DATAMATION 78®

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The One and Only

field-tested and proven 125 ips vacuum column tape transport in the industry.

The Kennedy Model 9300. Two years in design, and over two years in the field. That's one reason we don't ask you to evaluate a 9300 — and help us work out the bugs. We've already done that. Just ask any of the more than 3000 owners of Model 9300.
Model 9300 was the first tape transport with such features as a capacitive tape-location detector; air bearings and hard coated read-after-write heads.
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Data densities are 200/556 cpi or 556/800 on the 7-track unit and 800 cpi, 1600 cpi or 800/1600 cpi on the 9-track transport. The format is NRZ1/PE.
If you're looking for a 125 ips vacuum-column tape transport, you have two choices. You can help someone else work out the bugs on their transport — or go with the acknowledged leader. Kennedy.

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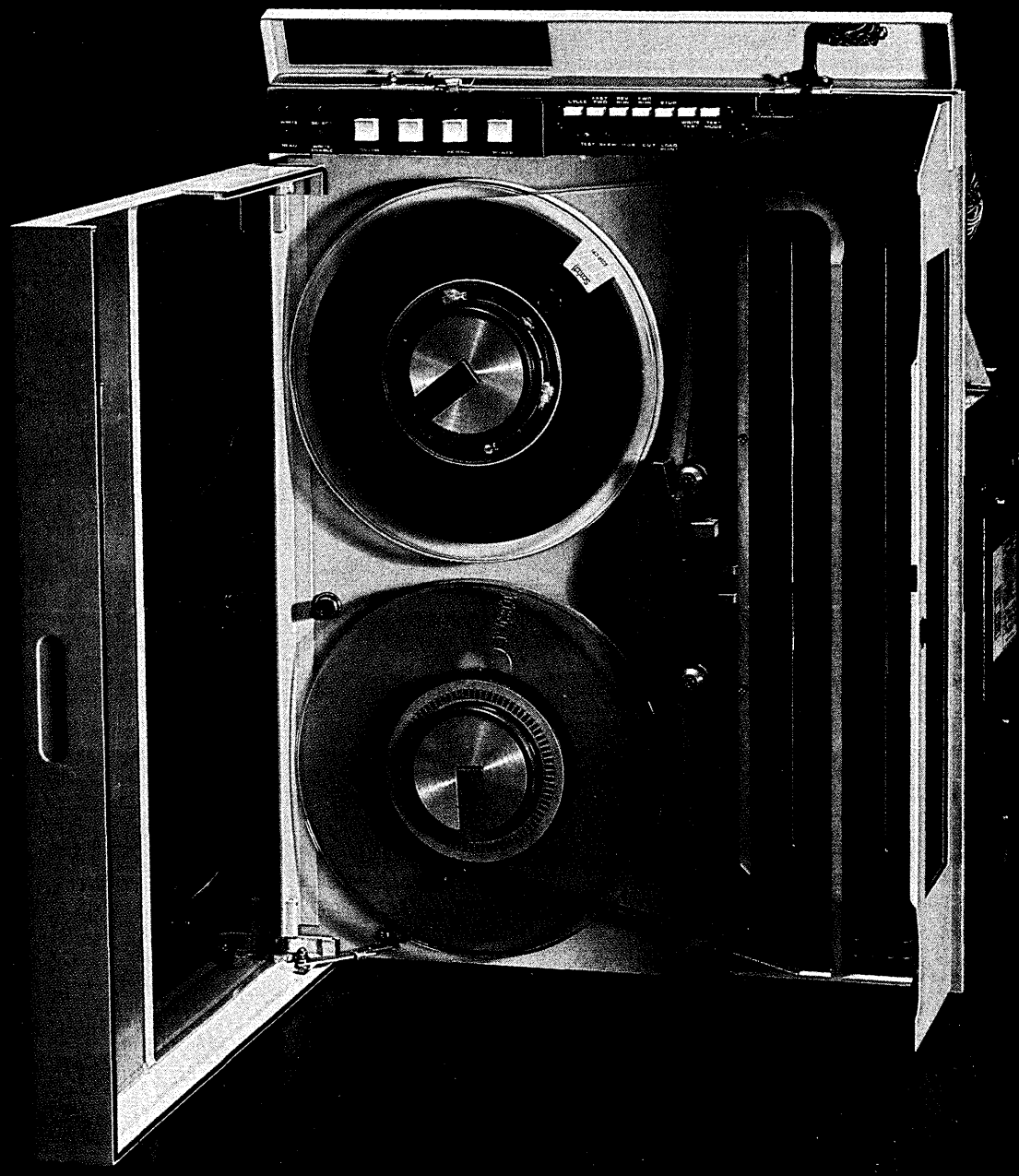

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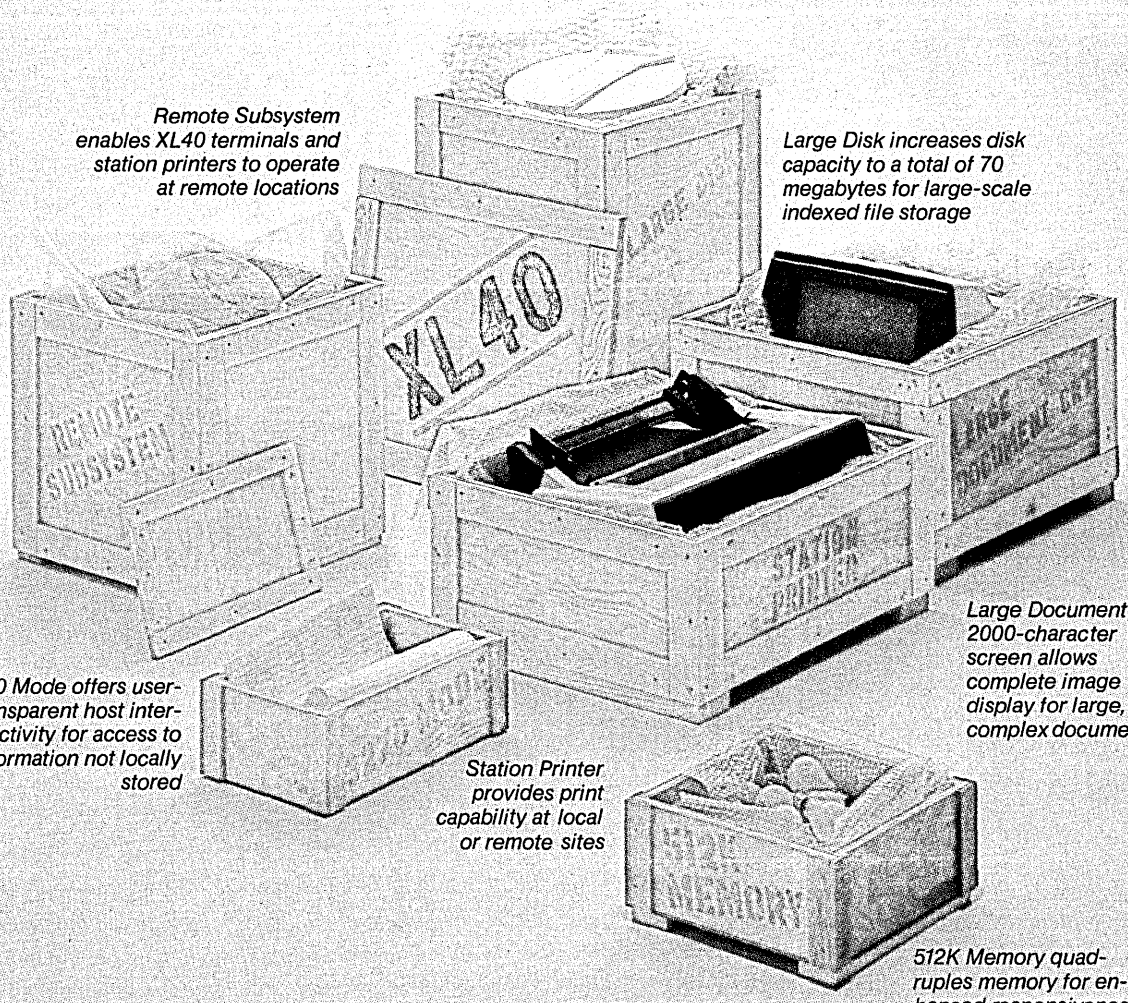
More versatility, with terminals and station printers that can be local or remote, and operate just as if they were XL40 cable-connected, wherever phone lines can be installed.

More flexibility, with both 480-character production screens and 2000-character large document screens, so we can configure the optimum mix for your requirements.

More source capability, with station printers under user program control that combine keyed data with disk file information to provide hard copy at local or remote sites.

XL40 DELIVERS DDP FASTER, FURTHER, EASIER



Remote Subsystem enables XL40 terminals and station printers to operate at remote locations

Large Disk increases disk capacity to a total of 70 megabytes for large-scale indexed file storage

3270 Mode offers user-transparent host interactivity for access to information not locally stored

Large Document 2000-character screen allows complete image display for large, complex documents

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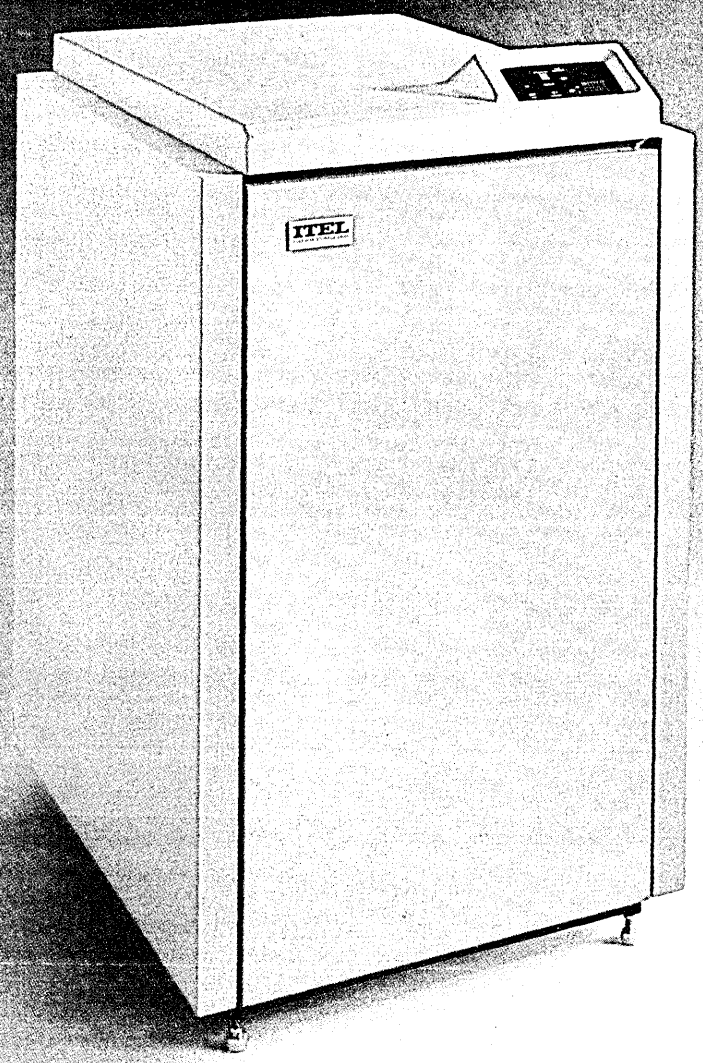
ITEL'S NEW 7350.



Not only does our 7350 offer all you expect from Itel disk drives, like our exclusive Dual-Port Feature, our patented Advanced Function Capability and the industry's fastest access time (4 ms track to track vs. 10 ms for IBM's 3350), but another unique technological innovation as well. Our exclusive microprocessor makes Itel's new 7350 the most maintainable drive in its class. And with other Itel standard features, the 7350 provides improved performance of up to 25% over IBM's equivalent, the 3350.

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CIRCLE 27 ON READER CARD

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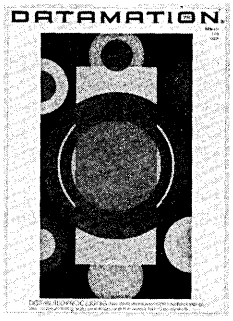

NEWS IN PERSPECTIVE

DEPARTMENTS

About the cover
As interrelationships between operating systems change, we take another look at the problems and consider possible new directions for distributed processing. Our design is by Barbara Benson.

DATAMATION.

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GRAPHIC DESIGN & PRODUCTION

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Production Assistant	Alberta R. Martin

CIRCULATION

35 Mason Street, Greenwich, CT 06830

Circulation Manager	Suzanne A. Ryan
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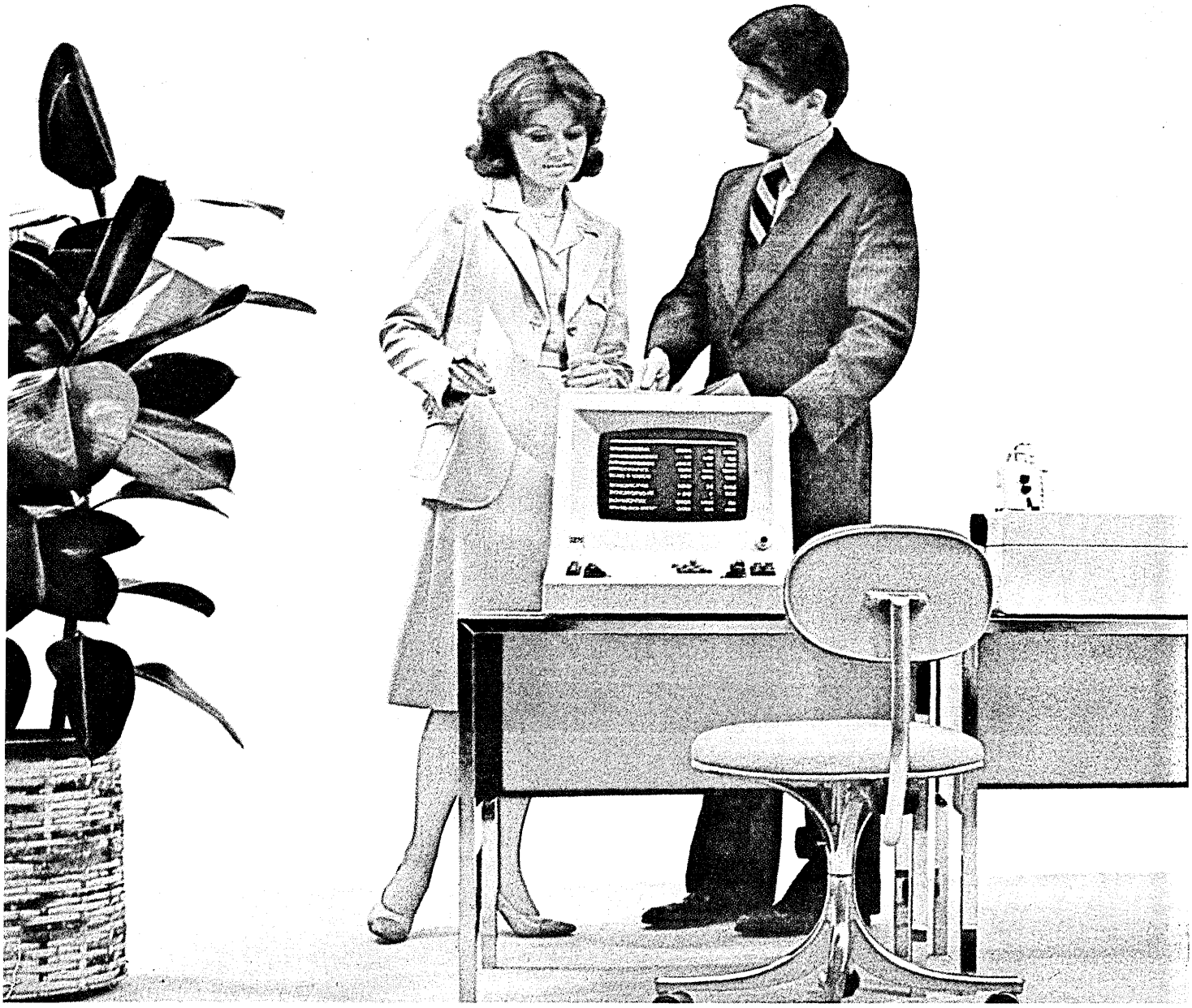

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Looking Back in DATAMATION.

March/April 1958

Technology: A new electronic revolution was reported "in the making" with the conventional transistor expected to be replaced by a new form "which may be called" the transistor diode.


GROSCH

People: Dr. Herbert R.J. Grosch was appointed assistant to the director of sales for the data processing division of IBM in White Plains. A survey article showed that typical data processing division heads were earning from $675/month to $1,000 while programmers were pulling from $400 to $455.

Companies: Philco Corp. introduced a new "high speed" electronic data processing system called Transac S-2000 with an average speed for addition and subtraction of one microsecond.

Meetings: An article previewing the Western Joint Computer Conference noted that electronic computers, "are being employed in steadily widening areas of activity."

March 1968

Companies: Announcement of Control Data Corp.'s "new supercomputer," the 7600, was deemed imminent. The machine was characterized as a "bigger, faster 6600." NCR launched its Century Series and demonstrated the 100 and the 200. IBM ceased accepting orders for the 360/91.

Trends: Malcolm K. Lee, Malcolm K. Lee Associates, Minneapolis, predicted the demise of the keypunch. The American Bankers Assn. came out in support of use of the Social Security number as the nationwide standard for personal identification in the banking industry.

Patents: A proposed ban on patents for computer programs was deemed "premature" by Patent Commissioner Edward J. Brenner.

Communications: AT&T proposed a wideband dataphone service, Data 50, that it said "seems to meet at least some of the dp industry's demands."

Systems: IBM's 360/85 was called the "fastest generally available" System/360.

❋

"ADR's LOOK®

spots problems in time to take action."

—Kenneth J. Panzarella, Vice President
Information Services Division, Carte Blanche

"ROSCOE® gives Carte Blanche a competitive edge in attracting blue chip clients and programmers."

"Our division is now an independent profit center, serving outside clients, in addition to meeting the internal needs of Carte Blanche. In our business, lost time quickly means lost revenue. To prevent that, our operations group uses LOOK throughout the day to see what is in the computer, what resources are being used, and what jobs are waiting to be processed. LOOK lets us see where the inefficiencies are and take corrective action," Mr. Kenneth Panzarella commented.

"We really don't know how much it would cost us if we didn't have LOOK, because it shows us things that are just starting to happen. With LOOK, we can stop and change before serious time losses occur. We are sure that LOOK has paid for itself many times over."

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These enhancements can be added into your present 4014-1. It's almost as easy as plugging in our peripheral hard copiers. Plotters. Graphic tablets and storage devices.

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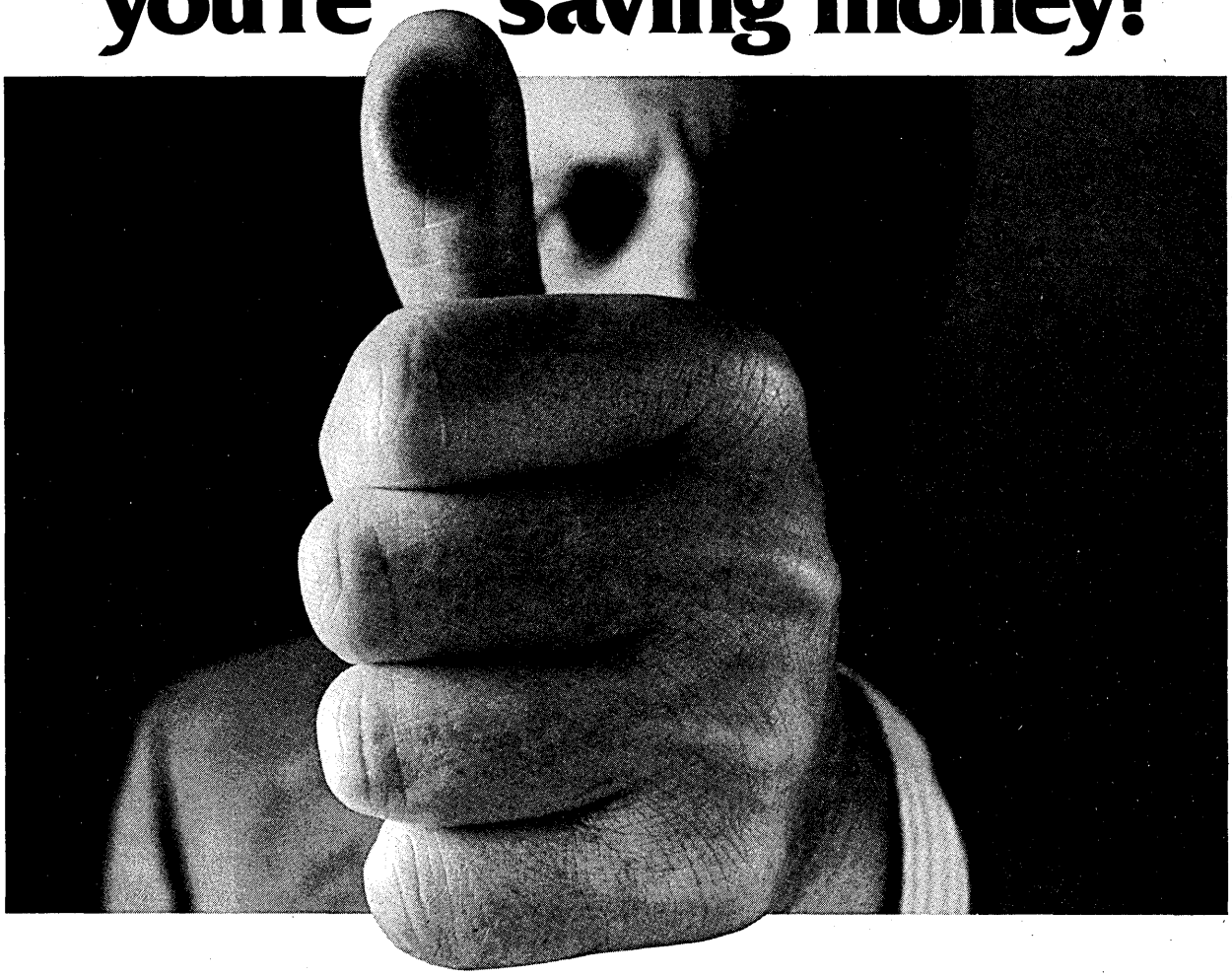

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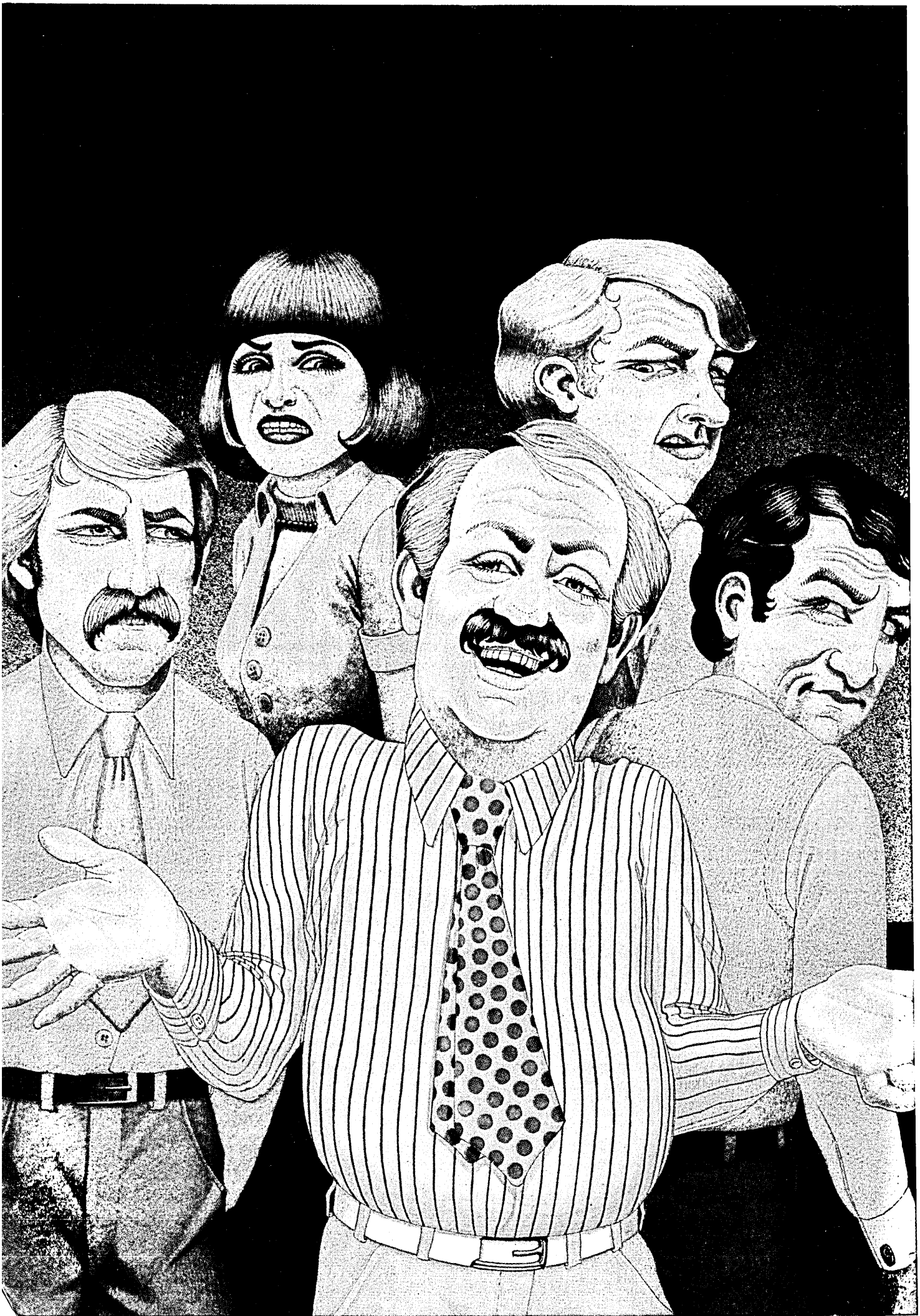

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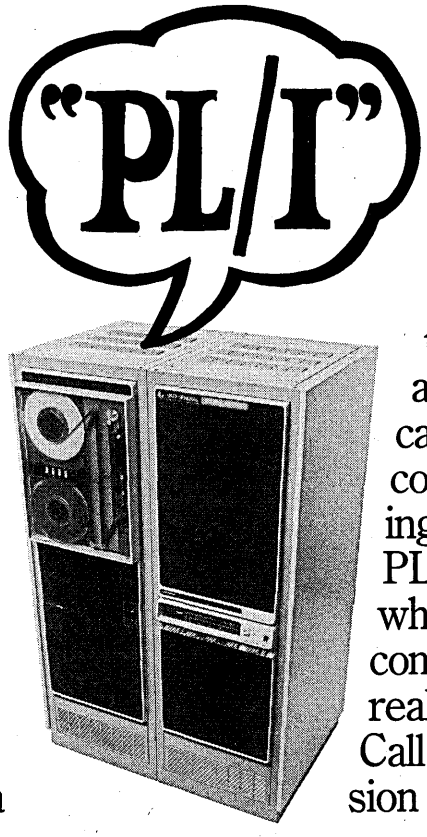

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LOOK AHEAD

THE IBM SERIES 1: EMPHASIS ON SOFTWARE

IBM's Series 1 is nearly 18 months old but relatively few of the minicomputers--less than 500--have been delivered. That number, however, is deceiving because it represents initial machines in multiple machine configurations. Insiders say IBM has a 10,000 cpu backlog and that figure is growing rapidly. Although at least three more models of the small computer are under development at the General Systems Div. in Atlanta, the current big emphasis is on software. GSD has a large software contingent working on the machine, concentrating on operating systems and operating system support for peripherals that will be announced in the future. Operating system support for the PCS communications processor should be out in late spring. Most conspicuous by its absence in the Series 1 is COBOL. IBM, of course, does not overlook such things and we hear the firm is close to offering COBOL developed by an independent company.

DEC TO GROW VAX 11/780 FAMILY DOWNWARD

There are hints surfacing that Digital Equipment Corp. will break tradition with its VAX 11/780 computer and grow the family downward rather than upward. The most obvious recent tip of DEC's hand is its new DECsystem 2020, which, in some ways, tops off the VAX machine. (At the same time, DEC is topping off its Series 20 family with the new 2060.) One thing, though, is certain about VAX--there is a big family coming, but don't look for much more in the way of hardware announcements this year. Coming soon for VAX should be COBOL and Database capability...In another development at DEC, the firm is consolidating its large scale integration (LSI) design operation in Hudson, Mass., and that is regarded as a signal that DEC will be designing and manufacturing more of its microelectronic components in the future.

BASEMENT BARGAINS FOR 360 SHOPPERS

A large user has acquired several 360/65s in the last few years, and today finds some fantastic buys in the used-hardware marketplace. The user recently bought a 65 with a half-megabyte and channels for $200K. A two-meg IBM LCS (large core storage) recently traded for $5K. How about $13K for a one-by-four string controller and four IBM 2401 (800-bpi) tape drives?

A broker tells of a 65 that recently traded for as low as $110K, but the value of those mainframes reportedly depends heavily on the channels that come with them. Without channels, they're virtually valueless. He says a 2314 disc drive fetches $16K and up, prices that are up from six months ago. And IBM 3420 tape drives are more expensive today than they were two years ago. But 360 main memory sells for $3K to $5K per half-megabyte.

FLAKES AND BUSINESS PREDATORS BEWARE!

Intel Corp. is prepared to wage war in the courts to protect its investment in developing its newer microprocessors and major supporting peripheral chips. The firm already has sued the U. S. Copyright Office to force it to grant a registered copyright for its 8755 erasable programmable read-only memory. And it's waiting for an infringer to pull what its general counsel and secretary,

Roger S. Borovoy, calls a "photographic rip-off" of successors to the 8080 microprocessor, like the 8085, the 8086, and the 8046, to get into another legal fray.

Borovoy is sure this will happen and Intel, he said, "is willing to spend whatever it costs us." He said he knows of one company in Japan and others in the U. S. and Canada that can take a chip and return a full set of masks within 30 days for $20,000 to $30,000. With the masks a competitor could duplicate the chip with a minimum investment. Borovoy said Intel spent $28 million on research and development for the fiscal year just ended, up from $21 million a year ago. He has taken his cause to the National Commission on New Technological Uses of Copyrighted Works (CONTU) and feels that, while this is not within the scope of CONTU's charter, the commission will say in its final report that this is an area Congress should look at. He feels Intel's strong position on legal action will scare legitimate companies away from copying but "the flakes and the business predators are out there." So far the only infringement of an Intel design has been of the 8080 and Borovoy declined to name the infringer.

ROYDEN SANDERS' NEW PRINTER

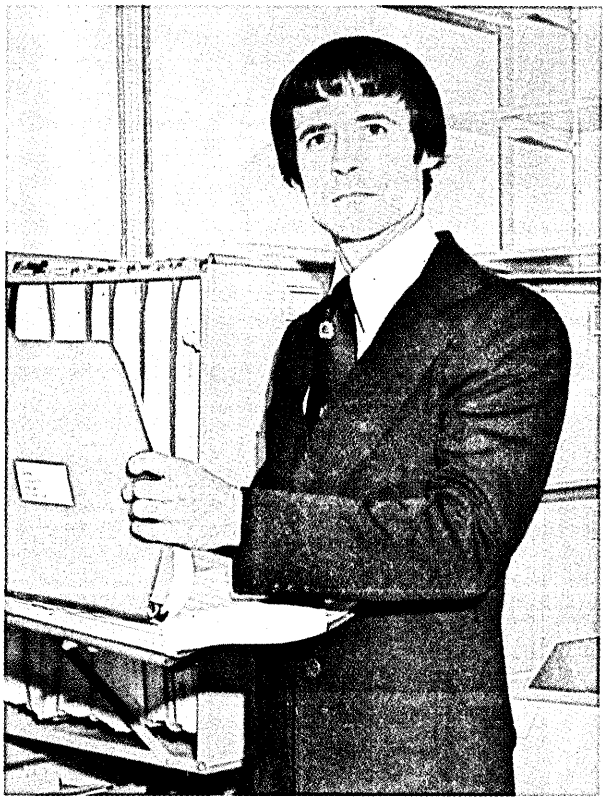
When we last left Royden C. Sanders, founder of Sanders Associates and Sanders Data Systems, he was summarily sacked by his board of directors and he fought back aggressively--but unsuccessfully--at the firm's annual meeting. Many figured Sanders' business career was over, but those who knew his engineering capabilities thought he just might be able to make a comeback. He has and the vehicle is R.C. Sanders Technology Systems Inc., of Derry, N. H. Moreover, the firm has begun to ship evaluation models of an unusual seven dot matrix head electronic printer that the company claims has print quality competitive with ink jet and daisywheel printers. The device, which sells for $1,700 in large oem quantities, can print characters in virtually any language including Chinese and Japanese. The plain paper sheet-fed device can also digitize handwriting. The company believes the printer will find its way into a wide variety of applications including word processing, small computer systems, and proof printing for photo typesetting. And the printer was designed by Royden Sanders, who serves as engineering manager of the company as well as its chief operating officer.

MOODY GETTING HIGH MARKS AT TELETYPE

Now that J. Roger Moody has settled in at Teletype Corp. as executive vice president in charge of sales and service, and research and development, his appointment appears to be taking on more than routine significance. As the former right-hand man of Archie McGill, the ex-IBMer who has been given the charter of leading AT&T into the promised land of data, Moody can be expected to continue to work closely with his former boss. The Bell system's operating companies have been slow to take to AT&T's new data drive and a strengthened Teletype could become a more effective national force for AT&T in the data area.

Already Moody, also a former IBMer, has been moving to beef up Teletype's relatively small marketing force of some 35 salesmen and although he has been on the job at Skokie, Ill., for just a few weeks he is already getting high marks for his decisiveness, marketing savvy and organizational ability. Moreover, Moody just received a nice

(Continued on page 232)



"When we first looked at MARK IV, we weren't even interested in acquiring software — we were just doing an evaluation of data base management systems. MARK IV sounded so good that we had to take a closer look. Because of the capability and productivity improvements it offered, we decided to go with it immediately.

"We've had such tremendous success with the system that we have made it the standard programming language — the only Cobol work we do now is maintenance of existing systems.

"We're extremely happy with the way MARK IV works with our data base. We installed IMS with DL/1, and that afternoon we were processing off the data base with MARK IV.

"An important part of our success has been in getting MARK IV out to our users. For example, the Director of Budget uses the MARK IV On-Line Query Language for evaluations and projections. Our Registrar people do the same with the MARK IV batch facility. When the user can get his own report out quickly, it creates immense satisfaction and reduced costs for all of us.

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"When people ask me what I think of MARK IV. I tell them they can't afford **not** to look at it. I am a firm believer in the results and benefits of MARK IV. It's one of the best pieces of software I've ever used."

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Views expressed are those of Mr. Baker and not necessarily those of the University.

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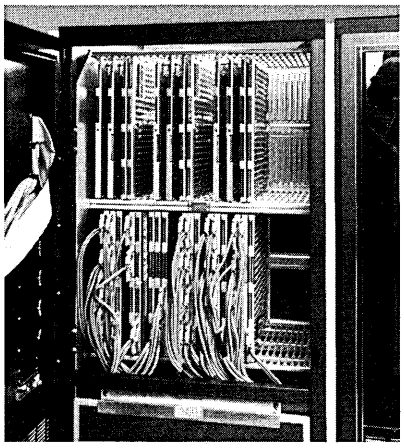

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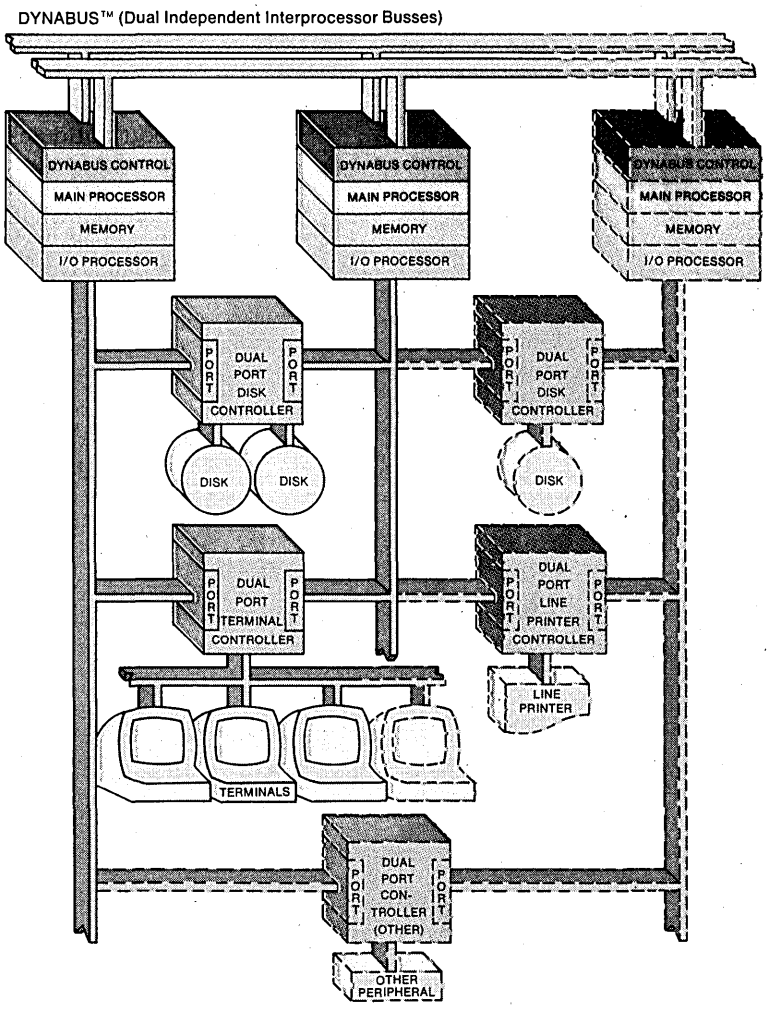

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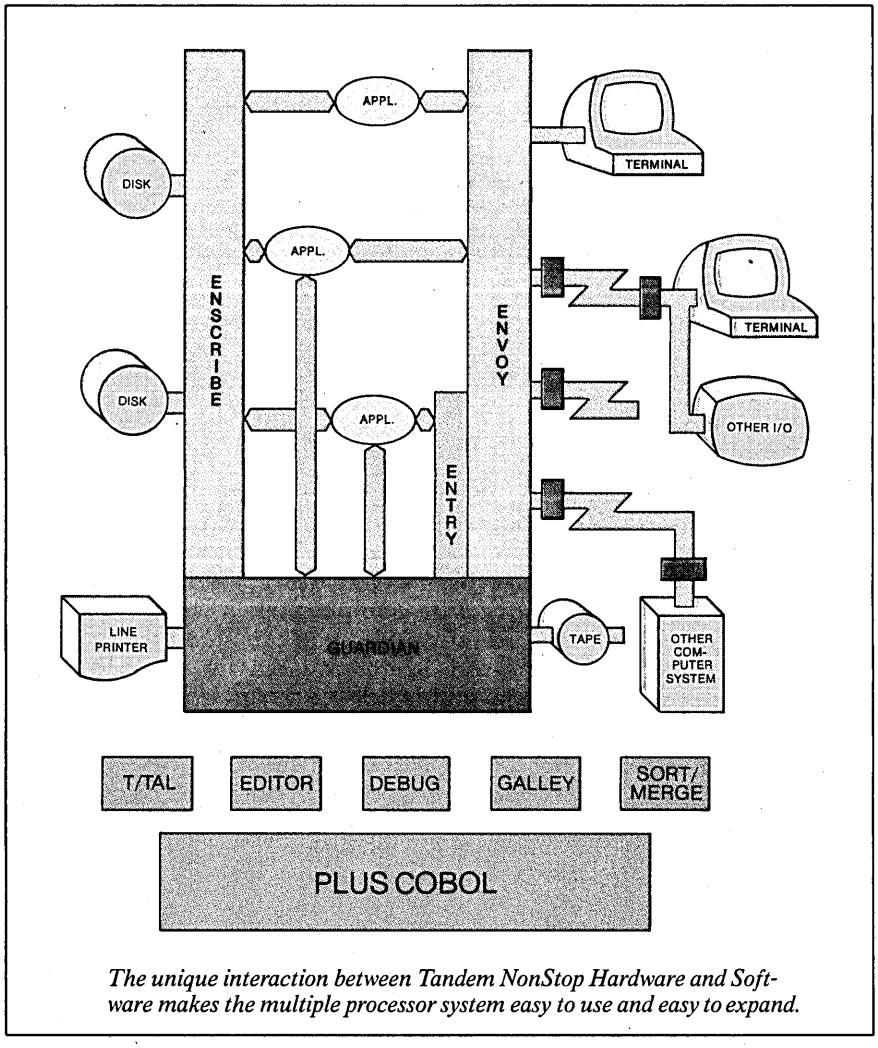
standard about our COBOL.



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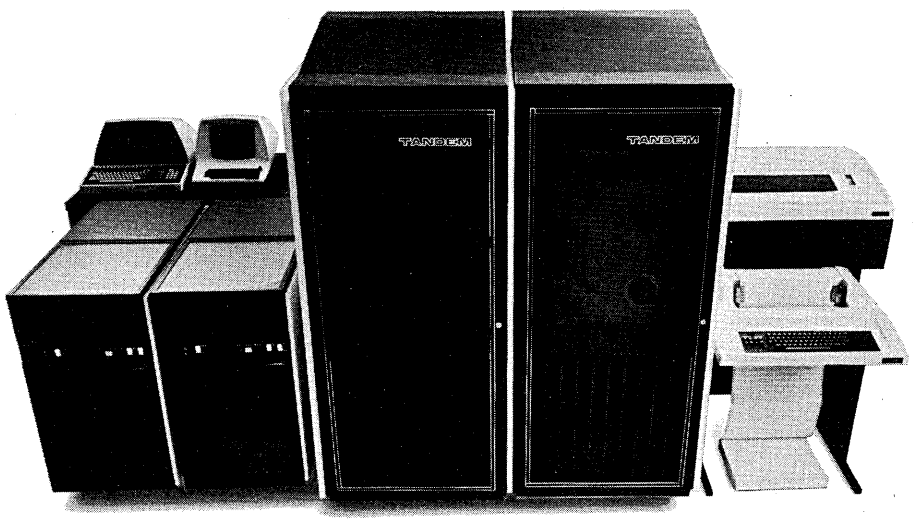

beginning of the program to set the NonStop mode. From then on, CHECKPOINT controls passing information to the backup process at critical points. CHECKPOINTS occur automatically at any OPEN or CLOSE after the backup is established. These two simple instructions eliminate the downtime, restart, and revalidation which plague any user without the Tandem NonStop capability.

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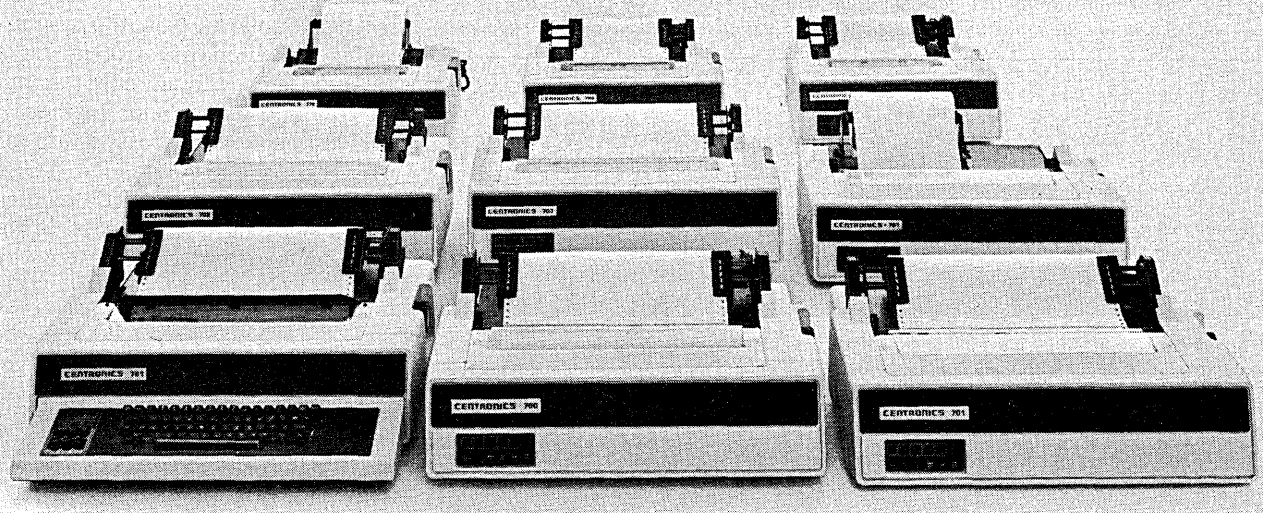

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CIRCLE 5 ON READER CARD

letters

Certification solution

Re "Computer Pros, Non-Pros: A Government Quandary" (News in Perspective, December 1977, p. 207).

In the past 30 years, "computer science" has become a real discipline, but certification and licensing remain as barriers to professional status for government employees. Many of us entered the field long before universities commonly offered degrees in computer science. Our knowledge is based on experience.

Our certification is made by our employers, who have the means to change the requirements. This creates a problem somewhat different from that facing employees in the competitive private industrial sector.

One solution to this problem would be for government agencies to depend on external institutions for certifications of their employees. Institutions for that purpose do exist, and are well recognized. Thus the term "computer scientist" would be reserved for those who have earned degrees from accredited colleges, or who have passed comprehensive examinations such as the CDP.

ROBERT G. ESTELL
San Diego, California

Humor wanted

There is an uncharitable slander that says all computer people are dull, humorless technicians. Yet it has been my experience that the exact opposite is more accurate. To substantiate my position, I am gathering a collection of original computer humor in the form of unofficial internal memos, such as the one announcing the addition of a new feature: the time-of-day sundial that would be ineffective after specific times each day and would require a new realignment of the cpu at the beginning and end of daylight saving time.

I would appreciate your readers sending anything along these lines, along with the name and address of the originator (if possible) to: 403-2525 Bathurst St., Toronto, Ontario, Canada M6B 2Y9

JOHN BEAMISH
Toronto, Canada

Credit where credit is due

I appreciated your article about my husband's award as Computer Science Man-of-the-Year ("People," December 1977, p. 31). The mention of his family was nice—and quite unusual from a publication.

However, in that mention Dan was quoted as having said I helped isolate him from "family crises" at times when he was extremely busy. While I did try to solve minor disputes and problems to enable him to concentrate on his work, Dan was always here, and that was the important ingredient in resolving all the "biggies."

SHIRLEY A. COUGER
Colorado Springs, Colorado

Self-starter

I read with interest Ms. Walsh's Forum, "Computer-Controlled Computers" (December 1977, p. 245). I fully agree with her point; in fact, I offer an example of such a self-controlled system.

Since its opening to the public in 1973, the computer exhibit at Boston's Museum of Science has controlled its own daily shutdown as well as its morning startup. This system, which I had the pleasure of maintaining for two years, was developed by Honeywell as part of a major computer display. The display itself is based around the H-316

minicomputer, with seven crt visitor terminals and two terminals for staff use. From each visitor terminal one can choose from among 12 games, use the "Museum Information Program," or use a specially developed algebraic programming language. In addition to the exhibit uses, a variety of administrative uses have been made of the equipment, including a mailing list system.

Since one of the museum's requirements was that little staff time be required to operate the exhibit, the specially developed operating system handles a number of chores usually done by an operator.

Based on a weekly schedule, the computer, at each day's turn-off time, loads in an end-of-day routine. This program cycles down the disc drive, turns off all terminals, the console device and line printer, then waits until the next day's startup time.

At the present startup time, the computer cycles up its disc drive, turns on all terminals and other peripherals, boots in the operating system and initializes each visitor terminal. None of these actions require any operator intervention.

I see no reason why such techniques cannot be applied to other installations as well. If we are willing to leave the computer running without human supervision, why not trust the machine to power itself down as well? Such capabilities require a minimum of modifications to the hardware and can end up providing significant manpower savings.

STEPHEN A. KARON
Director of Exhibits
Maryland Academy of Sciences
Baltimore, Maryland

Dataflow progress

Re: "Is the World Building Data Barriers?" (December 1977, p. 90): I believe that the delegates to the Vienna Conference on Transborder Data Flows were not possessed of fear-laden forecasts of evil to be perpetrated on computers. On the contrary, most delegates, and particularly computer users, were quite concerned with preserving a free flow of data across borders. It is worth remembering that one way to spread freedom of expression is to ensure free flow of information.

Service bureaus and other users are concerned with finding practical, low cost, and fair methods of introducing regulations that balance these characteristics with protections against possible abuses. I spoke at Vienna on behalf of the U.K. computing services industry, not just service bureaus. Some of our members have designed networks that traverse many borders (unlike the normal U.S. experience), and they are acutely aware of the cost and the impact on efficiency that draconian regulations will have on the free flow of information. . . .

The United Kingdom Data Protection Committee is due to publish a report early in 1978. Practicality, fairness, and, above all, consultation are needed. We believe that the U.K. Data Protection Committee has consulted fully; we hope it will recommend sensible principles of law—which we shall welcome as citizens—and practical methods or codes of practice for the use of personal data in computing systems—which we shall welcome as professionals.

We do not want haste or international arrangements that fail to recognize fundamental legal and cultural differences between nations. On the contrary, sound principles and standard practices are portable from one country to another, and rely on agreement rather than coercion. The motivations and plans for an international convention have only been fully exposed and debated since the consultative process has been widened.

The services industry has a responsibility to make its professional views

letters

heard, for it is probably one of the best sources of information—being user, designer, and vendor of data and information systems.

ALAN A. BENJAMIN
Director General
Computing Services Association
London, England

Change and analysts

One of the great dangers of the technological mentality is a tendency to trivialize matters dealing with human behavior. It is often easy to overlook the all-too-human aspects of engineers and technologists, but the penalty for such oversight may turn out to be quite dear. William Feeney and Frea Sladek are in danger of such oversight in their article "The Systems Analyst as a Change Agent" (November 1977, p. 85); and lest some managers greet this article with too much enthusiasm, it might be worthwhile to step back and view the systems analyst as a human being.

There is no debating that a change agent is necessary; the question is whether or not the systems analyst is the appropriate person for this task. Perhaps it would be wiser to bring in another individual, one skilled as a change agent and capable of serving as the link pin between the systems analyst and those influenced by his work.

In his book *Changing Organizations* Warren Bennis emphasizes the fact that a managerial change agent should have extensive professional training in the behavioral sciences. Is it reasonable to expect a systems analyst to have such a background in addition to expertise as a computer scientist?

When change *is* needed, one must not economize by expecting the systems programmer to perform two highly professional jobs simultaneously.

STEPHEN W. SMOLIAR
Assistant Professor
University of Pennsylvania
Philadelphia, Pennsylvania

Mr. Feeney replies: Systems analysts, whether they wish it or not, cause change. Procedures of an organization, and sometimes policy, are different after the visitation of the systems analyst.

Analysts I have observed, myself included, have been frequently unaware of the range of human behaviors possible. Our article was an attempt to raise the sensitivities of analysts; to point out the options open to them within the framework of a systems analysis.

The technological age is indeed fraught with dangers. One serious danger is the idea that one word can mean

(Continued on page 28)

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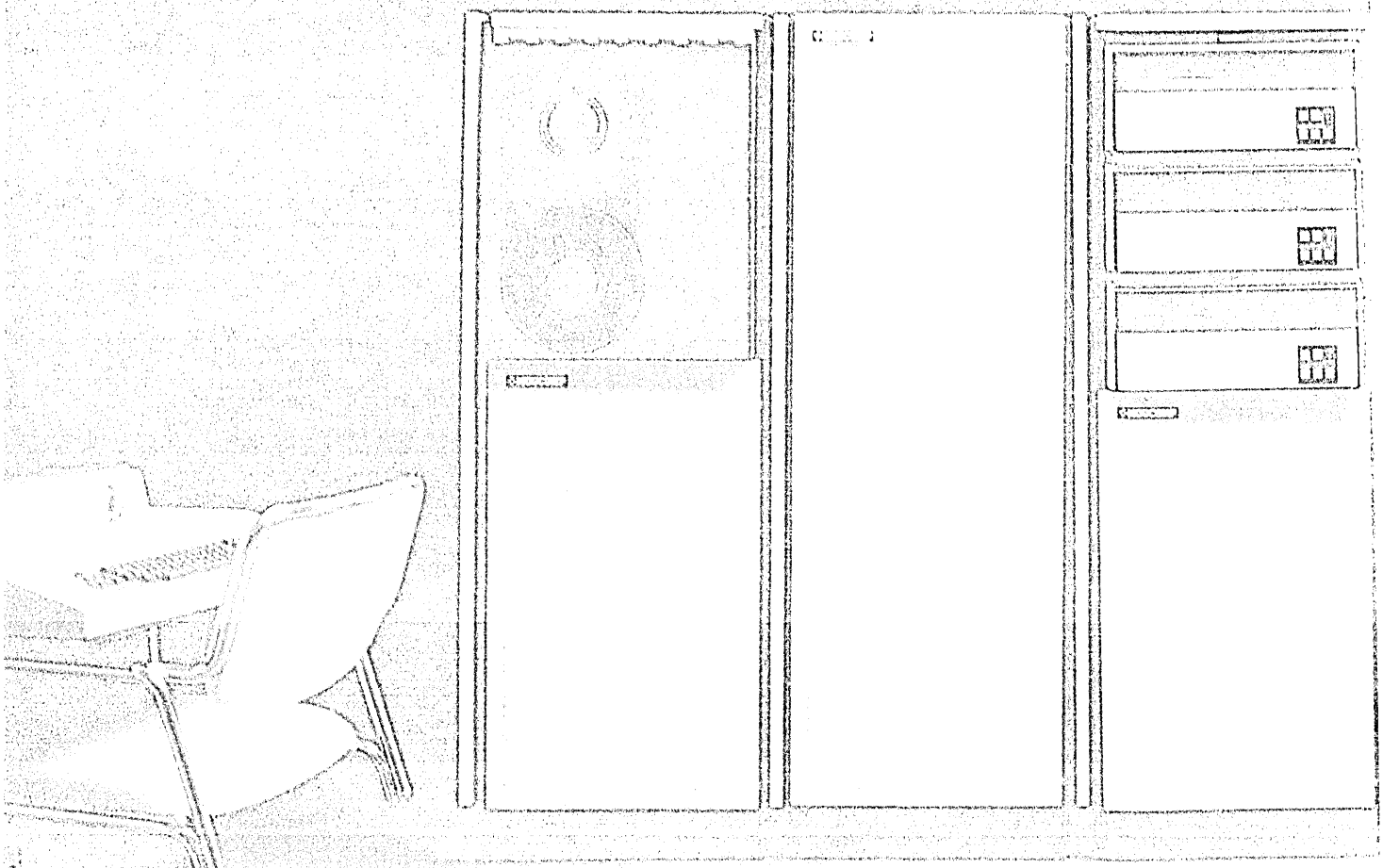

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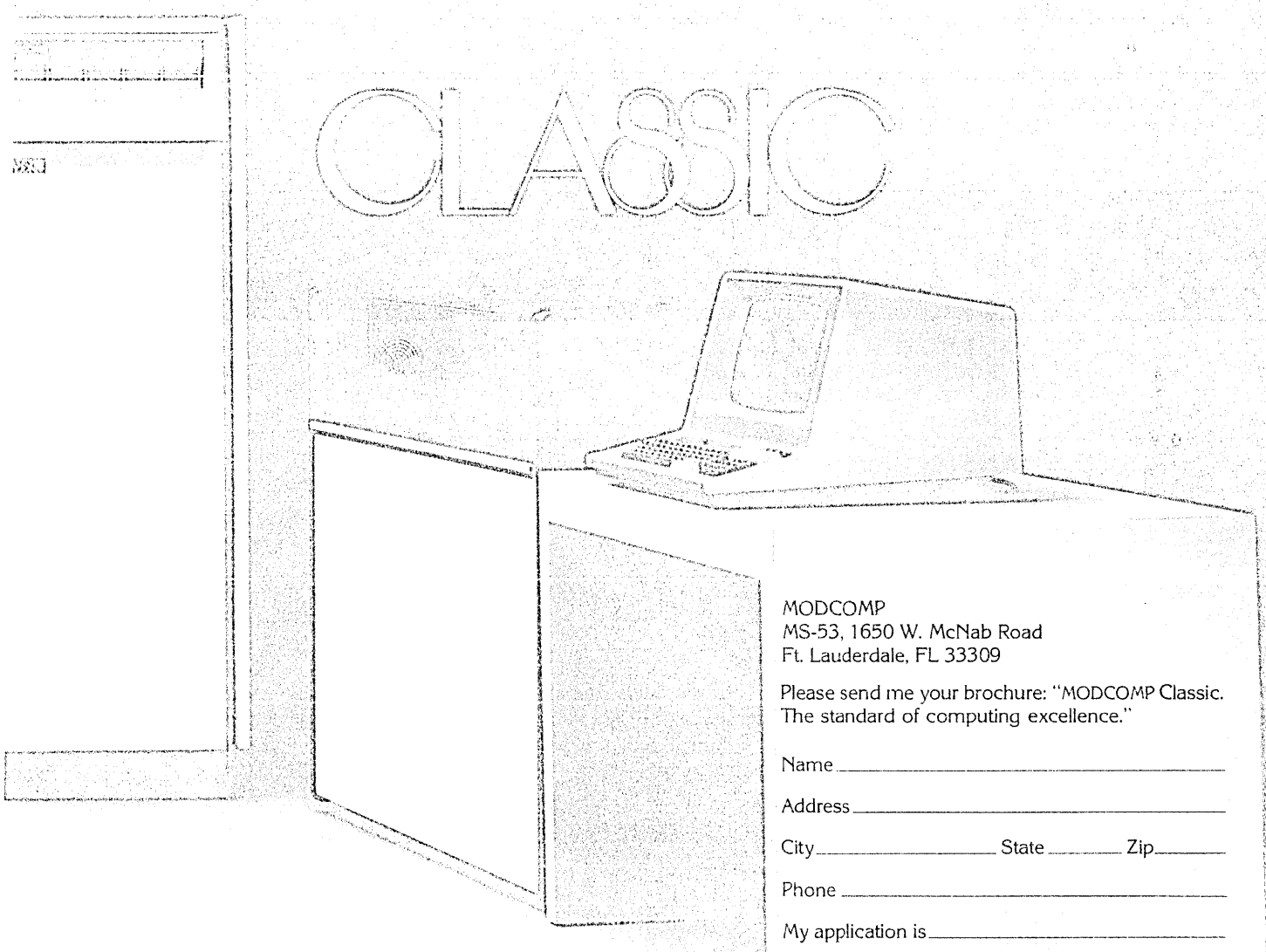

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CIRCLE 73 ON READER CARD

letters

(Continued from page 24)

only one thing. If the term "change agent" is taken to mean only change agent a la Warren Bennis rather than "change agent" in the role talked about in the article, then I feel the reader may be creating his own difficulties.

If the type of change generated by the analyst required very sensitive handling, then indeed a managerial change agent should be employed.

Toward software protection

I certainly agree with Roy Freed ("Copyrighting Programs is Unwise," Forum, November 1977, p. 227) that trade secrets' protection is to be preferred to statutory copyright as a way to protect software programs. But even that may not be enough to prevent the diligent from discovering that which is purported to be a trade secret: the relative ease of disassembly and decompilation lend support to my view that to make a software program available for use (i.e., to publish it) is to make disclosure. "Once a work is published," to quote Freed, "trade secrets' protection on disclosure ceases to be available." Like the wise software distributors referred to by Freed, I always urge my clients to take additional steps to protect that which is theirs.

"It is *only* (my emphasis) in the selling stage, after the program is complete, that we wonder about protection," writes Philip H. Dorn in the same issue ("Programs Are Not Books," Forum, p. 231). In my experience, waiting that long to wonder can be fatal, however difficult it may be "to consider protection of half-developed notions."

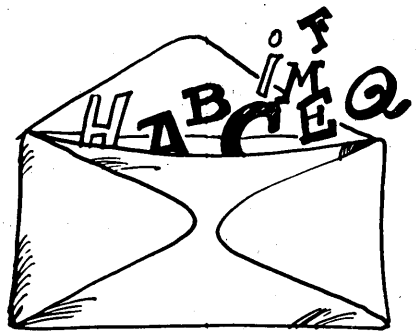
Both as a consultant and an industry watcher, I know that design, structure, logic, techniques, and know-how have migrated and will continue to migrate with the peripatetic programmer unless a prudent employer takes great care to assure that they do not. Few employers, in my view, exercise the care their interests would seem to dictate.

As the former manager of a computer installation, I can also attest to the behavior of my vendors' employees, behavior which jeopardized their employers' claims to a proprietary interest in software programs. Those employees disclosed every essential element of those programs in the absence of my signature on the license agreement that was reputed to be required before I could use the programs. In some cases, those proprietary products were in use more than four years outside the umbrella of the license agreement.

ROBERT M. GORDON
Irvine, California

Mr. Freed responds: Bob Gordon and I seem to be having a love feast. I reciprocate his sentiments by agreeing with his warnings that reliance on the trade-secrets' approach requires affirmative measures from the very start of the creation of a software program. Protective measures for this purpose are known and are used routinely with respect to other valuable technologies. We require merely disciplined use of them with respect to software programs. That includes marking of materials on all types of media and strict enforcement of procedures restricting disclosure, transfer, copying, and the like.

As my article suggested, the adoption of legal measures for protection of proprietary rights is not either a goal in itself or the sole step that should be taken. The legal measures are largely setups for the achievement of legal and economic advantages of various sorts, such as desired tax, antitrust, and liability treatments. Actual protection, however, requires careful resort to technical measures, such as restricted availability of source code, and to the actual security steps Bob Gordon recommends.



Jackson defended

Particularly interesting to me in the article "Comparing Software Design Methodologies" (November 1977, p. 89) was the explanation and evaluation of the Jackson Program Design Methodology. It was unclear whether the authors were evaluating the Jackson Methodology as a program design technique or a system design technique—they made no distinction between the two.

At Exxon we have been using an adapted version of the Jackson Methodology as a program design technique for three years. I would like to offer some comments and clarifications.

One of the most powerful aspects of the Jackson Methodology is the "notation"—it is so precise that once a program design is completed, a truly "structured" maintainable program results. Also, a program design once completed can easily be reviewed before any code is generated.

In our experience, the method is applicable to all sizes of applications, and to various kinds, such as scientific, engineering, systems programming, IMS, TOTAL, and minicomputer.

Mr. Peters and Mr. Tripp state that "error handling" capabilities had to be "wedged" into the technique. On the contrary, a very specific technique, "backtracking," is presented specifically to handle this situation.

The Input and Output Data Usage Diagrams provide a concrete starting point for a program design. These Data Usage Diagrams give the program's view of the data being processed. While the authors suggest that "the Methodology is valid only for serial files," we have found it just as applicable to a data base environment.

We have found our adaptation of the Jackson Program Design Methodology to be a very powerful tool and are using it with great success. I believe Mr. Peters and Mr. Tripp presented an oversimplified evaluation of it.

KATHLEEN S. MENDES
Senior Analyst
Exxon Corp.
Florham Park, New Jersey

Mr. Peters and Mr. Tripp reply: From the context of the article it should have been apparent that we were discussing program design, not system design, during our description of the Jackson Methodology.

We did not mean to imply that this method was not applicable to a wide variety of problems, only that the data structure must be known, understood, or imposed. Our use of the words "wedged in" reflects how the process called backracking impressed us—if you have to go back and do something, it seems you are wedging it in.

Regarding serial files, we meant that the database should be hierarchically organized in order to use the technique.

We hope this clarifies our discussion of the Jackson Methodology.

Recycling Horace

Of course Joseph Podolsky is right in aiming his recursive development cycle at the need to continuously maintain the system after it becomes operational ("Horace Builds a Cycle," November, p. 162). But it seems he has given the *classic* development cycle poor marks it doesn't deserve.

Podolsky implies that the classic cycle itself is the reason documentation of systems is poor, while the real reason is usually dp management's unwillingness to specify and require correct, current documentation. His well-written scenario also repeatedly hints that the classic cycle isn't being observed very well. Why should *it* take the blame for that? It's sound enough. The difficulty there also usually lies in lack of dp management commitment.

It seems to me that Podolsky's recursive cycle suggests a "quick and dirty" approach to specifying user needs on the first cut. As I see it, we too often do that now; thus he dignifies a practice that frequently has made antagonists of dp users. . . I don't see any reference in either his classic or his recursive cycle to perhaps the most critical phase of all: that in which the true nature of the

(Continued on page 37)

Hewlett-Packard

Computer Advances

Vol. 3 No. 2 March 1978

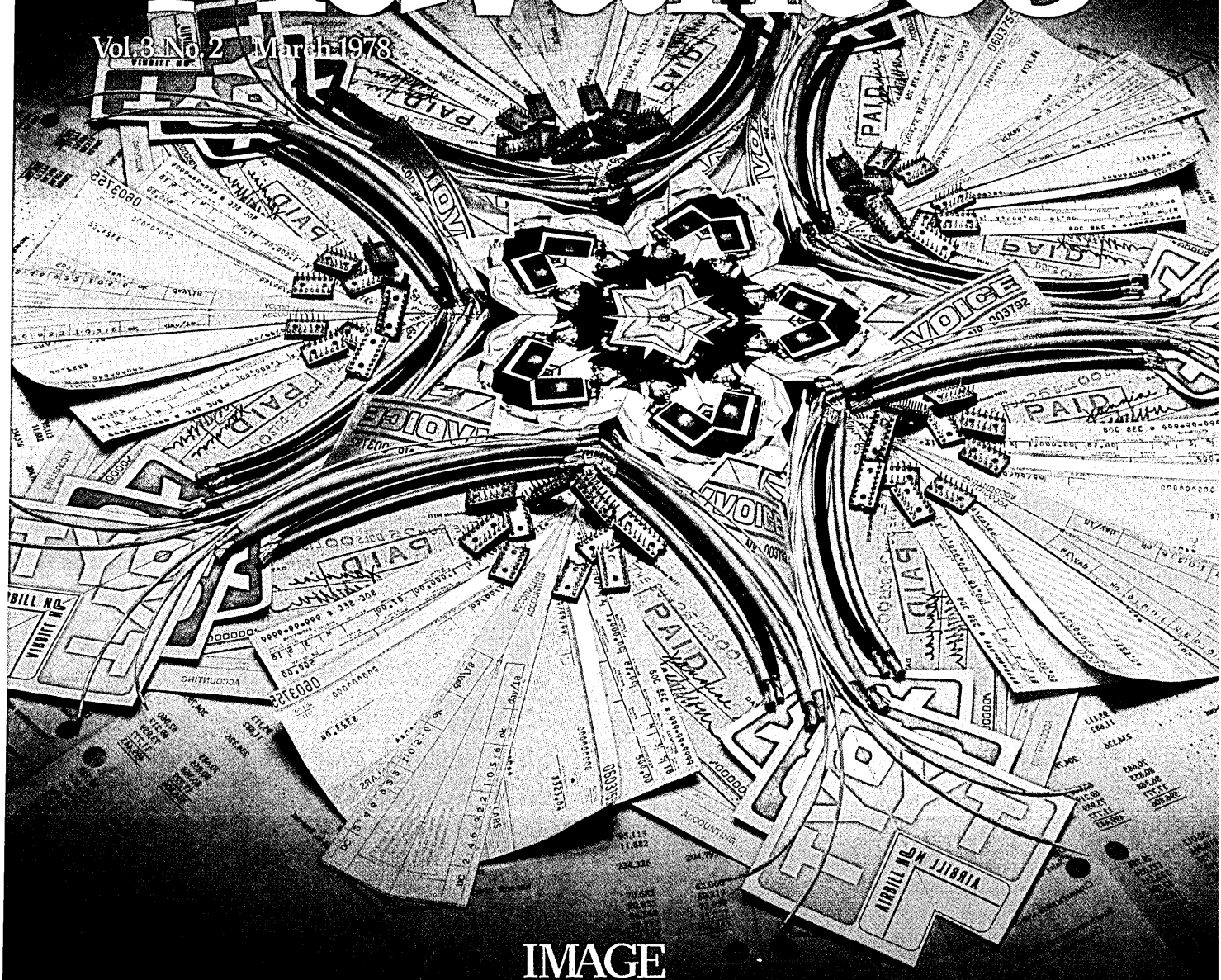


IMAGE reflects your data base management needs

Get to your data before it gets to you

Educated guesses don't work. Management decisions need to be based upon accurate information in all phases of an organization's affairs. Quick access to timely and complete data often makes the critical difference in operational efficiency. In response to this, Hewlett-Packard's general purpose computer system—the HP3000, and the HP1000 provide a full menu of data management software.

First, there is the HP3000's multiprogramming executive operating system which accesses files sequentially (each record processed serially in physical order), or directly (each record is accessed by a relative record number calculated by a software algorithm). Similarly with the HP1000's Real-Time Executive (RTE).

KSAM

KSAM/3000 (Keyed Sequential Access Method) provides a more sophisticated file access. KSAM files can be accessed by key values within the data record. Each data record contains one primary key field and may include up to 15 alternative ones. Access of these records can be sequential or random by either primary or alternative key value. KSAM/3000 also supports key access by physical or logical record number, or by chronological order.

KSAM/3000 users may also retrieve data by using part of a key rather than the entire key. Termed partial or generic key search, this approach is ideal for values that share a common beginning. Suppose you wish to find all customers in a certain geographic area. By specifying only the common first three characters of the zip code—like 950, it is possible to read quickly 95050, 95060, 95065, etc. Plus, generic key searches are perfect memory assistors. "I think the brand name begins with Ba. Let's see, is it Bates, or Battes...?"

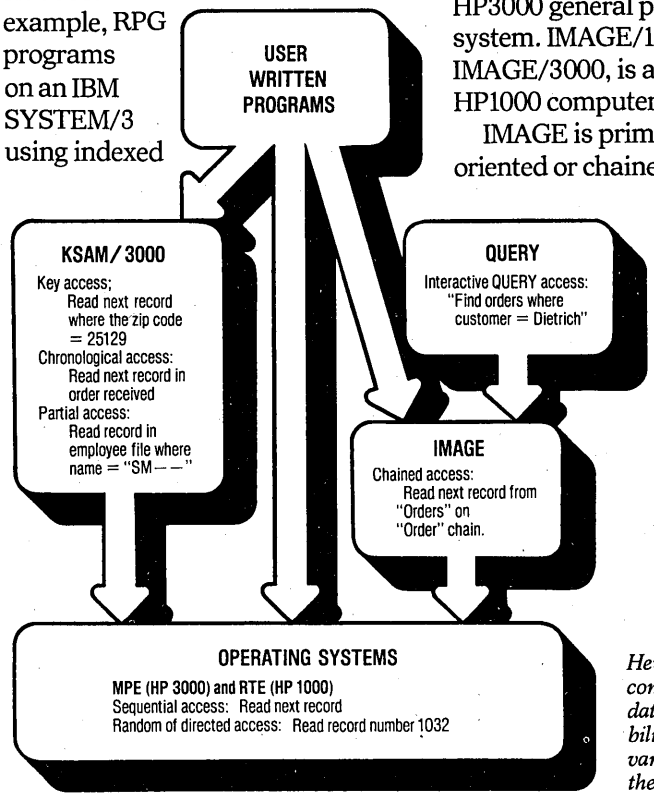
For those users with existing indexed sequential files, KSAM/3000 facilitates their conversion to the HP3000. For example, RPG programs on an IBM SYSTEM/3 using indexed access method require virtually no change to run on the HP3000 Series II.

IMAGE

As data handling requirements become more complex in terms of the number of files needed and the inter-relationships of data within the files, it makes sense to consider a data base management system. IMAGE, for example, is Hewlett-Packard's powerful data base management system which handles multiple files and which helps users define and create a data base tailored to their special requirements.

There are two versions of IMAGE. IMAGE/3000 runs on the HP3000 general purpose computer system. IMAGE/1000, a subset of IMAGE/3000, is available on the HP1000 computer system.

IMAGE is primarily a path oriented or chained approach to



Hewlett-Packard computers have a range of data management capabilities which offer users a variety of ways to access their data.

◀ *Our cover captures one kaleidoscopic moment. Similarly, in a continually evolving company, a Hewlett-Packard IMAGE/QUERY data base management system can reflect current financial, manufacturing, order and shipping information.*

data retrieval. Pointers are maintained which logically connect those records with common attributes into chained lists. This allows cross-referenced access to collections of data down to the smallest unit. This approach makes it possible to access related data very quickly.

Since IMAGE treats and maintains a data base as a unit, the user is freed from organizational concern and overhead. Plus, it has a coordinating facility SCHEMA which describes the structure, interconnections, and item level security of the data base.

Any HP3000 KSAM file or IMAGE data base is accessible from RPG, COBOL, BASIC, FORTRAN, OR SPL. IMAGE/1000 files are accessible by FORTRAN, ASSEMBLER, AND BASIC. Users can select the language most appropriate for each application.

IMAGE/3000, introduced in 1974, was the first data base management system available on a minicomputer. In the fall of 1976, it was elected to the "Software Honor Roll of Datapro Research Corp., Delran, NJ."

QUERY

IMAGE is used primarily by the computer system specialist and the programmer—those people concerned with data entry, organization and retrieval.

QUERY, a companion data base inquiry facility for IMAGE, is for the non-computer specialists whose needs are to retrieve, analyze and report information to support their job functions and decisions. QUERY facilitates spontaneous and unanticipated inquiry into the data base by authorized users. And, it can be used as an aid in designing data bases.

By entering English-like QUERY commands, an authorized user can retrieve, update, or modify data in an IMAGE/3000 or IMAGE/1000 data base—without learning complicated programming languages. These commands can be entered either interactively or in batch mode. QUERY adheres to all those security provisions of MPE and IMAGE/3000 described on the following page.

Ask her any question about a customer. With FIND, Sherry has the answer in seconds.

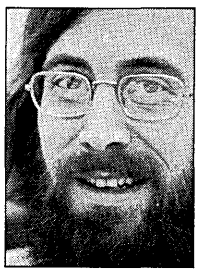
A user can casually and easily search an image data base and retrieve information using a FIND command—not by writing a program. QUERY locates entries based upon logical criteria and relational operators i.e. $=, \neq, <, >$. Or, the user can specify selection criteria as easy-to-understand mnemonics. Here's a sampling.

ISNOT—is not equal to
GT—greater than
LT—less than
IB—is between

Selections can range from simple requests—
FIND ZIP # IS 94508
to more complex ones based upon logical comparisons—
FIND PRODUCT IS 324L6A AND SALES-REGION IS 24 AND CUST-AMT-DUE IB 1000, 10000 AND DAYS-OVERDUE IGT 60
The number of logical relationships that can be specified in a single FIND command is practically unlimited!

With QUERY, Sam enters orders easily, even though it's his first day on the job.

To facilitate use of IMAGE by computer novices, a user can input one single command and QUERY will automatically execute an entire QUERY job consisting of many different QUERY commands. Similarly, a set of FIND or REPORT commands can be stored in a separate command file. This is a convenient time-saver for frequently used, or lengthy commands, such as the previous FIND example.



Ken is designing a data base. QUERY tells him if it's working.

For users writing programs which will access IMAGE date base files through IMAGE procedures,

Continued on page 6

Everyone needs security

Especially when building a data base

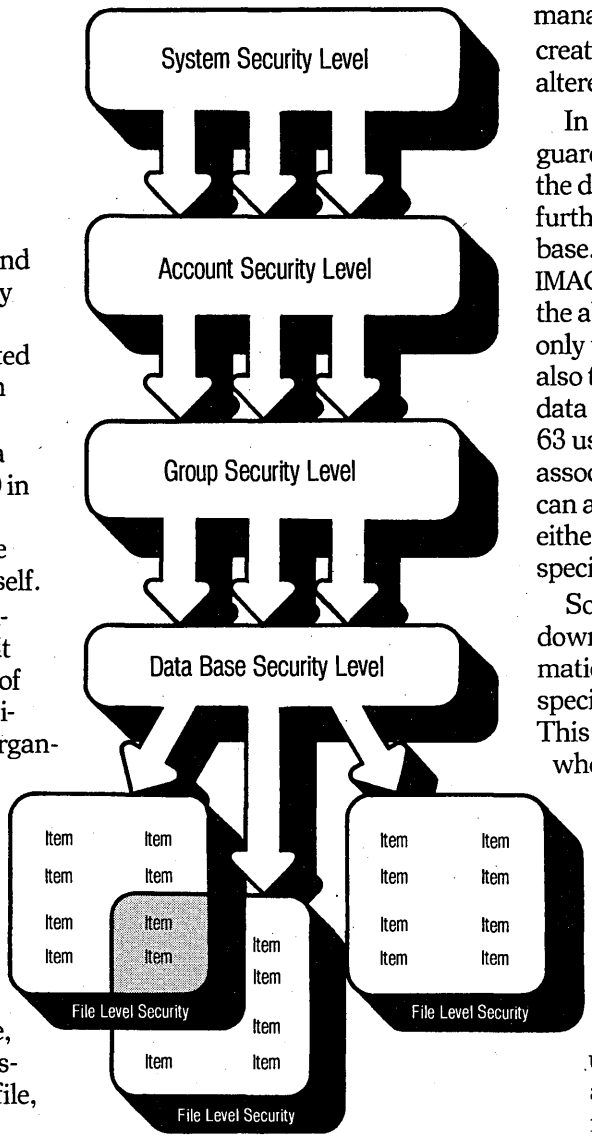
There is definite concern today about maintaining the security and integrity of data bases. Justifiably so. It is essential that any data base be designed and implemented so that only authorized users can access or modify the data.

Hewlett-Packard ensures data base protection for IMAGE/3000 in two ways. One is through the operating system—MPE, and the other by the IMAGE software itself.

The HP 3000 supports a multi-user environment. By necessity it must have an encompassing set of security procedures. MPE's multi-level security is based upon an organizational structure of accounts, groups, and files. An account consists of a group of files, and any of these files can be accessed by one or more users.

System access is granted only to those users with a valid log-on identification consisting of account, group and user name, each of which may require a password. Then, before accessing a file, this same log-on is used to pass MPE security checks at each of three levels—account, group and file level. By passing these security checks, the user is then allowed an appropriate file access, e.g. read, write, etc., as determined by his user class.

These access restrictions are set by the system and account managers when the account is created and, of course, can be altered as necessary.



Your data is secure in an IMAGE/3000 data base for you can control specific read and/or write access for each user right down to individual items in the data base. Prior to even getting to the data base however, the user must pass several security levels provided by the operating system (MPE) and IMAGE.

In addition to the security safeguards of MPE, IMAGE provides the data base administrator with further protection for the data base. The key to the strength of IMAGE/3000 and 1000's security is the ability to control access not only to specific data sets (files), but also to each data item (field). The data base designer can define up to 63 user classes, each with an associated password. Then he/she can associate each class with either read or write access to specific data sets and items.

So, the data base is protected down to the smallest unit of information, for example, a data item specifying an employee's pay rate. This ensures that the only users who access and/or change specific items are those whose job function require it.

Because multiple users can be simultaneously accessing and up-dating an IMAGE data base, data integrity must be assured. Upon entering the data base, users may specify the type of access they wish—e.g. read, modify, update, etc. Or this may be handled via a user program. IMAGE will allow that access only if it is compatible with the functions already being performed by the other concurrent users. This approach results in compatible sharing of the data base and ensures data integrity.

Especially when keeping track of court dates...

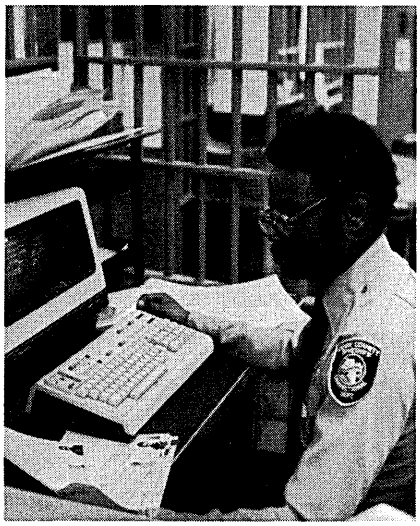
To the advantage of both prisoners and the institution, the Cook County Department of Corrections is using an HP computer system to deal with problems such as how to separately house experienced criminals from neophytes.

Their system, which includes 40 on-line HP2640 CRT terminals accessing an HP3000 with IMAGE/QUERY software, places current inmate records at the fingertips of cell assignment officers.

"A better informed correctional force means fewer problems," says J. David Coldren, Director of Criminal Justice Information Systems for the State of Illinois. Guards are more accountable now, security has improved, and prison tensions have been reduced to some extent."

"The new information system provides for other essential functions as well. One is to make certain that prisoners keep their court dates. This is no small task considering that, on an average day, 400 of the 4000 inmates are due in geographically scattered courtrooms, and that transportation and security must be arranged.

"IMAGE/QUERY provides for easy and convenient entering and retrieving of data, an important aspect for keeping track of inmate court dates. We have the flexibility to retrieve by judge, date, courtroom, etc.," explains Coldren.



"A good data base system saves development time. If we hadn't had IMAGE, we might still be writing our first application program," says J. David Coldren, of the Illinois Law Enforcement Commission.

A dynamic production environment requires a responsive data base management system. Farah Manufacturing Co., chose Hewlett-Packard's multi-terminal IMAGE/QUERY system.

... or delivery dates

"Even a small cutting order here can involve 60,000 production steps. Our IMAGE/QUERY system gives us control of each step of every order," says Randy Bohannon, Director of Information Services for Farah Manufacturing Company, the El Paso, Texas, men's and boy's apparel maker.

"Before we installed the central Hewlett-Packard 3000 system and three HP1000's, we used a production control system. It gave us data on only five or six major steps per order—barely enough to estimate delivery dates.

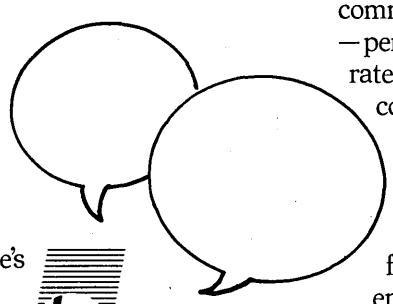
"Now with the IMAGE/QUERY system, we can not only predict deliveries accurately, but can immediately pinpoint problems. We can compute variances from our standard costs. This gives us an indication of what went wrong in the production cycle and enables us to adjust accordingly.

"Tracking begins with the cutting order. The system matches order assignments to fabric inventory in our three plants, sending a bill-of-materials along with the assignment. This on-line production data entry keeps the data base and our reports current.

"The system updates the data base from a single user transaction without duplicating the data in multiple files. QUERY allows us to generate non-routine reports on-line from any data we collect. In a dynamic production environment, that is sophisticated control," Bohannon concludes.

New & Noteworthy

More talk



Now, there's a lot more talking that can be done between the HP3000 general purpose computer system and certain IBM systems—specifically OS, MFT, OSMVT, OS/VS2, SVS, and MVS.

With MRJE/3000 (Multi-leaving Remote Job Entry emulator), the HP3000 can serve as a HASPII or JES2 work station for an entire distributed network. Jobs are transmitted easily over leased or switched lines. This new software package is a full job management system. Any HP3000 network terminal can submit jobs to the host, and become a HASP console to monitor job status, and to interrogate the IBM system. Commands to accomplish this are easy, and straightforward. For example: SUBMIT, DISPLAY JOB, CANCEL JOB.

MRJE/3000 simultaneously supports up to seven input, seven print, and seven punch streams—all the while with full operation of MPE—the multi-programming operating system of the HP3000.

A handy feature of MRJE/3000 is its ability to accept jobs for later entry to the IBM host. Jobs submitted off-line are spooled to be automatically transmitted once a communication connection is made—perhaps at night when telephone rates are lower. Output is returned—conveniently and automatically—to the designated peripheral device or file.

The January Computer Advances described RJE/1000, for the HP1000 which provides emulation of an IBM 2780 remote batch terminal to certain IBM 360 and 370 systems.

For more information on HP's Distributed Systems Network, check C on the reply card.

QUERY/ *continued from page 3*

QUERY is an excellent design and debug aid that helps you determine if your program is working properly. For example, have your program update a field, and then let QUERY immediately examine that data to see if it was, in fact, entered correctly. With QUERY, a designer can implement a small data base quickly, play with it, and get ideas on how to improve it. Plus, a handy FORM command provides current information on the layout of the schema—the data base structure.

Marco needs a financial report for a board meeting in half an hour. He gets it in 4 minutes.

QUERY provides two types of reporting capabilities. One, LIST, is ideal for quickie reports. It pulls out specified bits of information and automatically formats them. For example, the command LIST ALL INVENTORY FOR CURRENT-COUNT LT 125 would yield the specified inventory data in readable, columnar format.

Another more sophisticated REPORT enables the user to specify the report format with respect to header and column labels, page numbers and group labels. In addition, the user can sort entries through multiple fields, as well as total, average, or count columns of numeric data values. Arithmetic calculations can be performed using the ten query registers and the results can be printed in the report. As mentioned, frequently used formats can be stored conveniently in a procedural file.

If you would like more information on any of Hewlett-Packard's data management software, check the appropriate letter on the reply card.

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HEWLETT PACKARD

letters

(Continued on page 28)

user's problem (and the objectives/benefits of solving it) is documented. I recommend he make that "Phase 1" in both cycles.

NATE A. NEWKIRK
President
NGP *Associates, Inc.*
Mt. Kisco, New, York

Mr. Podolsky responds: Mr. Newkirk, in his last paragraph, points to the key reason for suggesting a recursive development cycle. In both the classic and recursive cycles, the Phase 1 Mr. Newkirk suggests is the Feasibility Study, where systems people and users first attempt to define the problem and set objectives.

The difficulty is that in the rapidly changing, sophisticated environment existing in many companies, neither the user nor the systems designer is capable of determining the "true nature of the user's problems."

Further, even if the system designers are successful in achieving a good initial problem definition, this definition is valid only for that point in time and does not deal with the dual problem of:

(1) Changes in the user environment during the course of system construction, and

(2) The "Peer's Law Effect"—"the solution to a problem changes the problem." Even if the system met the needs of the initial problem, and even if that problem did not change before the system was implemented, the successful implementation will cause changes in the user environment which will, in turn, require development recursion.

A recursive cycle does NOT imply negation of a classic cycle; it does imply that, usually, you will (or should) go through the classic cycle more than once, so you had better plan for those iterations. Neither does the recursive cycle imply an initial "quick and dirty" solution. At best, in a very stable environment, the initial solution will serve without recursion or with minimal recursion for a long time; at worst (and it's not so bad), the initial solution becomes a working prototype which serves its users while pointing the way in which future versions of the system can serve even better.

Data base and real world

Mr Sobczak's article, "A Data Base Story," (September, p. 139) certainly struck close to home in pointing out the people problems which have thwarted the implementation of the data base concept in the real world. Technical types consistently overlook basic human nature in their infatuation with the latest technological fad. . . The data base concept assumed that people in a company would cooperate in sharing their data with others, and in return, would be willing to use data maintained by others. In real life, people are neither that charitable nor that trusting: they don't want to share what they have worked to obtain, and they tend to see the quality of work done by other groups as inferior to their own.

"Data base" is nothing more than technical jargon, misapplied in most cases to perfectly ordinary traditional applications. . . I was present two years ago at a data base planning session where the record structure drawn on the blackboard was linear: a "root segment" which contained exactly one segment of the next level, which in turn contained exactly one segment of the next level, and so on. Furthermore, the file was always to be processed in sequential order; even random access was not a requirement. Yet the record structure was called "hierarchical," and the file was called a "data base." The air of the meeting was definitely one of surrealism.

Thank you for your article, Mr. Sobczak; for a while, there, I thought I was the crazy one.

PETER MARTIN
Parsippany, New Jersey

Fond memories

It was really a pleasure to read and recall many of the wonderful happenings over the period of your first 20 years (September 1977 issue). Certainly DATAMATION contributed mightily to the development of the industry by being the outstanding magazine that it is and was.

As one affiliated with the industry for a good period of time, your articles brought many great memories:

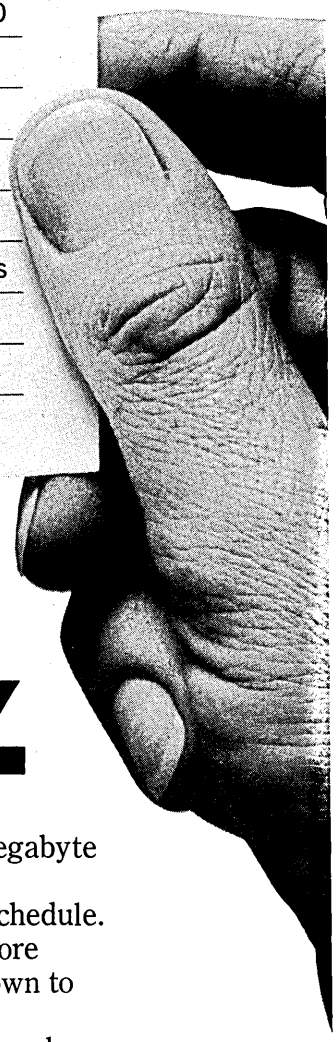
- The spectacular fire that occurred in ERMA's power supply (housed in a two gar garage adjacent to the building housing the computer) and the subsequent delay in debugging. A flipflop had about 13 tubes, if I recall, and matching them was a black art practiced by drunken technicians. The reject tubes were appropriated for use in home tv sets, and we seemed always to have lots of rejects.
- The great meetings held by the Digital Computer Assn. at various L.A. restaurants—generally a new one after each meeting.
- The rapid proliferation of new companies and instant $ millions (unfortunately most of it on paper).
- The really wonderful people involved, not the least of whom included Ham Styron—who would sell you space in DATAMATION even for citrus—Bob Forest, Bob Patrick, Jack Granholm, and so many others that certainly made life a wonderful and glamorous business.

You really brought pleasure to one ex-computer peddler with this issue.

VINCENT A. VAN PRAAG
Indian Wells, California

A COMPARISON OF REMOVABLE DISK DRIVES

	CALCOMP TRIDENT					OTHER STORAGE MODULES			
Capacity in megabytes	25	50	80	200	300	40	80	150	300
Sealed contamination control system	■	■	■	■	■				
MTTR (minutes)	60	60	60	60	60	90	90	90	90
MTBF (hours x 1000)	4	4	4	4	4	4	4	4	4
SMD (differential) interface			■	■	■	■	■	■	■
TTL interface	■	■	■	■	■				
Subsystems available	■	■	■	■	■				
Contract service available	46 cities					Less than 13 cities			
Lowest price/qty. 200	$4097					More than $4400			
Availability (typical)	30 days ARO					?			



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Like who offers the broadest family of models and capacities.

Like who builds a sealed contamination control system into each drive.

Like who has the shortest mean-time-to-repair.

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Like whose drives make *you* more competitive when *you* finally get down to the bottom line.

But why overwork your memory?

You can forget about all of the above if you'll just remember one thing:

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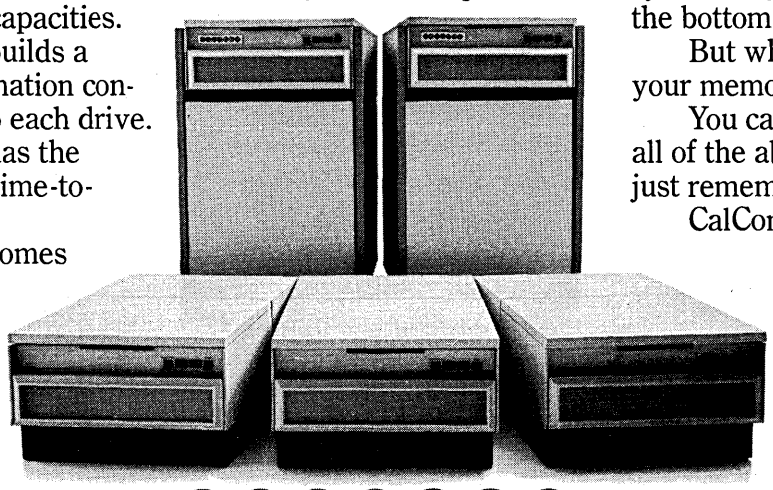

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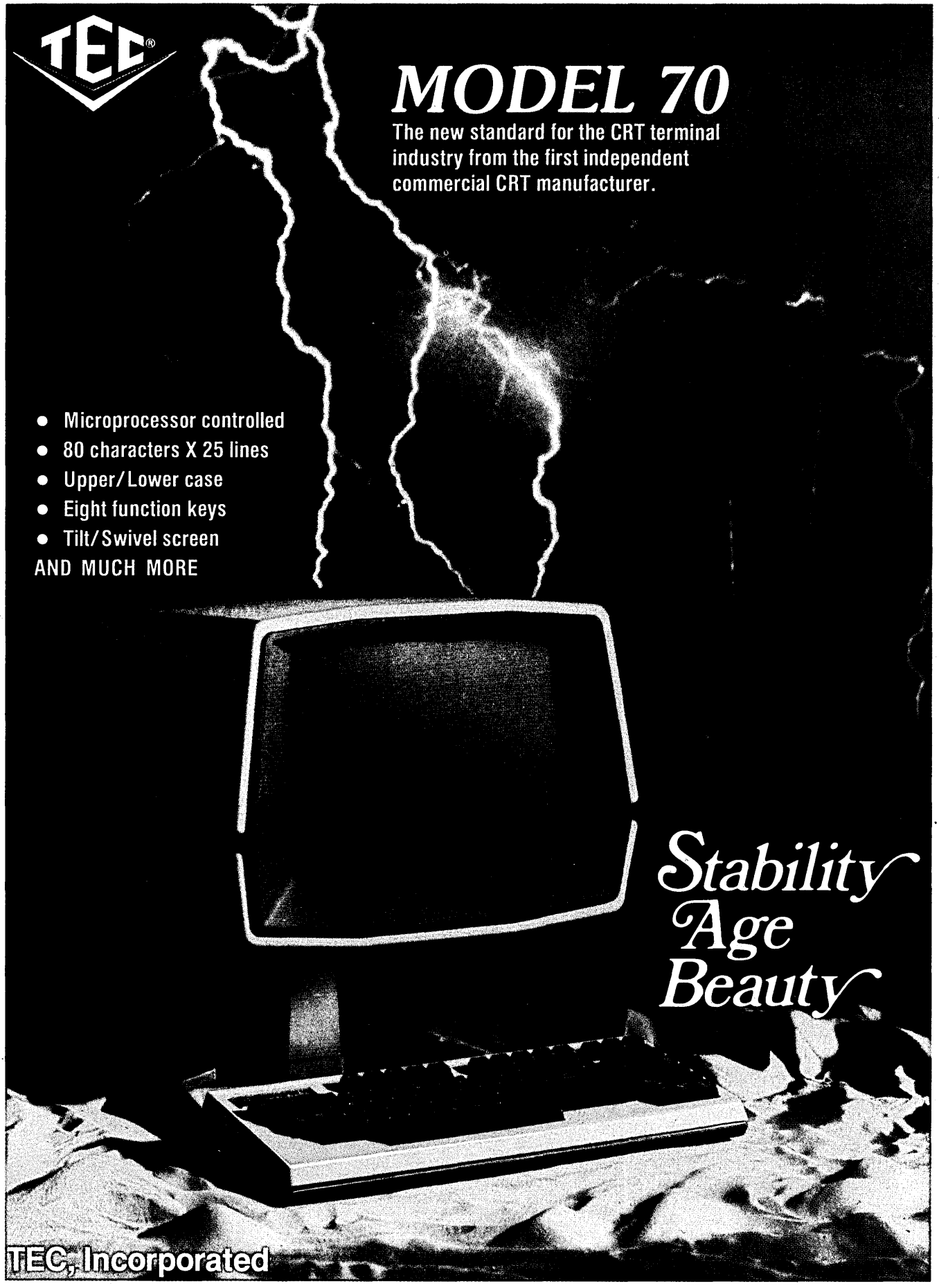

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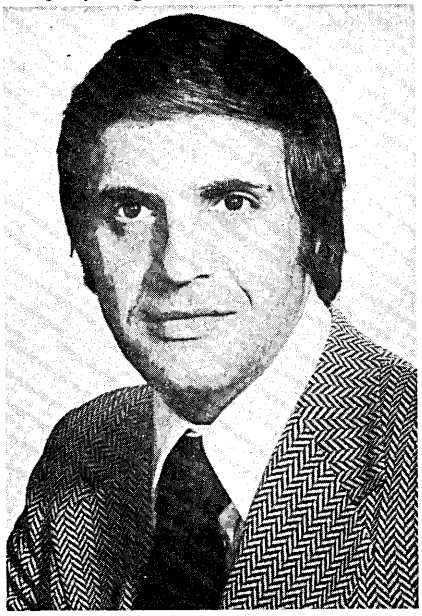
Bergeman of Burger King

Since stepping up to the top dp job last July at Burger King Corp., the Miami-based fast food chain, Carl T. Bergeman has followed a hectic schedule. In recent months he directed a conversion from a Burroughs B3700 to an IBM 370/148; developed a five-year plan for the fast growing chain; set up a budget for the new year; and has been evaluating equipment for its nine regional offices and 13 distribution centers.

It is all part of a restructuring plan to support and process data at the field level and to send to the corporate level only that data that is needed there. Included in the plan is a desire by the company to give its field operations one common piece of hardware and one vendor. Last month the company planned to upgrade its distribution centers, which mainly use Singer 10 machines; the IBM 3790, Series 1 and the Honeywell level 6 were among those being evaluated.



CARL T. BERGEMAN
A conversion and a five-year plan

At the restaurant level, Burger King has been using mostly PDP-8-based Manex systems made by the Electro-systems Div. of AMF Corp. But some stores use Documentors and Bergeman's group constantly is testing new offerings in the point-of-sale business. Its chain consists of 425 company owned stores and some 1,600 stores which it franchises. It is the second largest company (next to McDonald's) in the fast service hamburger restaurant industry. It operates stores in all 50 states and in Canada, the Caribbean, Europe, and Australia.

Bergeman, 40, joined Burger King five years ago this month as manager of systems and programming. He was named group director of information management last July and in October was appointed vice president of information management, a newly created position in the company, which is a subsidiary of the Pillsbury Co. of Minneapolis.

When he joined the company it was a chain of some 800 stores. "Just keeping pace with our growth is a hectic job in itself," he says. Bergeman left Sandoz-Wander, Inc., the pharmaceutical firm, where he had been running the company's plant in Denver. "Everyone was saying how great it is to live in the land of sunshine in Florida, but all that I see of it is night time," says Bergeman of his work days, which average about 11 hours. But he does sneak in a half hour now and then for a game of racquetball—from 6:30 to 7 in the morning.

His job in Denver was his only one on the operations side of business. Before that he was a systems and programming manager with Sandoz-Wander and earlier was with Hoffman-LaRoche, Inc., another pharmaceutical firm, as a programming manager. His BS in business management is from Fairleigh Dickinson Univ., Rutherford, N.J., and he did graduate study in psychology at Montclair State College in Montclair, N.J.

"I studied psychology because it intrigued me," says Bergeman, who points to his degree in business administration as the first qualification for his job. "But I guess it helped me understand the human element. In this business you're dealing with so many individualists—almost a race unto themselves." He does admit, though, that "things aren't what they used to be" in terms of the dedication one used to see among computer people, but he hastens to praise his staff for their performance during Burger King's recent conversion. "It was a hell of an effort in time and commitment on their part," he says.

Bergeman is a member of the Association of Systems Management (ASM), was the first president of the Florida chapter of CUBE (the Burroughs user group) and is an active member of the National Restaurant Assn. User Group for EDP.

After Six Months of Job Hunting

When Xerox Corp. pulled out of the mainframe computer business in mid-1975 (Sept. '75, p. 102), hundreds of computer professionals moved into the job market.

One of them was Glen A. Malmquist who had been manager, industry marketing for Xerox Data Systems. Like most displaced by the Xerox move, Malmquist went to a job based on his computer industry experience—as director, marketing for the Infonet Div. of Computer Sciences Corp.

What he's doing now, however, is based on a different kind of experience, that of spending six months in full time job-hunting. "The Xerox experience gave me insight into how others approach job-hunting and to the many pitfalls of job-hunting." Malmquist said. "Most of us are ill-prepared for job-hunting and, as a result, often settle for less than the optimum when we do change firms."

At CSC, Malmquist was charged with building a headquarters marketing/planning organization which would assume responsibility for product planning, product marketing, and product management. "I had to recruit 14 people almost immediately. It was during this period that I became aware of the severe problem that managers face in locating, screening, and, finally, recruiting talent."

Malmquist has combined this awareness with his experiences as a job-hunter in his new endeavor, Professional Referral Service, Inc., scheduled to "go live" April 1. "I opted to be a middleman," he said.

While recruiting at CSC, Malmquist said search firms did come to his aid in some instances, providing pre-screened candidates. But, "my experiences as a job-hunter and a builder of an organization convinced me there had to be a better way." He believes PRS is this better way. He's seeking to serve job hunters by maintaining a base of resumes, broken down by skills, and making these available to search firms, thus cutting the first-level candidate identification process of search firms. He conceives PRS as something of a "master source of talent."

Malmquist is convinced that the kind of service he intends to offer is particularly attuned to the computer industry because of its volatility. "It's full of specialists and specialties," he said. He gave as an example a case where a services firm might hire an accounts payable specialist thinking it might get into that kind of service. It then could decide this wasn't practical or profitable and the new employee would be "kind of shelved." Malmquist believes "boredom is unacceptable among computer people." He recalls working for a non-

computer company where he couldn't believe the "pace" of the rest of the company.

PRS will offer its services on a subscription basis for a charge to job-hunters of $15 per month or $45 per quarter. Renewal would be required each quarter to keep the system "self-purging." In addition to making a job-hunter's resume available to search firms, Malmquist will offer job-hunters a Newsletter covering such topics as resume writing and interviewing techniques. He will not charge the search firms.

GLEN A. MALMQUIST
"I opted to be a middleman."

Malmquist said he will use automation in his new operation "where necessary." He will use word processing for correspondence and a computer-based skills inventory system. He emphasized the fact that he will not use "computer matching," which he equated with computer dating.

A BSEE graduate from the Univ. of Illinois in 1960, Malmquist, 39, received an MBA from Stanford in 1962. His first job after Stanford was with Bendix Computer and his working life since then has been entirely in the computer industry. He has had no personnel experience, although his father was in personnel work giving him some familiarity with it. He thinks lack of personnel experience is a plus. "Personnel departments are on the lowest rung of corporate ladders. They are not staffed or budgeted to provide more than clerical help. They are consumed with problems of salary administration, benefit packages, and EEO and ERISA requirements."

Malmquist worked for Bendix for a year and then joined TRW Computers which became a part of Bunker Ramo which ultimately was acquired by General Electric. He left that firm in 1966 to join Max Palevsky's Scientific Data Systems. "That was an exciting environment," he recalled. "Even junior level people had great responsibilities. It was fun and a great experience."

Then came Xerox which acquired SDS in 1969 and with it what Malmquist calls "paper constipation." With others, he was charged with coming up with a plan to make Xerox number two in the computer industry. "We came up with a plan and a price tag. They didn't like the price tag."

In 1970, Malmquist left Xerox to join the Transital Div. of Sangamo Electric which was marketing a line of key-to-tape equipment. This operation later was merged into Gould Data Systems where Malmquist stayed until 1974 when he went back to Xerox Data Systems.

He recalls these as good days at XDS. "We finally knew who we were and where we were going. We were getting it all together. We had a good new line and orders were pouring in." Malmquist was en route from a presentation in Dallas to another in Chicago when he learned of the pull-out decision. He was in on talks with both Honeywell and Univac regarding acquisition of XDS assets. He recalled the surprise of a corporate level financial officer in on some of these talks. "He told me if he had known how well we (XDS) were doing, the decision might have been different."

Malmquist is confident of his decision on PRS which he sees as "one of the few organizations in the U.S. that truly represents the job hunter. Most firms in the employment realm are paid by client companies and therefore have their loyalties with those client companies."

In New Posts

ROBERT L. RUNGE was appointed vice president, systems development for Sycor, Inc., Ann Arbor, Mich. . . . ROBERT L. FRONK joined Arthur D. Little, Inc., as a senior member of the staff of the Information Systems section . . . JON S. GOULD, formerly vice president and director of securities processing software development for Citibank, is the new vice president of the DDP Products, Inc., subsidiary of Conversational Systems Corp., New York City . . . JAMES B. LAMBERT was elected president and chief operating officer of T-Bar Inc., Wilton, Conn. . . . Datatrol Inc., Hudson, Mass., elected EDWARD S. WALTER chief executive officer and president . . . JOHN MUSIC was appointed vice president and general manager of Docuprint, Inc., Melbourne, Fla., a wholly owned subsidiary of Documation, Inc., which will design and market word processing systems . . . DR. BRAD J. COX joined Tal-Star Computer Systems, Inc., Trenton, N.J., to manage the Toronto Star editorial system project designed to "free editorial personnel to do what they do best . . . and let the computers do the rest." . . . The Computer & Communications Industry Assn. retained DAVID S. COHEN of the Washington law firm of vom Baur, Coburn, Simmons & Turtle as counsel in matters pertaining to federal procurement of data processing and communications equipment . . . SHELDON H. KONOWITZ was elected vice president, management information systems for Schnadig Corp., Chicago . . . GEORGE J. FEENEY, who joined Dun & Bradstreet Companies, Inc., last October as director of advanced development, has been elected a vice president. Earlier, he was vice president and general manager of General Electric Co.'s Information Services Div. . . . WILLIAM Y. ARMS, a lecturer in computing at Open Univ., England, was named director of the Kiewit Computation Center at Dartmouth College . . . DR. EARL JACOBS was named vice president and general manager of the Industrial Products Div. of Computer Automation, Inc., Irvine, Calif. . . . TERRENCE E. BOEHME was appointed manager of Data Processing for Season-all Industries, Indiana, Pa. . . . RICHARD E. BICKHAM was named manager-well log evaluation, for Scientific Software Corp., Denver . . . MARY NEWMAN was appointed vice president and senior programmer/analyst for City National Bank, Beverly Hills, Calif. . . . Envirotech Corp., Menlo Park, Calif., named R. LA MAR THAYNE as vice president of Information Systems, based in its Salt Lake City data processing facility . . . WILLIAM ACKLEY joined Beehive International, a Salt Lake City based supplier of computer terminals and computer systems, as vice president of manufacturing and operations . . . E. ROY MOHLER was promoted to assistant vice president of American Reserve Corp., Chicago, responsible for the control of major computer-oriented systems projects . . . California Computer Products named TED T. LORBER marketing manager for precision graphics systems in its Graphics Products Div. . . . A.L. FRANK was promoted to the newly created position of manager, new product research for Boole & Babbage, Sunnyvale, Calif. ❋

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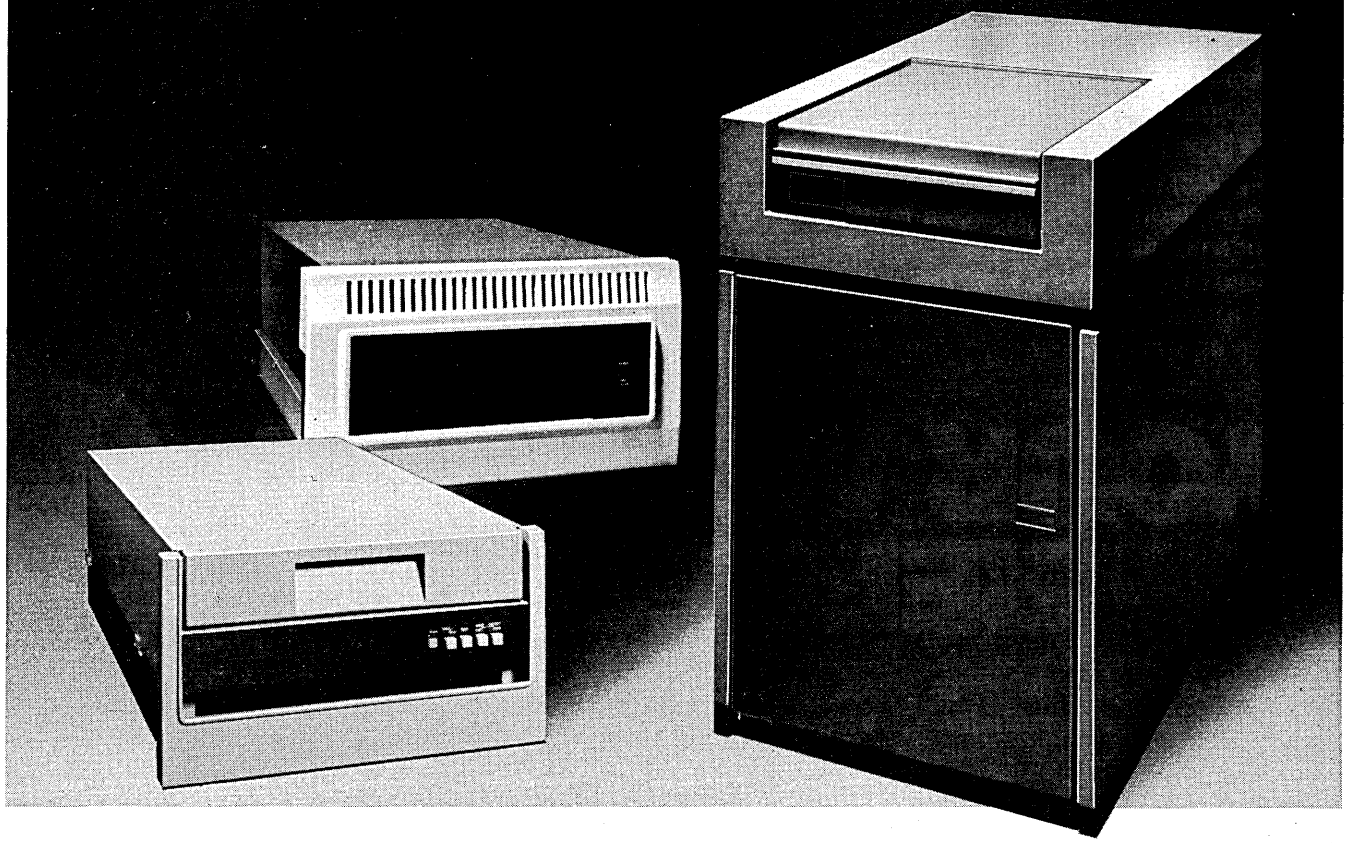

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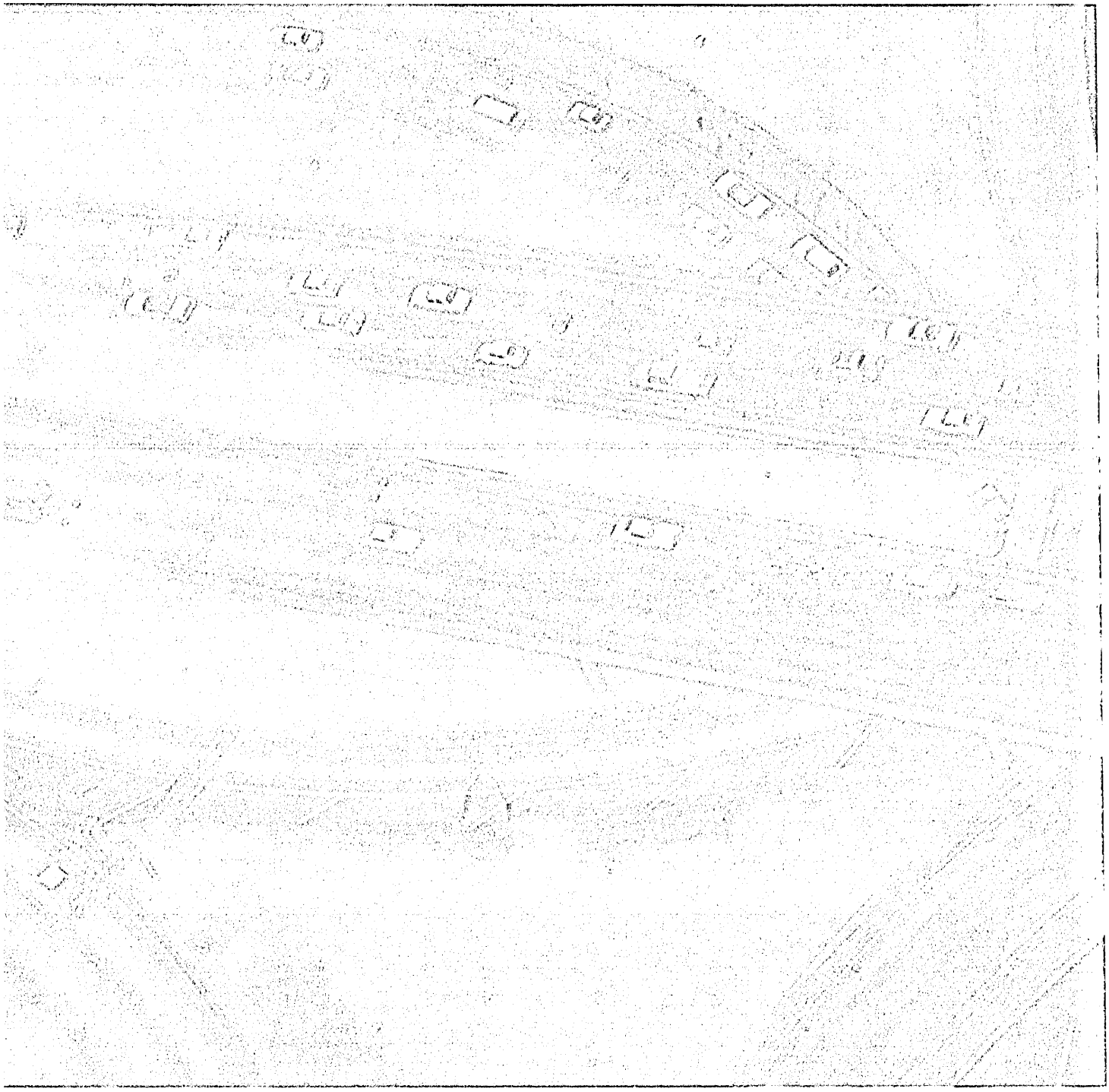

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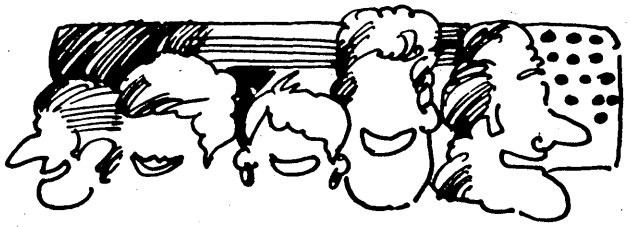


APRIL

Communication 78, **April 4-7**, Birmingham, England. This conference and exhibition, organized by the Institution of Electrical Engineers with support from the British government and the International Telecommunication Union, will highlight user aspects of communications equipment and systems. Switching and associated signal and control systems, terminal equipment, peripherals, and radio and defense communications will be discussed. Contact: IEE, Savoy Place, London, England WC2 OBL (01)240-1871.

COMMON Spring Conference , **April 9-12**, Miami Beach. Several sessions a day will be directed toward the user or potential user of the Series/1. Other topics to be covered are the control clerk function, dp unionization, and communicating with management. An informal discussion session will be held each evening. Contact: David Lister, COMMON, 435 N. Michigan Ave., Chicago, IL 60611 (312) 644-0828.

Americas Univac Users Assn. Spring Conference, **April 9-13**, San Diego. Featured speakers are Dr. Carl Hammer, who will address privacy and computer security, and Capt. Grace Hopper, who will speak on futures. Fee: $75. Contact: Barbara Gattus, Federal Yeast Corp., Highlandtown Post Office, Baltimore, MD 21224 (301) 633-8000 ext. 29.

ADAPSO 48th Annual Management Conference and Exhibition, **April 12-14**, Phoenix. Fifty booths will be included in CSE II, the exhibit portion. Workshops will be under the theme, "Focus on Profit, People, Products, and Promotion," and sessions will cover planning, documentation, software languages, contracts, software design, "Education, Training, Recruiting, and Retaining Good People," and "How to Make Money in Packaged Software." Fee: $200, member; $375, nonmember. Group discounts are available. Contact: ADAPSO, 210 Summit Ave., Montvale, NJ 07645 (201) 391-0870.

1978 Mini/Micro Conference and Exposition, **April 18-20**, Philadelphia. Twenty conference sessions will cover various business and technical topics such as "How to Make It As a Mini Distributor," "Getting Into the Small Systems Business," "The Microcomputer Software Crisis," micro software development methods, alternative mini systems architectures, mini languages, and 16-bit minis. Fee: $75 for three days, not including two special sessions on mini/micro applications and step-by-step design of the microprocessor system offered prior to the opening of the conference. Contact: Bob Rankin, Mini/Micro '78, 5528 La Palma Ave., Anaheim, CA 92807 (714) 528-2400.

Hannover Faire, **April 19-27**, Hannover Messe, W. Germany. This large international exposition, geared to an audience largely of decision-makers (owners, managers, engineers), will feature equipment and information about a wide range of industries including energy systems and conversion, transportation, research and technology, advertising aids, telecommunications, and measurement of test and automation equipment. Admission fee is a mere $8. Contact: Enno Stoltenberg, 2221 Rosecrans, El Segundo, CA 90245 (213) 973-8700.

8th Conference on Computer Audit, Control, and Security, **April 10-13**, *New York City. Contact: Institute of Internal Auditors, 249 Maitland Ave., Altamonte Springs, FL 32701 (305) 830-7600.*

Workshop on Pattern Recognition and Artificial Intelligence, **April 12-14**, *Princeton, N.J. Contact: Prof. Y.T. Chien. Dept. of Computer Science, Univ. of Connecticut, Stoors, CT 06268.*

National Information Conference and Exposition, **April 17-19**. *Washington, D.C. Contact: Information Industry Assn., 4720 Montgomery Lane #904, Bethesda, MD 20014 (301) 654-4150.*

Assn. for Systems Management Annual Conference, **April 23-26**, *Atlanta, Ga. Contact: ASM, 24587 Bagley Rd., Cleveland, OH 44138 (216) 243-6900.*

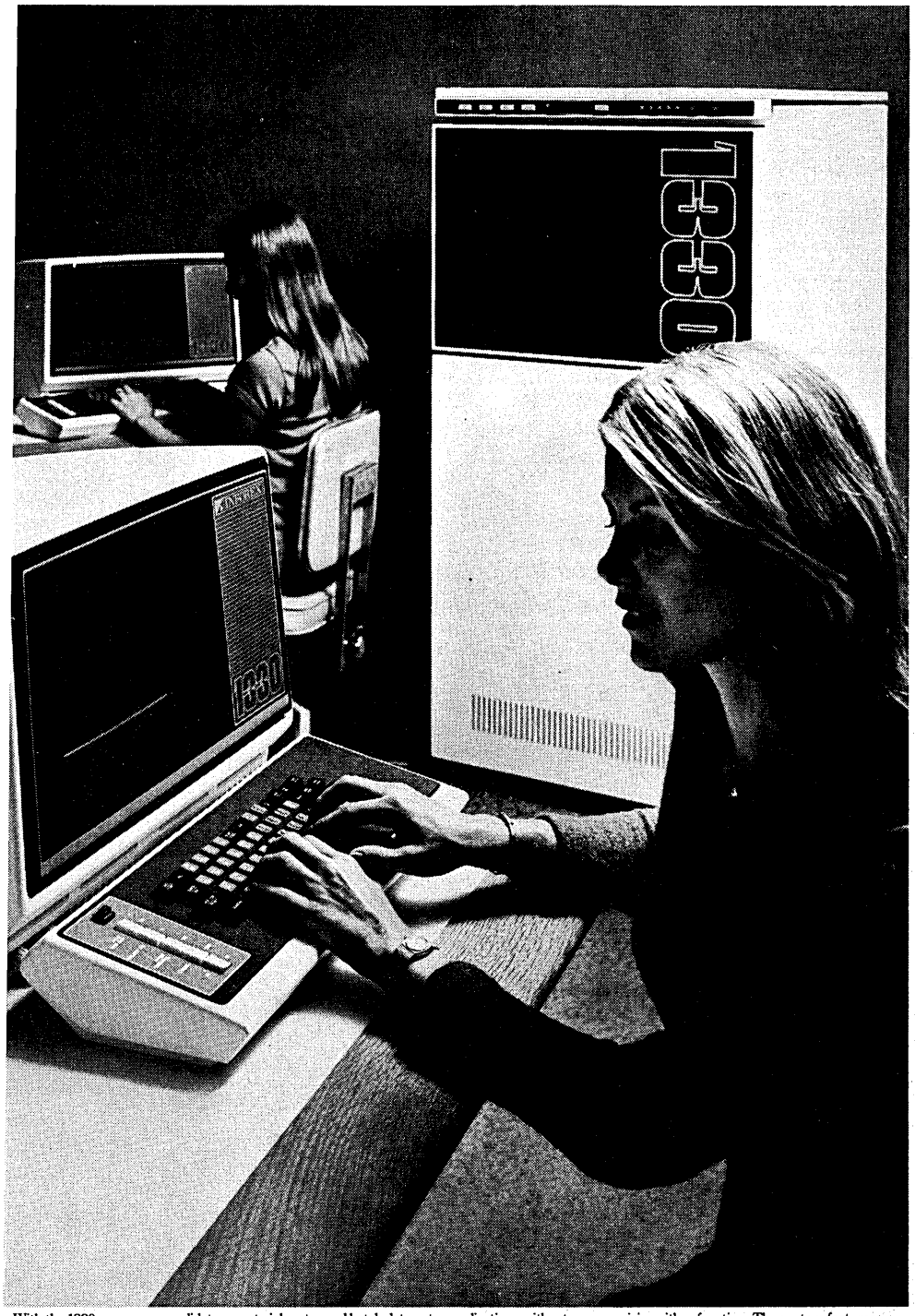
Percomp '78, **April 28-30**, *Long Beach, Calif. Contact: Percomp '78, 1833 E. 17th St., Santa Ana, CA 92701 (714) 973-0880.*

ON THE AGENDA

NACHA Conference, April 2-4, New Orleans. Contact: Karen Reed, American Bankers Assn., 1120 Connecticut Ave. N.W., Washington, DC 20036. **Metric Planning Forum, April 2-5**, Atlanta, GA. Contact: American National Metric Council, 1625 Massachusetts Ave., N.W., Washington, DC 20036 (202) 232-4545. **Symposium on Automatic Imagery and Pattern Recognition, April 3-4**, Gaithersburg, MD. Contact: Electronics Industries Assn., 2001 Eye St. N.W., Washington, DC 20006 (202) 457-4981. **Symposium on Computer Architecture, April 3-5**, Palo Alto, CA. Contact: IEEE, P.O. Box 639, Silver Spring, MD 20901 (301) 439-7007. **Independent Computer Consultants Assn. 1978 Conference, April 6-7**, St. Louis, MO. Contact: ICCA, P.O. Box 27412, St. Louis, MO (314) 576-1750. **Numerical Control Society Meeting and Conference, April 9-12**, Chicago. Contact: Carl Wangman (312) 724-7700. **NECON 78, April 20, 21**, Hartford, CT. Contact: DPMA, P.O. Box 562, Hartford, CT 06101. **Communications Satellite Systems Cohference, April 23-27**, San Diego. Contact: Dr. S.J. Dudzinsky, Jr., The Rand Corp., 1700 Main St., Santa Monica, CA 90406

CALL FOR PAPERS

Software Quality Assurance Workshop, November 15-17, San Diego. Abstracts on experiences with software quality tools or procedures for micro to maxi computers will be accepted until April 15. Suggested length is not more than five double-spaced pages. Ten copies of the detailed abstract may be submitted to Clint Woodworth, Clinton Woodworth Associates, 150 Lagunita Drive, Soquel, CA 95073.



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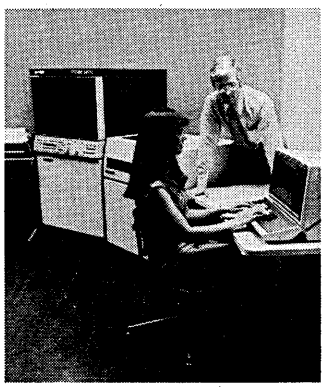

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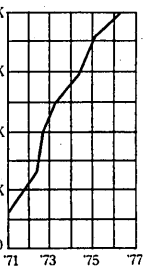

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1978 SHOWS AND CONFERENCES

MAY

Business Forms Management Assn., May 1-3, *Houston. Contact: Dorothy Holifield, BFMA, Room 519, P.O. Box 2511, Houston, TX 77001 (713) 757-3221.*

Midwestern Computer Expo, May 2-4, *Chicago. Contact: Edward Bride (617) 964-4550.*

PRIDE Users Assn., May 7-10, *Oconomowoc, Wisconsin. Contact: Don Demers, Borden, Inc., 180 E. Broad St., Columbus, OH 43215.*

Midatlantic Computer Expo, May 9-11, *New York City. Contact: Edward Bride (617) 964-4550.*

Micrographics '78, May 9-12, *Boston. Contact: National Micrographics Assn., 8728 Colesville Rd., Silver Spring, MD 20910 (301) 587-8444.*

Eurocomp '78, May 9-12, *London. Contact: On-Line Conferences, Cleveland Rd., Uxbridge UB8 2DD, England.*

Edp '78, May 9-15, *Milan, Italy. Contact: Tommy Thomas, U.S. Dept. of Commerce, Washington, D.C. 20230 (202) 377-4508.*

International Conference on Software Engineering, May 10-12, *Atlanta. Contact: IEEE Computer Society, P.O. Box 639, Silver Spring, MD 20901 (301) 439-7007.*

Canadian Assn. for Information Science, May 10-13, *Montreal, Quebec, Canada. Contact: Daniel Carroue (514) 875-8931.*

Data Entry Management Assn. Regional Meeting, May 11-12, *Columbus, Ohio. Contact: Marilyn Bodek, Data Entry Management Assn., 16E Weavers' Hill, Greenwich, CT 06830 (203) 531-4036.*

4th Illinois Conference on Medical Information Systems, May 11-13, *Champaign, Ill. Contact: Julie Garrett, Regional Health Resource Center, 1408 University Ave., Urbana, IL 61801 (217) 337-2324.*

Assn. for Educational Data Systems Conference, May 15-19, *Atlanta. Contact: Dr. James E. Eisele, Office of Computing Activities, Univ. of Georgia, Athens, GA 30602.*

7th ASIS Mid-Year Meeting, May 22-24, *Houston. Contact: ASIS Headquarters, 1155 16th St. N.W., Washington, D.C. 20036 (202) 659-3644.*

Canadian Computer Conference, May 23-25, *Edmonton, Alberta, Canada. Contact: C. Christie, Athabasca Univ., 14515 122 Ave., Edmonton, Alberta, Canada T5C 2W4.*

JUNE

ACM Sigplan Conference on History of Programming Languages, June 1-3, *Los Angeles. Contact: Billy Claybrook, Dept. of Computer Science, Virginia Polytechnic Institute, Blacksburg, VA 24061 (703) 951-5420.*

Isratech '78, June 4-8, *Jerusalem, Israel. Contact: Government of Israel Investment Authority, 641 Lexington Ave., New York, NY 10022 (212) 486-8538.*

National Computer Conference (NCC), June 5-8, *Anaheim, Calif. Contact: AFIPS, 210 Summit Ave., Montvale, NJ 07645 (201) 391-9810.*

4th Annual Symposium and Exhibition: MIMI '78, June 12-15, *Zurich, Switzerland. Contact Secretariat, MIMI '78, Interconvention, c/o Swissair Postfach, 8058 Zurich, Switzerland.*

Computers in Banking, June 13-15, *Zurich, Switzerland. Contact: Secretariat, Computers in Banking, Interconvention, c/o Swissair Postfach, CH-8058 Zurich, Switzerland.*

Institute of Internal Auditors International Conference, June 18-21, *San Francisco. Contact: IIA, P.O. Box 7876, San Francisco, CA 94120.*

Design Automation Conference, June 19-21, *Las Vegas. Contact: IEEE Computer Society, P.O. Box 639, Silver Spring, MD 20901 (301) 439-7007.*

First World Computing Services Industry Congress, June 20-23, *Barcelona, Spain. Contact: J.L. Dreyer (212) 867-2112.*

FTC-8, June 21-23, *Toulouse, France. Contact: Jean Claude Rault, DIB-Thomson CSF, 33 rue de Vouille, 75015 Paris, France.*

Syntopicon VI, June 21-23, *Washington, D.C. Contact: IWP Assn., Attn: Lorraine Lear, AMS Bldg., Maryland Rd., Willow Grove, PA 19090 (215) 657-3220.*

JULY

Summer Computer Simulation Conference, July 24-26, *Newport Beach, Calif. Contact: 1978 Summer Computer Simulation Conference, P.O. Box 2228, La Jolla, CA 92038.*

AUGUST

ACM Sigmini Symposium on Small Systems, Aug. 2-3, *New York City. Contact: ACM, 1133 Ave. of the Americas, New York, NY 10036 (212) 265-6300.*

Jerusalem Conference on Information Technology, Aug. 6-9, *Jerusalem, Israel. Contact: Anthony Ralston, SUNY-Buffalo, 4226 Ridge Lea Rd., Amherst, NY 14226.*

International Conference on Parallel Processing, August 22-25, *Bellaire, Michigan. Contact: Dr. Charles Elliott, College of Engineering, Wayne State Univ., Detroit, MI 48202 (313) 577-3812.*

Conference on Computer Graphics and Interactive Techniques, Aug. 23-25, *Atlanta. Contact: ACM, 1133 Ave. of the Americas, New York, NY 10036 (212) 265-6300.* ❋

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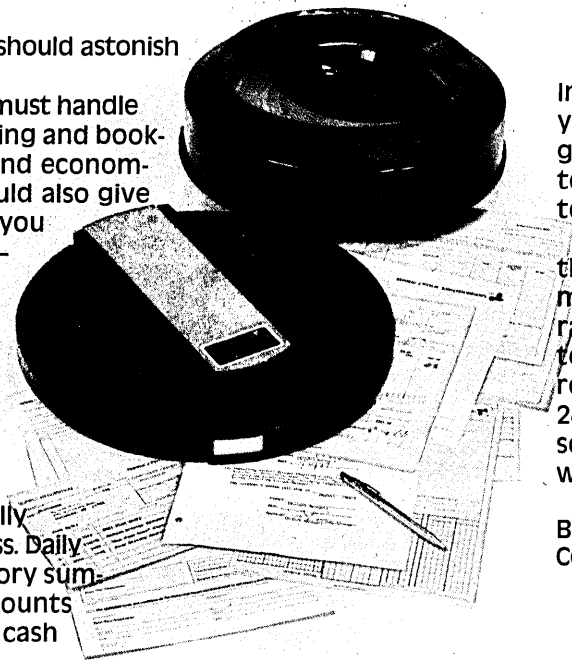

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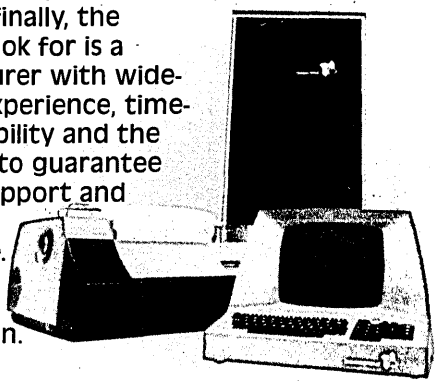

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To deliver such broad capability, your computer must be "interactive," the way Basic/Four computers are. That means transactions are processed as they're entered, and are immediately usable.

Your computer should answer questions *as* you ask them. In "real time." And in plain, everyday language. It should be so simple to operate, your order clerk becomes a "computer expert" in less than a day.

Full time commitment

We pioneered small business computers and they're our only concern. So we know we can help you.

No matter what business you're in, if your revenues are $500,000 up, you're ready for a Basic/Four computer. For less than $1000 a month, it can save you money, make you money, and help you grow. As it's doing for more than 4000 businesses of all kinds. As it has been doing for over five years.

Call your nearest Basic/Four systems sales office or write on your letterhead for our complete brochure. 14101 Myford Rd., Tustin, CA 92680

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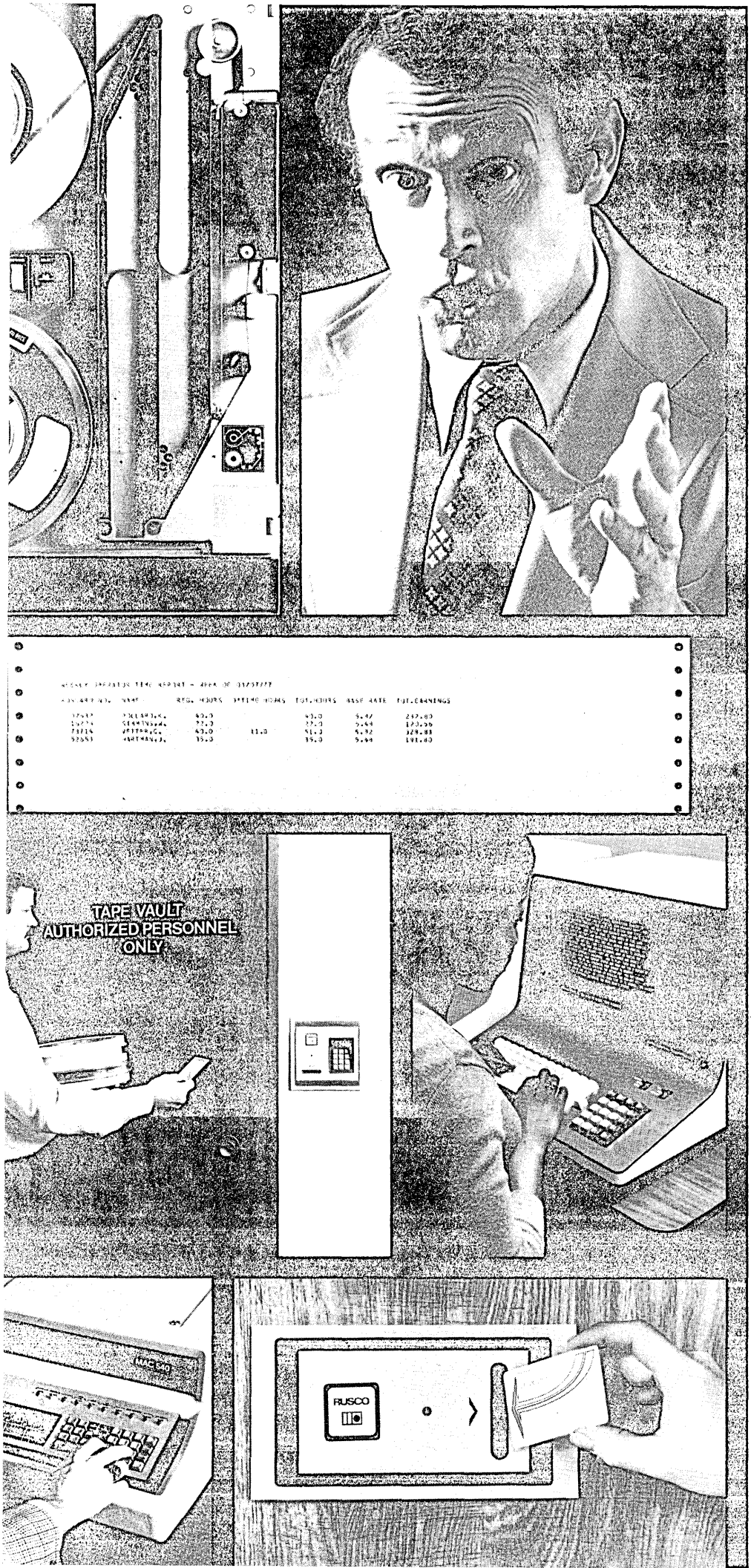
Albuquerque * Anchorage * Atlanta * Baltimore/Washington * Birmingham * Boise * Boston * Buffalo * Charlotte * Chattanooga * Chicago * Cincinnati * Cleveland * Dallas * Denver * Fresno * Grand Rapids * Hartford * Honolulu * Houston * Kansas City * Indianapolis * Las Vegas * Los Angeles * Lubbock * Madison * Memphis * Miami * Milwaukee * Minn./St. Paul * Nashville * New Jersey * New Orleans * New York * Orange County * Philadelphia * Phoenix/Tucson * Pittsburgh * Portland * Richmond * Sacramento * Salt Lake City * San Antonio * San Diego * San Francisco * San Juan * Seattle/Tacoma * St. Louis * Syracuse
Basic/Four Systems are also marketed in more than 30 foreign countries.



"Here's a hot tip for a hot topic-- *CARDENTRY for computer security.*"

"Figure it out.

We've got a small fortune here in hardware alone.

And it'd be hard to put a price on all the information we store—especially if it fell into the wrong hands.

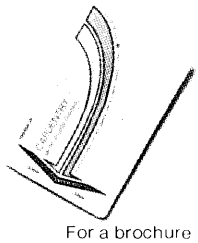
That's why I refuse to take chances with keys and locks to decide who goes where in this facility. Instead, I specified a Rusco CARDENTRY programmable access control system. It's not only far more secure—it's a lot more flexible, too.

For example, I can limit any employee's access to specified areas and time periods. After hours, I can make sure only the night shift supervisor can take the elevator to this floor. And I can key in commands to lock and unlock certain doors at preset times.

I even get a mag tape log of all comings and goings that plugs right into my payroll program to eliminate time cards! And if a power monitor or smoke detector trips, CARDENTRY sounds the alarm and pinpoints the location and time.

I really feel a lot more comfortable knowing CARDENTRY is on the job. Not just because it helps me manage better—I think of it as awfully cheap insurance for an awfully big investment!"

THE CARDENTRY COMPANY . . .



For a brochure detailing CARDENTRY's exciting capabilities, call toll-free: **1-800-528-6050, Ext. 691** (in Arizona call 1-602-955-9714, Ext. 691) or write **Rusco Electronic Systems 1840 Victory Blvd., P.O. Box 5005 Glendale, CA 91201**

RUSCO ELECTRONIC SYSTEMS

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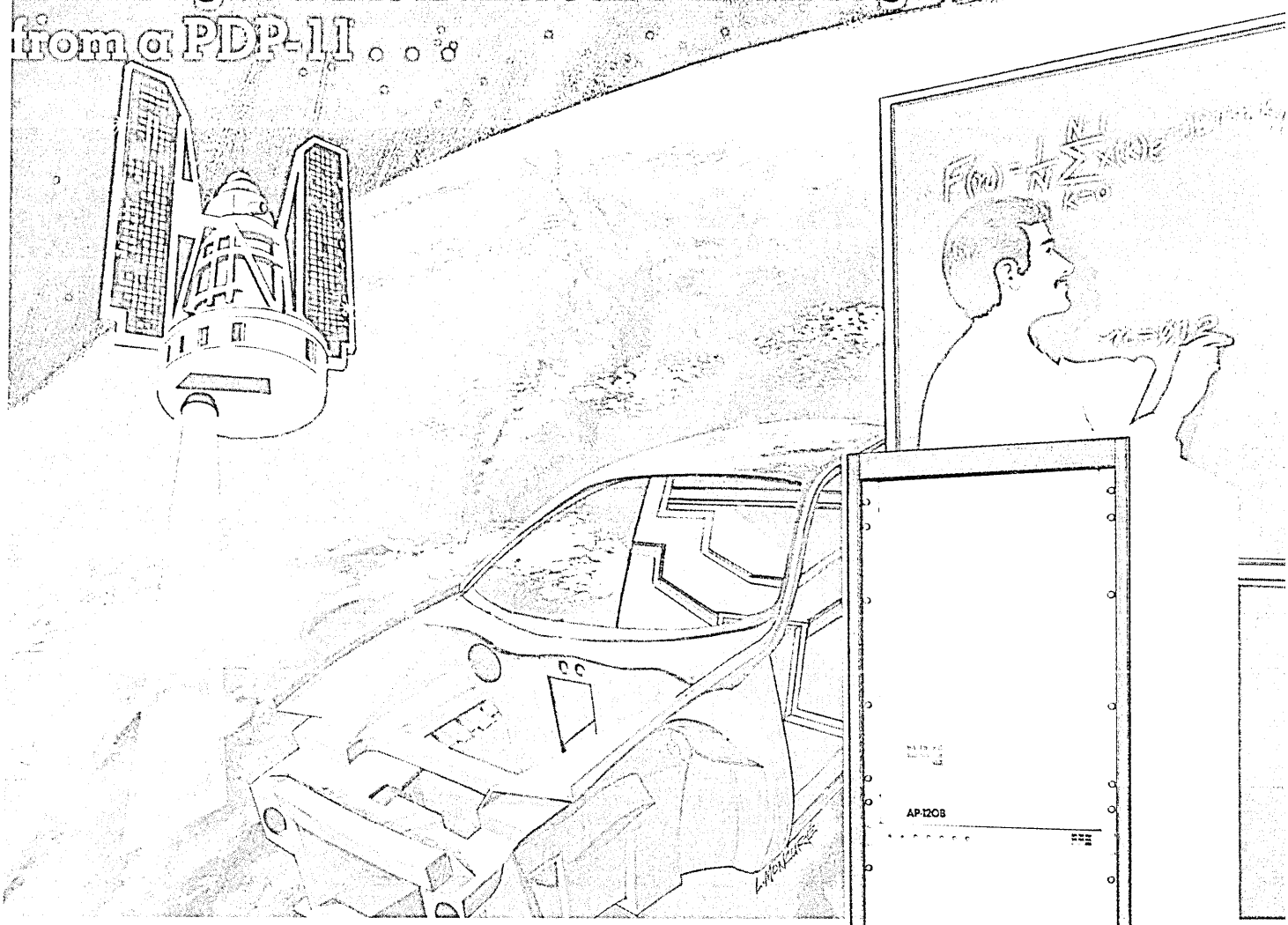
CIRCLE 85 ON READER CARD

How to get a 240X increase in throughput from a PDP-11 . . .



The FPS AP-120B Array Processor

A great contribution to technology, the minicomputer, but it can't give you the computational power required for scientific applications such as **digital signal processing, structural design** and **simulation,** and **image processing.** That's why FPS developed the AP-120B Array Processor — a new power in computing.

The AP-120B Array Processor gives economical minicomputer systems the **extraordinary computational power** of large computer mainframe systems. For example, an AP-120B has been used in a PDP-11/34 system to reconstruct and analyze complex digital images. Without the AP-120B, the task would take more than two hours. With the AP-120B, it takes less than thirty seconds — **that's a 240X improvement!**

While the PDP-11/34 and AP-120B offer considerably more compute power for less money than a PDP-11/70, a PDP-11/70 and AP-120B offer even greater data handling capabilities.

The FPS architecture is no secret. The design and instruction set take full advantage of the vector or array structure of most scientific algorithms. What's more, this computational power is **controlled by simple subroutine calls** from a FORTRAN program in the PDP-11, or other popular minicomputer.

The FPS Math Library includes more than 200 of the most commonly used scientific subroutines, and because the Array Processor is readily programmable, new routines can be easily added.

Hundreds of FPS Array Processors are in use today by people who want to retain the hands-on control and affordability of a minicomputer system, but require the exceptional throughput of a large mainframe for their applications.

Find out how this new power in computing (typically under $50K complete) can benefit your application. **For more information** and an FPS Array Processor brochure, use the reader response number or coupon below. For immediate consultation, contact Floating Point Systems directly.

The Age Of Array Processing Is Here . . . and FPS Is The Array Processor Company.

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☐ I have an immediate need. Please have a technical consultant contact me.
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Company _____ Phone _____
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My Computer System is _____ My application is _____

DATAMATION 3/78

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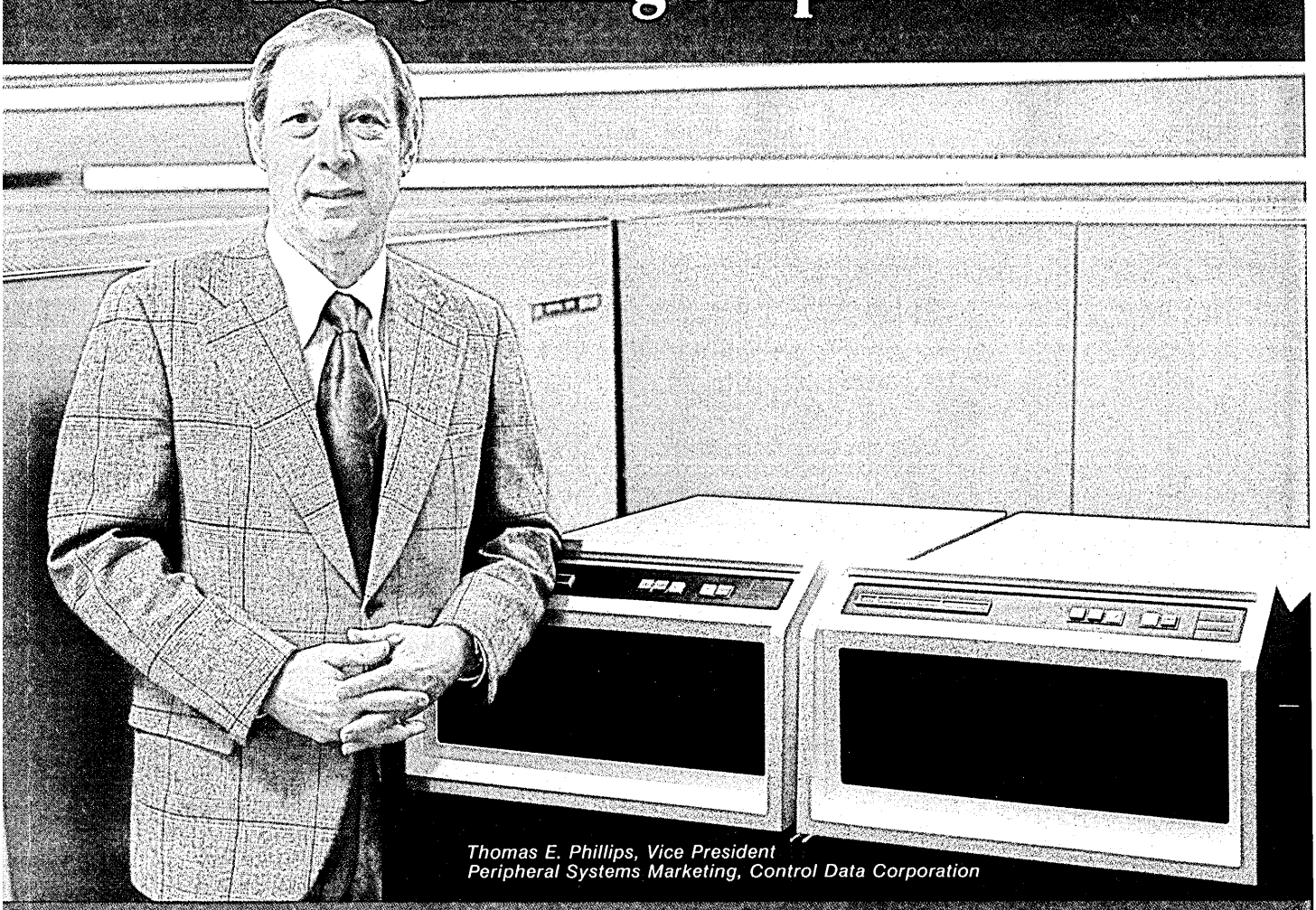
International offices: Geneva, London, Munich, Paris, Tel Aviv (Eastronix, Ltd.), Tokyo (Hakuto Co. Ltd.)

"Making better business decisions means making comparisons."



Thomas E. Phillips, Vice President
Peripheral Systems Marketing, Control Data Corporation

"Because our peripheral customers are IBM users, you know they made a lot of comparisons before deciding on our Monolithic Memory or our Disk Storage Drives.

"Of course hardware compatibility was a must. Our products had to fit into their system. But the most important factors were price/performance, software compatibility and service.

"For example, many businesses decided on our new 33801 Data Module Drive instead of a 3350. Why? Because with our drive they get more capacity, more fixed head storage, faster access time and without the need of costly software conversion. Another attractive comparison is our product's compatibility with either the 3350 or 3330-11 modes.

"And a lot of our more than 1400 IBM user sites thought our Monolithic Memory made more sense—when they discovered how economical it was and that we could deliver memory for the entire 370 line within 30 to 60 days.

"They compared reliability and service support too. Our customers can depend upon our broad product experience and our worldwide dedicated hardware and software specialists.

"But why not make your own comparisons. And review some of the other reasons our customers have made the better business decision. Call your local representative. For the number of our rep in your area, call 612/853-7600."

CONTROL DATA CORPORATION

More than a computer company

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

books

Modern Methods for Computer Security and Privacy

by Lance J. Hoffman
Prentice Hall, Inc.
Englewood Cliffs, NJ 07632
(1977)
255 pp. $17.95

After teaching a graduate level course on computer security at the Univ. of California for some years, Hoffman published his second textbook on computer security in May of 1977. He worked up his lecture notes, got a friend to dig out the answers to all the questions at the ends of the chapters, and published this tidy little textbook on computer security.

For students the outline of the book is good. It covers log-on sequences, audit trails, and encryption very well. Operating systems and machine architecture both deserve separate volumes in themselves, but are treated in single chapters. The last third of the book offers short chapters on statistical data banks, mathematical models, future research, non-technical aspects of computer security, and legislation. The bibliography is extensive, containing 212 entries.

The text is well written and the figures are clear, although the format in some places is choppy. If you have a knowledge of programming, data structures, and operating systems, you'll find the reading easy. If you have this background and need an overview of computer security, this book can fill that need. However, if you are running a shop, you'll have to look elsewhere for the operational aspects of security and you're on your own if you seek discussions of change control, routine maintenance in a secure environment, or check lists to help you audit your own installation.

—R.L. Patrick

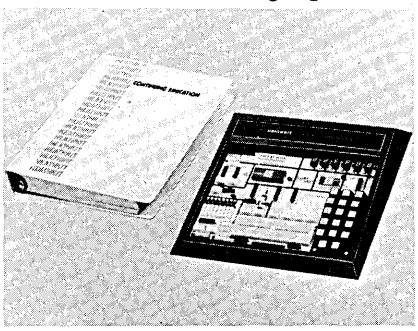
Mr. Patrick is a DATAMATION editorial advisor, independent computer consultant, and chairman of an AFIPS committee on computer security.

Individual Learning Program in Microprocessors

Model EE-3401
Heathkit Continuing Education,
Heath Co., Benton Harbor, Mich.
(1977)
850 pp. $89.95
Microprocessor Trainer
Model ET-3400, $189.95

If you're serious about getting into personal computing, and you have the $270 plus for this course, then it's a good way to go. On the one hand, you'll get experience building an electronic kit (the M6800-based Microprocessor Trainer), and on the other, you'll get reasonable explanations of how the pieces all fit together.

Don't be anxious about building the trainer; it took us roughly one week of evenings. We'd heard that anybody capable of tying their shoes could build a Heathkit. That may be too stringent a requirement: our assembler, who's never built anything electronic, wears boots exclusively. He only encountered one problem: when he plugged it in, nothing happened. Upon closer inspection, it turned out that, in his haste, he soldered the line cord to the wrong lug, and the



microprocessor trainer wasn't getting any juice. After a two-minute repair, he plugged it in, pushed RESET, and, as hoped for, the LED display lit up saying CPU UP. So much for assembly.

Up and running

With the trainer up and running, we turned to the course. Its first three chapters will tend to be old hat for individuals involved daily with programming; for the record the chapter headings are Number Systems and Codes, Microcomputer Basics (a description of a simplified microprocessor, which aside from word size, might be any single accumulator computer), and Computer Arithmetic.

After covering the basics we got to the crux of the matter. "In the final analysis," says the introduction to chapter four, "there are only two things you can do with a microprocessor. You can program it and you can interface it with the outside world."

Up to this point the student has performed four programming experiments, gaining experience in working with hexadecimal numbers, and learning a few machine instructions. With chapter four, Introduction to Programming, the course takes on branching and the functions of the various condition code flags. Bear in mind that this course assumes no prior knowledge of programming; it includes some descriptions of the art which won't sit well with professional programmers (after "defining the problem," flowcharting is defined as the second stage of the program development process). Pros also may not like having to assemble their code by hand, but it's a valid part of the learning process; for that matter the trainer has only a 17-key, dual function hexadecimal/command keyboard.

Digging deeper

In the first four chapters the student works within the confines of a simplified model of a microprocessor. Chapters five and six (The 6800 Microprocessor—Parts 1 and 2) introduce another accumulator, and a pair of 16-bit registers—the index register and the stack pointer. The rest of the instruction set and I/O programming also are explained. The last of the ten programming experiments demonstrates how to address each segment of the six seven-segment LED displays, how to call monitor subroutines to output data, and finally, through a series of refinements, how to program the trainer as a twelve-hour digital clock.

Interfacing, the other thing you can do with a microprocessor, gets treated in chapters eight and nine, with nine interfacing experiments. At the beginning of chapter seven we found that we were expected to have "a general knowledge of digital electronics." (Looking back to Heath's catalog, we found this prerequisite.) Our reviewer, who doesn't know enough electronics to tell you Ohm's Law, did know a little about digital circuits: he can, with suitable time allowed for reflection, recognize the symbology. That was enough. For that matter, the two chapters are sufficiently lucid to explain what's going on (three-state logic, control lines, memories and address decoding, and the Peripheral Interface Adaptor chip) to anyone paying attention.

If you don't have digital and electronics background, you may not be able to design your own interfaces, but at least you'll have a good idea of what's going on.

—Bill Musgrave

source data

reports & references

Mainframe User Bases Surveyed

Published by DATAMATION, this survey of over 4,300 sites using mainframe equipment valued at nearly $4 billion reveals attitudes and plans of IBM, Honeywell, Univac, Burroughs, and NCR users.

The comprehensive 300-page analysis of the marketplace details user buying intentions, including projected needs for plug-compatible cpu's and peripherals, minicomputers, and network systems. Also covered are trends and preferences such as purchase vs. lease decisions, software attitudes and plans, and supplier evaluations—from the *user* perspective. 1978 dp budget expectations and predictions for 1979 as well as many charts and graphs with accompanying notes of explanation are given in the 1978 Mainframe User Survey, priced at $950 and available from Deborah Dwelley, DATAMATION, 35 Mason Street, Greenwich, CT 06830.

Datacommunications Guide

The New *Auerbach Guide to Modems and Communications Test Equipment* is designed to help achieve cost-effective performance of modems, acoustic couplers and communications test equipment, and to provide quick and efficient methods of locating the cause of system line failures. Tutorials, spec charts and product reports are featured, as well as a directory of over 50 major suppliers. The guide is $24.95 ($29.95 outside the U.S. and Canada) from AUERBACH PUBLISHERS INC., 6560 North Park Drive, Pennsauken, NJ 08109.

Distributed Systems

This four-volume, two-inch-thick report summarizes discussions with users, manufacturers, systems houses and consultants; the tome may well be the definitive 150,000 words on the distributed processing phenomena. Split into sections separately oriented to management and technical types, a good deal of ground is covered including detailed information regarding the inner workings of SNA, X.25 and the IBM Series/1.

Vol. 1 is highlighted by some attempts to predict future IBM strategies. Vol. 2 is for the technicians. Detailed reports regarding approaches taken by 17 major installations fill Vol. 3, while Vol. 4 is a compendium of 11 appropriate technical papers. Written in the U.K., the report nevertheless reflects the multinational character of the problems and solutions. Price: $1,500 including packing and air mail; an IBM only subset is available for $500. Immediate delivery from EXPERTISE INTERNATIONAL LTD., Cleveland Road, Uxbridge UB8 2DD, England.

Japanese Directory

This 150-page directory of who represents whom is published annually by Japan Market Consultants, Ltd. The complex and often confusing Japanese distribution network includes both direct representatives and trading partners as well as some organizations that are both. This volume acknowledges the overlap but tries to sort them out for the Western businessman. Included are alphabetical listings of U.S. and European firms and their products together with information as to who is doing the marketing in Japan. Addresses and product listings are updated annually free of charge by the publishers. For the trading companies, the address and name of the chief marketing executive is included. Price: $95 prepaid, $105 if invoice is required. Available through GRAYDON ASSOCIATES INC. P.O. Box 566, Red Bank, NJ 07701.

Task Force How-To

Recommended as a productivity aid and a method for solving complex management problems, task forces can be particularly helpful when the solution must be interdepartmental. "How Task Forces Can Help You Solve Problems," a new report from Research Institute of America, covers how to set up a task force and how to make it work, with case study descriptions of task force applications. The cost (to non-members of RIA) is $3.50, prepaid. Department 111, RESEARCH INSTITUTE OF AMERICA, Mt. Kisco, NY 10549.

Computer-Aided Manufacturing

The 180-page proceedings of CAM-I's Sixth Annual Meeting contains a wide variety of papers on computer-aided design and manufacturing. The emphasis is on geometric modeling, process planning, numerical control and shop floor control, with specific subjects addressed ranging from drafting considerations to a call for the cooperation of education and industry. Included are a European Report, a Japanese Report, and various future plans and projections. $18 from CAM-I LIBRARY, Suite 1107, 611 Ryan Plaza Drive, Arlington, TX 76011.

Software Directory

"Interactive Graphics Programs" contains description of programs used for varied applications, such as management reporting, statistical presentations, and financial analysis. For each program there is a general description, special features, number of years the program has been available, date of last up-date or improvement, approximate number of users, purchase price, and types of compatible equipment. Also given is introductory information and a guide to selection of programs. The directory is part of a three-volume set which covers various aspects of remote computing. The graphics directory singly is $15 (prepaid). From Association of Time-Sharing Users, which also publishes a bi-monthly newsletter *Interactive Computing*. ATSU, 75 Manhattan Drive, Boulder, CO 80303.

DBMS Selection

"A Buyer's Guide to Data Base Management Systems" compares key characteristics of 15 leading systems: DBMS-10, DBMS-20, DL/1DOS/VS, DM-IV/I-D-S-II, DMS II, DMS/90, DMS-1100, INQUIRE, MODEL 204, SYSTEM 2000, TOTAL, ADABAS, DATACOM/DB, IMS, and IDMS. The latter five systems are also evaluated in depth. The guide aims to help the prospective user in the selection and installation of the DBMS best suited to his need, and includes information about features such as recovery, configuration, pricing and vendor information. $12 from DATAPRO RESEARCH CORP., 1805 Underwood Blvd., Delran, NJ 08075.

Advanced Technology Summary

Volume IV, No. 10 of FAIM's Current Technology Report, "Technological Trends 1977 to 1983," groups latest developments in the dp field into two categories: the first section, written by Louis Speilman of American Express, is about mini- and microprocessors and distributed processing; the second, by Peter Mackersie of Western Electric, covers trends in data networking. Coverage is straightforward and includes speculation on the future of such topics as systems development, design languages, network requirements, and the "Bell Bill." The report apparently stems from a Business Users Group meeting (no specific meeting of the New York group is cited).

The analysis includes many figures showing costs and detailing microprocessor hardware. Also contained are simple diagrams of telecommunications hardware, including front-end configuration, basic circuit arrangement, transmission control unit functions, and projected future configurations. Available for $25.00 from FAIM TECHNICAL PRODUCTS, INC., P.O. Box 1013, Melville, NY 11746.

(Continued on page 61)

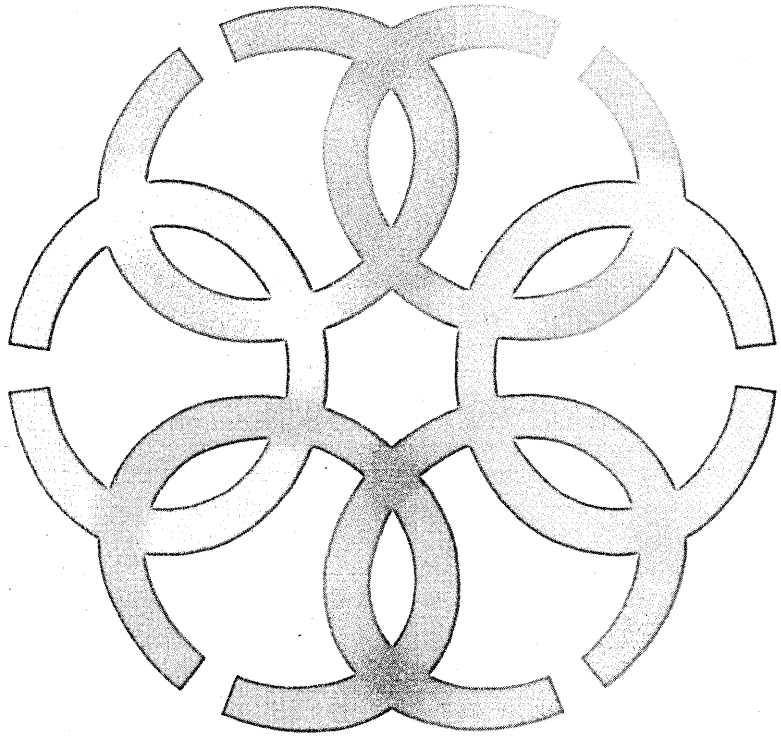
Imagine:

A large-scale computer system.

Functionally dispersed data processing.

A common, integrated data base.

Unlimited growth without economic penalty.



The ARC™ System

from Datapoint.

Put
Your
Imagination
to
work.

Turn
the
page.

Imagine. A large-scale computer system that would solve all of the problems that system planners have complained about in conventional computer architecture. That would work and grow without interruption, without extensive operator re-training, and without endless new model upgrades. A system that will adapt itself to your budget, and not the other way around.

The Attached Resource Computer™ System is Datapoint Corporation's solution to the inherent problems of conventional computer system architecture. It will eliminate the headaches which until now have seemed inevitable. Like updating several data bases, costly programming changes, and complete system failure. Not to mention the huge expenditures involved in hardware upgrades.

The ARC™ System is an *attached processing* system — based upon the idea of functionally dispersed processing resources, located in a company's offices, stockrooms, transaction counters, and warehouses. Operating independently, and yet as parts of a whole.

Because ARC allows all of these task-oriented processing stations access to the common data base, in as large (or small) a capacity as each company's needs dictate.

A unique modular architecture

How can ARC combine the effective throughput of a large traditional computer with the flexibility and convenience of a small computer?

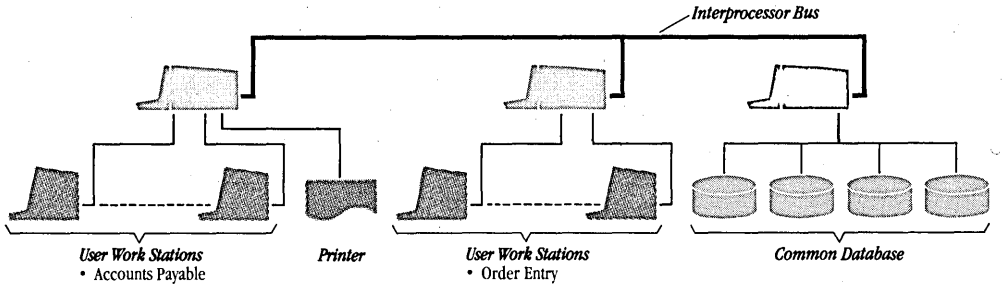
Because it takes the two basic functions of any conventional computer — applications program execution and data file management — and distributes them among two or more specialized computers: the applications processor and the file processor.

By attaching these two types of functionally specialized processors to an ARC System, each company can select just the right amount of processing power and on-line data storage that it needs. Without over-buying to stave off some future requirements. Or over-burdening an existing, insufficient computer.

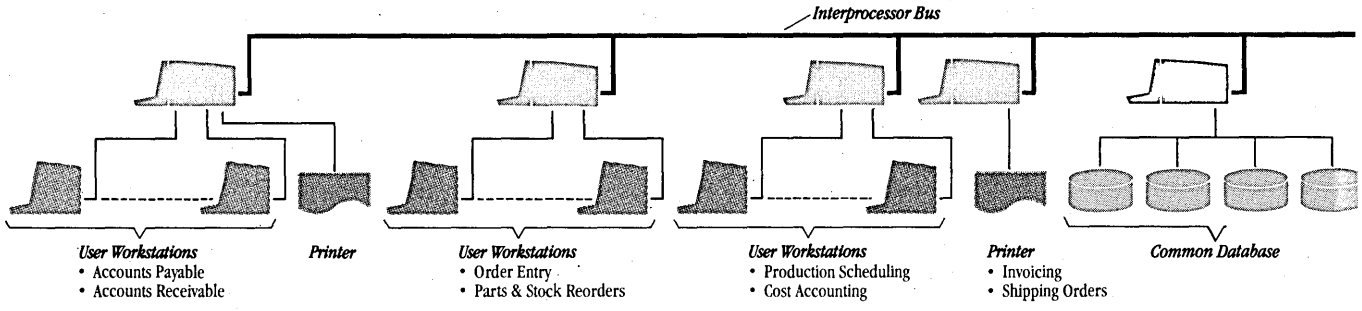
Unlimited growth without economic penalty

If more processing muscle becomes necessary as time passes, just add another Datapoint applications processor. Right where the work gets done. And if data

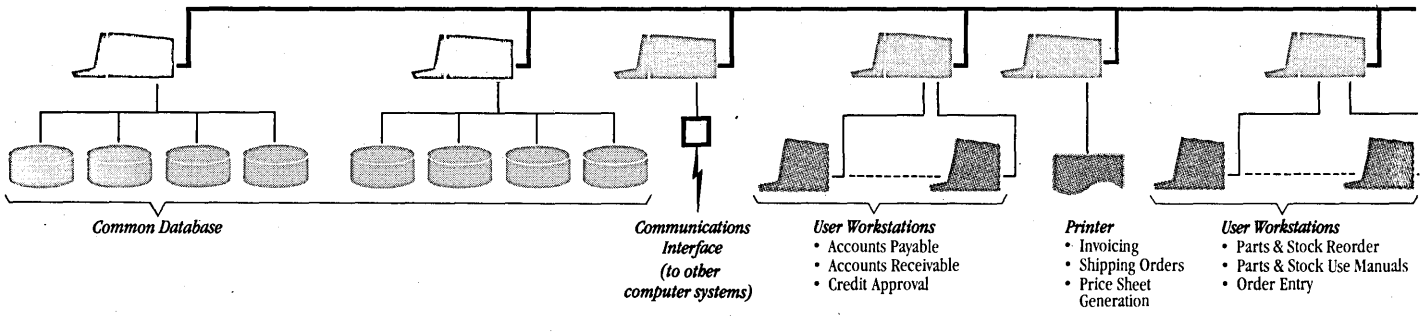
A small ARC system.



A medium ARC system.



A large ARC system.



handling capacity (or speed) needs to be boosted, additional file processors will each provide up to 200 megabytes more disk storage. While preserving the commonality of the data base. And at predictable, economical costs.

Every ARC system comes equipped with user-definable security software that allows each company to restrict access to the data base in several ways.

But the best news is that there is no central processing unit to get bogged down. No single component that will drag the whole system under if it fails. With the Attached Resource Computer, adding (or removing) any attached component requires no system downtime, no re-programming, and no re-training.

Functionally dispersed resources

The ARC System uses an electronic pathway called the Interprocessor Bus to communicate requests and data from one attached resource to another. This communication takes place at such high speeds that applications processors can get the data they need faster than if it were on their local disks. Even though the source of the data may be in another department.

Any number of applications and file processors may be connected to the Interprocessor Bus and located in the offices where they're needed. Each applications processor can have the printers, card readers, magnetic tape, or local disk storage that a traditional computer would have. And each applications processor can be dedicated to its own function, using any of the software in Datapoint's extensive library:

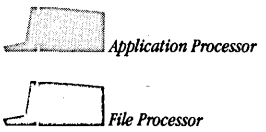
- DATASHARE® for multi-user, on-line transaction processing;
- COBOL for industry-standard batch processing;
- DATABUS®, RPG, SCRIBE®, and BASIC for other business needs;
- Telecommunications to other computer systems with Datapoint's networking software.

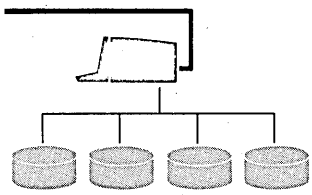
In fact, ARC even enables an existing IBM 360/370 mainframe to come on-line as an applications processor, using Datapoint's Direct Channel Interface Option.

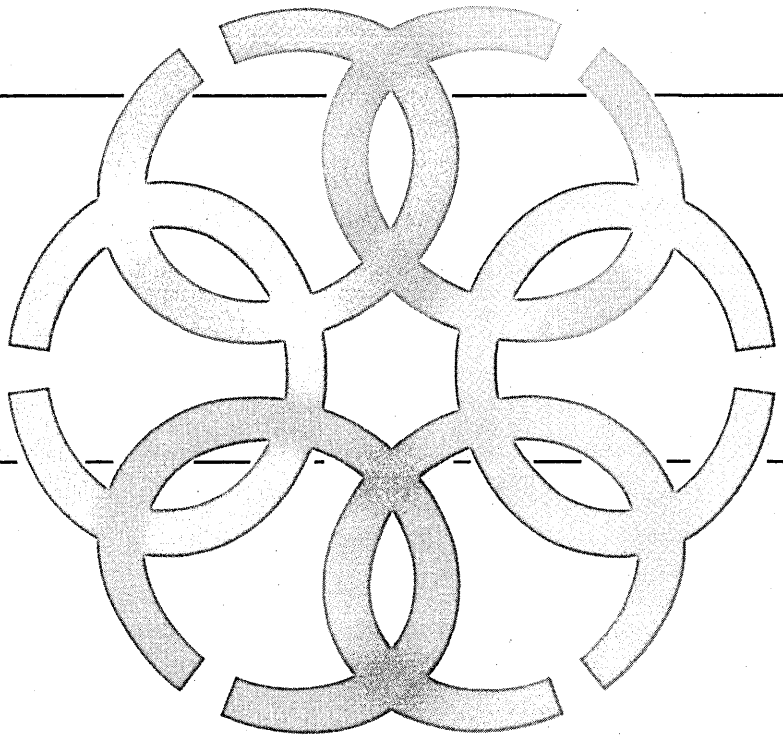
ARC supports all of the functionally dispersed tasks to be carried out at the same time — all on the common data base of the file processors.

Use your imagination.

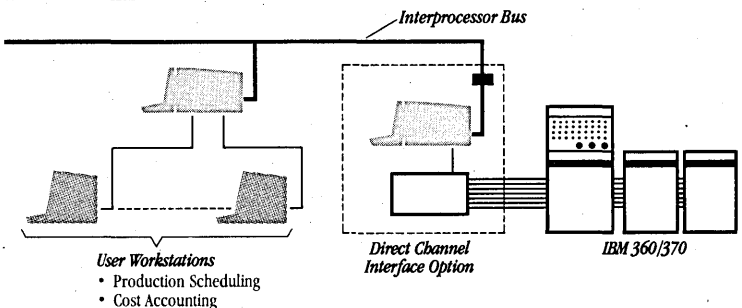
Take a look at some typical ARC Systems. And just imagine how they could be put to work for you.







The ARC™ System



ARC™ system components

Datapoint provides you with all the building blocks necessary to construct an Attached Resource Computer™ System to meet your needs.

Processors

6600 Advanced Business Processor, 120K user memory, supports all Datapoint peripherals and up to 24 user workstations.

5500 Advanced Business Processor, 48K user memory, supports all Datapoint peripherals and up to 16 user workstations.

6000 Series Attached Processors, 60K or 120K user memory, supports all Datapoint peripherals and 16 or 24 user workstations.

3800 Series Attached Processors, 60K and 120K user memory, for single-user data processing, data entry, and telecommunications.

1170 Dispersed Processor, 48K user memory, supports Datapoint peripherals and up to 4 user workstations.

1150 Dispersed Processor, 24K user memory, supports all Datapoint peripherals.

Peripherals

Disks:

25MB Mass Storage Disk drive, up to 200MB per processor as a local or common database

20MB Cartridge Disk drive, up to 160MB per processor as a local or common database

5MB Cartridge Disk drive, up to 40MB per processor as a local database

Printers:

30 cps Servo printer
80 or 160 cps Freedom Printer
120 LPM printer
240 LPM printer
300/600 LPM printers

Magnetic Tape Drives:

7 and 9 track

556, 800, and 1600 bpi recording densities

Software:

COBOL: industry standard business programming language

BASIC: general purpose business programming language

RPG: report-oriented business programming language

DATABUS/DATASHARE®: Datapoint's high-level business programming language for single or mulitple users

DATAFORM/MULTIFORM®: Datapoint's two-level data entry and checking language

DOS: powerful operating system with comprehensive utilities

SCRIBE®: Datapoint's powerful yet easy-to-use text processing language

DATAPOLL®: Datapoint's automatic polling and data communications program

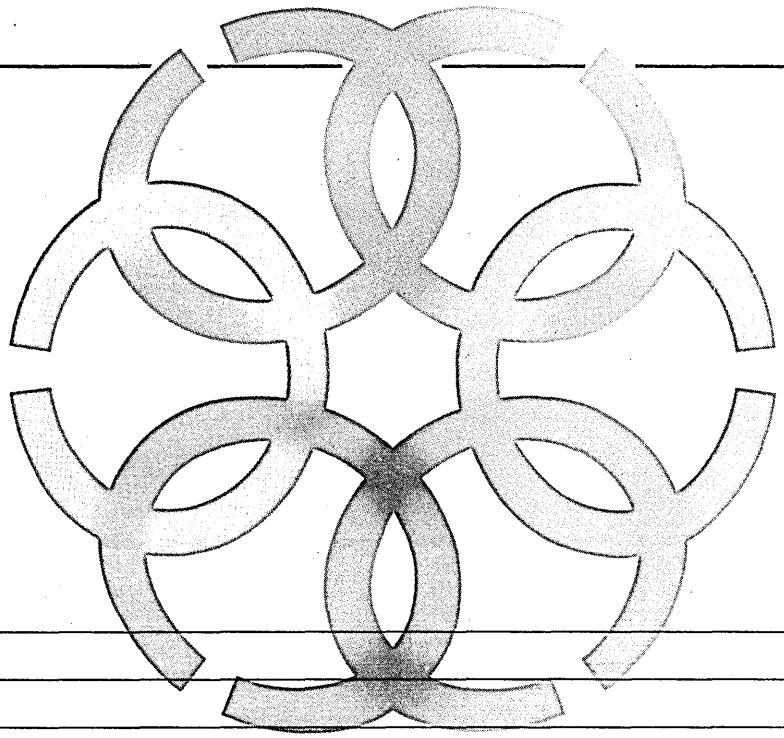
Communications: IBM, Honeywell, Burroughs, Univac, and other disciplines

Use your imagination.

Mail this coupon today and find out more about the most important development in data processing since the minicomputer: the Attached Resource Computer. From Datapoint.

DATAPOINT CORPORATION

The leader in dispersed data processing™



Datapoint Corporation
Attn. Marketing Communications
9725 Datapoint Drive
San Antonio, TX 78284

Tell me more about the ARC System!

Name _____

Title _____

Company _____

Address _____

City _____

State, Zip _____

Do you presently use Datapoint equipment? _____

CIRCLE 59 ON READER CARD

source data

(Continued from page 56)

Master Calendar Available

A calendar of meetings sponsored by AFIPS and other computer groups between now and 1981 is now available. The calendar will be updated quarterly, and information processing organizations are urged to contribute to the April 1978 edition. For a complimentary copy of the calendar or for inclusion of your schedule, contact Diane Stellingwerf, Editor, AFIPS Master Calendar, AFIPS, 210 Summit Ave., Montvale, NJ 07645.

vendor literature

Kits

The latest Heathkit catalog packs information on nearly 400 electronic kits and related products into 104 illustrated pages. Eight pages are devoted to Heath's two personal computers and related peripherals. Another two pages describe related self-instructional courses and applications software. Related products include test equipment, tools, and books. And for those who want to leave computing behind at the office, there's stereo equipment, televisions, ham radios, a pinball machine, and an indoor greenhouse, just to name a few. HEATH CO., Benton Harbor, Mich.

FOR COPY CIRCLE 438 ON READER CARD

Communications

Acoustic coupling at 1200 bps, and a replacement for Bell's 101C data set are the topics of two brochures from this vendor. In the acoustic coupler brochure, readers will find a discussion of automatic line turnaround, reverse channel, and filtering and transmitter design. Also discussed is how the unit's intelligence establishes line control and makes the two models in the line compatible with Bell 202C or 202CR modems.

FOR COPY CIRCLE 450 ON READER CARD

The second brochure describes the model 4700-Omni-DATX, which is designed to replace the Bell 101C data set, operating over TWX, or optionally, direct distance dial (DDD) communications lines. Auto/answer (for unattended operation), half duplex switching, and frame break signal are among the topics discussed. OMNITEC CORP., Phoenix, Ariz.

FOR COPY CIRCLE 448 ON READER CARD

Microcomputer Modules

Microcomputer modules and software are described in this eight-page brochure. After a few brief introductory comments, the pamphlet introduces the vendor's line of modules for data collection and industrial control. Displayed in a top-down fashion, with an 8080A-based cpu module on top, the line includes memory and I/O controllers, memory and I/O modules, and digital logic modules. A card file and a rack-mountable card drawer also are described. The vendor's support software, including assemblers, debuggers, math utilities, and high-level process language also are listed. With the exception of the math utilities, this software is available in micro-resident or PDP-11 versions. WYLE LABORATORIES/COMPUTER PRODUCTS, Hampton, Va.

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Two Catalogs In One

A technique popularized by the publishers of low budget paperback books, printing two titles between the same covers, has been used in this vendor's 1978 catalog. On one side it's the System Builders' Catalog from the vendor's personal computing division (it claims to be the "world's largest personal computing center"); flipping the 84-page booklet over brings the reader to the front cover of the vendor's used com-

source data

puter and peripheral catalog. Although we haven't counted, it certainly looks as if the vendor is right when it says the catalog describes more than 1,500 computer-related products from better than 170 different vendors. Among the products included are minicomputers, systems, and peripherals from Digital Equipment Corp., as well as minicomputers and/or peripherals from such vendors as Data General, Centronics, Wangco, Pertec, Data Products, Lockheed, Control Data, and Diva.

Need something bigger? How about an IBM360/75 or a lease package on a 370/168? For those interested in the personal side of computing, the catalog includes entries on Southwest Technical's SWTPC 6800, Intersil's Intercept Jr., Processor Technology's SOL-20, and Imsai's 8080 microcomputers, to name a few. Personal computing peripherals and software also are covered. The catalog devotes more than 10 pages to books covering BASIC, software, hardware, applications, and entertainment and games. The catalog sells for $1; it's available from American Used Computer Corp., P.O. Box 68, Kenmore Station, Boston, MA 02215.

Communications

"Communications: Toward a Global Community" consists of three articles discussing the transmission of information between computers, people, and sensors. The lead-off paper, "Computer Networks: the New Information Robots," concentrates on the merging of dp and communications. It discusses methods of delivery, including switched circuits, leased lines, packet switching, and satellite services, proceeds to information security and remote computing services, finally ending with a look at teleprocessing and its future.

"Moving People," the second title in the booklet, presents an overview of the communications system used by MARTA, the Metropolitan Transit Authority in Atlanta. MARTA's system provides communication for people, computers, and remote sensing devices.

The last article, "The 15-Minute World," describes C^3 — Command Control Communications — applications in national defense. The 16-page illustrated booklet, an issue of CSC Report, will be supplied at no cost as long as supplies last. COMPUTER SCIENCES CORP., El Segundo, Calif.

FOR COPY CIRCLE 443 ON READER CARD

Lighting

Indirect ambient lighting, for use with this vendor's series 9000 modular office furniture, is described in this 12-page, four-color pamphlet. Energy savings and human engineering considerations are discussed, and various configurations are illustrated in photographs and prose. Several pages are devoted to sketches of how modules may be configured, along with tables of dimensions. STEELCASE INC., Grand Rapids, Mich.

FOR COPY CIRCLE 444 ON READER CARD

courses

Telecommunications Planning

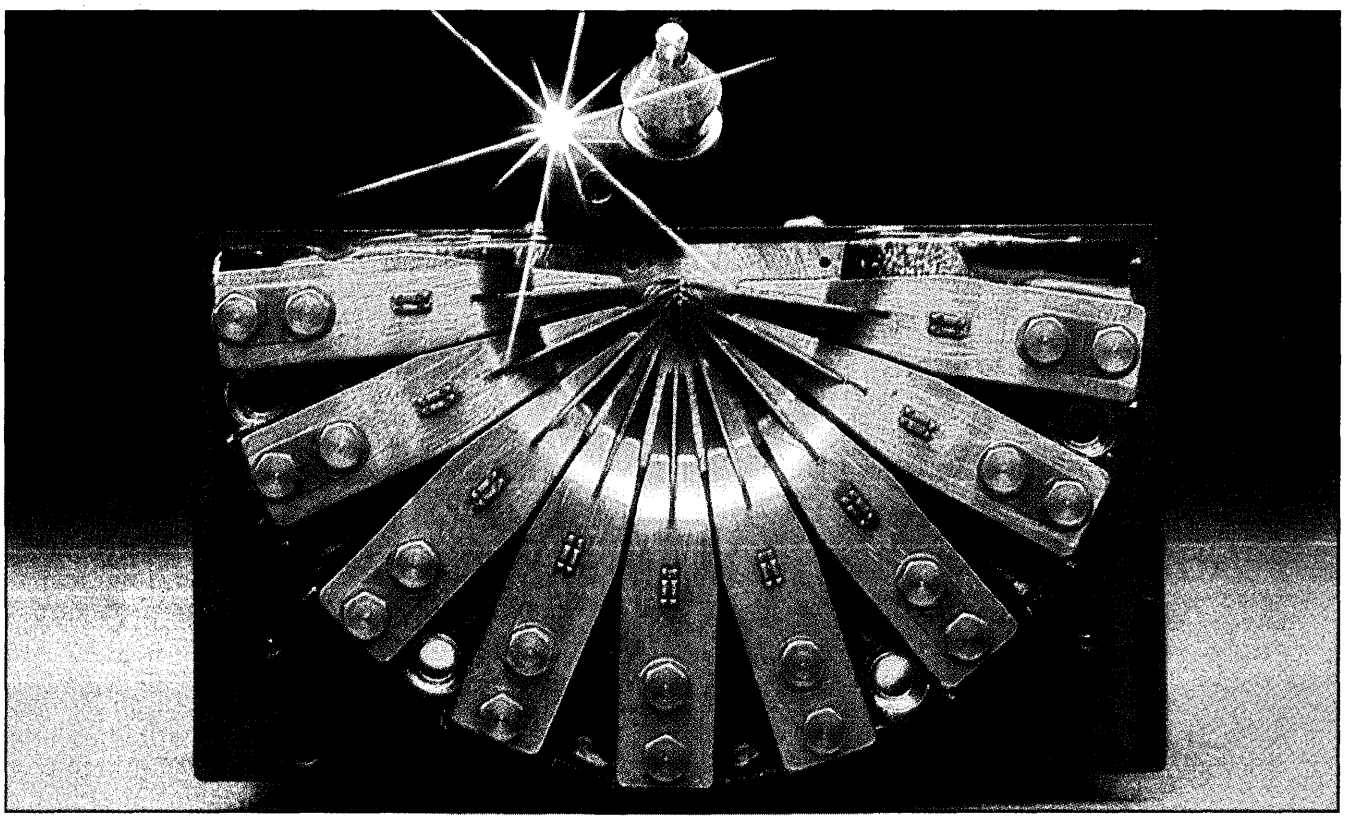
The second Arthur D. Little, Inc., forum on future directions in international telecommunications will be held in Amsterdam April 2-4. Focusing on planning rather than on technical aspects, the forum is aimed at top executives and will feature experts from Arthur D. Little. Fee: $650 (group discounts are available). Contact: Beverly Shackley, ARTHUR D. LITTLE, INC., Acorn Park, Cambridge, MA 02140 (617) 864-5770, ext. 2403.

Office Automation

Richard Miller of The Diebold Group will be the featured keynote speaker at

(Continued on page 66)

LET'S PUT OUR HEADS TOGETHER.



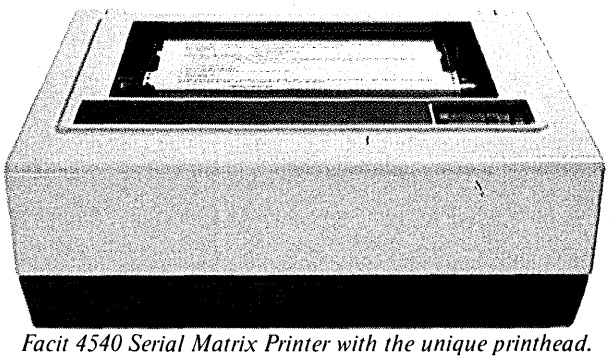
The Facit 4540 Serial Matrix Printer has already made a name for itself with its standard 250 characters a second – all crisp, fullbodied and perfect throughout the 500 million character service life of the printhead. Versatility comes from the rare 9×9 dot matrix, and the Facit 4540 offers a genuine 100% duty cycle and entire elimination of adjustment and lubrication.

The whole secret is in the unique printhead and its microprocessor controlled impact printing mechanism.

Integration of mechanics and electronics has made Facit peripheral data products world famous.

Facit 4540 extends this tradition.

So let's put our heads together. To make your systems more efficient, more competitive and more in demand.



Facit 4540 Serial Matrix Printer with the unique printhead.

FACIT DATA PRODUCTS

FACIT-ADDO INC., 66 FIELD POINT RD, GREENWICH, CONN. 06830. (203) 622-9150. TELEX 96-5998.

Without continuous computer measurement and analysis, there's no way an EDP executive can be held accountable for center efficiency—or lack of it. It's like asking a pilot to fly without instruments!

That's exactly why Tesdata MS Systems are now operational in more than 200 data centers worldwide. The MS System continuously measures the computer's operation, determines where inefficiencies exist, and reports to management in easy-to-understand terms so improvements can be made rapidly.

Independent studies show that most organizations can *easily* improve efficiency by 20% to 25%; most Tesdata MS users are reporting increases of 30% to 40% in workload and substantial reductions in overhead.

Significantly, Tesdata MS Systems are helping also to delay costly new equipment by months, so it is simple to document cash savings on a month-to-month basis. A Tesdata MS System pays for itself nearly as soon as it comes in your door. Just talk to some of our present customers. Don't fly blindly. Use an MS System to chart your future course.

Corporate Headquarters
7921 Jones Branch Drive
McLean, Virginia 22101
Telephone: (703)827-4000
Telex: 89-9489

European Headquarters
Station House
Harrow Road
Wembley, Middlesex HA9 6DE
Telephone: 01-903-6355
Telex: 923917

source data

(Continued from page 62)

an AIIE conference on word processing in New York City April 5-7. The theme will be the evolution of the office through word processing, data processing, and communication technologies. Promised are discussion by users, developers, managers, and planners on the latest equipment, applications, and management techniques. The second day will offer parallel sessions on managing word processing, managing personnel, equipment selection, communicating word processors, and emerging technology. The third day's program is devoted largely to trends and futures. Fee: $330. Contact: AIIE SEMINARS, Dept. PR, P.O. Box 3727, Santa Monica, CA 90403 (213) 450-0500.

Security and Privacy

Honeywell will host a Computer Privacy and Security Symposium on April 18 and 19 in Scottsdale, Arizona. Among the topics to be addressed are third party liability, update on federal activities, transborder data flow, communications protection, security in the distributed environment, contingency planning, and auditing and control. The symposium is aimed at managers and technical specialists. An optional open house and tour of the Deer Valley plant featuring product presentations and systems demonstrations will be offered April 17. Fee: $425. Contact: Jerome Lobel, HONEYWELL INFORMATION SYSTEMS, P.O. Box 6000, MS K95, Phoenix, AZ 85005 (602) 993-3193.

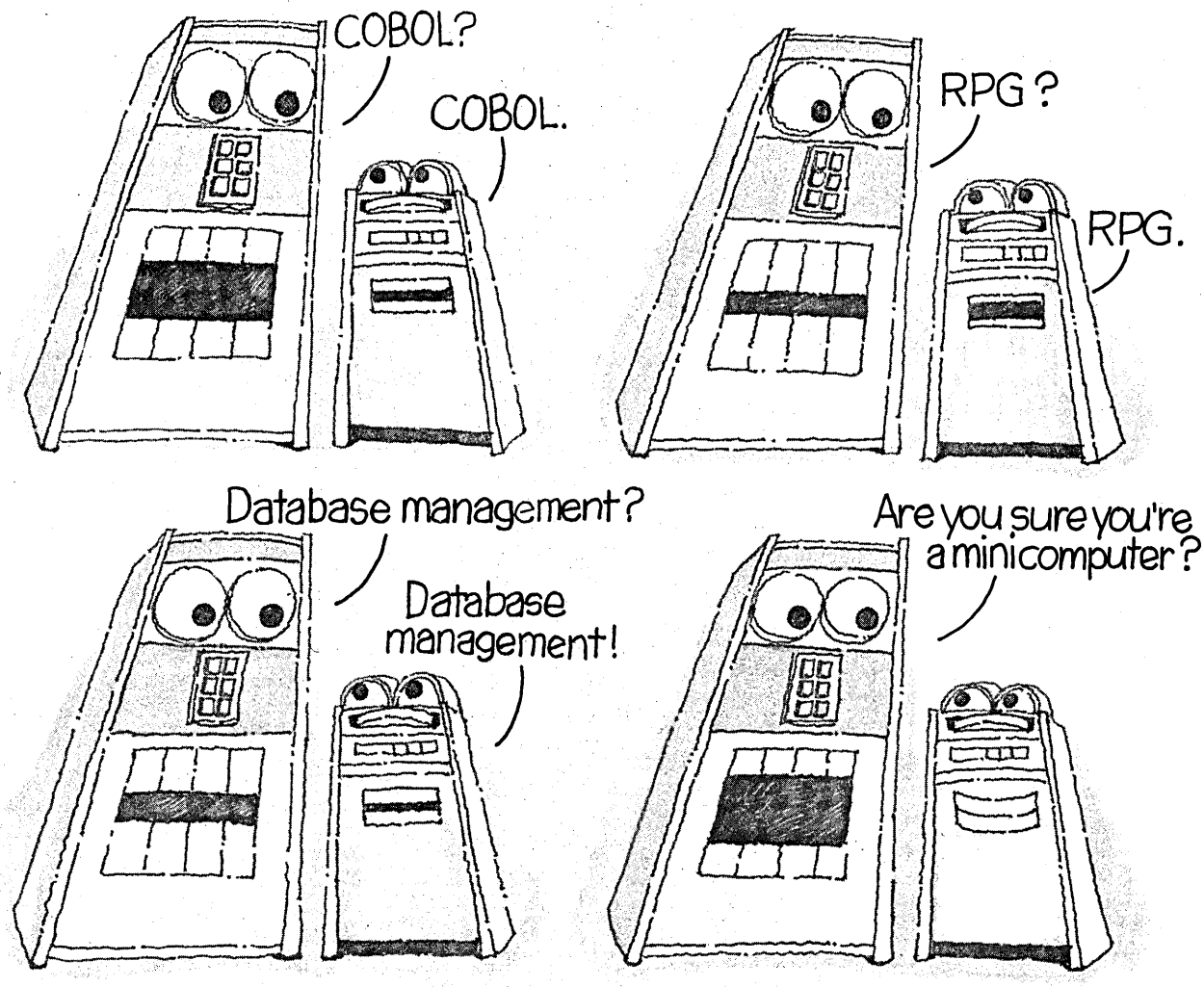
On-Line Systems

User psychology with respect to terminal dialogue, basic functions of an on-line system, software function considerations and potential hardware selection problems are covered by this color video course. Also addressed are reliability and integrity, and an overview of security problems unique to on-line systems. Accompanied by text and exercises, the course is available for rental or sale from ADVANCED SYSTEMS INC., 1601 Tonne Road, Elk Grove Village, IL 60007 (312) 593-1790.

Two From Management Dimensions

Two three-day workshops of interest to dp managers will be offered in San Francisco in April and in May in Chicago. The "Disaster/Recovery Plan" will focus on methods for development of a contingency plan from start to finish, including team organization and responsibilities, off-site procedures,

(Continued on page 70)



Our software speaks your language.

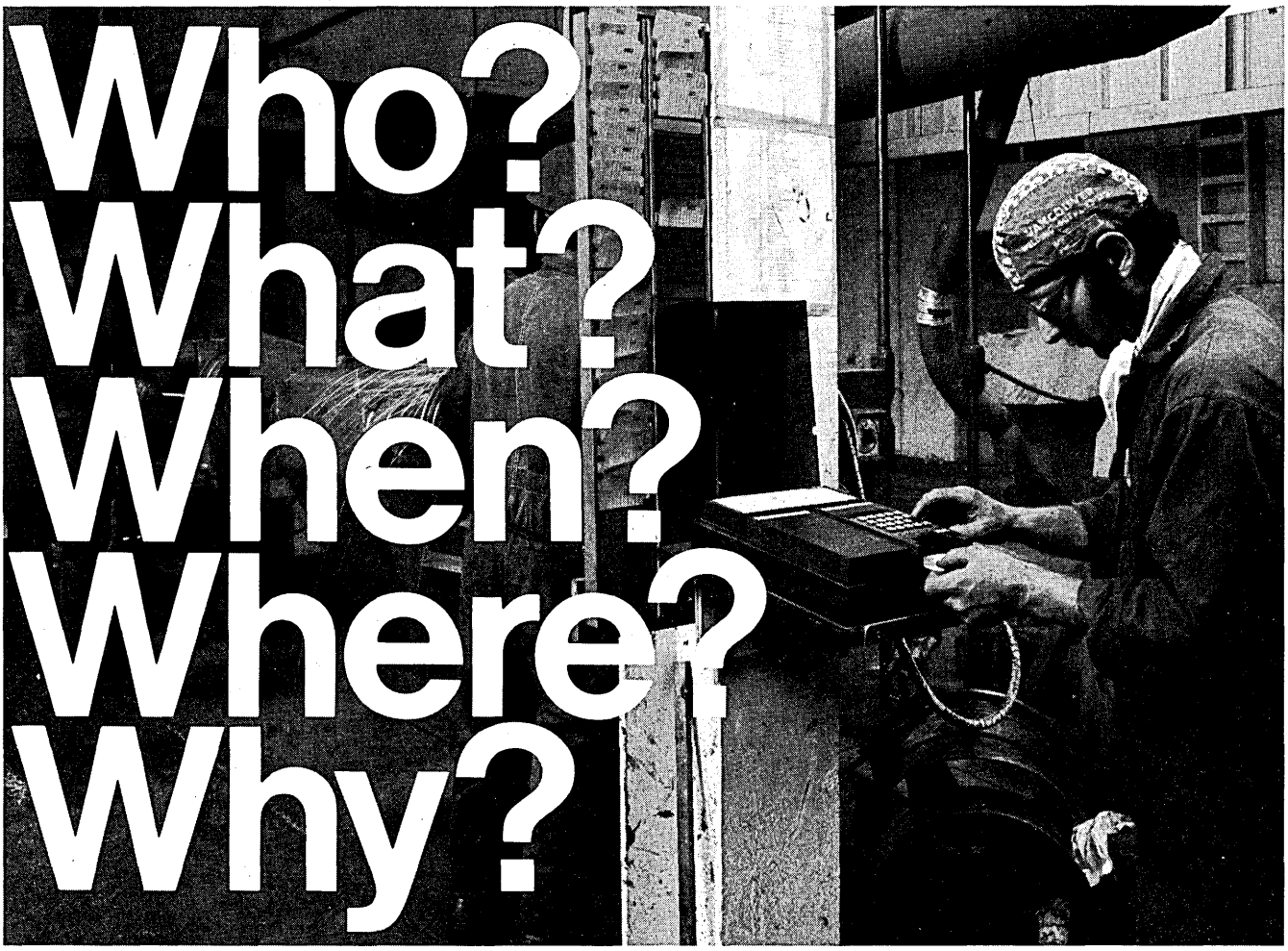
Now the largest manufacturer of interactive minicomputers offers the broadest spectrum of commercial software tools: ANSI '74 COBOL, DBMS, SORT, RPG, QUERY, MULTI-KEY ISAM, and more.

That means even better Datasystem functionality in commercial applications. Better because you get:

- great performance in multi-task environments with our new, easy-to-use, interactive, full-function COBOL
- advanced multi-key ISAM data management with our new RMS-11
- fast, versatile report generation with our RPG II
- super fast sorting of data files with our new SORT-11
- advanced data base facilities with our CODASYL-compliant DBMS-11
- quick easy access to data, plus flexible, selective reporting with our new COBOL-compatible DATATRIEVE-11

What's more, we've dropped our prices. And that means even better Datasystem price performance. For details, contact the nearest Digital office, or Digital Equipment Corporation, Business Products Group, MK-2/H32, Merrimack, N.H. 03054, (603) 884-5432. European headquarters: 12, av. des Morgines, 1213 Petit-Lancy/Geneva. In Canada: Digital Equipment of Canada, Ltd.

digital



That's what data collection is all about.

EPIC DATA offers you a simple, practical, flexible family of data collection products which can economically provide you with the information you need to answer these questions. Information which allows you to create reports on inventory status, job costing, production control, payroll, maintenance scheduling, access control, equipment circulation, time and attendance, goods consignment and circulation control so that management can make better decisions to reduce costs. And thereby increase profit.

WHO All data collected by the system can be pre-prepared. Or, where required, you may input variable data. By simply inserting his identification badge, punched or magnetic stripe, or reading the card's bar code, your employee tells the computer who he is.

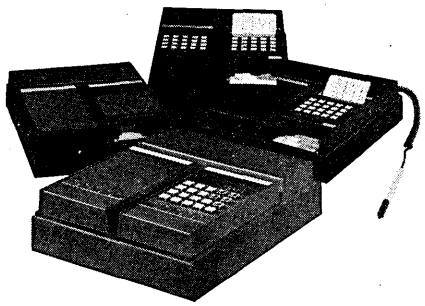
WHAT Job cards, bar codes or key depression – all assigned by management – tell the computer exactly what he's doing.

WHEN An internal clock records when he started and when he finished.

WHERE The location of the terminal or variable key input tells the computer where he's working while travelling cards, bar codes or key depressions on the terminal input the amount of inventory being worked on or used.

WHY This collected data may then be prepared into reports telling you who worked on what, when, where, how many, and, often why or why not this operation was profitable.

CALL US TODAY. An Epic Data representative is ready to discuss how our simple, practical, flexible data collection systems can improve your profits.



epic data

In U.S.A.. 6350 LBJ Freeway/Dallas, TX 75240
Phone (214) 387-3121/TWX 910-860-5676

International: 7280 River Road, Richmond, B.C. Canada
Phone (604) 273-9146/Telex 04-355701

U.S. Sales Offices: 6350 LBJ Freeway, Suite 282, Dallas, TX 75240, (214) 387-3121 • 17 Amfer Court, Bayshore, NY 11706, (516) 666-0797 • 3415 Hickory Trail, Downers Grove, IL 60515, (312) 968-8620 • 1724 South Heather Hill Rd., Hacienda Heights, CA 91745, (213) 965-2886

Representatives: ARIZONA BFA Corporation (602) 994-5400 • CALIFORNIA Moxon Electronics (714) 635-7600 • FLORIDA COL-INS-CO (305) 423-7615 • ILLINOIS Systems Marketing Corp. (312) 593-6220 • KANSAS/MISSOURI Digital Systems Sales (816) 765-3337 • MASSACHUSETTS J & J Associates (617) 729-5770 • MICHIGAN/OHIO WKM Associates, Inc. (313) 588-2300, (216) 267-0445 • NEW YORK Cane Technical Sales (914) 698-4411 • NEW YORK Ossmann Instruments (315) 437-6666 • PENNSYLVANIA WKM Associates (412) 892-2953 • TEXAS DMA (713) 780-2511 • WASHINGTON DPM Associates (206) 453-9082 • UNITED KINGDOM Sintrom Ellinor Ltd. Reading (0734) 85464

The impact of privacy laws on personal information records. And what to do about it.

Few legislative acts will exert greater pressure on your information management facilities than current and proposed privacy protection laws.

Designed to protect you, your employees and others, these far-reaching laws will demand cost-effective control of the collection, maintenance, and dissemination of an increasing variety of personal information.

This will include the control of source documents now stored in *conventional paper files*, as well as the control of your computerized personal data files.

System 200™ by A.B. Dick/Scott is an advanced, updatable micrographic record processing system that can provide the cost-efficient controls needed to satisfy three basic objectives of privacy laws:

1. Ready access to information.

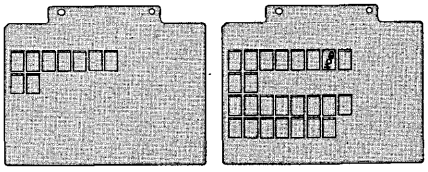
Under privacy protection statutes, it will be necessary to provide individuals having a need or right to personal information with ready access to their records.

You also will be required to furnish authorized individuals with a copy of pertinent information for their reference and use.

System 200 can help you satisfy both of these requirements by permitting ready access to individual records as well as providing suitable file copies without undue effort or expense on your part.

2. Protection against unauthorized access.

Privacy laws will also require recordholders to *safeguard* source documents against privacy invasions thus assuring complete security and confidentiality.



A single piece of 4" x 6" File Film accommodates 60 legal size or 98 letter size documents. Images can be recorded or updated in just 8 seconds.

File Film has an add-on capacity and prior recorded documents can be amended or voided to reflect specific changes.

System 200 can fulfill this requirement with built-in storage and referral controls that make it a highly effective yet completely practical "security screen."

All records related to an individual file are imaged on a master File Film which never leaves the central file area.

3. Accurate, up-to-date information.

A further requirement of privacy laws will involve the continuous need to control the *quality* of information subject to referral by authorized individuals.

This means the maintenance of accurate, up-to-date records which can be readily amended, voided or annotated for reliable audit trails or compliance with legal requirements.

System 200 is a completely *updatable* system already being used to maintain accurate, up-to-date personnel, medical, credit, law enforcement, insurance, and tax records in both the public and private sectors. To date over 30 million records have been imaged and stored on System 200 File Film.

Free brochure contains vital information.

Personal Information Records Management With System 200 covers a variety of record management subjects related to privacy protection laws, including file integrity, audit trails, and various legal requirements. Send for your free copy now. A.B. Dick/Scott, South Hadley, MA 01075. Telephone (413) 538-7550.

A.B. Dick/Scott is a joint enterprise of A.B. Dick Company and Scott Graphics, Inc., A Subsidiary of Scott Paper Company.

A.B.DICK/SCOTT

source data

(Continued from page 66)

backup procedures, transportation, internal auditor and plan maintenance, and more. "Increasing dp People Performance" will be a non-technical approach to solving personnel problems, such as lack of motivation, defensive actions and non-productive interpersonal relationships. Both workshops are also available as in-house programs, tailored to the needs of an individual organization. Fee: $430, plus $50.00 registration. Contact: MANAGEMENT DIMENSIONS, 1754 E. Morada Place, Altadena, CA 91001 (213) 797-1430.

Software/Hardware Tradeoffs

The three-day course "Software/Hardware Tradeoffs in Systems Development" will discuss design procedures that encourage such tradeoffs, and development procedures that maintain the connection between hardware and software progress. Distributed versus centralized intelligence, long-range maintainability and reliability, and software/hardware testing and documentation are among the topics to be discussed; realistic examples are promised. The course will be offered in Los Angeles April 24-26, in London May 22-24, in Washington, D.C. June 26-28, and in Amsterdam July 17-19. Fee: $445 (group discounts are available). Contact: TECHNOLOGY SERVICE CORP., 2811 Wilshire Blvd., Santa Monica, CA 90403.

periodicals

Information and Management

The IFIP Information Systems Group (IAG) now publishes the bi-monthly journal *Information and Management.* The journal aims to provide managers and administrators with material for training and education, to encourage progress in information system methods and applications, and to cover the latest developments in the field. Major categories are: applications, techniques, case studies, books, briefings and research, as well as articles. Potential articles are being accepted by Professor E.H. Sibley, Dept. of Information Systems Management, University of Maryland, College Park, MD 20742. Subscription price for libraries is $46.95; for individual research workers, $24.75. NORTH-HOLLAND PUBLISHING CO., P.O. Box 211, Amsterdam, the Netherlands.

Datacomm Plus Distributed

Datacomm Awareness Report announces a change of its name and focus to *Datacomm and Distributed Processing Report.* Directed toward dp, data entry and datacomm managers, upcoming issues of the monthly will cover distributed dp systems architectures, the Datapoint Attached Resource Computer System, the IBM Series/1 and PABX (Private Automatic Branch Exchange). Subscriptions are available for $70 per year from MANAGEMENT INFORMATION CORP., 140 Barclay Center, Cherry Hill, NJ 08034 (609) 428-1020.

Word Processing Newsletter

Newly available is *The Seybold Word Processing Report,* a monthly newsletter focusing on "the more complex video terminal oriented equipment." Each issue will contain an 8- to 10-page analysis of a particular system or an industry overview, and reports of new developments in the field. Cost is $60 per year, with discounts available for quantity orders and non-profit organizations. SEYBOLD PUBLICATIONS, P.O. Box 644, Media, PA 19063 (215) 565-2480.

Performance Management Handbook

A two-volume loose-leaf handbook is offered which contains tutorials on tools and techniques for a quantitative approach to edp performance management. Also included are descriptions of related commercial products. Vol. 1, "Audit and Control," released in January, can be used either as the basis for a management review and audit or as a guide for setting up a formal performance management program. Emphasis is on user requirements. Vol. 2, "Tools and Techniques," scheduled for release in April, provides information on available products and approaches for performance studies or analyses. Job accounting, monitoring, program optimization, operations control, communications, simulation and modeling, benchmarking, and statistical analysis are included. Quarterly updates will provide appropriate case material, describe new products and service, and update the bibliography. Price, including updates: $350 yearly; single volume, $195. APPLIED COMPUTER RESEARCH, P.O. Box 9280, Phoenix, AZ 85068.*

An unstructured programmer named
Brad,
Whose technique was terribly bad,
When told to eschew
The use of "go to"
Replied, "It's simply a fad."

—Skip Jordan

The price you pay for success ust went down. Way down.

You pay a price to be successful ith computers. A high price.

But you don't pay in cash. You pay aggravation. Lots of it. Late nights. lenty of them. And pains in your gut. harp ones.

At Perkin-Elmer we're working to ring down that price. Here's how.

Tell us what you want in omputer products.

We build computers and periphrals for people who've been there efore. People who have had enough ggravation. People who know what ey want. And aren't afraid to tell us.

In fact, we encourage our customrs to tell us what they want. Not the ther way around. Which, if you think r a minute, is a terrific first step on e road to success.

But, the real secret to success is service. The old-fashioned kind. The kind where we go to great lengths to make sure you succeed. The kind that only a Fortune 500 company can provide.

We'll do everything we can to make you successful.

For us, service begins with building computer products for people to use comfortably. Invariably, that pays big dividends in less operator fatigue and more usable work over the life of the product.

But, we don't stop there. We test every product. For two reasons: to make sure you get exactly what you order and to prove to ourselves that our product meets our own exacting specifications.

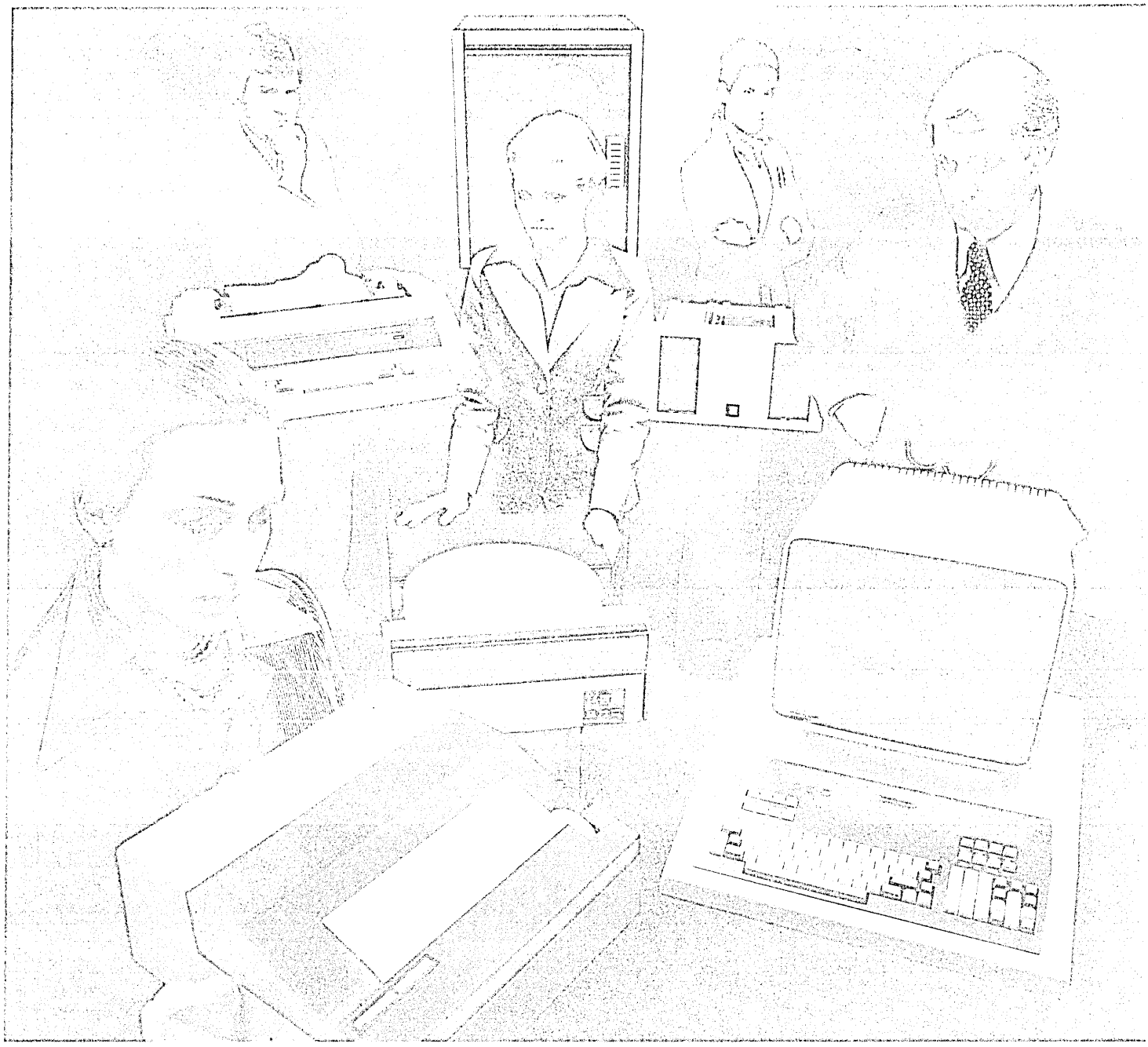
We provide training, too. At your place or ours. And if you need customer service, one toll-free call gets it. Days. Nights. Weekends. We're there.

Think about that when you're buying your next computer, peripheral, or system. Then call Perkin-Elmer. And pay less for success.

For more information, write Perkin-Elmer Data Systems Sales and Service Division, 106 Apple Street, Tinton Falls, New Jersey 07724 or telephone toll-free (800) 631-2154.

PERKIN-ELMER

Data Systems



The secret to success is a little bit of selfishness. And Perkin-Elmer peripherals.

We're a little bit selfish.

Let's face it.

You want to be successful. We want you to buy Perkin-Elmer peripherals.

The more successful you are, the more Perkin-Elmer peripherals you'll buy.

That's why we set up our entire peripherals operation to help make you more successful.

It's really quite simple. And a little bit selfish. Here's the way it works.

We make you really price competitive.

[illegible] just as bad. So at our Terminals and Wanger Divisions, we build peripherals with only the features you want, and you pay only for the features you need.

Selling your peripherals in your product means your product hits the market sooner and stays on the market longer. Because, together, we thought it out. And matched it to the application. From the very beginning.

Over 200,000 quality products.

When you buy Perkin-Elmer, you buy proven quality. Right now, Perkin-Elmer has over 200,000 terminals, printers, and disk, tape, and floppy drives out there. Working. In systems just like yours. That's quality.

Support when you need it.

[illegible] customers). And especially for service. In fact, one call to our No Hassle Toll-Free 800 number gets you service. When you need it. Where you need it.

QC to stretch your service dollars.

Uncompromising QC. That's how we became a Fortune 500 company.

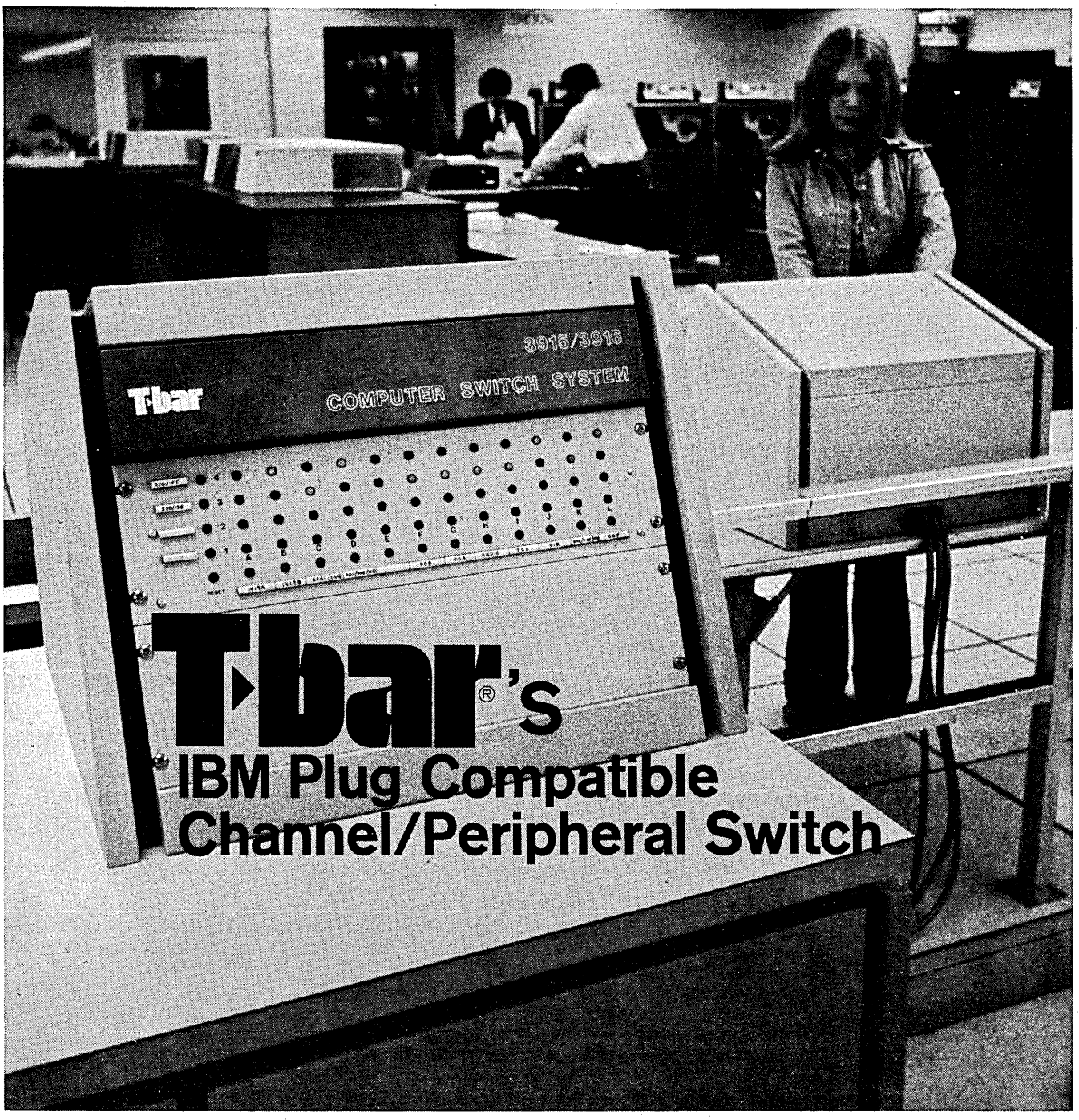
Perkin-Elmer QC people and their test procedures are the best in the industry, which means your peripherals are more reliable and your service dollars go a whole lot further. We invite you to join us and see for yourself.

Now you be a little bit selfish.

In fact, why not get started right away? For more information, write Perkin-Elmer Data Systems Sales and [illegible]

PERKIN-ELMER

Data Systems



T-bar®'s IBM Plug Compatible Channel/Peripheral Switch

T-BAR 4x12 Channel/Peripheral Switch Installation

For more efficient use of peripherals

T-BAR's 3915/3916 matrix switches for use with ITEL, AMDAHL and IBM 360/370 type computers permit load balancing by sharing printers, tape drives, discs and front ends between CPU's. Greater configuration flexibility is attained by using the larger T-BAR matrix sizes — up to 12 computer channels and 12 strings of up to 4 peripherals each — 12x12.

The 3915/16 computer switch speeds system restoral when mainframe trouble occurs. Pushing a button interchanges peripherals between a failed and back up system or reconfigures a computer room for multiple tasks on the same mainframe.

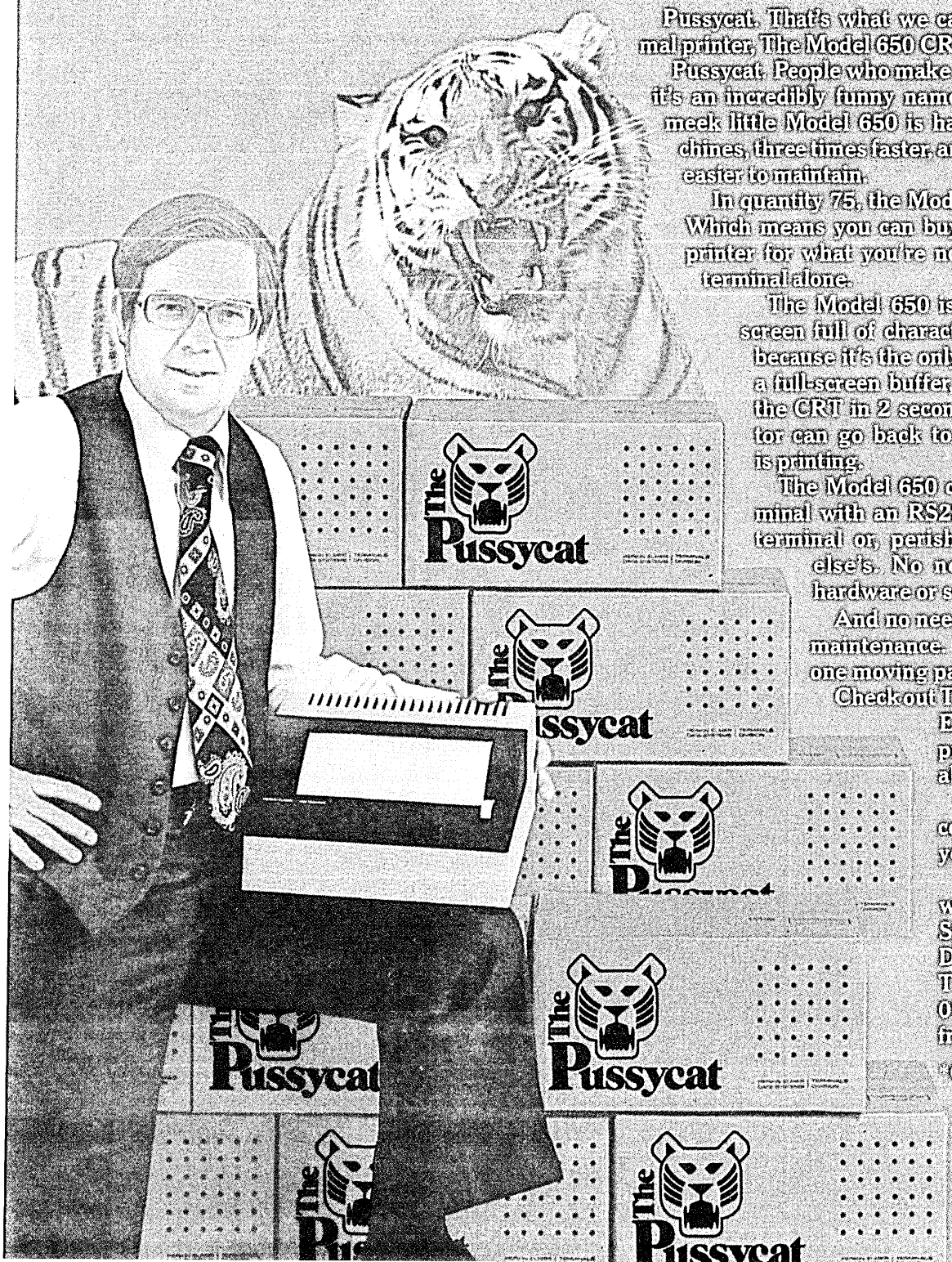
The switch can be controlled from an operator's position up to 200 ft. away.

T-bar® INCORPORATED

COMPUTER SWITCH DIVISION
141 Danbury Road. Wilton, CT 06897.
Telephone: 203/762-8351. TWX: 710/479-3215.

Smile, when you say pussycat!

Pussycat. Perkin-Elmer's $795* 100 cps CRT Page Printer.



Pussycat. That's what we call our new 100 cps thermal printer, The Model 650 CRT Page Printer.

Pussycat. People who make 30 cps printers will think it's an incredibly funny name. Until they realize our meek little Model 650 is half the price of their machines, three times faster, and a whole lot quieter and easier to maintain.

In quantity 75, the Model 650 is only $795 each. Which means you can buy a CRT and a Pussycat printer for what you're now paying for a printing terminal alone.

The Model 650 is fast. It prints an entire screen full of characters in 20 seconds. And, because it's the only printer in its class with a full-screen buffer, the Model 650 can free the CRT in 2 seconds or less. So the operator can go back to work while the printer is printing.

The Model 650 connects to any CRT terminal with an RS232 port—a Perkin-Elmer terminal or, perish the thought, someone else's. No need to replace existing hardware or software.

And no need to worry about noise or maintenance. The Model 650 has only one moving part—the platen.

Check out The Pussycat from Perkin-Elmer. It's a great little printer at a very reasonable price.

And, if you're one of our competitors...Smile, when you say pussycat!

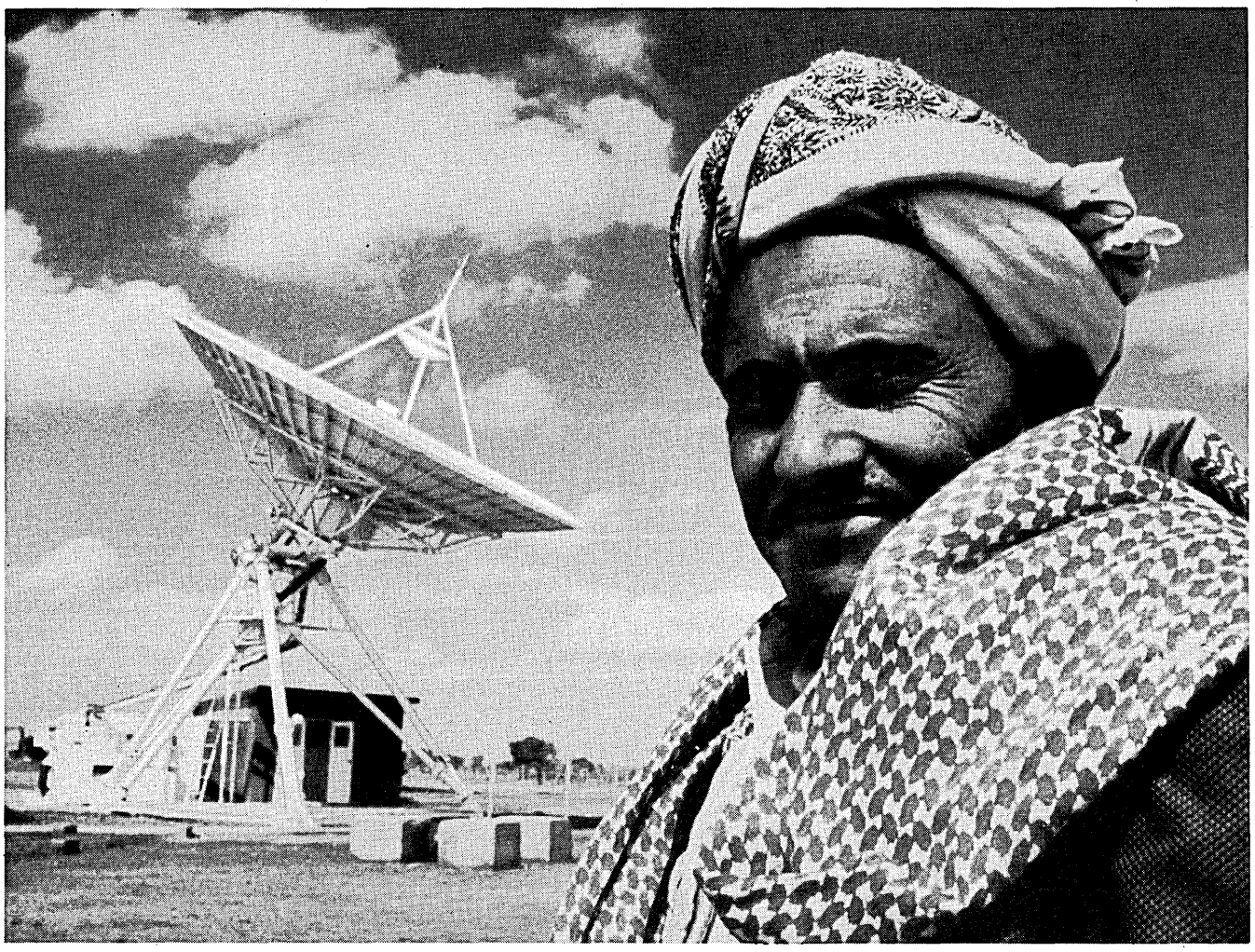
For more information write Perkin-Elmer Data Systems Sales and Service Division, 106 Apple Street, Tinton Falls, New Jersey 07724 or telephone toll free 1-800-631-2154.

*Quantity 75.

CIRCLE 74 ON READER CARD

PERKIN-ELMER
Data System

Sound & Vision



There's no quicker way to get TV, phone calls or data round the world than by the 45,000-mile satellite space route.

Earth stations send and receive messages to and from 'space stations'... the satellites. In recent months we've brought earth stations into service in the United Arab Emirates, Mauritius, Fiji, Seychelles and —shown above—the Yemen Arab Republic. The YAR earth station took just three months to complete from order to operation.

The 21 earth stations of Cable & Wireless and its associates are just part of our global network.

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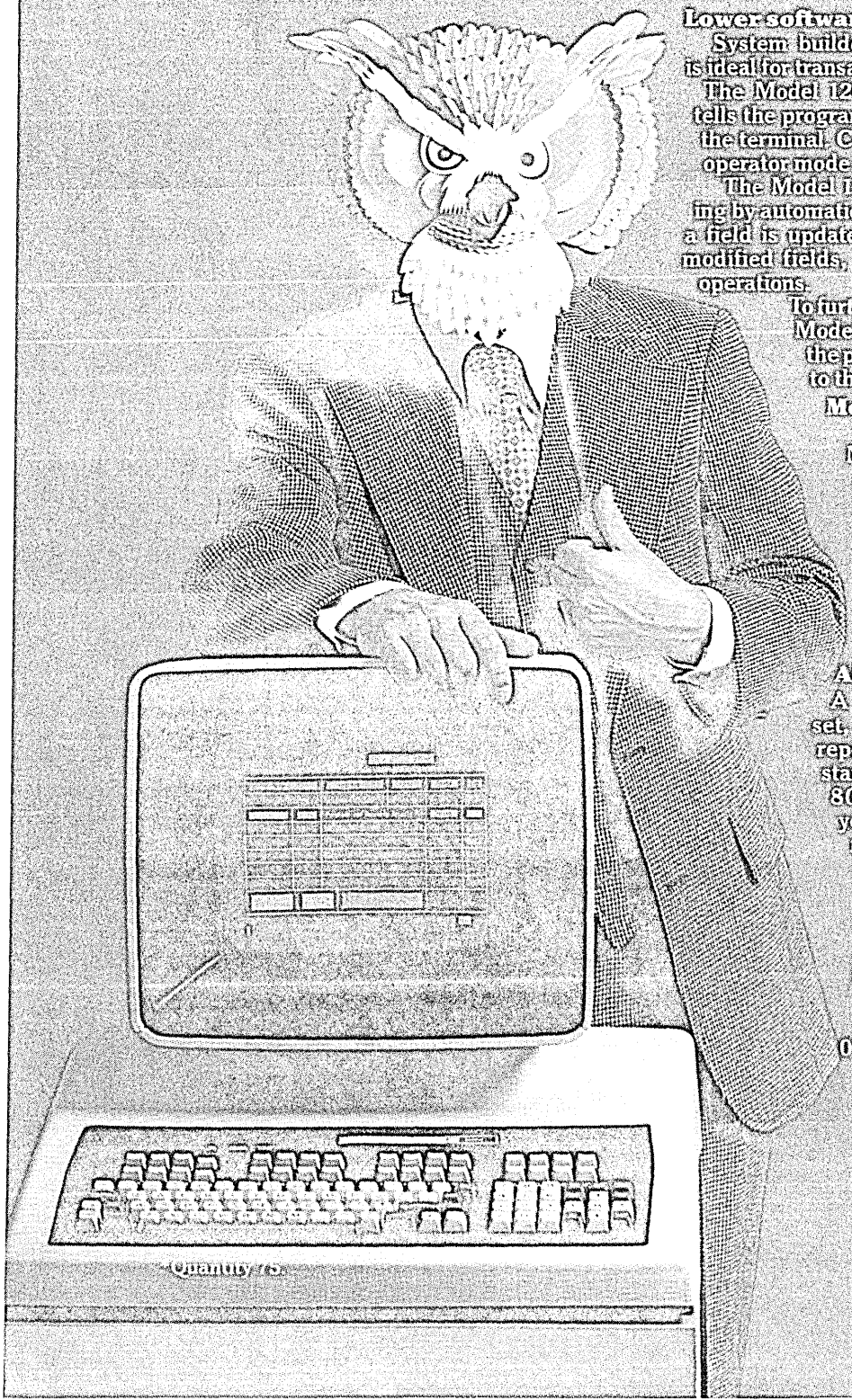

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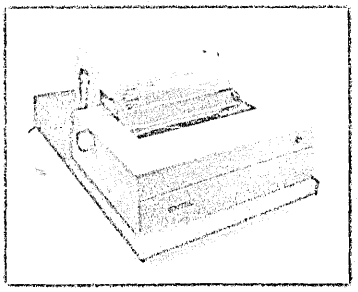

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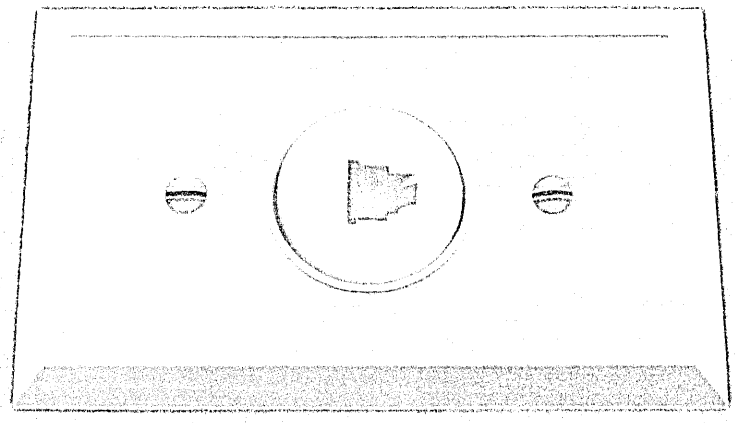

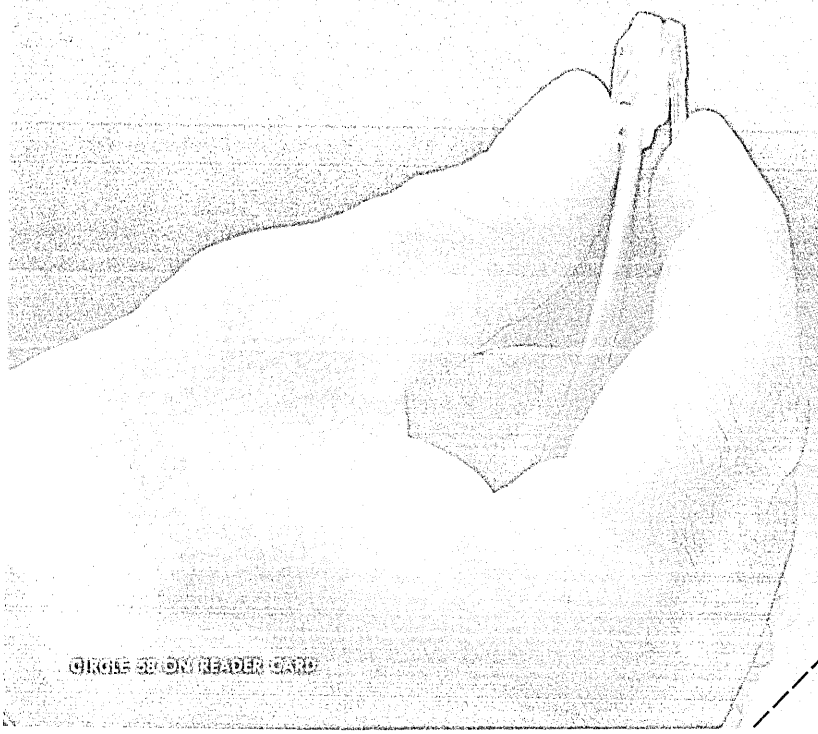

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CIRCLE 92 ON READER CARD

Editor's Readout

John L. Kirkley, Editor

Happiness Is Distributed Processing

Ours is an industry given to brief but intense enthusiasms. Still enthralled by our technology, we seek easy answers and instant solutions at the drop of an acronym. Each new engineering triumph promises the user fast relief from the corporate heartburn brought on by being the collector, keeper, massager, and disseminator of the company's vital information.

Distributed processing is our latest panacea. Sanctification is usually followed by initialization and we have now added DDP (distributed data processing) to our overflowing bowl of alphabet soup. This latest catch-label has been joyfully embraced by armies of advertising copywriters. Conference organizers are happy too—a session with DDP in the title is a sure draw. Consultants have a new hook to hang their hat on and Citibank alone has provided thousands of column inches for copy hungry trade press editors. Distributed processing seems to be a good thing for everyone—and it is.

But all this euphoria aside, just what is it? And what does DDP mean to the dp professional?—the man in the organization who has to respond to innovation while simultaneously keeping existing corporate systems functioning smoothly (a juggling act comparable to changing engines on a 747 while en route from Los Angeles to New York).

First he must sort out what people are talking about.

Unfortunately, not only do the journalists, consultants and conference organizers disagree, but the vendors also have their distributed definitions. Datapoint calls it "dispersed" processing; HP lashes 3000s together in clever ways; and IBM's director of distributed systems, G.P. Fusco, offers this in the January 1978 issue of Data Management magazine ". . . the term 'distributed' means an intelligent device with communications linked to a host processor in a network. It implies tight control and management of all the distributed nodes by the host." (Of course IBM mavericks at GSD in Atlanta may not agree, but that's another story.)

The point of all this is that it's a waste of time trying to pin down a definition of distributed processing. Instead of asking "What is it?", it's more productive to ask "What does it allow me to do?" And what this broad, fuzzy concept does allow us to do is to think in functional and innovative ways about how information can flow between people and machines. DDP provides a flexible conceptual framework for the creative dp manager, a framework that allows him to conceive and implement networks that may incorporate fax, electronic mail, word processing, distributed data bases, and plain old vanilla data processing. It promises a liberation from the corner we've been painting ourselves into with our large centralized machines since the late fifties.

Like all good functional ideas, DDP will only be around as long as it's useful. Soon enough a form of conceptual entropy will set in and it will begin to lose its effectiveness as a catalyst to our thinking.

But not to worry. Shortly another grand concept will spring onto the scene and, with the help of the editors, the copywriters, the conference organizers, and the consultants, the whole circus will start up again. We wouldn't have it any other way.

❋

Splitting off the communications processing function wasn't too difficult. Separating data base processing and setting up peaceful coexistence between coequal operating systems will be a whole lot tougher.

Let's Put Information Networks into Perspective

by Hal B. Becker

It is fast becoming a truism in the information network environment that the only thing that is constant is change. Change is an integral part of any successful organization's business practices, including its use of computers.

The very noticeable and growing trend toward corporate or organizational information networks leads to a new class of problems associated with their design and implementation. One of the more important ones is that the time-frame involved in identifying the need for a network, writing and issuing requests for proposals, and selecting and installing the chosen configuration—typically two or more years—frequently leads to the "vanishing problem" syndrome. By the time the solution is operational, the initial problem has either vanished or changed so drastically as to make the configuration of little value to the users.

It is obviously unrealistic to expect an organization to stand still for the two or more years involved in the design and installation of an information network. Change and the ability to adapt to it must therefore be an integral part of any approach to information networks—the classical centralized and the newer distributed configurations alike.

From the not so distant dawn of the computer age, the technology has pursued the economy of scale available by collecting an organization's information processing in a single, centrally located large-scale mainframe. But there exists a growing class of users for which pursuit of economy of scale through centralization results in confrontation with the complexity of scale inherent in current hardware and software offerings.

For such users, centralization becomes difficult if not impossible. This awareness quite naturally leads to the concept of "distributing" the information processing resources across two or more possibly geographically separated sites within the organization.

Users pursuing economy of scale usually run into complexity of scale as well.

The problems in converting

Interestingly, much of the incentive to distribute information processing resources originated within the user community, not with the computer manufacturers. Many users today view the new "distributed" concepts as a means of fitting computer resources (solutions) to their organizational needs (problems) as opposed to the previously customary fitting of the problem to the solution.

Users pursuing the traditional centralized approach quite naturally raise the following questions when viewing

the emerging "distributed" concepts:

- Will the new distributed concepts obsolete the centralized approach?
- How does one determine whether a centralized or distributed configuration, or perhaps some combination of the two, will provide the best solution?
- What basic steps are involved in the analysis, design, and implementation of an information network?
- Will it be possible to integrate existing, installed equipment in the new network (centralized or distributed), or must it all be replaced?

There is no single answer to computer users' needs. For some, the classic centralized approach will provide the most efficient, economical, and manageable solution. For others, distribution at one or more levels, or a combination of forms, offer the only workable answers.

Users with substantial investments in systems design, programming, and implementation of existing facilities (not to mention hardware costs) are understandably reluctant to remove and replace it with new equipment just so a network can be built. Usually this installed equipment represents one or more models from one or more manufacturers. This, coupled with the multiplicity of terminal and carrier offerings, suggests that it is realistic to expect that information networks will be configured using many manufacturers' and communications services' offerings. Successful approaches to the information network environment will thus recognize the reality of the multiple vendor situation and will plan accordingly.

Frequently, and in many cases predictably, the short-term solution becomes the long-term problem.

As users require even more accurate and timely information, more and more applications are being moved into the on-line environment. (A variety of terms are used, somewhat interchangeably, to define the goal of this migration including: "transaction processing," "event processing," "real-time processing"—a real misnomer—and others.) Much of this evolution has occurred in the form of short-term solutions produced under pressure to solve immediate, real problems. Frequently, and in many cases predictably, the short-term solution has become the long-term problem.

Adding to the complexity of the distributed concept is the realization that it is a complicated (if not prohibitively expensive) undertaking to benchmark proposed networks of even modest proportions. It is also becoming obvious that the design of optimum configurations using strictly manual procedures becomes progressively more difficult as size increases. An acceptable solution to these problems would involve the development of various automated analysis and design techniques.

These new techniques will enable network designers to: (1) identify existing, installed facilities that are to be included in the new configuration, (2) identify the additional functions necessary for accommodating additional applications, (3) derive and evaluate several possible configurations, (4) make rational decisions concerning varying degrees of centralization and/or distribution. A fifth and perhaps most important feature will be the ability, through modeling and simulation, to predict the performance of the selected configuration. This prediction will include not only the performance under initial, specified loads, but under the extrapolated, changing loading that will inevitably occur.

A not so obvious but fatal flaw appears in post mortems of failing networks.

Learning by living through it

A not so obvious but frequently fatal flaw is beginning to appear in post mortem evaluations of networks that failed to meet design specifications. Many networks are designed from the "physical" frame of reference alone. Only after all the hardware (physical) components are selected and configured are the software (logical) design considerations initiated. Yet, often one or more of the logical activities of the network will have a profound impact on its physical design. So the early identification and integration of the physical and logical elements of information networks is necessary.

The natural course of "learning by doing" eventually produced an awareness that a broader, structured perspective of the network environment is required. It became clear that a top-down approach that eliminated the problems inherent in the traditional, bottom-up technique is necessary.

It was further observed that most network design activities began with a very specific, detailed definition of a very specific set of applications to be accommodated. Predictably, the resulting configurations were designed to those applications and little if any capacity to adapt to the inevitable change was considered. This built-in inflexibility, coupled with the previously mentioned "vanishing problem" syndrome, produced a number of workable but unfortunately unusable configurations.

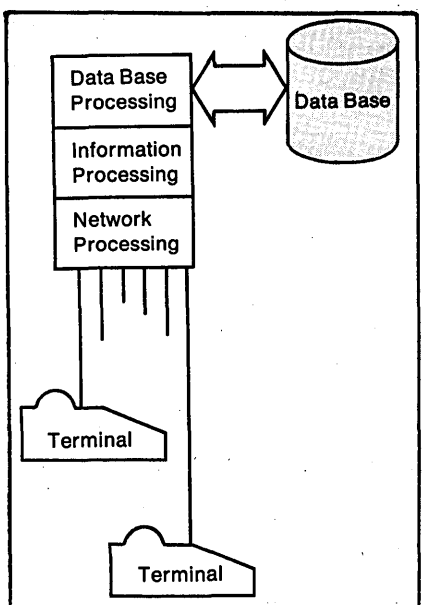


Fig. 1. Aiming for economy of scale, even in purely centralized computing, led the user directly to complexity of scale as well.

A realistic approach to the definition of a logically structured frame of reference involves the identification of the

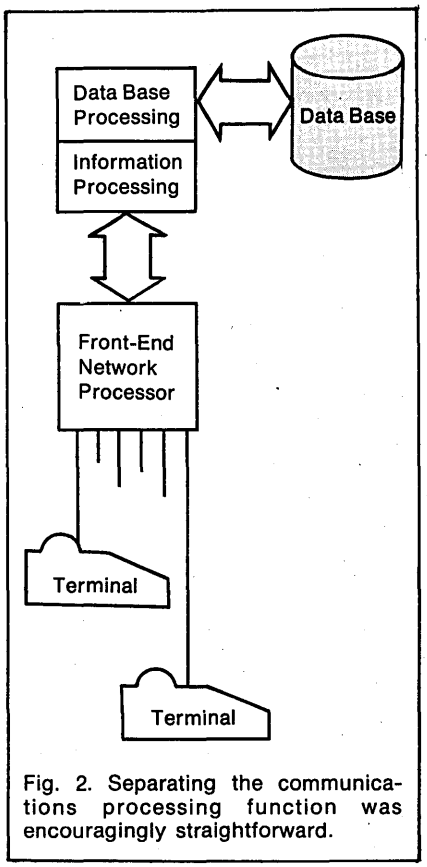


Fig. 2. Separating the communications processing function was encouragingly straightforward.

basic "function sets" required for the configuration of information networks. Fairly universal agreement exists within the industry that three such function sets provide the primary building blocks from which any information network (centralized, distributed, or combination) can be configured: (1) information processing, (2) network processing, and (3) data base processing.

Information processing can be defined as the manipulation (by application programs) of information to produce the desired results. Network processing is the control of information movement between the various locations (nodes) of the network. Data base processing is the storage of quantities of information, in one or more forms, available to the network and its users.

Built-in inflexibility, coupled with the "vanishing problem" syndrome, produced a number of workable but unfortunately unusable configurations.

In the beginning

In the beginning (circa 1960 and earlier), all three functions were contained and executed in a single computer (see Fig. 1). The growing overhead produced by the data communications explosion of the mid-'60s resulted in an initial separation of function that produced the front-end processor. This computer dedicated to data communications assumed the communications load previously handled by the host processor, thus freeing it to do the job for which it was designed: information processing (see Fig. 2). Almost universal industry adoption of this approach confirms its soundness.

The current and very visible trend toward on-line applications is resulting in the movement of requisite data bases from off-line to on-line status. This migration produces a higher level of interference between the information processing and data base processing functions since they must compete for common resources (memory space, processor time, etc.). The confrontation suggests that a second separation of function is in order. Movement of the data base processing function to a free-standing but connected data base processor is expected to allow improvements in efficiency and throughput over current technologies (see Fig. 3).

Interesting as this concept is, it should be noted that the separation of the information processing and data base processing functions is not a casual exercise. The data base function has, from the beginning, been well integrated with and controlled by the information processing function. Considerable effort is necessary to determine how best the separation should occur. It will probably be several years before this capability is available as a standard, off-the-shelf offering.

With the functional separations completed, each of the three (information processing, network processing, and data base processing) can cooperate or execute somewhat independently of the others with hardware and software optimized for its own function.

Network processing, the first to be separated, has reached a greater level of maturity than the other two. The newer, higher level "languages" appearing for network processing attest to this evolution. Similarly, the network processing function was the first to be distributed (see Fig. 4). The first time a network processor was configured in a distant cluster of terminals (mid-'60s) marked the beginning of the "distributed environment." At that time, the remote network processor shown in Fig. 4 was frequently called a remote concentrator. As such, it provided the cluster of terminals surrounding site "B" with an efficient, more economical means of access than was previously possible.

Figs. 1, 2, and 3 are all considered "totally centralized" configurations because all of the logic (software) for all three functions executes at the single, central location. Fig. 4 becomes a "partially distributed" configuration since the information processing and data base processing functions remain centralized at site "A" while the network processing function is distributed between the front-end network processor at site "A" and the remote network processor at site "B."

Separating data base processing from other information processing may take years.

The information processing function was the next to be distributed (see Fig. 5). The late '60s produced the "remote batch," "remote job entry," or "satellite" processors. These computers were typically smaller scale installations than the "host" information processing sites that accommodated them. In most cases, the satellite site was capable of only a subset of the host site functions.

Fig. 5 thus represents the next step toward distributed function. Information processing is distributed between the host site "A" and the satellite site "B." Network processing is distributed between the front-end at site "A," the remote network processor at site "B," and the satellite processor at site "C." Actually, the network processing capability of the early satellite processors usually took the form of a single-line controller, but later satellites evolved with multiline controller capabilities which could provide network access to terminals clustered around them.

The data base processing function in Fig. 5 remains centralized at site "A," and thus represents another example of a "partially distributed" configuration.

The distribution of the information processing function, while not as mature

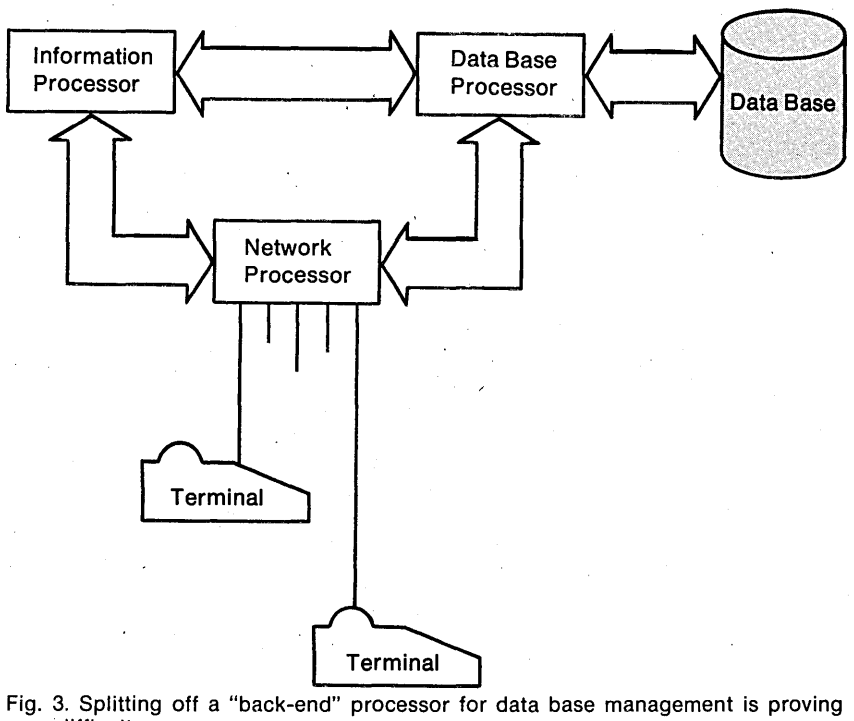


Fig. 3. Splitting off a "back-end" processor for data base management is proving very difficult.

as distributed network processing, has been occurring for several years. Remote batch, remote job entry, or satellite processors are readily available. The major limitation of most of these is that the satellite site must accept a subservient role to the host that serves it. With currently available, off-the-shelf offerings, it is difficult to configure information processors in a network that interact with each other as coequal resources. This coequal interaction is further complicated when each site is configured with a different manufacturer's hardware and software.

The next and final step toward "totally distributed" configurations involves the data base function. Addition of data base capabilities to the satellite processor at site "C" presents the possibility of either partitioning or replicating the network's data base(s). If the information maintained in the data base at site "A" is different from that at site "C," a partitioned data base exists. If the information maintained at sites "A" and "C" is the same (multiple copies), a replicated data base exists. It may also be desirable to configure some combination of the two.

All of the problems in centralized data bases assume new orders of complexity in distributed configurations.

When site "C" in Fig. 6 gets its own data base, this represents a totally distributed configuration. Each of the three functions (information processing, network processing, and data base processing) exists at two or more geographically separated locations.

Distributing the data base, being the newest technique, has possibly the greatest learning curve ahead of it. All of the problems inherent in centralized data bases (multiple update, concurrent access, reconciliation, etc.) assume new orders of complexity in the distributed configurations.

It looks appealing, but—

The emergence of the data base processor does present some interesting possibilities in totally distributed configurations. In Fig. 6 each of the three sites provides information processing, network processing and data base processing capabilities. Each function executes in a processor optimized (physically and logically) for that function and interference due to competition for common or shared resources is greatly reduced. Improved throughput and response time within all three functions can result. (And in fact, it is conceivable that networks different from that of Fig. 6 will be designed, some with one or more sites that have only communications and data base processing functions.)

Computer users are quick to consider configurations similar to Fig. 6 for distributing their information processing loads uniformly over the available resources. The three sites in the figure are considered coequal and, in theory, any job or task can be handled by any site. While possibly the easiest to talk about, this capability remains extremely difficult to implement with currently available off-the-shelf offerings for two very significant reasons.

Today's operating systems and data base managers evolved from, and are structured around, a centralized philosophy.

First, many operating systems of today have evolved from and are maintained under the traditional "centralized" philosophy. Most current operating systems do not readily acknowledge the existence of an "equal" within the same network. Peaceful coexistence at acceptable levels of interaction and thoughput is difficult to achieve. The evolution to truly distributed operating systems will not occur overnight nor will it be a trivial rewrite of the existing "centralized" offerings.

Second, currently available data base management offerings are still well integrated with information processing logic as they execute in the same processor, and are similarly structured around the classic "centralized" philosophy. The

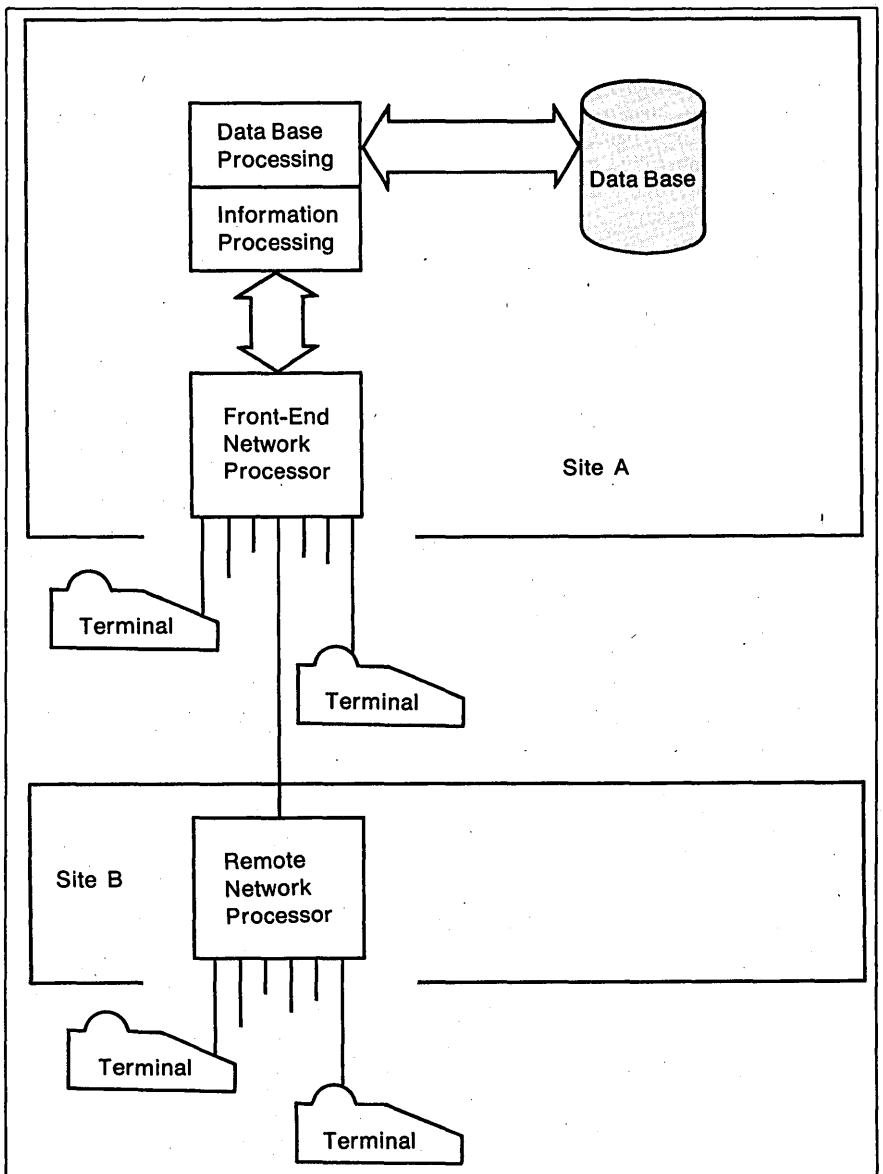


Fig. 4. Just as it was the first to be split from the mainframe, the network processor was the first to be put to work at a remote site.

partitioned or replicated data bases previously discussed are not readily supported by current offerings, and such distributed data base architectures also will not evolve overnight.

The protocol problem

A largely unexplored but fundamental need of the distributed networks being considered today is the area of "protocols" or "standards" for controlling the various functional intersections—information processing to network processing, etc. Considerable work has been done on the lower level, communication-link protocols. The intermediate and higher level protocols—linking application program to end-user, for example—appear to be equally important if the sought after efficiencies and throughputs are to be realized. While efforts in this direction are becoming visible, the world of standards is a very complex one and, almost by definition, very slow moving due to the multiple manufacturer, multiple user, multiple nation makeup of the committees responsible for their standards generation.

While most networks will be maintained for and used by a single corporation or organization, the need for intersecting networks also is beginning to appear. The larger airlines have had intersecting reservation networks for some time. Other industries, businesses, and organizations are beginning to explore similar capabilities. Without adequate protocols at all levels, however, these intersections will be extremely difficult to achieve.

The traditional approach to protocols involves a very specific, detailed definition of each bit position and field involved in a data or command transmission. Interaction between network elements requires that each have the ability to meet the specific, detailed requirements of the protocol. The multiplicity of different link protocols encountered in current offerings makes efficient intersection difficult.

An approach with perhaps greater flexibility involves the definition of a "higher level" protocol language. This language would permit the relatively easy generation of attribute tables which would define the level of protocol desired and the specific characteristics to be associated with it. Initiation of an intra- or internetwork intersection would involve the initial exchange of attribute tables by the intersection elements (terminal users, network processors, information processors, data base processors, etc.). Interpretive evaluation of the tables would then define the specific logical function necessary on both sides to achieve the desired intersection. Ideally, such a protocol language would be rich enough to accommodate easily the existing lower level link protocols as well as the new intermediate and higher levels.

The design objectives

Therefore, it appears possible to define a frame of reference from which all networks—centralized, partially distributed, totally distributed—can be derived. Further, the basic building blocks (functions) for all networks are the same: information processing, network processing, and data base processing.

Most operating systems won't peacefully coexist with an "equal" in the same network.

Given this structure, the objectives at the highest possible level of the network analysis and design sequence become:

1) Derivation of an appropriate "functional distribution." That is, at which locations within the network should each of the three functions (information processing, network processing, data base processing) be configured? Again, the possibilities range from totally centralized through partially distributed to totally distributed.
2) Knowing the functional distribution, what is an appropriate "functional density?" That is, how much of each function should be configured at each of the selected locations?
3) Given the functional distribution and density, what combination of physical and logical capability (in hardware and software) will best provide it?

Obviously, these objectives are stated at an almost philosophical level. Translated into actual practice, they demand a complex, many-layered sequence of events that must provide acceptable solutions to the user's stated problems in terms of:

Topology—Does the configuration provide acceptable levels of access to the users at their various locations?

Volume—Can the volumes of traffic associated with the various dimensions of the network (time-sharing, transac-

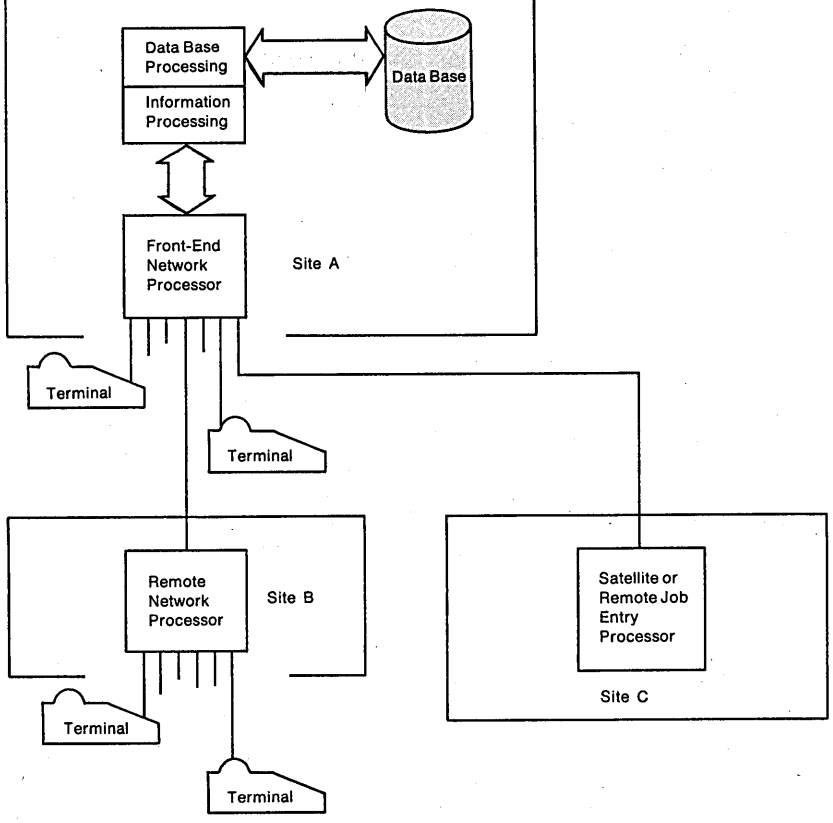


Fig. 5. Although it's close to the real thing, a network without a distributed data base is still only a "partially" distributed one.

tion processing, remote job entry, etc.) be accommodated?

Information processing—are the information processing resources adequate to handle the existing loads and provide for relatively easy growth to accommodate the inevitable change?

Data base processing—Are the data base processing resources capable of providing the levels of storage and access required by the information processing and network processing functions?

Response—Is the network capable of meeting the changing response-time requirements of the various users and operating dimensions?

Availability—Has an adequate level of hardware and software redundancy been configured in response to the stated availability requirements of the users?

Security—Has a set of physical and logical security measures capable of meeting the user's stated security requirements been integrated into the design?

An overriding concern that cannot be ignored is cost. Is the network that satisfies all of the above considerations economically justifiable?

Getting there from here

The capabilities of the new distributed networks hold great promise for the computer user community. While called a revolution by many, from a more realistic point of view, the concepts presented appear as a very logical evolution of existing, known technologies.

From organization comes understanding—we hope.

Still, many questions must be asked, explored and answered. Only a few of the more obvious have been presented here. And only some of the aspects of these are currently being investigated in research and development environments as well as at leading-edge customer sites.

It will always be possible to match a user with the necessary time, talent and funds with a manufacturer or set of manufacturers and produce a workable, special, one of a kind information network, centralized and distributed, tailored to that user's specific requirements. But computer manufacturers must view the issue from a somewhat different perspective also: what is an appropriate set of standard hardware and software offerings that provides the greatest latitude in the design and implementation of centralized as well as distributed configurations?

A few of the more complex aspects they must explore include:

- Separation of function between information processing and data base processing, possibly leading to a free-standing data base processor.
- The evolution of true distributed operating system philosophies.
- A similar evolution of true distributed operating system philosophies.
- Production of iterative, interactive network analysis and design sequences (automated wherever possible) that will permit the synthesis and evaluation of several potential solutions in a relatively short time.

From organization comes understanding. Current activities within the manufacturing community are directed toward the definition of the problem. Continuation and enhancement of the existing dialogue between the user and manufacturing communities will contribute greatly to a realistic, workable statement of the problem, and will establish a comprehensive structure within which solutions can be derived. ❋

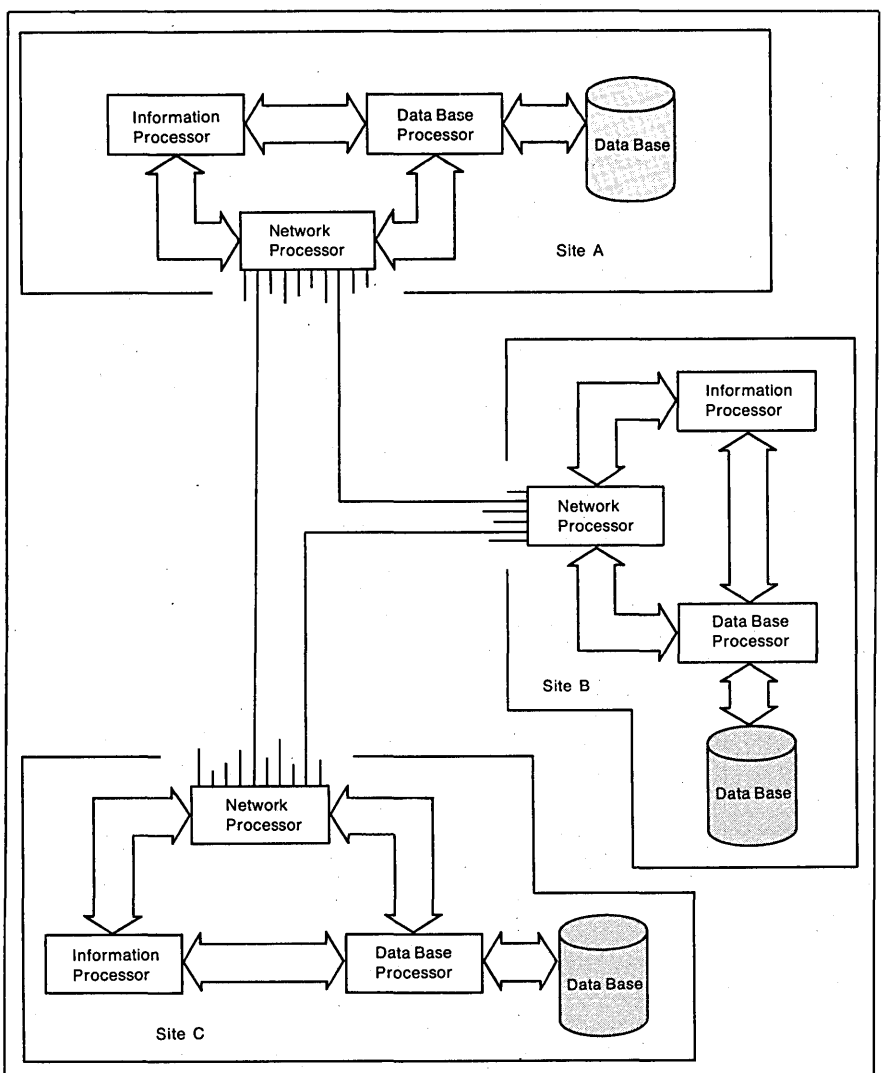


Fig. 6. Full-blown distributed processing, where at least two of the three kinds of functions are performed at at least one remote site, may not be easy to accomplish with off the shelf hardware and software for years.

Mr. Becker is currently program manager, distributed systems for Honeywell Marketing Education in Phoenix. He joined General Electric Co. in 1959 as a programmer/analyst in Detroit, and transferred to its computer department in Phoenix in 1963. His activities in Phoenix have been devoted exclusively to the development of data communications and information network technologies.

A British Example of Distributed Computing

by Alan J. Shepherd

The technology offers enormous potential, but tremendous dangers as well. What is technically possible is not always manageable.

After the great push toward centralization in the late '60s, the availability in the '70s of cheap minicomputers and the software to go with them has made it appear economically feasible for large corporations to place substantial computing power right back into their smallest operating divisions. Distributed processing is all the rage, but it is not without its dangers and its problems.

Over the last five years, Vickers Engineering Group's data processing has evolved from a totally decentralized to a distributed processing operation, with a substantial degree of central control. The approach adopted, and the reasons for it, could well be of interest to those undergoing or contemplating a similar change.

The Vickers Engineering Group comprises about 20 autonomous divisions, most of which are situated within a short distance of Newcastle, Leeds, London or Swindon. These divisions are engaged in a wide variety of manufacturing activities ranging from large custom jobs like giant power presses or container cranes to medium scale batch production of hydraulic pumps and valves. In between come "Chieftan" military tanks, printing presses, bottling machines, marine bearings and many other engineering products of all shapes and sizes. In addition to Engineering, there are three other major groups in the Vickers organization, each of which has up to 20 divisions.

Avoiding centralization

Prior to 1972 each Engineering Group division had individual responsibility for its own data processing activity. The largest division in each area had its own computer department, reporting at a comparatively junior level within the local accounting function. Smaller divisions either used the local facilities on whatever basis the owners laid down, or, as was frequently the case, chose to remain with accounting machines or manual methods.

By the late '60s, it was becoming apparent that substantial gains could be made by introducing on-line facilities and extending the use of computers beyond the accounting function into design, planning, and production control. In addition, the maturing of data communications and time-sharing was making it feasible to provide a more extensive computer service to the smaller divisions. It was equally evident that neither of these aims was likely to be realized within the existing organization structure.

The obvious answer was to set up a central organization that could provide the necessary impetus and expertise to get the proposed developments under way. However, the problems that other companies were running into with their attempts at centralization, along with a strong general management policy of local autonomy, led to considerable opposition to any plans for total centralization.

The local managers would feel threatened by a new, technically high powered organization over which they had no control.

Even on purely technical grounds, total centralization was hard to justify. Certainly the advantages of a large machine for handling manufacturing data bases and heavy technical calculations were evident, but the bulk of our commercial work was not at all suitable for the unintelligent remote batch terminals then available.

By the early '70s, the concept of the linked satellite computer was beginning to gain ground. This idea was attractive to Vickers, as it offered the possibility of accessing a more sophisticated central facility without becoming immediately involved with vast amounts of unnecessary data transmission or a massive operational reorganization. In addition, it had advantages over a totally centralized system: central mainframe loading could be reduced, some resilience to communications failure built in, and possibly the complexity of the central control software reduced.

Cost considerations initially prevented the adoption of such an approach. Small computers that could be used in this satellite role were still quite expensive. Even more important in Vickers' case, the company's accounting routines had mostly been written in PLAN assembler for small second generation ICL 1900 machines, and their conversion to some other computer would have been prohibitively expensive.

These problems were simultaneously solved by the introduction of the ICL 2903. This is a small, "soft" machine of modern design which is microprogrammed to process ICL 1900 code, and at the same time offers additional functions such as integral control of communications and disc drives, and the support of on-site data entry keystations.

We at first matched remote 2903s with a larger third generation machine in the 1900 range, the 1903T. This maintained software compatibility with the 1900 through emulation, but also provided an operating system which supports interactive computing, remote job entry, and 2903s as satellites. More recently we upgraded this to an ICL 2960, and our configuration now has 1-MB of MOS store, eight 200MB disc drives, a communications processor, and the usual tapes and slow peripherals.

Who will run it?

Improvements in technology had made the approach cost effective. It was also comparatively straightforward organizationally. In fact it could have been done without changing the organization at all, with each existing local de-

partment being responsible for its own machine, and a new central team taking responsibility for developing new applications. It was felt, however, that such an approach would not be satisfactory.

In the first place, the local managers would feel threatened by a new, technically high powered organization over which they had no control. The more conservative ones would be anything but enthusiastic about new applications in fields outside their experience. The more go-ahead ones, on the other hand, might well engage in a power struggle with the central site; supported by local management, they might attempt to expand their own machines and develop new applications rather than making use of the central team.

Consequently it was decided, for the time being, to place most of the satellite installations under control of a central organization. Each satellite was given its own manager who was responsible for control of the local systems, liaison with the central site and, most important, for ensuring that the needs of the local users were met.

We have found it works best if the local managers are people who see their prime career path in the central organization. Ideally they should be past members of the central team, but this was obviously not possible at the start.

It works best if the local managers are people who see their prime career path in the central organization.

The previous local dp heads were all given senior appointments in the new organization.

Except where an urgent application need existed, the sites without existing computers could be taken more gradually. Here the policy has been, wherever possible, to go for local hardware and system concepts that avoid the introduction of on-site specialist computer staff. This requires considerable care.

Generally speaking, it is practicable if locally stored data is strictly limited to input and output spool files. There is no reason why these files should not be indexed, to permit selective inquiry as an alternative to total printing, or even temporarily updated, so long as the file is provided as a whole from central sources on a regular basis.

As soon as any attempt is made to maintain master data files locally and hence become concerned about their security and integrity, local operational costs and problems are liable to escalate rapidly, until one ends up with a full-fledged computer department. Sometimes this can be justified and there are several Vickers sites like that, but one should not be deluded into thinking that he can get by without it.

Decentralized operational control may be more responsive to the user and less prone to administrative delays and inefficiencies, but it can also lead to terrible coordination problems. We found that the most important point here was to ensure that each system have only one point of control. However, this need not preclude some function distribution in the sense that a central machine may be used for time-sharing or remote job entry, and intelligence can also exist at the user end in the form of a fixed-program intelligent terminal.

Just as with having a single control point for each computerized system, it proves essential to have one point for the control of any master data file, where specialists can see to its integrity. Hence our data has been distributed only to the extent that control is distributed, no more, and there is a minimum of interaction at the data level between systems that are controlled from different points.

A completely different class of technical problems arises if a central data base must be updated from *all* distributed processing locations. With minor exceptions, fortunately for us, this has not been one of Vickers' problems.

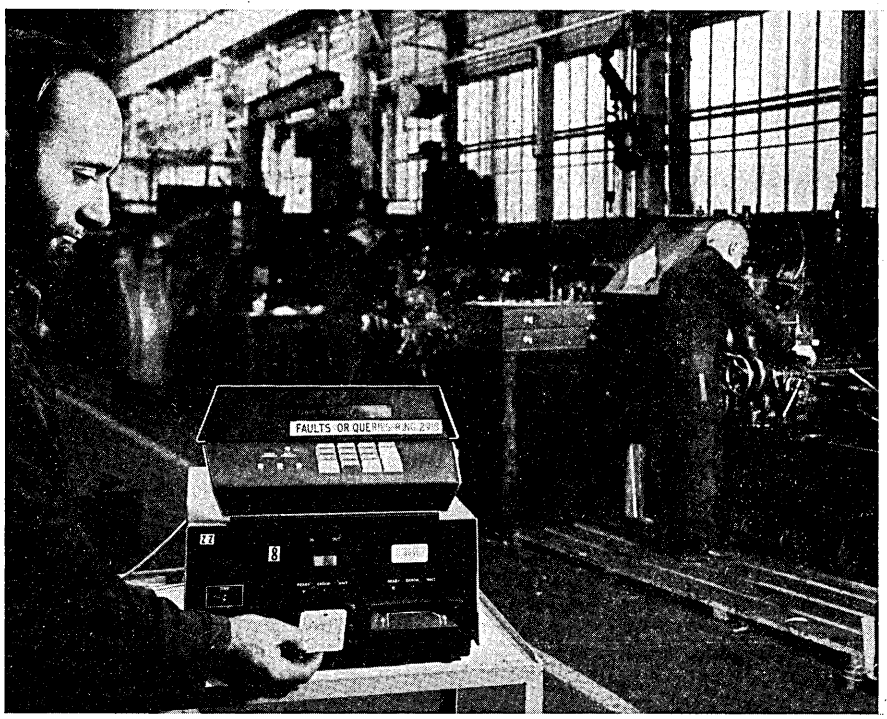
It is frequently suggested that one should distribute the data to the place where it is most used. Hence, for example, stock files for a warehouse might be maintained on a disc at that location, and other locations wishing to access them would do so through the processor there.

Such an approach is not impossible in principle. It can be regarded as a simple example of a distributed data base, which in general would also allow updating of any file from any point in the network. However, we haven't been convinced that hardware and software technology has reached the stage where it is generally usable in this fashion. When the technology has improved by another order of magnitude so that the organization problems can be tackled without interference, then the approach will be worth another look. In the meantime, it should be rigorously avoided by the ordinary user.

Who runs development?

The arguments over the control of application development follow the same basic considerations, but the emphasis comes out rather differently, and we have tended toward different conclusions. The advocates of local control of system development argue strongly on the basis of greater understanding of local needs, and greater responsiveness to local priorities. The ability to introduce small modifications and special reports at a few days notice always appeals greatly to local management and is reluctantly reliquished.

However, small local teams can be



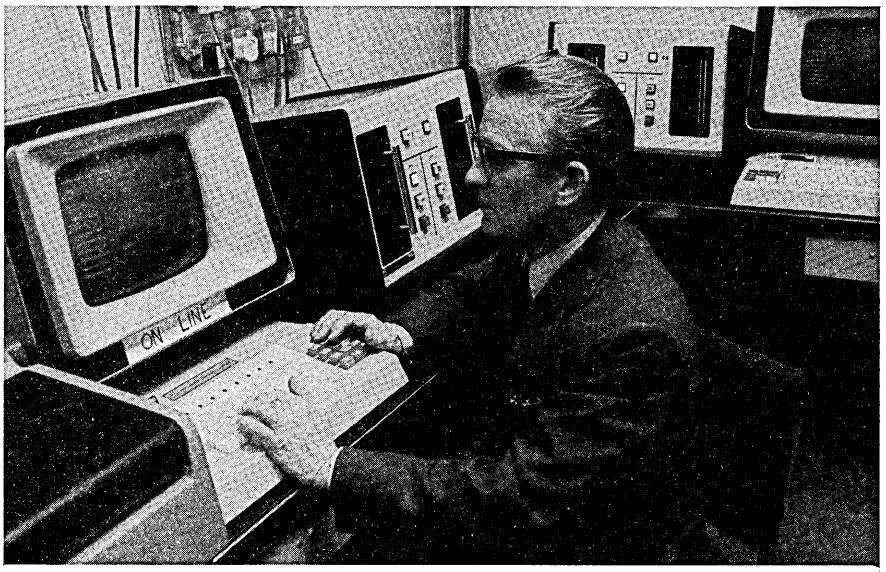
Vickers produces a wide variety of products ranging from "Chieftan" tanks for the armies of the world down to hydraulic pumps and valves. Part of the dp support for manufacturing is shop floor control through terminals such as the one above in the Power Press and General Engineering Div.

very vulnerable, because they rely for their continuing viability upon a few individuals for whom, at the same time, they can offer only limited career prospects. In addition, the heavy work load of "urgent" modifications, and probably lack of required standards and quality control, tends to lead to systems that are very hard for a replacement programmer to take over, as well as to greatly reduce the chance of substantial progress on major developments.

It was this need to make a substantial impact with new systems that made centralizing the major development activity essential in our case. To attempt to duplicate system development at each local site would have been prohibitively expensive. However, we do place very considerable emphasis upon the involvement of local user staff in requirements specification and in design and implementation; and we do have some programming capability at the satellite sites for carrying out maintenance and minor development work according to central standards.

As a rule, we consider it inadvisable to split work on a single system between several locations. Even with rigid control and standardization, the human communications problems can prove very expensive.

The central site for Vickers' distributed processing operation houses an ICL large scale mainframe (now a model 2960) which links to a continuously changing number of smaller ICL machines (including 2903s and 2904s) at the remote sites. Other Vickers' installations have heavy commitments to non-ICL hardware as well.



Vickers refers to intelligent terminal sites as Type 3 installations. (For a description of the terminology, see Fig. 1.) The terminal above connects to a small mainframe upstream, and also directly controls a cluster of shop floor terminals downstream.

Typecasting

The first 2903s were installed in 1974-5, with the central 1903T in Newcastle coming on-line at the end of 1975. Some ICL 2904s (somewhat more powerful than the 2903s) were installed in 1976-1977, and the 2960 early this year. Most of the Engineering Group development staff are at the central installation, but the Howson Algraphy Group also has a substantial team in Leeds, which is the point of control for its on-line systems.

The period 1976-7 was one of continuous expansion, with more divisions coming on-line, and new applications being developed. There are now over 20 sites in the network, with more on the way. These sites fall into four main categories (see Fig. 1, p. 90).

Type 1 has a small mainframe which itself controls an on-line system, and uses the central mainframe only for off-loading batch work on a remote job entry basis, and for time-sharing.

Small local teams rely on a few individuals, for whom they can offer only limited career prospects.

Type 2 also has a small and fully staffed mainframe installation, but uses this only for self-contained batch processing and as a bulk data terminal. These sites also make use of centrally controlled systems, and have display terminals linked directly to the central mainframe on the same communications line as the local cpu.

The 2903s and 2904s in the old 1900 sites are in this category. They played a wonderful part in getting the network smoothly off the ground, with a minimum of disruption, but the heavy staffing requirement does make them expensive. As more of the old systems were replaced by new ones, they became so lightly loaded in some cases that it was well worth moving off what was left and changing the site to Type 3. Specialist operational staff were no longer needed, and sometimes even more could be saved by moving the data input stations right out into the individual user departments.

Indeed, we move the input function to the user department whenever possible. This frequently eliminates a data transcription stage and its associated errors; and those errors which do arise can be detected and speedily corrected at the source. Immediate error correction, along with increased user satisfaction and responsibility, will often more than compensate for the higher keying efficiency of conventional centralized data preparation. It also often leads to greater interest in, and appreciation of, computer systems in general on the part of the user, which

can in turn lead to improvements in the systems themselves.

Type 3, then, has some sort of intelligent terminal. These terminals are becoming increasingly sophisticated and are often, in reality, quite powerful computers. However, the essential point is that they are programmed to need no specialist local dp staff.

They may be on-line, batch, or both, and may well have displays, off-line spooling of input and output, local format storage, extensive validation and data compression capabilities, as well as direct interaction with a mainframe. We are even starting to provide an autonomous word processing capability.

However, they do not under any circumstances support permanent master files, although there is no objection to allowing inquiry or even temporary updating of local file copies transmitted from the mainframe as mentioned earlier. Programs are downline loaded to them, or loaded from their own local peripherals; in the latter case, floppy discs are distributed from the central organization, and local program changes are strictly out of the question.

Type 4 has only simple terminals without local peripheral storage. They may still have limited intelligence for validation, protocol emulation, and code conversion. Except for time-sharing, these are usually attached to a Type 3 system rather than directly to a mainframe. Indeed, there are Type 1 and Type 3 systems within the central installation because there are good economic and technical advantages to the distribution of intelligence that we have gone for, even when it is not geographically necessary. In fact we have deliberately restricted the geographical distribution of Type 1 systems because of the amount of specialist support they require during the present period of rapid application development.

However, removing the on-line applications from the big multipurpose mainframe onto smaller dedicated machines has really paid off. It saves on hardware, because one no longer needs expensive surplus mainframe capacity to maintain response times. Moreover, software is simplified and it becomes economic to provide a stand-by machine that can be used for application development and batch work when the main one is operational. Meanwhile, the mainframe remains available for the kind of work that really benefits from the facilities it can provide.

The approach we've chosen in setting up these sites calls for good training and very carefully thought out fault-locating and reporting routines. It has proved necessary to keep central control of the latter, rather than allowing remote users to deal directly with suppliers, especially where several are involved.

We have also found it necessary to control software releases centrally, as suggested earlier. The effects of any laxity in the aspect of control can be exceedingly bizarre — and this means expensive and time-consuming. Different modification levels in the supplier's operating system, local fixes, different compilers, and so on can all have obscure and unpredictable results.

The Players on the ICL Bench

The ICL 1903T is a third generation machine with up to 256K of 24-bit word MOS memory. It has an instruction rate of about 250KIPS, and runs under the George 3 operating system, which supports a mixed workload of local and remote batch, interactive, and teleprocessing systems with automatic scheduling. The nearest equivalent IBM machine is the 370/145, but the operating environment is rather more like Univac's EXEC 8.

The 2903 is a more recent design, microprogrammed to implement the 1900 instruction set at a rate of about 50KIPS. It has integral control of local or remote displays and up to 240MB of on-line disc. It also supports up to eight local data entry stations and an RJE link to ICL or IBM machines (including HASP). It is broadly competitive with the middle to upper IBM System/3 range, and has up to 48K words of MOS memory.

The 2904 is an upgraded version of the 2903, with up to 96K 24-bit words of main memory and 480MB of on-line disc. It runs at about 80KIPS, and competes against large System/3s and 370/115s.

There is full program compatibility between all three machines.

The 2960 is still more recent. It runs at 500KIPS, and can have several megabytes of main memory and large numbers of 200MB disc drives. It has a native operating mode with Virtual Machine operating systems, but in its emulation mode offers an efficient microcode implementation of the 1900 instruction set and full software compatibility with the 1903T. ❋

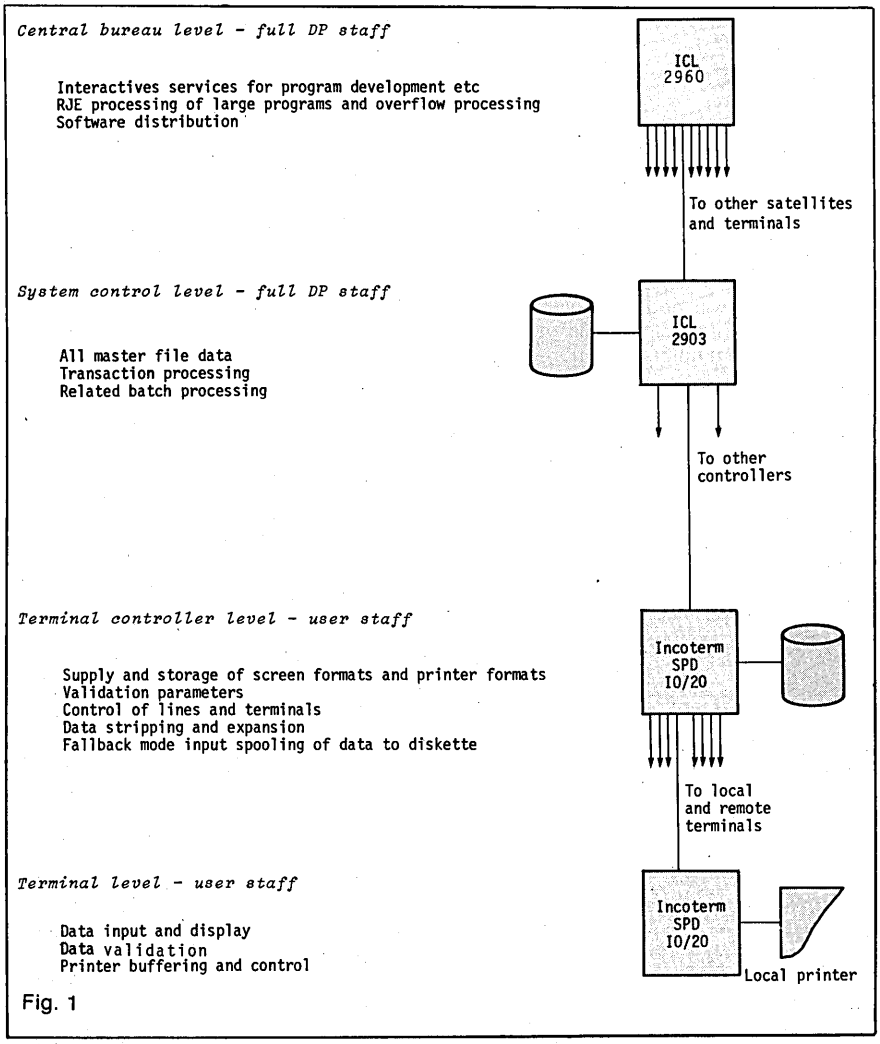


Fig. 1

An example

The Howson Algraphy warehousing system, controlled from Leeds, is a good example of the Vickers approach to distributed processing. It may be particularly interesting because: (1) it incorporates four levels of intelligence, with operational control at level two: (2) it has been operational for over three years; and (3) it is essentially self-contained.

It was the first major project to be undertaken by the new organization, and was under way well before completion of the Newcastle center. This particular application has since been further developed by Howson Algraphy's own team in Leeds. However, the basic approach was so successful that it has been used as the model for subsequent developments within the Engineering Group, including an on-line production control system for the Hydraulics Div. in Swindon, on-line purchase control for the Newcastle-based Armaments Div., and shop floor data capture for the Power Press and General Engineering Div., also in Newcastle.

The original Howson Algraphy requirement was for an on-line entry and stock control system to serve a distribution system of six warehouses in widely dispersed locations in England. In addition, the user required continued operation of a number of batch processed acounting systems originally written for an ICL 1902.

It was decided that these requirements could best be met by an ICL 2903 situated in the Leeds head office, on-line to intelligent terminal systems at each warehouse, and with an RJE link to the Engineering Group's ICL 1903T. The RJE link would meet overflow requirements for batch processing, particularly during the peak loading of the on-line system when the local machine would be saturated. The larger machine would also be used for all work involving heavy computation, and, through terminals on the same line, for financial planning and product design work. Once the system was in full operation, the central cpu would also be used for program development. (The major functions performed at each level are shown in Fig. 1.)

The provisions of a separate machine for this application was justified both on a straight financial basis and on the basis of improved control and a shorter implementation time scale. Hardware and software costs would have been about the same in the short term doing everything on a single, larger computer, but the distributed approach had a decided advantage once that mainframe became heavily loaded.

Operationally, the on-line system had little in common with the Engineering Group systems at that time, and any staff saving from a fully centralized approach would have been negligible. As most of the original development work was carried out by the central team, there was no duplication of expertise. Operational control was centered in Leeds, use of the central site mainframe in Newcastle being on a pure "service bureau" basis.

The predicted transaction rates were high, so the use of intelligent controllers to handle polling, basic validation, and the supply and removal of screen and printer formats was a highly cost-effective proposition. On the link to one large warehouse at Orpington, line loading was also a problem. By putting the controller at the remote end, formatting traffic was completely eliminated, nearly doubling the effective throughput. This provided another bonus, in that the remote cluster could work autonomously in an input spooling mode if the mainframe or communications system failed. This has proved invaluable, as the volume of orders at this site otherwise would present a major recovery problem after a long down time.

The benefits of centralization should not be thrown away in a mad rush to decentralize.

Resilience of the remote equipment is provided by arranging for one of the display terminals to serve as a standby controller, and by using a dual floppy disc drive. The disc electronics and the modem are presently the only items not effectively duplicated; this has not been found necessary, but duplicating them would not be unduly expensive either.

The minor remote sites in the mix require only a single operator, and it has been found quite adequate for them to share a single, centrally located controller. There were originally five remote stations on this controller but this number has now doubled, making it economic to install a second controller; either can handle the entire network with some loss of performance if the other fails.

The remote printers involved are all individually buffered by the terminals, and can be addressed directly by the mainframe if desired. Consequently, terminal operators are never held up while printing takes place.

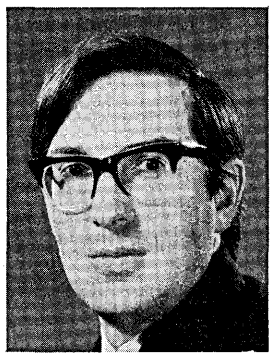
Further, all the remote terminal installations, including the large cluster at Orpington, are sufficiently straightforward to be supervised by any clerical supervisor in the user departments; there are no specialists on site.

Lessons learned

Perhaps the biggest lesson we have learned has been the benefit derived from the amount of flexibility built into our approach to distributed systems. The software compatibility between the central mainframe and the satellites makes redistribution quite practicable, and we do it all the time as the workload mix and the organization change. New satellites are added from time to time, new terminals continually, and there is a strong trend toward greater use of terminal intelligence. Even the central mainframe has been upgraded, as mentioned, to a new model ICL 2960. Any distributed network that does not have the capability to absorb these changes is unlikely to be successful over a period of time.

With the costs of software rising continually, it is becoming increasingly important to achieve the greatest possible degree of commonality and, where practicable, standardization. Distributed computing must not be allowed to become an excuse for the uncontrolled proliferation of incompatible hardware and software, if serious future problems are to be avoided. Neither must the benefits of common experience and expertise, reduced duplication of effort, and more sophisticated central facilities be thrown away in a mad rush to decentralize everything.

Modern technology offers enormous potential, but tremendous dangers as well. At every stage one must ask not only what is technically possible but also what is manageable. It is the organization that can take a balanced view, exploiting new developments without becoming overwhelmed by them, that stands the greatest chance of success. ❁



Dr. Shepherd is manager of the Technical Services Dept. of Vickers Management Services. He is responsible for the evaluation and acquisition of computer and communications equipment, and for advising on the potential exploitation of new technology.

His work includes the running of joint projects on production control with ICL and the British Dept. of Industry, the development of financial models, and general operational research work. Two other posts he currently holds are secretary of the Vickers Computer Policy Committee and secretary of the V. E. G. Computer Policy Board.

IBM's Strategy in Terminals and Distributed Processing

by Henry F. Sherwood

According to this author, what started as a desire to increase revenues from central site main memory and discs turned into a promotion of distributed processing—but only as an interim step on the way to more "central" sites.

During 1970, IBM raised the problem of terminal product planning to the status of a Key Corporate Strategic Issue. It was estimated that the 100,000 terminals already attached to IBM systems would grow to 350,000 units by 1975. Nor did it escape management's notice that the addition of one or more substantial teleprocessing applications to an IBM installation tended to produce a 2X to 4X increment in main memory requirements, and a 3X to 6X increment in rotating storage requirements. Thus IBM management concluded that the relatively poor profit margins (9-16%) of its existing terminals could be tolerated because of the terminals' dramatic effect on mainframe and peripheral sales.

First, terminals were a problem

A series of interim products including the 3705/4, NCP, VTAM and System/370 virtual operating systems were announced — in this author's opinion — to stall competitors' terminal and front-end products until IBM's ultimate software programs for network control could be completed. Then the subsequent announcement of SDLC and SNA with their orientation to block mode data transmission nicely tied in with IBM's plan for the centralized processing and storage of data generated by remote terminals. And the chief and modest problem IBM was left with after SNA's announcement was the development of software products to support it.

To tackle that, IBM by mid-1973, evolved an industry orientation to its terminal marketing strategy. Each industry had been analyzed to identify special purpose terminal applications packages which could be tied to VS operating systems and SNA. IBM's basic objective was to merge its applications-oriented terminal strategy with its centralized mainframe hardware/software strategy and thus encourage users to stay in the fold.

Some of the new products coming online as a result of the planning and development period of 1970-74 included: the

> It didn't escape notice that teleprocessing tended to produce a 2X to 4X increment in main memory use and 3X to 6X in disc.

3704/3705 communications controllers, the 3767 communications terminal, the 3790 communications system, the 3770 data communications system, the 3610 financial communications system, and the 3650 retail store system.

Unfortunately for IBM, due to conversion costs, delays in product availability (such as for NCP/VTAM), and VS performance problems, the migration to the virtual storage operating systems environment was not as rapid as originally anticipated. In the meantime, competitive software vendors were able to offer alternative data base/data communications functions which were well suited to the non-VS environment, and competitive terminal/front-end vendors were able to offer newer hardware which frequently exceeded the advantages announced for IBM's SDLC-oriented terminal and front-end products.

However, IBM was only slowed, not stalled. In spite of apparent limitations (such as being cumbersome for interactive processing), IBM remained emphatic about SNA and promoted the implementation of VTAM, NCP and SDLC since these all tie closely with the strategy of centralized processing and the carefully controlled account environment with which IBM feels most comfortable. As a result of that promotion, there now may be as many as 500 working VTAM/NCP/SDLC installations in the world. It may have been tough to sell that many, but IBM forces are artful sellers.

Then came distributed dp

In the meantime, there has been a growing use of both decentralized and distributed processing as a supplement for large institutional data processing requirements. There has been a steady shift in perspective from seeing computing as a solution for only the user's most critical accounting problems to seeing the data processing/storage resource as a tool for the day-to-day management of an organization's operations.

This led to a migration of user applications and a shift in budgetary emphasis from the purchase of raw computer

Mr. Sherwood's feature has been adapted from one being published simultaneously in the *Bulletin of the Information Technology Service* printed by SBS Publishing, San Jose, California. The source for the estimates in both articles is the 72-page SBS report "IBM's Terminal Strategy for Distributed Processing." The analysis and condensation of that larger document was done by the author and one of his associates, Mr. Charles A. Covell.

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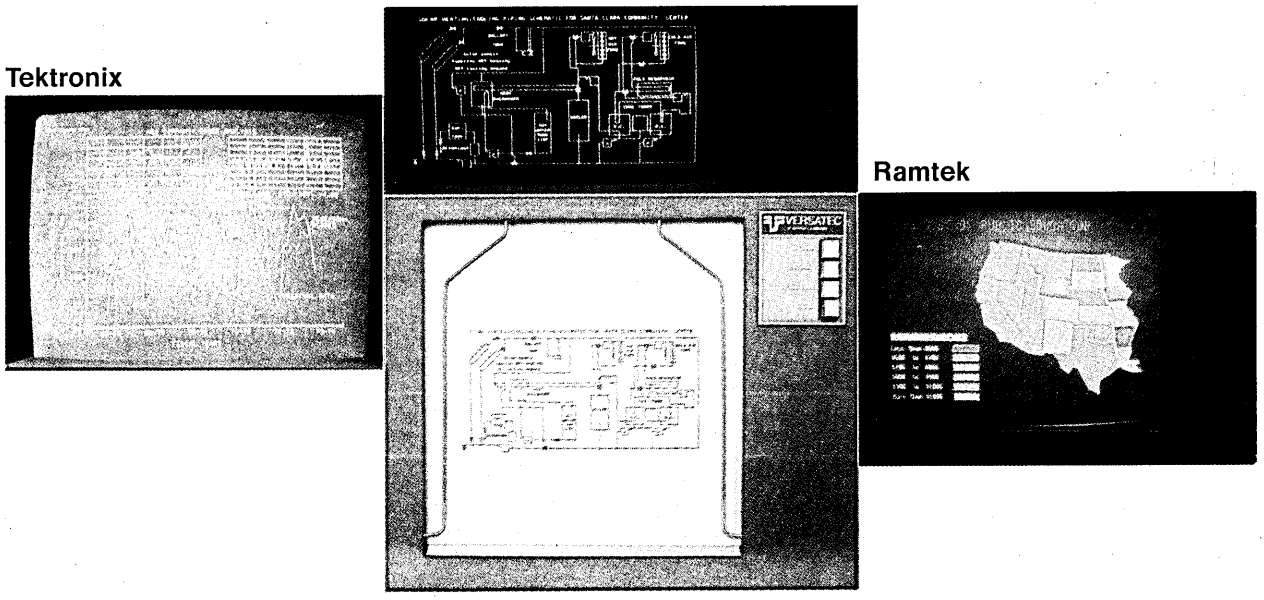

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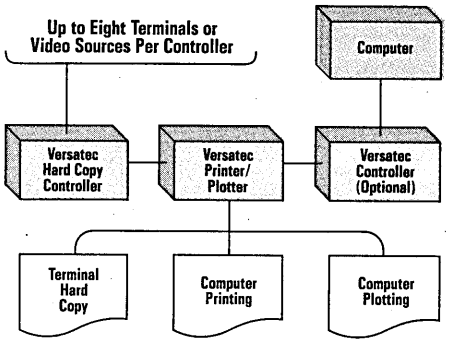

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power to the acquisition of hardware configurations supporting the use of a data base by the operating department. Good, clean (heavily edited), complete data in a readily accessible form became the essential element of these new applications — not its manipulation.

Hardware/software product development kept pace with these evolving needs. In fact, the improvements in these technologies in turn further stimulated the shift of user applications to localized problem-solving.

And now

During 1977, domestic users spent an estimated $7.1 to $7.6 billion on teleprocessing equipment and services. About half of this expenditure went toward the cost of transferring data from one point to another (lines, packet services, modems, etc.) and the other half for vendor-supplied hardware/software front-end and terminal products. This represents about 16% of the nation's data processing bill, or 19% of all expenditures by formalized dp organizations.

The installed base of single station terminals will continue growing from a population of about 216,000 units at year-end 1975 to an installed population of 684,000 units by year-end 1981. The most dramatic part of this growth is expected in programmable units, which will increase from 38,000 terminals installed at year-end 1975 to 255,000 units installed by year-end 1981, an average annual growth rate of 36%!

The provision of a user-accessible cpu also is impacting the market for multistation systems during this current period as evidenced by the installed base of crt display terminals attached to programmable controllers climbing from 74,200 units at year-end 1975 to an expected 416,000 by year-end 1981.

> The population of programmable terminals is expected to grow at 36% per year.

IBM does not appear to have reacted fast enough to this shift of user applications and the resultant impact on the selection of computer power, which is ironic since IBM is in large measure responsible for guiding the user to ever more sophisticated and integrated applications. And not only must IBM contend with the growing sophistication of the user application of computer power, it must also contend with an entirely new (for IBM) phenomenon: the emerging growth of the "do-it-yourself" attitude. This includes the growing cadre of experts within IBM's big accounts, and perhaps many of the small-to-medium installation users who are not yet locked in to IBM and may be able to find an alternative to IBM's line within a micro- or minicomputer-based framework.

Seeds for growing big sites

By the third quarter of 1976, I feel, IBM made a decision to alter the distributed processing product strategy. The new strategy was to consider the growth of decentralized data processing and the use of distributed networks as a bridge from centralized computing to multiple installations of smaller mainframes — which then, in turn, might grow into larger installations. In addition, IBM wanted to accommodate the growing do-it-yourself restlessness among its users, and this was

IBM DISPLAY TERMINAL FORECAST—U.S. INSTALLED BASE

		1975	1976	1977	1978	1979	1980	1981
2260	Remove	8,200	4,500	2,100	500	100	50	-
	Reinstall	2,050	700	200	-	-	-	-
	Net	6,350	2,550	650	150	50	-	-
2265	Remove	100	50	-	-	-	-	-
	Reinstall	-	-	-	-	-	-	-
	Net	50	-	-	-	-	-	-
3277	Remove	12,500	21,000	26,000	27,000	24,000	18,000	16,000
	Reinstall	12,000	19,000	23,000	20,000	15,000	9,000	7,000
	New	24,000	18,000	6,000	-	-	-	-
	Net	82,000	98,000	101,000	94,000	85,000	76,000	67,000
3275	Remove	1,100	1,900	2,800	3,400	3,600	4,100	3,700
	Reinstall	1,000	1,750	2,000	2,200	1,800	1,200	800
	New	1,900	1,450	750	-	-	-	-
	Net	10,700	12,000	11,950	10,750	8,950	6,050	3,150
3790*	Remove	-	400	1,260	3,800	6,000	8,900	11,500
	Reinstall	-	350	1,200	3,600	5,400	4,000	3,200
	New**	4,500	12,000	4,850	6,200	-	-	-
	Net	4,500	16,450	21,240	27,240	26,640	21,740	13,440
2915	Remove	3,600	4,950	5,300	5,100	4,300	3,600	2,900
4505	Reinstall	2,200	2,150	1,750	1,250	490	210	100
	New	-	-	-	-	-	-	-
	Net	22,700	19,900	16,350	12,500	8,690	5,300	2,500
3740-2	Remove	500	850	1,500	3,850	6,150	8,500	12,000
3740-4	Reinstall	450	800	1,400	3,600	4,300	3,700	4,000
	New	4,350	6,250	8,900	6,950	-	-	-
	Net	12,500	18,700	27,500	34,200	32,350	27,550	19,550
3274	Remove	-	-	-	-	2,200	8,100	14,200
3276	Reinstall	-	-	-	-	2,000	7,600	12,900
	New***	-	-	-	18,000	36,000	42,000	44,000
	Net	-	-	-	18,000	53,800	95,300	138,000
	TOTAL	138,800	167,600	178,690	196,840	215,480	231,940	243,640

** 3277 Displays on 3791 Controller.*

*** Includes use of Refurbished 3277 units from 3271/3272 removals.*

**** Excludes shipments of new Plasma Display panels attached to 32X controllers.*

Source: "IBM's Terminal Strategy for Distributed Processing," SBS Publishing (May, 1977)

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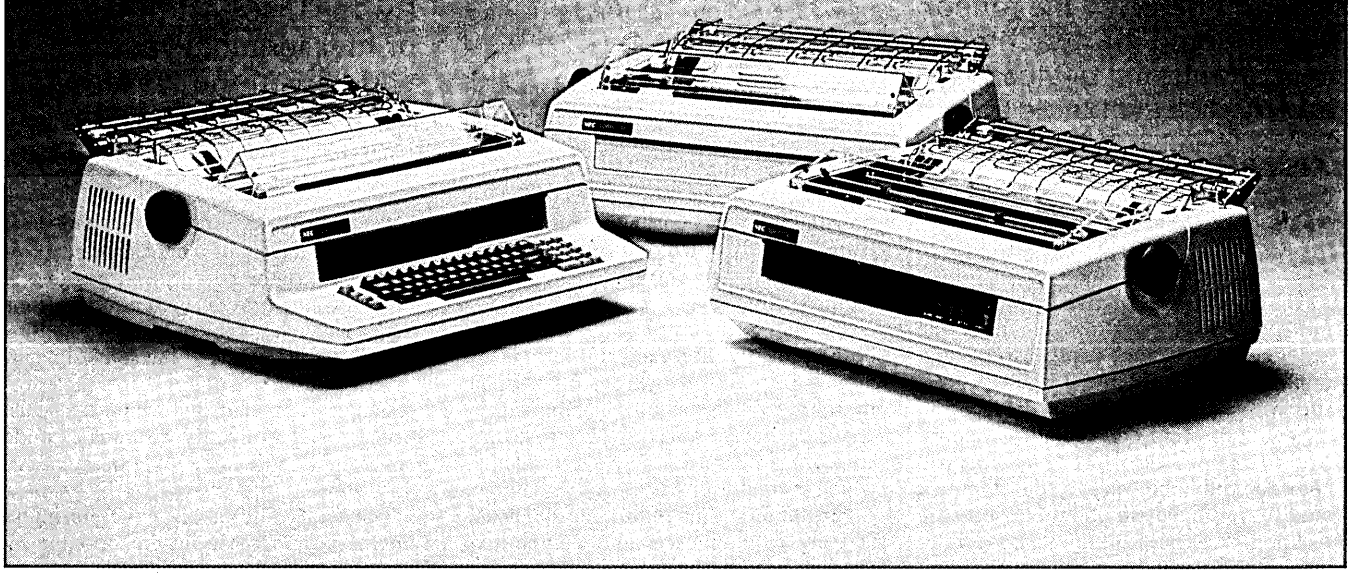

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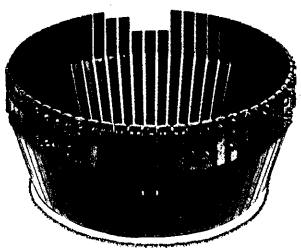

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to require a radical change in marketing techniques for the proposed Series 1 minicomputer system.

IBM's user base had a large psychological, political, and financial interest in the continuation of a centralized computing philosophy. IBM itself had a similar interest, with a stress on the financial aspects of continued centralization. Large mainframes, and IBM's virtual control over the majority of larger users, were sources of continued revenue stability and growth. Hence the distributed processing concepts announced under SNA would be continued under any strategy.

In one swift move, IBM defused much of the rancor surrounding the attachment of competitors' devices — and made it profitable to IBM.

New terminal products

The driving force in hardware technology over the next decade will be the growing use of microprocessors and minicomputers. The use of these processors will be enhanced by improvements in RAM, bubble, and disc memory systems. Micro/miniprocessor-based systems will continue to be the basis for developing a greatly improved small system software technology. The leading serial printer technologies will be based on the continued development of dot matrix and daisywheel impact mechanisms. The leading low cost line printers will use either dot matrix or band technology. The crt will continue to dominate the market for visual displays through 1981 even though both IBM and Xerox are preparing electro*chemical* panel technology for introduction by 1980.

IBM will not only emphasize the development of special purpose terminal hardware, but will place an even greater emphasis on the development of specialized applications software. This emphasis on software products which are heavily dependent on IBM host and terminal hardware characteristics is fundamental to the company's long-range planning. The application program strategy is driven by the need to pose as an applications expert to each industry in a fashion similar to that used in marketing System/32.

The General Systems Div. has a role in this too. In November 1976, GSD shipped the first commercial Series 1 processor. Series 1, with the raw compute power of a 370/135, will have sufficient configuration flexibility to cover the entire spectrum of distributed cluster node controller and decentralized processor requirements.

The marketing strategy for the series is both innovative and radical. It provides a migration path for loyal IBM mainframe users into the distributed — and if they choose, decentralized — processing environment. But it does so in a manner which is unique for IBM.

For the first time in this decade, IBM is actively helping users and competitive vendors attach non-IBM hardware to an IBM mainframe. In one swift move, the giant has defused much of the rancor surrounding the use of competitors' devices, and has done it in a way that will be profitable to IBM. In addition, IBM can now be on the competitive bid list when larger users publish an RFP covering new minicomputer-based applications. Losses, such as the ones to DEC at AT&T, to General Automation at Ford, and to Computer Automation at Fireman's Fund, can be reduced.

The revenue strategy

IBM is well aware of the tremendous growth of teleprocessing. More than 250 users now have more than 2,000 terminals *each* within their individual teleprocessing networks. And by year-end 1981, 85% of all terminals will be located at remote sites. In these large networks, it will be IBM's aim to reduce communications cost (through such ploys as Satellite ness Systems), while at the same time increasing user costs for those teleprocessing system elements which IBM sells: processor, peripherals, terminals, node controllers, software, and maintenance service.

By 1981, 40% of the printer terminal vendors and 26% of the crt terminal vendors will have been merged into other operations.

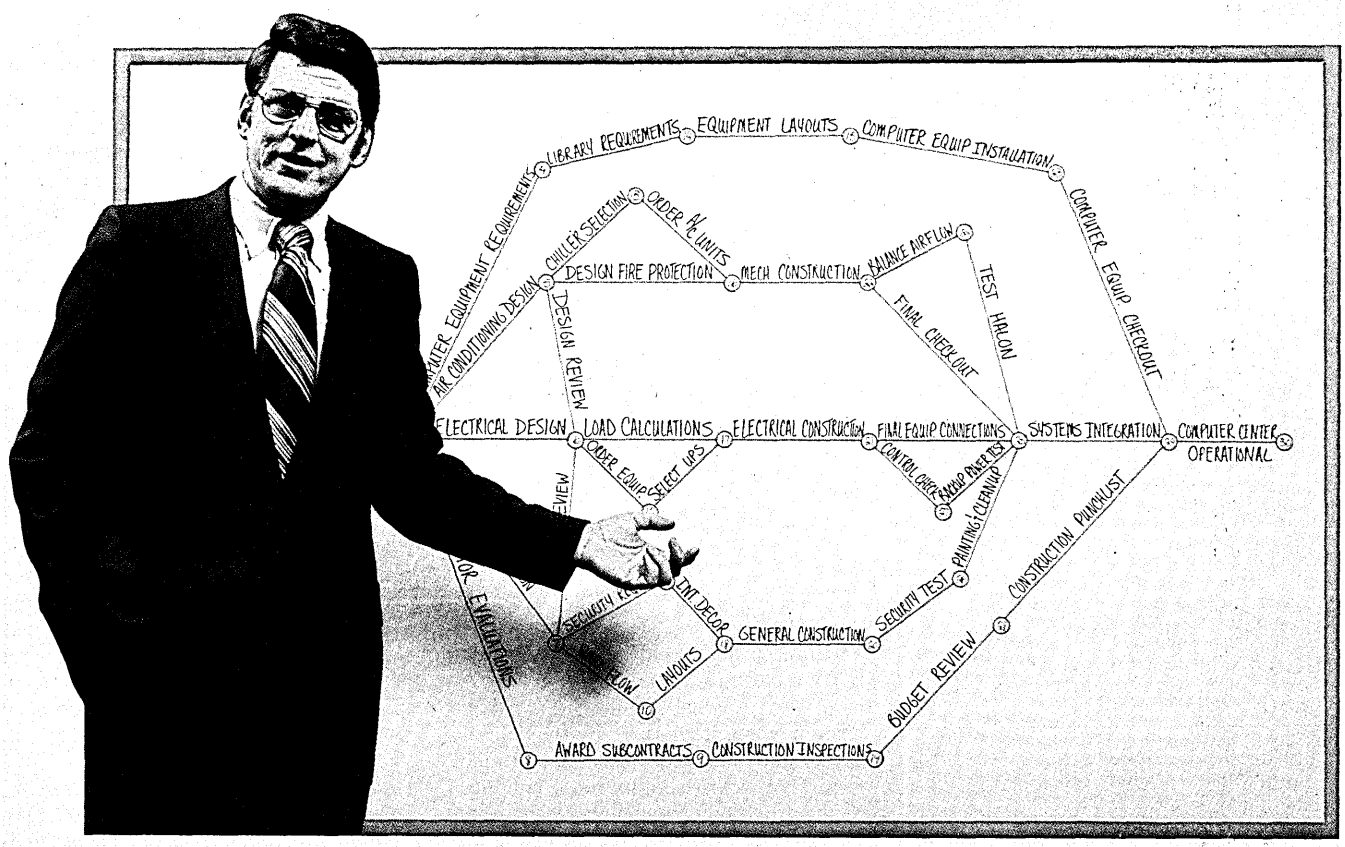
IBM will continue to reduce terminal operator labor costs where possible by providing local terminals that have software which can encode/decode and edit

IBM TELEPRINTER TERMINAL FORECAST—U.S. INSTALLED BASE

		1975	1976	1977	1978	1979	1980	1981
2740	Remove	8,000	14,000	12,000	9,000	8,000	6,000	2,000
2741	Reinstall	4,560	4,300	4,000	1,900	1,200	600	-
	Net	42,000	32,300	23,300	16,200	9,400	4,000	2,000
2770	Remove	1,500	2,700	2,500	2,300	1,800	600	300
3735	Reinstall	1,100	1,600	900	400	-	-	-
	Net	7,500	6,400	4,800	2,900	1,100	500	200
3770	Remove	-	240	1,000	2,300	4,500	6,900	9,000
	Reinstall	-	200	950	2,200	4,250	6,600	9,000
	New	2,400	9,600	14,400	10,800	9,000	7,800	6,000
	Net	2,400	11,960	26,310	37,010	45,760	53,260	58,760
3767	Remove	-	1,050	3,700	6,300	8,900	11,500	14,000
	Reinstall	-	1,000	3,600	6,000	8,300	10,700	12,900
	New	7,000	14,400	12,000	9,000	8,000	5,000	-
	Net	7,000	21,350	33,250	42,550	49,950	54,150	53,050
New	Remove	-	-	-	-	-	600	2,700
Tech-	Reinstall	-	-	-	-	-	550	2,500
nology	New	-	-	-	-	6,000	18,000	22,000
	Net	-	-	-	-	6,000	23,950	45,750
	TOTAL	58,900	72,010	87,660	98,660	112,210	135,860	159,760

Source: "IBM's Terminal Strategy for Distributed Processing," SBS Publishing (May, 1977)

"Systems planning includes the facility as well as the computer."



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More than a computer company

data, permit the accumulation of application-related data at the operator site, enhance the resulting data base structure with local processing capability, offer data security, and improve terminal reliability/availability.

IBM's revenue generating objectives seem to include: migrating users to the higher overhead/storage costs of VS functions, increasing the conversion of the 370 lease base to cash (already largely accomplished), introducing even more powerful 3XXX central processors to continue the stability and growth of central site revenues, heading off the alternative use of competitive minicomputers through the introduction of Series 1, and recapturing the technological (revenue) direction of "do-it-yourself" installations by offering Series 1 as an acceptable channel for these creative energies.

IBM will migrate its user base from "dumb" terminals to programmable terminals and cluster controllers. Once hooked, users will want to increase their terminal memory and disc capacity as their processing load increases. Next comes the introduction of a decentralized computer to offset the processing/data base deficiencies of the programmable terminal or cluster controller. This will then lead to the inevitable free-standing computer installation, loosely connected to a host mainframe through a distributed data processing network.

IBM is still vulnerable to vendors who will define response times.

Thus, as always, the primary purpose of IBM's new terminal strategy and the introduction of Series 1 is to recapture control over the direction of its accounts—and their contribution to IBM revenues.

Terminal forecast

Then there are the transmission control units. The Series 1 processor, or a similar one, will become the basis for a 370X product set replacement by year-end 1979. It will be possible to link two processors to provide redundancy, and two to four processors will be configured for load sharing and for providing redundancy in a multiprocessor host system. It is even possible that these processors will be integral to the 3000 series host processors and hence difficult to separate from the IBM software/hardware support structure built into these systems.

As far as crt's are concerned, we can project that IBM must announce a replacement for the 3275/3270 product sets. It has announced new multistation capability (the 3276 control unit/crt station, and the 3274 32-station, controller) but still needs a "dumb" single-tube terminal, as well as a user programmable single station unit with diskette/disc and teleprinter to replace the 3740-2 and 3740-4.

IBM has thus far failed to announce a suitable replacement for the 2741 and 2740-2 teleprinter terminals. We can expect to see the use of a Qume print mechanism in its word processing terminal for Office System 6, and the Qume mechanism, or an IBM version of it, in a free-standing teleprinter terminal by year-end 1979. In the meantime, IBM will announce a replacement for the 3767 and ship its first unit by year-end 1980.

IBM also will continue to upgrade the software and peripheral capability of the 3776/3777 terminals. The RJE function will continue to migrate to intelligent terminal products such as those offered by Four-Phase, Sycor, Harris, and of course IBM through its own 3790 and Series 1 controllers.

By year-end 1978, IBM will have effectively replaced the data collection and sensor terminal functions performed by System/7 with new hardware/software products attached to Series 1.

Although the firm has not met with overwhelming success in selling its concepts of point of sale, it will for the near term continue in its attempt to overtake the industry leader, NCR.

IBM has a much stronger competitive position in the banking industry. Here it has successfully insisted that users implement SNA/SDLC procedures in a VS environment in order to enjoy the benefits of the new 3600 teller terminal product family. We can see additional enhancements to this product line by year-end 1978, including improved MICR equipment and updated transaction terminal capability for credit/check verification.

Also expect IBM to attempt to combine EFTS functions with POS capabilities in a hybrid system.

The new scenario

IBM will patch its terminal problems, provide a migration path to distributed processing for its users, and give vent to the "do-it-yourself" installation using IBM controlled products. The Series 1 solves two problems, one for the user (who wanted to chart an independent but "safe" course into the use of minicomputers) and one for IBM (how to regain market control over these wandering accounts).

The competitive environment will soon be restated. The user will be presented with an increased selection of terminal hardware/software product alternatives, and a real choice as to how they will be distributed among the nodes in the network. The choice will be based on IBM's new strategy, the competitive reaction.

The cost of a successful entry to this business has steadily risen since 1969. By now, only the well-heeled can try. Only a few of those will succeed. We are in a phase of vendor consolidation. Familiar names will be lost or merged into other firms. (By 1981, this author estimates that 40% of the current primary printer terminal vendors and 26% of the current primary crt terminal vendors will have been merged into other operations.) Money for lease-base development will be harder to find. Money for the development of field service support programs will virtually dry up.

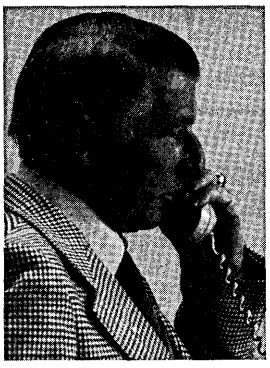
It is not necessarily the growth of the IBM spectre which causes these conditions. It can also be attributed to the lack of public investment incentive, and the high cost of new technology.

If it becomes cheaper (and it will/is) to store data base elements at distributed sites than to transfer it across land lines, then IBM's economic argument for large, centralized systems begins to disappear. Moreover, users will eventually realize that the single large centralized installation is too vulnerable to unfriendly penetration.

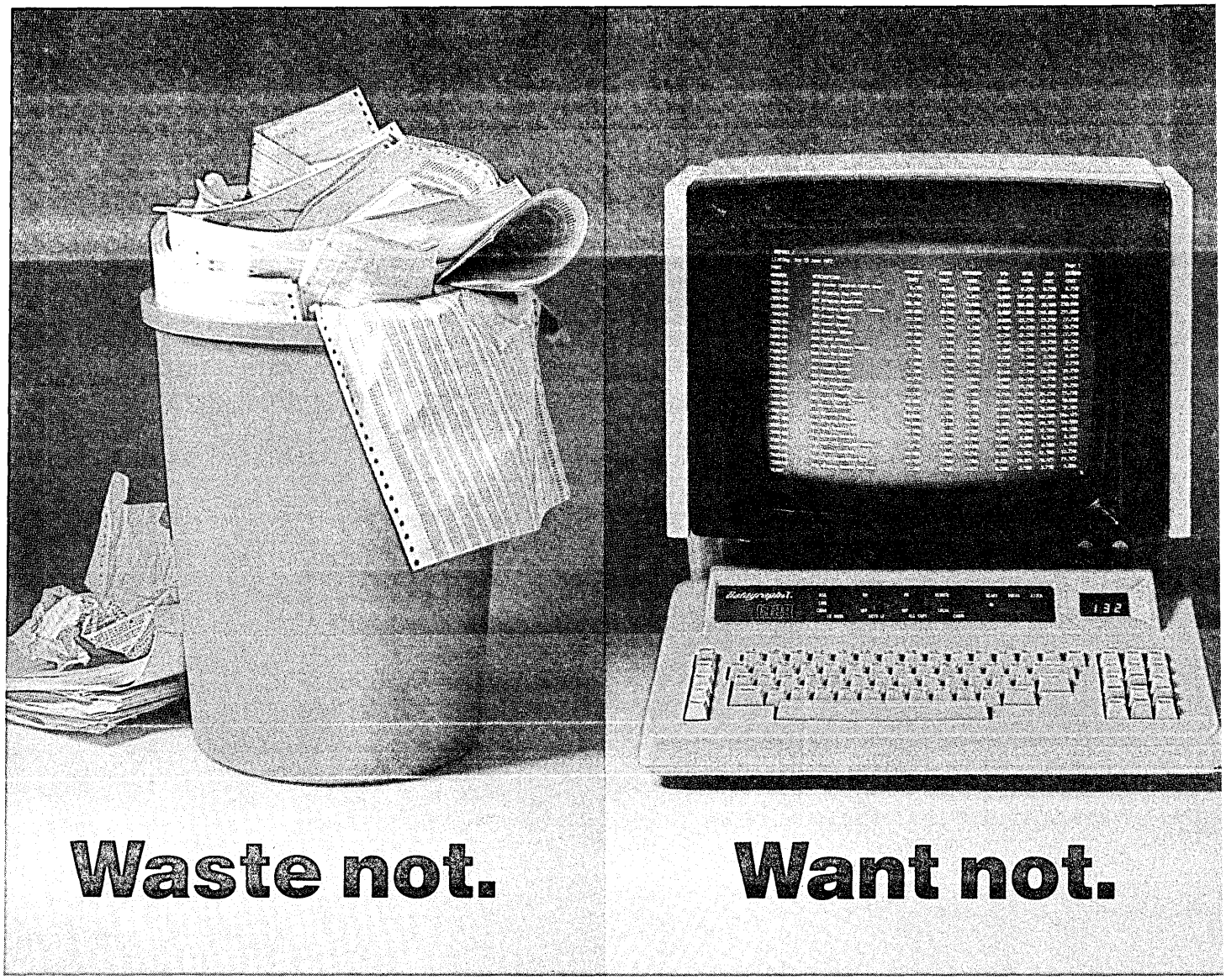
Competing vendors must simply keep on doing what they have always done. . . The more sophisticated users will respond.

But the user must also evaluate the conversion costs, increased capital costs, personnel costs, and equipment resources demanded by a conversion to the SNA environment. And without definitions of SNA response times, IBM is also vulnerable to vendors who will define response times.

There is no magic in SNA. In fact it is a highly vulnerable concept because it is costly to implement. Competing vendors must simply keep on doing what they have always done, offer a better, more cost-effective solution. The more sophisticated users will respond. ❋



Mr. Sherwood is a former vice president of Diebold Europe S.A., and founder and former director of the Diebold Research Program—Europe. He has been in dp since the origin of the discipline, and among other responsibilities has taught at the Univ. of Detroit and the Technical Univ. of Berlin. He presently heads a European dp consulting firm, H.F. Sherwood & Assc.



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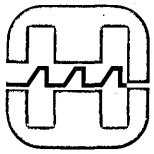

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CIRCLE 66 ON READER CARD

Communicating Word Processors

by Amy D. Wohl

The similarities between these devices and general purpose terminals is not coincidental.

Word processing is widely acknowledged as a concept whose time is now. But most word processors are today realizing only a part of their potential. They are used on a standalone or on-site basis to produce paper documents which are physically transmitted, by mail or messenger, to their destination. The more sophisticated use of such equipment, with documents transmitted electronically, accessed on display screens, and stored in an electronic file system for future reference, is a vast and fertile field whose topsoil has barely been scratched.

There are very likely between 275,000 and 350,000 word processing workstations in use in the United States today. Probably less than 10% of them are equipped with communications features on a reasonably active basis. Nevertheless, nearly every serious contender in the word processing market (currently, some 60 vendors) is offering some communications options or contemplates offering them shortly.

About 30% of all respondents to a 1977 International Word Processing Assn. survey stated that they will require some communications facilities within five years; in addition, about 12% of the 700-plus word processing managers queried expressed an interest in interfacing with a computer (another facet of the communications question). At any conference where word processing folks gather, seminars on electronic mail are well attended, with many participants — especially those from the federal and state governments and the *Fortune 500* companies — expressing a keen interest in planning for and implementing faster, cheaper, and more sophisticated communications networks for their organizations.

What's holding up the (electronic) mail?

With such widespread interest in electronic mail (and, especially, electronic mail systems based on word processing hardware), why is there so little actual equipment being used for it?

The first reason has to do with compatibility. Unfortunately, word processing manufacturers offer a number of different communications protocols. In some cases two or more firms may have a matching combination of emulation, protocol, code set, and speed, but run into another compatibility problem. Word processors do not just record and transmit text; they must also communicate formatting information and other special codes. If the codes of one system are different from another system (or do not exist at all), some fairly strange things may come over the line.

There are a few widely used protocol /code /speed combinations. Naturally, they are the ones offered by IBM, with its overwhelming strength in this marketplace (probably accounting for about 75% of all installed equipment). Originally, IBM concentrated on the magnetic card, Selectric typewriter combination; for communications this was compatible with the 2741 terminal's 135 baud ASCII transmissions. However, with the advent of the Office Systems 6 display-based equipment, IBM switched to a bisynchronous, extended-EBCDIC protocol (2770 compatible) with speeds to 2400 baud. A number of vendors continue to offer the 2741-compatible emulation; many are offering or plan to offer the newer 2770 emulation.

. . . a vast fertile field whose topsoil has barely been scratched.

IBM apparently intends to standardize on 2770 for the current generation of word processors as the 2741 line is no longer produced and the 2770 communications package is available on all new products, including the Qume-printer-based version of the mag card typewriter (the 6240) and the new Qume-based os6 models.

"Smart" word processors (those that are programmable) have another way of attempting to solve the compatability dilemma. They may offer a variety of emulations, with the user selecting the appropriate match either by loading a program (through magnetic card, cassette, or diskette) or by keyboard commands.

Again, however, there is little that can be done if two word processors use incompatible codes. For instance, both may communicate in teletypewriter emulation (asynchronous ASCII, 110 to 300 baud), but use different structures for their word processing commands. It will be physically possible to establish a link between them and send data across it, but most of the transmission is likely to be garbage.

A second reason word processor-based electronic mail hasn't caught on has to do with costs. They look too high compared to the USPS. But while line costs for a letter transmission may seem high at first glance, especially when compared to a 13¢ postage stamp, such comparison assumes there is no cost attached to the speed of delivery or certainty of receipt. With much business correspondence, however, delay is costly. In some cases (as with an expeditiously entered order), a precise dollar cost may be assigned to each additional day required for delivery. In other cases (consider a memo on an acquisition decision) it may be more difficult to know the cost of delayed or missing information, but the cost is definitely there.

When a value is assigned to timely delivery, electronic transmission costs are seen in a more appropriate perspective. Too, telecommunications experts are reasonably certain that higher transmission speeds and lower line costs will combine to significantly lower the cost of electronically delivering mail over the next decade.

One cost which must not be overlooked in the electronic mail equation is the true cost of the relatively expensive word processing equipment. If the word processor is utilized fully or nearly fully during the business day and communication is performed in otherwise unused time (at night, unattended, or in background mode), the cost of such communications facilities becomes minimal — just the cost of adding the option, generally $500 to $5,000 plus modem on a purchase basis. On the other hand, if the user must acquire expensive equipment which is to be used only infrequently, few applications could justify the cost.

Fortunately, the cost of word processing equipment in general has been coming down, making cost justification of infrequently used equipment easier. For instance, IBM recently announced purchase price reductions in most of its mag card line. In addition, the true cost of word processing has decreased as new generations of systems offer more sophistication and utility with only small increments (or no increment) in price. By the time this article is in print, it is pos-

sible that a low-priced typewriter-like system (with communications options) may be available in the $2,000 to $5,000 range. Such a product could have a revolutionary effect on schedules for the growth of electronic mail.

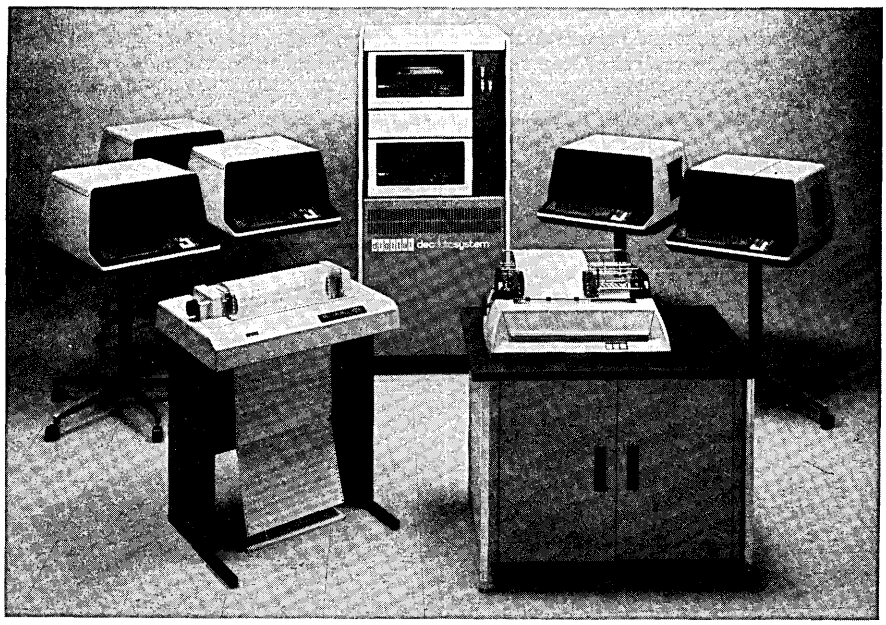
Another problem in the acceptance of word processing systems concerns the question "What will I use it for?" When a new technology appears, there is a lag between its conception and its implementation. Where the basis of the technology is establishing a network of interoffice or intercompany connections, it will not be useful until many offices or firms implement the technique. The current situation in communicating word processors and in the entire field of electronic mail is somewhat similar to the situation of television in the '40s: until many people could receive tv programs, no one wanted to spend money on programming; but until there were programs to receive, there was little incentive to buy a tv. Now the situation is that everyone will watch to see who else is buying word processing communications capabilities (and what types they are, remembering the compatibility question). Fortunately, the experience with tv suggests there will be a point when a "critical mass" is reached and many firms will almost simultaneously begin broad use of the new technology.

Looking over the possibilities

We are already well into the "looking around" stage, with many firms already setting up networks of communicating word processors to ship text between the branches of their own empire. Corporate control in these cases assures that compatible equipment is acquired and that the schedule of acquisitions is appropriate.

Of course, this means that many firms for the first time are taking an inventory of their existing word processing equipment. They may find that during the last dozen years they have acquired quite dissimilar and often completely incompatible pieces of hardware. Some effort will be made to create custom interfaces ("black boxes"), but eventually they will standardize on one or two types of hardware and place existing incompatible inventories in specialized departments where communications and other compatability requirements are not expected to exist. Some firms will choose to sell off their existing inventories of first generation equipment, creating in the process a strong second-hand equipment market where smaller firms with limited needs will be able to find less expensive equipment to suit their requirements.

Any number of other incidents could occur which would serve as a catalyst in reaching that critical mass, too. For instance, a utility or service firm could offer a conversion service whereby it would accept communications from any processor and send them to any other processor in the correct combination of code, protocol, speed, and so forth. The sender would be charged for line use plus a fee for the value added by the conversion service. This would have the effect of making every communicating word processor instantly "compatible" with every other. The user could still choose to access the service selectively, maintaining his own brand of intracompany compatibility.



The similarities between shared logic word processing systems and computers with terminals is not purely coincidental, at least not in DEC's line above. Up to 48 display terminals can share the processing and printing capabilities of a PDP-11/70; smaller networks can be configured around other 11-series processors.

Another catalyst might be the announcement by a major firm of a new generation of equipment. Such a new line conceivably could leap-frog existing hardware (although it might be compatible with some of it) and stimulate prospective users to view the communications question in a new light.

Don't rule out dp

Both of these scenarios ignore another strong possibility, that of the data processing departments taking the problem out of the hands of the office administrators. Communicating word processors are already being acquired for transmitting text or data to computers. Sometimes this is seen as a sideline of the equipment's main word manipulating chores (for instance when the local office of a large insurance carrier uses its word

(Text cont. p. 110; Tables p. 106)

Xerox is in the communicating word processing game with the 800 ETS standalone printer/keyboard station, the 850 shared logic display system, and the Xerox/Daconics shared logic display system shown above exercising its white-on-black and black-on-white screen choices.

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100 Marcus Blvd., Hauppauge, N.Y. 11787
Telephone: (516) 231-5400

I need more information on the System 70.

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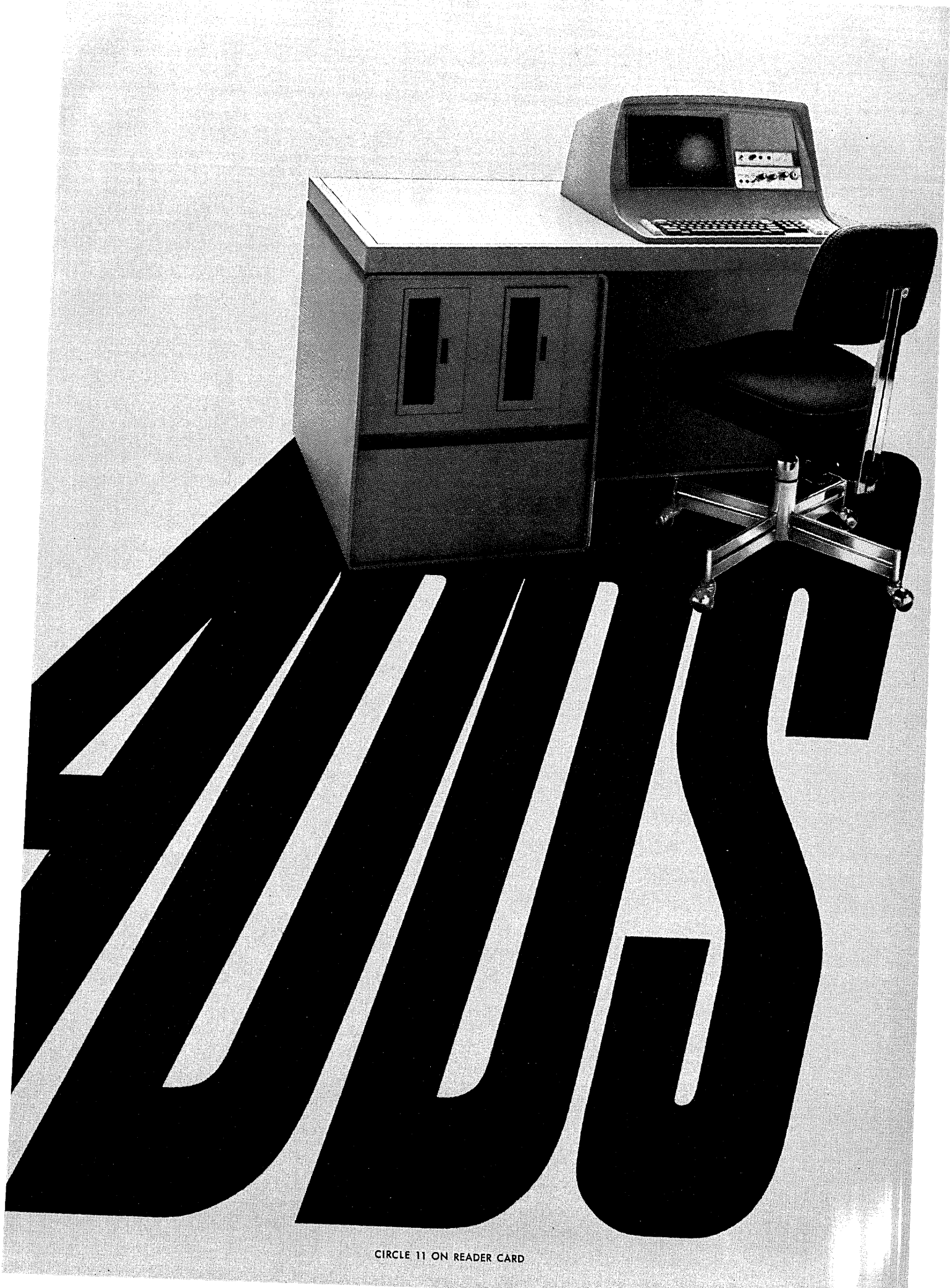
*Address*_____

*City*_____ *State*_____

*Zip*_____ *Phone*_____



CIRCLE 11 ON READER CARD

TYPICAL STANDALONE HARDCOPY WORD PROCESSING SYSTEMS

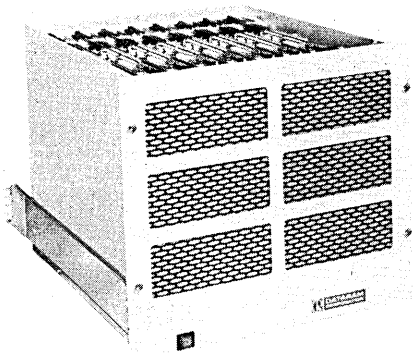
Manufacturer	Model	Media	Emulation	Character Code	Protocol	Line Speeds	Basic Price
CPT	Cassetype 4200	cassette	tty	ASCII	asynch	50 to 9600bps	$ 8,790
DTC	MicroFile	diskette	tty	ASCII	asynch	50 to 9600bps	$10,145
			IBM 2741	Correspondence	asynch	135 to 2400bps	
A. B. Dick	Magna I	mag card	tty	ASCII	asynch	10 to 30cps	$12,000
			IBM 2741	Correspondence	asynch	134.5/300bps	
IBM O.P. Div.	MC/ST-I	mag card	IBM 2741	Correspondence	asynch	134.5bps	$ 9,550
	MC/ST-II, 6240	mag card	IBM 2770	ASCII/EBCDIC	bisynch	600 to 2400bps	$16,500
Redactron	Redactor I	mag card/ cassette	tty	ASCII	asynch	10/30cps	$ 6,627
			Telex	Baudot	asynch	6.6cps	to
			TWX	ASCII	asynch	10cps	$13,242
			IBM 2741	Correspondence	asynch	134.5bps	
			IBM 2780	EBCDIC	bisynch	150 to 300bps	
Tycom	Datamaster	diskette	tty	ASCII	asynch	110 to 9600bps	$ 6,995
Xerox	800ETS	cassette	tty	ASCII	asynch	110 to 300bps	$11,700
			IBM 2741	Correspondence	asynch	150/300bps	

TYPICAL STANDALONE DISPLAY WORD PROCESSING SYSTEMS

Manufacturer	Model	Media	Emulation	Character Code	Protocol	Line Speeds	Basic Price
AES Data	AES-100	diskette	IBM 2741	ASCII	asynch	134.5/300bps	$18,700
			IBM 2780	EBCDIC	bisynch	2000/2400bps	
Artec	Display 2000	diskette	IBM 2741	ASCII	asynch	50 to 19,200bps	$12,050
Base	Ultra-Text	diskette	IBM 2780	ASCII/EBCDIC	bisynch	up to 9600bps	$25,000
CPT	Disktype 8000	diskette	IBM 2741	ASCII	asynch	110 to 2400 bps	$15,990
			IBM 2780	EBCDIC	bisynch	1200 to 2400bps	
DEC	310W, WS100, WS102	diskette	tty	ASCII	asynch	50 to 19,200bps	$14,500 to $21,300
Dennison	Wordplex/1	diskette	IBM 2741	Correspondence	asynch	134.5/300.bps	$16,500
			IBM 2780	EBCDIC	bisynch	2000 to 9600bps	
IBM O.P. Div.	OS 6, WP/32	mag card/ diskette/disc	IBM 2770	ASCII/EBCDIC	bisynch	600 to 2400bps	$20,970 to $41,900
Lanier	LTE-1, LTE-2	diskette	tty	ASCII	asynch	300 to 1200bps	$19,200
			IBM 2741	Correspondence	asynch	134.5 to 1200bps	to
			IBM 2780	EBCDIC	bisynch	2400/4800bps	$20,700
Lexitron	Videotype 900	cassette	IBM 2741	Correspondence	asynch	15/30 cps	$18,120 to
			Lexitron	Lexitron	asynch	1200/2400bps	$24,165
Linolex	4000 VTE	diskette	tty	ASCII	asynch	110 to 1200bps	$16,500
			IBM 2741	Correspondence	asynch	110 to 1200 bps	to
			IBM 2780	EBCDIC	bisynch	2000 to 4800bps	$19,500
Micom	2000, Mini-Edit	diskette, mini diskette	IBM 2741	Correspondence	asynch	50 to 1200bps	$ 9,800 to $16,900
NBI	System II	diskette	tty	ASCII	asynch	300 to 2400bps	$17,500
Q1	Q1/Lite	diskette	tty	ASCII	asynch	300/1200bps	$21,000
			IBM 2780	EBCDIC	bisynch	2000 to 4800bps	
Tycom	VIP	diskette	tty	ASCII	asynch	110 to 9600bps	$13,995
Vydec	1200, 1400	diskette	IBM 2741	Correspondence	asynch	134.5 to 1800bps	$18,800
			IBM 2780/3780	EBCDIC	bisynch	2000 to 9600bps	to
			Vydec	Vydec	Vydec	1200 to 1800bps	$21,300
Wang	WP10A	diskette	tty	ASCII	asynch	110 to 1200bps	$15,800
			IBM 2741	Correspondence	asynch	134.5 to 1200bps	to
			IBM 2780/3780	EBCDIC	bisynch	2000 to 9600bps	$18,800
Xmark	2002WP	diskette	IBM 2780	EBCDIC	bisynch	4800bps	$18,500

SAVE 80%

ON PDP 11/70 MAIN MEMORY



WITH DATARAM BULK CORE

1024K x 18 (one megaword) PRICE COMPARISON

DEC				DATARAM			
Qty	Item	Unit Price	Sub-Total	Qty	Item	Unit Price	Sub-Total
1	MJ11-BC 256K word (512KB) system	$ 55,500	$ 55,500	1	BC-417 chassis and accessories	$ 3,400	$ 3,400
3	MJ11-BG 256K word (512KB) additional	53,240	159,720	8	128K x 18 (256KB) additional	5,140	41,120
Source: Datapro. February '77			$215,220				$ 44,520

SAVINGS $\frac{215{,}220 - 44{,}520}{215{,}220} = \frac{170{,}700}{215{,}220} = 79.3\%$

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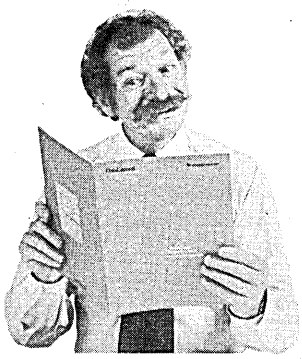
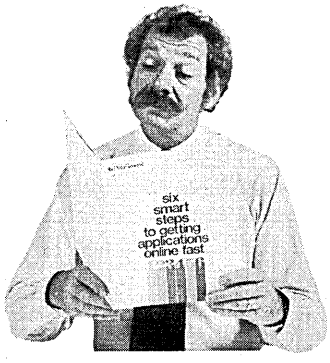
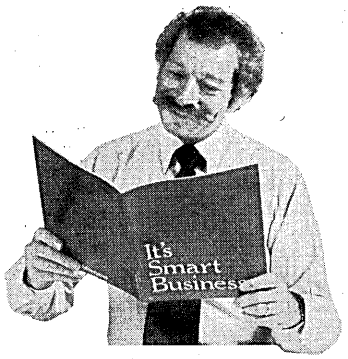


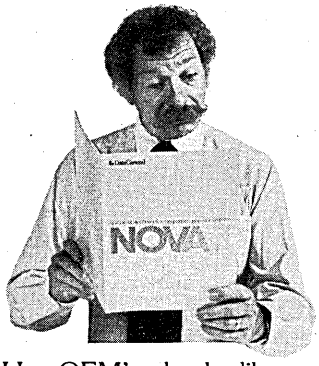
4. Describes seven important SUPPORT SERVICES that get systems up and running, then keep them there.



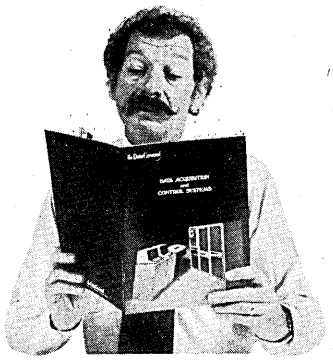
5. Find out how our Real-Time Disc Operating System SOFTWARE can get you on-line fast, and keep you there.



6. IT'S SMART BUSINESS to know how our way of doing business benefits our customers.

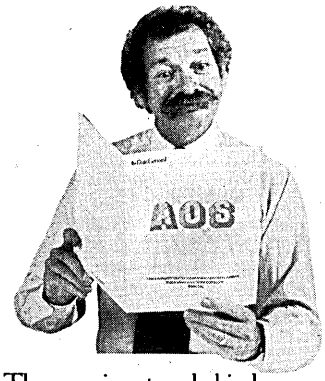


7. How OEM's solve the dilemma of keeping their system costs down with our NOVA 3 COMPUTER FAMILY.

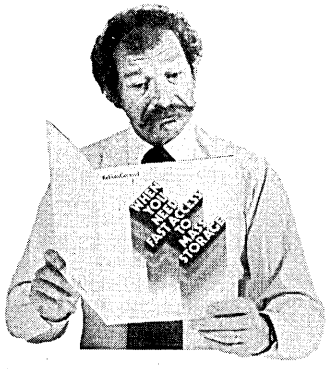


8. What you need to know about getting everything for a DATA ACQUISITION and CONTROL system from one place.

9. The last word in microprocessor-based microNOVA systems with full 16-bit NOVA architecture.



10. The amazing story behind our unique heuristic MULTI-PROGRAMMING operating system.



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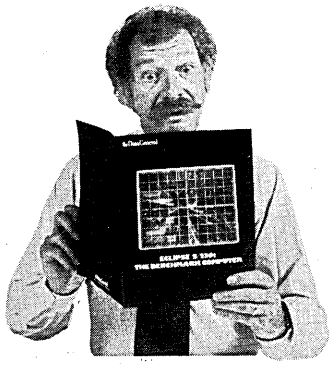
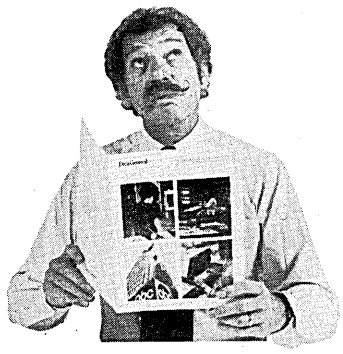
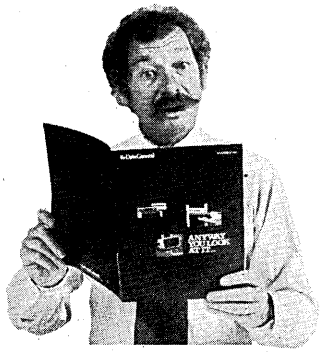


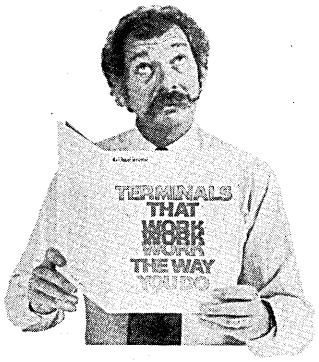
14. Wonder what sets the benchmark for big performance computer systems? Wonder no more, it's ECLIPSE S/230.



15. Is there a sensible way to use computers in DATA COMMUNICATIONS? The message comes through clear.



16. What's the most you can expect to get from a mid-range mini today? What you get with an ECLIPSE S/130—the standard setter.



17. You want terminals that work the same way you do? You want the facts on our DASHER TERMINALS.

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Data General

It's smart business.

processor to transmit new business to the main office's cpu for 20 minutes each afternoon). And sometimes it's a major requirement (one federal government office uses its system for generating form letters two hours each day, and as a terminal to an IBM 370 for text editing under ATMS for five hours each day).

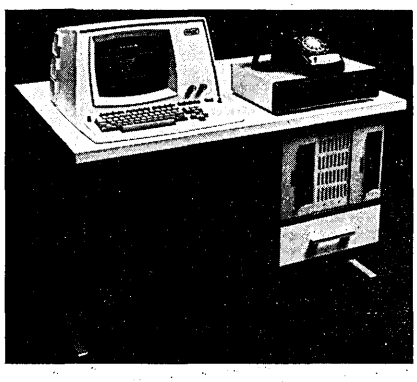
In a sophisticated office of the future (and a not very distant future at that), low cost communicating word processors may be at every secretarial station, where they will be used for typing tasks and for distributing electronic mail. Such stations will very likely also be used for accessing electronically stored files, and this calls for large scale storage (probably hard disc) and a computer. The individual workstations then could also be used for data entry and report generation.

However it goes, it behooves the dp manager to become familiar with the communications facilities within five cessing gear now so that he'll know how to interface them later.

While it is true that electronic mail in the office of the future may not be based upon word processors at all — some experts emphasize the use of facsimile or the expansion of the computer's network — it is likely that the existence of a very large number of office keyboards which can easily provide an interface to an electronic mail system will be perceived as too tempting to ignore. For some time into the future, word processing will continue to offer a fragmented approach to electronic mail, with discontinuities caused by hardware and software incompatability and the manual labor or expensive hardware required for implementation. However, as additional automated function is offered and the price of hardware reduced, word processors will continue to be one part of a viable technique to distribute documents electronically.

Reading the tables

There are certainly plenty of systems available to take on some of the elec-



When equipped with the Model 5528 communications controller, Wang Word Processors can talk to host computers or other Wangs while concurrently doing their word processing chores.

tronic mail load right away, from vendors that specialize in word processing. The accompanying tables attempt to assess the word processing models that offer some communications capability. The listings include the storage media employed; descriptions of the types of terminal the communications facilities emulate; information on code, line speed, and protocol; basic system prices including communications options; and any appropriate comments.

Note that there are vast differences between the communications offerings of various firms. Some of the most sophisticated word processing equipment offers only slow-speed teletypewriter emulation. In other cases, relatively unsophisticated equipment offers high speed transmission with many additional features. Most systems offer auto send or auto receive or both, to permit unattended transmissions; this ability to send communications to another office after hours takes some of the curse off low speeds, especially since line charges may be lower after hours.

A few systems offer such superior features as auto dial, polling, or concurrency (the ability to send a transmission in background while performing entry or editing on the work station). Concurrency becomes an important issue with shared logic systems. Some permit one station to communicate while others enter, edit, or print. Other systems require that the entire system stop working while communications occur.

Only basic information can be provided in the space afforded. For more detail on any of the systems, either contact the vendors directly at the addresses listed in the vendor index, or circle the appropriate number on the reader service card bound into this issue.

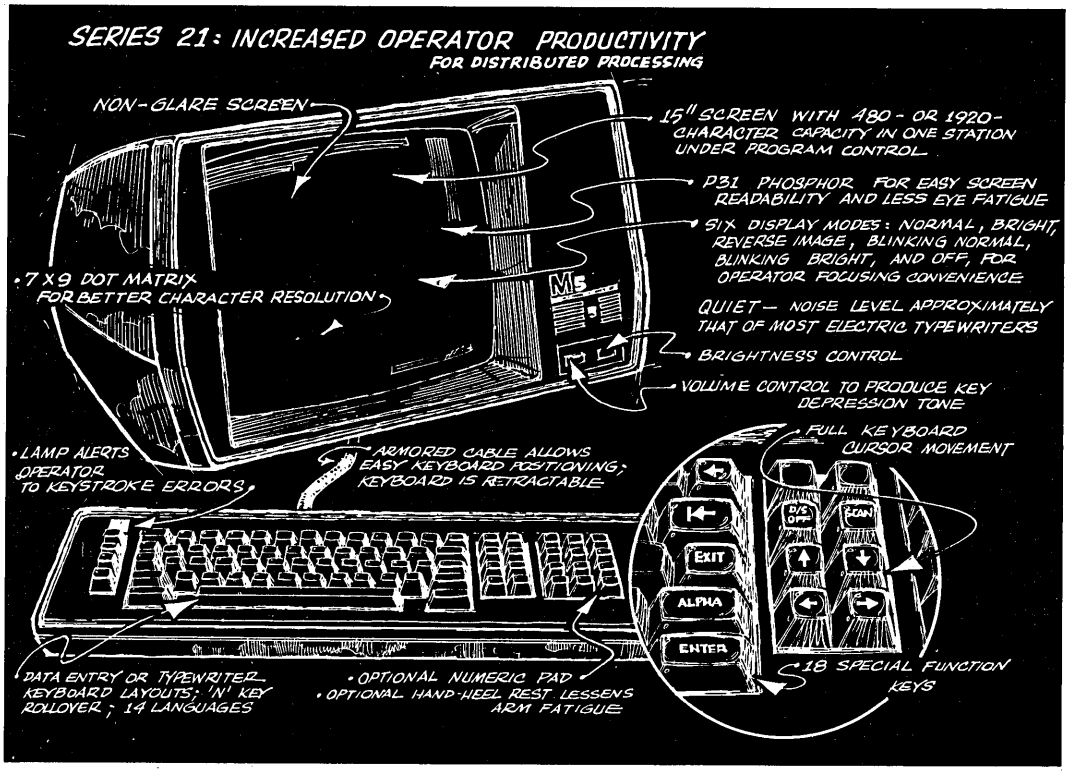
(Vendor Index, page 114)

TYPICAL SHARED LOGIC WORD PROCESSING SYSTEMS

Manufacturer	Model	Media	Emulation	Character Code	Protocol	Line Speeds	Basic Price*
Base	Ultra-Text II	disc	IBM 2780	EBCDIC	bisynch	up to 9600bps	$50,000
Daconics	Visual Type II	disc	IBM 2780	EBCDIC	bisynch	2000/2400bps	$45,000
DEC	PDP-11 with WT78	diskette/ disc	tty	ASCII	asynch	50 to 19,200bps	$30,000
Four-Phase	ForeWord	disc	IBM 2770/ 2780/3780	ASCII/EBCDIC	synch	up to 9600bps	$45,700
Genesis One	Wordstream	diskette	tty IBM 2741	ASCII Correspondence	asynch 50 asynch 50	to 19,200bps to 19,200bps	$40,000
Jacquard	J-100	diskette/disc	tty IBM 2780/3780 Univac 1100	ASCII ASCII/EBCDIC EBCDIC	asynch 135 to 1200bps bisynch 200bps synch 200bps		$14,900
LCS	Compu-Text	disc	IBM 2780	ASCII	bisynch	300 to 9600bps	$25,000
OmniText	Series 1600	diskette/disc	tty IBM 2741	ASCII Correspondence	asynch 110 to 300bps asynch 134.5/300bps		$16,900
Wang	WP20, WP30	diskette/disc	tty IBM 2741 IBM 2780/3780	ASCII Correspondence EBCDIC	asynch 110 to 1200bps asynch 134.5 to 1200bps bisynch 2000 to 9600bps		$18,000
World	TDS/36	disc	tty IBM 2741	ASCII ASCII/Corresp/ EBCDIC	asynch 110 to 19,200bps asynch 110 to 19,200bps		$60,100
Xerox	850	diskette	tty IBM 2770/ OS 6	ASCII ASCII/EBCDIC	asynch to 1200bps bisynch to 2400bps		$16,500

*Prices for shared logic systems vary widely depending on configuration and options, and many systems are leased rather than purchased. Consult the vendors for explanations of prices listed.

MDS Series 21. Engineered to make your operators more productive in 25 different ways.



Mohawk Data Sciences learned a lot about data entry productivity over the past 13 years while meeting the high-volume needs of more than 6,500 customers worldwide. In the engineering of Series 21™ we put those lessons to work. We learned, for example, that a large display screen makes an operator station easy to use. A 15-inch, non-glare CRT is standard on all Series 21 systems.

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__ Have a salesperson call.

__ Send a schedule for the next free DDP seminar in my locale.

DM 038

My application is _____

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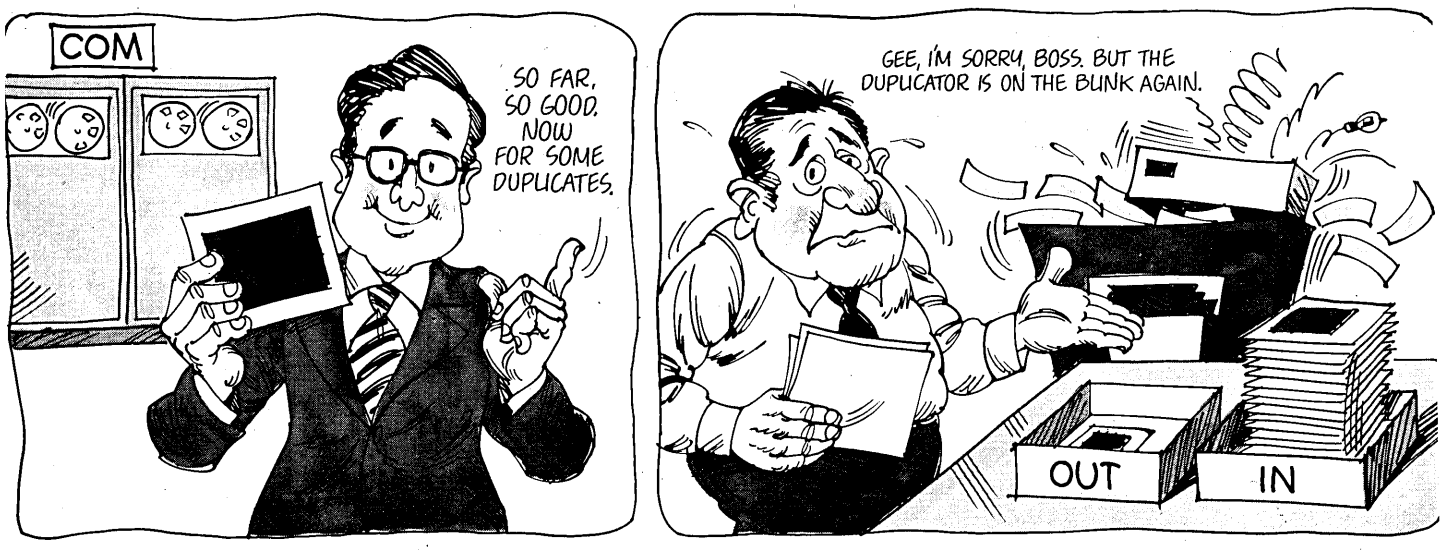
Mohawk Data Sciences



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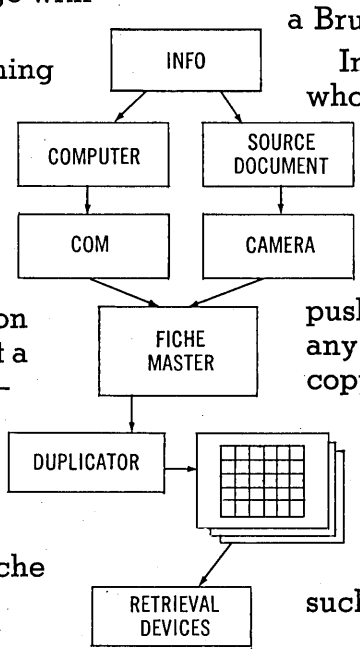

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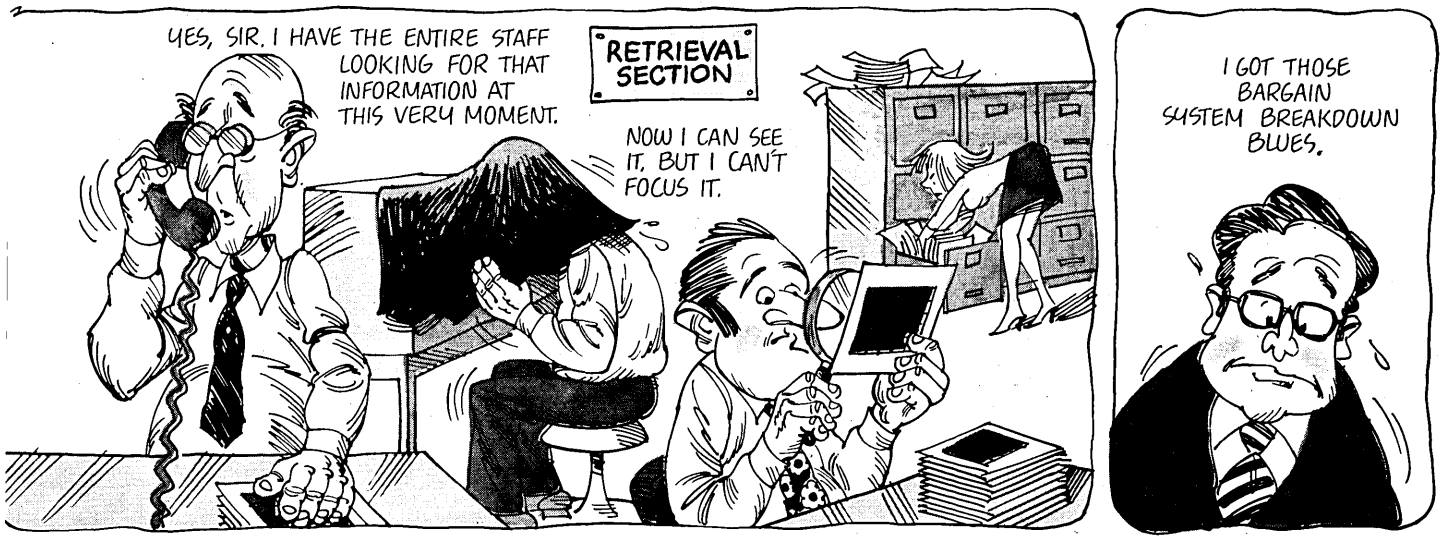
CIRCLE 50 ON READER CARD



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Communicating Word Processors Vendor Index

For more information about communicating word processors either contact the vendors listed below or circle the appropriate number on the reader service card bound into this issue.

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570 McCaffrey Street
Montreal, Quebec H4T 1N1,
Canada
(514) 739-2711
CIRCLE 450 ON READER CARD

Artec International Corporation
Charleston Business Park
2432 East Charleston Road
Mountain View, CA 94043
(415) 321-3300
CIRCLE 451 ON READER CARD

Automatic Electronic Systems—See AES Data Limited

Base, Inc.
437 Madison Ave.
New York, NY 10022
(212) 421-4307
CIRCLE 452 ON READER CARD

CPT Corporation
1001 S. 2nd Street
Hopkins, MN 55343
(612) 935-0381
CIRCLE 453 ON READER CARD

Daconics
(subsidiary of Xerox Corp.)
925 Thompson Place
Sunnyvale, CA 94086
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*

Mrs. Wohl is employed by Datapro Research Corp., Delran, N.J. There she acts as manager of word processing consulting services, editor of "Datapro Reports on Word Processing," and word processing editor of "Datapro Reports on Office Systems."

She was founder and president of the Greater Philadelphia Chapter of the International Word Processing Assn., and currently serves on its board. Mrs. Wohl is also a special advisor to the IWP Manufacturers' Advisory Council and a member of the program committee for Info 78.

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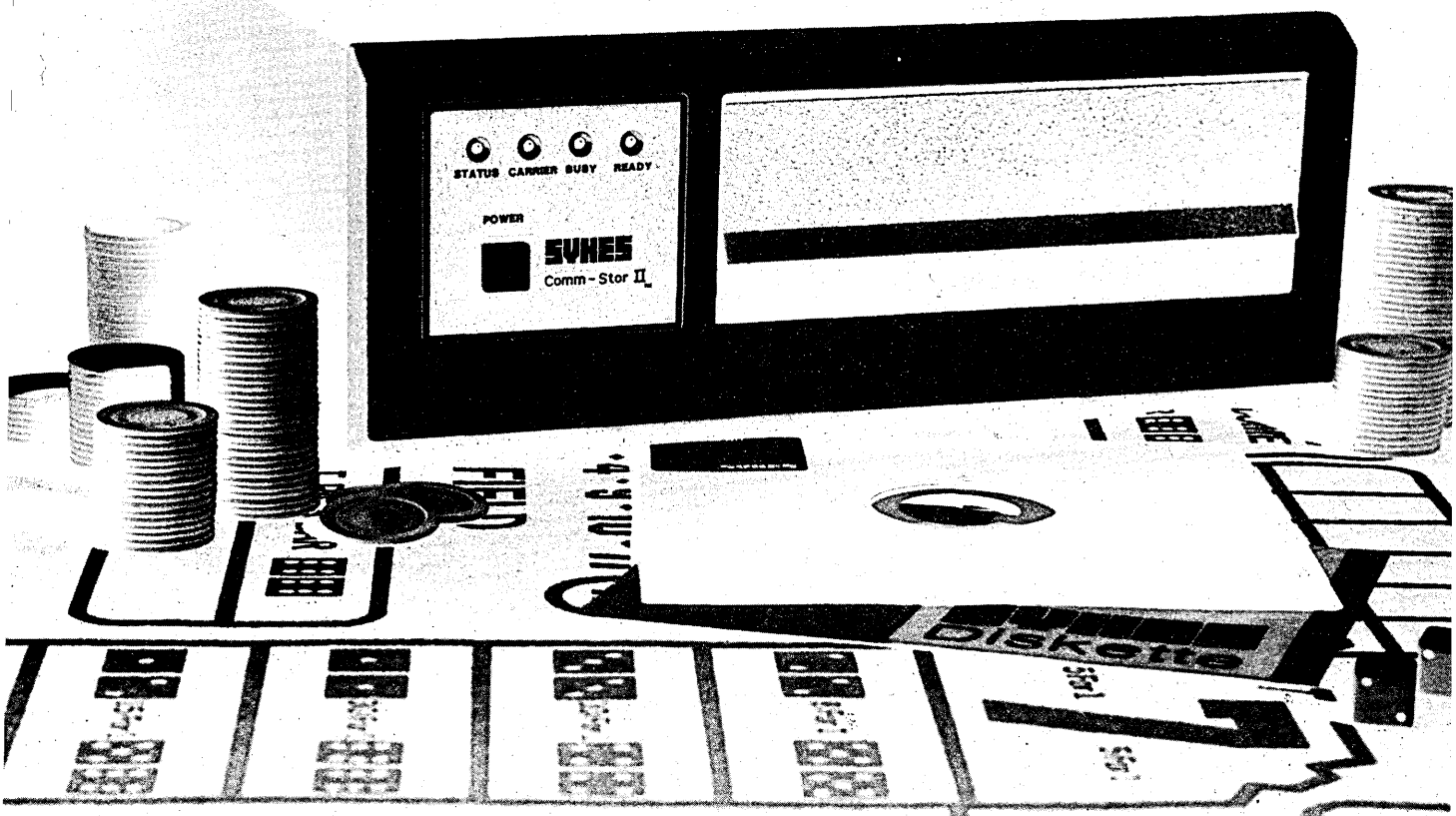

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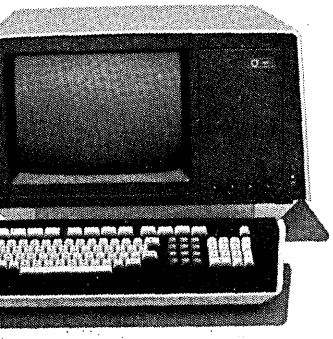

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"Designing by Committee" Works--Sometimes

by Dennis J. Streveler

It isn't the cheapest method, but it is the fastest. And it works.

Cost and time, the two old archenemies: speed up a project and it costs you more; slash its budget and prepare for the completion date to sink into the sunset.

The ad hoc design methods in widespread use in the software industry tend neither to minimize project costs nor to minimize time-to-completion. They tend to foster some sort of ill-defined compromise between the two.

But what about the project which *must* be completed with the absolute minimum of dollars? And the one which *must* be completed in the absolute minimum of elapsed time?

Do such situations exist? Time-critical projects not only exist, they are more prevalent in our industry than one might first imagine. Take as an example the defense industry: often a project must be completed in the shortest time to meet a tactical or strategic objective. Modern business imperatives bear a striking resemblance to such defense projects. Another reason speed can be necessary is our fleeting technology; so subject is it to instant obsolescence that often the only way to provide a reasonable life-span for a software product is to get it to work immediately.

A design has no bottom, no top.

A realistic approach

For a number of years I have experimented with the idea of "design by committee." The idea is quite simple: hatch a design; find a competent design team; then lock them in a room — and throw away the proverbial key.

Nothing new, you say? Well actually you are right. Call it organized brainstorming if you like. Or call it the "crisis" approach to problem solving. Some recent computer languages were apparently designed this way. And looking further back over computer history, Princeton's IAS machine was designed under World War II pressure by such a team chaired by none other than genius Johnny von Neumann.

In fact, you might wonder whether all projects are designed in this manner. Ab-

Case History #1: WAR!

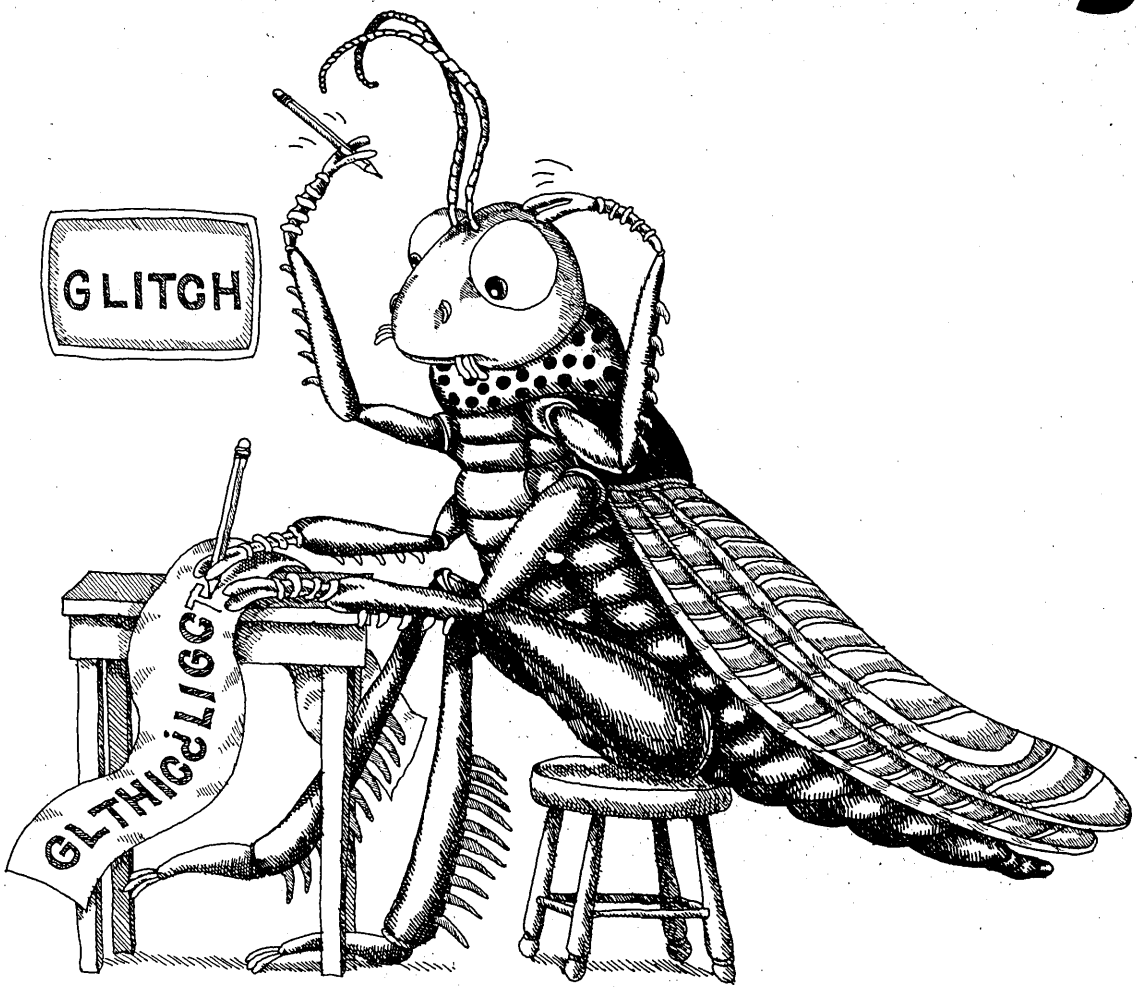
Project: Seek Data II, a USAF command and control system
Size: 200 programmer/analysts
Complexity: Three systems of approximately 125,000 source statements each
Languages: Cobol, Fortran, Assembly, PL/1, and DL/1
Equipment: IBM 360s
Setting: Vietnam, 1968 - 1970

This project was started during the height of the Vietnam war as an attempt to harness computer power to the elusively complex problem of scheduling tactical aircraft. It involved three distinct systems; one of them, dubbed "Frag Prep," was designed by committee.

Result:

Only Frag Prep was ever completed. It saw action in the war and was then transported home. It is still the model on which subsequent systems are based, a decade later. The other two, while similar in complexity, were hopelessly delayed and, finally, mercifully scrapped.

The Read/Write Error Bug.



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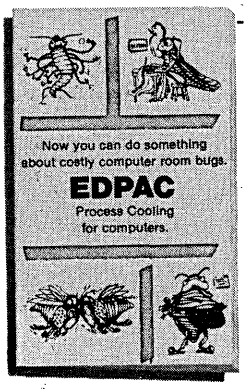

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solutely not! Usually none of the designers understand the whole project. In fact the whole design is never explicitly stated. It merely evolves.

A good design comes from the guts. It is discovered almost cathartically. It requires constant human prodding for this creative activity to occur — at least for it to occur at the fastest possible rate.

It doesn't help to uncover a design from the top down or from the bottom up. A design has no bottom, nor has it a top. One must know a design from the inside out. And this can only occur through constant human conversation and constant human scrutiny.

There are just too many possible blind design alleys; left alone, even a good designer will take too long to discover that his design work leads nowhere. But in "design by committee," where peers together conjure up the design, a fast "that's crazy!" (or worse) will get the design back on course — quickly.

The recipe

1. Wait for a truly time-critical application to surface. You should be convinced that either the sky will fall, your company will fold, or your head will roll if the project is not completed "yesterday."

2. Pick a design team that contains professional design peers. An odd number is preferred (for obvious reasons). And while job titles may differ, the individuals must respect each other and be able to withstand criticism. By all means include a representative of all user groups and management and anyone else who has a vital stake in the outcome of the project.

3. The team will in short order elect a chief. Some sort of secretary will also be needed.

4. The team will generate, as working papers and as proof of their progress, three sets of notes (see Table 1):
   - A *problem list* which chronicles unresolved problems in the design. Any alternative solutions should be noted in as much detail as common sense dictates.
   - An *action list* records who is responsible for thinking about which problems, who is responsible for concocting and presenting a solution — and by when.
   - *Design notes* are the documented solutions to the problems giving reasons for the rejection of alternative solutions and defending the adopted solution. As a ready-refresher reference this documentation is invaluable.

5. The proverbial door will be unlocked, the members released to other projects, when the problem list reaches near zero. At this point the design will be so well entrenched in the mind of the team and the solutions so obvious that the remainder of the project — coding, testing and all the rest — will go with so few hitches that everyone, especially the designers themselves, will be amazed.

Why it works

There are fringe benefits to this design process. For one thing, you will develop a design team well versed in all aspects of the design. Resignations, illness, vacations and the like will cause much less trauma. And there is likely to be a great learning spirit present. In many ways the team is a great training exercise since members in such close contact will learn important techniques from others who may have come from other industries or other academic backgrounds and have valuable experience ("I've seen this happen before . . .").

Case History #2: A Business Imperative

Project: *STARS*, an on-line medical accounts receivable system
Size: 6 programmer/analysts
Complexity: 125 programs
Language: ANSI Cobol
Equipment: A medium-scale Burroughs system
Setting: A large medical center, 1977

The accounts receivable system is the financial foundation of a medical center. Not only does it prepare the bills, it must cope with the production of medical claims which must appease a host of insurance carriers. And it must enforce a credit policy which is clearly unenforceable.

Pressures from new government regulations, consumerism laws, and expanded facilities made completing the system in the shortest possible time mandatory.

Result:

The system was not born overnight. At one point, the problem list contained over 250 entries. But the resulting system is stable, had amazingly few bugs, and has graciously accommodated modification. Its design is quite "strong," even compared to other systems running on the same equipment, written in the same language, and implemented by the same people — but designed conventionally.

Working Document	Its Design Objectives	Its Management Objectives
Problem List	What problems remain? What are the suggested alternative solutions to these problems?	Will we finish on time? How did the latest user perturbation of the design affect the project timetable?
Action List	Who is assigned the problems? When will suggested solutions be presented?	Are all design team members contributing equally? Is there a knowledge gap in one or more fields for which other team members should be recruited?
Design Notes	What was the agreed upon solution to the problems? Why were the alternatives rejected?	Are these design decisions consistent with the overall objectives of management? How will the design influence later staffing requirements?

Table 1. These three documents are constant companions during the design by committee process. In the end they chronicle the progression of the emerging design, a history which is especially useful during later modification, enhancement, and maintenance.

Design by committee works because the design phase of a complex project is basically heuristic, not deterministic. Following a pat methodology, top-down or bottom-up or whatever, implies that if we continue to plod along we will eventually find "the" answer. Well, we may; but the key word here is eventually. And that won't do if the sky is falling.

If a complex project is basically heuristic (perhaps, more aptly, artistic) then what must be employed is a design method that allows the freest possible

A complex project is basically heuristic, not deterministic.

communication and interchange of creative ideas. If smoke comes from under the designers' door, all the better: progress is being made. Substantial ideas emerge only through perspiration and perseverance.

Another way to look at it is this: programming techniques have now been developed that are aimed at minimizing interaction within the modules of a program. At the "atomic" design level this is sensible and, of course, desirable. But at the "conceptual" level this is folly, for the overall design is not so simplistic in structure.

Some reasons for this can be conjectured. For one, perhaps the weakest link in many computer software designs is the "file." Unlike simple parameters, which are passed between subroutines and mainlines, between co-routines, between chained programs, etc., files passed between programs contain an infinity of semantic information as well as "data." Files are not only made up of fields, but also of a complex set of connotations, implications, and assertions. Perhaps this is why "data dictionaries" and the like are coming into such prominence.

Or perhaps it is just that our old design tools have outlived their usefulness. A system flowchart is not really adequate to describe the complex interaction of transactions flowing through an on-line system, or to describe a multitasking environment, or a network. The system flow, and most documentation of that genre, is basically two-dimensional and iterative over time. Because of these limitations it is of little value during the design process of many kinds of state of the art projects.

Admitting a few objections

One of the most often voiced objections to design by committee is a fear of an inability to manage such a project. Yet ascertaining the true status of the project and where it is headed is actually the central strength of design by committee. For, by knowing the status of the problem list and action list and being able to peruse the design notes, the manager knows precisely where the project lies and how many significant problems remain. He has his finger on the true pulse of progress. (See Fig. 1.)

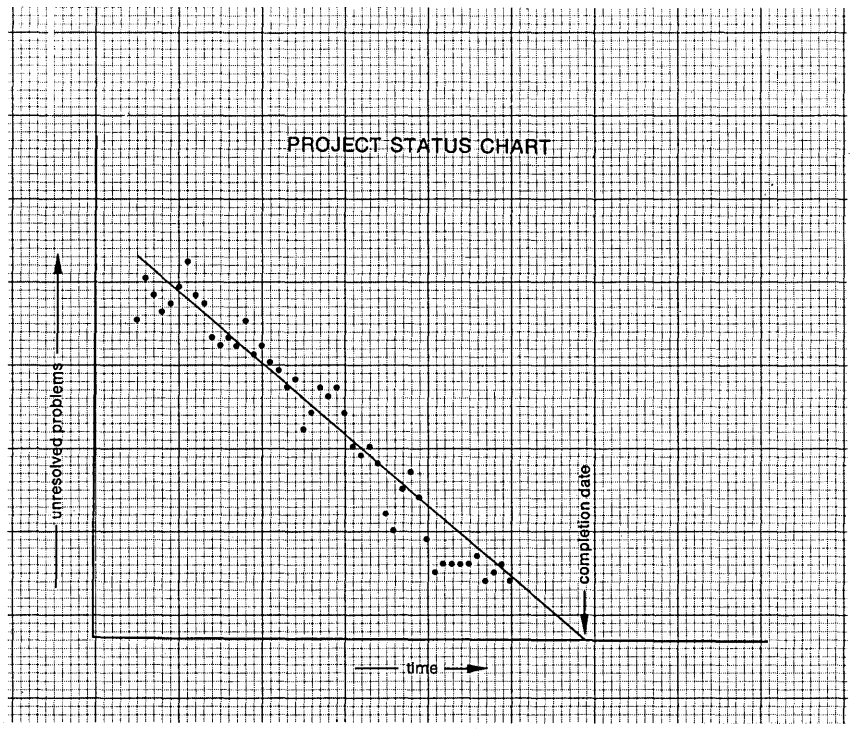

Fig. 1. The accuracy with which the project status can be known is a central strength of the method. Plotting unresolved problems versus time produces a scatter diagram. Fitting a straight line through the points helps answer questions like "Will we finish in time?" with increasing confidence as the drama unfolds.

Alas, there is little defense of the cost of this method. It is not the cheapest. But it *is* the fastest. And it will produce a design that is inherently more stable and therefore intrinsically maintainable.

It may also help you beat your competitors to the punch. Or save the sky from falling. ❋

Mr. Streveler is a systems engineer at Straub Clinic and Hospital, Inc., in Honolulu. In addition to his position at Straub, he acts as a lecturer in Computer Science at the Univ. of Hawaii and as a consultant specializing in computer systems designs.

He is shown here in the center of his design team, which includes (left to right) Norman Chan, Carol Milner, Kwai Yee Young, the author, Rachel Noguchi, and Randy Asagi.

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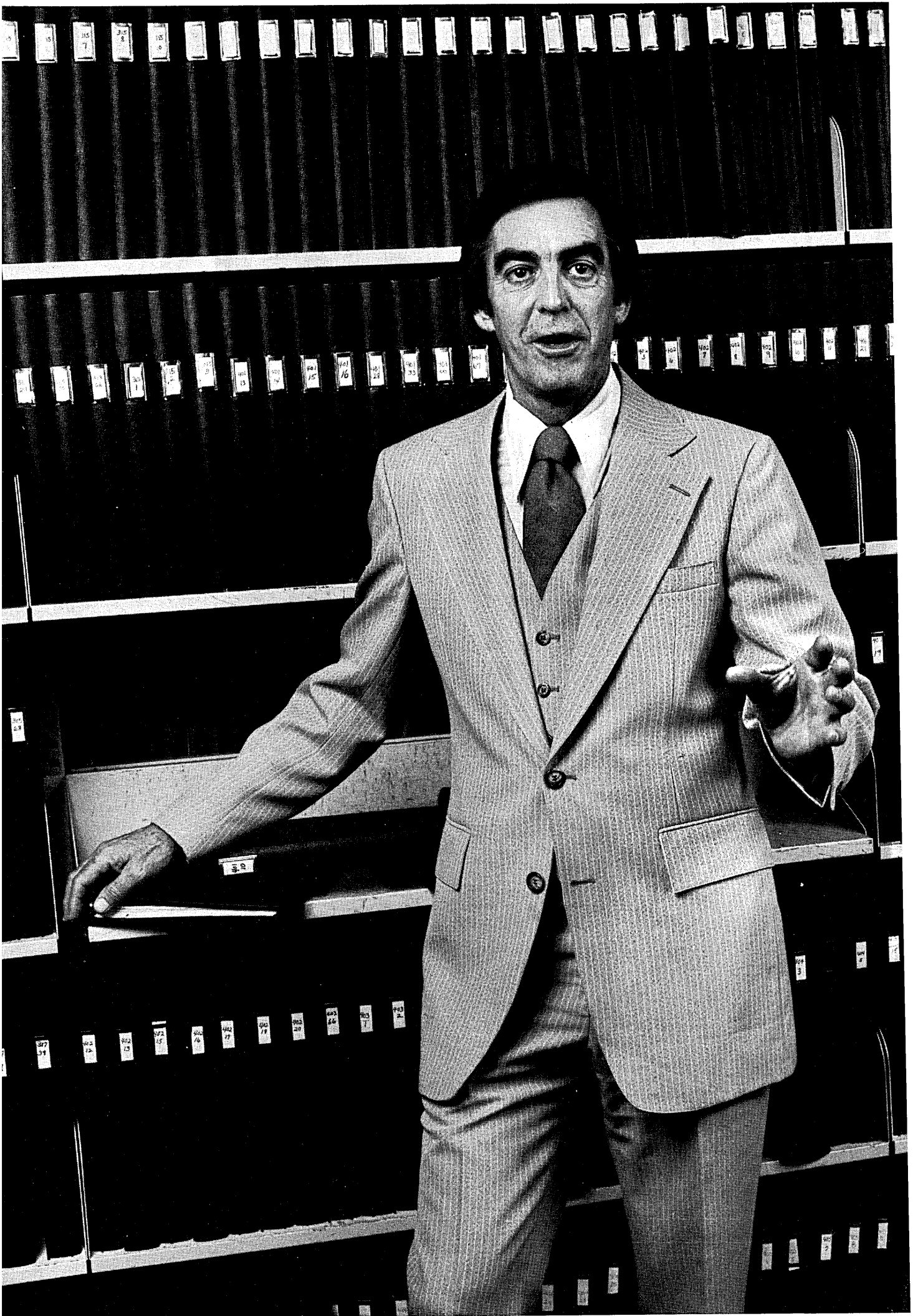

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Floyd Harris, VP
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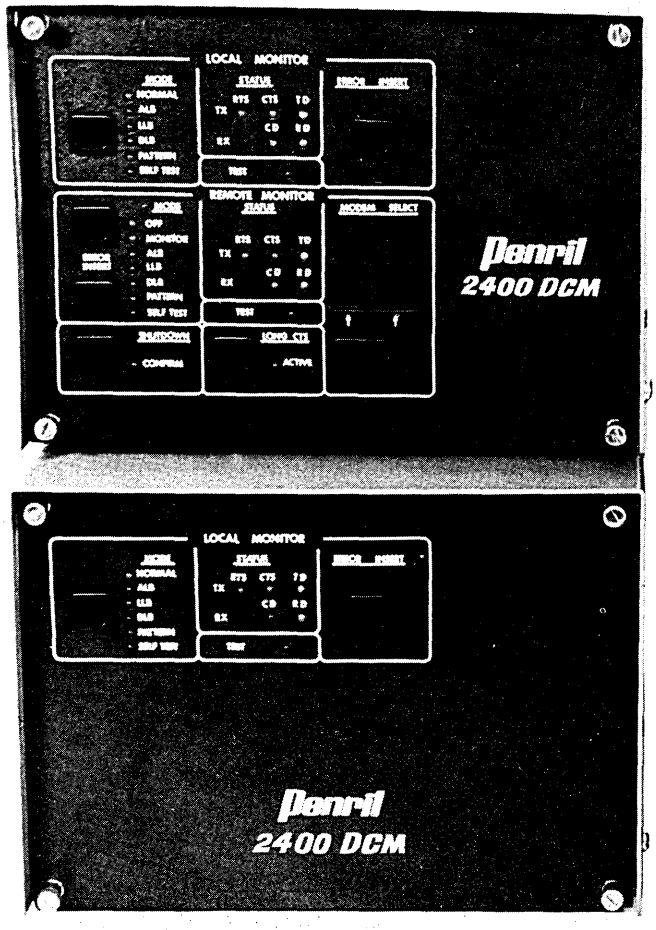

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Should Software Be Copyrighted?

by Edith D. Myers, Associate Editor

Trade secrets, patents, nondisclosure agreements, and common law doctrine are being used to protect proprietary software. Will copyrighting preempt them all? Can a copyright protect an intangible?

"Every thinker puts some portion of an apparently stable world in peril and no one can predict what will emerge in its place."

—John Dewey

Dewey made this statement many years ago but it is very aptly quoted in a 1977 report of the National Bureau of Standards on "Copyrights in Computer-Readable Works: Policy Impacts of Technological Change."

The study points out that innovations tend to make ambiguous the definitions of property rights that were perfectly clear before the innovations. It notes that an effect of successful technological change "is a multiplication of interest groups organized around the new technologies. The increase in number of interest groups causes an increased incidence of intergroup conflict. This often results in additional rules as well as more complex rules regulating group interaction."

Nowhere are these two effects more profound than in the current concern with protection of proprietary interests in computer software.

Article 1, Section 8 of the Constitution gives Congress the power "To promote the progress of science and the useful arts, by securing for limited times to authors and inventors the exclusive right to their respective writings and discoveries."

This led to today's copyright and patent laws, both of which have been used to some extent to protect property rights to computer software. Other means which are in current use are trade secret laws, contractual agreements and the Common Law Doctrine of Unfair Competition. There are those who argue that new legislation is needed.

The right to protect

Why protection? "A computer program is as much an intellectual property as anything else," said computer scientist and author, Dan McCracken, "and a guy who's slaved over a program for a year or more has the right to protect it."

And San Francisco attorney, Susan Nycum of Chickering & Gregory, whose practice is exclusively computer law, said protection of proprietary rights to software is the *prime* concern among her clients.

On the other side, there are some in the industry who, never having been burned, see no need for protection.

"It's like the elephant story," Evan Linnick, vice president of Informatics, Inc. says of the two views of protection. "A guy moves into a neighborhood and sprays his lawn every night. A curious neighbor asks what the spray is and is told it's elephant repellant. 'We've never had elephants here,' says the neighbor. 'Then this stuff must be good,' says the man."

> "A computer program is as much an intellectual property as anything else and a guy who's slaved over a program for a year or more has a right to protect it."

The Copyright Office has been accepting computer programs for registration since 1964. In its Circular 61, *Computer Programs,* dated March 1965, the office says certain issues about the copyrightability of programs are doubtful. The circular raised two questions: "Is a program the writing of an author and thus copyrightable?" and "Can a reproduction of the program in a form actually used to operate or be 'read' by a machine be considered an acceptable 'copy' for copyright registration?" Both questions still are being debated.

Congress defers

In the first major revision of copyright law since 1909, P.L. 94-553, enacted Oct. 19, 1976 and effective as of Jan. 1, this year, Congress deferred the issue of computer programs, turning it over to the National Commission on New Technological Uses of Copyrighted Works (CONTU) which will make recommendations to Congress on or before July 31.

The copyrightability of programs is the particular domain of a CONTU subcommittee which has held numerous hearings on recommendations it has drafted, drawing testimony pro and con.

The software subcommittee has released a draft of its report which says to date "only some 1,300 programs have been registered with the Copyright Office but a large number of general purpose programs available for sale or lease bear copyright notices, including, for example, all of the program products from IBM and the Digital Equipment Corp."

One subcommittee member author John Hersey *(A Bell for Adano* and *Hiroshima* are two of *his* copyrighted works) was more specific about registrations. He said that from 1964 to Jan. 1, 1977, "only 1,205 programs had been registered, and two companies, IBM and Burroughs, accounted for 971 of these." Hersey called use of copyright notice without registration, "a matter of bet-hedging, reflecting the industry's uncertainty about future legislation."

One provision of the 1976 revisions ends common law copyright protection previously available to manuscripts prior to their publication. Such work is now subject to statutory copyright as is a published work. "Thus, even if the author does not wish copyright, his work has it from the moment of its completion if it is in a category of copyrightable works and the work is not otherwise exempted from copyright," says the NBS report.

This statutory copyright does not now apply to programs because the new law hasn't put programs in that category yet. But the CONTU subcommittee will recommend that the full commission urge "the law specifically provide for the protection of programs."

Losing trade secret protection?

There is considerable concern in the industry that specific extension of the new law to cover computer software would preempt other protections, particularly trade secret protection.

Linnick of Informatics favors the strengthening of copyright law as regards programs, "but not to the exclusion of all other forms of protection,

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Even without a terminal you can easily view error indications on the front LED display.

Knowing better. The MSC 3602 knows better than to cause a system crash. The microcomputer scans one bit errors from its storage register and decodes them into a usable format. No more need for look-up charts. And error dumps to the terminal can be programmed at any timed interval.

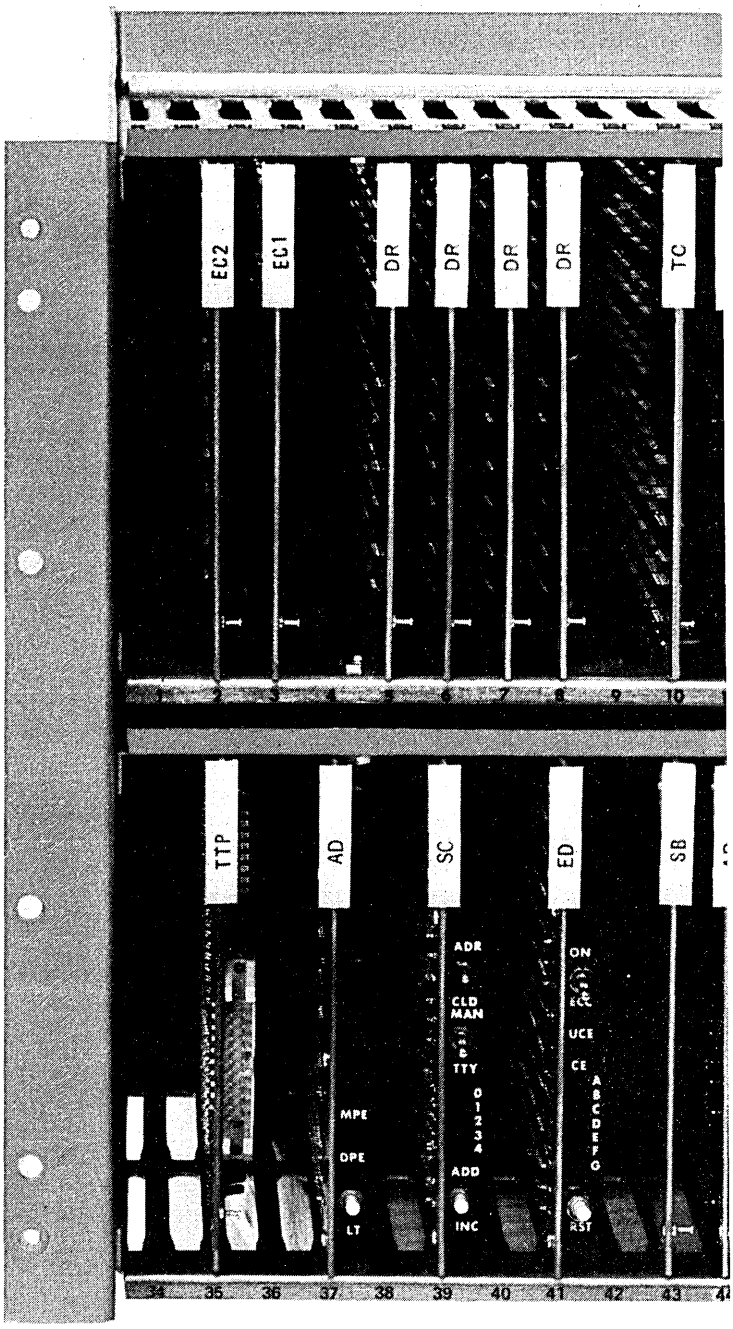
A double bit error causes a parity error message to be sent directly to the CPU.

Turn off the ECC and you can run full diagnostics.

Leaving interleaving. Our intelligent add-on performs at maximum bus speed without using complex interleaving addressing techniques. So, the MSC 3602 is easier to maintain and simpler to manage for you and your 11/70.

Memorizing more? The MSC 3602 will grow with you. It's expandable in 64K byte increments, with 2 megabytes in a single 10½" high free-standing or rackmount chassis including power supply and forced air cooling. An additional 10½" chassis will give you the total 4 megabyte PDP-11/70 maximum memory.

And MOS memory offers you low power requirements. Nonvolatility is available with battery backup.



Intelligent design. The MSC 3602's small size allows close placement to the CPU. Shorter bus lengths allow higher speed and reduce noise problems.

Socketed elements offer easy maintenance.

All cards are removable from the front.

Taking care of you. The MSC 3602 will help your system and your budget. It is competitively priced with unintelligent core and semiconductor add-ons.

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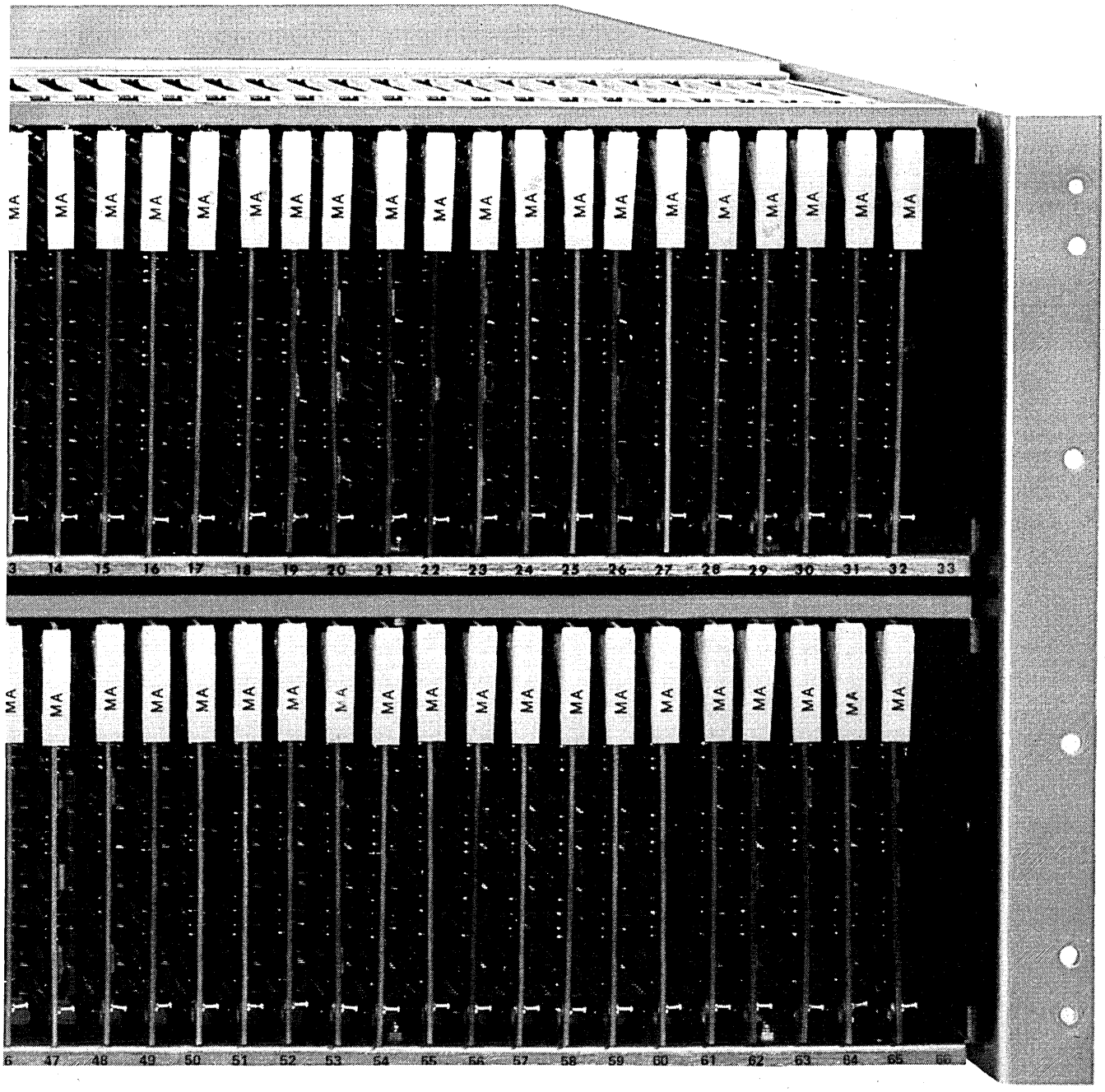

which seems to be the intent of CONTU."

The Assn. of Data Processing Service Organizations (ADAPSO), in a statement to CONTU, said it "favors revisions to the copyright statutes that will specifically include programs and which will increase protection against the unauthorized copying and use of computer programs. By the same token, ADAPSO urges CONTU that the strengthening of one form of protection should not be to the detriment of any other."

The CONTU report is unclear. If its recommendations are adopted, it indicates, trade secret protection will be preempted "to the extent that such protection is not different in kind from copyright infringement." Thus, trade secrecy protection could not be asserted where its purpose was to prevent the copying of a work."

"It's an iffy situation," said Mike Keplinger, assistant executive director of CONTU. "They (CONTU's recommendations) likely would not preclude trade secret protection where a contract sought to do something more than just prevent copying, like preventing disclosure of technology. But, if a trade secret-type contract only concerned the making of copies, trade secret protection probably would be preempted."

> "If a trade secret-type contract only concerned the making of copies, trade secret protection probably would be preempted."

Attorney Nycum sees things as "up in the air. It (the CONTU position) is not supposed to preclude it (trade secret protection) but I feel there'll be a court fight ultimately to decide the question."

Should the 1976 revisions be extended to cover computer programs, it is clear that only their expression—the forms the programs take in documentation or on tape, etc.—would be protected, not the concepts. The value of protecting the expression only has been questioned. The NBS study answers: "Copyright protection hopes to prevent a major type of market failure with regard to computer programs, but does not claim to protect against all types of market failure. Therefore, copyright is valuable, but not valuable for every purpose." It further states: ". . . very few programs contain (or need to contain) new concepts as unique as the simplex method for the solution of linear programming problems or the Fast Fourier Transform algorithm. . ." NBS would like to see further study on possible protection for such concepts.

Do programs have authors?

One of the questions raised by the Copyright Office back in 1965—is a program the work of an author and therefore copyrightable?—has been answered both "yes" and "no." Some

CHARACTERISTICS OF PROTECTIVE MECHANISMS

	Copyright	Patent	Trade Secrecy
General Considerations			
1. National uniformity	yes	yes	no
2. Protection effective upon	creation of work	successful prosecution of application	entrance into contractual relationship
3. Cost of obtaining protection	nil	moderate	moderate
4. Term of protection	life plus 50 years or 75 years	17 years	possibility of both perpetual protection and termination at any time
5. Cost of maintaining protection	nil	nil	significant
6. Cost of enforcing rights against violators	moderate	moderate	higher
7. Availability of:			
(a) statutory damages	yes	no	no
(b) attorney's fees from infringers	yes	yes	no
8. Protection lost by	gross neglect	unsuccessful litigation	disclosure
Software Considerations, Including Effects of Subcommittee Proposals			
9. Consistency with other copyright areas	yes	no	no
10. Availability of protective mechanism for some programs	yes	unclear	yes
11. Universal availability of protective mechanism for all programs	yes	no	no
12. "Process" protectable	no	yes	yes
13. Suited to mass distribution	yes	yes	no

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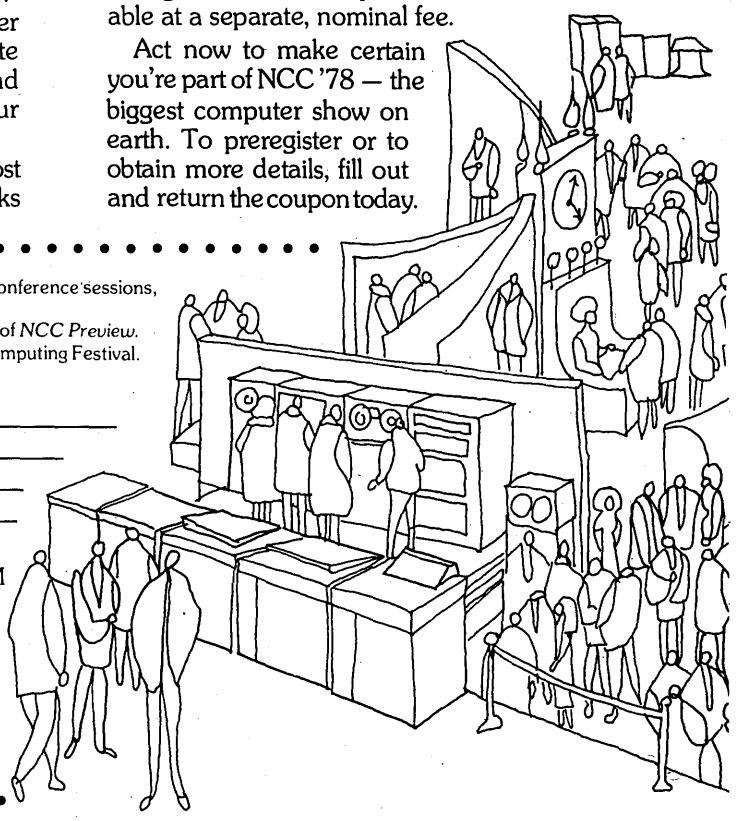

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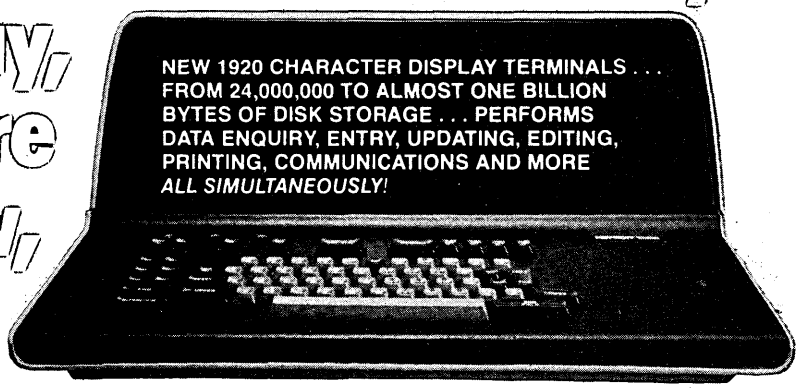

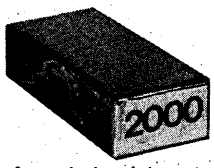

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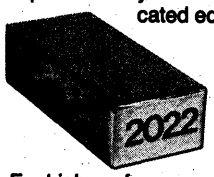

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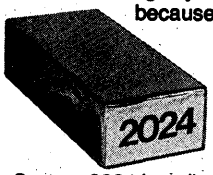

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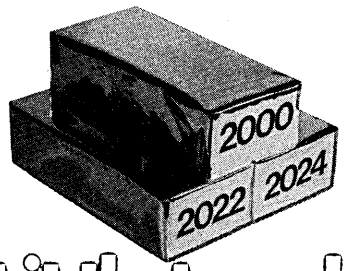

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hold that a program is a set of instructions for a machine, and in fact, since the machine cannot operate without the program, the program really is part of the machine.

The NBS study points out that programs are not part of a machine, saying "there is nothing inherent in a computer program that cannot be carried out by human labor, given either enough time or enough people to undertake the work."

Author Hersey, taking the "no" side of the authorship question, argued that a computer program "is not designed to be read by anyone; it is designed to do electronic work that substitutes for the very much greater human labor that would be required to get the desired mechanical result."

ADAPSO votes "yes." In its statement to CONTU it said "highly skilled, professional programmers create, or 'author,' programs. (And, in fact, there is a field in the Identification Division of a COBOL program that requests the 'name of the author.') In other words, programmers are developing 'writings' for highly technical areas which require perfect operation to be used properly by the computer. Thus, we contend that programs should be subject to copyright protection."

"As I see it, it's protecting ideas, like the formula for *Coca-Cola*."

So does the Computer and Business Equipment Manufacturers Assn. (CBEMA). In a statement prepared for CONTU it said, ". . . computer programs should be treated as 'works of authorship' . . . that some formal protection is needed to encourage the creation and distribution of computer programs in a competitive market . . . that copyright is the preferred form of protection; that programs are not *different* from other works now subject to protection. . ."

Industry consultant and DATAMATION advisor Philip H. Dorn takes a different view. In testimony before CONTU (November, p. 233) he said, "Books are the work of an author or group of authors sitting down to do the total job from blank paper to finished product. In a majority of cases, it is one author working from personal creativity. Programs, on the other hand, tend to be the work of teams which rely on other work done by other teams."

Some arguers against copyright protection for software contend it could lead to general perception of software as tangible, and thus subject to sales and property taxes. On the other side are people like Linnick who don't consider this a major issue. Linnick points out that different taxing bodies already hold a wide variety of attitudes toward the tangibility of software. He doesn't feel the extension of copyright protection to software would change this.

There is no doubt that trade secret law currently covers computer programs. Its use as protection has the advantage of granting broad protection against unauthorized disclosures. It requires no filing fees. If disclosures are strictly controlled, adequate policing can be possible.

To have trade secret protection, software must be maintained in secrecy in much the same manner as are industrial processes. "As I see it, it's protecting ideas, like the formula for *Coca-Cola,*" said Nycum.

An employer informs his employees as to the confidential nature of particular items of software, and he controls its dissemination. When distribution takes place in the marketplace, the proprietor designs the transaction so as to limit disclosure. The marketer generally limits the documentation accompanying his software.

The CONTU subcommittee found a number of "deficiencies" in trade secret protection: ". . . hostility to the free exchange of ideas . . . ease of loss . . . expense—each transaction involving a 'secret' program requires substantial expenditures to maintain its security, thereby adding . . . to the cost of the product . . . non-uniformity—each state is free to develop or not to develop the doctrine as it sees fit."

Patents are expensive

The extent to which patent protection is available for software is still unclear although a number of patents have been granted. The Supreme Court has deemed (May '76, p. 206) that a software system isn't patentable if premised on elements obvious to "those skilled in the applicable art."

Even where available, patent protection has some disadvantages. It is expensive (about $1,000 minimum filing and legal fees for a simple system); it takes time (from filing to issuance can run two to three years); when issued, a patent discloses the invention and requires the seeking of foreign patents if foreign markets are involved.

The Common Law Doctrine of Unfair Competition can be used to afford protection where there is no trade secrecy or novelty. Such a situation might be used by a company as proof that a former employee breached a confidential relationship and enabled a subsequent employer to compete unfairly.

Make it a criminal offense?

Use of this form of protection, like copyright law and trade secret law but unlike patent law, has its criminal side. State legislators are beginning to realize that civil remedies against trade secret theft, unfair competition, and copyright infringement are insufficient as deterrents. Since 1964, some 21 states have enacted legislation expressly treating misappropriation of trade secrets.

In its statement to CONTU, CBEMA urged inclusion in copyright law of language "increasing criminal penalties for data base and computer program copyright infringement."

An omnibus computer crime bill (S 1766), introduced by Sen. Abraham Ribicoff (D-Conn.), currently is before Congress but no hearings have been held and the bill could die in committee.

Donn B. Parker, SRI International, in an article in the *Los Angeles Times,* said he doesn't feel passage of a strict law is the best remedy. He advocates funding by government and business for development of ethical standards. "Many technicians still hold the belief, dating back to the early days of computers, that a program is owned by its creator, whatever his relationship may be to the system's actual owner."

Novelist Hersey notes in his written opinion that the only "testimony the Commission has had as to actual abuses and misappropriations of computer properties has come from the Stanford Research Institute. In 470 cases over a 10-year period reviewed by SRI, not one involved issues in the area of copyright. In all cases, there was an existing realm of law under which the crimes could be, and were, dealt with. The actual crimes were malicious mischief, arson, burglary, bombing, murder, breaking and entering, larceny, obtaining money under false pretenses, theft, forgery, embezzlement, violation of trade secrets, altering of records, invasion of privacy."

"It's absurd. A patent is for hardware. Copyright is for books and media."

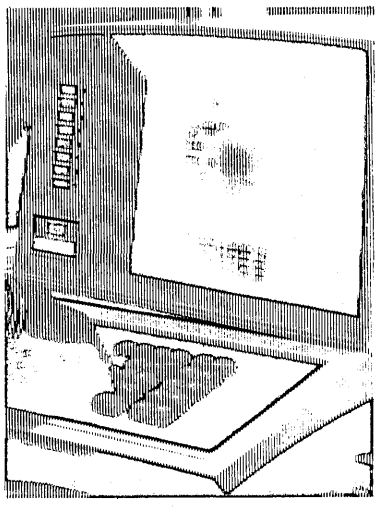
Hersey suggests (but does not advocate) a new law, the Computer Software Protection Act, which would establish within the Department of Commerce a Registry of Computer Software.

Programs are not books

Don Sundeen, president of Applications Software Inc., favors creation of a new law and feels it should come as a spin-off from NBS. He feels such a law could be "couched in the proper terminology. We're combining apples and oranges. It's absurd. A patent is for hardware. Copyright is for books and media."

Linnick thinks a new law "in some

Want to see tomorrow's distributed processing systems at work right now?



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The new PTS/1200 MARK•I and MARK•II systems bring the second generation of distributed processing to computer users.

What is the second generation? Four things: multifunction concurrency on a single system, greater network productivity at lower cost, availability of advanced technology **with no change to host hardware, software or applications investment,** and more local processing capability than you thought possible.

Raytheon's new MARK•I and MARK•II systems bring all four advantages in a single family of distributed processing products that is substantially below the cost of most alternatives.

Look at what you get with the new systems:

1. BISYNC or SDLC

Raytheon now offers the industry's most complete line of communications protocols, including 2780 and 3780 batch, 3270 interactive and HASP multileaving—plus SDLC, which will be available in the fourth quarter this year.

That means you can select a PTS/1200 and run it under your existing protocol immediately, with no redesign of access methods or central site software. You go from where you are today to where you may want to go tomorrow.

2. Large capacity peripherals

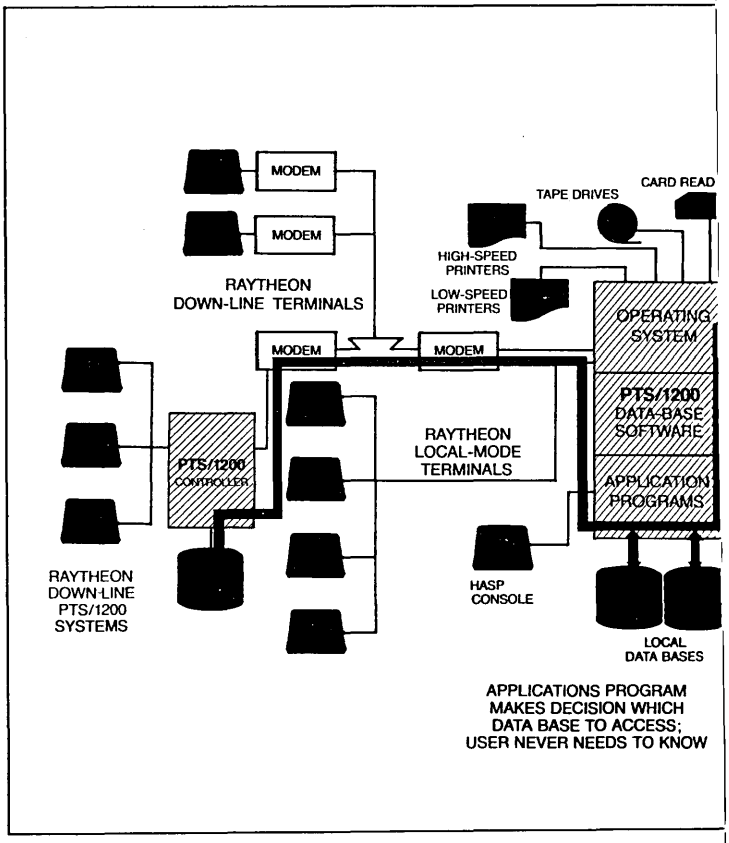
With the MARK•II system, Raytheon has added a level of peripheral power equivalent to many mainframe configurations: 80-megabyte disk drives—up to four per MARK•II for a total capacity of 320 megabytes per system; higher speed magnetic tape drives with recording densities of 1600-bpi; and a new 600 line-per-minute printer. Add that to the 20 other peripherals available on the PTS/1200, and you can configure a system to meet almost any requirement.

3. Advanced source data entry capability

A new parameter driven source data entry package permits non-programmers to set up data entry jobs. It incorporates a full range of edit, arithmetic and logical functions. The package lets users apply standard PTS/1200 equipment to many document conversions, editing, local storage and batch control tasks. The source data entry system, while not intended for high-volume keypunch room usage, can with minimum user procedural change be adapted to handle more easily a substantial amount of the source data entry and conversion work now done by assorted other devices. All concurrently with the batch and interactive communications that makes the PTS/1200 the first of the new generation distributed processing systems.

4. Five unique network productivity features

Raytheon takes the time, the effort and the complexity out of large data networks with a series of



new PTS/1200 MARK·I&II

five novel network support aids:

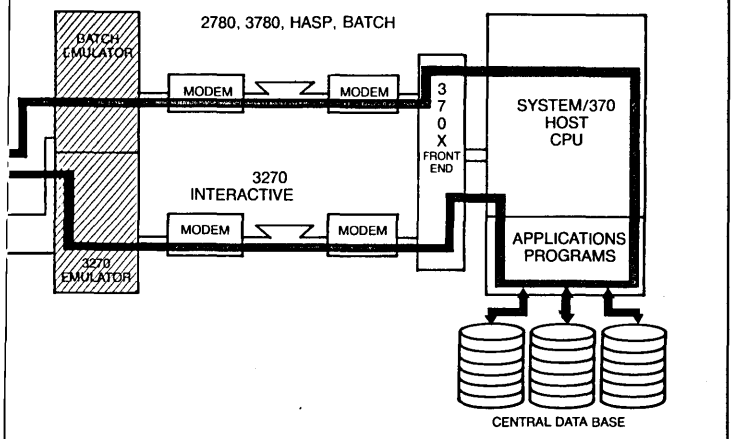
A **downline terminal facility** lets your PTS/1200 run a multipoint network of PTS-100 and PTS/1200 systems under 3270 protocol independent of a host mainframe. This allows further distribution of processing power to even your smallest sites.

A **teleprinter concentrator** lets your PTS/1200 control a downline TTY network and process it locally—or pass it upstream on the same lines—at the same time as your 3270-type terminal, or HASP, or RJE, or remote batch work is being performed. It's a little extra that can cut your communications costs for teleprinter networks by more than half.

An **enhanced software editor** incorporates significant facilities of IBM TSO software. It assists users to develop programs for their host computers by pre-editing on PTS/1200 systems. As code is developed and stored locally, it can be batched and sent to the host for analysis, editing and debugging—thus eliminating a high percentage of the message traffic and host overhead support now needed under TSO to support remote program development tasks.

A **remote debug facility.** With it, operators at the host PTS/1200 site can patch or debug programs operating on downline systems or terminals. In just minutes, not days. And without having to send staff personnel into the field.

And **downline program loading.** A facility that permits transmission of programs from central to remote sites. A nice extra that saves time and money.



5. Intelligent 3270 operations

Raytheon built its data systems business by emulating, and then by extending, the capabilities of 3270-type products. Within the PTS/1200 family, you can grow from basic 3270-type devices to intelligent 3270-type products, to completely concurrent on-line interactive and batch systems, to powerful free-standing local processing systems. Only Raytheon offers users a single migration path far into the future.

6. Soon, the PTS/1200 will support COBOL and word processing

Coming as part of the future of MARK•I and MARK•II is the addition of interactive COBOL to supplement our easy-to-use MACROL language, and the addition of our new Videotype word processors as peripherals in a shared data base system. By the time you are ready for those capabilities, you'll be able to get them all from Raytheon.

7. Next, 3274/3276 features

In addition to the enhanced 3270-type capabilities Raytheon now offers, shortly we will be supporting 3274/3276 features on our PTS-100 and PTS/1200 product lines.

Raytheon's MARK·I & II-- Part of the quiet Raytheon Revolution in data communications productivity.

Did you know...

...The PTS-100 is the most popular intelligent terminal in the world?

There are more than 50,000 PTS-100 terminals in use right now—all intelligent, and all working directly with a variety of host protocols, **including SDLC.** The PTS-100 emulates more than 20 protocols, costs less than almost any other intelligent terminal, and is supported by one of the industry's largest field maintenance organizations.

...The PTS/1200 was the industry's first distributed processing system with 3270 concurrency?

It was announced initially in 1975, when the term distributed processing was just coming into being. Today hundreds of PTS/1200's are installed at leading-edge user sites performing multiple tasks concurrently in network environments. Our new MARK·I and MARK·II systems add many more capabilities to the pioneering PTS/1200 system.

...That Raytheon Data Systems is one of the world's largest manufacturers of digital telecommunications systems?

Computer users rarely see the non-terminal side of Raytheon Data Systems. But we built and installed the world's first digital microwave radios for the telephone industry, and are one of the largest suppliers of such equipment throughout the world. Few terminal equipment suppliers today have the total knowledge of networks that Raytheon has.

...That Raytheon was the first U.S. company to link 3270-type terminals to public packet networks?

Packet networks are rapidly coming into use worldwide. They employ the X.25 standard and HDLC as link access protocols, instead of bisync or SDLC protocols. Last year, Raytheon introduced RayPACK and DMEP software packages to allow PTS-100 terminals to attach to X.25 packet networks and still appear to the host as 3270-type devices. Another example of Raytheon's commitment to lead in data communications networking.

...That Raytheon is now in the word processing business?

Soon, the Videotype CRT-based word processing products will be added to Raytheon's distributed processing systems as peripherals that share large common data bases. Another step in improving your data handling productivity.

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way might be a good thing but it would have to be done right and this might be difficult."

NBS suggests modification of existing law: ". . . as the uses to which computer programs are put or the manner in which they are used differ from more standard literary works, additional modifications of the copyright statute may be appropriate to specify the assignment of property rights with respect to each type of work. Categorization of computer programs separately from literary works might assist the process of specifying these differences."

Dorn believes eventually, "and probably sooner than most believe, it will be possible to protect a program by taking advantage of the computer hardware. Use of execute-only, read-only PROM, EPROM, or ROM would appear to be a very near-term development."

The CONTU subcommittee clearly does not think any new law is needed. It concluded that "programs are not different from other works now subject to copyright and, therefore, do not require a separate form of protection; that the use of any other mechanisms for securing rights in intellectual property impairs broad access to or use of information to a far greater extent than does copyright; and that many proposals for new forms of protection are in most respects indistinguishable from copyright."

> There has been no litigation to date on copyright infringement regarding software.

CONTU, in 1976, received written and oral testimony from 20 witnesses representing 18 organizations. It said 11 favored copyright, three trade secrecy, eight had no preference, and two perceived no need for protection. (Some supported more than one form and were counted more than once.)

Tests are yet to come

ADAPSO said its members used one or a combination of up to four protection techniques. Contract or license backed up by patent is used by 6% of ADAPSO members. Contract or license backed up by copyright is used by 33%, and contract or license backed up by state trade secret law, 35%. Requirement for "know-how" is used by 22%; use of cryptographic protection by 6%; and use of other means to limit access to software programs by 29%.

Sundeen, although he doesn't favor copyright protection, uses it. "We copyright listings and everything but we do it by default, to provide as much collective protection as we can get. The best protection without a doubt is a strong contract."

Linnick said Informatics relies primarily on contracts backed up by trade secret protection although "related documentation is copyrighted."

Nycum said she advises her clients to put "a copyright notice on the header tape and a 'not to be disclosed' notice on the cannister."

Actually, there has been no litigation to date on copyright infringement regarding software. And it could be that different forms of protection will continue to be used for different cases with no problems.

As the NBS study notes, the protection against reproduction afforded by copyright may be of little or no significance with respect to programs designed specifically for a particular user. Such protection may be quite valuable, however, for a program that would have a market of many users and could be reproduced cheaply in the absence of copyright.

CONTU expects to hold its last full meeting in May. If its recommendations to Congress after that are implemented without resolving which kind of protection preempts which other, Nycum's prediction of an ultimate court fight could come true.

Informatics' Linnick agrees. "The tests are yet to come." ❋

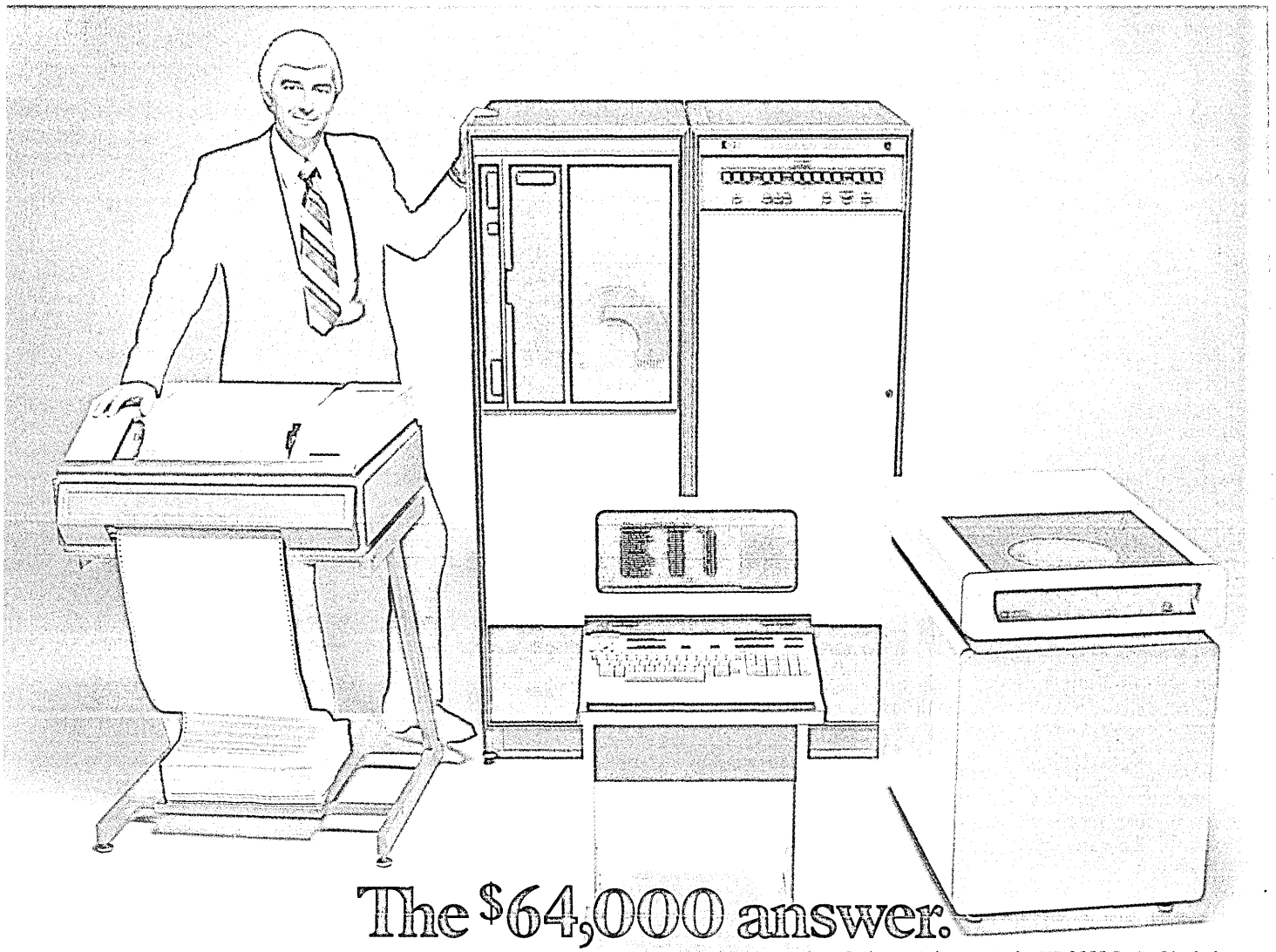
Man cannot live

That's why so many companies are firing their small batch systems and hiring the Hewlett-Packard 3000.

Our computer can easily handle your payroll, accounting, general ledger and other number-crunching jobs you're currently running on a time-sharing service or small in-house system.

But it also gives you immediate access to the information you need right now. Today's sales, inventory status, customer profiles, shipping records, updates on accounts receivables, projections — all these and more can be called up on CRTs or printing terminals.

Just about every business, from manufacturing and distributing to retailing and publishing, needs that kind of up-to-the-minute data. And, with prices starting at $64,000;* it's easy to make the switch to an HP 3000.

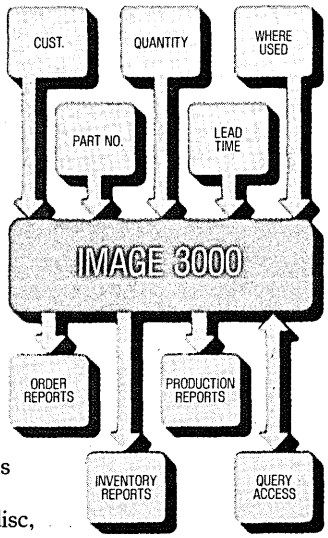


The $64,000 answer.

*U.S. domestic base price for HP 3000 Series I includes operating software and all equipment shown above, except the printer which is $9,400 extra.

by batch alone.

1.



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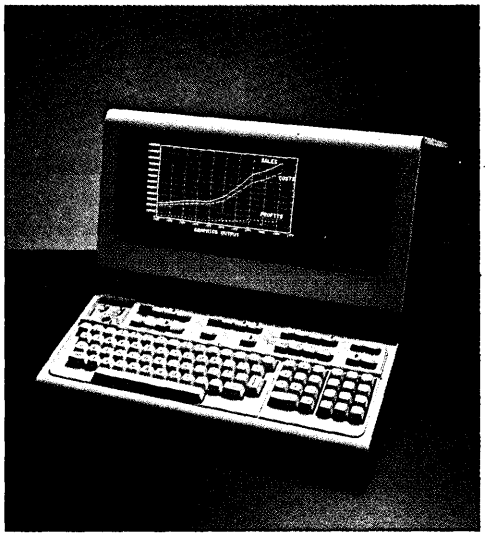


Two major features put the HP 3000 in a class by itself. The first is our state-of-the-art operating system, a Multiprogramming Executive that can manage a vast workload extremely fast. When we clocked one second of MPE activity, it handled 2,280,000 micro instructions in the central processor, 14 file accesses, seven input swaps and five output swaps.

This ability to "juggle" batch and on-line jobs lets you develop new programs on the HP 3000 while it's running your old ones. And we offer six "big computer" languages to keep your programmers happy. With COBOL, RPG, FORTRAN, BASIC, APL (Series II only), and SPL (our streamlined Systems Programming Language), you can develop the precise programs your company needs.

Virtual memory plays an important role in this performance. It gives you an almost unlimited program size by keeping the code and data on your disc, swapping only those parts that are needed in main memory. This operation is totally transparent to the user. And it's speeded up by our new 50 megabyte discs, with 5 ms seek time track to track.

The second major attribute is the HP 3000's powerful data management capability. Our IMAGE/3000 software, good enough to be named to the Datapro Software Honor Roll, puts a sophisticated Data Base Management system **(1)** literally in your hands. You can access files of consolidated data with our simple inquiry language, QUERY. Or use KSAM (Keyed Sequential Access Method) on our Series II to call up a series of related files. Our DEL/3000 Data Entry Library simplifies your terminal-oriented transactions.

A variety of HP terminals also makes it easier to input or call up data. For instance, our new graphics terminal **(2)** provides auto-plots at the touch of a key. And a new printing terminal **(3)** keeps information flowing from the factory or warehouse.

Another "big computer" feature is fault-correcting memory on the HP 3000 Series II. If a circuit fails, the memory automatically corrects itself and stores information about the faults in a RAM. Our engineers will call up that information during routine maintenance and replace the faulty circuit.

We offer two basic systems, based on CPU speed and main memory size. They're both very easy to expand to fit your needs, with additional discs, tapes, terminals, printers and other I/O devices. And, as we manufacture virtually everything in our systems, we can give you fast, knowledgeable service on any part of them.

So why don't you call the nearest HP office listed in the White Pages? Or write to Bill Krause, Hewlett-Packard, Dept. 415, 11000 Wolfe Road, Cupertino, CA 95014. After all, why should you put up with a computer that only does half your work, when you can have one that does it all?

3.

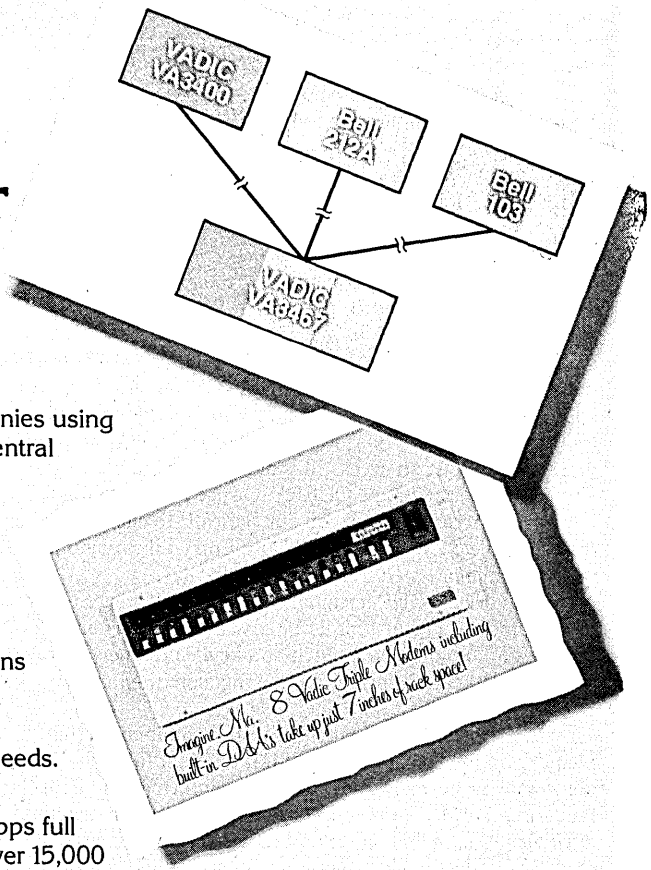
HEWLETT hp PACKARD

CIRCLE 63 ON READER CARD

47802HPG11

Dear Ma:

The crystal ball is right. Vadic's new microprocessor modem is a VA3400, a 212A, and a 103!



Imagine, Ma, a modem that time sharing houses, and companies using dial-up lines for data communications, can standardize on at the central computer site. With a single phone number for all asynchronous ports from 0 to 1200 bps, if desired.

By ingeniously building in a microprocessor, Vadic's new VA3467 automatically recognizes the calling modem, be it a VA3400, a 212A or a 103, and responds accordingly. All this on a PC board including direct connect (no need to rent your DAA's) for $850 or less! The VA3467 even tests itself continuously, plus contains all of Vadic's famous diagnostics.

The VA3467 is field expandable, too. You can start with just a VA3400 and later add the 103 or 212A depending on your network needs. That's what firmware does for you.

You just can't seem to catch up, Ma. Vadic invented the 1200 bps full duplex modem (the VA3400) 'way back in 1973, and has delivered over 15,000 to more than 1,000 customers worldwide. Now, Vadic has leapfrogged ahead with the TRIPLE modem. By the way, Ma, Vadic has just published a booklet comparing the VA3400 to the 212A in 14 critical areas. Better send for one. It's free.

Your independent thinking son,

Alexander Graham Jr.

PS: Vadic has shipped over 150,000 modems to date.

vadic

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CIRCLE 100 ON READER CARD

Can Today's MIS Manager Make the Transition?

by John C. Gilbert

Whether or not today's manager is ready, the computing world is changing.

A serious imbalance exists today between a company's total information resource and its information *processing* resource. Looking back, it's easy enough to see how the mismatch occurred. Looking ahead, it's equally clear that the condition cannot be tolerated for much longer. The role of information processing within a company will have to change, and with it, the role of the MIS manager.

We now have records of the types of things that occur in phone calls—and previously went undocumented.

The first business computers were used to automate functions that had been performed by punched card machines—those applications encompassing the high volume, transaction driven tasks of the organization. Some 25 years have marched by since those first applications were brought up, and the number of applications being processed has increased dramatically. But the characteristics of those applications have not changed; most automation is still devoted to transaction driven tasks.

Meanwhile, another significant change has been occurring. We have undergone an information explosion of enormous magnitude. Our libraries and files are crammed with information that cannot physically be catalogued and cross-referenced, stored and retrieved in a useful fashion. It's just there.

So while it appears that dp has been growing rapidly, the amount of information maintained in automated form actually has shrunk as a percentage of an organization's total information.

The early explorers

That's the position our organization was in a few years ago when we began experimenting with the tools of the office of the future. We soon discovered that for the first time we were capturing large quantities of narrative information which previously had eluded automation. And we gradually came to realize that the tools we had been using on quantitative information could be used to manipulate this narrative information as well. It was then we understood that computing was moving into a new arena, one which promised to dwarf all its past applications, and one which would change both our organizations and the way we work within them.

It started during 1974, when we became aware of some interesting work being done on the Defense Department's ARPANET. This network was originally constructed to link universities doing work for the Department of Defense, and its underlying idea was that computing tasks could be shipped around the net for processing on whatever appropriate computer was available. However, innovative students soon realized they could

We captured an important set of narrative information as a by-product of conducting our business.

write programs to send messages to their counterparts at other universities.

By the time we became aware of it, a whole series of evolutionary developments had led to systems called "sndmsg," "bananard," and one that is still popular today, "msg." The latter was the work of a graduate student at USC, John Vittal; it proved sufficiently robust that it remains the most widely used message system on the net today, even though it has not been maintained for three years.

Other experimental work had moved

Tektronix 4020 Series

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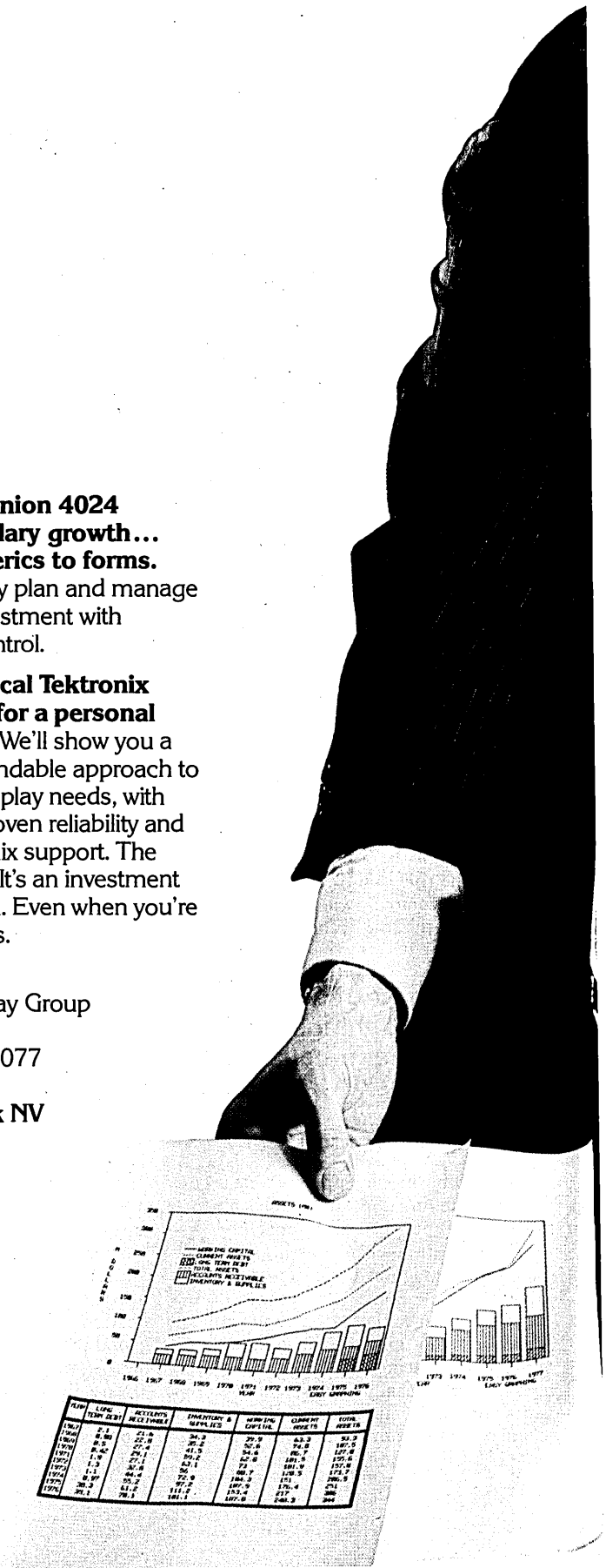

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the computer into supporting an office. Among the most significant was the development of the augmented knowledge workshop by Doug Englebart at Stanford Research Institute. The concept here was to link a computer to a display to increase the productivity of the office worker. In addition to the conventional keyboard, this system uses a "mouse" to control the movement of a cursor on the display, and a chording device to enter commands.

The system enables its user to edit data quickly and easily, or to browse through tree structures looking for information. It also enables use of a split screen so that work on information from several sources can proceed simultaneously. For example, quantitative data from a message might be read, moved to a table of values stored in another data base, and have calculations performed on it simply by using the mouse and chording device.

> To be useful to thousands of people, the software must be moved to personal computers.

Two people can link their displays and work on reports simultaneously though they are thousands of miles apart. In some cases their interaction is done through speaker telephones as well as through the displays; in other cases they simply split the screen so a section is available for transmitting comments to each other.

Still other important work on related systems has been conducted by the Univ. of California's Information Sciences Institute under Keith Uncapher. In addition to excellent text editors, spelling correctors, and message systems, ISI has been developing increasingly intelligent terminals, terminals which are obviously the harbinger of the personal computer systems of the future.

Still more development was going on under the direction of Ted Myer at Bolt, Beranek and Newman. His efforts led to enriching the message systems and linking them to a data base management system to facilitate filing, searching, and retrieval.

Trying for technology transfer

All of this work had to some extent benefited from ARPA funding. And all of it was being used in varying degrees in research organizations, but the technology transfer to the common office was not occurring. This is what we undertook to investigate.

We began by providing mailboxes and the type of tools mentioned to seven of us

who worked closely together at the Army's Materiel Development and Readiness Command in Virginia. It didn't take us long to realize that our daily work was affected in a number of ways. We were using computer based message systems in lieu of phone calls because we could thereby avoid the problems of missed connections and interruptions. This in turn meant that we now had records of the types of things that occurred in phone calls—and previously went undocumented.

These records could be filed, retrieved, forwarded, and searched. They were unambiguous in that they could be reexamined to see if we initially had misunderstood their content; this reduced our miscommunication. More importantly, we captured an important new set of narrative communications in our computers as a by-product of the conduct of our business.

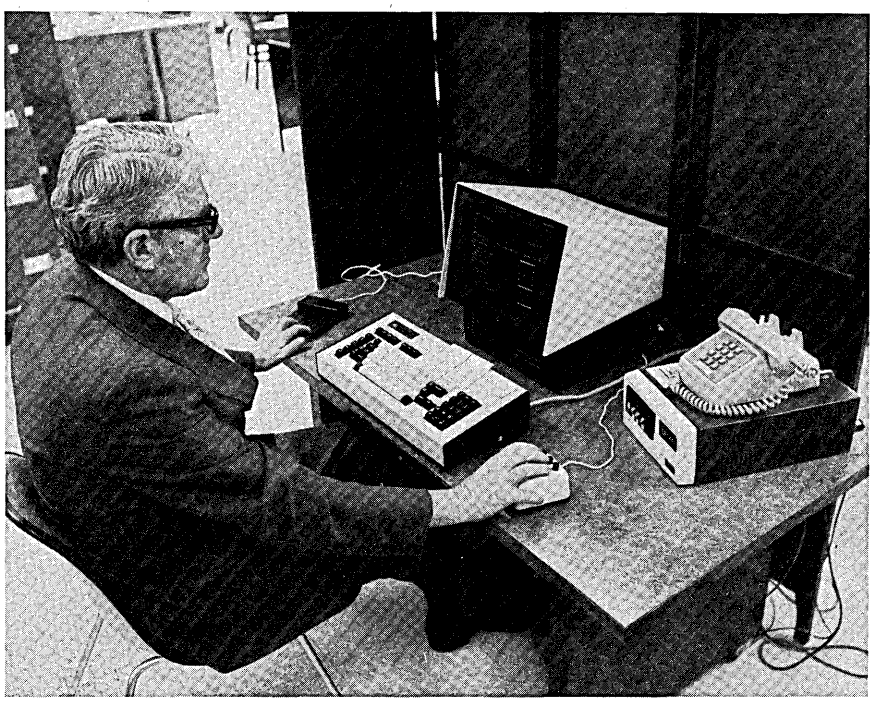
Similarly, when we used text editors to draft and refine our papers, we found that we could easily retain the various versions of that material, once again as a by-product of our normal work. When we maintained our calendars on the computer (and we have the ability to do that and to automatically coordinate open dates for meetings), we automatically captured the history of how we spent our time.

As months passed, more and more users obtained mailboxes and an increasing amount of our business was being conducted in the manner just described. One consequence was that as we added users, more of the narrative information we were handling was effortlessly made available in the computer. Our productivity was being enhanced by the use of the tools and the narrative information capture was free.

Now the tools of the automated office are some of my most significant aids. I have installed a second phone line in my home so I can use my terminal without tying up our normal line. I carry a lightweight terminal wherever I travel and answer my electronic mail from wherever I am in the country. People can reach me without ever knowing that I am traveling, and whenever I get back to my office, I am behind only on communications from persons who are not users of this service. Since all the organizations in my staff are users, I am always abreast of problems and can always participate in our decision making.

We'll still need a central computer for a number of reasons—some of which are not part of today's dp.

In fact, this text was originally drafted while I was sitting on my patio. It has been through numerous revisions that would not otherwise have been practical. It has been through a speller, and it has been transmitted to friends for their comments. These things are not practical to the same degree in another environment. But the important things are that they are available today, they are comfortable to use, and they capture the narrative information that has by-passed the computer in the past. Further, their impact on human productivity provides a strong incentive for their use.



Some early work in customizing computers for office use was done by Stanford Research Institute. Here a "mouse" (right) and "chording" device (left) are used to move a cursor and enter commands on SRI's two-dimensional display terminal. (The "operator" is Edward J. O'Donnell, chief of the scientific applications branch of the Army's MIS Directorate; the fact that he uses it himself, rather than through a secretary, was one of the author's interesting findings.)

The holdups

A factor seriously limiting their usage, however, is that the tools are primarily available on large scale computers and to a limited degree on minicomputers. To be useful to thousands of people, the software will have to be moved to personal computers. Fortunately, the lead time to move the software seems to be about the same as that required for personal computers of sufficient power—especially with respect to file storage—to become inexpensive enough to make it all worthwhile.

It now costs us approximately $3,000 to $4,000 per year to deliver interactive computing service to a person, whether using large computers or minis. This means we must get about a 25% gain in productivity for clerical personnel, or 20% from professional personnel, to justify the expense. If personal computers bring the cost to, say, $2,000 per year or less, that justification becomes reasonably easy.

If cost justification is one inhibiting factor, the unwillingness of office workers to use terminals is another. At present, our organization has about 300 people using the office automation services we're talking about. About one third of them use the services themselves; the majority get their secretaries to do it.

But the group which uses the services directly uses them more frequently and gets more out of them. Further, our experience indicates that peer pressure comes into play, and this tends to drive people to become at least casual users. Nonusers find they are not sharing in all the information passing through the network, and consequently are not fully knowledgeable. It is embarrassing to them to arrive at meetings ill prepared. They eventually are forced to become direct users just to stay in the game.

Looking ahead

We envision the personal computer having communications links to other computers in the organization—other personal computers, libraries, and message handling computers with archival files. They will also be capable of linking with those computers doing today's familiar data processing functions, and thus may sometimes act as an input/output device.

But we believe the normal mode of operation will be off-line for two reasons: to minimize communications costs and especially to increase the level of data security. Since the personal computer and its data are entirely within the control of the individual, there is a degree of security that cannot be present in a shared facility. Further, if the user wishes, every-

thing leaving his or her computer can be encoded (a technique which prevents forgery as well).

We've been thinking about the world of the future so we can anticipate what other computer-related changes may occur. We believe there will be many. For example, the same technology that is bringing us the personal computer is making it feasible to store economically graphics, pictures, and even digitally recorded voice. A big advantage of all this is that digital information can easily be moved across a communications network.

It certainly appears reasonable to assume that incoming nondigitized information might also be scanned by the mailroom, indexed using keywords, and loaded in a library computer. One way or another, the indexes could be compared with a list of people's interests and messages generated to tell them of the additions to the library file.

Yes, we'll still need a central computer facility for a number of reasons, some of which—like the computerized mailroom—are not a part of normal data processing today. It appears that when data must be shared, or when aggregations of data must be compatible, then that data and those aggregations should be centrally maintained. Thus we may expect continued growth in the classic data processing function.

But the big growth will come from assimilating computers into the office.

Playing four new roles

Ultimately, as a result of these changes, the responsibility for the act of computing will be diffused throughout our organizations. When it is, the design of the central information service will take on even greater importance than it has today. This will mean changes in our personal roles as well.

Tomorrow's information services executive will have at least four roles, some of them quite new. He or she will be the architect and information services planner, the information broker, the auditor who measures the quality of the service delivered and assures the integrity of the information system, and, finally, the operator of those systems that continue to be centralized.

Tomorrow's information services executive will have at least four roles—some of which will be quite new.

In my opinion, the role of architect and planner will be of paramount importance. This means that the information services executive will become much more a corporate staff member rather than being regarded as an operator, as is frequently the case at present. His or her decisions at this level will affect the way an organization can be structured and the efficiency with which it can operate. For example, the decision to decentralize all data processing to the maximum degree possible could leave almost no capability to assure the compatibility of the whole organization's operation. Such an action would be tantamount to completely decentralizing management responsibility.

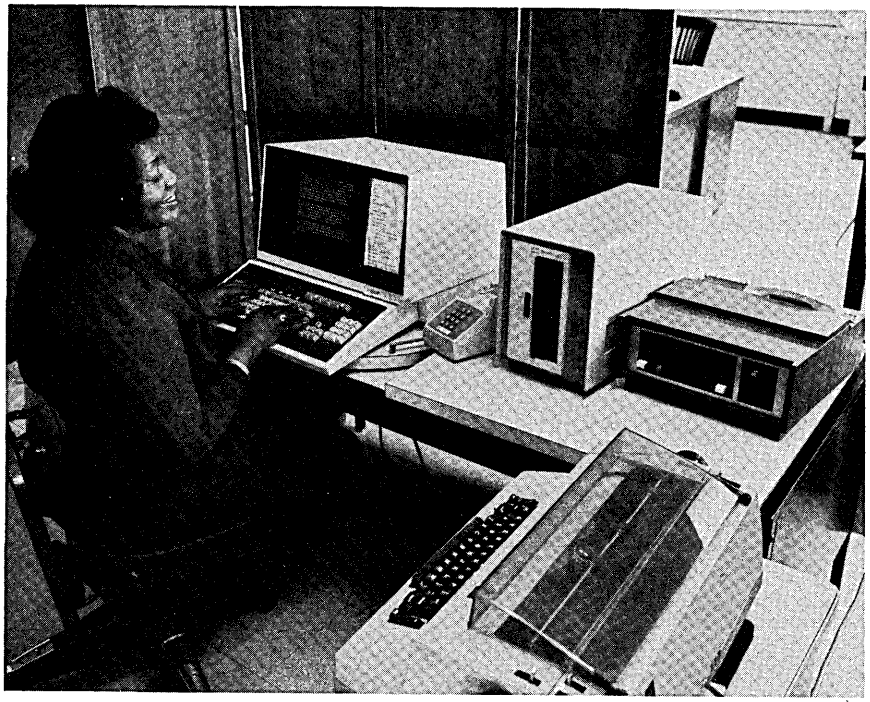
Strategic planning to provide the information services of the future will have a far longer time horizon than at present. This is true in any situation where complexity is increasing. When computers could only cope with sequential files stored on magnetic tape, the complexity of the systems that could be built was limited and the systems development time rarely took more than a year. With the advent of disc storage, it became possible to store multifunctional data bases on-line and the complexity of systems development stretched such projects out to between three and five years. Now with the possibility of linking computers through networks and sharing tasks between personal computers and centralized computing facilities, the planning to make the proper trade-offs among competing goals will stretch the planning horizon to about 10 years.

In our organization, we already are extending our strategic planning horizon to 10 years. Here are some of the long range issues we are forced to address:

1. Should we continue to maintain an integrated multifunctional data base or evolve to a system of local data bases which are only loosely coupled? (Surprisingly, the pros and cons of security in both scenarios are a major consideration.)
2. When we replace our current computers, should we do it with more large computers, or with a cluster of specialized minicomputers performing functions such as data base management and generalized inquiry processing?
3. When we develop the next generation of systems to support the office, should we move directly to the microcomputer or to minicomputers as an interim step—recognizing therefore that we would have to solve a formidable security problem?
4. Should we place only general purpose software in our dispersed minicomputers and microcomputers, or make compilers available so users can write their own programs?
5. How do we guarantee the sanctity of our information when so much of it is stored in our computers?

As information broker, the information services executive will have to become very service oriented. The job will require knowledge of how to connect people to the information they require. Even the job of maintaining the directories of users becomes a formidable task when all of the workers in the organization are using the computer for support.

The role of auditor embraces two func-



A full-fledged office system, like this one from CPU, Inc., requires a display/keyboard, printer, storage, and communications capability. Though presently sufficiently expensive to be difficult to justify for every dp user—demanding an offsetting 20% to 25% productivity improvement—their cost may soon be driven into a more reasonable range by improvements in microprocessors and related technology.

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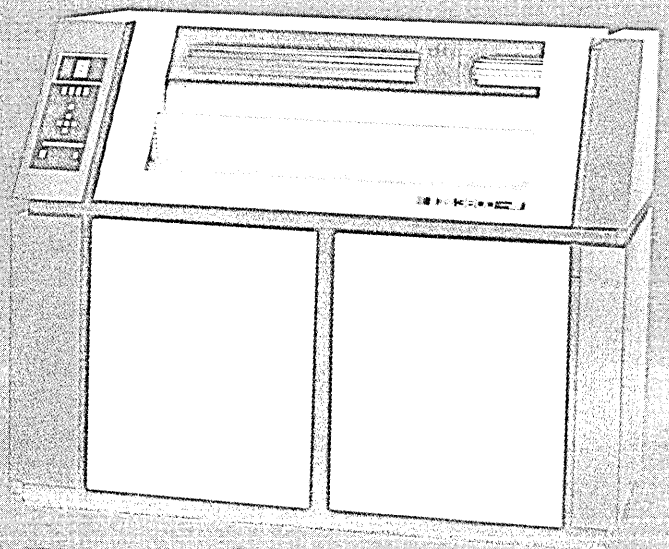

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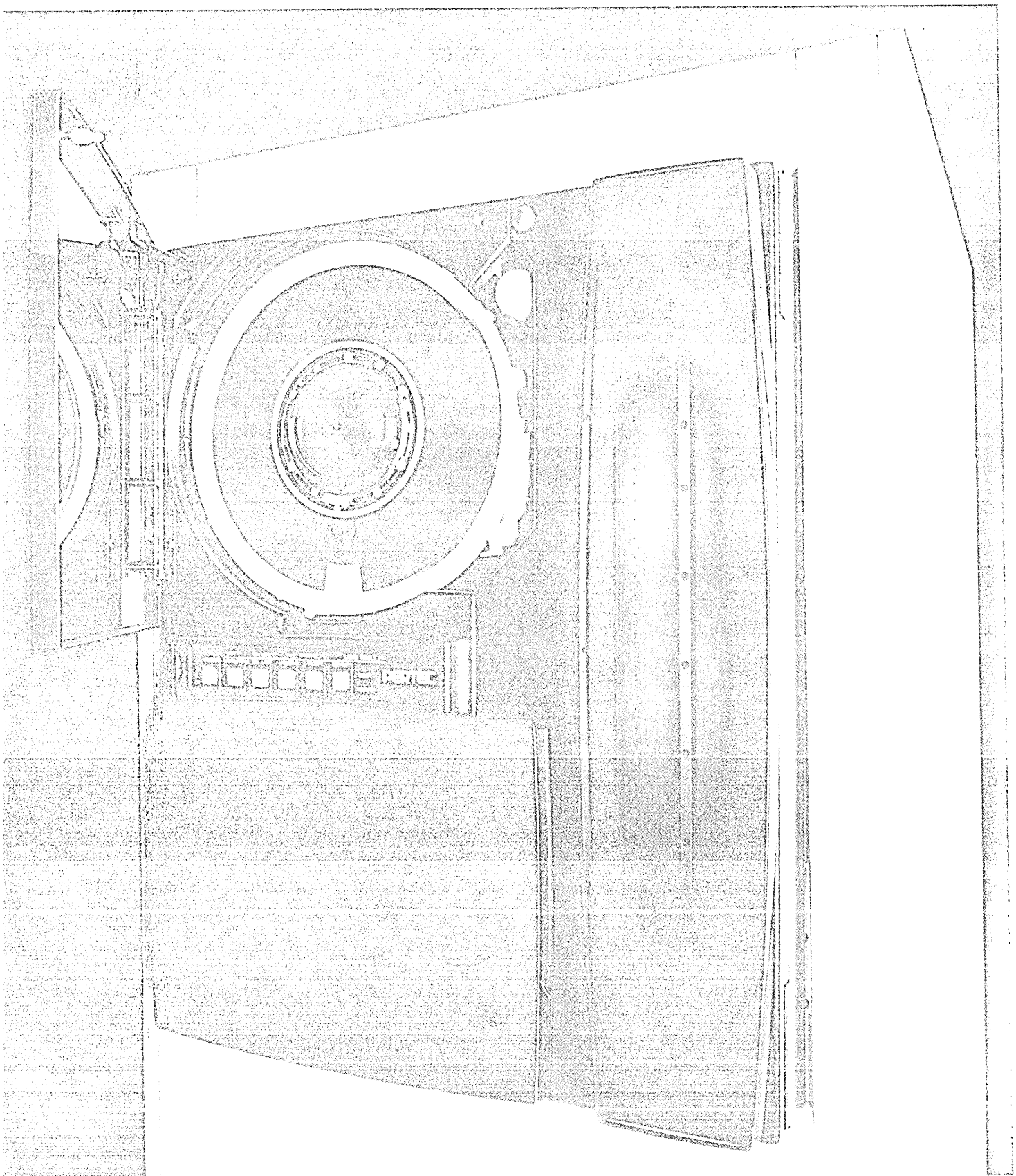
TOUGH COMPETITION:



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Name_____

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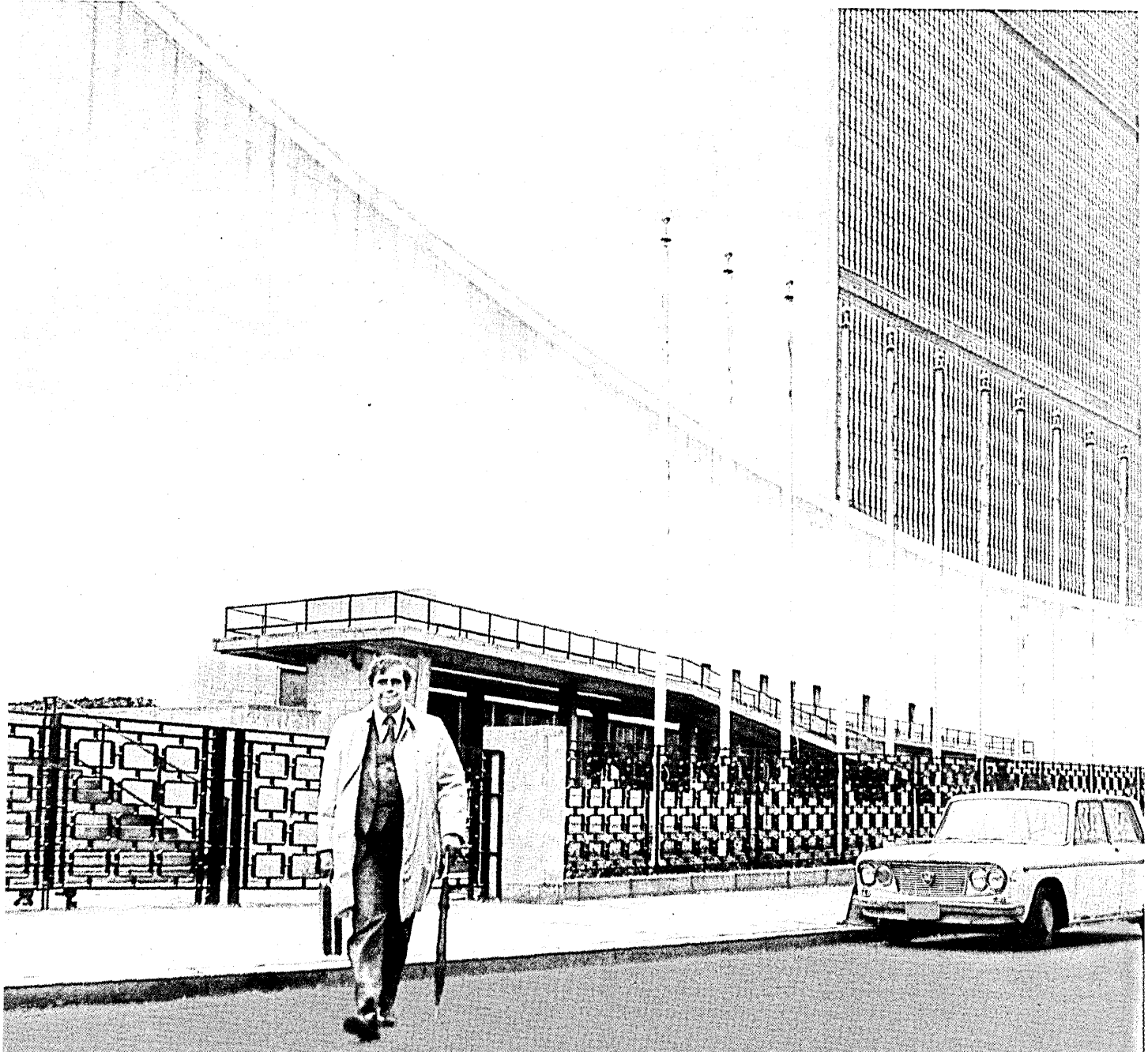

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tions, that of monitor of the quality of service and usability of the system, and that of preserver of the system's integrity. When we began operating some of our computing installations such that all of the input and output was handled remotely, we quickly learned the customers knew a lot more about the responsiveness and reliability of our services than the dp operations chief did. This has become increasingly obvious in our work with computer-based office support systems which are geographically dispersed and serviced entirely through a network. In fact, we are moving toward a situation where we will have to use a computer to sample our network to measure the quality of the service we are delivering with our other computers.

We have also found that training takes on a different complexion in a completely dispersed environment. Yet the knowledge of the people who are interacting with the computer dictates the limit of their ability to use it.

Finally, the problem of security can be mitigated by the advent of the personal computer, but it will not disappear. The information services executive will ultimately have to assure that the organization's information cannot be destroyed or altered by accident or malice. He or she will also be responsible for assuring that it cannot be accessed by those not intended to have access.

Again, the roles just discussed will require the information services executive to be much more of a salesman of his services than has been required of the MIS manager of the past. An increasingly knowledgeable group of users will require an increasing dependency on persuasion to shape the overall system.

The final function of this executive is that of operator of the centralized systems, and here the major problem will be in parceling energy so that this and all those other new responsibilities can be adequately met.

Many won't make it

I am not at all sanguine that most MIS managers will make the transition, and I have good reason to question whether or not they will. I recently sponsored a meeting for some of the MIS managers with whom I work most closely—all bright, tough minded, and competent. After a day and a half of presentations about the tools and technologies of the electronic office, we discussed the implications of these in their organizations.

One of the topics was the probable number of terminals or personal computers they would ultimately require. There are several thousand workers in each of their organizations today using computer products in the conduct of their everyday work, and yet each of these managers estimated no more than 200 as the ultimate number of potential users. The managers were simply too bogged down in the limitations we now see for response time on interactive systems.

Whether those managers are ready or not, it will happen. Technology and the evolution of computing science are conspiring to bring together communications, administration, and computing to form an information service. The role this service will play in our organizations will be absolutely vital.

The coming war

To obtain maximum effectiveness from the components of that information service, we will have to plan them in concert, and that will call for some changes. In most organizations, responsibility for these functions is widely dispersed. The administrative elements are generally responsible for mailrooms, word processing, and library operation. The MIS elements are responsible for transaction driven computing and the management information that can be derived from it. MIS and administration somehow split communications between them; even if data communications is under the aegis of dp, voice is not.

There will be a lot of infighting before all this gets straightened out. In the end, there will arise an information services executive of power and stature similar to that of the comptroller. The rank will be that of vice president and the information he or she controls will be viewed as one of the organization's most valuable resources. Such an executive, therefore, will sit "very close to the throne."

The current MIS practitioner may or may not be that person. Success will come to the one who starts now to conceptualize tomorrow's role for information processing and its manager—and begins to make it happen today. ❁

Mr. Gilbert is the director of management information systems of the U.S. Army Materiel Development and Readiness Command. In this capacity he is responsible for an annual computing budget in excess of $160 million, and for the operation of computing equipment used in the support of the Army's business and scientific data processing at over 80 installations.

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The World's Top 50 Computer Import Markets

by Bohdan O. Szuprowicz

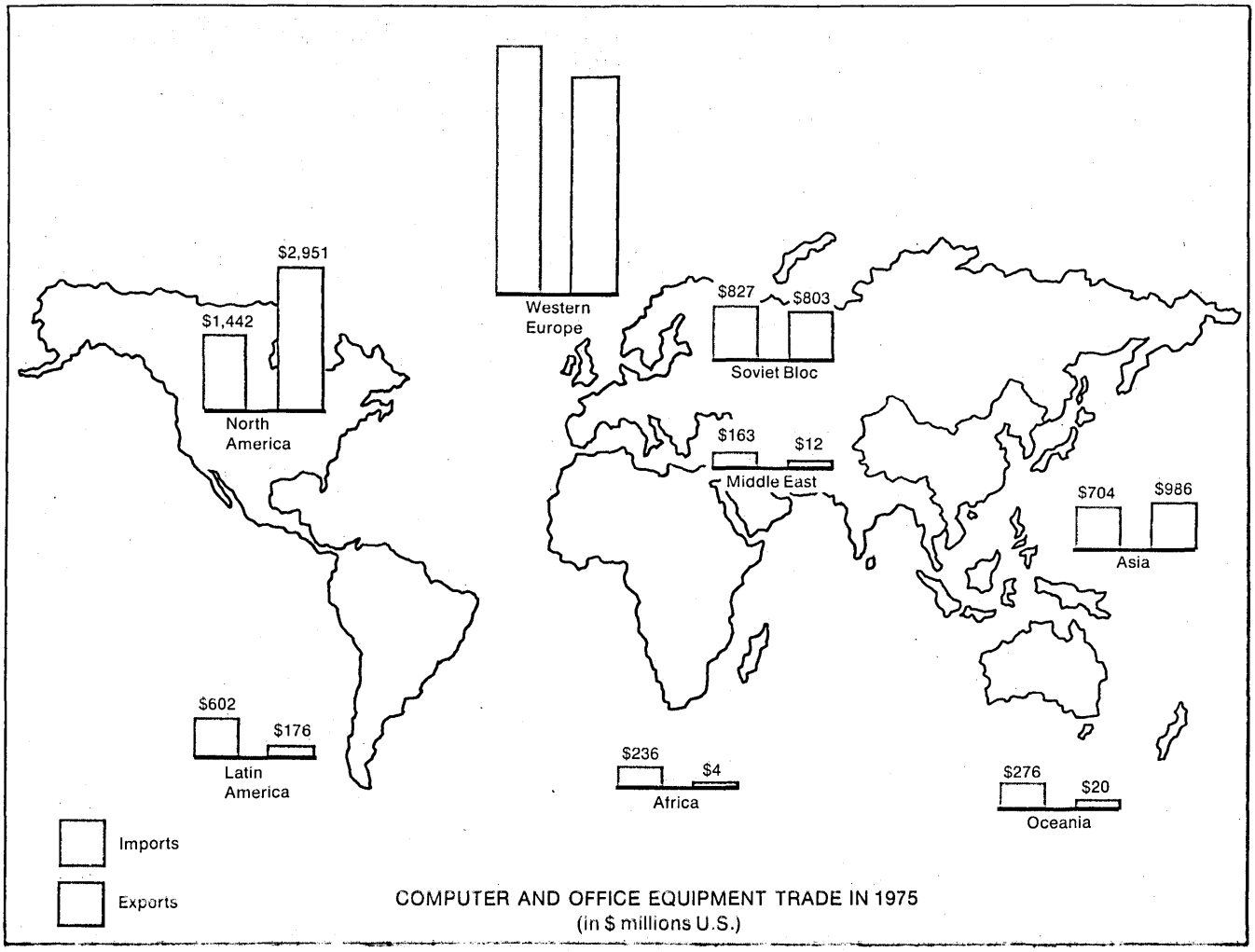
World trade in computers and related equipment is $10 billion per year and growing.

Most computer users are well aware that U.S. computer and office equipment manufacturers dominate the world computer scene and derive about 50% of their revenues from foreign sales. Few users stop to think what this really means to them, and even fewer may be aware that the United States is also one of the largest *import* markets in the world for these goods.

During the last 25 years American computer users benefitted greatly from global expansion of office equipment markets in general and computer markets in particular. World-wide demand for sophisticated equipment, in concert with relatively limited or non-existent manufacturing capabilities in some countries, created powerful incentives for American manufacturers both to expand production and to invest in research and development of equipment whose price/performance characteristics were continuously being improved. This expansion also resulted in rapid growth of world trade in computers and office equipment. Trading reached an annual rate of almost $10 billion in 1975; 30% of that was made up of exports of equipment manufactured in the United States, and most of that 30% was in mainframes, memories, peripherals, replacement parts, and dp accessories.

As a result of large production runs and global markets, a computer system in North America is relatively much cheaper than anywhere else in the world. If an "average" computer system purchase price today is taken to be about $200,000, in the U.S. it is only eight times the salary of an "average" systems programmer. At the other extreme the "average" computer system in the Soviet Union costs about $350,000, equivalent to between 100 to 150 times the "average" salary of a Soviet computer worker. Thus to the Soviet end user the computer appears to be about 15 times more expensive than to his American counterpart. Also, except in very special cases, the end user must satisfy himself with a much smaller choice of data processing equipment primarily manufactured within the Soviet Union or the COMECON group of countries.

In between the capitalist and communist extremes there is a whole range of countries in which the "average" compu-



COMPUTER AND OFFICE EQUIPMENT TRADE IN 1975
(in $ millions U.S.)

ter system is relatively cheaper than in the Soviet Union or Eastern Europe but still much more expensive than in the U.S. There is also a multitude of developing countries in Africa, Latin America, and Asia to whose end users computer equipment remains extremely expensive but of greater variety. They can contemplate purchasing virtually any equipment manufactured anywhere in the world, but are more often than not limited by the availability of foreign currencies, sometimes even relying on foreign aid programs from international agencies.

In many countries, recurring trade deficits and differences in perceived values of computer equipment also contribute to government decisions to support development of some computer equipment or at least of electronic components for their rapidly growing domestic demand and hopefully for export. France, Great Britain, and Japan are the obvious examples, but now several small and developing countries are also getting into the act.

Such an industry is not only very attractive to many countries because it saves hard currency for international trade, it is also attractive because it is a labor intensive industry which requires relatively small inputs of materials and therefore is perfectly suited to countries with large populations, high unemployment, and limited natural resources.

The example of Japan in particular has not been lost on other developing countries. Even few advanced industrialized nations can expect to match Japanese productivity and government support in this industry. Other populous and developing countries such as India, China, Brazil, Indonesia, and even Nigeria sooner or later will try to emulate Japan, at least in production of the most popular data processing equipment, to supply their own domestic markets, and check the outflow of foreign currencies.

Multinationalism

IBM in its infinite marketing wisdom was one of the first multinationals to realize the peculiarities of global computer markets and the incentives for local product substitution. As a result IBM invested heavily in wholly-owned subsidiaries and manufacturing facilities in countries such as West Germany, Japan, France, Sweden, the Netherlands, Brazil, and even India. IBM's policy created local manufacturing, preempting a good part of any possible competition in the starting years but also providing a range of export products to offset imports. Even today, different IBM office equipment products are manufactured in different countries; as a result, a good part of the international computer and office equipment trade consists of exports and imports of IBM cpu's, peripherals, parts, and components between various manufacturing countries.

To a degree, many computer users in smaller countries might not have been able to obtain their computer systems as early as they did if not for IBM's ability to supply system components from various countries rather than from a single country of origin. An IBM user in Kenya, for example, would get a cpu from England, peripherals from Germany or Sweden, and a terminal from Japan—all making up a familiar IBM computer system which

Standard International Trade Classifications

International trade comparisons in data processing equipment are possible as a result of the Standard International Trade Classification (SITC) codes used by many leading trading countries and international organizations to report annual imports and exports of specific commodities. Such data is normally collected by customs organizations and reflects the claimed value of equipment actually imported or exported by a particular country in a given year. This should not be confused with trade reports of sales of computer equipment to a particular country, which in fact may take several years to deliver and do not represent the magnitude of an import market on a regular annual basis.

Under the SITC system, groups of commodities traded internationally are assigned 3-digit codes. For example, code 711 represents power generating machinery; code 712 agricultural equipment; code 714 computers and office equipment; code 724 telecommunications apparatus; and code 734 aircraft and parts. Individual SITC code groups in turn are made up of several subgroup codes which represent specific product types.

The SITC code for computers and office equipment is 714. It comprises several subgroups covering typewriters, copying machines, and calculators, but by far the largest parts of SITC 714 are computers, peripherals, and components. In fact almost all the categories in this code are products manufactured and marketed by IBM, which is a good reason to use the classification for making international trade comparisons in this industry.

Major product categories and relative trade volumes in different SITC divisions are best illustrated by actual trade data from imports and exports of the United States for 1976, the last year for which complete U.S. data are available. In the table below, SITC 714.3 and SITC 714.9 (which consist predominantly of dp equipment) account for 85% of all U.S. trade in the 714 category. The typewriter subgroup is the next largest. (World trade in typewriters accounted for only 8% of the total SITC 714 trade in 1975, the last year for which complete international figures are available.) Most of the remaining categories are for equipment used for some other form of accounting, computing, or calculating.

Trade data under code 714 as a whole is reasonably indicative of the import and export of computer equipment, and in many cases detailed divisions are available down to the level of parts for multiplexors or keypunchers. However, it is almost impossible to develop a comparative table of world computer markets in such detail because several of the top countries do not publish commodity transaction statistics at lower code levels.

The work of collecting and reconciling worldwide import and export statistics for all commodities traded, including computers, is performed by the Statistical Div. of the United Nations in New York—which itself makes considerable use of computers to sort out the unending mass of trade statistics. This is probably the largest such effort in the world, and still it usually takes a year or two before statistics are compiled for all countries for any given year.

The delay is due to the fact that only the most advanced and industrialized countries, such as U.S., Japan, U.K., France and a few others, publish their foreign trade statistics within months of when transactions took place. Other countries are much slower in their data collection efforts. Then too, in all cases those statistics are available only in the language of the country involved and are reported in local currencies. Very often commodity reporting codes are totally different from the accepted SITC designations. As a result, the United Nations staff constantly faces the tasks of translation, currency conversion, and commodity code matching.

For example, the SITC 714.3 commodity group, which represents accounting and computing machinery such as computer mainframes and central memories, may not be as precisely defined in the Foreign Trade Statistical Yearbooks of all the countries. There are potential problems with statistics of

an end user in North America most likely would get directly from his local IBM branch.

To any end user in a country which has to watch its foreign currency supply carefully, such piecemeal imports would offer the attraction of his not having to spend too much of any single currency. For IBM, ability to import from several countries and accept payment in various currencies presents a competitive advantage over other computer manufacturers in those markets.

The major impact of minis

Everything was hunky-dory on the global computer markets until American minicomputer manufacturers challenged the big established mainframe makers a decade ago. The minicomputer manufacturers demonstrated to the world at large that minis can handle much of the "average" computing needs of typical computer users throughout the world. This is particularly true in many smaller countries where local enterprises, government agencies, and educational institutions are considerably smaller than those in the United States; their data processing needs are adequately covered by minicomputers which can be manufactured locally.

In recent years the microprocessor designers have given another challenge to the established computer manufacturing industry. Because of the great versatility of microprocessors, and their unit costs being within the affordable range of almost any existing or future end user, their manufacture is a highly attractive industry.

While general purpose computers are now manufactured in at least 15 different countries, minicomputers are already produced in at least 30, including Cuba, Bulgaria, India, Norway, China, Poland, Brazil, and the Philippines. The way things are shaping up, the microcomputer will in all probability be even more widely produced in a very few years. Already Austria, China, East Germany, and India have announced microprocessor products of their own, and Japanese production is growing by leaps and bounds every year.

In smaller countries, locally manufactured minis can handle all the load.

The resulting international trade in computers and office equipment as a whole has been growing at an average of 22% annually in recent years and should continue to do so for some time to come. However this trade is not increasing evenly in all parts of the world. It appears to depend on the existence of domestic computer manufacture and on market saturation. Regions with the smallest installed bases and a lack of manufacturing facilities have to import all of their equipment and therefore of course exhibit the fastest growth in office equipment and computer imports.

There are very wide differences in import growth between various regions of the world. United Nations International Trade Statistics define eight major trading regions which are primarily based on geographical considerations. These include Western Europe, North America, the Soviet bloc, Asia, Africa, Latin America, Oceania, and the Middle East. Aggregate statistical reports on trade in equipment shipped, and whether or not shipping costs are included.

However, U.N. statistics are of considerable value for developing reasonable estimates of the magnitudes of import markets within about 15% accuracy on a year-to-year basis. Changes due to inflationary factors are left to the user of the statistics. ❋

countries which do not use the SITC code for domestic reporting. In France and Japan for example, most SITC 714.3 products are reported under the European code 84 53 and its subdivisions. Soviet trade statistics use yet another and more general code, 15931, which represents computing machinery in general ("mashiny vychishlitelnye"). Some countries may use still other local codes which do not represent exactly the same product categories, and some, such as the People's Republic of China and Rhodesia, simply do not publish any foreign trade statistics.

The work is complicated by incomplete reporting by some countries, by different methods of figuring values of

SITC Code	Major product category description	U.S. 1976 exports*	U.S. 1976 imports*	% of total trade
714	Office machinery total	$2,937.4	$1,393.8	100.0%
714.1	Typewriters & checkwriting equipment	30.8	171.4	4.6%
714.2	Calculating equipment of all types	85.5	356.1	10.2%
714.3	Accounting and computing equipment	842.8	238.1	24.9%
714.3005	Computer mainframes and central memories	703.6		
714.3020	Paper tape and punched card equipment	105.3		
714.9	Peripherals, parts, and other devices	1,978.2	628.2	60.2%
714.9201	Computer input devices and parts	62.2		
714.9202	Computer output devices and parts	101.9		
714.9206	Combination I/O devices and parts	490.1		
714.9207	Random access storage devices	262.1		
714.9209	Storage devices except random access	101.3		
714.9213,4,5	Modems, multiplexors, and parts	34.6		
714.9216	Basic computer parts and accessories	617.9		
714.9218	Other computer related equipment	75.0		
714.9220	Parts for accounting and bookkeeping machines	69.6		

Source: U.S. Department of Commerce FT 135 Schedule A Commodities by Countries Series, December 1976, and FT 155 US General Imports Annual
*In $ millions U.S.

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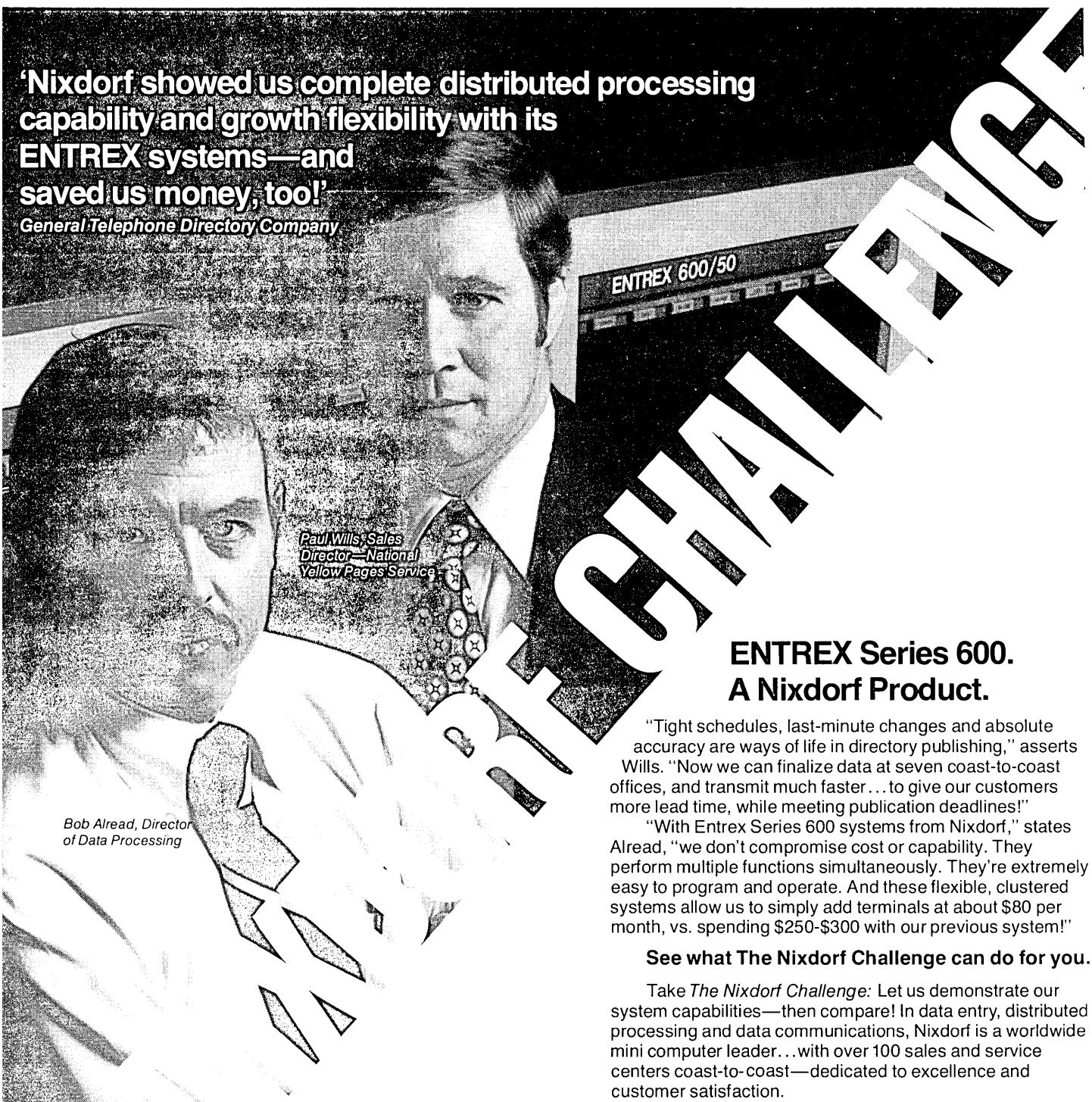

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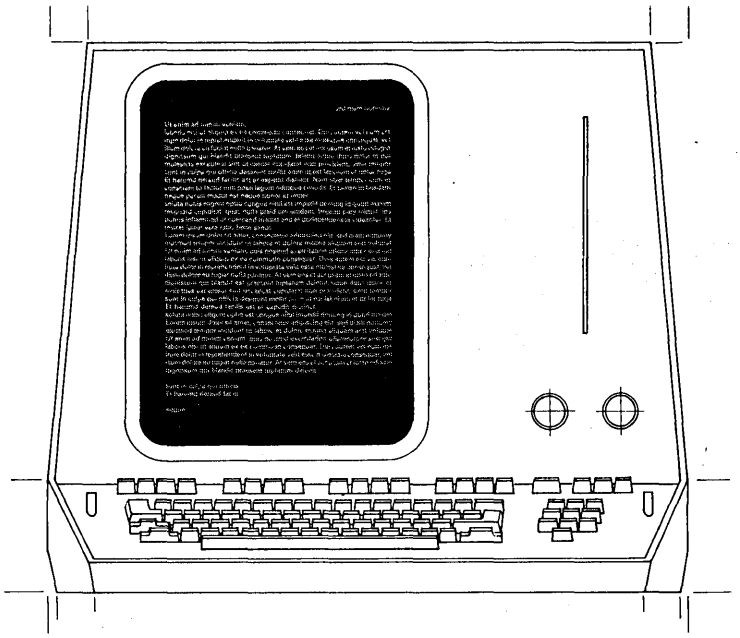

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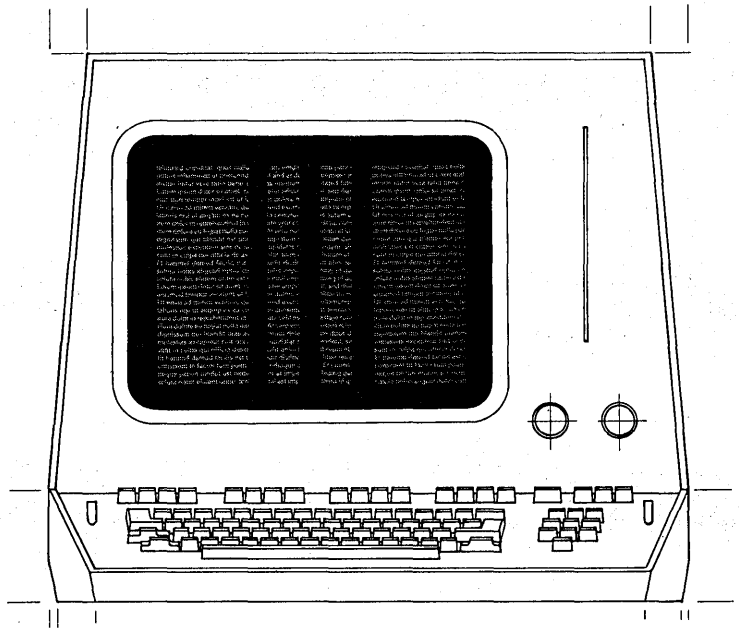


"office equipment" (which includes computers) are available for these areas.

Western Europe, the big market

Western Europe is by far the largest import market for computing equipment and accounts for over 55% of all the trade. Imports there have been growing at a rate of 21.8% in recent years, which is very close to the global average but well below import growth in some developing countries.

Unexpectedly, perhaps, Western Europe also contains the bulk of computer and office equipment *manufacturing* capacity outside of North America. Thus, as a region it also accounts for more *exports* of dp equipment than the other regions of the world including North America. This is because there is very high trade in these products between European countries, six of which are among the 10 largest computer import markets in the world. And actually a good part of this trade represents sales of American office equipment manufacturers such as IBM, CDC, Honeywell, Univac, Burroughs, Digital Equipment and several others which operate manufacturing facilities in Europe. Although American companies eventually obtain their overseas profits from such sales, considerable benefits in the form of employment, taxes, materials, services, and exports accrue in the first instance to the host countries in which such manufacturing facilities are located.

What this means to the Western European end user is that although computers to him do not appear as cheap as to his American counterpart, he probably has a larger selection of equipment than anyone else. On the one hand he has access to most equipment manufactured by American companies both in North America and in Western Europe as a result of aggressive marketing efforts typical of most American suppliers. On the other, he is exposed to European manufacturers such as ICL in the U.K., Siemens in Germany, Philips in the Netherlands, Datasaab of Sweden, CII-HB of France, Norsk of Norway, Selenia of Italy, and to a multitude of peripherals manufacturers, many of which are virtually unknown to the North American end user. There are of course exceptions in cases where governments constrain certain organizations to purchase only domestically manufactured equipment.

West Germany and France ranked in 1975 as the two largest import markets for computers and office equipment in the world. France, which occupied the top spot in 1974, reduced its imports growth during 1975 and "slipped" to second place. For the first time, however, imports of this equipment by West Germany and France reached over $1 billion per year. Now they represent 1.4% and 1.9% of total imports of those countries, respectively. This compares with 0.9% in the case of the United States, and only 0.7% for Japan. In the case of Soviet Union this ratio is only 0.8%, but in Brazil and India these categories constitute (again) 1.4% and 1.9% of total imports, respectively.

Although final figures for 1976 are not yet available for most countries, preliminary estimates (including currency conversions and code comparisons) suggest that in that year the U.S. and U.K. also became $1 billion office equipment import markets, rebounding from somewhat restrained imports growth in previous years. Conversely, France appears to have contained its imports growth rate. In 1976 it imported $1,056.8 million worth of computing equipment, growing by a mere 3% over the 1975 figure, and possibly dropping to fourth place.

France has a significant trade deficit and is one of the largest office equipment import markets in the world. It has very good reasons to continue developing its domestic computer industry and reduce its imports if possible. Characteristically, French minicomputer manufacturers already claimed 51% of the French minicomputer market in 1975 and are determined to intensify this effort with the introduction of new microprocessor products in the future.

West Germany, France, the U.S., and the U.K. are all importing $1 billion in dp goods annually.

The situation is somewhat different in West Germany, which is the second largest trading country in the world after the United States and enjoys a healthy trade *surplus*. Germany appears to concentrate on production and export of heavy industrial equipment and finished products, and can well afford to import all the office equipment that its users may desire for supplementing domestic production. German computer users therefore probably enjoy not only the largest choice of equipment but are also less constrained from using imported equipment than most computer users in other European countries.

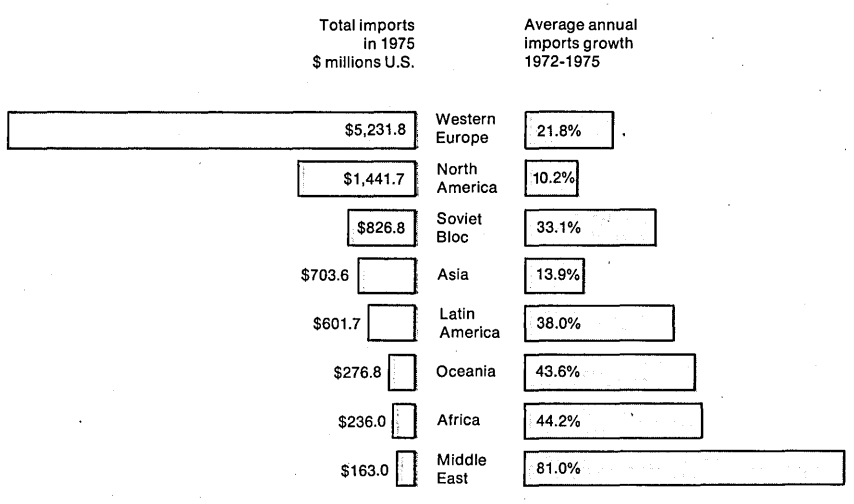
North America, number three in imports

Although North American end users have long been exposed to overseas office equipment products such as typewriters, calculators, and other simple devices, imports of more sophisticated systems such as foreign computers have only begun during the last few years. Manufacturers such as Philips, Nixdorf, Olivetti, ICL, and Fujitsu have made efforts to gain a foothold in the North American market. However, the bulk of imports to North America are some mainframe peripherals and parts manufactured by American subsidiaries in Western Europe, Japan, and countries like Singapore, Hong Kong, South Korea, and Brazil.

Non-American suppliers find it very hard to compete with well established American giants, particularly where support services such as software, maintenance, and rapid response must be provided. They may find it easier in the future if they market specific microprocessor-based products which may be repaired by changing some element which is kept in stock by representatives in major cities.

On the other hand, in office equip-

AVERAGE ANNUAL GROWTH IN IMPORTS OF COMPUTERS AND OFFICE EQUIPMENT 1972-1975



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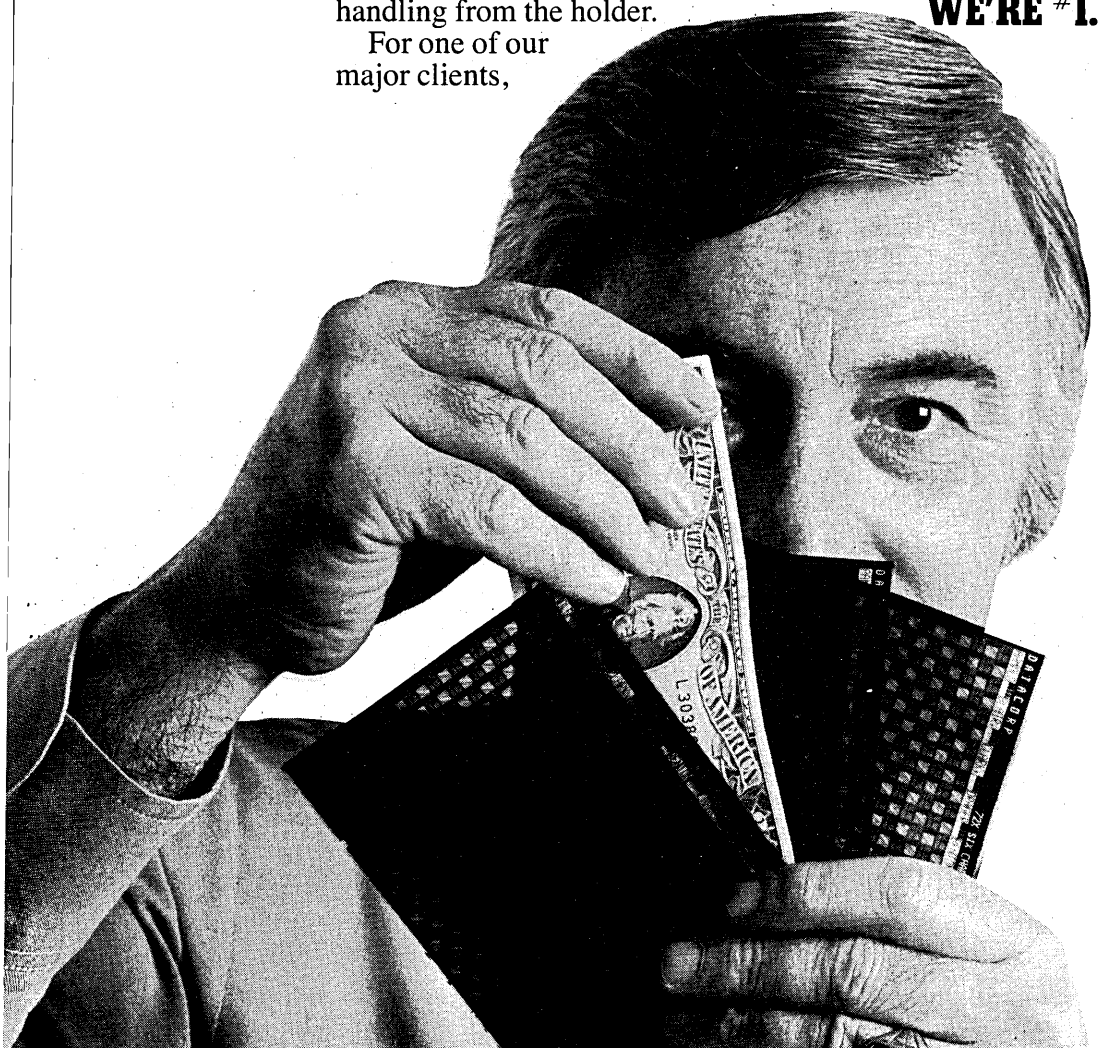

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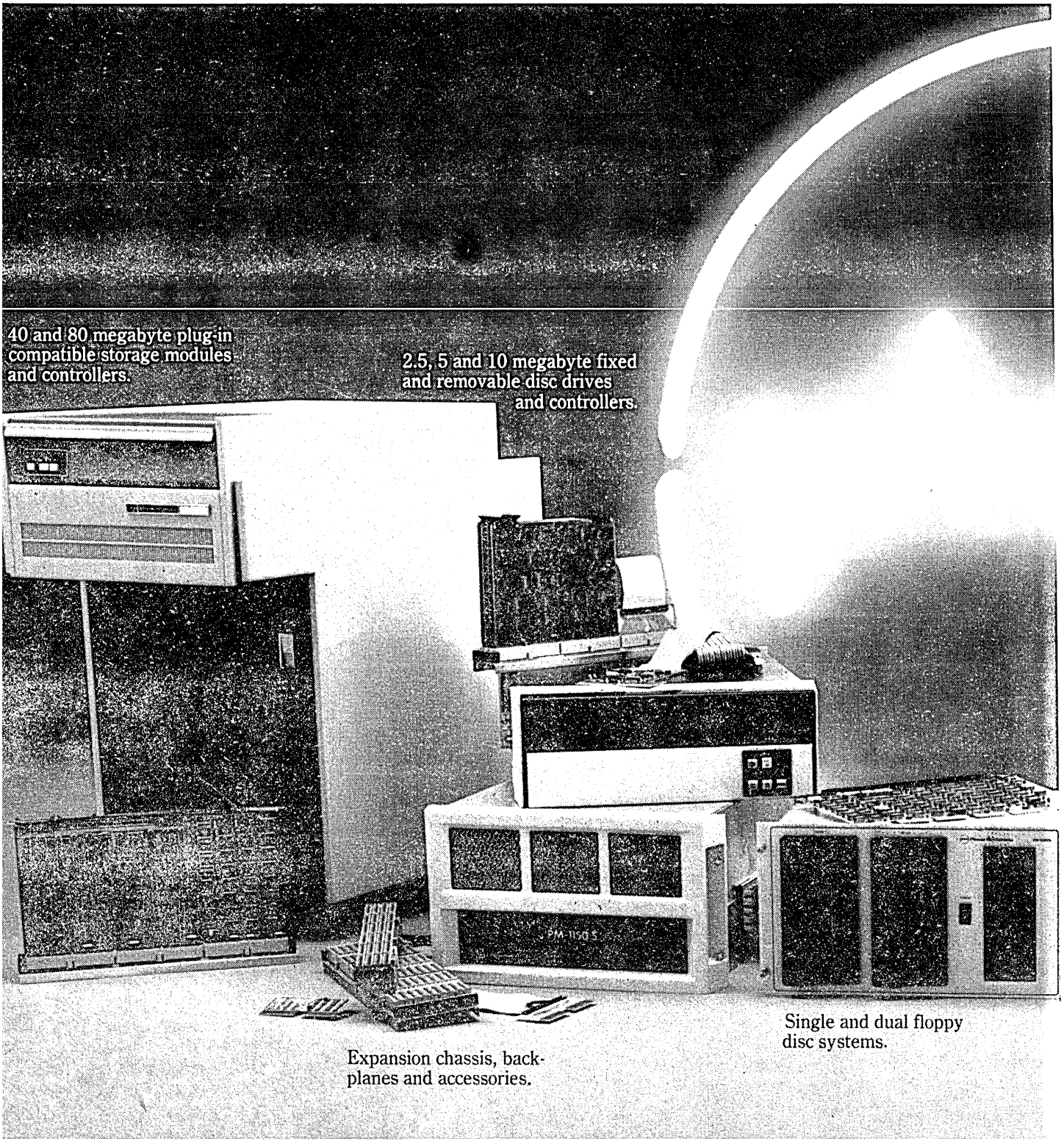

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ment products such as typewriters and calculators, North America is already a net importer which suggests that the advent of new microprocessor-based products may further increase future imports of such products. However, the recent growth of imports of office equipment products in North America has been on the average only 10.2% per year, or less than half the global imports growth rate. The United States ranked as the world's largest import market for office equipment in 1972 and 1973, but dropped to third place by 1974. Its importing position hardly changed in 1975, but increased somewhat in 1976.

The Soviet bloc's balancing act

It is interesting to note that the Soviet bloc is the third largest office equipment import region and that imports there

THE TOP 50 COMPUTER AND OFFICE EQUIPMENT IMPORT MARKETS
(in $ millions U.S.)

Country	1972	Rank	1973	Rank	1974	Rank	1975	Rank	Average* annual change 1972-1975	% change 1974-1975
World Total	**$5,728.9**		**$7,475.4**		**$9,019.7**		**$9,482.5**		**+ 21.8%**	**+ 5.1%**
West Germany	706.6	2	829.8	2	967.2	2	1,082.0	1	+ 17.7%	+ 11.8%
France	648.5	3	784.2	3	971.0	1	1,024.4	2	+ 19.3%	+ 5.5%
USA	732.1	1	909.7	1	926.7	3	932.0	3	+ 9.1%	+ 0.6%
UK	456.3	4	693.6	4	816.4	4	828.3	4	+ 27.2%	+ 1.5%
Italy	277.7	7	398.7	7	535.9	5	511.8	5	+ 28.1%	- 4.5%
Canada	371.1	5	430.4	5	519.8	6	506.9	6	+ 12.2%	- 0.5%
Japan	301.8	6	419.2	6	492.2	7	407.5	7	+ 11.7%	- 17.2%
Netherlands	226.3	8	283.2	8	357.8	8	356.4	8	+ 19.1%	- 0.4%
USSR	212.3	9	228.1	9	230.9	9	285.2	9	+ 11.4%	+ 23.5%
Spain	110.1	13	162.9	11	205.2	14	239.7	10	+ 39.2%	+ 16.8%
Belgium/ Luxembourg	138.3	11	197.6	10	222.7	11	230.6	11	+ 22.2%	+ 10.4%
Australia	104.7	14	152.9	13	230.7	10	220.9	12	+ 36.9%	- 4.2%
Sweden	114.3	12	135.0	15	181.1	15	212.1	13	+ 28.5%	+ 17.1%
Brazil	90.4	15	152.0	14	206.0	13	195.4	14	+ 38.7%	- 5.1%
Switzerland	140.4	10	176.9	12	208.7	12	193.3	15	+ 12.5%	- 7.4%
Czechoslovakia	53.5	21	93.6	19	137.6	17	182.8	16	+ 80.6%	+ 32.8%
Mexico	71.8	18	109.0	17	147.4	16	153.7	17	+ 38.0%	+ 4.3%
Poland	61.1	19	112.3	16	110.5	18	128.9	18	+ 28.8%	+ 16.6%
South Africa	49.7	22	79.5	22	101.6	20	125.8	19	+ 51.0%	+ 23.8%
Denmark	56.7	20	84.5	21	99.8	21	119.1	20	+ 36.7%	+ 19.3%
Austria	86.8	16	99.9	18	110.3	19	118.7	21	+ 12.2%	+ 7.6%
Hungary	30.7	27	41.6	26	79.6	24	88.7	22	+ 62.9%	+ 11.4%
Finland	39.3	25	60.1	23	80.2	23	85.3	23	+ 39.0%	+ 6.3%
Hong Kong	81.2	17	90.8	20	82.8	22	76.6	24	- 1.9%	- 7.5%
Norway	43.4	24	41.6	27	55.4	26	68.1	25	+ 19.2%	+ 22.9%
Iran	13.2	38	21.3	38	39.2	32	64.8	26	+130.0%	+ 65.3%
Venezuela	28.4	28	33.2	31	46.3	29	60.0	27	+ 37.1%	+ 29.6%
Yugoslavia	48.8	23	47.7	24	68.8	25	54.9	28	+ 4.2%	- 20.2%
East Germany	12.2	39	33.7	30	33.0	36	54.7	29	+116.1%	+ 65.7%
Bulgaria	21.6	32	23.1	37	42.5	31	50.8	30	+ 45.1%	+ 19.5%
New Zealand	13.2	37	24.3	35	37.3	33	48.6	31	+ 89.4%	+ 30.3%
Ireland	22.8	31	33.2	32	43.9	30	46.4	32	+ 34.5%	+ 5.7%
Argentina	31.8	26	40.9	28	50.0	27	44.9	33	+ 13.7%	- 10.2%
Singapore	28.2	29	47.0	25	46.8	28	43.7	34	+ 18.3%	- 6.6%
Israel	18.5	33	21.9	34	30.5	37	41.3	35	+ 41.1%	+ 35.4%
Romania	15.2	35	24.6	33	33.8	35	35.0	36	+ 43.4%	+ 3.5%
South Korea	15.7	34	23.2	36	29.2	38	29.4	37	+ 29.1%	+ 0.7%
Philippines	13.6	36	13.5	40	19.6	39	26.6	38	+ 31.9%	+ 35.7%
Portugal	24.0	30	35.3	29	36.6	34	23.3	39	- 0.9%	- 36.3%
Chile	3.3	52	3.1	55	7.8	55	23.3	40	+202.0%	+198.7%
Peru	9.3	42	11.8	45	12.6	45	19.6	41	+ 36.9%	+ 55.5%
Indonesia	4.1	50	8.9	46	11.5	47	19.2	42	+122.8%	+ 66.9%
Malaysia	6.8	46	12.7	43	17.2	41	18.8	43	+ 58.8%	- 9.3%
Nigeria	7.2	45	8.7	47	9.9	51	18.1	44	+ 50.5%	+ 82.8%
Cuba	4.3	49	2.4	56	7.1	56	16.8	45	+ 96.9%	+136.6%
Saudi Arabia	3.1	53	5.5	54	10.1	50	16.5	46	+144.1%	+ 63.4%
Colombia	9.3	43	13.3	41	13.8	43	16.4	47	+ 25.4%	+ 18.8%
Algeria	9.5	41	12.9	42	13.6	44	14.8	48	+ 18.3%	+ 8.8%
Greece	12.2	40	19.3	39	14.6	42	14.7	49	+ 6.8%	+ 0.7%
Turkey	6.6	49	7.4	51	17.8	40	14.6	50	+ 40.4%	- 17.9%

Source: Compiled by 21st Century Research from U.N. International Trade Statistics SITC 714

**Note that these figures are computed arithmetically from the 1972 and 1975 figures.*

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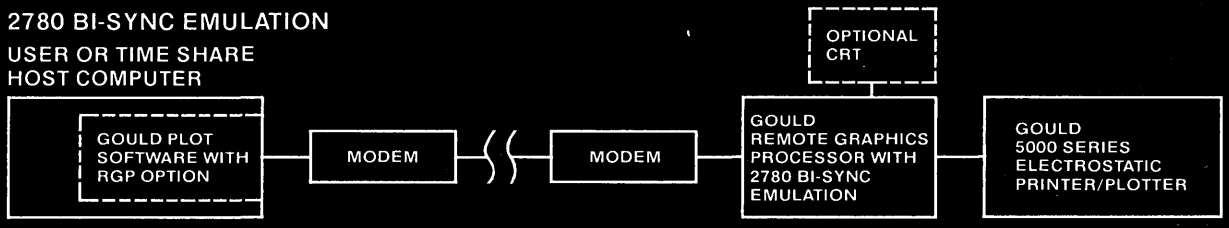

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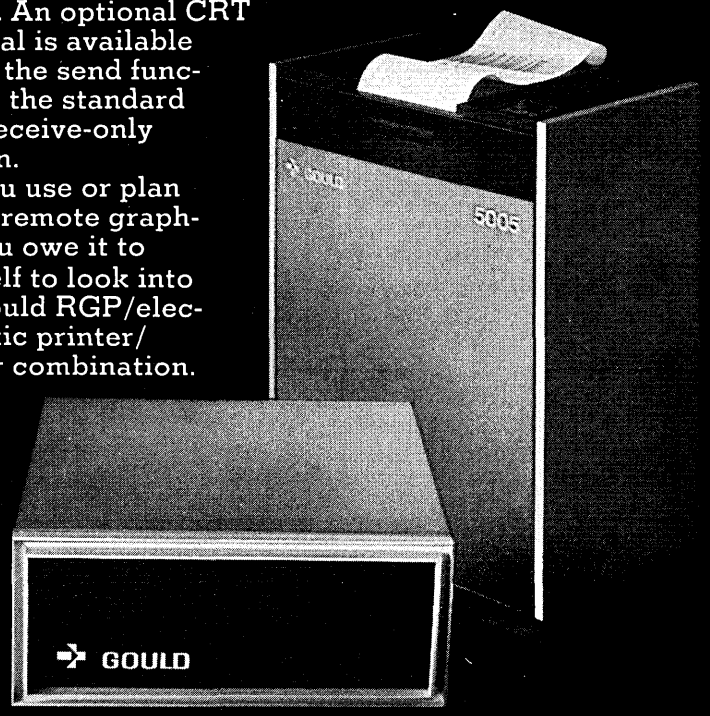

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have been growing at an average 33.1% annually—which is more than 50% faster than the global average. Except in the case of the Soviet Union, which is a large equipment manufacturer, imports growth in COMECON countries significantly exceeds average imports growth for Western Europe or the world as a whole. And of all Soviet bloc nations, East Germany has been showing the fastest imports growth rate, 116% during 1972-1975.

Significantly, East Germany is also the largest COMECON office equipment *exporter*. In 1975 East Germany exported a total of $413.0 million of office equipment, which ranks it as the seventh largest exporter in the world, somewhat behind Italy but well ahead of Sweden. East Germany is also the only net exporter of office equipment products among the COMECON countries, but its exports are mostly destined for the Soviet Union and other COMECON countries although sales have been made to many others.

However, office equipment trade within COMECON differs from that in other areas of the world. Every country in the Soviet bloc is now manufacturing computers and some peripherals both within and outside of the RIAD computer series, and each specializes in specific product lines. Interestingly, each country also keeps producing its own minicomputer models for domestic consumption as well as for export (even to the West). The resulting trade is arranged bilaterally by agreements which very often represent an exchange of specific office equipment products between different countries, not unlike barter trade. Equipment is allocated to waiting end users and there is considerable jockeying for position to obtain allocation priorities.

Only a small percentage of total COMECON imports are purchases from the West, and end users who wish to import Western equipment are often frustrated by shortages of hard currency, particularly when various "anti-import" committees can prove the existence of domestic equipment which can be substituted. It is also interesting to note that overall COMECON trade in SITC 714 products (Standard International Trade Classification 714 includes all computers and office equipment) is practically in balance, which reflects to a degree the planned bilateral nature of this trade.

Asia, dominated by Japan

Asia represents the next largest import area at $703.6 million in 1975. Almost 60% is Japan's. Asian imports average annual growth has been only 13.9% in recent years, well below the world average. Asia is similar in some respects to North America in that it is dominated by Japanese manufacturers somewhat as North America is dominated by U.S. suppliers. Like the latter, the Asian region is a net exporter of office equipment and has all the prospects of becoming an even larger competitor in future global markets. Because of the dominant position of the Japanese, Asian developing countries such as Indonesia, the Philippines, Malaysia, India, and China have a small effect on regional growth rates, even though they grow rapidly.

Japan is by far the most important Asian *im*porter of office equipment, but in recent years its imports have been reduced from a high of $492.2 million in 1974 to about $481.9 million in 1976. Preliminary results show Japan exported $456.6 million of SITC 714 equipment to the United States alone in 1976 and is expected to again have a significant export surplus in this product category.

Japan shipped an estimated $457 million in dp gear to the U.S. alone in 1976, leading to a nice surplus in trade.

Other Asian countries whose computer imports slowed in recent years are Hong Kong, Singapore, and South Korea. All three are manufacturers of electronic components and parts; Singapore and South Korea are also in fact net exporters of SITC 714 products. Preliminary estimates for Singapore indicate that imports were up again in 1976 to a level of $55 million, while exports of the same product category reached $75 million—considerably less than $137.7 million hit in 1974. This demonstrates how vulnerable some of the offshore exporters are to changing demand for their products in the industrialized countries.

Exploding demand in developing nations

In contrast to the relatively steady imports growth in industrialized countries, the situation in developing areas of the world is characterized by extremely rapid growth of computers and office equipment imports. There are several reasons for this.

First, developing countries possess a relatively small equipment base and show characteristic rapid growth rate typical of initial computerization periods in other countries. Second, most developing countries lack a domestic computer industry of any significance, and as a result they depend almost entirely on imports; this means imports growth rates for those areas are very similar to total computer market growth rates.

Other factors are industrialization and modernization programs which generate

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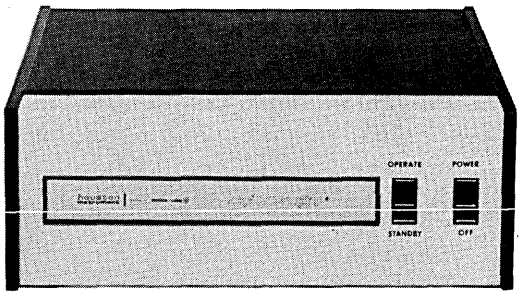

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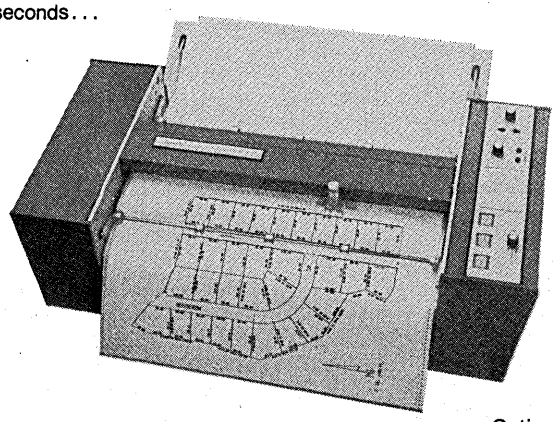

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increasing demand for office equipment and computers. Contrary to some popular beliefs, many populous developing countries cannot simply transfer large numbers of rural populations to work in their industrial sector; they need all of the labor in their agriculture, which is usually much less productive and mechanized than in more industrialized countries. This is true even for the People's Republic of China. As a result, industrialization in such countries also must rely on the most modern plant and equipment including computers and process control gear.

The OPEC oil embargo focused the attention of several industrialized countries, those which depend on strategic imports from less developed countries, on such commodities as oil, rubber, chromium, cobalt, copper, diamonds, gold, platinum, and even cotton and foodstuffs. Various programs are now being proposed to the developing countries, including offers of economic development assistance, advanced technology equipment, and know-how, in return for assurances and guarantees of supplies of those strategic raw materials without which some of the industrialized economies could grind to a halt.

The end users in developing countries in the future may be more able to choose and purchase their equipment as a result of making long-term agreements which guarantee purchases of raw materials and more stable markets to the developed countries. Their dilemma often has been a shortage of hard currency to purchase equipment and technical skills. In theory they are in a position to buy any equipment available anywhere in the world; but in some cases foreign aid programs are the primary sources of capital for office equipment, so the choice of equipment may be dictated by the donor.

Oceania is not really a developing area, but it does lack manufacturing capacity.

Then too, populous developing countries such as India, Brazil, Indonesia, or Nigeria are industrializing their economies, and they feel this is creating a large domestic potential market for dp equipment. As a result they want to develop local manufacture of minicomputers, or some peripherals at least, in order to keep a market share for their own products, to save hard currency, and hopefully even to generate export sales. India and Brazil are two good examples of this and both already had it out with IBM, which true to its own tradition maintains full ownership of its foreign manufacturing and marketing operations. (India caused IBM to close its operations there; Brazil joint ventured with someone else.) In such cases the end user may suffer temporarily for economic and political reasons which are beyond his control.

Latin America is the largest of the import regions in the developing world and accounted for $602 million in SITC 714 imports in 1975. The average imports growth there was 38.0% in recent years, almost double the global and Western European average. Chile and Cuba have shown the most spectacular average imports growth in Latin America, 202% and 97% respectively during the 1972-1975 period, and their imports still appear to be accelerating.

Even faster imports growth has been registered recently by Oceania. This region consists primarily of Australia and New Zealand; it is not really a developing area industrially, but its import growth reflects a lack of local office equipment manufacturing capacity and a large reliance on imports. As one of the largest importers of office equipment, already ranking 10th by 1974, Australia appears to be ready to support a sizable dp manufacturing industry of its own, and there are signs that this is taking shape. Imports in Oceania so far have been growing almost as fast as in Africa and are on the order of 44% annually, over twice the average global rate.

But by far the most spectacular im-

ports growth has been shown by the Middle East region, which includes Israel, Egypt, Iran, Lebanon, and many smaller Arab countries. Some, like Saudi Arabia and the Persian Gulf states, have large trade surpluses from selling oil, and are involved in numerous industrialization programs. This accounts for their rapid computer and office equipment imports growth rates of 81% in recent years, almost four times the world average.

Already there is an established computers and peripherals manufacturing industry in Israel, and some terminals production is getting under way in Iran. With the Sadat-Begin initiatives in recent months, hopes for peace in the Middle East are running high. Should this come about, considerable funds will be diverted from defense expenditures to massive economic development programs in the area. In a long range study of the Middle East to the year 2000, Israel alone projected a need for 5,000 computers, just about 10 times its present number.

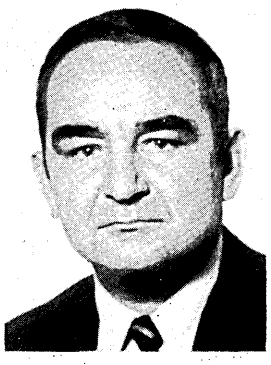
Ahead: big markets, big unknowns

Because of a great diversity of trends and political conditions all over the world, end users will not benefit evenly from expanding international trade in office equipment and computers.

North American and Western European end users will probably continue to benefit most because theirs are the most competitive areas and the largest potential markets. On the other hand, as minicomputers and microcomputers continue to proliferate, manufacturing bases for basic components and assemblies may shift even further to developing countries of Asia, Latin America, and the Middle East, where production advantages (particularly in lower labor costs) will continue to exist.

One big unknown is the People's Republic of China. Already estimated to be about the 10th largest electronics manufacturer in the world, it is in the process of rapid, centrally planned industrialization. In 1977 China announced a microprocessor product of its own and it is known to have built several computer models for domestic use. Because of its huge domestic market it is in a position to become a very significant factor in world microelectronic production, comparable to Japan today.

As individual countries go through the process of trying to establish their own office equipment and computer manufacturing industries, or to control marketing and distribution of such products in their countries, end users may temporarily experience restrictions on equipment choice, delays in deliveries, and quality problems. This is not likely to threaten the end user in developed countries, who is most likely to experience a surfeit of office equipment and data processing products in the years ahead as global production and competition continue to heat up.



Mr. Szuprowicz is president of 21st Century Research, an international market research firm. His past experience includes engineering and management posts at Boeing, Convair, IBM, CIER-Control Data, and High Technology West.

A frequent globe-trotter and industry reporter, he is the author of a multiclient study "People's Republic of China; Industries, Markets, Imports and Competition 1975-1985," and is presently preparing a book on the same subject to be published by John Wiley & Sons this year.

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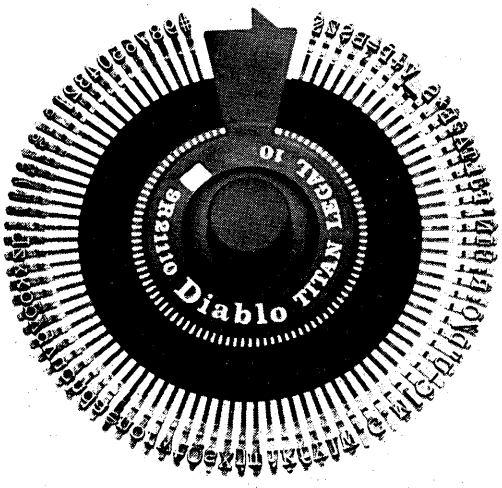

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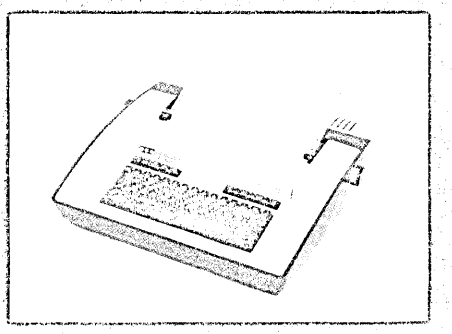

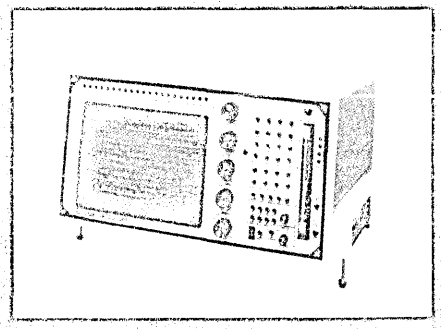

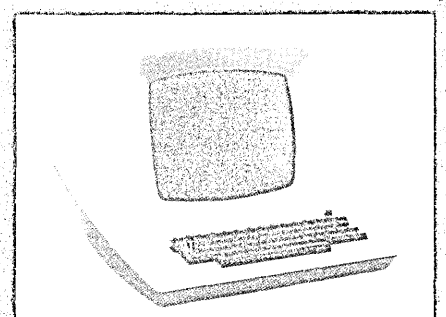

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Computing's Warring Camps: Uniglots, Rhythmists, and Others

by Ronald S. Lemos

Computing's opposing optimists and pessimists could take some lessons from the soft and squishy sciences. We'd all benefit.

Computing, like politics and religion, is a subject fraught with controversy. In general, the controversy revolves around means rather than ends, and has given rise to contentious denominations of intellectual and practioner cults which appear to have the same general goals. Each group fervently supports a different approach for achieving these goals while denying, misunderstanding, or remaining unaware of other approaches. This has led to partisan encounters between and within two computing factions, the optimists and the pessimists.

The optimists

The optimists enthusiastically promote new concepts or techniques they feel will improve productivity. They agree that computing problems can be solved, but disagree on the most effective means. Thus, the optimist faction itself is divided into four general camps: the uniglots, rhythmists, stylizers, and communicants.

A uniglot is one who uses or is able to use one language. Thus, uniglots attack software problems on the programming language level. They claim that if the "correct" language is used, enhanced, or developed then significant software problems will be solved. Differences of opinion on the efficacy of different langauges results in brabbling not only between, but also within low, high, and higher level language camps. The visionary uniglot believes in serious efforts (reminiscent of the 1960s), to develop a universal programming language as the panacea for software problems.

The rhythmists focus on organizational productivity differences between on-line and batch systems. They are interested in comparing the effects of different turnaround rhythms (repetitive stress in a regular manner) on decision makers and programming students, trainees, and professionals. The rhythmist camp contends that interactive (fast turnaround) computing increases organizational productivity and encourages more favorable attitudes in users since the stress of waiting for system feedback is reduced. Thus, productivity and the rhythmic response intervals of the computing system during the programming or decision making are inversely related. Productivity comparisons are measured in many ways, including the quality, quantity, and timeliness of work done in on-line and batch environments. Productivity also can be related to the predilection of decision makers to use the computing system, or for programmers to experiment with different language or machine features in on-line versus batch systems.

Computing is immature as a formal discipline.

Another current generation of optimists, the stylizers, believe that the particular programming language or turnaround cycle time is not as important as programming style. Enter structured programming and all of its derivitives. The impact of the structured programming trend is evidenced by the plethora of structured programming textbooks (even for APL), the numerous articles extolling its virtues, and the penchant for instruct-

ors to switch to teaching structured programming techniques instead of whatever they were teaching before.

However, operational definitions of structured programming continue to be varied and situational. They vary from specific language implementations utilizing sequence, choice, and repetition structures to nescient definitions focusing on the removal of GOTO's In general, the stylizers feel that structured programming principles can allieviate productivity problems through a formalization of the programming process.

The communicants are the latest distinguishable group of optimists. They don't focus on a specific language, on turnaround times, or programming style. Reminiscent of the behaviorist movement in management, they emphasize the importance of communication in computing instead.

The communicants advocate the evolution of systems development and maintenance based upon team and work group efforts. Their emphasis is upon interpersonal and intergroup communication. "Traditional," individual involvement in systems work is viewed as inefficient, hard to manage, and not conducive to "good" computing practices.

The communicants see a profound need for the reevaluation of the nature of human activities in the field of computing. This, they feel, will lead to significant rewards since the limiting factor in the development of computing systems is people and not technology.

The pessimists

The pessimists take a cynical view of software-related progress in computing. They view the "breakthroughs" proposed by the optimists as fads which pass through the following predictable life phases: increasing amounts of journal space (mostly testimonial), presentations at symposia and workshops, the introduction of new jargon, the inspiration of a rash of masters theses and doctoral dissertations and the stimulation of another generation of new and revised textbooks, the finding of no significant or measurable impact on industry practices, and replacement of the fad with some new one.

Consider the structured programming movement from the pessimist's perspective. This movement has been with us for about ten years. During this time an extensive bibliography has been developed. Symposia and workshops on the techniques have become regular occurrences. Terms such as "pseudocode," "functional decomposition," "stepwise refinement," and "modular organization" have given computing a whole new glossary. A rash of new and revised textbooks have inundated the market. However, there is virtually no evidence that structured programming has made any significant impact on industry practices.

According to the pessimist camp, the "royal road to computing" will not be found through high-level languages, interactive computing, or behavioral frameworks.

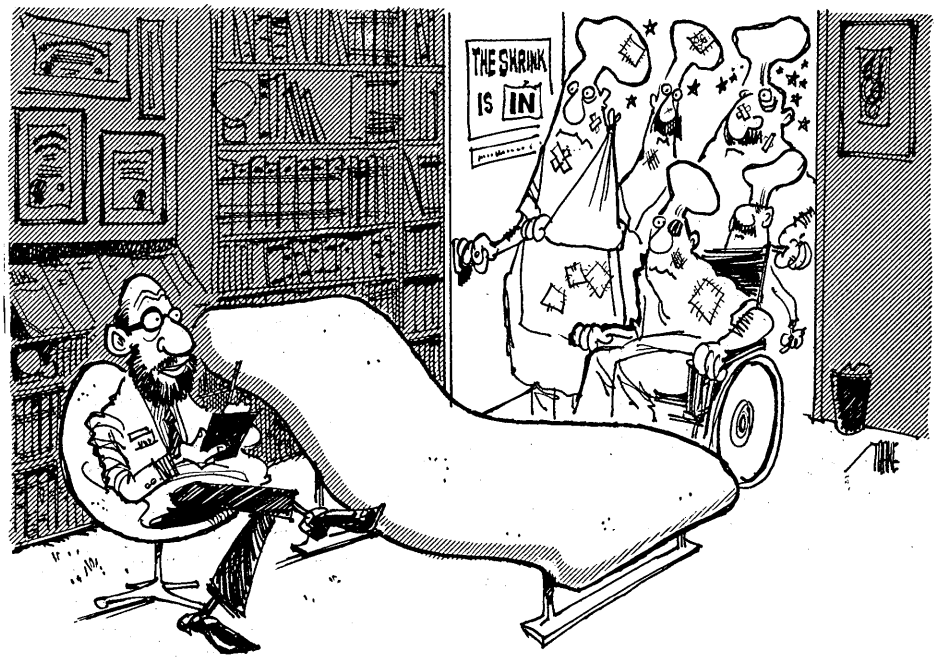
The pessimists see no salvation in computing fads or trends. They feel that computing systems are products of craft and not science. Thus, the alleged "breakthroughs" of the optimists will fail to significantly alleviate computing problems.

Toward a cessation of hostilities

The caricatural discussion of the optimist and pessimist factions emphasizes the differences between and within these cults, with each side either unabashedly supporting new trends and techniques or condemning them out of hand. The "ammunition" for these philosophical skirmishes consists mainly of unsupportable claims based on specific situational variables that are usually not identified. Thus, introspection and conjecture, followed by a case study approach or experience, are the foundations for the dogmatic perspectives of the two factions.

Computing is not, and will never be, an exact science like physics or mathematics.

Scientific objectivity is conspicuously absent and, worse, this significant limitation is not expressly acknowledged. Therefore the denying, discounting, or not being aware of other schools can only be counterproductive. What is needed is an organized approach, one which centers on a more global view of computing problems.



Computing needs to be more thoroughly integrated with the theoretical, empirical, and probatory progress of its allied and underlying disciplines. The social sciences are prime examples of relevant supporting disciplines from which we can derive fresh perspectives to problems in computing—and maybe even some answers. For example, teachers of computing need to draw on the large body of knowledge that exists in education. We need more familiarity with such areas as educational measurement and evaluation, curricular and instructional strategies, instructional technology, language instruction, and complex learning processes as they relate to issues in computing.

Similarly, computing professionals can gain insights into critical individual and group variables from psychology, sociology, and management. These disciplines have developed a great deal of relevant knowledge in such areas as human performance in man-machine systems, personality assessment, motivation, psychological measurement, cognitive development, small-group behavior, personnel psychology, creative behavior, quality control, management and organization theory, budgeting, and communication.

Thus, instead of concentrating solely on computing, we need to acknowledge computing's relationship to its underlying social science disciplines and develop a strong formal background of generalized skills and knowledge drawn from them.

The absence of such a multidisciplinary approach indicates that computing is immature as a formal discipline. Without valid underlying principles, the factionists only fantasize a stage of maturity and legitimacy comparable to that of the "hard" sciences. (That they do it is evident in such phrases as "computer science" and "software engineering.") However, computing is not, and will never be, an exact science like physics or mathe-

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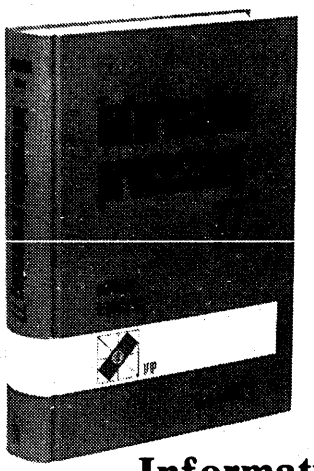

Information Processing 77

Proceedings of the IFIP Congress '77, Toronto, Canada, August 8-12, 1977.

edited by Bruce Gilchrist

1977 1040 pages US $65.00

With its focus on the congress theme of "The Maturing Profession-Perspectives and Prospects", this volume of proceedings will cater for the individual interests of specialists in a very broad range of fields associated with computing. In addition, it provides a comprehensive survey of the most topical developments in information processing, a survey invaluable for those who need to keep up to date with the subject's many facets. The 1977 Congress, like its predecessors, brought together a group of the world's foremost computer science authorities, and a special effort was made by these experts to ensure the particular relevance of the conference program to business users of computers.

Cited from DATAMATION, September 1977:

"... The IFIP programm committee carefully targeted these discussions at dp managers, bringing together big names in international computing to talk on such topics as data base management, distributed processing, microprocessors, telecommunications, and programming"

Education and Large Information Systems

edited by A. Buckingham

1977 246 pages US $26.75

This work gives a complete description of an important confrontation between educators and practitioners in the field of information processing. It discerns three essential requirements for the successful development of any information system: the combination of both theoretical training and practical experience for those involved in actual design activity; the suitable blend of techniques derived from different disciplines; and the appreciation of potential opportunities and problems for members of the organization within which the design takes place.

Architecture and Models in Data Base Management Systems

edited by G. M. Nijssen

1977 332 pages US $30.75

The study of data base management systems (DBMS) is gradually being approached from a more fundamental standpoint. That is, the conceptual foundations of this field are receiving considerable attention. The better insight gained in recent years into the problems encountered in data base management has led to the development of three principal schematic designs ("architectures") for a DBMS, in which the conceptual scheme itself plays the essential role.

At present, there is an on-going professional debate, sometimes referred to as the *Second Great Debate,* on which of these schemata is to be preferred. These proceedings of the fourth annual IFIP TC-2 Working Conference represent the latest contributions of professionals to this debate on the conceptual schemata in particular, and the fundamental aspects of DBMS in general. Various data models are subjected to a penetrating comparative analysis, and the use of natural language in relational data bases is considered, as is the temporal dimension in information modeling.

Informal Introduction to ALGOL 68

by C. H. Lindsey and S. G. van der Meulen

Revised edition 1977 370 pages
Paperback: US $14.50 Hardbound: US $28.75

This completely revised edition of the Informal Introduction is based on the Revised Report of the Algorithmic Language ALGOL 68. One leading computer manufacturer has released an implementation in virtually complete agreement with the current official definition, *and it should only be a matter of time before others follow.* The experience of implementation and use lead to many proposals for changes to the language, which are now incorporated in the Revised Report -- the official, rigourous and final definition of the machine independent programming language ALGOL 68.

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The ANSI/SPARC DBMS Model

edited by D. A. Jardine

1977 viii + 222 pages US $24.00

In 1975 the ANSI/SPARC DBMS Study Group produced an interim report describing a model for data base management systems, together with an identification and description of interfaces. This report provided an authoritative framework for further discussion and refinement of those interfaces which can be considered for more formal standardization efforts.
The 2nd SHARE Working Conference took as its theme this report. A comprehensive expository paper on the report itself and several papers on related aspects were presented. They generated illuminating discussions which clarified many of the concepts involved. They are contained in this volume in edited form. Papers on other aspects of current data base technology are also included.
Important state-of-the-art surveys on enduser interfaces, the present status of the CODASYL data base committees, data security, and data base administration, together with the ensuing discussions, enhance the practical value of this work.

ICS 77

"Computing's Many Facets"

edited by E. Morlet and D. Ribbens

1977 600 pages US $48.00

This volume contains the proceedings of the International Symposium (April 1977) organized by the European Chapters of the Association for Computing Machinery (ACM), and thus presents an invaluable up-to-date picture of recent developments in computing, both in research and practice.

Contributors of invited papers: *D. Bjorner, E. W. Dijkstra, R. Durchholz, E. Falkenberg, W. K. Giloi, Ph. Jorrand, F. King, Ch. Layton, B. Meltzer, A. Pirotte, M. E. Senko.*

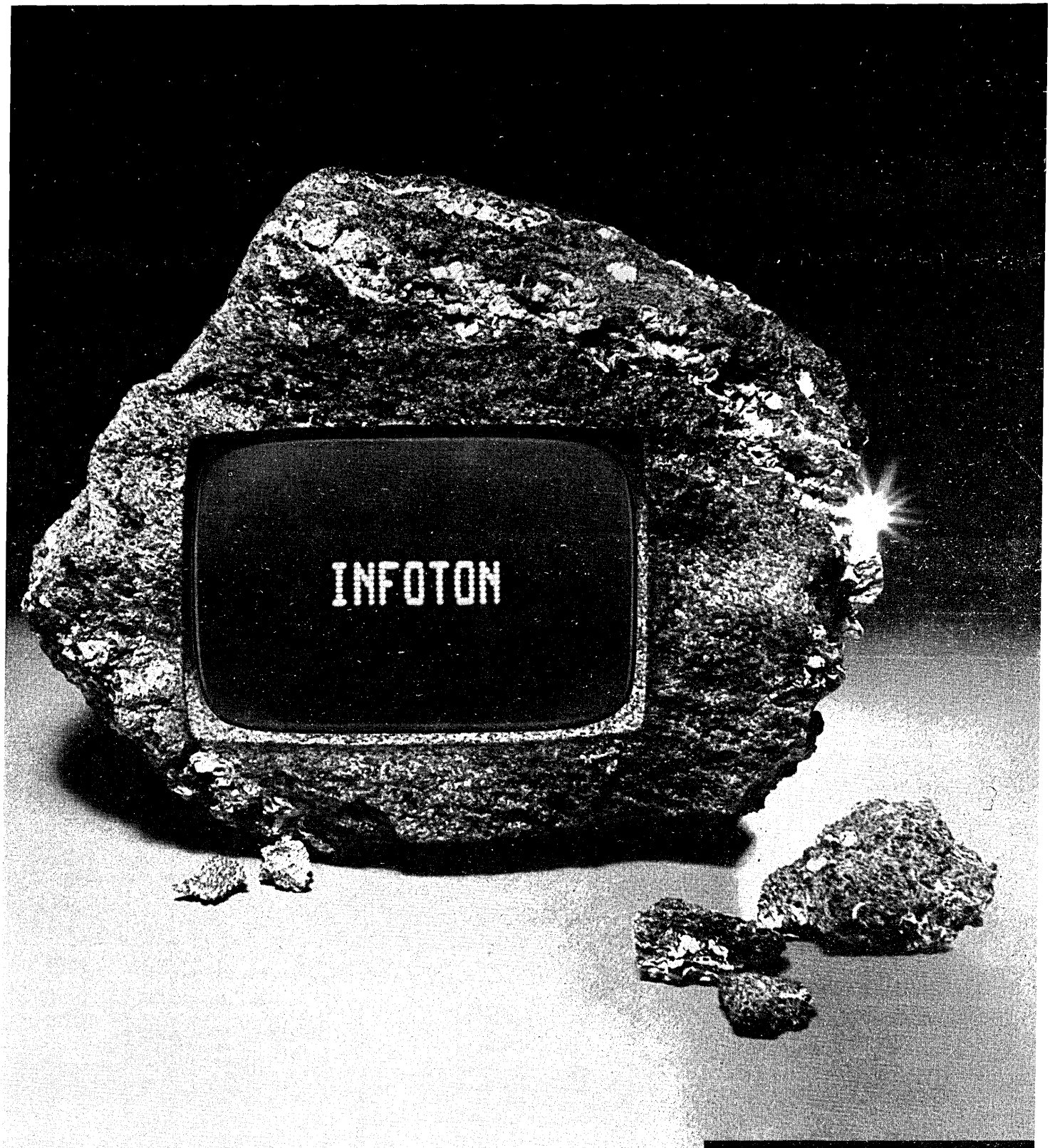
Information Systems and Networks

Design and Planning Guidelines of Informatics for Managers, Decision Makers and Systems Analysts

by G. X. Amey, K. Samuelson and H. Borko

1977 160 pages US $17.50

The book treats information system design in three parts. The first part related to definition of system objectives and to analysis and planning. The second is devoted to practice, operations and coordination and concentrates on the application of information to decision making. The third part discusses network structuring, development and perspective. Emphasis is placed on the importance of creating a methodology and guidelines as pre-requisites to the implementation of international information networks.



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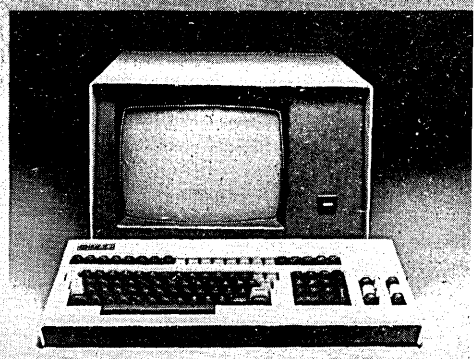

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matics. Computing is an inexact science like psychology or sociology, one which must deal with the complexity of non-deterministic human variables.

To reach even a stage of maturity comparable to these inexact sciences, computing must go through a long evolutionary process of developing valid principles based upon discovery, experimentation, and revision. This evolutionary process can be significantly shortened if we encourage organized efforts for subjecting new and developing principles and hypotheses to the replicative, empirical testing that is characteristic of social sciences.

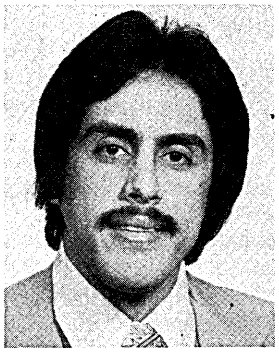
What about problems such as definitional differences ("good program" or "good programmer"?), lack of measurement tools, the complexity of individual and group variables, the cost of experiments, and experimental control? Yes, these problems are formidable, but they

> Incontrovertibly valid principles are luxuries.

are not unique to computing. They have been, and still are, characteristic of the problems encountered by the more mature social sciences. Yet these problems have not precluded significant advances in education, psychology, and sociology.

Although incontrovertibly valid principles are luxuries we will never know in computing, generalizations, principles, and hypotheses can still be useful if viewed in the spirit of objective empiricism. Similarly, while we will never "prove" our pet hypotheses, replicative testing will help us to establish the kind of body of knowledge that is characteristic of a maturing formal discipline.

And factionalism can only hinder this evolutionary progress. ✻



Dr. Lemos has done empirical research into programming language learning at California State University, Los Angeles, in the school of Business and Economics, where he is an associate professor of Accounting and Business Information Systems.

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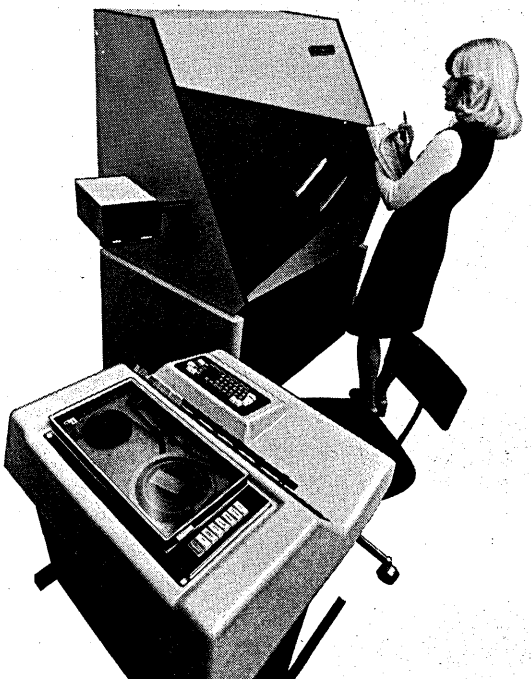

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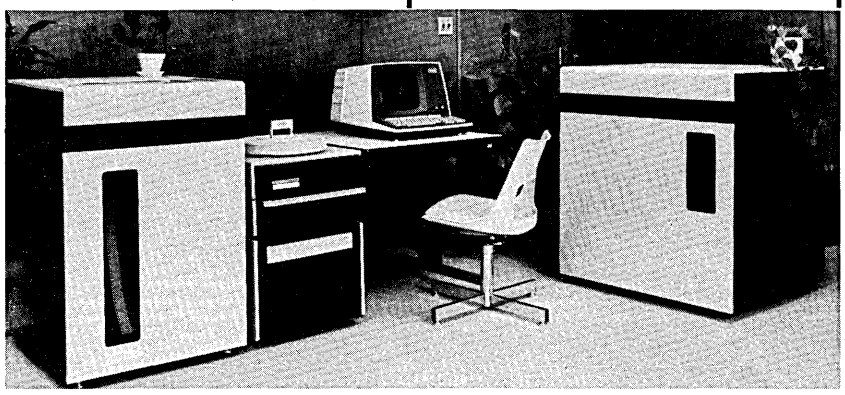

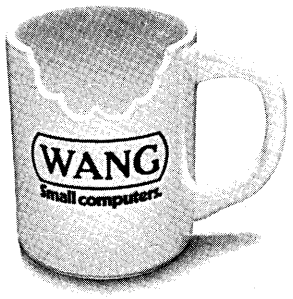

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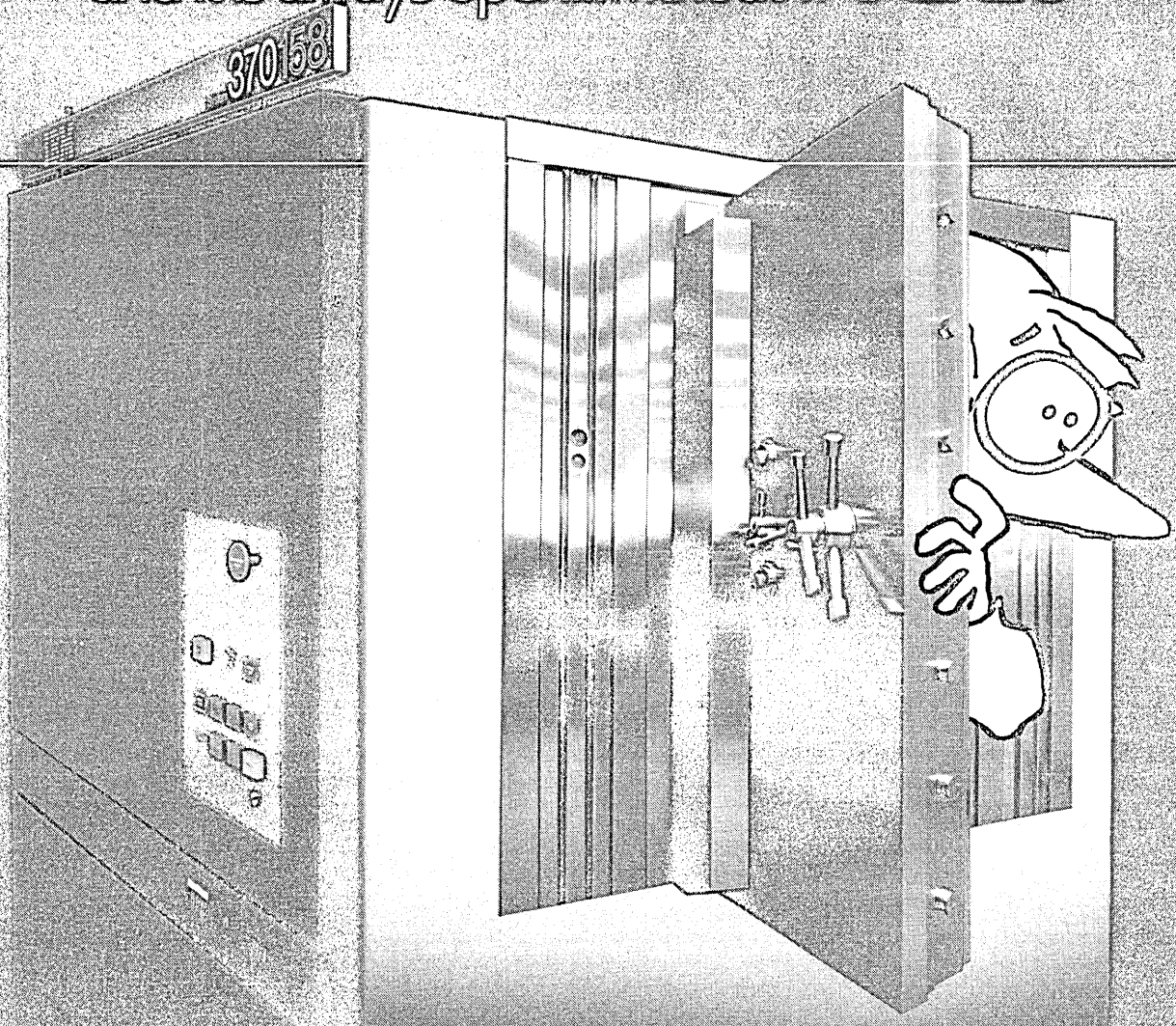

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The Knights and the Squires

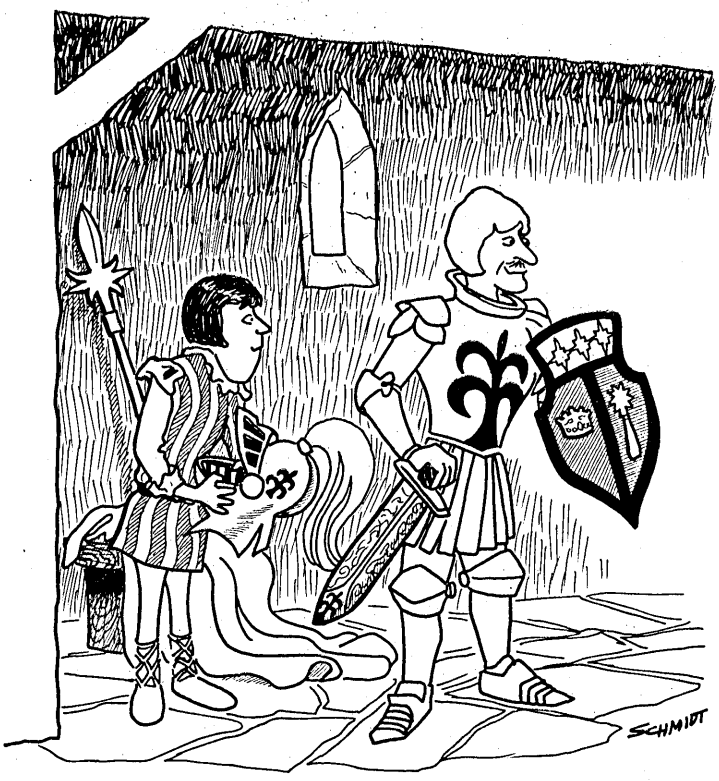
by W. A. Delaney

In the olden days of computing, teams of knights and squires were formed, with programmers as the junior members. Things are changing now.

In medieval times, each and every knight had a squire. The knight was "a man, usually of high birth, who, after serving as a squire, was formally raised to a higher honorable rank and pledged to chivalrous conduct." A squire was "a young man of high birth who served a knight as an attendant (and who hoped one day to become a knight)."

So much for medieval history. What has this to do with today's world? A lot. Especially with programming.

Programming is approximately 25 years old. Compared with other professions such as banking, engineering, or accounting, ours is very young. It's so young we are still trying to decide just what a programmer is. Little wonder then that nonprogramming personnel understand even less about what we do or how we do it. Yet, in many of our knight/squire programming teams, it is the nonprogrammers who are the knights.



The knight/squire teams began to form very early in the history of computing. As programmers began to be brought into the large organizations, they were made assistants to senior engineers, scientists, senior accountants or comptrollers. These nonprogrammer knights generated the problems for the programmer squires to solve. Only in rare situations did the programmer develop even the problem statement from the start. He or she was a "helper."

The "highborn" knights were in charge, though they knew little or nothing about computers, software, or how to use them to the best advantage. Their programmers worked diligently, but could rarely convince them that the computer could do far more than just solve traditional problems more quickly. In effect, the squires were trying to get the knight off his horse and onto a new, motorized vehicle, but to little avail. For many years, the squires and their computers were underutilized or, worse, misused.

I went through my share of it. From 1952 until 1954, my immediate supervisors were programmers and analysts; I learned from them. Since 1954, however, my immediate supervisors have been a varied lot: a mechanical engineer, a PhD astronomer, a PhD physicist, a PhD electrical engineer, a communications engineer, and several about whose background I'm still regretably in the dark. Some of the things they wanted the computer to do boggled the mind. Not one ever took the time or trouble to really study or understand what they had under their control.

Trying to break out

At two former places of employment, I attempted to break the cycle and develop a professional atmosphere in which programmers would be directed and supervised by their own senior programmers and analysts. We could then hire and train junior personnel and give them a professional ladder to climb to knighthood.

Projects and tasks would come in as formal, written job assignments, be approved by the programming manager, and then assigned to our own people to be completed under our own budgets and control and supervision. The engineer-knights would be clients.

It didn't work out. The knights from engineering didn't like this method, because they had no direct control over the programmers. One of my never ending jobs was to ward off raids by the knights from the engineering or financial departments, who would try to "borrow" several programmers for squire duties for several months or even years. They wanted, and obtained, direct control over their squires.

The knights would come at me through the chief engineer. More often than not I lost the battle, and these programmer/squires were sent forth to do battle as assistants to the engineer/knights. Trying to set up and maintain a professional programming organization in the face of these peri-

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With a computer tape like Epoch 4, America is the perfect place to introduce it if you want to find out exactly how good it is.

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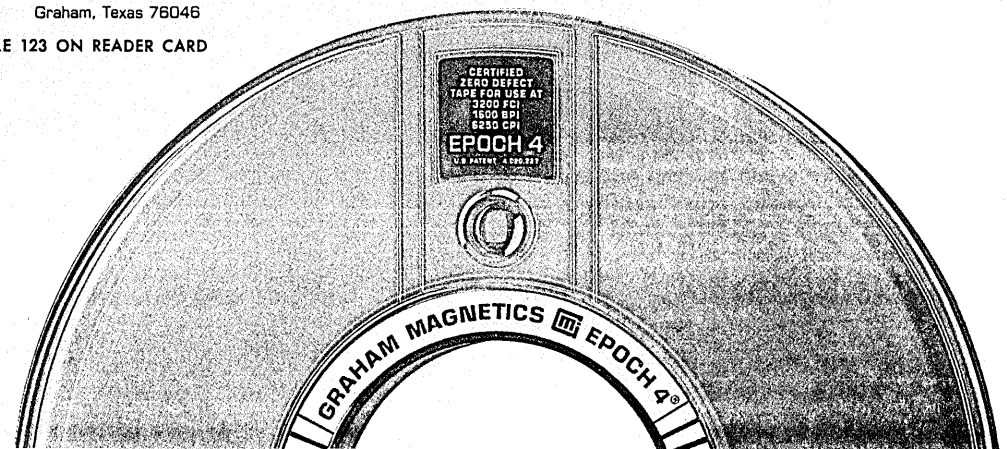
CIRCLE 123 ON READER CARD



THE FIRST, THE ONLY

Every once in a while something new happens that significantly alters the way we do things.

It has happened to Network Control.

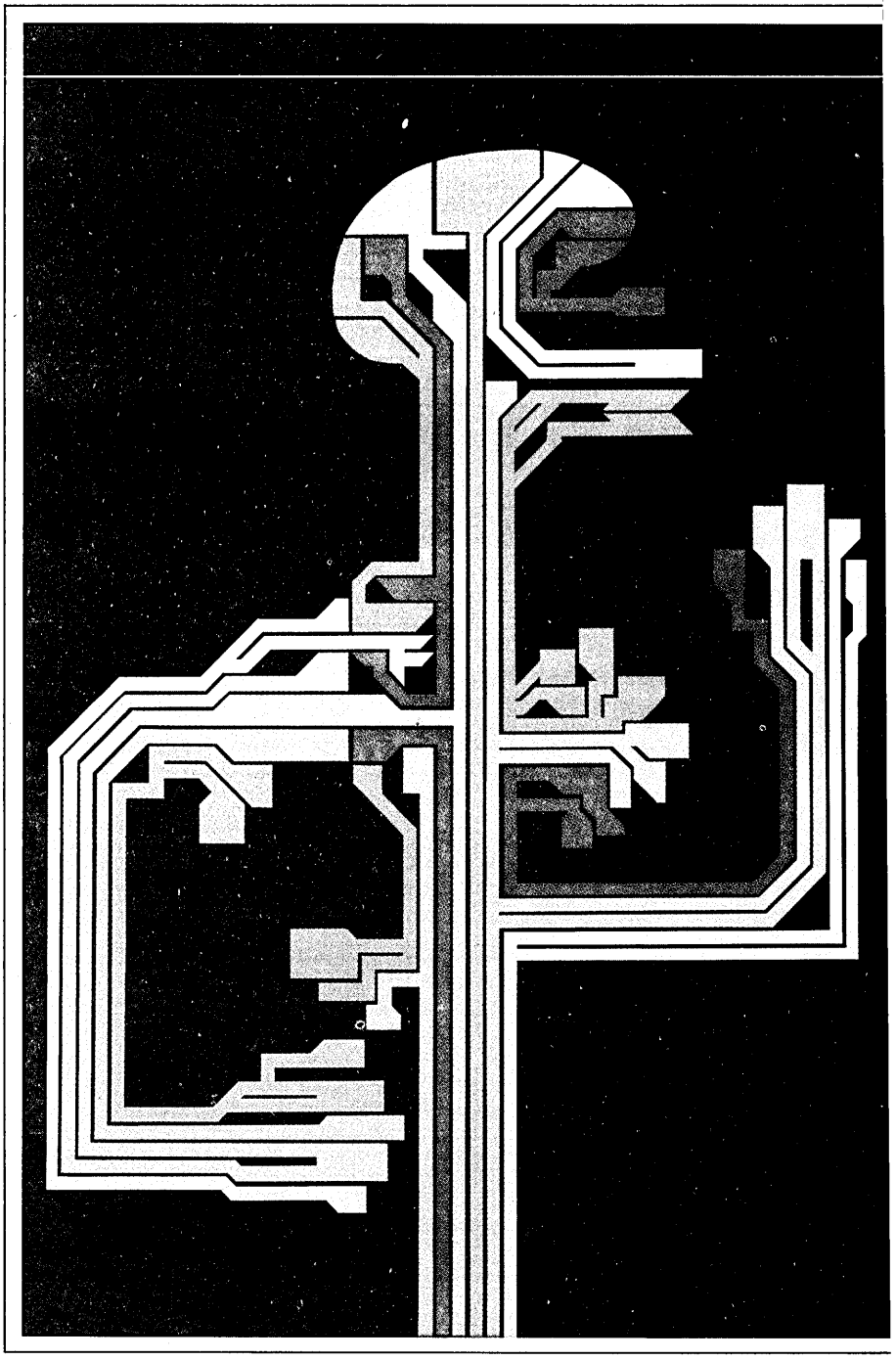
Introducing **EMS-One Event Management System** —a control system for data processing networks that functions much like the autonomic nervous system—continuously monitoring and spontaneously responding to changes. All automatically and at real-time speeds.

EMS-One is the first fully automated system for unattended network monitoring and diagnostics. It is a multi-processor based system just like the distributed data processing networks it is designed to manage.

Processing power of the EMS-One is physically located at all the data sources in a network. These remote processors continuously monitor and report any changes in the status of 14 individual test conditions existing at their locations.

Other processors constantly parallel poll all the remote processors.

Polling is simultaneous over all lines at speeds dramatically faster than conventional line-by-line, drop-by-drop methods. Any status changes are immediately reported to a control processor.



EMS-One

EMS-One's control processor interprets the status change, makes the necessary diagnosis, sounds an alarm, and reports the condition on a visual display in plain English. Additional data can be obtained via 49 "Manual Mode" tests and control functions—even while polling continues throughout the rest of the network.

There's more. EMS-One can also make unattended on-line tests—true quantitative measurements—after hours when you're not around. Automatically. All data is preserved in hard-copy form for review the next day—useful data for long-term observations of network performance trends and predictive failure analysis.

EMS-One is an adaptable Network Control System. Its "Self-Learn Mode" automatically learns the network whenever it is changed or added to.

No new addressing is required. And, there's never any need for software.

Excluding modems, EMS-One is a desk-sized work station that fits anywhere. A compact printer and a high-styled, easy-to-use console with functional keyboard and gas-plasma display complete the system.

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odic raids was difficult. The knights always wanted my best people, the ones who could work alone. (No one wants a squire who needs help or assistance to be a squire.) As quickly as we hired and trained junior personnel, they were drafted to support the knights.

Persons who worked in other organizations tell similar stories.

For years, programmers were considered to be one step above clerical help, but not true "professionals." Even today there are vestiges of the old knight/squire syndrome in existence. Some organizations still will not admit programmers to the technical staff until they progress to the level of analyst or problem originator. This requires several years and some never move up, whereas people with degrees in engineering, accounting, business, or the sciences become knights on the day they are hired.

As recently as 10 years ago, the hardware/software cost mix ratio in a large computer system or computer-based product was approximately 85% hardware, 15% software. All senior managers, technical directors, general managers, and the like were nonprogrammers. Most of the costs were from hardware areas, so it seemed reasonable that the knights would come from these ranks.

But as computers and other hardware began to develop into multipurpose equipment, and the costs began to drop drastically, the hardware/software cost ratio began to change. Today, the general opinion is that the ratio is about 50/50, with software costs on the rise and hardware costs still coming down.

Changing positions

If one can judge from historical records, then one can guess that in most organizations which pursue profit or efficiency, the names and faces at the top are going to change. The squires will become the knights, and the knights will become the squires.

This will not come about overnight; few things do. We can, however, accelerate the process by first being aware that higher management opportunities are going to become available to us squires in ever increasing numbers, and second making a real effort to become better qualified to fill these positions. For those who remain strictly technical and continue to concentrate only on mastering improved coding techniques, a job may still be there, possibly as a very senior squire, but not much higher.

The ambitious, those who yearn for knighthood, must prepare themselves, get involved in the business aspects of the overall project. One can get an MBA degree in three years or so by going to college at night. Even a few courses could improve your ability to talk with and understand the senior staff.

The higher up you go, the less you will discuss software and the more you will discuss plans and money, until one day you will spend most of your time discussing only money. So sign up at your local college and be ready for the switch that many believe is coming within the next five to seven years.

Before our squires move into management ranks, some pushing and shoving will go on.

In that not-too-distant future, we will see some chief engineers or technical directors chosen from the ranks of the former software squires. Promotions to vice president and general manager will follow for those who can direct the large projects of the future to successful and profitable conclusions.

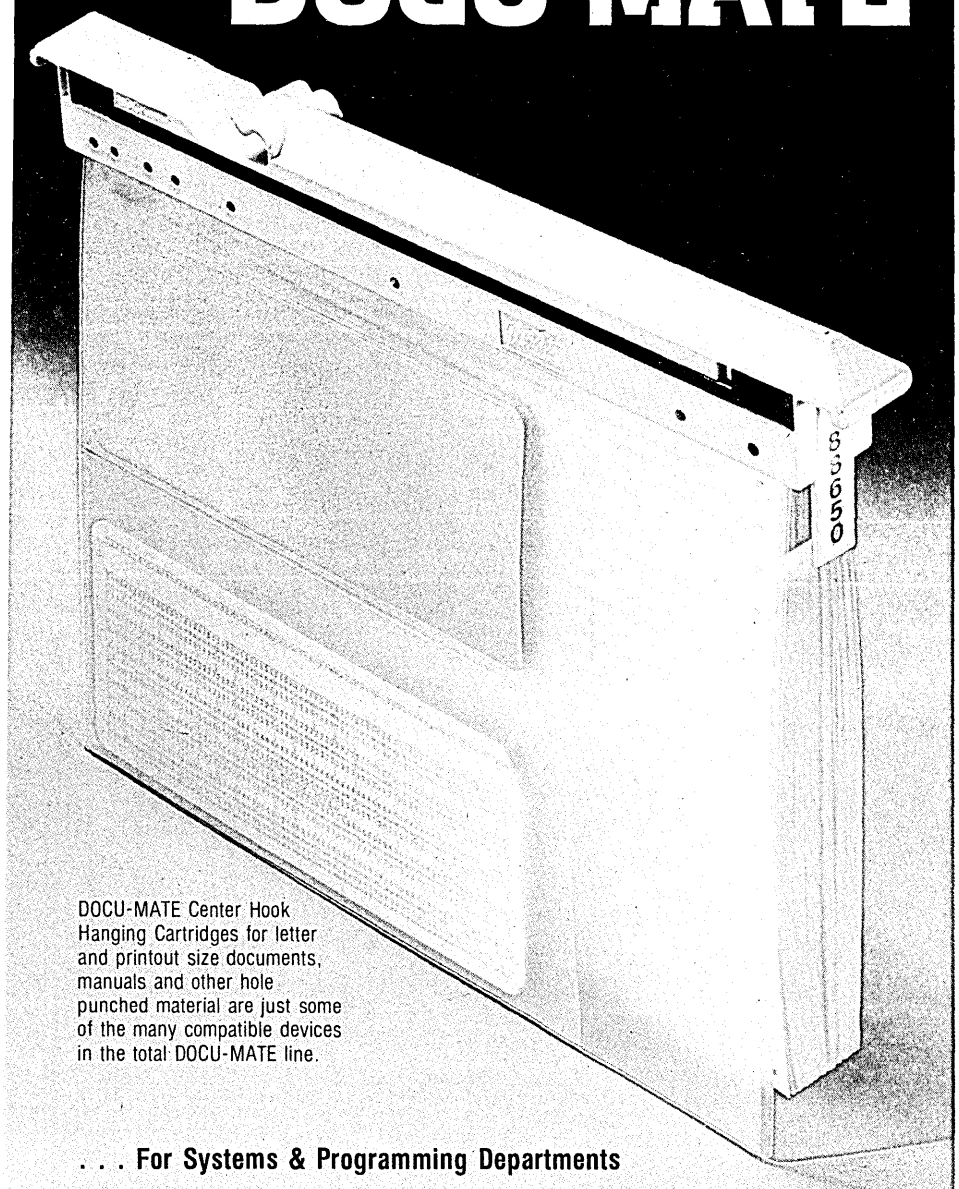
History, however, also teaches that no group ever willingly surrenders power without a battle. Much like the champion boxer, the traditional way for a knight to give up his title is by being vanquished on the field. In any case, it seems reasonable to assume that before our squires move into upper management ranks, push will come to shove.

The opportunity for women to come forward and join the battle seems to me to be especially good. During my (too) many years at work, whenever I saw a woman promoted she was always many times more qualified than the nearest man. As a result, we have some extraordinarily well-qualified women squires, who are ready now to cross the line into the upper ranks.

So be forewarned and forearmed, all of you squires. At long last our day is coming, and if you want to be knighted before the end of your careers, the chances seem bright. ❋

Mr. Delaney is president of Analysis and Computer Systems Inc., a Burlington, Mass., software-related company. A mathematician and programmer/analyst by background, he has been associated with RCA, Raytheon and various military agencies.

How to manage and control your DP Documentation with DOCU-MATE™



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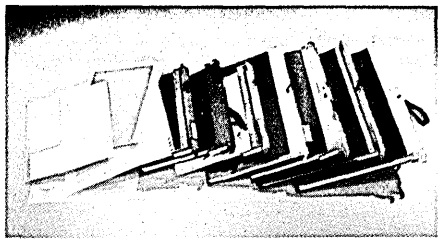

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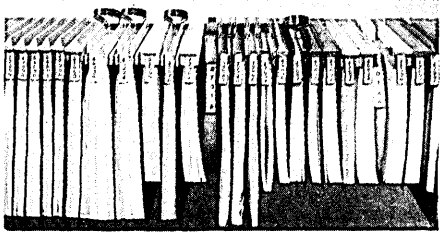

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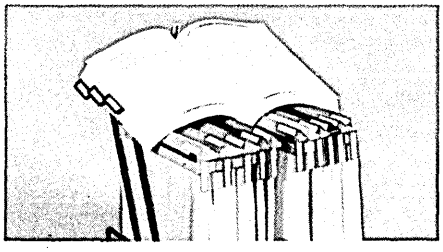

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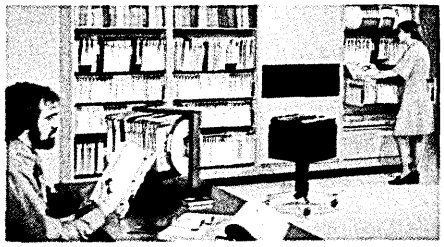

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CIRCLE 108 ON READER CARD

If you need to punch cards, read cards, or process cards in anyway...

we want to talk to you.

We want to talk to you about the TAB 501 Card Processor:
About the unique versatility and operating capabilities resulting from its built-in microprocessor, RS-232C and binary synchronous interface capabilities, plus multiple card processing and terminal functions:

- Minicomputer card input/output
- Data transmission via modem or cable for terminal applications
- Ability to interface OCR, MICR, bar code, etc. devices for multi-media applications
- On-line and/or off-line versatility
- Reading, punching, printing, verifying, and interpreting capabilities
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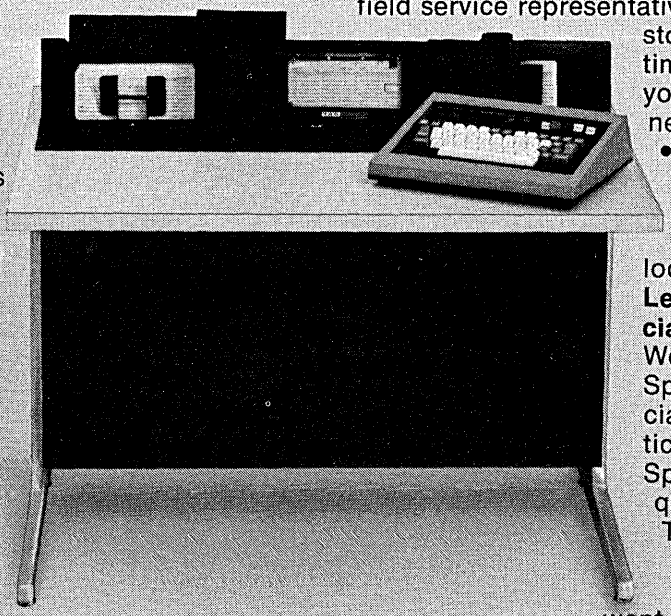
- Interface with TAB's 701 (3740 compatible) floppy disk for special applications
- Auxiliary card I/O device for key-to-disk systems with multi-media requirements
- Proven-in-use systems for your market!



We want to tell you how our new marketing program offers a unique business opportunity for OEM's and System Houses:

- By combining your industry/application expertise with TAB's versatile hardware to produce economical turn-key systems and improved profitability.
- By working with a successful supplier, offering you competitive prices, proven hardware, national field maintenance, and complete vendor support.
- By working with a vertically integrated supplier that provides 'total responsibility' — at TAB we design, manufacture, sell, service, and support all products for the OEM/system markets.
- Full service maintenance is available; local field service representatives with spare parts stocked locally assures a timely response when your customers are in need of service.
- Domestic as well as international sales and service representatives to support your local marketing program.

Let's talk about "specials."
We want your specials. Special applications. Special operating characteristics. Special interfaces. Special keyboard requirements. Because the TAB 501 card processor has this unique flexibility, we can give you what you want—easily and inexpensively. It's worth talking about.

Gentlemen: Let's talk.

Name _____

Company _____

Address _____

City _____ State _____ Zip _____

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Let's talk:

☐ OEM/Systems House Marketing Program
☐ Interfaces
☐ Terminal applications
☐ Special requirements
☐ Send more information

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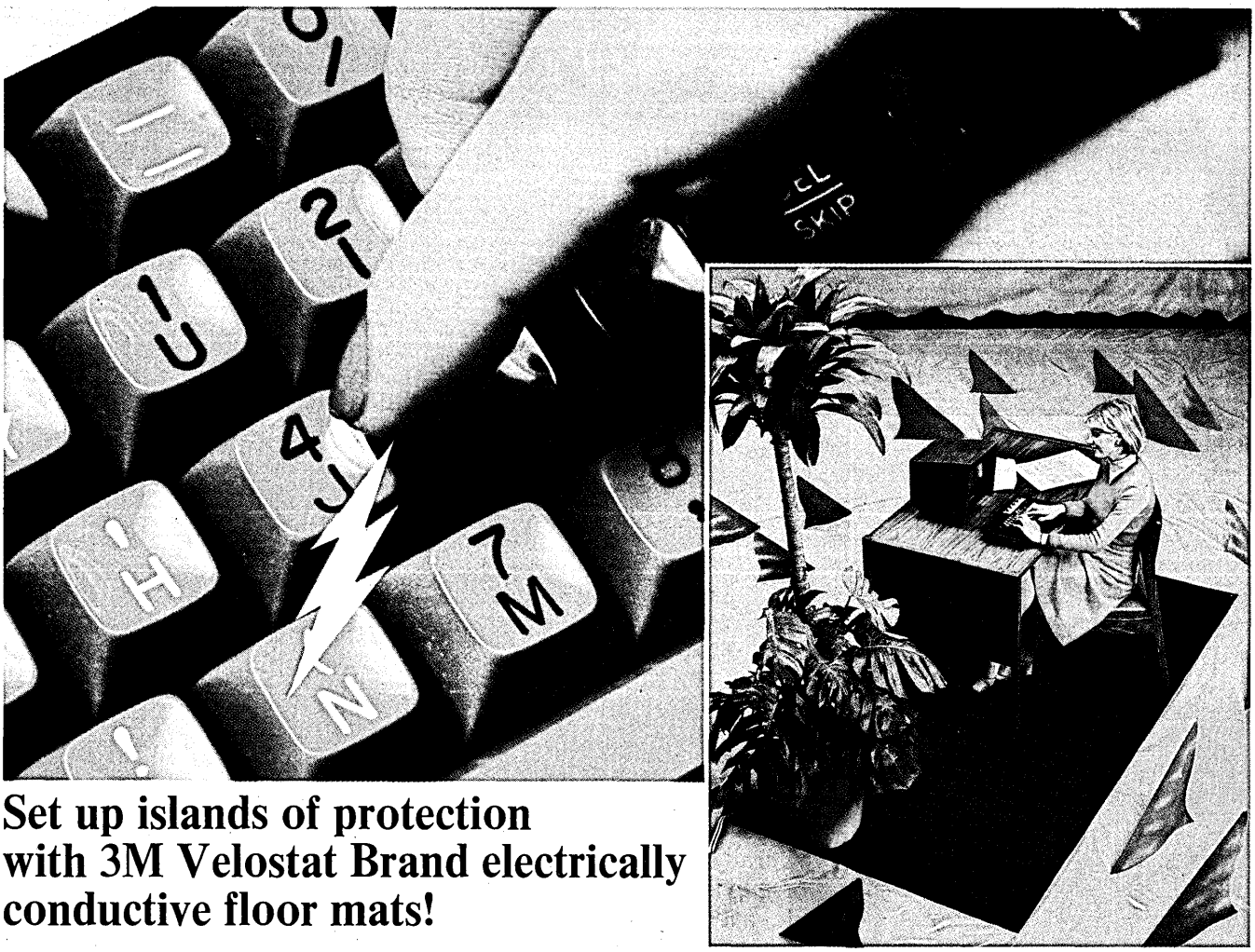
CIRCLE 41 ON READER CARD

Don't let static kiss your computer's memory good-bye!



Set up islands of protection with 3M Velostat Brand electrically conductive floor mats!

Static on personnel, discharged into a terminal, can upset the logic of your terminal, mini, or CPU . . . can send erroneous data . . . permanently damage circuits causing costly downtime and repair. No equipment is 100% immune. Some computer equipment makers report that as little as 200 volts of static can cause serious problems!

VELOSTAT Mats create positive paths to ground . . . drain static away from terminal operators . . . keep them static free. Simply place the mat where the operator must step on it to reach the keyboard, and the VELOSTAT Mats provide passive protection in such key areas as these:

- Around Data Entry, POS and Bank Terminals
- At Minicomputer and Word Processing Stations
- As a floor runner in Computer Room Entrances
- In front of Computer Printers and Disc Drives

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Dept. BZF-38
3M Company, St. Paul, MN 55101

3M COMPANY

YES, I'm interested in keeping static away from my terminal with VELOSTAT conductive floor mats.

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First we reduced your processing workload.

Now we've reduced the price.

$4995*

Model 770
Intelligent Terminal

When we introduced our powerful Model 770 Intelligent Terminal, we knew it would reduce your workload. We told you how it would ease the burden on your host computer and reduce your data communications costs. And we told you that by preprocessing your data at the source, the 770 would reduce errors, as well as delays in transmitting data (you could do it at high speed during times when line rates are lower). Our 770 Terminal has been as good as our word.

Now we've reduced our prices.

We've been able to lower the price of the 770 from $6400 to $4995 for a single terminal. If you order in quantity, we can reduce the price by more than half—to under $3200.

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The one thing we haven't reduced is our features. The 770 supports TPL, a high-level business-oriented language with the industry's leading forms package; dual minicartridge tapes; a 1920-character video display; up to 48K bytes of memory; a user-oriented keyboard for both data entry and application software development; a variety of communication modems or interfaces; and TI's total customer service with nationwide maintenance.

If you're ready to reduce your processing workload at our reduced prices, mail in the coupon. Or call your nearest TI sales office or Terminal Systems Marketing, (512) 258-7305.

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Yes! I am interested in the 770 Intelligent Terminal. 14-3-DM
☐ Please have your representative call me.
☐ Please send me more information.

Name _____
Title _____
Company _____
Phone _____
Address _____
City _____ State _____ Zip _____
Mail to: Texas Instruments Incorporated
P.O. Box 1444, M/S 784, Houston, Texas 77001

*Quantity one price, without built-in thermal printer. Prices U.S. domestic only.

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The Outer Limits of Distributed Data Processing.

are expanding direct computer access to source data in all kinds of businesses all over the world. Humble, handheld, battery-powered terminals like the new MSI [illegible] can be operated by any regular employee already working at the data's source. Yet these simple, little portable terminals are performing big data entry jobs like accounting data input, retail sales reporting, merchandise tracking and replenishment, inventory management and salesman order entry. And with the MSI/77's all-CMOS solid state memory, programmability, self-contained *throwaway* "AA" batteries and ultra-low cost, it's easy to see how MSI's going to expand those outer limits a whole lot further.

For further information please write to William B. Patton, Vice President Marketing

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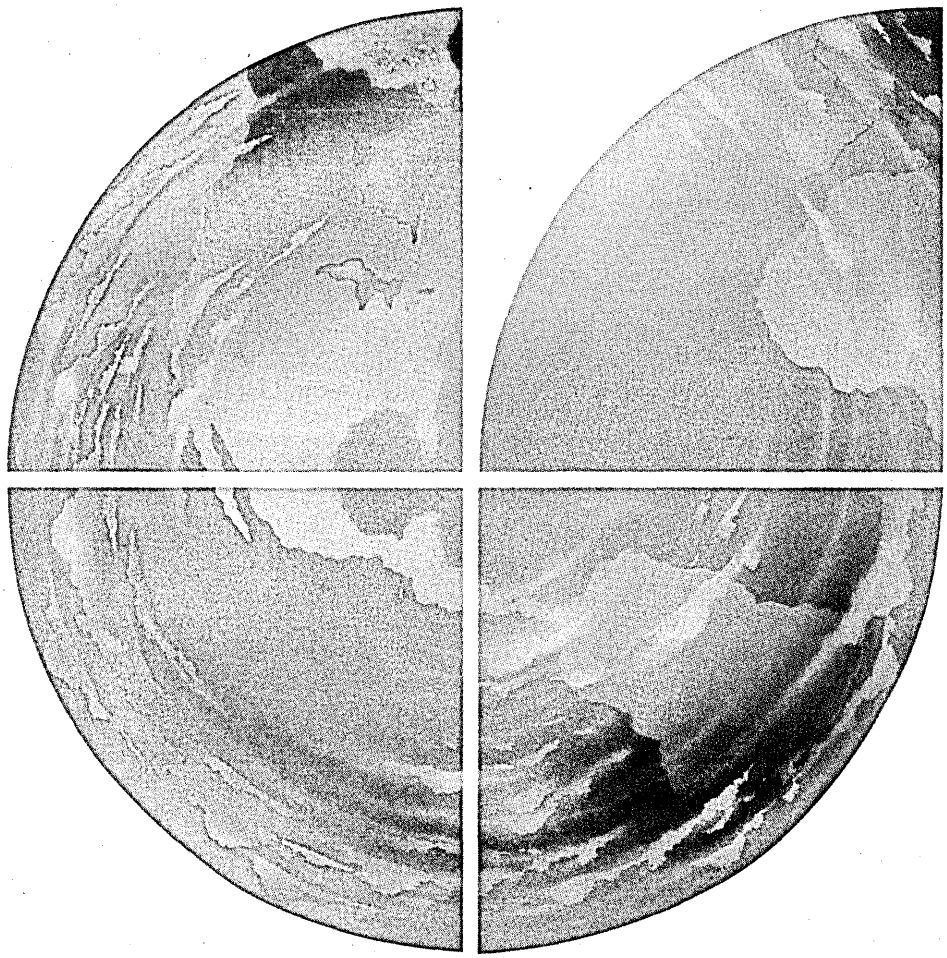
CIRCLE 91 ON READER CARD



IT'S A CHANGING WORLD

And nowhere has major change been more evident than in the data processing industry. We have experienced generations of expensive equipment conversions. Frequent programming language changeovers. And increasingly complex operating systems. This dynamic environment has created an unprecedented challenge for top management to insure that each data processing dollar yields the maximum return to the organization.

Over 2,000 clients, in 18 countries, have utilized Cincom Systems' software products and services to harness that change and to provide the foundation for their management information systems.

Cincom's TOTAL Data Base Management System is a prime example, a proven DBMS, serving a large diversified installation base with one common denominator—the stability of the information resource.

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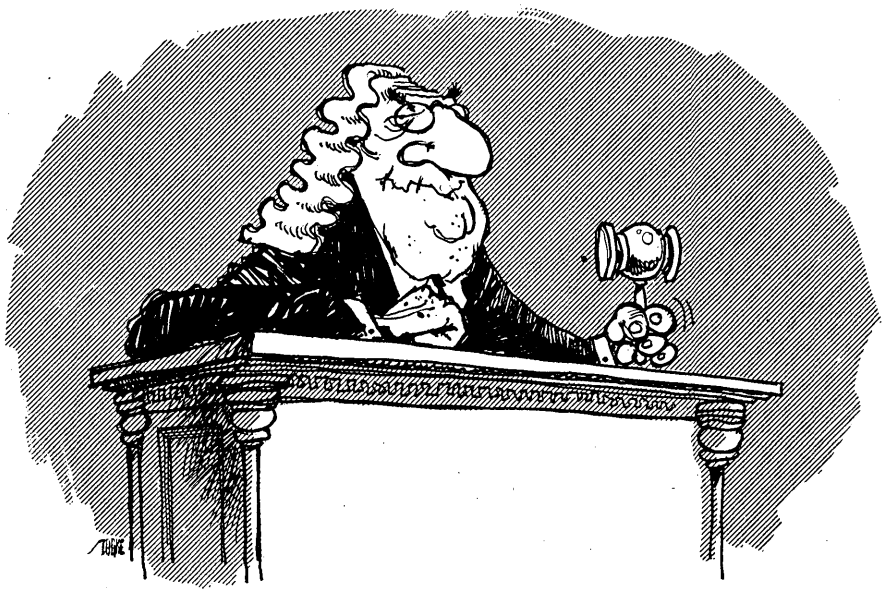


What You Say May Be Held Against You

by Daniel A. Mersich

A Canadian case involving Burroughs equipment could have far-reaching effects on both sides of the border.

A recent decision in the Canadian courts might have a subtle but profound effect on future relationships between data processing users and suppliers. Since that decision relied heavily on U.S. legal precedent, it also provides insight into how an American court might interpret the law in a similar situation.

SETAK, a Toronto service bureau, acquired Burroughs B500 equipment for use in carrying on its business. On finding dissatisfaction with the equipment and software during installation, SETAK wrote to Burroughs, suggesting that a less casual arrangement for resolving problems should be instituted in the form of regular progress meetings at which minutes were to be taken. This was agreed to, and both technical problems and the responsibility for solving them were routinely discussed and recorded at these meetings.

Unfortunately, matters went downhill in spite of these efforts, and SETAK commenced legal proceedings claiming damages for breach of contract.

Before the main question of breach could be decided, however, a secondary question of admissability of evidence had to be settled. SETAK took the position that minutes from the technical progress meetings should be allowed as evidence of Burroughs' alleged failure to live up to its contractual obligations. Burroughs, on the other hand, argued that the minutes were inadmissible, under the law on hearsay evidence.

Both American and Canadian law on hearsay evidence find their origins in the centuries-old British common law which stated that a written record was inadmissible hearsay unless the person who actually created the record took the witness stand and testified personally as to the information it contained. This obviously placed a tremendous burden on claimants who wished to enter business records as evidence in support of their claims, because several people might have made the entries or because many of those people might no longer be available to testify by the time the case came to court.

> . . . a wide and liberal interpretation should be given to "usual and ordinary course of business."

Seeking to ease this burden, many North American legal jurisdictions created exceptions to the hearsay rule by enacting statutes that allowed records made in the usual and ordinary course of a particular business to be entered as evidence without the supporting oral testimony of their author(s).

In deciding that the minutes came within the definition of being records created in the usual and ordinary course of SETAK's business, Mr. Justice Griffiths of the Ontario High Court of Justice noted that the Ontario Evidence Act closely followed the wording of an American enactment known as the "Model Act for Proof of Business Transactions," which was drafted in 1927 and adopted by the U.S. Congress nine years later.

After receiving full argument from both sides, Mr. Justice Griffiths relied on Canadian and American precedent to hold that a wide and liberal interpretation should be given the definition of "usual and ordinary course of business."

While the question of how damaging, if at all, the minutes were to Burroughs' defense was left unresolved because the parties chose to settle out of court on the main question of liability for breach, the preliminary decision stands as an important one. As we all know, regular progress meetings during the installation of even small dp systems are very important in identifying problems and assigning responsibility for their solution. If suppliers or users ever had doubt that their shortfalls, candidly discussed at such meetings, could later be used against them in court, that doubt has now been removed. ❋

Dan Mersich is a Toronto lawyer whose practice is restricted to computer related matters.

Babbage's Familiar Quotations

compiled and edited by Paul F. Roth and George E. Lindamood

The editors hereby and herewith disclaim and disavow any intent to misquote. Rather, any errors in quotation which may exist in the following are undoubtedly typos and will be masked by round-off in any event. It should also be explained that the editors' main intent was in attributing quotations which were virtually exact or real, thus resisting the urge to blow this whole thing out of proportion by including "non-quotations" and "un-quotations," such as Lindamood's preposterous characterization of the PDP-11: *"E Unibus plurum."* In certain cases, however, we do cite quotations that are more reputed than documented, thus indulging in the generally unexplored field of virtual quotations.

"Ask the man who owns one."
—Packard Motor Company *on leasing*

"And awaay we go!"
—Jackie Gleason *on Xerox computers*

"Don't ever look back; something might be gaining on you."
—Satchel Paige *on Seymour Cray*

"Enter and sign in, please."
—John Daley *on privacy*

"(The) evil men do lives after them. . . ."
—William Shakespeare *on BASIC*

"Frankly, . . . , I don't give a damn."
—Rhett Butler *on behalf of customer support*

"Nice guys finish last."
—Leo Durocher *on RCA computers*

"(The) Hebrews do it backwards, which is positively frightening."
—Lerner and Loewe *on stack machines*

"I do not choose to run."
—Calvin Coolidge *on behalf of the Burroughs B8500*

"I have a dream."
—Martin Luther King, Jr., *on interface standards*

"I know how to deal with these people—I shall get my own way, never fear."
—James Hilton *on behalf of Bob Barton*

"It was the best of times and it was the worst of times."
—Charles Dickens *on benchmarks*

"I've got a little list, I've got a little list."
—Gilbert and Sullivan *on behalf of COBOL*

"Let us begin."
—JFK *on ALGOL*

"Let us continue."
—LBJ *on FORTRAN*

"(A) little knowledge is a dangerous thing."
—Alexander Pope *on simulation packages*

"Look at me. I am here. I have dignity. I have pride."
—Whitney Young *on behalf of Herb Grosch*

"(A) man never feels the want of what it never occurs him to ask for."
—Schopenhauer *on virtual memory*

"My time is your time."
—Rudy Vallee *on behalf of INFONET*

"There's a sucker born every minute."
—P. T. Barnum *on Wimmix*

"Nuts!"
—General Anthony McAuliffe *on APL users*

"On the whole, I'd rather be in Philadelphia."
—W. C. Fields *on the NCC*

"Play it again, Sam."
—Humphrey Bogart *on SEAC*

"Stick close to your desk, and never go to sea."
—Gilbert and Sullivan *on Grace Hopper*

"(The) sun, which passeth through pollutions, and itself remains as pure as before."
—Francis Bacon *on IBM*

"To be, or not to be—that is the question."
—William Shakespeare *on ILLIAC IV*

"We are what we pretend to be, so we must be careful about what we pretend to be."
—Kurt Vonnegut, Jr., *on EDP certification*

"We could do that . . . but it would be wrong."
—Richard Nixon *on the ACM long-range plans*

"We have met the enemy, and they is us."
—Pogo *on behalf of the ACM executive committee*

"We will bury you."
—Nikita Khrushchev *on behalf of CODASYL*

"Who am I to question the dictates of Providence? I was sent here for a purpose and I shall stay."
James Hilton *on behalf of Bill Norris*

"Winning isn't everything, it's the only thing."
—Vince Lombardi *on antitrust suits*

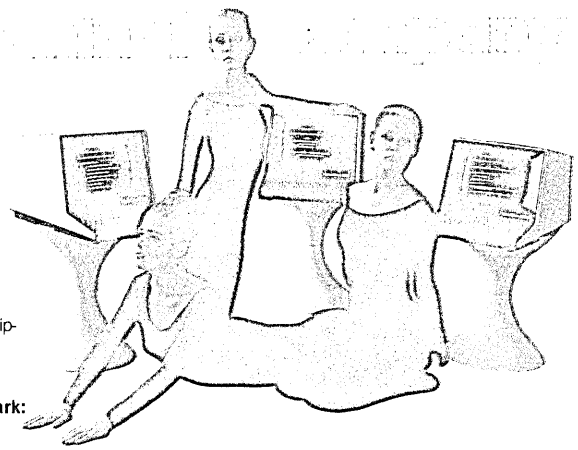
"(A) word about the Great Pumpkin. . . ."
—Linus *on Project MAC*

"You ain't heard nothin' yet."
—Al Jolson *on* DATAMATION

"You want more?"
—Charles Dickens *on paging*

"Zounds, there's no bearing this; it's worse than death."
—Oliver Goldsmith *on Babbage's Familiar Quotations* ❋

The authors are hard working government employees.



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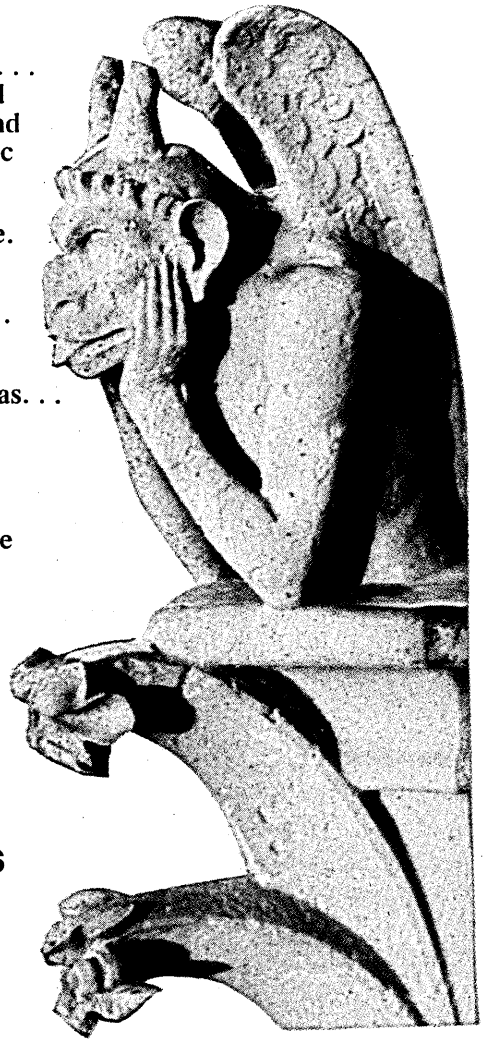
(James Allen)



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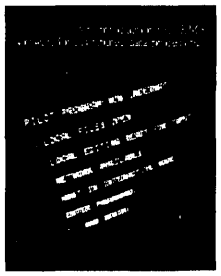

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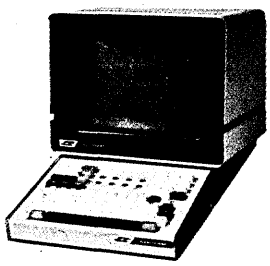

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Strangulation of World Economies

That's the charge levied by U.S. representatives to world conference on data flows.

European moves to regulate international data flows are premature and increasingly motivated by political and economic factors. If they continue to develop outside a world forum and agreed policy, these moves will become dangerous: at best they will isolate some countries from the mainstream of international trade, at worst they will lead to the "strangulation" of world economies.

This was the warning given by U.S. delegates to a gathering of the world's leading communications policy planners in Brussels, Belgium, last month.

At the venue, organized by the U.K. Online Conferences group, John M. Eger, former acting director of the U.S. Offices of Telecommunications Policy, challenged delegates to meet him in a roundtable discussion to begin fashioning a new agenda for world communications law and policy.

Eger, who served as telecommunications adviser to two U.S. Presidents, suggested an initial conference in London this June. "Planning for this must begin somewhere—and soon," he stressed. Like some other U.S. delegates at the conference, Eger was deeply concerned that data protection—which has already resulted in acts in Sweden, West Germany, and France—was being increasingly enforced in ignorance of user views and the technological issues involved.

Biting attack by IBM

IBM fielded 14 of the 200 or so delegates involved—including H. B. DeMaio, its data security chief from the U.S. They mounted a biting attack on European regulators, accusing them of "invidious protectionism." The company is becoming more open each day in its criticism of the 20-nation Council of Europe, the main focus for a new and more stringent convention for international data regulation.

For the first time in its evolution, IBM faces controls on the content of what it can put into its computers before transmitting. The worry and frustration showed on the faces of IBM's people, some of whom were the most vocal of all during question times. They continually questioned the "sincerity" and "motives" of the Council of Europe, and said that it seemed to them that the council was more interested in regulating technology than protecting privacy and had a range of "economic motives" for doing so.

Further attacks came from others in the 25-member U.S. delegation. Some said privately that they were "alive" to the possible dangers of a "trade breach" between the U.S. and Europe if barriers continue to be erected in the European communications theater against the free flow of information.

For the first time in its evolution, IBM faces controls on the content of what it can put into its computers before transmitting.

Tanks for flies

Though many Americans praised the efforts of the Council of Europe, OECD, EEC and other bodies, to protect the privacy of individuals, this worthy aim was getting lost in laws that were becoming more broad than necessary. "They are building tanks to kill flies," was the way one U.S. consultant put it.

A Council of Europe committee formed in 1976 is out to extend two draft resolutions (from 1973 and 1974) from earlier working groups into a fully fledged, "binding" package of international data regulations. Work on this is expected to be completed by the end of next year, it was revealed at the conference. After that it was generally felt that it would take the council's members up to three years (i.e., by year-end 1982) to adopt the proposals.

Tim Johnson, a communications expert from the British services company, Logica, told the gathering that it was becoming possible to identify "fairly well" the types of data flowing internationally: "But very little information is yet available about its volume or the pattern of traffic," he said.

The giant SITA network of international airlines carries some 100,000 million characters of traffic a year, "possibly 50%" of all traffic in public or private networks at present, Johnson said. A good many of the world's multinational companies have networks carrying in the order of 1,000 million to 10,000 million characters a year, and some have flows in excess of 10,000 million or 20,000 million characters a year, he said.

JOHN M. EGER
Planning must begin somewhere—and soon

Not "sensitive"

Johnson is currently working on a major study of this problem for the OECD. He said it was already clear that most information in these nets was not "sensitive" from a personal point of view. From some eight broad categories which information flow can be broken down into—Production & Distribution Control; Financial Management & Planning; Travel Reservations; Scientific Research & Development; Environmental Monitoring; Financial Transactions; Personnel and Payroll, and Government and Public Authority Data—Johnson said that only the

last three could be considered potentially sensitive to any varying degree.

Johnson said that banking messages and credit authorizations were essential to international trade and subject to a high level of security. He claimed that personnel and payroll information was rarely sent internationally, and then mostly for resource sharing reasons. He described the government and public authority area as "ill-defined and certainly not important in volume terms." But here, several governments do process both statistical and administrative information in other countries: a good example is Interpol, which is planning a network to transmit sensitive personal data internationally.

On the other hand governments are aware that information trade is big business and the cornerstone of modern economic growth. Hans Peter Gassman, head of the OECD's Information Computer and Communications Policy Program, said a twelvefold increase in data traffic volumes is expected by 1985 compared with 1975. Over the next eight years the current number of 270,000 data terminals in Europe will rise to over 1.73 million, he said.

Regulate the technology

Most of this boom has been brought about by technological innovations—mostly American in nature. The fact that current data protection aimed at these flows does not embrace manual systems led to strong U.S. feelings that Europe was out to regulate the technology itself.

Virtually the first question at the conference came from John Geraghty, IBM U.S.: "Why not regulate all forms of information? Information is just as damaging (or rewarding) even if maintained in manilla folders. Medical records (for example) are very sensitive in manual forms."

Keith Williams, IBM SA Europe, France, took up this attack later by complaining that, "I don't need a data inspection board to give me the right to check medical records kept manually."

Many delegates complained that the current Council of Europe definition of "personal data" includes information willingly volunteered—e.g., airline reservations, credit—as well as information regarding any specific person, such as a simple administrative message.

"You began with data which describes an individual and have now extended this to cover legal entities and business. But not much flow of data is about individuals," IBM's Williams said. He added that a lot of information in his own field was "market information data passing to suppliers from outside the country."

Christopher Layton, EEC Computer Science director, said that the Council of Europe was leading the way in the privacy field: "We hope to encourage and promote its work on the convention and embody it in community law. All standardization issues in Europe are boiling over to a critical point. The process of negotiation should come to a head in one year's time—and it's high time it did," he said.

Layton asked delegates whether business wanted its data to be protected, and if so, whether the practice should be harmonized. "There is no consensus on the protection of business data," he said.

Many delegates wanted to know, if this were true, why some countries had gone ahead and regulated anyway. A spokesman for Manufacturers Hanover Trust said that the new data act in France would cause his company a considerable headache, "But who do we take our problem to?"

> "Why not regulate all forms of information? Information is just as damaging even if maintained in manilla folders."

Onus on legislators

A spokesman for Unilever in the U.K., one of the world's biggest industrial groups, said his company didn't know about possible privacy legislation in the U.K. until a year ago. He said the onus was on legislators to air these issues more thoroughly and open channels for users to be consulted.

Many delegates said that if there was no interaction between lawmakers and individuals, how could lawmakers be clear what benefits they were bringing about for individuals in their name? One delegate suggested that as things stand, regulation must always precede reaction from individuals and an airing of the problem.

Allan Eriksson, Director, Ministry of Defense, Sweden, said: "Let me tell you some facts about trying to find facts. We made inquiries about the Nordic transborder flow to industries and other countries. In all countries except Sweden, nobody could be forced to answer. In one of the Nordic countries 15-20 requests were made. All were not answered and some of the answers were not telling the truth. In each of two of the other countries about 400 requests were made. In both countries less than 20 answers were given . . . As you understand in many countries it will be impossible to find facts without the help of data legislation or changes in the constitution," he said.

William Fishman, Assistant Director, Office of Telecommunications Policy, U.S., told the gathering that the U.S. had had similar problems in fact gathering. "Our task group looking into this problem has no effective way to interface with the private sector—we're eager for its views. Industry has to tell us which national laws are the most agreeable or least obnoxious," he said.

"We'll be going out with formal requests for information in the next few months," he said. He went on to stress that attempts to do this on an international scale were better than a "hodgepodge of national laws."

Even Jan Freese, Director-General of the Swedish Data Inspection Board, stressed that, "The problems will be considerably greater if the principles of legislation vary between the countries."

But Freese, a former civil judge, is a lawmaker and gave the conference the impression that he was compelled to make laws. Frits Hondius, head of the Council of Europe's Division of Public Law, said, "The purpose of law is to bring an element of stability in a changing society. Stabilizing the effects of the information revolution clearly is one of the most fascinating challenges faced by jurists in recent years."

Old rules don't fit

Here on this point OECD's Gassman sounded a crucial point: "The introduction and use of new technology has outpaced the existing legal framework, and many developments in this field are pioneer efforts operating in a no-man's-land . . . I am therefore inclined to think that we have indeed entered a phase of such drastic change that old rules do no longer fit and where new rules of the data game have to be established," he said.

According to Hugh Faulkner, Canada's Minister for Science & Technology, such "new rules" should be established to make the world less dependent on the U.S. He told an IFIP gathering in Toronto last August: "There is the danger of loss of legitimate access to vital information and the danger that industrial and social developments largely will be governed by the decisions of interest groups residing in another country."

It is believed by experts that the importation of information processing services has resulted in lost revenues of $150 million to $300 million in 1976 and may have cost Canadians 30,000 to 40,000 jobs.

Interdependence a necessity

In contrast, Eger stressed the world's interdependence as a necessity in his closing address. He said that countries fed each other through international trade—trade whose prime commodity is information. Nations erecting barriers against this free flow for reasons of national interest are potentially vulnerable

to information isolation.

Eger said that for many organizations throughout the world the uses and benefits of modern technology were too attractive to be denied. He said the need for technology was now obvious throughout the whole spectrum of human activity.

Gassman stressed that two-thirds or more of the world's countries are not yet involved in large scale data communications networks. To produce worldwide solutions now (without their input) would thus be premature.

Eger and Gassman both stressed that international cooperative action will soon become a necessity—but based on the new order not the old. "Existing forums are not equipped to deal with current global communications issues. They are either too political, lack understanding of the dimension of the issues involved, or simply are not vested with large enough mandates to begin solving the problems involved," he said.

It was clear in the eyes of IBM and CBEMA that nonexisting bodies were also a great problem. They are now likely to lobby with great ferocity to produce an international convention of their own—one linking multinational users, vendors, and service companies to the growing army of regulators.

Sweden, West Germany, and France have already produced acts. Austria and Norway were hot tips at the conference to introduce legislation this year. Bills for data protection situations are currently being discussed in the parliaments of Belgium, Canada, Denmark, Luxemburg, and New Zealand. Moves to consider some sort of data provisions are afoot in at least another 12 countries.

"We have a runaway situation," said one of Honeywell's leading Mark III network operators in Europe. "But at least at the moment they are allowing us to stay in the game."

—Ralph Emmett

Communications

Telephone as a Computer

Merger of two disciplines suggests exciting future to bankers.

Telephone. Webster defines this as an instrument in which sound is converted into electrical impulses for transmission by wire.

Webster's dictionary defines "computer" as an automatic electronic machine for performing calculations—not very similar. Not defined in the dictionary is *computications,* a word coined since what many see as the beginning of a merging of the industries which spawned the two devices.

It was used numerous times at an American Bankers Assn. Telecommunications Conference last month in Houston. Keynoter Robert B. White, executive vice president of Citibank, New York City, said *computications* is a mix of the old and the new with no complete cut-off.

White believes the next decade "will be a very exciting time with the most significant change being the merging of the telecommunications industry and the computer industry." He sees other changes, changes within the banking industry itself which "have seen Sears become the largest lender." He looks for a front-office evolution based on word processing devices and a move in paper-intensive back offices with their large batch computers to more real-time transaction processing systems.

"On-line will be the environment of the 1980s," said Dr. Howard Frank, president, Network Analysis Corp., although he worried that vendors don't understand or support on-line as well as they do batch and that qualified people don't exist in the quantities needed.

Having to cope

Frank believes that "every network concept ever conceived by man still is operating somewhere. Someone is having to cope. In the 1980s, we'll look at telecommunications as a resource. I'm optimistic. I like to think of the computer as part of a network rather than the network as part of a computer."

Harvey L. Poppel, senior vice president, Booz, Allen & Hamilton, talked about communications systems for

AT&T's Archie McGill: a buffer between AT&T and IBM.

hotlines, mortgages, transportation, and travel. "They all some place involve exchange of payments," he told the bank telecommunications people, "and you can play in all of them."

Poppel moderated a conference session in which participants were John Bishop, director, industry marketing, IBM, and Archie J. McGill, director, business market management, AT&T, who described his position as that of "a buffer between AT&T and IBM."

Perhaps even more of a buffer—in this case between AT&T and the specialized common carriers as represented by C. Gus Grant, president, Southern Pacific Communications Corp.—was Sen. Ernest F. Hollings (D-S.C.), who moderated a session on "Competition in the Regulatory Arena."

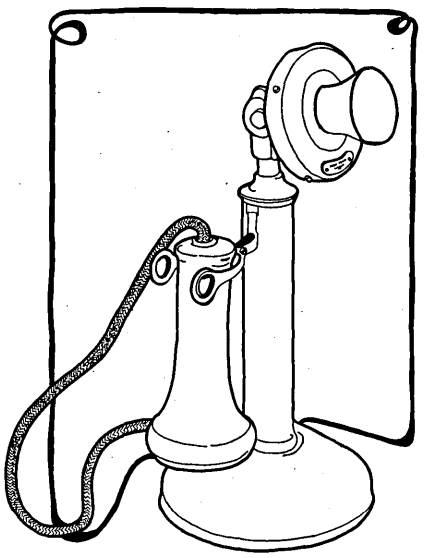
The biggest bone of contention between Grant and AT&T's executive vice president, J. E. Olson, was an AT&T filing for a declaratory judgment from the Federal Communications Commission on a federal court ruling that limiting MCI Communications Inc.'s Execunet voice service to existing customers is illegal (see p. 221). AT&T asked that it not be required to provide additional interconnections for the specialized common carriers pending a public finding in the MCI case. The FCC was to have ruled on the filing early this month.

Concern in spades

"What we have said," said Olson, "is that a public interest debate should get going now. There are 1,600 telephone companies that have a concern in this in spades. We need to know who's going to pay for what and on what basis. We need a public interest debate before we're required to let them interface."

Grant said he had no disagreement with the idea of a public interest debate but added, "in the meantime are we supposed to go out of business while we wait?" He said "denial of this indispensable component (additional interfaces to the AT&T network) would have catastrophic effects."

He referred to a telephone industry task force report on the interface issue, noting it "weighs about four pounds. We have examined its points, calculated our



fate. The specialized carrier market would immediately be reduced to one third our size and our revenues would drop immediately by two thirds."

Olson had called the task force proposal "a starting point for a public interest debate."

"If this is a starting point," said Grant, "I'd like to start from a little bit better level."

What is innovative?

Olson was unswayed. "If you're gonna have competition, and fair competition cannot stand with the pricing structure you have today, you tell me what is innovative about Execunet. Just pricing, picking off the cream. Where technology is concerned it's mostly analog. We want a thorough debate before the horse is too far down the road, a debate that will take into account the small users and the small communities."

Olson had opened his remarks by noting "competition is here to stay and the Bell system accepts that reality . . . It is not the Bell system's intent to be the sole supplier of telecommunications services." He said he hoped Bell's proposed primary instrument concept, under which every installation would have at least a single line and instrument owned and serviced by the phone company, would be widely accepted.

Sen. Hollings wondered what the impact of the primary instrument concept would be on banks. It wasn't answered by his panel.

> "We want a thorough debate before the horse is too far down the road, one taking in the small users and the small communities."

Richard Wiley, former chairman of the FCC, said the commission has had to move carefully to preserve the fruits of what AT&T built up in the non-competitive years. He called the commission's original decision (a stay on expansion) on Execunet "an attempt to hold the line."

Wiley believes that in telecommunications, "competition has reared its exhilarating head," adding that, "the American people can only be glad they don't get all the government they pay for."

Unthinkable

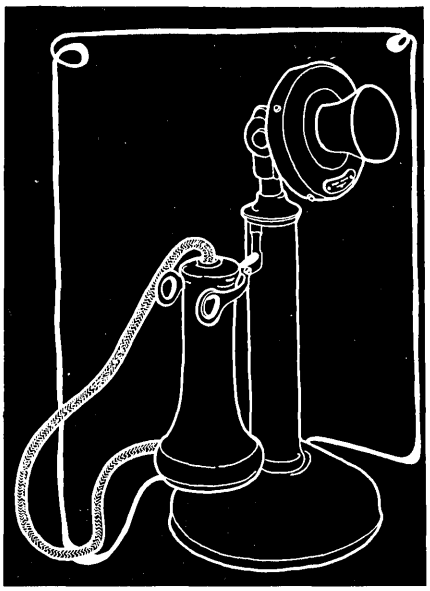
He feels "it would be unthinkable to regulate the huge data processing industry," and therefore predicted some deregulation in telecommunications, particularly in the terminal equipment area.

AT&T's McGill, in another session, agreed. "I believe the regulatory environment is going to continue to move toward a totally competitive attitude. There will be less regulation, particularly in the terminal environment. There are a lotta cats out there."

Said McGill of what the competitive environment means to AT&T: "The outside world is a new thing for us. Things are getting tough and they're going to get tougher." He said the phone company already has changed seven million accounts to an industry basis and has physically moved 19,000 people to accommodate the new kind of marketing thrust.

Illinois Bell, he noted, has its entire sales force on a commission plan and this is going to happen throughout the country. Asked if he felt the 1956 consent decree would hamper Bell in a competitive environment, McGill said, "I don't think it's a problem. We don't intend to offer anything that isn't communications." When this response drew a laugh, he rejoined, "that depends upon how you define communications."

The word competition was used in almost all of the conference sessions.



Keynoter White called the regulatory environment the factor "over which we have the least control. We would like it to be at a minimum level. There is a general pattern allowing more competition. This is good."

Explosion of networks

Frank of Network Analysis noted that in 1970 "there were only two carriers. Now there is a variety and 1980–85 can only get better. Line costs will go down. I look for an explosion of networks."

Allen Pearce, advisor to the White House Office of Telecommunications Policy, isn't so sure. "We do not have pro-competitive policies," he said during the regulatory session. He said the White House and Congress can influence the FCC but that passing laws is an insignificant part of the work of Congress, to which moderator Hollings interjected:

"Yes, I can put in all the bills I want to and old Olson (AT&T) can kill 'em."

Pearce believes there "is no such thing as full and fair competition." He referred to Karl Marx's look at the "dark side of competition in which the marketplace takes over and you get things like predatory pricing. On the other hand," he said, "more regulation has its hazards. I have a nightmare in which the FCC tariffs a pocket calculator."

As for clarification of the telecommunications regulatory confusion, Pearce said, "I can't offer much help from the White House. The President is concerned with other matters." He urged those in the field to "move together to increase the sensitivity of Congress and the White House."

Develop a plan

White urged the telecommunications practitioners to "develop a plan, develop an organizational structure." He said Citibank was moving to pull together voice, computers, and telecommunications in a matrix type structure which is neither centralized nor decentralized. He urged a closer look at labor costs. "Ours is from 40% to 50% and going up every year. Facility and support costs are going up 18% each year. Computer costs are coming down. We are trying to increase the computer cost within the mix because we believe we can use computers to increase productivity."

Frank advocated a "pooling of money" in network development. He referred to a state of Minnesota educational network. The customers were to buy their own terminals. The result was they all bought "clanking Teletypes. Now they're all upgrading until it will become one of the most expensive networks of its type." He believes a pooling of money for optimum equipment at the outset would have been preferable. "Get rid of the idea 'this is my domain.' You must integrate."

He advocates voice and data integration. He said "90% to 95% of any communications bill is voice. In the next five to ten years, voice still will dominate. You have a large voice network you don't use at night and 70% of any voice conversation is empty. In the next few years we should be treating voice as if it were data." He said integration could take place within the PBX. "Look for the latest digital PBX you can find."

Expanded role

Frank, like other conference participants, believes "the telecommunications manager is going to have to expand his role, to move up in the organization."

Poppel of Booz, Allen & Hamilton believes "it will be a good 20 years before we have a true, integrated communications network." He advocates what he calls a "white paper technique. You get smart people together for a two or three day retreat and come up with a white paper with statistics on information flow and information quality and predictions. Then look out at least 10 years and map out the potential. Determine what you

need to learn then come up with some immediate next steps."

No telecommunications conference would be complete without mention of distributed processing and this one was no exception, although it didn't come up often. Frank of Network Analysis called it a "mystical term." He said his company had done a survey of trade press advertising and articles in 1975 and again in 1977. He singled out DATAMATION's ads. In the whole of 1975, he said, only two ads used the term. In the January 1977 issue, he said, "44% of all ads had the term and most of the equipment being advertised was the same. It's the user perceptions rather than the technology that has changed. It depends on who you are and what you're trying to push and you can say anything about anything."

He could be right. There are those who, for regulatory purposes, would like to call a telephone a computer.

—Edith Myers

Shared Networks for Banking

The American Bankers Assn. has predicted the nation's banks will spend between $800 and $900 million this year for telecommunications systems and services.

The prediction was based on a 1976 survey of a cross-section of member banks by the association's Telecommunications Task Force. The survey indicated banks nationwide spent $550 million for telecommunications services and equipment in 1975 with an annual growth rate of about 16%.

"Interestingly enough," Stephen A. Ernst, chairman of the task force and vice president of Bank of America, told an ABA Telecommunications conference last month, "when considering the current high level of activity in the data transmission and electronic funds transfer areas, we find that banks spend on the average, more than 80% of their telecommunications budget on a rather mundane service usually called POTS—Plain Old Telephone Service."

And so the ABA is investigating the feasibility of a nationwide shared telephone network for bank-to-bank and interbank voice communications. First step, said Ernst, will be to sit down with AT&T "which is of course the predominant supplier of today's services, and see what they might be able to do for the banking industry."

Ernst pointed out that the concept of banking industry telecommunication network sharing is not new. "We now have the bankwire which soon will be offering us third-generation interbank message switching in the U.S., and we now also have SWIFT (Society of Worldwide Interbank Financial Telecommunication) for international message routing and the Fed Wire, the granddaddy of electronic funds transfer networks, is still doing a fine job for us every day."

Network of ACHs

He also cited the network of Automated Clearing Houses (ACH's) which are beginning to hook up to one another via telecommunications lines to handle bank-to-bank preauthorized paperless transactions.

"As a final example of existing banking industry telecommunication network sharing," Ernst said, "think about the use your bank may make of the facilities of National Data Corp., Rapidata, Tymnet and General Electric's Mark IV network for bank-customer or bank-to-bank electronic exchange of information. The point is, we already are deeply involved in operating and/or using industry telecommunication networks for a variety of purposes none of which relate to the one area where we spend most of our telecommunications dollars—inter- and intra-bank voice telephoning."

Some of the existing networks in use by banks were described at the ABA conference. Howard F. Crumb, adviser to the Federal Reserve Bank of New York, said Fed Wire, which connects 37 Federal Reserve organizations, more than 300 member banks and several government organizations, last year handled just under nine million messages. He said the cash settlement figure for the network on one day exceeded $200 billion.

Crumb said the Fed is looking at new capabilities which would be applications independent, communications only, functionally standard, and highly secure. He also would like to see an upgrade in some activities of participating banks. "We surveyed banks last year and found many don't have agreements regarding customer responsibility. Many are two weeks behind in reconciliation. You can't afford this in an electronic transfer environment. We asked about contingency plans and found there are virtually none." He said the Comptroller of the Currency "is going around doing the same thing."

SWIFT, which was set up in May 1973 by some 240 of the largest North American and European banks, was reviewed by Peter N. Drummond, North American Regional Manager. SWIFT has 15 member countries with a concentrator in each country and operations centers in Amsterdam and Brussels. Drummond said the network, on which SWIFT has spent $850 million, "supports anything from a Telex to a 370/168."

Approved vendors

He said SWIFT has three approved vendors, Burroughs, General Automation and ICL, "which simply means we supply and maintain the software." He said charge for the service is approximately 40¢ per message of which half is paid annually and half on a per-message basis."

"When we first got started" Drummond said, "many European banks thought of SWIFT as a club they couldn't afford not to belong to. They jumped in without doing a cost study. Now we play devil's advocate when a bank wants to join. We insist on a cost study."

He said SWIFT has a "firm commitment" from Japan and will begin negotiations in that country this month. Japan and Ireland are expected to be on the network early next year. "Latin America is important too. They've come to us."

SWIFT is supposed to be operational 24 hours a day, seven days a week. One user wondered why he was having problems testing on weekends. "The concentrator will be on but Brussels will be down. Can't you let us know ahead of time?"

Drummond said SWIFT "is still very young. When we find glitches we test to find out why and we do this on Saturday and Sunday and in the evening. It's always a last minute thing and it'll be this way for another six months. There's no time to advise users ahead of time."

"Some big names"

Among U.S. member banks, Drummond said Irving Trust and Chase Manhattan are doing "very well," accounting for 75% of the U.S. input. He said some U.S. banks are "doing very badly and there are some big names there." He said Italy, Austria, and Switzerland are only doing 50% of the SWIFT activity they projected while one bank in Brussels has matched the total U.S. input. "In Sweden," he said, "we are having problems with the PTT (Postal Telephone & Telegraph) which handles rates like a yo-yo."

Drummond attributed the slowness of U.S. banks in use of SWIFT, in part, to the fact that they have so many different networks with different message formats to deal with. He believes that ultimately a minicomputer can be used to transfer one format into a variety but "that's a long way down the road."

One network U.S. banks aren't dealing with yet but should be by May is Bankwire II, operated by Payment & Telecommunications Services Corp. (PATS), an operating subsidiary of Payments and Administrative Communication Corp. (PAAC) to which member users belong. Bankwire II will be a successor to Bankwire I which has been operated for PATS by Western Union on a facilities management basis. Collins Commercial Telecommunications Div. of Rockwell International will operate Bankwire II, also on an fm basis.

Easier to plan

Bernhard W. Romberg, PATS president, told the ABA conference that Bankwire II will be sending 20,000 messages per day involving $20 billion in funds. He said a delay in start-up was due to the fact that

"it is easier to plan than to implement. Testing was fraught with difficulties."

The network has switching centers in Jersey City and Dallas and concentrators in Jersey City, Dallas, and Cedar Rapids, and has a capacity to handle 65,000 messages per day. Romberg said the Federal Reserve late last year announced plans to provide Bankwire with settlement and currently is taking comments from members.

Public packet switched networks, specifically Telenet and AT&T's Transaction Network Service (TNS), were described by Stuart L. Mathison, vice president, Telenet Communications Corp. He listed as their benefits: low cost, high reliability, connection on demand, communications between dissimilar stations, the ability to add new computers or terminals at any location at any time, immediate nationwide service, and single supplier network management. He said Telenet is international and is adding new countries every month.

And for the future, John J. Sherman, assistant director, marketing, Satellite Business Systems, talked of what his firm expects to bring to the marketplace in the first quarter of 1981. This offering, he said, will integrate voice data and image and will provide such new applications as high speed facsimile and televisual communications.

—E.M.

Technology

Backend Processors: Is REM the Answer?

The backend processor, a machine that offloads from its host processor the job of managing a data base, appears to have come a step closer. The specific design of a dedicated processor to handle that task is still up for grabs, questions arising as to whether it should use a bubble memory or CCD's (charge coupled devices) or an associative processor.

The associative memory, referred to by some as content-addressable memory, has the capability of accessing data not by its address in storage but by its content. It thus has the advantage of speeding up the retrieval of data and simplifying the software. And it has the added ability to write information into multiple storage locations in one operation. But what has kept this technology from being applied to the backend processor job has been its high cost.

Attacking this problem is a new company, Semionics Associates, which has developed a low-cost Recognition Memory (REM), as it is called. In its bare-bones form, a package of 32K bytes and supporting electronics fits on two printed circuit boards. This is also combined with a Zilog Z80 microprocessor on an S-100 bus to form a content-addressable parallel processor (CAPP) system.

Since some users of the Z80 call their machine a ZPU and since the final product is a CAPP, it's thought that this processor could be called the ZAPP.

"The idea, you know, is that you can go to your whole memory in one swoop," says the firm's co-founder, Dr. Sydney M. Lamb. "If you want to know if something is in the system—zap, you find out immediately. No searching."

For a mere $11,510 the Berkeley, Calif., firm is offering an associative processor with 32K bytes of REM, 16K of RAM, 2K of firmware, dual floppy disc drive, crt terminal, and printer. Each additional 32K of REM is less than $2,500.

A ZAPP? Sydney Lamb (right) of Semionics with one megabyte associative processor. Box houses microcomputer and 32 cards, each holding 32K bytes of associative memory.

Boxes can be stacked

That storage capacity obviously does not accommodate your typical indexed data base. But the processor and a megabyte of REM can fit into one box, and these can be stacked to provide added capacity. Lamb describes an on-line library system with more than 10 million entries in its index, which would be uneconomical to store in a REM. But a statistical study showed that 10% of the titles accounted for more than half the system usage. Those 10% could be stored in the associative memory, significantly reducing the load on the host mainframe.

Agreeing with this approach to a backend design is Eugene I. Lowenthal of MRI Systems Corp., Austin, Texas, vendors of the System 2000 data base management software system. He suggests that the associative memory, lacking the functionality of a data base machine, could be linked to a separate processor.

"We've thought about this," he says, "and in our view the ideal situation is to have the mainframe hooked to a common backend, and that backend controls what I'll call an intelligent controller—this associative memory." With another processor linked to the host, he explains, the mainframe doesn't have to worry about communicating to some foreign device. It just does high-speed channelling to a mini, or whatever that dedicated processor might be, where the dbms software resides. Further, the mini would also have a very high-speed bus between its own memory and the associative memory."

Complement each other

"The backend has some advantages, just by itself," Lowenthal adds. "But when married to this type of technology, the two complement each other quite well. The (dbms) software, which is in the backend, can be much simpler because it's not doing all the sophisticated indexing, updating, and retrieval algorithms."

He explains there are a number of ways of organizing this. One could place indexes in the associative memory. One could page in the data base. Or put only the most frequently accessed parts of a data base in it.

In disagreement with both Lowenthal and Lamb is Prof. David Hsiao of Ohio State Univ. He thinks an associative memory large enough to accommodate either an entire data base or just its indexes is still not cost-effective today. And using the processor as a staging device between discs and the host mainframe only creates a severe traffic problem. "So most people using a backend processor for data base management try to minimize staging."

Hsiao speaks of 10-billion-byte data bases with indexes of from 1% to 10% of that, saying an associative memory with 100 million or a billion bytes is just too expensive. "It's still not promising," he asserts. And with a smaller memory you're swapping indexes, an inefficient way to use an expensive associative processor.

Academic to Lamb

All this, however, is academic to Syd Lamb, formerly professor of linguistics at Yale Univ. Before he formed Semionics in November of 1976, he was engaged in a 20-year study of how the human brain processes linguistic information. For example, what is it that makes it possible for the brain to understand what someone has just said? "Since

I had previously worked in computational linguistics," he explains, "I thought maybe we could build a new type of computer that would be organized more the way the human brain is organized."

Clearly the computer that performs operations serially would not do, for in language understanding several things must be done simultaneously. This interest in building an "electronic embodiment" of his theoretical model led him to the content-addressable memory.

"For instance," he adds, "in language understanding you have to have a dictionary and rapid access to your proper dictionary entry. You also have to have access to your syntax rules and semantic rules, and things like that. And there just isn't enough time to do all that searching if you want to do language processing in real-time."

Lamb, who comes across as more a research scientist than your basic computer huckster, says the same applies to the computerized voice recognition system, adding, "It's going to be the thing that makes speech recognition possible."

Other projects

Apparently others agree. Researchers at separate General Electric Co. facilities are said to be developing both an associative memory and an associative processor. The latter, described by a spokesman as nearing the stage of possibly becoming a commercial product, reportedly has been in use for more than a year. But its initial applications have been for the military, again in the processing of strings of text.

An associative processor system to process large volumes of unformatted textual data has been installed in the Pentagon by Operating Systems Inc. of Woodland Hills, Calif. It is to be followed by a few at the government's intelligence community. The so-called Associative Crosspoint Processor (dubbed AXP) works in conjunction with a Digital Equipment PDP-11/45, which serves as the host processor. This system is also available now commercially, selling for about $600K with a billion bytes of disc storage and 10 terminals.

Aimed at linguistics

But the AXP has a sophistication not initially intended for or available in Semionics' products. Lamb's REM, admittedly lacking some advantage of more elaborate associative memories, is being directed first at people performing research in computational linguistics, pattern recognition, and information retrieval with smaller data bases. And it's a product that can be incorporated into a terminal, a mini, or a mainframe—even in a personal computer. Now children will be able to get a home computer to parse their sentences.

—Edward K. Yasaki

History

NSA's Computer Story

Report lauds intelligence agency's pioneering role in computers

Over the years, bits and pieces on the computer exploits of the U.S. intelligence community have slowly leaked out. Following a strict policy of anonymity, this furtive fraternity of intelligence gatherers and guardians zealously tried to plug those leaks, making sure in their own inimitable way that no information on their systems or their use percolated out to the public.

Some of this secrecy, industry experts admit, is justifiable. But some is not. "There's no reason in the world," protests a White House dper, "why they (the intelligence agencies) shouldn't be more open about some of the details, not applications, of their systems except for the paranoia of some selected individuals in some of these organizations."

However, there is evidence that some of this paranoia is becoming displaced by a healthier, more open attitude. At least that's true of one intelligence establishment, the National Security Agency, often described as "the cryptographic wizard of the Western world."

In an unreleased report obtained by DATAMATION, the security schemers "for the first time" spill "some of the details behind the NSA computer story." Hampered by its "policy of anonymity," the agency, according to the report, has been unable until now to make its computer industry contributions known. "But, in this age of maturing appreciation of the role of computers in nearly all civilized endeavors, it is time," the report declares, "for acknowledging that NSA, too, uses computers."

Leading off with this self-effacing understatement, the report goes on to chronicle the agency's pioneering dp projects which "helped in laying the foundation of the computer industry." These pathfinding projects, worked on by a variety of leading industry vendors, started as far back as the 1940s.

The NSA study somewhat gratuitously claims that these landmark efforts spurred the fledgling computer industry on by exposing the selected system contractors to innovative techniques—techniques which were far ahead of what was at the time considered to be the current state of the art.

Early use (after World War II) of electronic digital techniques in special purpose "pre-computer" equipment built for NSA, the report claims, taught industry some valuable lessons in digital circuitry. These valuable lessons, the report maintains, "hastened the start of the computer industry."

Years later, "experience gained in the development of large-scale systems for NSA," the report contends, "resulted in design improvements for commercial computers." But perhaps the greatest boons to the infant industry, the report acknowledges, were spawned by the agency's ambitious Lightning project launched in 1957. Out of this promising project, worked on by such industry luminaries as IBM, Univac, RCA, and General Electric, many discoveries were made on "fundamental materials properties, high speed circuitry, and components fabrication." And it was these kinds of breakthroughs, the report maintains, "which assisted in the birth of another computer generation."

Atlas project

One of the first early steps taken by the agency to reach this second generation came when NSA decided in the mid to late '40s to build a von Neumann-type machine. The system, called Atlas after the mental giant in the "Barnaby" comic strip, was built by Engineering Research Associates Inc. and went into operation in 1950.

Perhaps the greatest boons to the infant industry were spawned by the agency's ambitious Lightning project launched in 1957.

Atlas is noteworthy, the report claims, because its drum memory "is believed to be the first in which drum locations (addresses) were permanently recorded electronically." Atlas' successor, Atlas II, also has a claim to fame in its logic design since, according to the report, it is "believed to be the first computer with two-address instructions." The report also contends that the second Atlas II was "the first core memory computer delivered to a customer in the United States."

Needing to speed up sluggish machine operation times for its cryptologic chores, NSA designed and built another major system, which it dubbed Abner. This machine was unique, the report points out, because of its instruction set—"undoubtedly the first which placed primary emphasis upon non-arithmetic operations."

Nomad was ditched

While all these alleged "computer firsts" are impressive, there were other R&D computer efforts at NSA which weren't so successful. One such program

involved the development of Nomad, a large-scale, high speed sorting machine. In 1952, Raytheon Corp. was brought on board to design and construct the system which used a relatively massive mag tape setup. Only three engineering test model tape drives had been built for the system when NSA decided to ditch the Nomad project in June 1954. The reasons cited by the report for this termination were Raytheon personnel losses, delays, and cost overruns.

Downplaying the Nomad defeat, the report goes on to point out how the dp industry benefited from this "unsuccessful" project. Several months after work was stopped, Raytheon decided to commercially market its Raycom computer, which the report says "differed only mildly" from Nomad's basic design.

Further fortuitous offshoots from the project developed later in 1954, the report adds, when a cooperative coupling between Raytheon and Minneapolis-Honeywell led to the formation of Datamatic Corp. This resulted, the report relates, in launching the Datamatic 1000, the first in a series of Honeywell computer models. As a historical footnote, the report recounts how Raytheon's share in Honeywell's Computer Div. was finally liquidated, "and the H-series computers continue to flourish."

The report also boasts of other ways it influenced the emerging computer industry. One way, the report explains, was through hiring personnel who later returned to or joined private industry firms, taking with them the wartime experience of having worked for a cryptologic organization. The report states: "IBM engineers in these organizations during World War II, after contributing to the advancement of information processing techniques, returned to IBM where they were very influential in the development of an experimental system of electronic tape processing machines. This TPM system led to the IBM 702, IBM's first computer designed especially for information processing."

Bogart computer

Pointing to the industry benefits derived from still another NSA computer scheme, the report uses the agency's Bogart computer as an example of how its system development drives led to the commercial marketing of several well-known dp machines.

Named after John B. Bogart, a famous New York Sun city editor, the system, operational in the late '50s, originally was designed to handle editing and formating chores. The report maintains that these systems (several were built) represented the first computer usage of magnetic logic in basic circuitry. It was also, the report adds, "probably the first U.S. computer which used 'design automation' techniques."

Bogart benefactors cited by the report include Univac, which used some of the system's features such as its index registers in the Univac 490. Control Data Corp., the report also affirms, used the machine as a model for some of its systems. "The CDC 1604 and CDC 160," the report maintains, "also reflected early Bogart design experience of that company's founders."

NSA's Bogart computer probably was the first U.S. computer to use design automation techniques.

Moving away from tubes into the transistor era, NSA came up with yet another system scheme to develop a series of small transistorized desktop computers. Configured around the same logic design as the Atlas II, the Solo system was contracted out to Philco Corp. in June 1955. It "holds the distinction," according to the report, "of being the first completely transistorized computer in the U.S." And the progenitor system was also used by Philco as the basis for its Transac S-1000 and larger and improved S-2000 computers.

Sophisticated Harvest

Another NSA system, called Harvest, is characterized by the report as "undoubtedly the most sophisticated computer of the second generation." One of the limited number of systems built by IBM as a result of its "Stretch" research program, the Harvest version of the Stretch model was delivered to NSA in early 1962.

The original design goals of the mighty mainframers, the report explains, were increased circuit speed, lower memory access time, improved logic design, and higher speed and capacity tapes and discs. Ironically, after a year of brainstorming and experimenting, IBM researchers had trouble meeting some of NSA's requirements, the report reveals. Consequently, the company's initial offer to build the NSA system for the "bargain" price of $3.5 million was rejected.

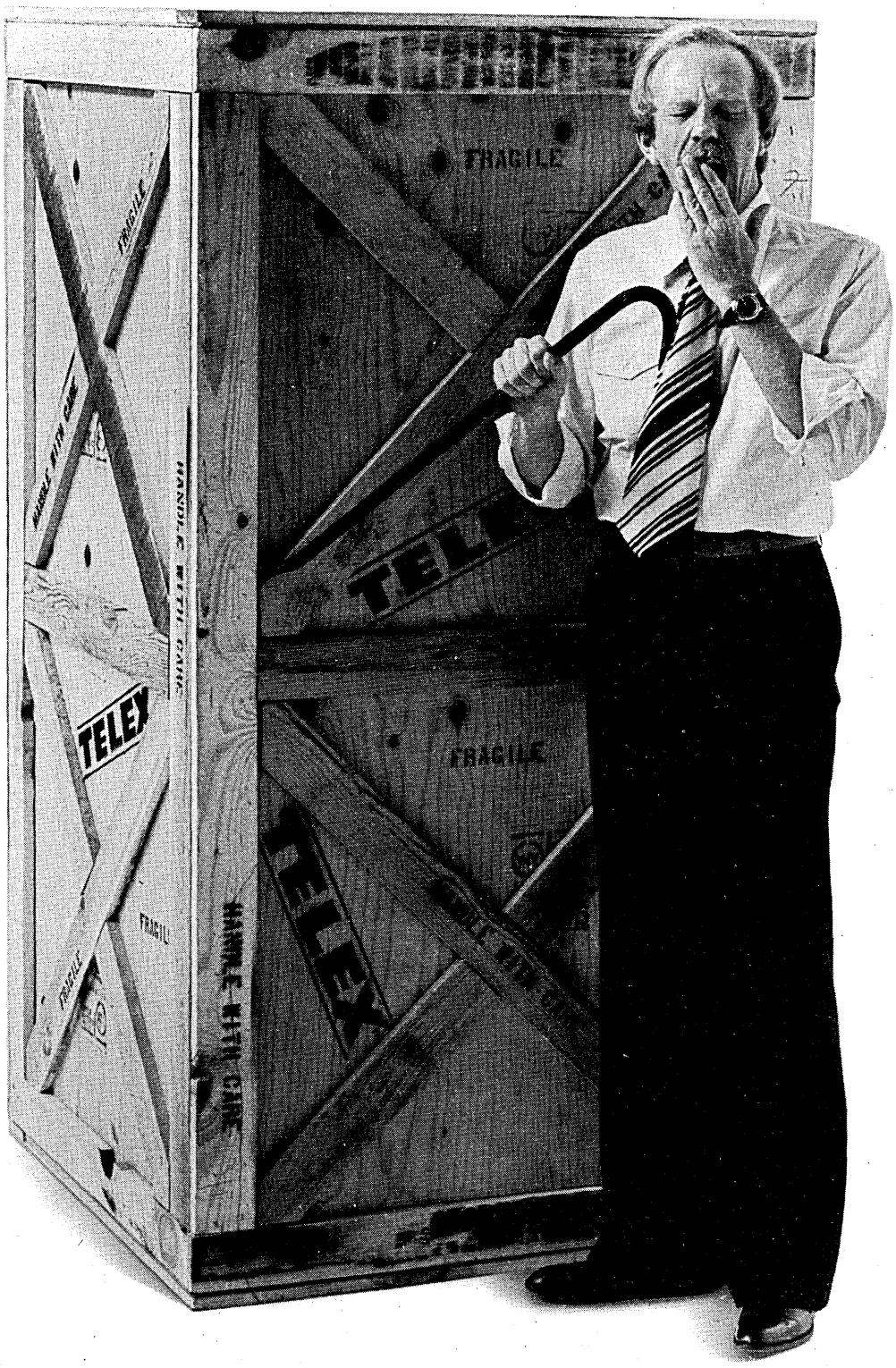
With its eye on the commercial marketplace, the indefatigable company had its computer architects rework the NSA-tailored Stretch (Harvest) system which subsequently won them a contract. (The Atomic Energy Commission, one of the first to jump on the Stretch bandwagon, had a firm contract with IBM for the sophisticated system in 1956.)

Summing up the Harvest saga, the report explains that the system "was used for 14 years (up until 1976) with emphasis on jobs not even conceivable for any other computer. It functioned very well

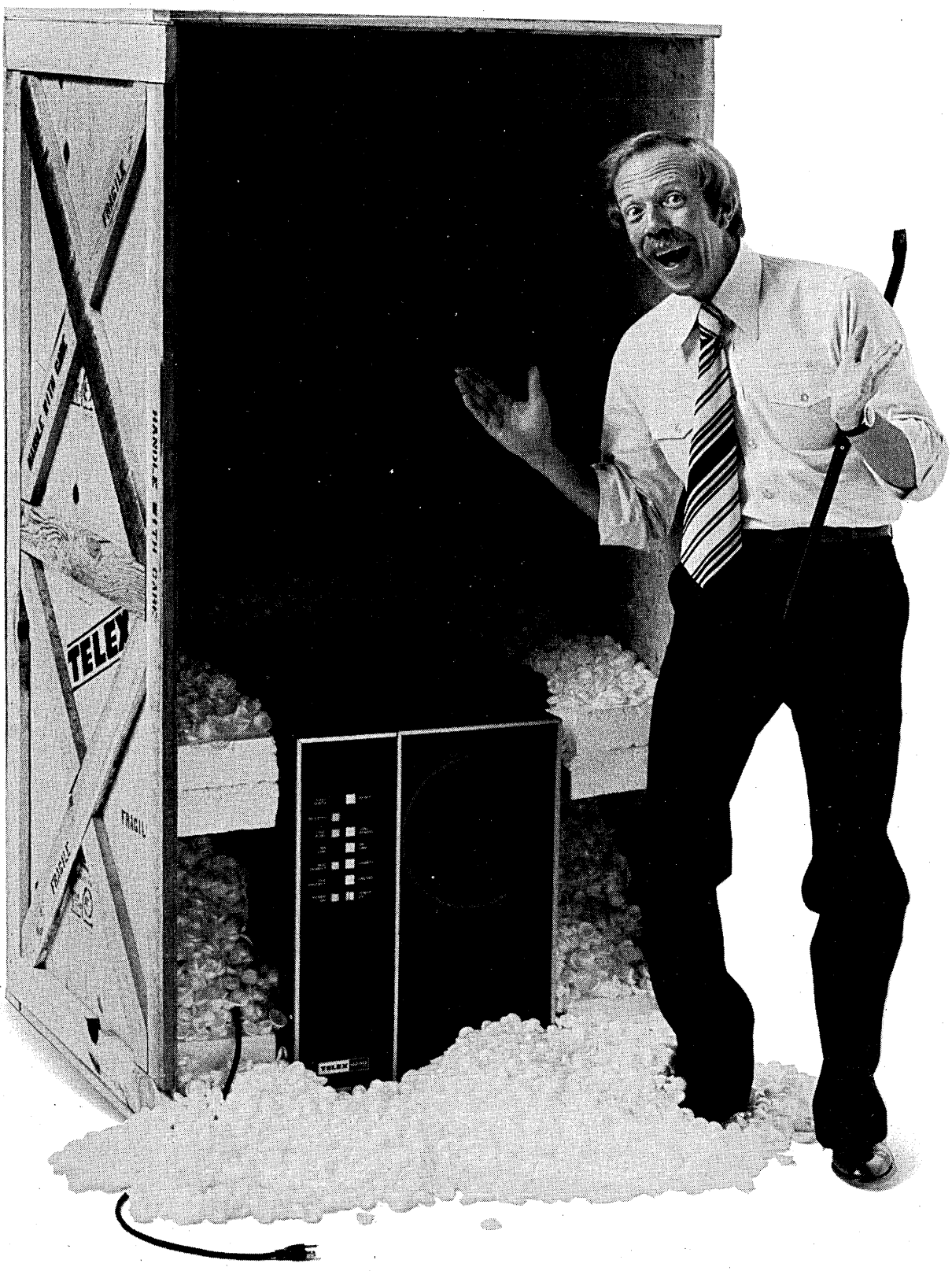
HOW NSA INFLUENCED COMMERCIAL OFFERINGS

Following is a chronology of computer "firsts" which the National Security Agency says had a profound influence on commercial computers:

- Oct. 1948: DEMON placed in operation. First practical use of magnetic drum for data storage for analytic operations at electronic speeds.
- Dec. 1950: Atlas I delivered; operational in one week. First parallel electronic computer in U.S. with drum memory. Forerunner of commercial ERA 1101.
- Apr. 1952: Abner operational; designed and built at NSA. Serial computer similar in logic to SEAC and EDVAC. Most sophisticated computer of its time. First use of computation simultaneous with input-output. Most complete complement of input-output capabilities (punched cards, punched paper tape, magnetic tape, parallel printer, typewriter, console).
- Oct. 1953: Atlas II delivered; forerunner of commercial ERA 1103 (Univac Scientific 1103). Model 2, delivered in November 1954, equipped with core memory instead of electrostatic store; first core memory computer delivered to customer in U.S.
- July 1957: First Bogart delivered. Believed to be first practical computer using magnetic (diode/core) logic in basic circuitry. Believed to be first computer to utilize design automation. Influenced design of several commercial models built by Univac and Control Data Corp.
- Mar. 1958: Solo delivered; first completely transistorized computer in U.S. Model for Philco's Transac S-1000 and forerunner of improved S-2000.
- June 1957: Lightning high-speed circuitry researches under way. Believed to be largest U.S. government computer research support. Influenced many commercial developments.
- Feb. 1962: Harvest delivered; most sophisticated model of Stretch series. The Tractor tape system was the first completely automated tape library. Influenced design of IBM System 360.



Announcing another new 6250 bpi tape transport...



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Engineering breakthroughs enable Telex to bring big computer storage and reliability to OEMs at a fraction of the size and cost.

The long-awaited 6250 bit-per-inch (bpi) tape drive for minicomputers is here.

The Telex Model 6250.

It offers minicomputer users nearly four times the tape capacity of the previous 1600 bpi drives. Yet it takes up only one-fourth the space and costs only about half as much as the worldwide accepted, big box 6250 bpi units Telex has supplied to IBM users for years.

The four-to-one size reduction wasn't easy.

It took three years and a whole new standard of design to pack all that technology in a 19-inch frame. Parts innovations. Creative placement of needed elements. New materials. All have led to a remarkable achievement in simplicity and reliability.

The machine meets all the stringent requirements of true high density, 0.3-inch inter-record gap recording in both read and write operations.

In addition, the drive:

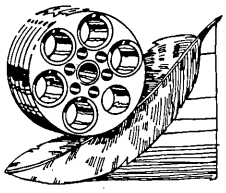
- Handles all three standard data formats—NRZI, PE and the new GCR.

- Runs reliably at speeds to 125 inches per second (models are also available at 45, 75 and 100 ips).
- Transfers data at the high speed of 781 kB per second (so off-loading can be done at nearly disk speeds).

- Rewinds a full 2400-foot tape reel in less than a minute. (That's 500 inches per second!)
- Reduces the complexity and cost of field maintenance (all work is done from the front).

Remarkable new capstan weighs only 1.9 grams.

To feel this Supr-Lite™ capstan is to believe its engineering achievement.



Not only does its lack of weight reduce inertia, it lets us use a smaller motor. Heat is reduced. Cooling blowers and hoses are eliminated.

Capstan walls are only 1/1000-inch thick, yet its patented manufacturing process assures strength, absolute roundness (and users a more consistent data rate).

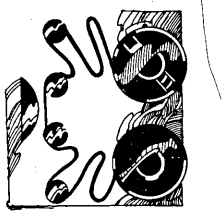
Telex tape path gets you up to speed in a hurry.

Perhaps the most dramatic example of how Telex miniaturized the 6250 is its patented tape path. The path is very compact, yet it retains four vacuum columns (just like big brother).

It brings new efficiencies in tape dynamics and reduces the length of tape required between head and primary vacuum columns.

Combined with our new capstan, friction and mass are cut down so much that the unit runs tape full speed forward to full speed reverse in a mere 0.13 inches (a new record).

Special vacuum buffers and fixed air bearings gently handle tape at the high program rates possible with short inter-record gap operation. They eliminate long spans of unsupported tape, thus avoiding harmful tape oscillations that can restrict programming.



And we're so confident of tape servo reliability that we covered up the tape path with the operator's panel (further reducing space requirements).

New controller/formatter handles up to eight drives.

It includes the same proven logic design as our big controller, only miniaturized to fit a 10 ½-inch-high, rack-mounted box. And it's flexible enough to intermix all four tape speeds and all three densities—800, 1600 and 6250 bpi—in the same subsystem.

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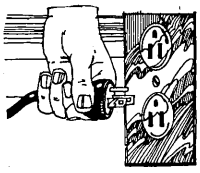
A common wall socket is all that's needed. And no special air conditioning. You can even operate it from a truck.

Design innovations with a goal of simplicity have enabled Telex to bring OEMs this remarkable new tape transport and controller. Large minicomputer users need this 6250 bpi mass storage capacity. Both dual density 800/1600 and 1600/6250 bpi models are available for 90 day delivery. Be the first to offer them.



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throughout, and to the surprise of many, even the Tractor tape transports turned out to be quite reliable." (The Tractor tape system is claimed by the report to be "the first completely automated tape library.")

Although no successors or commercial versions of the system were ever built, IBM, according to the report, did manage to get some succor for its efforts. Among the benefits chiefly accruing to IBM from the project were: logic technology which the company used in its 7000 series and later models; two microsecond core memories used in the firm's 7090 and other computers; and the Tractor tape system which the report contends "pioneered the use of error-correcting codes and deskewing buffers."

Lightning over drinks

Perhaps the most intriguing project the NSA engineers ever launched was Lightning. "Born at a cocktail party in July 1956," the project, "was one of the most costly as well as far-reaching research programs ever undertaken by NSA . . ."

During the course of the party recounted in the report, several high-level NSA equipment planners griped to the then-director of NSA, Lt. Gen. Ralph J. Canine, about their troubles with the agency's analysts who continually insisted on bigger and faster computers to meet their "insatiable" data demands. At that time the Harvest system, with its estimated 100-fold improvement over the best current computers, was already underway but several years downstream from completion, the report notes.

Gen. Canine, "exasperated" by this state of affairs, according to the report,

> "Dammit, I want you fellows to get the jump on those guys! Build me a thousand megacycle machine! I'll get the money!"

exploded, saying "Dammit, I want you fellows to get the jump on those guys! Build me a thousand megacycle machine! I'll get the money!" And apparently the gutsy general put his money where his mouth was, for within a few days of his outburst, the Lightning project was launched with a budget of $25 million for a five-year effort to come up with a thousand megacycle machine.

(Although ostensibly designed to operate at one-thousand million cycles per second, the machine, the report notes, would also rely on logic and systems improvements that would enable it to solve problems 1,000 times faster than the megacycle machines of that time.)

The Lightning project won backing at the highest levels of government (the Deputy Defense Secretary as well as the late President Eisenhower endorsed it.) The pioneering project pulled together innovative research work in key areas done by five major vendors—Univac, IBM, RCA, Philco and GE —and three universities, including MIT's Research Laboratory for Electronics.

Univac, which brainstormed magnetic film devices and circuits for the impressive project, is credited by the report with having developed "one of the earliest techniques for strip-line manufacture." The firm is also responsible, the report maintains, for "what may have been the first magnetic thin film content-addressed memory."

According to the report, "many areas of electronic data processing began to make use of Lightning's nanosecond techniques." As an example, the study cites the Univac 1107 which made use of thin film methods for fast memory. On an equally gushing note, the report praises the project, saying it "undoubtedly was responsible for inducing commercial firms to speed up their own advanced research efforts."

Counted on IBM

One commercial firm in particular that NSA apparently was counting on for more research rewards was IBM. Lightning-funded research at IBM was targeted toward the development of super-conducting films. When this financial support was dropped in 1961, IBM continued its cryogenic digging "although at a somewhat curtailed strength," the report reveals. But several years later, the company's highly touted Josephson Junction discovery prompted the antsy agency to contribute partial financial backing "to speed these developments," the report acknowledges.

It's not at all clear from the NSA report exactly what research funding, if any, is currently being doled out to industry vendors. Hedging on this issue, the report cryptically concludes: "It is generally agreed that the computer industry in the 1970s is approaching maturity. That is, the established leaders in the field are sufficiently secure that budgets for research can be supported for the most part without U.S. assistance."

—Linda Flato

Transportation

BART Going Distributed

The San Francisco Bay Area Rapid Transit (BART) District, heralded at its opening more than five years ago as the "first (metropolitan rail transit system) in the world to be completely automated," will replace its central computer facility with a distributed processing system coupled with a new communications system.

BART engineers, working with transportation specialists at the Univ. of California's Lawrence Berkeley Laboratory, will prepare specs for the computer system, while an as yet unselected group of communications consultants will cooperate with BART in the preliminary development of the data link. BART expects the proposals to go to bid within 18 months; the new system, estimated to cost between $10 and $20 million, should be online in four to five years, predicts M. H. Murphy, BART director of engineering.

"The central computer's role in controlling the transit system," explains Murphy, "often is misunderstood to be that of a central controller for the trains." Actually, it performs scheduling and smoothing, without controlling the movement of any train. Thirty-four controllers—one for each passenger station—run herd over the trains as they move from station to station.

Goodbye Westinghouse

A pair of Westinghouse Prodac 250 computers are to be replaced by the envisioned distributed system. In actuality, the Prodacs are old Xerox Sigma 2s, modified by Westinghouse. They masquerade behind Westinghouse nameplates, and exhibit a pronounced proclivity towards Westinghouse peripherals. Westinghouse equipment in the train detecting and tracking system will remain in place.

The data transmission system, DTS, will be redundant for reliability. It will incorporate the existing data acquisition system, which counts passengers entering the system through its automated turnstiles, and an alarm system for fire and security throughout the transit system. And, of course, it will link the planned distributed system.

BART recently got a demonstration of a fiber optic link supplied by Valtec Corp. of West Boylston, Mass. According to Valtec president James Godbey, the firm installed a 1.2 km link between two BART stations by lashing the noise-immune fiber cable onto an electrical line in the subway tunnel. The demo link carried color video signals; Godbey noted the cable's excess bandwidth could be used for data communications.

Murphy saw the demo and said the link performed well. He adds that BART was not ready to buy fiber optics because

there isn't enough experience in the field to provide good mean time between failure data. The price also presented a stumbling block, although Murphy says it may be competitive in two to three years when BART begins installation.

Price estimates

Computers for the distributed system are yet to be specified. Even the number of nodes in the system is not available; the only indication of the system's magnitude is the estimate that the communications system will cost between $7 and $8 million, with the rest of the budget going to computers (and, of course, programming, integration and implementation).

While the new system likely will include minis and micros, it's doubtful there will be a wide variety. BART currently uses about 14 different types of computers, which complicates maintenance, particularly of programs. So, the transit district wants to move toward a system-wide standard language. Again, it's too early to say what language will be selected.

The new system will be functionally similar to the existing system housed at BART's headquarters in Oakland. BART's 142 miles of track is broken down into roughly 1,500 blocks, ranging from 200 feet to 1,500 feet. Currently a status board shows segments of the system, comprising several blocks; if a train occupies a segment, that segment on the status board is lit. Today, with as many as 33 trains operating at any given time, the status board is almost continuously lit. Under the new system, occupancy by block information will be available at crt terminals. The status board may remain, but primarily for the sake of visitors.

Making headway

Currently, train movement is controlled by a system known as CABS—computer automated block system—which allows for only one train between each station at a given time. This results in a minimum headway (or spacing) between trains of six minutes. The new system, SORS—sequential occupancy release system—will allow headways of as little as three minutes by reducing the number of blocks required between trains.

Schedule smoothing will continue to be done in the new system as it is in the old: the scheduling computer can alter spacing between trains by having them wait in stations longer, or by changing the context in which on-train computer controllers interpret station controller speed commands. The station controllers issue commands to go at specific speed steps, while the on-board logic translates the steps into actual speeds according to the performance level assigned to the train by the scheduler. The scheduler can only change a train's performance level while it is stopped within a station.

—Bill Musgrave

International

The TV as a Terminal

Viewdata would enable British TV viewers to dial up data bases.

The newest British invention—a product called Viewdata—is now running about 18 months late, was developed long before any notions of market trials had crossed anyone's mind, and began as an attempt to evade the problem of designing a data service into a variant of the AT&T Picturephone.

Its origins lie in the British Post Office, that long nationalized telecommunications and postal service monopoly, which might seem an unlikely home for the most radical invention in consumer electronics since television itself.

Though a product like Viewdata has been possible for many years, it remains a fact that Sam Fedida of the Post Office's research department was the first actually to put it all down on paper, develop a commercially viable version and a working system, manage to stop those never-ending layers of Post Office management from unnecessarily complicating it (thereby keeping it low in cost and thus suitable for a mass market), communicate the excitement with which it was received upwards and thereby ensure that it would be seen through to a wide-scale commercial trial, which begins in June. And generally he kept the momentum going so that there now are some 25,000 pages of information up on Viewdata's computers, with 100,000 scheduled by the late spring.

The tv as a terminal

Put simply, Viewdata is an attempt to transform the home television receiver into a home information retrieval terminal and a home Telex-electronic mail system, using as many standard facilities as possible. However, when its market tests start next June, there will be less than 2,000 sets equipped to receive the service.

> All the tv set needs are additions; its circuitry does not have to be changed.

In its Telex role, Viewdata will be cross connected to the existing Telex network, adding a store and forward capability, and transforming the Telex system from 65,000 lines in the U.K. to a mass market text communication system.

In its information retrieval role, the information will be resident in computers placed within the Post Office's existing telecommunications network and will be accessed by the user through the existing local distribution network. Information the PO will make available is to be provided by Information Providers (IP's), not by the PO. These are outside companies who would sell data to a mass market, or Ministries and public bodies who wish to put out public announcements and who are willing to pay for it, and about 150 organizations—publishing houses and societies—who would provide Viewdata services or otherwise make commercial use of it.

This Information Provider formula, it is felt, will help Viewdata grow fast in acceptance. The Post Office would provide the lines, switching, and computer power and storage, all within the network. The outsiders would provide the data, formatting this data according to rules laid down by the PO and would be responsible for updating it, advertising it, and paying the PO to store it. In turn, they would be paid on an access basis: the greater the use, the greater the payment.

Modifications are added

In his early development work, Fedida who joined the PO in 1970 as manager of computer applications and R&D and who previously had been assistant director of research for English Electric, was aware that the standard tv receiver would require modification if it was to be used as a data terminal. It needed a modem and decoder circuits and I/O interfacing as well as a keyboard. But these are all additions; the tv set's circuitry did not itself have to be changed. As for the input device, the initial notion was to use the phone itself, but now a keypad is being considered.

Fedida also foresaw that within Viewdata there lay an embryonic electronic mail system for the mass market, and so provided a cross linkage facility into the Telex network in his design. And that is going to be implemented.

That opens an immense territory, not just access to the 65,000 Telex lines in the U.K. For Viewdata is a message communications facility on its own. Recently, a ceremonial transatlantic link demonstrating its use for the deaf was held. It is a conversational link, but what can apply for the deaf also can apply for those with all of their senses.

Five computers

Though developed on an HP 2100, Viewdata now is running on GEC 4080s, five of which have been ordered and are being installed. Designed originally for automatic plant control and process control applications, the GEC 4080 is a 16-bit, fast switch with a maximum core size of 1 megabyte. There are not many 4080s in use as yet, but those who have worked

with it say that surprisingly, the nearest comparable system is the PDP-11/70.

Viewdata software (CORAL/BABBAGE, with the GEC operating system written in CORAL) took about 20 man years to write. The Post Office's aim seems to be a maximum access time per page—or screenful of information—of two seconds, and an effective user population of 10 to 20 thousand terminals per system. But this will depend on where the various data bases are kept, the usage each gets, and the amount of swapping between systems. The Post Office intends to bring all data bases within reach of a local call, whether or not the data bases are situated within the caller's local area.

Content is the key

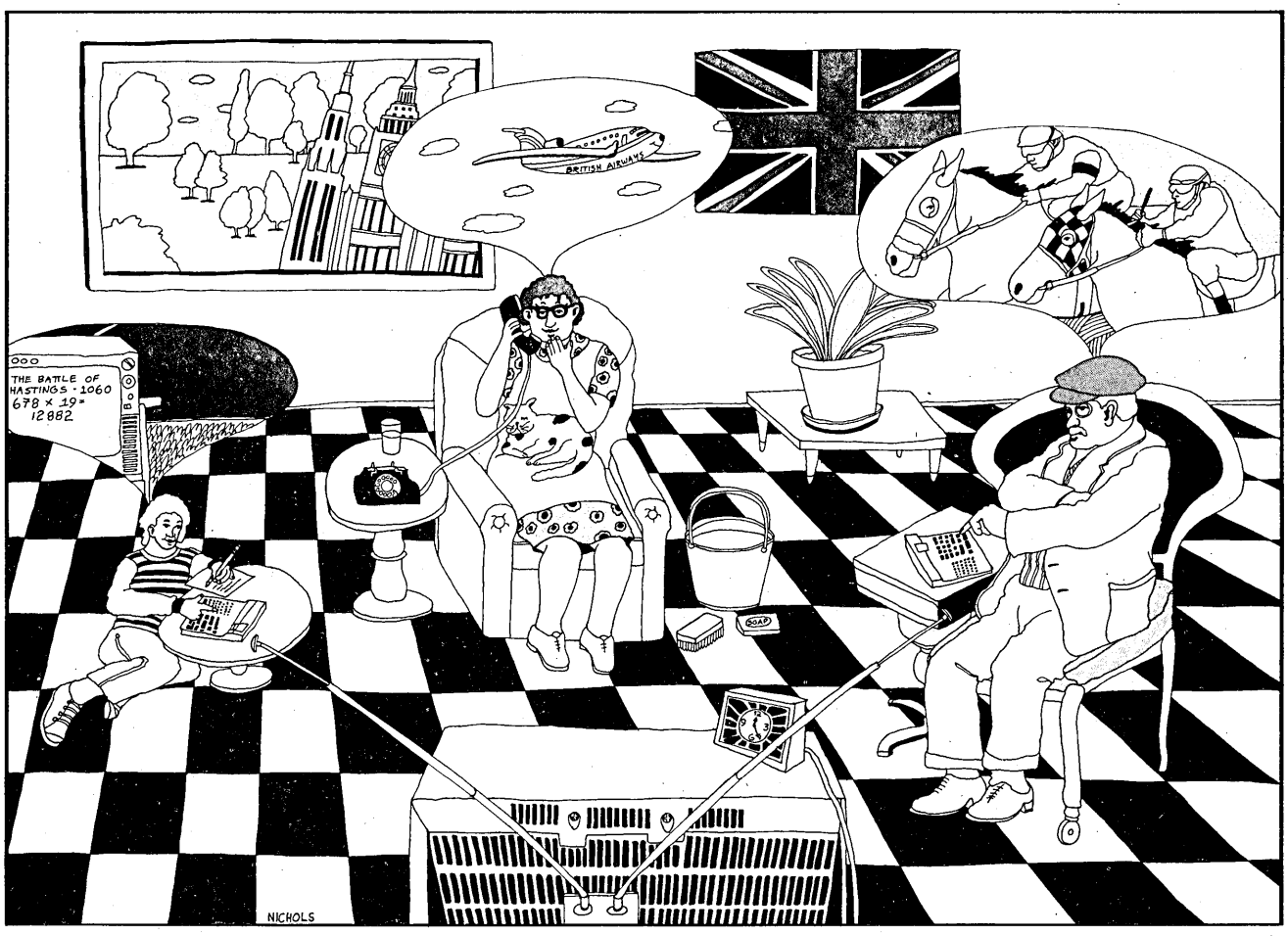
The rate at which Viewdata develops, of course, is going to be in large part dependent on the ingenuity of the IP's at producing data bases which a mass market will actually use. The variety of data bases already under construction is wide, and they include all of the obvious ones. Newspaper organizations are making use of their classified departments and their advertising gathering machinery to create a wide range of localized data bases. Among them are localized property market data bases enabling the user to look at houses by locality, price, and type; car sales data bases are being built on the same lines. Then there are the hotel, restaurant, and entertainment guides. And there are data bases which list all package tours available for use only by travel agents. These are data bases to which access will require membership of what is called a "closed user group," which obviously will pay premium rates. In the same market, and a threat to these travel agents, there is a data base of much wider appeal: it lists all British Airways flights and offerings, including holidays, and provides a facility to bypass travel agents, appealing directly to the public. As yet, it only is in the demonstration stage, but the implied threat is found in one line of each offering, which allows the would be purchaser to insert his charge card, confirm the booking, and have the purchase debited directly to his account.

One data base would help parents assist children doing homework.

Also under development are a number of encyclopedic data bases, including one geared to the examination syllabus that would provide answers for hard-pressed parents who almost every night are asked questions by their offspring—questions which they usually cannot answer adequately. Those should be worth a few million calls a week. And, of course, there are the betting data bases: the *Guinness Book of Records* is going up, and there is some quiet talk of someone preparing to put up the racing form book, giving the latest form, bloodline and results of all horses racing in the U.K. In a nation of gamblers, that has obvious appeal.

—Rex Malik

(British author and journalist Rex Malik is writing a second edition to his book, "And Tomorrow the World: Inside IBM.")



Europeans Entering U.S. Micro Market

Some leading European electrical and electronic groups are eyeing the microprocessor and microcomputer business, which so far has been exclusively a U.S. product. Some already have taken some small steps in that direction and others are looking for a way to become more than spectators.

The European computer industry—and its more knowledgeable users—are braced for what they consider will be the three most important micro technological developments in 1978:

—The announcement of single-chip 16-bit parallel microprocessors and microcomputers by the three giants of the LSI microprocessor industry—Intel, Motorola and Zilog—and the downward pressure this will exert on all 16-bit word minicomputer prices for the oem market;

—The anticipated announcements—partly as a reaction to the above to maintain their revenues—of 32-bit parallel maxicomputers similar to DEC's new VAX-11/78 by all the leading minicomputer manufacturers who have not yet done so, and the corresponding downward pressure that will exert on medium size general purpose mainframe prices;

—The technology and pricing structure that IBM announces for the anticipated E-series, which will be its reaction to the challenge of the 32-bit word maxis.

Good time to enter

In view of some of these developments, some European companies think that 1978 is a good year to jump in, because the relentless downward trend in microprocessor and microcomputer hardware prices is pressuring the revenues of all manufacturers in these markets. They must double delivery volumes every year just to maintain their revenues. And some of the smaller and weaker companies in California's "Silicon Valley" may run out of breath and R&D cash and begin looking for some rich European uncle short on up-to-date technological expertise.

Siemens set the pattern last fall by buying a minority interest in Advanced Micro Devices.

Siemens set the pattern last fall by buying a minority interest in Advanced Micro Devices and then formed a joint microprocessor development subsidiary with it, with offices in both California and Munich, West Germany. Ferranti, newly enriched with British National Enterprise Board capital, followed suit by acquiring Interdesign. And the British GEC group recruited no less a person than Geoffrey Cross, the former ICL managing director, and gave him authority to buy up promising U.S. microprocessor and minicomputer manufacturers.

Cross has not found (or has not publicly announced) a U.S. semiconductor manufacturer willing to join the British GEC fold, at this writing. And the tentative agreement to buy 25% of Modular Computer Systems (Modcomp) of Fort Lauderdale, Fla. (a company Cross had already had his eyes on when he was still ICL's boss) fell through. One reason for this abortive merger is that Arnold Weinstock, GEC chairman, is known for his intense dislike of minority participations, which he feels ties up GEC's capital without giving it any control. This is why he sold GEC's 18% stake in ICL to Plessey

VIEWDATA NO MORE COMPLICATED THAN A WASHING MACHINE

Protocols offered with Viewdata depart from other systems. Indeed, at this level it would be wiser to call them principles instead of protocols:

Data structure: simple hierarchic tree structure, seven levels with up to ten options at each point, so that at the seventh level one could be considering a million frames.

Information to the users: the system gives the minimum amount to the user at any one time, but always enough to start or move on. The user is always guided to his next action, the system never leaves him in the air.

All explanations are brief and simple and avoid jargon. All commands and presentations are consistent: the system must abide by the "law of least astonishment," computer responses must never be disconcerting.

Information is always presented in alphabetical or logical groupings.

The system is sympathetic to the user and tolerant of mistakes. Recovery is by the simplest possible method: go back to the last page using a standard key without having to remember what the last page was.

Lastly, there must be a provision for shortcuts, as the user becomes experienced. The shortcut mechanisms are also standard and simple.

Some limitations

Summed up, what you have is a system which, as seen by the user, never gets more complicated than operating a standard washing machine. Now all this might seem obvious in a mass market system, but it was not. Fot it has to be faced that the standard tv receiver has limitations. And, just to complicate matters, more were to be built in. Probably the most important came from the need to make Viewdata Teletext compatible.

Teletext is a broadcast news system using spare lines in a tv broadcast, its output appearing on a tv screen in alphanumeric form. It is used for news, stockmarket reports, weather, and similar information. International standards have been agreed on, and those standards set 40 characters to the line. On a 625-line system, using the U.K. standard 26-inch tv screen, this gives quite sharp character resolution, and a reasonable size text when seen at a normal viewing distance. However it only gives 40 characters to the line, which may well be a little restrictive in message transmission mode, particularly when the business letter standard, which arises more from usage and habit than from international agreement, is 80 characters to the line.

This is one starting limitation. Another is to be found in the graphics capability, which is limited. Viewdata provides seven color options, a character flashing capability, and upper and lower case alphanumerics. However, in graphics mode, hidden control characters are a restriction on the ability to use the full screen. Diagonal lines or curves can be achieved only by a succession of stepped squares, and it is not possible to use different colors within the same box. A blank must be left between each color change.

How they're solved

These problems are solvable: the PO and the tv industry are known to be working on a Viewdata Mark II tv receiver, a 1,000-line set which on current expectations will not be on the market until well into the 'eighties. Before then, however, there are expectations of upgrades of the existing set, with provision being made for a built-in cassette recorder, to take pages off and rerun them at leisure, and for plain paper output. That is going to be based on an optical printer on which much work has been done both by the PO and the industry, particularly GEC. The current talk is that the printer addition will add somewhere between $50 and $100 to the retail price of a set.

The PO too has long moved away from the use of the telephone dial for input. The IP's will get a full keyboard, the public a keypad which looks very much like a standard Hewlett-Packard calculator. It will be either infrared or acoustic coupled, and will have numerics and control buttons: the alpha arrangement has not yet been fully finalized, at least for the mass market.

ENHANCING IS OUR

H-P 3000 USERS: ONE BIG TELEFILE DISK DRIVE DOES THE WORK OF FIVE SMALL ONES.

The Hewlett-Packard 3000 is so powerful that people have trouble positioning it.

Is it a mainframe or a mini?

It's sold against other minis, with little disk drives. But talk to the users—especially those who have come to Telefile for big disk system enhancements.

They think of their H-P 3000's as mainframes.

One 300-megabyte Matchmaker drive does the work of five little ones from H-P, therefore uses about one-fifth the floor space. Less power and fewer spares are needed.

At comparable low storage capacities, Telefile systems cost less than half that of H-P. But as needs grow, the savings increase dramatically:

A Telefile four-300MB-drive system is priced at $82,500. It would take 18 drives, a very large room, and a check for $240,000 to get that same capacity from H-P. Your direct savings: $157,500!

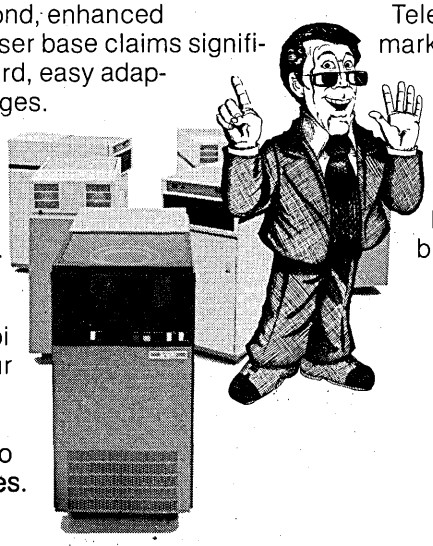
And that's not considering real estate. Or the dramatic performance advantages our users claim through Telefile's "virtual transparency"—proprietary software drivers that bring additional power without disturbing any H-P systems software or user application software.

There are several advantages: First, no operator retraining or surprises. Second, enhanced performance (our growing user base claims significant improvements). And third, easy adaptation to future system changes.

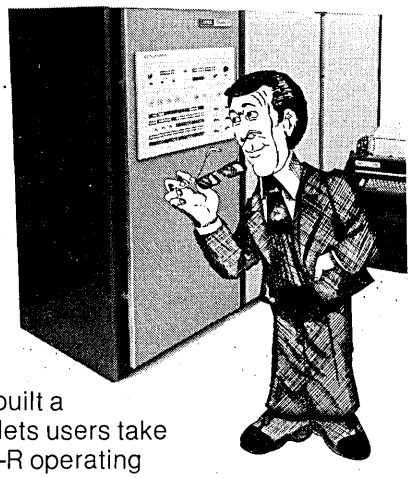
A copy of our white paper on virtual transparency will bring you up to speed on the subject. Write for it.

And speaking of speed . . . we can now back up your 300MB disks with the latest in high density 1600/6250 bpi tape drives. It's all part of our new Matchmaker I—mass storage systems that match virtually any minicomputer to the latest disk and tape drives.

CIRCLE 167 ON READER CARD



REMEMBER THE OLD SIGMA 5'S, 6'S & 7'S? THEY ARE NO LONGER LIMITED BY MEMORY.



Sigma machines are classic cases of what Telefile does when it sets out to enhance computers.

All three computers—designed by Palevsky's whiz kids at SDS—handle scientific problems with ease. Now, thanks to work done by Telefile, they're far more powerful than either SDS or Xerox ever intended.

Take the Sigma 5.

First, we designed and built a special memory map that lets users take advantage of CP-V and CP-R operating systems—still deemed the best in the world by Datapro survey.

When an Ohio user brought up their mapped Sigma 5 under CP-R, they found that it actually outperformed an adjacent, supposedly more powerful Sigma 7!

Originally, all three Sigma machines were saddled with a memory capacity of 128K words.

No longer.

Telefile now offers users of these computers a remarkable upward growth path without changing CPU's. It's a simple modification that allows memory capacity of Sigma 5's to grow to 512K words. Sigma 6's and 7's can grow all the way to 1024K words. That's a four- to eight-fold improvement!

Further reason why Xerox users look to Telefile to bring a longer, fuller life to their computers.

CIRCLE 168 ON READER CARD

Telefile

Telefile Computer Products, Inc.,
17131 Daimler St., Irvine, CA 92714, 714/557-6660

COMPUTERS BUSINESS.

FILLING THE UNIVAC-UUM. TELEFILE MEMORY BOOSTS 1108 SYSTEM THROUGHPUT BY OVER 25%.

When Telefile announced compatible, multi-modular core memory for Univac computers last year, we knew that it took only one-third the floor space, used 70 percent less power and cost only about half of that it would replace.

But it took an installation of nearly half a million words before the first real performance results came in.

They showed an overall *system throughput* improvement of some 30 percent!

Part of this was due to reduced access time from 1500 nanoseconds to 750 nanoseconds compared to the older Univac memory it replaced.

The rest was due to Telefile's interleaving capability between memory increments which effectively redoubled the speed of memory operation.

And that's not all. Service technicians claim that Telefile's modular system design drastically cuts maintenance time. Faults can be easily pinpointed and memory subassemblies quickly replaced.

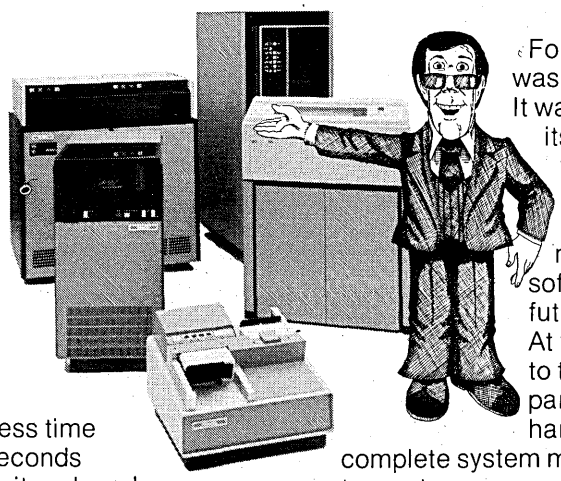
Telefile currently offers both multi-modular memory for Univac 494, 1106, 1108 and 1110 processors; and unitized memory for 1100, 1100/40 and 1106 processors.

And coming down the line is the most flexible mass storage facility Univac users have ever seen.

Enhancing an already great computer is what we do best.

CIRCLE 169 ON READER CARD

TELEFILE FILLS XEROX VOID. INTRODUCES OVER 20 NEW PRODUCTS SINCE BLACK MONDAY.



For Xerox users, Black Monday was July 21, 1975.

It was the day Xerox announced its withdrawal from the mainframe computer business.

Users were left with great computers, an investment in the world's best software, and an uncertain future.

At the time, Telefile announced to the world that it was prepared to "fill the void" with new hardware, software support, complete system maintenance—even total new computer systems.

Since then, Telefile has nearly tripled in size by rolling up our sleeves and rolling out the products.

To an existing array of eight Xerox-compatible products we added over 20 more.

Compact main memory, high speed printers, communication processors, solid state RAD's, array processors, Winchester-based mass store facilities, state-of-the-art consoles. And on and on.

Most represent powerful performance and cost advantages over the Xerox units they replace. All are *available.*

And now Telefile is taking the next logical step:

We're going right to the heart of the system by introducing—in 1978—a complete family of 32-bit computers designed to run all Xerox user software. Some models will outperform the fastest Sigma 9 four to one. That's **computer enhancement.**

CIRCLE 170 ON READER CARD

Please send me information as follows:

☐ Telefile . . . and the Computer Enhancement Industry ☐ Virtual Transparency White Paper ☐ Matchmaker Disk Pack Drives ☐ Matchmaker Mass Storage Systems for the H-P 3000 ☐ Main Memory for Univac Computers ☐ Enhanced Computers from Telefile ☐ Telefile's Xerox-Compatible Products ☐ Matchmaker Disk Systems for _____ minicomputer.

Name_____

Co./Inst._____

Address_____

City_____ State_____ Zip_____

and the British National Enterprise Board two years ago.

British observers feel, therefore, that he first agreed to the 25% stake in Modcomp only as an initial step to later majority control when Modcomp needed still more development capital. Perhaps this intention saved the Modcomp deal. Modcomp said its own improved financial condition changed its mind, and a joint European marketing venture was still being discussed.

Philips next

British and German groups flaunt their checkbooks in the U.S., and one feels that the giant multinational Philips of the Netherlands will not remain inactive. Philips already is well established on the North American market with its subsidiary Norelco, which among other things developed Philips' word processing system. The Italian Olivetti group was also rumored at one time to be negotiating to buy Microdata, although

If French elections fail to give the Left a working majority, CGE and Thomson-CSF may join the buying spree on the U.S. West Coast.

that ended with no more than an oem agreement to buy Microdata "Express" systems for marketing in Europe.

This leaves only the two large French groups CGE and Thomson-CSF. They are unlikely to move before the French legislative elections on March 21, as both are part of the French Left's common program for nationalization. But if the French elections fail to give the Left a working majority, both groups may join the buying spree on the U.S. West Coast. CGE especially wants to develop a microelectronic capability equal to Thomson-CSF's Sescosem, and a minicomputer capability matching the Thomson-CSF majority controlled SEMS.

ICL, which has operated a U.S. plant at Utica, N.Y., for nearly a full year, has big plans for the 1500 desktop intelligent terminal built at Utica. Confined under the old Singer management to the role of source data entry device, the 1500 is to be developed by ICL into a full-blown free-standing personal computer, to compete on all fronts with Datapoint's 2200, 5500 and 6600, as well as with the new IBM 5110.

Why pour in money?

Some observers wonder, though, whether it helps to pump a lot of European capital into U.S. plants and small companies? Won't that just serve to accelerate the U.S. lead?

ICL, Siemens, Ferranti, and GEC hope to emulate IBM's well balanced act. The giant's U.S. market share, profits, and employment have not suffered from the activities of its extensive European research and production facilities. Quite the contrary. The cross fertilization between the best American and European design concepts have helped it dominate both these markets more effectively.

Hence, ICL contributes a versatile intelligent terminal and small computer to ICL's product range in Europe, and eventually its light sales offices should be hawking the British made 2903/2904 range (and perhaps large 2900's) around the U.S.

Siemens already has established a joint microprocessor development company with AMD, which will act as a two-way channel of ideas and design concepts between Munich and "Silicon Valley," and introduce an element of originality into Siemens semiconductor output. (Hitherto it was based wholly on Intel licenses.) Ferranti is adding Interdesign chip models to its own component range, while using Interdesign as a launching pad into the U.S. semiconductor market for its own Uncommitted Logic Array (ULA). This is a standard logic device whose special application is only determined in the final collector diffusion isolation (CDI) manufacturing process.

This concerted expansion policy by the British and German computer manufacturers is only one aspect of a much more aggressive marketing effort in the minicomputer market. Siemens, Ferranti and GEC until recently had built minicomputers primarily for use in turnkey automation systems designed and built by their own systems applications subsidiaries. The same largely was true of the two

ICL has big plans for the model 1500 desktop intelligent terminal . . .

French minicomputer manufacturers (CII and Telemecanique Informatique) who merged last year to form SEMS. All these companies also have decided to compete aggressively in both the minicomputer oem and small business computer markets, as has CII-Honeywell Bull, with the Mini-6 (its label for the Honeywell Level 6).

Hard on small firms

The marketing drive by these powerful European groups is unlikely to impact substantially the established European market share of the U.S. leaders, DEC, Data General, and Hewlett-Packard. But it will make it much harder for the smaller U.S. and European minicomputer firms to maintain themselves on the market, unless they too join a more powerful U.S. or European based group. Some shaking out already has occurred. A year ago Varian Data Machines bought up Krantz Computer in West Germany shortly before being itself sold to Univac. Modcomp may be shored up by a joint marketing venture with GEC. But big question marks still hang over the European operations of General Automation, Computer Automation, Cincinnati Milacron, Britian's Computer Technology, and Digico, not to mention France's Intertechnique which has only just broken from Microdata.

Lowered IBM umbrella

For all the competitive turmoil on the minicomputer and microprocessor front, the European mainframe industry and market will not remain inactive either. Like U.S. mainframers, the European manufacturers currently are reexamining anxiously the impact of the lowering IBM price umbrella on their anticipated revenues and profits, and as one wag put it

The marketing drive by powerful European groups is unlikely to impact substantially the established European market share of U.S. leaders.

"moving the decimal point in their profit forecasts one position to the left."

It will be a particularly anxious year for ICL, despite its record revenues and profits last year, and its continuing successes on the business mini front. Time is running out on the large 2900 systems. If ICL cannot get the VME/B and VME/K operating systems to work efficiently before the end of the year, and give good time-sharing and/or transaction processing throughputs concurrently with batch processing, the large 2900s (announced more than three years ago) will lose all credibility, and the current trickle of large 1900 and System 4 private users deserting the ICL fold will turn into a flood.

ICL should also bring the 2950's smaller and bigger brothers—S2 and S3—to market this year, but under the guidance of Ed Mack, ICL's director of product development, there should be less difficulty in this, and it will produce a much needed cut in medium size processor production costs.

CII-Honeywell Bull has yet to release a credible operating system for its Level 64 medium size computer. GCOS 64 Set 1 has been a real memory operating system with multiprogramming facilities little more powerful than IBM's DOS and resembling the larger GCOS 66 in no more than

its job command language. By June, however, CII-HB hopes to release GCOS 64 Set 2, which should offer the same flexible virtual memory multiprogramming facilities for up to 60 jobs as the larger GCOS 66, in all but interactive time-sharing.

This also is the year when CII-HB must freeze the technology that it will use on its 1979 production lines for both P7G—or Level 64 Mark II—and the larger Level 66 processors that it will start manufacturing itself this year.

After the French legislative elections on March 21, some behind the scenes talks may also begin on CII-HB's proposals for European mainframe cooperation, but we are unlikely to hear anything public about them this year. For the European mainframe industry, as for many U.S.-based mainframers, the moment of truth will come when IBM announces its H series in 1980.

—Fred Lamond

(Mr. Lamond is European editor for Auerbach Publishers, Inc. and a contributing editor to DATAMATION *International. He lives near London.)*

Companies

Perkin-Elmer's 'One Vendor' Approach

It may not rank with some of the older, bigger and better known computer concerns yet, but Perkin-Elmer Data Systems is making a concerted effort to emerge as one of the major powers in the dp marketplace.

That's right, Perkin-Elmer Data Systems. The group, which recently entered the business systems market in a big way with the announcement of the Interdata 700 and 800 Business Systems, now encompasses four divisions and currently generates some $100 million plus in annual revenues.

Even so, Data Systems is still a babe in the woods as business entities go. For all practical purposes, it was conceived in 1974 when Interdata, the minicomputer manufacturer, was acquired by Perkin-Elmer, a big (currently $430 million in revenues) Norwalk, Conn., based corporation that manufactures technology based products such as analytical instruments. Some say it took its cue from another big analytical instrumentation manufacturer, Hewlett-Packard, which had become a ranking minicomputer manufacturer.

In retrospect the deal seems to have worked out well for both concerns. P-E likes the fact that Interdata fits well with the company's other high technology groups while affording a solid foothold in the lucrative small- and medium-size systems market.

Improved financially

And Interdata benefited as well. "We became part of a 'Fortune 500' company which strengthened our image," says Daniel Sinnott, who headed Interdata and now runs the Data Systems group as a P-E senior vice president. "In addition, our financial situation was improved at a time when money was growing tighter and tighter."

Despite the success of the Interdata deal, however, P-E began looking around for other acquisitions to strengthen its dp capabilities. The idea was to become a total systems vendor from whom oem and end-user customers could obtain minis as well as all their peripherals and software and service. "We always had a desire and mandate to think in terms of building a complete entity to serve the information processing industry," Sinnott explains.

Shopping around

In shopping around P-E came across a concern in northern New Jersey that manufactured I/O devices and a 30 character per second printer. Neither the company nor its product line were necessarily anything to write home about, but P-E executives saw a high quality, less expensive version of the 30 character printer in the firm's engineering lab. Impressed, they in effect acquired the company to obtain the product. The company became P-E's terminal division and the product served as the basis for P-E's carousel line of printers, one of its more successful products.

DANIEL SINNOTT
"We weren't interested in fire sales"

Wangco acquisition

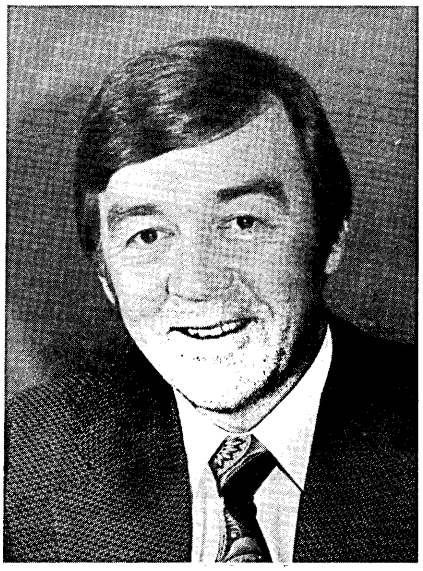
A more ambitious acquisition was the 1976 purchase of Wangco. Founded in 1969 by Dr. Ben C. Wang, Wangco had emerged as a leading producer of mass storage devices such as magnetic tape, cartridge disc, and floppy disc systems. Moreover, it seemed to fit P-E's buying criteria. "We were looking for a proven product line and a profitable company with an on-going management structure," says Sinnott. "We weren't interested in fire sales." The acquisition price was about $20 million.

> "Our financial situation was improved at a time when money was growing tighter and tighter."

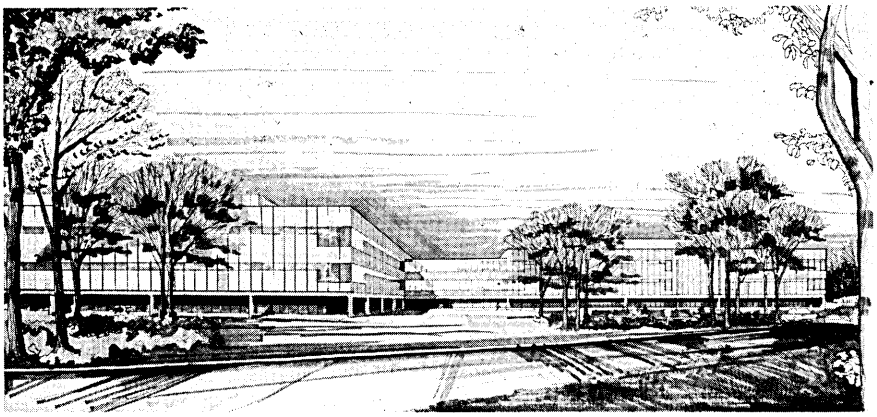
With Wangco in the fold to provide mass storage devices, Interdata supplying the computers, and the terminals group gearing up to manufacture crt's as well as printers, and the establishment of a separate sales and service organization, P-E had the framework in place to become a total systems supplier

Consequently in 1976 it officially formed the Data Systems group and a

JAMES BRUNO
He straightened out problems at Wangco in Los Angeles



DONALD M. DECKER
He heads flourishing Interdata division



NEW HEADQUARTERS: Architect's rendering of Perkin-Elmer Data Systems' headquarters complex to be built in Neptune, N.J. The 200,000 sq. ft. facility will be completed by mid-1979.

year later took the "one vendor" approach public at the National Computer Conference. For the first time, products from all three of its principal business units were displayed together under the P-E banner.

Problems developed

But as P-E soon discovered, forming a single business entity out of divergent operations was not simply a matter of giving all three the same name. Problems developed. The terminals operation didn't really understand Interdata's problems and was having difficulties coming up with the high quality, easy to use crt's Interdata required. Consequently James Folts, an Interdata product manager, was brought over to run the group. Within six months, the terminals unit had two new crt's—the interactive, low-cost 1100, and the OWL-1200 editing terminal—in production.

More serious concerns persisted at Wangco. A number of Wangco's competitors thought the new affiliation with Interdata would jeopardize Wangco's oem business with Interdata competitors like Modcomp. "They were licking their chops," says Sinnott, "but we haven't lost a single oem customer yet."

At the same time Wangco which had been experiencing a rapid growth ran into production problems. Shipping dates slipped and quality wasn't always what it should be, P-E executives admit. Consequently P-E Data Systems deputy manager James Bruno, whom Sinnott describes as a "great day-to-day manager," was sent out to Wangco's Los Angeles headquarters to help straighten the operation out. After three months Bruno felt the production and controls-related problems were fairly well under control. However, former General Instrument Corp. executive Sal Intagliata was brought in to run the group so that Bruno could return to his larger responsibility of riding herd over all three Data Systems operations as Sinnott's number two man. "We've got to get these companies to look more and more alike and do things in a more consistent fashion," says Bruno. "Contributing toward an overall goal pervades everything we do."

Interdata flourishes

Meanwhile, Interdata, now headed up by Donald M. Decker, a Univac and Control Data alumnus, seems to be flourishing. Sales for the group were up 50% last year and the addition of the 32-bit business systems, which are based on the model 7/32 and 8/32 processors, expand P-E's market opportunities beyond the scientific, simulation and oem field the firm had focused on in the past.

> "We've got to get these companies to look more and more alike and do things in a more consistent fashion."

Geared toward big users who want to add on to their internal dp capabilities in the distributed mode, the systems go for from $141,434 to $177,929 and can be expanded up to one million bytes of memory, while supporting as many as 32 crt's, eight 80MB disc drives or eight 300MB disc drives, and six tape drives.

The key question at Data Systems, however, is not reliability of an individual product, but whether the whole—P-E Data Systems—will add up to more than the sum of its parts. P-E corporate is betting heavily the answer is yes.

—Laton McCartney

Litigation

David vs. Goliath

MCI court victory may open lucrative market to special carriers.

MCI Communications, Inc., may have done for the specialized carriers what the 1968 Carterfone decision did for independent terminal makers—give the carriers a foothold in AT&T's vast and lucrative dial-up switched telephone market.

In late February, MCI was flush from a Supreme Court victory the month before but still awaited a ruling by the Federal Communications Commission over whether the telephone company must provide the company's Execunet service with local loop connections.

MCI has been offering Execunet service under a stay, imposed by the federal appeals court in Washington, D.C., which bars the company from signing up new customers. Last summer, the court decided this restriction was illegal and in January the Supreme Court declined to review the decision. The upshot: MCI, along with Southern Pacific—which has proposed a similar service called Sprint V—is now on the threshold of gaining that foothold in the telephone market.

AT&T said it's not obligated to supply any specialized carrier with the local loop connections and asked the FCC to endorse this position by issuing a declatory ruling. That ruling was expected by the end of February or early March.

Foothold for the carriers

An informed observer guessed that the request will be denied—that the specialized carriers will gain their foothold in the dial-up market, but that they'll be barred from expanding further. Specifically, MCI and Southern Pacific will be allowed to market their new services in the cities where they now have "section 214" authority, but not in additional cities—at least not until the FCC has conducted a lengthy investigation. (Section 214 of the Communications Act confers authority on the commission to allow a carrier to install the facilities for a new service offering, but not to offer the service commercially. That requires submission of a tariff, which is considered subsequently.)

> MCI could market Execunet in 18 cities and SP could offer Sprint V in 43 cities.

Under this scheme, MCI could market Execunet in 18 cities, while SP could offer Sprint V in 43 cities. All of the nation's major metropolises, with the exception of Seattle and Miami, would be connected to one or both services.

FCC position

Charles D. Ferris, the new FCC chairman, indicated that the controversy would be resolved along these lines in a letter to Rep. Lionel Van Deerlin of California, which was sent shortly after the Supreme Court declined to review last summer's Execunet decision by the court of appeals. Said Ferris: "MCI and other specialized carriers are now free, pursuant to the court's ruling, to use their established facilities to offer existing services or to introduce new services which are competitive with public message telephone services. Prior to authorizing additional facilities for any carrier, however, the commission must conduct an appropriate hearing or rule-making to determine what limitations, if any, the public interest requires concerning future service offerings of expansion."

Although Execunet principally is a voice communications service, about 10% of MCI's 9,000 customers use it for

data communications, says the company's senior vice president, Bert Roberts. In most cases, this latter traffic consists of message transmission at speeds up to 1200 bps. There are "no plans" to modify Execunet to attract additional data communications customers, Roberts added, but once the current legal hassle at the commission is resolved, Execunet will "lay the basis" for additional MCI services, using local telephone access lines that are designed specifically for non-voice applications.

Among the possibilities Roberts specifically mentioned were conditioned lines permitting communication among facsimile and other kinds of terminals at speeds higher that 1200 bps and a "degraded" service that would offer the user lower rates in exchange for "some" increased probability of encountering a busy signal.

Its life at stake

Execunet accounts for about 40% of MCI's revenue, Roberts said. He indicated the company's future existence is riding on the outcome of the current battle with Ma Bell and her sister carriers. That helps to explain why the case went all the way to the Supreme Court and why some 13 parties, including the Dept. of Justice, have filed comments at the FCC regarding AT&T's recent request for permission to deny local loops.

Execunet, and Southern Pacific's competing Sprint V service, each consist of a dial-up access line, connecting the customer's premises to a shared inter-city private line trunk that terminates in one or more remote local exchanges. The customer can call, or be called by, any telephone in a distant exchange to which he is connected.

> Execunet and Sprint V circuits are shared and thus considerably cheaper than equivalent dial-up service.

MCI charges 25–35 cents for each minute of Execunet usage, plus an additional amount for access that averages about 15% of the monthly usage charge. The customer must pay a minimum of $75/month, even if his usage and access charges are less. Southern Pacific's proposed rate for Spring V (the tariff hasn't yet been accepted by the FCC) is 20.2 cents for a minute plus 1.3 cents for each 100 circuit miles up to 700 miles. Beyond that distance, the mileage charge increases .35 cents for each 100 miles. That's the rate schedule during regular business hours. There are substantial reductions for nighttime and weekend use. The minimum charge is $60 a month.

Cheaper than WATS

Since Execunet and Sprint V circuits are shared, they're considerably cheaper than equivalent dial-up services. And in many cases, they're more economical than the telephone company's F-X or WATS offerings.

Roberts says an F-X user who has to communicate more than 15–20 hours a month with a city at least 300 miles away probably would save money if he switched to Execunet. Roberts added that Execunet usage charges are lower than those for MT (Measured Time) WATS. Thus, the customer "probably will save money by taking our service if all or most of his communication is with the 18 cities where MCI offers Execunet service."

If MCI can't lease additional local loops, however, it will be unable to sign up more than a handful of new Execunet customers. AT&T is defending its right to deny those connections on the basis of: a) a series of FCC decisions and related court cases which determined what interconnection facilities Bell must provide to "other common carriers" like MCI; b)

section 201a of the Communications Act. It requires interconnection between carriers only after the commission has held a public hearing and has determined that such linkages are in the public interest. The phone company argues that no such hearing has been held, and furthermore that the FCC decisions and court cases which defined AT&T's present interconnection obligations were concerned solely with private line service, not message telephone service.

The FCC took a somewhat similar position in 1975, when it declared Execunet was illegal. The commission's key point was that, in authorizing MCI to become a specialized common carrier, it had never granted the company permission to offer anything but private line service.

> Allowing MCI and other specialized carriers to offer competing MTS services will have no measurable affect on AT&T revenues for a considerable time.

Issue of public interest

But last summer, the U.S. Court of Appeals rejected this line of reasoning, pointing out that the Communications Act requires the commission to limit or deny a proposed communications service only if it has determined beforehand such action is in the public interest. "The commission has not so far determined that the public interest would be served by creating a monopoly in the interstate MTS (message telephone service) field," the court added; therefore, the FCC's denial of Execunet, which would help continue the monopoly, was ruled illegal.

AT&T, in its recent petition to the commission for ruling, insists it is not bucking the appeals court decision by refusing to lease additional Execunet local loops. The phone company reads the court decision to mean that the FCC must "consider" interconnection, rather than automatically order provision of these facilities, and this consideration must follow the rules specified in Section 201a of the Communications Act.

The Justice Department, along with the specialized carriers, takes a somewhat different view.

"In essence, the court of appeals ruled that the FCC may not lawfully restrict specialized carriers, including MCI, to providing only 'private line' services," said Justice. However, the AT&T petition "asks the commission to endorse the view that (Bell) has a de jure monopoly of intercity service and therefore AT&T should be permitted . . . to deny competing carriers access to essential local loop distribution facilities . . . to preserve its monopoly position."

No affect on revenues

Calling the telephone company's request for a declaratory ruling a "transparent attempt to preserve the status quo," Justice contended that allowing MCI and other specialized carriers to offer competing MTS services will have "no measurable effect on AT&T revenues for a considerable time" because the market is growing more than 10% a year.

AT&T has based much of its opposition to Execunet on this loss-of-revenue argument. Ironically, the 10% annual growth figure mentioned in the Justice Dept. statement came from a speech given last January by AT&T vice president William M. Ellinghaus.

"For over 20 years," the department added, "predictions of . . . cataclysmic harms . . . have been advanced . . . by the telephone industry . . . in the aftermath of virtually every pro-competitive ruling by the commission and the courts. There is no evidence that introduction of competition has caused either a deterioration of service or an increase in rates to any class of customers."

—Phil Hirsch

(Mr. Hirsch, a free-lance writer, covers communications related events for this magazine.)

Government

How DP Sharing Works

Bureau of Labor Statistics does work promptly, cuts costs.

Sharing of any kind doesn't come easy in the federal government which often seems straightjacketed by its own self-serving bureaucratic fiefdoms. This is especially true when it comes to computer consolidation where agencies get together and pool hardware, software, and even staffs for mutually beneficial results. Very few such computer combines have been set up by the feds, despite the fact that Congress has encouraged them.

The Brooks Bill (Public Law 89-306) in particular calls for joint use of equipment by two or more federal agencies and for the operation of equipment pools and adp centers. But most agencies have clung tenaciously to their own in-house systems. One exception is the Dept. of Labor's Bureau of Labor Statistics which has a cozy adp alliance with the National Institutes of Health.

As part of a department-wide dp consolidation drive in the late '60s. BLS turned over its burgeoning processing chores to an IBM 360/65 at the Labor Dept. and also gave the department its computer, an IBM 7074. But it also began looking for more suitable alternatives to the business dp environment of the Labor Dept.'s computer center and found it at the NIH.

"Having a computer sucks you into all kinds of distractions," Mendelssohn says.

NIH, with its scientifically oriented computer center powered by a set of multiprocessor IBM 370/168s, seemed a perfect match for the BLS scientific research requirements. So in 1970 the two organizations teamed up, but it wasn't until 1975 that an interagency agreement to share facilities and techniques formalized the time-sharing link-up.

Fortuitous move

Rudolph C. Mendelssohn, assistant commissioner for systems and standards at BLS, believes the NIH move was for-

RUDOLPH C. MENDELSSOHN
He was the happiest guy around when he got rid of computers.

tuitous. "Having a computer," he insists, "sucks you into all kinds of distractions. We had our own computers for a long time and I was the happiest guy around when we got rid of them."

Mendelssohn, who's been with BLS since 1940, has been immersed in the bureau's dp doings for the last 11 years. Getting rid of the computer, he explains, gave the bureau "psychological freedom" which allowed it to evaluate which outside services—federal or commercial—would give it the best deal.

"If you have your own machine, you have an emotional investment in it," he argues. "You're proud that you have a computer and you want to support it and all that. When you don't have a computer, you're relieved of that heavy emotional commitment and you can look at things objectively and decide what is best in terms of the services needed."

Churning out reams of labor-related statistical information, BLS has special adp service needs which call for both business and scientific data processing. Mendelssohn says the bureau "has the worst of these two worlds—we have a lot of data going in, a lot of number crunching, and a lot of data coming out."

MENDELSSOHN, left, reviews figures compiled through the bureau's LABSTAT system, a data base that functions as a repository for all current and historical data.

Split budget

The bureau's $7 million computer services budget is split three ways, 72% going to NIH, 25% to DOL and the remaining 3% shelled out to outside commercial service firms. (In the late '60 s when BLS first experimented with terminals mainly to do economic and statistical analysis, it used IBM's service bureau for a year.)

BLS started out using the mighty NIH computer center as a research tool. But the more the BLSers used the NIH facility, "the more we realized how powerful it was and that it could be used for both research and production," Mendelssohn says. It uses the NIH mainframes at night to do its huge number-crunching chores. All BLS research, program testing, and debugging as well as some smaller production jobs are done during the day on the NIH machines. (BLS processing represents about 20% of the institute's dp workload.)

The DOL dp center handles the remaining BLS production work. These production tasks, Mendelssohn points out, "are constantly being evaluated to see whether they should be moved to NIH." This evaluation process, he says, has been

going on for several years and has resulted in more and more of the production workload being transferred from DOL to NIH.

As part of this processing shift, BLS seven months ago moved its massive processing task on monthly occupational wage data over to the NIH computers. The Consumer Price Index was also sent over to NIH last month. Hoping to hand over the bulk of its production work to the institute, the statistical bureau would like to see NIH tackling all these jobs, with the exception of two specialized production projects that the DOL center will continue to handle.

There are approximately 25 of these major production systems which are used to compile statistics that allow analysts to monitor the performance of the U.S. economy. These systems, according to Mendelssohn, "take data from the outside world—from such places as business establishments, manufacturing plants, and retail stores all around the country—and compile various statistics." Each one of these systems may also have 10 to 30 programs of its own.

Monthly reports

The resulting statistics are usually compiled on a monthly basis. One example is the monthly employment survey which provides figures on the number of workers in various industries, along with their weekly and hourly earnings. One of the leading economic indicators, the Consumer Price Index, is another important statistical product which comes out every month. Used to track inflation, the CPI represents the prices paid by consumers for a fixed market basket of goods.

Most of the BLS production systems that create all these summary industry statistics have been designed, Mendelssohn explains, "so that the end product, which is the current month statistics, can be dropped into our data base." That data base, called LABSTAT, functions as a repository for all current and historical data.

This new system, an outgrowth of a sweeping system redesign project which began in 1972, became operational last October. Designed as a central cache for the wide range of time series that result from statistical surveys, LABSTAT now stores 60,000 of these series, covering prices, employment, unemployment, and other data. Within the next five months, Mendelssohn says, the completed system will contain more than 100,000 time series. (A time series is a time sequence of data on such things as the price of Grade A butter in Chicago over the last 50 years.)

> One of the program tools used by BLS is a general purpose table-producing language.

Accessed through a terminal, the LABSTAT data base is surrounded by various powerful analytical programs. These programs, explains Mendelssohn, allow BLS analysts to manipulate the files to "get insights which don't come out of the regular production process." One of the program tools which BLS is particularly proud of is a general purpose table producing language (TPL). This cross-tabulation system eliminates the need to write new tailor-made cross-tabulation programs for each new analytical task. Used heavily by the bureau since 1974, TPL was also offered to NIH, which has made extensive use of it.

Print control language

The BLS adpers have also come up with other generalized software aids that have stepped up efficiency. One example is a print control language (PCL) for easy table construction. (NIH not only uses PCL but also helped finance it.) While

NIH with common needs has benefited from these program products, BLS has in turn profited from NIH software developments and modifications which provide researchers with enhanced problem-solving muscle.

To answer some of its own pressing statistical processing needs, the bureau hopes to come up with some more generalized software solutions. BLS is working on a new charting system, slated to be ready in five months, and an ambitious full page composition system which will be operational by the end of next year.

BLS commissioner Julius Shiskin is in favor of any new dp developments that can boost efficiency at the 94-year-old bureau. With more than a novice's knowledge of computers, Shiskin, a statistician by profession, has his own computer skills, having developed an important economic analysis program while at the Census Bureau. Mendelssohn is grateful for Shiskin's support and help. He comments: "Commissioner Shiskin works quite closely with me in trying to get the bureau to move ahead in the computer area as rapidly as possible. He recognizes that the industry itself is moving very fast and the bureau has to run like mad just to keep up."

Word processing plans

In an effort to keep up with the latest technology trends, Shiskin has proposed that BLS experiment with word processing. Within the next three to five months, the bureau hopes to have a backbone word processing setup which will allow easy correction of all correspondence, documents and memorandums requiring the commissioner's signature. Under this scheme, all top BLS managers will enter their documents into a data set for review by the commissioner's secretary who can then make appropriate changes through a terminal.

> "Ever since we tied in with NIH, our ability to do research has expanded incredibly."

There are approximately 140 low speed terminals (hardcopy, crt, and combinations) in use at BLS' Washington headquarters. Used mainly for statistical analysis work and program testing and debugging, the terminals can also trigger production operations. In addition to the keyboard terminals, six RJE terminals handle large volume I/O tasks. Magnetic tape and punched cards provide mass input, and 1100 lpm printers generate listings and display computer results.

The bureau also is using the Labor Dept.'s remote terminal network (RTN) which allows transmission of BLS data from Washington to DOL regional offices where it can be accessed by BLS field forces. To step up data flow, BLS plans to use a high speed line to electronically link the NIH and DOL computer centers.

And it is looking into ways of giving its regional outposts access to its voluminous data base. Such a setup would also speed up processing, with reports from around the country channeled directly to the BLS field offices for transmission.

Other projects which key government policymakers could benefit from are also in the works. Mendelssohn notes that BLS is looking into ways to electronically transmit some of the key economic data to some of these officials. It also is making arrangements with the Federal Reserve Board to have it pick up some of this same data for transmission electronically to its member banks.

Promptly and accurately

Mendelssohn sees these projects as fulfilling the bureau's mission which is to serve the government and public by providing fast and accurate figures on economic trends and conditions. And the NIH link-up, he believes, has been crucial in improving this service. "Ever since we tied in with NIH, our ability to do research has expanded incredibly. We're now able to turn out many more analytical studies more promptly and more accurately," he says.

"We're able to do our work at a lower cost," he says. Last year, NIH had three price reductions totaling between 25% and 30%. "With that kind of savings," he reasons, "we can do even more work for the public."

So if these benefits really accrue through such symbiotic setups, why haven't more of the feds' dp managers jumped on the sharing bandwagon? Mendelssohn explains it this way: "It's just a phase people and institutions go through. People have to have terminals. Institutions have to have computers at some stage in their growth process. But ultimately they'll all come to realize that there's no glory in hanging reels of tape. Running a computer operation is a difficult and complex business and should be left to experts," he declares.

—Linda Flato

Software

Assurance for Package Buyers

A buyer of a proprietary software package who has gone back to the vendor for assistance in making modifications to fit a new operating environment, only to find the packages' vendor is no longer in business, can appreciate a new service.

Directed at the independent vendors is Info-gard. It stores the documentation, including the source code, in machine-readable form, narrative description and internal structure, thus assuring its availability when the packages' developer is no longer around to provide the support.

One buyer of packages says he had never thought about such a contingency. And a vendor of systems software says the lack of a third-party escrow-type service "has never cost me a sale." But a spokesman for the software firm admits that when a customer insists upon it, they include in the contract the fact that the source code and supporting documentation will be kept by the vendor's legal counsel in a secure vault.

A software company, of course, will want to store the latest versions of its products away from the firm's office, just in case of a fire or vandalism. But a package licensee who is concerned about this sort of predicament can also get the protection offered by a disinterested third-party's involvement on a contractual basis. Info-gard, Inc., based in Sunnyvale, Calif., and operating also out of New York City, reportedly uses facilities similar to those employed by banks for their off-site storage.

Administration

The CIO Would Head Information Function

Organizations now have a chief executive officer, chief operating officer, and chief financial officer. Still another functional title—the chief information officer—has been proposed.

This person would oversee within the organization all the communications, both voice and data, dp, word processing, and in-plant printing, as well as facilities planning, the latter because it is difficult to separate physical facilities from electronic facilities. So says Fred Held, director of management information services at the Mattel Toy Co. in Hawthorne, Calif.

Speaking at a conference in San Francisco on word/text processing sponsored by the American Institute of Industrial Engineers, Held said he does not advocate that dp be the inheritor of the word processing operation in an organization, but he does believe dp and wp belong under the same management. "Information is what we're talking about—information, communications, and data," he said. And there's a need for a mechanism to readily capture, store, retrieve, and communicate this information.

He believes data processing and word processing belong under the same management.

Cornucopia of solutions

The speaker contrasted this top-down view of information processing with the situation prevalent today. Currently, he remarked, one finds a "cornucopia" of technical solutions to the problem: basic typewriters, standalone wp machines, shared-processor systems, the use of outside service bureaus and in-house computers. And there's a voice communications staff, data communications group, word processing under an administrative services group, and dp—and they're not working together.

"In my experience," Held said, "it is extremely rare that the dp people work

together with the administrative services people . . . The reason for this is that administrative analysts generally have no technical computer background and shy away from the bits and bytes of the world." Nor do computer systems analysts, he added, take much interest in the nonprogrammable, special-purpose equipment used by clerks and secretaries.

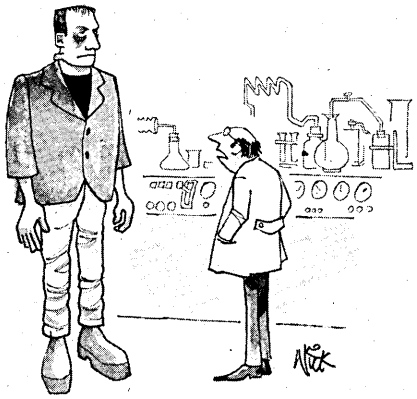
Responding to a question about contention for the resources of the information group, Held said that at Mattel new projects are evaluated as to time required, costs, and benefits. Jobs are then undertaken on the basis of priorities assigned to them. In descending order, these priorities are: mandatory, return on investment, and nice to have. And when there are competing priorities, a group of company executives that includes the chief information officer makes the decision.

Low paid secretaries

Conference keynoter Robert J. Potter earlier characterized the office environment as being unstructured. And inefficient because it is so unstructured. He said the number of original documents created on typewriters is estimated to be some 30 billion per year and growing at an annual 10% to 12% rate. And the demand for higher quality and faster turnaround on these documents continues to increase—this despite the fact that secretaries are in short supply and the general increase in their salaries remains low in comparison with other occupations for women.

Potter, who is president of Xerox Corp.'s Office Systems Div., cited a study that showed productivity among manufacturing workers in automated industries rising by 83% between 1960 and 1970. In that same period, white collar productivity rose only 4%, while operating costs for the office doubled. But, he added, capital investment for the typical secretary is only $2,000, compared with $25,000 per worker in manufacturing and $50,000 for the agricultural worker.

—E.K.Y.



"Actually, you were made possible by a grant from Exxon Corporation."

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BENCHMARKS . . .

Tax Hearing Postponed: A hearing before California's State Board of Equalization on its Rule 1502 covering "Automatic Data Processing Services and Equipment," originally scheduled for 2 p.m. April 5, has been rescheduled for 10 a.m., May 4, in Room 102, 1020 N St., Sacramento. The state's Sales Tax Action Group (STAG) which asked for the hearing on the rule, under which the state has been imposing sales and use taxes on software and some services, said the later date gained them a concession by having the hearing last the entire day. Had it been held April 5, the hearing would have started at 2 p.m. and STAG hoped, at best, for two hours. A STAG spokesman has called the hearing "one of the most important meetings (on the subject of the computer industry and taxes) ever held in California." California was the first state to impose sales and use taxes on computer software.

Proposed I/O Standard: The American National Standards Institute (ANSI) Data Processing Committee voted 18 to 13 to send a proposed I/O channel interface standard to ANSI's National Board of Standards Review. Supporting the proposal were plug compatible manufacturers and government agencies who contend it would spur sales of plug compatible peripherals and mainframes and increase competition to reduce prices. Opposing it were mainframe manufacturers who said it would be a costly, progress-inhibiting move that would lead to Japanese penetration and reduced American computer leadership.

Court Upholds FCC: A New York Federal Appeals Court agreed with the Federal Communications Commission's (FCC) conclusion that AT&T's Dataspeed 40/4 crt terminal is not a data processing device and upheld the commission's year-old decision to tariff it. The tariff was challenged by IBM, the Computer & Communications Industry Assn. (CCIA) and the Computer and Business Equipment Manufacturers Assn. (CBEMA).

No Primary Instrument Now: The Federal Communications Commission (FCC) has rejected immediate adoption of AT&T's proposed primary instrument concept and also turned down a request by the Computer & Business Equipment Manufacturer Assn. that the concept be totally rejected immediately. The commission instead opted to follow the recommendation of its Common Carrier Bureau to begin a major new inquiry into the concept, under which telephone companies would be the guaranteed suppliers of at least one telephone on a subscriber's premises.

ITT Buys Courier: Boothe Courier Corp. has agreed to sell its Phoenix subsidiary Courier Terminal Systems, Inc. and the Courier Terminals Div. of Canadian Boothe Corp. Ltd. to International Telephone & Telegraph Corp. for $50 million. Under the agreement ITT will pay $14.5 million cash and $35.5 million in five-year 8% notes. Boothe Courier will retain ownership of the land and buildings of Courier's operations and will lease them to ITT at $640,000 annually. ITT has been selling Courier products in Europe for the last three years.

Pertec Buys Into Tally: Pertec Computer Corp. has acquired Ball Corp.'s 14% interest in Tally Corp., Kent, Wash. printer manufacturer. Pertec, which once unsuccessfully tried to develop its own printer manufacturing capability, said it is interested in an eventual merger with Tally. Ryal Poppa, Pertec chairman and president, said the company's directors have authorized additional purchases of approximately six percent to enable Pertec to report Tally earnings on a minority interest accounting basis. He said there are no plans to propose the addition of Pertec representation on the Tally board.

Modcomp Ends Negotiations: Discussions between Modular Computer Systems and General Electric Co. Ltd. of the U.K. over purchase by GEC of 25% of Modcomp (Feb. p. 204) have been terminated. A joint European marketing venture by the two firms is still being considered. Modcomp directors had tentatively accepted the GEC offer but changed their position because of an improved financial position.

New Scanning Prices: NCR Corp. cut prices on its supermarket scanning systems and introduced new software packages for linking a number of supermarkets together and analyzing the information fed into the network. Under the new pricing, scanning modules used in a checkout lane will sell for $3,995. The old price was $4,995. D. J. McCarthy, vice president, retail systems, said the reduction "reflects advances in technology and manufacturing cost improvements as production volume has increased." The new software operates with an N-8359 computer and will handle communications between an N-8359 and NCR 255 checkout systems. NCR also introduced software for linking NCR 726 in-store minicomputers to IBM 370 systems.

Medical Systems Growth: The medical information systems industry in the U.S. grew from sales of $156 million in 1974 to $476 million in 1977, says an industry analysis published by Creative Strategies International, San Jose, Calif. CSI predicted this will increase to $1 billion in sales by 1982. The study indicates several factors will continue to retard the industry's growth for at least four more years. These include reluctance by health care personnel uncertain of their roles vis-a-vis the computer; health industry administrators who question the cost effectiveness of the vast capital investment required to implement a medical information system; and the growing concern over confidentiality of patient data.

New Name for WEMA: WEMA, formerly the Western Electronic Manufacturers Assn., has changed its name to the American Electronics Assn. "WEMA has been our full name for nine years," said J. J. Collmer, chairman of the board. "However, it is neither descriptive of the national scope of the association nor of the type of companies we serve. American Electronics Assn. says it all—simply but adequately." Founded 35 years ago, the association today has a membership of more than 900 companies and expects to grow to more than 1,000 by the end of this year.

A Profit for Cray: Sale of an $8.8 million Cray-1 system to the National Center for Atmospheric Research produced the first profitable quarter and year for Cray Research, Inc. President John A. Rollwagen said fourth quarter revenues of $9,823,162 produced earnings from operations of $3,015,760, equal to $2.07 per share. Additional income of $1 million, equal to 68 cents per share, from tax benefit of operating loss carryforwards brought net income for the quarter to $4,015,760 or $2.75 per share. A year ago the company was in its development phase and quarterly revenues were $508,999 with a net loss of $555,217, or 40 cents per share. ✲

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ADAPSO MEMBER SOFTWARE INDUSTRY ASSOCIATION

LOOK AHEAD

(Continued from page 18)
present from the Federal Communications Commission, which ruled that Teletype's model 40/4 is not a data processing device (page 230). That means Teletype, which had been keeping a low profile on the 40/4, can be expected to mount a more aggressive sales campaign for the data terminals.

CROSS SEEKING A U.S. CONGLOMERATE FOR GEC

Ex-ICL boss Goeffrey Cross, with anything from $260 million to $1 billion in British GEC money to spend on acquiring U.S. companies, has been given a big incentive to pick a winner. We hear he'll be paid for his services by a trunkful of shares in the company he buys. It's likely to be one rather than several as he's been looking at outfits in the big conglomerate end. GEC was to have invested some of its vast cash reserves in a European buying spree but that plan seems to have been dropped in favor of a strong U.S. foothold.

THE B5500 FINDS A RESTING PLACE AT THE SMITHSONIAN

History buffs will be glad to learn that the first production model of the Burroughs B5500 was saved at the 11th hour last month from the scrap heap and soon will rest at the Smithsonian Institution in Washington. Serial No. 101 of the first machine to offer virtual memory has been working away at the Burroughs Corp. plant in Pasadena ever since it came off the production lines in 1962. It was replaced in February with a B6700 and ordered dismantled and sold for scrap at 12¢ a pound before the March 6 California inventory tax assessment of about $24,000.

Daniel D. McCracken, the ACM's vice president who earlier had rescued the venerable Bush Differential Analyzer from a similar fate at UCLA, put Burroughs people in touch with the Smithsonian. And later in February, arrangements were under way in Pasadena to ship the B5500 to Washington, even though connecting pins on the panels of the machine's 10 cabinets had randomly been bent and cables cut to insure that the B5500 never again would work as a computer.

Burroughs next problem: what to do with the last production model of the B5500 which the company donated to Union College in Schenectady, N. Y. That computer is being replaced with a B6800 and is due to be dismantled in the fall.

RUMORS AND RAW RANDOM DATA

The Japanese are on the move in Mexico, quietly trying to extablish LSI production there so they can attract the U.S. market. As with other deals in Brazil, Spain, and Canada, they'll probably go in on a 49:51% basis, with the Mexican government holding the majority...We don't know if it's part of the same deal, but other sources say Mitsubishi will build terminals and microcomputers on the border for easy export to the U.S....Concern among some users of Incoterm terminals that they might be forced to take Honeywell Level 6 products as replacements, should be assuaged by a Honeywell assurance there is no such plan and that future Incoterm products will continue to be developed within the Incoterm organization that Honeywell acquired last October...Bell Data Network rumormongers (who may not have been aware that BDN would not be the real name of this service) will be interested to hear that the new name now being touted by AT&T is the "Advanced Communications System" (ACS). But hold the phone, the company plans another name change before it comes out with the service, still expected in June.

Turning a profit in turnkey systems:

If your business is selling turnkey computer systems, using the right computer can be the key to making more sales—profitably.

You need a computer that's easy to use—and adaptable to many uses so you can get more customers. And you want a computer that's priced to sell, at a margin that's profitable.

You want a computer that can really protect your proprietary software—keep it safe, and saleable, sale after sale. And you need a better way of supporting your software than having to visit sites.

You need a computer with proven reliability, so there'll be fewer service problems. And you want a fast, dependable service network when there are.

Needs and wants met here

For all this, the one computer you want is the one we make:

The BTI 4000 Interactive Timesharing System.

It's a ready-to-go system with 10 megabytes of storage, magnetic tape drive, and 8 ports—just add terminals. And it's easily expandable—add disk storage to 400 megabytes, increase user capacity to 32 ports, add peripherals like industry-compatible magnetic tape and a line printer.

The BTI 4000 is designed, manufactured and supported by Basic Timesharing Inc. We're the manufacturer with timeshare experience. Which has helped us produce a computer uniquely right for multi-user applications.

A dedicated performer

The BTI 4000 has been proven in all kinds of applications—general accounting, dealer inventory control, entertainment ticketing, text publishing, school administration, and more.

What's more, the BTI 4000 is proving its reliability at locations in 39 states, in 5 provinces of Canada, and in Europe, too.

Things you'll like

The BTI 4000 uses BASIC-X, an unusually powerful extension of BASIC. With the features you need to get your software up—quickly, efficiently. So you can start selling sooner.

The BTI 4000 Means Business.

Especially important to you, the BTI 4000 protects your proprietary software. So you can count on selling it again, and again. Without losing control of it. And with the convenience of dialup access, so you can support it without the cost of site visits.

Things your customers will like

The BTI 4000 is a true timesharing system. It allows doing any mix of tasks, all at the same time, from any number of locations.

Your customers will enjoy faster response, because the BTI 4000 implements many of your application program operations in firmware.

The system also offers continuous availability, because software backups, updates, and other housekeeping activities can be performed locally, remotely or programmatically, with users on the system.

And the BTI 4000 is so easy to manage, your customer won't have to add a specially-trained employee just to run it.

Service—good and fast

In the packaged systems business, service can have a real impact on your success.

That's why service is such an important part of our business.

The BTI 4000 is designed for over-the-phone, on-line diagnosis of actual and potential problems. 24 hours a day, 7 days a week, we're ready to help. If a BTI 4000 ever needs on-site service, we have a network of field specialists to provide just that.

Priced to please

A single BTI 4000 costs $35,950. There are attractive quantity discounts—like $28,760 each for a quantity of 10.

For that price you get all the features and support benefits mentioned above, not a scaled-down version.

You can get complete information at your BTI regional office, listed below.

The BTI 4000. It could be your key to turning more profit in your turnkey installations.

Basic Timesharing Inc., 870 W. Maude Ave., Sunnyvale, CA 94086. Sales Offices: East: Cherry Hill, NJ (609) 662-1122; Midwest: Minneapolis, MN (612) 854-1122, Chicago, IL (312) 298-1177; South: Dallas, TX (214) 630-2431; West: Sunnyvale, CA (408) 733-1122, Anaheim, CA (714) 533-7161

hardware

Off-line

Intel Corp., the Santa Clara-based semiconductor manufacturer, expects to announce a 16-bit microprocessor within the next few months. Known as the 8086, it belongs to the same family as the ubiquitous 8080 and the newer 8085, both 8-bit processors. With the addition of about 10 supporting chips, the 8086 is said to rival a minicomputer; Intel expects to come into competition with DEC's LSI-11.

Software compatibility within the 808X series will be provided at the source language level. PL/M programs written for the 8-bit processors is said to compile, without modification, for the 8086. Transferring assembly language programs will entail an intermediate step, as the new processor uses a different set of mnemonics. Intel will supply an 8080-to-8086 assembly source language translator. And the FORTRAN-80 compiler, described in this month's Software & Services section, is expected to be implemented on the 8086.

A little deeper within the 8086, users will find hardware multiply/divide, string manipulation instructions, and multiprocessing support in the form of test and set lock instructions for using semaphors. The chip can address 1MB, and features 23 addressing modes.

The 40-pin DIP-packaged micro will be offered in two versions: one with a 5MHz clock rate, the other with an 8MHz clock. The 8086's use of HMOS technology results in dense, fast circuits; internal switching takes as little as 2 nsec. A register to register operation can take as little as 250 nsec in the microcoded chip.

DATAPAD, the handwritten data entry system spotlighted in our December Hardware section, is being used by Chase Manhattan Bank for automating the input of miscellaneous data, such as cash hand tickets. Chase uses an eight station system, which took roughly two months to install.

In Norway, an instructional simulator trains students in radar navigation at sea. Mock RADAR screens, driven by a computer, show a would-be captain some of the harrowing experiences possible on the high seas.

The Consumer Food Group of General Mills has taken delivery of the 1,000th HP 3000 Series II.

Trust Department System

Trustware, a microprocessor-based, turnkey system, is designed to fit "virtually any trust department operation, and virtually any trust department budget." The vendor says that even a medium-size trust department, handling 500 to 2,000 accounts, can afford the Trustware system, and avoid delays associated with a centralized in-house dp center or a remote service bureau.

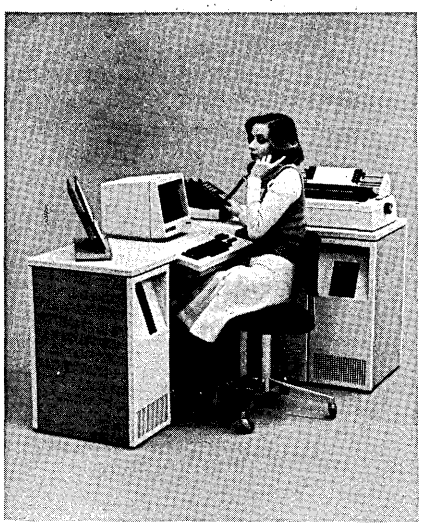
The system operates under job-priority control; passwords ensure data security and confidentiality. Functions supported include on-line file maintenance and account inquiry, as well as maintenance of transaction information on beneficiaries, securities, and brokers. Trustware handles security pricing, customer reporting (statements, reviews, remittance checks, and advices), and automatic transaction generation for dividends, interests, splits, maturities, fees, and CTF allocations.

Trustware hardware consists of a microcomputer, as many as eight video terminals, three disc drives providing 150MB of direct access on-line storage, a magnetic tape drive, and a line printer. The system also supports remote terminals. A complete two terminal system leases for $5,000 per month on a five-year lease. This price covers hardware, software, and maintenance. NCS/TRUSTWARE, Minneapolis, Minn.

FOR DATA CIRCLE 483 ON READER CARD

Information Processing

The Office System 6 family has two new members. The models 6/442 and 6/452 both have a crt display, diskette storage



(274,000 characters or roughly 130 pages per diskette), a 96-character multilingual keyboard, and a bi-directional 55 cps impact printer. The printer provides 10 pitch, 12 pitch, and proportional spacing, all with justification capability, and it uses an operator-changeable print wheel. Five type fonts are available. The model 6/452 also has a magnetic card reader/recorder, making it compatible with documents prepared by or for the vendor's mag card typewriters. An optional communications interface provides data transmission capability at speeds of up to 2400 bps; communications may occur between members of the Office System 6 family, and suitable programmed computers. The 6/442 goes for $485 per month on a three-year lease, the 6/452 is $580 per month on a three-year lease. The communications feature is $102 per month on a three-year lease. Purchase prices are, respectively, $17,250, $21,100, and $4,270. Deliveries start in July. INTERNATIONAL BUSINESS MACHINES CORP., Office Products Div., Franklin Lakes, N.J.

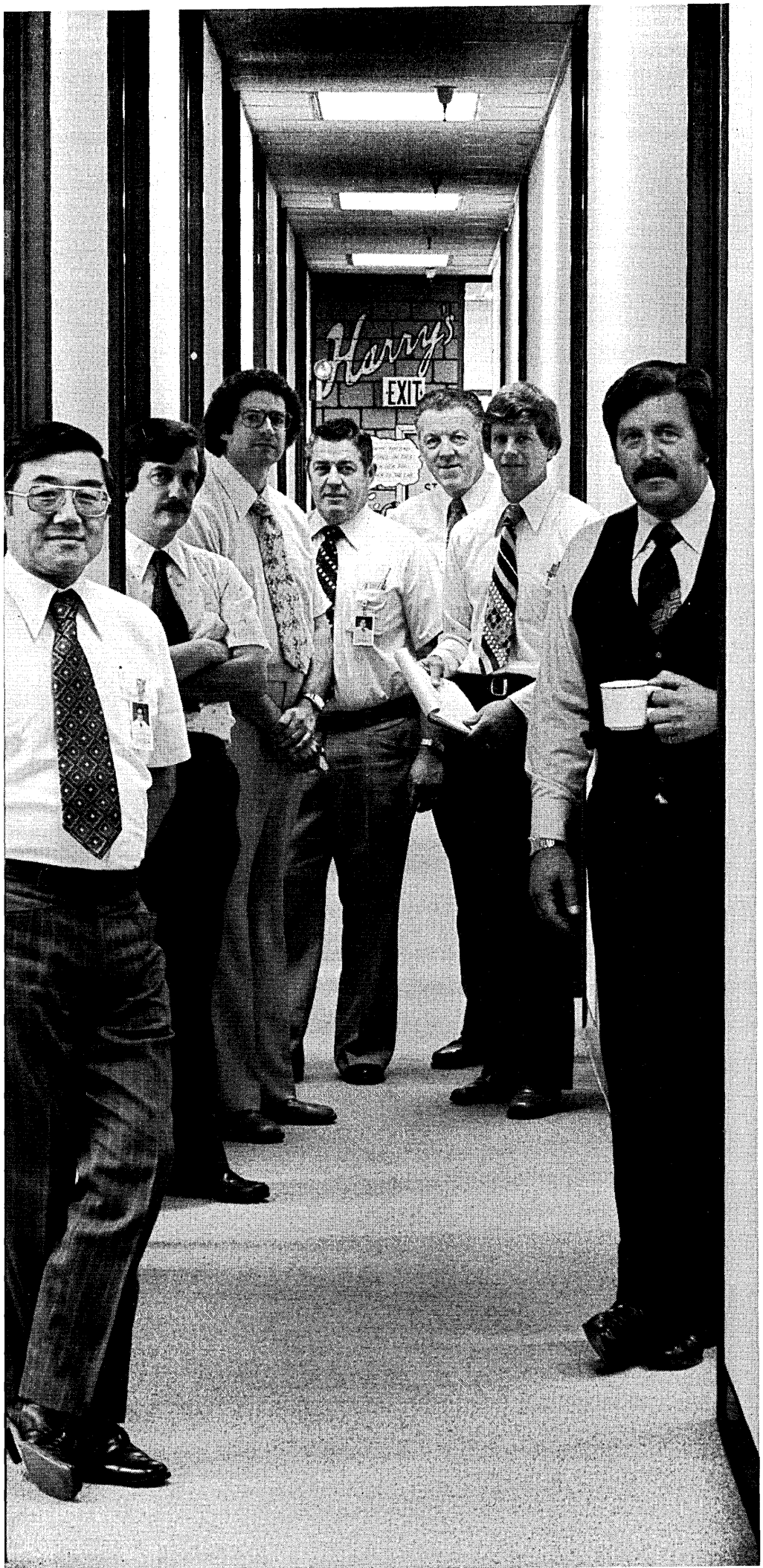
FOR DATA CIRCLE 481 ON READER CARD

Computer

The Eclipse M/600, said to be "one of the industry's most powerful minicomputer systems," represents both a new top-of-the-line machine for this vendor, and another entry into that ill-defined domain between minis and mainframes. On the one hand, it's a 16-bit machine, its programs are limited to a 64KB logical address space, and it can execute object code originally intended for the vendor's smaller Eclipses and even smaller Novas. On the other hand, it supports up to a meg of main memory, 64 users (cited as a realistic, not a theoretical, limit), a burst multiplexor channel capable of supporting eight controllers for high speed devices such as 3330s and Winchester discs, plus virtual memory, and PL/1. And it's pretty fast: a double precision (64-bit) floating point addition takes 1 usec, and a similar division takes 6.8 usec.

Contrary to our initial suspicions, the M/600 isn't expected to compete primarily with DEC's VAX machine, but rather with machines in the classes of its own PDP-11/70 and the DECsystem 20.

In addition to building a fast microcoded cpu (200 nsec microcycle time), the M/600 designers put together a three-level I/O system, intended to prevent bottlenecks. The fastest part of the I/O hierarchy, the burst multiplexor channel, handles up to eight high-speed controllers, and can run at the full memory bandwidth. At the low end of the I/O system, a two-board Eclipse S/130 mini functions as an I/O pro-



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Commitment. Founded in 1973, Shugart is committed to being the leading independent supplier of low cost disk storage. To be a leader in this complex product area, we believe you must understand the basic technology and concentrate company resources on applying this technology to provide cost-effective products.

Technology. Over the last five years our engineers have established the industry standards for floppy technology. This has allowed us to make breakthroughs like the first independently developed IBM compatible floppy disk drive. The first double density drive. The first minifloppy.™ And the first double-sided, double density drives. These product developments are hard at work in more than 150,000 drives.

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Leadership. More commitment, more technology, more experience. That's why more OEM's choose Shugart drives.

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CIRCLE 122 ON READER CARD

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cessor (IOP), interfacing to terminals and low-speed peripherals, such as card readers. The IOP off-loads the cpu, buffering input, performing error checking, and handing it over to the cpu one logical record at a time. The IOP also distributes output to terminals and low-speed devices. Between the IOP and the burst multiplexor channel in performance, a standard Eclipse data channel handles medium-speed devices, such as mag tape units and cartridge discs. Compatible with devices designed for use with other Eclipse models, this channel also provides communications between the cpu and the IOP. The aggre-

gate I/O rate for the M/600 is 10MB per second.

Within the cpu, the M/600 goes beyond the standard instruction sets of earlier Eclipses by including four source data processing extensions for both business and scientific applications. These microcoded extensions define commonly used operations as standard machine operations, bringing machine language closer to source language. The M/600 includes business extensions for character handling and a decimal edit instruction set with console functions which aid in debugging; a scientific extension supports floating point arithmetic. The preceding extensions are available for other existing Eclipse processors; unique to the M/600 is an aggregate operation set for functions such as exponentiation, logarithms, and trig functions.

The M/600 runs the Advanced Operating System (AOS). Programming languages supported include FORTRAN IV, optimizing FORTRAN 5, extended BASIC PL/1 (see p. 000), and the vendor's proprietary system programming language, DG/L. RJE80 and HASP II communications packages are also available.

An Eclipse M/600, with 320KB of core (800 nsec cycle), 96MB disc, 1600 bpi mag tape, 60 cps terminal printer, 300 lpm line printer, eight asynch ports, 1200/2400bps synchronous line interface, AOS, PL/1, FORTRAN IV, FORTRAN 5, BASIC and RJE80 sells for $164,100. A system with the same software, 512KB of MOS memory (read/write cycles of 500 nsec and 700 nsec, respectively), four 190MB discs, two 2MB fixed head discs, two 1600 bpi tape units, 600 lpm line printer, 600 cpm card reader, 60 cps terminal/printer, 32 asynchronous ports, and two high-speed synchronous line interfaces sells for $325,800. An additional half meg of MOS memory sells for $40,000. Deliveries are slated to begin in May. DATA GENERAL CORP., Westboro, Mass.

FOR DATA CIRCLE 484 ON READER CARD

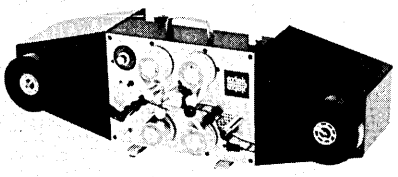
Power Supplies

The Micro-Supply series of miniature power supplies consists of a plug-in AC adaptor and a choice of nine of the vendor's regulated converters. At $69 for one, the MS TRIOUT 5/12/—5 is both the most expensive member of the series and potentially the most useful to users working with microcomputers and memory boards. It supplies +5 volts (250mA), +12 volts (100mA) and -5 volts (100mA). Pricing on other modules in the series ranges from $39.95 to $69, depending on type and quantity. SCIENTIFIC PROGRAMMING INC., Burlingame, Calif.

FOR DATA CIRCLE 433 ON READER CARD

Microfilm Cleaner

Two automatic microfilm cleaners, the 6065 and 6105, are designed for use with silver, diazo, or vesicular film. The 6065, a portable unit, cleans 16mm and 35mm film, while the 6105 handles films from 16mm to 105mm. The user threads the film between the velvet cleaning



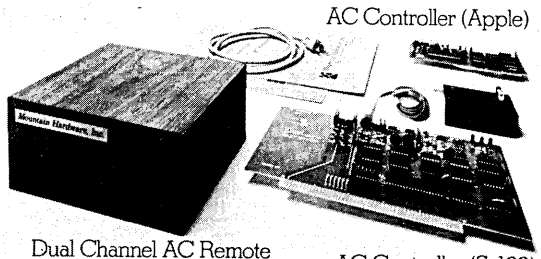
tapes and the rest of the process is automatic. A solvent helps remove even greasy fingerprints. The 6065 sells for $1,935; the 6105 is $2,390. EXTEK MICROSYSTEMS, INC., Van Nuys, Calif.

FOR DATA CIRCLE 482 ON READER CARD

Powered Breadboards

The Powerace line includes three powered breadboards. All three accept standard integrated circuit chips and discrete components with leads of up to 0.032-inch diameter. They all have a fused power supply and ground plane. Model 101 has a variable 5 volt to 15 volt dc 600 ma power supply and a 0 volt to 15 volt meter. It retails for $84.95. The 102 has a 5 volt, 1 amp

product spotlight



Remote Control

With the advent of personal computers, talk of the computer-controlled home began in earnest. No longer a topic relegated to science fiction novels, people began talking of wiring their homes into a personal computer programmed to start the coffee, turn lights on and off, and perform security functions. We haven't seen such a house to date (imagine the rat's nest of wiring involved), but these remote control units may usher in the smart house. Ingeniously, these units get around the wiring problem by making use of a system available in all homes: standard 110-volt electrical systems. Dubbed the Introl system, two types of modules interface applicances and personal computers. One plugs into S-100 or Apple II buses; the other plugs into a standard wall outlet. Communications between the modules are carried by a 50KHZ control signal transmitted over AC wiring. The central controller can address as many as 64 remote channels. Each remote unit has two independent 500 watt channels. The central controller can turn things on or off, and it can poll remote units asking for the status of each device. Subroutines for use with both BASIC and assembly language programs are provided for supporting the Introl system. The AC controller sells for $149 (kit) or $189 (assembled); dual channel AC remotes are $99 (kit) or $149 (assembled). MOUNTAIN HARDWARE., INC., Ben Lomond, Calif.

FOR DATA CIRCLE 479 ON READER CARD

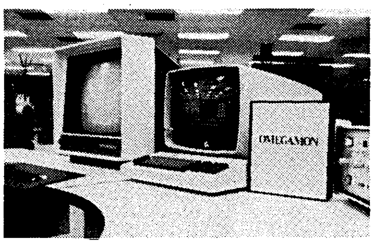
Design Flaw discovered in MVS!

IBM's new operating system is probably decreasing your throughput by 10-80% – even though your CPU is underutilized!

Flaw in Systems Resource Manager

Philosophically appealing, one of the goals of the SRM is to distribute machine resources with priority given to online systems (TSO) over batch. This prioritization becomes particularly important when the SRM detects a general system overload. The *flaw* is that when the system overload is *caused* by TSO, batch is always swapped out first, i.e. before SRM even begins to address the *problem,* batch is degraded! *OMEGAMON* has shown in installations across North America that often only 1 out of 5 jobs may be *active* at any one time while the CPU is only 60% busy!

What is OMEGAMON?



OMEGAMON is a state of the art software display monitor that functions exclusively on MVS via 3270 CRT's (dedicated or through TSO). It provides real-time information for both systems programmers and operators.

Exception Analysis

In addition to over 200 commands that enable comprehensive system exploration *OMEGAMON* also provides *automatic exception analysis* to warn of hardware/software problems, system availability, operational problems and performance bottlenecks.

Systems Approach to Performance

Rather than limiting itself to the *'magic'* of the SRM, ASM, RSM, *OMEGAMON* recognizes that the *operational bottleneck* must be a *major* component of any serious performance program! *OMEGAMON* can provide a common area for communication between operators and systems programmers.

Do You Have ANY of the Following Display Capabilities?

DASD DROPPED READY ANALYSIS

```
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
+DANGER:                         DASD DROPPED READY AT 164+
+CURRENT USER:                                       JES2+
++++++++++++++++++++++++++++++++++++++++++++++++++++++++++++
```

TASK WAIT ANALYSIS

```
JES2     WAIT   12   SEC  164 SPOOL, CONTROL UNIT
CICS     WAIT   1:18 MN                      <<RESERVE>>
TSOUS12  SWAP   2:23 MN                <<SWAPPED BY SRM>>
PAYROLL  SWAP  10:11 MN   <<DATA SETS HELD BY TSOUS12>>
SORTJOB  WAIT   3:19 MN   380             <<TAPE MOUNT>>
TESTJOB  SWAP   2:54 MN      <<WAITING ON SPOOL SPACE>>
TSOUS1   SWAP   4:13 MN        <<WAIT ON DEVICE SWAP>>
SALES    SWAP   4:33 MN              <<SWAPPED BY SRM>>
TEST15   SWAP   2:32 MN      <<WAITING IN ALLOCATION>>
JOBAA5   SWAP   13   SEC                 <<WAITING ON>>
          SMFBUF BUF01             PAYROLL
```

CPU ANALYSIS (DISPLAY TASKS OVER 15% CPU)

```
SCPU15  %     CPU        0    10    20    30    40    50
     TCAM     15.09   - - - - - - >
     CICS     21.22 - - - - - - - - - - >
     TSOUSER  43.22   - - - - - - - - - - - - - - - - - >
     TEST18   15.02   - - - - - >
```

POOR TSO RESPONSE TIME EXCEPTIONS

```
TSOUSER12 ELAP 3:18 MN   --2->4   6   8   10 (MINUTES  )
TSOUSER14 ELAP 9:45 MN   --2--4--6--8-> 10 (MINUTES  )
```

DEVICE TRACE (A NEW INNOVATION)

```
TRACE OF MVSRES: 161
DBSY       DDD   DDDD DDDDDDDDD
CBSY CCCCC
CHAN          HHH
IOQ  2222211111      111
I/O= 18          19   20  21
CPU  !!.........!!!.!....!!!..!!
USER SORT        TEST      SORT
CYL   23         600  601 400
TIME              55   27  43
NRDY
RESV
```

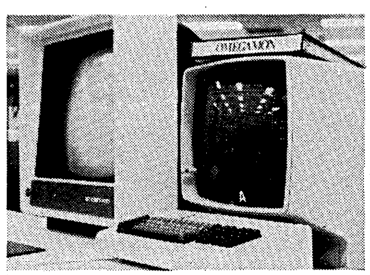
Competition between 2 jobs on same pack with some channel and control unit bottlenecks. Times are in ms.

DEVICE UTILIZATION (REQUIRES RMF-2)

```
STATP        DEVICE   CNTRL   Q LEN    RESV   RESX
162 MVSRES   --->     --->    222111   --->   ->
170 PAGE11   >        ->      44311
389 (TAPE)            -->
634 (COMM)   >
```

Each plot symbol = 10%. MVSRES:50% device busy, 30% control unit busy, IOQ = 1 for 60% and 2 for 30%, reserves: 30% (this cpu), 20% (external). Separate exception thresholds (used to select devices) can be specified for each variable 'STAT' provides same information on tabular (numeric) basis.

MVS is a moving target . . . . OMEGAMON can improve your aim!



- Installed and operational in 15 minutes.
- No hooks, SVC's, or authorization!

BUT WHAT ABOUT RESULTS?

Results During Demonstrations!

In one shop the entire system became locked out (including master console) during a demo. Not only was *OMEGAMON* still running but the exception analysis showed within 12 seconds that JES2 was hung on a control unit (see example)! In another case a system hung while *OMEGAMON* reported that every one (else) was waiting on MVSRES. A third case was caused by a page data set problem. In all cases the console was locked out leaving *OMEGAMON* as the *only* form of visibility!

More Problems!

In 20 working days in September, 1977 – 22 problems were discovered in 8 installations. One demo revealed 5 problems in 3 hours. What problems: DASD dropped ready, page data sets, MSS, MVS under VM, VIO, tape control unit, CICS loop, CICS slow down, TSO problems, SMF buffers, enqueues, user catalogs, TCAM buffers, DDR, reserves, SQA , , ,

OMEGAMON Users? (Partial list)

United States
- TRW Space Systems
- TRW Credit Data
- Atlantic Richfield
- Southern California Edison
- A.O. Smith Corporation
- Celanese Corporation
- Florida Power Corporation
- Warner Brothers
- Western Bancorp

Canada
- Datacrown
- Canada Systems Group
- Canada Life
- City of Toronto
- University of Toronto
- University of Manitoba
- B.C. Hydro

Geneva
- Cern

! Candle Corporation

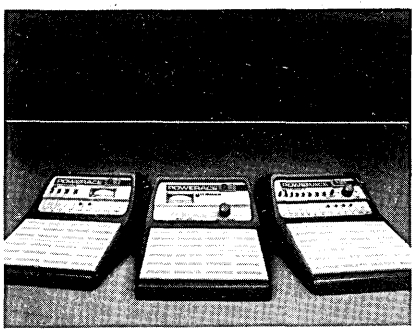
(Technical and marketing opportunities for top professionals: $40K)

Los Angeles:
CANDLE CORPORATION
4676 Admiralty Way, Suite 401
Marina Del Rey, Calif. 90291
1-213-821-2902

Canada:
CANDLE SERVICE CORPORATION
P.O. Box 280 Station "A"
Toronto, Ontario
Canada M5W 1B2
1-416-483-9041

Nov. 7-9, 1978
Sheraton-Park Hotel
Washington, D.C.

hardware



power supply, four slide switches with logic 1 or 0 output, and two momentary contact slide switches, which are debounced. The unit also has four LED's, a pushbutton switch with 8 msec pulse output, and a clock which generates from 1 Hz to 100KHZ, in multiples of 10. It retails for $114.95. The $124.95 model 103's power supply provides 5 volts, 15 volts, and -15 volts. It has a voltage meter, slide switches and LED's. AP PRODUCTS, INC., Painesville, Ohio.
FOR DATA CIRCLE 480 ON READER CARD

Terminals

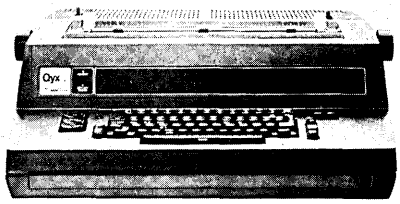
Two microprocessor controlled, bidirectional desktop terminals have joined this vendor's lineup. Both have RS232C interfaces, and both work with the ASCII character set, but each uses a different printing technique. The model 1720 runs at speeds of up to 45 cps using a daisywheel print mechanism. In addition to ASCII, the unit may be switched to 2741-compatible communications using either EBCDIC or correspondence code character sets. This terminal sells for $3,450. The 1760 uses a 7 x 9 matrix printing technique and operates at speeds of up to 200 cps. It sells for $2,990. Rental plans are available for both units, with monthly prices dependent on the term of the lease. XEROX CORP., El Segundo, Calif.
FOR DATA CIRCLE 485 ON READER CARD

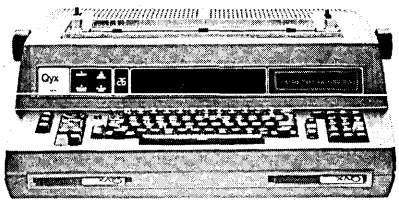
Smart Typewriter

We first heard of the Qyx Intelligent Typewriter when an associate called from the recent word processing show in New Orleans. He was impressed.

Based on three microprocessors, the typewriter is available in five levels of increasingly sophisticated capabilities. At the low end, level 1, it's a word processing typewriter with automatic erasing backspace, automatic centering and decimal tab, dual pitch and proportional spacing, and automatic phrase and format recall. This entry-level unit carries a price of $1,390. At the top of the line, level 5 includes dual minidiskette drives in its $7,750. Communications and display options are available on levels 2 through 5.

The Qyx typewriter has some interesting mechanical designs. The print mechanism resembles a daisywheel, but with a twist: the print wheel is electromagnetic and contains its own motor. The wheel floats along the carriage on a





magnetic force field. The carrier is moved by a low-inertia, high-speed linear stepper motor, requiring no gears, pulleys, or belts. The microprocessor controlled system for moving the carrier and the print wheel includes a feedback system for precisely positioning the character on the page. Even the rib-

bon cartridge bears mention: it's stationary (the ribbon feeds through flexible guides), and since its mass doesn't burden the carrier the cartridge can be bigger.

Initial communications capabilities include Qyx-to-Qyx, and Qyx-to-Vydec word processor; computer communications are coming. Initial availability will be limited to New York, Washington, and Philadelphia; other cities will be added later this year. QYX DIV., EXXON ENTERPRISES INC., Lionville, Penn.

FOR DATA CIRCLE 486 ON READER CARD

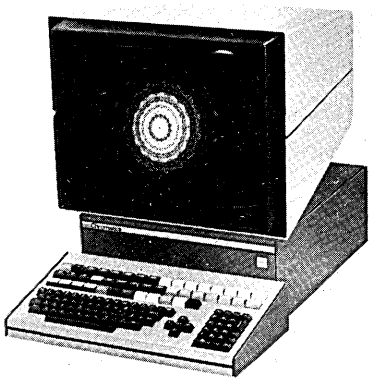
Magnetic Tape

"G" tape is certified write-skip free for life at recording densities ranging from 30 bpi to 6250 bpi. It is said to operate in environments with temperatures between 50° and 110° F, and relative humidities up to 90%. Its rated storage temperature range is even wider: -10° to 130° F. The tape gets its name from the geophysical industry, for which it was developed. It had to work at low speeds in the harsh environment of a ship at sea, and it also had to work with high performance equipment at shore-based dp centers. The tape's thickness, hardness, and strength are warranted for 25 years. G tape sells for about $18 per 2,400 foot reel. WABASH TAPE CORP., Huntley, Ill.

FOR DATA CIRCLE 487 ON READER CARD

Color Graphics

Take the form and function of a crt terminal, add a Z-80 microprocessor for its smarts, and a high-resolution (512 x 512) eight-color tube for a display and you've got this vendor's CG line of color graphics computers. Some might call it an intelligent terminal, but with user-programmability, and the availability of two operating systems, text editor, assembler, extended BASIC, and graph-



ics software, we won't argue about calling it a computer. The line includes models with 13-, 15-, and 19-inch screens, and resolutions of 512 x 256 and 512 x 512 individually addressable color points.

The CG line comes with 128-key keyboards, and synchronous and asynchronous serial I/O ports with TTL and RS232C interfaces. Optional interfaces include RS422, IEEE-488, 20mA current loop, and 8-bit or 16-bit parallel which allow DMA transfers at rates of up to 416KBps. The vendor offers both floppy and minifloppy drives as options.

The units support 64KB of program memory. Graphics software provides automatic generation of circles, arcs, rectangles, solid filled figures, vectors, and concatenated vectors. The screen may be partitioned into as many as four independent windows, each functioning as an independent terminal. The smallest member of the CG family, the model CG 1398, which has a 13-inch screen with 512 x 256 resolution, standard ASCII character set, and 96 user-definable graphic characters, sells for $8,995. CHROMATICS, INC., Atlanta, Georgia.

FOR DATA CIRCLE 489 ON READER CARD

Communications

Banks, airlines, and other businesses that use a variety of distributed terminals can use the Netrol network control system. The system comprises the functions of terminal control, data concentrator, multiplexor, data encryption, packet switch, and front-end processor. The system consists of one or more model 110 remote units and at least one model 4400 network control center. The remote units handle all terminal interfacing and control func-

tions, and can simultaneously interface a combination of virtually any bit-serial (asynchronous, synchronous, SDLC) terminals. Multi-point, point-to-point, and dial-in circuits are supported. Remote 110s communicate with central 4400s using an SDLC-like protocol.

The 4400 interfaces to central cpu's, appearing as a virtual terminal network. A 4400 can interface to several central computers which may come from different vendors. This interface may be via a block multiplexor channel or one or more serial I/O ports. IBM, Burroughs, and NCR protocols are supported; other protocols are available on a quote basis. Capable of handling terminals at speeds of up to 9600 bps, and trunk lines to 56Kbps, a model 110 remote unit with six ports capable of supporting 120 terminals sells for roughly $17,500. A 110 can support a maximum of 300 terminals. A central 4400 network control center starts at $54,000, for an eight trunk system including four serial ports, 10MB of disc, 300 lpm printer, operator console, and standard software. TRANSACTION DATA SYSTEMS, INC., Orlando Fla.

FOR DATA CIRCLE 491 ON READER CARD

Line Printer

The Memorex model 2089 line printer, which operates at speeds of up to 410 lpm, is a plug-compatible alternative to IBM's 3284, 3286, and 3288. It can be driven by System/3s, and 3271, 3272, and 3791 controllers. Character sets may contain 48, 64, or 96 EBCDIC or ASCII characters. The printer's adjustable forms feed tractors can accommodate paper widths from 4⅛ inches to 15 inches. A test switch on the operator control panel can invoke internal diagnostics to verify that the unit is fully operational. The printer includes a ribbon re-inking system. Options include eight-line-per-inch printing (in addition to the standard six-line-per-inch spacing), an audible alarm, and expanded vertical forms control. The 2089 sells for $11,000, or rents for $463 per month on a two-year lease. MEMOREX CORP., Santa Clara, Calif.

FOR DATA CIRCLE 490 ON READER CARD

Modems

The USR-300 series of modems comprises a pair of full- or half-duplex units. Model 320 is an auto-answer unit, while the 330 provides both originate and auto-answer functions. Both units operate asynchronously at data rates of up to 300 bps. They're compatible with Bell's 103 and 113 lines of modems. Connecting the modems to the phone system requires a CBS-1001F Data Access Arrangement (DAA) which can be leased from the phone company for about $5 per month, or purchased outright from this vendor for $165. The model 320, with either an RS232C or 20mA current loop interface, sells for $160. The 330, with either interface, sells for $185. It costs $10 more to get both interfaces on either modem. U.S. ROBOTICS, INC., Chicago, Ill.

FOR DATA CIRCLE 488 ON READER CARD

Line Printer

It's easy to see how this printer got the name Impact 3000: it's a 3,000 lpm

impact line printer. The printer's hammers are located behind the paper path;

a print band containing 432 characters is in front of the paper. That 3,000 lpm rating is for a 48-character set; larger sets are offered. Fonts include PL/1, commercial, scientific, and ASCII. The printer's power supply and microprocessor-based controller are integral parts of the Impact 3000. Lease prices are said to be 5% to 30% lower than those offered by IBM for its 3211; purchase price is $90,000. Deliveries are quoted at 45 days. DOCUMATION INC., Melbourne, Fla.

FOR DATA CIRCLE 492 ON READER CARD

Code/Protocol Converter

The BAC-2780 handles conversion of EBCDIC data in IBM binary synchronous protocol to asynchronous ASCII data (and vice versa) allowing the user to substitute a wide variety of peripherals for an IBM 2780. The converter attaches to ASCII peripherals through an RS232 interface. It implements CRC-16 error checking and recovery as well as providing full bisynch handshaking. Multiple-record transmission is supported for blocks of up to 400 characters; the unit has an internal buffer for 800 characters to improve throughput. It will work over point-to-point switched or dedicated communication links. The BAC-2780 sells for $3,250, with deliveries taking 30 days. A board to support multiple asynchronous terminals in a cluster arrangement is reportedly in the works. KMW SYSTEMS CORP., North Royalton, Ohio.

FOR DATA CIRCLE 493 ON READER CARD

Minidisc Controller

In addition to interfacing up to three Shugart SA-400 5¼-inch minidiskette drives to an LSI-11, the MDC 11 controller includes a DMA dynamic memory refresh controller and sockets for 8K 16-bit words of EPROM. Packaged on a dual-width card, the controller plugs directly into the processor's Q-bus. The controller performs track seek and verify functions, as well as 16-bit CRCC generation and checking. The unit also can format minidiskettes.

DMA dynamic memory refresh is provided for LSI-11 systems containing dynamic memories requiring external refresh. The DMA refresh is said to present less of a burden on the bus than the cpu-controlled technique. Provision is made for disabling the cpu's microcoded refresh function. The EPROM section of the controller board contains sockets for 4K words of 2708-type chips or 8K words of 2716-type chips. The EPROM may be addressed at any 4K (or 8K) increment. The MDC11 controller, with all three functions and a three-foot stub cable is priced at $510. The vendor also sells Shugart SA-400 drives for $325. ANDROMEDA SYSTEMS INC., Panorama City, Calif.

FOR DATA CIRCLE 494 ON READER CARD

Diagnostic Tool

The MicroSystem Analyzer can perform in-circuit emulation and "signature" analysis to help locate faults in microprocessor-based products. The signature analysis technique is based on the principle that a given bit stream will generate known "signature" data streams at each component node in the circuit. It is said this method allows a user to verify a device's performance by knowing the proper signatures to expect at each test point. The input bit streams are provided through in-circuit emulation. Presently, the MicroSystem Analyzer supports 8080 and 6800 microprocessors. The analyzer itself is controlled by dual micros which may be programmed by plug-in ROM's or keyed into the unit's RAM. The analyzer sells for $2,475, and the signature analysis capability adds $495 to that. MILLENNIUM SYSTEMS, INC., Cupertino, Calif.

FOR DATA CIRCLE 434 ON READER CARD

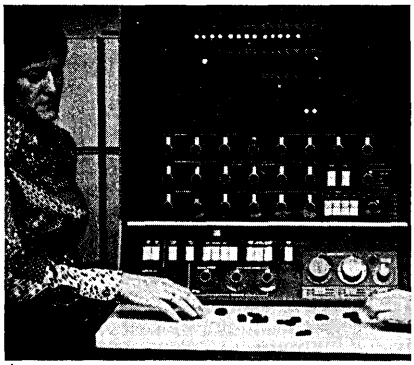
An old-fashioned programmer named Dunn
Who worked on the Univac One,
Proclaimed that it's fine
To have top down design,
"But, mostly, the program should run."

—Skip Jordan

software & services

Updates

There must be an awful lot of black bands on the wooly worms this winter, if weather predicting folklore holds true. Folklore has it that the number of black and brown bands on wooly worms (actually, the worms are the caterpillar stage of the tiger moth) indicate the type of winter ahead: the more brown colored bands, the milder the



weather. The Appalachian State Univ. in Boone, N.C. has a Center for Wooly Worm Studies, which is attempting to correlate the observed weather with folklore. The Center will use the Univ.'s Sperry Univac 90/60 computer to look for links between temperature, humidity, rainfall, wooly worm coloration, and the severity of the winter's weather.

The Canadian Standards Assn., (178 Rexdale Blvd., Rexdale, Ontario M9W 1R3) is considering forming two new working groups: one on data base management systems, the other on the PL/1 programming language. Interested parties should contact Hartley Rogers at the CSA.

Add another to the list of space project technologies that may find its way into the down-to-earth, real world: NASA End-to-End Data Systems, aka, NEEDS. Working with Harris Corp., NASA wants to develop an optical mass memory to replace its current use of mag tape and microfilm. The agency collects roughly 10^{11}-bits of data each day· storing and maintaining this data on tape and film currently costs an estimated $300 million per year. An engineering model of the new system is planned for 1981, with a prototype expected to be in use by 1984. The project has a goal of reducing cost by a factor of 10, and increasing accessibility to the data by a factor of 1,000.

CICS Data Entry

Key/Master is said to eliminate user programming for most data entry applications, and significantly reduce effort in the rest. Initially developed for use with this vendor's proprietary telecommunications monitor, Key/Master now runs under CICS and CICS/VS.

The on-line package is said to allow non-programmers to develop 3270 display formats at a terminal. Key/Master's format definition language uses high-level commands to define formats and specify edit checks and field manipulation operations. These functions can include arithmetic operations, field generation, automatic duplication, range checks, and table look ups. Where special editing or on-line file updating is needed, the services of a programmer are called for. Key/Master is said to help by providing convenient program exits for user-written functions.

The package requires roughly 32KB of memory. It's delivered pregenerated to operate in an unmodified CICS environment. Purchase price is $12,000; it leases for $295 per month. TURNKEY SYSTEMS INC., Norwalk, Conn.

FOR DATA CIRCLE 411 ON READER CARD

Program Editor

HP-3000 users doing program development work will probably be interested in Qedit, an editor designed specifically for maintaining program source files. Qedit can perform smart searching, selecting occurrences of a given string only when it's a valid identifier in the context of the source language (FORTRAN, COBOL, etc.). When adding lines to an inner loop in a structured program, Qedit can provide implied indentation, adding spaces to keep the new lines justified. The package maintains its work file in a format compatible with HP's compilers, so users needn't copy the work file back to the source file prior to compilation; there also is provision for invoking the compilers within Qedit. Users may switch their session's priority prior to issuing a high-overhead command, such as a file copy. Optionally, Qedit may be set up to drop automatically into another priority whenever specific commands begin execution. Qedit is supplied in object form on mag tape. It has a $100 per month, or $960 per year rental fee which includes maintenance. ROBELLE CONSULTING LTD., Delta, British Columbia, Canada.

FOR DATA CIRCLE 412 ON READER CARD

Micro Business Applications

Written in North Star BASIC, this vendor's business information system comprises 51 programs and 120 pages of documentation. The package includes general ledger, accounts receivable, accounts payable, inventory control, and payroll. General ledger can prepare balance sheets, income statements, and maintain the general journal. Accounts receivable includes aging. Inventory control includes inventory status reporting, on-line order entry, invoicing, and maintenance of purchase orders. Check writing and bill of materials are among the modules to be included in the first update to this package, expected in early summer. The package is written so as to allow the user to make modifications, or perhaps adapt it to another dialect of BASIC. It needs 24KB of memory. There are no user-defined functions, no data statements, and no multiple statements per line used in the package. The package sells for $200 in computer stores, or through the mail from this vendor. For mail orders there is an additional $2.50 postage and handling fee, and California residents should add 6% sales tax. THE COMPUTER MART, Orange, Calif.

FOR DATA CIRCLE 413 ON READER CARD

Distributed Processing

Add yet another facet to this vendor's distributed processing architecture, Distributed System/3000 (June 1977, p. 212). A software package, MRJE/3000 provides communication between IBM 360s or 370s and the vendor's 3000 Series II computers using HASP II or JES2 communications protocol. In distributed processing networks running DS/3000, several 3000s can communicate with IBM host via a single MRJE/3000 site. Users may simultaneously share common JCL files, simplifying program preparation and submission. Any 3000 I/O device or file may provide input or receive output. Users need not know commands used by the host computer, as the software will translate the user's requests into valid mainframe commands. Any terminal connected to the 3000 can be used in HASP or JES console mode, although this is not required for system operation. As many as seven input streams, seven print streams, seven punch streams, and one interactive HASP or JES console stream can be interleaved on the same communications line. Maximum line speed is 9600 bps; multiple lines are supported. MRJE/3000 carries an initial fee

asi/inquiry

The IMS DB/DC QUERY LANGUAGE

USED BY MORE IMS INSTALLATIONS THAN ANY COMPETING PRODUCT

ASI/INQUIRY is an IMS DB/DC query language that operates completely as an interactive Message Processing Program. The design of ASI/INQUIRY is such that the *structure of the data base is transparent to the user*. Moreover, one need not have familiarity with DL/1 segment logic or the complexities of multi-pathing. Extremely rapid response time is assured.

MAJOR HIGHLIGHTS

- ☐ End-user oriented
  - —Easy-to-use language
  - —Requires no knowledge of IMS
  - —Comprehensive diagnostic messages
- ☐ Rapid response time for even the most complex queries
- ☐ Dynamic priority scheduling to maximize system performance
- ☐ Availability of default as well as user-defined screen formatting

Recently delivered, Release 2 of ASI/INQUIRY contained a number of major enhancements, including:

- Development of a TSO-supported version
- Full support of IMS/VS secondary indexing
- Open-ended computational facilities
- Ability to SORT display output

In summary, ASI/INQUIRY represents the state-of-the-art product in an IMS DB/DC or TSO-supported IMS environment. It is the only system combining an easy to use language, complete user flexibility, and rapid response time in a single package. If you want to start answering "What if . . . . " immediately, call or write today for further information.

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The Software Manufacturer

Applications Software, Inc.
Corporate Offices
21515 Hawthorne Boulevard
Torrance, California 90503
(213) 542-4381

of $2,000 and a monthly charge of $75. HEWLETT-PACKARD CO., Palo Alto, Calif.
FOR DATA CIRCLE 414 ON READER CARD

PL/1

As we said in our January Look Ahead column, Data General has PL/1 waiting in the wings for its Eclipse line. The minimaker made its formal announcement in mid-January, with deliveries scheduled to commence at the end of this month.

Based on ANSI's 1976 PL/1 programming language standard, this compiler runs under AOS on Eclipse processors with at least 192KB of memory and a floating point processor. The compiler isn't strictly compatible with the 1976 standard (in some respects it's cut back, in others it's extended), but it is said to conform closely to the ANSI PL/1 subset standard currently in draft form. Aggregate arithmetic, PUT DATA, areas, and complex arithmetic have been omitted from this compiler, while interactive program development support, English-language diagnostics, three levels of compile time optimization, re-entrant code, and direct access to operating system functions have been added. And, it is said, any AOS PL/1 program can run under any PL/1 compiler that complies with the ANSI standard.

The compiler has better than 200 English-language error messages. At minor errors (such as an undeclared variable), the compiler notifies the programmer and supplies a probable fix so

software spotlight

A Little FORTRAN 77

This compiler meets and exceeds the ANS FORTRAN 77 Subset Language Specification, making it one of, if not the, first commercially available implementation of the new standard. Its price will be an obstacle to most home computer users, but the compiler may accelerate the development of useful, and inexpensive, application programs for the end user. It supports the vendor's floating point standard. When used with the run-time library supplied with the vendor's operating system, it gives full FORTRAN 77 language I/O support. And it's called . . . FORTRAN-80, probably because it's written for the vendor's 8080 and 8085 microprocessors.

The 1977 standard includes a CHARACTER data type, and supports structured programming using IF . . . THEN . . . ELSE IF . . . ELSE . . . END IF constructs. I/O capabilities include sequential and direct access files, in-memory file units (providing formatting and reformatting of data in internal memory buffers), and error handling facilities. Arrays may have as many as seven dimensions. This vendor has added binary and hexadecimal constants, user-defined INTEGER and LOGICAL variable lengths of one, two, or four bytes, and bit-wise Boolean operations.

The compiler accepts multiple compilation units from a single input file. It can, optionally, provide an assembly language listing of generated code. Cross reference, symbol attribute, and error listings are provided. Reentrant code can be generated. And the compiler generates relocatable code which can be linked to other FORTRAN programs, as well as those written in assembler or PL/M.

The FORTRAN-80 compiler runs on Intellec microcomputer development systems (MDS 800 or MDS 888), or Intellec Series II models 220 or 230. Dual diskette drives and 64KB of memory are required, as is the ISIS-II diskette operating system. FORTRAN-80 sells for $1,250, and is supplied on a diskette. INTEL CORP., Santa Clara, Calif.
FOR DATA CIRCLE 410 ON READER CARD

CUSTER

Migrating to MVS? Have a safe trip. Don't get ambushed by the wrong sort!

Call (201) 568-9700.

SyncSort rescue parties available on short notice.

1978? It's liable to be the *migratingest* year since the old Oregon Trail was closed down for lack of interest.

A lot of solid data-processing citizens — you may be one of them — are going to auction off the old system, pull up stakes and head out for the promised lands of MVS or VS1.

And IBM will be only too happy to help you get there! No doubt you've grown accustomed, these past few years, to the strident yells of their wagonmasters — and mistresses — "Head 'em up! Move 'em out!"

Well, great, we say. For the adventurous data processor with an itch for multi-programming, the streets of MVS and VS1 are paved with gold. Neither system is nearly as wild and woolly as it once was. Why, nowadays, even a sweet young programmer can walk down the streets without any problems at all!

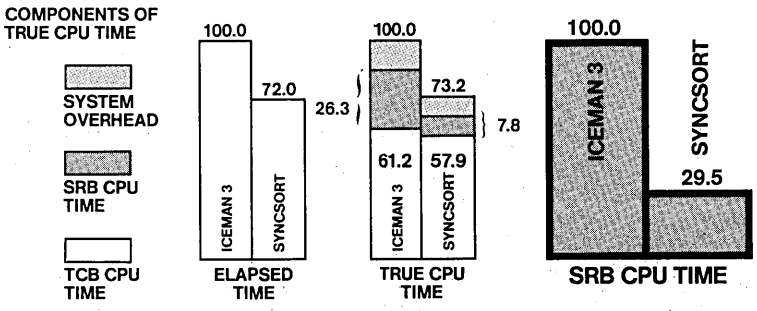
All the same, there are some dangers to keep an eye peeled for in the new land. No. 1 on the list is software that doesn't perform as well out there on the Frontier as it did Back Home.

In some sort programs, for example, there's a sneaky little component called "locked-up True CPU Time"— and it can be as paralyzing to a multi-programming system as a rattlesnake bite to a rabbit.

Like the mighty Sioux Nations, True CPU Time in MVS is divided into Systems Overhead and two other territories:

- TCB Time (Task Control Blocks), which is *interruptible*. If the CPU wants to switch signals, the message gets through and the cavalry arrives on time.
- SRB Time (Service Request Blocks), which is *non-interruptible*. The message doesn't get through and another one of those deplorable DP massacres occurs.

Take a squint at the charts below, particularly the two on the right. They compare SyncSort's overall performance with that of IBM's 5740-SM1, Release 3. *SyncSort has 70% less of that venomous locked-up time:*



But don't take our word for it it! Ask your friendly IBM rep. Chances are, he or she will look embarrassed and try to divert your attention to the shiny hardware goods laid out on the blanket.

If you keep probing, though, Old Straight Arrow will probably whisper, "If I was you pardner, I think I'd go with SyncSort."

And you woudn't expect Old Straight Arrow to speak with forked tongue, would you?

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the error won't be repeated down the line. This feature is said to reduce the number of compilations required to find all of the syntax errors in a program. Of course the compiler inhibits execution if it makes a fix. At run time, errors are identified by any of 50 English messages; if the programmer wishes, he can have the program trap its run-time errors.

The AOS PL/1 compiler and run-time library carry a license fee of $4,000. DATA GENERAL CORP., Westboro, Mass.
FOR DATA CIRCLE 415 ON READER CARD

COBOL

Although it says it doesn't plan to pursue the business dp market, this vendor has developed a COBOL compiler for its line of 32-bit computers. Designed to meet ANS X3.23 1974 and Federal Information Processing Standard (FIPS) 21-1 specifications, the compiler will be available for demonstrations and benchmark tests next month, with deliveries scheduled for May. The compiler carries a price tag of $5,000. SYSTEMS ENGINEERING LABORATORIES, INC., Fort Lauderdale, Fla.
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Cross Assemblers

This vendor has expanded its cross assembler offerings with the addition of programs which generate code for the Z-80, 1802, SC/MP, and 8048 microprocessors. All of these X8 cross assemblers run in 8K words under OS/8 on Digital Equipment Corp.'s ubiquitous PDP-8. The assembler uses a common format for the source language, making life easier for users of several different micros. Pseudo-ops and run-time options provide conditional assembly and a variety of listing features. Output may be generated in the micro's standard loader format, or in a format for burning PROMs and ROMs. Each cross assembler is priced at $400 in PDP-8 binary format on paper tape, Dectape, or floppy; source files are an additional $250. Educational institutions may qualify for discounts. SIERRA DIGITAL SYSTEMS, Reno, Nev.
FOR DATA CIRCLE 417 ON READER CARD

Coursewriter

While selling its BASIC interpreter to educational users, this vendor found quite a few that expressed interest in a similar implementation of Coursewriter. Enter CWR/TCP, said to require less memory and schedule I/O more efficiently than IBM's Coursewriter 3.4, after which it is patterned. With the exception of not supporting the full-screen 3270 operations of IBM's product, this package is said to be compatible with programs and files created for Coursewriter 3.4. With CWR/TCP, educational users can take advantage of the vast corpus of courseware written in Coursewriter, and they can develop their own. The package runs under DOS and DOS/VS on mainframes as small as 360/40s and 370/125s. It runs in one partition, typically taking 6KB of real memory, and 100KB of virtual memory. The CWR/TCP package is priced at roughly $2,400 per year. For users that already have the TCP time-sharing system, the CWR (Coursewriter) component is $900 per year. CBM ASSOCIATES, Lansing, N.Y.
FOR DATA CIRCLE 418 ON READER CARD

Commercial FORTRAN

Although Hewlett-Packard offers a FORTRAN IV compiler for its 21MX and 1000 series of minicomputers, this software house thinks its FORTRAN IV compiler addresses market segments HP misses. Specifically, this vendor feels its 32-bit integer arithmetic, and PRINT statement with capabilities for zero suppression, floating dollar signs, and comma insertions, will make its compiler, coupled with HP's computer, fit many business applications. The extended compiler is said to conform to the 1969 FORTRAN standard as implemented by HP. The compiler requires 10K words of user space and runs under DOS-M, DOS-III, and RTE. Code is generated in standard HP relocatable format. The compiler and associated

Mini/Micro 78

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STEP-BY-STEP DESIGN OF MICROPROCESSOR SYSTEMS

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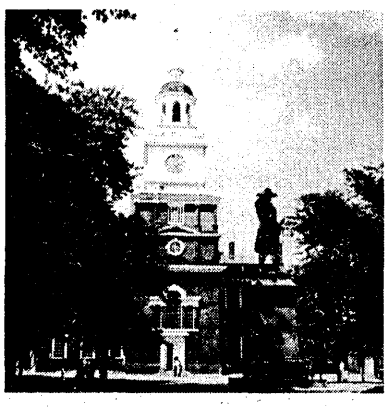
Sponsor: The International Society for Mini and Microcomputers (ISMM)



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run-time modules carry a set up fee of $4,800, and a monthly license fee of $30 per cpu. Program maintenance is an additional $10 per month. DATA SYSTEMS FOR INDUSTRY, Long Beach, Calif.
FOR DATA CIRCLE 419 ON READER CARD

Payroll

Users of this vendor's Visual I electronic accounting system can now get a payroll application system from the vendor for $1,200. A utility program, File Create and Maintenance (FCRAM), which handles indexed sequential files, was introduced at the same time as a no-cost package for all Visual I users. Payroll comprises modules for payroll processing, earnings/deductions report, U.S. savings bond reports, quarterly government reporting to meet state requirements, annual federal government reporting, and check extraction. Users can select payroll frequencies (weekly, semi-monthly, etc.). The payroll register can be produced during the payroll processing run, or at a later time as a separate operation. Users customize their earnings/deduction codes to fit their specific needs. Quarterly and annual payroll data are retained for preparation of required state and federal reports. A summary of the payroll transaction file is available through the check extract module; this module also interfaces to the check reconciliation module of the vendor's accounts payable package. PHILIPS BUSINESS SYSTEMS, INC., Woodbury, N.Y.
FOR DATA CIRCLE 420 ON READER CARD

On-Line Development

Designed for on-line program development via 3270 Model 2 display stations in a CICS DOS/VS environment, Vollie is a successor to this vendor's The Librarian/On-line source program management system. Vollie provides a library system for permanent data storage, on-line data entry and editing, maintenance for DOS/VS source statement libraries, remote job entry and output retrieval under Power/VS, and a variety of security features. Vollie's library capability uses a single data set, and provides each user with a dynamically allocated personal library. The package also compresses library entries, both conserving space and reducing I/O operations. Data entry and editing features include hexadecimal data entry, tabbing, and support of the 3270's hardware editing functions, including INS MODE, DEL, and ERASE EOF. Users also can display and modify DOS/VS source statement libraries, and in conjunction with the vendor's The Librarian package (if present) maintains master files. Vollie can submit jobs directly to Power/VS queues, display output at the terminal, and issue any Power/VS operator command. Security provisions support private libraries for each user, and a shareable, non-modifiable library (for things such as commonly used JCL) accessable by all users. Vollie carries a permanent license fee of $9,500. Lease prices range from $227 to $350, depending on the term of the lease. APPLIED DATA RESEARCH, INC., Princeton, N.J.
FOR DATA CIRCLE 421 ON READER CARD

RPG

RPGplus is this vendor's enhanced version of RPG II, tailored specifically for its 5500 and 6600 series processors. The compiler is said to generate object code that will execute anywhere from 20% to 400% faster than code generated by its predecessor. The largest improvements will be seen in programs that were I/O bound.

In addition to generating faster code, the RPGplus compiler is said to make programming easier. The calculation section can now include a move array verb (MOVEA), and input records may be described in any order, so data definition blocks can be used in more than one program. Programs written for the earlier RPG II compiler will compile under RPGplus.

The RPGplus compiler runs on 5500 or 6600 systems, as well as the recently

announced 3800 and 6000 series attached processors. The generated object code will run on any of the above as well as the smaller 1150 and 1170 processors. The compiler has a one-time license fee of $2,000, or a monthly license fee of $50. Quantity discounts are offered. Support, both maintenance and documentation, goes at $15 per month. DATAPOINT CORP., San Antonio, Texas.

FOR DATA CIRCLE 422 ONE READER CARD

Editor

CREDIT is an editor for Data General Novas and Eclipses. If you found that name in a program directory you'd probably assume it was a part of an accounting application, but then incorporating a vendor's name within a product name is no sure way to come up with a descriptive title.

A crt-oriented, full screen context editing package, CREDIT is designed for use with Data General 6012 crt's, or similar units. The vendor makes a good analogy to describe how this package presents a window into a file: it's much the same as using a microfiche reader, as opposed to line-at-a-time editing on a teletypewriter.

The package provides functions for inserting and deleting lines or characters, copying lines from one place to another, in the same or different files, character string searching and replacement, and user-controlled tab stops.

Available on a license basis, CREDIT has a one-time fee of $500 per installation, with multiple installation discounts. It runs in a minimum of 9K words, and is supplied on 9-track, 800bpi mag tape in RDOS dump format. It runs under RDOS (mapped or unmapped) versions 4.02 through 6.10. A different version, or program patches, are needed to run with terminals other than 6012s. CRR ASSOCIATES, Rochester, Minn.

FOR DATA CIRCLE 424 ON READER CARD

RPG II Documenter

Pathfinder is a utility program which documents RPG II programs and OCL for System 3 (models 8 to 15) sites running either batch or CCP systems. The package provides six basic types of reports. The data dictionary report shows the layout of each file, and identifies which programs use each field, and how they use the fields. All programs, procedures, and nested procedures within a system are listed by disc file name in the OCL by file report. Complete program libraries, along with all file names referenced by each program, are listed in the OCL by program report. A cross reference of all files, nested procedures, and procedures is produced by the OCL by procedure/nested report. The $D sort listing lists all available and working disc sorts within the system. And the system flow chart routine provides a graphic representation of where each program fits within the system. The package carries a price tag of $1,800, which includes on-site installation, training, and a one-year warranty. A conversion program soon will be available to convert the package for use on the System 34. HAWKEYE INFORMATION SYSTEMS, Canoga Park, Calif.

FOR DATA CIRCLE 425 ON READER CARD

Inquiry System

Total-IQ is an inquiry facility for users of this vendor's series 100 and 200 computers. As might be inferred from its name, the package works with data bases maintained by Cincom's Total data base management system.

Intended to answer ad hoc queries, the package operates on-line from a terminal. To make things simpler for a casual user, the data base administrator can define a dictionary of 18-character synonyms, which are used in place of Total's standard 8-character element names. Commonly used procedures may be cataloged for subsequent reuse. Dollar value fields may have dollar signs and decimal points supplied by the package. The Total-IQ package is priced at $10,000. HARRIS CORP., Computer Systems Div., Fort Lauderdale, Fla.

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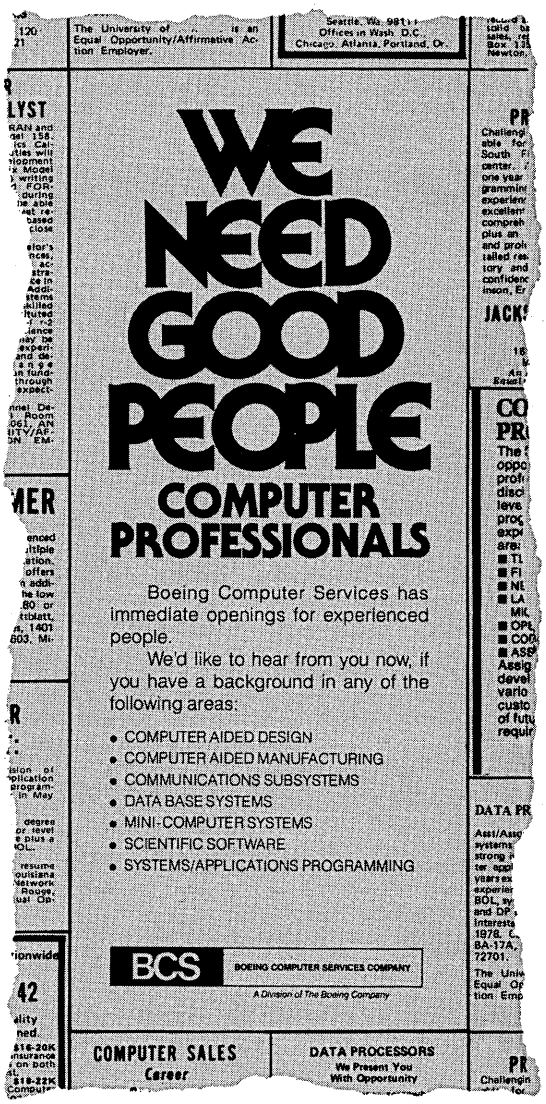

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