.

Murr's next move was to Peripherals Interface Co. (PICO) which was acquired by Datum in December of 1973.

An avid scuba diver and the father of five, Murr must like both his name and his industry for the name of his new company reflects both. "ROM has a meaning in the industry—read-only-memory—and it also stands for Ronald Owen Murr." ❋

In New Posts

H. L. (TED) BAYNES, senior vice president of United Virginia Bankshares, Inc., was elected president of the National Automated Clearing House Assn. . . . CLARK M. LAMBERT resigned as a data processing executive with The Miami Herald and Knight-Ridder Newspapers, Inc. to form his own company, CIRC, Inc. to develop minicomputer-based circulation systems for small to medium newspapers . . . EARL KENDLE was elected vice president-information systems for the Eaton Corp., Cleveland . . . BARBARA AMBROSE joined Holiday Universal, Inc., Towson, Md., as director of information systems . . . ROBERT B. SILLECK was appointed senior vice president of Bradford Computer & Systems, Inc., New York City . . . JACK I. EPSTEIN was promoted to principal in the Information Systems Division of Booz, Allen & Hamilton . . . J. J. BURKE was named vice president of Sperry Univac western operations . . . WILLIAM V. SCHELLINGER is the new president of Program Products Inc., Montvale, N.J., a subsidiary of Information Science Inc. . . . MICHAEL M. GORMAN joined Psi-Tran Corp., Arlington, Va., as a data base management systems expert . . . RICHARD J. CONLAN, in charge of Metropolitan Life Insurance Co.'s electronic installations, was named a senior vice president of the company . . . ROBERT J. BOHRER was appointed director of systems development for Digital Scientific Corp., San Diego. ARTHUR B. LEVIN was elected vice-president, product development, Decision Data Computer Corp., Horsham, Pa. ❋

Decisions

"Okay, Whitlow, you've marketed 1,000 SyncSorts. Now would you like to try for 2,000?"

(Sure. If IBM keeps making hardware, how can we miss?)

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If the question is sorting, the answer is SyncSort.

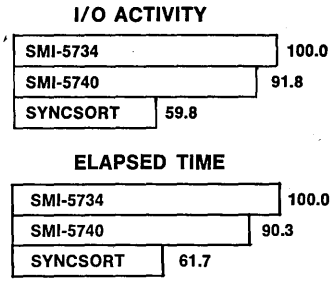
Sometimes we almost feel like Archimedes. It's as though we've discovered a natural law of our own.

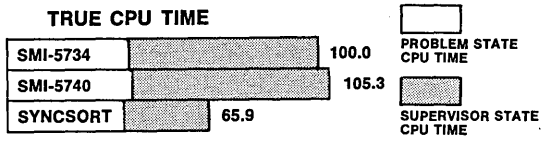
Even the Ph.D.'s around our place regard our discovery with a certain amount of awe. They refer to it, in hushed tones, as the "SyncSort Factor."

It's a progression that goes something like this:

1. IBM will continue to make and market computers. (That seems like a safe $2 bet.)
2. The busy people who use these computers will naturally require the best sort package they can obtain. (Sorting is the most frequent job on any commercial computer.)
3. These people — being intelligent men and women — will sooner or later find their way to SyncSort III-and-a-half. (It's the best sort package on the market.)
4. None of the foregoing will harm our business. (We will continue to update our package so that it will always stay ahead of the competition.)
5. This will lead to more sales and more improvements. (Maybe we should call our discovery the "Law of Perpetual Sorting Improvement!")

If you'd like a graphic representation of the "SyncSort Factor" take a look at the picture below. These graphs depict what happens when you match SyncSort III-and-a half against other sorts on the market today:





Performance is, of course, the bottom line in sorting. But it's not the only thing you should consider in choosing a sort package. Is the sort versatile, for example? Will it support 3350 devices in their native mode without having to sysgen a new system? SyncSort III-and-a-half *will*.

And how's the sort support? Will anybody help you phase the package in when you start using it? If you call the other supplier with a tricky little question, will there be anybody there willing to take the time and effort to give you a reasonable answer?

We will. In fact, we *like* receiving questions from users. It's a hangover from the days when we were pioneering all those developments that opened up the sorting industry. Once an explorer, always an explorer!

The foregoing are some reasons why SyncSort has been so successful in penetrating its market. (In fact, we think we may have obtained a bigger slice of our market than any other software product.)

So we don't see 2,000 users as an impossible goal. Not unless nature repeals the "SF." Or IBM goes out of business.

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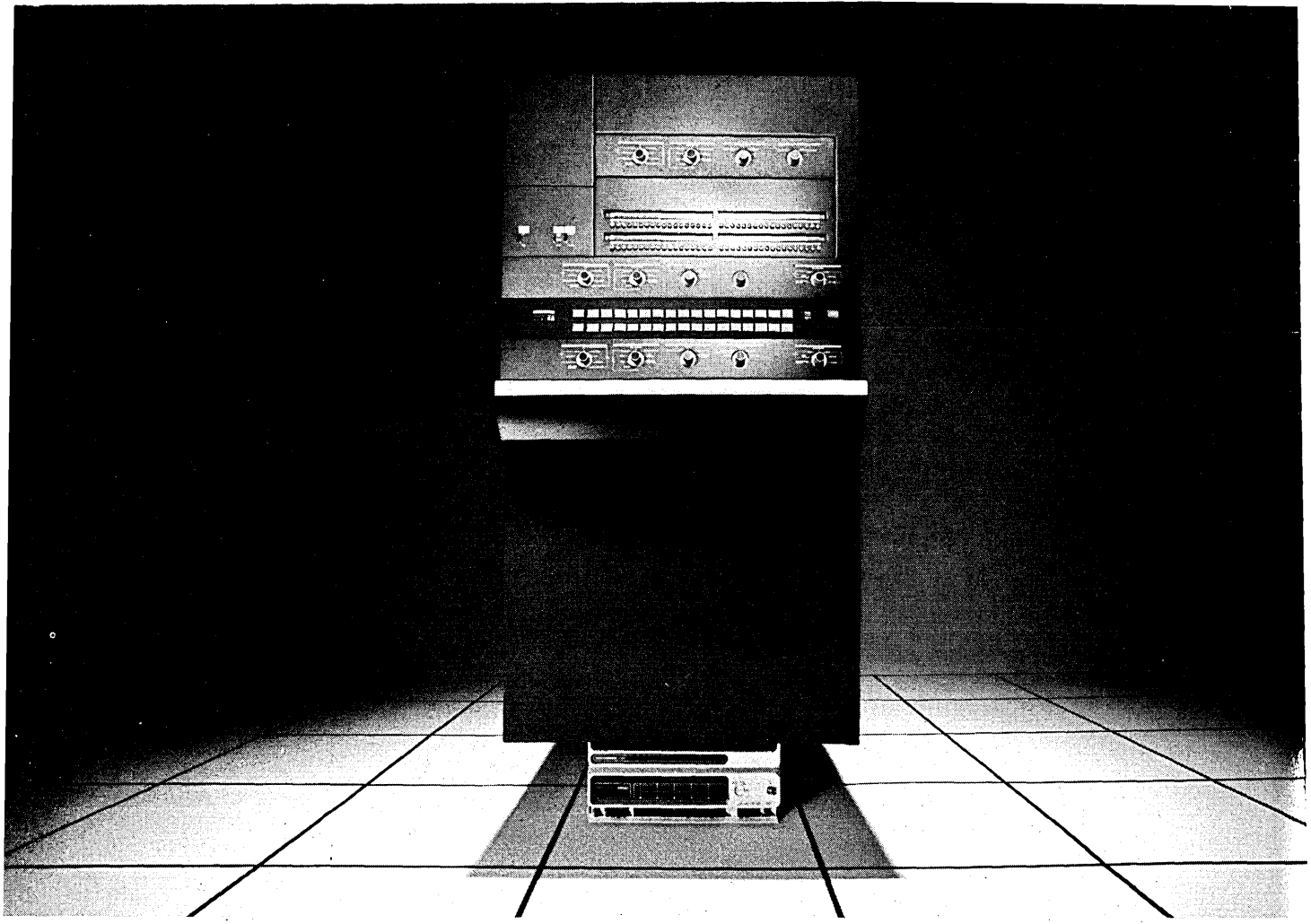

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And this COBOL takes advantage of the C/300's instruction set that's tailor-made for commercial applications. Which keeps both your programmers and your programs efficient.

And the ECLIPSE C/300 COBOL runs under our mature Real-time Disc Operating System. So you can concentrate on your software instead of ours.

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LOOK AHEAD

STAR DIMS AT LIVERMORE BUT FERNBACH SOFT PEDALS IT

Rumors that the Control Data Star 100s at the Lawrence Livermore lab in California have not been performing as advertised are soft-pedaled by Sid Fernbach. One of the two Star mainframes has been down for several months, undergoing an upgrade and memory change, says Fernbach, but it was turned back to the lab last month.

Uptime on the other hasn't been exactly sensational. "It has been giving us problems, but it's improved considerably," Fernbach says. They're now getting about 90% uptime on the machine that's been running, versus 95% on the CDC 7600. They include maintenance and unscheduled downtime. "It could be better."

As to computing power, he says the Star performs vector-type jobs at speeds up to 4 times that of the 7600. But the setup time for vectors is much more than they had anticipated, so those jobs are slowed down unless the vector is fairly long. On scalar jobs, the speed can be less than on a 7600.

WHAT'S IN AN OPERATING SYSTEM RELEASE?

Release numbers for IBM's Multiple Virtual System, MVS, usually reflect a number of patches and fixes for problems discovered by both IBM and early users of the giant's most sophisticated operating system. But in the case of IBM's latest release, 3.7, that apparently isn't so. "Maybe it's politically easier to call 3.7 a new release, but it looks to me like fully 50% of the code has been rewritten, and the cleaner interfaces between the system modules make it a lot easier to implement one module at a time," says a source at an international oil company whose corporate policy prevents her from being identified. "It got to the point where even they (IBM) couldn't seem to manage all the changes that were necessary to make the system run. So they've broken it into SU's - we have a new buzzword - for selectable units. This should make it easier on the user and IBM to work with the system." Our source has heard that there are less than 30 production users of MVS nationwide, and it's rumored that some users have attempted to implement MVS only to have to retreat to SVS, Single Virtual System, nee VS1. Perhaps 3.7 will entice them back into the fold.

IBM VS. CALIFORNIA - STILL COULD HAPPEN

IBM and the administrative branch of the State of California have signed an agreement which could mean almost $1 million to the Jolly Green Giant (specifically, $987,668) but maybe not. The amount was agreed upon by the two parties after almost two years of negotiation over who damaged whom and to what extent when IBM failed to convert the state's Department of Motor Vehicles computer operations into the Stephen P. Teale Consolidated Data Center by the agreed upon date of July 1, 1974 (August '74, p. 184). IBM acknowledged its failure to meet the deadline but wanted money for development work. The state contended it was damaged for things like continued rental to Univac for DMV equipment, continued salaries to personnel in the DMV separate center, and the fact that it was unable to implement a staggered renewal system for motor vehicle registration as soon as it had intended. In the signed agreement the state waived "consequential damages" including what it might have lost in the delay of the staggered renewal implementation. Each side gave a little, state officials said, but it's not all over yet. The agreement has an expiration date of Nov. 1, 1976. And, for IBM to get the money, a legislative claims bill is required. The author of one bill before the legislature at the time the agreement was signed declined to amend his bill to include the IBM claim. The legislature goes into its final recess for this year on Sept. 1. There's not enough time for a new and separate bill but the claim could be amended onto a "related" bill. A state official says there are "at least two bills" before the body "remotely connected" to dp which could "fill the bill." But, if nothing happens before Nov. 1, the whole thing is moot and IBM and the state could still go to court. Maybe the taxpayers of California should have something to say. DMV is still running on Univac equipment.

THE SHRINKING WORLD OF MICROPERIPHERALS

Tiny floppy disc drives are soon to be announced by at least two manufacturers: General Systems International of Anaheim and Shugart Associates of Sunnyvale. The drives will use discs roughly five inches in diameter as opposed to the present "big" eight inchers.

LOOK AHEAD

General Systems' device is said to provide the same amount of storage--250K bytes --as the eight-inch platter by using denser packing on the same number of tracks. The disc would look like an eight inch one to the cpu. Shugart's device, though approximately the same size, probably will offer less storage (otherwise the firm would be undercutting its own product line, which supposedly accounts for 70% of the existing market).

Uses are for personal computers, word processing systems and in applications where IBM compatibility is not important. Small enough to fit in the same spaces now reserved for tape cartridge drives, they allow easy upgrades to random access memory from existing systems without a price increase.

Later, General Systems will announce a four-high disc pack drive based on the "old" eight inch disc, providing as much storage, 29MB, as an IBM 2314 and fitting in the same size slots now used for single floppies. That product is expected to be offered by late '77.

MINIMAKER STRIKES AGAIN--THIS TIME A SERVICE BUREAU

Big dp mainframes aren't the only targets of minicomputer companies in the commercial market these days. A Data General Eclipse C/300--the firm's first Cobol installation of that machine--has knocked off a time-sharing service bureau at a large Connecticut insurance company, and in the process shaved the user's processing bill from $25K to $9K a month. The user converted some 350 programs with a single conversion program. Data General is training its sights increasingly on the big governmental market now that the U.S. Navy has validated DG's Cobol software for the C/300.

KEYDATA TAKES AIM AT MINIMAKERS WITH T-S PACKAGE

But mini manufacturers shouldn't get too complacent about time-sharing companies. To wit: a pioneering time-sharing company, Keydata, is taking direct aim at mini manufacturers with its System 800, a packaged time-sharing system that offers small commercial users a comprehensive package. For a flat rate of $800 a month, Keydata has an on-line package with inventory control, billing, accounts receivable and sales analysis. Aimed primarily at first time computer users the System 800 should find its way to small companies with sales as low as $750,000 a year. If Keydata is right on that strategy, then the system will be selling to some users who can't quite afford a minicomputer.

COLOR CRT MARKET: LITTLE GUYS PUSH THE BIG GUYS

Color alphanumeric crt terminals are getting the eye from some users, especially when they're competitive in price with black and white terminals and when they have some graphics capabilities. Terry Hughey, president of tiny Intelligent Systems Corp., Duluth, Ga., claims to have shipped "several" hundred units of that type priced at a high of $2,495, which includes an Intel 8080 microprocessor and keyboard. In kit form, they sell for $1,395.

Joe Morris, marketing director with Ramtek Corp., Sunnyvale, Calif. has identified the largest market as process control. He also sees some interest in alphanumeric color crt's with graphics among command and control, management information systems and "war room corporate atomospheres where trending and bar charts are routinely used." Some large users use them to monitor their computer center, says Elton Sherman of huge Conrac Corp. who adds, however, that color crt's won't become popular because of design and user problems. For instance, color crt's have to be degaussed regularly. And a recent study by Conrac showed that 7-10% of the population is color blind anyway.

Hughey, however, thinks that the relative success of his product is due to a proprietary circuit design for stabilizing the color convergence within a few minutes, compared with as much as an hour on others. And Stephen Cottrell, an industry analyst with Creative Strategies, Inc., of San Jose, noting that big manufacturers are staying away from the field says, "Big manufacturers are going to be dragged along by the little guys--probably kicking and screaming."

ISS SAID TO HAVE SHIPPED FIRST 3350-LIKE DISC DRIVE

Univac's Information Storage Systems' operation is rumored to have shipped a 3350-like disc drive. Everything is very hush-hush at the project and nobody's saying anything. But the guessing is that the destination for the device is Itel Corp. If ISS has shipped a 317-megabyte disc, it would be quite an achievement indeed, because

(Continued on page 128)

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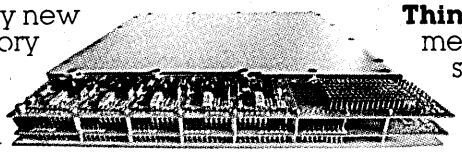
MEMORY+. It's an entirely new dimension in bulk memory for minicomputers. An add-on memory system used with MODCOMP computers to give you a whopping 4,000,000 bytes of directly accessible core storage. At far less cost than any other core memory you could ever buy. Until now.



The MODCOMP 256K-byte memory module that made it all possible.

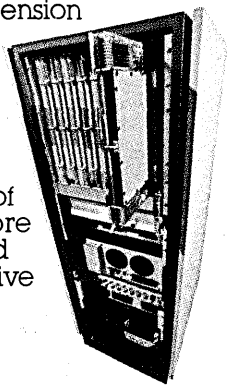
It opens up vast new possibilities for storing those programs and data you can't accommodate in main memory, but frequently need to get at—super fast.

Because now you have the best of two worlds. The capacity of disc. With the high speed and reliability of main memory. At an amazingly economical price.

The big breakthrough came when we found a way to slash the cost-per-bit of core by condensing a massive 256K bytes of memory into a single memory plane. In a single MEMORY+ device, anywhere from one to sixteen of these memory modules go together for a total capacity of 4 megabytes.

Consider what MEMORY+ can mean to you.

Think of it as a giant extension to main memory. It's both word and block addressable, and it swaps data so fast it appears to be a part of main memory itself.



Think of it as a way to beat the sluggish speed of fixed head disc. With its core memory access time, and transfer rates as high as five megabytes per second.

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calendar

AUGUST

Distributed Data Processing, Aug. 3-6, San Francisco. This conference is designed for executives and professionals concerned with current and potential applications of distributed data processing from either the dp or user point of view. Discussions will include classifications, trends, software and hardware developments; concepts of star and ring networks, and segmented systems; and a presentation on dp management problems involved in a "distributed" environment. Fees: $395; teams, $295. Contact: Dept. CL, AIIE Seminars, P.O. Box 25116, Los Angeles, Calif. 90025, (213) 826-7572.

1976 ACM Symposium on Symbolic and Algebraic Computation, Aug. 10-12, Yorktown Heights, N.Y. Five invited papers, 51 contributed papers, and a panel discussion will cover design and analysis of algorithms, complexity aspects, languages, data structures and systems for symbolic computation; combined use of numeric and symbolic methods, and applications. The conference is sponsored by the ACM Special Interest Group on Symbolic and Algebraic Manipulation. Fees: $50, member; $60, nonmember. Contact: James H. Griesmer, IBM Thomas J. Watson Research Center, P.O. Box 218, Yorktown Heights, N.Y. 10598, (914) 945-1582.

11th Int'l. Logistics Symposium, Aug. 17-19, Valley Forge, Pa. The Society of Logistics Engineers will sponsor this meeting on "Logistics 76, Heritage to Horizon." Fees: full registration includes luncheons and banquet, $75, member; $85, nonmember; one day registration is $30 and $40, respectively. Contact: Sam Hahn, 9720 Redd Rambler Dr., Philadelphia, Pa. 19115, (215) 464-4442.

SPIE's 20th Anniversary Technical Symposium, Aug. 23-27, San Diego. The Society of Photo-Optical Instrumentation Engineers has arranged an in-depth program on optics, electro-optics, photographic, and laser technology. There will be over 325 technical presentations plus about 140 instrument displays. Fee: $100, members; $130, nonmembers. Contact: SPIE, 338 Tejon Place, P.O. Box 1146, Palos Verdes Estates, Calif. 90274, (213) 378-1216.

Technology, Management, and Economics of Information Centers and Services, Aug. 29-Sept. 3, Easton, Md. The Engineering Foundation sponsors this conference to improve the "planning and management functions in the delivery of information services." The $200 pre-registration fee includes the conference, meals, and double occupancy rooms. Contact: Engineering Foundation Conferences, 345 E. 47th St., New York, N.Y. 10017, (212) 644-7835.

SEPTEMBER

COMPCON Fall '76, Sept. 8-10, Washington, D.C. "Computers by the Millions for the Millions" is the theme of this conference sponsored by the IEEE Computer Society. Topics will include computer applications, microprocessor development and applications, distributed processing, software development, system technology, real-time systems, component technology, and memories. Pre-conference tutorials will be held Sept. 7; they are #1, Structured Programming, and #2, Designing with Microprocessors, a hands-on session. Fees: tutorial #1: $50, member; $65, nonmember; tutorial #2, $60, member; $75, nonmember; conference: $50, member; $65, nonmember. Registrations after August 27 will require an additional $10. Contact: COMPCON Fall '76, P.O. Box 639, Silver Spring, Md. 20901, (301) 439-7007.

Advanced Summer Institute on Computer Architecture, Sept. 12-24, St. Raphael, France. The NATO Scientific Affairs Division is sponsoring this in-depth program. Topics will include principles of computing systems, fundamentals of computer architecture, problem and/or language oriented machines, hardware components (including microprocessors), and computer networks and communications. Major speakers from the U.S., U.K., and France will conduct the lectures. Contact: Prof. Douglas Lewin, Brunel Univ., Dept. of Electrical Engrg. and Electronics, Uxbridge, Middlesex UB8 3PH, England.

Western Electronic Show and Convention (WESCON), Sept. 14-17, Los Angeles. More than 400 exhibitors will display electronics equipment and components at this show sponsored by chapters of IEEE and the Electronic Representatives Assn. The registration fee (under $10) covers attendance at all technical sessions and exhibits. Contact: William C. Weber, Jr., WESCON, 999 N. Sepulveda Blvd., El Segundo, Calif. 90245, (213) 772-2965.

9th Annual Workshop on Microprogramming (MICRO-9), Sept. 27-29, New Orleans. This IEEE Computer Society workshop for industry, government, and academia will consist of short informal presentations, discussion groups, and case study tutorials. Topics include performance measurement and evaluation, system architecture, fault diagnosis and recovery, and microprogramming applications. Fees: $60, member; $80, nonmember; $20, student; after Sept. 13 fees are $70, $85, and $30, respectively. Contact: MICRO-9, Univ. of Southwestern Louisiana, Box 4-4330, Lafayette, La. 70504, (318) 233-3850, Ext. 538.

CALL FOR PAPERS

ACM Computer Science Conference and SIGCSE Technical Symposium, Jan. 31-Feb. 3, 1977, Atlanta. November 15 is the deadline for papers to be submitted for either or both of these meetings. Abstracts of research reports for the fifth annual ACM conference should be submitted to Prof. Vladimir Slamecka, Director, School of Information and Computer Science, Georgia Institute of Technology, Atlanta, Ga. 30332. Papers for the special interest group on Computer Science Education should be sent to Prof. John Goda at the same address. ❋

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

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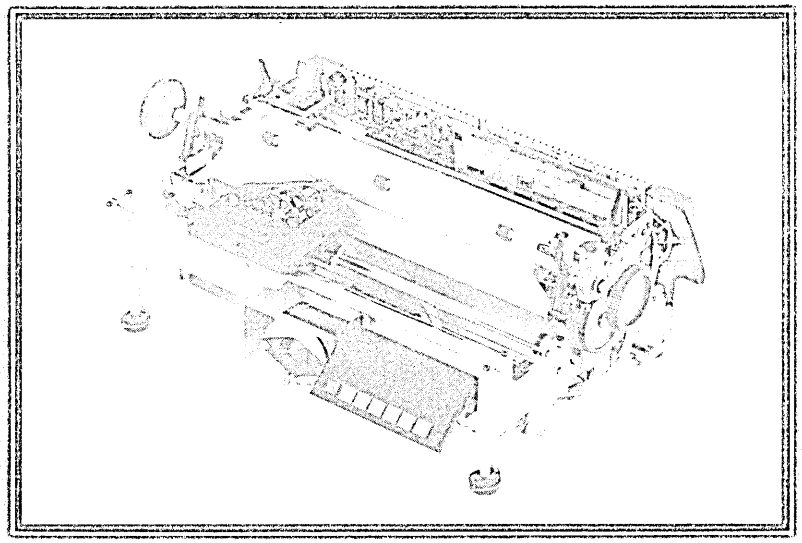

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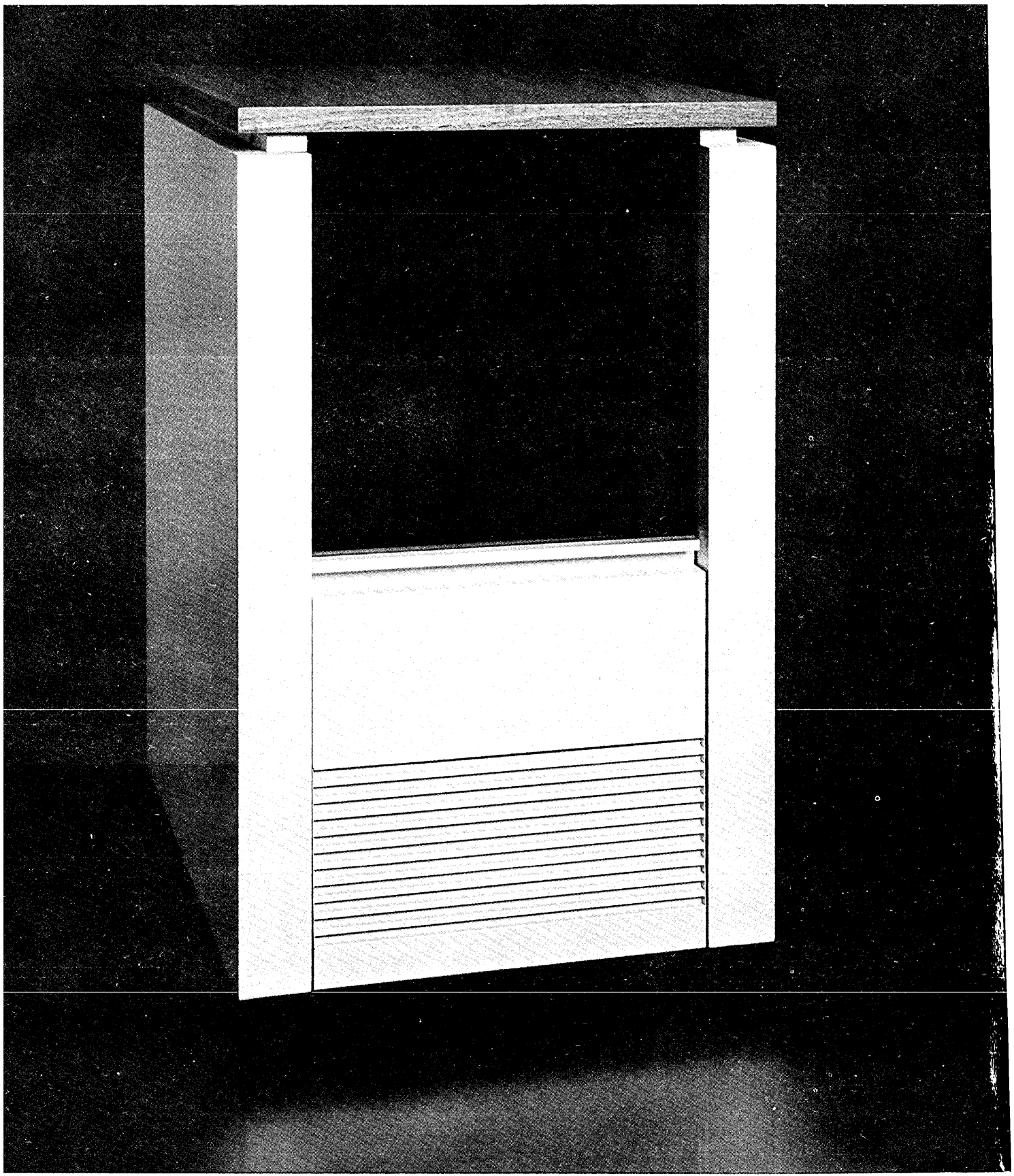

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Our new 4000-Plus minicomputer-based timesharing systems offer a number of plusses over the highly successful 4000 series:

String arithmetic, logical operators and many other language features now microcoded for faster and more efficient operation.

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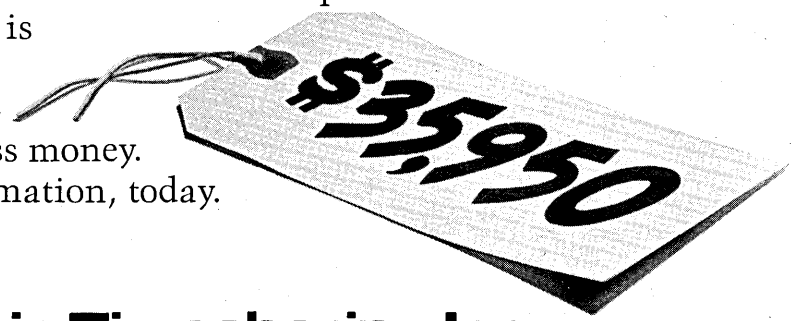
And while the new 4000-Plus systems give you these ease-of-use improvements, they still offer the advantages that made the earlier 4000 such a good timesharing system. Like hierarchal access, on-line software mobility, and a wealth of system management features. Like BASIC-X, the user language with the simplicity of BASIC and the sophistication necessary for demanding business and scientific applications. Modular expandability—in port capacity and mass storage. And 24 hours, seven-day-a-week on-line support.

The 4000-Plus series: a lot of plusses.

The one big minus? The Model 4000/15 timesharing system costs $35,950—representing a $20,000 reduction over the previous lowest-cost 4000. The bigger 4000/25 system is available at similar savings.

The new BTI 4000-Plus—a lot more computer, for a lot less money. Write or call for complete information, today.



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We'll pit our FORTRAN machine against anyone's.

You've heard the claims. How this FORTRAN machine can outperform that FORTRAN machine. Well, we figure it's time to introduce you to a FORTRAN machine that's not only fast, but could save you thousands of dollars as well.

It's the V76 system. Varian's FORTRAN machine. It's not only excellent for any scientific, industrial or real-time computation application, it costs up to 30% less than our competitors, such as the DEC T55 or DG Eclipse.

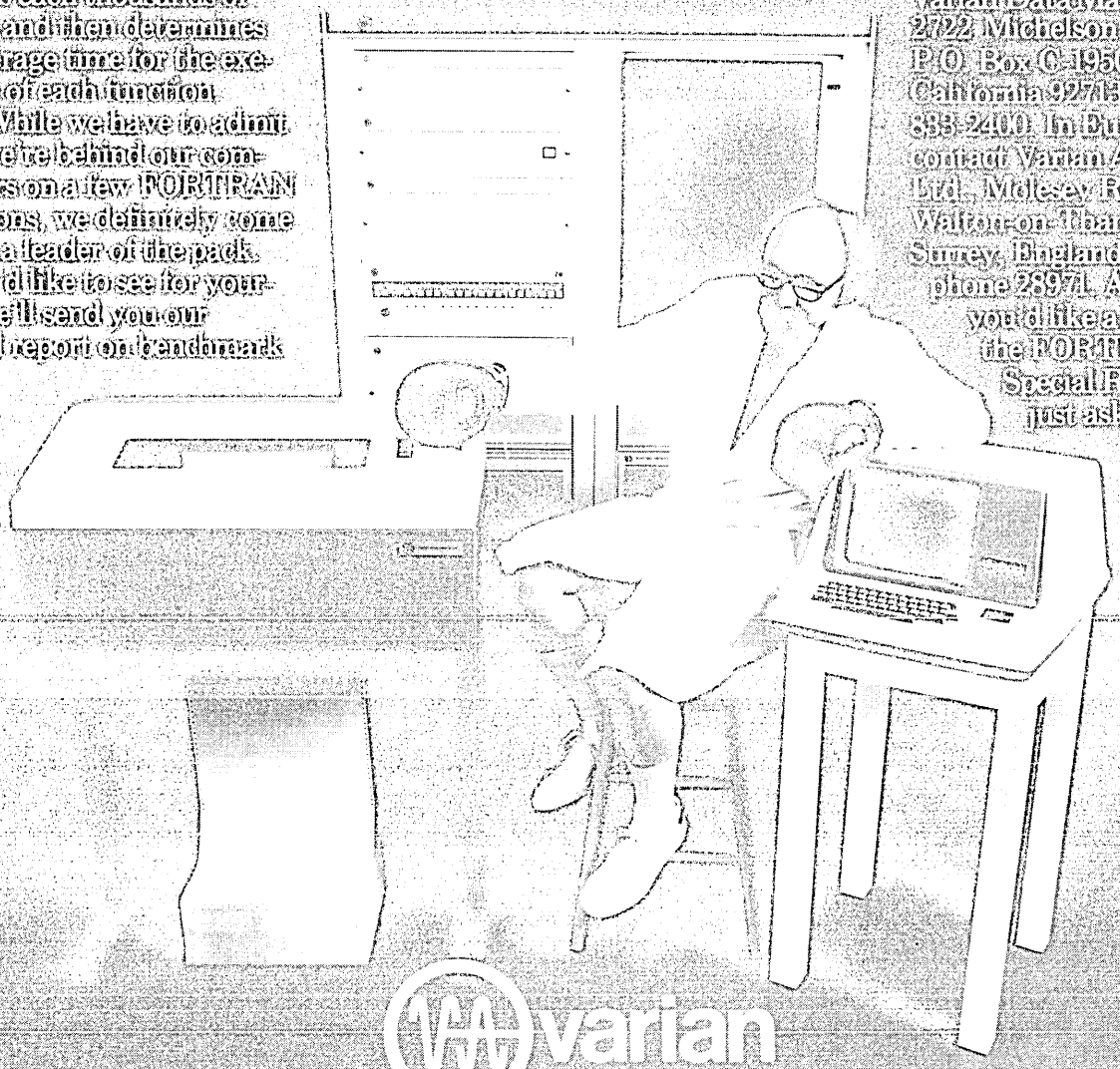
What about performance? Well, just for the record, we've used VDM's FORTBST program to evaluate both our V76 system and a series of competitive systems. FORTBST takes the 20 most fundamental of FORTRAN operations, repeats each thousands of times, and then determines an average time for the execution of each function.

While we have to admit that we're behind our competitors on a few FORTRAN functions, we definitely come out as a leader of the pack. If you'd like to see for yourself, we'll send you our special report on benchmark results and price comparisons.

Actually, the results came as no surprise to us. We've taken a group of exceptionally fast system components and totally integrated them for throughput speed. Firmware has been created and integrated into FORTRAN's run time to implement repetitious routines, special algorithms, and other functions.

In addition, the V76 high performance hardware — such as a floating point processor and cache memory — accelerate the execution of FORTRAN programs to a level unmatched by any other system in its class.

If you don't believe us we'll be happy to run one of your programs on our machine. Just call one of our 38 world wide offices or write Varian Data Machines, 2722 Michelson Drive, P.O. Box C-19504, Irvine, California 92713, (714) 833-2400. In Europe, contact Varian Associates Ltd., Molesey Road, Walton-on-Thames, Surrey, England, Telephone 28971. And if you'd like a copy of the FORTBST Special Report, just ask.



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

books

Data Processing in 1980-1985
by T. A. Dolotta et al.
John Wiley & Sons, 1976
191 pp. $13.50 ($6.50 paperback)

This interesting and important book is must reading for anyone concerned with the forces shaping contemporary data processing. At a minimum, managers of major installations should read it, and (even more important) so should managers of vendor product development activities.

This is the SILT report, the product of a committee of seven members (the seven co-authors of the book) established by SHARE, Inc. in 1973 to study questions related to future data processing. The seven are all data processing veterans, and their employers collectively constitute a significant part of the data processing user community. This is by no means the typical book that reflects the opinions of a single author; it is as close to a consensus of the industry as anything short of a comprehensive survey can be.

It is a sober book. Its title is a bit misleading; one might assume that it would be full of "gee-whiz" prognostications of microprocessor and communications cost effectiveness. Such subjects are treated, but only lightly. The authors believe other subjects are more important, as suggested by the book's subtitle "A Study of Potential Limitations to Progress." They believe that the pace of evolution of the dp industry is slowing, for reasons related to the management of dp, the quality of dp services as perceived by the end user, and the productivity of dp systems and application development efforts. They believe that "the major problems identified in this study are and will remain insensitive to details of system architecture," and reflect this belief in the emphasis they provide.

The first chapter, an overview, makes these beliefs clear. It is followed by chapters devoted to the environment, to users, and to applications. Among the highlights of these are:

- The discussion of standards, which points out a need for systems of standards that will permit complex systems to be constructed, not individual, uncoordinated standards.
- The definition of the kinds of system characteristics which will make them more attractive to users. Among these are ease of use, consistency, error tolerance, and the like; matters with which new technology per se cannot deal.
- The idea of separating the user's Installation Control Program (ICP) from the vendor-supplied System Control Program (SCP), with the former modular and user-modifiable and the latter unchanging and inviolate.
- A belief that there is a great potential for data processing service provided to the home, one of the few exceptions to the generally conservative tone of the book.

Chapters 5 and 6 deal with future hardware and software, intentionally incompletely; the authors concentrate on issues relevent to their theme and refer readers to other sources for more complete technology forecasts. The most outspoken words in the book are reserved for forecasts of software panaceas. The authors say: "Whether there has been any real and lasting progress (in twenty years) in the software development area is an open issue." The accuse the industry of a "deep belief in magic," asserting that in turn new languages, interactive systems, and structured programming have been oversold. They believe that real progress awaits the development of quantitative measures of software quality and system development productivity, coupled with management improvement, reduced duplication, and better tools for the end user.

Chapter 7 is devoted to management. In addition to treating the management of system development it contains interesting discussions of the effect of data processing on the management of the user organization and of the vendor's management responsibilities (SHARE is, after all, oriented to influencing the behavior of IBM). Users and user organizations are called upon to play a great role in developing the industry's practices, standards, and management methods. Chapter 8 then summarizes the book and presents recommendations for future development, again concentrating on issues of quality and management.

The optimist may feel a little restless after reading this book; some hope for example, that technological developments can lead to significant improvements in the quality of systems. Nevertheless, even the optimist would be truly blind if, after reading this book, he could return with a clear conscience to the convenient notion that more bits per buck or cleverer information retrieval algebras are important to the overall progress of the industry.

The book's credibility is enhanced by the authors' careful, conservative approach. This also results in a bit of an empty feeling, however, since they rarely put forward their own ideas about solving the problems they so cogently identify. They might have gone further out on a limb and recommended architecture, management processes, standards, or other possible solutions they believe might help. If these guys don't know how to solve the problems—or at least how to start—who does?

—Frederick G. Withington
Mr. Withington is a senior staff member of Arthur D. Little, Inc., and one of Datamation's contributing editors.

Crime by Computer
by Donn B. Parker
Charles Scribner's Sons, 1976
308 pp. $10.95

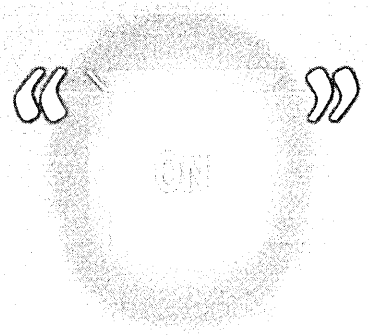
Donn Parker has made himself the outstanding authority on computer crime. His book summarizes virtually all that is known on the subject, including case histories of the Equity Funding scandal, the telephone company ripoff, and a detailed analysis of the perennial embezzlement by half-cent rounding. Along the way, one finds discussions of security and privacy, the problems induced by "systems hackers" at universities, and the use of computers to beat the Las Vegas casinos.

All of this is presented with a charming style; the book is anything but dull. It will probably be the most quoted and cited book in the field this year.

Computer crime can and does begin at an early age, specifically at the schools where computing is taught. The system hackers go quickly from clever use of the machines to even cleverer misuse. The facility provided for duplicating information is readily applied to duplicating problem solutions. And, of late, the sellers of canned term papers have updated themselves into sellers of canned programs for students who are delinquent in their assignments. The bank president, the industry manager, and now the teachers have to be put on alert against computer crime. The subject should not be avoided, but rather brought out into the open and discussed frankly and bluntly—and this Parker does.

Just as one cannot understand auditing without understanding embezzlement, or be knowledgedable in locksmithing without knowledge of lockpicking, so it behooves computer ex-

A Statement of Our Objectives:



In a word—that's it.

And nothing else could so eloquently express our intent:

To provide the people and companies we serve with products and services as absolutely reliable as possible; helping them achieve greater system availability than ever before possible.

We're AMCOMP. A company actively engaged in manufacturing fixed-head discs and tape drives, video recording and display equipment, and clustered terminal systems—an industry leader in future development within these product areas.

We are headquartered in Sunnyvale, California in a ninety-three thousand square foot complex; with additional manufacturing in Singapore, and sales and service centers in major U.S. and European markets.

In our thirteen years to date (under the banners of Data Disc and Bright), we have served an ever-widening spectrum of clientele, both large and small—computer systems manufacturers, prime users, and military and governmental organizations.

We would sincerely welcome the opportunity to be of service to you, too.

AMCOMP Inc.
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perts to study and comprehend the techniques of those who would subvert the use of computers for illegal or unethical ends.

Parker is careful to point out that the computer, which is becoming the central tool for white collar crime, is also the chief hope for detecting and combatting those crimes.

The opening sentence of Parker's book is "Our society is fast becoming dependent on the correct, reliable, and near-continuous operation by EDP personnel of digital computers and data telecommunications." Just as with any other technology with a steep wave front, its presence will trigger many people to stay up late figuring how to utilize the technology to get rich without working. As with all forms of warfare, the development of weapon and counter-weapon is endless. Parker has brought together enough information to define the battleground and the state of the art of the weaponry on both sides.

—Fred Gruenberger
A professor of computer science at California State Univ., Northridge, Mr. Gruenberger also publishes "Popular Computing," a computer hobbyist periodical.

(See also the Forum, "Another Parker Game," on page 155 in this issue)

Recursive Programming Techniques
by W. H. Burge
Addison-Wesley, 1975
277 pp. $19.95

Here is a book that stands head and shoulders over any other book written on recursive programming. The exposition is clearly and carefully thought out and the material is well organized. The book will serve well as a text, not for the duffer in the field nor for the language expert, but for the serious student of programming techniques.

Many of the developments in the book have appeared in Burge's previous articles, but there are also plenty of new ideas. In several instances, Burge has taken the nucleus of an idea from others and expanded it into a nicely generalized application of recursion. If there is a fault with the book, it must lie in the sparseness of practical examples and in the unending stream of acronyms used in algorithms and text as a shorthand in conveying the logical development of recursive processes.

In Chapter 1, without ever telling us that in mathematics recursion is a technique of defining a function or process in terms of itself, Burge explains verbally, formally, and symbolically the system of notations to be used in the book. He proceeds recursively from the very elementary to the quite complex with many examples. He leads one through the lambda calculus, a bewildering maze of combinatory logic in most expositions, in an easily understood fashion, spelling out algorithmically what each operator means.

In Chapter 2, Burge describes methods for converting recursive expressions into programs using, for the most part, Landin's SECD machine. His approach to the machine is gradual, showing how each of the elements of Stack, Environment, Control String, and Working Dump work in detail. In the later pages of the chapter, he shows some compiling shortcuts and expands the language to include assignment and branching statements and other features of current programming languages not included in the basic SECD machine. A novice couldn't write a compiler from this explanation, but he would get an idea of how compilers work, and a reasonably competent programmer should be able to implement recursion for any application compiler.

Chapter 3 is on data structures and here the sledding gets a little more difficult. Basically, Burge tries to show the inherent affiliation between data structures and the algorithms that generate and manipulate them. Systematic procedures for deriving programs for creating and analyzing tree structures and streams of data are set forth. A considerable space is devoted to showing how the two sorts of data and procedures map into one another. The chapter draws heavily upon combinatory logic, and in view of the very practical subject matter—data and data structures—seems somewhat esoteric. The exposition could have benefited by many more practical examples of lists, trees, combinations, sequences, permutations and their processing.

Chapter 4 on parsing really gets into the lambda calculus and finite automata, and advances the notions of combinatory logic quite a bit further. This chapter compresses quite a lot of language description techniques (describing constructs as definitions of new expressions in terms of old by applying the techniques so carefully set forth in the first chapter) and compiler lore into a small space. While the exposition is quite straightforward and has careful illustrations of top-down and right- and left-corner bottom-up parsing, plowing through the machinations of the automata does get a mite tedious. Again, practical examples rather than abstract illustrations could make the development very much more real to the reader. As an introduction to recursive techniques and the application of some of the previously developed logic to the subject of parsing, it serves very well as a teaser to more detailed development of the subject.

The last chapter is on sorting, or rather searching and sorting allied techniques. Sorting is a natural for recursion since most sorting functions consist of developing a strategy and applying it again and again at various levels or subcollections of data. Complex sorts are usually made up of several simpler sorts. This chapter does have a fair number of practical examples and deals with problems we all can understand. Techniques for networks and trees, shell sorts, tape sorts, heap sorts, and radix sorts are given. As with parsing, the whole scope of the subject is not covered in this single chapter, but a right good taste is found.

In summary, this is probably the most technically competent of the books published to date in this IBM-sponsored series on system programming. It represents a real contribution and, while it will never sell as many copies as Date's *Introduction to Data Bases,* it deserves to be in the library of any serious student of programming and programming languages. One doesn't get through the book in a day or two, but the kernel is much juicier after you get it out.

—N. E. "Gus" Willmorth
Dr. Willmorth has been employed at System Development Corp. since 1955 on a variety of projects, and is professionally active both locally and nationally. He has served as chairman of L. A. SIGPLAN and is currently a member of the ACM Committee on Self-Assessment Testing and the AFIPS committees on job descriptions for programmers and system analysts.

BOOK BRIEFS . . .

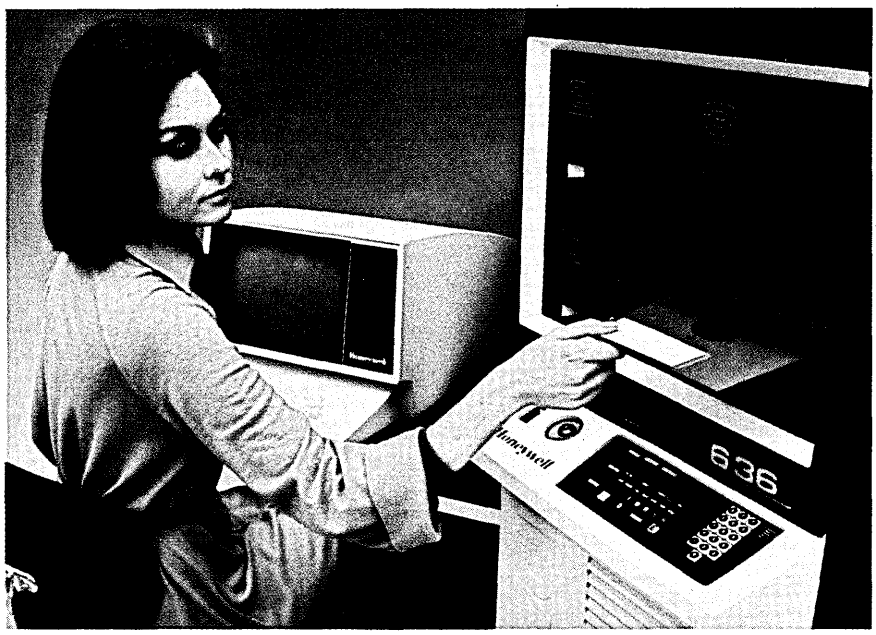
The Database Administrator
by John K. Lyon
Wiley & Sons, 1976
170 pp. $14.95

The last five years have seen a tremendous increase in the number of businesses intrigued with the concept of having databases from which management can draw information for intelligent, timely decisions. But the road from concept through implementation to management of this resource has been somewhat more difficult and expensive than was envisioned. This book serves as a practical guide for the person who has to manage the company's data base; topics include design, creation, maintenance, protection, and use of the data base.

Advances in Computer Communications
by Dr. Wesley W. Chu
Artech House, 610 Washington St., Dedham, Mass. 02026 (1976)
607 pp. $25 (paperback)

This updated reference work on computer communications (the first was published early in 1975) is a compilation of technical papers from various conference proceedings, transactions,

You asked for an easily configurable mini.



You've got it.

It's a snap to put together Honeywell's Level 6 mini to do the things you want. For example, suppose you want a system for data capture, storage and retrieval. Here's how you configure it.

1. Start with a rack-mountable Model 6/34 with 24K words of MOS parity memory, multiply/divide, realtime clock, 64 vectored interrupts, and bootstrap loader.

Now let's say you need four local entry stations and an operator's console with supporting peripheral capability. So you add:

- A Multiple Device Controller board to which you attach a console CRT, serial printer, and 512K byte dual diskette.
- A Multiple Device Controller board to which you attach 4 CRTs.

Now your configuration is complete, including all cables, mounting hardware and GCOS/BES1 software. And it's only **$19,978.***

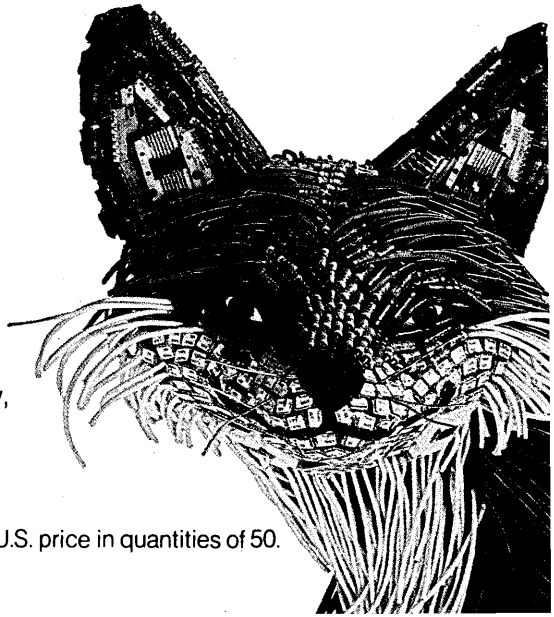
2. If you want communications and disk capability, here's what you do. Start with the basic Model 6/36 processor with 32K words of memory. Then add:

- A Multiple Device Controller board to which you attach a console CRT and serial printer.
- A Mass Storage Controller board to which you attach a 2.5 megabyte cartridge disk.
- A Multiple Line Communications Processor board to which you attach 6 CRTs on full duplex lines and a host processor communications link.
- GCOS/BES2 software.

Again, your system is complete, and the price is only **$30,147.***

There's lots more. Besides those mentioned, we offer a variety of central processor, communications, and peripheral options, plus additional software. And it's all backed by the extensive know-how, experience, and worldwide service organization of Honeywell.

We're excited about our easily configurable mini. To find out more, just circle the reader service card. Or write us. Honeywell Information Systems, 200 Smith Street (MS487), Waltham, Massachusetts 02154.



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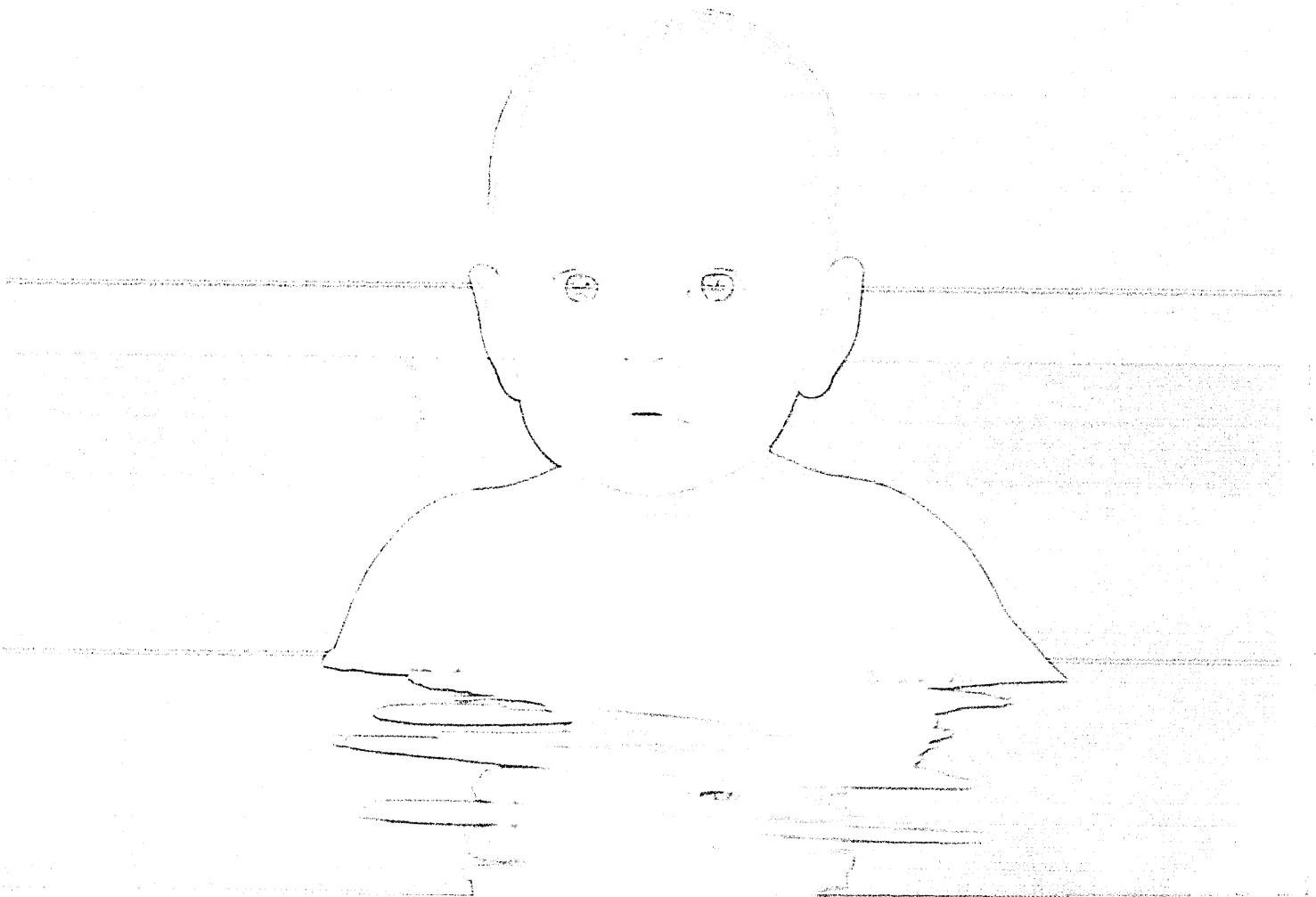
*U.S. price in quantities of 50.



The emergence of a new thinking machine.

The SEL 32/35.

Twice the power for half the price.

If your computing needs could be answered by such machines as Data General's Eclipse, or DEC's PDP 11 series or Interdata's 7/32, consider the SEL 32/35.

Rather than get into bits and bytes, there's really only one thing you need to know about the SEL 32/35: You get two to four times the power for every "compute" dollar spent. Period.

That's a pretty powerful statement. But the SEL 32/35 is a very powerful machine.

Extra power can go a long way to maintain the balance you need in your computer system, so essential for reliable, peak performance.

And extra power, for fewer dollars, can do wonders when you're trying to balance a corporate budget.

For more information about the new arrival in our family of computers, just circle our number on the Reader Service Card. Or, for faster action, call us direct.

Either way, we'll see that you get all the vital statistics on our new baby.

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and journals. Topics include statistical multiplexing, packet switching via satellites, network performance simulation and measurement, distributed data bases, common carrier facilities and services, and social, regulatory, and legal issues in computer communications. There is also a list of references to other literature in this field.

The Thinking Computer: Mind Inside Matter
by Bertram Raphael
W. H. Freeman & Co., 660 Market St., San Francisco, Calif. 94104 (1976)
322 pp. $12.95 ($6.95 paperback)

With many discussions in dp circles about artificial intelligence and the efforts being made to design "smarter computers," this timely volume examines some computer myths, explores current applications, and devotes a chapter to robots. This book should be of interest to both professional and general audiences curious about the potential impact of computers in their fields.

Queueing Systems, Volume 2: Computer Applications
by Leonard Kleinrock
Wiley & Sons, 1976
549 pp. $24.95

Volume 1 of this two-volume set (March '75, p. 144) concentrated on theory. This volume presents the tools of queueing theory so that they may be applied to real-world problems, and using today's computer systems. The first chapter is a queueing theory primer, and the subsequent chapters explore bounds; inequalities and approximations; priority queueing; time-sharing and multiaccess systems; computer-communication networks (using ARPANET as an example) in two sections—analysis and design, and measurement, flow control, and ARPANET traps.

Resume Writing: A Comprehensive How-To-Do-It Guide
by Burdette E. Bostwick
Wiley & Sons, 1976
213 pp. $9.95

While practically everyone has a "best" way to write a resume, it's a good idea to review some techniques and forms that have proven successful for people in jobs of all kinds. This cleanly-written book contains useful information and gives step-by-step procedures in how and what to write; samples of cover letters; analysis of styles; and many examples.

The Bugbook III
by David G. Larsen, Peter R. Rony and Jonathan A. Titus
E & L Instruments Inc., 61 First St., Derby, Conn. 06418 (1975)
580 pp. $14.95 (paperback)

This book describes microcomputer interfacing techniques and experiments using the Mark 80 microcomputer, an 8080 system. It is a technical guide with details on breadboarding, programming, generating a device select pulse, clock cycles and timing loops, and a chapter on subroutines, interrupts, external flags, and stacks. The book is the fourth in a series that treats the subjects of digital electronics, asynchronous serial data transmission, and microcomputers.

Assembler Language With ASSIST
by Ross A. Overbeek and W. E. Singletary
Science Research Associates, Inc., Chicago, Ill. 60611 (1976)
372 pp. $14.95

Are people still writing programs in assembly language? Well, if they are, here's a new text which, through ASSIST, "the most widely used student assembler in existence," teaches the fundamentals of assembly language. ASSIST has simplified I/O features and easily comprehensible debugging tools, and OS and DOS versions are available without charge from Penn State's Computation Center, University Park, Pa. 16802. The book contains complete sample programs and exercises, and no knowledge of higher-level languages or flowcharting is assumed.

Introduction to Microcomputers & Microprocessors
by Arpad Barna and Dan I. Porat
Wiley & Sons, 1976
108 pp. $10.50

This self-study volume presents its subject in a concise way, especially for the initiate who wants to learn techniques required for the efficient use of microcomputers and microprocessors. Each chapter is written to stand alone, and the book can be used as a convenient reference.

Electronic Composition
by N. Edward Berg
Graphic Arts Technical Foundation, 4615 Forbes Ave., Pittsburgh, Pa. 15213 (1975)
352 pp. $48 ($43, GATF members)

This guide to the "revolution in typesetting" provides an overview of characteristics of electronic text editing and composition systems to enable managers to evaluate the combined technologies of data processing and typesetting. The guide contains 18 sections, such as input considerations, editing and corrections, storage mediums, cpu, video display, and cost effectiveness, plus a glossary, index and list of text and periodical references.

Problem Solving and the Computer: A Structured Concept with PL/1 (PL/C)
by Joseph Shortt and Thomas C. Wilson
Addison-Wesley Publ. Co., 1976
372 pp. $8.95 (paperback)

The only prerequisite for this book, according to its authors, is common sense. Problem solving by computer is introduced by the techniques of top-down structured programming; and PL/1 as implemented on a PL/C compiler is the language used. The book seems well-organized and has numerous examples.

Computer/Aided Experimentation: Interfacing to Minicomputers
by Jules Finkel
Wiley & Sons, 1975
422 pp. $24.95

This generalized survey on the field of data acquisition provides good do's and don'ts, plus cautions on how to implement experiments using the computer as a tool. It is designed as reference for specific topics, (such as telemetry, interface logic design, peripherals, etc.) with each chapter written as an independent entity.

reports & references

EFT

Although the "biggest problem electronic banking faces is public acceptance," many facets of EFT will become commonplace within five to seven years, concludes a 20-page, multicolored booklet, *Trends in Electronic Funds Transfer*. The current status of four EFT systems—automated clearing houses, automated teller machines, point-of-sale terminals used for direct funds transfer, and automated payment by telephone—are reviewed. The impact on financial institutions, retailers, consumers, the dp industry, and auditing practices are examined; and the "case history" of St. Joseph, Mo. (pop. 77,000), "basically a conservative community," is presented. All in all, this booklet seems to be a very good introductory discussion of the subject. PEAT, MARWICK, MITCHELL & CO., New York, N.Y.

FOR COPY CIRCLE 210 ON READER CARD

Security Reports

Three useful reports on data security are available. *An Executive's Guide to Data Security* (G320-5647, 80¢) is a 14-page translation of an IBM Swedish study on the threat to data security. Methodology and available data security measures are discussed, as well as certain essential definitions of the problems.

Data Security—Threats and Deficiencies in Computer Operations (G320-5646, $1.10), another Swedish study, presents detailed results of observations made in nine dp shops. This 52-page report discusses the threats; conditions for the threats to exist; and deficiencies or weaknesses in hardware,

The era of personal programming is here.

Now you can make better decisions. More decisions. Faster.

You can put personal programming to work now. It's easy and economical.

Economical programmable calculators may well be more significant to business and industry than were slide rule calculators introduced just a short time ago. They represent a step function increase in computing capability. Capability you can use for: Optimization. Projections. Forecasting. Data reduction. What-if matrices. Iteration. Risk analysis. Probability. Mathematical modeling. Worst case analysis.

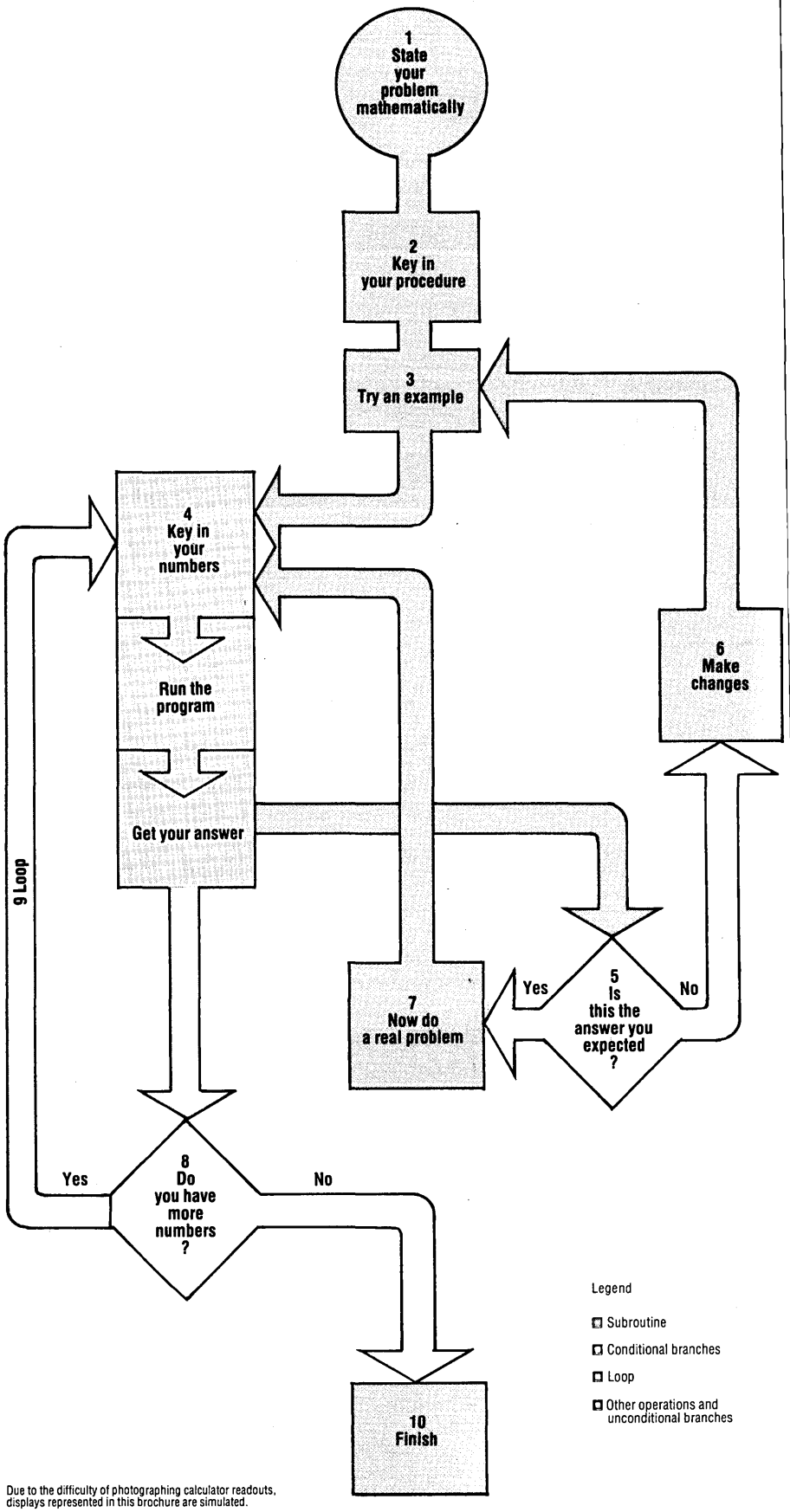
You may already be using these techniques, assuming you have the time. If not, you get in line to go on the computer. Or settle for something less.

Now personal programmables can help you cope with more data, explore with more insight, far more successfully than ever before. So you make better decisions chosen from more options—better decisions founded on a broader data base. More decisions. Faster. On the spot.

Programming is just logical thinking. Every problem has a logical flow. There may be constants to inject and variables to be put in. You have to compensate for these. The same is true when you program.

Let's follow the flow chart and step through a program on how to program:

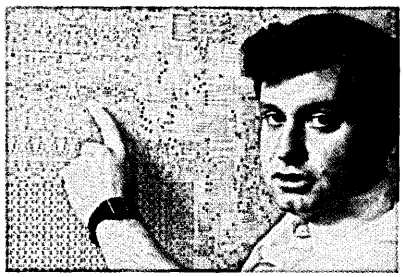
1. **State your problem mathematically.** Gather the equations and determine how you want it done.
2. **Key in your procedure.** List the keystrokes required to do the problem manually. Key them in. The programmable remembers.
3. **Try an example.** Before you do a real problem, be sure of your program.
4. **Key in your numbers.** Let the programmable try it. Making the calculations keyed-in in Step 2.
5. **Is this the answer you expected?** If not, you'll want to re-examine what you keyed-in and...
6. **Make changes.** Step forward or backward through the program to edit it. Try your example again. At Step 5 the answers should look good.
7. **Now do a real problem.** Your program is structured and tested—ready for your numbers. No need to key-in the program again. Only the variables. The programmable does the work.
8. **Do you have more numbers?** Here you can explore options: Ask *what-if?* Optimize. Or, determine what happens under worst-case conditions—take the Yes path.
9. **Loop.** Here's the real value of a true programmable. The work is done. From here on you get answers—all the answers you need. Automatically.
10. **Finish.** With an SR-52 you can record your program permanently on magnetic cards to use again and again. Or, with the optional PC-100 you can print the full contents of your program memory.



Due to the difficulty of photographing calculator readouts, displays represented in this brochure are simulated.

And when people put programmables to work, they discover how immensely useful they can be.

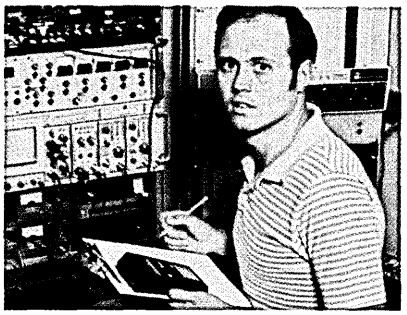
Some of the early users of handheld programmables were at Texas Instruments. Their goal—like yours—to make increasingly better decisions. Programmables helped them. They can help you too.



"A programmable can iterate 10, 20, or as many times as you want it to. The more you iterate the better your accuracy." Ken Davis.
Circuit Design Engineer.

"I've developed a program that evaluates the output voltage of a saturated transistor buffer amplifier. It's a calculation that has to be iterated many times. The programmable can do it in seconds. It would take a good half-hour to do it by hand.

"I've got another program which is a real help in designing MOS transistors. I input the process parameters and the DC operating point. The programmable calculates the dimensions. We often use it in the lab to evaluate a prototype circuit. If we find out that one of the components is not up to spec, we can check the numbers and make an on-the-spot evaluation of the design."



"I think its greatest value is the 'sensitivity' it gives you for variables."
Wally Rhines.
Research Project Manager.

"I save trips to the computer. At my desk, I can say, for example, 'Ok, if I double the oxide thickness, what does it do to the capacitance?' Once I have a mathematical model, I can make any relationship I want.

"Off the job I use it to evaluate stock options using statistical modeling. I define my risks more accurately, then I can decide if I am willing to take them. I increase my sensitivity for the way stocks move—seeing instantly what would happen to my option if the stock should move up or down several points."

"All I have to do is put in sales dollars. Then it computes: local tax, state tax, total tax." Robbie Askew.
Accounting Supervisor.

"I used to figure these taxes manually. It took a good eight hours if I didn't have any interruptions. Now in an hour-and-a-half I am finished. The programmable does all the work."

"I have instant turn around... examining different alternatives very rapidly... replacing intuition with insight." Tony Barlow.
Systems Designer.

"In systems design you depend on how rapidly you look at alternatives. That's what determines your effectiveness. In one case—cost control in software development—I was able to examine more alternatives than I would have been able to examine in a week's time—or even a month's time. The result was the best understanding we ever had of the factors that influence software costs."

"And I'm having a ball using it for things at home—from photography to games and puzzles."

"Now, because I can track complex contours with equations that generate NC tape data, we can develop more advanced tooling techniques."
Harold Larsen.
Tooling Engineer.

"The advantage is that you can work with the numbers instead of going to the model shop for mockups, which are expensive. Writing a program cuts down turn-around time, since you don't have to go through all this. And with reduced lead time and longer tool life we can cut our costs dramatically without cutting back on quality."

"We're getting yield improvements and therefore cost reductions. Because we can spot what's causing the problem quicker." Bob Wolters.
Production Engineer.

"We're constantly running data reductions, evaluating yield and related process parameters. Before, it was all done by hand or on a big computer. Now, we're finding a lot more answers that are useful to us. Because the programmable calculator is right here. It's available. It's quick. A technician can do statistical correlations in a couple of hours where it used to take me all day.

"I also use a programmable in my hobby—amateur radio. I am technical director of the state VHF-FM relay league. We've developed test tables to increase the range of mobile units—extremely valuable in emergencies."

A new unique Algebraic Operating System helps make TI programmables easy to use.

With the introduction of the SR-50 slide rule calculator a few years ago, Texas Instruments had a choice: algebraic entry or Reverse Polish Notation (RPN). TI chose algebraic entry because it's the most natural and easiest to use.

Now, with the new SR-52 and SR-56 programmable calculators, TI takes another major step forward in power and ease of use—the unique Algebraic Operating System.

What is AOS?

Actually, it's easier to use than to explain. AOS is more than just algebraic entry. It's a *full* algebraic hierarchy coupled with multiple levels of parentheses. This means more pending operations, as well as easy left-to-right entry of expressions—both numbers *and* functions.

Algebraic hierarchy.

This is the universally recognized order of performing calculations. Functions first. Powers and roots. Multiplication or division. Then addition or subtraction. AOS performs calculations in this order. But you have the option to change the order whenever you wish by using the parenthesis keys.

Why pending operations are so important.

Because you can compute complex equations directly. For example, a seemingly simple calculation like this:

$$1 + 3 \times \left[4 + \frac{5}{\left(7 - \frac{2}{9}\right)}\right] = ?$$

contains six pending operations as it's written. An SR-52 or SR-56 programmable calculator with full AOS easily handles it just as it's stated, left-to-right. You don't have to rearrange the equation, or remember what's in the stack as with RPN.

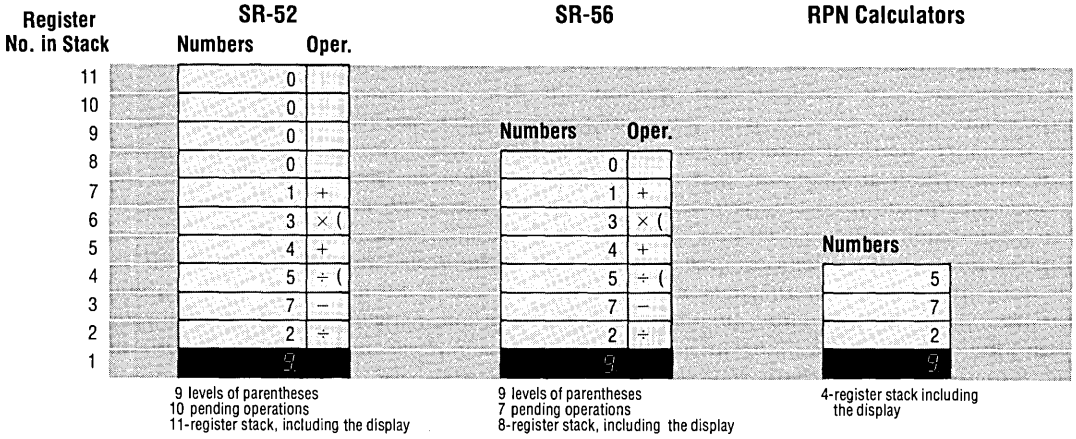
A calculator with "full AOS *remembers* both the numbers and functions in its register stack. And performs them according to algebraic hierarchy. As more operations become pending, the stack fills up (as shown in the diagram). Finally, when the equals key is pressed, the operations in the register stack are performed to give you the answer (15.21311475). Automatically.

AOS makes the calculator part of the solution. Not part of the problem.

The case for AOS is strong. That's why TI uses it. Whether you own a calculator with ordinary algebraic entry, or RPN or no calculator at all, we think you'll prefer AOS. Because you begin using it immediately. There's no new language to learn. Even if you are conditioned to RPN, the added value and power of TI's programmable calculators with unique AOS is well worth the easy transition.

Here's how AOS stacks up.

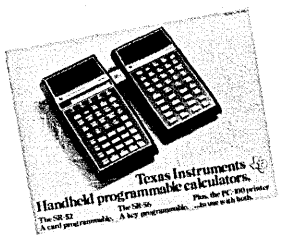
AOS remembers both numbers and operations, so you key-in your equation left-to-right.
RPN only remembers numbers, you have to remember operations and the order.



9 levels of parentheses
10 pending operations
11-register stack, including the display

9 levels of parentheses
7 pending operations
8-register stack, including the display

4-register stack including the display



Texas Instruments Incorporated
P.O. Box 5012 M/S 98
Dallas, Texas 75222

TIIRD

Mail the coupon and we'll send you a new 16-page brochure that delves deeply into the features of the SR-52, SR-56 and PC-100. We'll also send you a prerecorded program card and instructions so you can try an SR-52 at your TI retailer.

Check one. Send me: ☐ EE program card ☐ Statistics ☐ Finance

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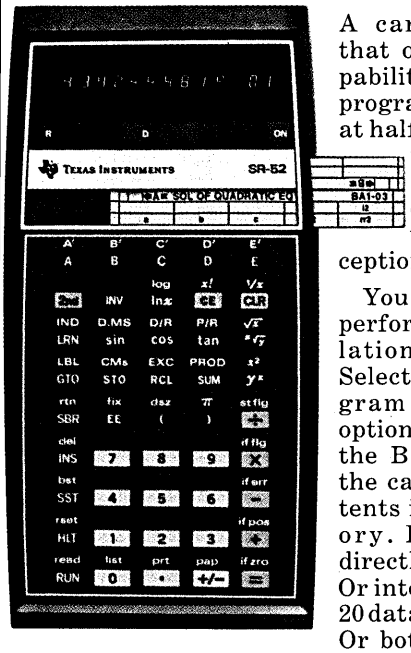
SR-52

$395.00*



A card programmable that offers twice the capability of the only other programmable in its class at half the price.† TI's advanced technology and start-to-finish quality control are the keys to this exceptional value.

You can process data or perform complex calculations automatically. Select a prerecorded program from one of the optional libraries or from the Basic Library. Load the card and put its contents into program memory. Key-in variables directly into the program. Or into one or more of the 20 data memory registers. Or both. Run a program as often as needed. Change values of variables if you wish. The stored program is unaffected.

Learns your way of solving problems. In just a few hours, you could be writing programs. Using its 224-step program memory, the SR-52 will handle programs you may have thought required a computer. Press LRN to store each following keystroke. Press it again and the SR-52 has learned your program. It's ready to RUN. Record your program on a blank magnetic card, and make it part of your personal library.

Computer-like branching. Offers three types of unconditional branching: Go to. Subroutine. Reset. And 10 conditional branches: Six display tests. Two flag tests. Two looping tests. Also, 10 user-defined keys.

Direct or indirect access to 20 data memories. Store numbers directly in memory registers. Or, store a number in a data memory specified by another register (indirect addressing). Add, subtract, multiply, divide within registers. Exchange display with memory.

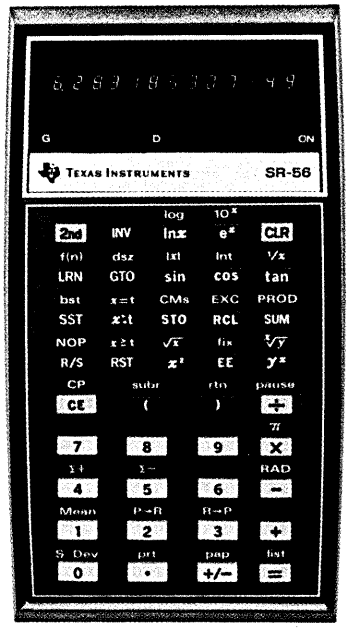
Edit and debug. Move through a program a step at a time. Forward or backward. Insert. Delete. Or write over steps.

Basic Library of 22 prerecorded programs. Twenty-two prerecorded program cards come with an SR-52. You can put them to work right away. You also get a 96-page Basic Library manual. Each prerecorded program card is supported with sample problems, user instructions and program listings. See optional libraries on the back cover.

• Conversions (1,2) • Solution of Quadratic Equation • Hyperbolic Functions • Prime Factors of an Integer • Complex Arithmetic • Checkbook Balancing • Compound Interest • Ordinary Annuity (1,2) • Trend Line Analysis • Permutations and Combinations • Statistical Means and Moments (1,2) • Random Number Generator • High Pass Active Filter • Low Pass Active Filter • Dead Reckoning • Lunar Landing Game • Diagnostics

SR-56

$179.95*



Easily becomes an integral part of your work. As a powerful slide rule calculator that also does double-duty as an economical, powerful key-programmable. Capable of solving many problems handled by computers with its: 100 programming steps. Eight-register stack (handles up to seven pending operations). Nine levels of parentheses. And 10 data memories.

Branches like a computer. Capable of direct addressing, which includes: Go to. Reset. Subroutine (4 levels). And six conditional branches: Two for loop control. Four test register comparisons.

Unique independent test register. Compare the value in the display with a value in the t-register – without interfering with processes in progress. If your test conditions are met, then a conditional branch takes place. Otherwise the sequence continues.

10 memories to do your tough problems. Store and recall data. Add, subtract, multiply or divide within a memory register. Without affecting the calculation in progress.

A unique pause key works two ways. Using this key in a program will display any step you designate for a ½-second. Hold the key down and you'll see the result of every step in the program for ½-second.

Easy editing. Single-step and back-step keys let you sequence through program memory to examine what you've done. If you pressed a key incorrectly, you can go back and write over it (NOP).

Also a powerful slide rule. 74-pre-programmed functions and operations. Handles basic math. Logs and trig. Advanced statistical problems. Polar/rectangular conversions.

An applications library, too. A 192-page collection of programs. All pre-written. Select a program. Follow the listing (putting in your own data, of course). And, you'll immediately begin using your SR-56's computing power to solve your own problems.

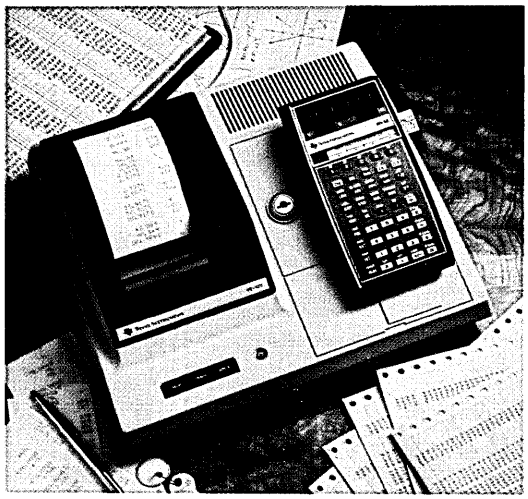
Every program in the Applications Library was chosen specifically on the basis of occupational demands. Each program contains a thorough description of how it works and the conditions under which it operates. There are also extensive examples of each program in typical problem solving situations.

• Math (10 programs) • Statistics (12 programs) • Finance (11 programs) • Electrical Engineering (11 programs) • Navigation (7 programs) • Miscellaneous and games (5 programs)

*Suggested retail price.

†Based on suggested retail prices of models available at the time of this printing.

PC-100 printer. Turns an SR-52 or SR-56 into a quiet, high-speed printing calculator $295.*



Imagine the convenience of getting a hard copy printout of: Data. Intermediate results. Answers. Imagine the efficiency of listing your entire program at the push of a key. Or, printing the calculator's entire data memory contents with a simple program. And now imagine seeing every step of your program as it's executed—both the number and the function. Imagine no more. TI's exclusive PC-100 printer is here. Ready to print ballistic trajectories or unit conversions. Complex tax analyses or simple cost/price margins.

Optional libraries of prerecorded programs for the SR-52. $29.95*

Math Library. Hyperbolic functions, quadratic and cubic equations, simultaneous equations, interpolation, numerical integration, differential equations, matrix operations, base conversions, triangle solutions, complex functions, and more. 34 program cards.

Electrical Engineering Library. Active filters, resonant circuits, T-π networks and transformations, transmission lines, phase-locked loops, transistor amplifiers, Fourier series, coils, power transformers, controlled rectifier and power supply circuits, and more. 25 programs.

Statistics Library. Means, moments, standard deviations, random numbers, permutations and combinations, t-statistics, analysis of variance, regression analysis (linear, power curve, exponential, logarithmic, quadratic), multiple regression, histograms, 12 distributions (normal, chi squared, Poisson, Weibull, hypergeometric, etc.) 29 programs.

Finance Library. Ordinary annuities, compound interest, accrued interest, sinking fund, annuity due, bond yield and value, days between dates, annuities with balloon payments, interest rate conversions, add-on rate installment loans, loan amortization, interest rebate, depreciation (SL, DB, and SOYD) and crossover, variable cash flows, internal rate of return, capital budgeting, and more. 32 programs.

More libraries on the way. Navigation. Surveying. Aviation.

*Suggested retail price.

Compare the SR-52 and SR-56 with other programmables in their class.

Programming capability	SR-56	HP-25	SR-52	HP-65
Program steps	100	49	224	100
Merged prefixes	•	•	•	–
Merged register ops. & comparisons	–	•	–	•
Program read/write on mag. cards	–	–	•	•
User defined keys	–	–	10	5
Possible labels	–	–	72	15
Absolute addressing	•	•	•	–
Subroutine levels	4	–	2	1
Program flags	–	–	5	2
Decrement & skip on zero (loop)	•	–	•	•
Conditional branching instructions	6	8	10	7
Unconditional branching	3	1	3	2
Indirect branching	–	–	•	–
Editing: Step	•	•	•	•
Backstep	•	•	•	–
Insert, delete	–	–	•	•
NOP	•	•	–	•
Single step execution	•	•	•	•
Pause	•	•	–	–

Operating characteristics	SR-56	HP-25	SR-52	HP-65
Logic System	AOS	RPN	AOS	RPN
Maximum number of pending operations	7	3†	10	3†
Parentheses levels	9	–	9	–
Memories	10	8	20	9
Store & recall	•	•	•	•
Clear memory	•	•	•	•
Sum/Subt to Memory	•	•	•	•
Mult/Div to Memory	•	•	•	•
Exchange display with memory	•	–	•	–
Indirect memory addressing	–	–	•	–
Exchange x with y	–	•	–	•
Exchange x with t	•	–	–	–
Fixed decimal option	•	•	•	•
Calculating digits	12	10	12	10
Angular mode Deg/Rad	•	•	•	•
Grad angular mode	•	•	–	•
Digits displayed (mantissa + exponent)	10 + 2	8 + 2	10 + 2	10 + 2

†RPN Calculators only store numbers, while AOS stores both numbers and functions in its stack.

Calculating characteristics	SR-56	HP-25	SR-52	HP-65
Log, ln x	•	•	•	•
10^x, e^x	•	•	•	•
X^2, $\sqrt{X}$	•	•	•	•
1/X, π	•	•	•	•
y^x	•	•	•	•
$\sqrt[x]{y}$	•	–	•	–
X!	•*	•*	•	•
Int X (integer part)	•	•	•*	•
Fractional part	•	•	•*	•
Trig functions & inverses	•	•	•	•
Hyperbolic functions & inverses	•*	•*	•*	•*
Deg/min/sec to decimal deg & inverse	•*	•	•	•
Deg to Rad conversion & inverse	•*	•*	•	•*
Polar to rectangular conversion & inverse	•	•	•	•
Mean, variance & standard deviation	•	•	•*	•*

*Programmable functions

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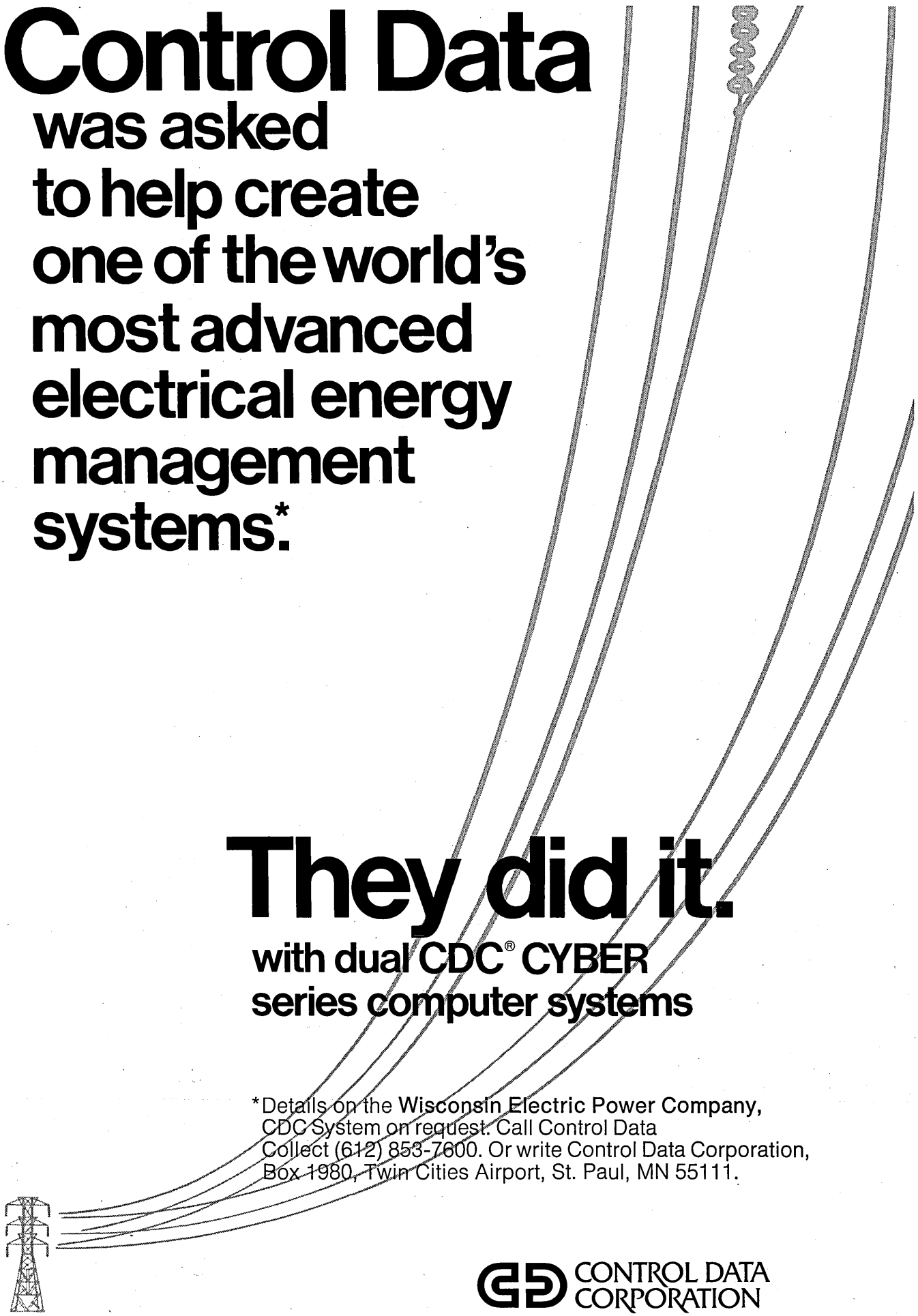

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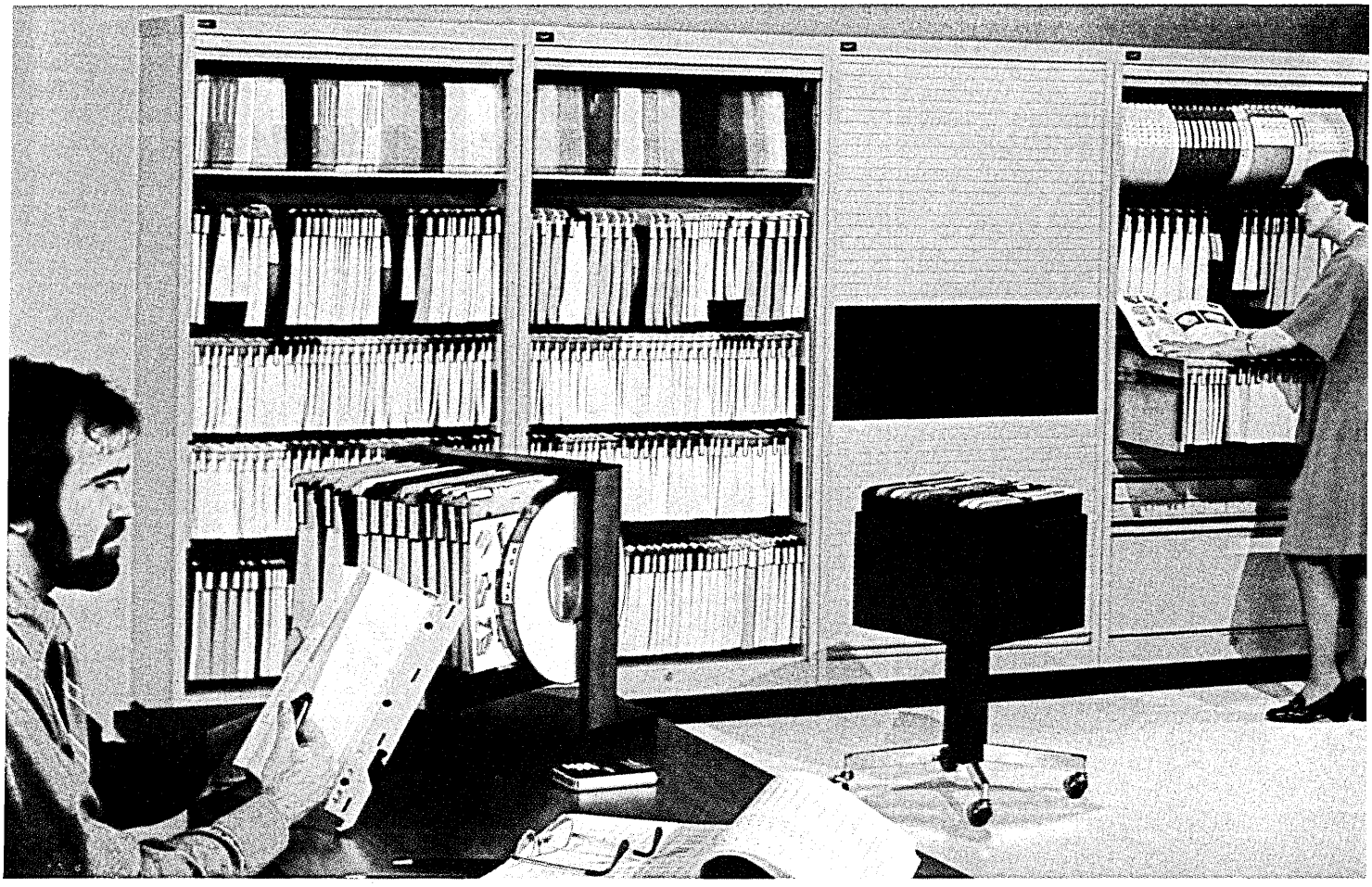

1 The many different sizes and shapes of documentation . . . manuals, computer reports and listings, flow charting and layout forms, punched cards and even magnetic files . . . don't fit properly into conventional office equipment.

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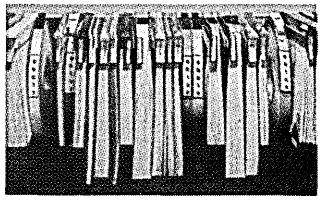

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source data

(Continued from page 34)

software, administration, or organization that may lead to security threats.

Data Security Controls and Procedures—A Philosophy for DP Installations (G320-5649, $1.10) is a 24-page report addressed to information systems management which presents measures IBM and others have taken for limiting risk in dp installations. Contact the nearest IBM branch office for copies.

Installing Business Systems

The 16-page guide, *Installing a Business Computer System: Pitfalls*, is directed toward the businessman about to install his first computer. Topics include reviewing the design specifications, management education, phased implementation, conversion planning, training, systems testing, and acceptance and backup procedures. A valuable checklist is also part of the guide. Price: free, with $1 handling and shipping in the U.S., $2 foreign. ROBERT E. BERKMAN ASSOCIATES, 5 Rita Drive, Morris Plains, N.J. 07950.

Data Base Management

A successful implementation of a full corporate data base system by Inmont Corp. of Clifton, N.J., encompassing all the company's divisions, is discussed in detail in the 98-page report, *Data Base Management—The Theory and the Reality*. Covered is the reasoning for going into data base, how the company selected its system, how it was implemented on a corporate-wide operation, and the problems and successes the company experienced.

In the second part of the report, William O'Brien, corporate director of MIS for Sperry Rand Corp., discusses data management definitions and concepts, comments on advantages and disadvantages of various approaches, and presents examples.

This report is one of this vendor's extensive current technical report series. Other recent titles are *Why Information Systems Fail*, *Technological Trends—1976*, and *Information Systems Planning in a Large Corporation*. Price: $25 each; any five for $100, or an annual subscription of 10 to 12 for $150. FAIM INFORMATION SERVICES INC., Box 1013, Melville, N.Y. 11746.

Job Seeker's Guide

Compjob—An Employment Directory is a 94-page guide for the job seeker in the dp industry. An alphabetical listing of firms from across the country that hire dp personnel, brief descriptions of the company and what it does, and the person to contact, are the heart of the directory. A very useful section of suggestions, questions, and answers begin the guide, and a sample resume is included. John Henry is the editor and publisher. Price: $5.95. EMPLOYMENT INFORMATION SERVICES, P.O. Box 3265, Chico, Calif. 95927.

Software Physics

The first report in the Software Engineering Report Series, *The Meaning of Computer Measurement: An Introduction to Software Physics*, is a 430-page loose-leaf format study of computer performance measurement. (See Kenneth W. Kolence, "Software Physics," June '75, p. 48.) Software physics is thoroughly introduced and used to develop practices required by capacity management, which is the overall process of assuring required computing capacity within cost, services, and reliability constraints. Performance measurement, workload forecasting, billing and costing, equipment planning, and scheduling are some of the activities compromising capacity management. Subsequent reports will present the full exposition of all the resulting software practices necessary to capacity management.

This publication is one of the activities of the Institute for Software Engineering; other activities are consulting and conducting seminars. The report is free to client members of the Institute, and $225 to nonmembers. INSTITUTE FOR SOFTWARE ENGINEERING, P.O. Box 637, Palo Alto, Calif. 94302.

Alphanumeric Display

Rated tops by 572 users were the alphanumeric display terminals produced by Applied Digital Systems and Four-Phase Systems, with Burroughs, Datapoint, ITT, and Courier following closely. The 54-page report, *All About Alphanumeric Display Terminals*, presents specific user ratings as well as detailed characteristics of 182 display terminals from 73 vendors. IBM displays are the most widely used, and users rated IBM and non-IBM displays nearly equal in overall performance, ease of operation, and display clarity with IBM getting the edge on keyboard feel and usability, hardware reliability, maintenance service, and software and technical support. Price: $10. DATAPRO RESEARCH CORP., 1805 Underwood Blvd., Delran, N.J. 08075.

Soviet Programming

Much of what is happening in programming in the Soviet Union is hidden by poor translations in obscure journals, or by overly mathematical treatment or by unfamiliar style. *A Survey of Soviet Programming*, a 136-page report prepared by Stanford Research Institute for the National Science Foundation, should help Westerners become more aware of general trends in Soviet software development. Programming languages from ALGAMS to REFAL are described, and chapters on operating systems, program development aids, a multilanguage programming system, theory of programming, and applications are included. There is also a very extensive bibliography. Price: $5.50 (ask for accession number PB251747). NATIONAL TECHNICAL INFORMATION SERVICE, U.S. Dept. of Commerce, 5285 Port Royal Rd., Springfield, Va. 22161.

WEMA Directory

The 28th annual WEMA ("the association serving the electronics industries") Directory lists 750 electronics companies in 28 states—up 50 from last year. The 168-page directory lists information on the association's member firms, including names of top management; company divisions, subsidiaries, and affiliates; number of employees; types of products and services; for of ownership (public or private) and where securities are traded; date established; etc. Price: $35 (prepaid only, and California residents should add $2.10 sales tax). WEMA, 2600 El Camino Real, Palo Alto, Calif. 94306.

Government Automated Decisions

Many federal agencies use computers to initiate actions that are not reviewed by people, such as issuing payments. A 72-page report, *Improvements Needed in Managing Automated Decisionmaking by Computers Throughout the Federal Government*, describes many problems experienced by agencies and suggests remedies. Price: $1. U.S. GENERAL ACCOUNTING OFFICE, Distribution Section, P.O. Box 1020, Washington, D.C. 20013.

vendor literature

Add-on Memories

A package of product bulletins presents this vendor's user and oem product lines. Replacement and add-on memories for most major minicomputers are described. The Buscomm H-11 Memory System for the DEC PDP-11, and add-ons for the IBM 360 Series and for the System/3 are also described. STANDARD MEMORIES, Newport Beach, Calif.

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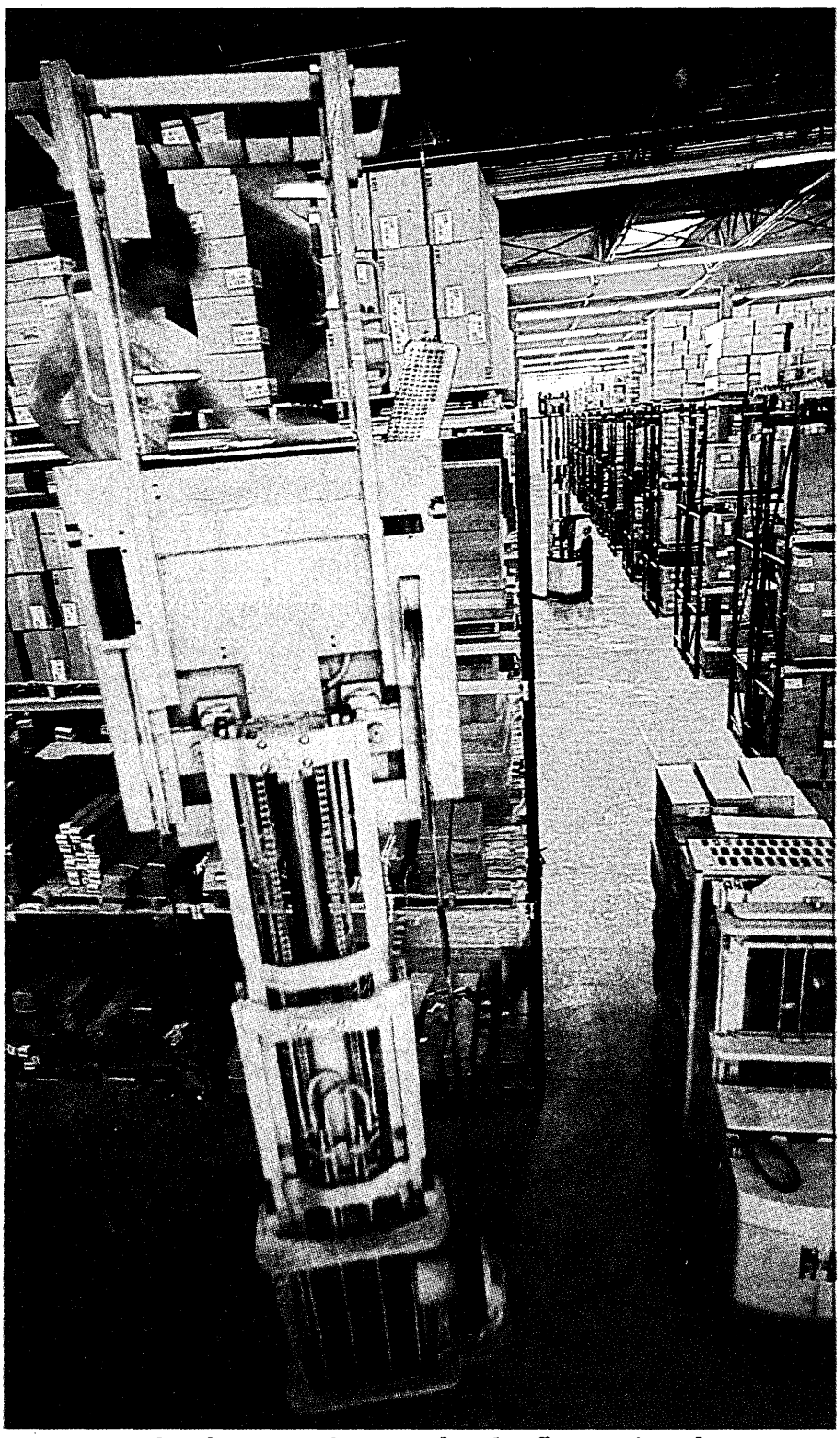
(Continued on page 150)

DP Dialogue

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



Distributed processing has stepped up the efficiency of warehouse operations at Wilson Sporting Goods Co.

Distributed Processing Links 25 Wilson Field Locations

Few companies today operate entirely out of one location. Even small firms are likely to have regional sales offices, while larger businesses may have dozens of operating units scattered across the country. For such organizations, a distributed processing system may help bring about some notable operating efficiencies.

Wilson Sporting Goods Co. of Chicago, a division of PepsiCo, is an outstanding example. Wilson is both a manufacturer and distributor of sporting goods, with one of the broadest lines in the industry. The company recently realigned its distribution network and now has 21 sales offices, each of which stocks some inventory, plus 4 large regional distribution centers. An IBM 3790 Communication System links all 25 locations to a System/370 Model 158 computer.

In a distributed processing system like the 3790, the workload is shared between the central computer and smaller units called controllers, which act as small processors. In the Wilson network each location has a controller online to a cluster of terminals and a printer, creating 25 small computing centers with local data processing capability.

Typically, after an order is entered at a Wilson sales office, it is transmitted via the 3790 to the Model 158 which forwards it to the appropriate regional center or centers. As the order is being processed, Wilson's companywide data base—including open orders, shipped orders and inventory—is updated. Customer inquiries concerning order status can be answered quickly through any terminal in the network.

"Customer service has benefitted greatly with the 3790," says Phillip D. Matthews, vice president, distribution.

(Continued on next page)

A pipe casing is welded on the Alaska pipeline. To help manage the $7 billion project, the Alyeska Pipeline Service Company is using an IBM System/370 Model 145.

Alyeska Develops a Total DP System in Record Time

When the Alyeska Pipeline Service Company was formed in 1970 to supervise the design and construction of the Alaska pipeline, many of the details of the project were still a big question mark. The only absolute certainty was the immensity of the challenge, particularly in the area of management control. The job called for the development of a total data processing system which would be flexible enough to handle very rapid growth.

Every aspect of the planning, construction and administration of the 800-mile pipeline must be fully documented to meet Federal environmental and regulatory requirements. That includes keeping track of inventory consisting of everything from Arctic outer gear to spare parts, managing a work force which swells to over 20,000 during the summer and providing accounting information for thousands of separate parts.

From the beginning, Alyeska has relied on various IBM computers to help handle the information. As the project progressed, the quantity of accounting data mushroomed quickly. "We went from processing less than 100 invoices a day out of our temporary offices in Seattle in 1974 to handling between 2-to-3,000 invoices daily on our Model 145 with VS/1 today," says Art Potter, manager of systems and computing. "Our online data base now includes over 2,500,000 records and it's still growing."

The toughest part of planning the system, according to Potter, was anticipating future data processing requirements without specific guidelines. "It was like compressing a 10-year corporate history into two years." says Potter, "We had to get every application up within a few months, because the actual pipeline construction was moving ahead so quickly."

Alyeska's system includes data processing equipment at five major construction sites and the Model 145 in Anchorage. Overall, the system must keep track of all the bills submitted to Alyeska by nearly 10,000 subcontractors. Each week, a performance report on pipeline progress is sent to the eight oil companies that own Alyeska for review on costs and efficiency.

Ultimately, records of all the expenses associated with the pipeline will go to the Interstate Commerce Commission (ICC) which is responsible for determining the rate of return the oil companies will be permitted to earn on their investment. Every expense will have to be documented and justified for the ICC.

When the pipeline is finally completed, Alyeska will be responsible for the total operation of the pipeline and terminal facilities at Valdez, Alaska. Currently, new data processing applications are being developed to support these pipeline activities. For example, sensing devices along the pipeline will transmit information to a computer in Valdez, which in turn will communicate with the System/370.

"One thing is certain," says Potter, "we could never have coordinated a project of this size without the computer. The financial accounting alone would have been a nightmare. We are confident that the experience our staff has gained working under the Alaskan constraints will provide us with the ability to develop the applications required when the oil starts to flow."

Wilson...

(Continued from preceding page)

"The time required to process and ship orders has been cut almost in half. All our sales offices now get order and inventory reports overnight, instead of two or three weeks later. And nine out of ten items ordered are filled on demand, without backordering. Overall, office and warehouse productivity rose 30%.

"The system has made possible much closer coordination between manufacturing and sales," he adds. "Since we are constantly up to date on order volume, we can adjust production in advance to meet demand.

"All these factors, plus our new physical distribution facilities, have culminated in a reduction of approximately $10 million in our total inventories—which in turn has increased cash flow and reduced our need for working capital."

The 3790 runs under Systems Network Architecture (SNA), an advanced IBM teleprocessing structure that unifies communications networks for greater efficiency and easier growth.

Bell Helicopter Gets a Lift from Computer-Aided Design

A helicopter rotor spins at 300 revolutions a minute as its turbine engine runs at 6,000 RPM. A multistage transmission, designed and manufactured by Bell Helicopter Textron, accomplishes a twentyfold reduction to provide lift for the craft. That capability alone makes it a very complex mechanism, but at Bell there is an additional requirement: the transmission must be able to run dry of oil for thirty minutes and survive.

That level of performance requires very precise design parameters. Bell's engineers have been using the Fort Worth company's IBM System/370 Model 168 to help produce reliable, cost-efficient helicopters. Much of the designing is done by engineers who interact directly with the computer via twenty-five IBM 3277 and 2741 terminals which are linked to the Model 168 under the Time Sharing Option (TSO) and OS/VS-SVS.

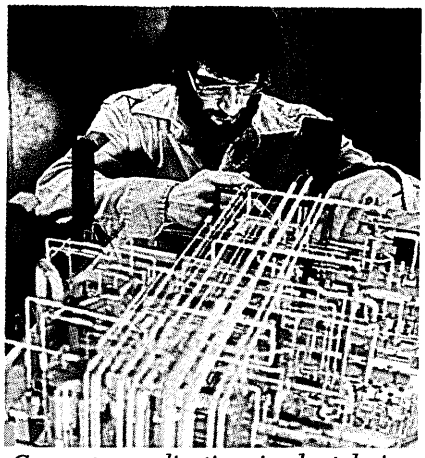
"With interactive computing, we've been able to increase the productivity of many engineers by a factor of four," says Joe Red, chief of scientific and technical computing. "By evaluating more options in the same time, they can minimize technical risks."

At Bell, computer-aided design is used to model everything from human factors, like legroom and headroom, to helicopter "survivability" under the most turbulent conditions. The company has developed over 500 specific application programs which run the gamut from designing the smallest gears to simulating the flight characteristics of the entire aircraft.

The computer is also used to formulate the "egg shell" configurations—the geometry of an aircraft's skin. In the manufacturing area, the computer keeps track of manpower requirements, operations plans and parts production schedules.

"Interactive computing and a comprehensive data base," says Red, "have helped us design and produce rotorcraft with the classical aerospace virtues—maximum strength, minimum weight and as much payload as possible."

The final touches are being applied to a helicopter at Bell Helicopter Textron in Fort Worth. The aircraft was designed with the help of computer simulations.



Computer applications in plant design are growing fast at UOP. This engineering model is of a new process plant.

Multiprocessing Ups Availability at UOP

"With our corporate computing load increasing by 37% a year for the last several years, system availability had become critical." So says Steve Bloch, director of corporate computer services for UOP Inc., explaining the company's recent move to an IBM multiprocessing (MP) system.

UOP, (formerly called Universal Oil Products Company) headquartered in Des Plaines, Illinois, is an engineering-oriented company which designs and builds petrochemical process and pollution control systems, and manufactures their engineered components. A major subsidiary constructs refineries. Its System/370 Model 158MP serves users in 18 divisions in the U.S. and Europe, plus several non-UOP companies.

In the multiprocessing system, two "tightly coupled" central processors back each other up to insure system availability. A single control program under the Multiple Virtual Storages (MVS) operating system automatically allocates work between the processors, dynamically assigning the load for maximum work throughput and best utilization of all resources.

"Certain of our applications—such as shop order control—are synchronized with physical operations," Bloch explains, "so computer availability is vital. That's why we wanted the back-up facilities and automatic error recovery of the multiprocessing system."

In a three-shift, six-day-a-week operation, Bloch notes, the system has been available more than 99.5% of the time.

Engineering productivity is also crucially dependent on computer avail-

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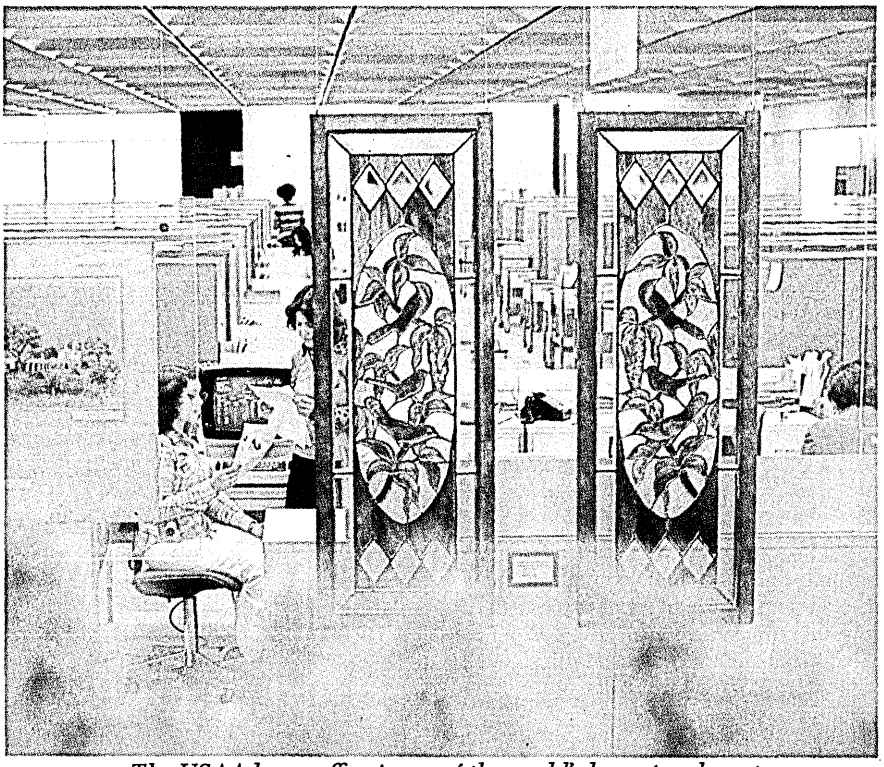

The USAA home office is one of the world's largest and most efficient office buildings.

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What insurance company has insured every military man who has walked on the moon? What's the largest property and casualty insurance company headquartered in Texas? Who is San Antonio's biggest private employer?

The answer to all three questions is the United Services Automobile Association. USAA is a unique member-owned cooperative, with over a million policyholders. Most members are active or retired commissioned officers in the armed forces and their dependents—and they're stationed all over the world. USAA has no agents. Its policyholders communicate with it mostly by mail and telephone.

To help meet their insurance needs—automobile, home, life, property—with efficiency and dispatch, USAA relies on a comprehensive IBM computing system built around an immense data base. It's one of the largest data bases running under IBM's IMS (Information Management System) used by any property and liability insurer anywhere, with 4.8 billion characters of online storage. The system runs on an IBM System/370 Model 168 computer.

The data base is remarkable for more than size. Unlike the insurance industry practice of indexing by policy numbers, USAA indexes by account (policyholder) numbers. Account numbers are cross referenced to policyholder's names. An average of three active policy numbers are carried under each account number.

This innovative policy of "a name, not a policy number" has some unusual advantages. A complete profile of any member's policies and other data can be flashed on any of 275 visual display terminals, both at the San Antonio home office and at five regional service offices around the country. Much of this data can be updated online, with the rest processed overnight.

And the transactions are copious. They include a daily average of 36,000 automobile data entry transactions, 24,000 policyholder online updates, 80,000 general inquiries, plus 5,000 hard copy batch document requests.

Data entry procedures, both for written forms and terminal display, are sequenced so that what appears on the terminal screen parallels the information on source documents. Compared with previous methods, this new online data entry system has reduced required keying time by 30% and operator training time by 60%. The transactions are edited as they are entered, thereby reducing the number of errors coming into batch processing by over 30%.

"Probably the best way to measure the cost effectiveness of our data processing operation is to compare the USAA underwriting expense ratio with the rest of the insurance industry," says Col. Martin Fishel, senior vice president, computer services. "Each year, USAA reports one of the lowest expense ratios in the industry. Our computer systems are a major factor in keeping these expenses down."

Multiprocessing...

(Continued from preceding page)

ability, he adds. Most of this work is unscheduled: engineers simply enter linear programs or other large-scale calculating jobs at will, via remote terminals in 22 locations.

This variability of demand was an important factor in the choice of a multiprocessing system. The UOP system solves difficult scheduling problems in sufficient time to avoid conflicts, eliminating most manual scheduling.

Engineers at Des Plaines use IBM's Time Sharing Option (TSO), which permits them to interact directly with the computer, completing their solutions while seated at visual display terminals. TSO also enables engineers to validate input data before initiating computer runs—preventing costly reruns and shortening turnaround time.

The data processing department itself uses TSO to enter and test programs under development. In this application, Bloch asserts, TSO has increased programmer productivity by 62%.

Bloch says, "the multiprocessing system has been remarkably flexible, absorbing wide fluctuations in volume. It's given us excellent availability while responding well to our increasing demand for interactive computing."

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

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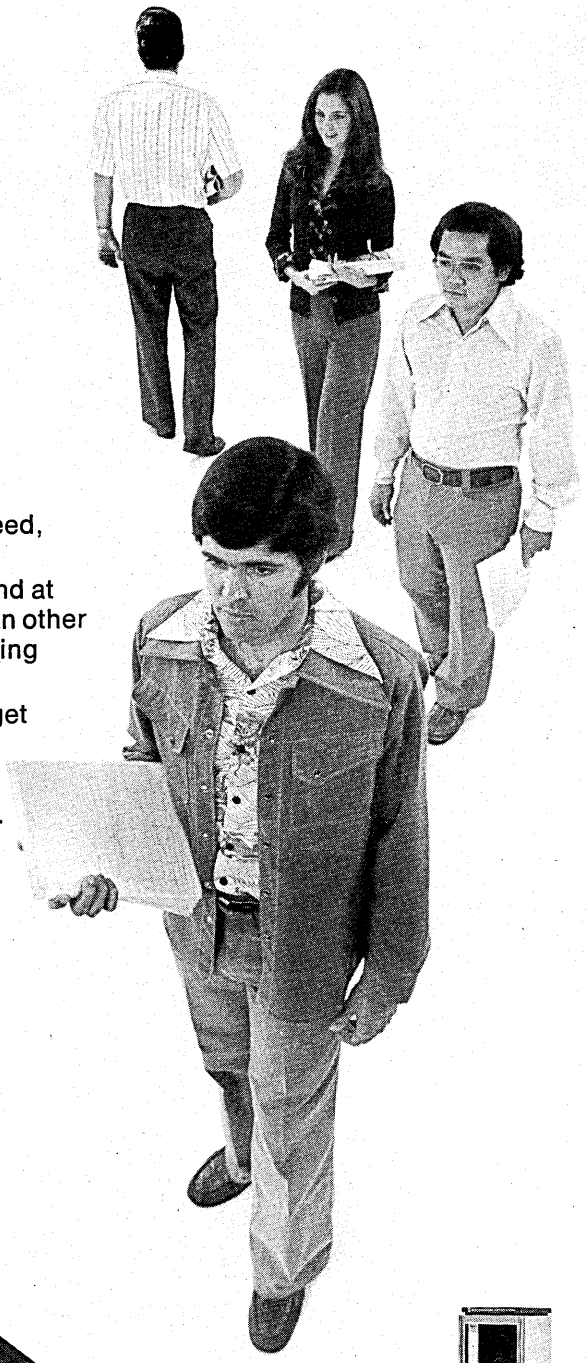

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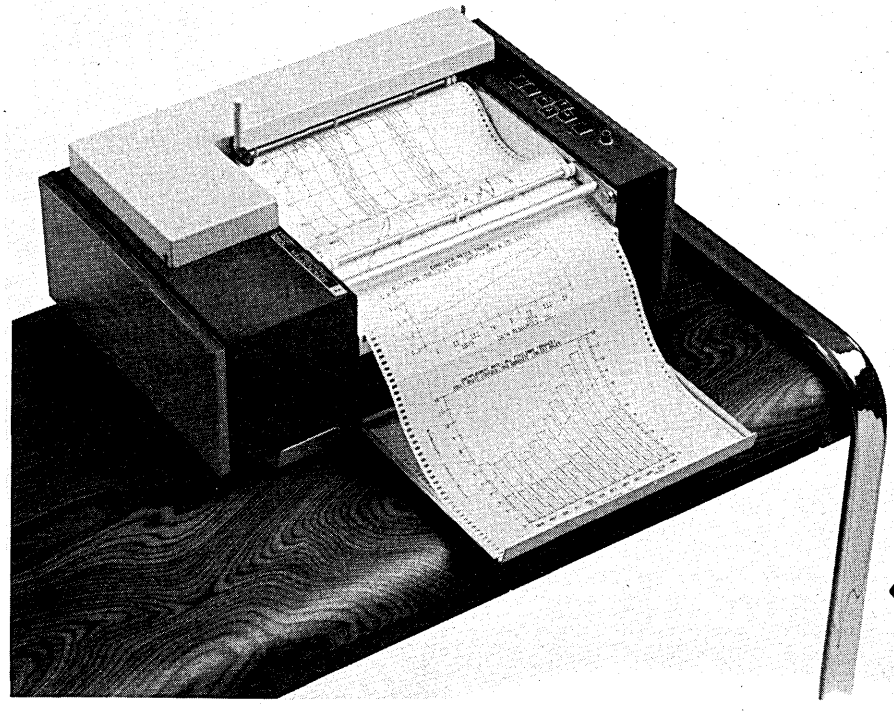

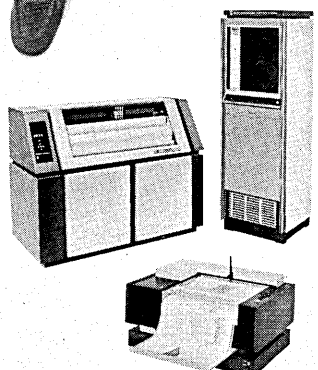

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Editor's Readout

W. David Gardner, Industry Editor

From Here to Eternity

IBM vs. Justice

In June of 1975 a most extraordinary event took place in Washington: The manager of a large federal governmental agency went before a U.S. Senate subcommittee and urged the senators not to give his agency more money.

The manager was Assistant Attorney General Thomas E. Kauper, the head of the Justice Department's Antitrust Division. "In my view," said Kauper, "to try to triple the size of the Division over a two or three year period would create severe managerial problems."

The Senate body was considering a proposal that would increase funds available for the antitrust division to $45 million in 1978; for a mind-boggling comparison consider for a moment the unlikely spectacle of the Joint Chiefs of Staff going before the Senate to speak out against an offer of more funds for the Defense Department. Small wonder, then, that Kauper's comments served to demolish any thoughts that the Ford Administration might become aggressive about antitrust.

Now, $45 million may seem like a great deal of money. But, in the context of other Kauper statements—"the price tag for ineffective competition could run as high as $80 billion a year"—the $45 million begins to look like pocket money. Moreover, at that time the U.S. economy was being ravished by runaway inflation. And, of particular importance to the computer community, the Antitrust Division had just begun the trial of its largest action ever—the IBM case.

During the early days of the case, IBM assembled a high-priced legal armada—led by the prestigious New York law firm of Cravath, Swaine and Moore—and it was trained in a series of legal skirmishes including the Control Data, Greyhound, and Telex cases. Thus, the IBM team entered the government case as battle-hardened veterans, its attorneys educated in the complexities of the computer industry and its paralegal support teams also well-trained. They quickly took the initiative and began to control the pace of the action.

Viewed from the outside, the Justice Dept.'s approach to the case sometimes seems confusing. In the early days of the Nixon Administration, the case went nowhere at all—an expected direction perhaps given that administration's lack of antitrust zeal, which was even less than that of the current administration.

There were hints of confusion even before the trial got underway. The Justice Dept. was caught in a massive document snafu and was compelled to ask for a delay in the start of the trial. An unnamed copying service was cited as the problem area. But what wasn't generally known was that the unnamed copying service was Xerox and the feeling was that if the government couldn't handle its copying requirements with the assistance of Xerox, which is synonymous with copying, then there might be serious administrative troubles in the government effort.

The lack of proper preparation and sufficient staffing during the early days of the IBM case appears to have taken its toll. The government action, for instance, bypasses the whole patent issue and the question of how IBM, which lagged behind in the early developmental days of the industry, acquired rights to many key patents. In view of litigation in private cases in which IBM has been charged with antitrust violations in its acquisitions of both early computing and core memory patents, those issues might well have been examined in the government action. (IBM denies any wrongdoing in the patent area, as well as all charges in the government case.)

Another omission by the government in the view of many close to the case is that the government has elected to call no users as witnesses while IBM has decided to call scores of users—presumably happy ones. From this, one might draw the conclusion that there is no such thing as an unhappy user of IBM equipment. One need look no further than users who converted from old IBM equipment to the 360 line for a reservoir of disgruntled customers.

A glaring omission: The government chose to spend just two days taking the deposition of Thomas J. Watson Jr. One can understand the reluctance of the Justice Dept. to put a man like Watson, who has had such a distinguished business career, through the ordeal of a lengthy and difficult deposition. But IBM attorneys have certainly had no compunctions spending days grilling in deposition witnesses who have agreed to testify for the government. After all, IBM has been charged with violating the antitrust laws of the land and Watson was at the helm of IBM when the alleged violations occurred.

Still, the government team trying the case in Federal District Court in New

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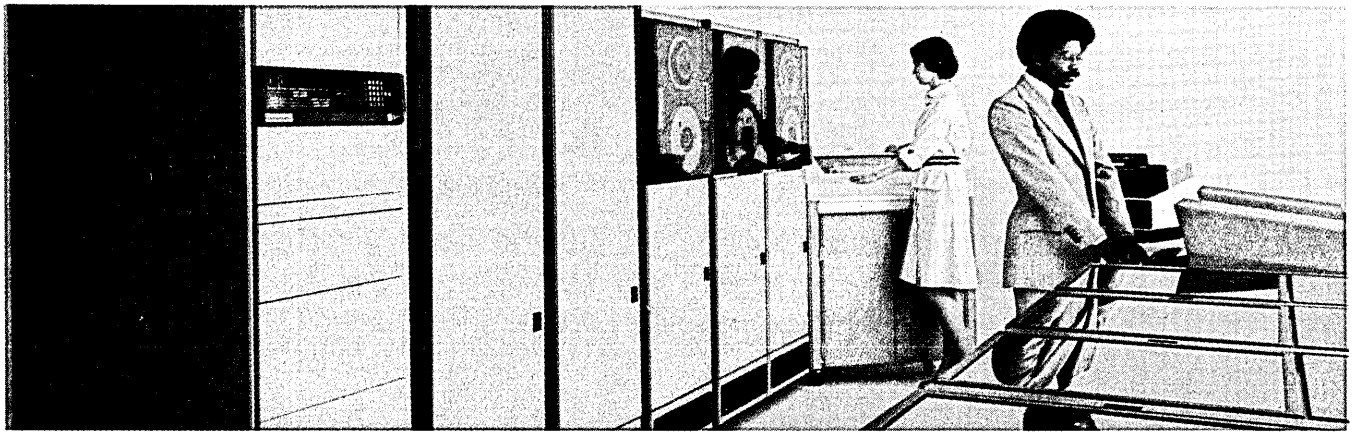

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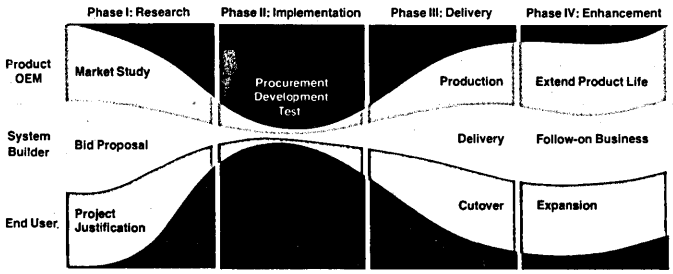

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From Here to Eternity

York is beginning to win the respect of more recent witnesses. Early witnesses in the case, often confused as to why they had been called to testify in the first place, came away privately complaining of the time they had to spend in giving elementary tutorials on computers to the government team. Now the government attorneys appear to have cleared that hurdle. Recent witnesses say the government team is honest, dedicated and works extremely long hours on the case. The government team, which has no sense for pyrotechnics and no instinct for the jugular, appears bent on establishing a court record. Now that the trial moves deeper into the so-called conduct phase and as the government team picks up experience, there is some feeling that the pace of the trial may quicken. Thus far, the case has been as exciting as a fly walking across a screen door.

It is widely believed that the government resources in the case are dwarfed by IBM's. Comparisons are difficult, because IBM doesn't discuss such things, but there are indications that pop up from time to time. In the settlement of the Control Data case—a lesser encounter than the government case—it was estimated several months before that case was scheduled to go to trial that CDC's litigation expenses were between $15 and $20 million. IBM has never given out a figure, but *Fortune* magazine, in a study in which it surveyed legal expenses of top U.S. corporations said IBM was believed to have spent more than $60 million in legal expenses on the CDC case. As for the government, it has spent less than $6 million to date on the IBM case.

It is to IBM's advantage that the case be protracted and indeed IBM's defense tactics tend to drag the case out. IBM normally has the government witnesses on the stand on cross examination longer than the government has them on direct. IBM has always insisted that it is expediting the case as best it can, but IBM's attorneys are not unaware that they have the power to drag the case out. Bruce Bromley, the senior Cravath Swaine attorney assigned to the IBM defense, once said that he could "take the simplest antitrust case . . . and protract it for the defense almost to infinity."

The investigatory stages of the current IBM case began in 1966 and, at the rate the case is currently progressing, it should be finally disposed of in the early or middle 1980s. Small wonder that an atmosphere of pessimistic resignation hangs about the case.

IBM's resources and the aggressiveness of its legal team enable the IBM effort to continue as the *de facto* prosecutor of the proceedings. Witnesses who agree to testify for the government find to their consternation that their future business plans and private customer lists are earmarked for introduction into the public record by IBM, which itself has been successful in protecting much of its own similar business information from introduction into the public record.

The legal maneuvering over the case's celebrated press gag order is also illustrative. In the pretrial stages of the case, when IBM decided it wanted press coverage of the case dampened, it pushed through a press gag order over the objections of the Justice Dept. Later, when IBM decided it wanted the gag order removed, that was done, once again over the objections of the Justice Dept.

An example of IBM's ability to generate press coverage favorable to its side was presented recently when IBM presented reporters with IBM's argument complaining about the Justice Dept. using FBI agents in the case. The press dutifully played up the issue, although FBI agents—employees of the Justice Dept., too—have traditionally worked on antitrust cases interviewing potential witnesses. We are not enamored with the idea of the FBI working in this manner—in fact these days it's hard to find anybody who likes the FBI at all—but where else can the Antitrust Division get the needed manpower, particularly when the head of the Antitrust Division begs off offers of financial help from Congress.

One cannot help but have the feeling that the real issues of the case have not been carefully or deeply probed yet and it is not our place here to pass judgment on the issues of the case. But it is fitting that IBM dominates the government case just as it dominates the industry.

Now, after 10 years into the case, pertinent words on it were spoken by Francis Biddle years ago who looked back on his days as Attorney General and said: "I have never been able to make up my mind as to just what attempts to enforce the antitrust laws have accomplished." ❋

Distributive Processing for Banking

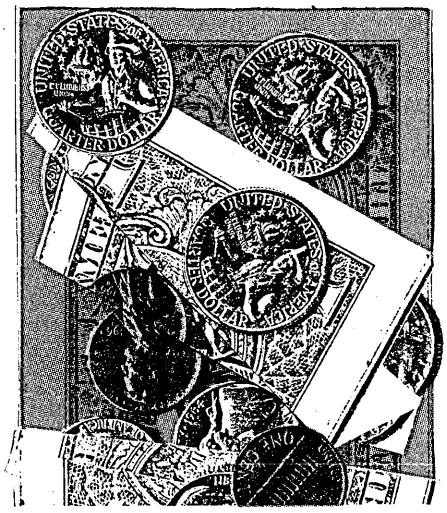
by John D. Foster

Clusters of minicomputers take on the jobs once done by large scale mainframes, and do them better. Systems design, application integration, and maintenance all become easier too. The field is wide open for change.

The Bank of America has developed an approach to distributive processing for making current information on more than 11 million accounts accessible through terminals in all its branch offices in California. The approach entails segmenting its data bases and distributing its application processing among minicomputer based processing modules, each with several computers. The term "distribut*ive*," defined as capable of being distributed, is appropriate to describe this configuration—rather than "distributed," which implies geographical distribution—since the data base segments and multi-cpu processing modules will actually be clustered.

The clusters will be in Bank of America's two data processing centers, one in San Francisco and the other in Los Angeles. There are more than 1,000 B of A branches throughout the state, and each center has been handling the processing for half of them—over three million transactions per day each. Presently, all the accounting entries from the branch offices are brought into the centers in the late afternoon by air and auto messenger. Files are updated and responses to inquiries generated in batch mode using large scale IBM mainframes—multiple IBM 370/168s and a 195 in each location. Printed output is returned to the offices early the following morning.

The inquiry network being established will obsolete this system of messengers. Video teller terminals will be connected through programmable control units in the offices to the dp centers over multidrop communication lines. The full network will include some 6,000 terminals and more than 1,000 controllers, divided roughly equally between the two centers (and the centers, in turn, will be able to communicate with each other).



We see a vast movement to small, cost effective, distributive and distributed systems for network processing.

The initial traffic for savings and checking accounts alone is anticipated to be in the range of 25-50 inquiries/second for each data center. It will be possible to support that workload using 2400bps leased lines and connecting an average of 10 branches per line; 18 such lines can then be terminated in a single processing module.

Three such processing modules could handle the inquiry traffic for half the state. However, other applications will also be supported, including the capture of data for new accounts, record changes, etc., for batch processing on the larger computers. (These applications will be supported by the initial configuration. Later, BankAmericard credit inquiries and loan processing could be added, among other tasks now being handled by the 370s.) Since each module is dedicated to processing a specific kind of application, additional applications mean additional modules; the centers will start with five to eight, but more can easily be incorporated as applications are switched over.

The communications lines from a set of offices terminate in a processing module in which their data is resident. Standard communications protocol (SLDC) and a standard message format facilitate message handling. The modules are linked through standard communications interfaces, thus readily enabling information exchanges among the terminals and specialized

modules. Further, software in pertinent modules will interface with external networks (SWIFT, Bankwire, Fedwire, etc.) and convert messages accordingly.

Modules within modules

The basic requirements which dictated the system design were: (1) reliability, (2) throughput, (3) ease of maintenance for hardware and software, (4) the ability to accommodate geographic dispersion, and (5) the ability to respond to 95% of all inquiries in less than six seconds.

The Basic Processing Module diagram (Fig. 1) illustrates the configuration designed to handle those requirements. Note there is no hierarchy, no master-slave relationship. The module data base is resident on at least four spindles of disc. This spread provides potentially greater accessibility to the data since four concurrent accesses (from four cpu's) are theoretically possible. Sufficient storage is provided to allow two generations of the module's data to be resident, plus backup copies of programs, tables, etc.

Each File Management Transaction Processor has direct access to the entire module data base. Provision is made to preclude concurrent update of a single record by both processors. The file processors contain only that system software needed to load, retrieve, and update the module data base and communicate with the Message Handling Processors, plus application software to process inquiries. Security and access authorization are shared between system and application software. The file processors communicate with the message processors over dual high speed communications lines.

The message processors route inquiries and responses to their logical destination; to their associated file processor if the required data/account is resident in that module, to another module where the required data/account is resident, or to the unit/terminal originating the inquiry/message. Also, all messages passing through a message processor are recorded on its associated logging device.

Duplication of module processors increases reliability. With all processors in a module aware of the other's status, if one file processor goes down the other automatically assumes the full workload. Similarly, if one message processor should go down, the other will assume the communications load automatically via switching or bridging of the external communications lines into that module. Failure of one component in a module cannot bring down the entire module or cause failure of service to the network of users. In the case of a disc problem, service may be degraded, however.

One half-module can handle the anticipated minimum peak load of eight inquiries/second. This design permits deliberate shutdown of half a module without interrupting service to the community of users. Thus while one half-module is responding to inquiries against "today's" data base, "tomorrow's" data can be loaded into another area of the data base by the other half. Upon completion of the load process, inquiry processing can be switched to the new data. In a similar fashion a disc failure can be corrected by one half-module while the other half continues inquiry processing against the remainder of the data base.

The Two Center Logical Concept diagram (Fig. 2) illustrates two clusters of modules with communications capability between the two centers. User terminal communications emanate from each module as above. This diagram also illustrates the capability of distributing application processing and data across modules depending on volume of activity and quantity of data. By the same token, a module can be dedicated to an application, or process more than one application.

The Network Operations Center shown in the figure is a module similar to the production modules. Additionally it has terminal and printer equipment with which the status of the network and its equipment can be monitored. Processor initialization and operation (inquiry, load, unload, recovery), as well as software maintenance and distribution are managed centrally for each installation by the network operations.

Specialized modules from any vendor may be added to the network facilities as required, provided they meet module interface specifications.

Specialized skills problem

Development and implementation of B of A's distributive processing

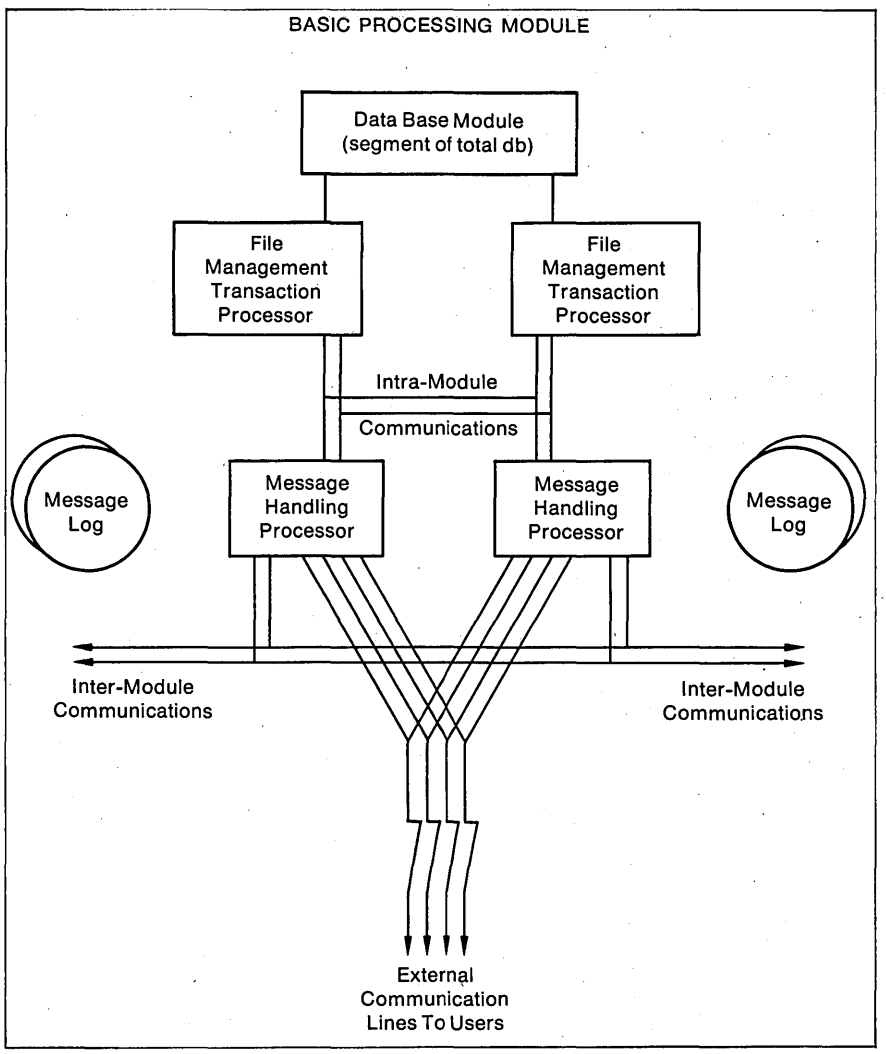


Fig. 1. There are four minicomputers in each module of the computer configuration (and between five and eight modules per site). Two of the minis in each module are for file management, and two for message handling. Presently, four General Automation 16/440s are used, backed up by four CalComp dual-spindle, 50MB discs to handle the data base segment; later, 80MB discs are expected to replace the earlier models.

In case of processor failure, maintenance, or even data base updates, one half of a module (two processors) can handle the expected load without seriously degrading response times. Disc failures are more of a problem, and do lead to slower service.

project is being carried out by a vendor and two bank teams. The vendor's team is producing and assembling hardware modules and system software. System software is modified standard software and some highly modular custom software. It performs simple operating system, file management system, and general communications functions.

The transfer of specialized skills is difficult.

The first bank team is responsible for all system software and maintenance of software acquired from the vendor. It is also developing specialized communications software, system/network standards, and network operations center software.

The second bank team is responsible for developing initial application software, its implementation in processing modules and interface with other applications in the network.

The hardware is now being installed in San Francisco and Los Angeles. By early next year, parts of the system will be in operation, and all branches should be on-line by late '77.

Practical management and staff utilization problems arose due to differing skills needed for large single computer systems and small computer network based architectures. The transfer of specialized skills is difficult. Implementation would have been easier and faster if a small interdisciplinary staff, familiar with communications and small scale systems, had been available from the onset.

The network approach has the advantage of facilitating evolutionary development and orderly system growth. But careful planning is needed! As experience is gained, new techniques and technologies developed, applications will be converted from inquiry with memo update to full on-line posting. New applications will be converted from batch to on-line processing. Integration of applications will be simpler in the network environment.

The mini-based systems are initially being set up at existing data centers for reasons of accessibility to the batch processing system, for ease of management while gaining experience, and because almost half of the checking account activity does not originate in our community offices (including checks cashed in stores and/or deposited in other banks). Initial application will call for a daily load of the data base from tape files extracted from our batch system master files during update each night.

However, B of A's business is naturally distributed throughout California, many United States locations, and worldwide. At some future time modules may be geographically distributed in the region they serve. This would reduce communications costs, reduce queuing and response times during peak activity, and truly fulfill the promise of distributed processing.

We see a tremendous potential for the concept. With performance increasing as it is in processor and secondary storage technology, and with cost per unit of measure dropping, the field is wide open for new ideas and for developing more efficient and effective ways of doing business. We see a vast movement to small, cost effective, distributive and distributed systems of network processing. The successful ones will adhere to basic system concepts, integrity of design, and retain that element of simplicity which guarantees success. ❋

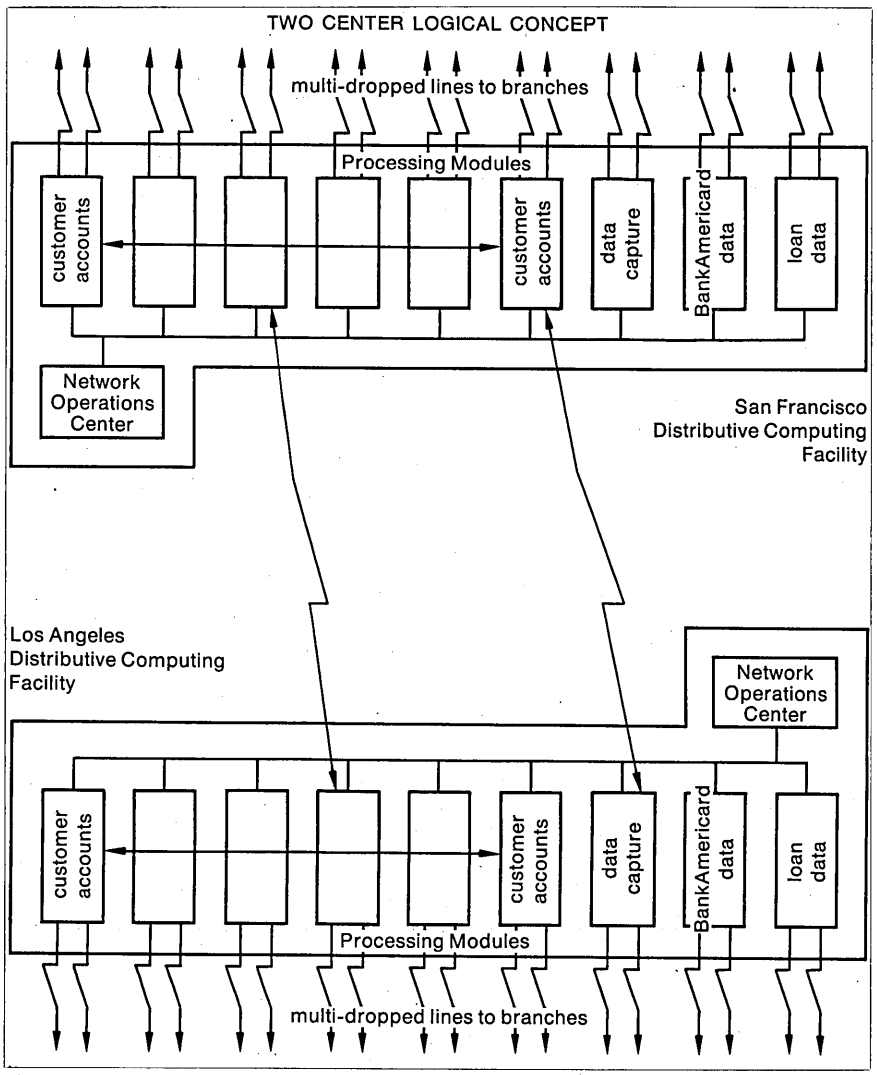


Fig. 2. The two California centers will start with 5-8 modules (each of which has four minicomputers and four dual-spindle discs as shown in Fig. 1). More modules will be added as applications such as inquiries for loans or for BankAmericard accounts are brought up. For simplicity, modules handle only one generic kind of application. Inquiries into savings or checking accounts are considered the same kind of application and handled within the same module. Similarly, inquiries into time plan loans or real estate loans might be handled by a single module.

Mr. Foster has been with Bank of America for over 29 years, and in computer systems since its inception in the bank in 1955. His experience includes application research, design, and development. Most recently he has been a member of a small advanced systems/development group which is responsible for developing new concepts for use in the bank environment.

Europe Claims the Lead in Banking

by Nancy Foy, European Editor, and William Helgason, European Editorial Advisor

European banks have more branches, more on-line teller terminals, do more networked data communications, and offer more services.

Walk into the old headquarters building of a major French bank. Three stories below the soaring stained-glass ceiling are mahogany counters. Customers of sufficient worth once were escorted up the red-carpeted "escalier d'honneur" with its golden mosaics to discuss their affairs in the paneled private offices upstairs. Today a merger has moved the headquarters, and the building is slowly filling with computer equipment and people. IBM dominates the banking scene here.

Or take a double-decker bus through "The City" of London, past the blank baroque Bank of England, through a square mile notable for buildings representing every major bank of the world competing architecturally as well as financially. Outside "The City," any neighborhood shows the difference between banking here and in America. The average block has a greengrocer, a butcher, a chemist, a pub, a betting shop—and probably two bank branches. Every branch is likely to have a terminal in the back office. This is Burroughs TC-500 country, with over 12,000 of the units ordered or installed.

Then drop into Stockholm, where a two-block walk reveals half a dozen downtown banks, all modern, with 5-10 teller terminals apiece. Philips claims 6,000 on order or installed in Sweden. Just across the Baltic in Helsinki, half the neon signs and what seem like half the major buildings cry out in two languages the names of big banks, all on-line of course, mainly to Honeywell systems.

Just as banking differs from other industries, so European banking differs from American banking. These differences are growing more important to Americans because where American banking is going, in many instances, European banking has already been.

In addition, the trend toward Electronic Funds Transfer Systems (EFTS) in the U.S. and the related development of the Society for Worldwide Interbank Financial Telecommunication (SWIFT) based in Brussels make the links from the U.S. to Europe much stronger and more immediate than ever before. (See Fig. 1, page 58.)

EFTS is just one factor accelerating change in the structure of American banking and in the use of computers in banking. Behavior patterns and legal changes are as important as technology here. Thus the old ways in American banks will give way, but new patterns are still unclear. It is important to learn as much as possible from European models. European banks have had more branches, more terminals, and larger data bases, and have offered more services longer.

Banks have so many branches that just painting the front doors of all of them might take 4,000 man-days. Making a change in the operation of terminals or in a computer system becomes an awesome problem.

The consumer viewpoint

They don't give away clock radios when you open a new bank account in Europe. In some places, in fact, it's rather difficult to open an account. You're interviewed as if you were trying to join an exclusive club. One reason for this is the built-in overdraft, which is almost an automatic courtesy for those who have established their credit-worthiness. The accepted limit of the overdraft is negotiated and monitored rather delicately, on a personal basis, hence the interview.

The reason for having a bank branch in every block is that much less banking is done by mail. Customers usually go to the bank to get checkbooks, make deposits or make withdrawals, although all three can be done by mail. Contributing to this is the fact that the European shop or market, unlike the Great American Supermarket, is unlikely to cash a check for much more than the amount of purchase.

On the other hand, the European cashing a check in a bank branch or in a store needs no driver's license to do so. He uses instead his Euro-check card, which has his signature and the Europe-wide Euro-check symbol.

The wide acceptance of the check guarantee card partly explains why credit-checking systems have not caught on in Europe.

Pieces of the system

The basic skeleton of the banking system is fairly similar from one country to another in Europe. There is always a government owned and controlled central bank much like the Federal Reserve Bank System in the U.S. In Germany it's the Bundesbank; in France, the Banque de France. Then there's the Bank of England, known colloquially as "The Old Lady of Threadneedle Street." These banks formally or behind the scenes regulate the flow of money in and out of the country, and play a fairly substantial role in setting fiscal policy.

Then there are the "merchant banks" that mainly serve industry and commerce with capital and banking services. These play the role that venture capital firms and a less conservative stock market play in the U.S.

The most visible banking manifestation in each country is the network of commercial banks that serve most individuals and smaller businesses. Huge and long-established, these are generally the portion of the banking system we are talking about when we refer to "European banks."

Every year *Fortune* magazine lists the top 50 banks outside of the U.S. (The world's three largest banks are U.S. firms—Bank of America, Citibank, and Chase Manhattan. The next seven largest are outside of the U.S.) Heading the 1975 list of foreign banks (1976 figures are not yet released) is the Banque Nationale de Paris, with assets over $38 billion and 54,000 employees. Of more interest to dp, BNP has 2,242 linked branches. Three other French banks are on the list: Credit Lyonnais (2,467 branches), Societe Generale (2,594), and Compagnie Financiere de Suez (1,468).

Barclays Bank in Britain, though third ranking in assets, leads the world in branches, with 5,015, followed (in Britain) by National Westminster (3,589), Midland (3,418), Lloyds (2,910), and Standard & Chartered (1,616)—for a total of about 15,000 branches among Britain's "Big Five."

Other multi-branched banks include Germany's Deutsche Bank with 1,269, and the Dutch Rabobank, which has "only" about $15 billion in assets but a whopping 3,155 branches.

Banks in smaller countries have less chance to make it onto *Fortune*'s assets-oriented list, but they are no less progressive and also have large numbers of branches. Sweden's largest bank, for example Skandinaviska-Enskilda, has placed orders for about 1,200 Nixdorf terminals. Svenska Handelsbanken, second largest, has almost finished installing Philips' teller terminals in its 1,100 branches.

Operations on this scale are almost unknown in America. Also part of the European system are the Agricultural banks, which serve their special customers very much as do the small private banks in farming communities in the U.S. Midwest.

Most European countries operate their own "post-bank" or "Giro" systems, serving small depositors through their local post offices. The Giro often handles central clearing functions as well, similar to the U.S. clearing houses, but offering other services too.

Then there are mortgage-oriented institutions like the U.S.'s savings and loans. Unlike S&Ls, which tend to be single-branch operations or to have only a few branches, the "Building Societies" in a country like Britain tend to compete nationwide. Though slower than the commercial banks to add terminals, they are under the same pressures to cut costs by holding down employment levels, and have become a major market for computer system vendors.

Going on-line

The banking industry, particularly in Europe, differs from others in the size of its investment in computers. Barclays, for example, has at least $150 million worth of computers and terminals, all purchased. (Most banks purchase rather than leasing or renting.) These tend to be replaced on a rolling five-year basis. That scale of business indicates why a company like IBM or Burroughs is willing to invest an entire branch to servicing a single customer like Barclays. It also helps explain why bargain-basement prices do not attract as much attention as

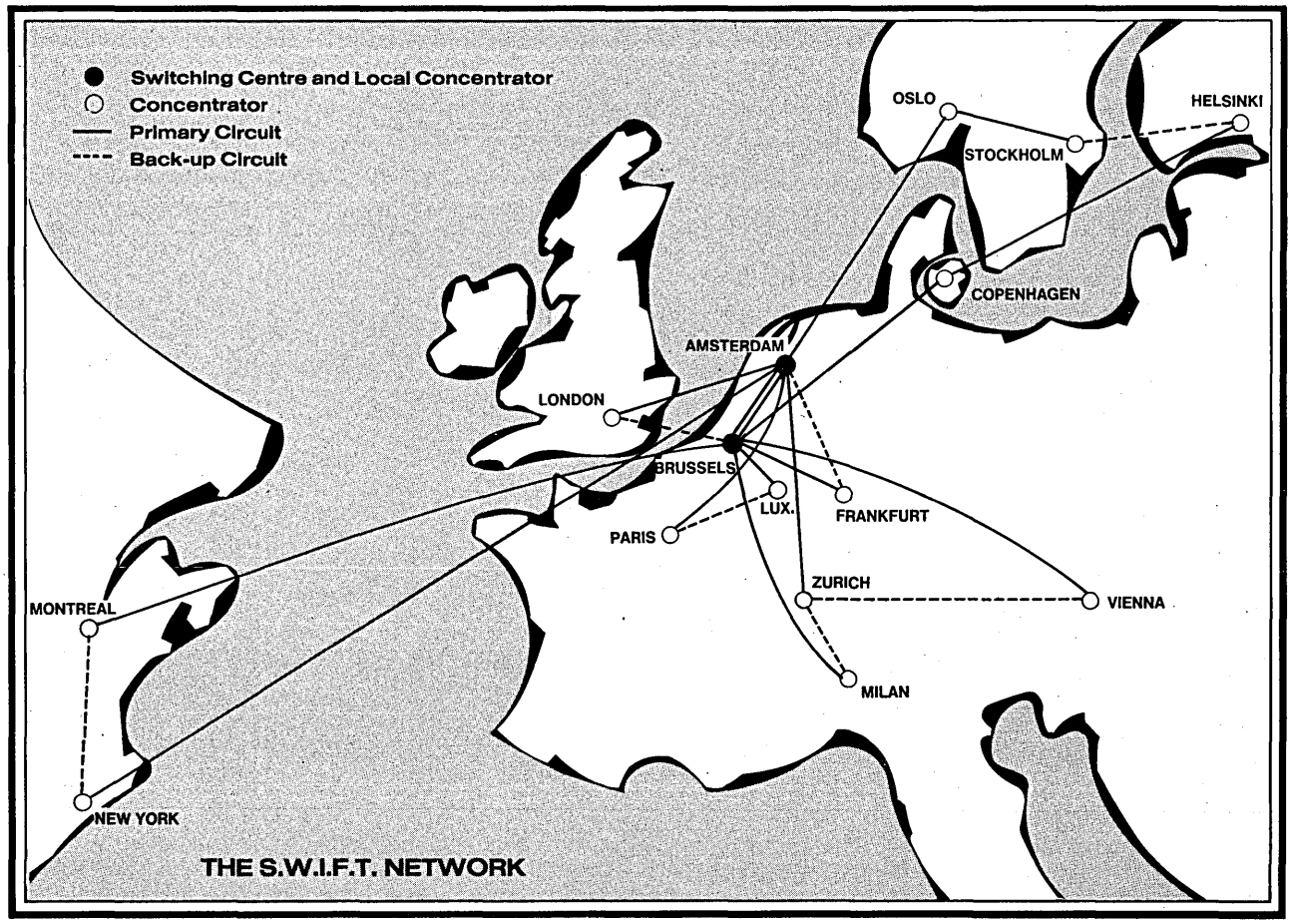


Fig. 1. SWIFT (Society for Worldwide Interbank Financial Telecommunication) is an association of European and American banks which is chartered to develop a data communications network for electronic funds transfer. The number of member banks is presently approaching 400, some 40-plus of which are U.S. institutions.

Problems with software have delayed the operation of the network; it is expected to begin carrying its first real traffic October 29. By the end of next year, it is anticipated that the network volume will be approximately 300,000 messages per day.

Major switching centers in Brussels and Amsterdam will have dual Burroughs B3700 computers with dual B774 communications front-ends. National concentrators in other major cities will have B775 processors. Member banks may eventually connect their mainframes directly to the SWIFT network, but most will initially connect through standalone node processors.

equipment with all the bells, lights, and whistles.

When European banks began to go on-line in the late '60s, the back office was the main focus in Britain. Burroughs and IBM competed fiercely here; after a dual B8500 was thrown out at Barclays, IBM gained the edge in mainframes, but the Burroughs TC-500 terminals invaded at least 12,000 of the country's branches.

Many banks are beginning to automate not only the paper-handling "back office," and the cash-handling "front office," but also the "floor." The floor is the space where you come in the door; today it is likely to contain a computerized cash dispenser to save the trouble of standing in line to cash a check.

In countries like Sweden there is less distinction or status barrier between back office and front office, but more emphasis on the teller having her own comfortable alcove. Thus IBM dominates the mainframe business (except in Finland where Honeywell has a well-entrenched distributor), but European companies like Philips and Nixdorf, with flexible and ergonomic teller terminals, have gained the lead in terminals. Many of the older back office terminals in Britain are about ready for replacement, and a trend toward teller terminals may be beginning in the huge U.K. market as well.

Another trend has been to the interbank network, between banks in a single country or between members of a single banking "family." Thus SWIFT is a natural development from networks like the three-bank Norwegian IDA network.

Wider spectrum of services

In addition to being more branch oriented and more international, European banks traditionally offer a wider range of services. These include: promissory notes, standing orders for automatic payment of fixed expenses, automatic payment of variable expenses, and direct debit and credit of payroll.

This range of services stems in part from a fundamental difference in how people do business. For instance, instead of sending merchandise and an invoice when he receiyes a purchase order, the European manufacturer tends to demand a promissory note along with the order. This he cashes at his own bank (say, for 94% of its face value for a 90 day note), which in turn hands it on to the customer's bank.

The European has more choices of services even at the checking account level. One is the "standing order" for paying regular fixed expenses such as school fees, union dues, or tv rental. Like the promissory notes, this service costs the customer nothing, and the bank saves on handling costs. Another is automatic payment of varying bills for specified services such as for electricity or phone bills; the bank simply notifies the depositor of the amount paid.

Another efficiency is the trend to stop a check (at least of small denomination) at the first bank it reaches. This is already done in Belgium and Sweden, and is under discussion elsewhere. In the U.K. the customer seldom gets his checks unless he asks for them specifically. Instead, statements include check numbers and other data for easy reconciliation. This change alone can eliminate nine-tenths of the paperwork at clearing houses. Further savings for banks will come as they shift from regular monthly or even weekly statements to quarterly or on-demand statements, making current account information available at branches through on-line terminals. Paper is expensive, as well as people, so savings are obvious here.

Crossing boundaries

The effect of national boundaries and currency controls is changing in Europe, and the U.S. has EFTS beginning to erode traditional one-state banking limits. Thus worldwide the trends to multi-branch on-line operation, more sophisticated computer usage, and greater interconnection between banks will continue.

The battle for terminal business between IBM, Burroughs, and vendors of smaller and more flexible equipment is also warming up, with high stakes and new opportunities for all contenders. Banks are still consolidating to achieve efficiency, and may do so more rapidly in the U.S. now, with larger networks the inevitable result.

SWIFT carries interbank linkages to their ultimate computerized conclusion. This is not just a big network, as Americans have tended to view it, but something that transcends all the national boundaries, cultures and differences, linking banks more closely not just within Europe but worldwide. By the end of 1977, an uncle in Amsterdam will be able to send $50 to his nephew in Iowa for receipt the same day. When that happens, the relatives in Iowa will want similar services.

Americans can learn a great deal from European banking experience. Europeans have already survived amalgamation, back office terminals, and now on-line tellers. One of the most important lessons is not technical but organizational—how to manage multi-branch operations on this scale. As a very simple example, consider that just painting all the front doors of all branch offices in a major European bank may require a planning operation involving 4,000 working days for painters. On this scale, contemplating changes in accounting and budgeting systems is awesome.

The bank is one of the most centralized types of organization imaginable because it must present the same face to the customer wherever he goes. Thus in many banks, hiring and training are completely centralized, even though there may be as many as 90,000 employees. The personnel director in one bank, for example, oversees about 2,000 employees directly, and another 35,000 in the branches. Introducing a new computer system, or even a change in terminal operation, is a significant training problem for him, and involves a major training budget.

Conclusion

The Europeans have learned to work with these large scale problems, and some of what's been learned may be transferable. But it works the other way too. One European banker points to an American example that could be useful to Europeans with organizational problems. One San Diego bank succeeded in applying budget and control methods developed for the manufacturing industry to its own business. It set out its services and products, each with its own price, profit, and cost figures. Thus it could decide how much each branch would "sell" of each "product," and generate a sales target. The sales target, in turn, could be translated into budgeted cost figures per branch and used to monitor progress. This made each branch or area manager head of a profit center.

The moral of the story is simple. As banks are getting bigger, the banking world is getting smaller. Each side will have a lot to learn from the other. ✻

Since 1972 Mr. Helgason has been an independent dp consultant. His clients have included some of Europe's largest organizations such as Unilever and Banque Nationale de Paris. For two years he was an associate director of the Diebold Research program—Europe, and at one time he was manager of dp and systems for T. I. Case Company's Clauson Works.

Among his other activities he finds time to act as a Datamation editorial advisor.

Centralization or Decentralization in Banking?

A participant in the recent INSIG 5th International Congress on "Computers in Banking" may well have returned from Paris somewhat confused. How could Citibank's R. J. Matteis and Barry Young sensationally present their decentralization of head office dp into 80-odd mini-based market sectors when Lloyds' G. B. Hague had just convinced everyone of the wisdom of that bank's centralization later this year into one mammoth dp facility? How can they both be right? And how could the directors of 10 major banks present as many different answers as they did to the question posed by the conference's theme: "Centralization or Decentralization in Banking?"

One reason for the different "answers" is that the theme was not very precise and was not meant to be. It left room for all the individual premises and considerations upon which each bank must settle the issue for itself.

Size of bank, size of market area, customer population density, branch office structure, market traditions, competitive situation, management philosophy are some of the key considerations when a bank decides how to structure its dp organization. Other subissues pertain, too, including: Where to put the processing, where the input, the output? Where is the decision making on banking matters—or on dp policy matters?

It is little wonder that each participant became somewhat confused as each speaker delivered his own and sometimes distinctly different viewpoint.

In spite of the lack of clear answers, now is the time to consider the problem, not only because of the clear trend elsewhere toward distributed or dispersed data processing, but equally because of the trend away from the prestige oriented, glass walled digit-temple. Today banking clout is manifested not in the dp center showcase but, more meaningfully, in teller terminals, customers' electronic identification pads, automated financial convenience centers, and customer bank communication terminals.

Yes, but sometimes no

Though "answers" could not be found, some tentative courses of action could be deduced. For instance, it may be argued that it is reasonable to:

- centralize the processing power to obtain economy of scale, ease of coordination, tightness of control and security.

- decentralize input, limiting errors and putting error correction where it belongs
- centralize systems development and programming to improve efficiency and create a professional "climate"
- decentralize output to place information squarely in the hands of the user (and most users are of course "decentralized")
- centralize file organization for customer-centered marketing
- decentralize decision-making based on dp output through terminals
- centralize the host computer for efficiency of the terminal network
- decentralize intelligence into terminals and branch controllers for local checking, preprocessing, and fail-soft backup

To consider these points, INSIG had succeeded in drafting a pretty formidable roster of speakers and session chairmen among banking's computing elite.

White Citibank is cutting its dp work into 80-plus segments, Lloyds is centralizing in one massive facility. Can they both be right?

The INSIG congress is overwhelmingly a European affair with French predominance. Only a handful of U.S. banks and a few banks from North African nations supplied the non-European participation. France had 47 banks and the rest of Europe 64 banks represented in the audience. The list of computer and terminal vendors numbered 13, right from IBM to TRW's Matra and Datasaab's Schlumberger.

Some typical comments highlight the sessions and discussions:

Wachovia's David Cotterhill: "For us, centralization is working . . . and working well."

Citibank's Barry Young, charged with the decentralizing of his own centralized head office dp function: "If I eliminate my own job I am out. If I don't I am out. So I shall succeed."

Skandinaviska Enskilda's Kjell Hagelberg: "20-25% more staff would be needed today if it were not for computers, terminals, etc."

Lloyd's Hague: ". . . the greater the number of links in a chain . . . the greater the risk of interruptions," and ". . . there is (around the world) a tendency to re-think some of the decentralized moves . . . evident in the past few years."

Den Danske Bank's K. Elboth: ". . . a highly centralized scheme is . . . more easily practiced . . . in a small bank operating in a small country."

Commerzbank's Wolfgang Starke: ". . . a constant need to re-examine the centralized dp organization, whether new technology, price changes in hardware, software or transmission, changes in payment transfer habits or in security demands make another type of organization more effective."

Kredietbank's Ferdinand Van Assche: ". . . telecommunication has allowed for the reconciliation of centralization and decentralization at the administrative level."

INSIG's Patrice Daudier deCassini summed it all up in true Einsteinian style: "We should not forget that centralization and decentralization are relative terms. A large, nationwide bank considering itself decentralized may well have far more centralization than a small, regional but centralized bank.

—Flemming J. Jensen

Mr. Jensen is a Danish citizen, managing director of The Copenhagen Group (a consulting firm with a wide variety of specialties), and one of Datamation's European contributing editors.

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By Kenneth Sholes, Vice President
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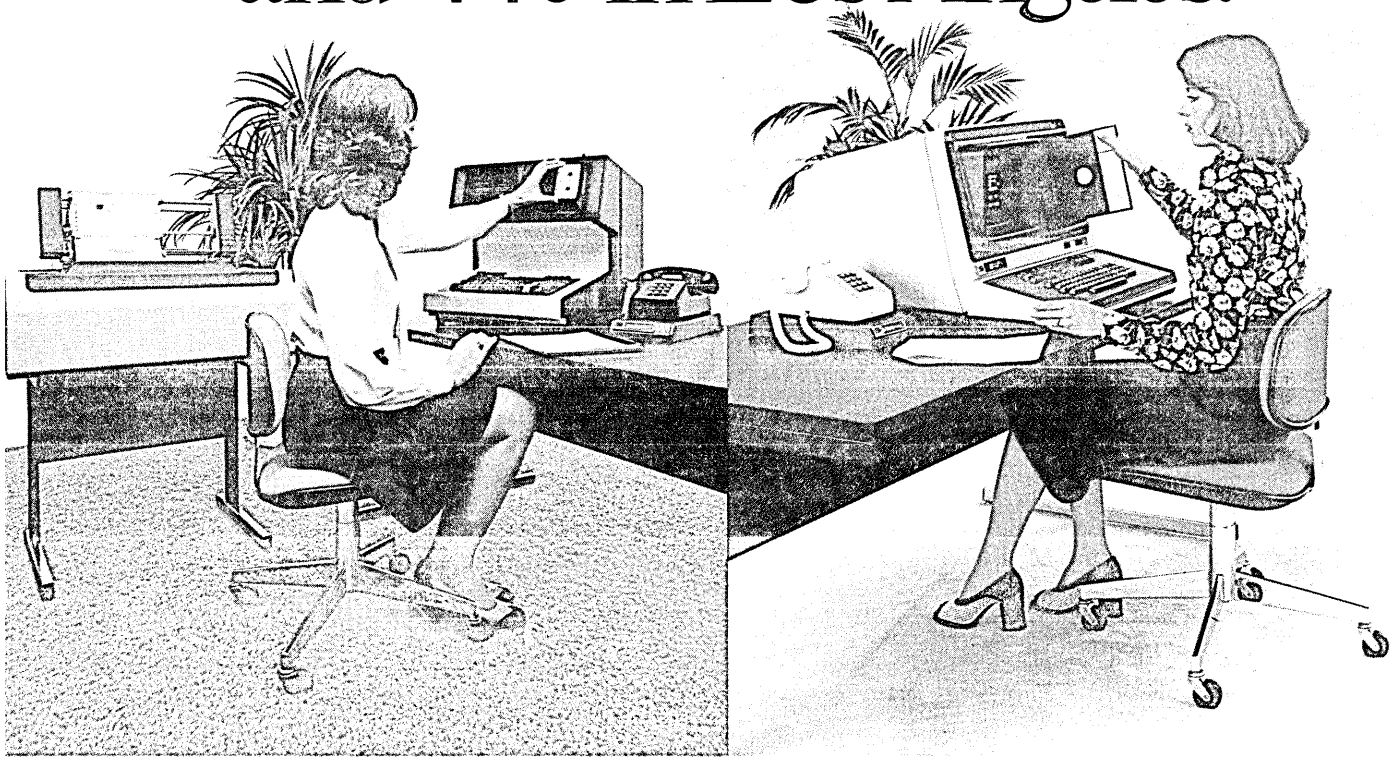

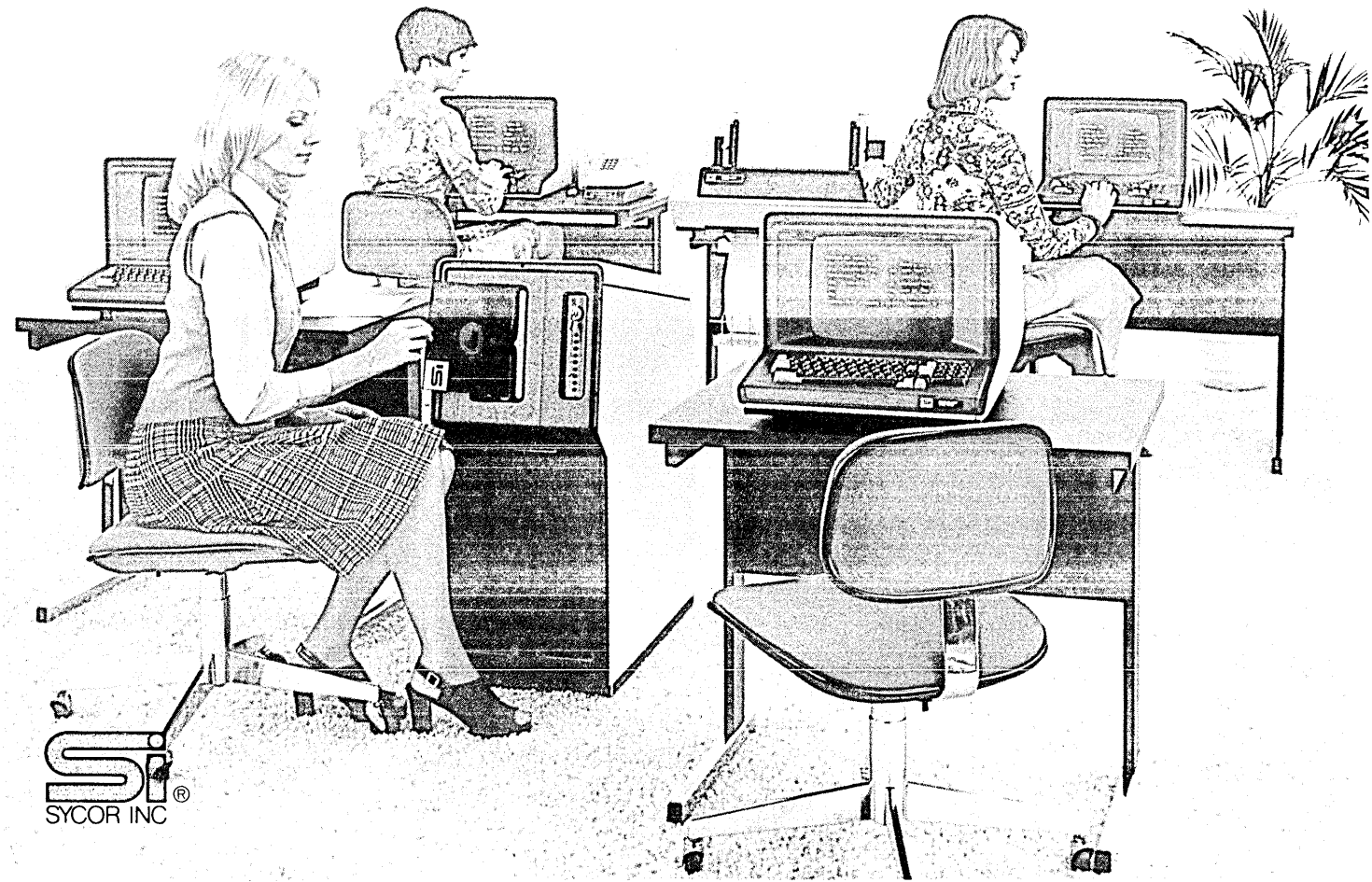

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CIRCLE 24 ON READER CARD

Fitting In That Extra Workload

by Joe M. Wiley

The systems analyst's bag of tricks should include at least simplified versions of time study and work sampling techniques. They pay off.

Nearly everyone has had some form of this experience: The boss calls you into his office to outline a new project for you. As he proceeds to describe the new task, unspoken thoughts go through your mind, such as "Oh, he can't be serious," followed by "Surely there is someone else that should have this project."

In my case these thoughts were followed by the feeble, hopeful question, "Isn't there someone that can make a reliable estimate from experience that will suffice?" The answer was, "Tom and I have worked out an estimate, which is that the new data entry load will be 220% of our present load. You have to confirm the accuracy of the 120% increase by an in-depth study." And so was born what I call "The Problem," determining what impact that new workload would have on our terminal network.

There are many tall tales about how big things are in Texas, and we do have a big heart for those who need help from others. Our organization, the Department of Public Welfare, has a budget of over $1 billion, and has nearly 14,000 employees. The computer operation presently may be small by some standards, but we will more than double its capacity in a few weeks with a second IBM 370/158. The installed machine has two million bytes of memory, thirty-six 3330 disc drives with 28 more on order, plus 22 mag tape units. There are 160 people in the computer operations group alone, plus some 200 more in programming and analysis sections. But closer to the heart of The Problem are the 225 terminals scattered throughout the State.

These terminals are used for two primary purposes. The first is data entry of applications for food stamps. The second, and larger use, is on-line retrieval of information on welfare cases, inquiries for case workers' questions on client status.

There are many welfare programs, such as programs for food stamps, Public Assistance, Medical Assistance, Social Services, and Child Neglect and Abuse. Of all the many programs, only applications for food stamps are presently being entered through remote terminals. This food stamp data entry process is interactive, with on-line error detection and correction. In contrast, all the other welfare programs use off-line, batch prepared and batch run applications. There are about 50 key-to-tape operators in the computer operations group for keying the field prepared applications.

Practically speaking, at the present level of evolution each welfare program has its own ISAM file; there are at least 16 major ones. There is a separate file for food stamps, another for Medical Services, a big one for several Public Assistance programs, a Federal-State Exchange file, and so on. There is no cross checking of these files except by manual means, and many welfare recipients are on several of the files.

Obviously, there is much disc space taken by redundant information, and no computerized cross checking if one person applies for assistance under different programs through different case workers at different offices. It is this situation that keeps many terminal operators busy performing on-line inquiries.

Any system designer worth his salt should have thought to himself, "Why haven't they merged all those files into just one data base?" That is what is now being done, and we are going a step further by changing over from batch to on-line input. And this leads to the problems of determining the new load on the terminals.

In such a situation, the number of new terminals needed cannot be determined unless one knows the capability of existing equipment for absorbing additional work. The assumption could have been made that the terminals and people were 100% utilized under the previous operations, but even a casual study showed this not to be our case. At today's costs of terminals, telephone lines, and operators, making an assumption of 100% utilization could be an expensive mistake. Such were the circumstances that caused this writer, who had to that point been a programmer and network analyst, to become involved in the time and motion study business.

The network analyst who finds himself with a need for making time studies can accomplish his goal with only an elementary knowledge of the subject. The basics are quite simple, and a simple approach should be satisfactory for estimating staffing and equipment needs. (On the other hand, setting times for worker pay or evaluation of unit production is entirely a different matter, especially if unions are involved, and the techniques outlined here would not do for such lofty applications.)

Two techniques are available for simple studies. The first is time studies, and the second is work sampling. Time studies are more suitable for repetitive work, and in most cases best to use on data entry. Work sampling, best used on tasks without clearly defined steps, can be applied to inquiries.

Time studies

Our first attempt at time studies was the formal technique of defining work elements (such as pick up form, select screen format, enter form, wait for computer edit response). This was soon abandoned. Next, it was found that the presence of an analyst from the "home office" with stopwatch in hand flustered the workers and changed the environment, so this was also abandoned.

The technique used was to have the office supervisor collect the data. A stack of forms representing about two hours work was assigned an operator, and the time to do the stack was timed by a watch or wall clock. Each such batch was called a "case" for statistical validation. (Having the supervisors collect the data has political advantages in acceptance of the results too.)

It was not at all our objective to

squeeze more production out of the operators through work speed-up. What was needed was some idea of the ratio of productive time to idle time, assuming that production was at a normal rate. By having one study cover an hour or two of data entry, such extraneous items as supervisor-worker coordination, forms dropped on the floor, and slow network response time got included in the averages. However, break times or personal item times were excluded.

It is important not to bias the averages by studying only the fast or slow operators. To circumvent this, the supervisors rated the employees in advance so that average times could be obtained for an average employee. The times obtained for operators with unusually high productivity were noted for reference, but not used as part of the averages.

How much data must be collected? The answer to this comes from establishing a level of confidence goal prior to making the studies. The standard set for The Problem was that 95% of the cases must fall within ±5% of the mean. Five percent is very tight, and a 10% range would be acceptable in most cases. In our studies data was collected from several operators in each of three regional offices. The averages for each were amazingly close.

If many operators are studied, use the average from each 1-2 hour study as a case in computing the standard deviation. If only one or two operators are available, then make studies over several days. In any event, consider 8-10 cases as the minimum.

The second technique for obtaining average times to do a task is through work sampling, which was used on studying inquiries. At first it appears to be an imprecise technique, yet it can obtain excellent results if used properly. The method is simple in concept but difficult to explain. The best explanation probably is through an example.

An observation point was set up in an inquiry area so that several terminals and their operators could be seen clearly. At precisely one minute intervals—to the second—one operator was observed to determine if she was working or idle. A tally mark was put in a "Yes" or "No" column according to the result of the observation. Sixty seconds later another operator was observed, and so on in a round

WARNING: SUDDEN OVERLOAD

A common tree in Central Texas is a Chinaberry. There are probably more broken bones from climbing in Chinaberry trees than in any other species of tree. This is because the limbs are brittle. They break without warning, and dump the unfortunate climber ingloriously to the ground. Under certain circumstances computer systems and subsystems can behave the same way. For the unwary, the repercussions can be worse than a broken bone if, without warning,

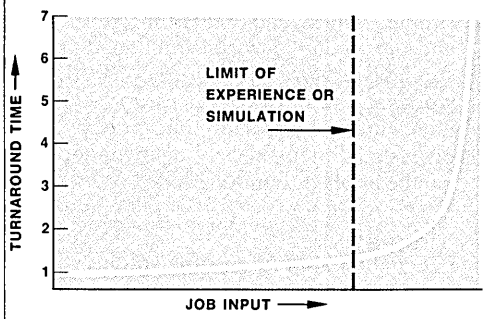


Fig. 1. A "reasonable" projection of turnaround time vs. input load.

computer system capacity suddenly runs out.

Fig. 1 graphically illustrates the sedative—the source of unwariness. Suppose experience with varying workloads on your system has shown a curve of response or turnaround times like that in the figure.

Such a curve can give a dp manager a feeling of security about the capacity of the system to absorb steady growth or new applications. Expecting a 30% increase from a new system? It is quite possible that the true case looks like the curve in Fig. 2.

The mathematical basis for the unfortunate state of affairs pictured in Fig. 2 can be found in any text on queuing. Queuing math is not the sort of light reading the average reader takes to bed. It is recommended, though, for just that, as it beats counting sheep every time. Because of this characteristic, few people are familiar with the behavior of multiserver queues under conditions of high facility utilization. Dp managers do not need to suffer through the weighty math of it so long as they understand what can happen.

Before going further, the term "server" needs defining. The server represents the grocery clerk, bank teller, or computer working to reduce the line waiting for service, which is the queue.

Although a computer system may seem to be singular, it should be looked at as a multiserver in a complex system. Large computers have multiple discs, tapes, I/O channels, etc. working simultaneously at several jobs. Deciding just how many servers one system can represent is terribly complex, if not impossible.

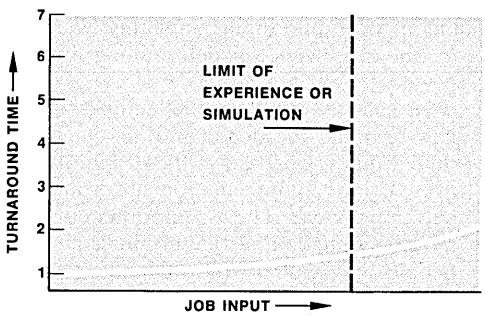


Fig. 2. What the real relationship between turnaround and load may be.

To simplify it, let's use the count of partitions in the operating system as the server count. References to servers and partitions will be used synonymously.

Small to medium operations that are largely batch oriented have little or no worry about a sudden overload slipping up on them. The first reason is shown in Fig. 3. One curve is for a single-tasking system, such as most minis or an IBM 1401. The second shows the case for three partitions, such as for DOS on an IBM 360. (The

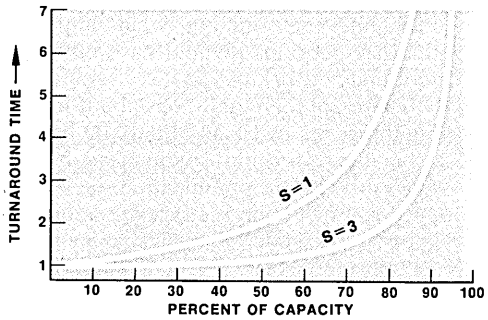


Fig. 3. Turnaround times for a single- and triple-partition system.

vertical axis is the ratio of wait time to average execution time. For example, at Level 3, the wait time averages three times as long as the execution time. The curves assume that each partition is equally loaded.)

For one to three partition systems, turnaround times start to lengthen when capacity use reaches the 60 to 70% range. This gives warning in time for action to be taken to expand capability. The second reason for the absence of sudden overloads in small systems is operator "feel" for loading on the system. With a maximum of three jobs in process at one time, turnaround times are obvious.

robin fashion. If for some reason a determination could not be made as to whether the operator was busy or idle, then no tally was made. Skipping a tally does not affect the results.

During the hours for which observations are made, it is important to record manhours for which the terminals are staffed plus a count of work units produced. Short breaks by operators are handled in one of two ways. If manhours are not accumulated during the break, then skip the observations for that station and minute. If the operator is not logged off, then continue to observe and tally in the idle column. Either way is fine.

In one regional office, observations were made of four consoles from 8:00 A.M. to 5:00 P.M., including breaks and lunch. The total number of observations made was 298, of which 142 were in the "Yes" column. Therefore, the percent worked was 47.6%. The terminals were staffed for 24 hours and 5 minutes, so the productive work time was 47.6% of 24:05, or 688 minutes. During the day, 471 inquiries were processed, so the average time per inquiry was 1.46 minutes. Subsequent studies made at two other regional offices came out at 1.45 and 1.48 minutes!

Some pointers in making a work sampling study are necessary. First, *something* related to the observation intervals must be random. The usual procedure is to get a table of random numbers to use as the intervals of time between observations. This is essential in repetitive work so that the observation cycle does not coincide with the work cycle. In the inquiry case, though, the telephone calls arrive at a

When it comes to a large scale system, though, feel for turnaround and backlog is often lost. One cause for the loss of feel is remotes. On-line interactive terminals and RJE terminals generate cpu load which computer operators at the central site do not control. The extent of the facilities used and the backlog waiting is not always obvious. On-line terminals may be assigned as many as 10-100 partitions, RJE one or more partitions, and local job streams another 10-15.

To further complicate getting a feel for the loading, some jobs may by their nature take a long time. For example, a tape job might take 10 hours elapsed wall clock time. Did the job take this long because of cpu loading or because of the nature of the job? It is impractical to analyze every case to determine the cause for the long execution.

The old reliable indicator of system utilization is turnaround time. Using turnaround is like climbing in a Chinaberry tree. Fig. 4 shows why. The curve is for a 50 partition model, but the curve for either 10 or 100 partitions doesn't look much different.

The danger comes from complacency. As time marches on, successive 5% increases in workload are absorbed with hardly a bobble in turnaround time. System utilization could go right on out to 95% and turnaround still looks good. What happens, though, on the last 5%? Increases this small can occur overnight from seasonal variations or insignificant new applications. When capacity approaches 100%, turnaround reaches to infinity.

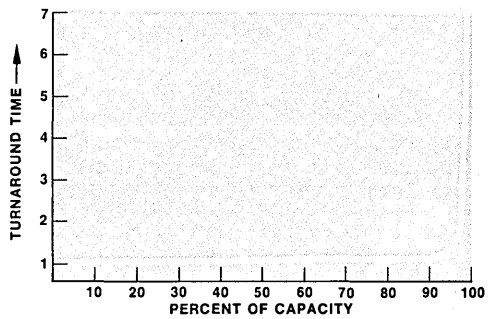


Fig. 4. Turnaround times for a 50-partition system.

The curve for multiserver queues applies to other situations, too. Suppose there are 10 terminal operators giving credit reports by telephone. Study shows it takes an average of two minutes to service an inquiry, and the average number of calls during a peak hour is 261. Even during the peak, the wait time on hold averages only one minute. This seems good to management, so the expense of added terminals and operators is declined.

What will happen to this credit bureau during the Christmas rush? At an increase in business of only 10% they will find the average time on hold increases from one minute to six minutes. A 12% increase in business will send wait time to about 15 minutes!

Why does this happen? At the 261 calls per hour level, the operators are 87% utilized. With multiserver queues, though, wait time still looks good at this level. (Wait time as used here is queue time minus time to serve.) Look at Fig. 4, though, and see what happens at 97% and 99% utilization.

I strongly recommend that queuing math be taken up as bedtime reading. It should promote a good night's sleep—for more than one reason. ✲

random interval so the work is not cyclic relative to time.

Next, make the observations in such a fashion that the operators do not know they are being observed. Otherwise, they might try to influence the results. Also, watch for operators trying to make themselves look good by adding on fake work counts. This will cause the average time to process an inquiry to come out on the low side.

Statistical validation for work sampling is too involved to use the usual techniques. A simplified, time-saving method is to break up the studies into two-four hour intervals. Use the time obtained from each study as a case, and use the same statistics explained for time studies. If the range of cases is too wide to reach the 95% level in a few studies, then two things can be done. Either lengthen the time for each study, or isolate the factor causing the wide range and break it out into a separate study.

"Accidental" benefits

Being an efficiency expert is not usually considered the function of a network analyst. Yet if your company can save a bunch of bucks through reducing terminal and operator costs, then maybe it is, in fact, a proper function.

In answering our one question, "What impact will the new workload have on terminal needs?" we fell into a methods improvement of major significance. Interestingly, it was discovered by a back door route. Here is how it happened. The question arose as to what should be the proper level of service in handling telephone inquiries. "Level of service" means how many callers will be put on hold waiting for an operator; and if they have to wait, what wait interval is reasonable.

To find the answers to these questions meant digging out a book on queuing math and doing some hasty review. This review brought out the fact that level of service is greatly influenced by specialization of the servers. For example, suppose a service counter performs either task A or B, and a customer must go to the proper server. Queue time is 2.5 minutes when there are three servers at counter A and four at counter B. In contrast, if the servers are cross trained to handle both A and B, then the total number of servers needed is reduced from 7 to 5, and queue time falls to 2 minutes. The elimination of specialization reduces the number of workers needed for a given level of service.

In reviewing the formulas, it was realized that the terminal operators *were* specialized. The regional offices with more than three or four operators had separate data entry operators and inquiry operators. This specialization resulted primarily because teaching an operator both jobs took another two to three months.

The level of service was studied. It was found that only one in ten, or fewer callers had to wait, and waiting time was less than one minute. Running this through the formulas showed that the greatest possible utilization of terminals and people would be *less than 30%* at that level of service. When the new system is installed it is expected that full utilization of inquiry operators can be achieved—without lowering the service level—by training the operators to perform data entry until the phone rings.

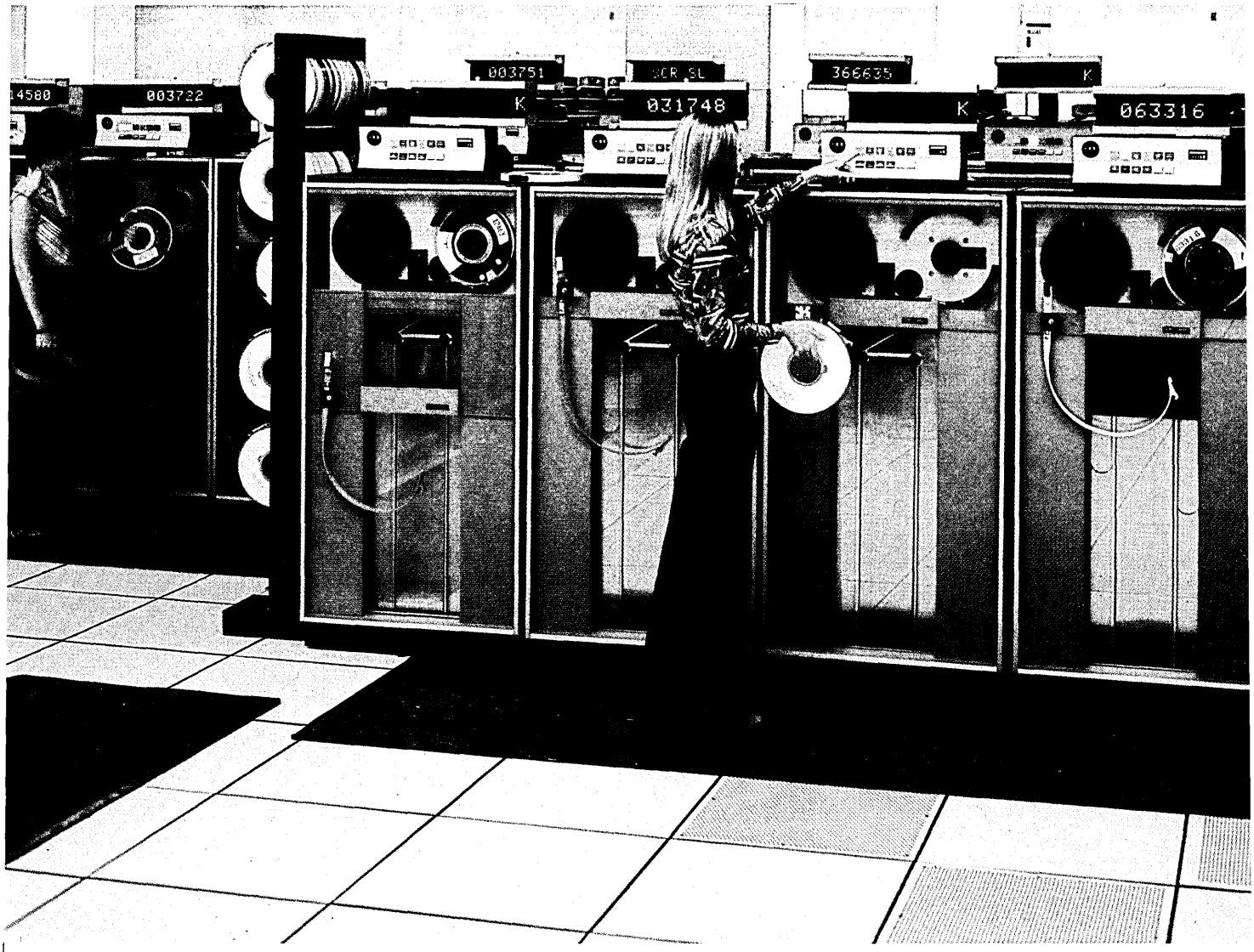
$80,000/month savings?

As for The Problem, the proof of the pudding is in the eating, and since it will take six months or so to install and learn the new system, the accuracy of the study has not been proven. Some of the results are interesting, though. According to the time studies, the quick estimate of a 220% data entry load was right on the nose.

Based on that estimate and 100% utilization of terminals, 95 additional terminals would have been needed. However, the time studies combined with the methods change determined that the existing staff could absorb the new workload with no increase in terminals! Thus, the studies might result in a savings of about $80,000 per month over what would have been spent had the assumption of 100% utilization of terminals been made.

It is hoped that relating this experience can be of help to the reader pondering the question of how many terminals are needed for some new application of remote data entry. ❋

Mr. Wiley is the data communications analyst for the Texas Dept. of Public Welfare. During the four years prior to joining the State, he headed his own firm that developed and marketed minicomputer based turnkey systems. He has 19 years experience in the computer profession, most of which was spent in the design and programming of real-time systems.



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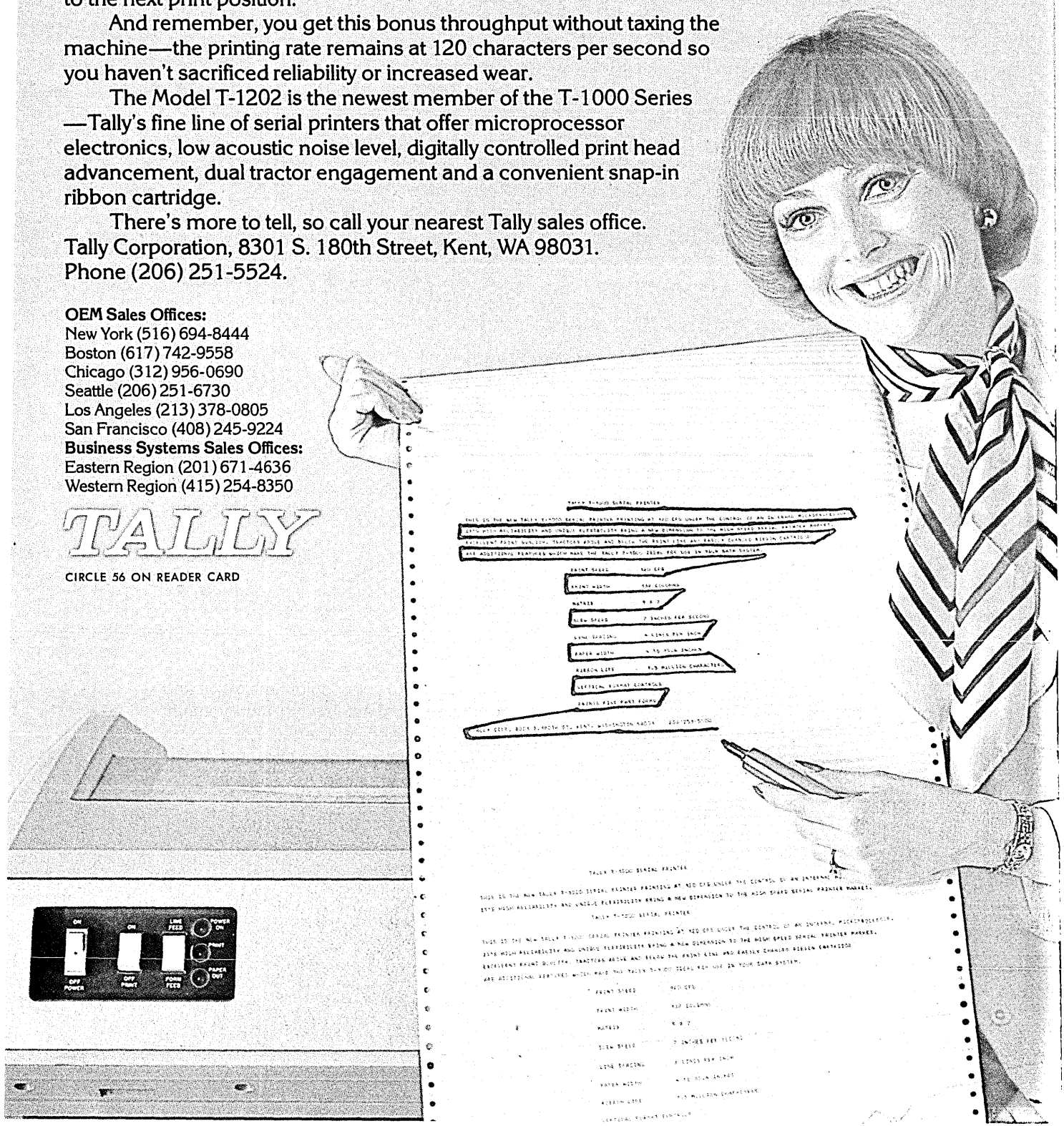

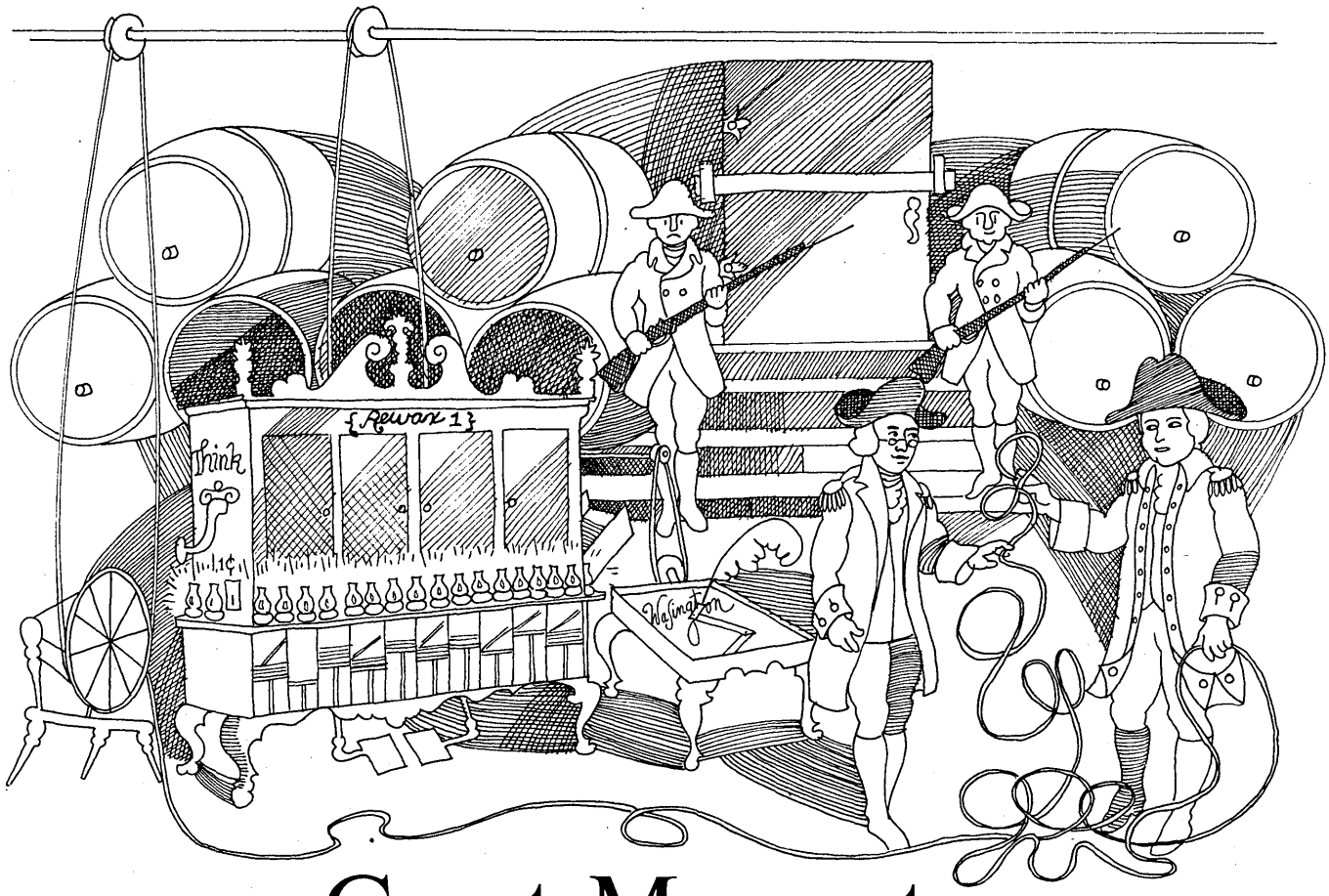

Great Moments in the History of Computing:

December 12, 1777

by Jackson Granholm

"Great Moments" was first presented by Benedict Arnold at the Nauseum Theatre, London, on November 18, 1787.

DRAMATIS PERSONAE (in order of their respective appearances)

COLONEL ECKLY MAUCHERT, Project Officer of REWAX
SERGEANT REED COBOL, Aide-de-camp to Colonel Mauchert
PROJECT GUARDS, members of the Revolutionary infantry
DR. GROSSLY J. R. HERBERT, Scientific Advisor to REWAX
GENERAL GEORGE WASHINGTON, Commander-in-Chief of the Revolutionary Army
DR. BENJAMIN FRANKLIN, American Ambassador to France
MARTHA WASHINGTON, wife to General Washington
BETSY ROSS, a seamstress of Philadelphia
CALABASH, minor Aide to General Washington
Various Aides and Flunkies to General Washington

Scene: The central control room of REWAX, *the Revolutionary War Automatic Control System.* REWAX *is located in the underground wine cellar of a secret location in rural Pennsylvania. The walls are lined with casks, flasks and bottles. It is here in* REWAX *Control that the true nerve center of the revolutionary war effort of the colonies is located. A great central processing unit with chippendale cabinet and kerosene console lights stands center. Around it are input-output units with mechanically-actuated quill pens. A modified spinning wheel serves as winder, punch, and reader for Baudot tape. Armed guards in revolutionary war uniforms protect the single door to the upper world, and various doors lead offstage to the executive offices of Control. Colonel Eckly Mauchert,* REWAX *Project Officer, stands center intently reading a long and tangled string of punched tape. As the curtain rises, Sergeant Reed Cobol is at his side. Both men appear disturbed and agitated.*

MAUCHERT: Great George, Sergeant, if I read this tape properly, it says the Commanding General is coming for a personal inspection.

COBOL: Is that his official title, Sir, "Great George"? I thought we were fighting not to call the King that.

MAUCHERT: Don't be dense sergeant. "Great George" is an expression—an exclamation of surprise suitable for use by those who shun blasphemy and obscenity. Actually his official title is "General Washington," and his given name just happens to be George. He's not related to King George the third so far as I know. At any rate, he's coming, so far as I can tell from this. Here, you try to read it. These computer people are all weird with their codes and things. [*Hands tape to Cobol, who looks intently at it.*]

COBOL: Yes, Sir. That's what it says, I think. It says he's coming today, too. Of course, [*turns tape over*] if we're holding it the wrong side up, it also says the latrine supplies will be delivered late again.

MAUCHERT: Geez. We're not ready for any damn inspec-

tion by the commanding general. This dumb hunk of junk hasn't worked right since that nut of a professor decided to put virtual memory in it, whatever that is. We got the whole backroom full of punched paper tape that came in by horsecart from Boston all the way to Savannah. Where is that ding-ding, anyway?

COBOL: Which particular ding-ding, Sir?

MAUCHERT: Our Chief Scientist, or whatever his title is.

COBOL: You mean Dr. Herbert, Sir?

MAUCHERT: Yeah, that ding-ding.

COBOL: He's out back, Sir, curling his beard.

MAUCHERT: I understand he came over to our cause from the Canadian side of the lines. I'm not sure I go for that. Probably someone offered him a bigger paycheck.

COBOL: Oh, I'm sure Dr. Herbert is highly qualified and devoted, Sir. Why, without him we would never have had this REWAX project.

MAUCHERT: That's exactly what I mean.

COBOL: And then we'd be out in the front lines, fighting and freezing.

MAUCHERT: You got a hell of a good point there Sergeant. I like Dr. Herbert better already. Remind me to promote you to top sergeant sometime. You got a good head on your shoulders. Go find that great inventor for me, will you?

COBOL: You mean Dr. Herbert, Sir?

MAUCHERT: Right on.

COBOL: He really is worthy of respect, Sir. I understand he was decorated by the Marquis de Lafayette and he has a Ph.D. from Mother Machree University. [*Salutes, does an about face, and exits upstage right.*]

MAUCHERT: [*singing to himself*]

A Ph.D. from Mother Machree, parlez vous,
Did a medal get from the Frenchmen, yet, parlez vous.
With his mixed-up code and screwy math
He'll lead us down the primrose path,
Hinky-dinky parlez vous.

HERBERT: [*entering*] Colonel, dear boy. You requested the presence of my bod? Sorry, I was preoccupied out back with filing my teeth.

MAUCHERT: We got a hell of a situation coming up here Herbert. A real, by God crisis. The Commanding General is coming to visit.

HERBERT: General Washington?

MAUCHERT: Whom else? Or is it who else?

HERBERT: General George Washington?

MAUCHERT: Himself.

HERBERT: How do you know? Who told you he's coming to visit?

MAUCHERT: Your stupid big kludge of a machine there told me. It says so right here on this tape that came in not over an hour ago. See. [*Hands him tape.*]

HERBERT: For pity sakes. I didn't know we were back online. It was only Thursday that the snow load broke all the clothesline between the tomato cans. But I think you're right. Of course, if you hold it the other way around, it says we are out of cannonballs. But I think we ought to plan on a high-level visit.

MAUCHERT: I've already planned on it. I've told all the men to polish their socks and other foot wrappings, and to shine their rifles. What I want to know is what are we going to do with this big hunk of junk you got sitting here in this booze bunker. Can we throw a tent over it and pretend it's a pile of ammo?

HERBERT: You cut me to the quick, Colonel, dear boy. We'll warm it up for a high-level VIP demo, of course. [*Pushes console buttons. Lights begin to flash and strange gurgling and choking noises issue from the* REWAX *mainframe. The tape machine jerks slowly fore and aft, getting nowhere in particular.*] We'll just load up a few flashy routines here—impress the hell out of everybody.

MAUCHERT: Have you ever met General Washington?

HERBERT: Why yes, of course. We're bosom buddies from way back.

MAUCHERT: How will I recognize him?

HERBERT: You'd know him anywhere. He looks just like his picture on the dollar bill.

MAUCHERT: Really?

HERBERT: Yes, really. But don't stand too close to him if he gets excited.

MAUCHERT: Why not?

HERBERT: Well, his false teeth are made of wood, you know, and if he starts talking too fast he'll spray you with splinters. It's damn painful.

MAUCHERT: I'll try to stand out of range of his fire.

COBOL: [*Enters upstage left from door to upper world. Guards stand at attention and present arms.*] TENHUTTTT! [*General George Washington enters, accompanied by Dr. Benjamin Franklin, Martha Washington, Betsy Ross, and various aides and flunkies.*]

WASHINGTON: At ease, men. Rest, smoke if you got'em.

MAUCHERT: [*Saluting and extending hand.*] Welcome to REWAX, General Washington, Sir.

WASHINGTON: Yeah, well, O.K., thanks. It's been a long trip with the redcoats out on the road everywhere. We like to never have made it. What's your name, Colonel?

MAUCHERT: Chicken Colonel Eckly Mauchert, Sir, serial number 0-76 double-07, Project Officer of REWAX.

WASHINGTON: Well, Colonel Mauchert, this is Dr. Benjamin Franklin, our nation's ambassador to France, home on a little sabbatical, and this is my wife, Martha, and this is Miss Betsy Ross who's in the tailoring business in Philadelphia, and these folks are the rest of my entourage—if you're a big general you have to have an entourage to travel—and that bearded pundit fussing with the levers over there is Dr. Grossly J. R. Herbert, Chairman of the Revolutionary Scientific Advisory Committee. And anyway, folks, meet each other.

FRANKLIN: Tell me honestly, George, are we spending money for this funny farm?

WASHINGTON: Calm down, Ben. It's hard enough to keep up morale without the snide remarks.

MAUCHERT: General, it's a great honor to welcome you here. We've looked forward to meeting you for a long time, and, of course, the word of your great strategic victories comes in regularly to us over the clothesline and the tomato cans. I would say, without doubt, that the staunch men of the military, nay, of our whole embryonic nation, look up to you as to a father and a fearless leader, and . . .

WASHINGTON: Knock off the brown-nose, Mauchert. We've got some real problems up here and, by God, I've got to get a few of them straightened out. . . . [*to Herbert*] Shut that damn thing off, Doc. A man can't hear himself think in here with that squirrelly thing running!

[*Herbert turns off the* REWAX *mainframe and strolls indolently over to join the group.*]

WASHINGTON: Now let's get down to where it crumbles, cookiewise. Are you clowns in charge of payroll processing up here?

MAUCHERT: Well, yes Sir, according to the memo from Congress the disbursement software is our responsibility.

WASHINGTON: Never mind the doubletalk. Who is supposed to send out the blasted money to the troops on time?

MAUCHERT: Well I guess that falls under our charter, Sir.

WASHINGTON: You bet your bippy it does. I got my men down there at Valley Forge with their tushies hanging out, and we haven't seen the payroll wagon in over two months. Now we got to get this straightened out before I got a first

class riot on my hands.

MARTHA: Don't get excited, George, remember your teeth.

HERBERT: Now just a dog-boned minute, George. You can't blame the Colonel here for any payroll screw-up. We're ready, willing, and able to turn on the old payable processeroony, but we don't have the media.

FRANKLIN: The media? What the hell is the media?

HERBERT: We can't feed ya with no media.

WASHINGTON: What are you talking about, Doc, No media? Can't you put it to me in the King's English, you should pardon the expression?

HERBERT: It's been over two and a half months since we ordered blue cards from Boston. Anybody with an ounce of sense knows that you can't put out a government payroll without little G.I. blue punched cards. It just can't be done.

FRANKLIN: He's got a point there, George.

MARTHA: Mercy sakes.

WASHINGTON: Well, I'll be dipped. Why didn't you let me know about this, Colonel?

MAUCHERT: Well, you see sir, the snow broke the clotheslines and all . . .

WASHINGTON: Couldn't you send a man on a horse?

MAUCHERT: We haven't been issued any horses, Sir. They've all gone to the cavalry or to the mess halls.

Congress owes to all our fine citizens who support the war effort? You got anything to do with that here?

MAUCHERT: Well, yes Sir, that's around here somewhere on the flowchart. I think that maybe we are supposed to process the military procurement items, at least.

WASHINGTON: You in charge here, Colonel?

MAUCHERT: Yes, Sir.

WASHINGTON: Sure as hell never know it from talking to you. Now what about the payables?

MARTHA: Remember your teeth, Dear.

ROSS: Even something down would help.

MAUCHERT: Well, Sir, I suppose its the same old story of the blue punched cards. I mean, if Boston can't get off the dime well I . . .

WASHINGTON: You see this lady here that I introduced you to, this Miss Betsy Ross of downtown Philadelphia, you see her standing here?

MAUCHERT: Why, yes, of course, Sir. Looks rather attractive, doesn't she?

WASHINGTON: She does not! You got to get this pushy broad off my back, Colonel. Like over a year ago I ordered a regimental flag from her. Old Franklin here said she was the best damn seamstress in Philadelphia, but, just between us, Ben is getting a little senile, and, besides, he can be conned by anything in a skirt. Anyway, she did the flag for us, and I must say, its about the screwiest design job I ever see. But,

WASHINGTON: [*To aide who takes rapid notes.*] Dammit, Calabash, see that we get a TWX off to Boston to find out what's holding up the blue cardboard, and send a memo to quartermaster telling them to send the Colonel here a horse. His on-line capability is suffering, or whatever.

HERBERT: George, you really ought to take a look at the strategic monitoring capabilities of our little system here. That's what it was built for, dear boy.

WASHINGTON: Never mind that. We've got practical problems to worry about. We don't need your Rand Corporation technical crap. Save it for the CIA.

HERBERT: Just let me turn it on here and give you a brief demo. [*Turns to* REWAX *which starts gurgling and gulping again.*]

WASHINGTON: Now, Colonel Mauchert, what about the government accounts payable? What about the bills the

the pay never came for the flag. Not only will she not deliver the flag to us, she follows me all over the universe yelling for her money. It's driving me cuckoo.

Isn't there some way this stupid system of yours could just write a plain old check so I can sign it? I got to get rid of this broad. She's driving me out of my gourd.

MAUCHERT: Well, I'll ask Dr. Herbert.

HERBERT: Just a moment, dear friends. Let me show you all the wonders of our simple system here. Now it has just prepared a war game situation report addressed to you, George. Of course, it's a simulated situation, but it gives some insight into our strategic capabilities.

WASHINGTON: Can you, for criminiddly's sake, shut that damn thing off, Doc. It's driving me ape with that goony noise. [*Herbert shuts off* REWAX]

HERBERT: Now you will note, General Washington, that

this is set up just like a field forecast of the next British moves, and it includes a prediction of firepower, position, and so forth. You will note, dear boy, that the system has even addressed the report to you formally.

WASHINGTON: What's is this, Grossly? Your damn machine has spelled my name "WAFHINGTON." It can't even spell right.

HERBERT: Oh dear me. That must be a keypunch error. But, General, you always write your name so that the "S" looks just like an "F." You really can't blame the keypunch operator for that.

FRANKLIN: Where you been lately, Doc? You ivory tower nuts are all alike. Don't you know that writing all your "s's" to look like "f's" is the "in" thing to do these days? It's the latest rage in France. If you'd subscribe to *Poor Richard's Almanack* you'd know what's going on in the world.

WASHINGTON: So what good to me is a hypothetical situation report? We don't have any hypothetical situations out there. We're out there in your field situation looking at your real damn British redcoats with their high-powered rifles, and anybody who thinks that your limejuicer can't shoot straight better go see his head shrinker.

MAUCHERT: Shall we show the General the—you know?

HERBERT: Why not? Now George, dear boy, actually we have done some real strategic analysis of the situation. Just let me turn the system on here. [*Turns on* REWAX.]

WASHINGTON: Do we have to have this stupid noise?

MARTHA: Remember your teeth, Dear.

FRANKLIN: Sounds like a hog stuck in the mud.

HERBERT: Now observe the quill-pen output here, Dear Boy. We have fed the system a complete strategic input of the present situation. It will analyze the various options, and give us your optimum moves as output.

FRANKLIN: Bull!

HERBERT: There. You see, the output strategic analysis report is complete. [*Hands Washington the report.*]

WASHINGTON: I can't read this. It's written in some damn gobbledygook. What the hell are all these "GO TO's"?

MAUCHERT: Well, Sir, you've got to follow the thread of the analysis.

WASHINGTON: I've heard enough about thread from Besty Ross.

MAUCHERT: You see, Sir, the analysis begins with your present military position.

WASHINGTON: Flat on my butt in Philadelphia.

HERBERT: You see, Dear Boy, you've got to start retreating?

WASHINGTON: Retreating!

MARTHA: Dear, remember your teeth.

MAUCHERT: Yes, you see, Sir, First you retreat south through Delaware and Maryland.

HERBERT: Then you retreat south through Virginia.

WASHINGTON: Virginia, yet!

MAUCHERT: By this clever retreating, you make the British think you are weak and have given up. You trap them into landing General Lord Cornwallis on the Coast of Yorktown with his army.

WASHINGTON: Cornwallis! Why the hell would they land Cornwallis? He can't fight his way out of a wet paper bag.

HERBERT: Exactly! Now you've got them trapped!

WASHINGTON: Got who trapped?

HERBERT: The British, Dear Boy. By retreating, then suddenly cutting them off at the pass—at Yorktown, that is—you have won the war!

WASHINGTON: Where is Yorktown, anyway?

MAUCHERT: It's down the coast there somewhere, Sir, on the James River, I think.

WASHINGTON: Damn swamp, no doubt.

HERBERT: Well, that's it, old bean. The complete analysis of proper strategy.

WASHINGTON: Are you serious with this idiocy? You actually mean that I should start retreating south? That I should take my ragged and brave little army across Delaware, and Maryland, and across Virginia? I live in Virginia, dammit. I don't want any fighting going on there. It will have a bad effect on property values. Besides, if I start retreating again I'll have a mutiny on my hands, especially if you clods can't get out the payroll. This is just about the biggest crock I ever heard of. I don't know who got the wild idea for the appropriation for this boondoggle, but you can bet your blue cards I'm going to get it shut off.

FRANKLIN: You tell 'em, George.

ROSS: What about my check?

MAUCHERT: Oh yes, Herbert, by the way, do you suppose we could get the output to produce a special check on the pen printer so the General can pay Miss Ross here and get her off his—I mean, off the payables list?

HERBERT: Why not. Indeed, why not? [*Pushes buttons.*] What's the check for, George?

ROSS: For the flag, dammit.

HERBERT: The flag? Isn't that the geometric design job you ran through the computer down at the Moore School?

ROSS: That's right. It came out real neat too, but I'm not delivering it till I see my money.

WASHINGTON: All right, my foot. I specifically ordered green polka-dots on a puce background. This dippy dame runs it through the university computer and comes up with a psychedelic version of the British flag colors, red, white, and blue, mind you, with stars all over it. It looks positively weird.

MAUCHERT: I've always sort of liked "Don't tread on me!"

HERBERT: [*Handing him huge output sheet from pen printer.*] Here you are Dear Boy, a machine-written check with official account number.

WASHINGTON: Where do I sign? [*Mauchert points, Washington signs, hands check to Betsy Ross.*] There, now will you shut up?

ROSS: This is a dumb-looking signature. Looks like your name is "WAFHINGTON."

WASHINGTON: Is the amount O.K.?

ROSS: Yes, it's O.K. I better deposit it before you go chapter eleven.

WASHINGTON: Where's my flag?

[*Ross reaches into purse, pulls out revolutionary war stars & stripes, hands it to Washington who holds it up for all to see.*]

HERBERT: That doesn't look so bad, George. I think it's kind of attractive.

WASHINGTON: They sure are funny looking polka dots.

MAUCHERT: If I may say so, Sir, it is unique, and it has a certain kind of memorable aspect.

WASHINGTON: Well, maybe so. Besides, I can always run it up the pole and see who salutes.

HERBERT: Well, at least it's paid for. You see, dear boy, our little system here does have some virtues.

WASHINGTON: Yes, I guess it did pay for the flag and got this dizzy dame off my back. But there's one thing you can bet on. With a flag design like this, no one will remember it a hundred years from now.

ROSS: Who cares, so long as the check doesn't bounce?

WASHINGTON: But let me make one thing perfectly clear. I don't know where you and this crazy computer get off with this retreat south through Virginia crap. There's one thing I do for sure know, and that is nothing important has ever happened at Yorktown yet, and you can bet it never will. You can quote me on that. Well, it's time to go. I've got a busy schedule to keep. Let's shape it up, people. ❋

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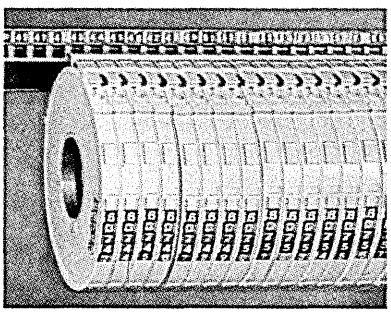

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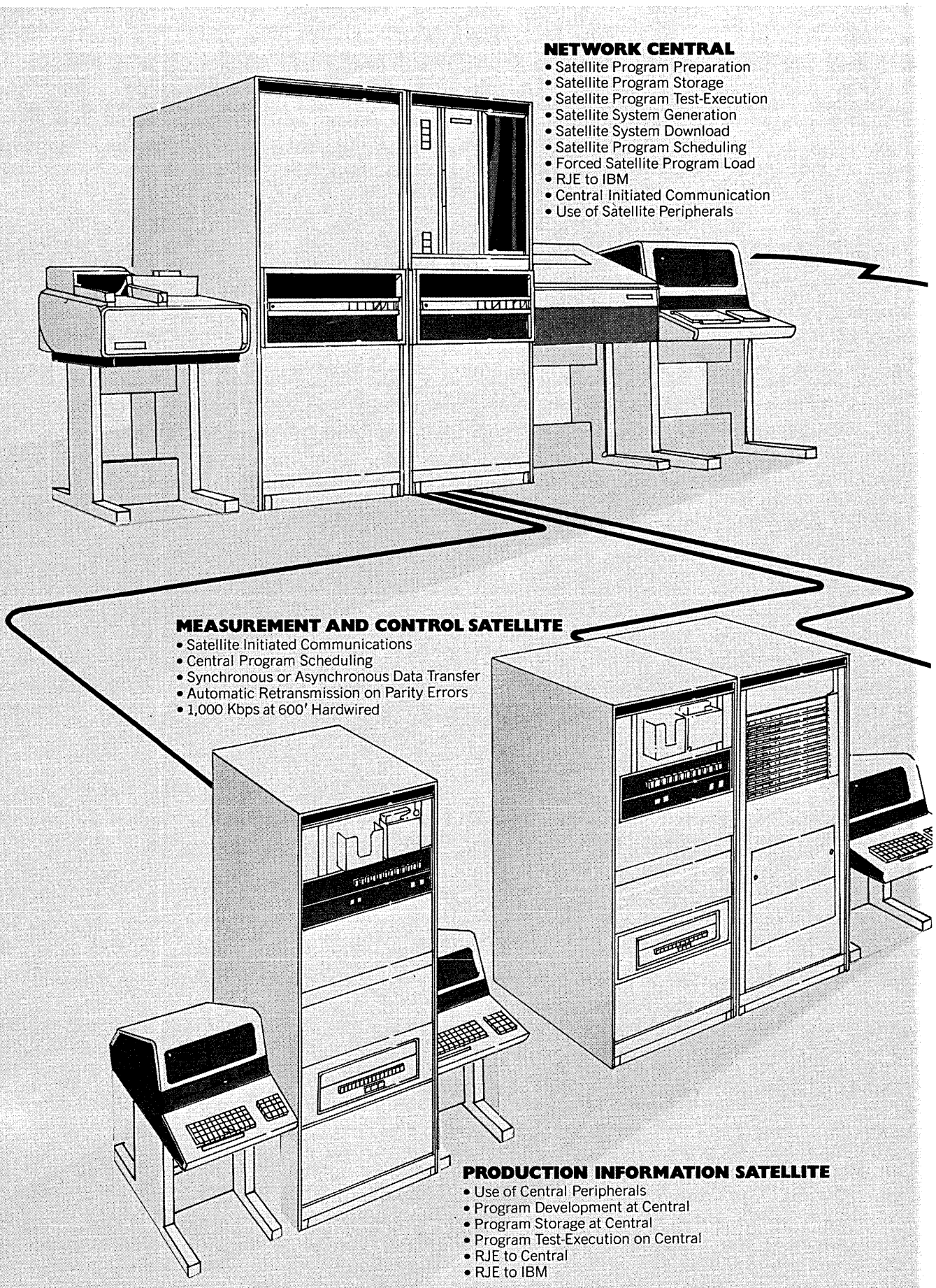
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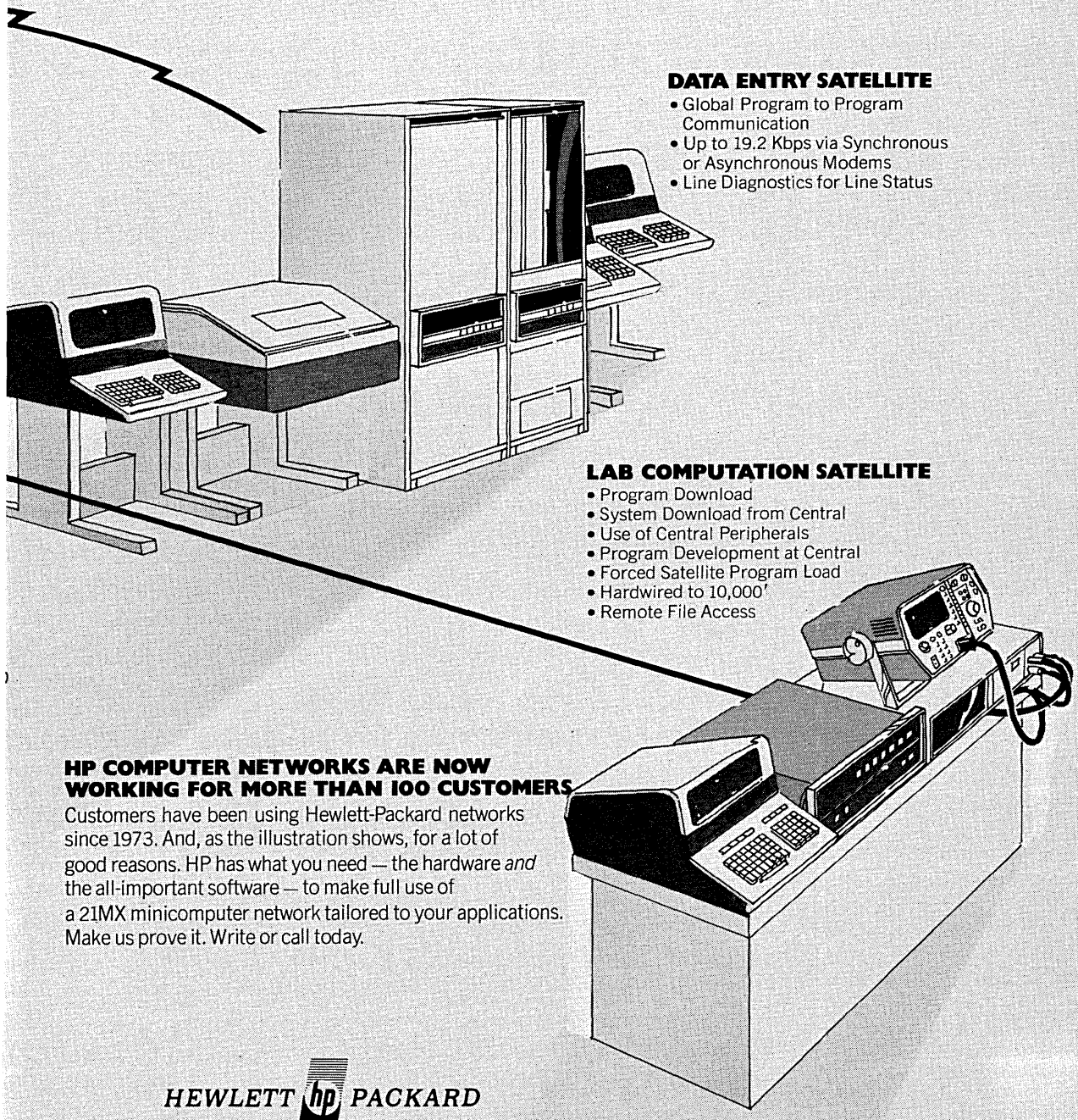

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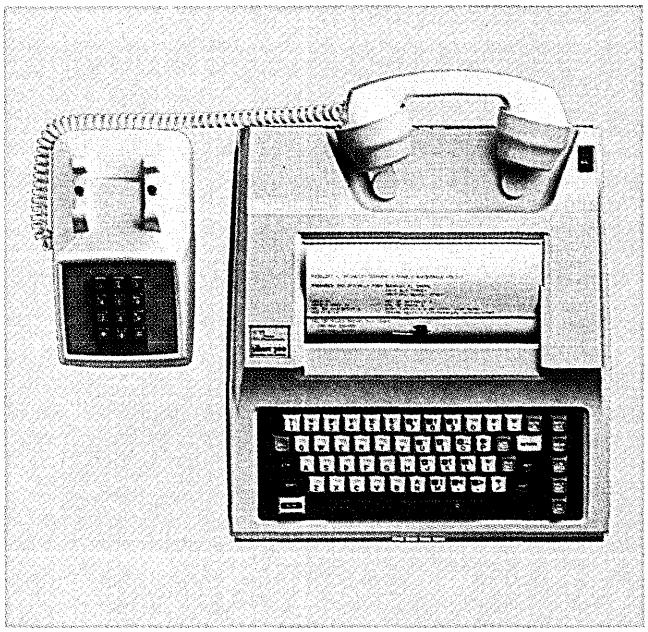

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Structured Programming in Assembler Language

Capt. Gary E. Rieks, U.S. Marine Corps

In addition to great reliability, improved readability and greater ease of debugging result.

Structured programming is a technique that embraces the goals of reliability, maintainability, and flexibility in software design and implementation. However, because of design requirements, installation restrictions, or programmer training, the choice of programming language is usually predetermined. The concepts of structured programming must either be tailored to the selected language, or not used at all. This discussion of structured programming in assembler language may prove useful, especially to those installations that have macro definition facilities.

Key structuring elements

In the initial design stages, structured programming (SP) begins in the form of structured flowcharts or pseudo-language macros. These in turn consist of—and are restricted to—a small, well-defined set of program-flow control blocks or control functions. The "function modes" of each control block may in their turn be composed of other blocks (see Fig. 1). In fact, "top-down" strategy starts the initial design with one block, and further refines each function into other blocks until the lowest level of specification is coded. This strategy allows for a maximum integration of segments, modules, and programs with a minimum amount of design time.

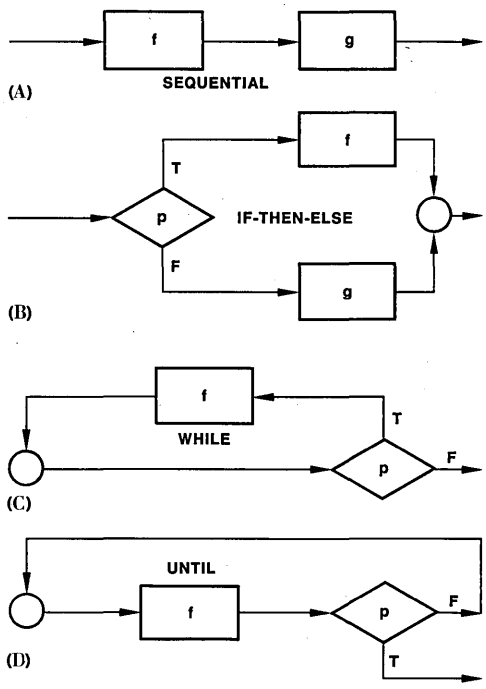

Fig. 1. The flow of control is through control macros or control blocks which in turn are composed of other blocks.

Each fundamental block has one entry and one exit point which excludes the overlap of functions and increases program reliability.

Along with reliability is the need for readability and ease of debugging. In SP this is enhanced by grouping "chunks" of code (5-9 functions limited to 10-120 lines of code) into segments which appear on one to three pages of source listing. These segments form a module which, in turn, forms a program.

Development proceeds top-down and breadth first in SP. All segments of one level are developed in a left to right process, based on sequential order or complexity, before the next level is refined and tested.

Application to assembler

When it comes to debugging assembler language code (ALC) programs, there are three major areas of consideration: The ability (1) to read and understand the intended function of the code, (2) to follow the flow of control for designated test cases, and (3) to ensure data item integrity.

Application of SP appreciably eases the problem of following the program flow of control. But one may ask if a structured ALC program really in-

creases readability or environmental integrity?

With the low level nature of ALC—that is, one statement corresponds in general to one machine instruction—a simple function in design may be a few or many instructions. This fluctuation in lines of code has a detrimental effect on readability regardless of organization. However, in adopting SP segmentation, developing meaningful control function macros, and employing documentation to define function parameter usage, the comprehensibility of structured ALC programs is greatly increased over nonstructured programs.

Environmental integrity is the concept that portions of code in one segment of the module do not inadvertently modify the contents or logic of other portions of code. By applying certain practical restrictions on data item usage, the likelihood of program correctness is increased.

In itself, SP does not ensure environmental integrity, but it does establish a framework to develop some workable methods. The goals are that data item usage should be clearly recognizable for each segment, and universal referability should be restricted to a minimum.

The SP approach to ALC

A practical, productive approach to applying SP in ALC involves using macro definitions for each segment of code, and for complicated control functions.

Before establishing control macro formats, the following developmental guidelines are offered:

1. That each segment be defined as a macro with single entry and single exit points.

2. That each segment accept a parameter list, and all identifiers be either global, local, or constant to each segment.

3. That control macros establish the flow of control as set forth in Fig. 1, and reduce the need for explicit testing and branching in ALC.

4. That the control macros be nestable and signal an error condition if macro overlap occurs.

5. That control macro formats and predicate functions be simple, readable, and flexible. (A predicate is a logical expression or a boolean variable —that is, it can take a value of true or false.)

What are proposed here are the control macros IF, WHILE, UNTIL, and DO, which will establish a flow of control as set forth in Fig. 1. Each of these macros, except the DO, will accept and evaluate a logical expression consisting of logical functions (AND,OR,EXOR,-NOT), comparison tests (GT,EQ,LT,-etc.), and operands in various formats.

Each of the control functions mentioned specifies the entry point to a control block, but not an exit point. To specify exact ranges requires an END macro for each control macro. These additional END macros may be named ENDWHILE, ENDIF, ENDUNTIL, and ENDDO. Fig. 2 presents a format for control macros that stays within the guidelines presented.

As guideline 5 states, not only must the control macro be readable, but so must the predicate that is to be evaluated. One set of SP macros developed by Marvin Kessler and used within the IBM Federal Systems Division—M. M. Kessler, "Assembly Language Structured Programming Macros," IBM, Gaithersburg, Md., 1972 (an informal report no longer available)—has a predicate format that is very flexible, but its format is rather awkward and does not enhance readability. The basic predicate formats in Kessler's macros are:

(1) Condition

(2) Comparison—function, Operand1, Condition, Operand2

(3) Instruction, Operand1, Operand2, Condition

where "condition" specifies a branch condition. The condition parameter is either a number or a special mnemonic (see Table 1).

The advantages of Kessler's predicate formats are that all possible ALC tests and comparisons can be included within the predicates, and the length of the predicate is only limited by assembler resources.

For the sake of simplicity and increased readability, two different, more restrictive predicate formats are proposed here. (They are presented in Fig. 3.) Each predicate has a maximum size of 255 characters, and the logical comparisons are limited to operands that are character, binary, packed decimal, or floating point. The choice of format is a matter of style but format 2 proves to be more versatile:

(1) ((OP1.EQ.OP2).AND.(OP2.EQ.OP3))

(2) (EQ,OP1,OP2,OP3)

Note that the above expressions are equivalent, but (2) is shorter.

Implementation of control macros

The control macros IF,WHILE, and UNTIL, as developed by the author, accept two operands. The first operand is a logical expression enclosed in parentheses, and the other operand is a unique name that is used to establish the correct range of the control function. The control macro generates the control instructions and calls the macro SYSEVEXP, which generates the code that evaluates the logical expression and sets a control byte true or false.

The macro SYSEVEXP in turn evaluates one function of the logical expression by calling one of eight macros: SYSAND for the logical function "and," SYSOR for the logical "or," SYSEXOR for the "exclusive-or" function, SYSNOT for the "not" function, SYSCHAR which performs a designated comparison test on character operands, SYSBINRY which compares binary operands, SYSPACKED for packed decimal, and SYSREAL for floating point numbers. The macros SYSAND, SYSEXOR, SYSOR, and SYSNOT may in turn call SYSEVEXP in order to evaluate operands that are logical expressions.

Each control macro has both an associated depth counter, and a depth array that stores the second operand of the macro at the current depth. The END macro, which has an operand that matches a value of the depth array, marks the range of that control function.

Each control macro establishes the uniqueness of the second operand by defining a storage location of zero length using the second operand as its label. Two macros with the same second operand will generate an assembly error.

The "secret" of detecting overlap of

```
(A)  WHILE logical-expression, END = id-name
     ENDWHILE id-name

(B)  UNTIL logical-expression, END = id-name
     ENDUNTIL id-name

(C)  IF logical-expression, {END = id-name }
                            {ELSE = id-name}
     [ELSE id-name]
     ENDIF id-name
     (If the "ELSE = id-name" is specified then the ELSE macro must also be
     present)

(D)  DO [TIMES = exp
         [UNTIL = exp], [BY = exp], [INITIAL = exp]], END = id-name
     ENDDO id-name
```

Fig. 2. An END macro is needed for each control macro. Brackets indicate optional operands, while braces indicate that one option must be chosen. The term "exp" stands for a full word, a binary identifier, or a number within the range $2^{\pm 32}$. The operand "id-name" is a unique name of one to eight characters.

control macros is that each macro increments both its own depth counter, and also the depth counters of all other control macros. The END macros in turn decrement all depth counters. Each control macro and its appropriate END macro generates labels and branching instructions based on the current depth counter for that control function. If two or more control macros overlap in range, then undefined labels and addresses will be generated since the depth counter will be incorrect, based on the depth array value at the current depth.

To sum up, this system (illustrated by Figures 4 and 5, page 82) ensures that: every control macro is unique; each control macro must have an END macro; all END macros are unique; each END macro must have an initial control macro; an improper overlap of control functions is detected; and nesting of all control macros is possible.

Some further details are yet to be discussed.

Some benefits

Increased readability results, and a measure of this is the percentage savings in source code per segment. In programs developed by the author using the formats and control macros set forth here, this space savings per segment averaged over 25%, and in a few cases, exceeded 50%. Using control macros definitely increased the readability of complex predicates and nested control functions.

The average execution time per iteration of a control macro developed by the author was in the range $2*10^{-4}$ to $9*10^{-4}$ seconds (on an IBM 360/50). For production related processes that deal with external storage and files, this time is negligible. Telecommunication systems must be analyzed more carefully; a total system increase of a few seconds may not be acceptable.

On systems with small amounts of available core, control macros may not be desirable. A complex control macro may require 84 bytes. This additional space requirement for modular, production programs may not create undue concern.

Environmental integrity

Within an ALC program, all locations and registers are universally referable. Though global access allows great flexibility, it also increases the difficulties of maintaining environmental integrity. The use of SP in ALC allows more restrictive application techniques to be applied to operand specification and usage. This restriction increases reliability without excessively reducing flexibility.

One method used by the author was to divide data items and registers into five functional groups: GLOBAL, LOCAL, CONSTANT, WORKAREA, and OUTPUT. Each segment was defined as a macro, and each data item within that segment was given a status.

GLOBAL items are referable and changeable in any segment, provided that the use of the data item remains the same. At definition time, the "use" of a GLOBAL item is declared, usually by a comment on the source listing. Every reference to that item must coincide with the declared usage, or another data item must be defined.

A LOCAL item on the other hand has no reference or meaning in any higher level segment. Its use is restricted to the segment for which it is declared. In order to restrict references to a LOCAL item, the last four characters of the item's name may be specified with the system macro variable &SYSNDX. (&SYSNDX is a variable that has a four digit value which is incremented by 1 for every macro call, and remains relatively constant for all statements within each macro definition, regardless of how many inner macro calls are generated.) This use of &SYSNDX gives a unique number for each macro, and hence a way of defining LOCAL items and instruction labels.

The use of CONSTANTS and WORKAREAS is self-explanatory. These types of data items are defined within the main level segment, whereas LOCAL items are defined within their segment of use. It was found convenient to give CONSTANTS meaningful names and to use some character designator (WKAREA1,WKAREA2,etc.) for WORKAREA items. Intersegment communication through the use of WORKAREAS was forbidden.

Communication between segments was done via CONSTANTS and macro parameter lists. Of those operands passed to a "called" segment, only the operands designated as OUTPUT data items were allowed to be altered by the called segment. In a sense, a segment may be thought of as a "weak" subroutine.

Using the above classification and restrictions, the author found that out of 10,000 lines of code, no bugs were found that caused one segment to in-

CONDITION NUMBER/MNEMONIC		ARITHMETIC	TEST UNDER MASK	COMPARE
1	O	OVER/FLOW	ONES	
2	P/H/GT	PLUS		GREATER THAN
4	M/L/LT	ON MINUS	IF MIXED	LESS THAN
7	NZ/NE	NOT ZERO		NOT EQUAL
8	Z/E/EQ	ON ZERO	IF ZEROS	EQUAL
11	NM/NL/GE	NOT MINUS	NA	NOT LOW
13	NP/NH/LE	NOT PLUS		NOT HIGH
14	NO		NOT ONES	

```
Example: An IF macro using the above format:
         IF  (CLC,CHAR1(6),=C'PHIL1.',NE),AND,
             (CP,COUNT1(8),=P'50',EQ)  THEN
```

Table 1. A set of structured programming macros with a very flexible predicate format were developed by Marvin Kessler at IBM. The condition parameters are either numbers or special mnemonics. The format is rather awkward however, and readability suffers.

```
VERSION 1:
    logical-exp = (operandA.logical-func.operandA)/
        (operandB.comparison-func.operandB)
    logical-func = AND / OR / NOT / EXOR
    comparison-func = char-func / binary-func / packed-func / floating-pt-func
    operandA = logical-exp / boolean-variable
    operandB = number / identifier / character-string-in-quotes
    char-func = EQ / GT / LT / GE / LE / NE
    binary-func = EQB / GTP / LTB / GEB / LEB / NEB
    packed-func = EQP / GTP / LTP / GEP / LEP / NEP
    floating-pt-func = EQF / GTF / LTF / GEF / LEF / NEF
    boolean-variable = variable-with-value-T-or-F
    number = string-of-digits-optional-sign / (register-number)
    identifier = S1 / S1 (L1) / D1 (L1, B1) / D1 (B1) / D1 (X1, B1) *

VERSION 2:
    logical-exp = (logical-func,operandA, . . . . ,operandA) /
        (comparison-func,operandB, . . . . ,operandB)

NOTATION: "/"means "or"

*IBM SYSTEM/360 reference format: S1 = name plus optional displacement expression, L1 = length, D1 = displacement number, X1 = index register, B1 = base register.
```

Fig. 3. Simplicity and increased readability are claimed for these predicate formats. Considerable savings in source code per segment is an additional benefit.

advertently alter the logic or data items of another segment.

The technique summarized

Defining segments as macros is the most convenient way of declaring segments in ALC. In this manner LOCAL data items become definable: segments may be given names, may accept input parameters, and can be listed in any order.

From the above discussion, a technique of application can be summarized to help ensure environmental integrity.

1. Each segment is defined as a subroutine, as a separately assembled module, or as a macro. The suggested macro segment format is presented:

EJECT

(*starts listing at top of the next page*)

MACRO

&NAME

name-of-segment

&operand1,

&operand2,. . .

(*prototype statement of macro,* &NAME *is a label that is placed on the first instruction of the segment*)

***SEGMENT name-of-segment CALLED BY calling-segment-name, LEVEL-#,NO-# ***

(*this comment is generated in the assembly listing and marks the range of this segment,* LEVEL-# *is the number of this level of refinement,* NO-# *is the number of this segment within the level*)

.* other-comments

(*these comments will appear in the macro definition only*)

ALC for function

(*all labels and local variables are to use* &SYSNDX *in their name*)

*** SEGMENT name-of-segment ENDS, RETURN TO calling-segment ***

MEND

2. All data items and registers at time of definition are to be labeled as either GLOBAL, LOCAL, CONSTANT, WORKAREA, or OUTPUT.

3. WORKAREAS are restricted to buffers, registers, and local data items. WORKAREAS are not to be used as GLOBAL, CONSTANT, or OUTPUT data items. Register usage must use the save and restore concept for each segment call.

4. CONSTANTS are never altered once they are defined.

5. All references to a GLOBAL item must be for the same use. The cross reference table at the end of an assembly listing is most helpful in checking out usage.

6. Recursion of macro segments is possible. It may be necessary to stack some GLOBAL items, but otherwise macro segments are designated for recursion.

7. Data items passed to a segment as macro operands are to be noted as OUTPUT or CONSTANT to the called segment. GLOBAL items need not be passed as macro operands.

8. The use of a pseudo-language greatly aids in design and provides a compact comment language. The comments at each level of code are made appropriate to that level of logic.

9. All areas that will be addressed using an explicit base register notation must have a special address marker placed at the end of the defined region. This special marker would be used as

```
                  MACRO
                  WHILE  &EXP,&END=1
.*****************************************************************
.*       THIS MACRO GENERATES EXECUTION TIME CODE THAT WILL      *
.*    EVALUATE THE LOGICAL EXPRESSION '&EXP' AND REPEATEDLY      *
.*    EXECUTE THE CODE BETWEEN THE 'WHILE' MACRO CALL AND THE    *
.*    CORRECT 'ENDWHILE' MACRO, UNTIL '&EXP' EVALUATES AS FALSE.*
.*       THE INPUT EXPRESSION IS ENCLOSED IN PARENTHESES (MAX    *
.*    LENGTH IS 256).  THE SECOND PARAMETER IS A UNIQUE          *
.*    IDENTIFIER (MAX 8 CHARACTERS - FIRST CHARACTER MUST BE A   *
.*    LETTER).                                                   *
.*       THIS MACRO MAY BE NESTED WITH ITSELF, 'DO', 'UNTIL',    *
.*    AND THE 'IF' MACROS.                                       *
.*****************************************************************
                  GBLC   &IEWTIL(256)
                  GBLA   &IEWCNT,&IEWNUM,&IEWRAY(256)
                  GBLA   &PNTER1,&IEVCNT,&IETCNT,&IEDCNT
&IEWNUM           SETA   &IEWNUM+1
&IEVCNT           SETA   &IEVCNT+1
&IETCNT           SETA   &IETCNT+1
&IEDCNT           SETA   &IEDCNT+1
&IEWCNT           SETA   &IEWCNT+1
&PNTER1           SETA   1
                  AIF    ('&END'(1,1) EQ '1').ERROR
&IEWTIL(&IEWCNT)  SETC   '&END'
&IEWRAY(&IEWCNT)  SETA   &IEWNUM
                  B      SYSWS&IEWRAY(&IEWCNT)
BIT&SYSNDX        DS     C
&END              DS     0C
SYSWS&IEWRAY(&IEWCNT)     SYSEVEXP  &EXP,BIT&SYSNDX
                  CLI    BIT&SYSNDX,C'T'
                  BNE    SYSWE&IEWRAY(&IEWCNT)
&PNTER1           SETA   1
                  AGO    .END
.ERROR            MNOTE 12,'ERROR IN WHILE MACRO'
.*****************************************************************
.END              MEND
```

Fig. 4. This example of a macro illustrates the approach that can be used to design a higher level macro so that nested macros are possible and overlap can be detected. These lines of code may never be seen by the user who just calls the macro.

```
                  MACRO
                  ENDWHILE  &NAME
.*****************************************************************
.*       THE 'ENDWHILE' MACRO DESIGNATES THE EXIT POINT OF A     *
.*    'WHILE' FUNCTION. EVERY 'ENDWHILE' MACRO MUST BE PRECEDED  *
.*    BY A WHILE MACRO WITH THE KEYWORD PARAMETER &END EQUAL TO  *
.*    THE ID-NAME PARAMETER &NAME.  THE &NAME PARM CAN BE UP TO  *
.*    8 CHARACTERS LONG - THE FIRST CHARACTER MUST BE A LETTER.  *
.*****************************************************************
                  GBLC   &IEWTIL(256)
                  GBLA   &IEWCNT,&IEWRAY(256),&IETCNT,&IEVCNT
                  GBLA   &IEDCNT
                  AIF    ('&IEWTIL(&IEWCNT)' NE '&NAME').ERROR
&IETCNT           SETA   &IETCNT-1
&IEVCNT           SETA   &IEVCNT-1
&IEDCNT           SETA   &IEDCNT-1
                  B      SYSWS&IEWRAY(&IEWCNT)
SYSWE&IEWRAY(&IEWCNT)     EQU   *
&IEWCNT           SETA   &IEWCNT-1
                  AGO    .END
.ERROR            MNOTE  12,'ERROR IN ENDWHILE MACRO'
.*****************************************************************
.END              MEND
```

Fig. 5. Each control macro has a unique END macro, and each END macro must have an initial control macro.

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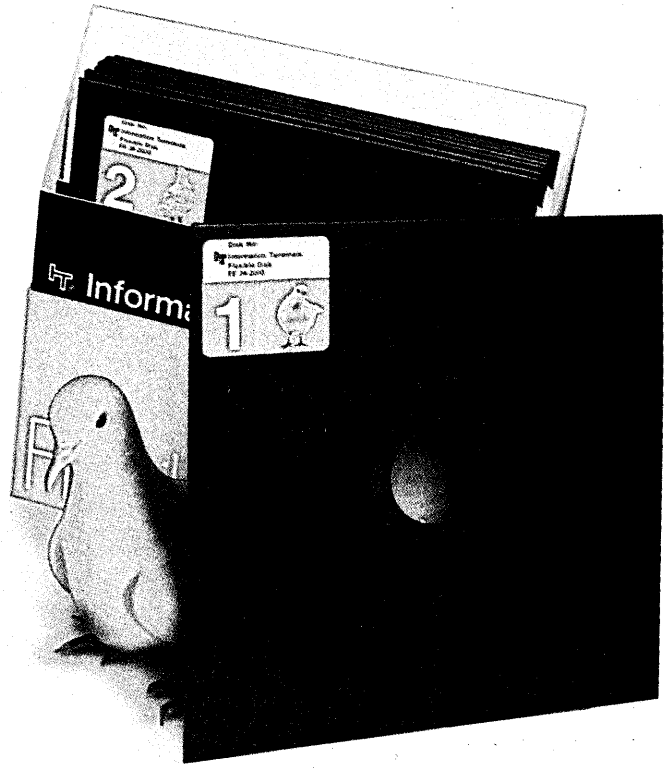

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one indicator that would terminate incremented indexing.

10. Checkout of environmental integrity is done at each level of design before the next level is refined and coded. The use of stubs to define lower level segments that are not yet refined provides a method of returning fixed replies for given input in order to test higher level logic.

11. Single operations such as CLI,CP,CH,CR,etc. are in themselves sufficiently understandable, and may require only a comment to increase readability.

12. The operations branch on count (BCT,BCTR) and branch on index high or index low or equal (BXH, BXLE) can be used to form simple DO loop control formats.

By structuring programs into segments and implementing control techniques for data item usage, the programmer's energies are directed toward designing and coding programs that give the right results, rather than debugging programs that give wrong results!

Conclusions

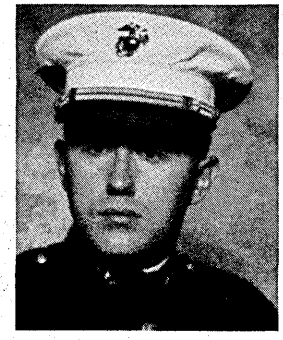
The techniques discussed here were applied to about 10,000 lines of code comprising four programs. The programs were of moderate complexity, dealing with system catalog functions and reformatting Job Control Language (JCL) on the system's libraries. The priorities on development were reliability, flexibility, processing time, maintainability, and core usage.

Results of development were these:

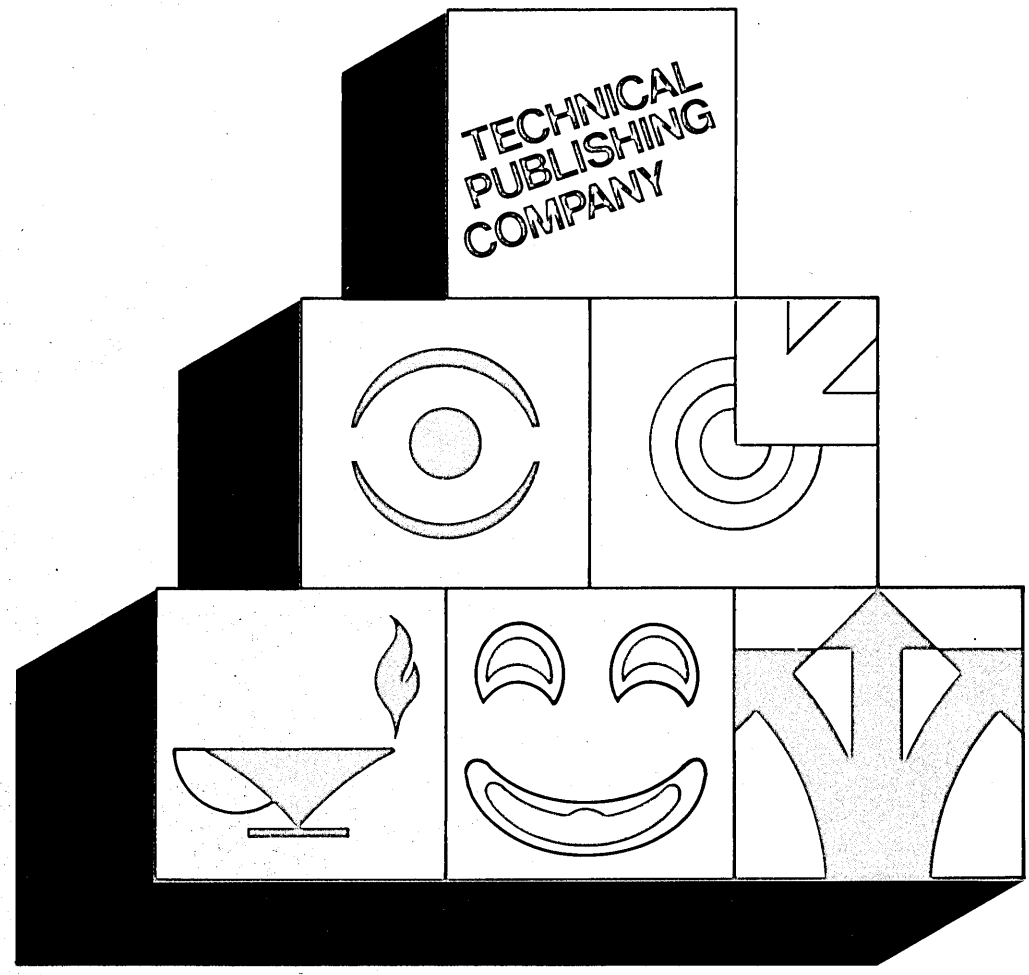
1. The profile of time involved was 60% design, 25% code and test, and 15% debugging.
2. The average debugging time per error was 30 minutes (which includes reassembly).
3. Four major changes were requested one week before production. All changes were made on schedule.
4. The programs proved to be 99% reliable (measured in terms of rejected input cases).
5. A general purpose utility and a special purpose program were designed from the source coding of one of the structured programs, in one working day. The structured technique helps do away with "reinventing the wheel."

Compared to writing similar but nonstructured ALC programs, the improvements in maintainability, flexibility, and reliability were tremendous. Changes to programs, not to speak of the ease of understanding them, were often difficult to impossible in larger nonstructured ALC programs (3,000 lines of code or more).

The results of the four structured programs were an unqualified success, especially in the areas of reliability, maintainability, and flexibility. They were within acceptable limits for speed and core usage. The concept of structured programming in assembler language code proves, then, to be both workable and quite productive. ❋



Capt. Rieks is a special project officer at the Marine Supply Activity in Philadelphia. He previously served as head of production control, dp training officer, and assistant head of systems support. His M.S. in computer science is from the Univ. of Iowa.



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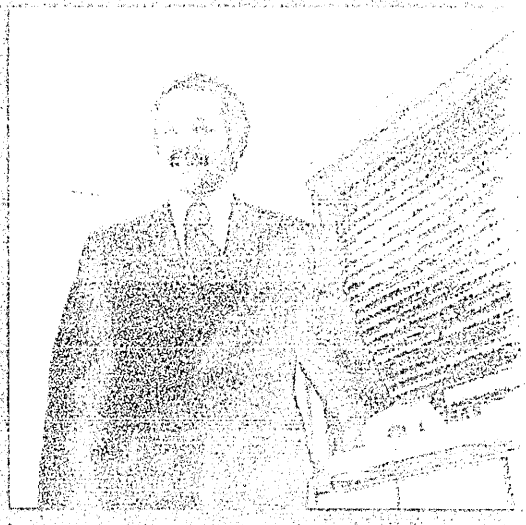

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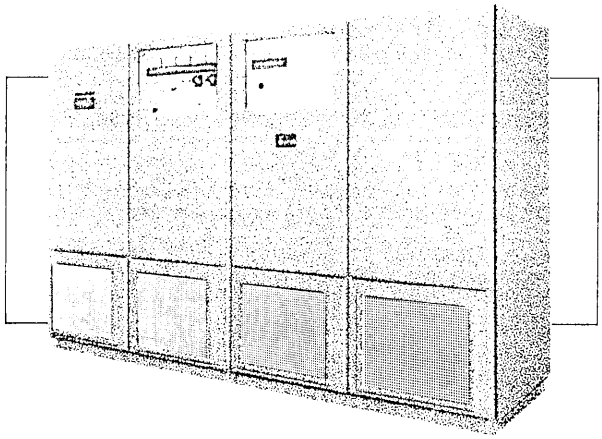

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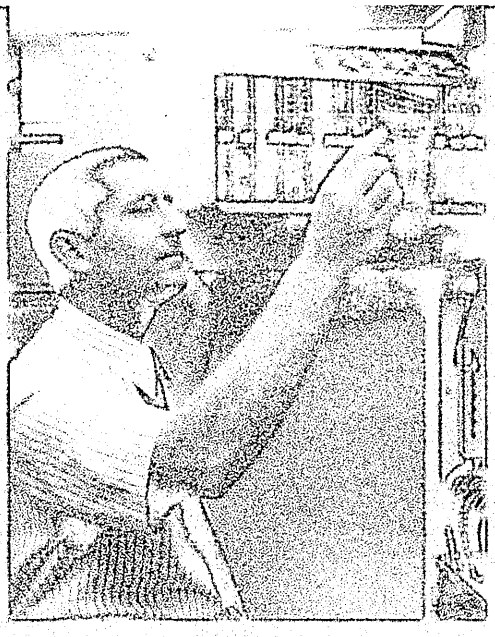

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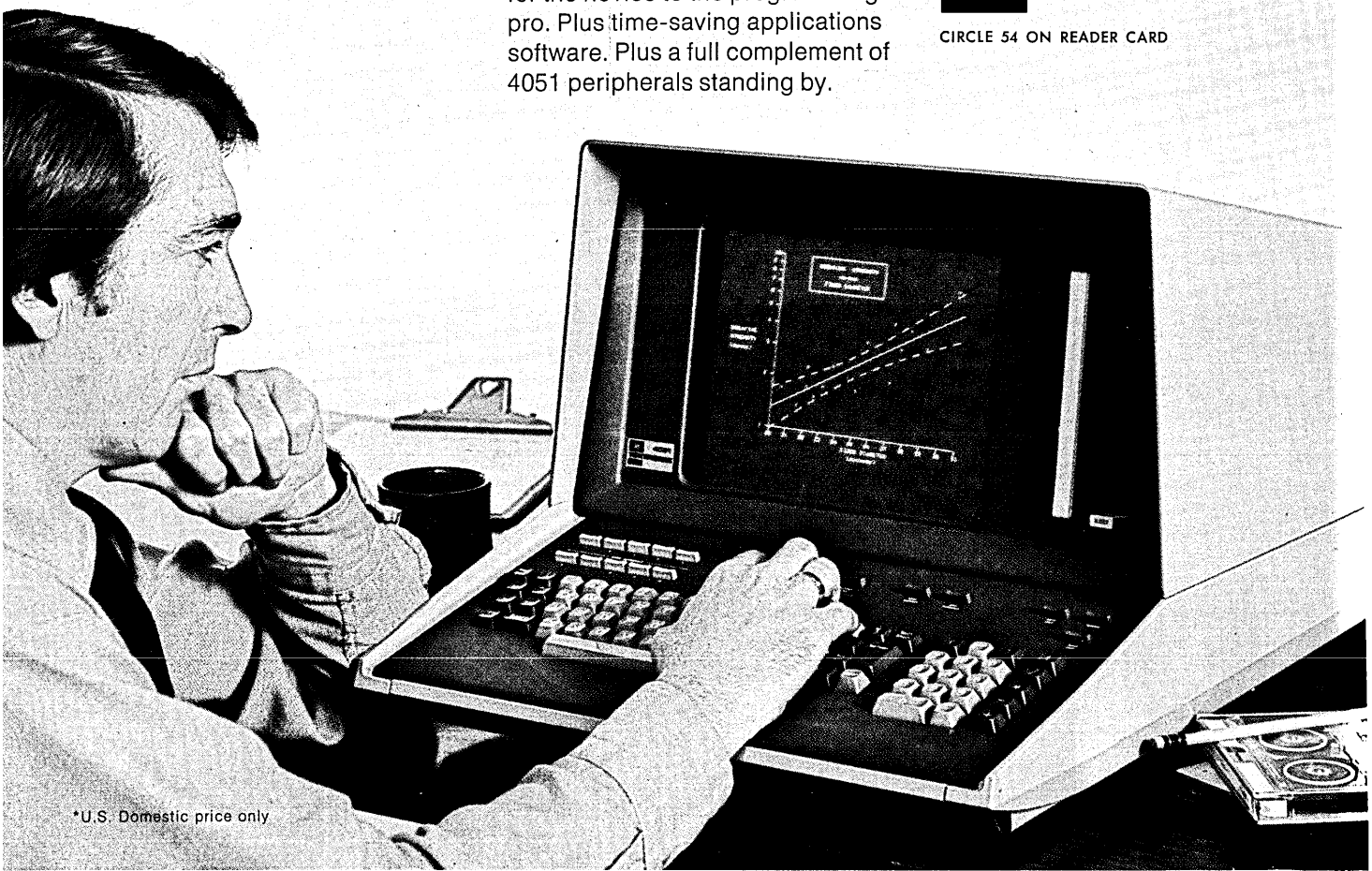

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Insight and Creativity

by Thomas R. Gildersleeve

Call it induction, or insight, or simply creativity. It's needed at every point in the definition, design, and construction of a data processing system.

Much has recently been done to make programming less of an art and more of a science. Some attempts have even been made to produce tools to aid in the more methodical parts of systems analysis. But very little help has been offered for the tougher parts of system development, those involving invention or creativity. Indeed, it may not be possible to teach someone to think creatively, but it is possible to show how some people have learned to do it, and it should be possible to learn from their example.

Let's begin by looking at a problem in which creativity is needed to arrive at a satisfactory solution.

Back in the good old days when they threw debtors into jail, a merchant had the misfortune to get overextended on his loans from an unscrupulous and thoroughly repulsive money lender. Now the merchant had a young daughter whose beauty was matched only by her innocence and purity (naturally). The money lender lusted after this paragon (naturally), and he craftily proposed that Providence be allowed to resolve their differences.

The merchant, his daughter, and the money lender were standing on a pebble strewn path, and as in all good logical problems, each pebble on this path was either pure black or pure white; there were about as many black pebbles as there were white ones, and they were all mixed in together.

The money lender's proposition was that he would place one white pebble and one black pebble in a leather money bag (naturally), and the girl would select one pebble from the bag. The merchant's debts would be forgiven in any case, and if the girl selected the white pebble, she also was free. But if she selected the black pebble, she became the property of the money lender, to do with as he wished.

As the money lender put the pebbles in the bag, the girl noticed with horror that both the pebbles the money lender selected were black: What did the poor girl do?

If you like this kind of problem, why don't you see if you can solve it? If not, I'll tell you what she did. She selected a pebble from the bag, fumbled it, and dropped it on the path, where it became lost among all the other pebbles.

She then told the money lender he could determine the color of the pebble she selected by checking the color of the pebble left in the bag, took her father's arm, and left in triumph.

In solving her problem, the girl used two kinds of thinking. First of all, the girl had an *insight*. Insight is the recognition of the relevance of some fact to the problem at hand. The girl experienced insight when she recognized the relevance to her problem of the color of the pebble remaining in the bag. In some way, she was able to tear her mind away from the terrible and hypnotic implications of the color of the pebble she had to select, and to change her frame of reference to the color of the pebble left in the bag. Then almost instantaneously, and certainly without thinking about it, she was able to *deduce* the consequences of dropping one of the pebbles on the path.

Because we human beings seem to be unhappy unless we can put a tag on everything, we have names for these two types of thinking. We can call the first induction, the second deduction. Thus, induction is concerned with obtaining insights, sometimes into general principles, from collected information, and deduction is concerned with determining the conclusions that follow from given premises.

The trouble with putting a name on everything is that, once we've done so, we seem to think we know a lot about what we've named. Sometimes this is the case, but sometimes it isn't. For example, we know a lot about deduction, and therefore, the name is meaningful—we can describe in great detail what it is the name refers to.

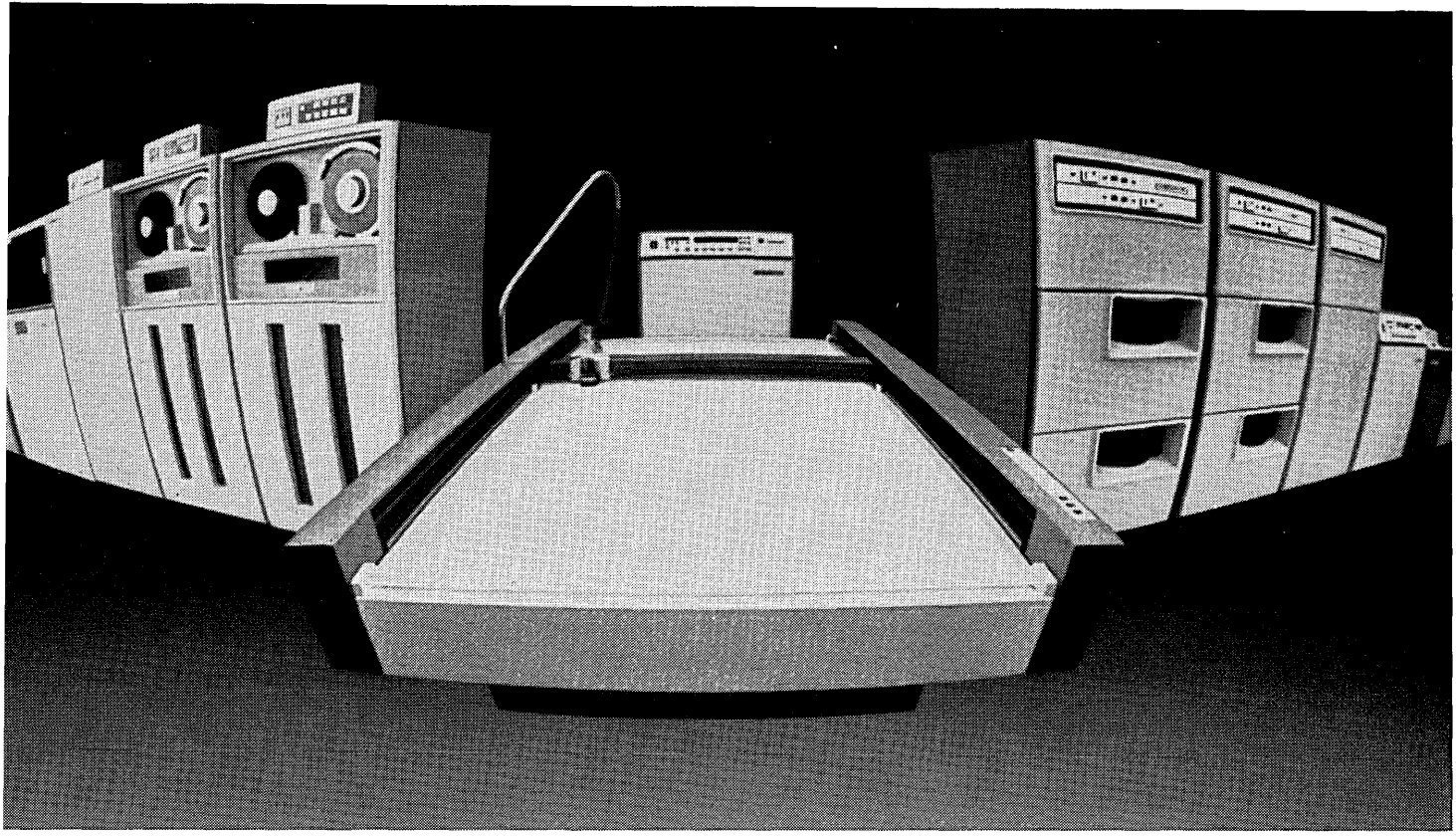
On the other hand, we know almost nothing about induction, and to think that we do, just because we have a name for it, is a delusion. As a matter of fact, use of the word frequently obscures the fact that, when it comes to induction, we often don't know what we're talking about.

Consequently, since in general we do know what deduction is all about, let's skip that and start trying to identify what we know about induction.

Induction is concerned with gaining insight from collected information. It's used in so-called "problem" areas. A problem is presented in the form of some undesirable situation. For example, skis don't grip slopes covered with hardpack. (Solution: Edge the skis with metal.) Or someone recognizes that a generally satisfactory situation can be made better. Developing a better typing mechanism (like the Diablo "daisy petal" typewheel or IBM's "golf ball") is an example. Most applied engineering falls into this category. So does revision or creation of a data processing system.

At least five types of activity can be recognized as being parts of the inductive process:

- Stating the problem
- Collecting the facts
- Organizing the facts
- Developing ideas
- Testing the ideas



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There's some tendency to say that these activities occur in the sequence listed, and in broad terms, such may be the case. However, there's considerable overlap and leaping from one activity to another.

1. It's unlikely that even the attempt to state a problem will be made without some facts on hand.

2. The way the problem is stated influences the selection of the facts and the way they're organized. At some point, the increasing sophistication acquired by trying to satisfactorily organize the collected facts may lead to a restatement of the problem.

3. Ideas can't be suppressed. They happen anytime. An unexpected but fruitful idea may feed back on the way the facts are organized and even modify the problem statement.

4. Testing of ideas is also a continuous process. Many tests are purely logical in nature and are applied as soon as the idea occurs. Others call for the collection, and consequent organization, of facts previously considered irrelevant. Some test results suggest further ideas, and the feedback cycle begins again.

As deBono says: In practice, thinking is a messy business. (See bibliography.)

With this caveat out of the way, let's take a look at each one of the activities making up the inductive process.

Stating the problem

It should go without saying that a precisely stated problem is a long step toward solving the problem. After all, it's pretty hard to get someplace if you haven't spelled out where you're going. Nevertheless, one of the more common causes of failure in problem solving is insufficient time spent in coming up with a precise problem definition.

This story exemplifies the importance of precise problem statements:

A paper manufacturer had a pulping plant connected to a paper machine. In the pulping plant softwood logs were converted to pulp. The pulp was then strained and fed into the paper machine through a pipe. One day splinters were found in the paper being produced. It was assumed that a screen used to strain the pulp had broken, and $70,000 of new equipment was ordered.

However, one man examined the splinters and found that they were hardwood, not softwood. Armed with this information, he then discovered that the pipe connecting the pulping plant to the paper machine was made of hardwood. As a result, he hypothesized that the pipe was breaking up on the inside. Investigation proved him right. The ordering of unnecessary new equipment could have been avoided if, at the outset, the problem had been defined as "**hardwood** splinters in the paper" rather than as just "splinters in the paper."

Data processing system development and modification seems to be particularly susceptible to inadequacies in problem statement. Most system development and modification begin with a problem statement, and frequently, the problem statement is provided by the user as part of his request for services. In a course on system development methodology, I introduce the topic of problem definition by suggesting that the attendees and I play the following game. They're system analysts and I'm a user. Our organization has an order entry system to which I want a modification made. I state the problem as follows: "I need a report that will keep me informed on the aging of back orders."

I then ask the attendees to respond to this request as system analysts. Invariably there then follows a discussion of the format, sequencing and frequency of the requested report. Often the discussion ends right there. Sometimes it dawns on an attendee that what I've described is a solution, not a problem. They then ask me the appropriate question, "What are you going to use the report for?"

In answer to this question I tell them that I'm going to use it to see that back orders get filled on a first in, first out basis—that is, when stock is replenished, the oldest back orders get filled first. On the occasions where the conversation has gotten this far, the class attendees invariably accept this answer, and the discussion ends. No attendee has ever recognized that my answer is another solution statement, and the problem remains undefined.

If they were to ask me why I want to fill the back orders on a first in, first out basis, I'd have to say that the longer an item stays on back order, the higher is the probability that the order will be cancelled. Only now is the problem beginning to be uncovered. Order cancellations must be undesirably high, or I never would have developed a concern for getting the oldest back orders off the books first, and I'd never have asked for the back order report in the first place. The problem is a too high rate of order cancellation.

This example also emphasizes why good problem definition is important. Once we determine that it's the cancellation rate which lies at the root of the problem, it becomes possible to conjecture that better inventory or production control techniques may be a more effective solution to the problem than any monitoring of back orders.

A good problem statement begins with two things.

1. A description of the present situation

2. A standard of performance—that is, what performance is desired?

Problems are then stated in terms of how the present situation deviates from the standard of performance. These deviations must be precisely defined—what is deviating, where the deviation is occurring, when it's occurring, and the extent to which it occurs.

The beginning of a good problem statement might be as follows: "The longer an item is on back order, the more likely cancellation becomes."

Here the standard of performance is no cancellations (or some reasonable approximation thereof), and the problem statement describes when and to what extent deviations from this standard occur. (We are, of course, presuming that this kind of "headline" statement of the problem can be backed up by statistics demonstrating quantitatively the increase in occurrence of cancellations as length of time on back order increases.)

Effort can now be productively spent in determining what circumstances create back orders; to what extent these circumstances result in back orders; what influence elimination of these circumstances would have on order cancellation; what is required to eliminate these circumstances; whether, in fact, any solutions to this problem lie in the data processing area; and what these solutions might be.

Collecting the facts

We have little to say about fact collecting outside of observing that the problem statement is going to be your guiding principle as to what facts are pertinent, and therefore, what facts should be collected. Consequently, we want to once more emphasize the importance of taking the time to come up with a precise problem statement before formal fact collection.

Organizing the facts

The more facts you have bearing on your problem, the more likely you are to come up with an effective solution. However, the pertinence of information is often lost in the quantity of information available. Organizing the information is a way of causing the pertinence to become evident. The periodic table of chemical elements is an example of how the organization of information allowed discovery of pertinent relationships concerning the characteristics of the chemical elements.

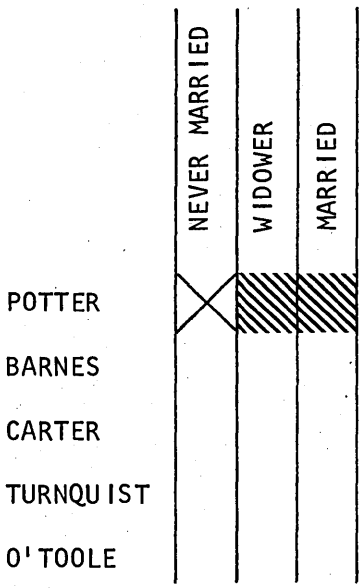
There are two activities in classifying information: (1) setting up a classification scheme; (2) sorting the information into the scheme, which generally requires the use of some amount of deduction. Again, there's a tendency to consider this a two step

process, but in reality there's considerable interrelation between the two activities. The first classification scheme is usually preliminary, and to satisfactorily contain the collected information requires continuous modification as the sorting proceeds.

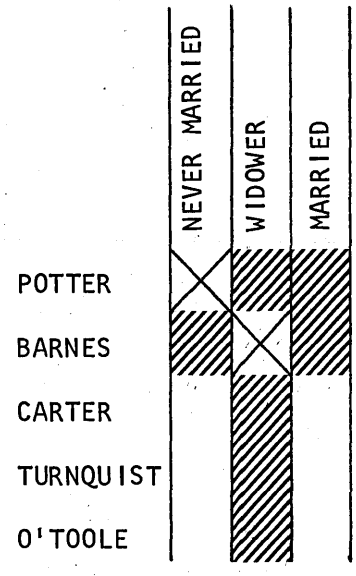
Here's a problem solving exercise involving fact organization.

Potter has never been married. Barnes and Carter are brothers-in-law. Turnquist and O'Toole have the same marital status. Two of the five men are Californians and three are Texans. None of the men has ever been divorced; one is a widower; only two (both Texans) have never been married. If Barnes is a widower, what is the marital status of Carter?

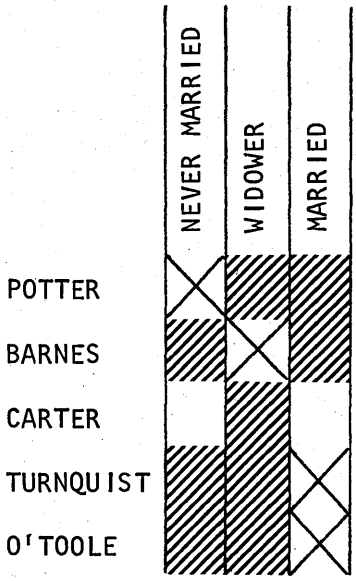
We'll use a grid on which the given information can be organized.
Potter has never been married.



Barnes is a widower. Moreover, only one is a widower.



Turnquist and O'Toole have the same marital status. This status can't be "never married," because only two men have never been married, and Potter is one of them. Therefore, both Turnquist and O'Toole are married.
Two men have never been married. Potter is one of them. Carter must be the other. Therefore, Carter has never been married.



Notice that the state in which the men live and the fact that Barnes and Carter are brothers-in-law are irrelevant to the solution. It's common in problem solving situations to discover that information collected ultimately turns out to be irrelevant. This shouldn't concern you. You should consider it nothing more than an occupational hazard.

Developing ideas

Up to now we've confined ourselves to problems where, if the problem is correctly stated, the solution can be deduced from the collected information. However, many problems require for solution the recognition of the relevance of information to the solution where the relationship isn't deductive. This is the heart of the inductive process—the insight into the relevance of information to the problem at hand. For example, the merchant's daughter experienced insight when she recognized the relevance to her problem of the color of the pebble remaining in the bag.

All of us have considerable intuitive powers which allow us to gain insight; the things preventing us from exercising these powers are our inhibitions.

There's not much we can do about our inhibitions. Basically, we're stuck with them. However, we can become familiar with our inhibitions, compensate for them, and in this way allow our creative powers to pass around the roadblock set up by our inhibitions. (I recommend Edward deBono's book, *The Five-Day Course In Thinking*, as an excellent device for learning about your own personal inhibitions and how to compensate for them. We won't plow this ground again here.)

However, there are some recognized techniques for trying to get insight. One technique is fluency—the generation of a large number of ideas. Don't immediately try to solve the problem. First, try to generate as many ideas about the problem and the information you've collected as possible.

One way of generating ideas is brainstorming. Brainstorming is generally done by a group of people. The object is to come up with ideas without regard to their practicality or impracticality. Criticism of any idea, yours or somebody else's, is forbidden. The benefit is that many apparently harebrained ideas, which would never by themselves survive the onslaught of critical review, do when allowed to survive, get modified and combined with other ideas to result in practical solutions that otherwise might never have been thought of.

You don't have to have a group to brainstorm. You can do it by yourself. Just remember the basic rule: no criticism of any ideas while in the brainstorming mode.

Our description of brainstorming brings out two other techniques of creative thinking: elaboration and transformation. Elaboration is the embellishment of a basic idea with details. Transformation is the combination of things in new ways. Both can be done methodically. After or during a brainstorming session, you can deliberately try to embellish every idea generated with as much detail as possible. You can also make a matrix of your ideas and methodically investigate each possible combination of ideas.

Obviously, both elaboration and transformation can be quite time consuming. Therefore, they should be used only to the extent necessary. Thus if some elaboration and transformation produces apparently fruitful ideas, work with them at least temporarily; if the ideas fail, return to the process.

Extended effort

Another technique for generating a large number of ideas is extended effort. Here the idea is that, after you've come up with all the ideas you can with respect to solving a problem, you consciously extend your effort and come up with even more ideas. Studies indicate that the ideas developed as a result of extended effort tend to be better, in the sense of being more effective problem solutions, than the ideas produced beforehand. In this regard, here's some advice from deBono:

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Every decision is made with some degree of uncertainty. Confidence in a decision does not depend on the lack of any alternative, for that might indicate a lack of imagination, but on the ability to see many alternatives, all of which can be rejected.

A fourth creative thinking technique is flexibility—changing your frame of reference. Look at things from as many points of view as possible. The merchant's daughter used the technique of flexibility when she changed her frame of reference from the color of the pebble she had to select to the color of the pebble left in the bag.

A fifth technique is to try to develop general principles. It's probably better to use an incorrect principle and modify it as required, than to avoid principles altogether.

With respect to developing general principles, ultimately, all generalizations are based on experience. Past experience is most useful in solving new problems if the attempt to generalize on the experience is made at the time the experience occurs.

So part of creative thinking is discipline. When you've solved a problem, or when you've seen someone else solve it, think about it from the point of view of what general principles were applied. Where else have you seen these same general principles applied successfully? What common characteristics do problems in which the principles apply have? In this way, you organize your experience and prepare yourself for the problem you haven't yet faced.

Related experience

In general, the more your past experience is related to the problem at hand, the easier the problem is to solve. Thus, after you've designed a number of programs, designing the next one isn't much of a challenge. It's that first program design that's formidable. So here's some advice: If the problem you're facing is unfamiliar to you, seek out the advice of people who have contended with such problems.

If prior similar experiences aren't available, analogies are sometimes helpful. For example, consider the following problem.

A harmful tumor inside the body of a patient can be eradicated by a sufficient concentration of x-rays. A beam of the required strength would, however, also destroy all intervening tissue. On the other hand, a beam weak enough not to harm the surrounding tissue would be too weak to destroy the tumor. What method should be used to destroy the tumor? Here's a hint: Think of how core storage operates.

To destroy the tumor, several weak beams proceeding from different points of origin are made to intersect at the tumor's location. Anyone familiar with the operation of core storage should have an advantage in solving this problem, since core storage operates by means of weak currents combining to operate on cores at the intersections of the currents.

Finally, the exact combination of facts that constitutes a good solution is something we can never predict. We must rely on the natural creative ability of our minds to come up with this combination. So vary periods of concentration on the problem with periods of, if you will, benevolent neglect. The common experience of going to bed with a problem and waking up with the answer emphasizes the importance of this technique.

However, don't think you can solve problems by ignoring them. Benevolent neglect works only after extended periods of deep immersion in the problem. Then your subconscious has the material it needs to work on while your conscious attention is elsewhere.

Testing the ideas

We must always remember that, to be creative: an idea must be practical; it must work; it must, in fact, solve the problem.

Ideas are tested both during their development and after a tentative solution has been selected. During idea development, typical idea testing consists of the use of deduction to eliminate unsuitable ideas. However, ultimately a tentative solution is selected, and this solution must be tested, to see if it holds up, before you can conclude that your problem is solved.

The great contribution of scientific method is recognition that it's thinking *plus* testing which creates knowledge. (The "knowledge" we create may unfortunately be that at this point in time there is no available solution to the problem, but even that is more knowledge than we started with.)

Creative thinking is used at all points in the definition, design and construction of a data processing system. As an example, consider the design of any data processing system.

To determine the best design, you must have an objective against which to measure alternatives. Determination of the objective of a system is equivalent to problem definition. The more precise the definition, the greater the likelihood of a successful design.

When doing the design, develop alternatives and ultimately fix on the design that incorporates the best features of the alternatives. Remember: don't concentrate on solving the problem right away. First generate ideas. Too often poor design is a function of adopting the first approach considered. And don't forget to get the advice and consultation of other design experts.

You don't know whether your design works until the system is put into production. Even then, you'll never get a clear test of the effectiveness of your design efforts unless, as part of that effort, you include in the system features that will give you feedback on how well your design is meeting its objectives in practice. Incidentally, to build in these feedback mechanisms, it's once more necessary to have clearly defined objectives so you have something against which to measure the effectiveness of your design.

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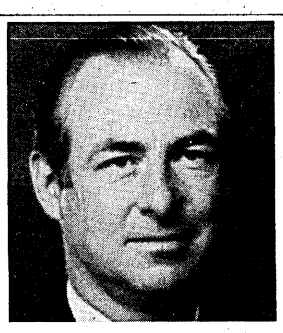
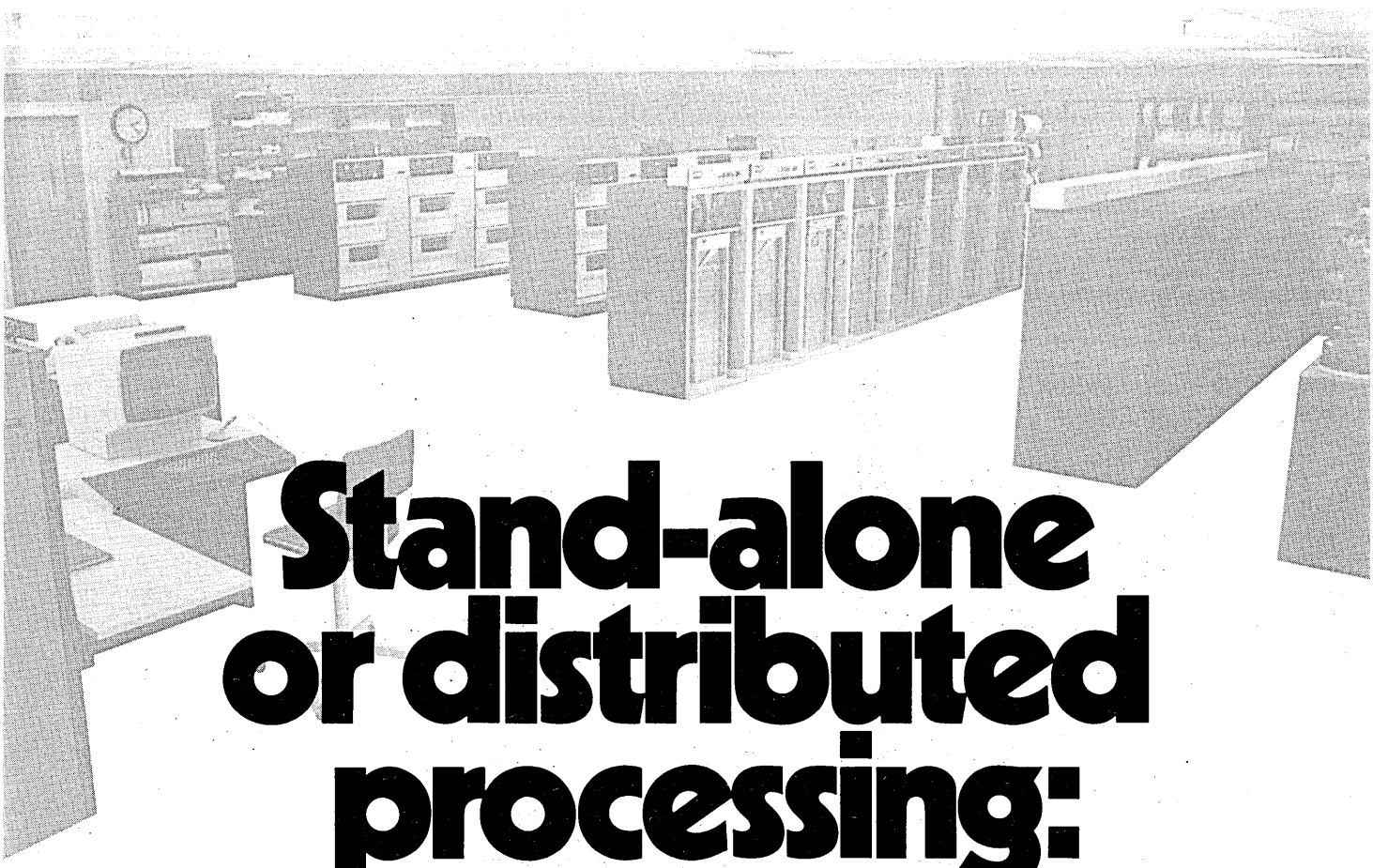
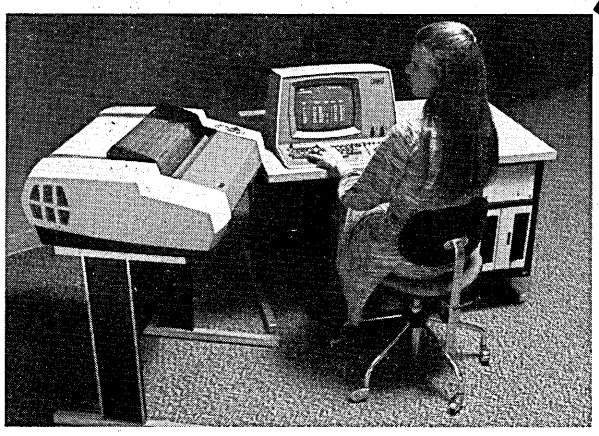
The problem concerning the five men and their marital status comes from Upton and Samson.



Mr. Gildersleeve has been in the data processing field for 22 years, 14 of which he spent with Univac, six as an independent consultant, and two with Equitable Life Assurance. His primary experience has been in software development and in the training of dp personnel. His present position is as Equitable's manager of corporate computer services fiscal control.



Stand-alone or distributed processing:



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Conferences

Everyone in a Buying Mood at Largest NCC

Strong international flavor; privacy questions rise; transfer of dp people; 1977 show nearly sold out; personal computers are talk of the show; computer picks Ford in '76.

The largest national computer conference ever was pleasing in many ways, less than pleasing in others.

Certainly the sponsoring American Federation of Information Processing Societies (AFIPS) had to be pleased that attendance at the fourth National Computer Conference (NCC) in New York City surpassed not only that of the first three but attendance at all the predecessor twice-a-year Spring and Fall Joint Computer Conferences.

Exhibitors were pleased with both quantity and quality of the attendance. "Everyone seemed in a buying mood," said one.

Richard Pick of Microdata Corp., who did booth duty at a display of the firm's Reality system, said happily at the end of the third day, "I've talked to 800 people and at least 50% of them are firm prospects for a sale." Since the Reality system appeals primarily to small business, this may indicate that a new breed is taking note of the NCC's.

NCC BOX SCORE

The National Computer Conference drew a record turnout of 35,085 to New York this year, 759 persons more than attended the 1975 conference in Anaheim. The previous record was set in 1969 at Boston when 34,500 attended the Spring Joint Computer Conference, predecessor of the NCC.

Actually, this year's record was helped by 22 exhibitors more than in Anaheim. Exhibitor registration reached 7,113, compared with 5,242 last year. The number of paid and exhibitor guests was smaller in New York (26,462) than in Anaheim (27,853). Other categories are complimentary, press and program members.

The appearance of 1,871 additional exhibitors indicated that the vendors were expecting a turnout almost as large as in Anaheim and wanted to be well-staffed to handle their requests. And that happened. ✲

Not so pleased were attendees who had to stand for long periods of time in the sweltering heat (New York City had its first period of high humidity for this year during NCC week) in lines snaked out of the New York Coliseum and onto the sidewalk. A big problem was the plastic badges that served as registrant identifiers and imprint devices to order vendor literature. Each card took at least two minutes to produce and, in some cases as long as four, making for slow moving lines. Hard pressed registration clerks finally gave up and issued hand printed paper badges.

The combination of heat and humidity is never pleasing but hardly AFIPS' fault. The overworked air conditioning systems of the Coliseum and the conference hotels were hardly equal to it. And it certainly wasn't fun, in these circumstances, to walk the four blocks between the Coliseum and the hotels and the alternative, shuttle buses, took longer.

Probably the greatest sufferer from the heat was Sonny Monosson, president of American Used Computer Co., a familiar sight wearing his sandwich board advertising used computers on the hot sidewalk with his bow tie wilting.

A perennial problem with all trade conferences is getting the right sessions in the big and small rooms and this year's NCC was no exception. Sparse audiences occupied large halls while next door people were packing the aisles of smaller ones.

Sessions generally lackluster

Reaction to the sessions was that generally they were lackluster. Common comments were "boring . . . not much new . . . and disappointing."

Among the innovations at the conference this year was the elimination of conference luncheons—a policy that caused a wag to comment that New York's Mayor Abraham Beame should have passed a resolution complimenting the conference organizers for contributing to the health of the local restaurant trade. (A cup of coffee in one local eatery sold for 75 cents, for starters, and a lunch with one martini added up to $12.)

The kids were there and more of an attraction than at past conferences. More than 50 students of all ages exhibited projects on the Coliseum's third floor. It was awesome to watch a bright ninth grader demonstrate, via a terminal, a sophisticated program he had developed.

And it was fun to look at the artwork of even younger students with such catchy titles as, "Mom at work at home with Her Computer." Then there was the picture book done by a second grader titled, "The Computer Likes You."

Surprises at art exhibit

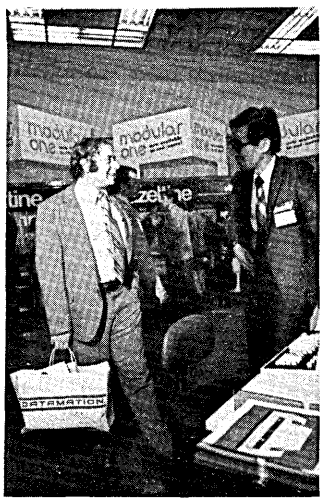
There were a few pleasant surprises in the ambitious computer graphics art exhibit.

Dominating the exhibit by sheer size was a 7 ft. by 9 ft. scanchrome reproduction of Gilbert Stuart's portrait of George Washington, done by E. T. Manning. Manning and two colleagues, George Beher and Leon Harmon, also collaborated on a rendering of Lincoln whose face, like Washington's, emerged uncomfortably from a maze of computer generated rectangles.

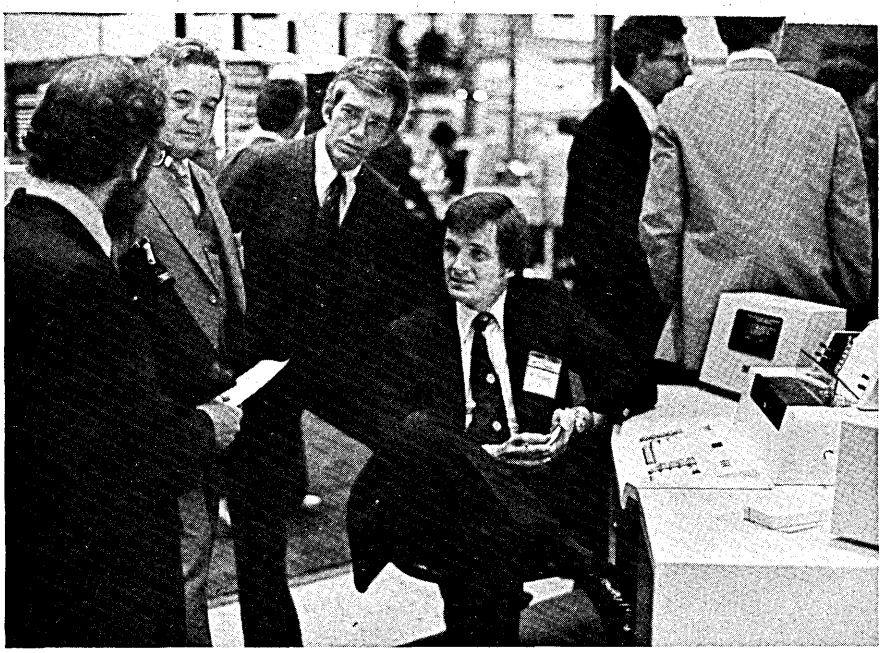
Among 398 pieces submitted by computer artists from 15 countries, most were generations of highly decorative patterns or drawings of fish and flowers with the aid of a plotter.

A notable exception was the Systems Dimensions Ltd. collection from Ottawa. Artists like Zdenek Sykor of Czechoslovakia, Edward Zagec of Italy and Roger Wilder of England are using computer generated patterns and permutations as a jumping off point to create truly original works of art produced with professional skill and finish.

Another standout at the show was a collection of small works by Duane M. Palkya,from the University of Utah. Palkya uses an image processor to create highly original self-portraits and cartoons. Using an electronic palette of 256 colors, he paints "directly into a frame buffer interfaced with a PDP-11/45 using various mathematical brushes."



LARGEST NCC was all business at three-story showing in New York Coliseum.



Some companies took advantage of the NCC for things other than pushing products.

Four Phase Systems chose the occasion to take its stock public. It sold 900,000 shares on the show's first day at an introductory price of $16 per share. It has been a long time since a computer company has gone to the public markets for initial financing during a computer conference.

Four Phase, a manufacturer of distributed processing systems, is headquartered in Cupertino, Calif. Their stock was quickly bid to a premium by investors.

At the Four Phase booth, however, it was business as usual. The company introduced new equipment including its System IV/50, a 24 station COBOL programmed distributed processing system.

Like most exhibitors, Four Phase was pleased with the quality of the conference audience. "The quality of the people who stopped by our booth was the best I've ever seen at a computer show," said a spokesman. "We saw more end users than in previous years. I thought there was more interest in systems than in oem equipment."

New name

Data Disc of Sunnyvale, Calif., timed a name change announcement for the NCC. The company is now known as Amcomp. Formed as a disc company 13 years ago, the firm has branched out into tape drives and systems. "It's difficult to sell Data Disc tapes," quipped president, James Woo.

Its newest offering, the Amcomp 6000 system for automated newspaper copy control and production, was announced simultaneously at the NCC and the American Newspaper Publishers Assn. conference in Las Vegas.

Siemens, A. G., Data Processing Div. of West Germany and General Systems International, Inc., Anaheim, Calif., chose NCC week to announce a cooperative marketing pact whereby both companies will market specific Siemens oem products in the U.S. and Canada. Products covered by the agreement are a family of disc drives up to 500 megabytes; a family of tape drives up to 250 ips, MOS memories from 32 kilobytes to 2048 kilobytes; and a variety of specialty products including impact and nonimpact products. The tape drive family includes a 6250 bpi model which both Jurgen Sinz, vice president of oem sales for the Siemens division and Willi Jilke, president of GSI, say will be "highly competitive" with those produced by IBM and Storage Technology.

They also were enthusiastic about prospects for a printer compatible with

the IBM 3410. The printer was displayed at the show. "Ours costs $46,000 compared to IBM's $310,000," said Sinz. "We expect to get 30% of the whole world market by the end of the '80s."

International Computers Ltd. (ICL), a last minute entrant in the exhibits, chose not to use NCC for announcement of its model 2904 computer to the U.S. The announcement came a week later.

International flavor

There was a strong international flavor to this year's conference. The Japanese were at the NCC in strength, displaying printers, terminals, and other products—many of which still lack U.S. manufacturing and marketing reps.

The British Business Equipment Trade Assn. brought over 10 U.K. firms to test the water of the American market. They were offering modems, software, display terminals and even services.

The international flavor was evident off the exhibit floor too. At a Computer Industry Assn. (CIA) meeting on "The European Independents—Competitors or Partners?" Helmut Rausch, Nixdorf, Germany, said "We in Europe are steering a boat between Scylla (IBM) and Carybdes (regulation). We don't know which is more dangerous." He agreed with the CIA's push for preannouncement of standards and total unbundling from IBM. He is against regulation. "We will fight it."

Rausch called the German government's equivalent to the U.S. Federal Supply Schedule "an excellent tool to press IBM for preannouncement of standards."

He said six German companies, including Nixdorf, are discussing an association which would be a pressure group. "We'd like to be allied with CIA but first change the name." Rausch thinks similar associations in other countries should be allied with CIA.

He indicated he felt CIA should be better prepared and criticized the association for lack of support of member witnesses in the IBM antitrust case.

J. Imbert of Transac, France, said independent manufacturers problems are similar worldwide and that IBM is one of them. He said terminals represent a good opportunity for independents in Europe since users are just starting to think about them.

Imbert thinks U.S. and European manufacturers should get together for "two-way cooperation—not just one way." His example: Transac markets Incoterm products in Europe and now, Incoterm will market Transac products in the U.S.

B. O. Evans, IBM vice president and president, Systems Communications Div., chaired an international plenary session on "Twenty-five years of Computing and the Impact on International Developments."

He posed the question of why Europe has not had, in effect, commercial success in computing since they have contributed so much to the technology and its developments. "They had it in their hands but something happened."

Heinz Zemanek, IBM fellow in Austria said Europe was "stronger in ideas than execution."

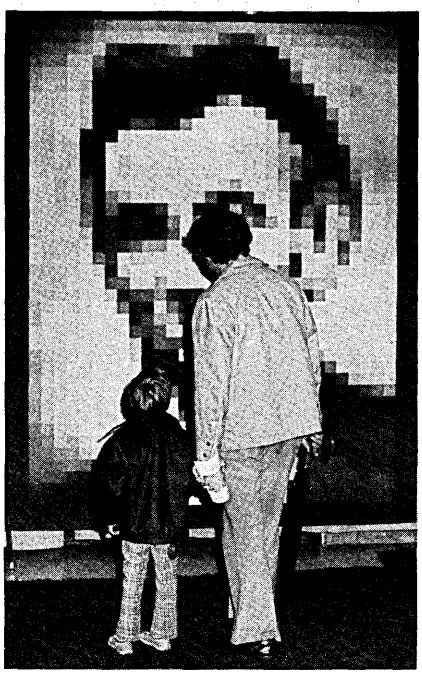
The question of "Why England hasn't developed as well as you here think we ought to?" was addressed by Professor A. S. Douglas, London School of Economics and Political Science. "Most people in the U.S. sincerely believe that the passage of time and progress are synonymous. We have some inhibitions about following the line of producing more wealth."

Evans said the British questioning of growing for the sake of increased wealth is "either an excuse or brilliant foresight."

Japan's aggressive efforts in computing were reviewed by Shiro Omata, president of Nippon Univac Kaisha Ltd., Tokyo. "The computer will become a major export item of the future. By 1990 the computer industry (in Japan) will use every 10th worker." He said there is a rapid increase in Japan in large and small scale system usage.

A. A. Dorodnicin of the U.S.S.R. didn't show up. In his stead, Dr. Rein Turn of the Rand Corp. reviewed some Soviet activities. He mentioned a plan to establish a net of 10,000 multi-access utilities throughout the U.S.S.R. for industries and regions—in the 1980s. "Even if the centers and hardware are set up, the software problems will dwarf these problems . . . Whether the Soviet Union has learned from our large system disasters remains to be seen."

In a session on "Computing in Europe," Control Data Corp.'s Robert Koenig described a Ryad 1040 CDC purchased in East Germany. He said it is two times faster than the IBM/145 in sci-



PORTRAIT OF LINCOLN: E. T. Manning, George Beher and Leon Harmon collaborated on this rendering of Lincoln from a maze of computer generated rectangles.

ACM'S Special Interest Group on Computers and the Physically Handicapped (SIGCAPH) provided sign language interpreters for deaf visitors to the NCC. Steven Jamison, vice chairman for the deaf, said the service was provided at no charge.

entific and engineering applications and about equal in business data processing. Integrated circuits provide a "respectable level of performance" with advanced algorithms. He said the peripherals are "not great," with disc drives being the most serious deficiency.

International visitors who were not scheduled to speak got into the act too. During a question and answer period of a session on privacy, much concern was expressed over the possible use in the U.S. of a universal identifier, particularly the Social Security Number. One man was quite worried about the fact that the Internal Revenue Service puts his SSN on the label which brings him his tax return forms, "out there for all the world to see."

A visitor from Sweden got up to say "we have a universal identifier and it appears on the face of envelopes. The only people who seem concerned are certain ladies because the identifier does contain age. We think it leads to more openness."

Rose on privacy (and Hays)

Privacy was touched on by Congressman Charles G. Rose III, a last minute substitution for Congressman Wayne L. Hays (whose hardware, Rose said, was down) in a plenary session on "Public Policy and Computers."

"If you think there has been misunderstanding and misconceptions about nuclear energy, I can assure you that public misconception and distrust for the whole area of computer privacy is capable of outdistancing that sort of misconception area by a factor of at least ten," said Rose.

"Some have said," he stated, "that the IRS has been proposing a program that would give field agents portable computer terminals with access to federal income tax records of American citizens. I'm very much in favor of the IRS doing as efficient a job as it can to keep our tax laws enforced. There are privacy considerations and questions of security. We have a right to know that this information is secure and incapable of falling into the hands of those who would put it to mischievous use."

Jerry Rosenberg, Polytechnic Institute of New York, offered a suggestion for the IRS in a privacy session. "If the IRS can generate a label for each one of us at the time they send out their tax returns, why couldn't they run a check at the same time to let us know what personal data they have on us. Most of us would be shocked."

Privacy was a concern in Electronic Funds Transfer sessions too. Paul Armer, Center for Advanced Study in Behavioral Sciences, Stanford, Calif., expressed a concern he has expressed many times before: that a full blown EFT system would allow those running it to know "where we are all the time in real time." The knowledge of this, he said, "has a chilling effect. It would affect people's behavior. They'd act differently. I don't want to live in a world like that." He received a round of applause for the comment.

That Armer's concerns will be one of many subjects studied by the Electronic Funds Transfer Commission, was made clear by Jack Benton, executive director of the commission. Restructuring of the financial industry is a major and perhaps overwhelming object of the group's attentions but Benton said the commission would go far beyond this. He said they have identified eight major areas of study including such things as privacy and security, technology, and telecommunications. He issued a plea to the data processing community to "get involved with us. You're paying for it."

The matter of involvement also came up in sessions on privacy and on the computer profession. Louis D. Higgs of the Privacy Protection Study Commission virtually paraphrased Benton's plea. "Get involved. Get in touch with the commission. We need you."

Transfer of dp people

Transferring data processing employees to and from the department may be becoming an effective way to involve future executives in the data processing function of large companies, San Mateo, Calif., consultant George Glaser said at a session entitled, "Executive Management Must Become Involved."

Glaser and Gopal Kapur, of Kapur and Associates, Danville, Calif., recently interviewed 35 companies in an informal study of management techniques and attitudes related to more effective use of data processing (May, p. 59). They discussed such things as the reporting relationship between the dp department and the users, long range planning, personal liaison, and the use of corporate data processing committees.

Glaser told of a large oil company which had transferred 22 persons out of the 260-person dp department to other functions within the company and replaced them with "knowledgeable" persons from other departments. "Although they left the dp department with no intention of coming back," Glaser said, "some did." Two or three other companies they interviewed were contemplating similar policies and many others not interviewed had implemented a transfer policy.

"We're going to see more of it," Glaser said, "particularly with persons who show a capability in more than one area." He admitted that there are problems (one being that salaries are higher in the dp department) but he said it is a way to get bright persons to think of themselves as a member of a company and not as a computer person. Glaser said, however, that there will continue to be persons in companies with such plans who will remain in the dp department for their entire careers. "This is fine," he said, "but hopefully the persons they deal with will have a better knowledge of computer usage."

Eight of nine professional development seminars, at $50, drew 60 to 80 persons out of a capacity of 100. One, on structured design, conducted by Edward Yourdon, was sold out.

'77 show a near sellout

As the conference ended, more than 800 of the 922 booths for the 1977 NCC in Dallas had been reserved. NCC has the option of enlarging the booth space in the huge Dallas convention center to 1,200 booths on one floor. Harris Corp. signed up for the largest booth for next year, 30 ft. by 100 ft. IBM will have 40 ft. by 60 ft.

Attendance at the Dallas affair, next June 13–16, is a question mark. Howev-

Theodore J. Williams New AFIPS President

The American Federation of Information Processing Societies, which spent $10,000 studying the feasibility of launching a magazine this year, is expected to invest another $50,000 doing further study.

This was decided at the society's biannual board meeting following the National Computer Conference where Dr. Theodore J. Williams of the Instrument Society of America, was elected the society's new president.

Dr. Williams, professor of engineering and director of the Purdue Univ. laboratory for applied industrial control, succeeds Dr. Anthony Ralston who did not run for a second term as president of the super society of 15 computer-related organizations representing 125,000 members. He defeated Ed Palmer of the Data Processing Management Assn.

The other officers were reelected: Dr. Albert S. Hoagland, vice president; Dr. Sylvia Charp, secretary, and Walter A. Johnson, CDP, treasurer.

The first AFIPS study, conducted this spring, anticipated that initially the publication would be a monthly of 80 pages with about 20 pages of advertising. Ralston, who proposed the idea, said it was expected to lose money during the first three years of publication and the society would have to raise $590,000 in front money to launch it. He said it might become profitable within three years, thus easing the money-making activities of the society which at present relies on the National Computer Conference proceeds for 80% of its budget.

Results of the next feasibility study would be presented to the board at its December meeting. ✻

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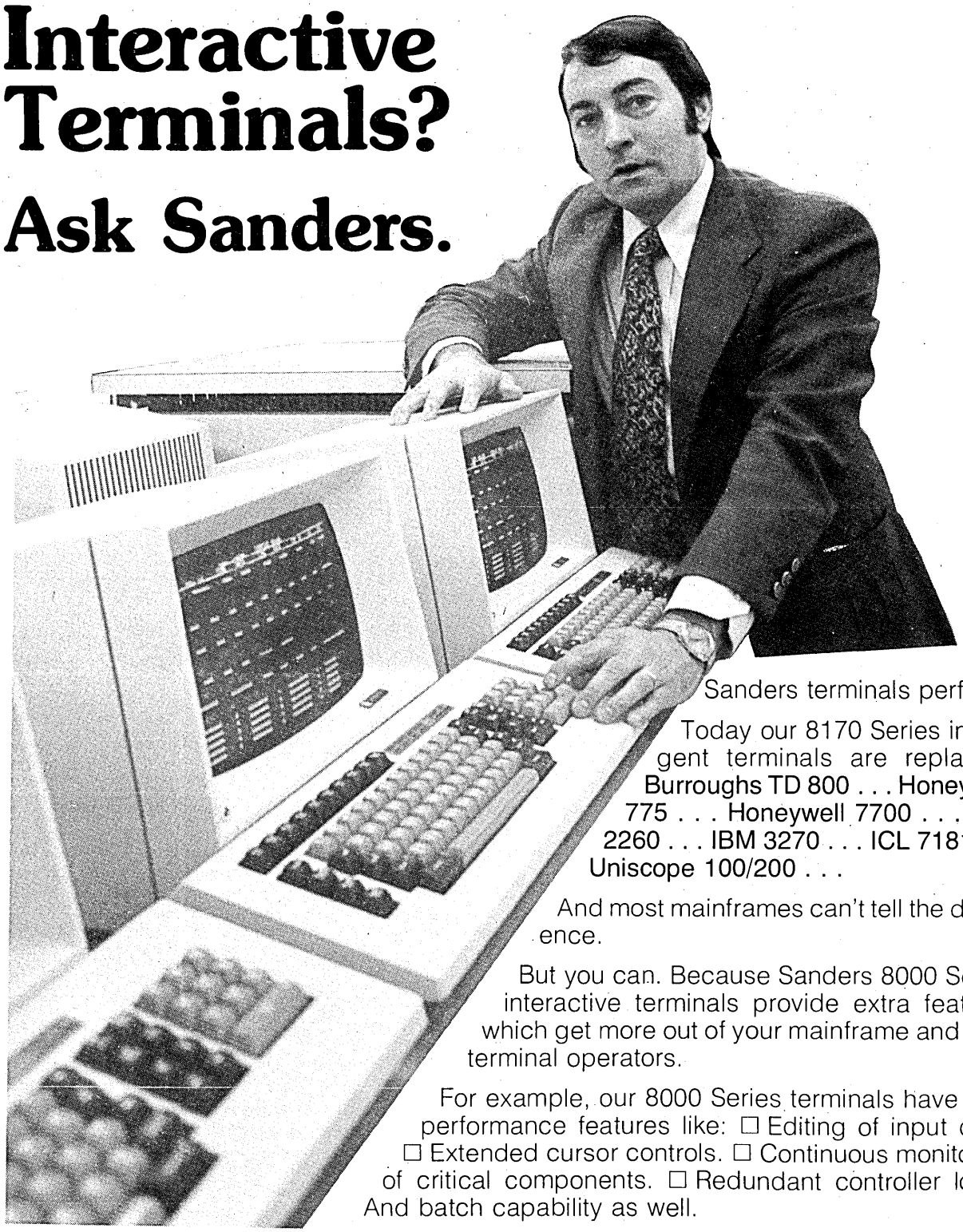

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er, the attention being given to personal computers at Dallas could draw a large turnout to the first National Computer Conference ever held in the Southwestern U. S. Dr. Portia Isaacson said a display of 100 home-brew machines and their applications software is planned for the conference, together with the first national programming contest.

The computer hobbyists were out in full force at this year's conference. Exhibitors said they were seeing "more computer hobbyists and computer hackers" than ever before.

Personal computers proliferate

A session on "Personal Computers" was a crowd drawer and a crowd pleaser. Stephen Gray, president of the Amateur Computer Society noted that the hobby field has grown from "a few dozen engineers building machines from scratch prior to 1974 to a point where it supports 30 or 40 clubs, a couple of dozen newsletters and three magazines."

Ted Nelson of the Univ. of Illinois said the home computer market will "totally swamp all other uses of digital equipment." He predicted "10 million mainframes or mainchips within the 1900s."

He talked of the computer as a home appliance. "For those who say the computer is just a tool—balderdash. The computer is a way of life and you know it."

He referred to the "absurdity" of the term microcomputer. "A computer, damn it, is a computer. They should never have gotten big." And as for the term dispersed, he said "we should never have gotten centralized."

He said the use of computer centers has been "a cuckoo way of using computers all along." This, he believes, leads to loyalty to the manufacturer. "If IBM had wanted people to understand computers back in 1964, they would have understood them by 1965."

Nelson described a computer store he is thinking of starting in Evanston, Ill. It would be called the Itty Bitty Machine Co. and would offer franchises a la McDonald's. "And if anyone tries to sell you something using our initials . . ."

Nelson's comments underscored some of those made by David Ahl in a session describing a survey of public attitudes toward computers in society.

"In the future the computer will be not merely in the realm of the scientist or data processing specialist but it will be available to everybody." If Nelson gets his Itty Bitty company going the future may be imminent.

The conference keynoter, J. Paul Lyet, chairman of the board and chief executive officer of Sperry Rand Corp. seemed to agree with this. "In the future," he said, "a computer terminal will be as much a part of home decor as a television set is today."

Everyone's a consumer

And if not big in the home it still will be a part of everyday life. IBM displayed its supermarket scanning system at the show and it drew the kinds of crowds you might expect at a supermarket show but not at a dp show. But, everyone's a consumer.

And they like to be entertained too. Data General did well with a booth built like a circus and stocked with a juggler, a pretty girl, a karate expert and a belly dancer. Datum did well with an extremely able magician. Both firms managed to find time to show their products.

Lear Siegler tried a homey approach. Their booth was designed like a living room to "make our customers feel at home with our products."

There seemed to be 100 printers on display and maybe that many floppy disc drives.

Texas Instruments showed a non-dp product which obviously interested a dp audience. It's their new digital watch which will sell wholesale for about $13 and retail for $20.

And there were products for the hobbyists. MITS of Albuquerque was showing its latest Altair computers and National Semiconductor had an $89, two inch thick loose leaf notebook containing a microprocessor, a board, a 256 bit RAM and all the instructions to assemble and program.

Harris was showing an innocent little box which could have been any kind of a processor or even a modem. It was the company's own fiber optic interface, a device which already has seen duty in government contract projects for computer to computer linkages, and which will be used by Harris in its own systems for linking processors and peripherals.

Centronics showed its Kanji printer, a dot matrix impact device capable of writing all those pictograms used by the Orientals.

Raymond Engineering had a tape drive which used the tiny ITC tape cassette, the one that's small enough to lose in a pocket.

Modular Computer Systems Inc. introduced a new, low cost version of its MODCOMP computer family. Called the MODCOMP IV/35, the 32 bit computer is offered with one megabyte of memory and 32 direct memory processor I/O channels and in a typical configuration will cost $42,500.

Controversy at Pioneer Day

The greatest controversy of the show —at least of the technical sessions—came where it would have been least expected, in the Pioneer Day panel sessions. The topic for the three-segment program was the ENIAC, the machine considered to be the first general purpose programmable digital computer.

The session, 30 years after the completion of the machine, turned out to be a continuation of a long ongoing discussion of who should get how much credit for the project.

"Thirty years have gone by and we

FUN AT NCC: Visitors like to be entertained and came in droves to the Data General circus, the magic show by Datum. Lear Siegler presented its products in a booth designed like a living room, "to make our customers feel at home with our products." And there seemed to be 100 printers on display and maybe that many floppy discs.

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have the history all screwed up," said John Mauchly, who, with J. Presper Eckert, was largely responsible for the creation of the 18,000 vacuum tube monster.

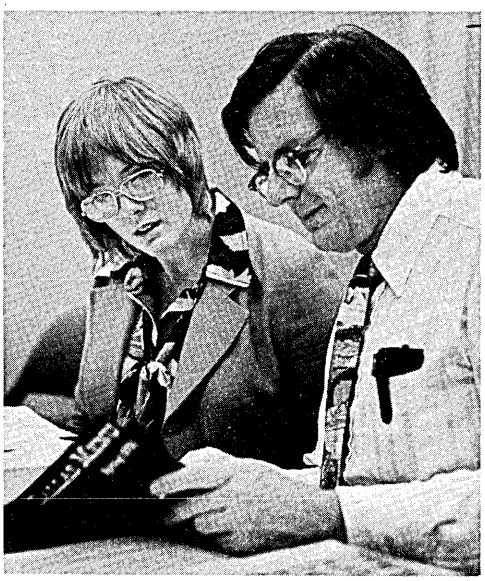
Mauchly's principal antagonist was Herman Goldstine who had been the Army's liaison officer on ENIAC. A specific area of disagreement was over the contributions of John V. Atanasoff. Goldstine supports the idea that Mauchly was influenced by Atanasoff's work. Mauchly denies this.

There were other quarrels about the influence of Charles Babbage; the contributions of John von Neumann to stored program machines; about how well the ENIAC worked when it was turned over to the Army. The many pioneers in the audience got into the act. Little was settled.

Anyone could vote

As befits a bicentennial year, there was lots of red-white-and blue in evidence on the three exhibit floors.

And, as befits an election year, anyone could vote and many did. Bourns Inc., Riverside, Calif., conducted the mock election from its booth. Voters pencil marked their preferences on ballots which were standard 80 col. Hollerith-coded marked cards listing 31 candidates and issues.



DALLAS IN '77: Dr. Portia Isaacson, conference chairman, and Dr. Robert Korfhage, program chairman, for NCC in Dallas next year plot things for show. Call for papers has been issued on the Technology of Computing, The Uses of Computing, Management and Computing and the Individual and Computing.

Poll data was read by a Bourns Series 6000 Optical Mark Reader, and stored in a minicomputer which emulates a remote computer mainframe. Each voter was given a printout of the vote total up to the minute of his casting his ballot. Final printouts were issued when the show closed.

Voters were asked who they thought would be the Democratic nominee, the Republican nominee, and the Independent Party nominee. They also were asked to select among nine issues those they thought would be big in the coming campaign.

Candidates for the Republican and Democratic nominations were pretty much those listed on ballots in all states. The Independent nominees were somewhat different. They were Linda Lovelace, Truman Capote and Archie Bunker.

The winners: Jimmy Carter, Gerald Ford, Linda Lovelace and the economy. The computer also came up with a presidential prediction—Gerald Ford. If he wins, maybe he'll come to the next NCC.

(This article was written by Edith Myers with reports from Philip Dorn, John Kirkley, Tom McCusker, Richard McLaughlin, David Gardner and Angeline Pantages)

Teletype Could Market 40/4

AT&T, already denied a tariff on its synchronous clustered Dataspeed 40/4 terminal by the FCC, might be able to market the device through Teletype Corp.

This idea was deemed feasible by two speakers at the National Computer Conference. They were Larry Darby, an economist for the Office of Telecommunications Policy and Andrew Margeson, a staff member of the House Commerce Committee's communications subcommittee.

The FCC rejected Bell's proposed tariff for the 40/4 on grounds it is data processing rather than communications equipment, and therefore AT&T's marketing of the device would be in violation of the consent decree it signed with the Justice Dept. in 1956.

Margeson, in agreeing to the feasibility of Teletype's marketing the 40/4, said "I hope we can get into a good dialog on that matter." He was referring to hearings which his subcommittee plans to hold on the Consumer Communications Reform Act.

Teletype is a separate subsidiary of the telephone company, so it satisfies —at least in part—one potential objection of independent terminal makers. A big problem is that Teletype can market only "communications" equipment since each terminal in its product line must first be tarriffed by AT&T Long Lines or a Bell operating company.

Thus, in order for Teletype to be able to market the Dataspeed 40/4, either the phone company would have to win its present battle to get the terminal accepted as communication equipment, or the 1956 consent decree would have to be modified.

IBM and the Office of Telecommunications Policy already have endorsed a change in the consent decree and there seems to be growing support for change. The FCC's Common Carrier Bureau, when it decided the 40/4 was data processing rather than communications equipment said "we believe the appropriate way to deal with this problem is through a petition seeking a revision of the Commission's rules, as well as a reopening of the 1956 consent judgment."

One source said it might not even be necessary to decide immediately whether the 40/4 is data processing or communications equipment. He said Teletype could be allowed to market the equipment "until such time as the FCC's upcoming computer/communications inquiry is completed and the Commissioners define a permanent boundary between data communications and data processing." The AT&T consent decree probably would have to be amended, he added, "but this shouldn't be difficult—the Justice Dept. has stated repeatedly that it favors more competition in the telecommunications marketplace. Allowing Teletype to market the 40/4 on a temporary basis would test one possible means of achieving that goal." ✲

Compounded Market Expansion Predicted

"Expenditures for edp, telecommunications and related information resources will increase at an annual, compounded rate of 11-12% over the next decade and will reach $350 billion by 1985."

This was the prediction of Harvey L. Poppell, of Booz, Allen, Hamilton, in a National Computer Conference session on "Communications, Computers, and Word Processing." He said these same expenditures in 1975 were $150 billion. Vendor supplied services will grow more than three-fold, from $72 billion in '75 to $220 billion in '85, he said.

The basic force behind this market expansion, Poppell explained, is the growing synergism between the telephone, computer, and manual input devices like the typewriter and facsimile machine. By 1981, he expects this development to lead to widespread use of intelligent data terminals, digital facsimile, and advanced word processors, followed by portable, compact telephones, digital telephone, interactive desk ter-

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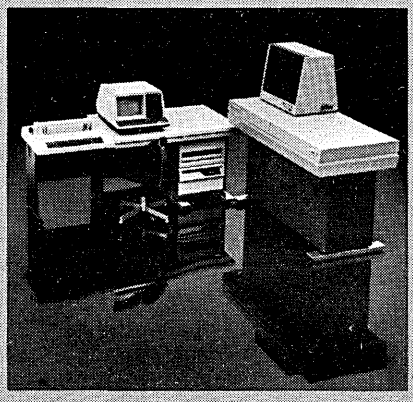

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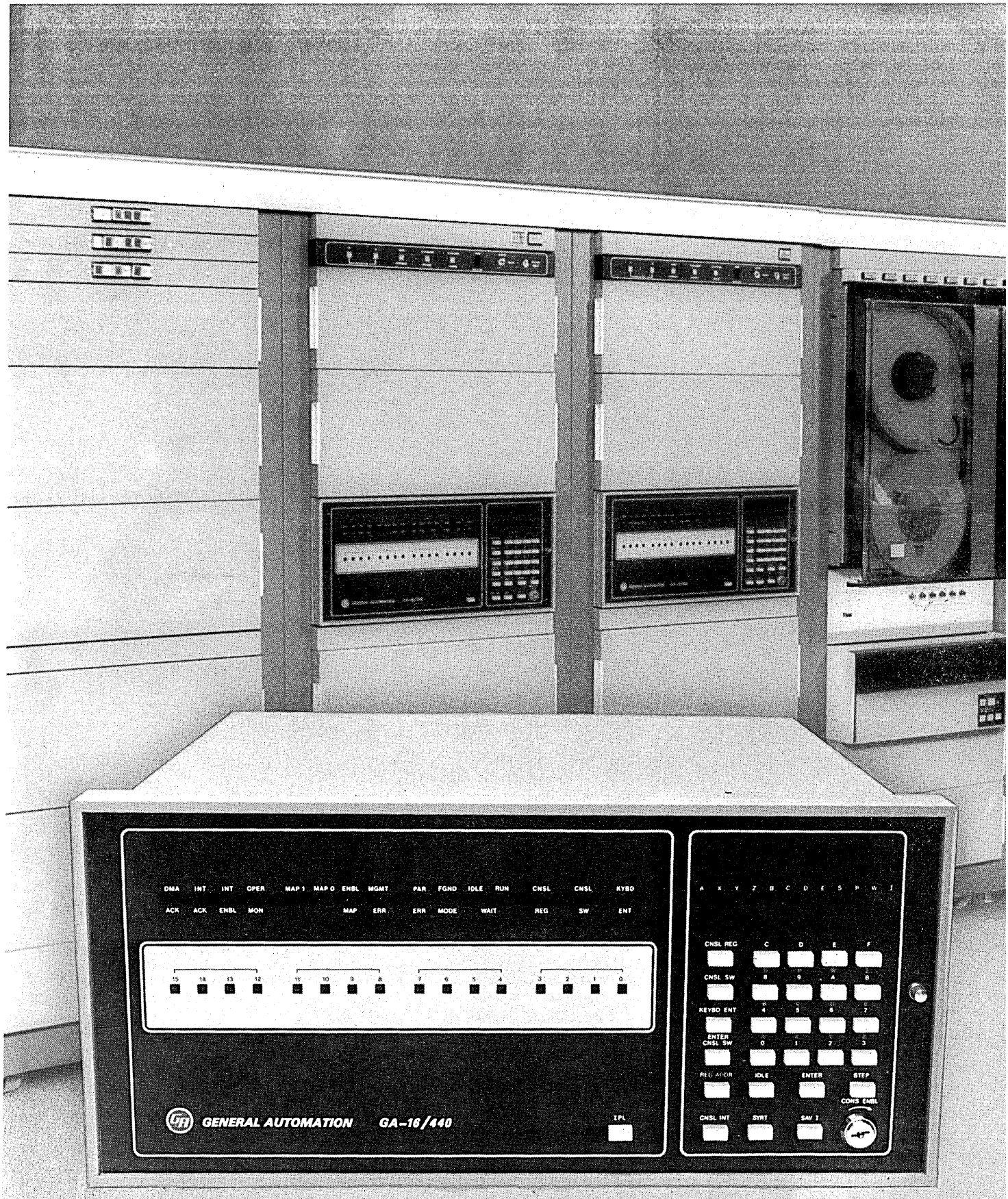
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INT ENBL
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ENBL MAP
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PAR ERR
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minals, and teleconferencing devices between 1979 and 1984. Along with improved terminals, he said, will come significant changes in information storage/processing and translation/switching. He predicted, for example, that intelligent PBX's, store/forward facsimile, and distributed processing will all be in common use by 1981 and that store/forward voice service, distributed hierarchical storage, computer load-leveling, demand-assigned channel allocation, use of mobile radio for personal communication (through pocket-sized telephone sets), and lightwave transmission, will become commercially viable telecommunication offerings between '79 and '84.

By 1985, Poppell said, business and government organizations will communicate through multipurpose information centers. Each center will be linked to terrestrial and space satellite common carrier networks, as well as to portable and mobile communication systems. These transmission facilities will be accessed through a variety of terminals providing voice, data and/or video input/output. ✲

Packet Protocol Criticized

X25, the new packet network communication protocol awaiting final approval by the Consultative Committee on International Telephone and Telegraph (CCITT), the standards-writing organization of the world's telephone carriers, came in for some criticism at the National Computer Conference.

Louis Pouzin, director of France's Cyclades Network, said X25 controls only that portion of a message path between the user's data terminal equipment and the nearest network node, thus excluding the virtual circuit between the entry and exit nodes. One result, he said, is that if a packet develops errors while traveling within the network, or duplicate packets are inadvertently sent, X25 does not provide a means of reporting either fact to the user. In other words, he said, "Thou shalt trust the carrier."

Pouzin added that "it is not clear why the CVC protocol (the packet level control scheme in X25) comes on top of an HDLC procedure. They are both local protocols, controlling the transfer of data between data terminal equipment and its nearest carrier office."

By not developing a packet level protocol that offers true end-to-end error and flow control, Pouzin said, the carriers have created the necessity for "yet another protocol." He said many users and systems suppliers will not be content to "trust the carriers," so they will develop their own end-to-end control schemes to supplement X25. The alleged result will be increased transmission overhead and a need for the user to make an additional investment in hardware/software at the network interface. Systems performance, Pouzin said, will suffer because these multiple protocols will reduce throughput.

He suggested a better scheme would be to separate the "transport" functions of the protocol—for example, establishment and termination of transmission between the end points of the message path—from the communications processing functions involving the information portion of the message. Packets would be sequenced at the receiving end into proper order.

He said the carriers oppose such a scheme because they want to market computer front ends, concentrators, and intelligent terminals in addition to transmission service. By controlling the interface between these devices and the network, Pouzin claimed, the carriers believe they can acquire a competitive edge over independent manufacturers.

"It may be tempting for some governments to let their carriers monopolize the data processing market as a way to control IBM," Pouzin said. "What may happen is that they fail in checking IBM but succeed in destroying smaller industries. Another possible outcome is underdevelopment. It looks as if we need some kind of peacemaker to draw up boundary lines before we all get into trouble." ✲

Antitrust

The West Coast Cases: Lively Affairs to Be Tried by Juries

As the Justice Dept.'s 10-year-old antitrust case against IBM lumbers along in a federal courthouse in New York City, computer industry watchers are beginning to turn their attention to the so-called "West Coast cases" in which IBM has been charged with antitrust violations by competitors.

On the basis of the extensive pretrial records that have been accumulating in the California cases, it is evident that the private companies have prepared their cases carefully and—unlike the Justice Dept.—they are relying heavily upon industry experts to prepare their presentations.

While the government case will be decided by a federal judge and that trial shows signs of droning on for years, the West Coast cases are all expected to be decided by juries in relatively short trials that will be measured in weeks and months rather than years. There are indications from the pretrial records that the West Coast cases could be lively affairs.

The first case scheduled to come to trial in November is the $600 million (treble damages) antitrust suit brought by California Computer Products. IBM has countersued by charging CalComp with misappropriation of IBM trade secrets.

There are indications that IBM won't have as easy a time with the CalComp case as it had with an earlier antitrust case with Telex, a case that IBM first lost, but later won on appeal. IBM also won a trade secrets action against Telex.

While the Telex attorneys had to fly by the seat of their pants on a crash preparation of their case against IBM, CalComp has spent several hundred thousand dollars over seven months in preparation for the case.

Requests jury trial

CalComp has retained a high powered and effective jury trial attorney, Maxwell Blecher, to present its case. CalComp has requested a jury trial and this could be significant. With the new members of the U.S. Supreme Court—the so-called Nixon court—the Court has swung sharply in favor of big business in antitrust matters. On appeal, however, appellate courts including the Supreme Court, would find it more difficult to reverse a jury decision provided, of course, that CalComp can win in the first place.

The CalComp case has become something of a personal crusade for CalComp's chairman Lester L. Kilpatrick, who outwardly displays an emotional anger against IBM that is rivaled only by that displayed by another computer company chief executive officer, Walliam Norris of Control Data. Norris, firm was the first to sue IBM—back in 1969—and CDC eventually won a $100 million-plus settlement from IBM.

What are the chances of settlement in the CalComp case? At this point no one can say with any certainty but Kilpatrick has recently been moved up to chairman at CalComp and George Canova named president—a move that some believe would facilitate a settlement between CalComp and IBM. Nevertheless CalComp and Kilpatrick remain heavily dug in for a tough fight, even though the firm has been under financial pressures in recent weeks.

In the meantime, IBM has moved one of its most able and trial-hardened at-

torneys, David Boies, from its New York law firm of Cravath Swaine and Moore, to be the trial attorney in the CalComp case in Los Angeles. The move has prompted some observers to speculate that the New York firm will supervise all of the West Coast cases.

Better position than Telex

As for the trade secrets issue, CalComp is considered to be in a better position than Telex, for instance, because the California firm specialized in manufacturing plotters and even IBM purchased plotters from CalComp.

Some of the CalComp case pretrial proceedings hint that the case may delve into some of IBM's undercover and security activities. U.S. District Judge Roy McNichols, who is presiding over all the West Coast cases, has ordered a former high official of the FBI, who was hired by IBM, to detail his conversations with former U.S. Asst. Atty. Gen. Henry Peterson.

The former FBI official, Courtney Evans, has said he discussed the alleged misappropriation of trade secrets with the Justice Dept. official. Evans is said to have been hired to work for IBM by the firm's general legal counsel Nicholas Katzenbach, a former U.S. Atty. Gen. Pretrial records from West Coast cases involving IBM indicate that Evans was interested in potential Justice Dept. charges against IBM competitors on the trade secret issue. No charges, however, have ever been filed.

Memorex next

When the CalComp trial is completed—probably in late winter—the next case scheduled to be tried is the Memorex case. Memorex, with fairly extensive resources, appears to be preparing the most comprehensive IBM antitrust case of all, with the possible exception of Control Data. Memorex is seeking $3 billion treble damages against IBM.

Memorex has also requested a jury trial and its trial attorney, John L. Endicott, of Los Angeles, is described as methodical, low-key and businesslike. Of all those firms to make presentations, Memorex stands to be the best match for IBM.

"Memorex has been putting everything on computers," said one observer. "And Memorex' computers are as good as IBM's computers." Indeed, Memorex has been compiling its data file for the case on an IBM 370/155.

Memorex recently changed law firms, retaining Gibson, Dunn, Crutcher of Los Angeles, as its new legal counsel. While some valuable time has been lost in the changeover, the new firm has more extensive resources and, in the long run, the Memorex effort should be strengthened by the move to the larger firm. If Memorex cannot be ready in time, then its case will be postponed and the next case in line moved ahead in its place.

One interesting aspect of the Memorex case is that the peripherals firm has been pursuing broad pretrial discovery into IBM's European operations. Court records show that Memorex has been taking depositions of IBM executives in Germany, France, and the United Kingdom. In the various antitrust actions thus far IBM has been able to isolate its international operations from involvement or scrutiny and the Memorex case could open up a whole new dimension in IBM litigation.

In addition, Memorex may be home free on the trade secrets issue because IBM agreed in an earlier suit with Memorex to drop any trade secret misappropriation charges against Memorex.

Forro and Transamerica

Another antitrust suit brought by a small firm—Forro Precision, Inc., of Woodland Hills, Calif.—is scheduled to be tried with the Memorex case. IBM has filed a trade secrets misappropriation suit against Forro and that case could muddy the waters of the Memorex case, some believe. Forro seeks $36 million treble damages from IBM while the latter firm seeks $25 million from Forro in the counterclaim suit.

The other remaining major West Coast case, instituted by the Transamerica Computer Corp., a subsidiary of the Transamerica Corp., is slated to be tried—like the other cases, a jury trial has been requested—at the conclusion of the Memorex case.

Transamerica is seeking $390 million in treble damages from IBM which has instituted no counterclaim against the company. Transamerica placed substantial amounts of Telex equipment on lease. A similar suit, instituted against IBM by Hudson General, will be tried with the Transamerica case.

In another possible development, it is conceivable that the IBM-Greyhound Computer case could end up among the West Coast cases. IBM won that case a few years ago and it has been languishing on appeal in a Federal Appeals court in San Francisco since April of 1974. If the case is overturned, it would presumably be sent back to a Federal District court for trial.

—W. David Gardner

Photographer Seeking $20 Million from IBM

A retired Akron, O., photographer is taking on IBM in a patent infringement fight with a $20 million purse at stake.

Retiree Frederick C. Tambling contended in a suit filed recently in U.S. District Court in Akron that IBM is making billions of dollars by selling and leasing cold type print composing machines that use his patented invention.

The "Selectric" Line

The IBM equipment in question is the "Selectric" line of composers: "Selectric" composer, magnetic tape "Selectric" composer and electronic "Selectric" composer. Tambling's attorney, William R. Holland, estimated the equipment brought IBM an income of $3 billion over the past six years, the time limit for filing infringement suits.

The $20 million in damages asked, he said, is a "conservative" amount. The figure could go to $150 million, or the usual five percent royalty rate if the $3 billion estimate is accurate.

IBM denied using the Tambling patent in any of its equipment, although the company's patent attorneys have contacted Holland, the attorney said.

Covers add-on mechanism

The Tambling patent covers an add-on mechanism to a typewriter which transmits electrical impulses from the typewriter to a printing station. A negative would then be made and used in printing. In the suit, Tambling does not claim to have invented the Selectric typewriter.

Tambling, who now lives on Social Security in a retirement community in Florida, received his patent in March 1968. According to the suit, Tambling had no plans then or now to manufacture and market the invention because he lacked the capital and because of the "vastly superior competitive position" of IBM. Shortly after the patent was issued, Tambling did have negotiations with Addressograph Multigraph about using his invention, but no agreement was reached, according to Holland.

Tambling heard about the IBM line of composing machines at the retirement community although the machines had been marketed for approximately 10 years. Tambling then contacted Holland who investigated the possible patent infringement.

Issue of timing

The Selectric composer line is covered by a patent issued two months after the Tambling patent. It is Holland's contention that there are no basic differences in the two patents. He claims the two patents were issued in overlapping time periods and by different sections of the patent office.

A jury trial has been requested. IBM has been granted an extension in order to study the suit and answer the Tambling brief. If the case goes to trial, Holland said he is hopeful it would be scheduled within a year.

Tambling is a former Akron *Beacon Journal* photographer and for many years operated a private photography studio in Akron.

—K. Endres

User Groups

Rising From The Ashes?

The degree of optimism evident at a meeting of Xerox Data Systems equipment users last month in Phoenix could be matched only by the pessimism of the same group when it met last December in San Diego, its first meeting following Xerox' announcement that it was getting out of the general purpose computer business.

Honeywell, which officially took over the Xerox customer base in February, was there in full force and seemed to be saying the right things. They had an attentive audience in the 335 members of Exchange, the XDS user group. The attendance was up from 229 in San Diego and that had been the best attended Exchange meeting ever.

Concerns about field service were the only dimmer to the bright mood of the group. One user, who praised his Xerox field engineers as "high quality people" and said he feared he'd lose them because they don't feel they have a career path with Honeywell, received a round of applause.

Happiest of all were the users of CP V, a Xerox operating system that users have labeled "the most efficient operating system there is" and "the richest system available."

For these users, Honeywell has developed a "bridge concept," an operating system internally designated CP-6, designed to run on Honeywell level 66 computers. The company said it will combine the best of CPV with the best of GCOS, a Honeywell operating system.

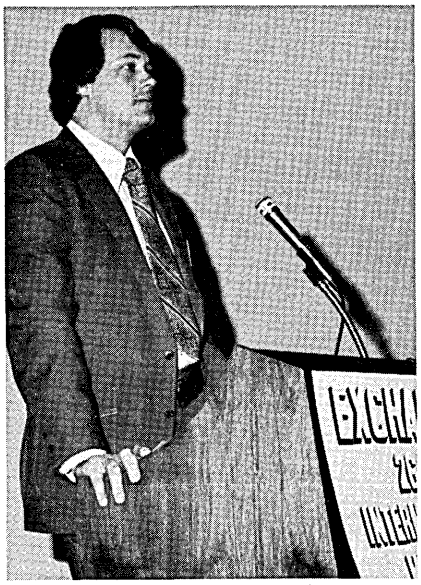
Rattling stickers

During the Phoenix meeting, members of the Exchange CP V technical committee, which has been working very closely with Honeywell in development of the CP 6 concept, were distributing "I go with CP 6" stickers. Randy Best, Motorola, chairman of Exchange explained why. "Some of the members of top management (Honeywell's) are not total believers. They're not as enthusiastic as we would like them to be. We wanted to rattle a few cages."

To say that the involved CP V users are enthusiastic would be the understatement of the year. The superlatives flowed like wine . . . "amazing . . . great . . . unbelievable . . . " Jim Herrell of Motorola went so far as to say "Xerox' decision to withdraw from the computer business could turn out to be the best thing that ever happened to us."

He amplified. "Potentially, four or five years out, we're going to have more than we would have had with Xerox. And it's nice to have a vendor that's a full fledged computer company, not just a copier company that's dabbling in data processing."

The plan is to announce CP 6, or whatever it might be named, late this year with availability in 1978. Users are willing to wait. They point out that Xerox' new cpu wouldn't have been available until that time anyway and "this will be better."



RANDY BEST
Chairman of Exchange

BILL SMART
A relationship based on realism

CP V users represent 50% of Exchange's membership but a lot more than 50% in terms of dollar value of equipment installed and in level of participation in Exchange. Honeywell executives said they gave CP V first priority because of the number and size of users involved and because "it was the most difficult area we had to address."

They avowed they'd give the same "level of effort" to working out a bridge solution for non CP V users but admitted that maybe there'd be "no solution" for them. They promised some kind of answer by the next Exchange meeting which will be held next December or January.

One of the names being considered for CP-6 is Project Phoenix. Best liked this. . . . "rising from the ashes."

One feature the new operating system will have is PL/1, something CP V does not have. It also will have a new RPG II and a new Basic. The thing users like best is that they can go ahead and develop new applications using CP V because they've been promised minimal conversion problems. They have something to tell their management. Honeywell says it has committed to an investment of "millions of dollars" to the concept of the new operating system.

In explaining the selection of level 66 computers as hosts for CP 6, Robert Hesser, product manager for Honeywell, went to great lengths to explain the similarities between the architecture of level 66 and that of the Xerox Sigmas and 560 computers. It's like a full circle. Henry Haugland later said the basic concept of the architecture goes back to the General Electric 635. Many 635 users migrated to Scientific Data Systems (later Xerox Data Systems) and, in a way, they're now back with General Electric. Honeywell acquired General Electric's computer operation in July of 1970.

A part of Honeywell's effort to get CP 6 going was to acquire Xerox' CP V design team. Most of the development work on CP 6 will be done by this team, in El Segundo, Calif.

CP 6 was not the only goodie Honeywell had to talk about. The company is working on a controller that will enable Sigma users to use Honeywell peripherals. This should be available sometime in 1977. Honeywell also pledged to continue to enhance CP V and asked users to "let us know your survival requirements." Other new promises were for a Sigma 5 map, multiprocessing capability for Sigma 6, and new memory for Sigma 9.

Based on realism

Generally, Honeywell representatives were quick and frank with their answers to the users. In a luncheon talk, Bill Smart, vice president of Honeywell Information Systems, said "ours is a relationship that's based on realism." It seemed to be that way.

A realistic fact which was not totally addressed was the service problem. The questioner who was applauded when he worried about his field support said he'd had a lot of talks with his field engineers. One thing they were concerned about was salary. They'd had, he said, performance reviews since they became Honeywell employees, but no raises because they already were being paid more than Honeywell field engineers.

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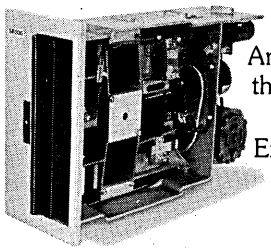

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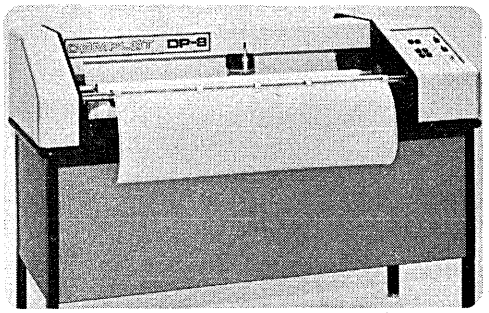
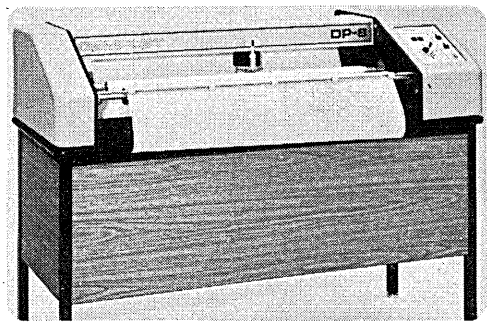
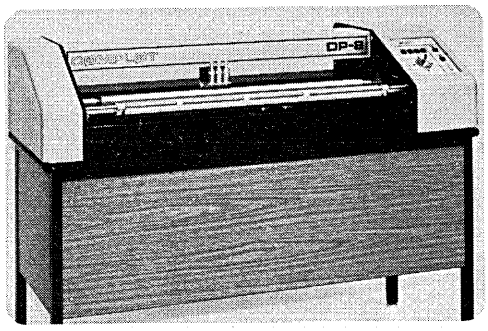
  Plot timer clock — (contact factory for price)



DP-8V
3 IPS, Single pen
$7600



DP-8S 4.5 IPS, Single pen,
9 switch-selectable step sizes
$8400



DP-8-S3 4.5 IPS, 3 pen,
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Owen Keefe, Honeywell's director of field operations said "this is not the forum to discuss salaries." It's a sticky problem. Even users agreed to this while they worried about their support. Keefe wondered if the applause that came to the worried questioner couldn't have come from Xerox FE's.

But there seem to be few problems ahead for CP 6 or Project Phoenix or whatever . . . if it happens.

—Edith Myers

Communications

MCI's Execunet Is Still Alive

MCI still holds on to its Execunet telephone service despite a ruling early this spring by the FCC that MCI is not authorized to offer it. The U.S. Circuit Court of Appeals for the District of Columbia will have the final word.

Early last year, AT&T charged that Execunet is a cut-rate version of long distance dial-up telephone service and asked the FCC to terminate it. In July, the commission complied, but MCI subsequently persuaded the appeals court to review the order and meanwhile delay its implementation. The court then referred the case back to the FCC for reconsideration. That phase of the proceeding largely was completed in May with issuance of the FCC's second order. The case will now be returned to the appeals court for final action.

Execunet is important because it represents an attempt to define, or redefine, depending on one's point of view, the boundary between the services offered by specialized and telephone common carriers. Depending on where this boundary is placed, MCI and the other specialized carriers will or won't be able to invade the huge dial-up market now monopolized by Mother Bell. Many specialized carriers are slowly drowning in a sea of red ink, so they are especially eager to crawl ashore within the confines of the AT&T preserve.

Execunet is also important to telecommunications users because it offers significant rate reductions compared with long distance station-to-station and WATS rates.

MCI's allegations

Another issue in the dispute involves MCI's allegations that Bell officials engaged in illegal ex-parte discussions with the FCC staff before the commission's first ruling in the Execunet case last July. If proven, that charge would be particularly damaging to Bell's public image because of recent findings by a subcommittee of the Texas legislature that Southwestern Bell has engaged in massive illegal lobbying activities.

MCI already has concluded that the activities in Texas were directed from 195 Broadway (see accompanying story) and has asked for a comprehensive investigation by the FCC, Congress, the Justice Dept., and the SEC. Assuming MCI can prove that AT&T officials tried improperly to influence the Execunet decision, the chances of such an investigation being launched will be much greater. Also, Congress is apt to look

MCI Seeking Federal Investigation of Bell's Political Action

MCI has asked the FCC, the Justice Dept., Securities and Exchange Commission and Congress to launch "immediate and comprehensive investigations into the pervasive, improper political activities of AT&T and the Bell System companies."

Citing a recently-issued report by a subcommittee of the Texas Senate, which found massive evidence of improper conduct by Southwestern Bell officers and employees, MCI said "there is no reason to think that Bell's political activities are limited to Texas." It continued: "Former executives of Southwestern Bell are presently executives of AT&T itself, and of other Bell operating companies."

AT&T vice chairman William M. Ellinghaus said MCI's request for an investigation of the phone company was "irresponsible mudslinging of the cheapest kind." He insisted that the Texas subcommittee's report exonerates Southwestern Bell of any wrongdoing in connection with electronic surveillance and wiretapping, political contributions and rate making."

"Moreover," he added, "those who are familiar with these two-year-old allegations will know they also have been thoroughly investigated by two grand juries and the Securities and Exchange Commission. Similarly, the Missouri Public Service Commission conducted its own investigation of these charges and also exonerated Southwestern Bell."

Similar to other charges

MCI, however, said that the improper activities substantiated by the Texas legislative subcommittee are similar to those charged against Bell subsidiaries in Missouri, Kansas and North Carolina. National elections are now underway, MCI pointed out, "and unless someone steps in to stop practices such as those uncovered in Texas, the Bell System can be expected . . . to engage in political misconduct on a nationwide scale."

Some excerpts from the Texas subcommittee's report, which was released last April 27:

—Southwestern Bell "systematically manipulated rate data so as to maximize its profit – to the confusion of city councils and at the expense of the consumer.

—"Southwestern Bell has displayed a lack of candor in discussing legal and regulatory requirements before municipal officials; the company has used methods of calculation which inflate expenses and rate base figures, while simultaneously claiming rates of return so low that they would be unacceptable in any other business. The company has been deceptive in its calculation of depreciation and tax expenses."

—". . . Through the use of elaborate corporate expense accounts, Bell officials have entertained public officials and politically influential persons on a regular basis. Such entertainment was often timed to coincide with the company's appeal to local city councils for a rate increase.

—". . . The existence of a political fund within the Bell hierarchy and its regular infusion into state and local political campaigns is well established. According to testimony by Bell's state lobbyists, total state level political contributions averaged at least $14,000 a year, and similar programs have also existed in other states served by the Bell System.

—". . . As part of its strategy of lobbying by entertaining, Bell Telephone has over the years maintained numerous hunting leases around the state of Texas. Politicians and journalists regularly visited these hunting leases at Bell expense. Bell executives negotiated and paid for the leases in their own names, then were reimbursed . . . by the company. For whatever reason, the company apparently wished to keep its entertainment activities as private as possible. The ulimate cost, of course, was borne by the telephone customer."

Bell's Mr. Ellinghaus in denying the charges said that, "Rather than another needless—and pointless—investigation of the Bell System, what's needed now is for Congress to press ahead with a thoughtful inquiry into the policies of the FCC which have lately given rise to so much confusion and acrimony within the communications industry."

—Phil Hirsch

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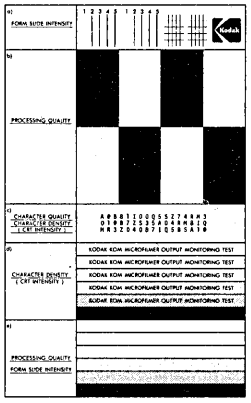

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less favorably on the "Consumer Communications Reform Act."

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Execunet went into operation in 1974. A customer in any of 15 cities can place an Execunet call through any pushbutton telephone—even a public one—to any telephone in one of the other cities. The links at either end of the message path are AT&T local loops. They're connected by an MCI trunk which the Execunet patron shares with others. He pays a minimum of $75 a month for the service. There's a per-minute charge for each call, based on time and distance, and a $30 a month connection charge for each dedicated Execunet termination.

At the oral argument which preceded last month's FCC ruling, MCI vice-president Ken Cox, a former FCC commissioner, said his company is entitled to provide any service for which it files a legally-authorized tariff. While MCI believes Execunet is shared private line service, he continued, it is not restricted by its basic FCC authorization to private line offerings. The specialized common carrier decision, Cox contended, gives a "broad charter" and "we could file a tariff to . . . offer any service any other carrier can offer."

This view received some support from American Satellite and Southern Pacific. They said the question facing the commission was limited to whether Execunet is an authorized specialized carrier service, adding that the FCC's written decision should not draw an "arbitrary line" around the services that specialized carriers can legally offer.

AT&T Attorney Edward L. Friedman said Execunet customers are not limited to any designated telephone at either end; none of the facilities is dedicated; and a new and separate path is established for each call. Execunet, Friedman added, is "simply a cut-rate version" of message toll service.

—P.H.

Legislation

Hartke Promises Early Hearings

Sen. Vance Hartke, who appears likely to become chairman of the Senate Commerce Committee's communications subcommittee next year, carefully avoided making any controversial commitments when he spoke to the Indiana Telephone Assn. about the Consumer Communications Reform Act of 1976. He did say that the subcommittee "should be ready to move quickly" into hearings on the legislation "shortly after the beginning of the new Congress."

Although Hartke was the original sponsor of the bill in the Senate, he made it clear that he isn't necessarily committed to it. "Your industry came to me with strong convictions that the current course of FCC actions was . . . leading to disastrous consequences for the ordinary telephone user. I don't know if you are right or wrong, but I am persuaded that Congress must act meaningfully to review the issues you raise."

Shift to Congress

His major point was that the FCC has been deciding issues which are properly the responsibility of Congress. He quickly added, however, that "I don't think it is entirely the agency's fault." Rather, Congress has failed to keep up with the technological changes that have occurred since passage of the Communications Act of 1934. "But now it is time for Congress to face the future," he added. "The FCC trend toward new telecommunications policies unratified by Congress has been accelerating at an alarming rate. The Congress must reassert itself."

Shortly before Hartke's speech in Indiana, the FCC sent Congress a lengthy statement explaining why it opposes the communications bill. Part of the presentation consisted of an economic analysis, prepared by the common carrier bureau, which concluded that "competition in the private line and terminal equipment markets has had no discernible effect on telephone industry earnings or revenues, nor on the rates charged for local telephone service" and "there is no significant likelihood this situation will change in the immediate future—thus allowing ample time for completion of the FCC's economic inquiry and Congressional review of the findings and conclusions in that proceeding without risk of impact on local telephone rates."

The bureau also suggested that, based on a recent study conducted by the New York Public Service Commission, "there is a high probability" basic telephone service customers may be subsidizing private line and terminal services, rather than vice versa as the industry claims.

The bureau said a number of studies supporting the telephone industry's position have been submitted in the inquiry. "While we have not fully completed our review . . . of these studies . . . we have identified numerous deficiencies in the data . . . and interpretations." By comparison, the "most comprehensive study by an independent organization to date" is the one done by the New York PSC. This study "has the added benefit of having been tested in the crucible of a full evidentiary proceeding."

Doesn't benefit consumer

The FCC statement included "separate views" from Commissioner Benjamin Hooks, who said "I cannot agree in all cases, without a great deal of further study, that competition in the field of telephone service, is in the interest of the American consumer."

While competition may benefit business users by reducing private line and terminal charges, he explained, "the plain fact is . . . if the telephone companies lose the high-volume, high-profit business, others may have to make up the lost revenues so as to permit the appropriate rate of return . . . Maybe the average residential subscriber, over the years, has been getting some 'free lunch' because of the higher rates the telephone companies charged to business users before (the advent of the specialized carriers), . . . But I am not necessarily opposed to (this) since businessmen benefitted from the availability of lower-cost service to ordinary subscribers."

A total of 141 representatives have now endorsed the Consumer Communications Reform act. The sponsors consist of 84 Democrats and 57 Republicans who, together, comprise nearly one third of the House membership. In the Senate there are 12 sponsors—nine Democrats and three Republicans. ✲

Satellites

Justice Asks Study of SBS Proposal

The FCC should conduct a detailed investigation of the Satellite Business Systems domsat application before deciding whether to approve it, the Dept. of Justice said late this spring.

There are two basic questions to answer, explained the department in a statement signed by Asst. Attorney General Thomas E. Kauper, head of the antitrust division; Jonathan C. Rose, his deputy, and two other attorneys. One question is whether granting SBS operating authority would be in the public interest.

"From a cost standpoint, celestial communications systems may enjoy decisive advantages, but they also may not. Much of the overall circuit cost may be attributable to switching and related components, and even drastically cheaper transmission costs may not measurably affect overall cost figures . . . (Also) advances in terrestrial transmission techniques, such as Bell's "Data Under Voice" technique, suggest that even if transmission costs are a sig-

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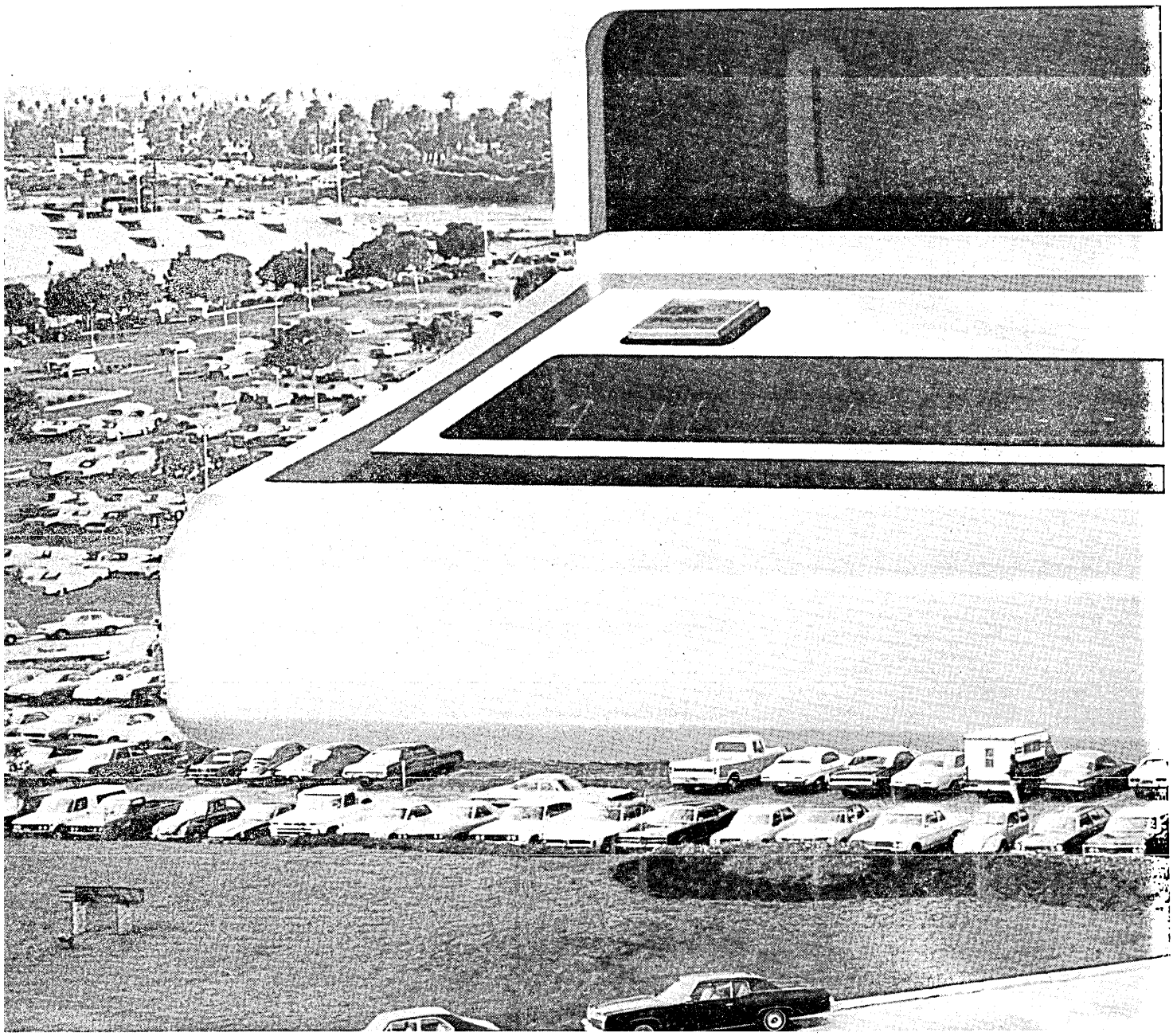

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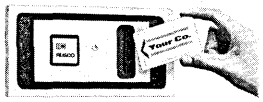

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nificant variable, celestial circuits may not prove decisively cheaper . . .

"Neither is it clear that celestial communications techniques will make possible services not otherwise available from a technical standpoint. 'Value-added' carriers—Telenet, Graphnet, and proposed entrant ITT—provide highly-specialized data communications services using terrestrial links. New technologies such as microprocessors, intelligent terminals, and minicomputers may meet demands that in the past might have relied on remote access data processing."

The other major question requiring detailed examination by the commission, said the Justice Dept., is the competitive impact of the IBM-Comsat-Aetna joint venture. "It is familiar antitrust teaching that a joint venture between two of a small number of potential entrants into a market, especially a highly concentrated market, may be unlawful under section 7 of the Clayton Act...Where the existing market is highly concentrated (and the telecommunications field clearly is dominated by a single firm, AT&T) potential competition can be an especially relevant consideration, and the need to preserve it highly important . . .

Knock out others

"It is possible . . . that the proposed entry of IBM and Comsat will yield substantial benefits (by) providing new, significant competition in a telecommunications industry that is not now very competitive. It is also possible that the joinder of . . . Comsat . . . and IBM . . . could effectively preclude any additional, general purpose entry into the domestic satellite field (and) might not provide effective competition with established firms . . . but concentrate on new . . . service offerings sufficient to afford IBM decisive advantages in these evolving fields."

The Justice Dept. statement on SBS was one of several submitted to the commission in recent weeks. Here are highlights from some of the others:

—American Satellite Corporation: "IBM has failed to form a separate domsat corporate entity which is 'more than a mere division' of the corporate parent," as required by the FCC in February '75 when it invited IBM and Comsat to re-draft and resubmit their original application.

—RCA: ". . . It appears that the worst of the commission's fears may be realized by implementation of the SBS system: communications and data processing services will be inseparable and the existence and level of cross-subsidization will be indeterminable."

—Western Union: IBM "is in a position and has an incentive to make available to SBS—but not to other domestic satellite carriers—IBM's vast technical resources in the data processing field. The consequence is to provide SBS with a decided competitive advantage . . . There is no realistic prospect that Comsat and Aetna would have either the incentive or the capability to overcome IBM's reluctance to wage a full-scale competitive war against AT&T . . . AT&T has leverage over Comsat's policies similar to that which it has over IBM's" (the phone company is one of Armonk's major customers). "Plainly, therefore, the probable impact of SBS entry would be the emergence of a duopoly . . . in the electronic communications market and the domestic satellite communications market and the reenforcement of the barriers to entry in those markets."

—Computer Industry Association (CIA): "SBS's mere promise that interconnection arrangements will be offered through tariffs on non-discriminatory terms and conditions is of little comfort to manufacturers who realize that interconnection charges for maintaining their equipment on IBM computers may be prohibitively expensive though still . . . 'non-discriminatory.'" ✲

International

Pains and Payoffs In Going Abroad

As more and more companies recognize these days, there is a lot of money to be made in international markets. IBM brings in more than half its profits and last year its revenues from international sales, and most other mainframers are beginning to approach that point.

But for the smaller companies without 40 or 50 years experience in foreign markets, it can be a trying experience, fraught with problems. These break down, roughly, into three major categories:

—nationalistic markets and local customs,

—make or buy decisions (franchises, agents, distributors, or having your own subsidiaries), and

—how to coordinate with and support the foreign operation.

Nationalism isn't just a matter of 'Yankee Go Home!' scrawled on walls. It is often a subtle question like making sure you don't have Denmark and Norway reporting to a Swedish manager, or even a Londoner running an operation in Scotland. It is strongest in France, where the demand for documentation and contracts in French has sometimes stopped otherwise sound orders from going through.

The local customs and laws also can cause problems for the smaller firms who expect that buyers will respond to their products with similar enthusiasm to Americans. They don't. They are neither backwards nor unsophisticated, but the typical European customer will buy something only after he has seen it working. Furthermore, the typical accounting package, for example, takes a major rewrite to suit it to French laws and customs, another major rewrite for Germany, and so on. Scandinavia, though it is a relatively small market, is often a favorite entry place for American firms because its users are most tolerant on this front, and often welcome new ways of doing things, and new products as well.

Achieving credibility

The make-or-buy decision is a tricky one. Having your own subsidiaries costs money—getting and training good people in each market, choosing which markets to try for and in what order, and surviving that long, slow buildup until you and your product have achieved credibility—European credibility, which is quite a different matter from American credibility.

If you choose the less expensive, ready-made approach, you'll have the same problems whether you use a franchisee, a distributor or an agent. One veteran American recalls his own pains: "The agents didn't know what they were getting into, and neither did we. The market demanded more effort in sales and support than we'd experienced. Most of them lost interest."

Another American agrees. "We ended up financing our distributors rather than vice versa, regardless of their size or strength. The agent has expectations which usually exceed the terms of his agreement, and the supplier goes into the agreement thinking it will eliminate detail problems, but it really creates them. So no matter how explicit the contract, their expectations are at odds; it's just human nature. And thus you get into disputes over documentation or support, and the overseas guy has the best leverage by not paying the supplier until he gets the support he feels entitled to."

Another problem, for own-companies as well as agents, is lead time in a fast-moving technology. Often, by the time an agent has been found, signed up, trained, and set up in operation, the parent company is several new products ahead—and he's committed to selling an already obsolete product. Even though

this might suit the show-me center of the market, it is disheartening when he's dealing with the sophisticated state of the art user who knows the difference. And to keep his people trained in the latest products is an expensive job, entailing transatlantic travel as well as lost man-weeks.

Follow the agent

This highlights the coordination problems. The American firm that chooses an agent and then goes away, waiting for money to drop in its lap, will soon have an ex-agent. Letters do very little good, but in the experience of some Europeans, Americans have not yet discovered the transatlantic phone. The annual executive visit is unlikely to bear fruit unless it is backed up by the relaxed weekly phone call, lavish use of the Telex, and building personal relationships.

Support problems mean not only the willingness to send the best man from the U.S. to bail out a troubled European user, but also scheduling product launches (and budgets) to allow time (and expense) for local organizations to translate as necessary into local languages. (Technical manuals can often be left in English, but woe unto the company that tries to do its ads and brochures in pure American for European markets.)

Three companies doing well in the European market talked recently of their initial experiences and the approaches they took to entering it.

Franchises for Tesdata

When Thomas E. Stone bought the portion of his firm that was developing hardware measurement and software products, he quickly cast his eye overseas. In 1971-72 his company, Tesdata Systems Corp., McLean, Va., negotiated six exclusive franchises, mainly on the basis that the franchisee would buy one machine and be entitled to certain U.S. training and documentation, plus an agent-type discount. But except for one good relationship in Scandinavia, the results were unimpressive, so Stone in late 1972 hired Dick Hatton, a Philadelphian, who had spent 14 of the last 18 years abroad. His brief was to start a Tesdata subsidiary in the U.K. and later in Germany, and to increase the cash coming in from the franchises.

"This was supposed to generate the cash flow to expand our own organization," Hatton recalls, "but it didn't happen that way. I found that I had more problems than cash flow with the franchises, so my time was more profitably spent on the new markets. We were able to meet blue-ribbon clients rather quickly, and built up a substantial business within six months. So as it turned out the cash from our direct marketing was to some extent being spent on airline tickets to coordinate with the franchises."

A way out

Faced with the classic problems of large claims for support, small or slow payments, and mutual disappointment, Hatton began in 1973 to look for graceful ways out of the franchises. By that time his U.K. company had raised money through a 30% equity offering.

By the end of 1974 Tesdata had ended all the exclusive agreements, retaining several that were non-exclusive. In 1975 it formed companies in Germany and France, and this year in Scandinavia, Benelux and Italy. The only profit center in Europe is the U.K. 'parent' company.

In a 30-man company the chief does most of the coordination, so Hatton spends much of his time flying between subsidiaries. He visits the U.S. 2 to 3 times a year, and Stone makes about two trips a year to Europe.

Hatton believes marketing should be decentralized. "They know their own markets and their own problems. I've seen too many headquarters experts fly in with perfectly good ideas, but the local guy can't usually implement more than 25% of them, and he goes his own way anyway. I don't think a company our size can afford that luxury."

Finance, on the other hand, is completely centralized. "All major decisions in a company with working capital limitations have to be pointed towards maximum flexibility," He says. Personnel is decentralized, but Hatton is consulted about important decisions. Support is locally controlled, but resources are shared, and the major depot and repair facilities are in London.

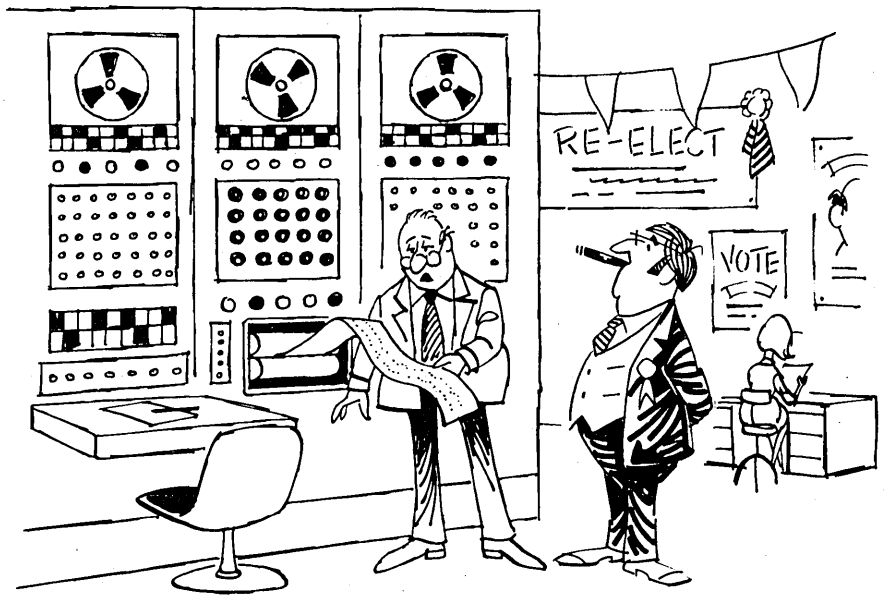
All manufacturing is still in the U.S. Tesdata, like other maturing companies, has pretty good documentation now, but even so, marketing literature is rewritten into "English English" for the U.K., and the Germans and French do likewise.

In 1973 the operations brought in $385,000. In 1974 this doubled to $795,000. Then in 1975 hardware measurement began to soar and Tesdata showed 150% growth to almost $2 million, with a pre-tax profit of about $210,000. This is being plowed back into European expansion, with an emphasis on more support people. "Now we're getting a sharp growth curve, which brings a whole new set of problems," says Hatton happily. "We have to change from an off-the-shelf approach to more measured delivery patterns."

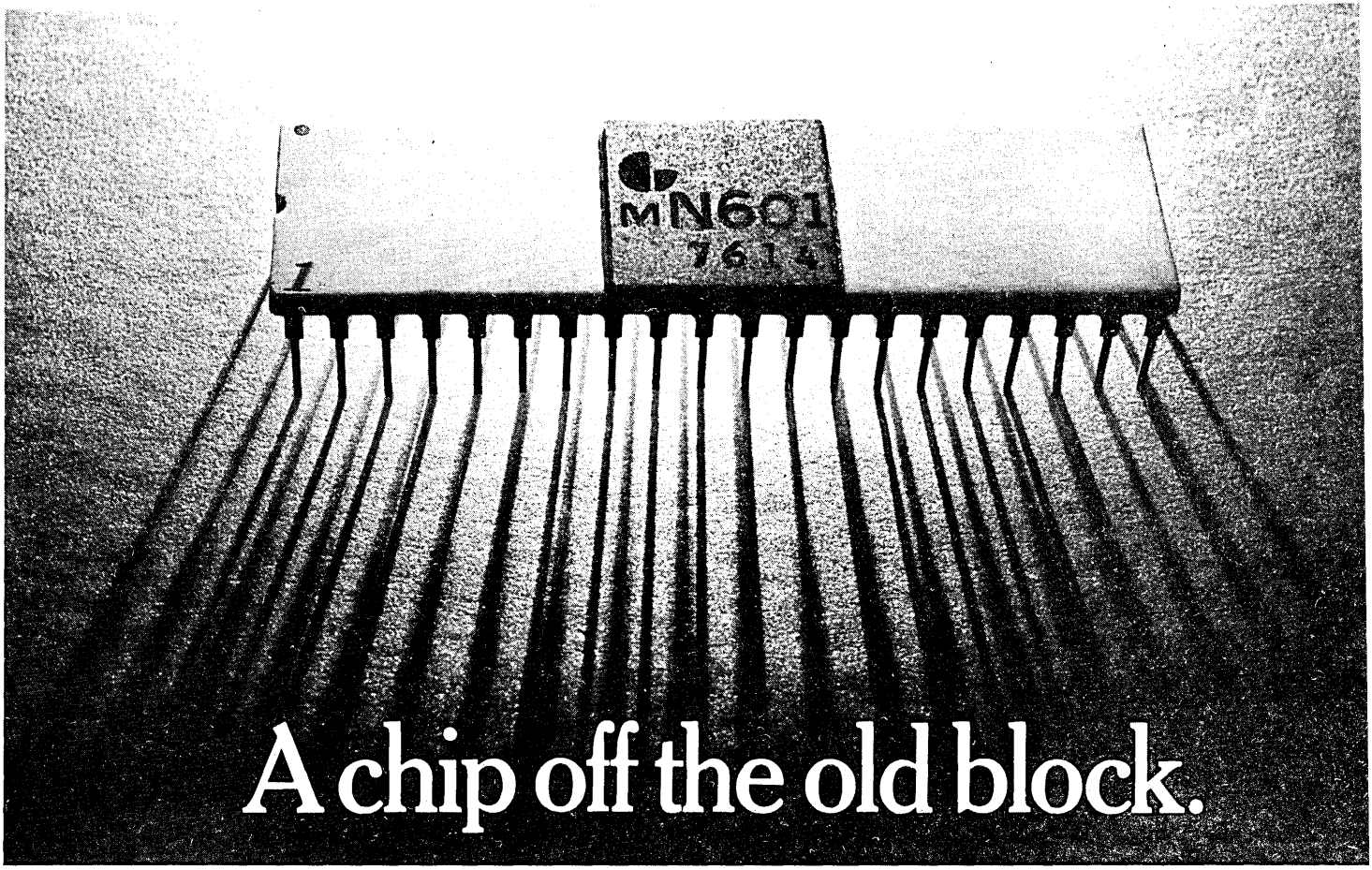
He sees one major difference in Europe that will be important for other companies entering the market. "European customers don't like to feel they're on their own as much as U.S. users do." So in Europe Tesdata bundles into its price services such as a full one-year warranty and guaranteed response time, including the cost of travel, labor and parts.

Distribution for Centronics

In a way the history of Centronics



"The computer says its projected forecast shows you will be re-elected, but that it personally wouldn't vote for you."



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The mN601 is the first microprocessor designed and manufactured by a minicomputer company. And it's the highest performance NMOS microprocessor on the market. With our 160 nanosecond RAM, it has a memory cycle time of 960 nanoseconds and the fastest instruction times going. Like an Add of 2.4 microseconds. And a Load of 2.9 microseconds.

The mN601 has the 16-bit NOVA instruction set including hardware stack for easy programming. And 16-bit data for efficient memory use.

It also has hardware multiply/divide for fast program execution. Integral data channel logic for easy interfacing to high performance peripherals. Control and timing for high density RAM memories. Integral hidden refresh logic that overlaps instruction execution timing. Plus a unique I/O encoding scheme for efficient easy interface design. Even the real-time clock is included. All of which reduces the chip count.

And all that computer is in a single chip.

And because the mN601 is a NOVA, it uses the most mature, field-proven software you can get with any micro. So you can cut back on development time and cost by using compatible software like our diskette-based Disc Operating System and our Real-Time Operating System.

Also, the mN601 comes with the full documentation support you'd expect from a minicomputer company like Data General.

If you want more than a chip, you can get it. There's a whole chip set, a 4K computer-on-a-board and a fully-packaged 9-slot microNOVA MOS mini. And there's more.

Don't stop here.

Sign up for a technical seminar on the microNOVA. They'll be held in major cities around the country from New York to Los Angeles. They'll last a half-day. And they're free.

For more information call our toll free number, **800-225-9497** (Unless you're in Massachusetts. In which case, call 1-617-485-9100 Ext. 2509.)

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A giant reduction in the NOVA line.

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CIRCLE 48 ON READER CARD

Data Computer Corp. of Hudson, New Hampshire, parallels that of Tesdata, with a single product, its printer, creating a situation where the child becomes the parent as the terminal boom took off at the beginning of the '70s. The company began to think European immediately, first with large oem deals with Nixdorf in West Germany and later with Singer's overseas operations. But as one marketing man recalls, the company needed representation to penetrate deeper and to give good service.

E. TREVOR ROBINSON
"Now we have to do the harder things"

In 1972 Centronics closed a distributorship deal with a new U.K. firm, called CORE, which became the nonexclusive distributor for all of Europe—similar to a lot of deals being made at that time. Centronics continued to handle the large accounts directly, with CORE concentrating on smaller ones.

Centronics says the communication lines were kept open and strong. The firms exchanged visits several times a year, and both pointed their activities to maximizing sales. The Centronics man recalls no problems of import/export or administration, but points out that with an independent distributor, the U.S. company cannot go in and tell them what to do. Centronics had no international sales organization, but there were experienced international men at headquarters, doing international product management, product planning, advertising and sales promotion.

Sudden break

The break, when it came, was sudden and dramatic. Centronics had been pressing CORE for $1.8 million it owed for previously delivered goods. It terminated the distributorship in June and instituted U.K. liquidation proceedings in July 1975. CORE countersued in New York for $10 million for loss of the agency, then withdrew this in August and in October filed an antitrust suit for $10 million instead. In December, just before the liquidation suit was due to be heard, CORE filed for voluntary liquidation, leaving Centronics as the largest creditor.

Before the October pyrotechnics, Centronics began to move quickly toward setting up its own overseas companies. The marketing man says "There were lots of users in Europe who needed continuing spares, technical support, all the things a customer has to have when he buys a product." They brought Max Hugel into the company (he had been president of Brother International, which makes the mechanism in the printer), and he decided to market directly in the U.K., France and Germany, with distributors for the balance of Europe. Germany by that time had the Nixdorf connection and a CORE-generated customer base, for a total of about 4,000 machines, with a similar number in the U.K., and about 1,000 in France. The European total was over 12,000 in mid-75.

By early 1976 President Bob Howard was able to report that Europe was improving faster than they had expected.

Data 100's own thing

"I've been given an unbelievable amount of freedom in Europe," says Trevor Robinson, Data 100's vice president for European operations. Robinson, with 25 years in the computer industry, formerly was a designer and then marketing man for Control Data in Australia. He was one of the earliest investors in Data 100, a Minneapolis manufacturer of remote batch terminal systems, and knew the founders well. Thus he was a natural choice in 1970 when the company wanted a non-American to set up its operations abroad.

Data 100's international philosophy, like its American approach, is consciously IBM-like, with an extraordinary emphasis on customer support; this carried with it the financial problems of building a lease base and a string of subsidiaries rather than going for distributors and farming out leases. Most of the problems have been finding the cash to keep up the momentum and fill the pipeline.

Robinson's automony, in retrospect, seems earned. He has been entrusted with the money to build operations as he saw fit, and he has responded by meeting projections every year. "We've been lucky," he says modestly. "We found good, dedicated people."

Robinson doesn't believe in living in airplanes though he visits most operations once a month. "I *do* believe in the wonderful device called a phone," he says. "We have enormous phone bills." This is particularly important in service situations. If a terminal can't be fixed within four hours, the serviceman is supposed to get on the phone to London, and it's quite normal to "talk him down" with expert advice, until the problem is solved. "You can even solve a problem in Singapore on the phone, if you have personal involvement rather than the spectator attitude so many companies suffer," says Robinson.

Robinson's approach has been to decentralize as quickly as possible. Given autonomy from the parent company, he feels the domestic and international operations have grown up as cousins, with useful differences.

He figures it takes about 100 installations as a lease base before a country can support its own Data 100 company, so in a number of places (including Scandinavia) the company works through distributors. "If you don't think a market is large enough to support your own operation, then hand it over to a distributor early," he advises. "This is always tempting. The cash improves your cash flow, but if the business is good, someday you have to go in and buy back that business."

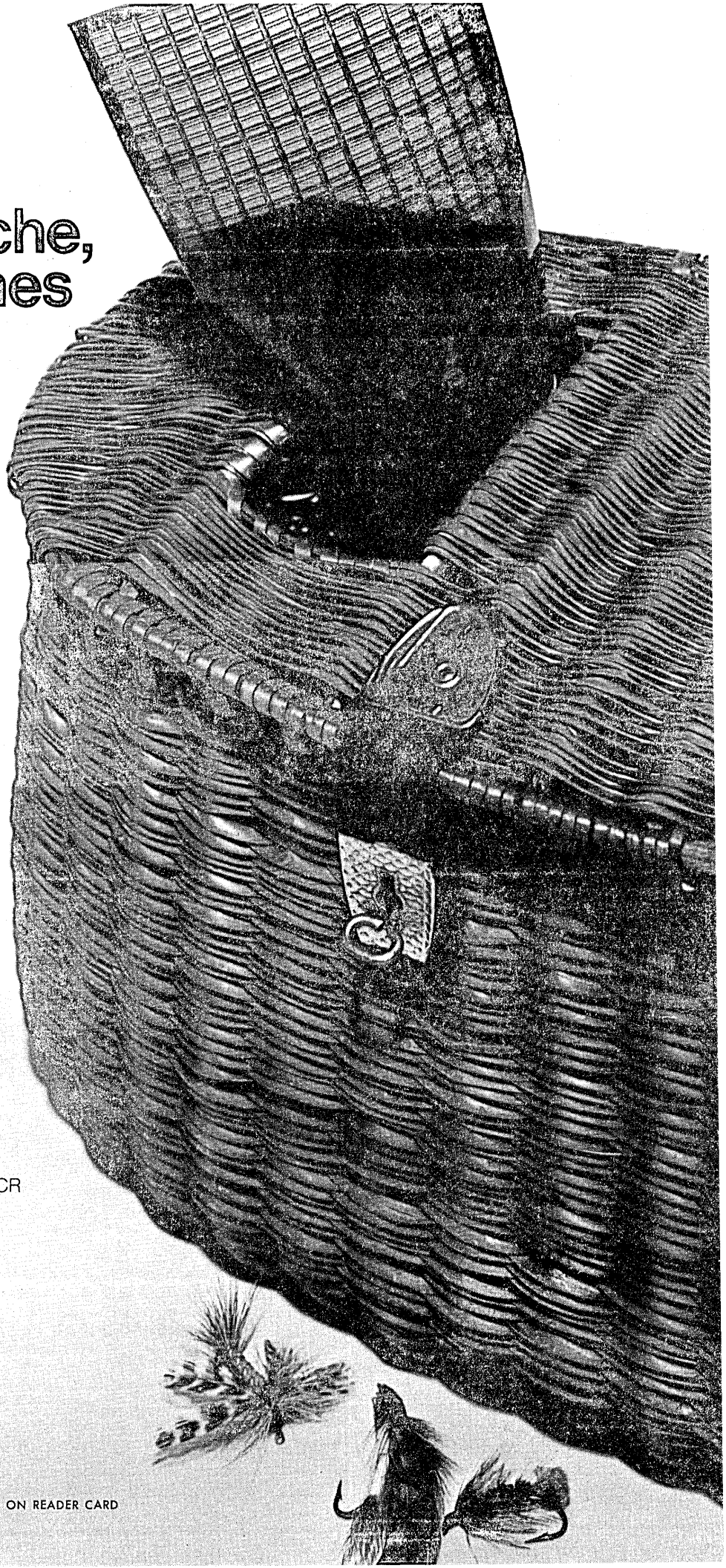
In several countries where Data 100 has no outpost or distributor, firms like CDC have installed equipment on an oem basis, but Data 100 would prefer to have its own image where it can afford it. Tied to a Fortune 500 customer base, they have equipment in many places where they might not otherwise choose to be.

"We have done the first things—to set up the lease base," says Robinson. "Now we have to do the harder things—set up the organization structure and management in a scientific manner, without too many preconceived notions."

The measure of Data 100's overseas achievements is not only a customer base of 1100 intelligent terminals, but more important, Robinson points out, "Not one has ever come back from an unhappy customer." The company now has manufacturing facilities in the U.K. and Ireland, a new joint venture in Japan, and revenues of about $100 million a year, about 30% of it from the international operation.

—Nancy Foy

When it comes to fiche, the small ones we keep.



Nothing too small about COM at your NCR Data Center. Coast-to-coast, NCR Data Centers either prepare Computer Output Microfiche or have sold COM recording equipment to companies who have seen the light. These companies have quit producing tons of computer printout which is only referenced occasionally, if at all.

The storage savings with COM are almost unbelievable—about 98%! Yet retrieval of needed information is always faster than with hard copy. Your NCR Data Center has inexpensive readers which are virtually maintenance free. If service is needed, you'll find an NCR Data Center serviceman works as if he's on his own time.

The best way to start saving with fiche is to let your NCR Data Center do the preparation. Later, if you wish, you can buy the recorder hardware and do your own. It's driven with mag tape only, so your computer is free to do what computers do best. The more efficient use of computer time is one big reason for the spiraling growth of COM.

Get all the facts from your NCR Data Center, or Write NCR Data Center, NCR Corporation, Dayton, Ohio 45479.

NCR

Complete Computer Systems

CIRCLE 95 ON READER CARD

News in Perspective
BENCHMARKS . . .

Micro in Attache Case: Students taking a free, two-week course in the application of microcomputers got to use this micro in an attache case, a training aid developed by people at the Lawrence Livermore Lab in California as part of its technology transfer program. Gene Fisher (left) says there's a small proto-

typing area on board where students can debug some programmable chips, such as PROMs, peripheral interface adaptors, and asynchronous receiver-transmitters. The Intel 8080-based training aid was taken home by students—who came from local colleges, hospitals, and industry—to perform homework assignments. The course, made possible by an NSF grant, was for engineers who had a logic background but no computer experience.

Opel on IBM: International Business Machines Corp. continued to report a "high rate" of outright sale of computers in relation to leases, John R. Opel, president, told a group of financial analysts visiting an IBM plant in Boulder, Colo. Although IBM executives previously cautioned that the high proportion of sales wasn't expected to continue all year, Opel said the high rate has been evident through the month of May. With the exception of the General Systems Div., which makes small computers and is slightly below its sales plan, all divisions are doing well, including its European division which will be a "star performer in 1976." In Japan, it continues to do very well, despite government subsidies to three Japanese companies which enable them to "settle for profit levels below anything tolerable to a risk-taking, open competitor."

Meanwhile, IBM is offering early retirement inducements to 2,900 employees at plants in Kingston, Poughkeepsie and East Fishkill in the mid-Hudson River valley of New York state. The company expects to consolidate some manufacturing operations and reduce employment there because of improved manufacturing efficiency and technological advances. It will transfer most of the employees, but also offer early retirement to persons who would have at least 25 years of service by Dec. 31, 1977.

Amdahl Going Public: With at least a dozen of its large computers installed and with more on order, including five from AT&T, Amdahl Corp. of Sunnyvale plans to go public with an initial offering of one million common shares. Amdahl said it will offer 928,000 shares to reduce short-term debt and to augment working capital. Certain stockholders will offer the remaining 72,000 shares in the proposed sale underwritten by a group led by First Boston Corp. Various models of the Amdahl 470V-6 are priced from about $3.8 million to $5.2 million and operate on IBM programming with performance advantages at less cost than large IBM machines. Fujitsu Ltd., a Japanese concern that makes subassemblies for Amdahl, owns about 30% of the California company.

NCR Selling Subsidiary: NCR Corp. and E-Systems, Inc., of Dallas, announced an agreement in principle in which the Dallas firm would acquire NCR's subsidiary Electronic Communications, Inc., for an undisclosed amount of cash. Electronic communications, which develops and makes advanced electronic communications products for defense and space programs, had sales last year of $45 million and employs 1,500. E-Systems is a high-technology company that develops and integrates electronic systems. It has some 9,000 employees internationally.

Interdata at Citibank: Interdata's portion of the celebrated decentralized computing project at First National City Bank of New York is $2.4 million—the bill for eight complete model 8/32 Megamini computers, each with 524K bytes of mainframe memory, three 300 megabyte discs, plus printers, tape drives and terminals. They'll replace $3 million for two large IBM 370/158s, but also provide six times more computing power, says John L. Hughes, vice president for data processing of Citibank's Securities & Government Services Group. He said that will enable his organization to cut computer operating costs in half "with lower priced hardware and software, fewer people and reduced operating expenses." Each of four divisions within the Citibank group will install two Interdata systems.

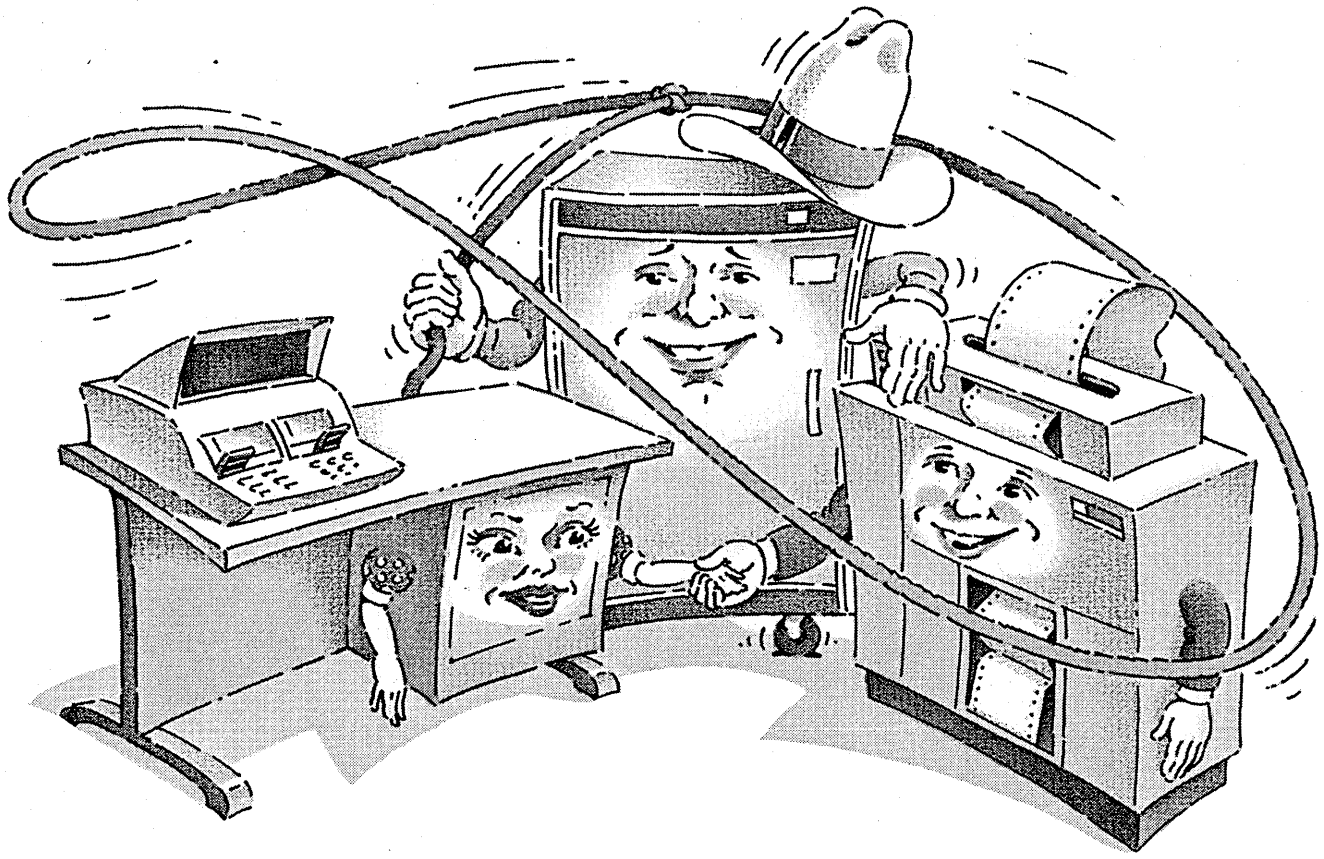
1,000th Eclipse Delivered: Data General Corp. delivered its 1,000th Eclipse computer, a C/300, worth $250,000, to Societe Generale, a major French bank in June. Delivered 16 months after the first Eclipse was shipped in February 1975, the machine will be installed in the bank's London branch for foreign exchange dealing. Eclipse machines include the S/200, a scientific model, and the C/300, a commercial model, and account for close to 20% of computers shipped during the past 16 months.

More Changes: Ailing minicomputer maker General Automation fired its top-ranking vice president George Vosatka and repositioned sales vice president Jay Kear in the latest of a series of management and organizational changes. The company also reported a nine-month loss of $1,232,000 in the fiscal quarter ended last May 1, compared with a loss of $2,540,000 in the same period a year ago. The company's sales in that period totaled $47,804,000 compared with $41,393,000 in the previous year. Lawrence A. Goshorn, president and chairman, said he expects shipments in the fourth quarter to set a record. Mr. Vosatka said his ouster was due to a differencce in management philosophies. Richard P. Carroll replaces Mr. Kear as vice president of marketing. Kear will work with Goshorn on major corporate customer programs.

Back on Top: Joseph Kruy is back in as president of Cambridge Memories, following seven months as the company's chairman and Jerry E. Goldress, a Los Angeles management consultant, has resigned. Goldress came in temporarily after the company suffered a $4 million loss in 1975, compared with a profit of more than $1 million the year before. While Goldress was president, the company laid off some 100 persons and consolidated several management posts. John J. Coleman, former president of LTM, Inc., joined the company as chairman of the operating committee, replacing Mr. Kruy. The company said the appointment of Mr. Goldress was temporary and the "current realignment of management is in keeping with those expectations." Cambridge recently returned to profitability.

Big Again: The Western Electronic Show and Convention (WESCON) is soaring back in size to pre-recession days, thanks to a sudden surge of interest in microprocessors. This year's show in the Los Angeles Convention Center Sept. 14–17 will draw some 370 exhibitors to 725 booths, compared with 530 booths a year earlier in San Francisco. All 170,000 square feet of the center will be used to house the show. WESCON spokesmen said nine electronic distributors plan huge exhibits to display microprocessor technology. It will be the largest show since 1970 when the event was held in two big Los Angeles halls. Attendance is estimated at 30,000. ✲

Now you can tie a top-quality printer to distributed computers.



In the eyes of many observers the development of computers has far out-stripped development of printers. As you move into distributed computing, we suggest you consider this proven method of solving printing problems before they start.

Our Grumman Printer Controller ties a wide variety of computers to the world's most renowned printer for combined reliability, speed and quality. In distributed computing it provides you with the opportunity to develop high quality, highly reliable batch terminals driven by a mini.

Our printer controller interfaces an IBM 1403 model -2, -3 or -N1 to a variety of computers, including Burroughs, CDC, Data General, DEC, Digital Scientific, IBM 1130, Univac and Xerox. We can quickly adapt the IBM 1403 to many other computers, also. For multi-vendor installations we can add a switch to your controller to allow you to connect the IBM 1403 to either of two different computers.

Users can rent, lease or buy both the printer and controller. And we are ready to work with systems designers of distributed computing, too.

For full information, call or write Joe McDonough, Grumman Data Systems Corporation, 45 Crossways Park Drive, Woodbury, N.Y. 11797. (516) 575-3034. Telex: 96-1430.

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In Germany: Institut Für Angewandte Elektronik, Zentrale Verwaltung, D 2072 Bargteheide, Am Bargfeld 17, Germany

LOOK AHEAD

(Continued from page 18)
IBM just shipped its first 3350 in March. If ISS or Itel decides to market the disc, then IBM could have some stiff competition.

Meanwhile, Storage Technology's sputtering Super Disc program appears to have gotten off the ground. Production shipments are increasing--perhaps as many as 40 or 50 Super Discs a month are being produced--and users who had trouble with early devices are now reporting they are pleased with the product. The next two or three months, however, are the crucial ones for Storage Technology on the new products, because they will tell whether the disc will be a truly dynamic product or just another good disc. One bright sign: System Development Corp., the sophisticated software house, is said to be close to ordering several Super Discs.

SANDERS NEW MANAGEMENT COULD SETTLE IBM CASE

The new management of Sanders Associates is said to be reviewing its antitrust case against IBM. Instituted by former company head Royden Sanders, and actively pushed by Arthur Carroll, former head of Sanders Data Systems, the suit lost those chief backers when both men left Sanders Associates. Like all the firms that have sued IBM, Sanders Associates is grappling with the overwhelming documentation involved in doing legal battle with IBM. The New Hampshire company will have plenty of time before trial to settle the case: the trial, which would center around interfacing standards, is not scheduled to begin until January 1979.

INDICTMENT AGAINST IBM IS DROPPED

A criminal indictment filed last September against IBM and five individuals who allegedly conspired in a bid-rigging plot to award a computer rental contract to IBM has been dismissed in Hudson County, N.J., by a Superior Court judge who said the indictment was "fundamentally unfair." In the indictment, it was said that Burroughs Corp. and Honeywell were closed out of the bidding. IBM conducted its own investigation and said "IBM personnel may have gone too far in an intensive and overzealous sales effort," but it couldn't find any criminal activity. Last month the company said it was "pleased" the judge quashed the conspiracy indictment.

WANTS OUT OF THE LOOP

The big banks in Chicago want to get out of the loop. Continental Illinois, a pioneer in Electronic Funds Transfer Systems (EFTS) knocked down by an Illinois federal court last December on attempts to install remote electronic teller units on grounds they are branches and in violation of the state's non-branching laws, is still trying to bring Illinois into the electronic age. Speaking in support of a proposed Chicago Community Banking Ordinance that would allow the electronic terminals, among other things, John H. Perkins, Continental president, came up with a startling statistical comparison. In Chicago, he said, the per capita ratio of banks to people is around 1 to 26,000. "By contrast, both New York City and Los Angeles have one full-service banking office for every 5,600 people." Continental, barred from the use of the remote service units, still is branching out in EFTS and last month opened its 206th electronic check-verification terminal.

RUMORS AND RAW RANDOM DATA

Teletype Corp. still produces the mechanical Teletype model 33. At the National Computer Conference last June in New York, the company displayed its 600,000th production model, decorated in the red, white and blue bicentennial colors...From the monthly publication, Popular Computing: "If one programmer can do a task in one day, two programmers can do it in two days."...The 1976 International Computer Arts Exhibition will be held Oct. 1-11 at the Sony Building in the Ginza district of Tokyo, Japan. Everything goes at the exhibit: graphics, panel displays, film and video, recorded sound, sculpture and written media, real or quasi real-time systems using microcomputers, minicomputers or time-sharing. *

THE MATCHMAKER

Telefile introduces the only disk system flexible enough to match any minicomputer with any of the hot, new 3330-type drives. Big disk storage at a mini price.

Telefile now has available the most flexible large capacity disk system for minicomputers on the market today. The Matchmaker. It comes two ways:

As a disk system for users (DS-16-C) where we match your minicomputer with *any* of the latest 3330-type technology drives you want. Telefile supplies the complete package.

As an OEM disk controller. You can order just controllers alone (DC-16-C) and mix and match minicomputers and drives to satisfy your customer's whims and storage requirements.

Either way, disk system or controllers alone, you are assured of flexibility, performance features, and price no one else can match.

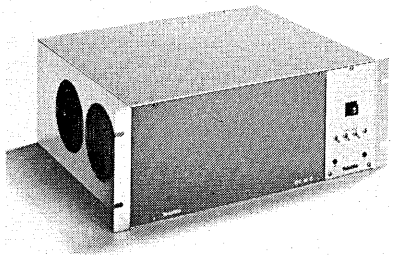
Each system stores up to 1.2 billion bytes.

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.

Choose any of the latest drives.

You've seen them announced one-by-one and they're coming on strong. CalComp's Trident. Control Data's Storage Module. Diablo's 400 Series. The Ampex 9000's and Memorex 677's. Each builds upon IBM 3330 technology, which means higher storage densities and new circuitry for superior reliability.

To switch drives, simply change one controller circuit board. We've timed it at 63 seconds flat!



Compatible interfaces to eleven minicomputers.

We're designing a complete line of compatible interface boards to match up to many minis: Data General, DEC, Interdata, Keronix, D.C.C., Microdata, Honeywell, Lockheed, H-P, Varian, and Cincinnati Milacron. Simply fit our tailor-made computer interface module inside your computer chassis and you're in business. If you have another type mini, we'd be glad to design one for you.

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.

We'll even make you a faceplate.

If you want to show the Matchmaker off, we'll make a bezel to match your computer panel. Private label it and call it yours. There's no end to the flexibility.

Easy "front door" maintenance.

Five circuit boards slip right in from the front of the DC-16-C Matchmaker. A disk interface board, a general interface board, a command/timing board, a memory/address board, and an optional maintenance board for offline disk pack formatting and test exercising.

Unmatched features

- Contains 512-byte buffer for data rate matching
- Variable data search and read
- Block transfer of data up to mini-addressing capacity
- Offset positioning and data strobe controls
- Write protection to the sector level
- Sequential or staggered sector addressing
- Defective track relocation and alternate track addressing
- Overlapping seek capability
- Multi-sector operations across head and cylinder boundaries

We wrote the book on disk controllers, and you can get it free.

For years, we've helped minicomputer users grow their disk capacities. Now our Matchmaker system is a quantum leap forward. A new in-depth, hot-off-the-presses Matchmaker technical manual gives you all the facts. Write for it. Prove to yourself that this is one disk controller no one else can match.

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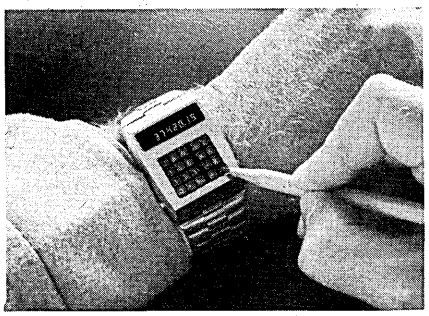
hardware

Off-line

If you've been in this industry any time at all, you're probably a buzzword expert by now. If you'd like to find out just how good you are, you could take a crossword puzzle "test" being offered by International Communications Corp., 8600 N.W. 41st Street, Miami, Fla. 33166. As you might suspect, the test is principally data communications term oriented, but any dp-er worth his or her salt should be able to crack the 80-word puzzle in less than half an hour. If you successfully complete the puzzle, you'll receive a nice certificate that says you're a buzzword expert signed by ICC's own Sherry Moreau, one of the best buzzword manipulators in the industry.

Will the digital watch craze be replaced by the combination digital watch/digital calculator craze? It's possible, thanks to developments at Hughes Aircraft Company's Solid State Products Division in Newport Beach, Calif. Distributed only by North American Foreign Trading Co., New York, the 1.4 x 1.25-inch device adds,



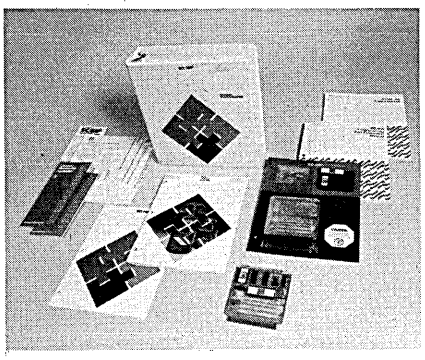
subtracts, multiplies, divides, has a memory, a constant for multiplication and division, and performs reciprocals, squares, and percents, in addition to the time & date. Firm pricing hasn't been determined for the product, but one potential retailer said the price might be "way out in left field."

Only the name's been changed dept. That nice looking floating point processor featured on p. 216 of our May issue isn't manufactured by Microprocessor Systems Design. That was just a phrase on the company's letterhead (next to the address) that made it look like the name. The company's real name was Applied Cybernetics. But that was in May--the company has changed its name to Cybernetic Micro Systems and moved to 2460 Embarcadero Way, Palo Alto, Calif. 94303.

$99 Computer

For less than the cost of many scientific calculators, you can now get your hands on an eight-bit microcomputer kit that can be assembled in something less than an hour (if you aren't all thumbs). The price is even more amazing when you see how the product comes "packaged." It comes in the form of a notebook with instructions on how to get the job done.

Each notebook includes an SC/MP



microprocessor, a single-chip cpu housed in a 40-pin dual-in-line ceramic package, and featuring static operation, forty-six instructions, single-byte and double-byte operation, software controlled interrupt structure, built-in serial I/O ports, bidirectional eight-bit parallel data port, and a latched 12-bit address port. Also included are a 4K-bit ROM organized into 512 bytes and pre-programmed to contain "KITBUG," which is a monitor and debugging program that assists in the development of the user's application programs. "KITBUG" even provides teletypewriter I/O routines and allows examination, modification, and controlled execution of the user's programs. Also included are two 256 four-bit words, a voltage regulator, an eight-bit data buffer, a timing crystal, tty interface, a 72-pin edge connector, a 24-pin ic socket, a 40-pin ic socket, a printed circuit board, eight capacitors, and seven resistors. Large quantities of the "SC/MP" kit are immediately available from the factory and franchised distributors. NATIONAL SEMICONDUCTOR, Santa Clara, Calif.

FOR DATA CIRCLE 229 ON READER CARD

Telecommunications Terminal

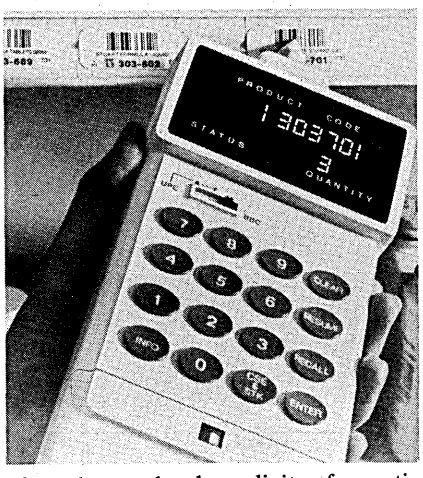
This systems house figured that if it stuck a microprocessor into a Teletype Corp. model 33 or 35, the terminal could then communicate with TWX, Telex, Timeshare, DDD, satellite, private lines, and computers with simple keyboard instructions, eliminating the need for separate terminals for each network. There's an added plus: the phone company will service the terminal anywhere in the U.S., making the product desirable from the point of view of communications integrity. Other features include automatic time/date stamping on all messages sent and received, automatic keyboard dialing and redialing, and a mini-buffer mode allowing the user to create a short message in the buffer memory and send it automatically without using tape. There are built-in diagnostics. Prices start at $3,495 and units are immediately available across the U.S. SIDEREAL CORP., Portland, Ore.

FOR DATA CIRCLE 231 ON READER CARD

Portable Order Entry

The culmination of a two-year research effort has led to ULTRAPHASE, certainly the most highly developed portable data entry system that has yet come to our attention. Just for starters, the product reads Universal Product Codes UPC-A and UPC-E in either direction as well as other bar codes by means of an optical scanning probe built into the unit that automatically turns itself on and off for the reading operations.

ULTRAPHASE weighs 26 ounces, is built out of shock-resistant Lexan, and has an LED display for showing 12 digits



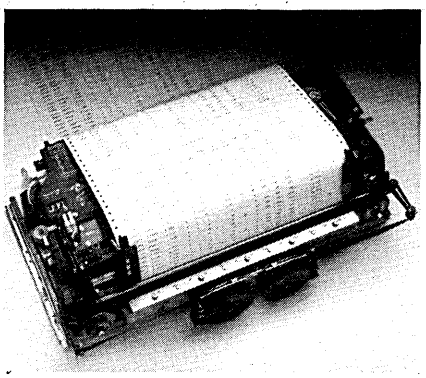
of product code, three digits of quantity, plus a status code. The concave keys provide positive tactile feedback, and there's a microcomputer inside (of course) to check entries and detect errors. Two removable memory packs store up to 800 line items and sound an audible alarm when nearly filled. The data transmission speed is 120 cps. The price, including the microcomputer

module, two memory packs, and service module (sounds like an Apollo spaceship) is $2,950. Applications in pharmacies, supermarkets, hardware stores, mass merchandisers, automotive supply outlets and similar concerns with a broad mix of products on-hand are expected. BERGEN BRUNSWIG CORP., Los Angeles, Calif.

FOR DATA CIRCLE 232 ON READER CARD

Printer Mechanism

Competitors always speak highly of Teletype Corp. products, and the terminal king is giving oem's a chance to get their hands on one of the printer mechanisms. It's a 132-column tractor feed device that operates at 300 lpm and accommodates standard fanfold forms from 4-⅛ to 15 inches wide, 2-½ to 22 inches long, and up to 6-ply



forms. The printer is available with the ASCII set as well as the full 96 UPPER/lower case repertoire. An extended font feature permits character sets to be increased up to 190 characters. Additional features include fold-over, optional even or odd parity recognition, automatic new line, form-out options, paper out alarm, a two-line buffer, and built-in diagnostics. The printer is priced under $2K f.o.b. at the factory. TELETYPE CORP., Skokie, Ill.

FOR DATA CIRCLE 230 ON READER CARD

Small scale Range

The B 80 system is perhaps the most technically advanced small scale or distributed processing system yet introduced, and should appeal to three types of markets. Obviously, users of Burroughs L series of office computers will find the B 80 an easy way to get into true data processing (the B 80 comes complete with a version of Burroughs' successful Master Control Program operating system, MCP), but the system should appeal to first-time users, and users of other brands of minicomputer systems as well. On this last point Burroughs has done a clever thing: an offering called the Data Base Bridging System, contained in a complete offering of systems and application software now called Computer Management System, CMS, makes it possible for users of other minicomputers to transfer existing data bases over to the B 80 using magnetic cassettes.

All the advanced system design characteristics seem to be present in

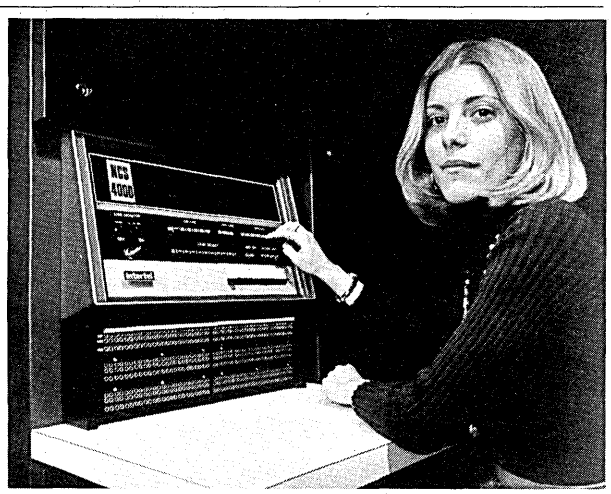
the B 80, including virtual memory management, and enough microprogramming support to enable the system to dynamically adapt itself to a variety of program languages, including COBOL, RPG, Network Definition Language (NDL), and Message Processing Language (MPL). Memories are expandable from 32K bytes to 61,440 bytes in 4K increments. There's even instruction look ahead, buffered I/O handling, and a host of peripherals. Communications, in either synchronous or asynchronous mode, range from 75 to 9600 baud. Prices for systems begin around the $20K mark and go as high as $150K. Deliveries are as quick as you can order one. BURROUGHS CORP., Detroit, Mich.

FOR DATA CIRCLE 233 ON READER CARD

Medium scale System

Though it's equipped with a console that looks for all the world like you're in command of a CDC 6600 large scale system, the Cyber 70, model 71 is the smallest member of the Cyber 70 family and is being prepared to joust with product offerings from the likes of DEC, Univac and Honeywell. The pricing seems to be very attractive: $305K, or $6,775/month (on a three-year lease) for a system with 64K 60-bit words, and 10 smaller processors (peripheral processor units) for handling peripheral and I/O operations. Each PPU has its own 4K 12-bit word, 1 usec processor, and you can get up to 20 of them on the model 71. The central processor runs at 1.2 million instructions per second, or 2 million if a sec-

product spotlight



Communications Diagnosis

The NCS4000 just might make it possible for organizations that do a great deal of computer communications to make the job livable. The problem has been in diagnosing where the problems really were in giant networks, and has necessitated an entirely new approach to product design.

The NCS4000 is expressly designed for very large networks, and the good news is that the designers have found a way to pass analog test signals around hub sites so that in-depth testing can be carried out on-line *anywhere* in the network. Anywhere means testing up to ten lines with as many as 400 drops on each line, and testing every remote drop, no matter how deeply embedded in the network. One of the advantages that will undoubtedly come out of all this is an end to false alarm service calls. The system can test "around" multiplexors, concentrators, and remote processors, and is said to be easy enough to operate that no engineers or technical people need get involved. On-line tests take place while the network is operating and test results are displayed in English. Several customers have decided that this technique is the way to go, the first being New Zealand National Airways.

Networks are, by nature, custom things, and pricing for the NCS4000 system can range from as little as $50K to well over $100K depending on individual customer requirements. INTERTEL INC., Burlington, Mass.

FOR DATA CIRCLE 228 ON READER CARD

ond cpu is added. Also featured are 24 operating registers, a central exchange jump, central memory priority access, integer multiply, and real-time clock. Memory can go up to 128K of main, and you can tack on extended core as your budget allows. It's claimed that the little model 71 can handle both batch and time-sharing applications and can support up to 500 simultaneous remote terminal users depending upon how much system resource each requires. This is where the central exchange jump feature comes in handy. It allows the cpu to quickly save all registers from one job and get it processing on another—critical in a multiprogramming environment.

Software includes CDC's Network Operating System (NOS) and Network Operating System/Batch Environment (NOS/BE), also offered on other Cybers. First deliveries are scheduled for this month. CONTROL DATA CORP., Minneapolis, Minn.

FOR DATA CIRCLE 234 ON READER CARD

Versatile Terminal

The Model 300 is a 30 cps printer, microprocessor, and 4-16K memory teleprinter that features the ability to operate on the Telex network at 66 words per minute, the TWX network at

100 words per minute, and on the telco network at 300 wpm, all at the flick of a switch. Five configurations are available: Telex, TWX, TWX/DDD, Telex/-TWX, and Telex/TWX/DDD. Complete with automatic send/receive capability, the model 300 is priced at $3,295. TEL-TEX, INC., Houston, Texas.

FOR DATA CIRCLE 237 ON READER CARD

Communications Printer

The model COM communication printer has a list of interesting features. For example, a microprocessor is used to obviate the need for padding and fill characters to be generated when short line messages are sent at 1200 baud. The COM operates bidirectionally at 180 cps across 136 columns. A single block of 1,400 characters of 10 column width lines can be transmitted to the printer at 1200 baud. The MTBF for the printer is something over 500 hours (which seems a little low) but it's claimed that the unit can operate in most applications for six months without requiring service. It's priced at $3,990 and is available within 60 days. HYDRA CORP., Mountain View, Calif.

FOR DATA CIRCLE 235 ON READER CARD

Card Readers

This new series of one-at-a-time card readers can be used for work/data collection, station, and badge card readers. In addition to reading identification badges, the CB 100 and CB 200 handle punched or mark sense cards as small as 22 columns. Cards of any length can be processed, and a variable speed transport control helps make the unit compatible with data output timing signals. The CB 100 provides for straight-through feed (enters the front and exits the back), while the CB 200 incorporates a reciprocating feed system that enables the card or badge to enter and exit the same port. Prices are approximately $875 in orders of 100 units. PERIPHERAL DYNAMICS, Norristown, Pa.

FOR DATA CIRCLE 236 ON READER CARD

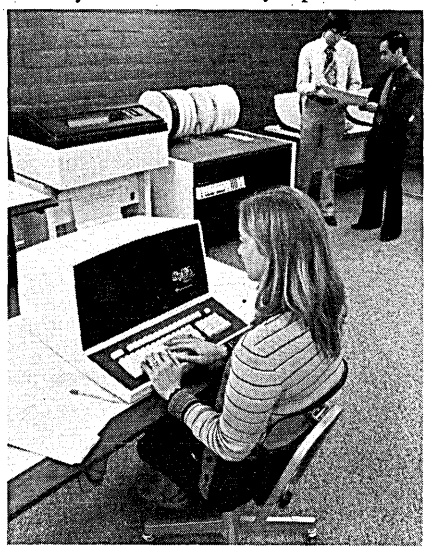
Distributed Processing

Add another competitor to the long list of companies claiming to have just the right product for the distributed processing market. The SYFA system probably won't be an easy one for Computer Automation to sell, for the system is late to the market (principally because of legal scuffling with Datapoint over the heritage of the software) and it's the firm's first commercial product. Still, outsiders and competitors who've seen it give it very high technical marks, and CA *seems* sincere with its commercial effort.

SYFA is based on a modified Megabyter 16-bit processor offered to oem's for more than a year. Concurrent, interactive communication between as many as 24 crt terminals, with additional capabilities for batch processing and communications with other computers is what SYFA is best at. The sales targets will be multi-divisional corporations where there is a need for both local and remote processing.

The software that makes it go is called SYCLOPS, for SYFA Concurrent Logic Operating System, a virtual storage management monitor that supports a multitasking structure with 24 variable-sized partitions, spooling for two high speed printers, demand paging, and dynamic resource allocation. The system uses a new programming language called SYBOL, a business-oriented language that provides resources for telecommunications, real-time coordination of independent tasks, and security features.

The hardware is expandable from a 64K system all the way up to a full

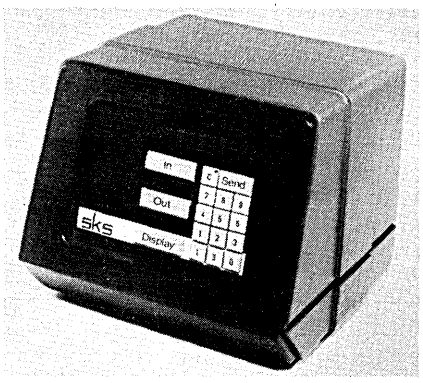


megabyte and supports up to eight disc drives, either 81 or 56 megabytes of capacity each. A basic system with a 64K processor, eight communications ports, disc drive and software is priced at $54K. Deliveries are being quoted as 60 days. COMPUTER AUTOMATION, INC., Irvine, Calif.

FOR DATA CIRCLE 238 ON READER CARD

Oem Terminals

A series of small, microprocessor-based, magnetic card terminals has just been put on the U.S. market (since last month's National Computer Conference) by this German manufacturer which is making inroads into foreign markets. The series is available in five categories, ranging from a read-only model up to a unit that offers five



function keys, a ten-digit numeric keyboard, an eight-digit LED display and a sixteen-digit numerical impact printer. Some of the applications found for the products in Europe, and which will probably be among the first in this country, are data collection, access control, automated parking, and credit

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Sterling Computer Systems, Inc., Subsidiary of Sterling Electronics Corp.
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cally—especially in the areas of mortgage taxes, comparative analysis and other specific applications. With DATACOM, we're beginning to take for granted features such as relating multiple customer accounts and providing sales data on properties. DATACOM's efficiency is the key."

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Rulon Brough, MIS Director
The Southland Corporation
Dallas, Texas. (The world's largest retail convenience food chain with over 5,500 7-Eleven stores nationally.)

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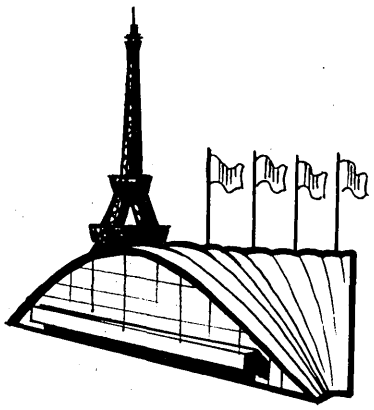

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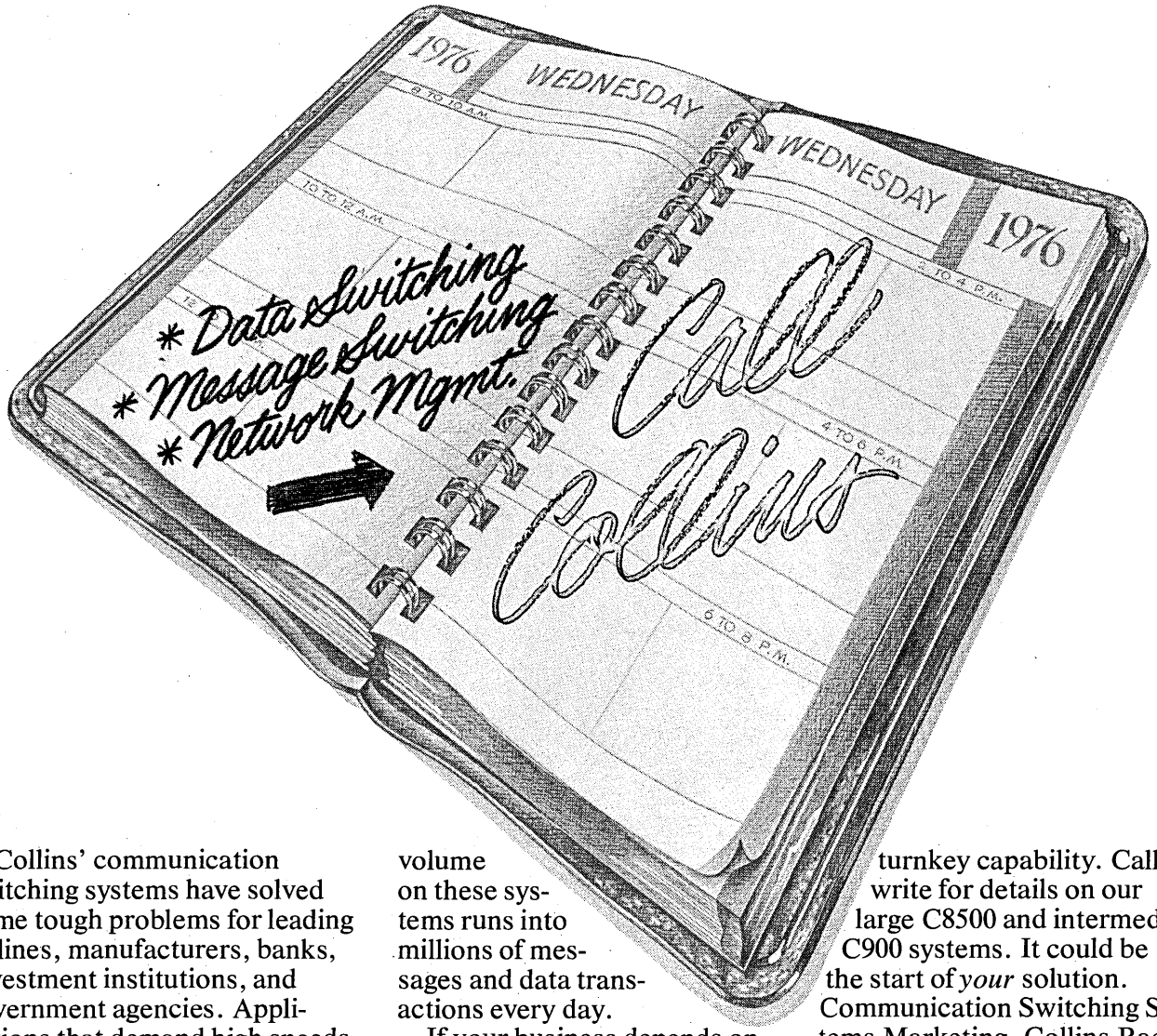

Collins' communication switching systems have solved some tough problems for leading airlines, manufacturers, banks, investment institutions, and government agencies. Applications that demand high speeds and capacities, utmost reliability, and the know-how to make it all work. The total traffic volume on these systems runs into millions of messages and data transactions every day.

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CIRCLE 15 ON READER CARD

authorization. Depending on quantities and specific product requirements, the terminals range in price from $1,600 to $2,400 each. QUATRO, INC., East Hanover, N.J.

FOR DATA CIRCLE 239 ON READER CARD

Optical Mark Reader

An optical mark reader for less than $1K ($995) is available from this manufacturer. The model 4200-CM feeds and reads cards at up to 300 cpm and is capable of reading 40-column marked cards and converting the data to standard 12-channel Hollerith output signals. The 4200-CM is also available with RS-232 communication interface circuitry for $1,295. CHATSWORTH DATA CORP., Chatsworth, Calif.

FOR DATA CIRCLE 240 ON READER CARD

Text Editing

The Redactor II comprises a 5,000 character crt display, from 500 to 4K positions of magnetic storage, and an optional 220 lpm printer. The large crt screen operates in several modes, including instruct, edit, record, play, duplicate, and store/recall from memory. The crt can display a full page in proper format, or enlarge portions of the page to double size for easier reading—a nice feature. All characters can be displayed in upper and lower case, including all accents and diacritical marks, underlines and control characters. Text being changed can be

made to blink to display in higher intensity, or be shown in reverse brightness. Data can be inserted from the keyboard, from magnetic storage media (cassettes), or from the system's memory. Many changes can be made without typing; for example, entire paragraphs can be moved from one location to another, formats changed, and type pitch altered. The system can be instructed to find sets of words and to insert, alter, or delete them.

The basic system sells for $10,500, or rents for $300, with maintenance of $40/month. The line printer sells for $6K and rents for $200 with maintenance of $25/month. First deliveries are slated for the fourth quarter of this year. REDACTRON CORP., Hauppauge, N.Y.

FOR DATA CIRCLE 241 ON READER CARD

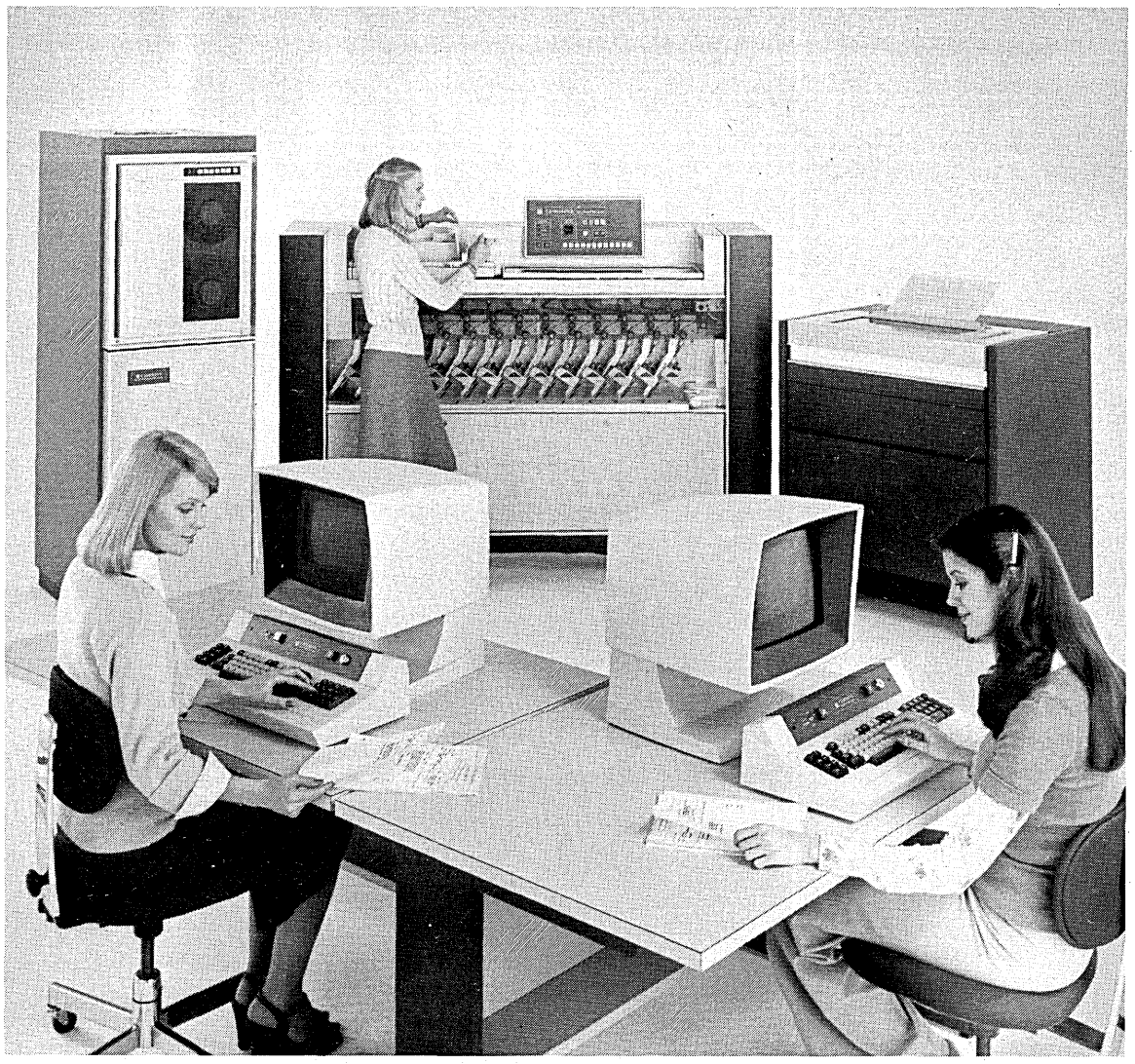
Serial Printer

The "WideTrack" in this case is not an automobile model but rather an extra wide 40 cps daisy wheel printer with a print line length of 26.4 inches, or about twice as long as standard models. The latest variation of this manufacturer's design can thus print 264 characters at 10 characters/inch, and 316 characters at 12 characters/inch. A microcomputer has been incorporated to replace most of the electronic components and connections present in earlier models. The WideTrack printer is priced at $1,700 in orders of 100. QUME CORP., Hayward, Calif.

FOR DATA CIRCLE 242 ON READER CARD

Teller Terminals

The 2500 modular terminals system includes a 48K microcomputer for directing and controlling various elements of the system, interactive controllers, three types of keyboards (from 16 to 56 keys), two crt units, three printers, two magnetic stripe devices, and an automatic change dispenser. The system functions either on-



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Stay out of the rough and away from hazards. Shoot straight for the green. Your best shot for low cost, efficient data processing is with a Cummins 4400 KeyScan System.

For key entry and/or automatic scanning of documents, the 4400 System can perform...

...as a host system collecting pre-processed data transmitted from remote systems.

...as a dispersed processing system, where data entry and extensive front-end processing and report generation must be performed concurrently and on site prior to transmission to a mainframe.

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The 4400 System can have up to 32 CRT/keystations. A scanner with OCR and/or MICR reading capability can be added to automatically process intermixed remittance advice forms, checks, and other documents to maximize funds availability. Comprehensive software and a powerful processor with up to 128k bytes of memory support the system and all peripherals. RPG II enables you to generate reports and listings to your needs. ISAM and sort merge for disk and tape files are also available. If the game is on-line, you're still in it with 3780, 2780 or 2968 communications.

The system is designed to maximize the efficiency of the operator. The processor affords data entry priority status. All editing and validating routines are performed in the background and never interfere with or slow down the key operators. All errors are detected and corrected at the point of entry.

Putt around if you must, but if you're ready to tee off on improved data processing, write for literature describing our 4400 System or our new 3400 System which is tailored to smaller volume, dispersed processing requirements. That way you'll know the score and when the time comes to make a decision, you'll go with a winner—a Cummins KeyScan System.

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CIRCLE 18 ON READER CARD

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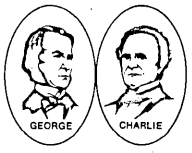

George & Charlie, I've got a paging problem and I'm a true believer in automation and low overhead. Send me more information on APO so we can optimize our VS paging—*automatically!*

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or off-line. For off-line usage, data is recorded on magnetic cassettes at the microcomputer for subsequent processing on a central cpu. In on-line operation, data is transmitted directly to a central computer where files are updated as transactions occur. Two types of software are available; one for handling thrift institutions and the other one for commercial banks. Up to eight work stations, any combination of keyboards, displays, printers, and magnetic stripe readers, can be con-

trolled by the microcomputer. The price of the 48K micro is $10,020, or $375/month. A typical eight-station system including a numeric function keyboard and display and journal validation printer at each station, plus shared passbook/document printers and alphanumeric keyboards, is priced at $7,750 per station. NCR CORP., Dayton, Ohio

FOR DATA CIRCLE 243 ON READER CARD

Flexible Disc

The model 110 is a double/single density flexible disc that can be adapted by oem's to both MFM and M²FM encoding techniques and accommodates up to 6.4 million bits of data on one side of standard media. Single density storage in variable formats provides up to 3.2 megabits of data. The 100 is fully IBM compatible and will read and write IBM 3740 formatted diskettes for up to 1.9 megabits. The 100 features a cast frame, ceramic read/write head, daisy chain capability for up to four drives, parallel ready lines, etc. It's priced at $500 in orders of 100. GENERAL SYSTEMS INTERNATIONAL, INC., Anaheim, Calif.

FOR DATA CIRCLE 244 ON READER CARD

Small scale systems

This manufacturer's 3000 systems got off to a rough start years ago, but with most of the problems solved, the engineers have gone back through the machine and almost totally replaced every box with higher-performance parts. There are even a few nifty new features.

Benchmarks against the "old" 3000s show throughput improvements ranging from two to six times in typical business operations, principally made possible by a new faster cpu, 450 nsec memory (33% faster than the old spec), and more of it—up to 512K.

One of the new features is an automatic error logging logic that identifies the culprit in memory that is causing problems so that it can be taken care of during routine maintenance. Many of the more heavily used software functions have been committed to microcode, and there are new instructions to bring the total to 209 mnemonics. There are now three models in the series, and users of the previous 3000 versions can have their systems upgraded in their shops. Prices range from $110K to $190K across the three models. Deliveries are underway. HEWLETT-PACKARD CO., Palo Alto, Calif.

FOR DATA CIRCLE 245 ON READER CARD ❋

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Updates

An interesting new wrinkle just announced by Burroughs Corp. for its B 80 series is in the Hardware section this issue. It's called the Data Base Bridging System, consisting of a series of programs that arrange current data bases from Burroughs L series and other manufacturers' systems into a proper format for the B 80's disc storage. It uses magnetic tape cassettes as standard media for data transfer.

Continuing a history of firsts that includes founder Benjamin Franklin Goodrich having the first private phone in Akron, Ohio in 1877, the B.F. Goodrich Co. has become the first company in the Akron area to utilize domestic satellite transmission for voice and data communications. First link in BFG's 59,750 mile telecommunications network to go fully satellite is from the Akron headquarters to the Dallas, Texas sales and service facility. But they still don't have a blimp.

One of the original and most successful independent software products recently reached an important milestone: Informatics, Inc.'s MARK IV file management and reporting system recently reached the 1,000 installation level, representing more than $40 million in revenues to the Canoga Park, Calif., firm. Who implemented number 1,000? It's a four-way toss-up between two service bureaus in Venezuela and Thailand, and two banks in South Carolina and Minnesota.

Despite the fact the U.S. Patent Office recently won the Dann vs. Johnston software patentability case, Marty Goetz, Senior V.P. of Applied Data Research is optimistic about the future of software patents, and believes that the Patent Office will soon end its three-year moratorium on issuing patents. Goetz bases his reasoning on the fact that, once again, the Supreme Court, in deciding that the logic behind Johnston's program was obvious "to someone reasonably skilled in the art" of programming, nothing was said about the patentability of programs per se.

ACM's X3J3 Committee on FORTRAN development is "favorably disposed" toward a proposal to incorporate an IF-THEN-ELSE structure into the current revision of Standard FORTRAN.

Microcomputer Basic

This small firm claims to have been busy developing compilers for other manufacturers for years and is finally going to market something of its own —sort of. Among its achievements the firm claims the first FORTRAN on a 4K 16-bit mini for Texas Instruments several years ago, and the first time-sharing COBOL on a mini, NCR's 8200 compiler.

The product is called Micro Basic I, a BASIC compiler that generates code for the Intel 8080, and before September, the Motorola M6800. The compiler is intended to help with the development of application programs on the Intellec MDS system, and includes the compiler, text editor, loader, debugger, and the run-time support. The developers claim that Micro Basic I is a well rounded compiler, but point out that compared to the Dartmouth Basic, two capabilities are missing that could conceivably affect the types of applications that can be approached with the new product: there are no matrix handling capabilities, and only integer numbers are processed (no floating point).

The complete system sells for $325. A load and go version includes the loader and execution system and is priced at $96. A run-time version for running programs compiled under a full system is priced at $66. The price includes the object code delivered in paper tape form and implementation and user manuals. The manuals are available separately for $10 each.

Instead of being available directly from the developers, Micro Basic I is distributed through the Hamilton Avnet Electronics Distributors nationwide network. RYAN-MCFARLAND CORP., Rolling Hills Estates, Calif.

FOR DATA CIRCLE 214 ON READER CARD

ABEND Catcher

Tired of having your 360 or 370 job terminate on you simply because of a simple little data error? For $195 you could obtain a package from this vendor called the Bad Data Monitor Program that intercepts the ABEND, allowing you to correct the data, re-execute the instruction, and continue execution as if nothing bad had ever

software spotlight

Manufacturing Process Control

One of the applications goldmines that is going relatively untapped is the potential interface between process control type applications as a logical addition to manufacturing programs. The problem has been that the FORTRAN or COBOL programmers responsible for work in progress or order control programs didn't know anything about (and were a bit scared of) "funny" process applications, and the people familiar with process applications never heard of FORTRAN, so not much was being accomplished. If the walls are going to come down between these two critical elements of manufacturing, it will probably be due to a large extent to programs like this one, developed by a user (the Stone Container Corp.)

The program is called Measurement and Control Hierarchical System. It is written primarily in IBM DOS FORTRAN IV utilizing a combination of assembler and FORTRAN subroutines. The elements of the system include a set of programs that *run* on an IBM System/7 to perform data acquisition and control functions, a set of programs for the 370 that perform control and monitor functions, and a set of programs written for use with the Minimum Telecommunications System (another field developed program, number 5798-ALN) which also resides in the 370.

The set of programs enables the user to access information from three important sources: the plant, for new or existing instrumentation is wired to an S/7; the System/7 itself, which is busy relaying info to the 370 and executing plant control functions, and the 370, which allows user programs to access and update data bases before returning the updated elements to the S/7. With this type of communicating configuration, numerous new programs can be run to (hopefully) better manage the manufacturing operation. Examples would be more accurate historical analyses, dynamically modified procedures executed by the S/7, etc. A system as small as a 92K model 370/-115 is all that is needed to begin running the Measurement and Control Hierarchical System, and many manufacturers already have that much capacity on-hand already. The licensed program requires 12 consecutive monthly payments of $585. IBM CORP., White Plains, N.Y.

FOR DATA CIRCLE 213 ON READER CARD ✲

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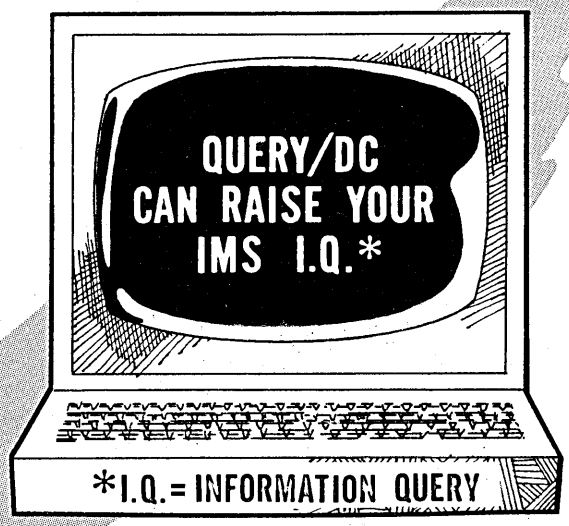

Whether you're a programmer/analyst or an end-user, QUERY/DC makes it easy for you to:

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happened. Optionally, the little routine can give detailed information about the data that (almost) caused the ABEND. There's a three-week free trial on the program, and it runs on any OS or VS equipped 360 or 370. EON COMPANY, Anaheim, Calif.

FOR DATA CIRCLE 215 ON READER CARD

Assembler Language Debugging

Certainly there's still a lot of program development taking place that uses 360 and 370 assembler language, and CLIDEBUG has been developed to ease the task of developing such programs. It runs in the batch environments under OS-MFT, OS-MVT, VS1, and VS2.

CLIDEBUG provides interruption monitoring and automatic recovery; temporary modification of data and instructions; externally specified execution breakpoints; externally specified snapshot dumps or registers, buffers, instructions and data; externally invoked instruction-by-instruction tracing; SPIE exit simulation as normal program code; and external measurement of execution frequencies for performance evaluation. The services are invoked by using external control statements instead of having to insert and remove coding for debugging purposes. Although primarily intended for assembler language programs, CLIDEBUG can also be applied to high-level languages, including FORTRAN, COBOL, and PL/1.

The object code and complete documentation, including installation instructions, operating tips and usage examples is available for $150/month, including maintenance. The source code can be provided for a one-time charge of $3,875. COMPUTER LINGUISTICS INC., Albany, N.Y.

FOR DATA CIRCLE 216 ON READER CARD

Employment History

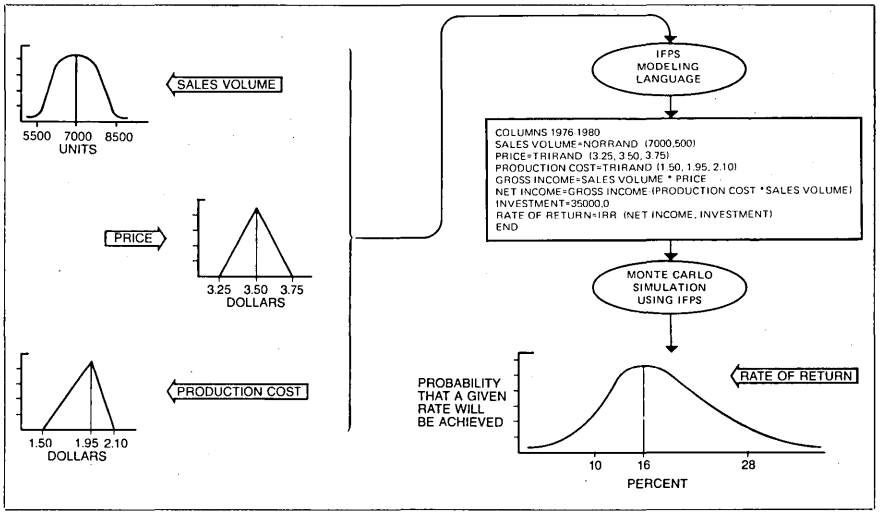
Organizations whose payroll and personnel systems do not include the maintenance and reporting of historical personnel data can take advantage of this package called the Employment History System. It's offered for use with the firm's Payroll/Personnel System, but can be purchased separately for interfacing with an organization's existing application—it's written in ANSI COBOL.

The system extends payroll and personnel capabilities by providing a permanent log of all selected personnel data changes. Additionally, the reasons for the changes (new hires, leaves of absence, promotions, separations) are also permanently recorded, and can be used for Affirmative Action and collective bargaining reporting, and for studies of personnel activity over periods of time. An employment history report is generated which presents chronological employment information for all or selected groups of individuals. The file structure and data element definitions are transparent to application programs, making it possible to change the data format or the content of the history file as new reporting requirements arise without affecting existing programs. Elements of the system include an update facility, a periodic consolidation program to handle user retention requirements, an input module, and a display routine. Source code, documentation, and installation manual are priced at $3,500. INTEGRAL SYSTEMS, INC., Walnut Creek, Calif.

FOR DATA CIRCLE 217 ON READER CARD

Financial Planning/Analysis

A financial planning and analysis system called IFPS (Interactive Financial Planning System) has been added to Control Data's worldwide CYBERNET time-sharing network. IFPS consists of a report generation module designed to enable non-cp-oriented executives to develop output describing long-range strategic planning, intermediate and short-range tactical planning, capital budgeting, resource allocation and cash flow analysis by using English-like statements.



One handy feature of IFPS is a "what if" command that can be used with the spread sheet or risk analysis capabilities of the package, allowing the user to plug in alternative variables and ascertain which factors are the most critical to the problem. As many as 500 variables can be defined. The user can choose between complete reports or for selected items. A consolidation feature useful in budgeting applications is available. Also featured by IFPS are a single specification statement that provides up to 100 time periods for analysis, and built-in financial analysis capabilities that include present value, internal rate of return, depreciation and amortization. Small models can be setup under IFPS and run for as little as $5, while larger runs might run as much as $50. CONTROL DATA CORP., Minneapolis, Minn.

FOR DATA CIRCLE 219 ON READER CARD ❋

Trend Analysis

Trend Analysis/370 was developed to aid executives and staff managements in financial institutions display business information graphically, but it's claimed that the same types of reports (graphs) can also be used in manufacturing, retailing, distribution, processing, and utility shops, which is probably true. The program isn't something one just drops into a 370 and runs, however; you'll need at least a 370/145 with a megabyte of memory, IMS/VS, a 3277 display terminal, a System/7 if you want color displays, a color tv monitor to display them (and that's one device that IBM doesn't build yet), and a 3286 printer if you want hardcopy.

But what you'll have when you've amassed this configuration should be the envy of your competitors, a system capable of providing three basic types of business reports: single period comparisons (which compare the performance of more than one organizational element, such as bank loans, deposits and withdrawals, for a given time), historical analysis (comparing the performance of various elements such as available capital, cash flow and investments, of a single company over a period of time), and historical comparisons.

A menu displayed on the 3277 allows the user to select options. A nice finishing touch to Trend Analysis/370

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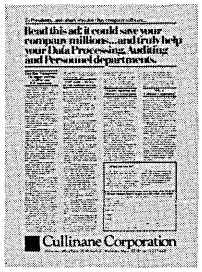


Cullinane Corporation

Wellesley Office Park, 20 William St., Wellesley, Mass. 02181, (617) 237-6601

is that the screen reminds the user how to have the information printed for a permanent record and/or displayed in graphic format using up to six colors and black and white. The basic program, available in the fall, rents for $500/month under license. The color graphs will cost you $160/month more. IBM CORP., White Plains, N.Y.
FOR DATA CIRCLE 218 ON READER CARD

370 Terminal Servicing

Users with a substantial investment in IBM 2260/2848 terminal systems will doubtless be interested in this package which is essentially a modification to the IBM 3705 communications processor emulator program. The terminal polling logic is moved to the 3705, away from the mainframe, which should result in a substantial reduction in cpu servicing. (It's estimated that a 370/145 with DOS/VS, and BTAM processing 10 interrupts per second generates a two percent cpu load.) With the polling package, polling lists associated with lines using 2848/2260 protocol are stored in the 3705. When the host initiates a poll operation for a single logical control unit, the 3705 enters auto-poll state and polls all control units. Negative poll responses and timeout conditions are processed alone by the 3705 without generating host I/O interrupts—just the way NCP/VTAM does. The package requires approximately 1000 bytes of 3704/3705 storage and is available on a lease basis for $600 per month, including maintenance. COMM-PRO ASSOCIATES, Manhattan Beach, Calif.
FOR DATA CIRCLE 220 ON READER CARD

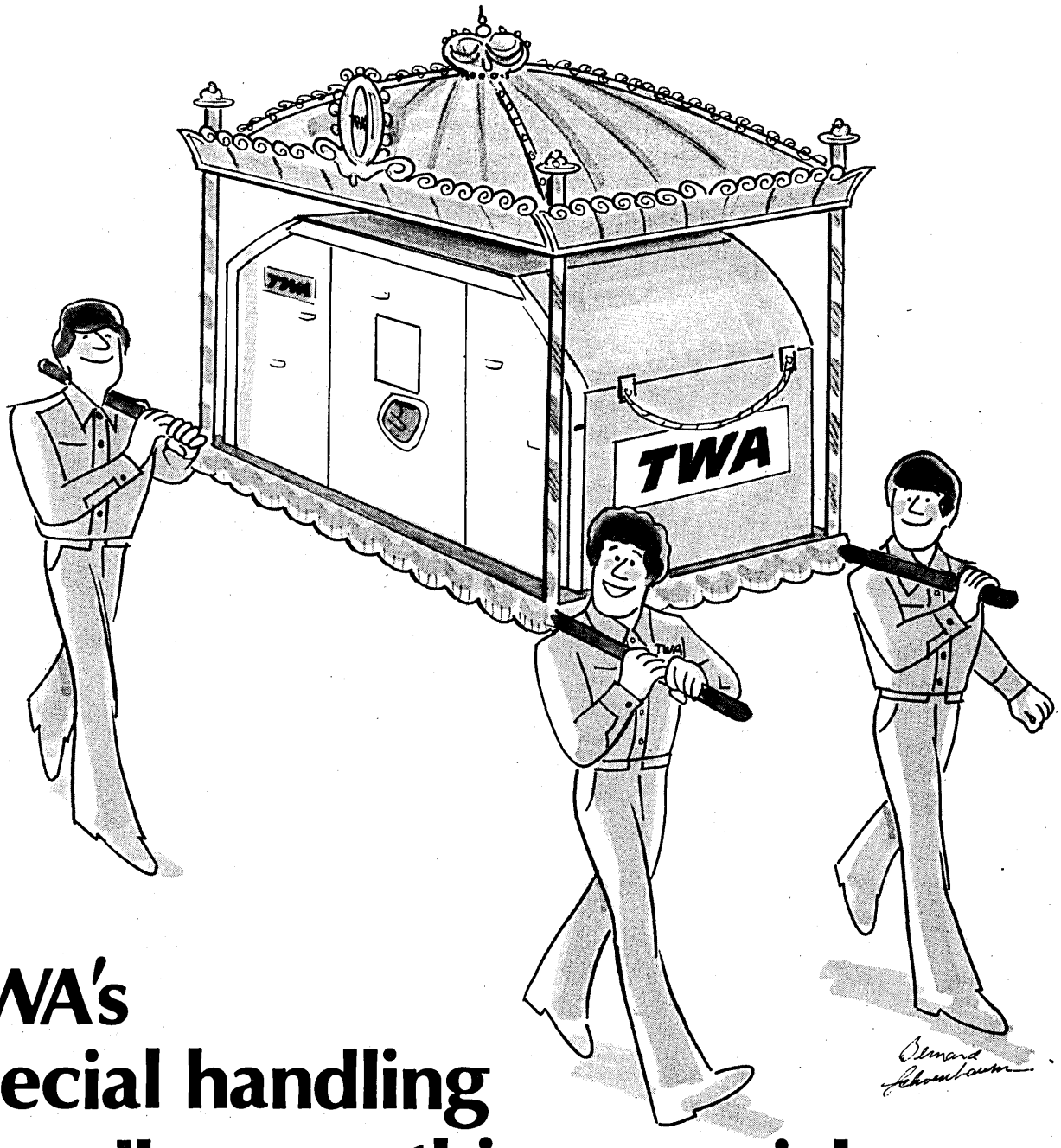
Pert Services

PERT, the Project Evaluation and Review Technique package credited with helping to bring the Polaris submarine program to fulfillment in less time and for less money than was anticipated many years ago, is still undergoing development, principally to fit it to commercial applications. An example is this vendor's version, offered as a terminal-oriented service. The product is called ACTION/PERT and is managed by English-like controlling statements so that it can be used by nonprogrammers. Additionally, the product is based on the "activity on node" approach rather than the "activity on arrow" approach which the vendors feel is antiquated because it necessitated dummy activities to be generated. For those not familiar with PERT, the output resembles a schematic drawing that shows which activities are behind schedule, on schedule, or ahead of schedule (and thus have some slack time), enabling management to conceivably alter resource allocations to keep large projects on schedule. This particular vendor foresees applications in building construction, facilities and capital equipment management and expenditures, new product planning, data processing projects, and marketing research.

The charge for access from 15 cps terminals is $12/hour for connect time; $15/hour for 30 cps terminals. Add to this 50 centers per cpu second, with the cpu being a 370/155. There are discounts for volume users. ACTION/PERT is APL-based. APL SERVICES, INC., New York, N.Y.
FOR DATA CIRCLE 221 ON READER CARD

File Compaction

BEST (Bit Efficient Storage Technique) consists of two subroutines for reducing and expanding file sizes on the IBM System/3. BEST can be implemented at the file, record, or field level. Where many application programs use a particular file, the user can choose to initially condense the entire file and expand it before running an application program that uses the file. The pro-



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grams that use the file can thus be converted one at a time until they all use the new condensed files. Savvy users will see the reasoning behind all this: the possibility of making do with the amount of file storage devices on hand, thus saving money, and the possibility of improving performance by transferring more information on cpu/disc read/writes. Either way the benefit is potentially less rental to shell out each month. Seven key codes are used to manipulate the system.

There's a one month trial period for the package, which rents for $30/month, or $290/year on a license basis. If the user isn't satisfied with the trial, he doesn't have to pay for it. A paid-up license is $1,440. The linkage is RPG II. STANDARD SOFTWARE CO., Silver Spring, Md.

FOR DATA CIRCLE 222 ON READER CARD

Report Generator

GIANT is the name of this report generator developed for the Digital Equipment PDP-8/A-based 310 small business system. The product is designed for the non-programmers who need only be able to use the editor in order to get full usage from the system, it's claimed. Further, there is no requirement to be familiar with machine characteristics or file organization details.

As the manager composes the report on the system's display screen, the user gets a good idea of how it will appear in hardcopy, and can alter the appearance to his or her liking. Headings can be specified and total/sub-total requests are performed on "breaks" as desired. New files can be set up with the aid of an indexed-sequential access method that is described as being able to find any existing record in two disc accesses or less. A file maintenance and data entry module are also part of the package. Prices vary from $1K for the full system, to $250 for the ISAM package. A 24K 310 is sufficient for running GIANT, but better performance is obtained from 32K systems, say the developers. SECOND SOURCE, Sunnyvale, Calif.

FOR DATA CIRCLE 223 ON READER CARD

Source Library

The headlong rush to convert old batch applications to on-line systems has presented vendors of packages developed years ago with an opportunity to upgrade and modernize their original products. One such product is LIBRARIAN, a source program management system that has been offered in batch form to IBM DOS and OS users for years for keeping track of, and updating, source program libraries.

Users who want to maintain their libraries through CICS terminals can now do just that with LIBRARIAN/Online, or LIB/OL for short. There are two versions: BX and IX. LIB/OL-BX performs updates to a source program library by a remote scheduled batch execution of LIBRARIAN. LIB/OL-IX executes the program during the programmer's terminal session so that the results can be immediately verified. Both versions allow the programmer to display all or a portion of a program on the screen and browse either forward or backward. A split-screen design lets the programmer see source statements on the lower portion while updating them in the upper portion. LIB/OL-BX is priced at $1,700 or $100/month on a license basis, while LIB/OL-IX goes for $3,500, or $200/month. The batch LIBRARIAN is a prerequisite to both versions, and, in addition CICS is required for LIB/OL. APPLIED DATA RESEARCH, Princeton, N.J.

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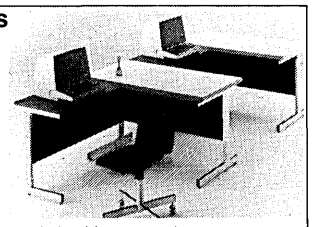

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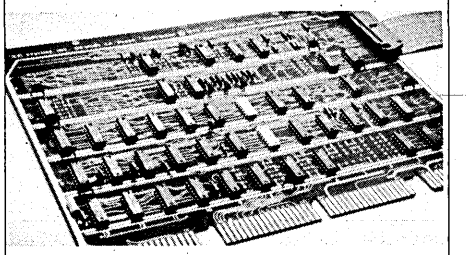

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source data

(Continued from page 44)

Paperless Records
"The Living Record System," a multicolor 14-page brochure, explains this vendor's System 200 records management system. Using transparent electrophotography, up to 98 letter-sized documents can be recorded on microfiche sized record film. Updating capability is claimed by annotating or adding to a record file. Enlarged paper copies can be easily obtained from the film. A. B. DICK/SCOTT, South Hadley, Mass.

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Graphics Display
Graphics processing in terminal hardware, video technology with selective erase, data compression through conic curves—these are some of the features available on this vendor's interactive computer graphics display terminals. An 8-page booklet explains technical features "that do with hardware what most terminals require to be done in software." The patented Conographic curve generator displays curvilinear information by converting all contour data to conic curves. HUGHES AIRCRAFT CO., Inudstrial Products Div., Carlsbad, Calif.

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Microcomputer Reliability
The 14-page "Reliability Report RR-10" presents test results, field reliability data, and failure mechanisms on the 8080 and 8080A microcomputer. Claimed as "the industry's first comprehensive report on microcomputer reliability," the study includes complete device descriptions, block diagrams, and test curves. INTEL CORP., Santa Clara, Calif.

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Intelligent Terminal
The ADDS System 70, designed particularly for remote branch operations and capable of source data entry, inquiry-response conversations, and batch data transfers, is described in a brochure. Priced at $5,000 per unit (if purchased in moderate quantities), the intelligent terminal has automatic functions adaptable to specific applications. APPLIED DIGITAL DATA SYSTEMS INC., Hauppauge, New York.

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Minicomputer Accessories
A 24-page catalog contains descriptions and prices of flexible discs, line printer paper, media cabinets, docu-

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source data

(Continued from page 150)

mentation binders, system manual racks, portable disc and tape cases, connectors and cables, and a number of other items of use to the minicomputer facility. MCA MINICOMPUTER ACCESSORIES, Palo Alto, Calif.
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Market Research Software

Marketab III is a software package to facilitate the tabulation of surveys performed for market research .An 8-page brochure describes the general advantages, options, and features of the package. The system is a three phase one: editing and logical cleaning, data manipulation, and tabulation and format. MNEMONICS INC., Norwalk, Conn.
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Numerical Control

A multi-colored 16-page brochure describes this vendor's Compact II timesharing system for computer assisted, numerical control part programming. Explanations and illustrations of the system, the Compact II programming language, sample programs for milling and drilling, training, service, documentation, and machine tool links are included. On-line editing, on-line graphic plotting, and other extensions of the system are described. MANUFACTURING DATA SYSTEMS INC., Ann Arbor, Mich.
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Crt

The Video 100, in this vendor's interactive crt terminal series, is described in a 4-page brochure. It can be standalone or interfaced with a magnetic tape cassette buffer or teleprinter. It can be equipped with a standard EIA RS232C interface, acoustic coupled, or data access arrangement. WESTERN UNION DATA SERVICES CO., Mahwah, N. J.
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courses

Decision Analysis Self-study

"The bigger the risks, the more complex the issues, and the more uncertain the outcome—the more you can profit from a scientific, decision tree approach," says Dr. Howard Raiffa, professor at the Harvard Business School and author of the self-study program, *Analysis for Decision Making.* This course consists of 20 audio cassettes and 10 coordinated manuals which take the listener step by step through fundamentals of decision tree logic, probability theory, risk analysis, and estimation of uncertain quantities. Case examples from business, technical, and public policy situations, and programmed exercises and problems are included. Price: $750. ENCYCLOPAEDIA BRITANNICA EDUCATIONAL CORP., 425 N. Michigan Ave., Chicago, Ill. 60611.

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This forum is offered for readers who want to express their opinion on any aspect of information processing. Your contributions are invited.

the forum

Another Parker Game

The following news item appeared recently in the financial pages of a local newspaper:

"Stanford Research Institute has been awarded a three-year contract by the National Science Foundation to find out why computer mistakes, such as incorrect billing, occur. One area of concern is mistakes by programmers who write the instructions to the computer. Information should be sent to SRI . . . attention Donn B. Parker."

In the interest of saving the taxpayers the three-year time lag for the study to be published, I will give you the following results free.

Errors are caused by:

99.00% Data entry errors caused by illegible handwriting, fatigued operators, and other miscellaneous human problems.

.001% Program logic errors which have escaped the programmer's attention because they are buried in coded procedures which may or may not be well documented. No data validity checks. No extensive testing.

.001% Inadvertent modification of a program by itself or by an erroneous overlay.

.001% Operating system failure, usually I/O or in the communications handler subprograms.

.001% Fraud.

.096% Computer operator error as caused by entering the wrong date, using the wrong tapes, and other assorted human problems.

Of course, Parker will have a lot of tragic stories to get media attention and here we go again. He will have a super large literature search, a new computer glossary for the uninformed, at least 20 pages of questionnaire copy, a detailed explanation of the methodology of the research, a summary of statistical manipulations that allow one to use a very small sample size to carry out the projections to the third decimal place, and a host of other innovative reportage techniques.

the forum

Give us something we can use

I would much rather see a $300,000 checklist of standardized instructions that could be used for the briefing of data entry personnel than a cross-referenced, categorized tabulation of the heart-rending people problems caused by, or attributed to, data processing errors—no matter how interesting or amusing these individual stories may be.

If I were paying for the entire study (and as a taxpayer, I have no doubt that I am picking up an imperceptibly miniscule portion of the tab), I would prefer a study which would become a useful reference work in my day-to-day operations, rather than a specialized, attention-getting report that reeks of stylized, self-serving, academia.

Since the causes of most dp-related problems are somewhat obvious, spend the same amount of time, effort, and money in showing me *how to* minimize data-entry errors caused by fatigued operators working under rigorous deadlines, *how to* use self-coded validity checks to reduce data input errors, *how to* generate test data for wide-ranging program testing, or *how to* deal with the problems of the real-time entry of correction data while leaving a government accepted audit trail.

If this money must be spent on research and the inevitable report, do something to help those of us who worry about the contamination of our data bases by foreign data of unknown format. Some easily-implemented, common sense systems and procedures need to be defined, based on the assumption that it is a statistical certainty that errors will continue to be made in data entry, data communications, and in the other internal and external phases of the dp operation, *and* which provide a solution, or, at least, a methodology for correcting those inevitable errors within an acceptable time limit and at a cost consistent with the goals of a profit-oriented or service-oriented organization.

All I ask is that *every* organization involved in spending the taxpayer's hard-earned money on computer-related research, consider leaving the reportage and story telling to Truman Capote, and set about helping those of us who may lack the time and massive resources to help ourselves discover the answers to providing better service to our respective publics.

However, if nothing else, we can at least sit back and watch with some amusement as the publish or perish syndrome is fulfilled. It is more entertaining than television, about as costly as an original one-hour tv pilot, and will be infinitely more useful than the results of Parker's last survey!

—Stephen R. Levine, III

Mr. Levine is president of Innovators International, a Beverly Hills-based management consulting firm.

COBOL is Too Big

COBOL is no longer the simple language which conquered the commercial computing world a decade ago. It has now grown to a frightening size and complexity. Few people would argue against the need for facilities which have been added to the language to permit modular programming, telecommunication, and data base manipulation. But it is foolish to assume that these facilities have not taken something away from the language—its relative simplicity. New facilities such as these have involved a large number of new reserved words, COBOL verbs, clauses, and accompanying rules. The extent of this growth in size and complexity, and

the adverse effect it is likely to have on all COBOL users, teachers, and compiler writers, may not yet be commonly realized. Possible solutions to the problems, however, exist.

The increased complexity of COBOL

A comparison of the 1968 and 1974 specifications of American National Standard COBOL illustrates the growth of the language within a mere six years:

- Four completely new facilities have been added: the indexed I/O, debug, inter-program communication and communication modules. Major additions have also been made to many of the facilities which existed in the 1968 standard (e.g. MERGE and STRING).
- The number of verbs has increased from 32 to 42.
- The number of reserved words has increased by over a quarter to 308.

It seems likely that the next standard will confirm this rate of growth with, for example, 13 new verbs specifically for data base manipulation. So the COBOL of today is a large language, which is still growing fast. Its mere size prevents it from being a simple language, but the situation is made worse by a number of unnecessary and inconsistent formats and rules.

The biggest avoidable contribution to the size of the language is the trend toward inventing completely new elements of COBOL for each new facility. One of the features of COBOL's original design was the use of the WRITE verb for all large volume output (whether it was to a printer, punched cards, or a disc). But now the communication facility requires the use of SEND instead of WRITE, and the data base facility requires the use of STORE instead of WRITE for outputting data. Thus we are now faced with an ever increasing list of verbs for each function: the list currently stands at DISPLAY, GENERATE, RELEASE, REWRITE, SEND, MODIFY, STORE, and WRITE for output.

This situation is a consequence of the general approach of adding new facilities (such as "report writer," "communications," and "data base") *onto* the language instead of incorporating them *into* it. Thus new language elements (such as the READY verb, realms, and messages) are invented instead of modifying existing features (the OPEN verb, files, and records) to cope with new concepts. Although there are arguments to support the "add on" approach, it cannot be denied that these additions are contributing appreciably to the size of COBOL.

Problems caused by size

It is becoming a major task training COBOL programmers if they are to know the full language. In practice, many programmers will never learn the full language, and will often write inferior programs as a result. They will simply regard the rest of the language as a source of extra reserved words that must be avoided when user-defined names are devised. Even those programmers who are taught the full language, or learn it for themselves, will find it impossible to retain it all in their heads. They will, at worst, give up the battle, or at best, have to relearn on each occasion those features which they use infrequently.

The user will also face the problem of larger compilers, which are more expensive to write, and consume extra storage and processing time when they are running. Even those users who are prepared to ignore such innovations as telecommunications and data bases will be lucky to escape from these side effects. For they must either use the large compilers with their associated overheads, or else—if one is available—use a subset compiler. The user, however, has little chance of obtaining an efficient compiler for the particular subset he wants.

Short-term solutions

The arguments given here are based largely on features of

COBOL which are yet to make their full impact; some users, however, already consider COBOL to be too large. Their approach to this current problem is obviously relevant to the more serious problems ahead. The normal solution is the obvious one: if the language is too large, don't use all of it—in other words, use a subset. As already mentioned, this is the approach taken by compiler writers when providing COBOL on smaller machines; and it is, in fact, an approach which is encouraged by the American National Standards Institute, which specifies COBOL in a modular form.

A similar approach also has advantages to the user with a more comprehensive COBOL compiler. By using a subset, he can avoid some of the problems already described of a large language, and can also exclude those features of COBOL which are considered undesirable on the grounds of efficiency, style, or compatibility.

However, this approach has its problems. In the first place, selecting and updating a subset is time-consuming, and secondly, since it is unlikely that the subset will be unanimously accepted by the programmers, there is the problem of enforcing it. The latter problem would be solved by the existence of a compiler or preprocessor for the subset, but in the absence of such software, only the less reliable approaches of a special programming manual or strictly enforced standards remain. But any method chosen to enforce a user's subset will involve an appreciable amount of work.

For the more sophisticated user there is another problem. As COBOL continues to grow in size, any worthwhile subset will itself be large. A subset can obviously exclude some of the more obvious duplicated features of COBOL, but others are too deeply embedded in the language. For example, many users will require data base facilities and normal file processing facilities (FD, OPEN, READ, etc.) for printing and reading cards or tapes. But sequential files on discs could be set up using either facility, so there is a duplication of methods which cannot be avoided with COBOL as it stands. In fact, any organization which uses data bases and telecommunications, as well as more traditional techniques, will need to use a large subset of COBOL. Thus it is reaching the stage where subsets will be so large that they fail to solve the original problem of a large language.

Another technique to ease the requirement that programmers know the entire language is modular programming. Programs can be designed so that report writing, telecommunications, and magnetic file processing (for example) are all coded in different modules. This would allow each programmer to specialize in different aspects of COBOL, although the program designer would, of course, need to know at least the broad principles of the whole language.

The long-term solution

Subsets and modular programming can protect users from some of the problems of a large language, but the only complete solution is to restrict COBOL to a reasonable size. One possible definition of a reasonably sized language is one in which the average programmer is capable of remembering the function, but not necessarily the precise syntax, of every element of the language. By this or other definitions, ANS 74 COBOL could be regarded as already being too big. Furthermore, at its recent growth rate, COBOL must be regarded now, or in the near future, as too large by any reasonable definition. It is essential then that the overall size of the language should not be allowed to increase any more, and it is highly desirable that it should, in fact, decrease.

Those responsible for developing COBOL can help achieve the first objective by placing greater emphasis on how

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proposed new features fit into the overall language. Inconsistencies and overlaps between new and existing features must not be allowed.

There is also the need to tackle the existing language. This would involve a group of people who are willing to produce proposals aimed purely at simplifying the language. Although formulating such proposals would not have the glamour of adding new features to the language, they are likely to be far more important at this stage in the language's development.

Compatibility

The type of changes to COBOL which are being proposed here would obviously affect existing users and programs to a far greater extent than adding new facilities to the language would. But if a language is unduly complicated, the problem cannot be solved by making it larger; so COBOL cannot be upward-compatible indefinitely.

In fact there have been precedents for dropping certain constructs from COBOL. Over the years the CONSTANT SECTION, the SIZE clause—and in the last standard—EXAMINE, NOTE, and the ACTUAL KEY type of access method, have been dropped from the language. Even these relatively modest changes could cause much inconvenience to existing users if, for any reason, they transfer programs to a compiler based purely on the 1974 standard.

The problem is that an installation's programs can be protected by a COBOL standard, and then when a new standard is published, this protection can disappear overnight. What is needed is *step-wise compatibility* which would remove elements from the language more gradually: in two stages instead of one.

To achieve this, a vital extra module would be added to the standard specifications. It would contain all those language elements which were in the previous standard but had been dropped from the current one. Implementors would be urged to write compilers which included this module of "dying" features, but programmers would be warned against using them in new programs. The "dying" features would be omitted from training courses, and the manufacturers could help by hiding them in an appendix in their COBOL manuals. Then in five years' time, when another standard is produced, these "dying" features would disappear altogether, and sensible installations will by then have very few programs containing any of them. However, during the five years while these programs were being phased out, the user would still have the full protection of the standard.

In the knowledge that users are thus protected, CODASYL could become more adventurous in removing from the language outdated and redundant features which survive chiefly for the sake of compatibility.

Conclusion

COBOL has weathered storms caused by new developments such as telecommunications and data base, and by new languages such as PL/1—and there are few signs of it sliding from favor. However, COBOL is already too large and complicated, and methods such as the use of subsets, which are currently used to overcome the problem, can only be partially successful. Thus if COBOL is not simplified, it is likely to lose favor in due course, and such loss of favor will accelerate if COBOL continues to grow at its present rate.

—John M. Triance

Mr. Triance is chairman of the British Computer Society's COBOL Specialist Group, and is lecturer in computation at the Univ. of Manchester Inst. of Science and Technology. He has also produced a television series as well as a book on COBOL.

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