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DATAMATION®

1957 77 1977

June

THE TOP 50 U.S. COMPANIES IN THE DP INDUSTRY

Also: looking at Brooks' Law, selecting computers, international data traffic, and structured BASIC

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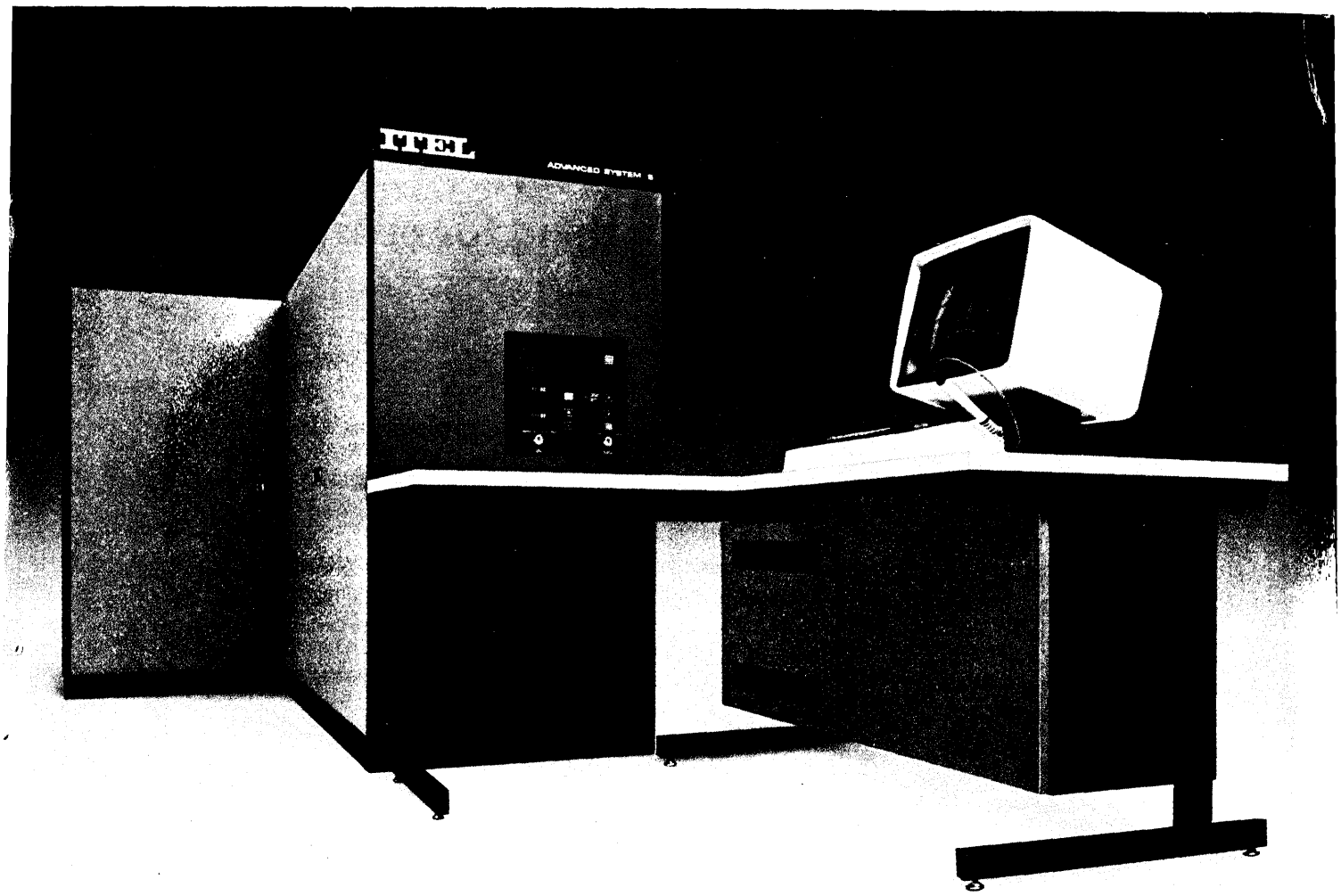

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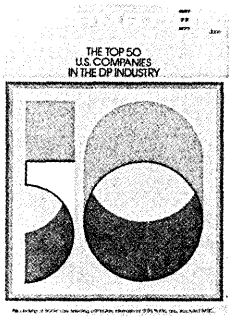

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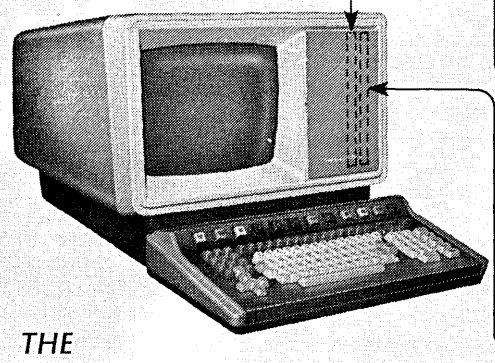
The strength of the top fifty U.S. dp companies featured in this issue is reflected again in our "Top 50" design by Barbara Benson.

MEGADATA's Model 700/UETS
Universal Emulating Terminal System

THE MEGADATA WAY



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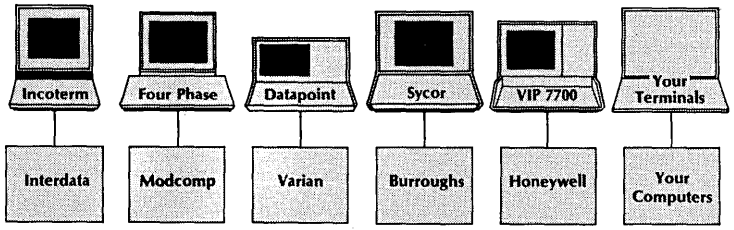
THE OLD WAY



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ADR's The LIBRARIAN®/Online Speeds Program Development, Increases Productivity, and Bypasses Delays for Colonial Life Insurance Co.

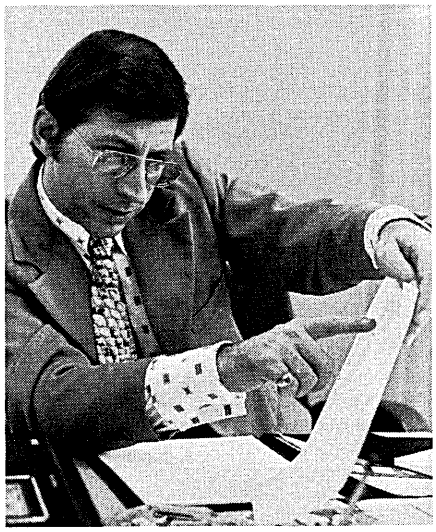
In mid-1975, Colonial Life installed The LIBRARIAN for greater program security and more efficient program management. A year later, The LIBRARIAN/Online was added to further reduce programming time through online system access.

Working under batch, Colonial Life's programmers were often delayed a week waiting to complete a simple update. Waiting for keypunch. Waiting for remote testing. Waiting for hardcopy output.

The LIBRARIAN/Online bypassed these delays by giving the programmer a direct means of entering, reviewing, and retrieving data without hardcopy input or output. Programmers now display program modules, make changes at the terminal, submit them, and get the compilation output back in a matter of minutes.

Now even the biggest jobs can be ready for testing in less than a day...

"And our programmers have a lot more control. Because time lapses have been eliminated, they don't have to reorient themselves all the time to continue a job,"



Second Vice President Howard Lackow points to the steady increase in source code output since installation of LIB/OL.

The LIBRARIAN/Online is operational under both OS and DOS and supports CICS and other teleprocessing monitors. All of the updating functions available to programmers working in a batch LIBRARIAN environment can be invoked from teleprocessing terminals.

LIB/OL gave online access with a full range of module updating and control functions.

The LIBRARIAN is a four-time DATAPRO Software Honor Roll winner installed in over 3,500 installations, and The LIBRARIAN/Online is currently installed at over 250 of those sites.

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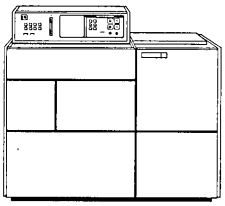
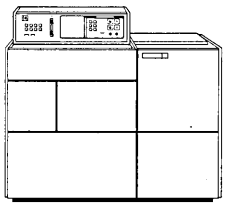
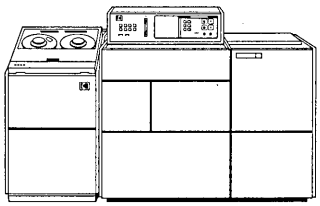


Komstar 100 microimage processor—on-line to IBM S360/370 computers, for distributed processing.



Komstar 200 microimage processor—intelligent, on-line to IBM S360/370 computers, saves CPU formatting time.

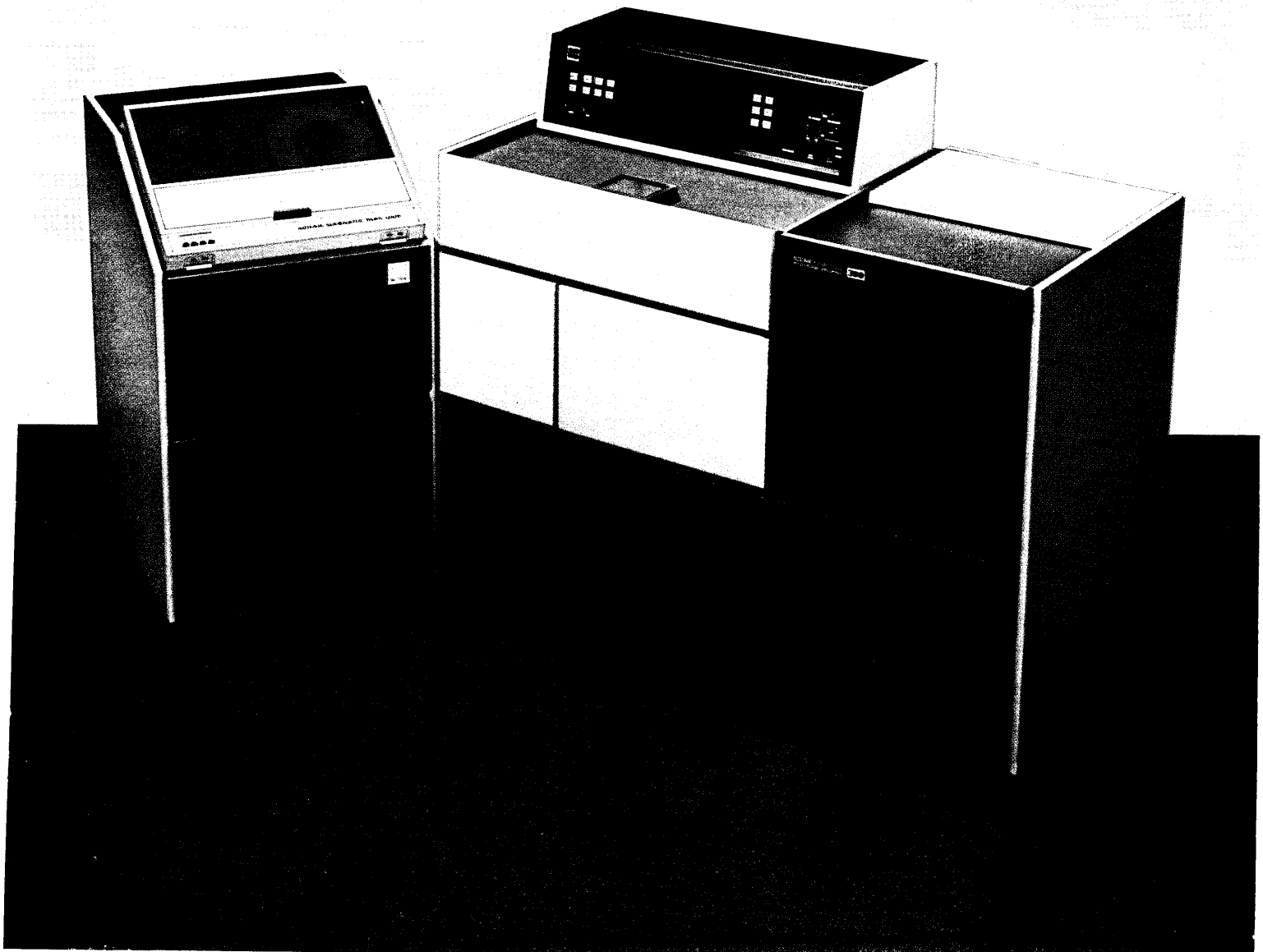


Komstar 300 microimage processor—intelligent, off-line COM, formats print tapes from most major mainframes.

For the detailed story, write Eastman Kodak Company, Business Systems Markets Division, DP-7916, Rochester, N.Y. 14650.

KODAK KOMSTAR Microimage Processors

Kodak



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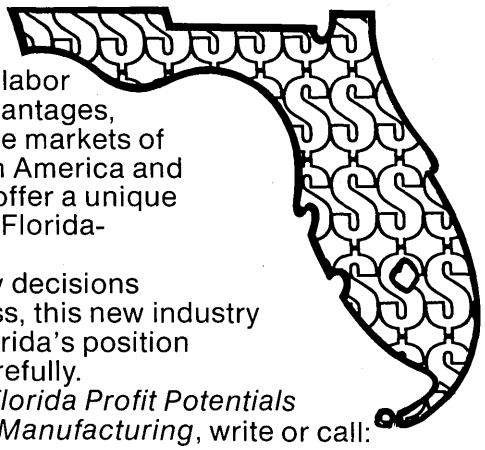

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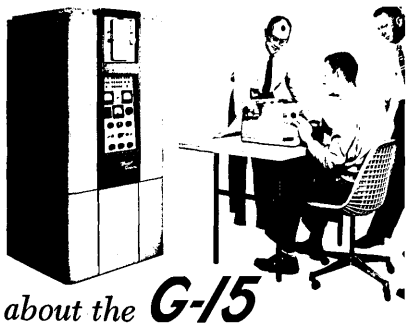
Looking Back in DATAMATION.

On our 20th anniversary

May-June 1958

Computers should perform much of the programming function, argued an article, "Simplicity and the Computer: Bendix Offers a Short Cut to Instruction, Operation." Compilers were dismissed because they required two operational steps, generating object code on tape or cards and subsequent loading and execution. Additionally, since object code looks so much different than source code, the paper asked, "How can programming errors be found which were made in writing the simplified [source] program?" Bendix'



about the G-15

solution for its G-15 computer was an interpreter, such as its Intercom 1000. Intercom had three-part numeric instructions which specified index register, operation, and data address—a definite simplification of the G-15's multipart instructions which included timing information, internal register references, and more.

A woman attendee at the recently held Western Joint Computer Conference commented, "Where this used to be an intimate gathering, half the world now seems to be beating a path to our door." The WJCC drew about 2,000 persons.

June 1967

Honeywell, Burroughs, and RCA filed protests with the Secretary of the Air Force over the selection of IBM for the then-largest single dp contract—the $100 million plus Phase II Base Level Automation Standardization program. One of the questions asked was why the Air Force opted for a bid $50 million more than the others.

The Bell System was reportedly experimenting with 12 and 16 button touchtone telephones for transmitting numbers, letters, and symbols.

Sexism '67: an ocr vendor advertised that its "optical reader can do anything your keypunch operators do. (Well, almost.) It can't get mad and make silly mistakes. Or pout for days. Or cry." ❋

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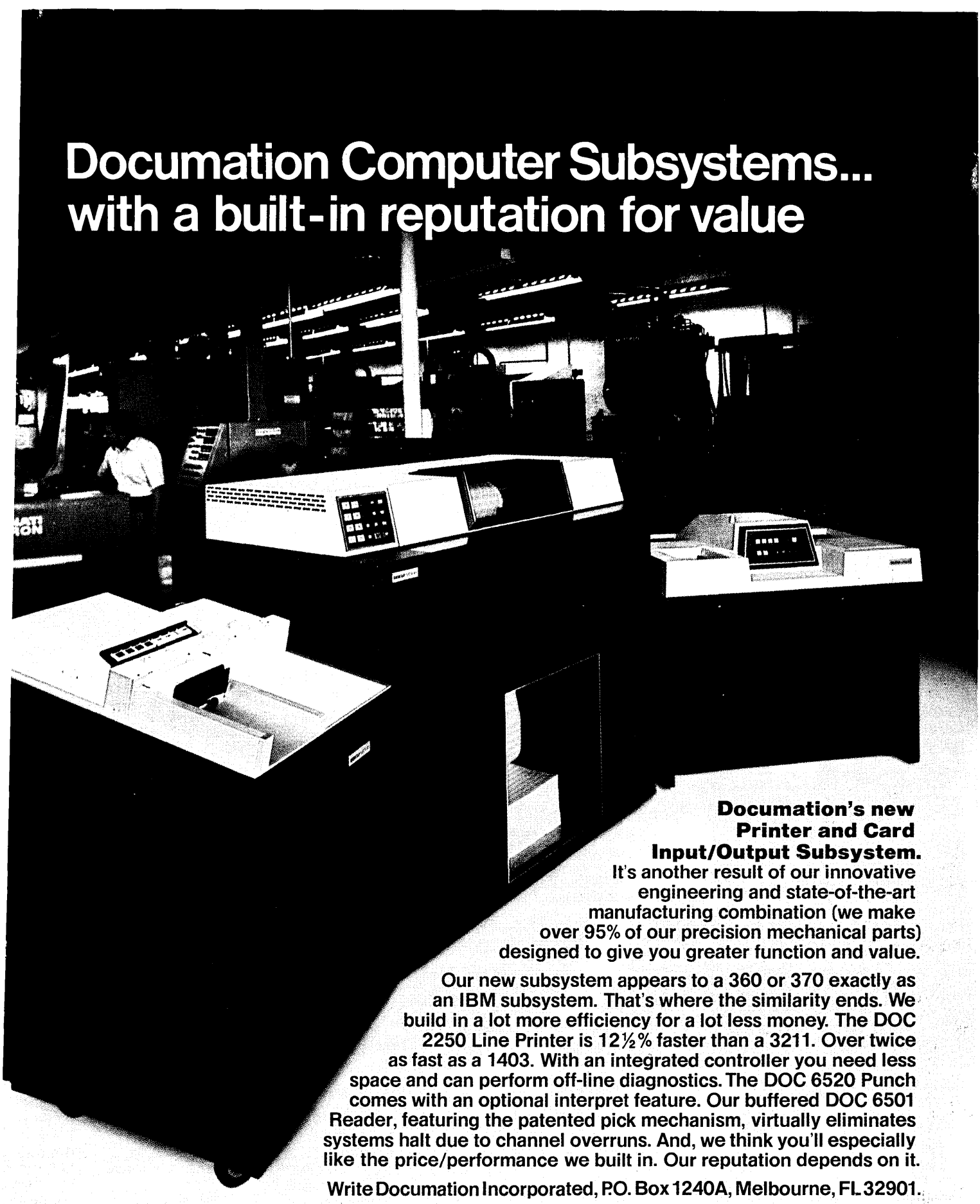

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CIRCLE 145 ON READER CARD

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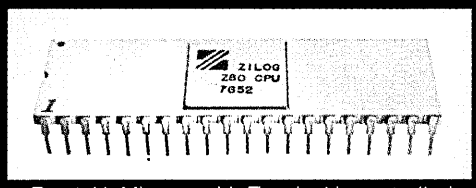
Photograph of Display, unretouched

Now you can get quality resolution and a combination of true graphics and true alphanumerics at an affordable price.

Ramtek introduces the new Micrographic Terminal. No longer do you have to settle for poor resolution or give up color in economy priced display terminals. Ramtek gives you a high resolution, flicker-free display on a resolvable matrix of 512 elements by 256 lines. And you get a choice of black and white or any 8 of 64 colors as well as split or dual screen capability. The independent alphanumeric refresh offers you single character addressibility within a visible matrix of 25 rows of 80 characters that are crisp. sharp and well defined.



Ramtek's Micrographic Terminal is controlled by a powerful Zilog Z-80 with 28K bytes of PROM and 16K bytes of RAM.

In addition you can program the Ramtek Micrographic Terminal and give it the dedicated capability and intelligence you need for your application. Ramtek's software gives you TTY compatibility and high level graphic functions commanded by ASCII text strings. You can choose from an extensive list of options such as floppy disc interface, additional serial I/O ports, alphanumeric overlays, user defined fonts, color selections and packaged software.

More good news: prices for a black and white basic system begin at just $4,700 and for color at only $5,400.

But to fully appreciate the contribution the Ramtek Micrographic Terminal can make to your application, you'll need to know more details. Just call or write Ramtek Corporation, 585 N. Mary Ave., Sunnyvale CA 94806. If you're really in a hurry call us at (408) 735-8400 and ask for Todd Martin.

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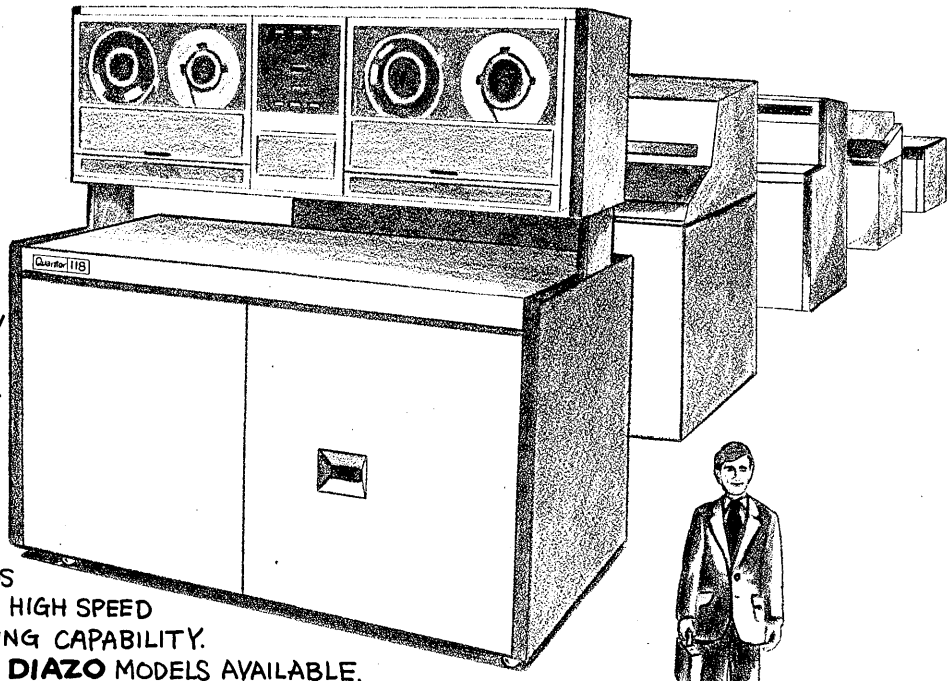

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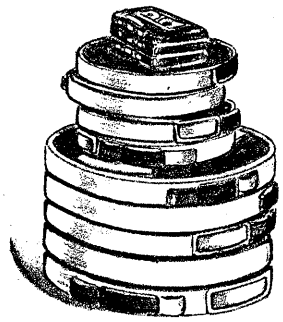

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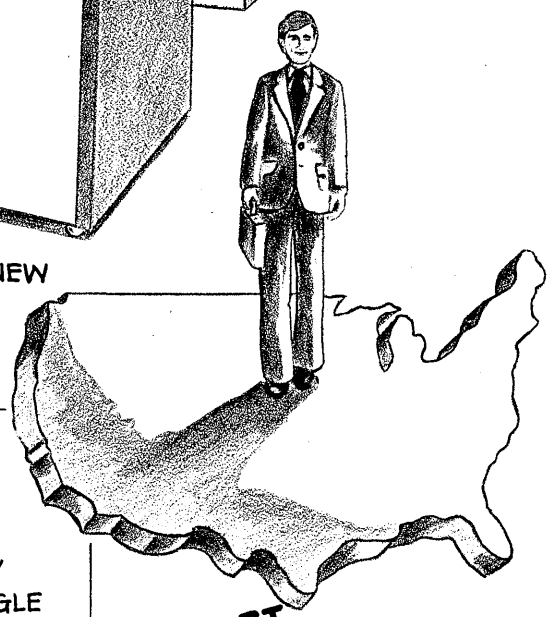

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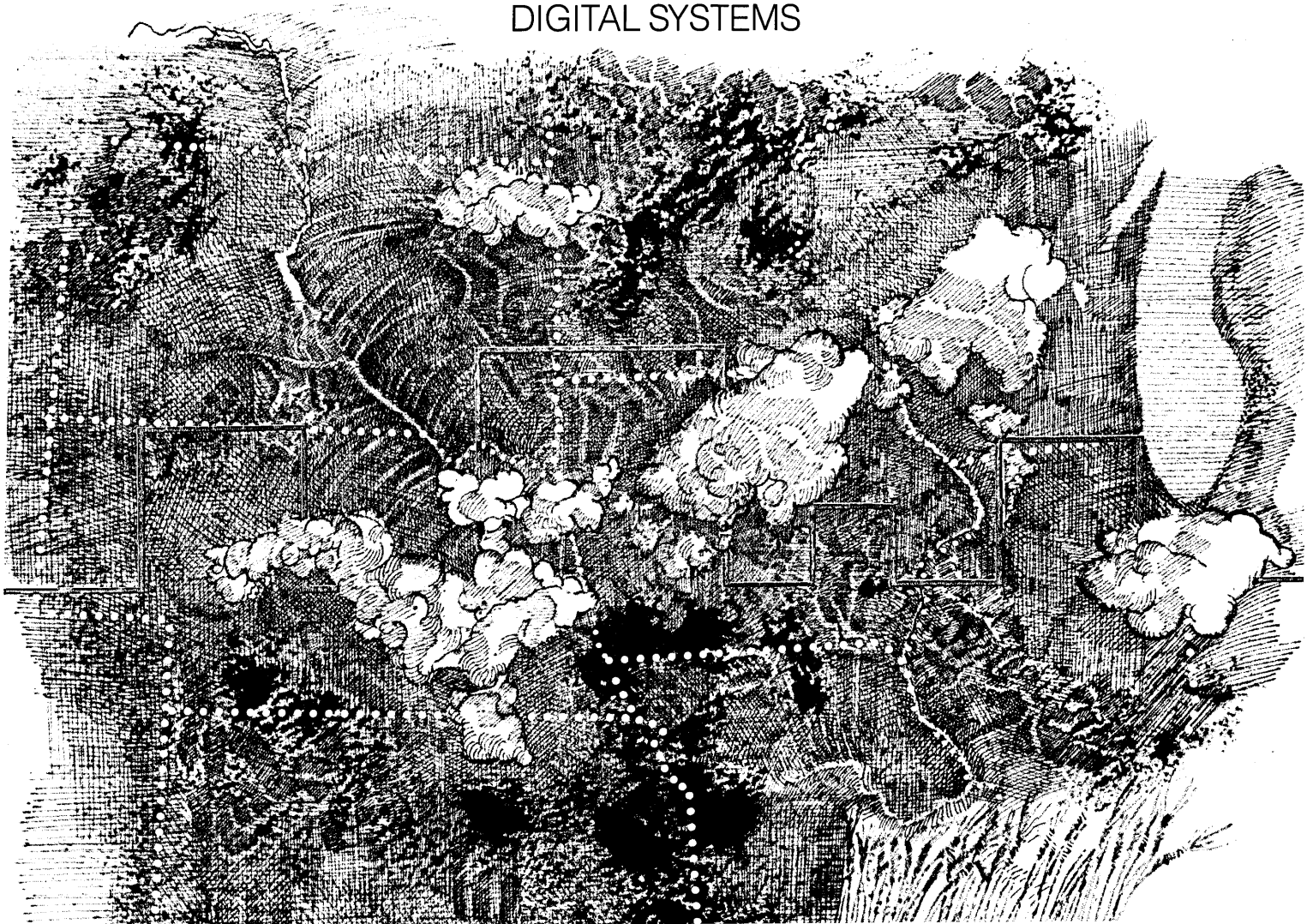

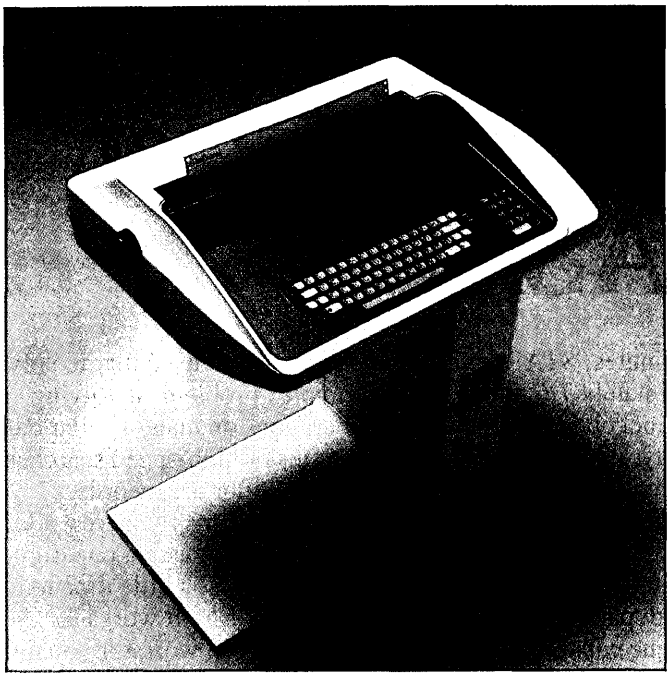

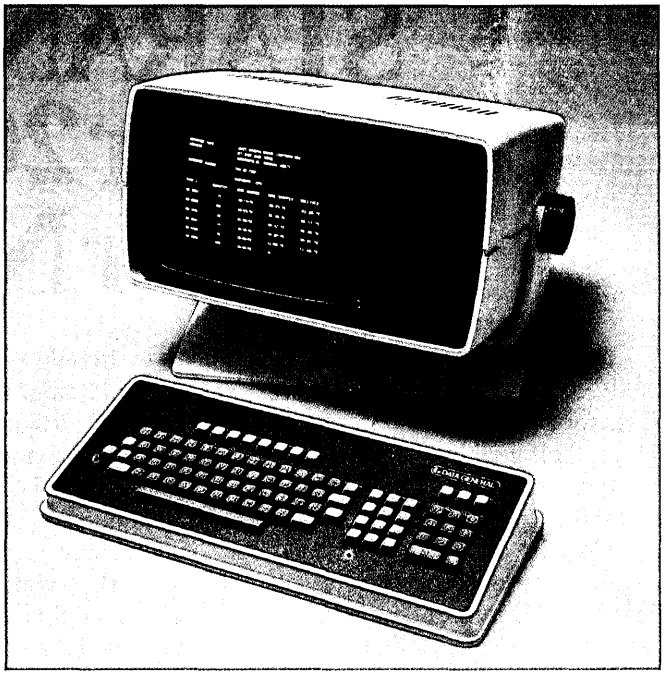

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LOOK AHEAD

THE REAL ELECTRONIC MAIL BOX

Everybody's talking about electronic mail but Cook Industries, an international commodities house based in Memphis, actually has an electronic mail box system up and running. An extension of the firm's administrative message switching network linking processors in Paris, Hong Kong, and Memphis, the mail box sorts out messages by kinds of text, compares text to users' information requirements, then alerts users on their crt's that this information is being held for them in the electronic mailbox.

Developed by Quotron, the 60-crt and 20-printer system enables users to access the electronic mailbox, transmit over the administrative message switching network, or access commodity data bases--all on the same crt. Soon the system also will allow users to go into the firm's 370/158s as well. "And they will never even know they're changing hosts," the firm's director of corporate telecommunications, Buford F. Smith, says. As far as Smith knows, Cook is the only user in the country to have a system like this actually operational.

STILL TAXING

The taxing problem of taxes--particularly retroactive taxes--continues to plague the data processing services and software industries and individuals and companies still are fighting back (May, p. 155).

In California, a new group called STAG (Sales Tax Action Group) has been formed to fight retroactive imposition of sales and use taxes. The California group "firmly opposes retroactive application of sales and use taxes upon California computer companies, and is prepared to question the actions of the State Board of Equalization in applying its ambiguous regulations in an inconsistent manner through auditors totally unversed in data processing matters and having an attitude of 'when in doubt, tax.'"

And in New York, Bob Sherrin, hero of a successful legal battle in Florida to offset software sales taxes, has filed a petition against the New York State Dept. of Taxation and Finance seeking a hearing by the state under the Administrative Procedures Act, which he used to win his point in Florida and which he feels will be "even more effective" in New York.

In Wisconsin, Michael E. Zeidler, who has been waging a single-handed battle against that state's legislature to defeat a 4% sales tax on computer services, wrote a letter to state lawmakers congratulating them on "putting me out of business." A Senate bill including the tax seemed assured of passage in mid-May.

A LOT OF EXPLAINING FOR DEC'S COMPONENTS GROUP

Digital Equipment Corp.'s components group may have trouble this year justifying to its dealers a very unusual deal it offered to AT&T for the DECwriter II--a three-year, 15,000 unit "umbrella contract" that provides for DEC actually to sell DECwriters to Bell operating companies individually. According to retailers and internal DEC sources, several options were granted to the Bell companies that have never been offered to the 100 independent retailers who have formed the backbone of the DECwriter's end user sales force.

The options are: whole unit warranties, undersize orders and shipments (each priced with a $50/unit surcharge), and DEC factory options integration. The most explosive element in the AT&T deal, however, is the no-bill-back provision that Bell wrangled from DEC. The Digital Components group had sold terminals to their retailers at discounts of up to 44% off list for unit sales of 1,000. But for AT&T, they developed a new 5,000 unit volume price of 56% off list. The catch is that while AT&T signed for 5,000 units annually, the contract provided that Bell wouldn't be billed back if the amount went below that figure. There was a proviso that the discount would be guaranteed for 20 months and then is to be adjusted if collective Bell purchases are less than 6,000 units for the first 18 months.

And there are other favorable price considerations offered to AT&T by the very successful components group which this year will glean an estimated $90 million, largely from volume-lot sales of the DECwriter. Among them are year-by-year price integrity, with DEC's price increases to be applied only upon the beginning of the second and third year of the contract, and then only to a maximum of 10%.

THE LINEUP HAS TO BE LEGIT

With more than 2,000 orders in hand for its 3033 computer, IBM clamped down on "position selling" for the computer. Some leasing companies howled; others accepted the edict as a blessing.

IBM told its customers that IBM must have evidence that firms ordering the 3033 will own the machine after it's installed and that it will enforce the edict by doing "preliminary credit reviews" on potential buyers. It said in a letter circulated to customers in late May that "any misrepresentation will be grounds for cancellation of future shipments of on-order IBM machines."

Position selling has been going on for a long time, but it reached its height after IBM salesmen frightened 370/138 and 370/148 prospects into ordering in a hurry, and there were some reports it sold out 370/148 production for the next three years. IBM complains of "an alarming increase" in the number of speculative orders--ones in which a user signs up for a machine, is given an order position number, and then sells it to third party lessors, dealers, and brokers. An order position for a 148 was selling for as high as $40,000 to $50,000 early this year, but a lessor says this dropped to about $25,000 as many jumped in, seeing an opportunity for a quick killing. A Chicago law firm was known to have placed orders for 148s, even though it doesn't use computers. And a small user ordered three 3033s strictly for speculative purposes.

One leasing company says its main edge against IBM is to be able to offer machines immediately to users who are tired of waiting for IBM delivery schedules. So it buys position orders. But Mordecai Weissman, of O.P.M. Leasing Co., who sympathizes with IBM's position, says his recent "defensive order" for many IBM 3033s has been cut in half following the IBM edict, which seemed to guarantee an end to speculative ordering.

IBM -- THE MARKETING EDGE

Marketing isn't everything but it's a lot for IBM. Still one more testimony to the goliath's marketing edge came during the American Bankers Assn. Operations and Automation Conference last month when R. T. Strother, v.p., Union Trust Co., Darien, Conn., explained why his bank, with an in-place, on-line network of 13 Docutel Automated Teller Machines, chose to go to IBM 3614s when it wanted to expand the system.

"Docutel's (the acknowledged ATM leader) marketing people were not overly enthusiastic over our inquiries about seven new machines. They came forward with only a modest amount of advice, their sales office suffered an inordinate amount of turnover, and some of the advice supplied, such as software cost figures, turned out to be inadequate.... IBM... offered a great deal of advice and bent over backwards to answer all the difficult questions raised by the intrusion of a whole new line of hardware and a new line of protocol into an already complex project." The addition of IBM ATM's meant new (additional) software and new communications protocols. All this for a system called, "Tabby the Timeless Teller, a white cat with a big wink."

SHORTCUT TO ANTITRUST SUITS

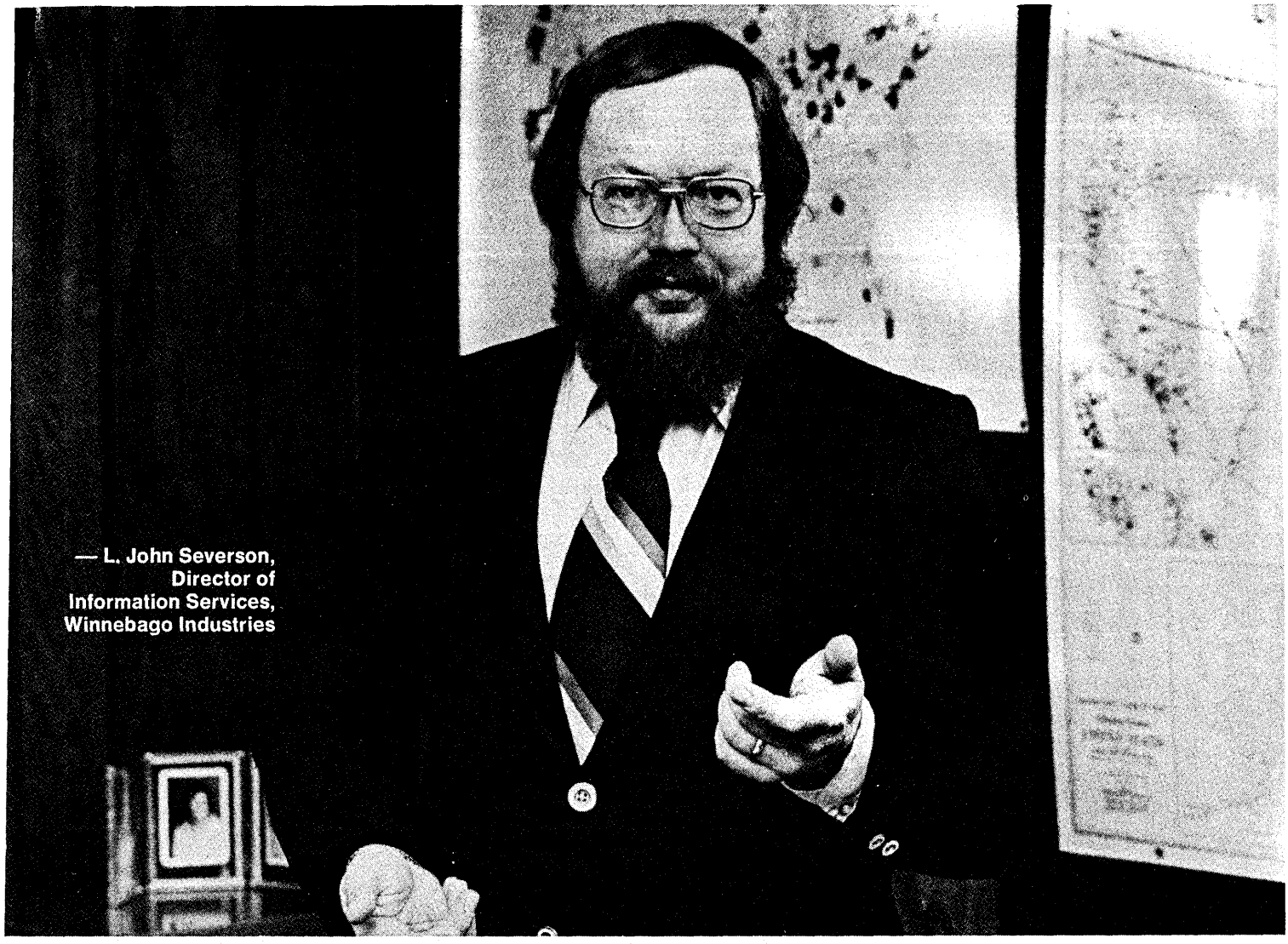
The government's gargantuan trust-busting suits against IBM and AT&T may be headed for resolution, but not in the courts. Congress, which has been trying to overhaul the antiquated antitrust statutes for several years, seems ready to tackle the corporate giants. The end result, say Capitol Hill observers, may be legislative remedies designed to restructure the computer and communications giants.

Targeted for enactment within the next two years, this legislation would obviate the need for continuing the long, drawn out litigative battles. Under the new laws, Congress itself would revamp the two companies or provide the Justice Dept. and/or the Federal Trade Commission with rule-making authority to handle the restructuring. The "interesting twist" on the AT&T side, according to one source, would be the impact of the trust-busting legislation on Bell's own legislation, the Consumer Communications Reform Act. While the antitrust drive picks up steam, the Bell Bill may die a slow death, he predicts. But hammering out the compromise legislative solution, he points out, will be "a friendlier audience," the Senate Antitrust and Monopoly Subcommittee, whose chairman, Sen. Edward M. Kennedy, is expected to combine forces with Senate Communications Subcommittee leader Ernest F. Hollings.

FIRST TERABIT, NOW TETABIT

Who's ever heard of a tetabit memory? Probably nobody, but within the next five years the new storage technology may become as commonplace as terabit memory almost is. At least that's what the Institute for Advanced Computation is hoping. Part of NASA's Ames and the Dept. of Defense Advanced Research Projects Agency (ARPA), the Sunnyvale, Calif., think tank is experimenting with a new memory system which promises to provide a storage capacity of 10^{16} bits for a 10 tetabit memory (A tetabit being 10^{15} bits).

(Continued on page 200)



— L. John Severson,
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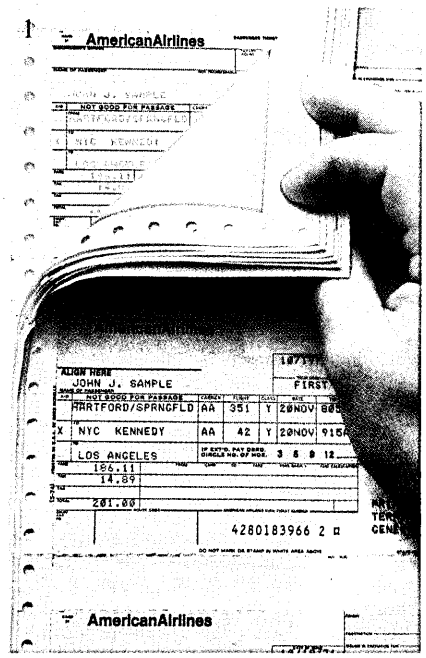

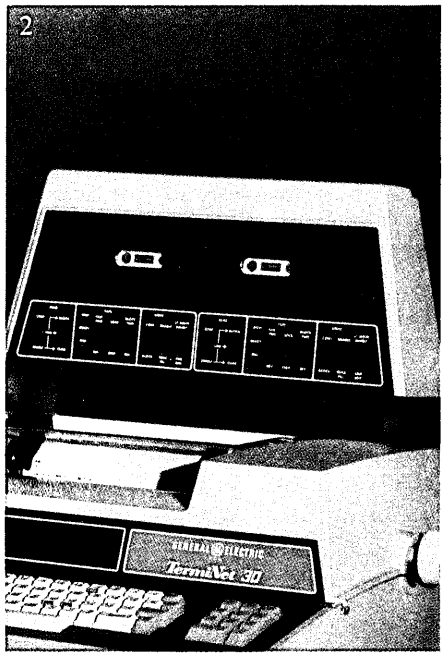

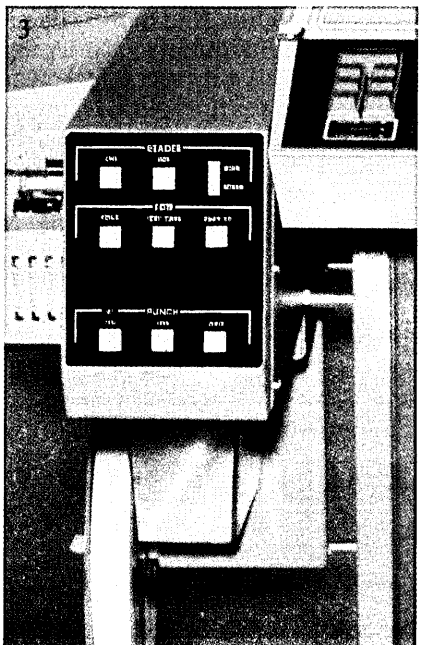

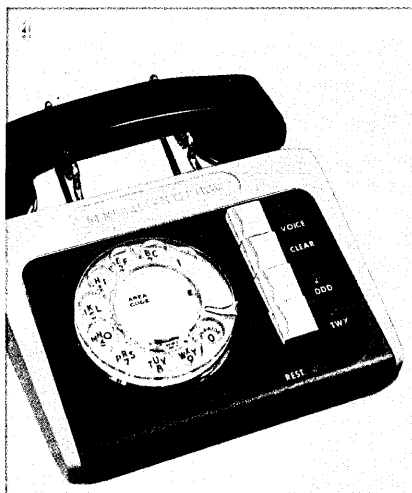

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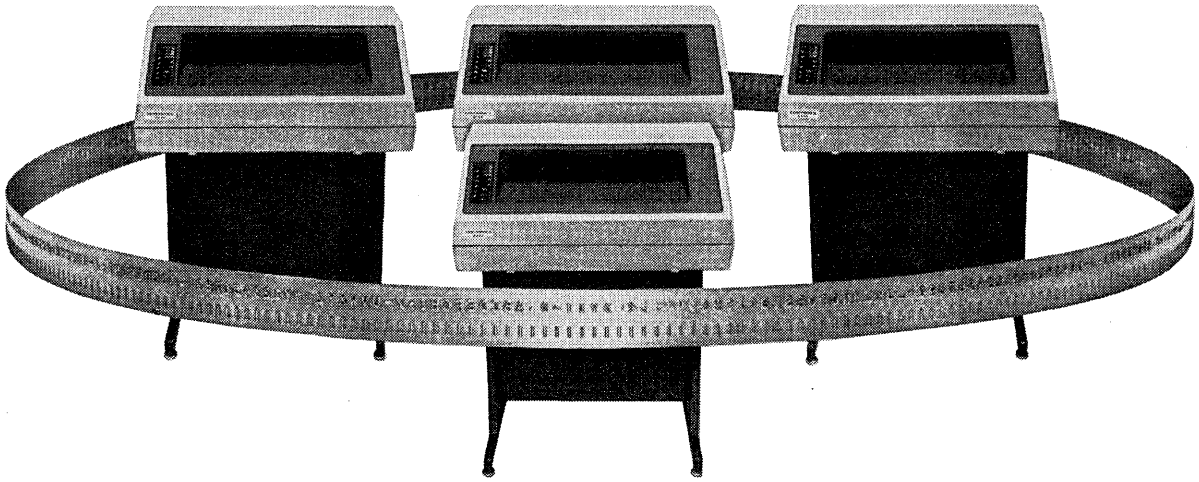

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letters

"Architecture" answers

Although I am no longer intimately involved in military computer development, as the "father" of the Navy's All Applications Digital Computer (AADC), as well as the Standard Airborne Digital Computer (AN/AYK-14), I was disappointed to learn that the AN/UYK-20 computer architecture rated worse in quantitative scoring against other computer architectures ("Comparing Computer Architectures," February, p. 48). The AN/UYK-20 architecture is the basis for the AN/AYK-14 presently being developed by CDC for the Naval Systems Command. The choice of that architecture as an emulation target for the AN/AYK-14 was based on advice provided by several eminent organizations, among them the Naval Research Laboratory (NRL) for which co-author Mr. Smith works. As a result of such advice, the AN/AYK-14 projet was redirected by the Assistant Secretary of the Navy to disregard commercial architectures and commercially available software, and instead proceed with a hardware-oriented procurement of an AN/UYK-20 emulator. The bulk of the AN/AYK-14 support software was, and still is, to come from the military software pool which Burr and Smith call "relatively weak."

The idea for a Computer Family Architecture (CFA) as presented in the article is not new. It has been bouncing around for quite some time; and as we know time and technology take their toll. Because CFA fails to recognize the ascendancy of microprocessing and its impact on computer system architecture for military systems, the conclusions drawn by the CFA study are, for the most part, irrelevant.

First, no modern microprocessor architecture was considered for evaluation, yet conservative projections indicate that 90% of all data and signal processing in future military systems will be accomplished using embedded microprocessors or distributed computing networks built up from microprocessor-based computers and "smart" subsystems/terminals.

Second, programming for large scale computers should be accomplished using Higher Order Languages (HOL's), specifically in order to decouple the programmer from his computing environment and link him more closely to his problem environment.

Third, most available support software is not available in HOL form. Such software is not very transportable. Do we recode all "available" support software in the HOL in order to make it transportable? Is it proposed to buy only commercial DEC computers to support militarized PDP-11 architectures? Do we use our military computers to host support software?

These questions have been asked before. They still need answering.

In summary, the approach described in the article can be of value when applied in a timely manner.

RONALD S. ENTNER.
Burke, Virginia

The authors respond: Readers should be aware that Mr. Entner's letter is another shot in a bitterly contested battle which was fought over the instruction set to be used in the Navy's AN/AYK-14 airborne computer, then known as the "Interim Standard Airborne Digital Computer." In the cases of both the AADC and the AN/AYK-14, Mr. Entner favored the introduction of novel new architectures to the Navy, and in both cases he was opposed by NRL, which wanted to limit the spread of new architectures in the Navy, and to try to move the Navy more or less into the computer industry mainstream. The AADC effort, after the development of one advanced development prototype of a machine wth a very novel instruction-set architecture, was redirected into the Computer Family Architecture effort described in our article. An existing instruction set, already in use in the Navy's AN/UYK-20 standard shipborne computer, was selected for the AN/AYK-14, more or less over the dead body of Mr. Entner. The two NRL individuals who are most responsible for NRL's position on both the AADC and the AN/AYK-14 are Dr. Bruce Wald, superintendent of the NRL Communication Science Div., and his "left hand man," Y. S. Wu, and we thought that it would be appropriate for Dr. Wald to answer Mr. Entner:

"I am the luckless bureaucrat who four years ago earned the wrath of individuals in the Naval Electronics Systems Command by suggesting that the instruction set architecture of the AN/UYK-20 was hastily chosen and probably poor, and then two years later earned the wrath of Mr. Entner and some of his associates in the Naval Air Systems Command by suggesting that their "Interim Standard Airborne Digital Computer" should be software compatible with the AN/UYK-20 rather than introduce still another obscure instruction set architecture. When asked to justify my position, Y. S. Wu compared the Navy's situation to that of an individual possessed of an unsatisfactory spouse, but of insufficient capital to afford a divorce. I am pleased that the fears that Mr. Entner expressed at the time of the AN/AYK-14 debate about whether it would be possible to produce competitively a cost-effective AN/UYK-20 emulator proved groundless, and that the hardware being sought has a sufficiently general implementation architure to emulate other machines and permit a gradual and cost-effective separation.

Whether or not one agrees that "90% of all . . . processing . . . will be accomplished using microprocessors or distributed computing networks," the "ascendancy of microprocessing" does not diminish the importance of standardization of programmable devices at the level at which they are programmed. Mr. Entner can rest easy knowing that the PDP-11 architecture has already been successfully built and used by the thousands as a microcomputer—the LSI-11.

I, too, hope that some day all our programming is done in HOL's which "decouple the programmer from his environment." The only nontrivial programs known to me that are sufficiently decoupled to be completely transportable are written in APL, and not all APL programs are transportable. Until such languages are perfected and gain wide acceptance, we are faced with situations such as Mr. Entner describes. Until that great day arrives, the military will continue to press for standardization of the instruction sets of their micro, mini, midi, and maxi computers.

. . . and more

It is unfortunate that you printed the conclusions represented by "Comparing Computer Architectures" (February, p. 48). Although the technique presented is appealing, I am not surprised that you were taken in along with many military managers. The study fails to consider the real world problems facing military program managers.

I was involved as one of the 18 Army/Navy users some time ago. Our agency had approximately two-thirds of the Army's then-current requirements for this type of minicomputer. It was our judgment that the factors and weights used in the architecture study did not quite reflect our needs. We slightly modified the factors and weights to adjust to our mission, and lo and behold, came out with a totally different architecture as the "winner." In fact, it was one of the architectures which failed the initial "absolute" criteria.

As the article suggests, benchmarking is a reasonable way to compare equipment. Comparing architectures, it seems to me, is almost meaningless. One can get almost any answer, depending on the criteria and metrics chosen. The article says that it is difficult to compare architectures by benchmarking, and then procceeds to compare architectures by benchmarking.

In my opinion, the major error in selecting adp equipment using this method is that it addresses primarily the architecture rather than the application as a total system, which includes size, weight, power requirements, the military standards (of course), the maintainability, reliability, availability, militarized peripherals, etc.

D. H. MC ELHONE
Fairfax, Virginia

(Continued on page 22)

letters

What kind are you?

I just finished Norman Grabowsky's article "What Kind of Programmer Are You?" (March, p. 134) The only possible response to it would be to offer my sincere condolences to his employers.

JOHN F. FAHEY
NYS Dept. of Motor Vehicles
Latham, New York

I took Mr. Grabowsky's test, and found I qualified as a mathematician rather than a good programmer because I did not question a given—that *I* must be one or two. I question Mr. Grabowski's assertion that a good programmer must write needless code as a control on a situation that does not require it. He should be convicted of mayhem.

W. R. PATTERSON
American Friends Service Committee Inc.
Philadelphia, Pennsylvania

. . . Readers of Mr. Grabowsky's article might like to append another category: auditor. The auditor adds another step—test it. Many programmers (and especially good ones) assume they cannot make a mistake and, accordingly, testing is a waste of time.

JOHN P. HARRISON, CPA
Main Lafrentz & Co.
New York, New Yrok

. . . The test only told me more than I wanted to know about Norman Grabowsky. Any project manager who issues an interface specification ("always has a value of one or two . . .") and then after the project is finished announces that he lied must be trying to get revenge for past frustrations.

DENNIS HOBDE
GTE Sylvania
Mountain View, California

. . . I presumed that the program checked that the value was one or two. He did say "always." Yet he rates his last solution best because it checks for *I* being one or two. Foul! I cry. Even though his point is well taken (one *should* always check), I found myself annoyed. But, lest you throw sour grapes at me, I point out that in my book none of the answers were satisfactory as an example of good programming. Not a single one of them had a comment.

JEF RASKIN
Bannister & Crun
Brisbane, California

Having evaluated myself as a programmer, I found the author holding true to form as one who provides specifications to a programmer. Upon completion of the task, we learn that the original specification was untrue, and the checks should be made to flag those cases when *I* really isn't (ha, ha) equal to one of the promised values. Ho hum. Such are the weeks and months in the life of a working programmer, and we accept that. However, the author's favorite solution (10) would hopefully raise the hackles of a good programmer in alarm. To misprogram because of faulty specifications is one thing, but to assume that if *I* is not equal to either of its required values it should be casually set to one by the program? Mr. Grabowsky, for shame!

J. JOE BEARDSLEY
Salt Lake City, Utah

Mr. Grabowsky responds: If a programmer is naive enough not to check the value of variables even when told they will always be in a given range, he deserves the midnight call he will probably get when his program bombs. As consolation he can always hurl insults at his client or user when he discovers they lied. The important thing is, after all, that it is their fault.

Some people stated that if I is found to be out of range, the program should immediately terminate. However, without further information on what the overall program does or what I is used for, this is a question of philosophy. There certainly are situations where the process should be terminated, such as real-time data collection. As for setting the value of I arbitrarily equal to one, if one decides to adopt the philosophy of continuing, he obviously has two choices and I see no clear cut advantage to setting I equal to two. A more valid criticism in this area was offered independently by several readers, that when an invalid I is detected the value of I should also be printed.

Most everyone assumed I favored solution 10—"good programmer." Actually solution number six—"computer scientist"—is by far my favorite. However, I would check for I first, and since I have no delusions of my mortality or anyone else's, I would put in a comment if I remembered.

Kudos and applause

I wish to applaud your article by George M. Dick on modems ("The Lowly Modem" March, p. 69). Of the many facets with which one can become involved in dealing with computers, there is one that is basic to the whole industry, and that is hardware. A halfway decent understanding of "how the thing works" seems to me an essential part of doing the best job we can whether it be sales, programming, hardware procurement, or data processing management. I look forward to more articles describing other aspects of computer hardware.

On another front, let's hear it for PL/1. Lee Milligan's eloquent assertion ("Why Not PL/1?" March, p. 270) about the suitability of the language for an extensive variety of processing applications is overdue.

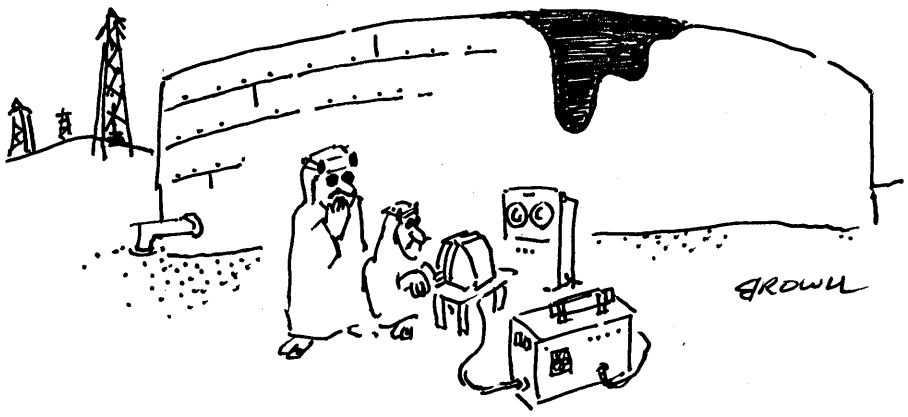
Having been an assembler programmer for six years, and having used COBOL, ALGOL, BASIC, FORTRAN, and RPG, I can safely say that PL/1 gives the programmer and the data processing manager the best for the money.

DENNIS NENDZA
Arizona Feeds
Tucson, Arizona

Kudos to George M. Dick for his excellent primer/refresher presentation on modem communication. His careful "modulation" of basic concepts resulted in an appreciative "demodulation" at my end, with Datamation as the simplex medium.

By example, Mr. Dick has demonstrated that the essence of dp technology can be expressed in a manner meaningful to those on the fringes.

(Continued on page 222)



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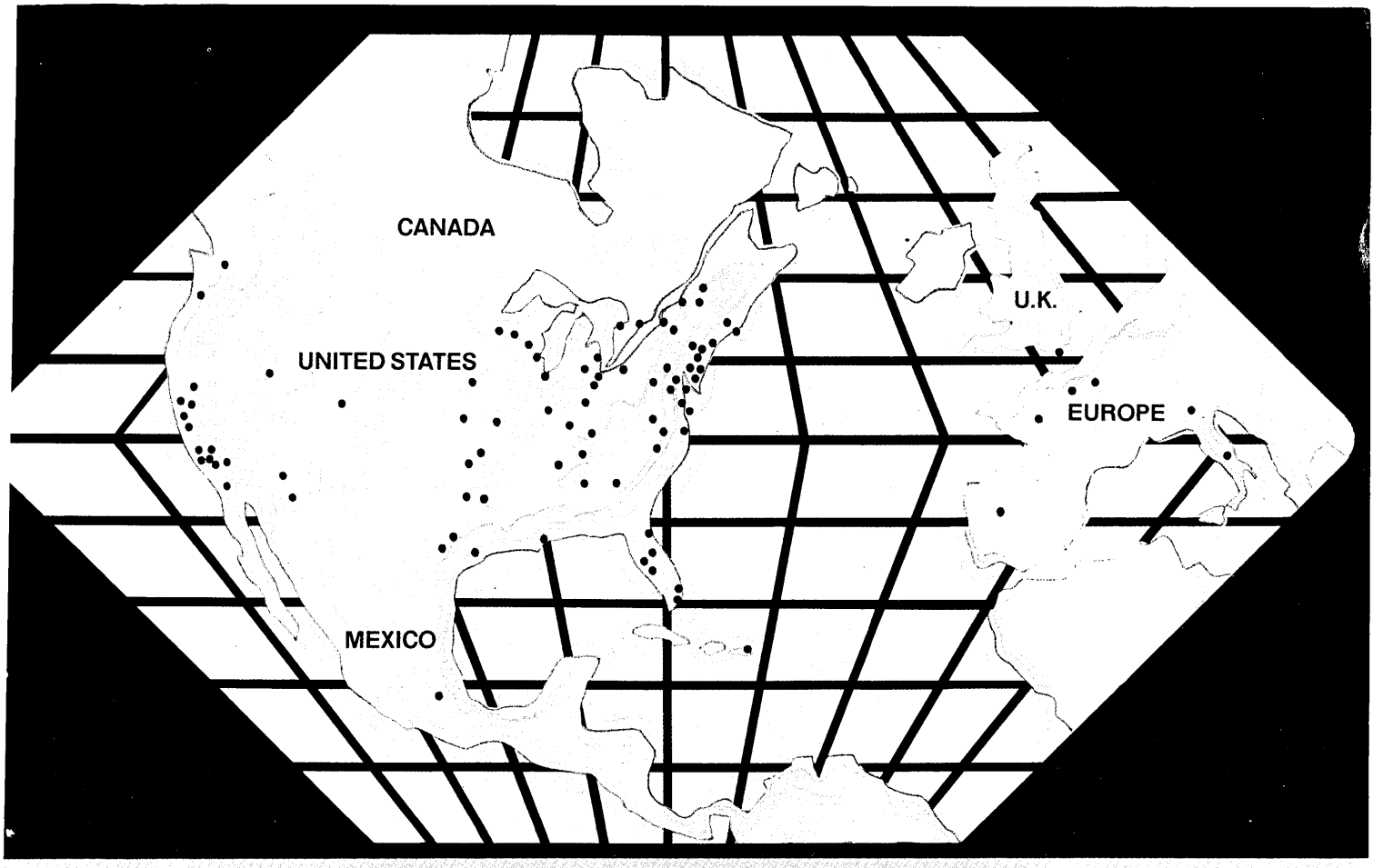
"Hmm . . . try branch on overflow."



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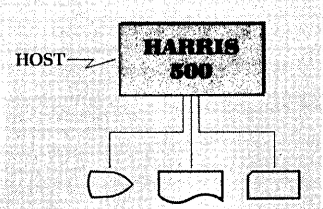
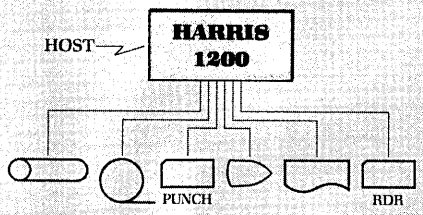
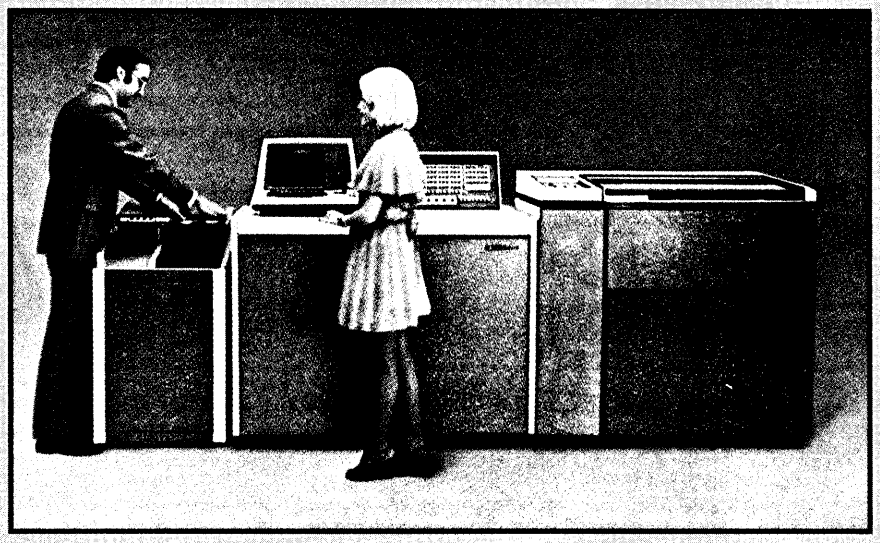
CIRCLE 12 ON READER CARD

Harris 500
Intelligent Remote Batch Terminal



Expanded Harris 1200 Remote Batch Terminal supporting multiple peripherals into mainframes such as IBM, CDC, UNIVAC and Honeywell.





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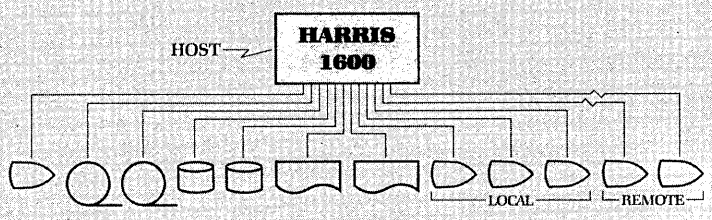

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Look at Harris
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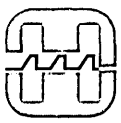
For a more detailed look at what Harris can do for you, contact your local Harris sales office or Harris Corporation, Data Communications Division, 11262 Indian Trail, P.O. Box 44076, Dallas, Texas 75234, (214) 620-4400.



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people

Nine Years Later

They say ideas are a dime a dozen, but George W. Thorpe's brought in revenues of $32 million in 1976.

The idea budded nine years ago in Atlanta, Ga., as National Data Corp. when Thorpe, a retired Air Force Colonel and later assistant v.p. at Southern Railway System, believed he could apply the concepts he had learned to aid business organizations. Thorpe, today, is chairman of NDC.

After graduating from Virginia Polytechnic Institute with a chemical engineering degree, Thorpe went to flight school, and at the end of World War II, he stayed with the service as an Air Force officer assigned to jobs in operations planning. His 25-year career led eventually to Strategic Air Command headquarters in Omaha, Nebraska, where he was deputy director of intelligence. He developed three intelligence processing centers for correlating massive amounts of tactical data and computing trajectories not only of the SAC missile force, but all the missiles in the free world with the exception of the Navy Polaris.

"I had been a permanent colonel in the regular Air Force for 12 years, and I decided if I was going to leave and see what the business world was like, it best be at that time rather than staying another five years." Among the job offers Thorpe entertained was one from Hart, Schaffner, & Marx as a v.p. of manufacturing. But another opportunity presented itself at Southern. Thorpe was to plan and implement an overall system designed to allow centralized control of the amount of power to be put on each train, timing, distribution of cars, switching of cars, and making up each train. For Thorpe, it was an ideal transition job as he felt that a considerable length of time with the service had left him "a little lopsided from being rounded." Coming from the military, one is more oriented toward providing a good service and not being too cost conscious," he explains.

"These were three of the most valuable years of my life, because they allowed me to use all the things I had been exposed to in the Air Force for long periods, and at that time the Air Force was a quantum jump ahead of business."

When Thorpe found it difficult to put in a full day's work with Southern and devote any time to his idea for NDC, he resigned and returned to Atlanta, home of his wife, Sally. Seven months and no pay later, with "zero finances," he had persuaded 10 investors to put up $50,000 each as seed money, permitting more extensive planning and systems design work.

"It was not enough," explains Thorpe, "because the character of NDC was to accommodate a customer on a national basis, not just regionally. This meant setting up four regional centers, getting dual computer systems, programming people, and it forced us into going public before we were operational. We organized in August, went public in May, and at that time we had no customer, no computer, but one hell of a good idea and a bunch of very enthusiastic people."

GEORGE W. THORPE
His outside interests are his inside interests

Thorpe wanted some insurance, back-up, so to speak, so instead of carrying one application originally, he had two programmed. "Ironically, the one we used to raise the money was the one which didn't pan out." It was a system for matching over and short freight, but the trucking industry didn't cooperate. It put in all its shortages, and few overages, so NDC could not get a match. "We could have saved them a ton of money, and the concept was right, but the practicality of it was not." The successful application was an authorization system for the petroleum industry, a market NDC carved out by citing the need for automated methods. NDC still services 28 petroleum company customers, among them Atlantic Richfield which just renewed its contract for four years. Though some of the other largest petroleum customers have since departed, electing to perform the service themselves, NDC had them for five or six crucial years in its own development. The gasoline credit authorization service was extended to private label cards, for the airline industry and others, and eventually Master Charge and BankAmericard. NDC also serves as a national and international switching center transmitting authorization information throughout the U.S. and Canada.

Cash management is now one of the company's largest services and a growing market segment. More than 1,000 companies with numerous chain stores are able to keep up with combined daily cash receipts through a deposit reporting service. The service is offered through more than 100 banks in the U.S. and Canada. On average business days, 50,000 deposit reports are processed, concentrating an average of $1.5 billion.

"We have most of the field to ourselves, and what little is left over some bank is trying to handle itself," says Thorpe.

Another facet of cash management is a service introduced in 1976, and 150 banks are participating to serve customers with a balance reporting service. It allows the corporate treasurer to have all his balances arrayed before him each day so that he can make better financial decisions.

At the request of General Motors, NDC set up a system to track floor plans for its dealers and reconcile each dealer's payment according to a GM policy of extending credit for no more than 19 days on all new cars shipped.

NDC has moved into consumer services with locating systems. Two thousand motel/hotel operations use NDC's capabilities for booking reservations, direct mail catalog merchandisers subscribe to the telephone ordering service, and Ford Motor uses it to help stranded motorists locate nearby dealers for repairs.

In December, NDC introduced a computerized pharmacy management system, Datastat, that allows the pharmacist to call up patient or prescription information on in-store equipment and communicate with a pharmaceutical data base. Datastat uses a Drug Interaction Guide developed at the Medical Univ. of South Carolina that permits the pharmacist to screen a patient's prescription for allergies, drug interactions, and overlaps before filling it. Twelve terminals have been installed—six in Atlanta and six in Charlotte, N.C., and the initial marketing thrust will be toward independent pharmacists.

Over the last two years, NDC has developed an outside sales force, a vital link in bringing the company new ideas for market entry and signifying a strengthening of the marketing efforts

as well as redirection from a technology driven company to a marketing driven one.

Thorpe concludes that building NDC has set some tight limitations on his recreation and leisure, and explains it this way, "My outside interests are my inside interests." It's made NDC one of the 10 largest companies in the computer services industry.

Third Time the Charm

It took Willi Jilke three tries at three companies to get an IBM 2311 equivalent disc drive on the market. Now he's into floppies.

The founder and chairman of the board of General Systems International, Inc., Anaheim, Calif. is a native of Czechoslovakia. He received a bachelor's degree in mechanical engineering from Esslingen Engineering College in Stuttgart Germany, and, upon receiving it, was brought to the United States by Excello Corp. to work for its Cadillac Gear subsidiary in Detroit.

"They were looking for young German engineers and I wanted to leave Germany," said Jilke.

He stayed with Cadillac for seven years during which he earned a master's degree in electrical engineering from Wayne State Univ. "They never raised my salary while I was going to school," he recalls. "When I was going to school, I didn't care. When I finished I went to my boss and asked for a 50% increase. He didn't go for that so we compromised on a 20% increase per year and I would tell him when to stop."

He never did. In 1964 he moved from Cadillac to Excello Corp.'s Bryant Computer Products explicitly to develop a 2311 equivalent disc drive. "In six months we had an engineering prototype. In 24 hours they canceled the project. Three years later they were out of the business."

He next joined Xerox Data Systems with the intention of doing the same thing there. He had responsibility at XDS for the design and development of mechanisms and electronics for disc files. "I got so involved with other developments there was never time to get a 2311 project going."

In 1968 he resigned from XDS to cofound, with George Canova, Century Data Systems. The two received $1.3 million in financing from California Computer Products and a dictum from CalComp president Les Kilpatrick, which boosted Jilke's personal finances. "I'd bought a house in Palos Verdes because that's where we were going to set up the company. Les decided the company should be in Anaheim." Jilke sold his house, after living in it for only one month, at a hefty profit. He still likes real estate as an investment. He owns 25 houses which he says, with appreciation included, make him more money than GSI and another company he owns, Video Systems International, combined.

GSI was formed in May 1973 expressly to develop an IBM 3740 compatible data entry system for Hitachi, BASF, and Applied Magnetics Corp. "All contracts were signed, sealed, and delivered," Jilke recalls, "before IBM made its first shipment. Then IBM did make its first shipment . . . of units incorporating LSI technology. With the electronics available on the open market we couldn't be cost-competitive. Hitachi did go into production, but the others decided it wouldn't be cost-competitive."

WILLI JILKE
Now he's into floppies

GSI and BASF sold rights to the system to Siemens which, in turn, financed LSI development. Then GSI sold AMC LSI rights and AMC is now ready to go into production and will pay GSI "a minimum royalty." Siemens is now in pilot production in Mexico City and expects to get into full production by September or October.

GSI's floppy discs initially were a side product from the 3740 system development. "We made a Chinese copy of IBM's for the Japanese," quipped Michael N. Krunic, GSI's v.p., sales.

The company's business currently runs about 50% systems and 50% floppies. Jilke projects that floppies will account for about 80% of business at the end of the current fiscal year, which began in April. He anticipates $3 million in business this year and $10 million next year.

Having started with three people, the firm now is up to 80 and Jilke expects this figure to grow to 150 by the end of this year. "We're beefing up marketing and manufacturing," he said.

In New Posts

EDWARD BLECKNER, JR. was appointed president of Milgo Electronic Corp., Miami . . . JOSEPH M. RUSCHE was named divisional vice president of sales, Banking and Commercial Systems, by the Information Systems Div., Bunker Ramo Corp. . . . PETER S. JONAS was elected vice president and controller of General Automation, Inc., Anaheim, Calif. . . . DR. CLEMENT L. MC GOWAN was appointed Director of Technical Support, SofTech, Inc., Waltham, Mass. . . . JOHN P. MACRI was appointed staff vice president of Telecommunications and Computer Services, RCA Corp. . . . LELAND H. AMAYA was elected president of Securities Industry Automation Corp. ERNEST J. SASAKI was appointed executive vice president of MDB Systems, Inc., Orange, Calif. . . . EUGENE B. SMITH on leave as associate professor of Business Analysis and Research, Texas A & M Univ., was elected president of the Data Processing Management Assn.'s Education Foundation . . . United Telecommunications, Inc. elected JOE B. GIBSON vice president-corporate planning . . . DAVID J. CHAPMAN was named general manager of the Ampex data products division . . . CHARLES R. BUSH was named vice president, operations, for MSI Data Corp., Costa Mesa, Calif. . . . JAMES G. BURKE is the new president of Xebec Systems, Inc., Santa Clara, Calif. . . . W. M. BARNES was appointed vice president of Collins Communications Switching Systems, Dallas . . . HERBERT F. SCHANTZ was elected vice chairman of the American National Standards committee on ocr . . . TERENCE W. RANDALL was named president and chief operating officer of Canada's Incoterm Computers and Terminals Ltd. . . . RONALD M. RUTLEDGE was appointed assistant chief of a newly formed Data Engineering & Development Div. at the Federal Aviation Agency's National Aviation Facilities Experimental Center ❋

UDS has the ideal instrument for verifying data integrity in your communications system. It's the new COMTEST microprocessor-based network analyzer. It weighs only 24 pounds, it fits under an airplane seat, and it can give you complete confidence in your data communications network.

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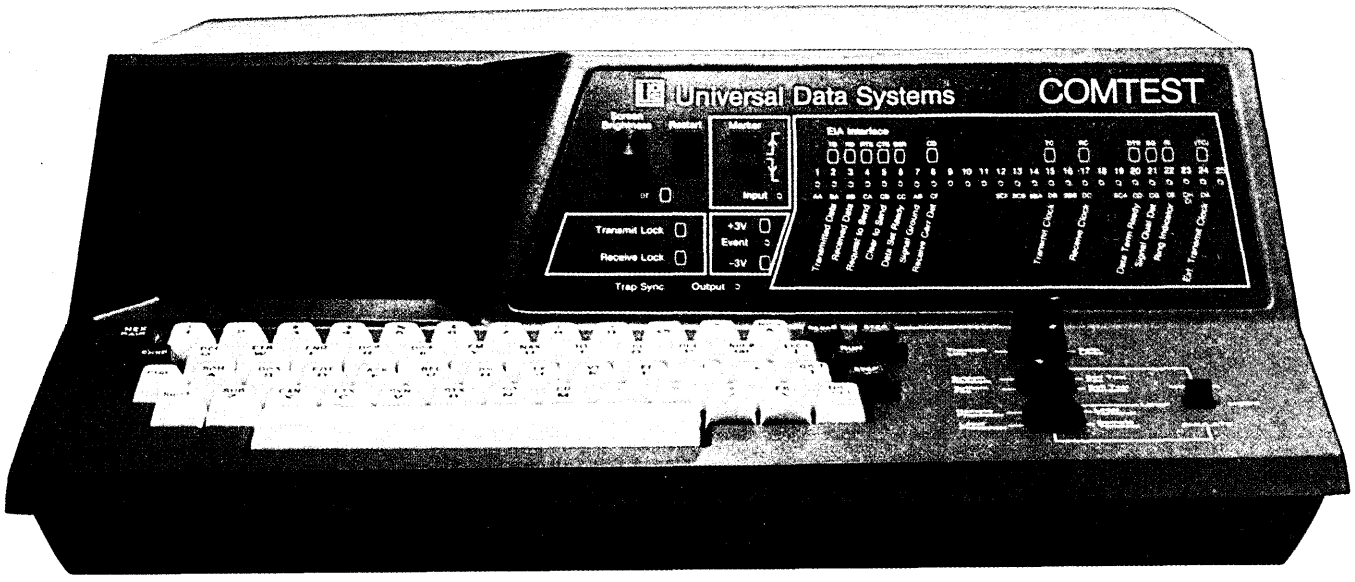

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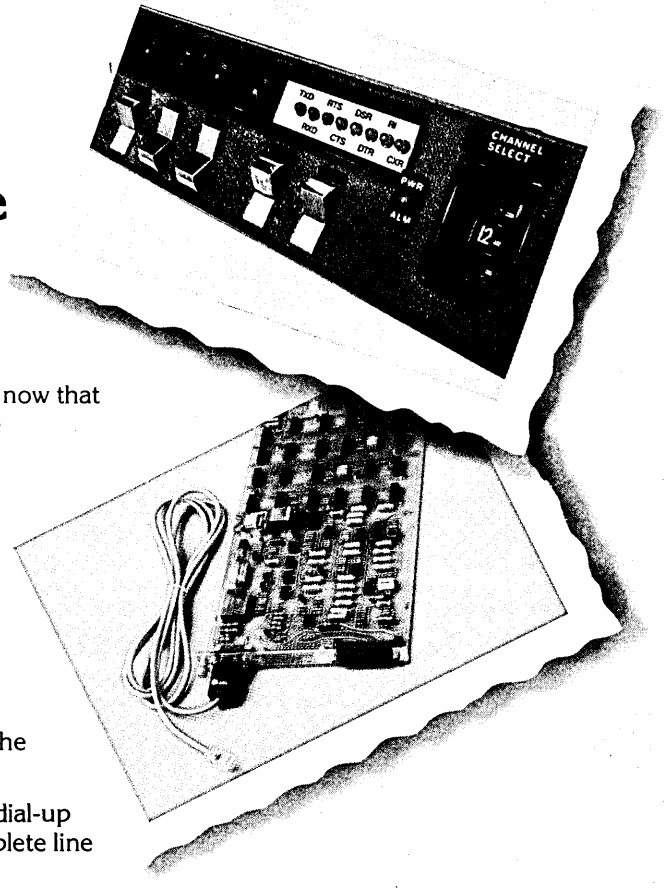
Dear Ma:

You may be getting back some DAA's now that Vadic modems no longer need them.



A lot of folks will be moving out of your high rent district, Ma, now that Vadic is delivering direct connect 300 bps modems, the first to be registered under Part 68 of the new FCC rules.

It's an historic occasion, because modem users happily will no longer have to spend from $4 to $8 each month renting your Data Access Arrangements (DAA). Instead, the new Vadic 317S connects directly to the telephone network, using the FCC approved data jack.

For end-users, the VA317S is available, with Vadic's powerful displays and diagnostics, either in a stand-alone cabinet, or in the Multiple Data Set System where 16 modems (including built-in DAA's) take up just 7 inches of vertical rack space. OEM's can buy the VA317S packaged on a single PC board.

The VA317S is only the beginning, Ma. Before long, all Vadic dial-up modems will have built-in DAA's. Also, Vadic has designed a complete line of stand-alone, rack mount, and card form DAA's.

You can get the whole story, Ma, by phoning, or writing, to Vadic today.

Your independent thinking son,

Alexander Graham Jr.

PS: Vadic has shipped over 140,000 modems to date.

vadic Member of IDCMA

THE VADIC CORPORATION
505 E. Middlefield Rd., Mountain View, CA 94043
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CIRCLE 89 ON READER CARD

Our cup runneth over...

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Today. A total line of magnetic media products From 300 U.S. and Canadian locations. With fast, professional assistance. From the finest distributor organization in the industry.

Why? The "virgin" quality characteristic of all Wabash products. Pure. And Perfect. This combined with extremely attractive pricing—makes Wabash a remarkably superior choice in most any cost/quality analysis.

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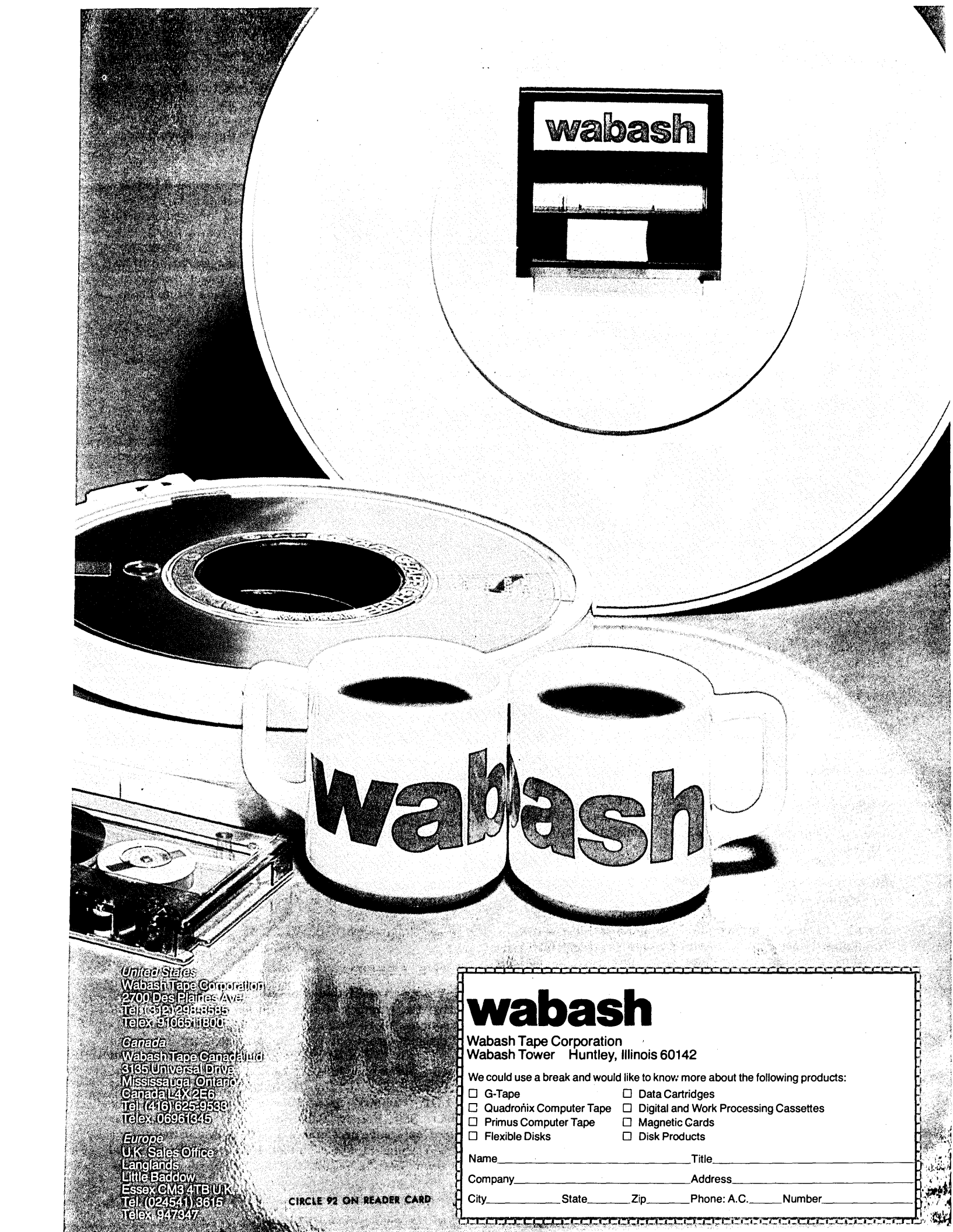
Clip the coupon or give us a call. Your local Wabash rep will make some interesting comparisons for you in the space of a coffee break. He'll even bring the coffee cups.

For all of you who are already Wabash magnetic media product users, your Wabash representative wants to share a coffee break with you too. To thank you—and make a toast—to all of you whose confidence has made us what we are.

SKOAL!



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Tel. (312) 298-8585
Telex 910651 1800

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3135 Universal Drive
Mississauga, Ontario
Canada L4X 2E6
Tel. (416) 625-9538
Telex 06961345

Europe
U.K. Sales Office
Langlands
Little Baddow
Essex CM3 4TB U.K.
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wabash

Wabash Tape Corporation
Wabash Tower Huntley, Illinois 60142

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- ☐ Quadronix Computer Tape
- ☐ Primus Computer Tape
- ☐ Flexible Disks
- ☐ Data Cartridges
- ☐ Digital and Work Processing Cassettes
- ☐ Magnetic Cards
- ☐ Disk Products

Name_____ Title_____

Company_____ Address_____

City_____ State_____ Zip_____ Phone: A.C._____ Number_____

CIRCLE 92 ON READER CARD

calendar

JUNE

Machine Processing of Remotely Sensed Data, June 21-23, Purdue Univ., W. Lafayette, Ind. Sixteen sessions are scheduled for this three-day symposium, including such topics as preprocessing, processing systems, scene modeling, data analysis, and other applications of machine processing. The symposium is sponsored by the IEEE Computer Society, the IEEE Central Indiana Section, and other professional societies with interests related to remote sensing. Fee: $75; students, $35; includes a copy of the proceedings. Contact: D. B. Morrison, Purdue Univ., LARS, W. Lafayette, Ind. 47906 (317) 749-2052.

International Symposium on Fault-Tolerant Computing, June 28-30, Los Angeles. Sponsored by the IEEE Computer Society's Technical Committee on Fault-Tolerant Computing, papers presented at this seventh annual gathering will cover topics such as: fault-tolerant system architecture; fault diagnosis, reconfiguration, and recovery; error control in computers and computer networks; and verification of hardware/firmware/software design. Fee: $80, members; $100, nonmembers; students, $25. Contact: Prof. Arthur Friedman, Dept. of Electrical Engineering and Computer Science, Univ. of Southern California, Los Angeles, Calif. 90007 (213) 746-5236.

JULY

Minicomputer Applications, July 18-20, New York, N.Y. This three-day conference will be of interest to those in government, business, and other organizations, and is designed to promote effective minicomputer applications by attendees. Overviews and case study workshops will present applications experiences and "lessons learned" by users. The first day will include overviews of the minicomputer in the mini and maxi organization, hardware, architecture, and software trends. Workshops on the second day will present in-depth studies of current minicomputer applications. The conference will close with an exploration of "System Selection Methodology." Fee: $295. Team discounts are available. AIIE Seminars, P.O. Box 3727, Santa Monica, Calif. 90403 (213) 450-0500.

4th Annual Conference on Computer Graphics and Interactive Techniques, July 20-22, San Jose, Calif. Sponsored by ACM/SIGGRAPH, the conference will focus on research, applications, and education in computer graphics and interactive techniques. Papers presented will cover a variety of topics including graphical theory and techniques such as languages, hardware, software, tools, standards, line graphics, human factors, and data structures. Applications in the areas of environmental, urban, transportation, music, business, statistics, decision making, and computer aided design will also be examined. Contact: Stephen Levine, Lawrence Livermore Laboratory, P.O. Box 808, Livermore, Calif. 94550 (415) 447-1100.

Optical Character Recognition Users Assn. Exposition, July 24-27, Washington, D.C. Entitled "Expo 77," this first annual equipment, supplies, and services exposition will feature desktop to large stand-along scanners, point-of-sale devices, hand-held wands, and other associated supplies and services organizations. The exhibit will be held in conjunction with the OCRUA's semiannual conference, which will include industry sessions on banking, credit cards, distribution, education, graphic arts, retailing, and utilities. There will also be extensive educational sessions for the new and potential ocr user. Contact: OCRUA, 10 Banta Place, Hackensack, N.J. 07601 (201) 343-4935.

Institute of Management Science 23rd Annual Meeting, July 25-27, Athens, Greece. President Tsatsos of Greece will be the keynote speaker at this meeting of management scientists, operations researchers, and those involved with project management. Seminars will be held on manpower planning, organizational design, and management information systems, among others. Fee: $160. Contact: Joe Behar, TIMS XXIII, IBM Corp., 1133 Westchester Ave., White Plains, N.Y. 10604 (914) 696-1900.

CALL FOR PAPERS

Papers on any of the following subjects are now being accepted for the 7th Annual Conference of the Assn. for Computer Programmers and Analysts to be held Nov. 9-11 in New Orleans: minicomputers, microprocessors, networked minicomputers, distributive processing, microcomputers as communications front ends, or data base languages for minis. Papers must include an abstract of not more than 150 words, and should be double-spaced with a total length of six papers or less. Deadline for submission is July 1, 1977. Completed papers should be sent to Gary Shurman, ACPA VII Conference, 6405 Gladys St., Metairie, La. 70003.

The 1977 ACM George E. Forsythe Student Paper Competition is open to any student who has not received a bachelor's degree before April 1, 1977. Papers on any topic related to computers and their applications are due by Sept. 15, 1977. Due date for stating intent to send a paper is June 30. For details, contact Prof. J.A.N. Less, ACM Student Paper Competition, Computer Science Dept., Virginia Polytechnic Institute, Blacksburg, Va. 24061.

Tutorial papers describing practical results with computer networks and networking systems or presenting new research results are solicited for the Computer Networks Symposium to be held in Gaithersburg, Md., in December 1977. Suggested topics include multicomputer, value added, or terminal-oriented networks; network design or access techniques; economics, management or measurement of networks; applications; and future directions for networking. Three copies of a 1,000 word abstract should be submitted by July 15, 1977, to Ronald L. Larsen, NASA Goddard Space Flight Center, Code 570.1, Greenbelt, Md. 20771.

ON THE AGENDA

14th Design Automation Conference, June 20-22, New Orleans, La. Contact: Judith Brinsfield (201) 386-3169. **International Word Processing Assn. Conference, June 21-23,** Portland, Ore. Contact: International Word Processing Assn. (215) 659-3220. **1977 Joint Automatic Control Council Conference, June 22-24,** San Francisco. Contact: J. S. Tyler (415) 494-1165. **5th International Conference of the EDP Auditors' Assn. June 27-29,** Houston, Texas. Contact: Stan Barnes, P.O. Box 61790, Houston, Texas 77208. **Conference on Computer System Productivity, June 27-29,** Washington, D.C. Contact: Institute for Professional Education (703) 527-8700. ✲

New! DATUM Tape or Disc Systems for IBM Series 1!

Series 1 users can now add mag tape memory capability to their Series 1 (Models 3 or 5) installation! The new DATUM seven- or nine-track system permits recording densities of 200 bpi NRZ through 1600 bpi, phase-encoded. Speeds: from 12.5 ips through 125 ips. As many as four transports can be used.

A 5440 removable-media disc system that is software-compatible with the IBM 4962 Disk Storage Unit is also available.

Both systems incorporate the new DATUM "Universal User's Adapter," a device that allows connection of external devices to the Input-Output bus of Models 3 or 5 of the IBM Series 1 computers. The Adapter operates in the "cycle -steal" mode while exchanging 16-bit words with the computer. With this Adapter, Series 1 users can tailor their system to their own exact requirements, even to the extent of interconnecting several computers.

Diagnostic and operational software is included with each system. Color-coordinated cabinets can be ordered. Service and installation is offered throughout the U.S. Deliveries are 90 to 120 days ARO.

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Anaheim, California 92806
TWX: 910/592-1289 • 714/533-6333

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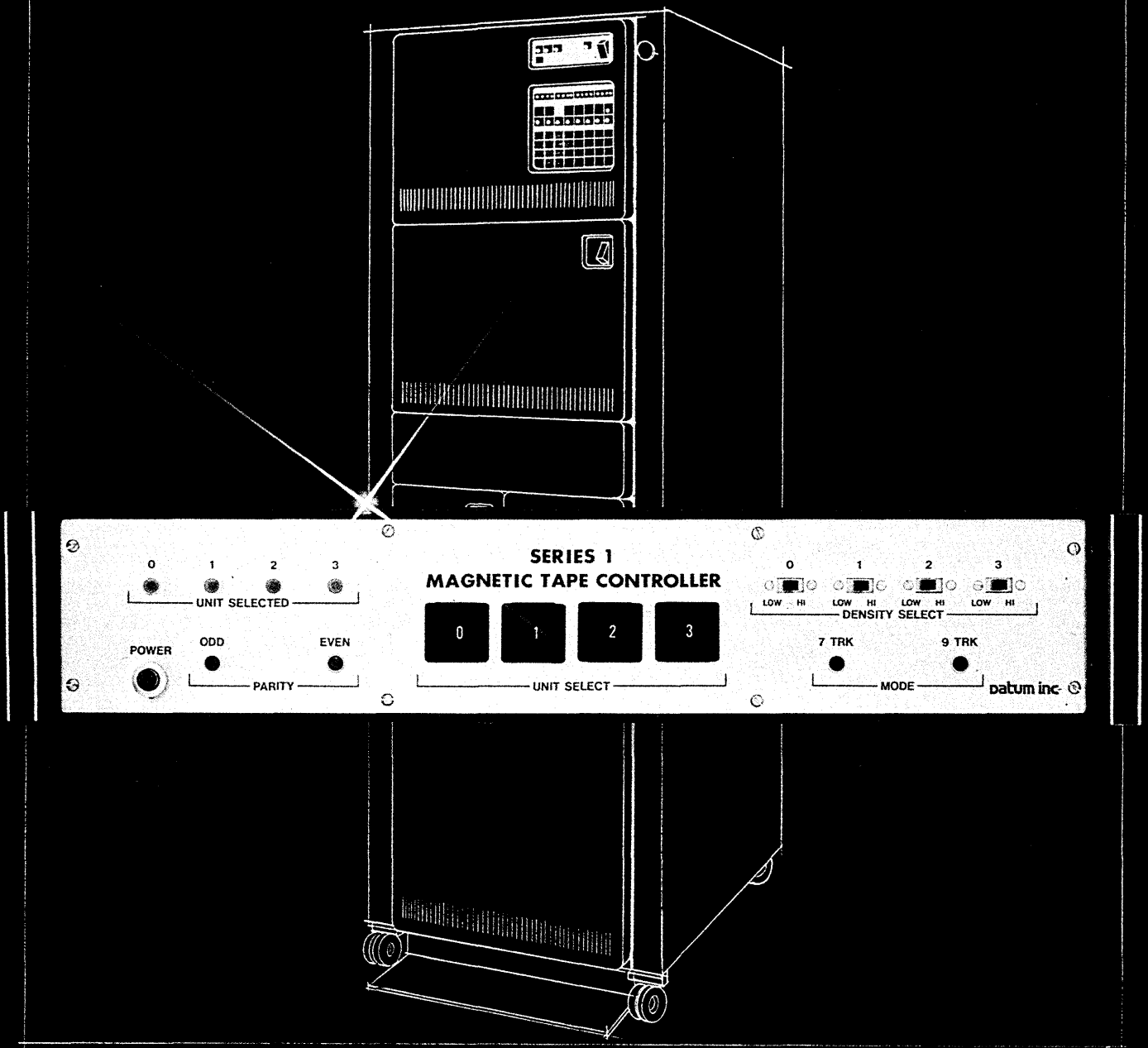
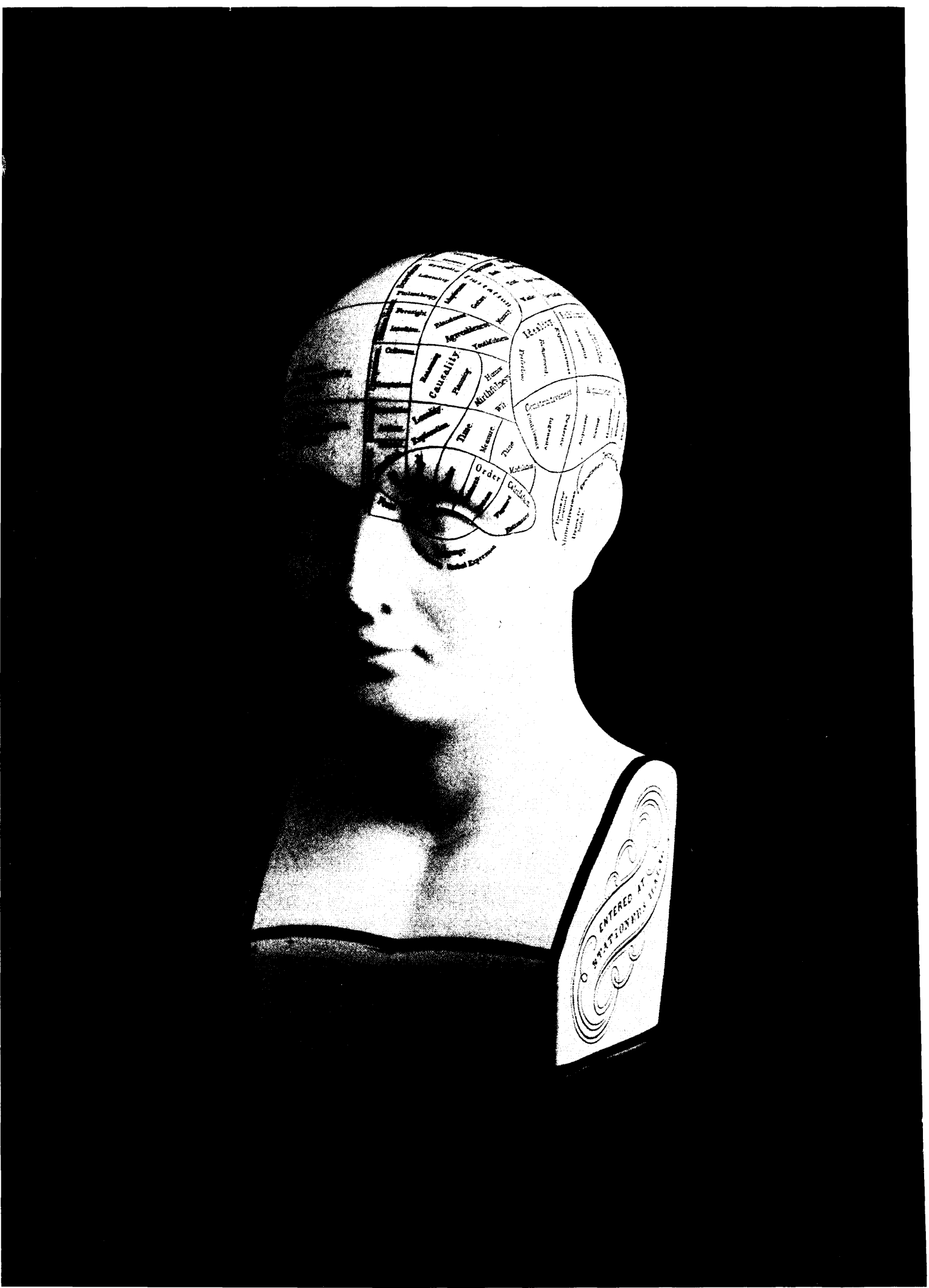
datum inc

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Introducing the SEL 32/75 System.

The Computer with a Subconscious.

Your eyes blink 25 times a minute. You don't realize it because this routine, like thousands of other vital routines, is handled by your subconscious.

That's important, because this parallel processing frees the conscious part of your mind for critical decisions.

This is also a good description of how the new SEL Regional Processing Units operate within the SEL 32/75 System. Working independently, these RPU's contain sufficient control and buffer storage areas to process an I/O region and transfer the resultant data directly to main memory. Computer system throughput is further enhanced by High-Speed Floating Point Hardware, Writable Control Storage, and flexible interleaving.

The SEL Memory MAP efficiently manages up to 16 million bytes of main memory, with no instruction overhead.

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You see, the well-established SEL 32 computers fit the term "minicomputer" in price alone. Based on true 32-bit architecture, all are fast, powerful machines using functional, proven software. SYSTEMS computers are proving their worth in big jobs like seismic exploration, power plant operations, aircraft simulation, and scientific computation.

The SEL 32/75 System fits neatly as head of the SEL 32 family. It's more powerful, more flexible, more throughput-oriented than any computer we've ever built.

We'd like to help you explore how the SEL 32/75 System could simplify your computing requirements. Just circle our number on the Reader Service Card, and we'll send our brochure in the blink of an eye.

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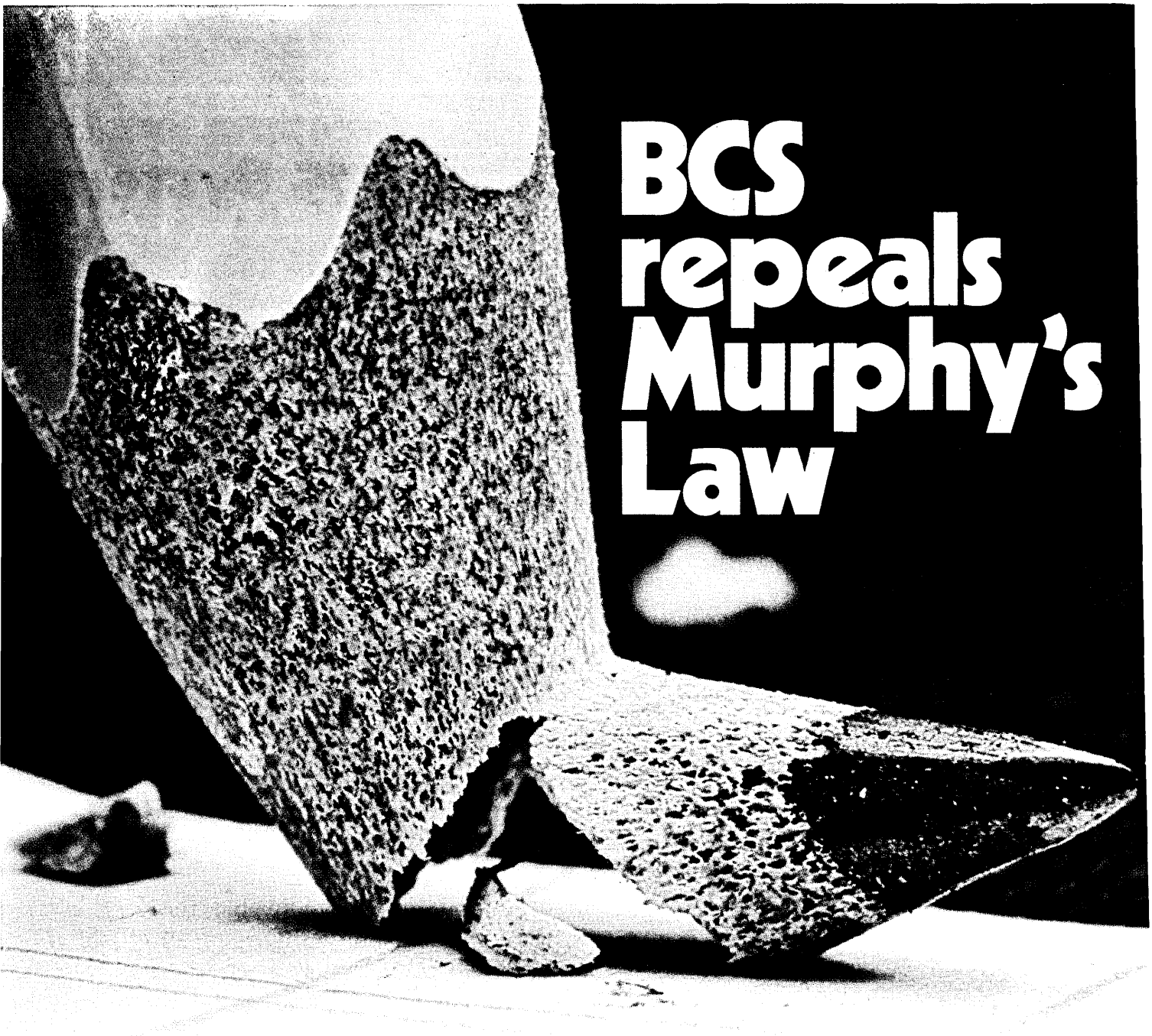

Whatever can go wrong, will... and at the worst possible time, right? Not anymore. Now BCS offers Project/2, an easy-to-use project management tool that offers high visibility and comprehensive scheduling with built-in controls. And you don't have to be a computer programmer to use it.

Project/2 is the way to keep your project—large or small—on time and within budget. And you can access the system from anywhere in the country via MAINSTREAM® —the unique BCS timesharing service. For a free copy of "How to Repeal Murphy's Law," mail the coupon now. Or call your nearest BCS sales office to learn why BCS is "the best reason to go outside."

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source data

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

books

Why Distributed Computing?

by P. J. Down and F. E. Taylor
Hayden Book Company, Inc., 50 Essex St., Rochelle Park, N.J. 07662 (1977)
176 pp. $9.50

Distributed computing has been variously defined by data processing pundits to range from the ARPANET on the one hand to any terminal-based system on the other. This little book, produced by staff members at the National Computing Centre (NCC) in the U.K., takes a serious stab at defining distributed computing. But even more importantly, the authors go on to discuss at some length the implications of a distributed system, financial, technological and managerial, and further, they suggest some key points to be considered in the decision making process.

The book is based on an NCC survey of U.K. users and suppliers; it is clearly not the result of theoretical discussions among academicians. The numbers presented are of the hard, practical variety, and the cost curves rely more on accumulated experience than text book equations.

Noting that distributed computing arrives in a company by accident, or to solve an overload problem, or even occasionally by design, the authors go on to take a toe-hold in the sales process. While some vendors may find the description uncomfortable, few who have been in the industry will fail to recognize the "Irreverent View of Marketing."

Down and Taylor have tackled a number of the really tough problems in distributed computing. This includes costing, the management of the computing facility, and distributed data storage. Their definition of the job assignment and qualifications for a line controller are excellent, a model of its type and a very important suggestion.

The only point on which Down and Taylor might be faulted is their seeming evasion on the point of local programming. Can the local user be permitted to write local code in RPG or BASIC, or does all the code have to come from some central authority? Not an easy question, and one that is being debated widely, the volume skirts the issue several times and never quite comes to grips with it.

Written for a U.K. readership, the book is full of apparently strange nomenclature and non-dollar financial data. However, there is nothing very hard to translate, and the number relationships stand up. In any event, the concepts are the same although U.S. readers will want to remember the relatively short distances between major U.K. cities.

> This little book takes a serious stab at defining distributed computing.

The book includes a slightly dated list of reading references that needs modernization. Also, four typical case histories are included, and one can not help but wish that more had been printed. A short but pithy discussion of legal issues is built on strictly U.K. citations, but one can easily find parallels over here.

On balance, a recommended book. Much cheaper than attending one of the many conferences on Distributed Computing that now seem to occur almost daily. More importantly, the book deals with the complex management issues that these conferences never seem to cover.

—**Philip H. Dorn**

Mr. Dorn is a multi-faceted dp consultant working out of New York City. This issue marks the beginning of his 10th year as a contributing editor for Datamation.

Managing Data Processing

by Edward O. Joslin and Richard A. Bassler
College Readings, Inc., P.O. Box 11244 Alexandria, Va. 22312 (1976)
344 pp.

The compilers of *Managing Data Processing* took a novel approach in selecting the articles which appear in their book. They conducted a survey of the opinions of 1,000 managers in business, industry, and government to determine the relative importance of a variety of aspects of data processing. Articles were chosen from recent issues of leading periodicals to encompass the subject areas of primary interest. Readers of *DATAMATION*, the *Journal of Systems Management*, *Data Management*, and *Computerworld* will recognize most of the 82 pieces which comprise this book.

The articles cover in three or four pages such subjects as disaster recovery, performance evaluation, auditing controls, software selection, and managing the knowledge worker. Treatment of these subjects, while necessarily brief, is of sufficient depth to give the intended audience an appreciation of the major considerations and concerns at the reader's assumed level of familiarity. Joslin and Bassler have chosen the material well toward achieving their objective of informing non-dp managers.

The book also contains some messages for the dp manager on topics of current interest. It features some of the authorities, such as Soden on planning and Parker on security, and there are several viewpoints on the important topic of privacy, and descriptions of the experiences of others in managing change.

The intended readership consists of managers in positions related to data processing. Such managers who want a general understanding of the nature and dimensions of present day data processing management will find the field well covered by the subjects chosen.

—**Jack Van Paddenburg**

Mr. Van Paddenburg is the manager of data processing for Southern California Edison Co., in Rosemead, Calif.

vendor literature

Small Computer Catalog

A fully illustrated, 22-page catalog describes the complete line of computers, computer systems, peripheral equipment, and software available from this vendor. The Sol-20 is said to include all the essential elements as standard equipment, including central processor, memory, keyboard and display, software, a power supply, and appropriate packaging, and it is claimed that it can be operated efficiently by a person without any prior computer experience. A centerfold chart suggests uses for the unit in the home, office, lab, and schools and universities. The catalog also discusses systems, personality modules, software, memories, disc storage and interfaces. PROCESSOR TECHNOLOGY CORP., San Francisco, Calif.

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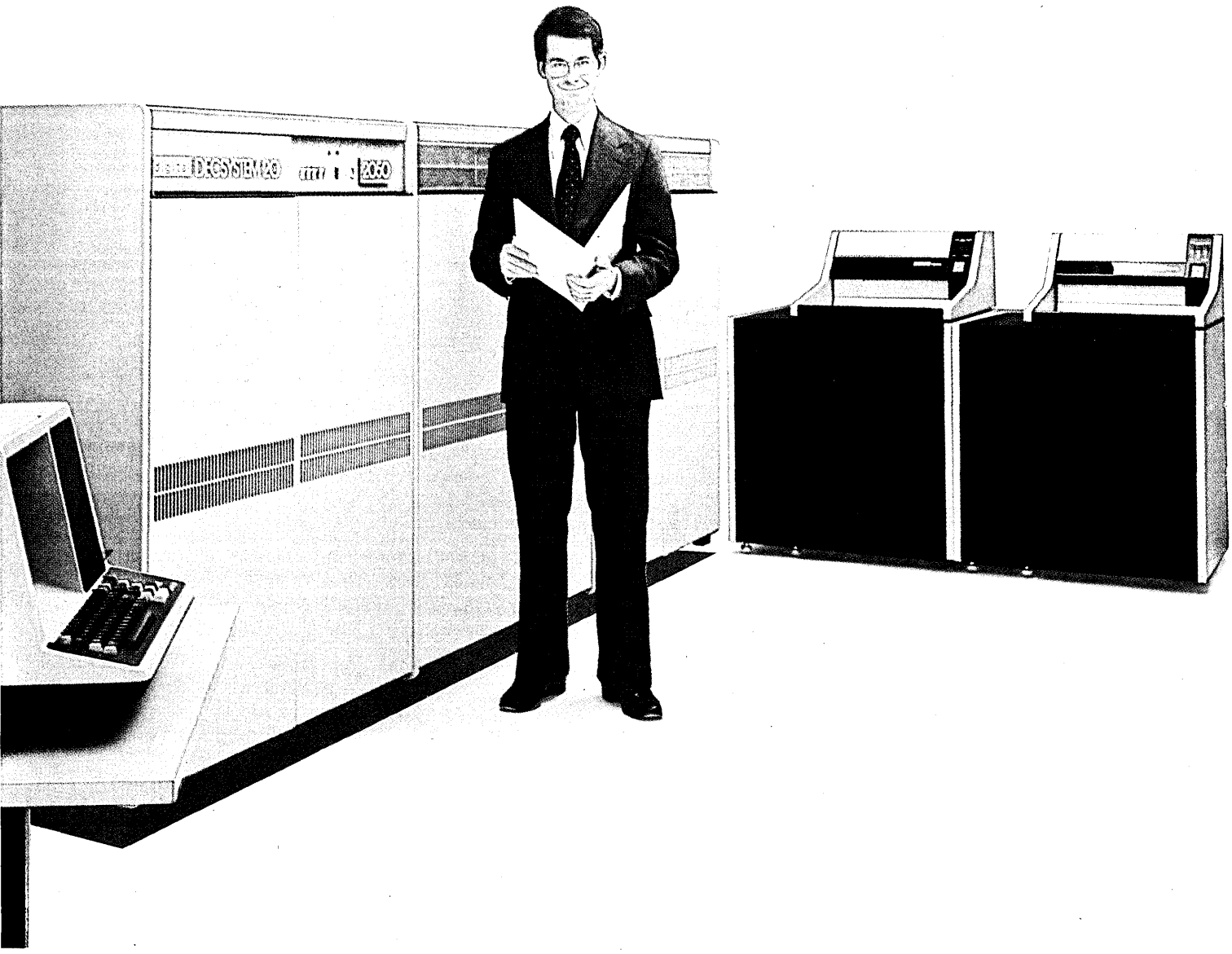
(Continued on page 44)

The 36-bit DEC
The world's only
with fifth



SYSTEM-20. interactive computer generation software.

While most people are still struggling with early generation interactive computer software, we're already delivering our fifth generation:

DECSYSTEM-20.

From Digital Equipment Corporation, of course.

The 36-bit DECSYSTEM-20 has the only software system on the market that's more advanced than the best in the industry—the software of our pioneering 36-bit DECsystem-10's.

We've built on and extended that 12 years of technology with:

The new TOPS-20 process structured operating system, featuring high modularity, built-in prompting facilities, internal consistency checks, virtual memory, and a human-engineered user command interface. All designed to make the DECSYSTEM-20 incredibly easy to use. And it's the most reliable software in the industry.

Integrated symbolic debuggers for every major language the system uses. So you can create, execute, and debug a program in about one tenth the time of other systems, for unbelievably high programmer productivity.

A comprehensive set of compilers that provide a full range of high-level languages: COBOL, FORTRAN, APL, a P/L I subset, BASIC PLUS 2, and ALGOL.

A full set of system utilities, including an Editor, MACRO assembler, LINK linkage editor, and GALAXY multi-programming batch system.

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Most important of all, this great software, even the batch system, has been developed to work through *terminals*. To put all the power of the DECSYSTEM-20 wherever you need it.

DECSYSTEM-20. Up to 128 simultaneous users. A total systems cost starting at under $10,000 a month.

And twelve years of the world's best interactive software behind it.

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MR1-1 M/55 D-6-77

digital
LARGE COMPUTER GROUP

source data

(Continued from page 41)

Modems and Multiplexors

A fully illustrated catalog of this vendor's entire line of modems and multiplexors and other data communications products is now available. The 8-page brochure includes descriptions and photographs of the Bell, IBM, and CCITT-compatible modems, frequency division multiplexors (FDM's), synchronous and asynchronous line drivers, system enclosures, data set cabinets, and related accessories.

Also given are detailed charts with modem specifications such as baud rate, modulation mode, operating mode, line conditioning, and synchronous/asynchronous operation. Other charts include key specs for the firm's line of FDM's and line drivers. There are descriptions of accessories, and a brief explanation of the company's marketing philosophy and engineering capabilities. PRENTICE CORP., Palo Alto, Calif.

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Security Bibliography

A complimentary 12-page bibliography which cites 135 of the most useful computer security information sources is now available from this computer security clearinghouse. The 5 x 7-inch bibliography includes summary descriptions for more than 100 of the sources listed. COMPUTER SECURITY INSTITUTE, Northboro, Mass.

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Plant Management

A new bulletin is now available which describes the hardware, software, and peripherals of the DPM 60 series distributed plant management systems from Digital Equipment Corp. The systems offer data collection and factory process control on an integrated network based on the PDP-11/34 central processor. DIGITAL EQUIPMENT CORP., Northboro, Mass.

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Type Element Catalog

More than 60 new type elements which fit both IBM Selectric and Remington typewriters are described in this catalog, "Index to Available Type Elements." The catalog also includes samples of the more than 20 type styles, and defines the terminology associated with type element design. The vendor also will repair broken elements for a fixed price of $7.95. DSG, INC., Philadelphia, Pa.

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reports & references

Guide to Periodicals

Over 1,000 articles and letters of interest to computerists are listed in the new publication, "Periodical Guide for Computerists." The 20-page guide includes over 100 subject headings such as references to specific microcomputers, fiction, games, history, humor, languages, memory, music, robots, and standards. Articles cited are drawn from 15 magazines of interest to computer hobbyists. Price: $2.50. E. BERG PUBLICATIONS, 1360 S.W. 199th Ct., Aloha, Ore. 97005.

Mail-order Computing

"Mail order Computers" are now available through the new 48-page catalog from the Computer Warehouse Store. The catalog explains five different microcomputer kits, and lists many 90-day warranteed user peripherals such as crt terminals, keyboard/printer terminals, video monitors, tape drives, disc drives, and printers.

A special report in the catalog, "All About Hobby Microcomputer Systems," tells what to look for in selecting a microcomputer system (data width, addressing capacity, and instruction set, for example), micro alternatives (home-brewed computers, kits, and assembled systems), basic system considerations, and system versatility through expansion. A chart to aid comparison shopping reviews price, features, software, configuration, and systems components of some of the most popular micros.

There is also a book section with reviews of over 150 computer-titled books, covering software, hardware, and languages.

Slated to be printed twice a year, this first issue is available for $1 from COMPUTER WAREHOUSE STORE, Dept. C., Box 68, Kenmore Station, Boston, Mass. 02215.

Municipal Minis

The 164-page report *Minicomputers: An Alternative Approach to Municipal Information Systems*, summarizes the results of an applied research project that studied the feasibility of utilizing low-cost minicomputers to develop an in-house municipal information system in Boise, Idaho. The applied research work that resulted in the document is technically complex. Consequently, many pages of the report describe very complex research and findings and may be of little interest to the general reader. However, the report has something for both the managers and the technicians. The manager will gather the essence of the research by reading pages one through eight only, while the technician should find useful material in the entire report. The manager may also find the tools of city programs, such as contracts and bid specifications, useful in the acquisition of computer based information systems.

As a result of this research project, it was found that there are both advantages and disadvantages to the use of minicomputers in municipal information systems, but the advantages outweigh the disadvantages.

Sample chapter headings of the report include: Scope of Research; Data Collection Procedures and Findings; Support and Applications Software Experience; and Review After Eight Months. Price: $7.00 NATIONAL LEAGUE OF CITIES, 1620 Eye St., N.W., Washington, D.C. 20006.

Datamation Subject Index

There are still copies of the 1976 subject index available without charge to our readers. The index includes references to feature articles, conference reports, book reviews, News in Perspective, and the Editor's Readout. DATAMATION, Los Angeles, Calif.

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Packet Data Communications

Written for communications managers, computer and terminal equipment manufacturers, common carrier and PTT engineers and managers, and service bureaus, this report is on the current status of packet data communications in the United States. The two volume report includes packet-switching technology, the status of U.S. public packet-switching networks, services offered, interfacing options, pricing structure, applications, and economic comparisons. Volume one is a packet communications study of over 200 pages. Volume two consists of a collection of reprints of articles and standard documents on packet communications. Prepared by Digital Communications Corp and Future Systems Inc., the price is $225 for both volumes. FUTURE SYSTEMS, INC., 4 Professional Dr., Ste 141, Gaithersburg, Md. 20760.

Business Programming

Business Programming Concepts is a 124-page book which covers business programming fundamentals ranging from system analysis through data file manipulations and report generation. The book is geared towards standalone

(Continued on page 49)

GCOS 6/MDT (Multi-Dimensional Tasking) Software

Executive Components
- Executive/Monitor
- I/O Handling
- Communications Supervisor

Program Development Tools
- Execution and Operator Control Language Processors
- Text Editor
- Linker
- Cross-Reference Program
- Assembler
- Macro Preprocessor
- FORTRAN Compiler
- COBOL Compiler
- RPG Compiler

File Management System
- Files
  - Sequential on all media
  - Relative on mass storage
  - Relative with deletable records on mass storage
  - Variable sequential on magnetic tape and mass storage
  - Indexed files on mass storage (fixed and variable length)
- Access Methods
  - Sequential on all devices
  - Direct on mass storage
  - Indirect on mass storage
- Level of Access by Tasks
  - Read Only
  - Read/Write
  - Exclusive Write
  - Exclusive Read/Write
  - Read/No Write

Utility Components
- Volume Preparation
- File Support Utilities
- Copy
- Print
- File Dump
- List Names
- Import Partitioned Access Method
- Export Partitioned Access Method
- Compare
- Patch
- Debug
- Memory Dump Editor
- Disk Sort

Can we help you?

Honeywell's approach to distributed systems is realistic. It lets you build your system based on current needs. And it lets you evolve into more sophisticated applications as priorities and plans dictate. And you benefit from working with a company that can help meet your total requirements and provide the full support you need, wherever you need it. We'd like to work with you on both current and long term solutions to your data assembly, data processing, and distributed system requirements.

Please contact your nearby Honeywell Information Systems sales office. Or write us.

Honeywell's new distributed systems terminal, DST 6/500, is a powerful unit for the remote user who needs extensive local processing and communications capabilities.

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Waltham, Massachusetts 02154

First the lion.

Start with the upper end of Honeywell's Series 60 family, the large-scale Level 66 system. Here you have a powerful, large-scale multi-dimensional central processor. You have hardware and software features that simplify the management and utilization of your data. You have reliability with a minimum of human intervention.

The modular design of Level 66 systems lets you do what you want to do now and grow as your requirements grow. You can add resources where and when you need them most – input/output devices, processors, or memory – without having to swap out your system. And without reprogramming and retraining.

A well-managed computer...

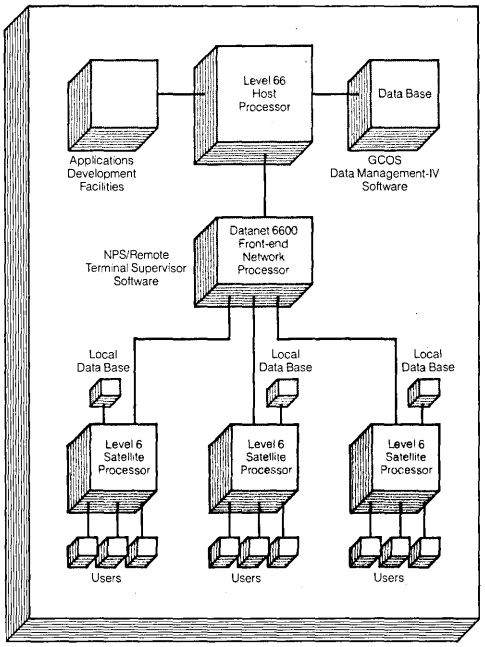
GCOS (General Comprehensive Operating Supervisor) is the executive software for all Level 66 systems. GCOS controls, schedules, and monitors all activities, and adjusts processing activity to changing demands. Processing modes include transaction processing, data base inquiry, time sharing, interactive job entry and execution, and batch processing. These modes are available at the central site, or remotely via Level 66 communication facilities – and they're available concurrently, using a common data base.

leads to well-managed data.

Data Management-IV (DM-IV) is the Level 66 data base management system designed for high volume on-line transaction processing, and efficient, interactive remote query and reporting. It uses a common language for defining, managing, and directing data, and provides a standard user interface that is simple and logical. It allows a common file description to govern the structure of all data, but is independent of that structure.

DM-IV gives your key people timely access to vital information, and provides data integrity protection, security, and automatic recovery and restart.

Basic Elements of Distributed Systems Environment



A system that works better, longer.

Level 66 systems have many features to ensure maximum uptime. While your work is being done, on-line testing programs can check the operation of the system. Automatic error analysis and logging programs provide fast, diagnostic reports that help identify potential trouble spots and avoid interruptions.

Configurations with more than one of any module (two processors, for example) not only increase throughput, but provide built-in backup. Should one module go down, GCOS allows you to dynamically reconfigure the system to work around the inactive module and provide significant fail-soft protection.

And now for the fox.

The fox, of course, is Honeywell's quick, versatile, and smarter-than-ever line of Level 6 minicomputers. Level 6 features an extremely flexible architecture and advanced modularity. It's a combination of large-scale integrated logic circuitry, firm-ware driven micro-processors, MOS memory, and etched-wire connections that achieves plug-in modularity with optimum configurability.

Coupled with its powerful and compact processing capability is a superior communications processor. Level 6 technology and packaging are used in the Honeywell DATANET 6670 Front-end Processor. Honeywell minicomputers are also being used as network processors and as intelligent terminals, doing everything from remote job entry to multiple work station data entry.

Summary of Level 66 Characteristics

Model	Memory Size Range[b]	No. Processors	No. System Control Units (SCU)[c]	No. Input/Output Multiplexers (IOM)	No. Input/Output Multiplexer (IOM) Board Slots
66/05 ICU[a] 66/07 ICU	96K to 512K	1 or 2	1 or 2	1	18
66/10 ICU 66/17 ICU	96K to 512K	1 or 2	1 or 2	1 or 2	18
66/10 FS[a] 66/17 FS	96K to 1024K	1 or 2	1 to 4	1 or 2	35
66/20 ICU 66/27 ICU	128K to 512K	1 or 2	1 or 2	1 or 2	18
66/20 FS 66/27 FS	128K to 1024K	1 or 2	1 to 4	1 or 2	35
66/40 ICU	128K to 512K	1 or 2	1 or 2	1 or 2	18 to 27
66/40 FS	128K to 1024K	1 or 2	1 to 4	1 or 2	35 to 54
66/60 ICU	192K to 512K	1 or 2	1 or 2	1 or 2	27
66/60 FS	192K to 1024K	1 to 4	1 to 4	1 to 4	35 to 54
66/80 ICU	256K to 512K	1 or 2	1 or 2	1 or 2	27
66/80 FS	256K to 1024K	1 to 4	1 to 4	1 to 4	35 to 54
66/85	512K to 2048K	1 to 4	1 or 2	1 to 12	Not applicable

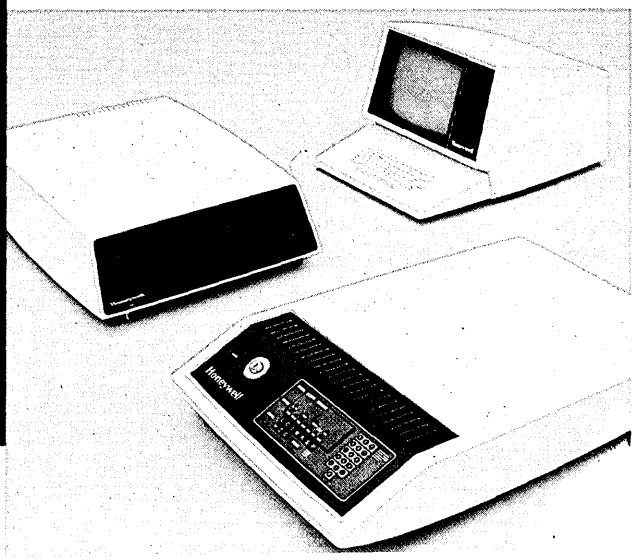
[a]Integrated Control Unit (ICU) contains the input/output multiplexer, system controller, mass storage processor, unit record processor and memory units in a single unit. Freestanding Systems (FS) house these units in separate cabinets.
[b]Sizes given in K words—K=1024.
[c]No. of SCUs *required*—one SCU can accommodate 512K words of memory. (Additional SCUs are optionally available.) An Integrated Control Unit (ICU) system can support a maximum of two SCUs; a Freestanding System (FS) can support a maximum of four SCUs.

The software wherewithal.

Level 66 communications software includes the Network Processing Supervisor (NPS) and Remote Terminal Supervisor (GRTS) which simplify implementation of an information network and help optimize both response times and line costs. Messages from several terminal stations can be concentrated and forwarded to the host computer via a common communications line. And with NPS, transactions can be passed directly between stations.

Since NPS has its own access to stored information, the host system is free for other tasks and remote sites are insulated from host system operating conditions.

Level 6 offers a choice of rack-mountable, cabinet and tabletop models, and includes a full line of low-cost peripherals in both tabletop and rack-mounted versions. The cabinet version is shown at the left, the tabletop version with diskette and CRT below.



Cross our Level 6 fox with our Level 66 lion and what do you get?

A new breed of distributed systems that command a lot of respect.

Honeywell's Distributed Systems Environment integrates satellite minicomputers and general purpose systems, within an environment of cooperating software.

It lets a modern organization distribute appropriate data bases and application programs among remote locations. In short, it's a system that works the way a modern company works.

CIRCLE 59 ON READER CARD

source data

(Continued from page 44)

computing applications and dispersed processing networks. It stresses the importance of intensive planning before any major programming system is implemented, and discusses the factors a system designer should consider. Also included is a discussion of data organization including the use of Indexed Sequential (ISAM) data files.

As an example, a payroll system is used to provide an illustration for the theoretical points that are made. The payroll application is taken from conception and planning through implementation, including data base usage and report and paycheck generation. Price: $3. DATAPOINT CORP., Marketing Communications, 9725 Datapoint Dr., San Antonio, Texas 78284.

Typewriter Details

A new 21-page Datapro report *All About Office Electric Typewriters* points out that six manufacturers (Adler, Facit, Olivetti, Olympia, Royal, and Sperry Univac) are challenging IBM's 80% share of the $500 million/year electric typewriter market. This competition is expected to further stimulate development of new features and to improve price-performance and delivery of models from all these manufacturers.

Thirty-eight models of single element and typebar electric typewriters are compared, and detailed charts giving comparative specifications are included to aid buyers in matching the right model to the specific application. Also included are the results of a user survey of office electric typewriters in which nearly 700 machines are rated on overall document quality, ease of operation, performance, and reliability, and vendor support. Price: $12. DATAPRO RESEARCH CORP., 1805 Underwood Blvd., Delran, N.J. 08075.

International Directory

The 1977 *World Telecommunications Directory* provides information on tariffs, pricing, and technical conditions in each of 60 major countries, and less detailed information on 110 others. Information on those countries covered in detail includes: government controlling agencies and common carriers (including names, titles, addresses, telephone, and telex numbers for key executives); domestic telephone and telex service and tariff; international telephone and telex service and tariff; domestic and international private leased circuit services and tariff) and special systems and services such as digital networks, packet-switching networks, etc. (if any). This infomation was obtained from official PTT and common carrier sources. Most tariffs are presented in local currency, Gold Francs, or the currency used by the PTT or common carrier to quote tariffs. Price: $950; includes three updates to be delivered in 1977. FROST AND SULLIVAN, INC., 106 Fulton St., New York, N.Y. 10038.

Data Base Directory

Descriptions of over 250 data bases from 25 remote computing vendors are contained in the 75-page directory, *Data Bases Available to Users*. Indexed by subject, the directory has listings under topics such as banking, business, economics, education, energy, engineering, finance, science, stocks and bonds, and many others.

Published by the Assn. of Time-Sharing Users, the directory is part of a two volume set, but is available separately to non-members of ATSU for $15 (prepaid). Also published by ATSU are a bimonthly newsletter, "Interactive Computing," and a two volume set of directories which cover many aspects of remote computing. ASSN. OF TIME-SHARING USERS, 75 Manhattan Dr., Boulder, Colo. 80303.

courses

Management Skills

This five-day course is project-oriented, and designed for systems analysts, project leaders, programmer analysts, and supervisors and managers. "Management Skills for the Systems Professional" covers the essentials of management as they relate to the dp field. Each registrant will be assigned to a group of other managers with similar backgrounds and expertise. The object is to work out solutions to simulated management problems and then present results to the entire class. Skills covered will include: ways to organize the systems department, interviewing potential systems personnel, training the systems team, allocating personnel, setting priorities, communication, and making presentations. The course will be held July 11-15 in New York and Sept. 19-23 in Chicago. AMERICAN MANAGEMENT ASSOCIATIONS, 135 W. 50th St., New York, N.Y. 10020.

Distributed Dp

"Distributed Data Processing" is actually a two-course program. The conference, to be held July 11-13 in Washington, D.C., is designed for executives and professionals concerned with current and potential applications of distributed data processing, either from the dp or user viewpoint, and will provide an overview for the user considering his first distributed data application. The more experienced user may benefit from exposure to a wide range of applications experience. Fee: $295; teams $195.

Designed for experienced users, the second course will be held July 13-15, following the conference. This course will cover system design steps including requirements specifications, trade-offs, benchmarking, network topologies, modeling, node selection, software, and test plans. Fee $295 (both courses $495); teams $195 each course. AIIE SEMINARS, P.O. Box 3727, Santa Monica, Calif. 90403.

Decision-making

A special one-week course in "Statistical Design and Analysis for Decision Making" will be held July 11-15 at the Georgia Institute of Technology in Atlanta. The course is designed to prepare the practitioner with appropriate statistical tools for analyzing data from planned and unplanned experiments, including statistical model building. Course participants will gain an understanding of the assumptions underlying the methodology presented, including limitations, and will have the opportunity to solve a variety of problems with a time-shared computer system. George Adams, GEORGIA TECH, Dept. of Continuing Education, Atlanta, Ga. 30332.

periodicals

Small Business Computing

A new publication, *small Business Computor* will feature articles on small business computing and data processing from many viewpoints, including those of the legal and accounting professions. The publication is aimed at educating and assisting the small business executive in the use of computers, computing, and data processing to better manage and control business.

The word "computor" was coined to reflect the publication's theme, "man, not machine," and refers to the person who computes as opposed to "computer," the machine. The publication is designed to be free of technical jargon, and will hold the viewpoint that the human, legal, and control aspects of computing are of primary importance to the community and the small businessperson. SEI PUBLICATIONS, P.O. Box 145, Newington, Conn. 06111. ✻

At last, a cure for "I Got Those Old Three in the Morning Blow-up Blues."

The cure is the UCC-15 Job Recovery Management System. With this software package, the task of rerunning or step restarting production jobs is now as simple as changing a single JCL parameter.

UCC-15 automatically corrects the OS catalog, scratches unnecessary direct access data sets, adjusts GDG biases and starts at the proper job step. Manual errors in restarting and rerunning can be completely eliminated. The latest version of UCC-15 can also provide data base recovery when a rerun or restart is necessary.

Most of our customers tell us UCC-15 works so well, they'd forgotten they even had it. If you're tired of your phone ringing at 3 a.m., you can ring ours anytime at 1(800)527-3250 (in Texas, call 214/688-7313) or circle #93

Other UCC software packages include:

A Tape Management System that insures against loss or destruction of data (UCC-1). Circle #94

A DOS Under OS System that lets you use DOS programs, without reprogramming, while you convert to OS (UCC-2). Circle #95

A Disk Management System you should investigate before you buy another disk drive (UCC-3). Circle #96

A PDS Space Management System that eliminates PDS compression (UCC-6). Circle #97

A Data Dictionary/Manager that will really get IMS under control (UCC-10). Circle #98

A General Ledger/Financial Control System that your Accounting Department has been dreaming of (UCC-FCS). Circle #99

Software packages like these. Another way—

We're helping the computer to do more of the work.

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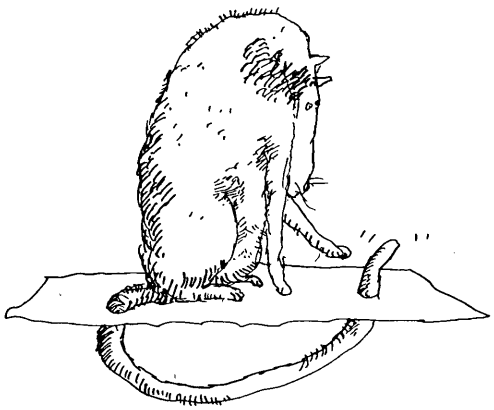
Editor's Readout

John L. Kirkley, Editor

Wagging the Dog



Tired old cliches become tired old cliches because they are often extraordinarily appropriate.

Take that old saw about the tail wagging the dog. Next apply it to the world of international data communications policy. The tail is made up of a confusing tangle of national governments, the PTT's, and various international bodies such as the Council of Europe and the OECD (Organization of Economic Cooperation and Development).

And who's playing the role of dog?

Unfortunately it's the user: the companies and individuals whose livelihood depends on the transfer of information back and forth across the globe . . . across the crazy quilt of boundaries that separate nation from nation.

For the most part these boundaries are imaginary, political fictions, dotted lines on a map. But when it comes to the transnational flow of data, they are beginning to take on all the impenetrability of a brick wall.

On page 115 of this issue, you'll find an excellent discussion of this problem by Russell Pipe and our international editor, Angeline Pantages.

Basically the situation is this. Major users of international data communications—multinationals, service companies (G.E., Tymshare, Control Data, etc.), educational organizations, the press—all depend on the free flow of information to go about their business. But, realizing that information is a vital commodity, many nations are becoming alarmed by this unchecked tidal wave of data flowing in and out and through their countries. Using the privacy issue as a lever, the European nations are erecting datawalls that could, in the authors' words, "turn computer/communications technology back ten years."

In this technology and in this industry the U.S. is clearly the world's dominant force. But when it comes to formulating telecommunications policy, the Europeans have a commanding lead.

The Council of Europe is already working on the second draft of a convention that could, if adopted, have a profound and stultifying effect on the free flow of data. The OECD, the European Economic Community, the Nordic Council, all are developing highly specific conventions restricting transnational data flow.

And what is the United States doing about all this?

Alas, not enough.

We do not have a national computer/communications policy, much less an international one. There is no unified voice representing a U.S. position at the negotiating tables of Europe's policy makers. Operating under the Carter administration's negative attitude toward forming new committees, the State Department is having trouble forming an industry/agency task force just to study the problem. And the Office of Telecommunications Policy, a logical choice to represent us overseas, is worried about its very existence.

It's not that OTP, State, the National Bureau of Standards, and all the others are indifferent to the issue or unaware of the high stakes in the game. It's just that as a government we have not gotten our act together.

The issues are tough, complex, and often involve technological as well as political considerations. Government needs industry help, but so far industry involvement has been minimal.

Despite the negative White House attitude, a strong, well-balanced industry advisory committee should be established to help formulate computer/communications related policy. We must be a leader among the nations of the world in setting information policy as we accelerate into the Information Age.

Otherwise (to dust off another cliche) we may wind up crying over spilt milk . . . or, even worse, find ourselves being wagged by a tail not of our own choosing. ❋

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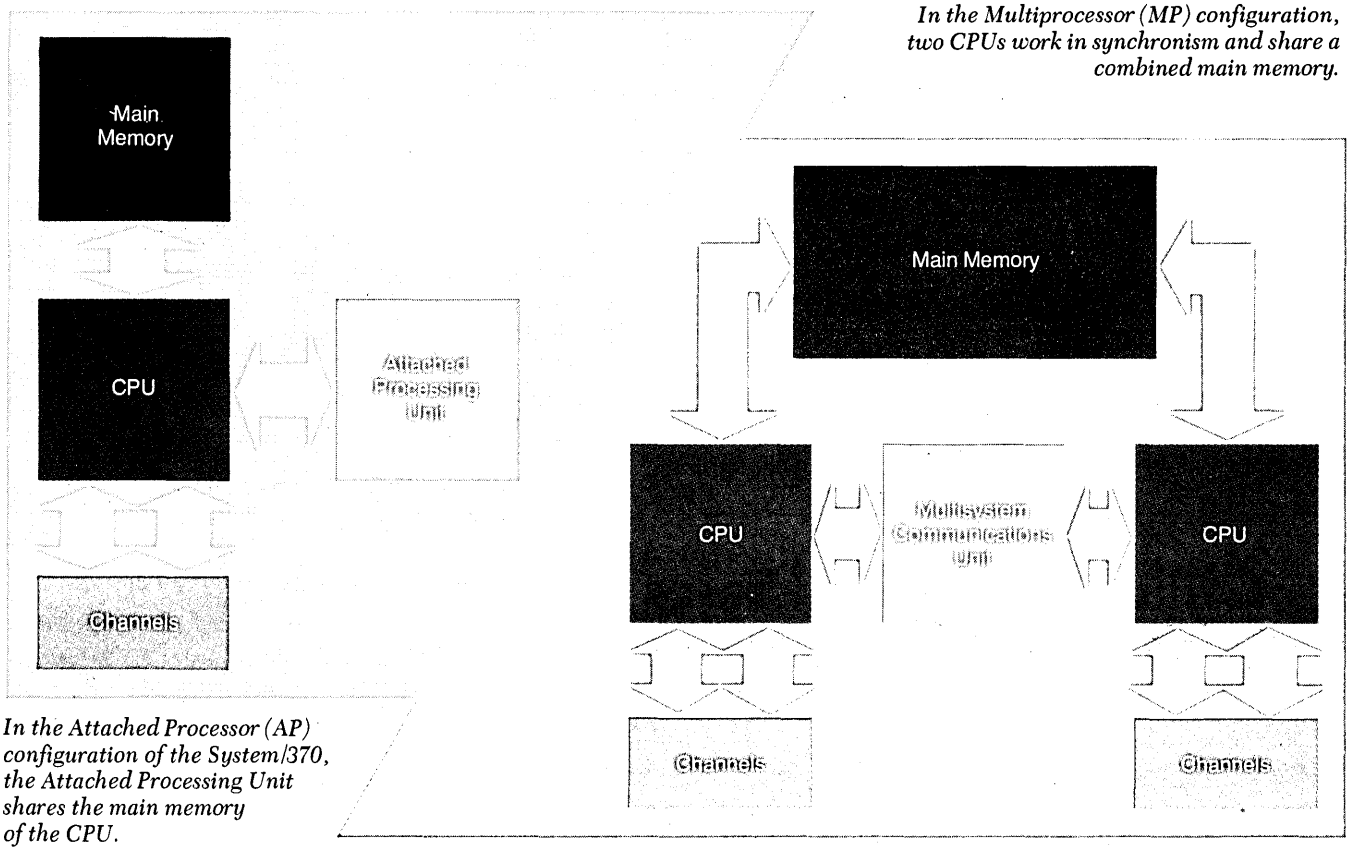
DP Dialogue

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



In the Multiprocessor (MP) configuration, two CPUs work in synchronism and share a combined main memory.

In the Attached Processor (AP) configuration of the System/370, the Attached Processing Unit shares the main memory of the CPU.

AP: Multiprocessing and Cost/Performance, too

More terminals in the online data network...

Enhanced applications demanding more resources...

Expanding business and a surging flow of transactions...

An accumulation of small increases like these may press the throughput capacity of the large data processing center. Or the pressure can come from a major new project—a high-volume data base application.

Until recently, the center would install an additional uniprocessor. But now there is another growth option with major economies and operating benefits: the System/370 Attached Processor, Models 158AP and 168AP.

Firestone Tire and Rubber Company, INA Corporation and Merrill Lynch & Company are among those who have found that adding an Attached Processor can provide—at much less cost—nearly the same throughput as two uniprocessor systems.

The Attached Processor is added to the main central processing unit, sharing its channels and memory. Both processors are controlled by one Multiple Virtual Storage (MVS) operating system which automatically balances the workload for highest productivity under user-selected priorities. Large multitasked jobs may be completed rapidly if both tightly coupled processors can be applied to them. There is no need to divide data files because both processors use the same main memory and system control program.

Thus the 158AP and 168AP provide further options in addition to the System/370 Multiprocessors, Models 158MP and 168MP. Multiprocessors are fully duplexed processors, each with main memory and channels. They can be reconfigured to continue operation if one processor is removed from service. Multiprocessors give high throughput and system availability.

However, the lower cost AP system offers about the same throughput as MP at a much better cost/performance ratio—where main memory, channels and availability of the uniprocessor are adequate.

The Attached Processor has been designed specifically to permit system growth without disruption. With its MVS operating system, it presents to each application the appearance of a single system, and functions as a single high-capacity processor for job entry, scheduling and control.

Advertisement

SDLC Cuts Network Costs for First Federal of Peoria

"We are supporting 200 terminals in 44 locations in central Illinois from this computer center. And we need reliability and operating economy. That's why we went to SDLC, installing the 3600 Finance Communication System and the 3270 Information Display System." The speaker is Alfred Biagini, vice president-data processing of First Federal Savings and Loan Association of Peoria, Illinois.

SDLC stands for Synchronous Data Link Control, an advanced line control discipline for communication between terminals and computer. It is a key element of Systems Network Architecture, IBM's most advanced telecommunications technology.

"We've been able to adopt SDLC gradually," says Biagini. "With System/370 we can run different types of terminals—with different line disciplines—against the same application programs. And we can operate the 3270s at some locations under SDLC while running others under the older bisynch discipline. We can convert a few at a time, with no impact on the application software of our Model 145.

"We achieved immediate savings at each location," he adds. "SDLC requires little phone line conditioning and uses a low-cost modem, so our leased line cost is $79 per location instead of $203.

"At the same time," he notes, "our SDLC lines are remarkably trouble free." SDLC includes highly sophisticated error-correcting facilities which compensate for most common line imperfections, making it very reliable.

"Our tellers found they were getting faster 3270 display response during terminal transactions using SDLC. We measured a decrease from 6.56 to 4.44 seconds. Equally important, we see less variation in response time in the busiest periods: 25 instead of 66 percent.

"We've also reduced the total number of leased lines," Biagini says. "SDLC lets us put dissimilar terminals on one line. A 3270 display system and a 3600 series unit on one line, for example, can access the same or different applications. Here at First Federal, SDLC is providing better performance at significantly lower cost."

Online teller terminals improve customer service at First Federal of Peoria. SDLC significantly cuts network costs.

Online Processing Proves Thrifty for Schwitzer

"With an online data base system, our data processing costs are 15 percent lower than they would have been under batch. For one thing, we've eliminated data entry. Users now enter their own data at IBM 3277 Display Stations, and they take responsibility for its correctness. This eliminates a cost, improves data accuracy and enhances coordination among departments."

Henry W. Moore, Jr. is describing data processing at Schwitzer Engineered Components, Indianapolis, where he is manager of information systems. A division of Wallace Murray Corporation, the company is a leading manufacturer of turbochargers and other engine components for trucks, heavy off-road equipment and automobiles.

Schwitzer uses IBM's Data Language/1 (DL/1) to manage its online data base. "Under DL/1," Moore says, "we can respond much more quickly to users' needs—doing in minutes what would have taken days. Management doesn't always know in advance what information will be needed. We can respond fast to unexpected queries.

"For example, with the material and labor standards stored in our data base, we can quickly answer 'what if' questions about the impact on margins of changes in these cost elements."

At Schwitzer, applications such as production scheduling, material and inventory transactions, receiving and purchasing are online to the IBM System/370 Model 145. In all, some 900 programs access the common data base.

"Since information in a DL/1 data base is not redundant," Moore says, "cost-related items are the same whoever looks at them: accounting, purchasing or manufacturing. And we've gained a great deal of design flexibility in system development. We can add to a file or change the length of a field if an enhancement or new application requires it without affecting existing applications.

"To illustrate, before installing DL/1 we had to modify a purchasing file to accommodate an additional function. The enhancement cost us about $8,000 to develop. If we'd had DL/1, it would have cost $1,000.

"A programmer can build relationships between data elements 'on the fly' using simple procedures," Moore notes. "DL/1 handles data storage and manipulation functions for him; he needn't be concerned with file structure at all."

IBM's DL/1 online data base system supports manufacturing and marketing of turbochargers (seen here in final assembly) at Schwitzer.

TSO: A Sharp Pencil for Bendix Cost Estimators

Cost estimating to prepare aerospace electronics bids is challenging, time consuming, and expensive. The Flight Systems Division of Bendix Corporation routinely spends $50,000 or more to develop a single competitive bid and its thick volumes of supporting documentation.

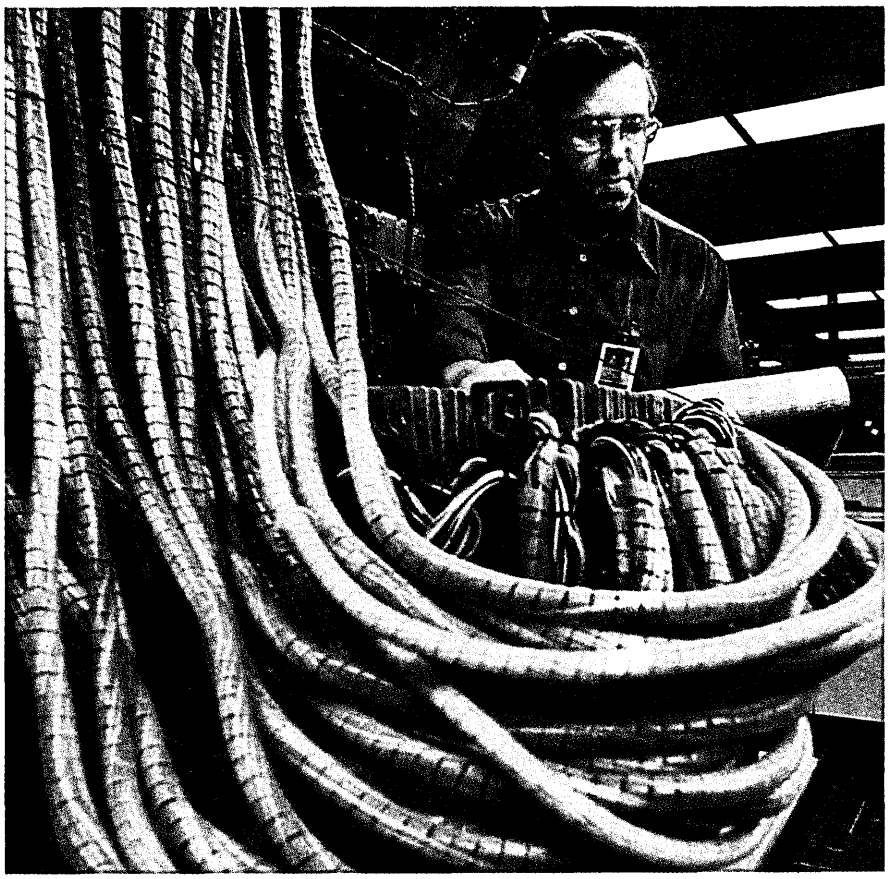
Now, with interactive computing, reports Will E. Frey, manager of cost estimating for the Teterboro, N.J. division, Bendix is producing estimates faster than ever before, with less overtime and greater accuracy, and with productivity increases of more than 30 percent.

"In 1975," he says, "we began to convert to interactive computing procedures under TSO." (IBM's Time Sharing Option, or TSO, supports interactive use of the computer by end users.)

"One reason for going interactive," Frey continues, "is that preparing an estimate is a huge data entry job: a cost analyst must enter hundreds of line items to be separately calculated by a costing formula. Handling data entry interactively, the analyst enters these numbers directly, as he develops them. This eliminates data preparation as a separate activity, while programmed checks catch most data entry errors immediately.

"With interactive computing, we can try different numbers—shifting profit margins or labor costs a little—to see the effect on the final numbers. In the same way, we can test the economics of alternate manufacturing technologies—to see, for example, whether it would pay to invest in an automatic insertion machine for printed-circuit board fabrication. In a competitive climate, this lets us sharpen our bids.

"In the negotiating phase of a contract award," Frey adds, "after the supplier is selected, it is standard practice for the customer to go over the bid in great detail, questioning the numbers and looking for opportunities to reduce the price. With an interactive costing system, we can respond to the customer immediately; we can answer questions and sometimes conduct negotiations over the phone."



Automatic test equipment puts Bendix-made aircraft navigation equipment through its paces. Estimators at Bendix cost the development and production of sophisticated flight electronic systems with greater speed and accuracy than ever before through the use of TSO.

Cost analysts in the division headquarters use IBM 3767 or 2741 Communication Terminals, which access a System/370 Model 158 in the company's Teterboro, N.J. complex.

"We've just about eliminated night work," adds Allen Handzo, cost estimator. Not a professional programmer, Handzo briefly studied VS BASIC, an IBM programming language oriented to the end user. He has written 50 programs now in use by the cost estimating department.

"Preparing the sheer volume of tabular material formerly required big pushes of overtime to meet bid deadlines," Handzo says. "Now we finish a bid early enough to let top management take a thorough look at it. And, if management review leads to revisions, the computer can quickly generate a new estimate in full detail."

"We can develop more and better information for our customer," says Frey, "and respond better to his needs. These are important advantages in a very competitive market."

Software Products from IBM

Three products available from IBM support conversational computer applications:

1. Interactive Instructional System (IIS) Used for individualized computer-based training of personnel, and for the creation of computer-aided instruction programs.

2. Display Management System/ Virtual Storage (DMS/VS) Provides display functions in pre-programmed form for applications using the 3270 Information Display System under Customer Information Control System/Virtual Storage (CICS/VS).

3. Interactive Query and Report Processor (IQRP) Permits end users to query data files or extract information in a simple free-form language.

For more information on these products, write to the Editor of DP Dialogue at the address on the right.

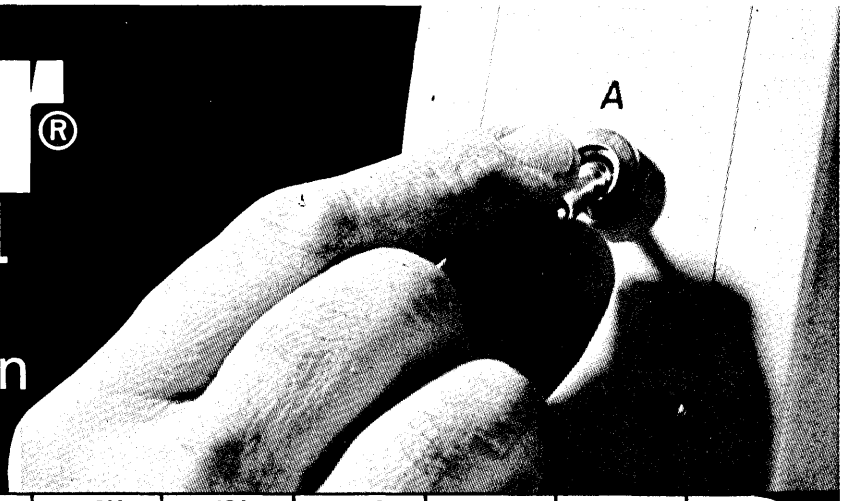
DP Dialogue is designed to provide you with useful information about data processing applications, concepts and techniques. For more information about IBM products or services, contact your local IBM branch office, or write Editor, DP Dialogue, IBM Data Processing Division, White Plains, N.Y. 10604.

IBM
Data Processing Division

T-bar®

SYSTEM RESTORAL
SYSTEM MONITOR

data communication switches



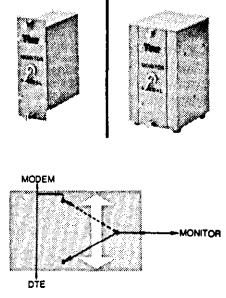
Economical T-BAR SYSTEM RESTORAL Switching is available for use in the smaller Data Communications networks.

These T-BAR Series **5700** Switches, for Fall-Back, Monitor, Crossover and Spare Modem, are all inexpensive, yet highly reliable methods to quickly restore failed service or rearrange equipment to your optimum reconfiguration.

For larger facilities, select from T-BAR Series **5000** Switches. Illustrated product literature on both Series 5700 and 5000 are available upon request.

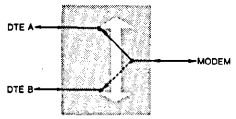
5711 RS232 Monitor Switch Single Line Panel Mounting

5721 RS232 Monitor Switch Single Line Desk Mounting



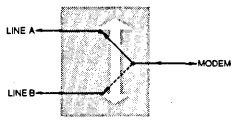
5712 RS232 Fallback Switch Single Line Panel Mounting

5722 RS232 Fallback Switch Single Line Desk Mounting



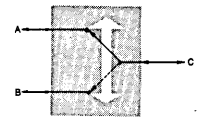
5713 Telco Fallback Switch Single Line Panel Mounting

5723 Telco Fallback Switch Single Line Desk Mounting



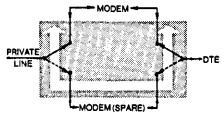
5731 16 Conductor Fallback Switch Single Line Panel Mounting

5741 16 Conductor Fallback Switch Single Line Desk Mounting



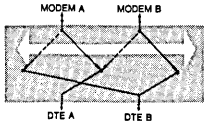
5732 RS232/Telco Spare Modem Switch Single Line Panel Mounting

5742 RS232/Telco Spare Modem Switch Single Line Desk Mounting



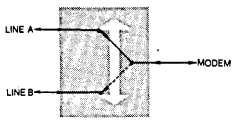
5733 Telco Crossover Switch Two Lines Panel Mounting

5743 Telco Crossover Switch Two Lines Desk Mounting



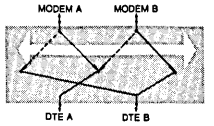
5734 Telco Fallback Switch 4 Lines Panel Mounting

5744 Telco Fallback Switch 4 Lines Desk Mounting

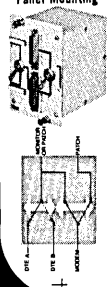


5735 RS232 Crossover Switch Two Lines Panel Mounting

5745 RS232 Crossover Switch Two Lines Desk Mounting

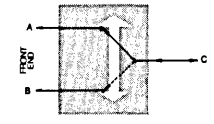


5736 RS232 Patch/Monitor/Fallback Switch Single Line Panel Mounting



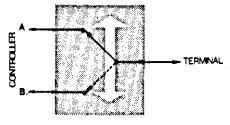
5737 Wide Band Fallback Switch Single Line Panel Mounting

5747 Wide Band Fallback Switch Single Line Desk Mounting



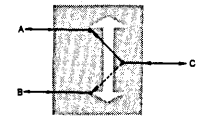
5738 Video Terminal Fallback Switch 4 Coax Lines Panel Mounting

5748 Video Terminal Fallback Switch 4 Coax Lines Desk Mounting

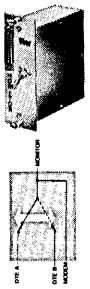


5739 48 Conductor Fallback Switch Single Line Panel Mounting

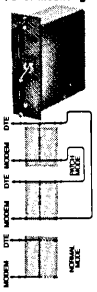
5749 48 Conductor Fallback Switch Single Line Desk Mounting



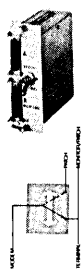
5752 Fallback/Monitor Switch Single Line Panel Mounting



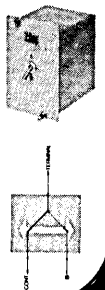
5756 RS232 Patch/Normal Switch Single Line Panel Mounting



5757 RS232 Patch/Monitor Switch Single Line Panel Mounting



5773 Incoterm Terminal Fallback Switch (One Coax and One RS232)



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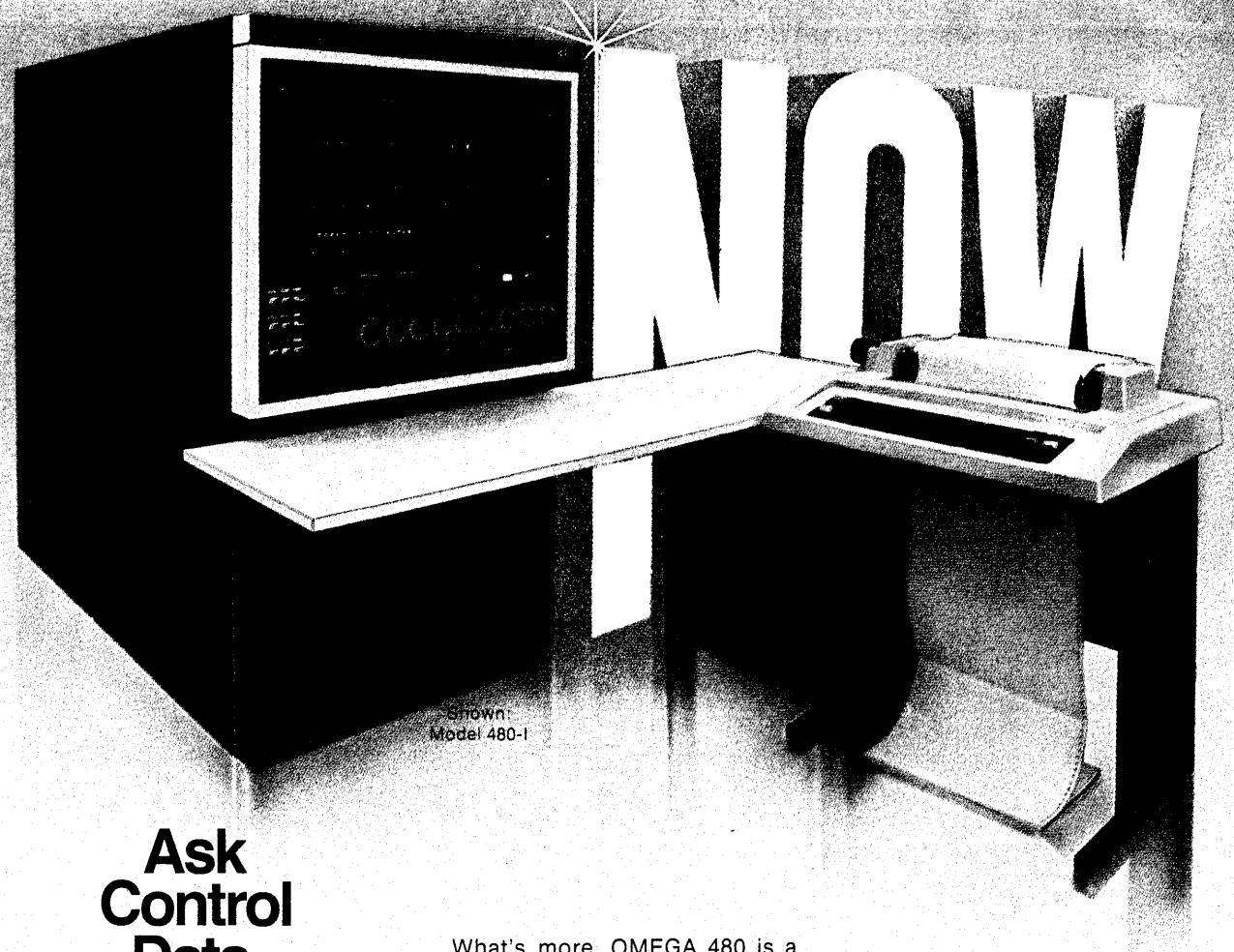

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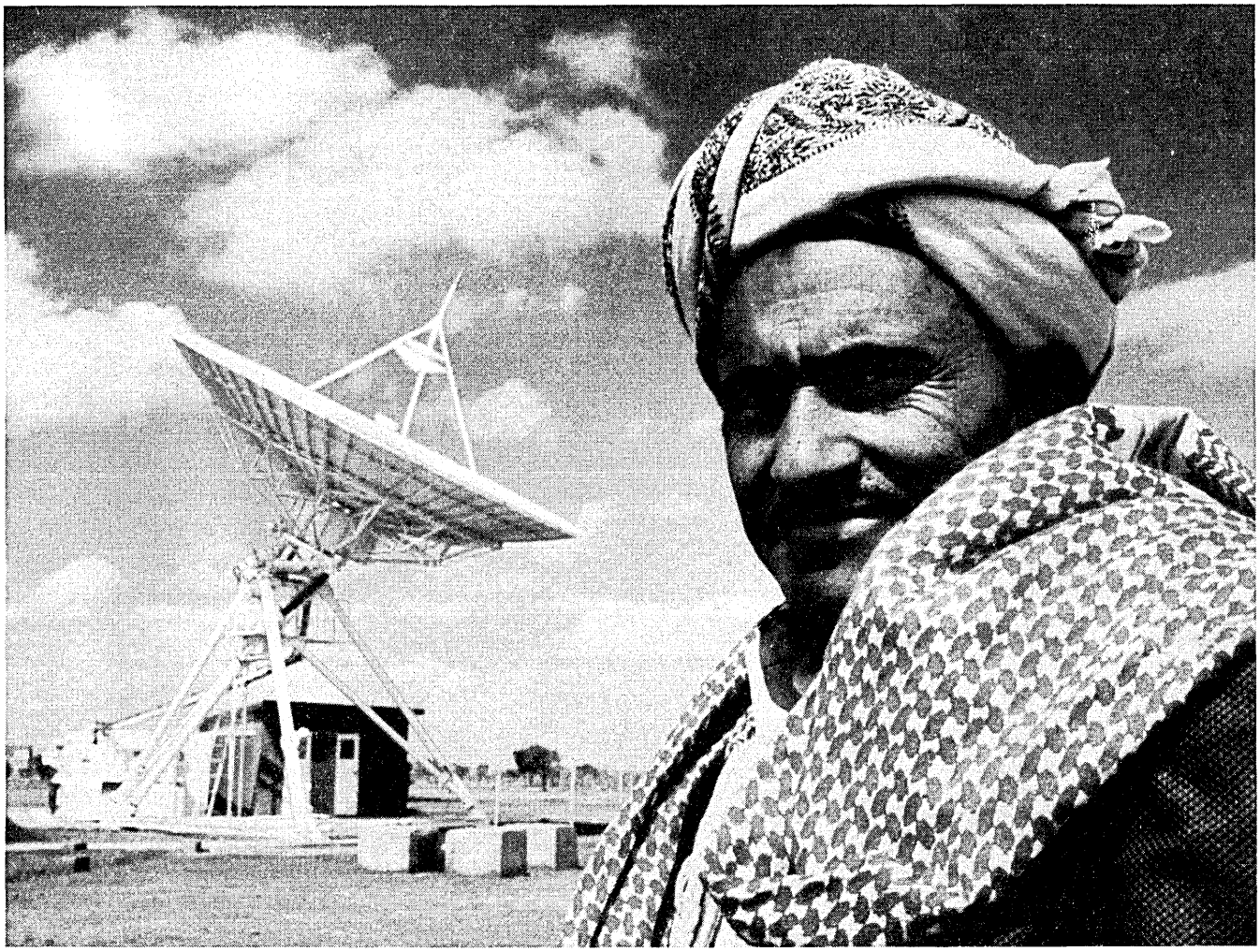
CIRCLE 23 ON READER CARD

Sound & Vision



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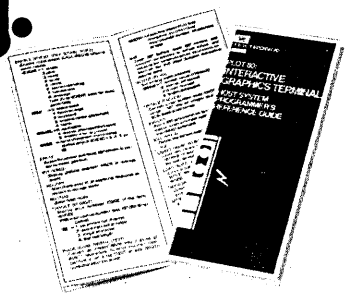
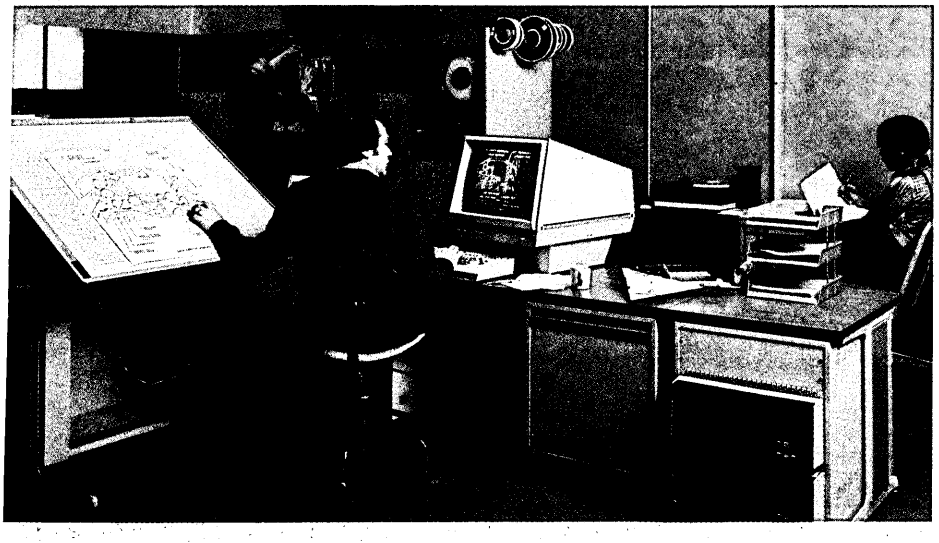
"The 4081 helps me solve two design problems: waiting and paying."





Operational software is built into the 4081 package. Your host programs can conveniently control the 4081 terminal functions. Assemblers and compilers are also available to expand terminal functions to your special design applications.

Problem: Waiting for design answers from an overloaded host and communications system.

Your design ideas don't come easy . . . especially when your host leaves you continually waiting. Progress is bogged down by host updating and retransmission of redundant picture information or bulk data.

Solution: Tektronix' 4081 Interactive Graphics Terminal.

The 4081 enables immediate display of local picture files without host dependency. Our revolutionary 19" refresh storage tube displays both our famous resolution plus dynamic interactivity: Like animation effects. Rubber banding. Dragging. Plus, local picture manipulation and picture transformations help enable dramatically improved response times.

Reduce frustration and the delays of a noisy line.

The 4081 supports block data transmission and error detection to allow reliable transfer of large data files.

A 19" display, hardware, software, host compatibility, a special local CPU for display and graphic control, bulk tape storage—it's all part of the package. Plus much more.

Create your own system from our plug-in peripherals.

Like hard copy units, mass storage devices, plotters or graphic tablets. We have many rental and lease agreements to choose from, plus excellent warranty and maintenance. Call us, the world's Graphics leader, or write:

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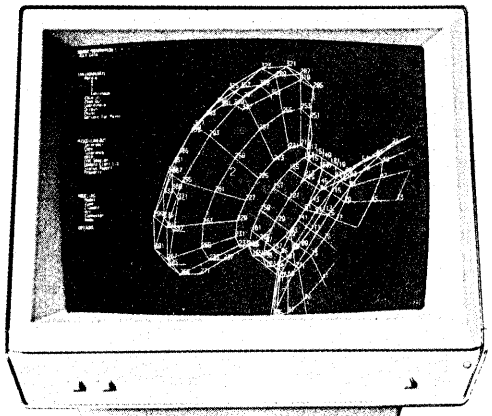
Information Display Group
P.O. Box 500
Beaverton, Oregon 97077
Tektronix Datatek NV
P.O. Box 159
Badhoevedorp, The Netherlands

Break the time barrier. Get the 4081.



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CIRCLE 86 ON READER CARD

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What's full of information, needs very little room, can be updated in seconds, and takes a big load off your computer?

The answer is System 200 by A. B. Dick/Scott, the highly flexible and completely updatable micrographic record processing system that can give you new, cost-effective options in efficient information management.

For example, System 200 offers you a practical, proven means of eliminating many of the time- and space-consuming inefficiencies associated with bulky paper files.

When you consider that a single file tray 16" long will hold the equivalent of 4 to 5 four-drawer files – or up to 50,000 documents – it's easy to see why System 200 can provide substantial space savings over other record-keeping systems.

Total file security protects you and your records.

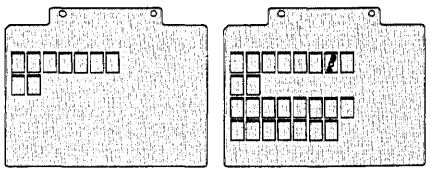
Unlike paper files which are subject to random access and uncontrolled removal, System 200 offers built-in security advantages that make it an excellent "records watchdog."

While users can review System 200 record contents in whole or in part, as well as add, void, or annotate as necessary, File Film never leaves the master file area.

This means that, while System 200 is as responsive to record requests as paper files, it offers additional built-in safeguards against costly out-of-file losses or unauthorized removals.

As a highly controlled, yet completely flexible approach to mass records storage, System 200 is ideally suited to the long-range maintenance of all types of banking, financial, law enforcement, government, personnel, and health and institutional files.

The file security of System 200 also offers long-range advantages in terms of controlled access and rapid record retrieval to simplify compliance with the requirements of current and pending privacy protection laws.



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 capability and can be updated. Prior recorded documents can be readily annotated for record control purposes.

A natural complement to your computer data file.

While System 200 functions superbly as a stand-alone information storage and retrieval system, it can also serve as a practical mass-information adjunct to computerized data sources.

For example, as each document is imaged on System 200 master File Film, basic data can be extracted from the document and keystroked into a separate electronic storage summary file.

You can then refer to your computer file for quick, on-line answers to routine questions or turn to your System 200 master File Film for complete, in-depth information.

Find out more... send for free, illustrated brochure.

To help you determine how System 200 can best be applied to your information management needs, we invite you to send for a comprehensive brochure and a special computer compatibility supplement without obligation.
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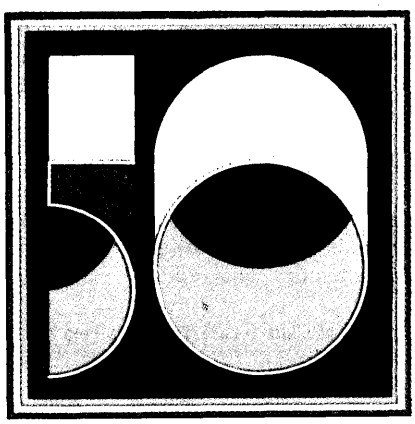


The Top 50 U.S. Companies in the Data Processing Industry

by Oscar H. Rothenbuecher

The second annual survey finds a business worth $25.3 billion, with half of that amount again going to IBM.

For the second year, Arthur D. Little, Inc.'s surveyors have set out to measure for DATAMATION the scope and health of the data processing industry as reflected in its top 50 members. The surveyors' job is a difficult one, partly due to the fact that the industry has very fuzzy edges, making the definition of just what "DP" is critical to the ranking of its firms.

Another problem they have to contend with is that most multi-faceted firms, including many of the most prominent in our industry, do not split out data processing related revenues as such. None report them at the level of detail we'd most like to see, in terms of specific products and services; therefore a good deal of investigation, analysis, and estimation is necessary.

What the surveyors have found is a strong, healthy, and rapidly growing industry. According to annual reports for fiscal 1976, the 50 largest U.S.-based companies in this business received revenues of $25.3 billion from dp products and services. That's a good step up from 1975's $22.2 billion—14% more. There seems to be no difference between the rate of growth for U.S. markets or foreign markets for U.S. firms either; the expansion was world-wide.

As a result of this growth, a company's dp revenues had to be $55 million before it could be counted as one of the top 50. Last year that revenue cutoff point was only $40 million. Several companies which could not keep pace with the industry's rapid growth simply fell off the list to be replaced by others which either accelerated at better than average speeds, expanded by mergers and acquisitions, or benefited from changes in how the ADL surveyors drew their line.

Companies whose revenues grew at prodigious rates included Datapoint and Informatics (both with 50% better dp revenues than in 1975), Data General (49%), Tymshare (46%), Wang Laboratories (39%), and McDonnell Douglas (38%).

Then too, the number of companies which are expanding through acquisitions is growing. In one instance, the acquisition of Wangco by Perkin-Elmer, the result was a considerable increase in volume. In other instances, such as the acquisition of Data Pathing by NCR, Caelus Memories by Sperry Univac, Sanders Data Systems by Harris, and Terminal Communications Inc. by Telex, the effect was less dramatic, at least for 1976.

In still another case, the 1975 acquisition of Computer Machinery Corp. by Pertec, the companies have chosen *not* to consolidate financial reports for fiscal 1976 as we had anticipated. (We added the two's revenues for the 1975 list assuming they would. Since they have not, and since neither company is large enough to make this year's list alone, the entry for Pertec/CMC has been dropped.)

Some of the firms changed position or appeared for the first time because of a change in reporting perspective. Should credit reporting through a data communications network be included as general purpose data processing business? Should point-of-sale systems count as general purpose dp products? Even the surveyors disagreed. But since such information is clearly given in the text profiles which accompany the listing, the outside observer can make his own decision. (Some of the firms involved in the definitional quandaries are Xerox, Computer Sciences, Bunker Ramo, and McDonnell Douglas.)

The information presented in this article was compiled as a result of a study conducted for Datamation by Arthur D. Little, Inc. staff under the supervision of Mr. Rothenbuecher.

The big seven

Of course such changes affect the small firms more drastically than the large ones. Nothing is likely to dislodge IBM from its 50% of the business for

some time. The "big seven" remain dominant. In fact, the sizable gap between seventh and eighth position actually widened from $270 million in 1975 to $401 million. Hewlett-Packard, the eighth company, could double in dp revenues and still not come close to displacing DEC, smallest of the "big seven."

These top few firms' combined revenues grew at a rate of 14%, so they continued to share 86% of the total market; the remaining 43 firms are left to share that (again) 14% remainder.

The only change in position among the top seven was between Sperry Univac and Honeywell, which interchanged second and third places. Actually, however, inaccuracies in definitions and in estimating are probably greater than the difference between the two; they were essentially neck-and-neck both years. (Sperry's choice of March 1976 as the end of its fiscal 1976 doesn't help clarify the matter either.)

Although that (magic?) 14% growth figure holds for IBM, revenue increases actually varied considerably among the top seven firms. Two exceeded IBM's growth, NCR (because of its success with financial and retail terminals) and DEC (because the minicomputer business is doing quite well, thank you). The other four, whose business is more heavily concentrated in full-size computers, grew at rates varying from 8% to 13%. Control Data's mainframe growth was really the lowest, but its overall performance was enhanced by strong showings in peripherals and services.

Actually, because revenues from full-size (non-mini) computers accrue to a relative few of the leading vendors, mainframes are usually assumed to be a greater proportion of the whole than they are; according to our estimates, revenues from mainframes amounted to only about $6.2 billion of the $25.3 billion industry total. By far the largest category is peripherals and terminals at $10.0 billion. Service and software revenues are at $5.2 billion and gaining, minicomputers at $2 billion (and also gaining). Supplies and media—which are counted as dp related items for the top 50 firms even though no firms producing *only* dp and media were considered—accounted for the final amount, about $1.9 billion.

Revenue growth varied widely by category of product and service. To no one's surprise, revenues from minicomputers paced industry growth by increasing 24%. More surprising is an equal increase in software and services. Part of the latter is accounted for by increases in prices for field engineering services and by IBM's increasing unbundling of systems programs, but much of the increase was from business expansions in the most successful large service bureaus.

Growth in peripherals and terminals revenue was a solid 11%, while growth in general purpose mainframe revenue was small, as suggested, only 5%. More in-place systems grew by expanding memory and adding peripherals than were replaced by new ones in 1976, but that picture will change in 1977 and even more in 1978 as the recently announced new generation mainframes are delivered in quantity.

1976 DP REVENUE INCREASES OF THE "BIG SEVEN"

	1975 Revenue ($million)	1976 Revenue ($million)	% Increase
IBM	$11,116	$12,717	14%
Burroughs	1,447	1,630	13%
Univac	1,295	1,430	11%
Honeywell	1,324	1,428	8%
CDC	1,218	1,331	9%
NCR	960	1,100	15%
DEC	534	736	38%
	$17,894	$20,372	14% avg.

Revenue is very heavily concentrated in a few top firms in the dp industry. These seven account for over 80% of the revenues of all the top 50 firms, and the 50 very likely account for 95% or more of all the dp business.

Reading the tables

The final outcome of all this, as mentioned at the start, has been a healthy amount of business for these top 50 firms in which the industry is so heavily concentrated. The listing on page 64 shows just how much. Selected data for them is given in descending order of dp revenue for fiscal 1976. Note that in cases where two companies' dp revenues are estimated to be about the same, the firms are listed alphabetically. Also note that in a few cases where no definite data were available, an estimate is given.

The right half of each line in the tabulation contains information which is available in annual reports. The left half contains data relating directly to the dp activities of the company. Since firms generally do not break out this latter kind of data in their consolidated statements, the entries mainly reflect Arthur D. Little estimates.

For more detailed information on the individual firms, the text profiles are provided, complete with bar charts illustrating the source of each firm's monies. Some definitions are required for full understanding, however. To begin with, the revenues counted in the tabulation and in the profiles are those revenues stemming from the sale of data processing products and services provided to the general user population outside the supplying organization. Specifically excluded are sales of special military or defense systems, and sales of special purpose systems in which the general public would have no interest.

Categories included are:

- mainframes—general purpose computers (including native memory supplied with them but excluding peripherals and terminals).
- minicomputers—all end user and oem minicomputers and their native memories, again exclusive of detachable peripherals and terminals.
- peripherals and terminals—all units shipped as part of complete systems or shipped separately, including data entry equipment and add-on memory.
- media and supplies—media such as disc packs, magnetic tapes, carbon ribbons, and incidental forms. (Again, no major forms manufacturers are included.)
- software and services—software products and all types of usage, maintenance, third party leasing, training, and customer assistance provided for a fee. Data communication services without processing operations are not considered part of the data processing industry under the scope of this analysis.

There is always some question as to whether the top 50 or top any number accurately reflects the whole picture. To a surprising extent, it works in dp.

The industry remains highly concentrated, not only in the top seven firms but in the top 50. There are certainly many, many small companies in this business which gross less than the $55 million required to make the 50th position, but their combined revenues can scarcely total more than $1 billion. Even if they did garner that much business, the top 50 firms would still account for 95% of the total. For all financial intents and purposes, the top 50 *are* the U.S. data processing industry.

Disclaimer

The information reported in this feature is based on data provided in annual reports and other publications of the companies covered, Moody's, Standard and Poor's, and Value Line financial services, and trade publications. While our estimates represent the best efforts of Arthur D. Little, Inc. and DATAMATION on the basis of available information, we cannot in any way guarantee completeness or accuracy.

While our estimates were shown to the companies in *all* cases and were often improved by company sources, many companies preferred not to comment nor to provide the details desired. Companies with activities and volume rating them for inclusion in the listing but not shown are invited to contribute the appropriate information for future

consideration.

Due to the peculiarities of reporting cycles and policies of companies covered, inconsistencies and inaccuracies may have developed. Contributing to these are the following facts:

- The fiscal year by which companies report is not always identical to the calendar year, leading to differences in reporting periods, final adjustment considerations, and the like. Where this is the case, comparison of results for fiscal 1976 as presented by one company with those presented by another company for fiscal 1976 of a different period may lead to some inequities.
- Identification of dp revenues and breakdowns of product class contributions are often not made available, or counts and definitions may vary from the mode which we selected.
- Double counting of oem-supplied products such as minicomputers or peripherals and terminals has probably occurred, because revenues of both the originating manufacturer and the assembling vendor are likely to include them. The inflating effect of this factor is probably only of minor impact in the context of total industry revenues.

In spite of all these factors, we have a high degree of confidence in the data presented, and feel that the industry can make good use of them with the proper precautions. ❋

50

BUSINESS PROFILES
(IN ORDER OF INDUSTRY RANKING)

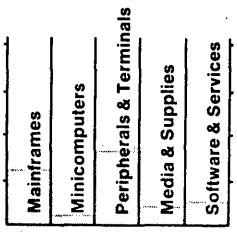
1 International Business Machines Corporation
Old Orchard Road, Armonk, NY 10504 (914) 765-1900

During 1976, IBM data processing related revenues advanced by about 14% to $12,717 million, 78% of the total corporate revenues. Half of this originated in the domestic market, half in the international sphere.

IBM maintained its lead in the world-wide data processing community by the announcement and enhancement of processor systems, by improving the capability and modularity of its software offerings, and by introducing technologies it had not previously used, such as ink-jet printing. The company also passed the benefits of lower manufacturing costs to the user through price reductions, as in the case of its memory systems prices which were reduced by about 30%.

While the economic recession still had some effect in slowing the growth in demand and shipment volume for some processor systems in the earlier part of the year, the demand for additional capacity for installed systems resulted in orders for peripherals and terminals. This product category is believed to be the largest contributor to IBM's volume, accounting for about 40%. Mainframes are estimated to contribute 33%. With an increasing tendency to charge license fees for program products, revenues from software and services are increasing slowly but steadily, and are believed to have contributed 13%. While minicomputers still remain a relatively small part of the total, in the 5% range, their contribution is already considerable in its absolute volume which is well over half a $ billion. Media and supplies account for the remainder of about 9% of total.

Percentage of data processing business attributable to main product and service categories.



2 Burroughs Corporation
Burroughs Place, Detroit, MI 48232 (313) 972-7442

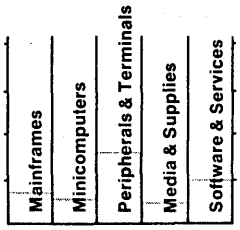
The revenue produced by Burroughs data processing products and services during 1976 rose by 13% over the previous year, to $1,630 million, providing 86% of the total corporate revenues. Strongest growth was reported in terminal products, which together with peripherals account for about 37% of the volume. Services and software have grown to be the second largest source of data processing revenues to Burroughs, amounting to about 24%. Mainframes contributed 17%, minicomputers about 13%, media and supplies the remainder of approximately 9%.

While Burroughs continues to pursue the giant computer field actively with its impressive new products based on its own high speed circuitry (Burroughs Current Mode Logic) used in the new very large B7800 System and the Burroughs Scientific Processor, it also keeps its attention appropriately focused on the small systems category. Here Burroughs provides in its B80, B800, and B1800, a compatible range of small systems, supported by its integrated set of operating system and application software, called Computer Management System.

Then too, with the growing importance of electronic funds transfer in the financial industries, Burroughs can be expected to expand on the position it has gained servicing financial institutions.

The firm's international activities also expanded in a targeted manner. In Japan, Burroughs extended its commitment by fully acquiring its marketing company there, whose operating results have since been included in the corporate reports. In Brazil, a country whose data processing market gains in importance as its industrialization continues to advance, Burroughs maintained its respectable number two position.

Percentage of data processing business attributable to main product and service categories.



3 Sperry Rand Corporation
1290 Avenue of the Americas, New York, NY 10019 (212) 956-3273

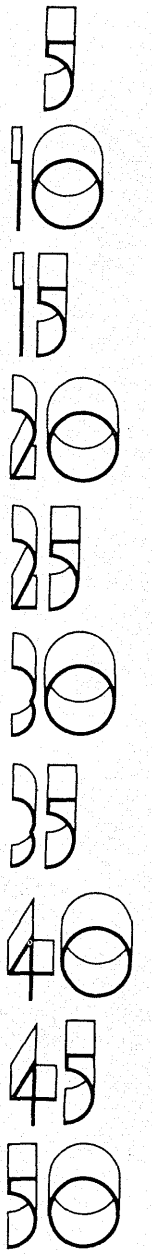
During *fiscal* 1976 Sperry Univac's contribution to the total revenues of Sperry Rand Corporation increased both in percentage and in absolute volume. (Sperry Rand's fiscal

THE TOP 50 U.S. COMPANIES IN THE DP INDUSTRY

RANK	COMPANY	DP REVENUES $M	Estimates for 1976 DP REVENUES (% of total revenues)	U.S. DP REVENUES (% of total dp revenues)
1	International Business Machines	$12,717	78%	50%
2	Burroughs	1,630	86%	57%
3	Sperry Rand	1,430	45%	58%
4	Honeywell	1,428*	47%*	45%*
5	Control Data	1,331	98%	66%
6	NCR	1,100	48%	51%
7	Digital Equipment	736	100%	62%
8	Hewlett-Packard	335	30%	52%
9	Memorex	310	90%	58%
10	TRW	295	10%	90%
11	3M	211	6%	80%
12	Itel	189	73%	90%
13	General Electric	185	1%	80%
14	Automatic Data Processing	178	95%	90%
15	Computer Sciences	165	75%	81%
16	Mohawk Data Sciences	162	100%	43%
17	Data General	161	100%	59%
18	Electronic Data Systems	133	100%	95%
19	Management Assistance	123	100%	60%
20	Storage Technology	122	100%	75%
21	Data 100	120	98%	67%
22	Xerox	120	3%	100%
23	California Computer Products	116	96%	76%
24	Ampex	115	45%	53%
25	Bunker Ramo	107	34%	90%
26	Amdahl	93	100%	75%
27	Harris	92	18%	90%
28	Teletype	90	50%	90%
29	System Development	85	77%	95%
30	General Instrument	84	22%	80%
31	Tymshare	82	100%	85%
32	Wang Laboratories	82	85%	55%
33	McDonnell Douglas	77	2%	100%
34	Dataproducts	75	88%	75%
35	Telex	75	71%	74%
36	Raytheon	74	3%	80%
37	Perkin-Elmer	73	21%	75%
38	General Automation	71	100%	70%
39	Datapoint	68	94%	54%
40	Sycor	67	100%	56%
41	Texas Instruments	66	4%	90%
42	GTE	65	1%	95%
43	Four-Phase Systems	63	100%	80%
44	Inforex	63	100%	44%
45	Tektronix	62	17%	59%
46	Wyly	62	97%	47%
47	Recognition Equipment	60	92%	75%
48	Informatics	59	100%	93%
49	Electronic Memories & Magnetics	58	63%	90%
50	Boeing	55	1.4%	95%

Reported Data					
1974 TOTAL REVENUES $M	1975 TOTAL REVENUES $M	1976 TOTAL REVENUES $M	1976 NET INCOME OR (LOSS) $M	NUMBER OF EMPLOYEES	RANK
$12,675	$14,437	$16,304	$2,398	291,977	1
1,533	1,702	1,902	186	49,884	2
2,613	3,041	3,202	145	87,090	3
2,626	2,760	3,009*	113	70,775	4
1,101	1,246	1,358	13	41,553	5
1,979	2,166	2,313	96	67,000	6
422	534	736	73	25,000	7
884	981	1,112	91	32,200	8
218	264	345	40	6,800	9
2,486	2,586	2,929	133	87,625	10
2,937	3,127	3,514	339	78,500	11
144	204	260	16	2,800	12
13,918	14,105	15,697	931	380,000	13
112	155	188	18	6,500	14
147	177	220	7	7,200	15
168	170	162	14	3,800	16
83	108	161	19	5,780	17
114	119	133	14	3,942	18
77	94	123	13	2,600	19
75	99	122	8	2,161	20
70	96	122	6	2,873	21
3,505	4,054	4,404	359	97,336	22
130	123	121	(4)	2,800	23
272	242	255	8	10,000	24
314	289	316	8	9,448	25
NA	14	93	23	777	26
437	479	514	27	12,600	27
NA	157E	180E	NA	3,300E	28
90	109	110	2	3,600	29
404	401	376	7	22,800	30
46	56	82	7	1,600	31
64	76	97	6	2,600	32
3,075	3,255	3,543	109	63,000	33
69	86	85	7	2,928	34
90	106	106	4	2,350	35
1,929	2,245	2,463	85	52,600	36
272	297	349	20	9,600	37
61	56	71	(1)	1,500	38
34	47	72	6	1,921	39
40	55	67	5	1,508	40
1,572	1,368	1,659	97	66,162	41
5,661	5,948	6,751	453	187,000	42
36	50	63	7	1,158	43
52	57	63	3	1,400	44
271	337	367	30	12,970	45
88	65	64	(71)	1,700	46
43	59	65	6	1,967	47
33	39	59	NA	1,900	48
111	92	92	9	3,600	49
3,731	3,719	3,918	103	62,600	50

E estimate NA not available * includes CII-HB; other figures do not



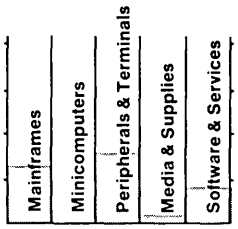
year ends on March 31. As a result, the performance reported here is for March 31, 1975 to March 31, 1976.)

At $1,430 million, the revenue contribution was up 10.8% over the previous year's level, and contributed 45% of Sperry Rand's total. The effect of the economic recession in the earlier part of the fiscal year slightly reduced the contribution from mainframe products to 35%, but the improving economic situation boosted peripheral shipments, increasing their relative share in the product profile to 40%. Sales of media, supplies, software, and services remained practically unchanged and combined to contribute 25%.

Univac's international operations provided 42% of these revenues.

New product introductions show Univac's intent to reinforce and complement its position in the dp market. Its model announcements in the large scale 1100 series and the medium size 90 series are directed at providing improved cost performance to the established data processing user community. At the small end of the spectrum, the 90/25 becomes Univac's new offer of an entry level product to the small computer shop. To the small business user, the new Univac business system BC/7 attempts to provide the product solution which has been long awaited in a category now filled with a multitude of competitors.

Percentage of data processing business attributable to main product and service categories.



4 Honeywell Incorporated
Honeywell Plaza, Minneapolis, MN 55408
(612) 870-5200

The revenues which Honeywell derived in 1976 from its Information Systems activities, including CII-Honeywell Bull which was reported on a consolidated basis, amounted to $1,428 million, or about 47% of the corporate total. Dp revenues are essentially equal to those of Sperry Rand, making the contest for the number three slot in the industry *very* close.

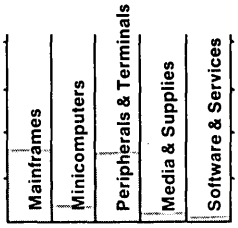
Honeywell Information Systems activities lagged in the first half of the year, but increased in the latter part as the economic recovery required expansion of systems support among its customers. Increases were especially noticeable at both ends of the product spectrum. The large models of the 60 series were in strong demand, and can be considered promising for the future due to the announcements of new advanced technology systems. At the small end of the spectrum, Series 60 Level 61 orders are picking up. A new product introduced during 1976, the Level 6 minicomputer, has also received widespread attention and is beginning to find increasing application in the communications-oriented distributed systems environment.

In the international market scene, the merger of CII with Honeywell Bull brought about a combination of opportunities to be realized and problems to be solved. The opportunities lie in the favored status which CII-HB is accorded by the French government regarding mainframe orders from its agencies. Taking advantage requires considerable efforts to achieve the aspired shipment levels, and extensive conversion aids to facilitate customer migration.

The technology advances incorporated in the new large scale Model 66/85 and its architectural features are indicative of HIS capability to advance the state of the art, helping the firm to gain further confidence among the large users with operations in distributed processing.

General purpose mainframe products continue to hold the largest share in the HIS product profile with 43%. Peripherals and terminals follow closely with approximately 40%. Minicomputers have expanded to 8%, while service and media reportedly contribute less than 10%.

Percentage of data processing business attributable to main product and service categories.



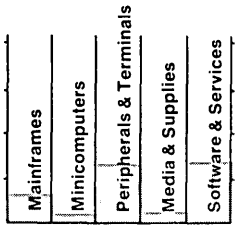
5 Control Data Corporation
P.O. Box O, Minneapolis, MN 55440 (612) 853-8100

Control Data reported "computer business" revenues (that is, exclusive of Commercial Credit Corp.) of $1,385 million, constituting an increase of 12% over the previous year's level. Of this volume, 98% is attributable to the kinds of data processing related products and services included in this survey. The largest contribution comes from services and software activities, which account for 36% of the total. This considerable share originates in its largest part with Control Data's world-wide computer service operations, considered the largest in the industry since it acquired the Service Bureau Corporation from IBM. Control Data also has unbundled its software to the greatest extent among computer manufacturers and thus derives considerable revenues from software product licenses.

"Computer systems," in which Control Data lumps mainframes, peripherals, and terminals supplied with its computers, minicomputers as used with its terminals, and small systems, account for 31%, peripherals supplied separately to Control Data customers and to the oem market account for the remainder. We have tried to reallocate these activities into the product profile categories shown. Our estimate is that all peripherals and terminals combined account for 35%, media and supplies for 5%. Computer mainframes themselves and attached memory are attributed 19%, minicomputer processors with their memory 5%.

CDC continues in its efforts to increase its international business, which in 1976 contributed 34% of its data processing related revenues. While it has shown continued interest in expanding its activities in the Eastern Bloc countries, shipments and services to them reportedly amounted only to 1% of the company's volume.

Percentage of data processing business attributable to main product and service categories.



6 NCR Corporation
1700 S. Patterson Blvd., Dayton, OH 45479
(513) 449-2000

NCR improved its position in industry-specialized data processing products and services last year, strengthening its position as a leading supplier of data processing systems to financial and retail organizations, especially in the terminal and data entry areas. And the company further increased its commitment to this field by acquiring Data Pathing, Inc.,

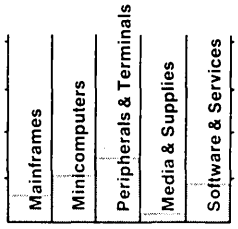
noted for its factory data collection systems.

In the mainframe area, NCR introduced a new equipment series, the Criterion computers. Featuring distributed architecture, extensive microprogramming capabilities, and a new operating system providing virtual machine multiple operating environments, this equipment holds the promise of providing its users with the flexibility and reliability required in communications-oriented data processing modes.

With the announcement of the new computer family, NCR also indicated that special software will increasingly be subject to usage license fees; this policy is in accordance with growing industry practice and can be expected to become a growing revenue source for the company.

The effect of the transition which the firm is making from its former electromechanical accounting products to on-line data entry and inquiry environment is reflected in the growing contribution which data processing revenues have made to the corporate total. In 1976, this amounted to 48% of NCR's a total revenue, or $1,100 million, almost half of which came from international operations.

Percentage of data processing business attributable to main product and service categories.

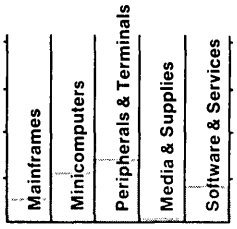


7 Digital Equipment Corporation
146 Main St., Maynard, MA 01754 (617) 897-5111

During fiscal 1976, Digital Equipment Corporation was able to increase its revenues by 38% over 1975. This achievement is attributed to a fast recovery from the preceding recession, and to DECs' ability to exploit the opportunities which this situation presented. Attempting to further improve its product position vis-a-vis the user demand, DEC introduced a number of new products and services, ranging from the medium-sized DECSystem-20 to the small-end DEC Data System 310; it introduced new peripherals and terminals; and expanded its software to support data base and communications applications.

As might be expected, two-thirds of DEC's volume originates from minicomputers, peripherals, and terminals. About 20% is attributed to service and software, 12% to the larger mainframe processors. International activities accounted for 38% of the overall revenues.

Percentage of data processing business attributable to main product and service categories.



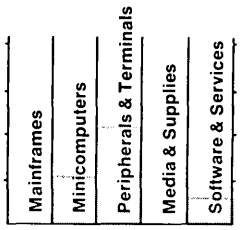
8 Hewlett-Packard Company
1501 Page Mill Road, Palo Alto, CA 94304
(415) 493-1501

Revenues from the activities of Hewlett-Packard's Electronic Data Products group continued to grow strongly during 1976. This development is mainly attributable to substantial gains reported in computer systems. Gains made here are in large part the result of the introduction of the Hewlett-Packard minicomputer system HP 3000 Series II, which is oriented to distributed computing. The introduction led to a strengthening of H-P's position in the minicomputer marketplace, where it holds the number two place in value of installed systems.

Data processing related revenues are estimated to contribute about 30% of the total corporate revenue. Minicomputers themselves provide about 30% of the dp volume, related peripherals and terminals slightly over half, with the remainder attributed to software and service.

With Hewlett-Packard's international activities in this field growing consistently and substantially in 1976, revenues from Hewlett-Packard's foreign activities now contribute close to half of the total dp revenue.

Percentage of data processing business attributable to main product and service categories.

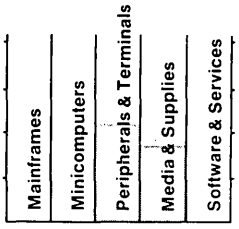


9 Memorex Corporation
San Tomas at Central Expressway, Santa Clara, CA 95052
(408) 987-1000

Memorex revenues in 1976 from semiconductor memory systems, discs, terminals, and magnetic disc and tape media grew considerably over the previous year. The growth was caused by the growing need for greater memory and storage capacity, and Memorex' capability to respond to this demand cost-effectively.

Peripheral products and terminals accounted for about 60% of the volume, media and supplies for 40%. Domestic revenues, which account for 58% of Memorex' total dp revenues, advanced strongly, while foreign revenues increased at a slower pace.

Percentage of data processing business attributable to main product and service categories.

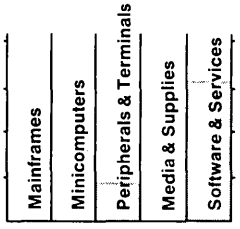


10 TRW Incorporated
23555 Euclid Avenue, Cleveland, OH 44117
(216) 383-2332

TRW expanded its activities in data processing related products and services. Building on its extensive experience in computerized consumer credit reporting, it developed and launched at mid-year a business credit reporting service for the 40,000 member National Association of Credit Management. In the equipment service area, based on an agreement with the Singer Corporation, it took over the maintenance and service operations of the previous Singer Business Machines Division. In the data processing product area, it extended its offerings with the introduction of a microprocessor-based, point-of-sale terminal.

Revenues from these activities have grown to $295 million, with 80% originating from services and 20% from terminal products.

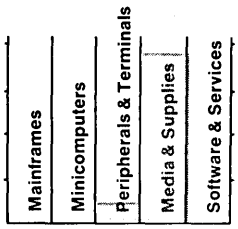
Percentage of data processing business attributable to main product and service categories.



11 3M Company
3M Center, St. Paul, MN 55101 (612) 733-1110

3M continued its activities as a major supplier of magnetic recording media to the data processing industry, mainly by providing disc packs, tapes, cartridges, and cassettes. Other related activities are in computer output microfilm, word processing, and data entry equipment. The revenue contributed by these activities is estimated to be only 6% of 3M's corporate total. Of this 90% is seen as originating from recording media sales, 10% from peripheral and terminal equipment.

Percentage of data processing business attributable to main product and service categories.

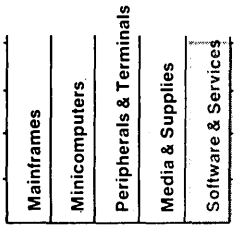


12 Itel Corporation
One Embarcadero Center, San Francisco, CA 94111 (415) 983-0000

Itel's data processing related revenues grew 29% in 1976 as it increased the activities of its Data Products and Data Services groups. Last October it announced the Advanced System, a family of six computers which are fully compatible with IBM's mid-size to large System/370 models. The AS machines, manufactured for them by National Semiconductor, enjoy a price/performance advantage over comparable IBM products, but were not delivered in 1976 and therefore have not affected the firm's 1976 revenues.

Itel's Data Services group also expanded its activities by offering specialized remote data processing services such as on-line banking functions. Combined, the revenue which Itel derived from data processing related activities accounted for 73% of the corporate total, or $189 million.

Percentage of data processing business attributable to main product and service categories.

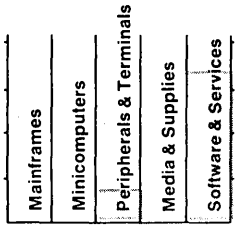


13 General Electric Company
3135 Easton Turnpike, Fairfield, CT 06431 (203) 373-2211

General Electric's major data processing related activity, providing time-shared computer services, continued to grow through 1976. External sales of these services are estimated to amount to $160 million. For the improved support of the increasing volume of its international computer services, a large computer center was added in Amsterdam.

In its other area of data processing related activities, terminal products, General Electric improved the attractiveness of its Terminet printer by the announcement of a 132 column print width. Revenues from terminals are estimated to be in the $25 million range. The combined revenues from both activities are estimated to have contributed $185 million to GE's total corporate revenues.

Percentage of data processing business attributable to main product and service categories.

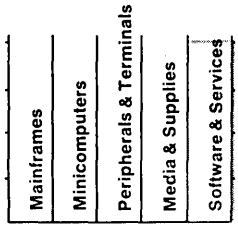


14 Automatic Data Processing, Incorporated
405 Route 3, Clifton, NJ 07015 (201) 472-1000

ADP continued to expand its business volume, from growth in packaged conventional data processing services as well as by increasing involvement in specialized, reactive on-line services. In the latter, ADP gained competence not only from internal development, but even more so from a series of successful acquisitions of organizations which had established themselves in specialized fields.

While the company's main source of revenue continues to be its domestic activities, it is expanding its international operations, most pronouncedly in Western Europe, but also in other promising areas, like Brazil.

Percentage of data processing business attributable to main product and service categories.



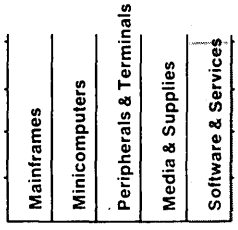
15 Computer Sciences Corporation
650 N. Sepulveda Blvd., El Segundo, CA 90245 (213) 678-0311

During fiscal 1976, Computer Sciences' revenues in total grew 24%. These were obtained from a variety of contract services and from the operation of its Infonet data communication and processing services. Under contract, CSC provides a variety of services, ranging from systems development to facilities management to users who are predominantly in federal, state, and local government organizations.

Its Infonet division, providing remote data processing through its extensive communications network, experienced a revenue growth of 28% over the previous year.

Computer Sciences data processing revenues from the general public, after exclusion of special defense-related contracts, is given at 75% of the corporate total or $165 million; 19% of this came from foreign operations.

Percentage of data processing business attributable to main product and service categories.



16 Mohawk Data Sciences Corporation
1599 Littleton Road, Parsippany, NJ 07054 (201) 540-9080

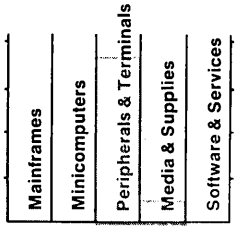
Mohawk continued to place increasing emphasis on its primary customer, the end user. It directed its new product offerings and enhancements to existing products to the

operator-oriented data entry field and withdrew some of its oem products.

While this led to a reduced revenue level of $162 million, it also resulted in a turnaround from the loss situation of previous years; together with an extraordinary income of $9.4 million from a successful debenture exchange, it resulted in a net income of $14 million, making its fiscal 1976 the first profitable year since 1970.

Mohawk's recent product action indicates its intent to strengthen its position in the expanding field of distributed processing. About 90% of its revenues is derived from peripherals and terminals, 10% from media and supplies. And 57% of the 1976 revenues were from international operations.

Percentage of data processing business attributable to main product and service categories.

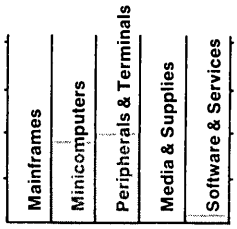


17 Data General Corporation
Route 9, Southboro, MA 01722 (617) 485-9100

Data General's growth accelerated further in 1976. Its revenue increased by 49% over the previous year, reaching $161 million. Demand from a growing group of mature and sophisticated end users has been met by Data General with increasing capability of its hardware, and was paralleled by the appropriate enhancement of supporting software. Resurgence of demand from oem customers further benefitted DG's performance.

It is estimated that about 45% of Data General's volume is derived from minicomputers, half from peripherals and terminals, and the remaining 5% from the sale of services and software. Foreign operations expanded to a level of 41% of total revenue.

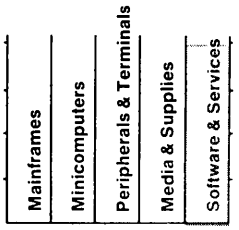
Percentage of data processing business attributable to main product and service categories.



18 Electronic Data Systems Corporation
7171 Forest Lane, Dallas, TX 75230 (214) 661-6000

During fiscal 1976, Electronic Data Systems' revenues advanced to $133 million. Its growth of computer facilities management services to large organizations, especially in the health care field, has slowed as some of its previous customers have elected to turn to in-house computer services. In its efforts to compensate for this loss of business EDS has entered into an insurance-type contract with the state of North Carolina through its subsidiary, EDS Federal Corporation, from which it expects substantial new revenues.

Percentage of data processing business attributable to main product and service categories.

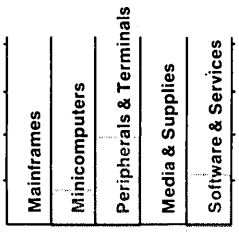


19 Management Assistance Incorporated
3000 East 44th Street, New York, NY 10017
(212) 557-8310

In fiscal 1976, MAI further continued in its penetration of the small business system market, with its revenues advancing by 30% to $123 million.

Peripherals and terminals are estimated to contribute half of these revenues, minicomputer processors 20%, service and maintenance activities 30%. MAI's commitment to increasing involvement in the small business system market is indicated by its decision to take up the manufacturing of the central processing unit of its Basic/Four computer.

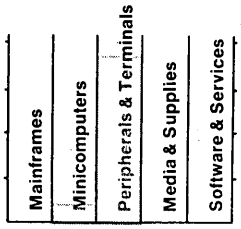
Percentage of data processing business attributable to main product and service categories.



20 Storage Technology Corporation
2270 South 88th Street, Louisville, CO 80027
(303) 666-6581

Storage Technology Corporation continued its revenue growth during 1976. Its product line of magnetic storage devices proved competitive in meeting increasing user demand cost-effectively. As a result, STC's revenues increased by 23% over the previous year to $122 million.

Percentage of data processing business attributable to main product and service categories.

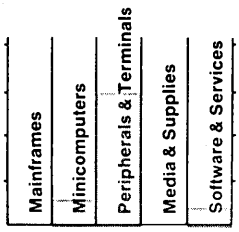


21 Data 100 Corporation
6110 Blue Circle Drive, Minneapolis, MN 55435
(612) 941-6500

Data 100 expanded its data processing volume by 25% to $120 million. While the majority of its activities is directed to the end user of its peripheral and terminal products, Data 100 was also able to expand its oem position in line printers with a multi-year agreement with Sperry Univac.

About three-quarters of Data 100's revenues is derived from peripherals and terminals, 15% from minicomputers (usually imbedded in other products) and 10% from service. Foreign operations account for approximately one-third of the total revenue.

Percentage of data processing business attributable to main product and service categories.



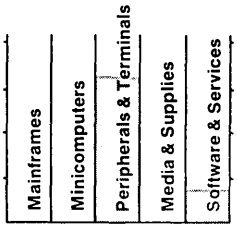
22 Xerox Corporation
Stamford, CT 06904 (203) 329-8711

Xerox's activities related to the data processing field are mainly in the manufacture and marketing of peripheral equipment. Products include electrostatic high speed printers for computer hardcopy output and electrostatic plotting devices. Xerox also provides computer services, primarily in the format of decentralized accounting for small businesses.

The company maintains a strong dedication to the improvement of office automation through computerized support. Its Daconics subsidiary produces word processing systems which perform computerized document storage, retrieval, and exchange among offices.

Revenues from these activities are estimated to constitute 3% of the corporate total, or about $120 million. Of this, 80% is attributed to peripherals and terminals, 20% to services. And all of this revenue results from domestic activities.

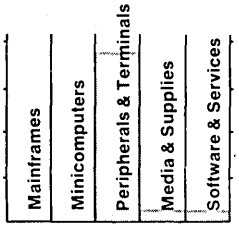
Percentage of data processing business attributable to main product and service categories.



23 California Computer Products, Incorporated
2411 West La Palma Avenue, Anaheim, CA 92801
(714) 821-2011

In fiscal 1976, CalComp's revenues continued to decline slightly. While revenues derived from plotting systems advanced again, disc, and specifically tape systems revenue, continued to decline due in part to the drop-off in deliveries to Univac, lower order levels from oem customers, and delays in achieving volume production of new products. Of CalComp's $116 million revenues, 90% is attributed to peripherals, with the reminder coming from media, supplies, and services.

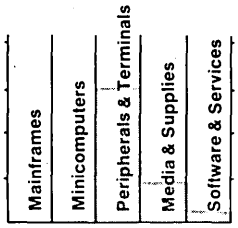
Percentage of data processing business attributable to main product and service categories.



24 Ampex Corporation
401 Broadway, Redwood City, CA 94063
(415) 367-4456

During its fiscal 1976, Ampex revenues grew slightly over the past year as the company benefitted from increasing user demand for additional storage and memory capacity for computer systems. This demand was especially strong among the users of minicomputer systems, for which Ampex offers attractively priced core memory. As a result, Ampex derived an estimated $115 million in revenues from data processing related activities. Three-quarters of this volume is attributed to memory and storage peripherals, 20% to media sales, the remainder to services. Almost half of these revenues, 47%, are attributed to international sales.

Percentage of data processing business attributable to main product and service categories.



25 Bunker Ramo Corporation
9000 Commerce Drive, Oak Brook, IL 60521
(312) 986-2700

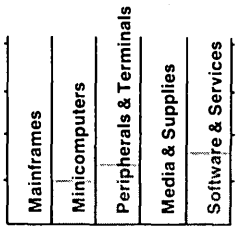
The Information Systems Division of Bunker Ramo offers a variety of data processing services and terminal products.

From its computer center in Trumbull, Connecticut, Bunker Ramo reports market information on every major stock, commodity, and options exchange in North America. It also provides statistical information and interfaces with the news gathering services of Dow Jones. This information, provided through the communications network maintained by BR, gives subscribers instant access to a wide array of business and financial information.

Terminal products manufactured by Bunker Ramo are directed to serve the remote information handling requirements of users in the banking, brokerage, insurance, and other business environments.

The revenues which the company derived from these activities were about $107 million, slightly more than one-third of the corporate total; 25% of them are attributed to minicomputers, 35% to terminals and peripherals, and 40% to computer services.

Percentage of data processing business attributable to main product and service categories.



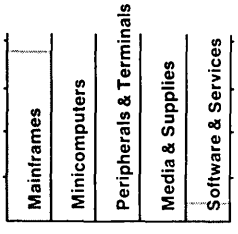
26 Amdahl Corporation
1250 East Arques Avenue, Sunnyvale, CA 94086
(408) 735-4011

1976 was the year in which Amdahl Corporation gained the position of a noted competitor, mainly to IBM, in the field of large scale general-purpose computer systems. Amdahl's product, called the 470 V/6, is a powerful computer which uses advanced circuit technology and is able to operate under the same systems software and applications programs as its IBM competitor, the System/370 Model 168. Amdahl's 470 offers about one-and-a-half times the processing power of the 168 at approximately the same cost, permits effortless conversion through its plug-to-plug compatibility, making it attractive to a number of large system users.

Customer demand for the system resulted in about 30 installations by the end of 1976, and revenues for the year of $93 million. Approximately 25% of these revenues were derived from international operations.

Since IBM's announcement of the 3033 processor in March 1977, Amdahl has expanded its product line with the V5 and V7 computers, and has reduced its prices.

Percentage of data processing business attributable to main product and service categories.

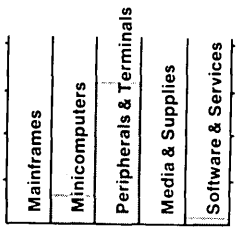


27 Harris Corporation
55 Public Square, Cleveland, OH 44113 (216) 861-7900

Harris Corporation continued to expand its activities in the data processing oriented field throughout its fiscal year 1976. The revenues which it derived from computer supported text editing, composition and typesetting systems, terminals, minicomputer (or midicomputer) systems, and supporting software are estimated to amount to $92 million, about 18% of total corporate revenue. Of this, 80% is attributed to terminals and peripherals, 15% to minicomputers, the remainder to services and software.

Harris' determination to further strengthen its position in the data processing field is evidenced by its active acquisition program aimed at further complementing its capabilities and product offerings in communications-oriented data processing.

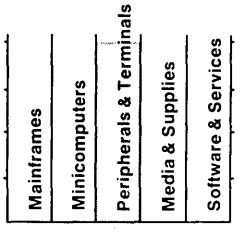
Percentage of data processing business attributable to main product and service categories.



28 Teletype Corporation
5555 Touhy Avenue, Skokie, IL 60076 (312) 982-2000

Teletype Corporation, a wholly owned subsidiary of Western Electric Company, continued in the active marketing of its teletypewriter and data terminal products. Its revenues are estimated to have grown about 15% to a total of $180 million, of which half are attributed to products which found usage in the data processing environment.

Percentage of data processing business attributable to main product and service categories.

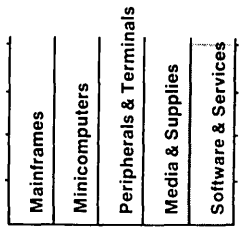


29 System Development Corporation
2500 Colorado Ave., Santa Monica, CA 90406
(213) 829-7511

During its fiscal 1976, System Development Corporation provided a variety of generalized data processing services which contributed about 77% of its total corporate revenues. Among these were vertical industry related services like TEXT II (a turnkey system for automating editing, production, and accounting operations for newspapers) and Search Service (which offers on-line access to a comprehensive data bank in science, technology, patents, engineering, and commerce). SDC also focuses efforts on the development of custom systems such as for hospitals and for electronic funds transfer. Total revenues from all these activities amounted to $85 million.

Other activities of the company, which are of special, mostly defense-related nature and not counted in the category of data processing activities for the general public, include such projects as the development of the Parallel Element Processing Ensemble (PEPE), a supercomputer rated by SDC as capable of hundreds of millions of operations per second, built to SDC specifications by the Burroughs Corporation for use by the U.S. Army's Ballistic Missile Defense Advanced Technology Center.

Percentage of data processing business attributable to main product and service categories.

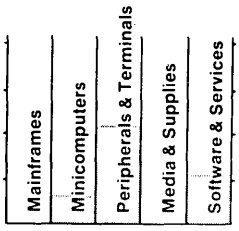


30 General Instrument Corporation
1775 Broadway, New York, NY 10019 (212) 541-8200

During General Instrument's fiscal year 1976, its data product related activities expanded, and contributed about 22% of the total corporate revenues, which themselves declined from the previous year level.

Major activities contributing to data processing revenues were in the Unitote/Regitel point-of-sale business, the Documate payment processing system for utilities, insurance companies and banks, and in a number of on-track and off-track wagering and automated lottery systems supplied to the legalized gambling industry in several states. Data processing related revenues received by General Instrument from these sources in its fiscal year 1976 totaled $84 million.

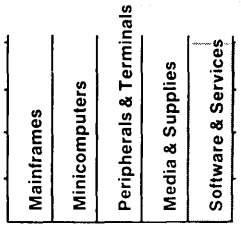
Percentage of data processing business attributable to main product and service categories.



31 Tymshare, Incorporated
20705 Valley Green Drive, Cupertino, CA 05014
(408) 446-6000

Tymshare expanded its activities with new services to an increasing number of commercial users of its remote services in the U.S. and abroad. Its specialized services in areas like data base management, media research, census research, etc., coupled with its TYMNET international data communications network, met increasing acceptance from a wide array of user organizations. As a result of this, combined with the effect of acquisitions which took place in 1975, Tymshare revenues in 1976 grew by 46% to $82 million.

Percentage of data processing business attributable to main product and service categories.



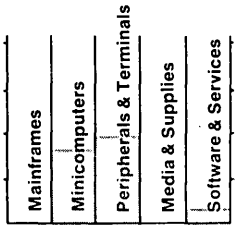
32 Wang Laboratories Incorporated
One Industrial Ave., Lowell, MA 01851 (617) 851-4111

During fiscal 1976, Wang Laboratories successfully extended the marketing of its small interactive computing systems. With a number of program packages tailored for special applications in the automobile dealer, public accounting, banking, civil engineering, and similar environments, it was able to provide turnkey small system service to a large number of organizations in these industries. Of Wang's revenues, 85% were derived from data processing products and

services. Of these, 40% are attributed to minicomputers, and 50% to terminals and peripherals, while the remaining 10% are derived from computer services and software.

About 45% of these revenues were obtained from international marketing activities.

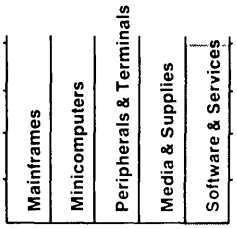
Percentage of data processing business attributable to main product and service categories.



33 McDonnell Douglas Corporation
P.O. Box 516, St. Louis, MO 61366 (314) 232-0232

McDonnell Douglas Automation Company (MCAUTO) continued in its growth in 1976. Active marketing of remote computing services to commercial customers in the hospital, insurance, manufacturing, and distribution industries resulted in a revenue gain of 38% over the previous year's volume, bringing it to $77 million.

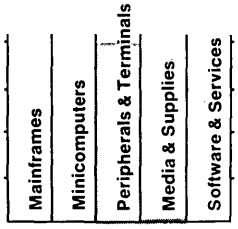
Percentage of data processing business attributable to main product and service categories.



34 Dataproducts Corporation
6219 Desoto Avenue, Woodland Hills, CA 91364
(213) 887-8000

The main source of Data Products data processing related revenues is line printers, which account for most of its volume. Core memories accounted for approximately 15% of revenues. The increasingly competitive situation in the oem market to which Dataproducts addresses itself with its printers, and the receding demand for large scale core memory, have affected the total corporate revenue volume, which at $85 million for its fiscal 1976 is slightly below the previous year level.

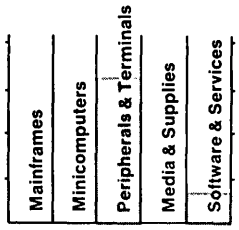
Percentage of data processing business attributable to main product and service categories.



35 Telex Corporation
P.O. Box 1526, Tulsa, OK 74101 (918) 627-2333

Telex reported revenues for its fiscal year 1976 on the same level as for the previous year. Reduced demand for magnetic tape drive and the very competitive situation in the disc drives market have not allowed its revenues from computer products to grow. But by increasing emphasis on selling its products to third party leasing companies rather than attempting to finance leasing of its equipment itself, Telex was able to improve its net income considerably. Its improved financial condition permitted the acquisition of Terminal Communications Inc. from United Technology toward the end of 1976, a move interpreted as being intended to strengthen Telex' position in communications.

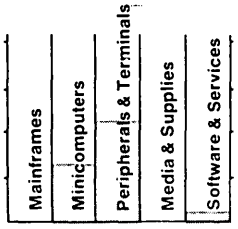
Percentage of data processing business attributable to main product and service categories.



36 Raytheon Company
141 Spring Street, Lexington, MA 02173
(617) 862-6600

Raytheon's end user related general purpose data processing activities are estimated to have contributed 3% of the total corporate revenue. This amounts to $74 million, of which 60% is attributed to terminals and peripherals, 35% to minicomputers, and the remaining 5% to service and software activities.

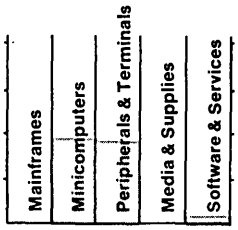
Percentage of data processing business attributable to main product and service categories.



37 Perkin-Elmer Corporation
Main Avenue, Norwalk, CT 06856 (203) 762-1000

Perkin-Elmer Data Systems activities increased considerably in 1976. Besides the growing volume of minicomputer (or midicomputer) marketing by its Interdata, Inc., subsidiary, this increase resulted partly from its acquisition of Wangco Data Systems. Dp revenues grew to 21% of Perkin-Elmer total revenues and amounted to $73 million. Foreign marketing, specifically in Europe, contributed about 25% of this amount.

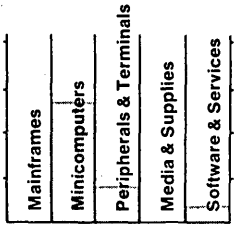
Percentage of data processing business attributable to main product and service categories.



38 General Automation, Incorporated
1055 South East Street, Anaheim, CA 92805
(714) 778-4800

General Automation's revenues in fiscal 1976 grew markedly over the previous year. Activities were strongest in the oem minicomputer category which account for an estimated 70% of the total volume. Terminals are estimated to account for 20%, services for 10% of the total revenue volume. International activities continued to grow and now provide about 30% of General Automation's total revenues.

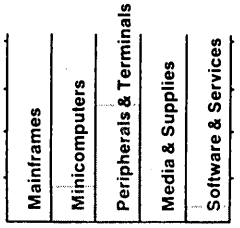
Percentage of data processing business attributable to main product and service categories.



39 Datapoint Corporation
8400 Datapoint Drive, San Antonio, TX 78284
(512) 690-7000

The increasing demand by users for distributed intelligence in data entry and inquiry applications allowed Datapoint to expand its activities considerably. Its revenues reported for fiscal 1976 grew more than 50%! The advance was strongest in its domestic marketing. Foreign activities contributed about 46% to the corporate total.

Percentage of data processing business attributable to main product and service categories.



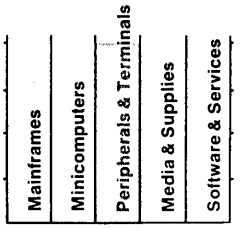
40 Sycor Incorporated
100 Phoenix Drive, Ann Arbor, MI 48104
(313) 971-0900

Sycor continued in its successful marketing of its intelligent terminal products and terminal equipment. Domestically, revenues increased 35% over the previous year.

Foreign marketing of Sycor products, handled in 38 countries by Olivetti of Italy, was also at record levels in 1976. To continue its long term growth in international markets, Sycor also established a distributor arrangement in the European Computer Machinery Company group, which is a major factor in the European key-to-disc market. A downturn in Olivetti's sales and orders late in 1976 is expected to be counteracted by the offering of a new line of terminal systems.

Sycor's Total revenues grew to $67 million.

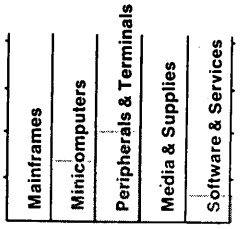
Percentage of data processing business attributable to main product and service categories.



41 Texas Instruments, Incorporated
13500 North Central Expressway, Dallas, TX 75222
(214) 238-2011

Texas Instruments actively continued marketing its terminal and minicomputer systems, producing dp derived revenues estimated at $65 million. Of that total, minicomputers contributed approximately 35%, terminals and peripherals 50% and software and other services 20%. About 10% of this volume is attributed to international sales.

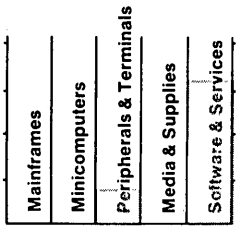
Percentage of data processing business attributable to main product and service categories.



42 General Telephone & Electronics Corporation
One Stamford Forum, Stamford, CT 06904
(203) 357-2000

GTE Information Systems expanded the scope of its computerized information services which it offers to the securities trading industry. New features provide subscribers with latest trading information on the most active listed securities from the New York, Midwest, and Pacific stock exchanges. Revenues are estimated to have grown to $65 million, of which approximately 80% originate in services, and the remainder from the marketing of terminals.

Percentage of data processing business attributable to main product and service categories.



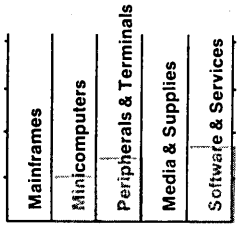
43 Four-Phase Systems, Incorporated
19333 Vallco Parkway, Cupertino, CA 95014
(408) 255-0900

Revenues derived by Four-Phase Systems from its products dedicated to remote computing applications have grown to $63 million.

Concentration on specific industries with its minicomputer systems, and combining specialized software packages with interactive capabilities, has made the firm's systems effective complements to large central host computers. An estimated 25% of Four-Phase's revenue is related to the minicomputer content of its systems, 35% to peripherals and terminals, and 40% to software and services.

About 20% of the dp total originates in foreign activities, mainly from an agreement with Philips Data Systems of the Netherlands which provides for the sale and maintenance of Four-Phase products in Western Europe.

Percentage of data processing business attributable to main product and service categories.

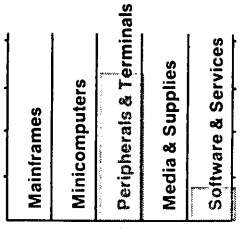


44 Inforex, Incorporated
21 North Avenue, Burlington, MA 01803
(617) 272-6470

Continuation of Inforex' strong marketing thrust for clustered key data entry systems resulted in a revenue growth for the company to $63 million. Combined with concentrated efforts toward reducing cost and improving profits, net income practically doubled over the previous year. The main volume of Inforex' business lies in terminals and peripherals, which account for nearly 80% of the total. Here the introduction of new products which provide increased capabilities for local data is indicative of Inforex' intent to expand its position in the growing field of distributed processing. Services and software account for the remaining 20% of revenues.

About 56% of the total originates in international activities.

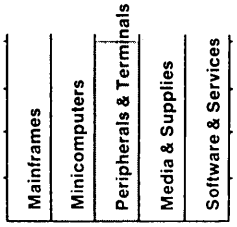
Percentage of data processing business attributable to main product and service categories.



45 Tektronix, Incorporated
P.O. Box 500, Beaverton, OR 97077 (503) 644-0161

Tektronix, generally recognized as the leading supplier of cathode ray oscilloscopes, is increasingly directing product efforts to the field of data display and related processing capabilities. With growing emphasis on its marketing of compact, desktop graphic computing systems, its revenues from information display products have grown, contributing about 17% of the total corporate revenue for an amount of $62 million.

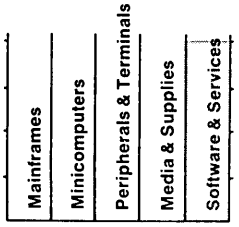
Percentage of data processing business attributable to main product and service categories.



46 Wyly Corporation
P.O. Box 6228, Dallas, TX 75222 (214) 688-7100

The performance of the Wyly Corporation was affected by the fact that its ambitious venture of providing nationwide data communications services could not meet the goals which had been set for it. In consequence, the services provided by its DATRAN subsidiary were terminated in August. The computer services provided by University Computing Company remained the main source of revenues for Wyly Corporation in 1976, which amounted to $62 million.

Percentage of data processing business attributable to main product and service categories.

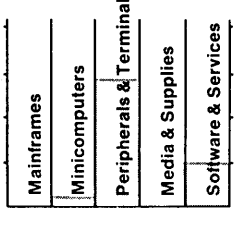


47 Recognition Equipment, Incorporated
P.O. Box 22307, Dallas, TX 75222 (214) 438-8611

In fiscal 1976, Recognition Equipment's total revenues grew to $65 million. With its product line dedicated to the automatic reading of input for large volume data processing operations, the major share of the revenues derives from its check processing equipment. A new product line, offering handheld ocr data recognition devices for point-of-sale data entry and inventory control applications, is now being delivered also.

Approximately 25% of data processing related revenues is attributable to international operations.

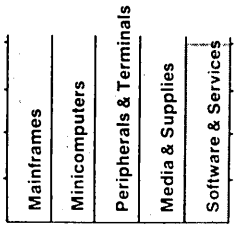
Percentage of data processing business attributable to main product and service categories.



48 Informatics Incorporated
2103 Ventura Blvd., Woodland Hills, CA 91364 (213) 887-9040

Informatics Inc., a subsidiary of Equitable Life Assurance Society, reports an increase of 50% over its previous year revenues, to an amount of $59 million! Software product sales, especially of the MARK IV Systems, advanced well both domestically and internationally, reaching a level of 1,150 installations world-wide. Information processing services and related systems development services also showed good growth.

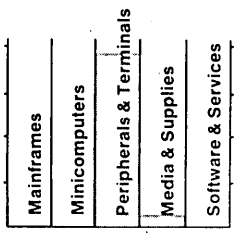
Percentage of data processing business attributable to main product and service categories.



49 Electronic Memories & Magnetics Corporation
1880 Century Park East, Los Angeles, CA 90067 (213) 556-2323

Data processing related activities of Electronic Memories & Magnetics were affected by the reduced demand for core memory products, and the marketing of its magnetic disc products was subjected to strong competitive pressures. As a result, the contribution of data processing revenues to EM&M declined to $58 million.

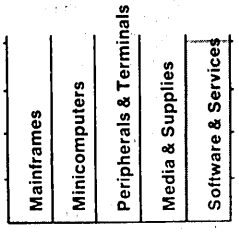
Percentage of data processing business attributable to main product and service categories.



50 Boeing Company
7755 E. Marginal Way, Seattle, WA 98124 (206) 655-2121

Boeing Computer Services, a wholly owned subisdiary of Boeing Company, provides a variety of computing services through a network of computer centers and communications lines. Revenues derived from providing these services to customers outside Boeing are reported as $55 million.

Percentage of data processing business attributable to main product and service categories.



Mr. Rothenbuecher is a senior staff member of Arthur D. Little, Inc.'s Information Systems Planning and Management Group. He has been with the dp industry for more than 20 years. Presently he is doing applications development, operations audit, product development, and marketing research for domestic and overseas clients.

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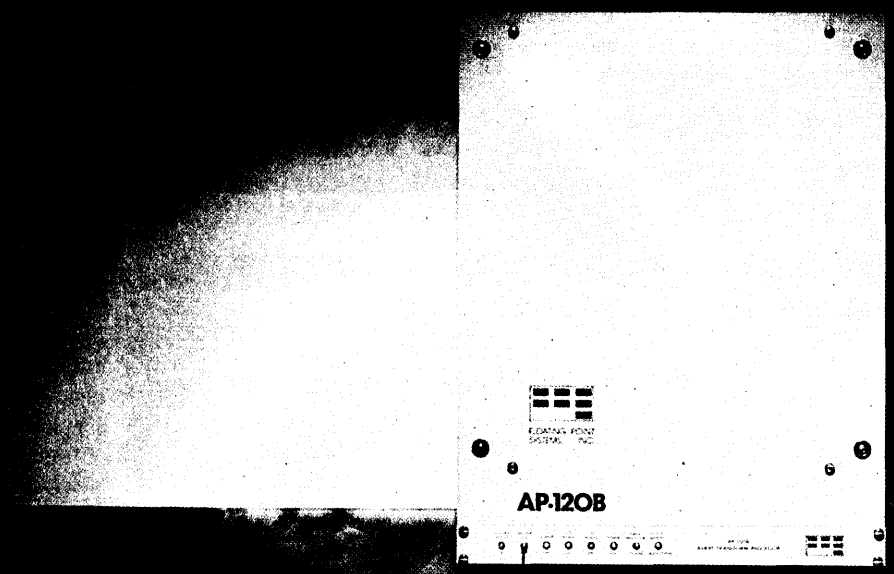

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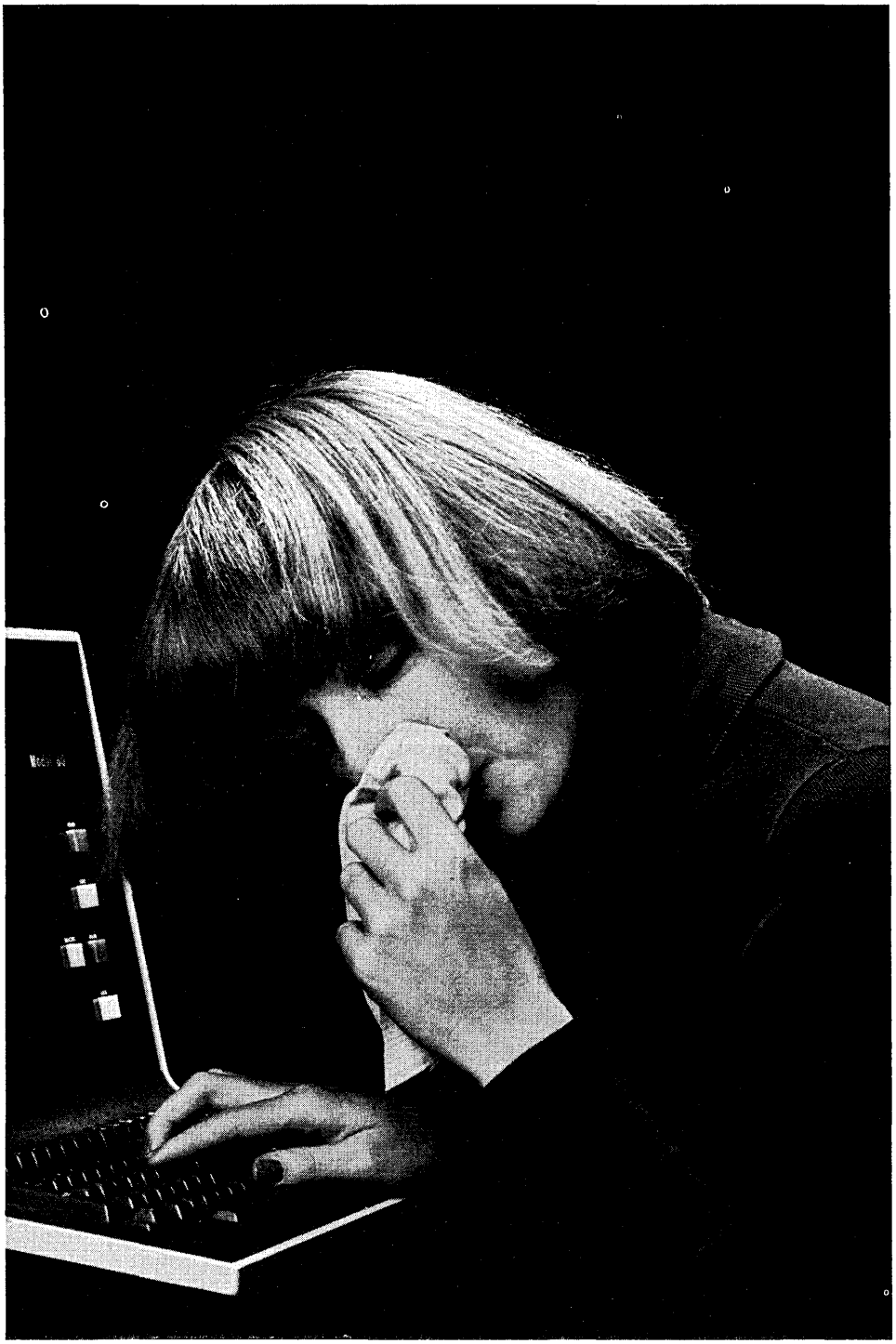

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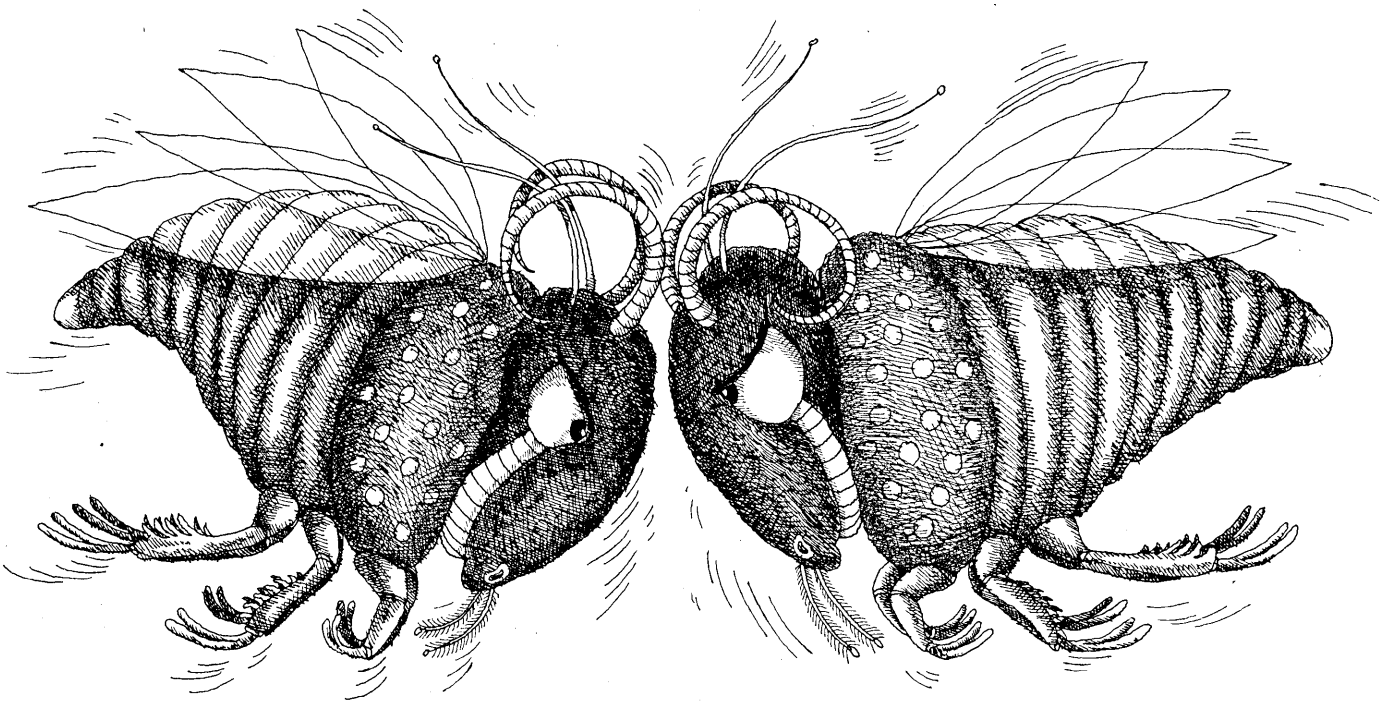

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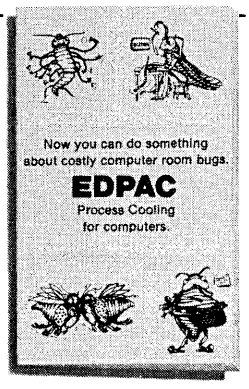

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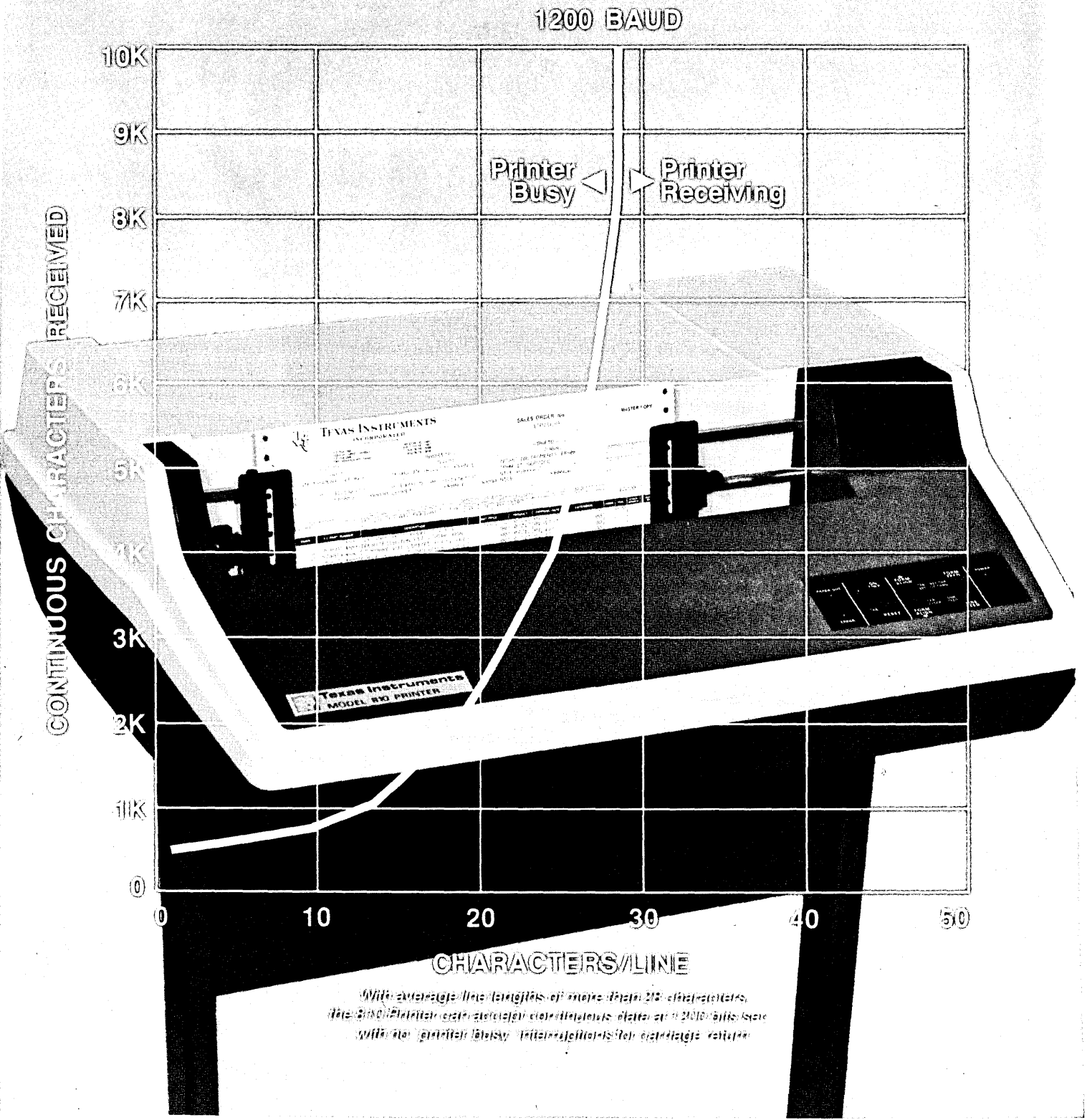

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A Close Look At Brooks' Law

by R. L. Gordon and J. C. Lamb

Adding people to late software projects sometimes helps, but only if more people are added than expected to be needed, and only if they are added sooner than they are expected to be needed.

One of the triumphs of the industrial revolution was the production line. The interchangeability of men among jobs with little or no training required was viewed as finally giving management complete control over requirements needed for meeting fluctuating output demands. The construction of complex machines was merely the result of a well-orchestrated sequence of simple tasks, done by simple men who were largely replaceable and interchangeable. No longer would management be beholden to whimsical demands from skilled artisans in order to obtain vital services.

Alas, with the advent of the information revolution, many a manager finds himself at the mercy of not one skilled artisan, but legions of them who go by occupational titles such as programmer, digital designer, or systems analyst. Many managers find they have lost control over the labor requirements needed to complete the construction of complex systems of logic by these types of workers. One of the earliest indicators of this trouble was the late delivery in the mid-1960s of operating systems for many third-generation computers, the most notable one being IBM's OS/360.

The management and technical lessons learned from the OS/360 experiences have recently been publicized in a book titled *The Mythical Man-Month: Essays on Software Engineering,* by Dr. Fred Brooks, the manager of the OS/360 effort (Addison-Wesley, Reading, MA, 1975). As the title suggests, the assumed interchangeability of men and months for large software projects is severely challenged, as summarized by Brooks' Law:

"Adding manpower to a late software project makes it later."

The lack of interchangeability between men and months was recognized by Dr. Brooks as being made up of two factors. First, some tasks are inherently sequential in nature, and are paced by the rate at which a single individual can do them (more men will not decrease the time). Second, software efforts are exercises in complex relationships, and require a great amount of communication between and training of the workers involved. How then can a manager estimate or control the cost and time to deliver a software product? On what basis should management decisions be made?

Brooks' Law, although for the most part accurate, is admittedly an oversimplification. The addition of manpower *may* help in certain cases. A desire to explore some of the factors involved in large, complex efforts and possibly to provide some guidance to software managers has led us to construct a simple model of worker productivity. The model is based largely on psychological observations of group interactions and of general learning performance. It is used to explore the effects of high personnel turnover and lost productivity due to adding manpower to existing projects.

"Adding manpower to a late software project makes it later."

The rapid explosion of the information industry during the past two decades has resulted in an increased specialization of its workers. Each new skill group will develop efficient communication among its workers, resulting in a unique jargon that is often unintelligible to outsiders. The users and management of large software-based systems are often perplexed by the jargon of system analysts, programmers, program librarians, technical writers, etc., with whom they must communicate.

On very large projects these general groups of people may even become further specialized; for example, some programmers are conversant in only certain high-level languages such as COBOL, FORTRAN, and PL/1. Even when programmers stick to a particular language, if they must interface with a complex operating system such as VM/370, further functional specialization takes place, as indicated by classified ads for System 370/360 BAL Telecommunications Specialists.

Aside from certain conceptual trends that are basic to all languages (the concept of data types, syntax, and flow of control), a large portion of a programmer's knowledge is specific to a particular environment and/or project and cannot be transferred to other languages or computer systems. For example, languages that allow automatic data conversion during elementary operations and during variable assignment will require that programmers have a knowledge of many different combinations of data types and operations in order to ensure correct programs. Such knowledge is gained only by frequent practice leading to the fluent use of a particular language.

The situation is even worse for large software and hardware systems that are in use but incompletely documented. A programmer may develop an entire body of knowledge about the system known only to him. Such highly specialized knowledge is gained either through much communication with current and former system users or by trial and error. Much productive time is lost, either because the programmer uses other people's time to learn or because he spends an inordinately long time in the trial and error process. Such an operating environment has grave consequences for a manager, and it may even contribute to allowing a person to become irreplaceable.

The total effect on the information processing industry is widespread and disastrous. Many software projects are not just a "little bit" late, and a "little bit" more costly, but are very late and a lot more costly. Evidence of one year projects taking two years, and $1 million projects actually costing $2 million can easily be found.

Ignorance of personnel learning curves and group communication requirements are two major reasons that most managers are unable to develop realistic labor estimates and thus find their projects getting into trouble. So let's look at them.

The learning curve

Learning is essential to accomplish a job but is generally considered to be nonproductive. The major motivation for management investment in learning is the belief that it will pay off in increased productivity (although some

enlightened managers also know there is a side benefit of worker happiness). Learning can be considered as either the acquisition of a basic skill (learning to program) or acquisition of knowledge for a specific task ("the coming up to speed" effect). We will generally be concerned with the latter, although our results apply to both cases.

The general shape of the learning curve (see Fig. 1) is well-known to psychologists and has the form

$$F(t) = e^{-kt}, \qquad (1)$$

where the range of F(t) is from one to zero, with zero signifying a completely learned task. A fully trained employee is supposedly a fully productive worker (omitting the effect of communication with other workers). The productive time for a single worker, P(t), is therefore 1− F(t), or simply

$$P(t) = 1-e^{-kt}. \qquad (2)$$

Fig. 1 illustrates a typical productivity curve where the shaded area is nonproductive manpower. Learning time can be given as time spent up to "T," the moment when a person is spending only 5% of his time learning. In Fig. 1 the shaded area represents 32% of the learning period "T" (6 months in this case), leaving only 68% of the learning period as productive time.

Suppose a Productive Man Year (PMY) is required to do a project. (To simplify computations, our programmers work 250 days/year or 2,000 man-hours/year.) And say the person selected has a learning curve of six months (k = 0.017 for t in days). The manager had better schedule the project for one year and two months. If the job must be done in one year, obviously more than one person is needed; and then something else must be accounted for—these people will usually find it necessary to train and communicate with each other.

Suppose after six months a major competitor lures the worker away. As Fig. 2 shows, only one-third of a PMY has been applied to the project; the rest of the one-half man-year has gone into training. If a new worker is immediately started and requires the same six months of training, then after one year the project will have received only two-thirds of a PMY. The task won't be finished until one and one-third actual years have passed.

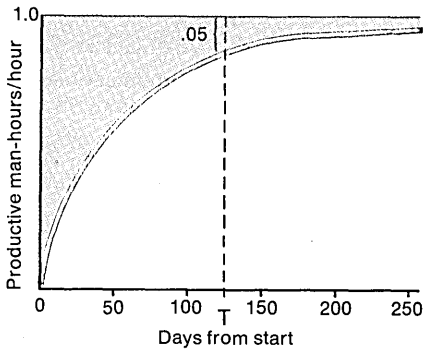

Fig. 1. This is the basic shape of the "learning" curve. The person is considered fully trained when he spends only 5% of his time learning.

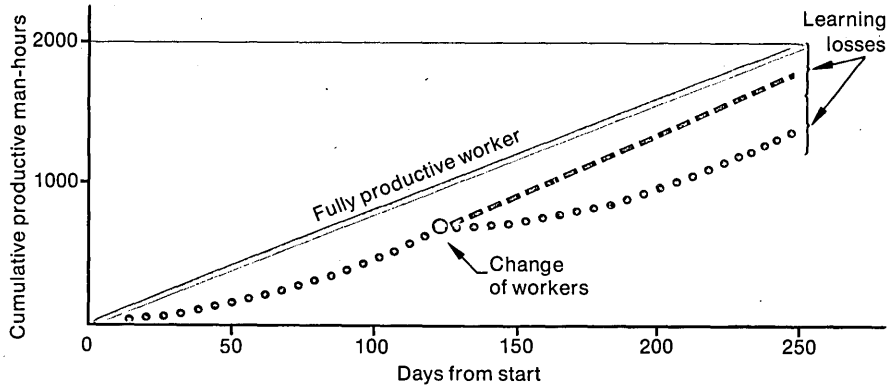

Fig. 2. On a single-worker, one-year project, substituting a new employee half way through will cause the work still to be one-third unfinished at the end of the year.

The figure also presents what happens by assigning a person simultaneously to two unrelated projects to ensure personnel interchangeability. It will result in at least a double training penalty for each project, a costly insurance.

Bringing in reinforcements

Even if the project doesn't lose the worker after six months, suppose it is realized that the project will be late, and another person is added at the six month milestone. Then 2,000 productive man-hours (PMH) are needed; 600 have already been received from the first person, who is now fully trained and should give 1,000 productive hours in the next six months. Combined with the 600 from the second person during the training period, the total is 2,200 PMH's and is safely over the total numerical requirement.

However, the original worker must spend most of his life training the new person (since he may have specific knowledge of which he is the sole custodian). Therefore, the productive hours for the next six months aren't any greater than the new person's total (see Fig. 3) and the project has received a total of only about 1,775 hours at the end of the year—less than one PMY for one and one-half MY of total time spent "on the job." And the project is still late!

We modeled the time loss due to teaching as the number of hours the original group (in our example, one person) spends teaching. The number of hours initially spent teaching (eight man-hours of teaching per day is usually assumed at the start because one person from the group can teach up to five or six newcomers) is reduced at the same rate the newcomers achieve productive man-hours. In other words, teaching is modeled as the inverse of learning.

Our harried manager now needs only about 225 PMH's to complete the project. Both people are trained and putting in 16 PMH's per day, and so the manager asks for exactly 14 days extension, cashing in the last of his own good faith chips with his own manager. Poor chap, he forgot that he doesn't have just two programmers, he has a group of two programmers. Groups need to communicate internally to get any job done, and this com-

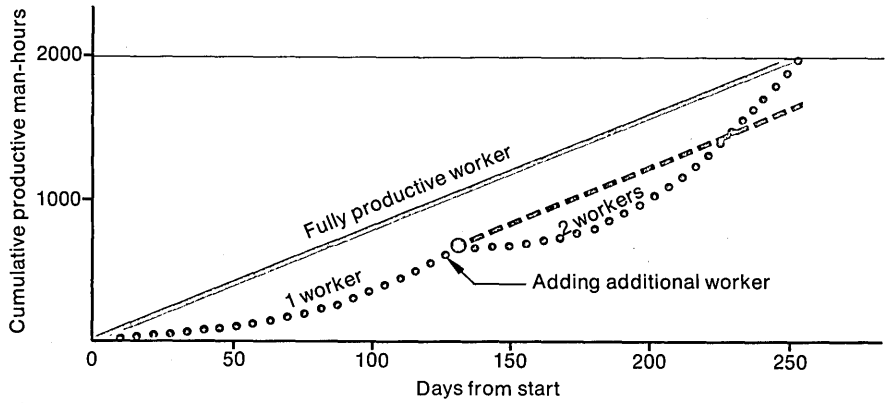

Fig. 3. Due to the cumulative learning time and teaching time loss, adding a second worker to a project which is only slightly late may not be enough.

munication amounts to nonproductive time to handle administrative details: who's going to do what, etc.

We have modeled the time lost for communication as a logarithmic function of the number (I) of possible communication links within the group. Specifically, it is the information contained in the number of links plus one:

$$\text{man-hours of communication/day} = \log_2\left[\binom{N-1}{\sum_{I=1} I} + 1\right] \cdot \quad (3)$$

Thus, as Fig. 4 shows, the rate at which time is lost due to communication is a function of group size. Large teams generally have persons whose sole function is communicative. These people are not included in the model, and this accounts for the flattening of the curve.

Using our model of group communication we find that the two programmers use about one hour per day communicating, and so to finish the project takes 15 days instead of 14. Our poor manager gets fired for failing to meet any deadline, despite what seems like more than ample resources.

This is what happens on major jobs. The effects of "coming up to speed," learning, having to teach new personnel, and the task of communicating and coordinating among group members are enormous. Our model has described these three elements. With its aid, we shall investigate some strategies for minimizing these effects.

Monday morning quarterbacking

What can we learn from the loss of our manager? Could he have called a better ball game? As promised, the application of our model to a more complicated situation yields guidelines to the selection of different strategies.

Assume that we have a four-man team of fully trained specialists. The solid line in Fig. 5 shows cumulative man-hours for a typical project, given the first string team. The team has four milestones (indicated by triangles) to be passed. Every three months, the team progress is reviewed with respect to the milestones, and any required remedial action is taken.

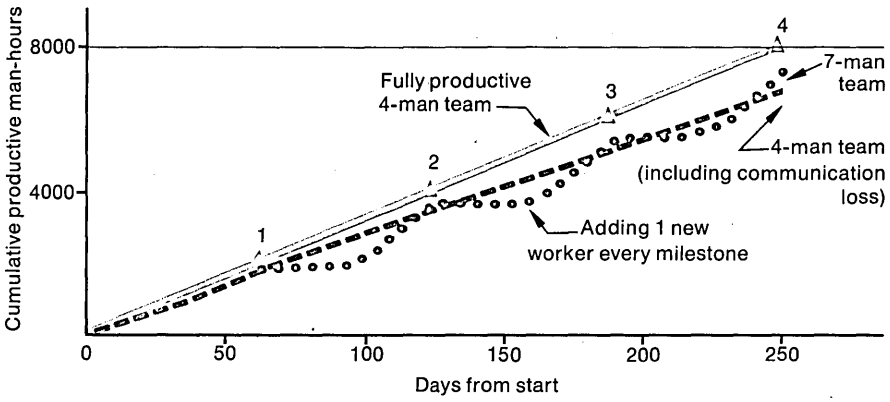

Fig. 5. Adding new persons at each milestone missed may be the worst strategy. In the case of a four-man team with milestones every three months, the strategy would result in spending 11,000 man-hours to realize 7,500 productive man-hours.

Failure to take the group communication loss into account will result in the first deadline being missed by 175 man-hours (indicated by the dashed line in Fig. 5). Extrapolation shows the last deadline will be missed by 700 man-hours. Adding an untrained person to the group will certainly make the whole project later and all subsequent deadlines will surely be missed (confirmation of Brooks' Law). In fact, adding one new untrained person at each milestone (dotted line) seems to be the worst possible strategy. It not only requires a total of peak workforce of seven people at the end of the year, but also results in accumulating only 7,500 PMH at year's end from a total expenditure of 11,000 man-hours.

An alternative strategy is to add very early more workers than might be expected to be necessary. Suppose the team size is increased by 50% (add two untrained workers) after noting that the project is in trouble at milestone 1. Fig. 6 shows that milestone 2 and milestone 3 will be missed, but the final milestone will be met. What is needed is a strong manager who knows that he has made the right decision and who has the courage of his convictions to keep his hands off the project.

Note that the cumulative productive man-hours (CPMH) at the end of the year have increased to about 9,200 of 11,000 total, well over the first approach using a peak work force of only six. Clearly, the second strategy is better since it minimizes training and total personnel requirements.

In fact, adding one member at the very beginning is the best strategy of all, since it only requires a work force of five and produces enough PMY's to get the job done. Since it is too much to expect a manager to sense trouble before the project starts, it seems that the most practical rule is to add more manpower than you think is necessary as soon as you sense trouble, and then don't change anybody's job until the project is finished.

Of course there is the solution of increasing the basic 2,000 man-hour year to 3,000 man-hours by asking the original team members to work seven

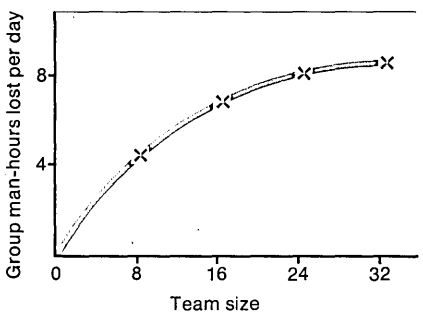

Fig. 4. On a two-man project, the workers may use up an hour per day in communicating (half an hour per day each). On larger projects, the number of communications links increases, but the utilization of each goes down.

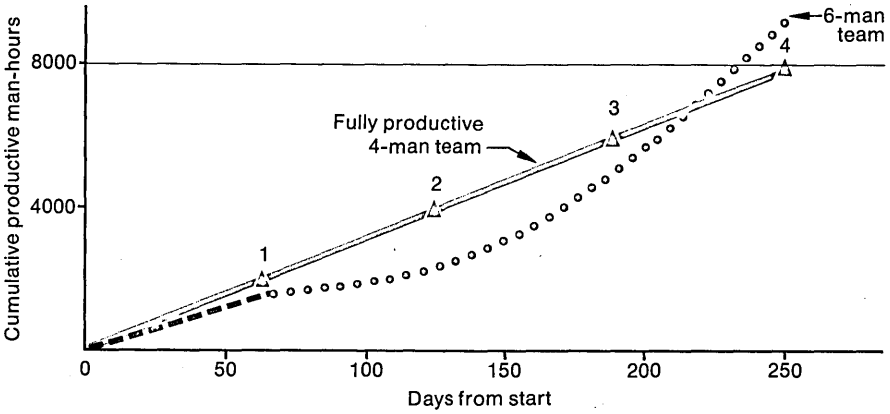

Fig. 6. The best way to recover from a slipping schedule is to add more people than might be expected to be necessary, and to add them early. It takes a little confidence to pull off.

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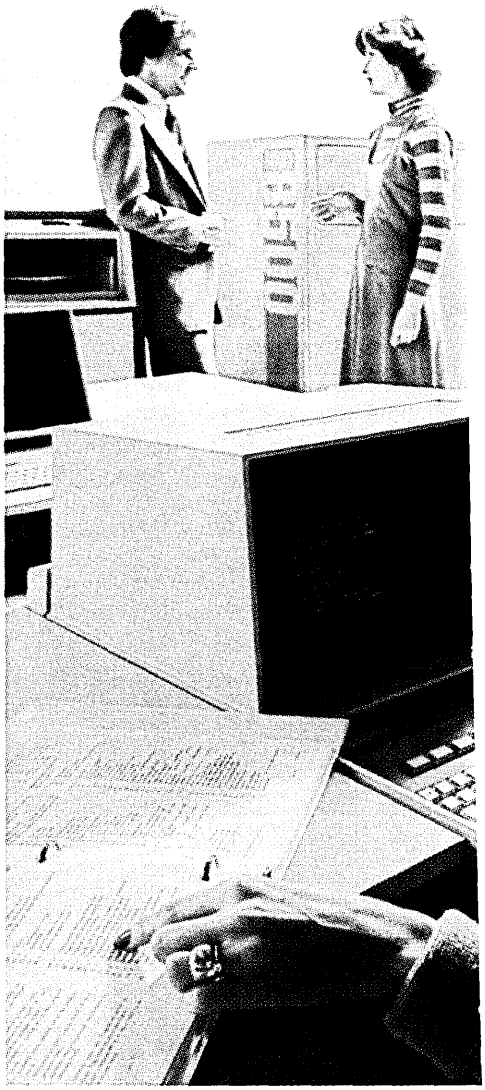
The NCR 8450

The NCR Criterion 8560



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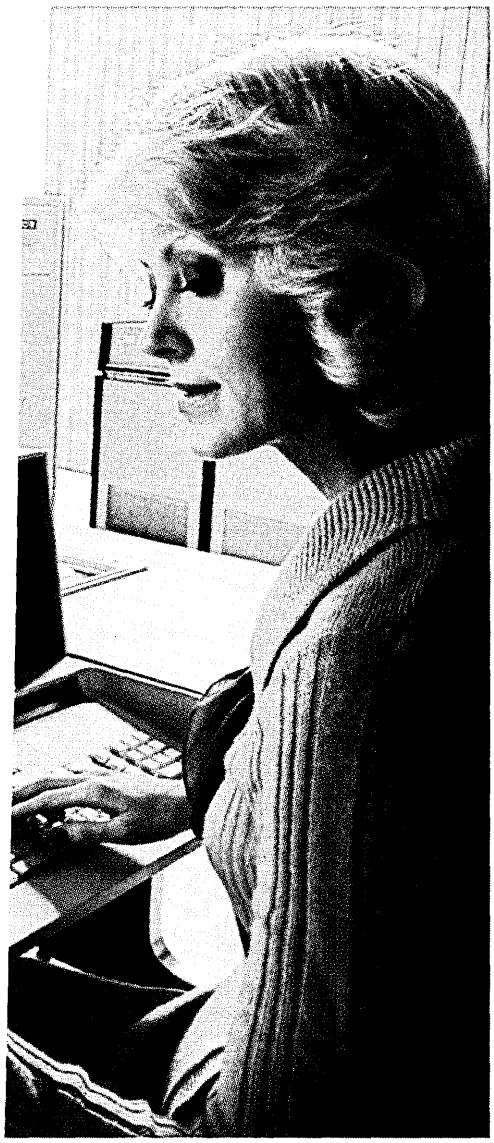
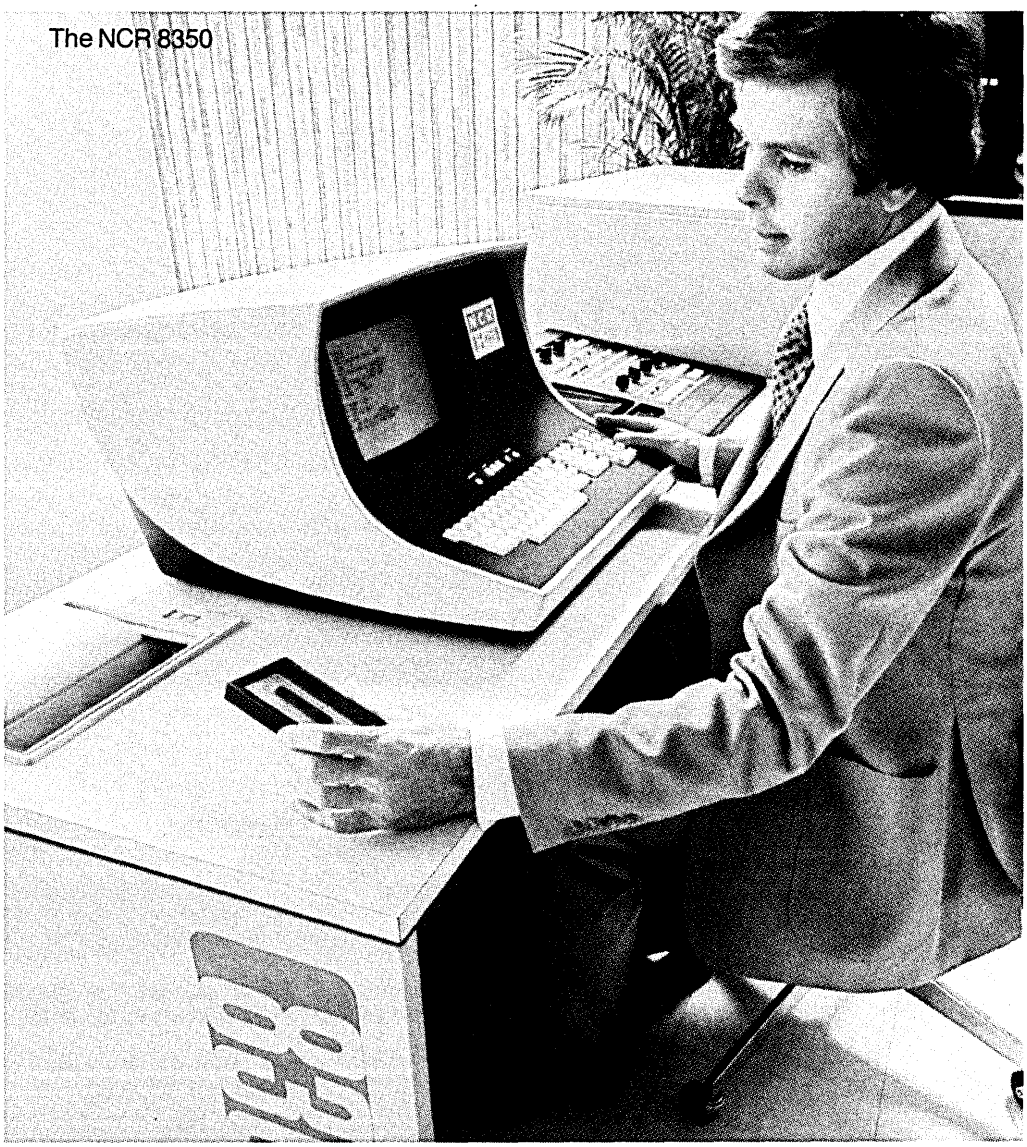


The NCR 8350



And still more computer systems to come.

days a week, 365 days of the year. This solution usually falls apart after only a short while.

It is always easier on Monday morning to decide which play should have been called than during the heat of the game on Sunday. The reflections of many a sadder but wiser manager who has just missed a project schedule can be summarized by the phrase:

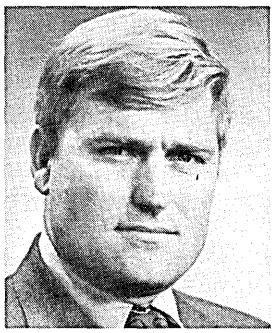
"I thought we knew more about (substitute your favorite computer phrase)! I didn't know we would take so long to come up to speed."

Such expressions indicate the length of the training period was probably incorrectly estimated, a not uncommon happening. The key to successfully estimating training requirements is to establish what is known. For most cases, this requires chasing down a myriad of details concerning the status of system documentation, the completeness of specifications, the knowledge of a particular worker, etc. Thus, the initial planning and estimating activity is a task that requires resources and must be scheduled.

Only at the end of the planning can one gain a more precise estimate of the total manpower resources required to accomplish the project. However, for projects that are founded on new ideas, the job of finding out what is known turns out to be the project! As Brooks points out, "For the human makers of things, the incompleteness and inconsistencies of our ideas become clearer only during implementation."

Just as ball games are played out in stages with built-in time for regrouping and replanning (such as halftime), perhaps it is wise to schedule large projects only from one stage to another. Checkpoints for reestimating resources must be built in and strategies of personnel resource management must be employed that minimize the duplication of communication and training efforts. ❋

Dr. Gordon has been with the Naval Underwater Systems Center in New London, Conn., since 1966 and is presently head of the Computer Technology Branch. In this position he consults on Navy-wide projects involving $millions in software. He has been an adjunct associate professor at Brown Univ. in Providence and at the Hartford Graduate Center in Hartford, teaching graduate courses in software engineering and computer performance.



Currently on leave as a research fellow at MIT's Sloan School of Management, where he is doing work on the development of management information systems, Dr. Lamb has been at NUSC since 1970. His work with the Navy has recently been in specifying hardware and software for training systems. Prior to joining NUSC, he held management positions with GE's Information Systems Div. and with General Dynamics.

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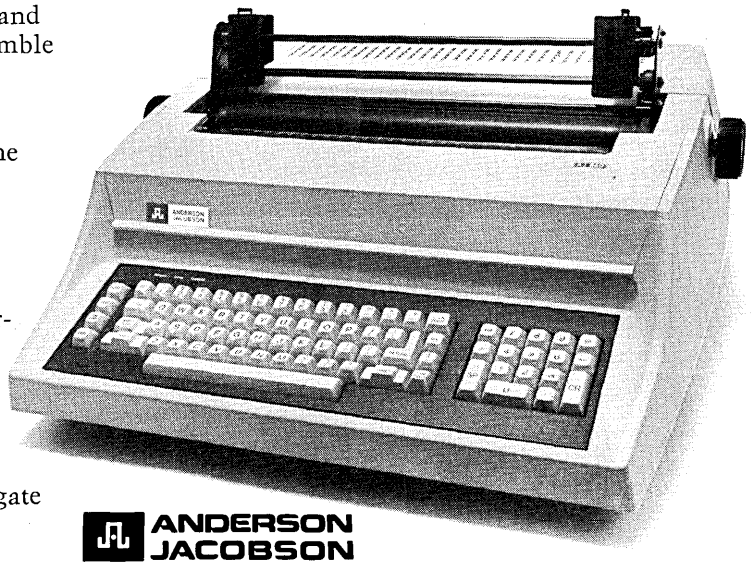

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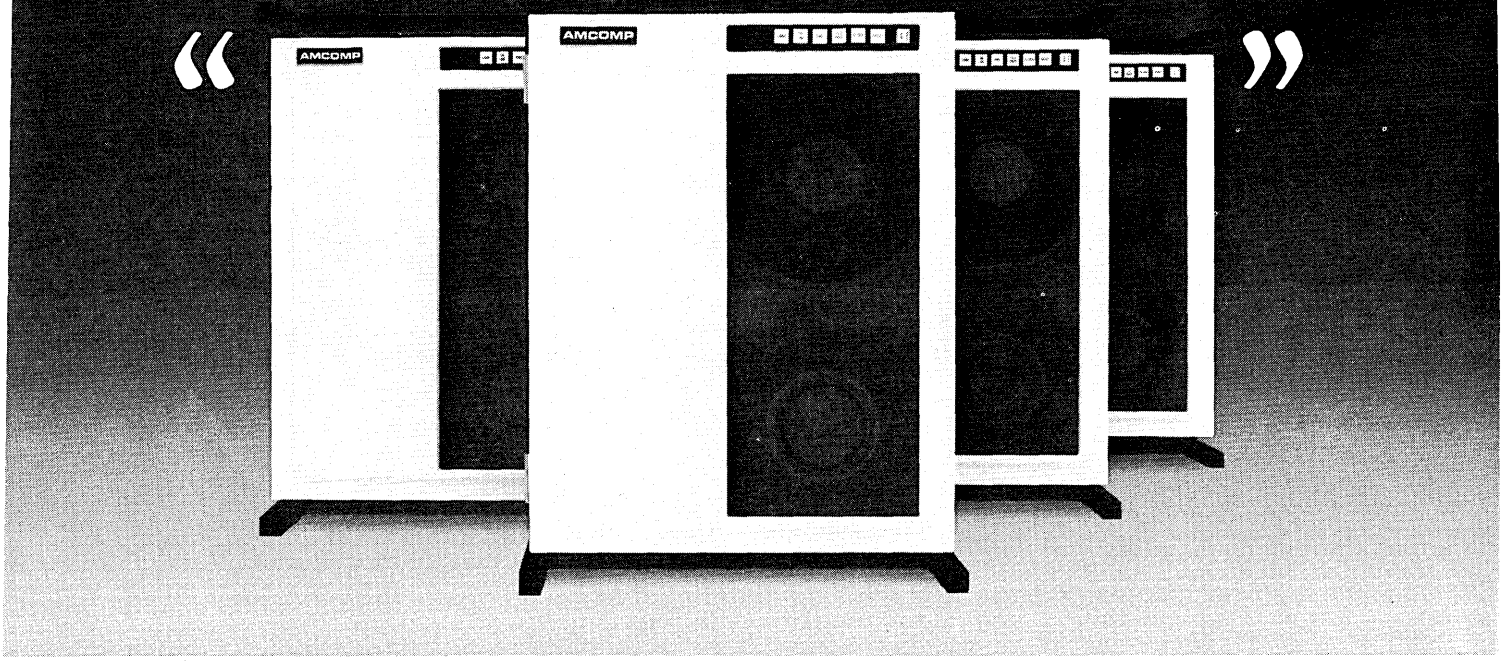

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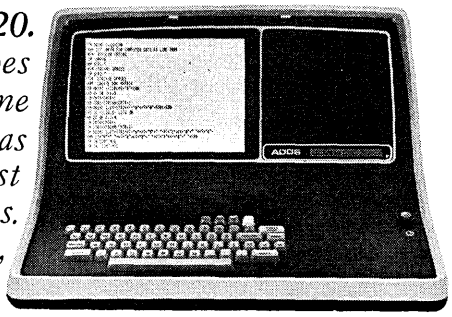

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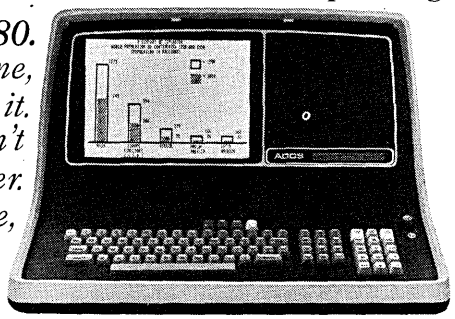

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Hobbits, Dwarfs, and Software

by A. D. Suding

Budgeting ratios can be used to analyze software projects just as financial ratios are used to analyze corporate performance. The trick is to find them.

Recently the Southern California Edison Co. was involved in a complex project for the development of an on-line Customer Information System. We were putting customer account files on-line to the various offices, starting from scratch in the coding, but using what we thought to be a proven design.

The dp field has been notorious for poorly estimating the time and resources required for such a development, and as it turned out, we were only average in some respects, coming in on time but way over budget on man-hours for one thing. But we looked at this project as a test case, carefully recorded man-hours against budget activity, and now feel we can do a great deal better our next time around. We also think we've identified some rules of thumb which could make estimating and project control easier for us—and for anyone else.

The project involved developing the inquiry phase of a Customer Information System in a period of four calendar months so that Edison could quickly provide access to billing information on its 3.5 million customers. The team assigned the job consisted of a project leader, a systems analyst, two programmers, and several users. (The dp titles don't imply much here; the analyst and programmers did about the same kinds of work.)

As of now, some 12 months after the project began, we have 150 terminals in operation. By next January, we expect to be servicing 700 terminals, and to have a data entry and update facility working.

The project used IBM's *Application Design Service (*ADS*), which provided us with documentation for such an on-line system specifically tailored to a utility company.* ADS *describes overall requirements, major subsystems, suggested screen formats, plus program narratives and flowcharts for building the system to use* CICS.

With the purchase of ADS, *we were able to start coding almost immediately. We used* COBOL, *and the resulting programs operate on an* IBM *370/168-*MP *using* MVS, CICS, VTAM, NCP, *and* SDLC—*all the current teleprocessing software and methods.*

CIS *was our first on-line system, and, as knowledgeable readers will expect, two of the budget items overrun were "training" and "customizing* ADS."

Still, the project worked, and we consider the information gleaned to be very valuable for future projects. Here's how it went.

ONCE THERE WERE three dwarfs and a hobbit who built a cottage called Inquiry. The dwarfs had no prior experience with cottages, usually preferring castles. The hobbit, a cave specialist, had bought some plans from *Mechanix Illustrated*, which had to be adapted to their particular environment.

MISMATCH OF ANTICIPATED AND ACTUAL ITEMS

Activity	Items anticipated but not charged	Items charged but not anticipated
Software development	40 hours	52 hours
Design package customizing	8	237
Overhead	—	457
Miscellaneous	—	100
Scheduling	8	110
Programmer and user training	—	220
Time off	—	138
Writing procedures	96	—
Total	152 hours	1,314 hours

Table 1. Of the total time budgeted, 152 hours (8%) was allocated for work which never materialized. Of the actual time spent on the project, 1,314 hours (47%) were spent on unanticipated items.

TIME SPENT ON UNANTICIPATED ACTIVITIES

	Hobbit	Dwarf A	Dwarf B	Dwarf C
Overhead	50%	4%	6%	4%
Miscellaneous	15%	27%	34%	10%
Scheduling	22%	—	—	14%
Total	87%	31%	40%	28%

Table 2. The hobbit's time got eaten up in overhead, for which he didn't budget at all, so his total isn't much help. The dwarfs, despite their best efforts and various ways of estimating, averaged 33% of their time (12 hours/week) on unanticipated items; next time they'll plan for that.

Fig. 1 shows the actual work done to build Inquiry. The work categories are ordered from top to bottom by the amount of total work they represent. Notice the relationship of the activities with respect to the implementation line. "Software development"—including programming, testing, and writing JCL—shows a rapid jump, followed by a gradual decline to implementation.

"Miscellaneous" represents activity that wasn't anything in particular, but Inquiry wouldn't work without it. "Miscellaneous" starts right after the peak of software development, jumps suddenly at implementation, and continues after that a bit.

It is interesting that "Software" picks up again after implementation, reflecting the effect of requests for revisions.

Fig. 2 shows the level of actual and budget hours on a weekly basis. As you can see, the relationship between the two curves is nil, which shows how much hobbit building contractors know about dwarf work. Anyway, the weekly work was not forecast with any accuracy.

Let's look at those budgets some more. Table 1 shows, by summary activity, how many hours were budgeted but not charged (hours budgeted for work that never materialized) and how many hours were charged but not budgeted (new work that was defined as they went along).

The former situation is small, amounting to 152 hours or about 8% of the hours budgeted for the project. It was mostly due to the need to write procedures for operations, for controls, for handling restarts, etc. The dwarfs managed to pawn it all off. Well, everybody knows dwarfs and procedures don't mix.

Where the time went

The other case is more dramatic. New, unanticipated work activities took up 1,314 hours, some 47% of all the time spent. The team obviously did not budget completely. "Overhead" is the worst. (Hobbit work, eh?) But

they purposely did not try to guess in that area. In "Software Development," they were pretty close on the other hand; those dwarfs knew their business. In the rest of the categories, they fell between those two extremes.

But this is just saying that the team spent time on items they had not anticipated, right? Take a gander at Table 2, which breaks down this unanticipated time by person. The hobbit had planned to help with construction, but spent all his time decoying trolls away from the dwarfs instead. So his "unanticipated" time is high. The dwarfs ran between 28% and 40% unanticipated time. Averaging that, we get 33% or 12 hours/week spent on unanticipated activities. That's what they might allow for next time. However, according to Fig. 1, they should allow more of it towards the end of the schedule than at the start, or do a better job of scheduling.

Table 3 gives a summary look at the grand totals for actual hours worked versus the budget. It shows overspending/underspending on items which were in the budget as well as spending on unanticipated items.

Since the team had not tried to budget everything (especially the hobbit), they were 50% over budget overall (Column A). But, comparing those items for which they *did* budget with the corresponding actuals (Column B), they were 15% *under* budget.

Does this coming in under budget mean that they knew how they were going to be spending their time? Not exactly. We could (but won't) plot the time each person expected to spend on an activity each week versus the time he actually spent on it. If the estimates were right, or close, the points on the plot would be on or near a diagonal, a one-to-one correspondence. Well, for this project they look more like the pattern of holes in acoustical ceiling tile—there's no "pattern" at all.

It turns out that even though the workers knew what they had to do (which Table 3, Column B shows), they didn't have any idea which week they were going to do it in until they had finished it.

Weekly variance is useless

"So," the dwarfs and hobbit say over coffee, "since charting how much we vary from our weekly plan doesn't mean much, we'll have to use variance based on completed activities."

"After all, on an activity-by-activity basis, the budget accounts for 81% of the fluctuations in the actuals," says the statistically-minded dwarf, "while on a weekly basis, it's only 35%."

"Well in that case, we better keep our work items small enough so we don't go too long without knowing where we are," says the hobbit.

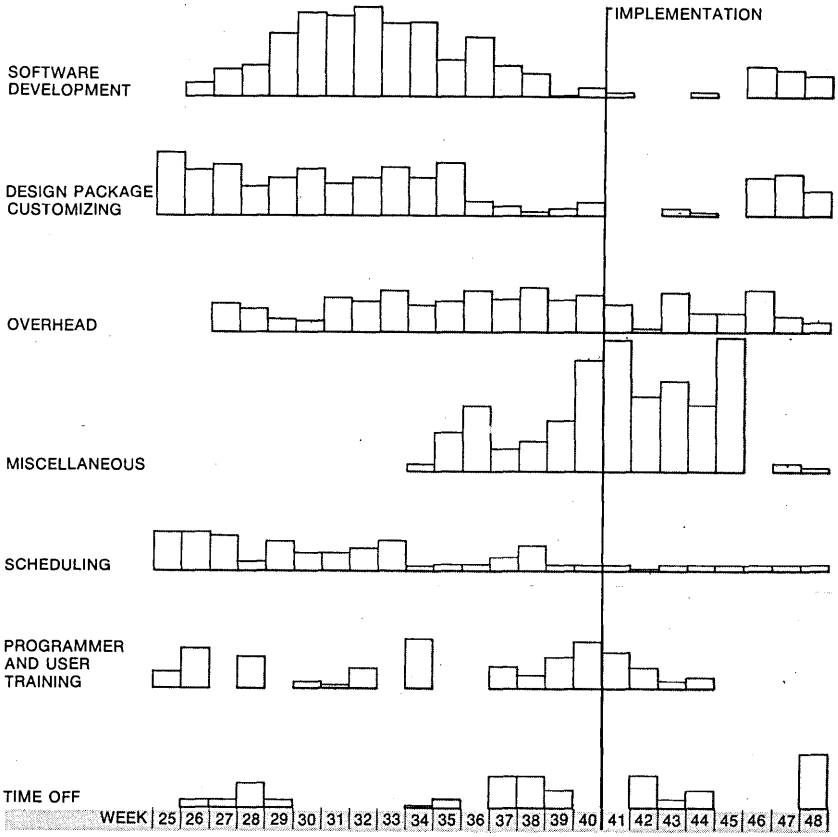

Fig. 1. Here's how the work was split up. The tallest bar represents 135 hours.

MISMATCH OF BUDGETED VERSUS ACTUAL WORK

Activity	"A" Total Budget versus Actual Total			"B" Budget versus Actual for Defined Items		
	Budget	Actual	Variance	Budget	Actual	Variance
Software development	926	721	205	886	669	233
Design package customizing	408	562	−154	400	325	75
Overhead	0	457	−457	—	—	—
Miscellaneous	320	334	− 14	320	234	86
Scheduling	88	306	−218	80	196	−108
Programmer and user training	56	276	−220	56	56	0
Time off	0	138	−138	—	—	—
Writing procedures	96	0	96	—	—	—
Totals	1,894	2,794	−900	1,742	1,480	278

Table 3. Column A shows that the actual time spent was way over budget. Column B shows that the overrun was not on budgeted items; it was on unanticipated work.

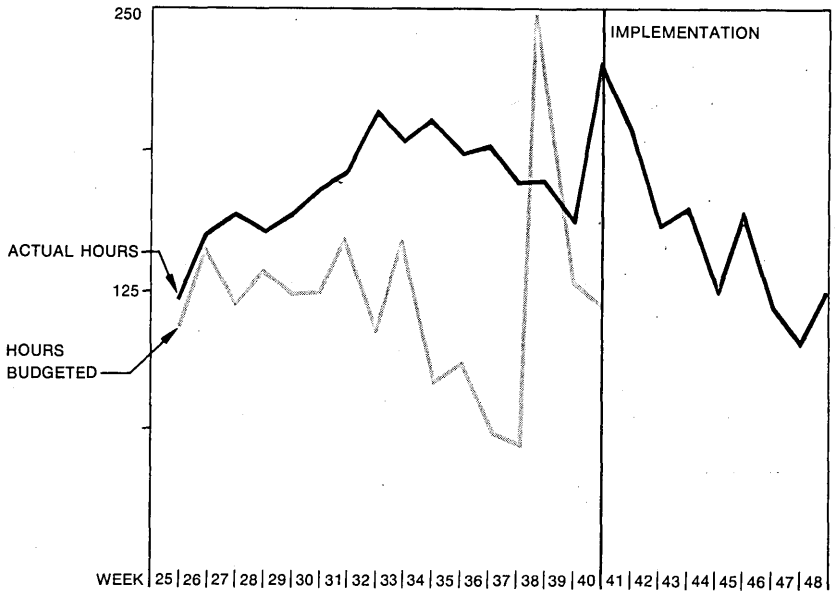

Fig. 2. As with many dp projects, the budget and actual lines show little relation.

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ESTABLISHING WORK PATTERNS

Measure	Hobbit	Dwarf A	Dwarf B	Dwarf C
A. Avg. weeks/activity	3.8 weeks	4.3 weeks	6.2 weeks	5.8 weeks
B. Avg. activities/week	2.9 items	2.3 items	4.5 items	4.0 items
C. Unique items worked	11 items	10 items	28 items	23 items
D. Share of unique items	15.3%	13.9%	38.9%	31.9%
E. Weekly share of budgeted items not worked	6.5%	0%	50.5%	43.0%
F. Weekly share of activities worked but not budgeted	28.1%	19.4%	23.7%	28.8%
G. Weekly share of all activities worked	21.4%	16.7%	32.9%	29.1%

Table 4. Struggling with the work pattern data leads to some guidelines; allow for one activity per week of schedule, and overlap two to five activities—lasting three to six weeks each—per week.

And since the hobbit brought it up, meander on to Fig. 3. This shows that weekly time was mostly recorded in units of eight hours or less. Now if they did that, that means they had to be working on several items a week. Let's see, 40 hours/week divided by eight hours/activity, that's close to five items a week. A similar number to the organizational concept of "span of control," eh? And for once the budget agrees with the actuals.

But let's pursue this topic of the number of items each person works on. It's one of the most important things we learned.

Last illustration, whew! Godfrey Daniels, look at all the numbers! By the way, you'll notice the frequent changes of units in Table 4, so we won't mention it.

Lines A and B show the average number of weeks an activity took to complete (four to six) and the average number of activities worked on each week (two to five).

Line C shows the number of activities the person worked on over the life of the project. And Line D gives the same thing as a percentage of all unique items.

Notice how the hobbit and dwarf A have smaller numbers in lines A through D. This may seem trivial at first, but look at dwarfs B, C, and D. The numbers show that the more items there were to work on over the life of the project, the more were worked simultaneously each week (instead of more shorter items being worked serially). And the people with more items tended to take more elapsed time to do each of them.

Of course, the type of work being done also impacted this pattern. (For the record, dwarfs B, C, and D were on module-oriented stuff.) For instance, how long a person spends working on each activity may be determined partly by the number of activities he has to do, as well as the type of work. And personal work habits influence this, too.

The guidelines

What about determining the number of activities that *should* be assigned to a person? Lines E, F, and G give a clue. Line E shows that dwarfs B and C were responsible for almost all of the budgeted items that weren't worked on the week they were supposed to be. If the goal was to anticipate which items were to be worked, they blew it. But notice, from Line C, that they had defined the highest number of items to begin with. Maybe their work was defined with too much detail to be accurately estimated.

Lines F and G show the other side of the coin. Line G shows what percentage of all the tasks being worked on during any week were worked on by each person. The hobbit's number is 21.4%.

Line F shows what percentage of all

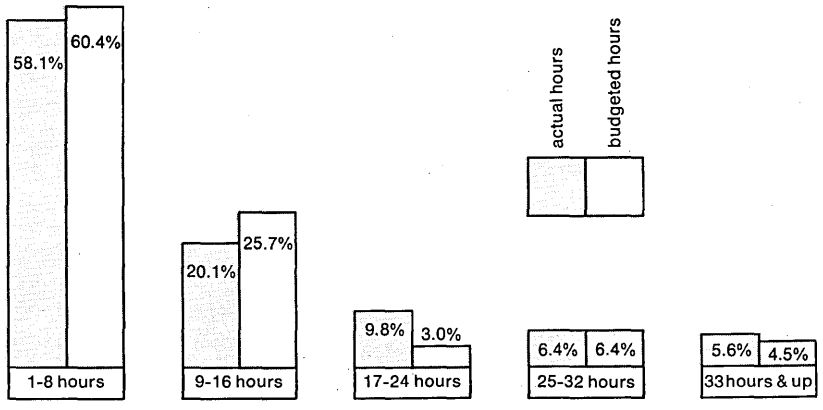

Fig. 3. The time spent on each activity each week was most frequently 8 hours or less.

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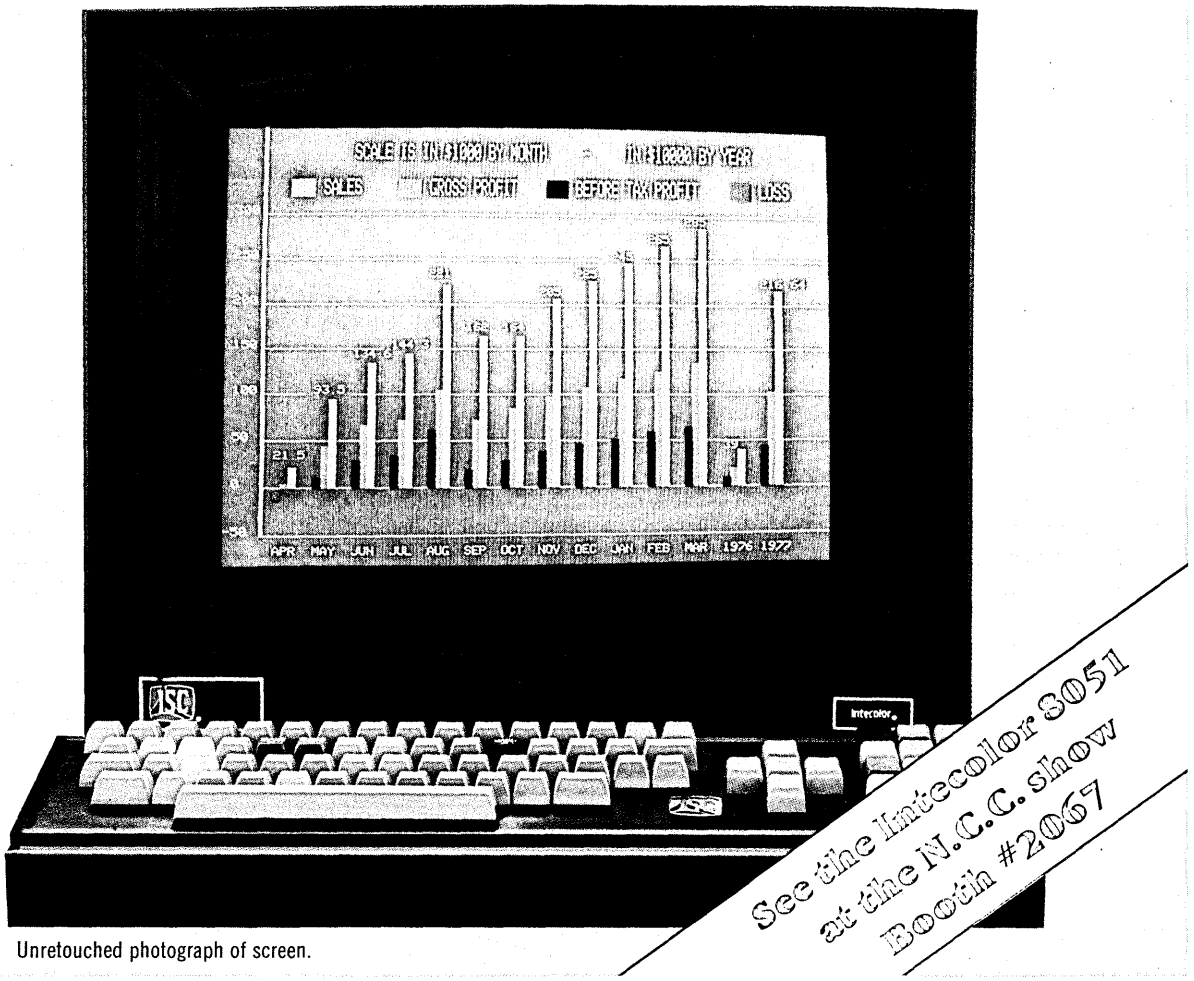

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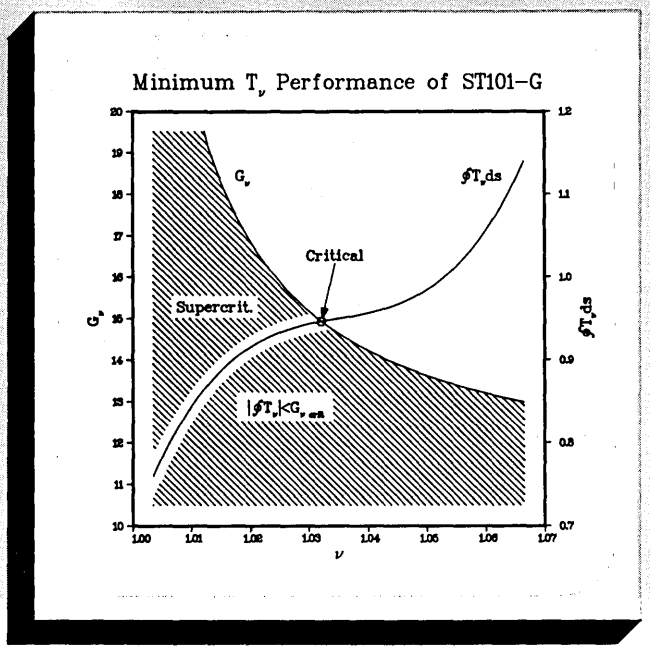

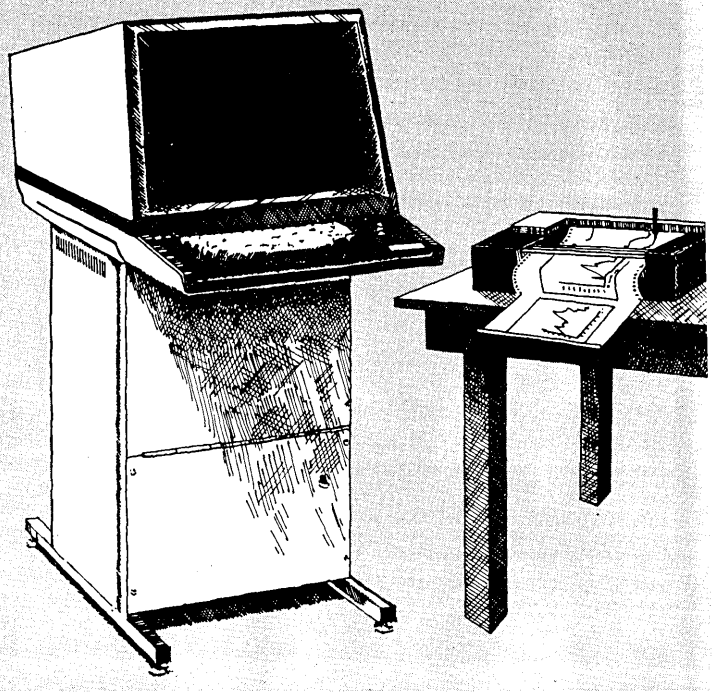

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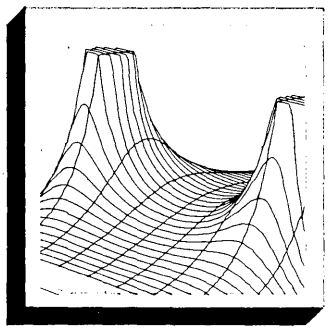

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the unbudgeted items are being worked on by each person. If the hobbit were responsible for only "his fair share" of unbudgeted items (which means only items not budgeted for that *week*), his number should be close to 21.4%. It's not; it's 28.1%.

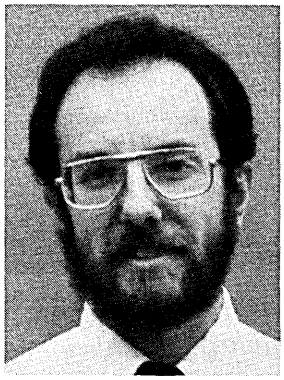
The same thing is true for dwarf A. These two workers were further out of line than the others. Maybe they could have estimated better if they had defined more items to begin with. Then the jumps between the work items wouldn't have been so big they couldn't be accurately estimated.

Yikes! We have a bracket: 23 to 28 items are too many to estimate well, and 10 to 11 are too few. Half-way between is 18. Now our original schedule was for 16 weeks. So a guideline might be to allow for one activity per week of schedule, and to overlap two to five activities—lasting three to six weeks each—per week. All depending on the type of work. This may minimize the skipping of budgeted items and the recording of unbudgeted ones, making the schedule more worthwhile.

What we've done is to suggest using budgeting ratios to analyze projects as financial ratios are used to analyze companies.

Well, the dwarfs and hobbit worked the way they wanted despite what the schedule said. Maybe by following the patterns indicated here, the next budget and schedule will more accurately foretell what will happen.

I understand that the cottage, although superficially similar to the original plan, is trimmed out quite differently and looks like a castle buried in the ground. But everyone is happy with it. ❋



Mr. Suding was the senior dwarf on the CIS project. His past experience includes developing a resource allocation and scheduling program, PERT/CPM scheduling, manpower budgeting for dp using IBM's Project Management System IV, and work on a manpower budgeting and reporting system for the engineering department.

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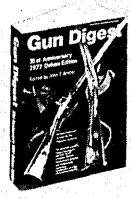

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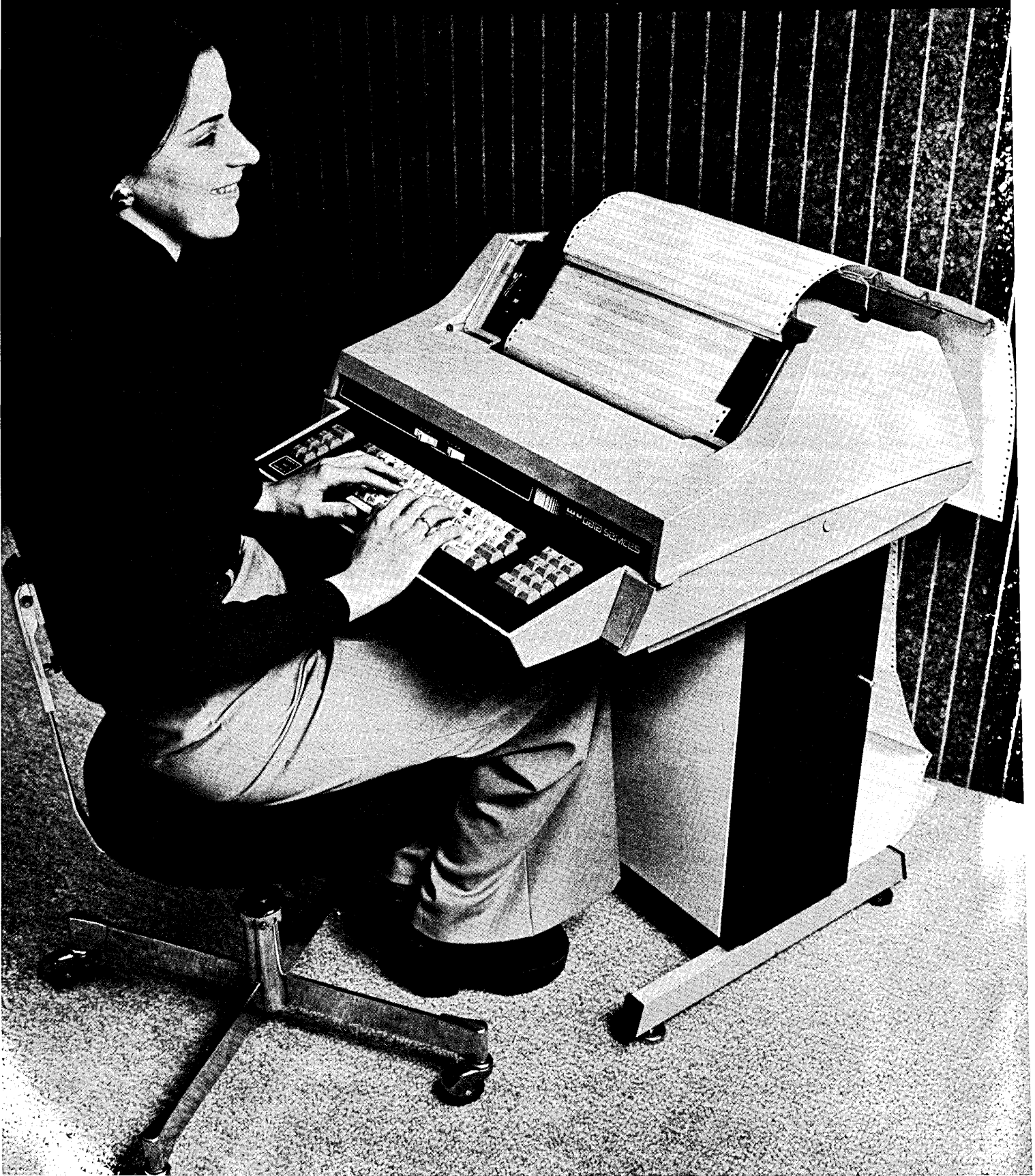

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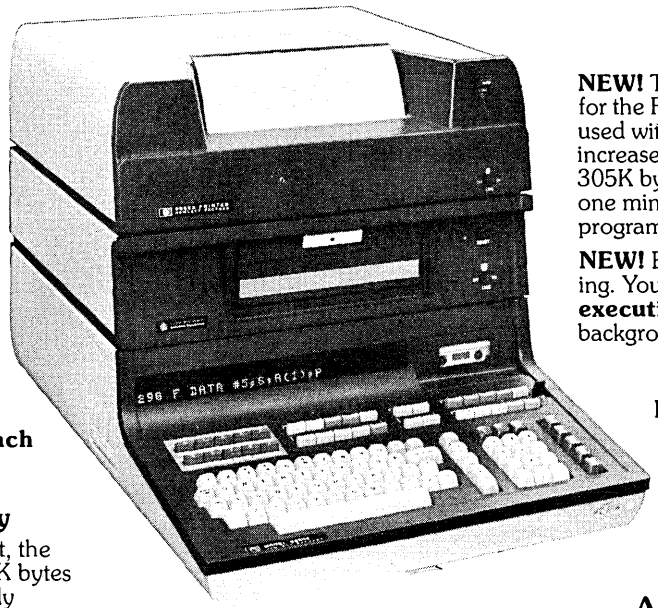

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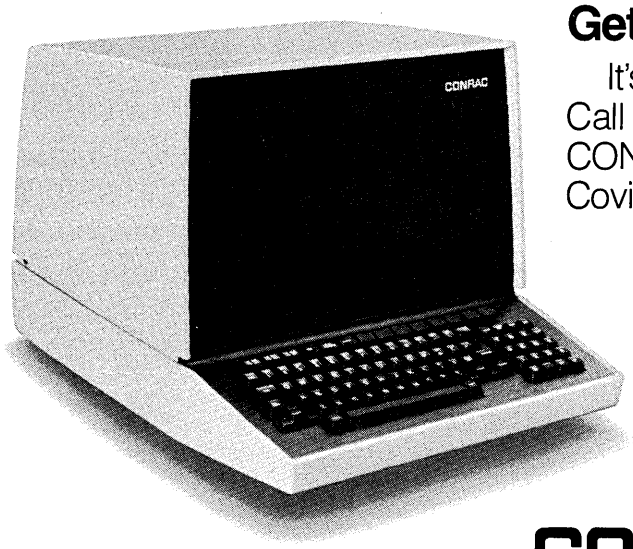

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A Dynamic Approach to Selecting Computers

by Phillip Ein-Dor

The present generation of computers allows for easy upgrades between compatible processors. That outdates the old methods for selecting them.

The process of computer system selection is usually a static one. Needs are projected for some time in the future, usually four to six years, and a system selected to meet peak requirements during that period.

By ignoring the dynamic development of computing requirements during the planning period, however, this approach may considerably distort the analysis and result in decisions which are economically suboptimal. This is especially true when a rapid growth in workload is anticipated and where the systems being compared are of unequal capacities.

The problem

The problem, and an approach to a solution, is presented here in the form of an example based on a case in which the author was involved. The case is not presented in all its detail and the data have been changed somewhat in order to facilitate the presentation.

Assume an organization which has decided to replace its existing computer system in preparation for a major expansion in its information processing activity. Proposals are on hand from three manufacturers, A, B, and C, each of whom has a number of systems to offer, named A1, A2, . . . C4.

Benchmarks have been performed for a representative sample of the organization's workload on one or more systems of each manufacturer. The least powerful system, A1, has been chosen as a reference point, and its capacity assigned a value of 1. Based on the benchmark runs and extrapolations from them, the capacities of the remaining systems have been determined as multiples of the capacity of A1, and tabulated as in Table 1, where

	System			
Manufacturer	1	2	3	4
A	1.0	1.8	2.6	3.5
B	1.2	—	—	3.3
C	—	1.4	2.3	3.4

Table 1. System capacities in reference to model A1.

	System			
Manufacturer	1	2	3	4
A	$60	$82	$100	$115
B	$77	—	—	$97
C	—	$82	$98	$116

Table 2.

each column represents systems of comparable capacity.

From the table, it follows that system A2 of manufacturer A is 1.8 times more powerful than system A1. System B4 of manufacturer B has 3.3 times the capacity of the reference system, A1, and so on.

The rental prices of the various systems detailed above, including software charges, are exhibited in Table 2.

Dividing the data of Table 1 by those of Table 2 provides an indication of the capacity per dollar outlay, which we can call cost-effectiveness, of each of the systems. These figures of merit are contained in Table 3. Given the economies of scale of computer systems, it is not surprising to find that, for each manufacturer, the larger the system, the higher its cost-effectiveness.

Now let us assume that the firm faces an anticipated growth in workload as exhibited in Fig. 1. The horizontal axis in this diagram represents years, where year 0 is the current year

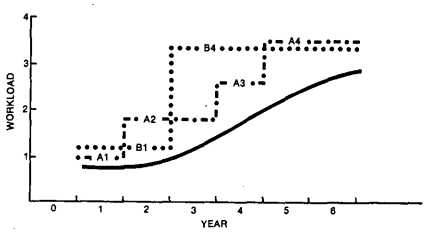


Fig. 1. For the workload and set of machines studied, the "old" static evaluation done for computer selection indicated Product Line B was the best choice. Dynamic evaluation determined Product Line A was the best choice, for a discounted cash flow savings of $350,000. For this situation, Product Line C was out of the ballpark.

—in which the selection decision will be made—and year 1 is the year of installation. The planning horizon considered is six years. The vertical axis represents anticipated workload expressed as multiples of the workload capacity of the reference system, A1.

The workload projection represented in Fig. 1 is typical for an organization with currently stable procedures and slowly growing volumes, which has not recently undertaken any major new applications. This is reflected in the relatively flat workload curve for years 0 and 1. The planned major expansion in information processing activity causes a rapid climb in the curve in years 1 through 5 with a subsequent return to stability in year 6.

The old way

Under the conventional form of computer selection, a system should be chosen which either satisfies immediate requirements and is evaluated, qualitatively, as having good growth potential or satisfies requirements for the next five or six years.

At the end of six years, for this system, the workload will be about three times the capacity of the reference system. The only systems which meet this requirement are A4, B4, and C4. This is illustrated on the right-hand margin of Fig. 1, in which system capacities are marked off on the same scale as forecast workloads. Since, from Table 2, system B4 is both the cheapest of the relevant systems and also has the highest figure of merit for cost effectiveness (see Table 3), it is the logical choice in this case.

The requirement could, of course, be met by installing two or three smaller systems. Given the economies of

	System			
Manufacturer	1	2	3	4
A	1.67	2.20	2.60	3.04
B	1.56	—	—	3.40
C	—	1.71	2.35	2.93

Table 3. Cost effectiveness figures (multiples of capacity of A1 per $100,000 monthly rental).

scale displayed in Table 3, however, this is clearly not a cost-effective solution.

The solution, however, leaves much to be desired in terms of utilization of the system installed. In years 1 and 2 it will be utilized one-third or less, and only towards the end of year 4 will utilization approach two-thirds. In terms of the cost/utilization, this is clearly not very satisfactory.

With a twist

How can the solution be improved? The answer lies in a modified approach to the upgrading of computer systems. In the past, when new generations of equipment were introduced every four or five years, a major upgrading usually entailed a complete renewal of a system, with previous generation equipment being replaced by that of the new generation. But since the introduction of fourth generation computers, a noticeable change has occurred. It is generally conceded that there will be no more revolutionary changeovers between generations, and evolutionary growth will become the order of the day.

With respect to peripheral equipment, the evolutionary approach is already well established and most systems are progressively upgraded by the addition of new peripherals, or the exchange of lower capacity peripheral units for those of higher capacity. This is especially obvious with respect to discs and other mass storage units.

Given the compatibility provided between the processors and operating systems within the product line marketed by each manufacturer, it is now feasible to apply the evolutionary approach to system upgrading to cpu's as well as to peripherals.

It is then possible to plan the replacement of a cpu after one or two years' service rather than after five or six years as has been the practice. If this approach is accepted, then one no longer selects a single computer system but rather one selects a series of computers within the compatible range offered by one manufacturer. This new approach can have considerable impact on the outcome of the computer selection process.

We first assume that it is feasible to install a system for as little as one year, provided that it will be replaced by a compatible system from the same manufacturer's product line. We assume further, for simplicity of exposition, that all installations are performed at the beginnings of years, and that systems must be upgraded at the beginnings of years in which they would otherwise become saturated.

(There is no difficulty, in real cases, in dropping the second assumption and permitting the installation of systems at any desired time. This will probably lead to a quarterly or monthly rather than a yearly analysis, with more number work and greater accuracy. For clarity of presentation, the yearly basis has been adopted here.)

Given the decision rule prescribed above, the growth path for each of the systems would be as in Table 4, and as exhibited in Fig. 1.

The discounted present value of the rental streams, assuming a 20% cost of capital, is $3.15 million for manufacturer A, $3.50 million for B, and $3.78 million for C. Thus the dynamic evaluation presents A as the economically optimal solution, rather than B in the conventional evaluation. The total undiscounted cash flow for this solution is $6.65 million compared to $6.98 for the static selection procedure.

In this manner, the dynamic approach to computer system selection may, in certain circumstances, point to different solutions than the static approach.

The analysis above has been performed on the assumption that equipment is to be rented. If purchase is deemed preferable, however, the method is equally valid, with purchase prices appearing in the analysis instead of rentals. Furthermore, if the dynamic analysis is performed for both lease and purchase, it can be of assistance in deciding on the method of acquisition.

In using the dynamic approach for selecting the form of acquisition, take care to ensure that the values incorporated in the analysis are comparable. This requires that all relevant costs be factored in. For example, where maintenance charges are included in rentals, they should either be added to purchase costs also, or else rentals should be computed without maintenance. If purchased equipment is to be replaced, resale values should be determined and treated as negative costs. Any tax or excise differentials should also be taken into consideration.

Because of varying life expectancies of units within the projected system growth path, and because of variations in the ratio of purchase prices to rentals, it is almost certain that an economically optimal solution will indicate that some units should be purchased and others leased. This implies that the analysis should be performed stepwise. As each change is made to the system in the course of the analysis, the profitability of lease versus purchase should be evaluated; new units should thereafter be considered as acquired in the least cost mode.

It must be emphasized that the preceding analysis is valid only for the very restricted set of circumstances presented by the workload projected for a given organization at a given point in time. In no way does it attempt to identify a product line which is superior in any general sense. It determines a unique solution for a unique situation which is not transferable to any other situation.

But it's sensitive

Sensitivity to workload projections: In order to illustrate the sensitivity of the method to a given workload, consider the workload projection illustrated in Fig. 2 and analyzed in Table 5 (p. 108). The discounted present values (at 20%) are now $3.66 million for A, $3.67 million for B, and $3.62 million for C. Thus in this case, C emerges as economically superior in spite of its poor *prima facie* showing in Table 3. Again, a unique solution to a specific problem.

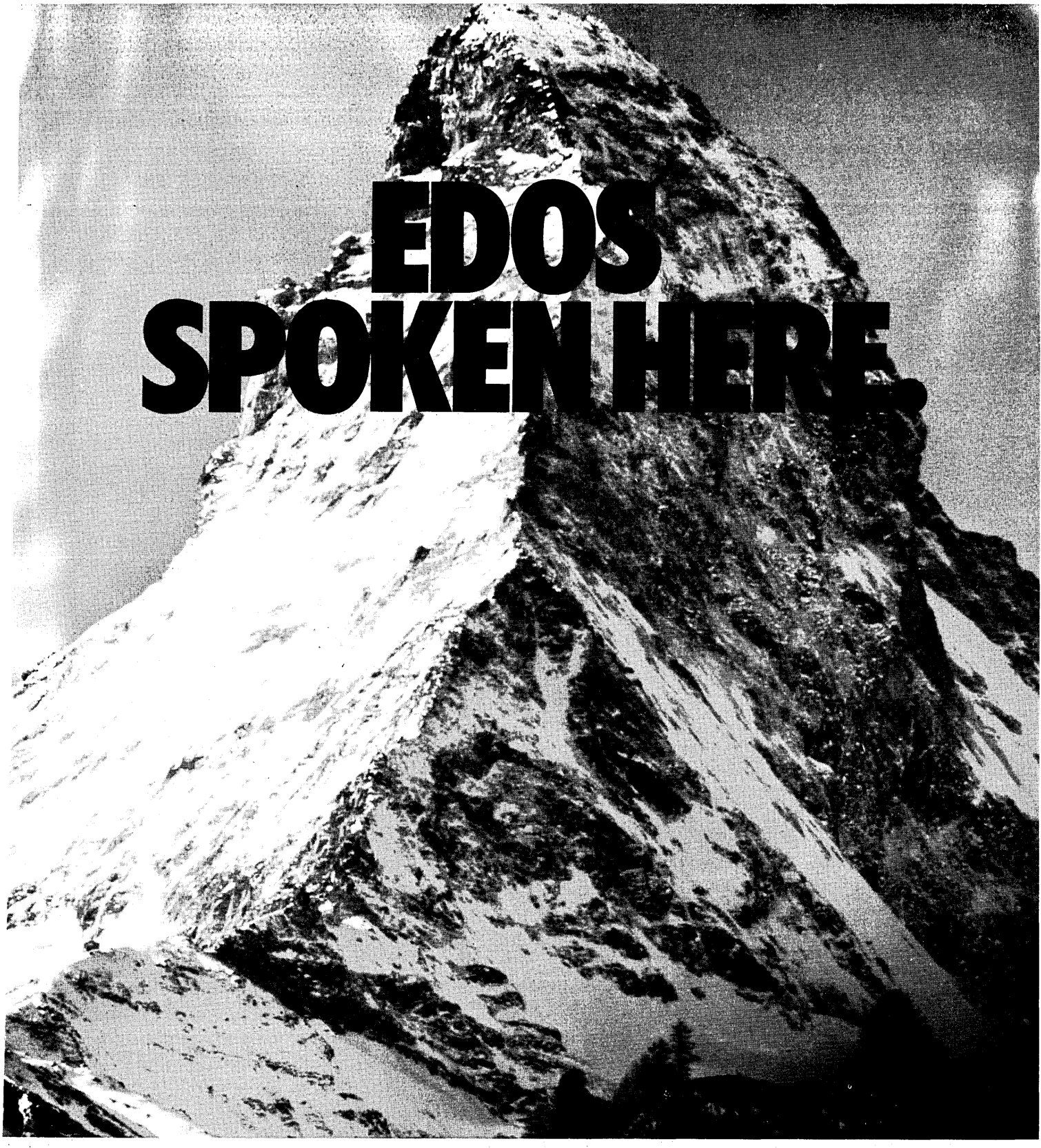
Sensitivity to benchmark runs: In addition to being sensitive to workload forecasts, this method is also very sensitive to the initial benchmark which determines the relative capacities of the systems under consideration. It must be kept in mind that we are not considering the relative capacities of the systems in general, but their relative capacities under the specific job mix of a particular organization. Thus errors in the benchmark job mix or evaluation procedure may distort the outcome.

Sensitivity to discount rate: Since the final selection is made on the basis of the discounted rental flows caused by the systems, the discount rate can obviously affect the outcome. In the analysis of Table 4, the employment of

Year	Workload (year end)	Manufacturer A			Manufacturer B			Manufacturer C		
		system	capacity	rental	system	capacity	rental	system	capacity	rental
1	.85	A1	1.0	$ 720	B1	1.2	$ 924	C2	1.4	$ 984
2	1.10	A2	1.8	984	—	—	924	—	—	984
3	1.55	—	—	984	B4	3.3	1,164	C3	2.3	1,176
4	2.10	A3	2.6	1,200	—	—	1,164	—	—	1,176
5	2.65	A4	3.5	1,380	—	—	1,164	C4	3.4	1,392
6	2.95	—	—	1,380	—	—	1,164	—	—	1,392

Note: Rentals are annual rental charges in thousands.

Table 4. System growth paths for projected work load of Fig. 1.



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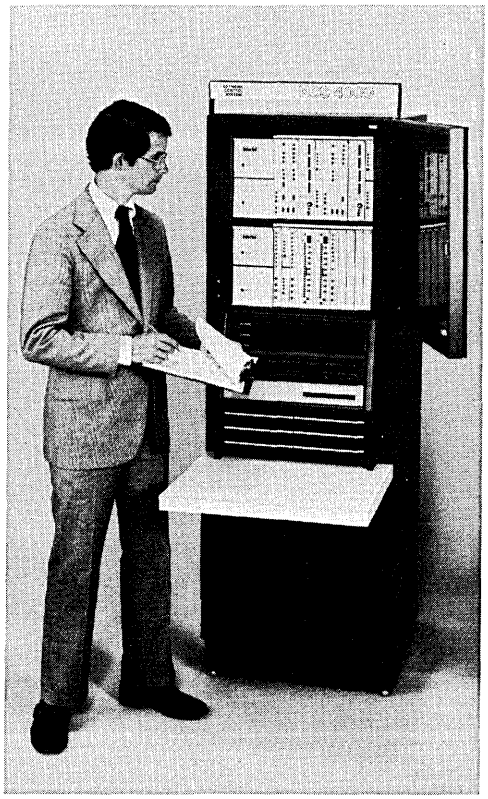

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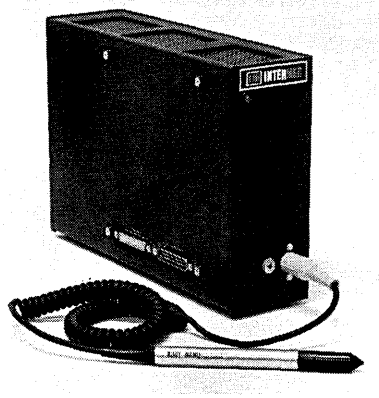

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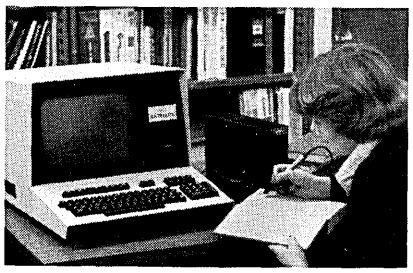

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Year	Workload (year end)	Manufacturer A system	A capacity	A rental	B system	B capacity	B rental	C system	C capacity	C rental
1	1.1	A2	1.8	$ 984	B1	1.2	$ 924	C2	1.4	$ 984
2	1.3	—	—	984	B4	3.3	1,164	—	—	984
3	1.9	A3	2.6	1,200	—	—	1,164	C3	2.3	1,176
4	2.1	—	—	1,200	—	—	1,164	—	—	1,176
5	2.2	—	—	1,200	—	—	1,164	—	—	1,176
6	2.3	—	—	1,200	—	—	1,164	—	—	1,176

Note: Rentals are annual rental charges in thousands.

Table 5. System growth paths for projected work load of Fig. 2.

a 10% discount rate rather than 20% turns the tables, and points to product line B as slightly more cost-effective than A. The further the interest rate drops below this point, the better B looks.

Rent or purchase: The analysis here has been performed on the basis of the assumption that equipment is to be rented. If purchase is deemed preferable, however, the method proposed is equally valid. In fact, if all relevant costs are factored in, this analysis will also indicate which of the methods of acquisition, purchase or rental, is cheapest in terms of present value.

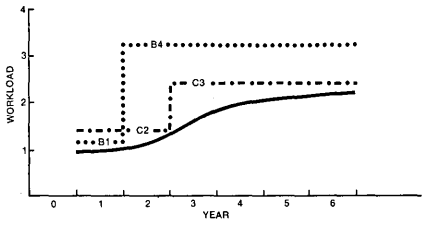


Fig. 2. Given a different workload, one that plateaus earlier, Product Line C becomes the best choice, despite its poor prima facie showing in Table 3.

General perspective: The methodology proposed here is a basis for determining the relative cost-effectiveness of product lines in a given situation. This alone is not, of course, the only criterion for system selection. Other criteria such as software availability, manufacturer service, or reliability may well be at least as important. However, it is also wise to base one's decisions on as accurate a determination as possible of the cost factor. We believe that the proposed approach is more accurate than conventional methods, especially in periods of dynamic growth.

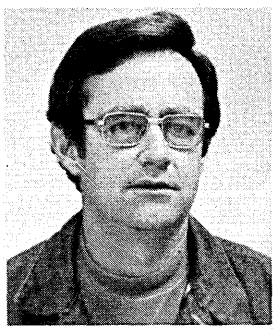
This analysis is also of considerable interest where a system is already installed. In such cases, using a static approach, conversion costs will almost invariably rule out a change from one product line to another. The dynamic analysis may well indicate that the changeover is warranted, even when conversion costs are included. This in fact occurred in the case on which this paper is based.

By the numbers

The steps involved in the dynamic evaluation of cost-effectiveness overtime for a series of computer systems is as follows:

1. Determine relative capacities of relevant systems—possibly by benchmark runs.
2. Forecast the workload for the planning period in terms of a reference system.
3. Prepare a growth path for the systems proposed by each manufacturer with respect to the forecast workload and determine rental (or purchase) costs for each system.
4. Determine the discounted current value of each outlay stream, and so determine which manufacturer has the most cost-effective product line for the situation under study.

The application of this method may lead to considerably different results than the conventional methods of cost comparison. ❋



Dr. Ein-Dor is a lecturer in the information systems graduate program at Tel-Aviv Univ. He has been involved in computer selections since 1961, first as a salesman for IBM (Israel), and currently as a consultant to several private and government organizations.

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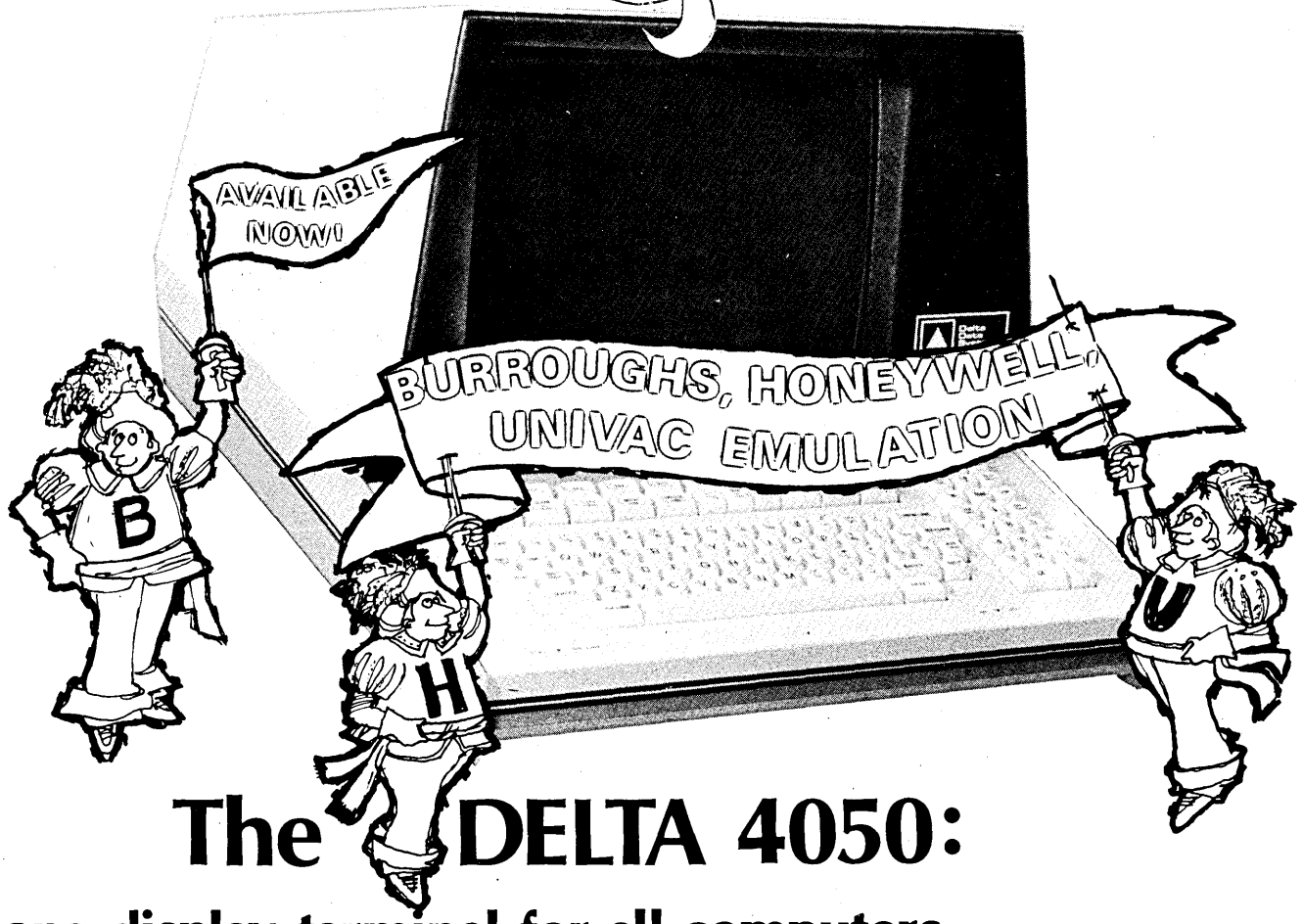

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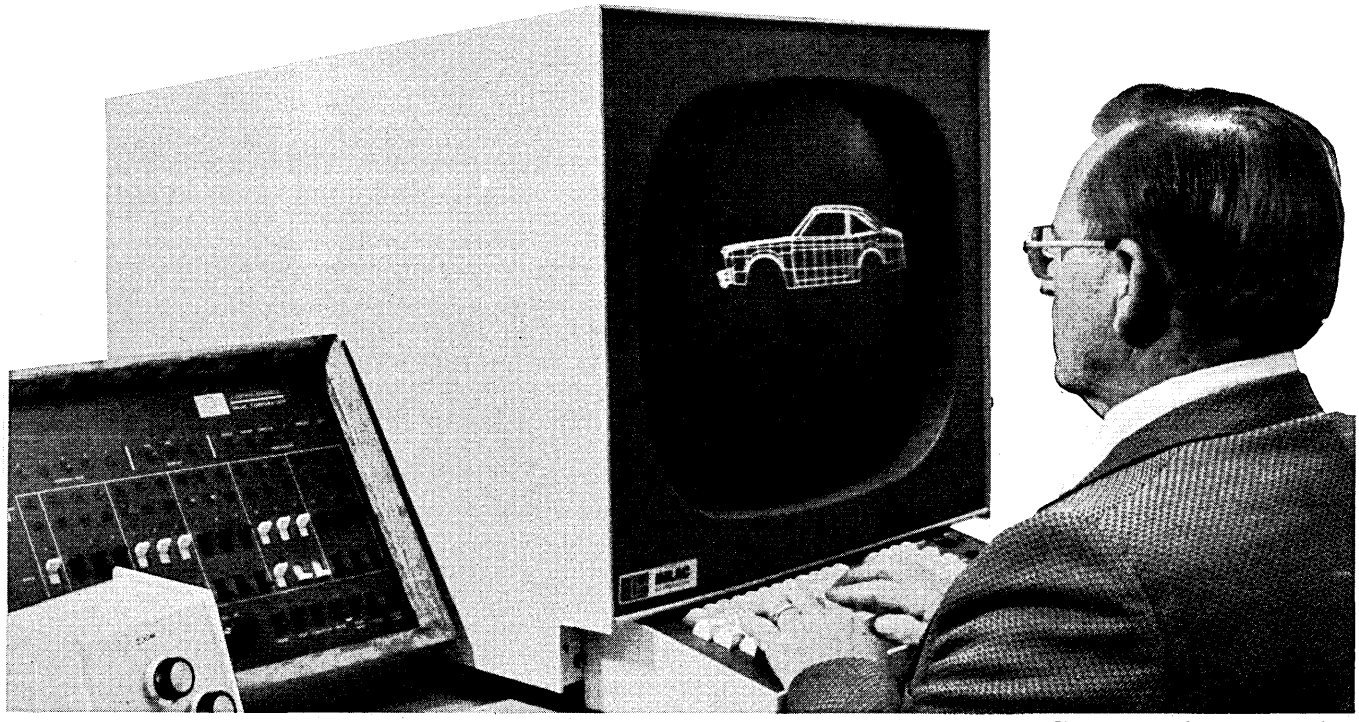

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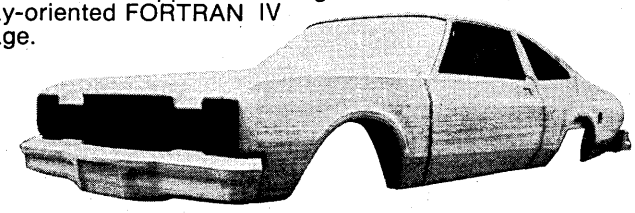

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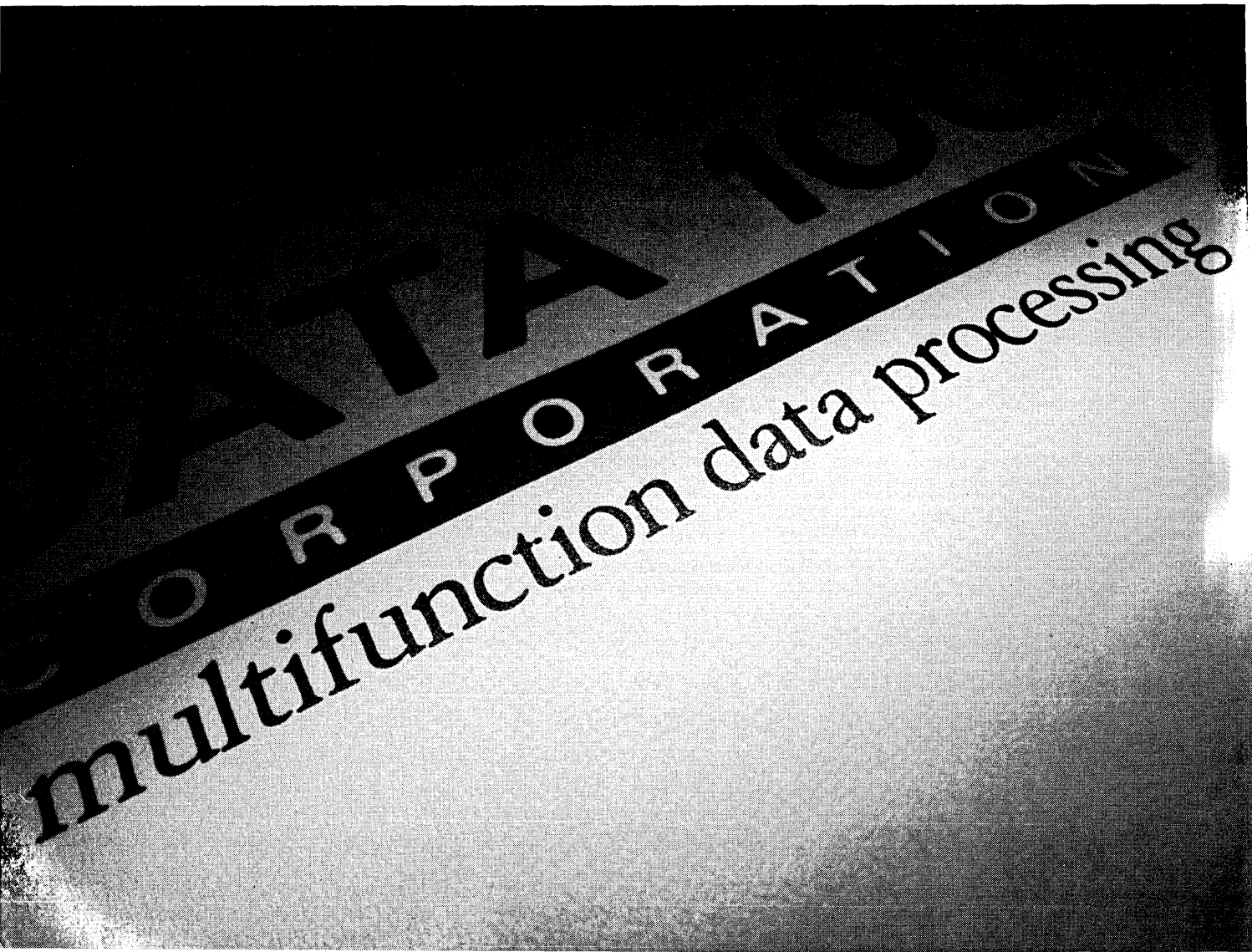

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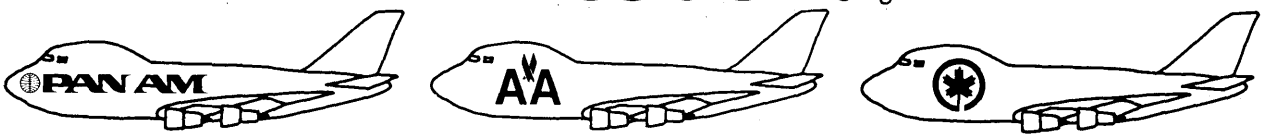

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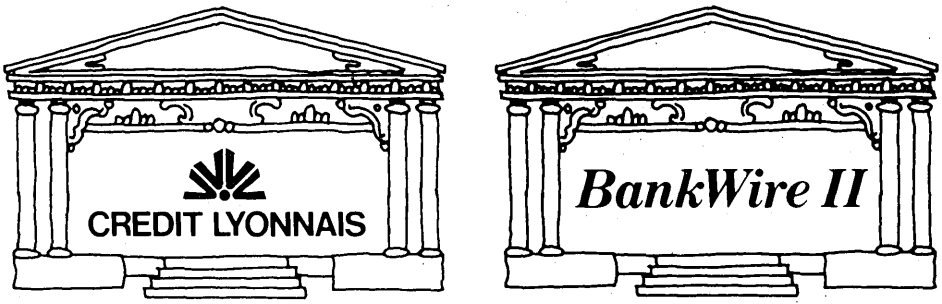

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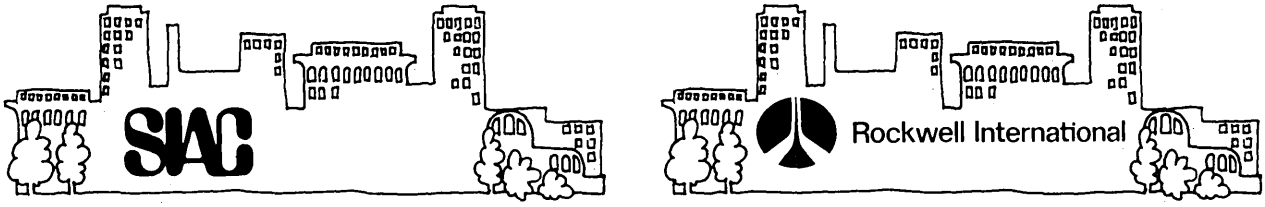

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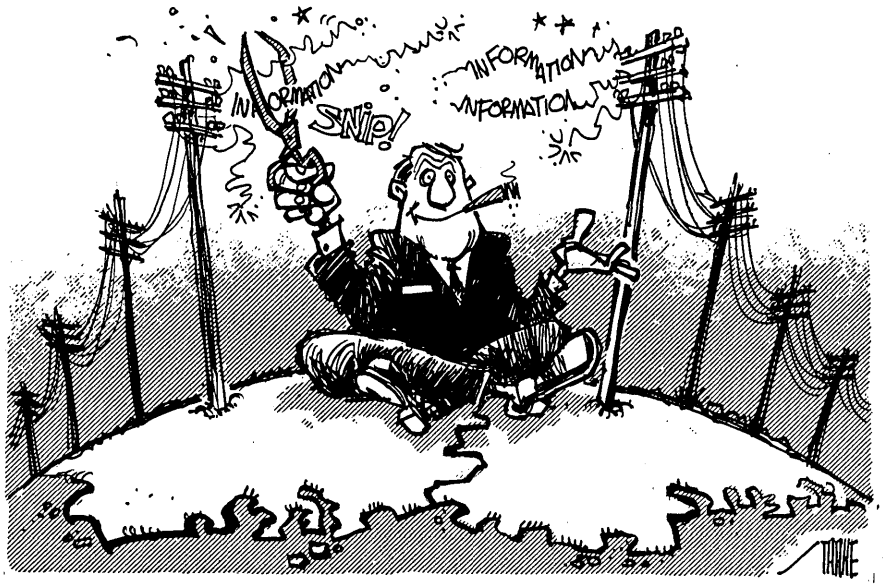

A New Headache For International DP

by Angeline Pantages, International Editor, and G. Russell Pipe

Information is a commodity. Therefore its trade can be blocked, controlled by governments, taxed or tariffed, and used as a bargaining chip.

In the name of privacy and the rights of the individual, the world may be erecting and tripping over barriers to the free flow of information across borders.

Frightened that computer and communications technology is rendering borders meaningless, many nations are scurrying to reestablish those borders through data protection laws. Groups of those nations are also at work trying to harmonize those laws, which is presumably a sound idea, but one which carries with it the danger of data cartels.

The major problem is that the definition of what data is to be protected has spilled out of the privacy realm to include any information affecting national sovereignty, cultural values, and technological advancement. And that leaves room for a great deal of interpretation.

Coping with those interpretations, and the regulatory tools being developed to enforce them, will be one of the major headaches and operating costs of multinational computer users, vendors, and service firms for decades to come. These laws could affect every aspect of how a company organizes its data processing and transmission, decide the countries in which a service firm can economically do business, and generally turn the application of computer/communications technology back 10 years.

Meanwhile, the United States, snug and comfortable with its dominance of the computer/communications industry and its position as the world's leading *im*porter of data, has been asleep at the switch. Struggling domestically to develop its own privacy stance but devoid of a national information policy, the U.S. has blithely ignored warnings of data protectionism abroad as well as entreaties to take a leadership role in global information network developments.

> . . . one of the major headaches and operating costs of multinational users, vendors, and service firms.

Becoming mildly interested, it has just yawned into a sitting-up position to see if a crisis is brewing. There *is* hope in a new government agency task force, led by the State Department, although it does not yet have top executive support. Nor does it yet have the means for real input from industry.

A major protagonist on the question, Brendan McShane of General Electric Information Services Business Div., feels that "Europe has finally figured out a way to blunt American technology. The privacy issue provides an economic wedge that they weren't able to develop in the computer mainframe and services business."

McShane, GE's consulting specialist on telecommunication policy, believes that Europe and Japan have "bought the idea that the world has entered the post-industrial era in which information is the chief commodity, and that unless they do something quickly, the U.S. will control the information society of the year 2000. Japan and Europe have developed a focal point, while we sit here fat, dumb, and happy."

Sam Harvey, former head of Singer's information services and developer of its world-wide utility, criticizes the data protectionism trend as "allowing technology to be the tail that wags the dog. Instead of trying to lock both data and technology inside their boundaries, countries should be trying to do a first class communications job for the world."

Wrapped up in McShane's and Harvey's complaints are the many levels of concern in this issue. The possible negative impacts on multinationals are on one level. On another are the economic conflicts among nations if protectionism is used as a competitive weapon. And on the highest plane, data walls

could thwart the ultimate goal—the establishment of global information networks that could raise the level of education, knowledge, and discovery around the world.

Data havens and pirate computers?

What can nations be doing for such a noble cause, privacy, that could hold such potential dangers for the computer user, the U.S., and the world? The data protection movement is widespread. Eighteen nations have laws on the books or in the works. The first danger is the chaos that can result from too many disparate laws. Recognizing this, many nations are banding together to harmonize them. They also want reciprocity—protection for their information when it is in foreign hands.

Data havens, like tax havens, are a great fear among Europeans especially. They foresee that computer users in countries with strict regulations will move their operations to countries having either no law or very liberal practices. The notion of pirate computers operating in international waters is not considered far-fetched.

The four organizations trying to develop such a convention include the 19-member Council of Europe, which is concentrating on the human rights issue and has already developed a first draft agreement. Another is the 24-

How U.S. Firms See the Problem

Major multinationals indicate that their planning for world-wide data processing is stymied—both in terms of the technical configuration of their networks and the applications they can process.

A consumer products manufacturer with a major central utility feels that with the data prohibitions, his firm will have to increase the power of distributed processors to handle files that must be kept locally. His firm just went through the process of eliminating regional centers around the world to establish the utility. "We wouldn't hire any more people to handle this than we already have," he added, noting that his firm couldn't contribute to the local employment goals of the data laws.

The oil company executive explained that his firm processes much seemingly non-sensitive data through central systems, and current thinking is to increase centralization of certain applications to save costs and labor. But since the data base restrictions are "capricious and politically motivated, we just don't know what will be prohibited and how to plan for centralization."

Also, this firm currently has medical histories on its employees. Although the individual's files are kept in his country, summaries are transmitted into a central file. This manager is concerned about restrictions against recording such data; he is unsure if even the summaries will be permitted across certain borders.

Medical, skills, credit records

A chemical company retains a world-wide personnel skills file in a central location. If some of this information were to be labeled taboo for transborder flow, "we would be hurt, but so would the individual," says a manager. "Hopefully, these countries will take these factors into account while they're trying to protect their citizens and 'cultural identity.' "

A banking expert pointed out that the restrictions on credit information could have severe implications for international credit cards, such as Bank of America's new Visa card. Even if the data is kept locally, how can a traveler be checked out abroad?

The prospect of handing over codes for encryption and algorithms for data compression to government agencies for monitoring concerns every multinational computer user and vendor. From a security standpoint, multinationals hold much data private: corporate financial and planning data, proprietary designs and inventions, pricing data, competitive analyses, etc. Those who use service firms expect them to keep the data secure. Decisions on transmitting such data and divulging the codes will be incredibly complex. "It may lead to no transmission at all," said one executive, who noted that there are already many countries to which his firm will not even send a letter.

Technically, how does a company sending packets of voice, information, and graphic data tell some government authority how to unscramble this "at any point and at any time?" Even decoded, "they'll end up with four spoken words, half a report, and half of someone's head," quipped one manager, although he allowed that such monitoring can and is being done.

Cutting off services

When it comes to international service firms, the GE's, Tymshares, and Control Datas could face real problems. Alden Heinz of Tymshare noted that if the restrictions on data flow are severe enough, firms like his will have to decide whether to establish local centers in those countries. "Very few nations offer sufficient volumes of business to justify that—Germany, the U.K., France."

Regardless, the cost of duplicating large utilities will be exorbitant; hence, certain large-scale applications will not be available from such firms in all countries. Local operations will have to take on the task, or the users will have to go to in-house systems, or they'll all go without. And the foreign service firm will suffer loss of some economies of scale and load leveling (across time zones) of their giant networks.

Liability is another question for service companies. Who is responsible when a customer transmits a file into a service network abroad and something goes wrong—the customer or the vendor? Or what if that customer sends out files that are embargoed from external transmission? Most of the time the service firm does not even know what data is being processed in its utility.

A group of multinationals that one forgets as such is the press. Members transmit articles internationally quite freely, but many publications and news services have centralized data files that certain personal histories of people all over the world. Will the press be a "data haven" of sorts, or will privacy clash with freedom of the press and information here?

In another arena, talk of data walls affecting the level of education around the world sounds like a future prospect. Philip Onstad, director of telecommunications policy for Control Data, says it is a problem today. CDC itself is marketing the computer-based education system, PLATO. Onstad points out that embargoes on personal data flow could affect such education in countries that cannot afford their own networks. Further, development of courseware is dependent on performance feedback and this is best accomplished in large consolidated central systems.

The multinationals—in industry, education, the press—are worrying a lot about these issues. They worry too about the use of restrictions, equipment standards, monitoring, and regulations as political and economic weapons. And U.S. firms worry about the lapse in time before American privacy laws for the private sector are passed. Even though that body of law itself has some costly impacts on them, without it their communications with some corners of the globe could be cut off for lack of reciprocity in data protection. ❋

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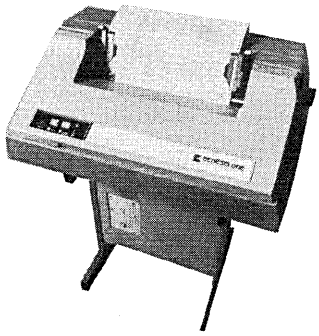

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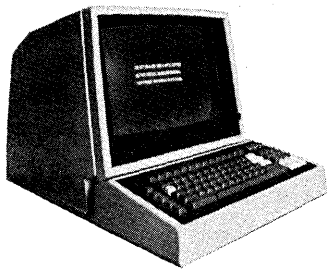

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member Organization of Economic Cooperation and Development, whose members are the developed nations of the free world, including the U.S.; its charter includes the economic and technological aspects of the data issue. Also, the European Economic Community and the Nordic Council are at work on their versions.

Such conventions carry their own problems. First, they too may have to be harmonized with each other, unless one is to have as many conventions as there are laws. Also, agreements among select nations with common economic interests, such as the EEC, could lead to a data cartel. And, even a single international convention could be a disaster if improperly handled. ("No one has an adequate definition of 'data' yet," argues McShane.) This has already been shown by the Council of Europe's draft, which is extremely controversial (as discussed later).

The heart of the issue, however, is embedded in the content and restrictions of the laws and proposals. The rules and principles of transborder data flow are developing along these lines:

- requirements that certain data files remain in the country of origin;
- restrictions on certain types or volumes of foreign processing that can be construed as affecting national sovereignty, cultural identity, and technological advancement;
- establishment of national enforcement authorities and international supervision mechanisms; and
- legal rights provisions allowing the individual to access and correct personal data regardless of its location.

One can see how much room is left for interpretation. Too much economic and personal data leaving a country could be dangerous to national sovereignty or security. What happens if a system fails or a crisis develops, a country asks? Americans have a difficult time identifying with this concern, but talk to Sweden or Canada, two leaders in the privacy movement.

A report by the Swedish Defense Ministry pointed out that more than 2,000 systems containing personal data on Swedish citizens are located in other countries. This export is expected to increase with the introduction of the Nordic and European data networks.

Canada has been dismayed by the amount of its information flowing one way—southward into the U.S. While there is not yet any legislation against this flow, U.S. industry has been warned. In fact, a medical information bureau owned by U.S. insurance companies bowed to Canadian wishes and established a Toronto subsidiary to keep Canadian data. (Too, certain Canadian provinces now won't let credit information out of the province, let alone out of the country.)

Protecting privacy? Or trade?

The sense of national vulnerability is very understandable on those terms, but the interpretation of sovereignty could be very broad when coupled with the goals of "cultural identity and technological advancement." Cultural identity is a boggling concept. Nations fear the "homogenizing" of their citizens when they are in international files used to make decisions—on careers, education, medical questions, etc. In many nations, there is personal information that not only cannot be transmitted, but also cannot be recorded except under special circumstances and approval: race, politics, opinions, trade union membership, medical condition, culture, philosophy, religion, criminal offenses, etc. Then, credit information certainly must stay within some boundaries.

The protection of technological advancement is a loaded issue. Many nations obviously want more local processing of data so that local skills and technology are developed. Naturally, revenues and more support for local industry also result—doing well by doing good. U.S. industry can identify with such goals, but in perspective of current events, one can see why McShane is worrying about economic and political motives behind "privacy" laws, and about U.S. obliviousness.

Despite their many efforts to compete, France, Germany, the U.K.—in fact, the entire European Economic Community—have long been frustrated by American dominance of the computer/communications industry. (Japan has followed its own highly subsidized course to overcome it, with increasing success.) Not only are IBM and other American manufacturers and service companies a thorn in Europe's side, but modern global communications is becoming a threat to Europe's public communications utilities and postal services (PTT's) as well. Electronic funds transfer threatens the mail. Satellites can rob revenues from the PTT's. The existence of private international banking and airline networks menaces them. They even fear IBM's Satellite Business Systems will extend its beams internationally.

> Europe has finally figured out a way to blunt American technology.

Data protectionism could help the PTT's as well as domestic industry. These government monopolies are trying various means to ensure and increase their trade. One good recent example is the balloon floated by the Italian communications authority on behalf of the European PTT's (and with support from international carriers). This is a proposal to eliminate flat-rate charges for private lines and replace them with a fixed rate, plus a charge by character or message—a move users say would mean an increase in costs by three to five times the current rate.

This only *seems* to take us afield from the privacy issue itself, but as McShane points out, "No one understands there can be a connection between the data and communications moves."

Stopped at the border

How do you stop data from crossing borders? Regulatory bodies and methods for control are in most proposals. One method is to require the registration and licensing of files. Sweden's data inspectorate has been doing this for a few years now. While it has not wielded this power as a bludgeon, it *has* turned down some applications for external transmission of files.

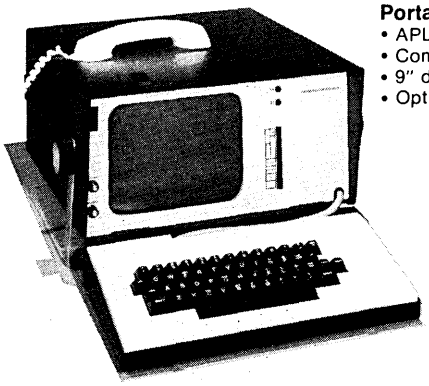
For example, a rural county of 80,000 inhabitants wanted to have health identity cards embossed by a British firm. Magnetic tapes of the population registry were to be sent to the U.K. But the request was denied because Britain "lacks insurance in terms of law or administrative authority against stealing or further use of this population file." (Remember, the U.S., the biggest data importer, also has no privacy law for the private sector yet.)

> It's leading us to an international regulatory agency.

In another instance, Siemens Ag. was centralizing its corporate-wide personnel files and wanted to transfer files on Swedish employees to its Munich center. Germany had no data law then, so permission was denied. (Noteworthy is that trade union interests prodded the Swedish data board because they wanted to keep the records locally available. That brings up the question of what happens to interpretation of "law" when pressure groups get involved.)

Another method of control is to devise standards for movement and manipulation of data. The Germany Federal Data Protection Act, passed last November, is a move in that direction. It obliges processors to prevent unauthorized physical access to facilities, provide controls over data linkage, and institute technical measures against improper input, access, communications, transport, and manipulation of stored data. German data processors

See things your way



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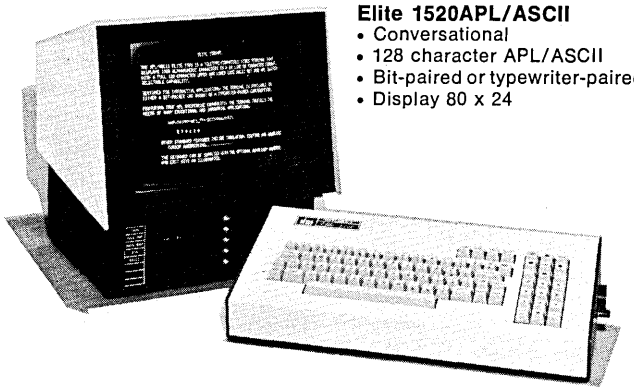

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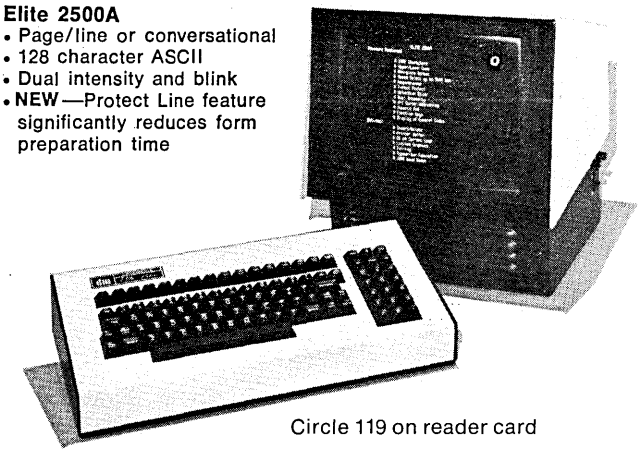

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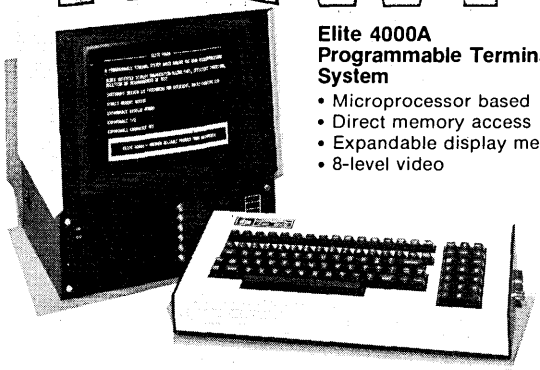

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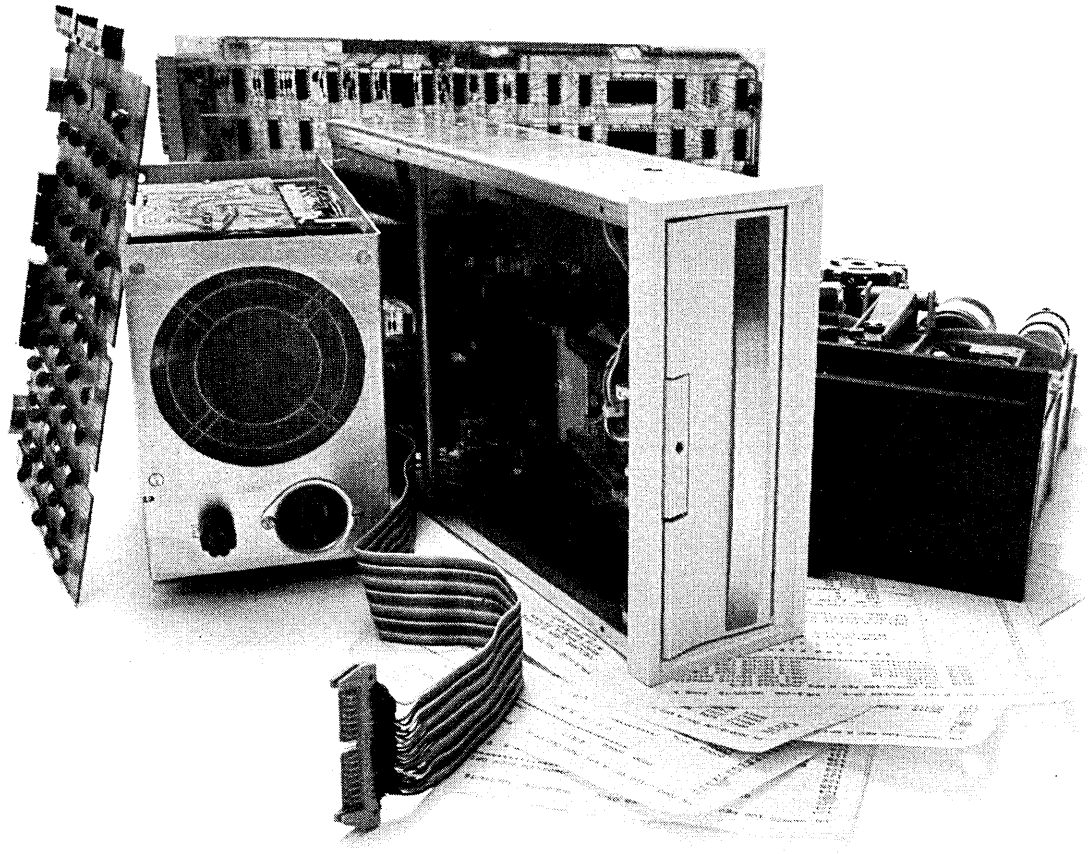

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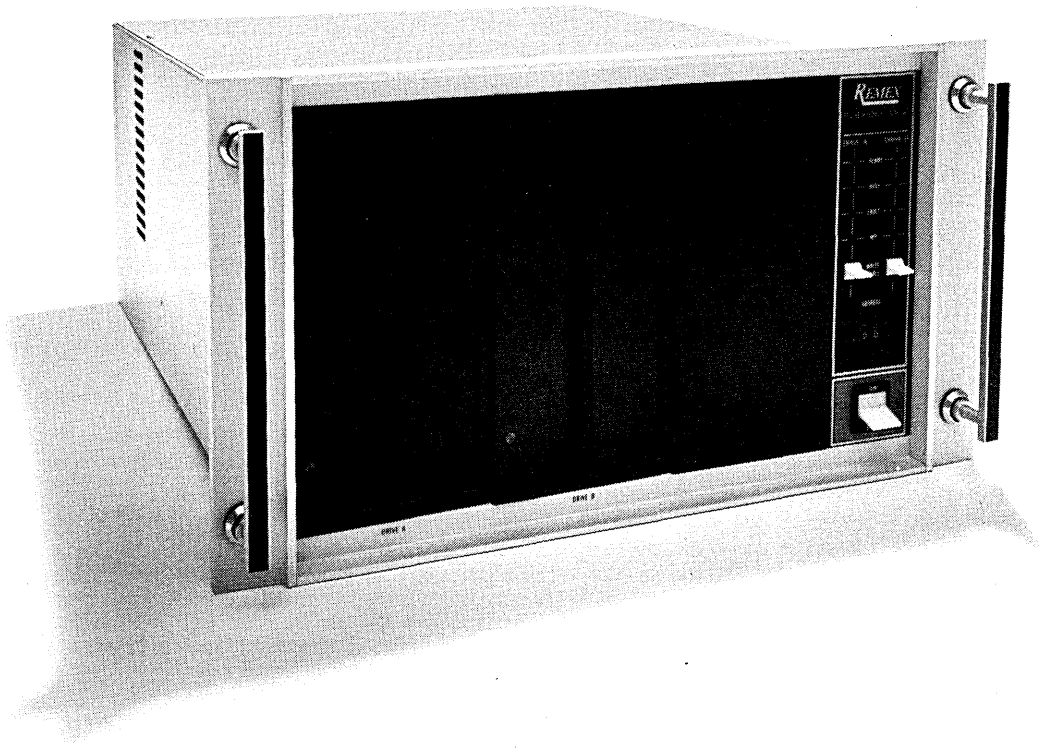

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are as confused about this as anyone else. One can envision the evolution of specific standards and requirements that will be as complex as U.S. tax law.

Governmental inspection at any time or point in processing or transmission is another "brilliant" idea for control. The U.K. seems already prepared for it, since the British Post Office—independent of the privacy issue—must be able to read any transmitted message. If enforced, this implies that customers must hand over encryption codes and data compression algorithms to a government body.

We noted some data may not be recorded nor transmitted. Some countries, like Belgium and France, are making it a criminal offense to break those embargoes. In France, violators could pay fines up to $400,000 and receive prison terms up to five years for recording or transmitting "sensitive" data.

Finally, if a firm or organization does everything properly—registers the data base, keeps the right data the right way, hands over its codes, keeps backup files—it may, in certain countries, be allowed to pay an excise tax. This is to compensate the country for loss of domestic services because extraterritorial data processing is being used. That falls under the "ensure technological advancements" goal.

In France, fines of up to $400,000 and prison terms of up to five years for recording or transmitting "sensitive" data.

Europe's convention a disaster

We noted earlier that treaties or conventions were in development to resolve some problems. The Council of Europe, led by Holland's Frits Honus and France's Louis Joinet, has produced a first draft convention. No one questions the integrity or honest intent of these men, but industry's reaction so far to the implications of this draft is that it's "disastrous."

The U.S. association for business equipment manufacturers, CBEMA, generally feels the draft addresses regulatory methods for data processing more than it does individual rights. Also, the definition of personal data is such, says CBEMA, that it includes "airline reservations and data regarding any specific person, such as in an administrative message. In substance, the definition is broader than even HR 1984 [the U.S. privacy protection law which operates only in the public sector], since it doesn't require a file." Further, the convention precludes recording data on the "intimate private life" of an individual unless permitted by law, which CBEMA says could make many common data collection activities "suspect."

The Council of Europe's draft goes along with national proposals that state that dp systems must conform to security standards on installations and devices, as well as data. In CBEMA's view, "this could be used by any signatory nation to set specific equipment standards it decided to impose." The draft also suggests independent government authorities within each state supervise "the operation and use of automatic processing of personal data in its territory. . ." The association says this might lead to licensing dp centers and their personnel. Suddenly, we've gone from controlling data to controlling standards, equipment, centers, and dp personnel.

Any signatory nation could set specific equipment standards.

No one speaks for the user

What is the U.S. doing to examine this issue and evolve policy? At best, any efforts can be called fledgling.

The only group directly addressing the data protection issue is an interagency task force, established last year under the leadership of the State Department. Chaired by Dr. Oswald Ganley, State's deputy assistant secretary for Advanced and Applied Technology, this group includes representatives from the Office of Telecommunications Policy, the Department of Commerce Office of Telecommunications, National Bureau of Standards, Office of Management and Budget, and the Federal Communications Commission, among others.

The group has two major tasks. One is to represent U.S. opinion and policy in the Organization for Economic Cooperation and Development. The other is to wake-up high level policymakers to the ramifications of the issue and help them devise an American position.

The task force members are aware of the issue's importance, although some are not convinced of the need for U.S. participation in an international treaty or convention. "Should there be restrictions on data flow? I don't think so," said one official. He admitted, however, that this may beg this issue, since the U.S. cannot unilaterally control the international situation. Some officials also don't think there's a crisis, stating it will take five years to develop any convention and five more to achieve approval.

In February, this task force held a meeting with "randomly selected" industry representatives, mostly from the computer field. It was an informal, unofficial meeting, so no minutes were recorded for the public's edification. In fact, not all task force members even were present to hear industry's views.

GE's Brendan McShane, CBEMA's v.p. Oliver Smoot, and ADAPSO's international relations chairman, Philip Onstad of CDC, were among attendees. Each noted that the group called for an industry advisory committee. "The government cannot establish policy based on a three-hour session with a few members of industry," says McShane. Onstad adds, "We [computer service companies] cannot be the spokesmen for the end user. Our job is to secure the data. We're not aware of the types of files users have. This concerns all industry. Their voices must be heard."

The government cannot establish policy based on a three-hour session with a few members of industry.

But the wheels of government grind slowly. Two roadblocks exist. One is that not enough people in and out of government understand the situation enough to be confused and worried.

Another roadblock is that President Carter is trying to cut down on the number of organizations, committees, agencies, etc. within the government. This edict is being interpreted to include new committees, and the rules to justify them are very tough; some bureaucrats are even afraid to suggest them. (Industry is also a little leery of participating in formal committees, since everything said must be on public record—a result of the recent "Sunshine" laws.)

Should such a committee be denied, industry may have to continue informal meetings with the task force. Certainly Dr. Ganley's group wants all the input from industry it can get, although it would like consolidated, carefully reasoned positions. But informality means unofficial and unofficial means unrecorded, at least not for widespread public consumption. For those readers that want to support such a committee or ask for more information, we include a short list of people to contact, now.

In addition to calling and writing the U.S. task force, American computer managers and vendors may make themselves heard at two upcoming conferences. Over September 20-23, the OECD will hold a "Symposium on Transborder Data Flows and Protection of Privacy" in Vienna; most of the 23 member countries will send representatives. And over February 7-9,

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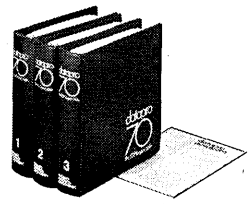

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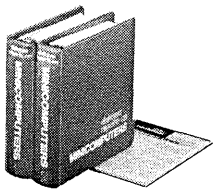

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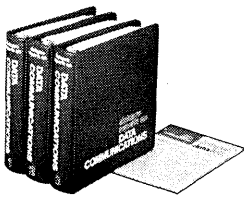

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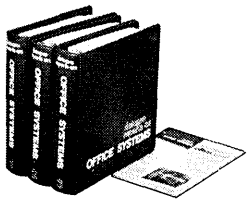

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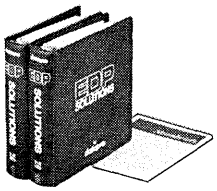

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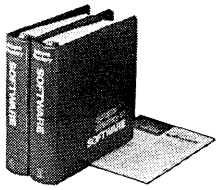

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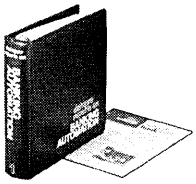

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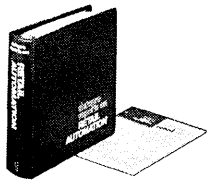

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HP's Terminals: smart, but simple.

With 10,000 sold in just two years, Hewlett-Packard's CRT line has made a considerable impact on the terminal market. The secret? Human engineering.

By designing our smart terminals around a microprocessor, we've managed to uncomplicate difficult jobs and make simple tasks a piece of cake.

But that was just the beginning. We wanted to make our terminals easy to maintain and expand. And we wanted to make them easy on the eyes, both from the operator's point of view and as pieces of office furniture.

We did it all. Our terminals won design awards for their appearance. And our exceptionally clear, high-resolution displays have won the hearts (and eyes) of everyone who has to spend long hours in front of a CRT.

Reducing operator fatigue.

For our screens, we use a 9x15 character cell, with dot shifting to provide exceptionally clear definition. You don't have to peer at tall, skinny letters. Ours look like the best typewriter printing, with the right spacing and descenders below the line.

By using white characters rather than green, we've made the display brighter and easier to read. (Have you ever tried watching black and green television?)

Several other screen features simplify an operator's life. Inverse video, optional half-brightness, underline or blinking characters can be used to stress important information, and reduce mistakes in transmission.

Plug-in modules for quick changes.

That's the simplest way of adapting a terminal to your job. So we offer a variety of components that pop in and out.

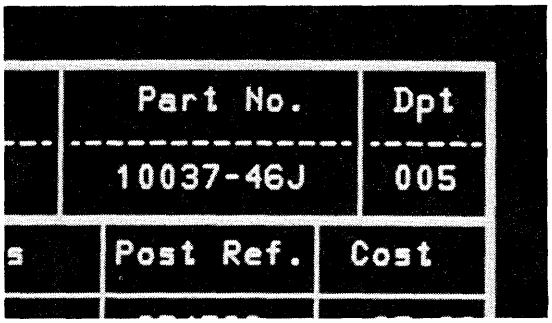
All our terminals have plug-in character sets to cover a wide range of computer languages. And a plug-in Forms Drawing option lets you generate almost any form your company uses.

Our smartest terminals let you plug in fully integrated mass storage. This takes the form of twin cartridges, each able to store up to 110,000 bytes of data or programs.

You can use this information locally (the terminal's "soft keys" save a lot of time and effort on off-line jobs) or transmit it to your central computer.

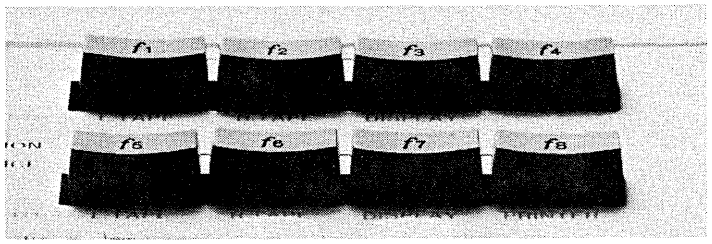
Another new terminal, the ultimate "have-it-your-way" design, should be extremely popular with OEMs. You can pick and choose from a variety of hardware modules, and write your own firmware. Everything plugs together for a virtually custom display station.

Some intelligent ideas for smart terminals:

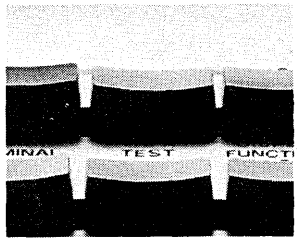


An exceptionally clear display eases long sessions at the CRT. A Forms Mode aids accurate data entry.

Plug-in mass storage: you can get up to 110,000 bytes per cartridge.



The "soft keys" on our smartest terminals let you execute complex operations with a single keystroke and eliminate many repetitive jobs.



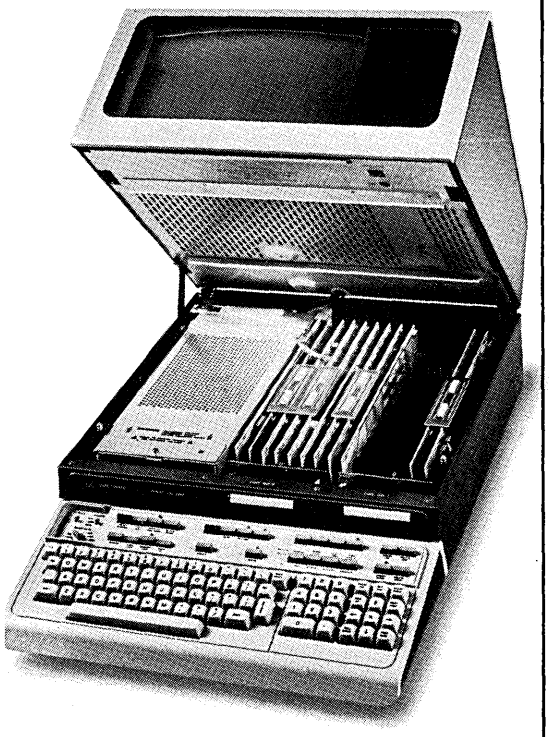
Problems? The self-test key helps pinpoint them for you.

Maintenance is a snap.

Unsnap a couple of catches and our terminal is wide open. The plug-in PC boards are right there. What could be easier for changing options or speeding up repairs by our servicemen?

Not that downtime is a problem. Our terminals have such a good MTBF that we've lowered our maintenance price twice in the past 18 months.

And when you do need service, you've come to the right company. We have more than 700 Customer Engineers ready to



give you support, documentation and training.

So when you're choosing a terminal, think of your people first. Then think of the terminals that are smart enough to be almost human. Your local Hewlett-Packard sales office can give you complete information. Or mail us the coupon and we'll send you the facts.

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Smart doesn't have to mean complicated: eight HP terminals that prove the point.

The HP 2640B Interactive Display Terminal. Even our simplest terminal has many intelligent features, including an enhanced high-resolution display, plug-in character sets, dynamically allocated memory, microprocessor control, full editing, self-test, forms mode and more. It's a lot of terminal for the money.

The HP 2640C Cyrillic Display Terminal. This has everything you like about the B version, but it speaks Russian too.

Cyrillic *Swedish* *Arabic*

The HP 2640N is fluent in Danish or Norwegian.

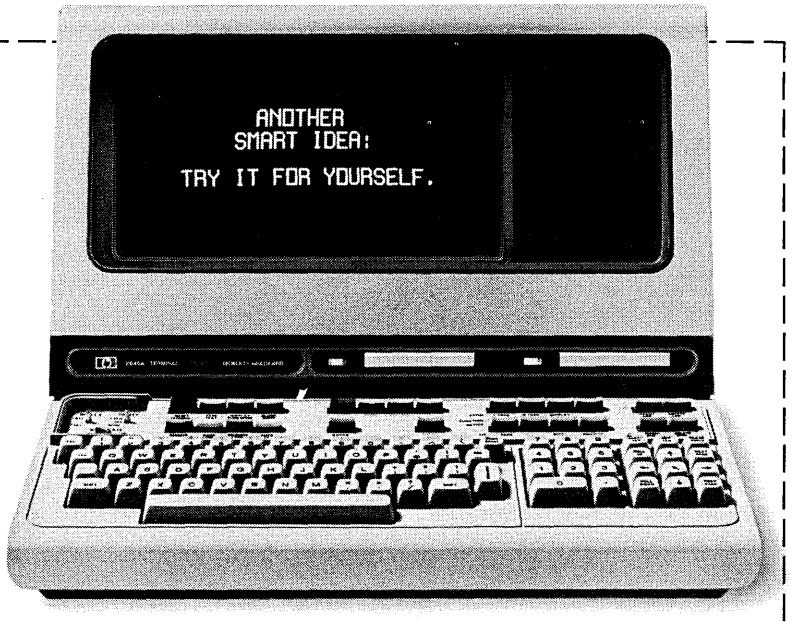
The HP 2645S completes our Scandinavian coverage with Swedish or Finnish.

The HP 2645R. Designed for an application in Iraq, this model enters Arabic characters from right to left. It also works from left to right for standard computer languages.

The HP 2645A Display Station. Our smartest terminal, it can transmit at rates up to 9600 baud, has a forms mode, user definable "soft keys," and optional fully integrated mass storage. A very intelligent choice.

The HP 2641A APL Display Station. This is modeled after the 2645A, but also includes a full 128 character APL set, plus an APL 64 character overstrike set.

The HP 2649A Mainframe Terminal. This data station is ideal for OEMs. It lets you design custom firmware for your special application and pick the hardware modules your system demands. Available with all of the 2645A's advanced features.



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NEW HEADACHE

1978, ON-LINE of London will host an open conference on "Transnational Data Regulation," at the Hotel Europa in Brussels.

The Cast of Players

Jimmy Carter, President, The United States of America	The White House Washington, D.C.
Dr. Oswald Ganley Chairman, Interagency Task Force, and Deputy Assistant Secretary, State Department	OES/APT Department of State Washington, D.C. 20520
Hans Peter Gassmann Head, Informatics Studies Unit	OECD 2, rue Andre Pascal 75775 Paris, Cedex 16 France
Frits Hondius Chef de la Division II de la Direction des Affairs jurisdiques	Council of Europe 60 rue de Marechal-Leclerc Griesheim sur Souffel 67370 Truchtersheim France
Philip C. Onstad Chairman, ADAPSO International Committee	ADAPSO 210 Summit Avenue Montvale, New Jersey 07645
Peter F. McCloskey President, CBEMA	CBEMA 1828 L Street, N.W. Washington, D.C. 20036
Brendan McShane Consulting Specialist	General Electric Co. Information Services Div. 401 North Washington Street Rockville, Maryland 20850

As a last salvo on the importance of participation, we conclude with these comments from John Eger, former acting director of the Office of Telecommunications Policy and participant in OECD and task force discussions:

"The problem is we are not organized. Through the strident cries of the McShanes, we are getting organized. Government thinks nothing can happen without us [the U.S.]. It can. But through an industry advisory committee, we can, in a noncompetitive quasi-governmental way, address the concerns, create an agenda, and help the government make policy on our involvement in international decisions. We should be playing a leadership role. Other nations are looking to us for it."

Eger goes on. "This is only the tip of the iceberg. There are profound issues like government information policy, information policy in the developed and developing world, copyright issues, data base publishing, economic analysis of the cost of data protection and transfer, the productivity consequences of international data flow. There is a whole new body of international law that has to be developed, and it's leading us to an international regulatory agency."

Not only do the rules of international data flow have to be harmonized among the developed nations of the free world, but also among the developing nations, says Eger. The latter step will require sharing technology with these nations and agreeing on the exchange and flow of information across a wide breadth of applications —health, education, international law enforcement, weather forecasting, crop protection. Then will come an accommodation with the Communist countries in the form of agreements on standards, non-censorship, and on the transmission of mutually beneficial information.

"There is a legitimate reason for increasing involvement in these forms. If we are going to build global networks, we can only do it with international agreement. We can't go around the rest of the world." ❋

Mr. Pipe is an independent consultant based in Europe. He is currently working on problems of public policy aspects of data processing and transborder data transmission for groups such as the Organization for Economic Cooperation and Development in Paris, and the Intergovernmental Bureau of Informatics in Rome.

He has also acted as an expert in information policy issues for the U.S. Domestic Council Committee on the Right to Privacy, Executive Office of the President, as a special consultant to the Senate Committee on Government Operations in the development of the Privacy Act of 1974 (S3418), and as a privacy consultant to Congressman Barry M. Goldwater, Jr.

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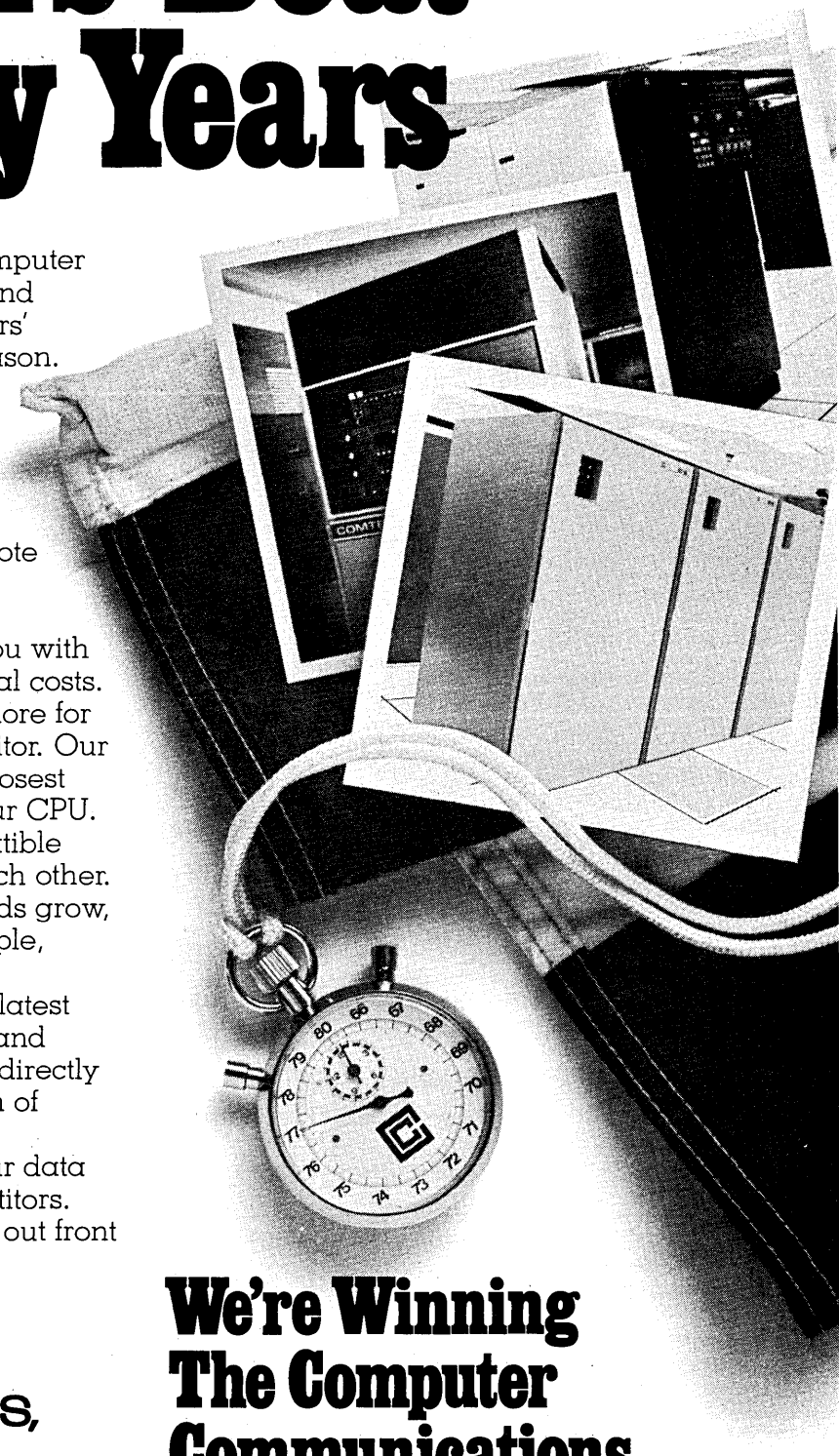

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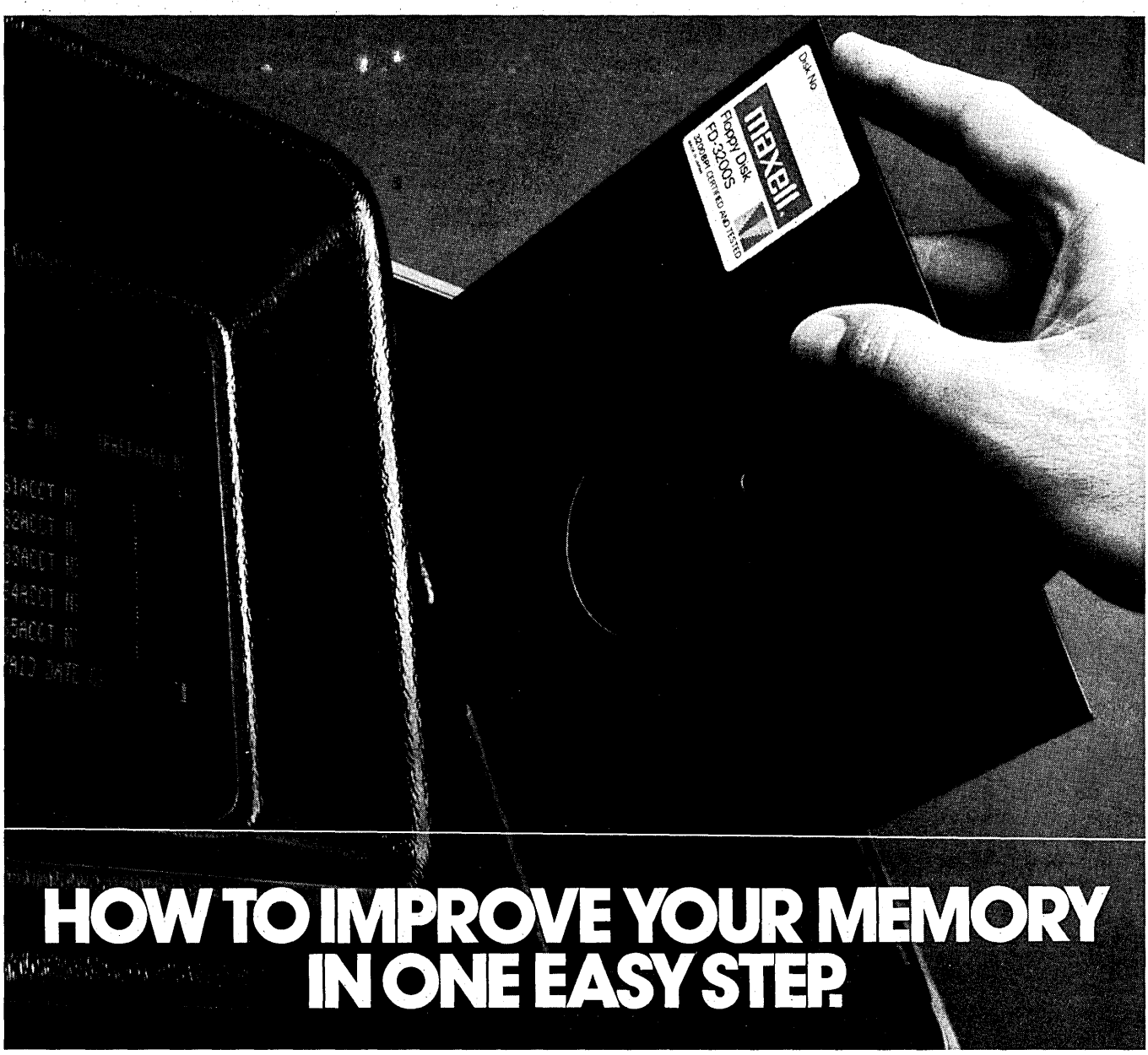

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See at the NCC Show, Booth #1697

The Role of the Data Dictionary

by George Schussel

Their primary purpose is to aid in the control of the corporate data resource, but they also help in reducing programmer error and even in documentation.

For several years, not only has it been in vogue but also considered good business practice to devote closer attention to the management of data as part of the corporate dp function. Witness to this is the rapid emergence and acceptance of data base management systems (DBMS) as primary control software in manipulating information files. Many feel that the arrival and acceptance of data base concepts and data base management systems is the single most important happening in the data processing field since the development of operating systems.

Data dictionaries are part of this "happening." Altogether different types of software products from DBMS's, these dictionaries are now becoming widely available and readily accepted as primary tools for better data management. They can be used with or without DBMS's too, as the two package types are complementary, not mutually exclusive.

A data dictionary is a repository of information about the definition, structure, and usage of data. It does not contain the actual data itself. Simply stated, the data dictionary contains the name of each data type (element), its definition (size and type), where and how it's used, and its relationship to other data.

The purpose of such a tool is to permit better documentation, control, and management of the corporate data resource, goals which may or may not be achieved through the use of a DBMS. Advanced users of data dictionaries have found them also to be valuable tools in the exercise of project management and systems design.

The rationale for data dictionaries is different from that for the formation of a formal data base and a DBMS, which is, of course, to achieve data independence. Historically, DBMS's have gone a long way toward allowing independent management of actual data occurrences and of the programs that manipulate and access such data. This independence of control has resulted in substantially enhanced usefulness of the data.

Information need no longer be stored in fixed master files which are suitable for only one application. Through a DBMS' ability to take one physical description of data and multiply it into a large number of alternative, logical descriptions, it's possible for the same data to serve a multitude of users, each having a slightly different picture of the data. Used in this context, data has not become locked away in the programs but has become more of a corporate resource.

That is what happens when a DBMS is properly used. Frequently, however, they have been used for their storage and retrieval capability primarily, as alternatives to ISAM or VSAM, for example. This is not a recommended use of DBMS's but has happened frequently, nonetheless. Unfortunately, the mere presence of a DBMS does not mean that data are controlled or managed any better than in second generation files; this enhanced control can only be brought about by edp policies directed toward improved data quality.

What are they good for?

It is here that a data dictionary comes in to play. Containing all of the definitions of the data, the dictionary becomes the information repository for data's attributes, their characteristics, their sources, dispositions of usage, and interrelationships with other data. It serves to answer questions like:

1. What kind of validity tests have been applied to this data type?
2. Who is authorized to update it?
3. What modules, programs, and systems use this data type?
4. What are the valid ranges of values for this data?
5. What security level is applied?
6. Who is allowed to access the data?
7. By what other names is the data type known in various application environments?
8. In what reports does this data type appear?

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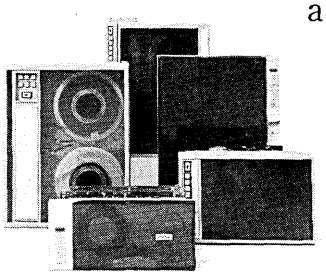

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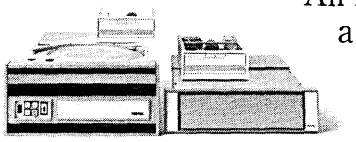

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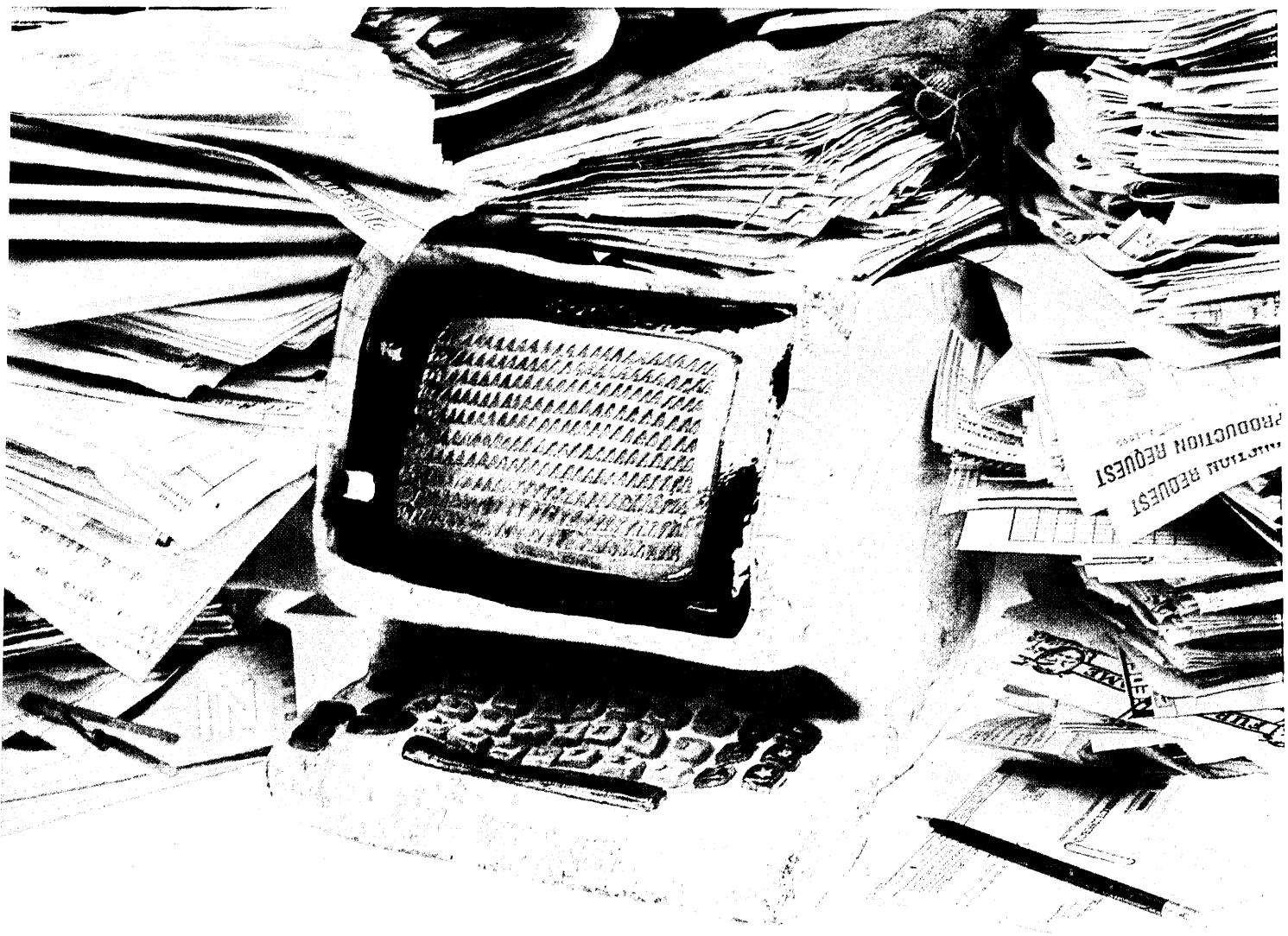
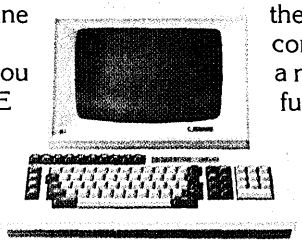


When the lines are down, does your 3270* get buried? Our Harris** 8180 doesn't.

You try to load your 3270. But your trunkline or mainframe is tied up—or is down—so you get a NOT AVAILABLE signal.



So what does your 3270 do? Nothing. And the work piles up. And operators sit around, then go on overtime. And your company loses business. And your user-departments raise hell.

What's the solution? More mainframe? More lines?

We say no. We say the solution is the Harris 8180 terminal.

The Harris 8180 is 100% compatible with your IBM 3270. But it can also process and store data on site—distributed processing—without trunkline or mainframe.

How come? Because the Harris 8180 can be configured to perform a number of special functions. Let's look at one of them: Queued Transaction Handling.

Queued Transaction Handling lets you store data at your 8180—whether the data are keyed by your operator and stored prior to transmission to your CPU, or received from your CPU and stored prior to local display or printing.

Result #1. Your Harris 8180 can take and store data from your operator, even when your CPU can't take it from your 8180. Then, when your 8180 can get thru, it can transmit the data without re-keying—and in a fraction of the time your operator took to key the data initially.

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CIRCLE 81 ON READER CARD

9. What is the input source for this data type?

Frequently we find data dictionaries being used in combination with DBMS's. As suggested earlier, this is not necessary and, in fact, enlightened shops in the 1960s that did not have a DBMS installed were already using data dictionaries. Also, today a majority of the estimated 4,000-plus North American users of DBMS's do *not* yet have data dictionaries installed, although it is my guess that most of these sites will eventually migrate to become dictionary users.

When used in combination with a DBMS, a dictionary can become exceedingly powerful with automatic interfaces providing:

1. The ability to *automatically* copy definitions and generate entries from existing information contained in COBOL and PL/1 programs and/or the DBMS schema and subschemas. Used in this way, naturally, the dictionary can only perform clerically and will not streamline an already existing mess of incongruent definitions.
2. Alternatively, these definitions may exist in the dictionary and we can *automatically* generate schema and subschema sections from the entries. But not all dictionary/DBMS interfaces work in both directions. So it's important to analyze each particular interface to verify what capabilities are supplied; maximum value can be achieved only through this two-way interface.

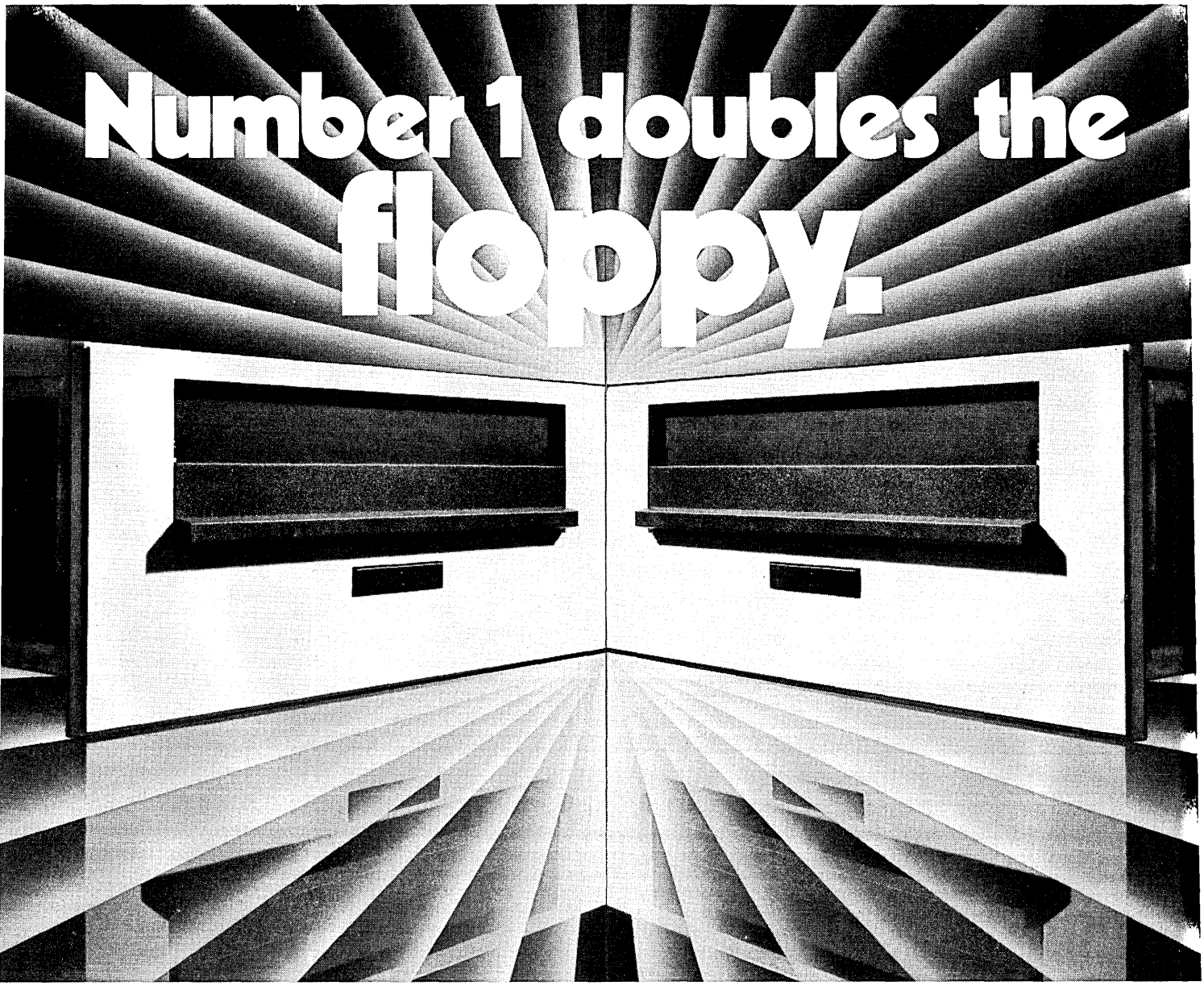
Clearly, while the use of a DBMS to manage the data base does not by itself generate any documentation improvements, the use of a dictionary provides documentation of a quality and form that is simply not available through less formalized procedures in the dp environment.

Also, the availability of an accurate and widely used dictionary will allow project managers to improve new project estimates. This applies especially to maintenance projects where experience has shown estimates to be off frequently by as much as 100% to 300%. Through the use of the dictionary, the project manager can learn how often a data type is used, what program modules use it, and how it is presented to those modules. In a maintenance environment, this sort of quickly available information can be invaluable in calculating the impact and cost/benefit of

TYPICAL DATA DICTIONARY PRODUCTS

Vendor	Dictionary Product	DBMS Interfaces	DBMS Required	Access Security	On-Line Access	Dictionary Entry Generated Automatically?	Definitions From Dictionary Automatically?	Approximate Pricing (for standalone)
MRI Systems	Control 2000	System 2000	System 2000 (must license)	yes	TP 2000	promised	promised for COBOL PL/1 FORTRAN BAL	$15,000
Synergetics	Data Catalogue	IMS TOTAL	no	yes	TSO (inquiry only) CICS	yes	COBOL PL/1 BAL	$12,900-$18,900
Cincom	Data Dictionary	TOTAL	TOTAL	yes	no	no	no	$11,000
MSP, Inc.	Dctamanager	IMS TOTAL IDMS ADABAS	no	yes	Intercomm Taskmaster ROSCOE IMS/DC CICS TSO CMS ETSS	yes	COBOL PL/1 BAL MARK IV	$9,900-$24,900
IBM	DB/DC Dictionary	IMS DOS DL/1	IMS or DOS DL/1	no	IMS/DC (VS)	yes	COBOL PL/1	$290-$580/mo
Cullinane	IDMS Dictionary	IDMS	IDMS (no license fee)	no	TSO IDMS Query	Sept. 1977	COBOL PL/1	$15,000
Arthur Anderson	Lexicon	IMS TOTAL IDMS	no	no	TSO	no	COBOL PL/1	$10,000*
Univ. Computing	UCC 10	IMS	IMS	no	IMS/DC	no	COBOL	$18,000

Table 1. *This software is installed only in conjunction with Arthur Anderson & Co. services.



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Data. Data. The new SA850 double-sided floppy packs twice as much data as a standard unit—up to 1600 Kbytes (unformatted). Yet the SA850 is identical in physical interface, mechanical outline and package size to the industry-standard—our SA800/801. It's plug-compatible, cabinet-compatible.

Faster. Faster. Access time is more than twice as fast. The SA850 moves from track-to-track in 3 milliseconds, with an average access time of less than 100 milliseconds. The secret is a proprietary Fasflex™ actuator that delivers positive, low-friction head movement.

Media. Media. One drive reads and writes them all. Single or double density. Single or double-sided disks. Industry standard diskettes and IBM Diskette 2, too.

Features. Features. The head carriage assembly allows loading of the two read/write heads simultaneously on both sides of the disk. (No more head load pads!) Plus this head can be replaced without an alignment disk, scope, or special tool—and it's totally self-aligning.

Lower heat dissipation and better PCB packaging promise even better reliability. A new I/O controlled programmable door lock strengthens data security.

And there's more, more. So before you look at another floppy, see the SA850 twice. See it in our brochure. Then watch it perform in a demonstration with your own system.

The SA850. The doubled floppy from number 1.

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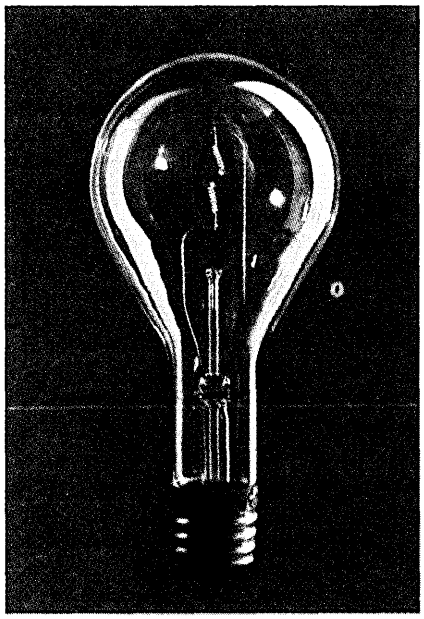

This team of field engineering professionals helps Four-Phase distributed processing systems achieve better than 99% uptime nationwide in typical multi-shift use. And every service incident which does occur is analyzed by the Four-Phase field engineering support group to determine whether maintenance response was timely and efficient and to supply statistical data to guide our product engineers toward even higher equipment reliability.

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any proposed change.

Programmers learn to appreciate the advantage of the tool by automatically generating file descriptions through COPY's into their programs. This is because the COPY facility reduces the total amount of coding that is required and, of course, by COPYing rather than re-entering, errors are reduced.

Who makes them?

There are a number of important differences in the eight packages outlined in Table 1, though all are marketed as general-purpose data dictionaries. Cincom Systems' Data Dictionary was introduced in 1976 and has been marketed primarily to existing customers of Cincom's TOTAL data base system. Control 2000, likewise, has been offered by MRI Systems Corp. for use with its System 2000; it was announced in 1977.

The Data Catalogue (Synergetics, 1973) and UCC Ten (University Computing, 1970) are marketed to users of IBM's IMS (and in Data Catalogue's case, also to users of TOTAL).

DATAMANAGER was introduced in 1975 by MSP, the only vendor in Table 1 whose *principal* product is a data dictionary. DATAMANAGER has been interfaced with most of the data base management systems used on IBM's mainframes.

DB/DC Dictionary from IBM and IDMS Dictionary from Cullinane are both fairly recently announced products (December 1976), and DB/DC is intended only for IBM's proprietary DBMS's (IMS and DOS DL/1). Cullinane's product, although based on the proprietary IDMS, IDMS Query, and CULPRIT packagers, doesn't require licenses for those packages for dictionary use only.

The Lexicon Dictionary is part of a powerful software package which includes generator capability, query capability, plus input processor, data extractor, and table maintenance systems facilities. Arthur Anderson and Co. the vendor of Lexicon, is a major accounting firm substantially different from the other vendors who are all primarily concerned with computer hardware or software. The firm has not been aggressive in selling Lexicon outside its own customer base of audit clients, usually supplying it as part of a combined package including consulting services.

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The prices of these packages tend to be relatively conservative compared to the prices of DBMS systems. Perpetual paid-up license fees run in the range of $10,000 to $25,000 on a one-time fee basis, with annual maintenance charges running around 10% of the original license amount.

What should they have?

In looking for a dictionary package, questions to ask include:

1. Is it based on a specific data base management system?

One important thing to look for is whether the product includes, as part of its own file structure, the use of an already existing DBMS. This is important in ascertaining the usefulness of the dictionary. A true network-based DBMS internal structure may offer more flexibility than the more conventional ISAM or VSAM-based dictionaries, but at an increased overhead cost.

Also, for those dictionaries that do use a DBMS as a file controller, it may mean that rights to use of the DBMS must be acquired before the dictionary may be run—not necessarily a desirable feature (and not true of Cullinane's product). Then too, those based upon DBMS's are usually proprietary products marketed by the same vendor that generated the DBMS, and intended for an environment which consists primarily of an interface to files controlled under the DBMS.

A review of the packages on the markert shows that generally (but not always) the packages which support their own generalized file structure rather than being based on some other have been interfaced to a wider variety of DBMS's and do a better job in supporting standalone individual files.

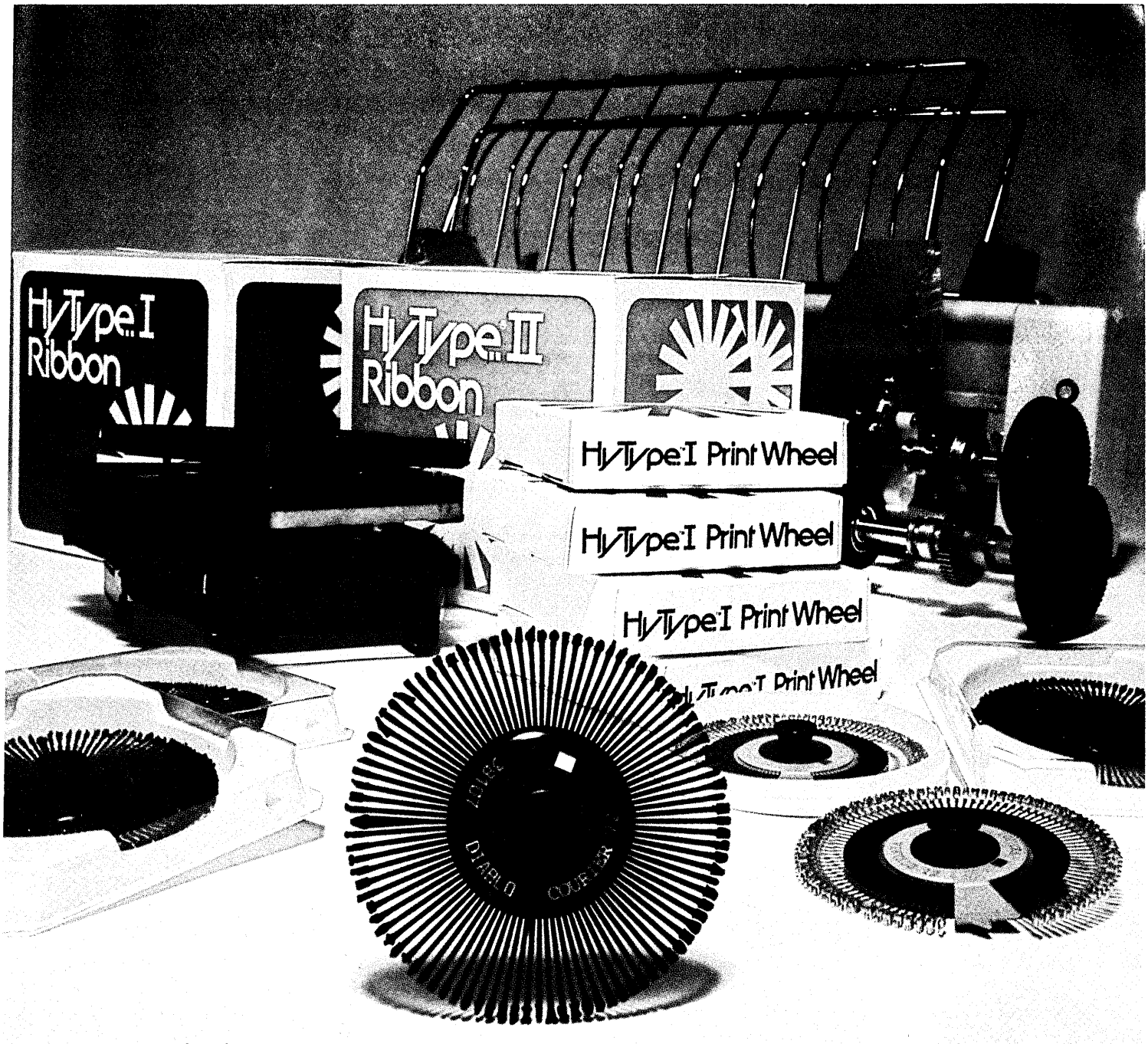
2. Has it been interfaced to a wide variety of DBMS's?

With the advent of the large scale disc drives and the wide availability of DBMS software, it is clear that the majority of large scale users of data will be moving to (if, in fact they haven't already) the use of DBMS (or often several different ones for mature users). Accordingly, a data dictionary can only be significantly useful if it is automatically interfaced to all of the DBMS's being used.

Also, importantly, when these interfaces don't exist, the potential exists for updating information in the DBMS while forgetting to make the appropriate update in the dictionary, or vice versa. Once the two systems get out of phase, there will be a tremendous loss of credibility, in addition to other severe problems.

3. Is it easy to use?

A number of non-dp personnel may use the data dictionary. James Martin (*Principles of Data-Base Management*,



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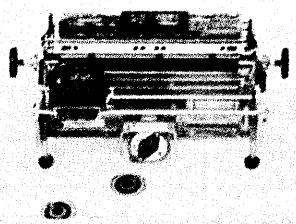

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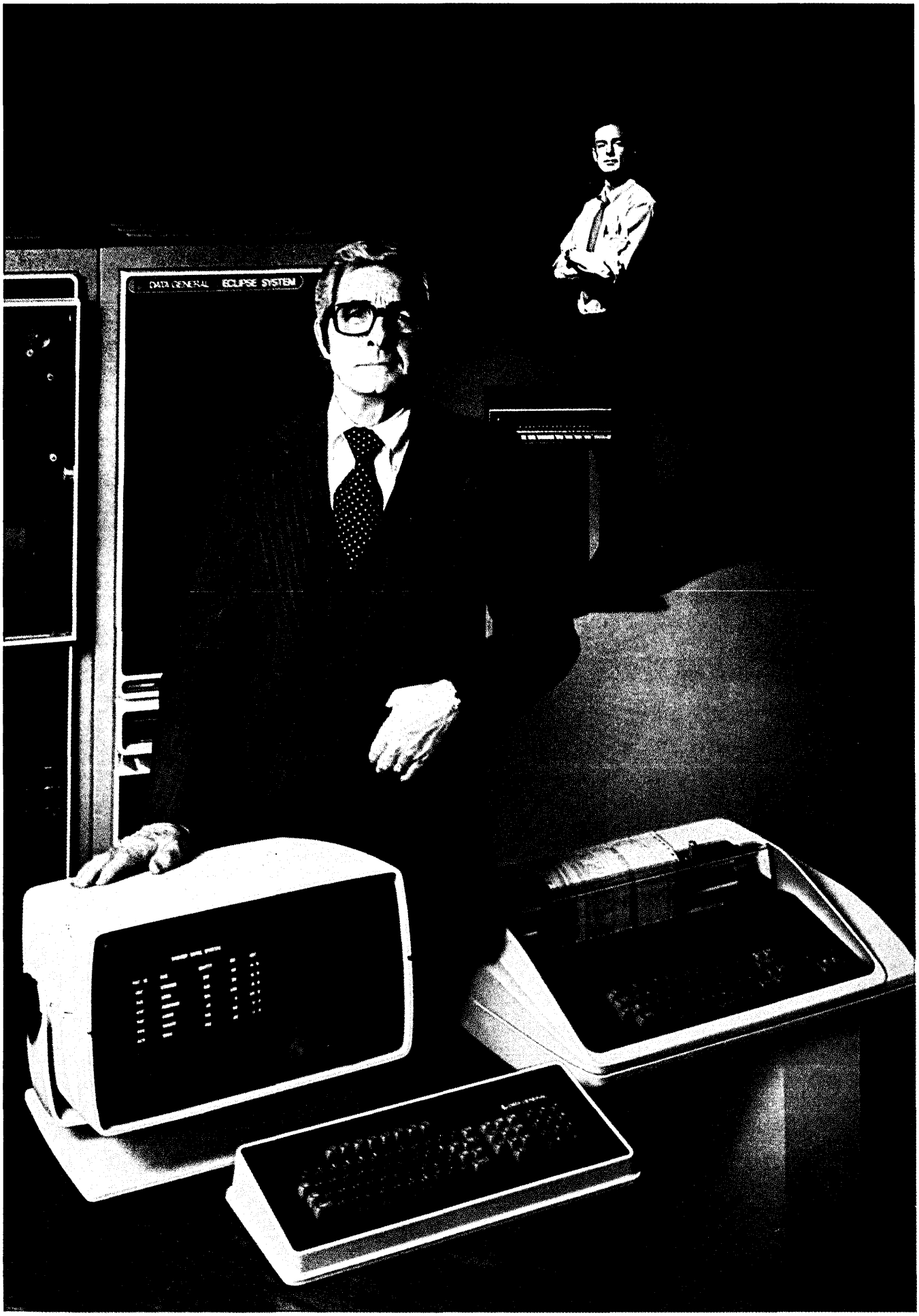
CIRCLE 25 ON READER CARD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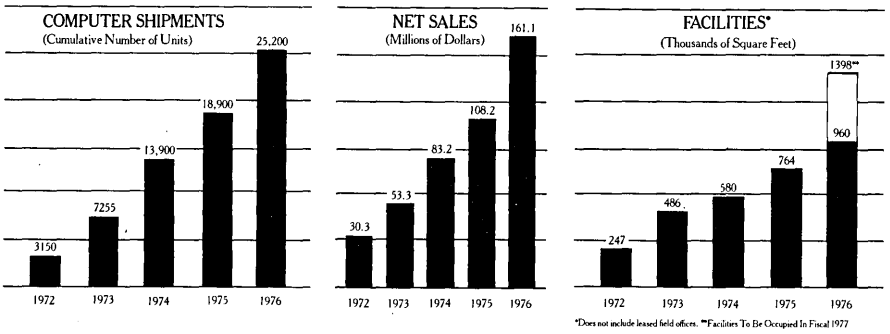

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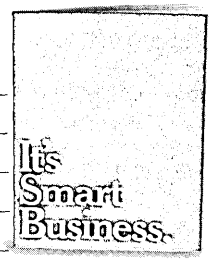

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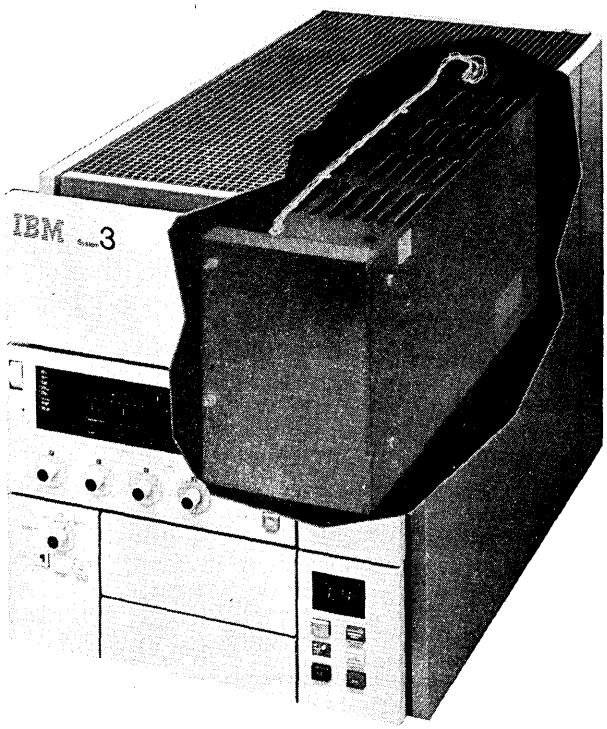

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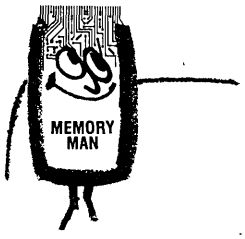

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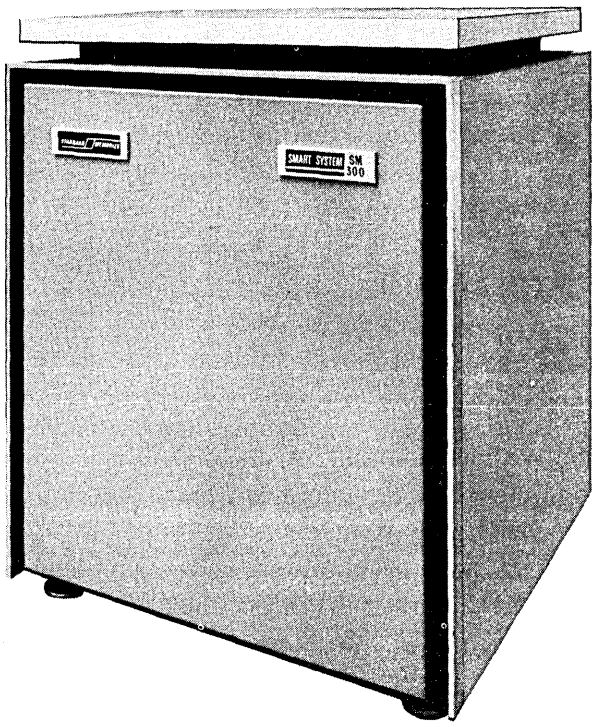

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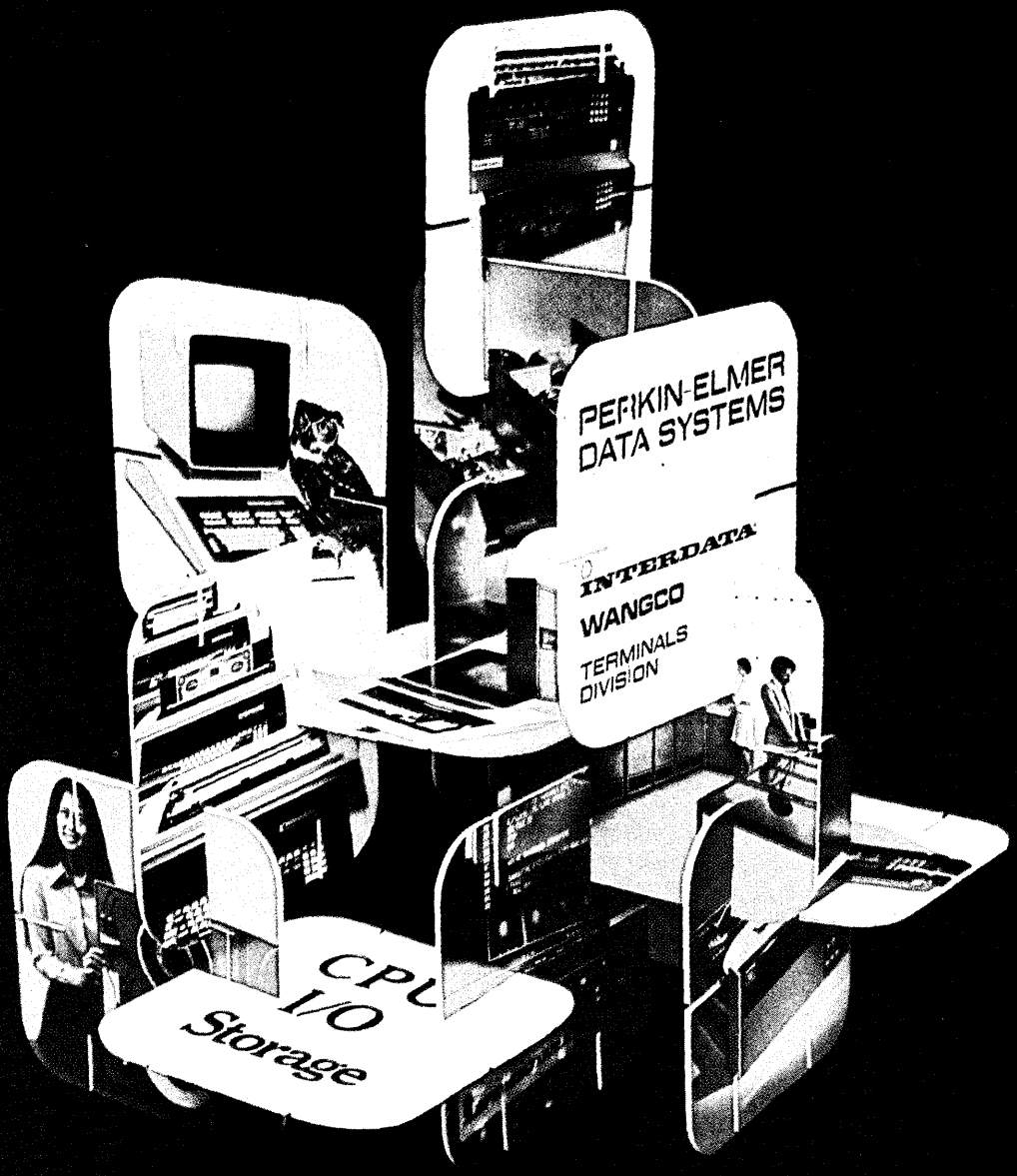

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CIRCLE 80 ON READER CARD

Prentice Hall, 1976) has postulated that active users of a dictionary should include general management, auditors, spontaneous users of terminals, application planners, data base management, the data administrator, systems analysts, and programmers.

Clearly it is difficult to imagine an environment where, at a minimum, data administrators, systems analysts, programmers, and auditors would not all independently wish to access information on the dictionary. In this environment, a free-form or easy to use English-like query language in an on-line capability can be very important.

4. Does it support on-line interaction?

Some dictionary systems have been designed to run only in a batch environment, although some have been interfaced with one or another teleprocessing product for availability in an on-line environment. Unless management wishes to print out the dictionary's contents on a periodic basis, generating a lot of paper, on-line access is key. (When the dictionary is printed you're never sure the printed version you have is the latest. Only on-line inquiry can verify this.)

Also, a facility to support "keyword" query is desirable. The other part of on-line interaction is the ability to update; some systems may support query but not on-line update.

5. What kind of reports are available?

All of the packages come with many different standardized report formats. These are useful, but some of the packages also have free-form reporting capability with the equivalent of RPG report generation. Also, a USER EXIT capability for applying other RPG packages to a dictionary file is sometimes available. These additional abilities are essential for custom tailoring reports.

6. What about automatic interface to existing programs?

A dictionary package will usually be introduced in an environment where a large number of COBOL or PL/1 programs already exist. The ability to automatically create data entries from the data divisions of these programs is a significant aid.

7. What kind of security is available?

Some feel that because the dictionary gives a model of the corporate data, that the perfect fraud could best be tested by analyzing it through the relationships contained in the dictionary. In any case. with all information concerning the corporate data resource located in the dictionary data base, it is clear that responsible management requires control of access to those definitions. Note that the level of security mechanisms offered by the various packages differs substantially.

8. "What will it do to the overall systems if we change the structure of this data element?" answers.

Some of the systems allow operation in a "simulation" mode whereby various structure or individual data type changes can be made and the results simulated. This is a distinct aid to the systems planner.

The most general and useful structure for this capability would be when a system would allow definitions in three categories, "Superceded," "Effective," and "Proposed" with only one Effective set of definitions being allowed concurrent with an unlimited number of Superseded or Proposed definitions. Naturally, the system should block any attempts to make changes in the Effective or Superceded modes.

9. What COPY*ing facilities are available?*

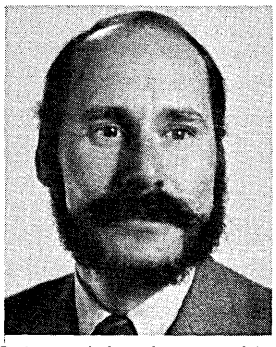
To be really appreciated by the programming staff, the ability to automatically generate data descriptions and COBOL, PL/1, or assembler code from existing definitions in the dictionary is important.

10. What automatic controls are provided?

Synonyms or several different names for the same definition may be all right and can be controlled by the dictionary. Homonyms or one name with different definitions are treacherous, however, and the package should enforce uniqueness here.

Conclusion

The 1970s have witnessed the emergence of data base and DBMS technology from the haven of the dp sophisticate into the real world. From now through the early 1980s, it is hard to believe that the use of data dictionaries will not follow a similar path as they become more appreciated in their role as controllers and as basic tools for analysis and design. Not only does it seem likely that most DBMS users will acquire data dictionaries for assistance in managing the corporate data resource, but many of the non-DBMS users will also analyze the advantages of a data dictionary for their environment. ❋



Mr. Schussel is vice president of the American Mutual Insurance Companies in Wakefield, Mass., where he is helping to use data base and data dictionary concepts for enhancing older non-flexible systems. Schussel is active on the Governor's Advisory Committee on Computers (Massachusetts) and has been Course Director of AMR's Data Base Design Course since 1971.

DATA DICTIONARY VENDOR INDEX

For more information about the data dictionaries mentioned in this article, either contact the vendors listed below, or circle the appropriate number on the reader service card bound into this issue.

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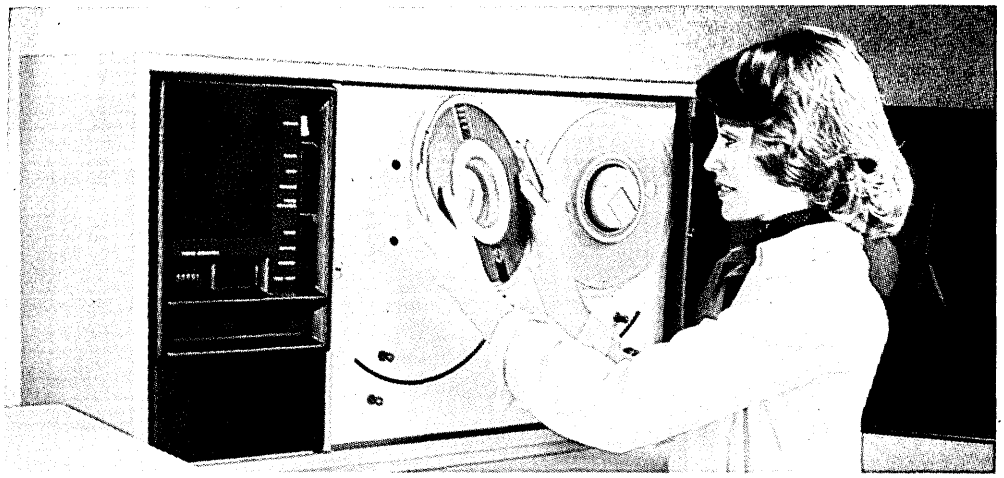

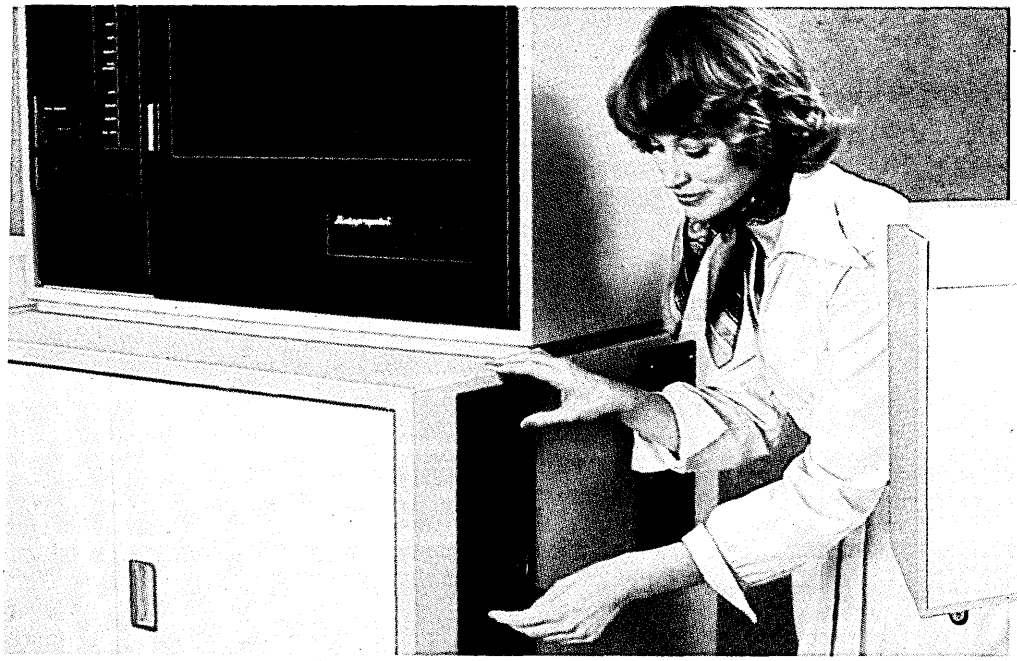

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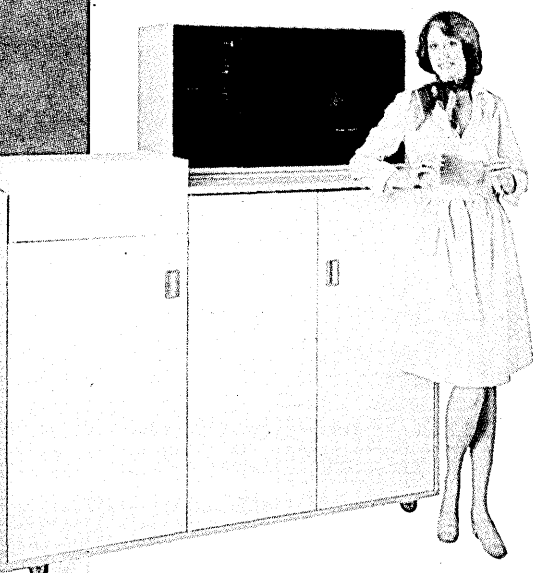

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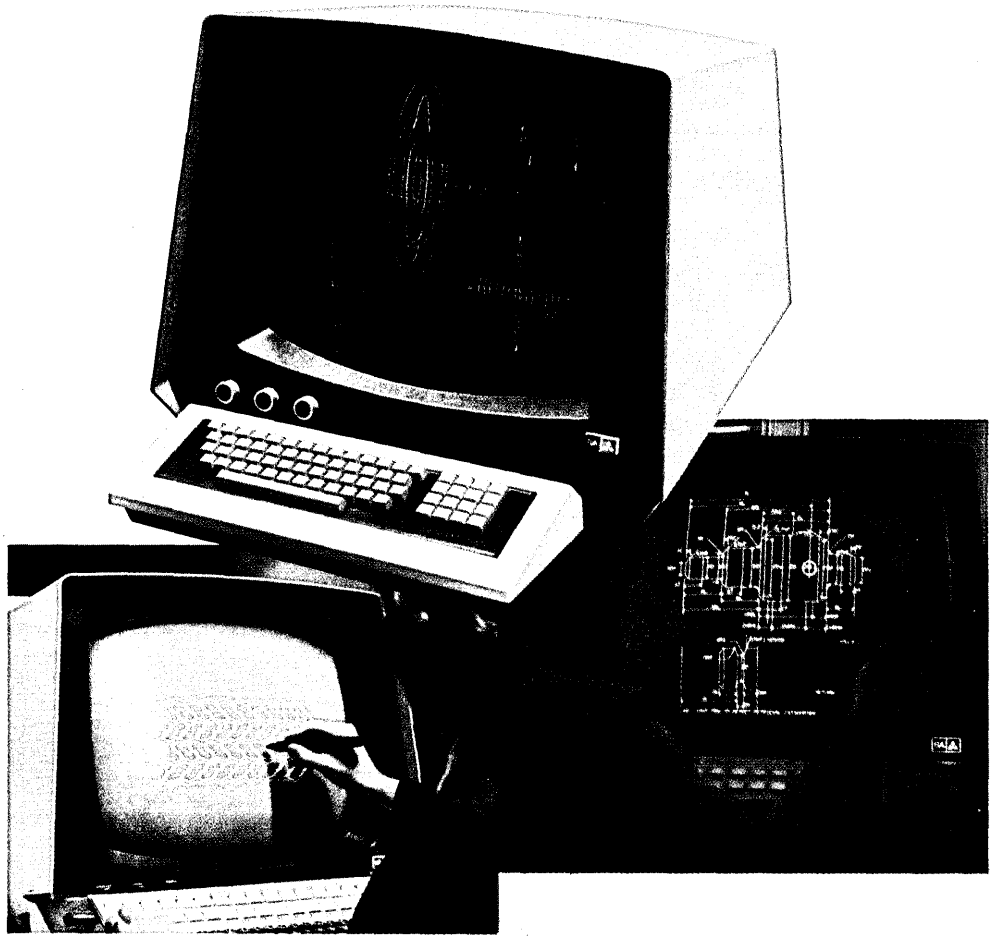

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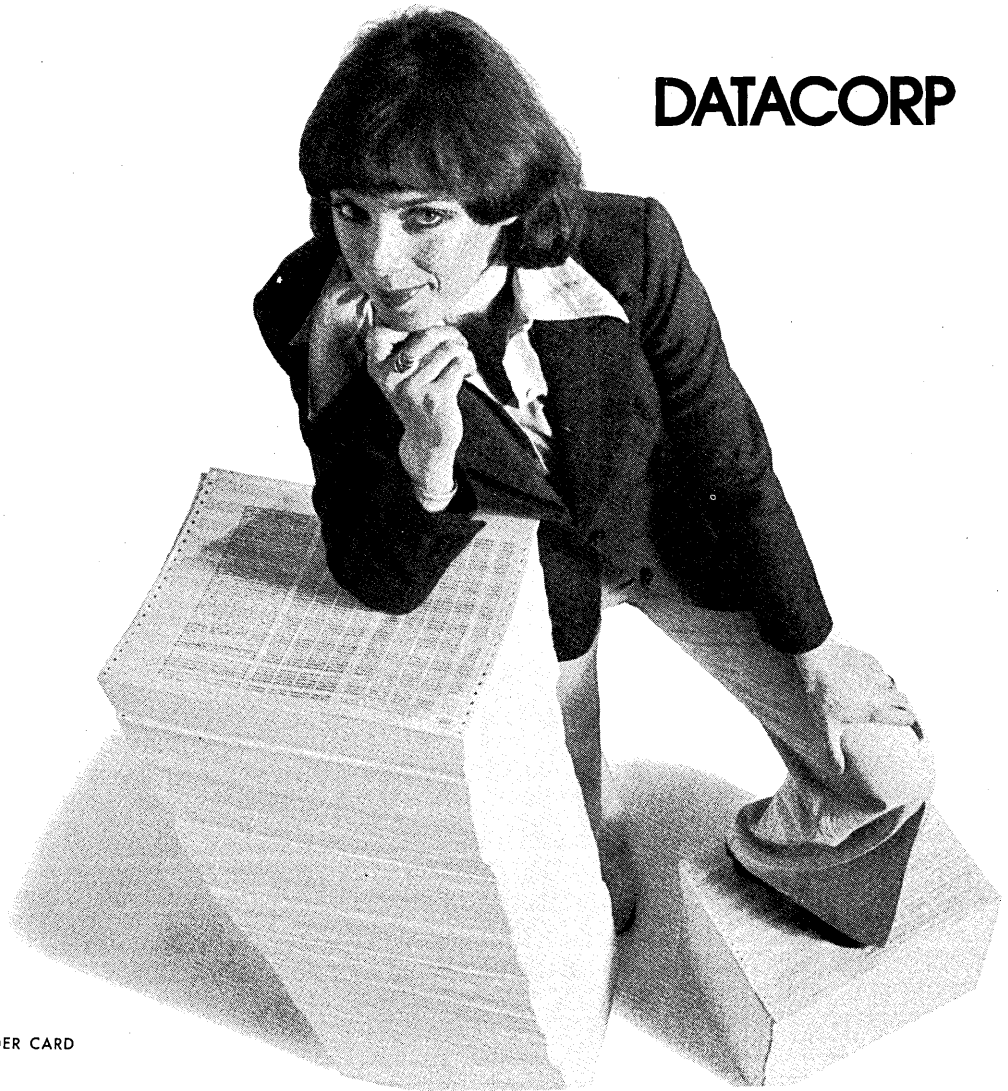

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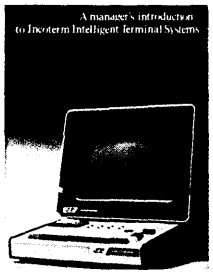

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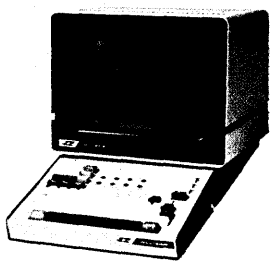

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Structured Programming in BASIC

by Peter B. Worland

True, the language is not exactly suited to structured programming—it's used mostly because it's there. Let's make the best of it.

Some proponents of structured programming have argued that it is not possible in unstructured languages like standard FORTRAN and especially BASIC, and that the use of such languages actually implies the need to carry out structured programming in a "higher level" language with subsequent translation by a compiler or preprocessor into the unstructured language, hand translation being considered impractical.

Basic Control Structures

Certainly BASIC should not be used as the vehicle for the systematic development of algorithms. But it is possible to provide control structures in BASIC which lend themselves well to hand translation from a "higher level" language, without an "almost superhuman" discipline. The approach to be discussed below works quite well.

The primary reason for considering BASIC in this context is its general availability (or rather, the unavailability of ALGOL, PL/1, PASCAL, etc.). There are versions of BASIC available from computers on the order of an IBM 370/165 down to the smallest DEC PDP-8. Like the proverbial mountain, the language is used because it is there (or perhaps because it *was* there). Also, for teaching purposes, BASIC is one of the easiest programming languages to learn. Furthermore, because of its string handling capability, it is more appealing for a general class of students than is FORTRAN.

The present scheme for structured programming in BASIC uses six control structures. It is important to note that the approach shown below can be implemented without a preprocessor. The examples below are given in terms of the UNIVAC 1100 Series BASIC, UBASIC.

Simple sequence

The first, and most elementary structure, is the simple sequence, which consists of a sequence of instructions without any transfer of control state-

```
        IF   condition                                  THEN m
kREM        THEN (optional comment)                     GO TO n
m                 [do this if the condition is true]
pREM    END IF
n
        ...

10      IF   X < = 50                                   THEN 40
20                                                      GO TO 80
30          THEN DOUBLE THE WEIGHTING FACTOR
40REM             LET W(I) = 2 *W(I)
50                LET T(I) = T(I) + W(I) *X
60                LET I = I + 1
70REM   END IF
80      ...
```

Fig. 1. The IF-THEN structure with an example.

```
        IF   condition                                  THEN 1
kREM        THEN (optional comment)                     GO TO n
1                 [do this if the condition is true]
                                                        GO TO p
mREM        ELSE (optional comment)
n                 [do this if the condition is false]
        END IF
p       ...

100     IF   N1 = M                                     THEN 130
110                                                     GO TO 180
120REM      THEN FOUND FORMER EMPLOYEE
130               PRINT N1, N2, T
140               LET S = S + T
150               LET W = 1
160                                                     GO TO 220
170REM      ELSE CONTINUE SEARCH
180               LET I = I + 1
190               LET M = N(I)
200               LET W = −1
210REM  END IF
220     ...
```

Fig. 2. The IF-THEN-ELSE structure with an example.

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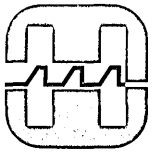

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ments. For example:

```
READ A, B, C
LET X = (A + B + C)/3.0
LET Y = SQR(X)
PRINT X, Y
```

is such a sequence. This sequence could be delimited by BEGIN and END *comments* (using REM statements) to give the appearance of a block structure, but they are not really necessary with this approach. The fact that such sequences always contain, or are nested within, other structures is sufficient to delimit them.

IF-THEN and IF-THEN-ELSE

The IF-THEN and IF-THEN-ELSE control structures may be implemented by means of REM statements. Figs. 1 and 2 contain the general form and an example of the IF-THEN and IF-THEN-ELSE structures, respectively. In the figures, k, l, m, n, and p represent line numbers.

In both cases the box is given for emphasis. The code in the boxes looks very much like the corresponding construction in ALGOL or PL/1. And that is the intention; it is quite natural to write this part of the code first as a refinement of the program development process, and then fill in the necessary GO TO's and REMarks to *force the structure to operate the way it looks.*

The use of REM statements this way may seem quite awkward and rigid. The extra step of putting in GO TO's becomes nearly automatic with a little practice, and coding *must* be a rigid process with creative program design preceding it.

It should be noted that GO TO's must be used in a language like BASIC, but only to implement the control structures given here, if possible. Also, note that the GO TO's are placed as far to the right as possible, and the REM's to the left, to improve the readability of the programs.

A nice feature of this approach is the ability to use comments with the THEN and ELSE keywords, as in the above examples. This feature is important in the formation of indefinite loops, to be discussed below.

Definite loops—those whose termination depends on a counter of some sort—are easily handled using FOR-NEXT loops. No special REMarks are needed since the FOR and NEXT statements clearly delimit the loop.

DO-WHILE and DO-UNTIL

Indefinite loops—those whose termination depends on a change in the value of some parameter other than a counter—are another matter. Generally they are implemented as a DO-WHILE or DO-UNTIL type of control structure. This type of control structure can be simulated in BASIC as shown in Fig. 3.

```
1REM    LOOP (optional comment)
k           ...
            ...
mREM    ***EXIT FROM LOOP (optional comment)
            IF condition THEN    p
            ...
nREM    END LOOP (optional comment)                    GO TO k
p       ...

200REM  LOOP WHILE SCORE = 0
210         READ N, S
220REM  ***EXIT FROM LOOP WHEN END OF LIST
230         IF S < 0 THEN 280
240         LET S1 = S1 + S
250         LET S2 = S2 + S*S
260                                                    GO TO 210
270REM  END LOOP
280     ...
```

Fig. 3. An indefinite loop structure with an example.

```
1REM    ON e  GO TO m1 , m2, . . . , mk
m1      CASE 1: (optional comment)
            [do this if e = 1]                         GO TO r
mREM    CASE 2: (optional comment)
m2          [do this if e = 2]                         GO TO r
            ...
pREM    CASE k: (optional comment)
mk          [do this if e = k]
qREM    END CASES
r       ...

300     ON INT (X)/5+1 GO TO 320, 350, 350, 350, 380, 380

310REM  CASE 1: 0 < = X < 5
320         LET Y = X + 2
330                                                    GO TO 400
340REM  CASE 2: 5 < = X < 20
350         LET Y = X * X
360                                                    GO TO 400
370REM  CASE 3: 20 < = X < = 25
380         LET Y = 3 * X + 1
390REM  END CASES
400     ...
```

Fig. 4. The CASE structure with an example.

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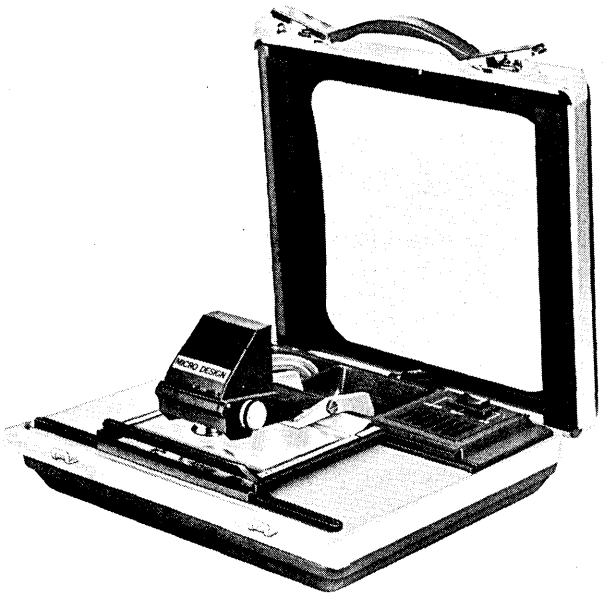

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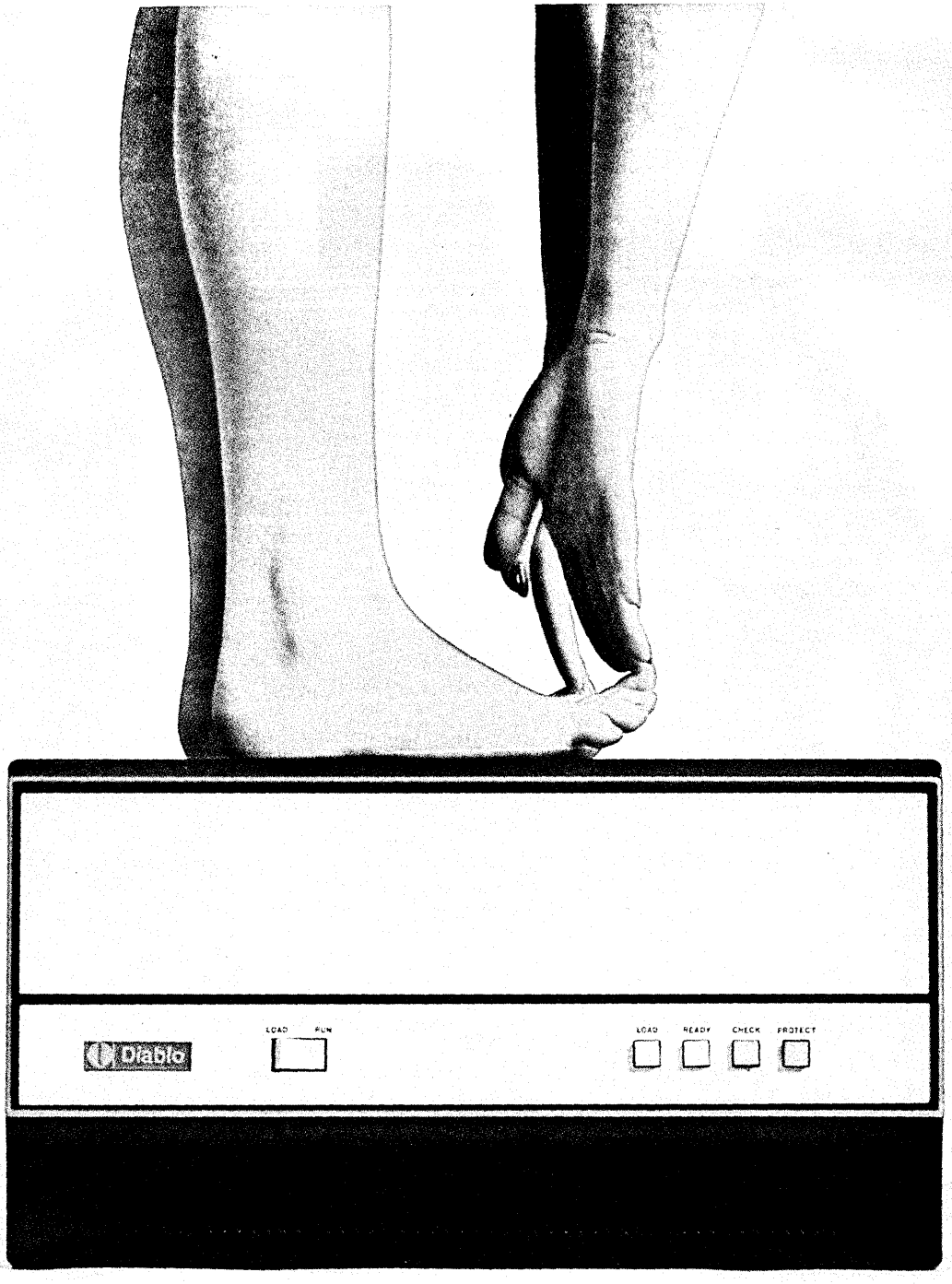

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Note the effective use of the comments following the keyword LOOP. Again, a single GO TO is used to implement the loop. The awkwardness is in the exit from the loop. An IF statement must be used, and it should be clearly labeled as an exit. A comment can also be used here to indicate the reason for termination.

CASE

The sixth and final control structure proposed here is the very useful CASE structure, which is a generalization of the IF-THEN-ELSE construction. The general form, together with an example, is given in Fig. 4.

Once again, appropriate comments can be very effective. The key to the use of the CASE structure is in the determination of the values of the integer expression *e*, and in the fact that the number of line numbers in the GO TO list can exceed the number of cases if some of the numbers are repeated.

The above control structures can be implemented in BASIC without a preprocessor; a preprocessor can be designed. This means that the REM statements and GO TO's would not be necessary to implement the structures. But the use of a preprocessor also has its drawbacks. Ideally the structuring facilities should be built into the compiler/interpreter. A preprocessor will accept a "structured" BASIC program and produce "standard" BASIC as output to a file which must be executed later as a BASIC program.

This is in itself an awkward business; the user is running two programs instead of one. To debug such a program the user may have to examine the output from the preprocessor as well as the compiler/interpreter. For very small systems (such as an 8K PDP-8) this approach may not be possible at all.

The use of the above control structures in a BASIC program can significantly improve the readability of the program by simplifying the control paths. Certainly the use of these structures will not guarantee a well-structured program; but neither do they do so in ALGOL or PL/1. The structure is really determined not in the coding, but in the design stages of programming.

Certainly structured programming is concerned not only with the control structures, but also with the design process. But the process of algorithm design should really be language independent, except for the last refinement step, and consequently will apply equally well to programming languages other than BASIC. ❋

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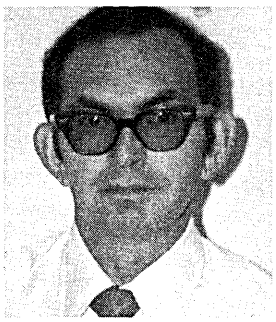
"Would You Believe Structured FORTRAN?," Hull, *SIGNUM Newsletter 8*, Vol. 4 (1973), pp. 13-16.

"On Structured Programming in FORTRAN," Charmonman and Wagener, *SIGNUM Newsletter 10*, Vol. 1 (1975), pp. 21-23.

The six control structures presented are those from Hull with improvements suggested by Charmonman and Wagener.



Dr. Worland is currently director of the computer center and associate professor of mathematics at Gustavus Adolphus College in St. Peter, Minnesota. He has held computer science faculty positions at Virginia Commonwealth Univ. and the Univ. of Nebraska-Lincoln. His current interests are in numerical analysis, programming languages, and computer science curriculum development. He is the author of a forthcoming book, "Introduction to BASIC Programming—A Structured Approach," to be published by Houghton-Mifflin Company.

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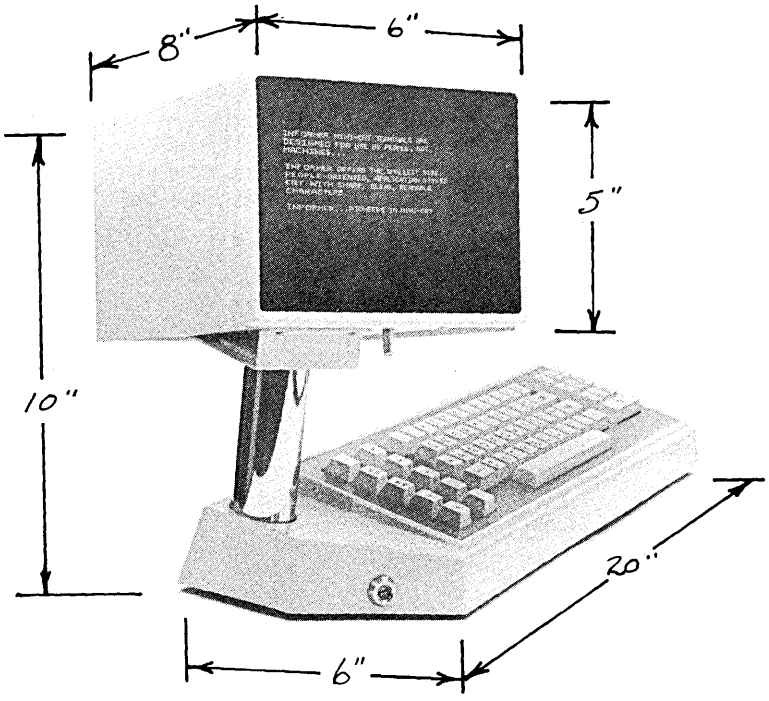

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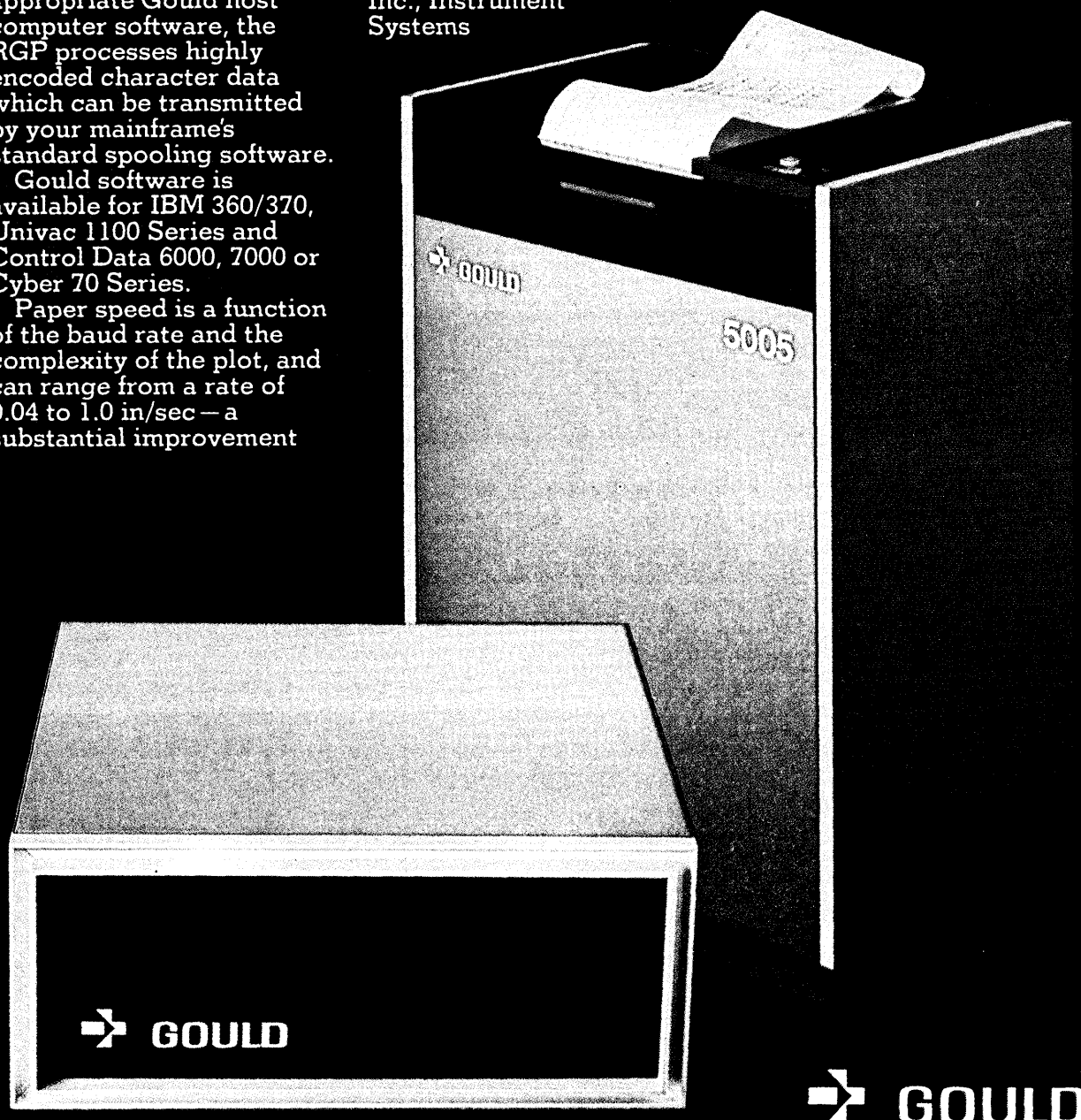

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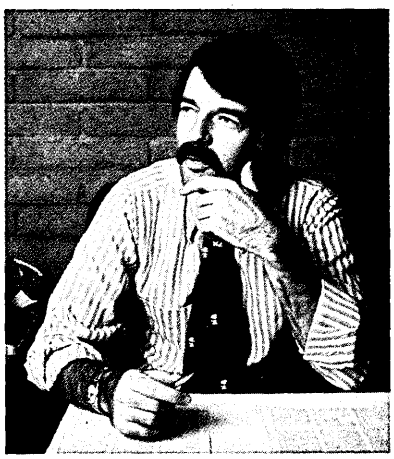
Paul A. Strassmann
Director, Administrative and Information Systems, XEROX CORPORATION



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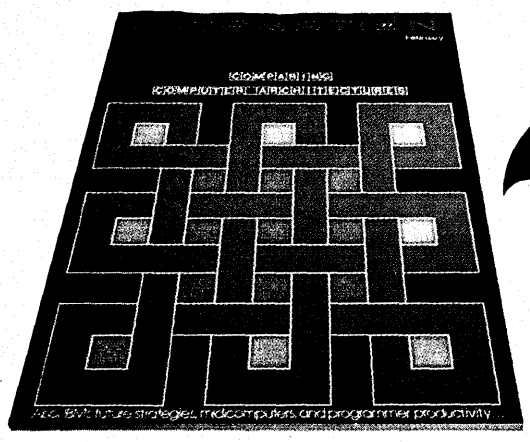

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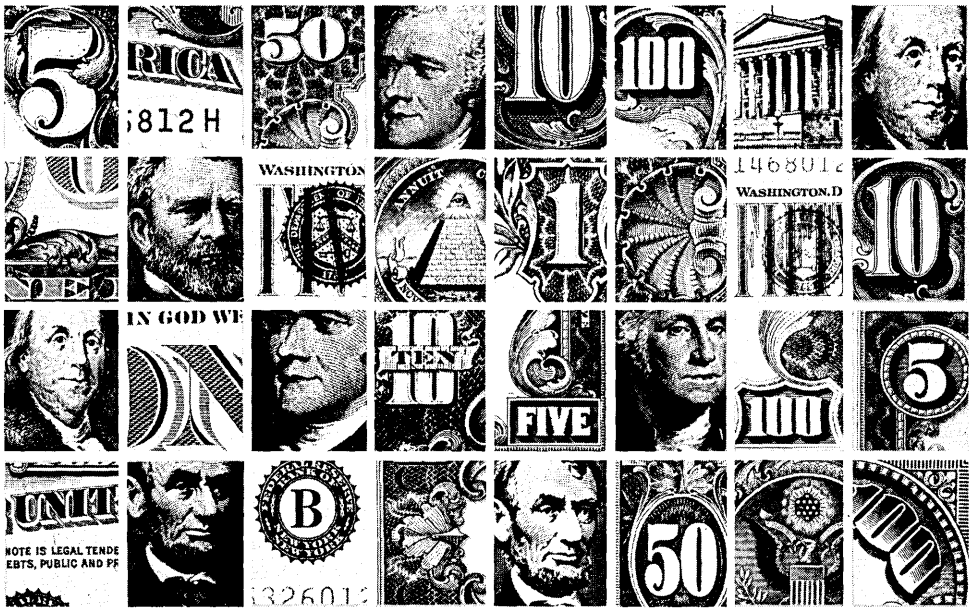

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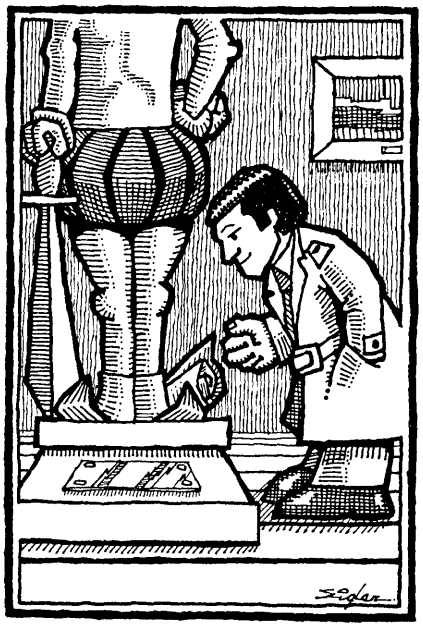
CIRCLE 44 ON READER CARD

The Programmyr's Tale

by Louis Fried



WHILE touring England in 1971, I happened to visit Canterbury Cathedral. As I strolled through those venerable halls, hallowed by the prior attendance of so many historic figures, I happened to notice a roll of paper tucked behind the foot of a statue. I picked it up, thinking to drop it into the nearest trash receptacle, and saw that it was brown with age. It occurred to me that the paper might be an interesting curio, so I slipped it into the pocket of my raincoat.

Later, at my hotel, I started to peel off the outermost leaf from the roll. The aged, brittle paper cracked and fell to the desk top. In amazement I stared at the old English handwriting . . . "Wrytten in Parliament for want of a better activitye, on thys Second day of July, Anno Domini 1386, Geoffrey Chaucer."

Knowing that Chaucer had been elected to Parliament in that year (and that he had written the *Tales* shortly thereafter) I immediately suspected that I might have a treasure in my hands.

I have spent the last six years painfully reconstructing the following text from the fragments of faded and cracked paper. And I have been amply rewarded by being able to present to the world a heretofore lost fragment from the famous *Canterbury Tales* entitled, "The Programmyr's Tale."

THE PROLOGUE OF THE PROGRAMMYR'S TALE

All with that jollye companye
So also there chancet to be
A certayn scribe, wha all could see
Was learned in programmyrie.

The wife of Bath, being full bolde
And having supped and ta'en her ale,
Called out to him, "My storye's told,
Now, gude lad, let's hear your tale."

Thys programmyr seemed mickle dour
But oft was head wi' some sly jeste.
A squint did ayde hys visyon poor,
And quills and papers filled hys veste.

mickle (greatly)

Two toes from each foote he'd
removed,
A sure sign of hys trade, withal.
For the initiates of hys lore
Maun count in hexidecimal.

maun (must)
. . . hexidecimal (16, ten fingers and six toes)

He coughed, he spat, he hemm'd,
he hawed,
He hesytated over long,
And said, after sae long he'd stalled,
"I fear ye no will ken my tongue."

sae (so) ken (understand)

"For tho' I'm learnéd, e'en well
schuled,
And have red werkes few ithers ha'
seen,
By English grammyre I'm not ruled,
I speke the tongue of the machyne."

With thys, forsooth, the companye
Did speke with one another 'til
They said that, "Tho' we ken sae wee
We'll hear your tale anon and still."

sae wee (so little)

With 'at the programmyr raysed up,
"Be it on your own heads," said he.
"I'll tell a tale, tho' wee ye ken,
Of an unholy tragedye."

Illustration by Bud Sigler; Joan Lesser/Etcetera

HERE BEGINNETH THE PROGRAMMYR'S TALE

The tale I'll tell is of a Kynge
Wha reignéd in a far countrie.
He hight Kynge Abacus, and the
thynge
That 'mused him most . . .
machynerye.

hight (was named) 'mused (amused)

Through a' the length of a' the world
And a' the span of Christentie,
Kynge Abacus sought every churl

(Continued on page 162)

Wha ken'd aught of thys mysterie.
And swyche strange names he heard
them called,
As "Mechanick" and "Engyneer"
And "Mathemátycian." Apalled,
He asked advyce of hys court seer.

swyche (such)

The seer quothe with full curtesye,
"My liege, I make thys true
confession,
Your people hath grete miserye
Whilst you are filled with thys
obsession."

grete (great)

"The Northmen raid townes grete
and small
And pillage up and down the coast
Whilst all your knyghtes sit in the hall
And brand and armour it doth rust."

brand (sword)

"Gif ye maun spend your time with
thys
Obsession with mechanyck sense
Then use it for your people's gude,
I wis
That it would make a fine defense.

Gif (if) wis (think, believe)

After the Kynge had hanged the seer
For being sae unseemly rude,
He bethought himself, "I do aver
The seer's advyce was really gude."

"I'll biggit myself a grete machyne
That it will all my problems solve,
And make a plan that will, I ween,
Make enemy attacks dissolve."

biggit (build) ween (think, believe)

With Math'matycian at hys side
The Kynge a mighty plan began
To biggit an Engyne, tall and wide,
Swyche as never seen by mortal man.

With Engyneer and Mechanick
He biggit a tour on the shore,
Withal of stane and not a stick,
To see wide seas and the land o'er.

tour (tower) stane (stone)

From thys high tour the watch
could see,
Whilst still on ship, the enemy.
And sound alarum unto hys liege
As how the enemy did lie.

And all within the tour was made,
From wall to wall, machynerie
That for the horse and for the blade
Deviséd would a strategie.

So then did Abacus call hys men,
And ilka knyghte and ilka squier,
That could with gude will hand a pen
He bade him be a programmyr.

ilka (each) hand (hold)

And thys intent, thys Grete Machyne,
Was made, i' truth, of wire and words,
So that, where Generals might ha'
been,
Machynes could soon command men's
swords.

Anon, with programmyng compleat,
The Kynge called for a Systemes
Teste.
And all hys court around did meet
As he the start button ypresst.

The Grete Machyne did make a moan,
And lightes flickered within the tour,
Sae trembled even every stone
And prynters chattered hour on hour.

As all they stude, the companye,
And marvelled at the Grete Machyne,
And heard the bells and whistles crie,
The sonne sank lowe, and it grew e'en.

crie (cry) sonne (sun) e'en (evening)

And as it went tóward midde watche,
And programmyrs o'er consoles
slumped,
The Kynges courte, by the light of
torch,
Looked on, as the Grete Core
ydumped.

Full seven maids with seven cartes
Were presst to carry ye printout,
Withall it was on seven partes,
The better to be spread about.

Now ilka programmyr did werke,
And many a greying bread did tug,
For none did any duty shirk
To find and fixe ilka sma' bug.

Whilst thys grete effort moved apace,
The kyngdom's enemies presst sore.
And it became a noble race
To fixe all bugs ere there were war.

Then came a day, unto the Kynge
A herald brought the sad report
Of Northmen souldiers gatheryng
And ships approaching ilka porte.

The Kynge call'd up hys men to war
And sounded out a stout alarum.
He rede him ilka programmyr
To save hys native land from harm.

rede (advised)

The niest thynge the Kynge did hear
The Northmen twinned him o' the
porte.
They gid and harreyed wi'out fear
And o' the Kynges vassals made sport.

niest (next) twinned (separated from)
gid (went)

The Kynge bade start the Grete
Machyne
Whilst he sent pages to espie.
He wrought that wi' their e'en sae
keene
He'd know whereat the Northmen lye.

wrought (thought)
e'en sae keene (eyes so keen)

And with that data he would feed
The program in the Grete Machyne
Sae it would gie him, wi' gude speede,
The course to slei the laily feen'.

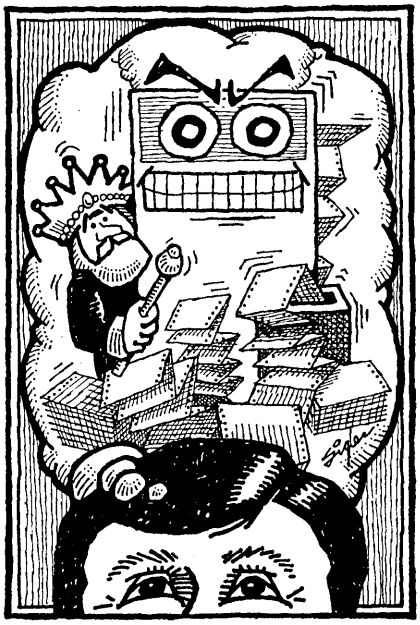
The course, etc. (The way to kill the loathsome fiends)

Full speedilye the newés rived.
The Northmen tranckled 'cross the
lea.
And they reported (who survived)
That stiffe in stowre were the enemy.

rived (arrived, traveled)
tranckled (traveled)
stiffe in stowre (strong in fight)

The Kynge ypresst the button greene
And called on ilka true yeman
To stand hys post at the Machyne
And generate the battle plan.

yeman (yeoman, servant)



'Mid flashing lights whirling gears
The chatter of the prynters 'gan.
The Kynge made haught of all hys
fears,
Depending on the battle plan.

haught (light)

For three full days the prynters ran,
Yspewing paper, league on league.
From carrying paper to the van,
Thrice seven maids moaned wi'
fatigue.

van (vanguard, battlefront)

(Continued on page 166)

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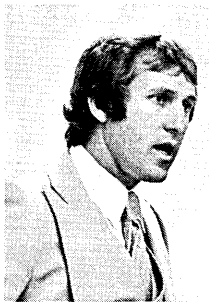

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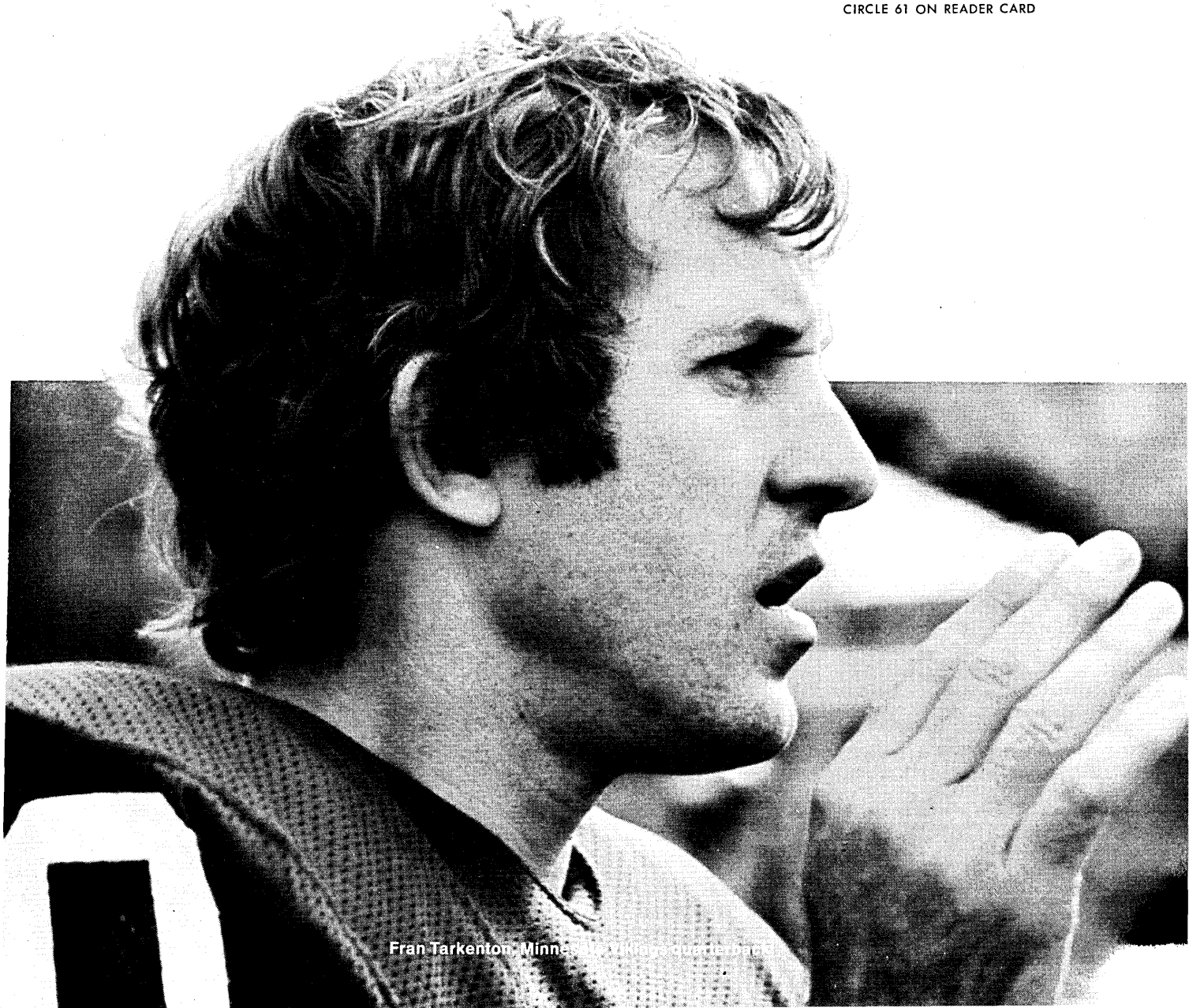

Distributed Confusion

There are almost as many approaches to distributed processing as the
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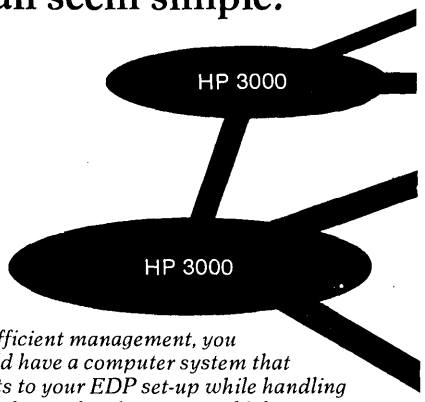

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ire computer companies offering them.
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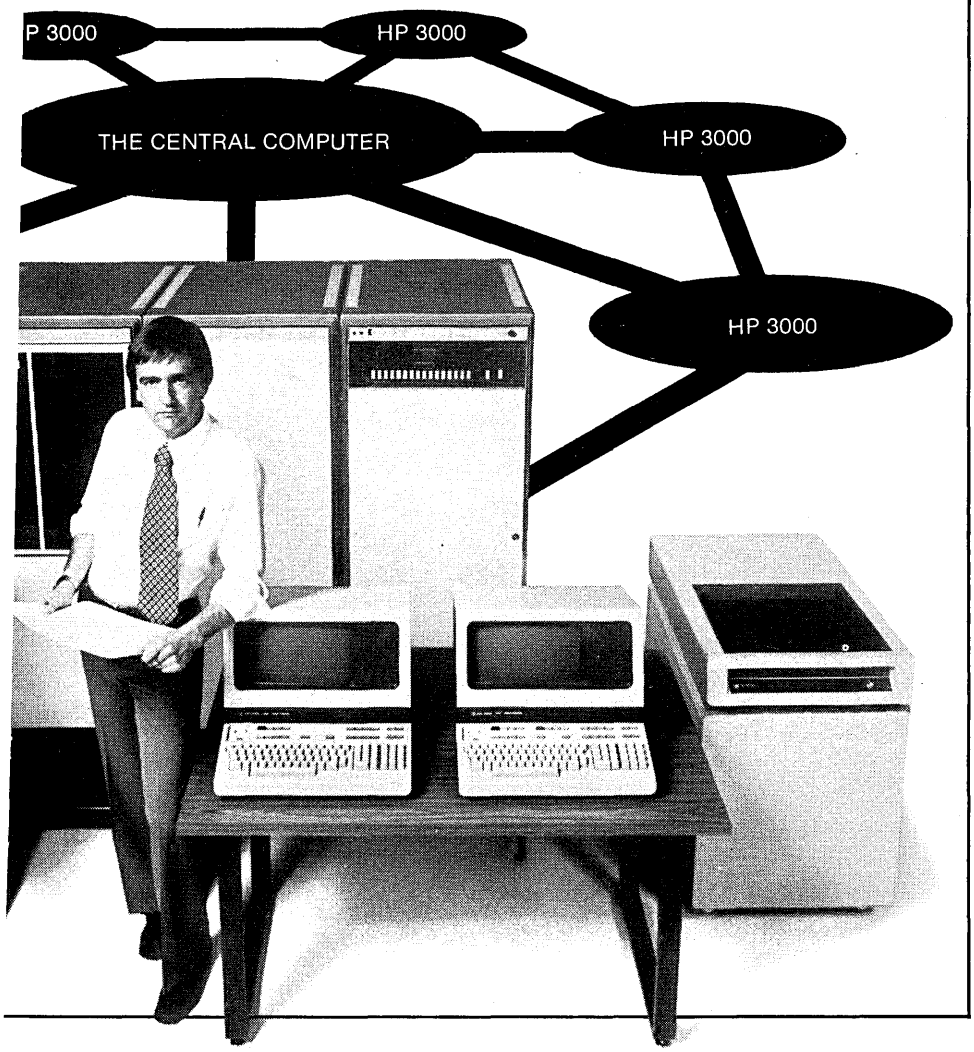

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PROGRAMMYR'S TALE

Anon a squier called to the Kynge,
"The enemy is at the yates,
My liege, if ye'll no' do sommethynge
Our life is forfeit to the fates."

yates (gates)

At that a strange sound fill'd the air,
A rhythmic rattle, o'er and o'er,
An harmonic that did bid fair
To shake the tops of every tour.

The prynters that in unison
Were ilka pryntyng the same line
Shook tour and wall and ilka stone,
And made of mortar, powder fine.

First fell the arches, then the wall,
And then the tour itself did sway,
As stane fro' stane began to fall
The courtiers did fiercely pray.

stane (stone)

At length the tour began to moan,
The whirlyng gears began to clash,
Midst smoke and dust and crackyng stone
The Kynge ywatched the Systeme crash.
The Kynge to hys programmyrs said
(With wae hys body was estooped)
"Wha' was the cause of our sair dread?"
They answered, "Sire, the program looped!"

wae (woe) estooped (stooped, bent)
sair (sore)

The Kynge ycursed with hys last breath,
"My countrie 's ta'en by Northmen wilde,
All programmyrs, on pain of death,
Are evermore from here exiled."

ta'en (taken)

Sae now I gae from shore to sea,
My soul and spirit sair yflayed,
And ilka foote wi' digits three,
I search a place to ply my trade.

At thys the merrye companye
Did laugh and so themslves bestir
With every sort of jollitye,
For who would hyre a programmyr?

SAE ENDETH THE TALE OF THE PROGRAMMYR

Louis Fried has recently joined the staff of Stanford Research Institute as a management systems consultant. He has been director of MIS for several firms including Ampex, TI Corp. of California, and Bourns, Inc.

RAMIS DOS

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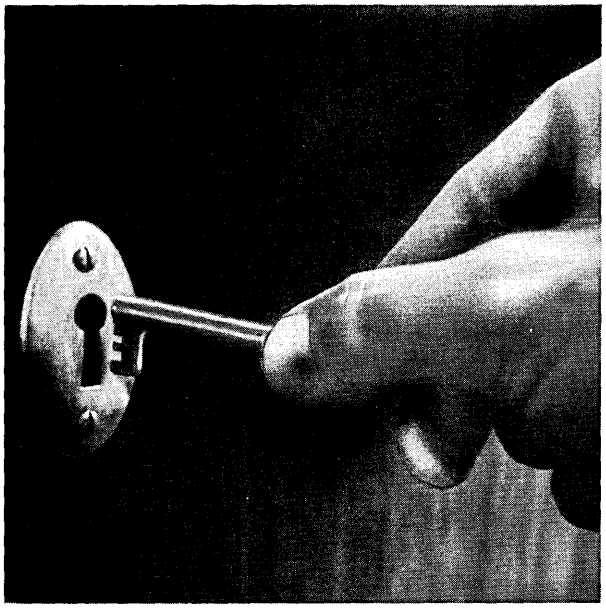

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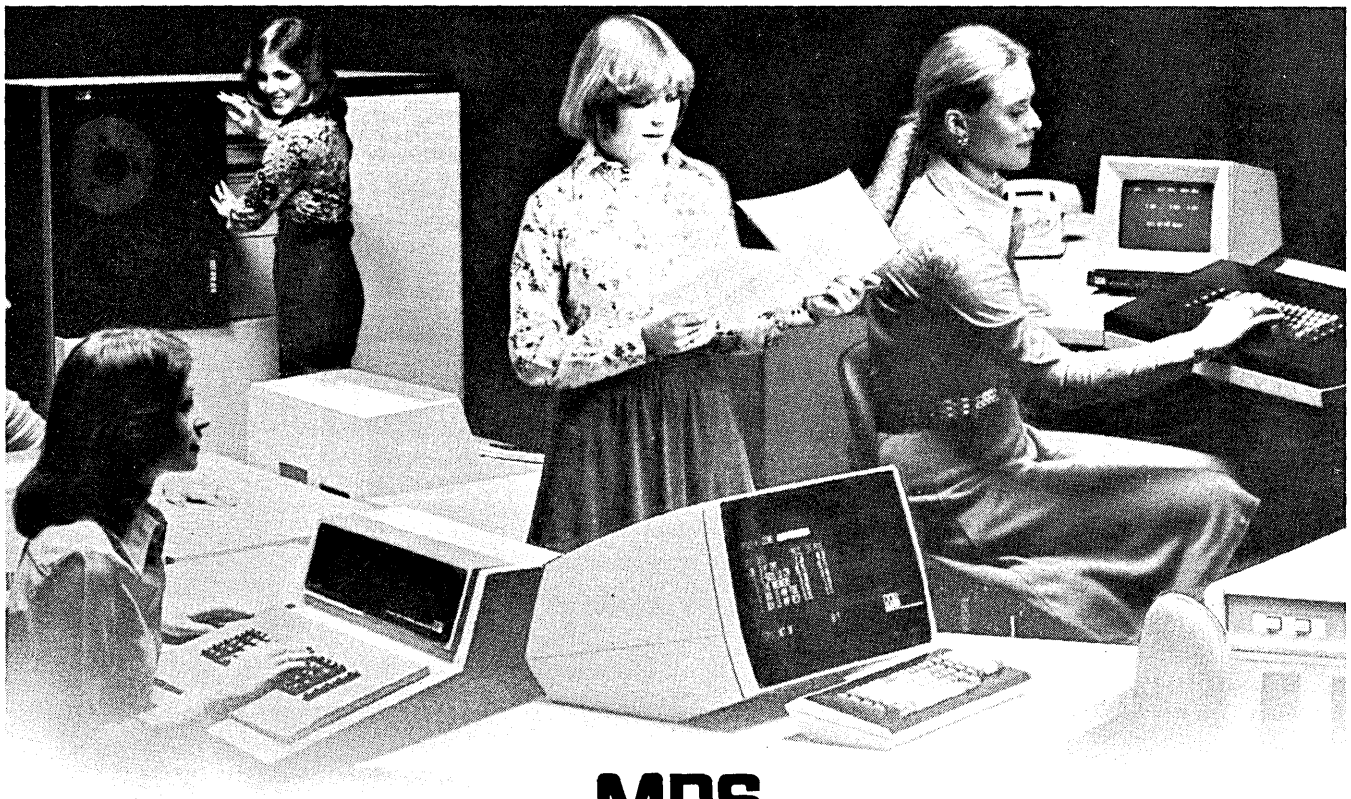

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Wall Street

Shakeout on Wall Street

As Business Tightens on the Street, Mergers and Increased Use of DP Threaten Service Industry

John E. Letson, senior v.p. of the computer and communications systems group for Bache Halsey Stuart, the brokerage firm, has his work cut out for him. Letson's company has just merged with Shields Model Roland, Inc., another brokerage house. Now Letson and his staff must convert the Shields data communications operation—the firm had been tied onto the Western Union Sicom system—onto the Bache 2400 and 4800 baud data communications network. Concurrently, Bache plans to load the Shields internal data processing operation from the Shields IBM 370/30 onto its own Univac 494S. And like everything else on Wall Street, the conversion has to be completed yesterday, if not sooner.

Letson is one of the lucky ones. Caught in a financial squeeze because of sharply reduced commission rates on stock sales (the old, set rates were dropped a little over a year ago) and the public's continued lack of real enthusiasm for the market, firms on Wall Street, one of the country's major dp and data communications users, are experiencing an intensive shakeout, one that will directly or indirectly impact every dp shop in the industry, as well as the vendors that sell to them.

Wall Street traditionally has been a big time spender when it comes to automation. As Bernard A. Weinstein, v.p. of communications for E.F. Hutton & Co. notes: "Even though the firms down here are relatively small compared to Fortune 500 companies, they often spend more on data processing and data communications than a lot of far larger companies."

But given the current tremors rocking the industry—a half dozen firms have merged in the past few months and other consolidations are imminent, Wall Streeters say—users are necessarily tightening their belts and vendors are scratching to provide the industry with what it needs at a price it can afford to pay. Underlying all this is the question, who will survive and who won't?

Service industry vulnerable

On the vendor side, seemingly one of the most vulnerable targets is the service industry, firms like Automatic Data Processing or Midwest Stock Exchange Service Corp., that have traditionally handled the massive "back office" (where the stock trades are processed) function for many brokerage outfits. But as these firms merge, the service companies are losing some of their customer base. "If this merger syndrome continues, it could hurt them as far as their operations work is concerned," concludes Donald E. Brown, a senior v.p. in charge of communications and dp for Paine Webber Jackson & Curtis, Inc.

Brown's own company recently merged with Mitchell, Hutchins, Inc., which had been farming its dp work out to both Midwest and Automatic Data Processing. Now the Mitchell work will be loaded onto the Paine Webber system. Scratch one customer for Midwest and ADP.

Similarly, in the recent Spencer Trask & Co. consolidation with Hornblower & Weeks-Hemphill, Noyes, Inc., Hornblower decided to run Spencer's dp operations on its own computers. Previously, the firm had been using Midwest Service. Scratch another Midwest customer.

Positive side

Yet there's a positive side of the service picture emerging from the present Wall Street environment as well. As the competition to survive becomes more fierce, houses that had no dp capabilities at all, or were saddled with small, inadequate internal systems, are turning

Arthur Lavine

DONALD E. BROWN
Paine Webber v.p. says merger syndrome is going to hurt service bureaus

to the service firms for help.

"With these mergers business is falling off on one side and coming on another," says Dennis Kasun, v.p. of marketing for B.T.S.I., the Control Data division that provides service and software to the brokerage industry.

As an example of what Kasun's talking about, B.T.S.I. recently signed on Drysdale & Co., a firm that had been manual, was rapidly expanding, and wanted to automate.

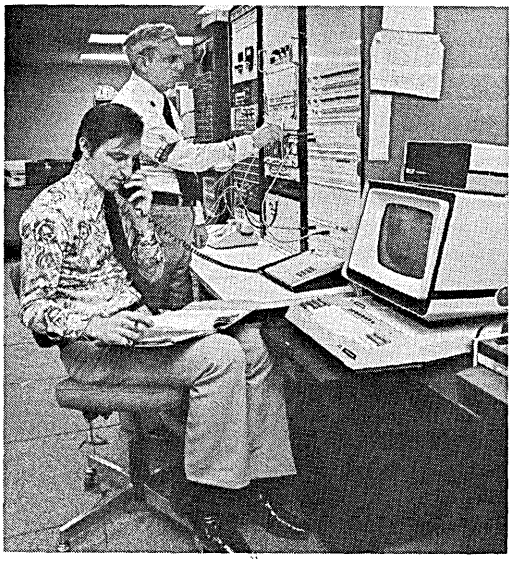
ADP, in turn, just brought Robinson-Humphrey Company, Inc. into its fold. That regional, Atlanta-based brokerage concern made an attempt to install an IBM order entry system, but the firm's salesmen weren't happy with it. Among other things, they complained about the lack of fractions on the keyboard (stock prices, of course, are quoted in fractions) and the fact that crt screens often required as much as a minute and a half to clear—far too long in the highly volatile market environment. Consequently, the firm decided to bite the bullet, drop the IBM system, and turn to ADP.

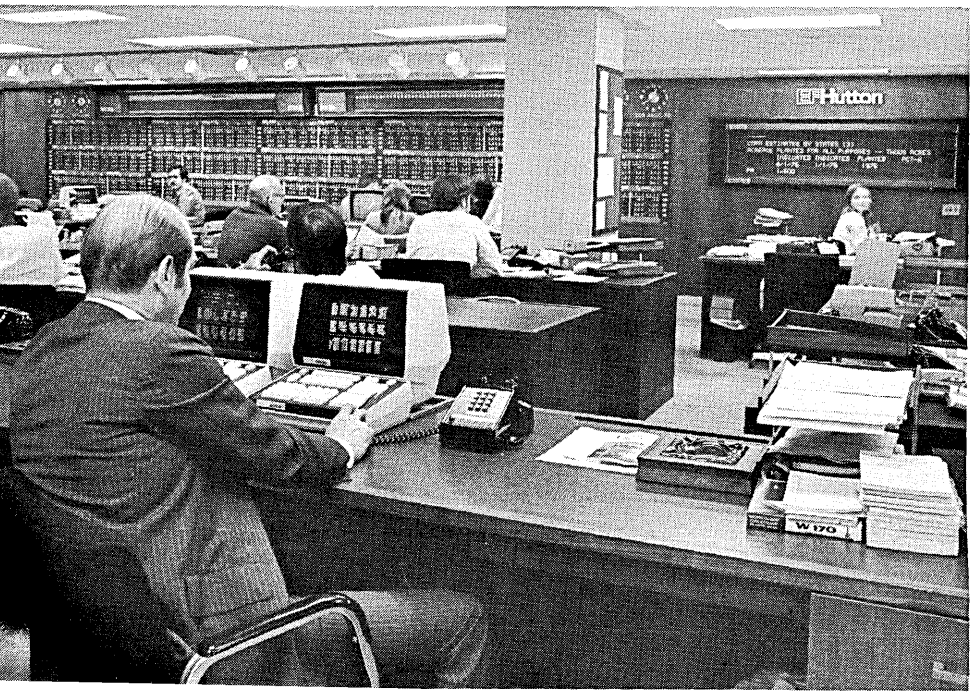
Service firms respond

At the same time, many service firms are responding to today's more competitive environment with analytical programs to support the industry's attempt to market products like options, commodities, and fixed income (Treasury Bills, Certificates of Deposit) investments. ADP, as an example, has successfully peddled a management and trading tool for GNMA (government-backed mortgage securities) securities to firms like Dillon, Read & Co., Inc. B.T.S.I. has sold a number of software packages for margin trading that go for up to $50,000, plus another $10,000 to $20,000 for conversion. "The brokerage houses could probably develop a similar package themselves for about the same cost," Dennis Kasun explains. "But this is a proven package they can begin using almost immediately, whereas to do it on their own would probably take a year and a half."

A number of other firms have also enjoyed considerable success selling packages to Wall Street. "Right now software is probably the most important game around in this business," offers William F. Cordo, a senior v.p. in charge of information systems and services for Blyth Eastman Dillon. "And a lot of business is going to the independent software houses now because many of the individual brokerage firms have had trouble attracting the kind of people with the heavy backgrounds needed to develop programs internally."

Another service firm that's made substantial in-roads in the brokerage community, Monchik-Webber, designs and develops systems on a turnkey basis as an oem for Data General. It also has an options trading service that some 60 houses subscribe to in lieu of developing this tool themselves. "The actual number of firms in this industry may be diminishing somewhat," Winston P. Smith, Monchik's marketing v.p., says, but the volume of business is still strong. Today there's also a much better appreciation of, and demand for, computer-aided management tools such as ours. The people coming into the industry from business schools are used to working with computer-aided tools, and they're making more intelligent demands on their operating people."





COMPASS: E. F. Hutton's real-time system, COMPASS, soon will be upgraded into a distributed processing network with 150 minis and provide branch processing and regional processing on the minis and central processing on two IBM 370/158s. Photo at left shows Hutton technical control center which monitors COMPASS facilities with Atlantic Research Corp., network control console, and Incoterm intelligent crt terminal. In photo below, integration of Bunker Ramo System-7 quotation network with COMPASS system converts quotation terminals into dually functioning quotation and data terminals. Part of screen is used for obtaining quotes and the rest displays administrative messages, market flashes, or data on customer accounts.

Time-sharing usage high

"Half the effort, or more, today is providing analytical applications for sales support," Blyth Eastman Dillon's Cordo agrees. "And it's often cheaper to buy this outside. Consequently, time-sharing usage is tremendously high today. It's become very accepted as an additional tool."

And as the need for more sophisticated "front office" analytical tools increases, users are expecting more from their equipment vendors. Today, for example, a Quotron, Bunker Ramo, or GTE Information System can't expect to survive by merely providing a stock quotation system. Donald Brown of Paine Webber explains: "The quote information is the lowest common denominator in this business, the lifeline, and you simply can't eliminate it. But now you want the same quote terminal to have multiport capability and be able to provide a variety of real-time applications in addition to the quotes."

Another feature Brown and other users are looking for from the terminal vendors is a highly reliable printer that can be attached to the crt and be left unattended all night as the firms process their back office work. "Right now the

printer has been the Achilles heel of the terminal vendors selling to this market," Brown believes.

Vendors acknowledge need

Vendors like Bunker Ramo agree greater responsiveness is required today. "We've got to go further," Kieran Hickey, the firm's v.p. of sales for brokerage systems, asserts. "There's certainly a need to provide second and third port and eventually data base switching capabilities."

Bunker is also talking about developing MIS systems for firms that want to provide their investment managers and sales reps with real-time statistical and analytical data that can be used in a trading or customer support situation. Some firms—Goldman, Sachs & Co. for example—have developed comprehensive, easy-to-use systems like this on their own at relatively little cost.

Moreover, Quotron came out with an MIS system several years ago called Billboard. Largely on the basis of that and the fact that its mini-based terminals have the capability to provide access to a wide variety of market-oriented data bases over different baud rates and protocols (the minis act as emulators for everything from 3270s to Teletype 40s), the firm's market share on Wall Street has jumped from about 6% to approximately 40% in the past few years, it claims.

With the mainframe vendors—and now with the intelligent terminal and mini manufacturers as communications networks expand and distributed processing capabilities are added—Wall Street has also proven technologically agressive, often leading the vendors.

IBM duplicates system

Paine Webber's system, for example, is so sophisticated that IBM has duplicated it at its Raleigh, N.C., facility and is using it to evaluate performance characteristics of an unannounced MVS system it's currently developing.

Running on two 370/155s (soon to be replaced with 158s), the totally integrated real-time system operates in three phases (trade processing, settlement day processing, and on-line data collection) concurrently, and enables the firm to switch as many as 200,000 messages daily.

Perhaps most importantly in today's current expenditure-conscious climate, the most recent upgrade of the system—replacing as much hard paper as possible with crt's—was brought in within budget expectations. "We built a model before we ever began work on the system so we knew what our problems were going to be in advance," Donald Brown explains. "As a result, in an 18-month project involving $4 million in resources there was only a $20,000 overrun. You don't see the kind of seat-of-the-pants management and planning of a few years ago down here anymore."

Hutton's real-time system

Bernard Weinstein at E.F. Hutton is also going through an upgrade with that firm's real-time system, COMPASS, moving soon into a distributed processing network utilizing 150 minis and providing a three level base hierarchy—branch processing and regional processing on the minis and central processing on Hutton's IBM cpu's (two 370/145s and a 360/50, soon to be replaced by two 370/158s).

"We've had to take the lead in working with vendors and in determining the shape of developments," Weinstein says. "This is particularly true in the communications area. The brokerage business is a communications-intensive business, and every generic function is really a communications function."

What will emerge from the various systems developments and the current shakeout? Wall Streeters anticipate an increasing number of firms sharing the same data communications and data processing facilities (already Merrill Lynch, Hutton, and Paine Webber are promoting their dp capabilities to other houses); a continued effort to effect cost efficiencies with vendors while pushing for the new technologies this fast changing business requires, technologies that are increasingly the keystone to the success of the industry. "When you think about it," says Bache's John Letson, "these mergers wouldn't be possible unless the industry's computer and communications systems weren't already in place."

Another dp executive puts it less politely. "The data communications networks and the systems they're built around have made it possible for a firm in the Midwest, say, and a firm in the East to consolidate and operate economically on an integrated basis. What's really happening is that technology is saving Wall Street's collective ass."

—Laton McCartney

User Groups

Shedding the Cash Register Image

NCR's Anderson Talks of a "Vastly Different Image" in a Short Time

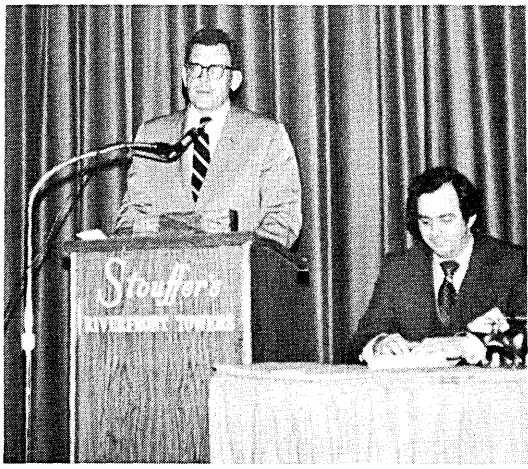
"The old cash register image, which has clung so tenaciously to our company for 90 years, is at last beginning to fade away," William S. Anderson, chairman of NCR Corp. told 656 NCR users who convened in St. Louis in late April.

Anderson's appearance before the Federation of NCR Users preceded by one day a New York City press conference at which NCR announced three new computer systems and told of more on the way. As was the case a year ago when NCR announced the Criterion computer family (May 1976, p. 144), users were given a sneak preview.

The NCR chairman told the New York press conference that "NCR today is primarily a computer systems company." He told the users that "edp products, either directly or indirectly, now represent half of our total business."

He told them that NCR has attained "a vastly different image in the data processing industry than it had a short time ago. Formerly, most of what one read or heard about the company was more negative than positive. Today it's just the opposite. At least 20 computer industry investment analysts have published studies on the company in recent months. Fifteen of those reports were favorable, three were neutral, and only two were unfavorable."

He pointed to NCR's performance in the first quarter of this year (May, p. 264) "when again our revenues, operating earnings, and bookings established new quarterly records."



NCR'S PRESIDENT, Charles E. Exley (left) made his first appearance at an NCR Users' conference late April in St. Louis. Flanking him is Charles Yahn, United Associated Grocers, Inc., Robesonia, Penn., newly elected chairman of the Federation of NCR Users.

news in perspective

R & D investment

Anderson said NCR will be investing $105 million in research and development this year. "That is twice what we spent for R&D in 1973, during my first full year as president of the company. And we have scheduled another large increase in R&D expenditures next year."

Charles E. Exley, Jr., who joined NCR last fall as president (September 1976, p. 187) after 22 years with Burroughs Corp., which he left as executive vice president for finance, told the New York press conference that NCR in 1977 "will release seven new central processor modes, of which three are multimode processors. The largest of these will be the V-8590 which has more than twice the power of the largest-scale system previously produced by NCR."

Raymond B. Smith, assistant v.p., product development and management, detailed the new offerings for the users and talked about "migration path engineering," a term that he said "highlights a design philosophy that extends the transition path into more advanced series of mainframe families to provide you, the user, with a bridge into the technology of the late and early '80s."

He explained NCR's numbering system for its computer systems families. "Each system has a four-digit number. The high order digit is the series number. The second digit is the family or processor. The third digit is the model and indicates power ranges. The fourth digit is reserved for special models, such as a special financial or retail model. Within NCR, we have reserved 8000 to 9000 for our edp systems families."

In addition, he explained, NCR uses a letter prefix to indicate the primary mode of operation for its systems—I for interactive, N for batch (multiprocessing), and V for virtual.

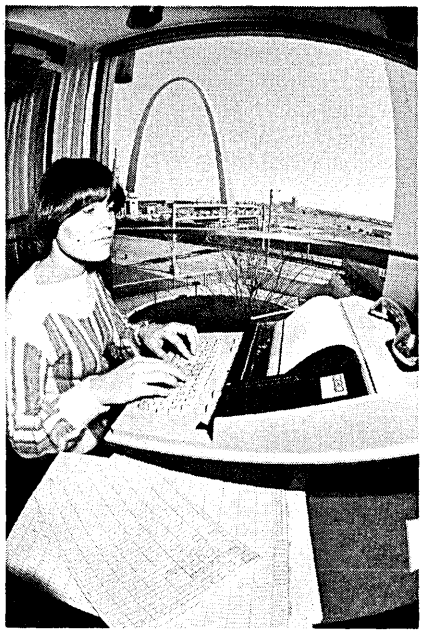
New systems

The new systems announced in April were an N model in the 8300 family, the N-8350; N and V models in the 8400 family, the N-8450 and the V-8450, and N and V models of the 8500 family, the N-8560 and the V-8560 (see page 204). Scheduled for introduction in the fall are the I-8450 and the V-8590, the high power system mentioned by Exley.

Few of the users were surprised by the announcements. Most had been pre-briefed by their salesmen and those who hadn't had "heard rumors."

And it was a Criterion computer, announced for the first time at last year's NCR users' meeting that was keeping things in order at this year's event. The Criterion 8570, first in the St. Louis area, was located at Databank Corp. in Crestwood, Mo., a data processing subsidiary of the Dyna-Group Financial Centers which includes Clayton Bank, Hampton Bank, Crestwood Bank, and Ellisville Bank. The computer, during the conference, was linked by dial-up telephone service to a small, typewriter-like Model 260 terminal at Stouffer's Riverfront Towers, site of the meeting.

Preregistration forms and checks were sent to Databank where the information was entered into the Criterion via another 260 terminal. Periodically, the computer would transmit a list of newly received data to Stouffer's. A reservations clerk made room assignments and transmitted that information back to the Databank computer.



RESERVATIONS CLERK Jane Dueker of Stouffer's Riverfront Towers in St. Louis transmits confirmation of room assignments for the NCR Users' conference to a Criterion 8570 computer at Databank Corp., Crestwood, Mo., which processed conference registration information.

On the day the conference began, the terminal at Stouffer's was moved to the registration area to check-in attendees, again transmitting information to the Criterion. Next, a series of rosters was produced for each attendee by the Databank computer at 2,000 lines per minute, and by other NCR systems at the Cooperating School Districts of St. Louis County and at the National Benevolent Assn.

First for Criterion

NCR users' conferences have utilized on-line registration systems before, but this is the first time a Criterion has been used. The 256K system at Databank was installed only last February.

Glennon Hunn, president of Databank, talked to a user group session on Century to Criterion conversion. He explained that among the services his company performs for owner banks was on-line inquiry for tellers, personal trust accounting, and automated clearing house functions.

At the beginning of the conversion period, he said, the Criterion and Century systems were operated in parallel. NCR officially turned the system over to Databank on February 5, 1977. That was a Saturday. The same day the firm unplugged common trunk peripherals for its Century and plugged them into the Criterion. "We ran all the diagnostics we could," said Hunn, "and everything functioned properly. On the next day, Sunday, we brought up our CIF (Customer Information File) master file, and it was fat city. Actual full conversion took place Feb. 10. Things that took us four and one-half hours on the Century dropped down to three hours on the Criterion." Hunn said his company had been paying $13,400 per month on a five-year lease for its Century and no dollars for software. For the Criterion it pays the same monthly rental plus software charges which brings the total to $15,606 . . . but the company attained "a 4.5% increase in throughput for one program."

Hunn mentioned the fact that his company sent an operator to an NCR operator school for the conversion and "we think we could have survived without it. We wasted a day and one-half of an operator's time." He did say he thought the schools could be valuable for inexperienced operators.

His feeling on the schools was echoed by Allen C. Carlson of Superwood Corp., Duluth, Minn., who addressed another user group session as a first time user of an 8200 system. "If the operator is new, it's a good idea to send him to the schools, but not if he's experienced."

Both good points to make at a conference which had as its theme, "Toward More Effective and Efficient EDP Organizations."

Other points

Conference keynoter Dr. John Demidovich, professor of Computer Systems Analysis, School of Systems and Logistics, Air Force Institute of Technology, Wright Patterson Air Force Base, Dayton, Ohio, had some other points to make on the theme. He looks at effectiveness and efficiency as totally different things. "Effectiveness is doing the right thing and efficiency is doing things right. It's possible to do a job that shouldn't be done efficiently."

He admonished his audience, primarily data processing managers and directors, "to get back to basics . . . to start with the problem and work back to the computer. The ultimate responsi-

bility for systems' success must be assigned to the user."

He advised his audience to be managers rather than technicians.

Another user group speaker, Evelyn F. Thomas, data processing manager, Intercounty Construction Corp., Hyattsville, Md., took a different kind of look at management—from the standpoint of women who might want to advance into its ranks in the data processing field. She concluded that data processing "is an excellent field for women who want to advance to management positions. Performance counts. There are no physical limitations. It's a flexible profession. It's new and it's not as closed as older, traditional professions." She warned, however, that there still exist such entry level barriers as the typing test for women who are first-time applicants. She referred to the question, "How fast do you type, honey?" as a "degrading experience."

The various industry groups among NCR users had their special offerings both from users and from NCR. Joe Moody, assistant v.p., retail, for NCR told a session that "retail was the leader of all our professional groups in 1976." He said point-of-sale is "big but not that profitable," adding that emphasis in the near term and the future would be on greater use of small, medium, and large-scale computers.

In a retail user session, Lee Roberts of Thalhimer Brothers Inc., Richmond, Va., described a Purchase Order Management System for retailers which it has been developing in conjunction with NCR. Test equipment for the system was brought into the store in September 1976 and the store still is making changes. Roberts believes POM systems should come before POS because they're the systems that can "tie the whole retail loop up." He feels the system his store is developing can feed merchandise and financial systems and computer controlled ticket making. "It can lead to work load forecasting." He believes it will be two years before this can be effective. He predicts that the system, when full blown, will cost $1.2 million per year to run, "but we'll get more than that back." He said it will, for his store, result in a reduction of the accounts payable staff from 27 people to nine people, just for starters.

For the bankers

And there was something for the bankers among NCR users. NCR's financial v.p., William Walsh, promised lots of goodies for the financial community, most to be detailed at a financial user meeting next fall (May, p. 266).

Banker users talked of POS experiments with the usual emphasis—the technology is there, the big thing is selling it.

The federation of NCR users is seven years old. Its annual meetings started with an attendance of 350. As its attendance has grown, so has the number of its constituent societies. Naturally, in an industry dominated by acronyms, the sub-groups conform. There is CHUG—cooperative health-care users group; PONY—Pennsylvania, Ontario, and New York Users; SBUG—Service Bureau Users Group; GAIN—Government Agencies Involved with NCR; and many more, all very uggy.

CHUG, one of the more active of the user groups, conducted a tour of St. Louis' Deaconess Hospital during the user meeting, to see a pilot installation of the NCR Medics on-line interactive system based on a Criterion central processor. It attracted more than 40 people, requiring the one bus hired to make two round trips between the hotel and the hospital.

And CHUG gave the federation of users its new vice-chairman, Grace N. Householder, director of data processing, Weirton General Hospital, Weirton, W. Va., current president of CHUG and elected to the federation's number two spot on the last day of the St. Louis meeting.

Others elected were Charles Yahn, United Associated Grocers, chairman; Donald Swedish, manager of data processing for Merchants Consolidated Ltd., Winnipeg, Manitoba, Canada, secretary; and Thomas Morgan, manager of data processing for the J. M. Ney Co., Bloomfield, Conn., treasurer.

And not all of the NCR user groups are labeled by acronyms. At least one isn't. That's the Diehards. It includes users who cling fondly to their old NCR 315 computers introduced in the early 1960s.

—Edith Myers

Automation

One Step at a Time

The Many Approaches to Automating the Patent Office

For close to 20 years, the U.S. Patent Office has been the target of automation zealots who have vainly tried to push the 175 year-old bureau into the computer age. Pushing the hardest, of course, have been hardware and software peddlers. They "come in full of self-confidence," moans one beleaguered Patent Office staffer, "saying they have solved the basic problem and now they can solve ours. Many times they don't really understand the magnitude of our problem. And they go away with their tail between their legs."

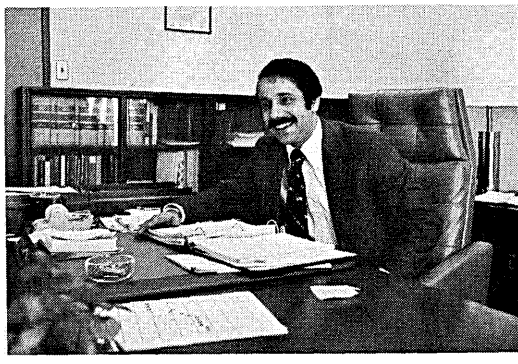
Officials at the Patent and Trademark Office point to "the magnitude" of their problem to assuage the proselytizing automation advocates. Their arguments seem persuasive. And they're all based on past, ill-fated attempts to computerize the voluminous patent files.

Efforts to automate the Patent Office date back to the late 1940s. But it wasn't until 1969 that the real automation drive got underway with the formation of the Computer-Aided Classification (CAC) Committee. Made up of personnel from the Patent Office and the National Bureau of Standards, the group was charged with formulating a strategy to "implement computer aids to patent classification." In 1971, this project was expanded and became part of Project Potomac (Patent Office Techniques of Mechanized Access and Classification) which was supposed to brainstorm proposals for a computerized classification and retrieval system.

The ambitious but ill-conceived project was shelved in 1972. NBS, in a subsequent (1973) review of the operation, reported that Potomac's "broad goals resulted in obscuring the intent and results of the CAC plan." The study also noted cautiously that, "Technology isn't ready to solve the whole patent examination problem. But in specialized areas technology can and does aid the examiner."

One step at a time

Since Potomac's demise, the PTO has been wary of launching any grandiose dp schemes to automate its manual patent examination procedures. Instead, they're taking a "one step at a time" approach. "We shouldn't just go charging off into the sunset," argues patent research specialist Patricia McDonnell. "That's what happened back in '71 and '72. Somebody started (making computer plans) without really determining



GEORGE S. VAVERIS
A lot of work has to be done before you go running off into the sunset

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Jacquard's total systems manufacturing ability has allowed us to create made-for-each-other software/hardware that we call Multi-Tracking.

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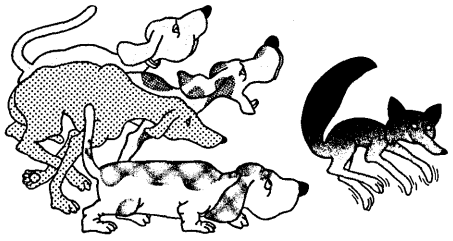


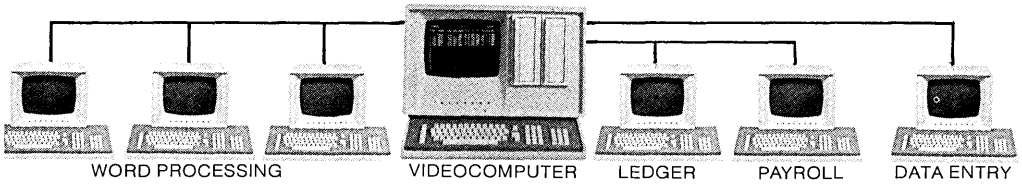
Re-entrant Code Keeps You Ahead of the Pack. Built into our systems software is a feature which automatically generates re-entrant code for any application package in memory.

Other systems offer re-entrant code as applications software. But you'll pay for redesigning it when you upgrade, because they don't have our total system power.

Hardware is only part of the story. Judging a small business system by its hardware alone is much like comparing the fox to the hound. Both are cousins and have the identical inventory of parts. But the fox has gained a superior reputation for keeping ahead of the pack. How? His programming is superior. So if you're joining the hunt, be careful! You could get badly bitten.

DISTRIBUTOR INFORMATION AND DEMOS AT NCC BOOTH #1195 AND IWPA CONFERENCE BOOTHS #611-613

A typical small business system showing Jacquard's Multi-Tracking capabilities. Because the Jacquard system can keep track of its terminals, you have total flexibility in a multiple user/application configuration. Here you see six terminals sharing three applications concurrently, without additional copies of any program being added to memory.



Our time sharing and time slicing capabilities simulate full power/direct access to the computer. So each operator receives instantaneous answers, and throughput is enhanced.

That's how Jacquard's Multi-Tracking keeps you ahead of the one-track pack. Simply and economically.

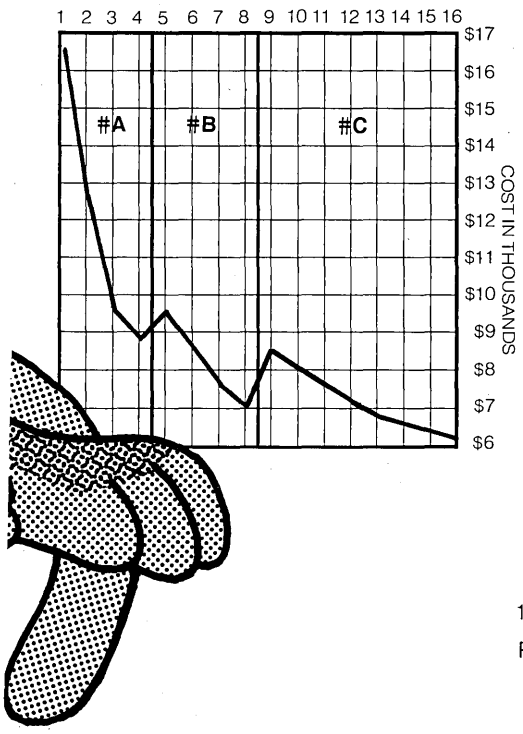
The Bigger You Get The Better We Look. In a multi-station situation the average cost per work station drops for either word or data processing configurations.

#A: Floppy disk systems with one printer and word processing software.

#B: 12 MB disk systems with 2 printers and word processing software.

#C: 24 MB disk systems, 2 high quality printers, one fast printer (rough drafts) and word processing software.

NUMBER OF J105 WORK STATIONS



Our Business Software Package Complements the System's Unique Design. Our integrated set of accounting programs include General Ledger, Accounts Receivable, Accounts Payable and Payroll. They are designed so that a multiple terminal installation can use information from different companies, different accounting periods and different applications concurrently.

The system's editing capabilities assure you of maximum data accuracy. The program's financial reports can be varied to content and format without the operator needing special technical abilities. And because the programs are interactive and conversational with step-by-step operating instructions, they are easy to use.

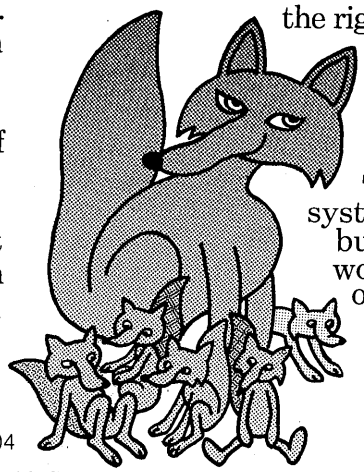
Word Processing. For the price of eight simple automatic typewriters, you can have our system with eight terminals. The word processing system allows users to draft, store, recall, modify, append, edit, format and print any type of business correspondence or documents from interoffice memos to high volume direct mail campaigns. You also can use it for complex tasks such as preparing address lists which can be sorted by up to 20 different criteria.

Outfoxing Costs. The Videocomputer is priced low enough to be used as an intelligent terminal. Yet it's powerful enough to be used in demanding distributed processing situations.

Another nice feature is that the system is a totally self-contained unit. You don't need additional office furniture.

SPECIFICATION CHART
J100 Processor: 16 bit word, up to 128 K bytes, DMA, Power Fail Auto Restart, Real Time Clock, 1920 ch CRT and Keyboard, built-in Floppy Disks.
Peripherals: Up to 30 satellite CRTs, 6-12 Megabyte Cartridge Disks and 80 Megabyte Drives, 800 and 1600 BPI Tape Drives, Multiple Printers: 30 cps to 900 lpm, Async/Bisync communications
All software supported, available now.

End Your Hunt. If you've been searching for a system to handle small business functions, word processing, distributed processing or data entry, write Jacquard for information or a demonstration. You're on the right track.



The system your business won't outgrow.

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Jacquard Systems

what the requirements were or whether it was even feasible. As a result, things got out of control and the project was halted. What we're doing today ... is a natural outgrowth of what we've learned from our failures over the past 20 years."

And it's obvious from looking at their automation track record that there have been more failures than there have been attempts. The bulk of the bureau's research and development efforts have been focused on developing cost effective computerized patent searching tools. R&D work in this area peaked in the early '60s and has since tapered off. But the end goal is still the same—to come up with an automated set-up to aid patent application examiners in their tedious and time-consuming job of manually searching through the gargantuan patent file.

Back in 1956, *Newsweek* magazine touted the bureau's bold dp gameplan: "By the end of 1956, the bureau hopes to search its files by computer. The machine will sort any similar invention among patents that were granted in the past. It will take an examiner only a few minutes to decide whether a new application has merit. Now it takes an average of a full day."

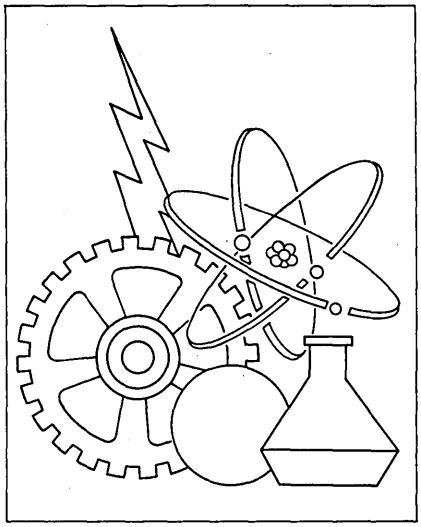
Needless to say, these bold plans never came to fruition. As they were 100 years ago, the patent searches today are still done by hand, only now instead of a day it takes an average of two to four hours to scope the file. And it's the size of this file and the way the patent examiner uses it that patent officials claim have bogged down automation attempts.

System dates to 1902

The present manual file contains 22.5 million patent documents, representing the four million patents that currently have been issued. To index these patents, the bureau uses a complex classification system, originally developed in 1902. The system is made up of more than 300 major classes which are further broken down into 95,000 detailed technological categories, called subclasses. Under this hierarchical set-up, patents, which are assigned nine character numbers, are slotted into the various pigeonholes primarily on the basis of the function the patented process or article performs.

Outsiders who have tried to do their own searches with this scheme continually complain about how complicated it is. The bureau, which admits the system is hard to use for outsiders, maintains that it can't be simplified because technology can't be simplified. Because of the dynamic nature of certain technologies, the bureau must periodically reclassify various patent groupings. "And the obvious constraint on the system," explains one PTO staffer, "is that the classifier must classify today's inventions, trying to anticipate what technology is going to generate tomorrow."

However, even with these constraints, dp industry observers still insist the PTO's classification scheme is inadequate and an impediment to computerization. Declares one more vocal industry expert, "The Patent Office is perhaps the nation's most extreme example of the problem of getting to a data base computer system. And this derives largely from the fact that they have invested in this obsolete and inappropriate numbering system that can't be changed. As things stand now," he stresses, "the application of the computer would be seriously hampered by this rotten classification system. Because if you just automated the first classification system and keypunched the classifications to all the patents, you'd still have to look at the documents themselves to determine relevance."



PTO SYMBOL: Patent Office's manual file contains 22.5 million patent documents, representing four million patents that currently have been issued.

Patent Office agrees

Ironically, this is also one of the PTO's arguments against moving to automation. Using the manual system, examiners make about 1,800 searches a week, processing over 2,000 patent applications a week and a little over 100,000 a year. (102,000 applications were filed last year and at least that many are expected this year.) The snag is in the search process itself. For as patent research specialist McDonnell points out, "searching entails not just looking for documents disclosing what is being claimed, but also looking for documents which disclose something close to what is being claimed."

One information retrieval expert dubs this the "high recall" problem. "The difficulty in patent searching," he affirms, "is the need for high recall—the need to retrieve everything that is even remotely similar to a patent submission." It's difficult, but it is possible through automation, he contends. Other technologists disagree, saying this "search for concept" problem has not been cracked by automation since very little progress has been made in the area of artificial intelligence.

To support the manual set-up, PTO officials laud the effectiveness and economy of their current search system. Among the benefits, they maintain, is the examiner's ability to combine document identification and retrieval all in one step by simply removing a potentially useful item from the file. (This also leads to serious file integrity problems which they also readily concede.) Another advantage claimed by the bureau is the ability to revise or rearrange documents in response to sudden shifts in technology.

Despite these claimed advantages, the PTO realizes there are "inherent weaknesses" in its manual methodology. In addition to the file integrity loophole, they cite other dilemmas such as the growing space requirements for the mammoth file and the substantial clerical processing needed to refile removed documents.

Microform search system

To get around some of these problems, the bureau two years ago began experimentally operating an on-line computer controlled microform search system (CCMSS) for searching patents in the areas of general purpose digital processing systems, special purpose digital processing systems, and analog-digital converters. Developed by Image Systems Inc., the system consists of four micrographic terminals linked to a Varian 620L minicomputer. To expand the system's capacity, the PTO plans to add eight more terminals to handle 35,000 more documents. (The present set-up handles 15,000.)

In addition to CCMSS, the Patent Office also has a few files which are searched on its in-house Honeywell 2015 computer. Some other files on smaller technology areas are handled by Termitrex optical coincidence gear. But the biggest PTO push is on the CCMSS system. As part of this system, the bureau hopes within the next two years to be able to set up remote on-line terminal hook-ups at satellite patent searching centers, located near major depository libraries or industrial sites.

While the Patent Office has made slow, piecemeal progress in incorporating automation into its patent searching function, the office has made con-

siderably more headway in using computer power to support some of its management information and administrative requirements. To handle these chores, the office uses its Honeywell 2015 and three Four-Phase Systems Inc. Model 470 minis. One typical management information system running off the 2015 is the Patent Application Location and Monitoring (PALM) system. In addition to tracking the status and location data on pending patent applications, the system also generates reports on examiner productivity. On the trademark side, the bureau has a similar system called the Trademark Reporting and Monitoring (TRAM) system which doles out information on the status and location of pending trademark applications.

The office also operates a slew of resource management-type systems to support payroll, personnel, and accounting operations. Again, all these systems run off the 2015, which is rapidly becoming overloaded. William Spittle, head of the PTO's systems development division calls the mainframe a "Model T," and admits the computer "really can't support some of the equipment facilities we have on it."

An upgrade next year

To meet the bureau's increasing demands, the PTO has opted to upgrade to a new system which it hopes to have in operation by next year. George Vaveris, the newly appointed director of the Office of ADP Administration, describes some of the new system requirements: "Obviously the emphasis is going to be more on on-line retrieval and probably on-line update. We're going to start with this baseline system to do what we do now, redesign some of these systems and augment new ones as requirements are approved." Once these system requirements are okayed, he explains, the final decision will then be made on whether to contract out some of the dp service, expand mainframe capability, or go to a distributed mini network.

The emphasis is on on-line retrieval and probably on on-line update.

All these future plans hinge on a concepts study, the first phase of which was recently completed by the PTO. Designed to improve the bureau's "system approach," the study will involve a five-year office-wide effort. The first part of the probe laid out the bureau's "conceptual" requirements. The second stage, just kicked off, sets up a project management team to coordinate planning and implementation of these manual and automation-based requirements. It's during this second phase that the PTO team will delve into hardware and software specifics. Also the group will pinpoint what ADPer Vaveris refers to as "the high payoff areas." Two of these areas, already identified, are automation efforts in support of search systems for patents and trademarks.

Computerization of trademark searches is much easier than automating patent searches, according to Vaveris, "since the searches are not as complex and the files aren't as large." Because of these patent file management problems, PTO officials are pessimistically predicting that patent searches won't be fully automated for more than five years, possibly 10 years. And "the biggest holdups," Vaveris contends, "are technology coupled with economics."

Use multiple technologies

But computer specialists disagree. The technology, they protest, is not the real hang-up. One hardware heavy offered this approach: "The obvious strategy is to use multiple technologies—an encoding classification scheme which is digital and a direct recording scheme which is either microfiche or videotape. It's going to be a long time," he notes, "before we have digitally based files large enough to hold all the patent documents." To trim the time an examiner spends responding to patent applications, he suggests a word processing system made up of multimedia terminals that could be used by the examining force to pick up productivity.

This multitechnology approach has also been espoused by other computer technologists who maintain that a hybrid of different developing techniques might meet the PTO's needs. Specifically, they point to advances in computer controlled micro image retrieval. When linked with word processing terminals, this could evolve, says one industry expert, into "a real office of the future."

Over the years, the government intelligence community has been experimenting with various document retrieval set-ups. And they are continuing, according to one source, to shell out money on these types of systems in hopes of developing a solution to their enormous document manipulation, retrieval, scanning, and editing problems. "And perhaps, once again, as in the dim past of computing, this seed money will produce products that not only help the Patent Office, but in the end a lot of other people too," notes one industry insider.

But when and if this seed money materializes, it won't be coming out of the Patent and Trademark Office's coffers. "It would be very easy," vows Vaveris, "to turn this place into a technological showcase. But it would be at the American taxpayers' expense." And also at the PTO's expense. The bureau's FY '78 budget is $86 million, a paltry $4.4 million of which is earmarked for ADP.

One computer scientist, Cornell Professor Gerald Salton, who is a noted information retrieval specialist, sympathizes with the Patent Office's budgetary constraints. But he is quick to repudiate Vaveris' claims of technological inadequacy. To back up his contentions, he cites similar data retrieval systems that have been set up by large libraries, such as the Library of Congress which is saddled with 60 million documents. Other systems, particularly those that store legal text in machine-readable form, he points out, provide very thorough searches of the full text—a capability which the PTO also needs.

"In designing automatic retrieval systems," Salton observes, "It's not a technological problem . . . The big problem is more of a practical problem—they are very strapped by their budget. We, the designers of new retrieval systems, come to them and say 'look you could do this or that.' But unfortunately they don't have the personnel to implement these systems, and they don't even have the funds to hire them in the first place. And at the same time, they can't shut down their operation and reopen in three years when they finally have a system. So they're stuck."

The big problem is that the PTO is very strapped by their budget.

And that may be just what the Patent Office wants, at least temporarily. Trying to learn from its past automation boondoggles, the bureau seems to have opted for a slower, more cautious approach. It's also not sure computerized patent searching will pay off since bureau brass claim they can't eliminate examiner overhead costs which are continuing to rise.

So it looks as if the Patent Office's big computer plunge has been postponed again, as it was in the '50s and more recently in the early '70s. The PTO's ever-patient ADP boss Vaveris believes this "measured thrust" tactic will prove effective. "Everybody," he complains, "speaks in terms of hardware alternatives like distributed processing networks. That may or may not be what we end up with. "The technology," he insists, "is a factor as is the cost of the technology and peoples' ability to use it. You cannot force a distributed processing or minicomputer network on an unsophisticated environment. People have to be trained, the systems have to be accepted. There's a lot of work that has to be done before you go running off into the sunset. And that's what we're doing right now."

—Linda Flato

Microfilm

Why Should Everything Be Stored Digitally?

Increasing costs of paper and of storing and mailing it has propelled the microfilm industry in recent years to annual growth rates of 30%. Various studies show that 1976 revenues for microfilm companies reached well over the billion dollar mark, a total increase of 250% over the 1970 figure of $400 million.

And at the National Micrographics Assn. annual meeting in Dallas last month, the conference keynoter Donald N. Frey, chairman of Bell & Howell Co., said the industry in 1980 will be doing about $2.5 billion a year. Frey listed some very obvious reasons for the popularity of microfilm over paper: the cost of duplicating microfilm is 15% of the cost of making copies of paper. Microfilm storage costs are 1/45th that of storing paper and it takes up only 2% of the space that paper ordinarily occupies. The cost of mailing and distributing microfilm is one-tenth of 1% that of paper.

Besides these economic factors, Frey attributed the growth of the industry to "its highly important system advantages" and said its future hinged on its ability to communicate these advantages to potential users. "To reach full potential, microfilm must not only store information economically, it must permit the frames of interest to be readily retrieved from storage," Frey said.

He said far too much effort had been spent in producing hardware to efficiently record and display microfilm, and not nearly enough in development of systems to allow efficient retrieval of the recorded image.

Not taken seriously

Comparing the use of microfilm and data processing hardware, he said that while the dp industry offers a highly developed system capability of data processing, "microfilm information storage and retrieval systems have been typically unsophisticated. The result is that the data processing community does not take microfilm very seriously."

While a number of standalone microfilm storage and retrieval systems had been devised, he said they failed to achieve the versatility and labor efficiency that is possible through a fully integrated system with microfilm and other data. "For our industry to reach its full potential there must be more integration of microfilm hardware with data processing systems," Frey said.

COM in data bases

One such system—the integration of on-line computer systems and computer output microfilm (COM)— is being used with great success by some companies, said William McCullough, national sales manager for U.S. Datacorp's U-COM division. But he said too many companies overlook its potential cost reduction and system enhancement because of a lack of knowledge on the part of systems designers regarding ways in which COM is used. He attributed this lack of understanding to the dearth of user education within the computer output microfilm industry, particularly when compared to that being carried on by the computer industry related to on-line technology.

U.S. DATACORP'S MC CULLOUGH
Too many companies overlook its potential cost reduction

McCullough said that in most data bases a small number of files represent a majority of all activity, while there is other data that is not really worth the time and money it takes to store, update, and retrieve. Here is where an integration of COM-generated microfiche and on-line systems can be especially fruitful.

"Overall speed of key information retrieval via crt can be increased at no expense in data availability," McCullough noted. "The data entry or keying part of the retrieval can be simplified. Combined with smaller files, less data to search, and less to output to the crt, a net increase in throughput should result."

While McCullough admits that certain functions rightfully belong to an on-line system, much non-critical and detail information can be efficiently moved off on-line to microfiche. If needed, it can be referenced on the crt by fiche number and grid coordinates.

"The key factors in determining how to employ COM best in a data base are to define clearly the requirements of the system, and what your organization is willing to pay for the system," McCullough said.

Alternatives to on-line

He outlined three alternatives to full on-line systems: the first is to put an entire file on COM, then provide the most critical information on-line. An index to all items in the data base can be maintained on the computer for rapid access to detail information.

BELL & HOWELL'S FREY
Industry won't reach full potential unless dp is integrated with microfilm

The need for on-line systems can be reduced further by putting the entire data base on microfiche, and maintaining only a COM index on the computer.

The final alternative—putting the entire data base on COM only— raises the question of whether the data base has to be on-line at all. If a system does not require an on-line update capability, COM can meet the retrieval and display requirements of many users through daily updates.

"If it is determined that COM can meet the requirements of an information system, then the costs, when compared to an on-line system, are very much less," he added. For instance, he said a COM viewer can be purchased for less than one month's rental of an IBM 3270 terminal; a COM recorder can be leased for about the same cost as one IBM disc drive; and a 500,000 page data base could be produced on COM and kept current on a daily basis for less than $6,000 a month.

Problem of film processing

A problem in microfilm's acceptance, according to Frey, is the need for chemical film processing where the slow speed of the film processing cycle often has been the deciding factor in ruling out the use of microfilm. But most manufacturers are tackling that problem. D. W. McArthur, v. p. of Minnesota Mining and Manufacturing Co.'s microfilm products division, said his company's new line uses a dry-silver camera with built-in thermal developing, thus eliminating the need for plumbing to process with wet chemicals. The camera does not produce any liquid waste requiring disposal, nor are specially designed rooms required. Among 3M's products introduced at the conference was an enhancement to its laser beam COM recorder, called the Laser Fiche Recorder which automatically delivers individually cut and completely processed dry-silver microfiche.

Eastman Kodak Co., which introduced the industry's third recorder to use laser technology in early June, did not display the device at the conference. It was understood to be part of the company's National Computer Conference products, however. The first laser recorder was developed by Stromberg Datagraphix, Inc., a subsidiary of General Dynamics, and displayed at the NMA conference five years ago, but never was offered for sale.

Datagraphix announced five new products at the conference this year, including a 48 megabit dual disc drive and controller for its models 4550 and 4560 COM recorders. The drive allows users to access software randomly instead of sequentially, as with the firm's flexible disc drives.

Bell & Howell introduced a microfilm-compatible 6250 bpi magnetic tape drive which allows the company's COM recorders to process print tapes written on the higher density tapes. Thus, the company explained, no mainframe computer time is wasted converting to lesser tape densities.

Most of the COM recorders at the show did more and more of the formatting, indexing, and other preparations formerly done by a host computer. Quantor Corp. introduced its Q118, a COM recorder equipped with a 10.2 megabyte random fixed disc. The minicomputer-controlled recorder has a 200 inches per second tape rewind speed and is aimed at high volume COM users, including COM service bureaus. The disc, according to the company, gives the system greater flexibility.

120 exhibitors

The four-day conference drew some 7,500 persons to Dallas to view products of 120 exhibitors, mostly companies offering viewers, retrieval systems both manual and automated, storage systems for microfilm, chemicals and film, and, of course, COM recorders.

The COM industry, which seven years ago consisted of about 20 manufacturers, now has been pared down to a handful: Stromberg Datagraphix, Bell& Howell, Eastman Kodak, 3M, Information International Inc., and Quantor Corp. Memorex did not exhibit at the conference, but one of its recorders was displayed by Quantor, which sells them. California Computer Products was scheduled to exhibit but dropped out, and it was understood the operation was for sale.

But COM business is booming, nevertheless. The COM manufacturers occupied the largest booths at the show, and industry observers say that 845 COM recorders will be installed in 1977, compared with 650 last year. By 1980, according to these estimates, 1,856 will be installed bringing the number of COM installations to 8,843. At the end of 1976, there were 3,180 installations.

—Tom McCusker

Banking

Harder Sell Needed for EFT

A Pennsylvania Savings & Loan once promoted a bill paying from home service with billboards proclaiming "Stamp Out the 13 Cent Stamp."

Donald R. Hollis, v.p., The Chase Manhattan Bank, suggested avoidance of "ever higher postal rates" as a selling point for preauthorized payments during the 1977 National Operations and Automation Conference last month in New Orleans.

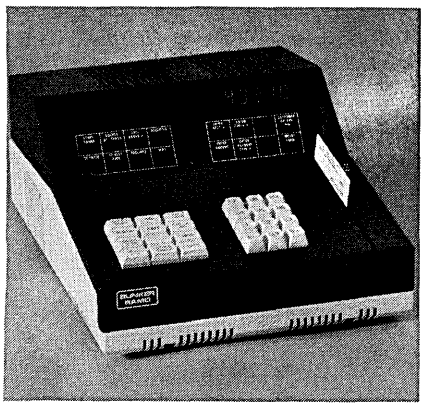
Savings on postage has long been a thrust in banks' promotion of Electronic Funds Transfer Systems (EFTS).

But proof that the banking industry is not out to do in the U.S. Postal Service may be forthcoming if banks respond favorably to one of a variety of new terminals introduced during the New Orleans conference. It's by Bank Computer Network Corp., Schiller Park, Ill., and it, among other things, dispenses first class postage stamps. An authorized customer using this automated teller terminal (ATM) can get stamps charged directly to his account without having to have change and without paying anyone a profit, as is the case with traditional stamp dispensing devices.

NCR Corp., whose 770 is an ATM leader, was in New Orleans with its new 1770 in-lobby self-service terminal (May, p. 266). With this terminal, customers are guided by step-by-step instructions which appear on a visual display screen. They can make deposits or withdrawals, tranfer funds from one account to another, make inquiries on the status of accounts, or pay bills.

From Bunker Ramo

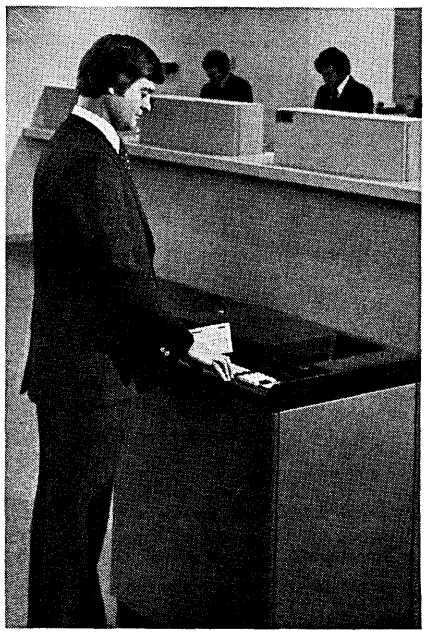
Bunker Ramo introduced a terminal designed for use at point-of-sale (POS) locations. Called the Financial Transaction Terminal (FTT) it provides such services as check verification, credit/debit



THIS NEW point-of-sale terminal offered by Bunker Ramo can handle check verification, credit card authorization, bill payments, and other electronic funds transfer functions at retail locations.

card authorization, deposits, withdrawals, transfers and inquiries to and from checking, savings, and card accounts. It also can handle payments to card and club accounts, utilities, and loans.

Periphonics Corp., Bohemia, N. Y., chose the New Orleans conference for formal introduction of a new telephone bill paying system it calls Bank-From-Home. The system, which features a very human sounding voice response, already is installed at Louisiana National Bank, Baton Rouge; Germantown Savings Bank, Bala Cynwyd, Pa.; and



NCR's new 1770 self-service financial terminals are designed for use in bank lobbies to supplement teller windows during peak periods.

Greater New York Savings, New York City.

Periphonics also introduced support for the IBM 3600 financial terminal series with its T-Comm 7 communications network controller which frees host computers from the need to perform Systems Network Architecture (SNA) functions.

H. Pyle, president of Periphonics, noted during the conference that banks have been slow to promote such services as Bank-From-Home . . . that customers are not being made aware of such immediate benefits as a minimal transaction charge, typically 10 cents, lower than the cost of a postage stamp.

A service bureau executive interested in the Periphonics system wondered if his small bank customers, for whom he felt the system ideally suited, could afford the necessary promotion.

Promotion and selling the public continues to be a stumbling block to all aspects of EFTS.

More progress

H. L. Baynes, senior v.p., United Virginia Bankshares, Inc., Richmond, Va., and president of the National Automated Clearing House Assn. (NACHA), said that nationwide, Automated Clearing Houses "have made more progress than any other EFT system." He said NACHA has 32 regular members with 27 operational, that 3,500 companies have signed up for debit/credit systems, that ACH is no longer an experiment, and that it is free of operational inadequacies.

But, said Baynes, "too few banks are selling. They are waiting for the ACH's to do it." It works, he said, but awareness is still low.

Hollis of Chase believes that "consumers remain suspicious of banks in general and EFT in particular. Too much of the publicity they have seen has been negative. Accordingly, it behooves us to invest in education which capitalizes on the government's recurring payment campaign (such as with direct deposit of Social Security checks)."

Baynes noted that privacy is a consumer concern with ACH's. His feeling is shared by Barry F. Sullivan, executive v.p. of The Chase Manhattan Bank and outgoing chairman of the ABA's Operations and Automation Division.

"Perhaps we've felt that the issues of privacy and security and legality of records would go away on their own. Sadly, they have not and will not . . . . Issues like privacy must be confronted straightforwardly and resolved directly through the concerted attention of all of us."

Conference keynoter, Richard L. Kattel, chairman of the board and president, The Citizens and Southern National Bank, Atlanta, had some similar thoughts.

"You know better"

"There has been some concern that EFTS will lead to the indiscriminate dissemination of personal records," said Kattel. "But, as you know better than anyone else, the computer records can be made more confidential than they are now. Nevertheless, we should take the initiative to design and actively support whatever additional changes in systems or legislation are required to be absolutely certain that the confidentiality of our customer records is protected . . . and then make certain they know it."

John H. Watford, president and chairman of the board, Atlantic Operations, Inc., Jacksonville, Fla., which handles data processing for 31 banks in Florida, learned that records can and should be better protected the hard way.

He told a conference session on "Data Security" he would share "true ripoffs." His firm has ATM's in eight different locations. The system of which they are a part is built around a Customer Information File. "When you build a system around a CIF you expose yourself to true data security problems. It took our minimum wage employees two and one-half months to figure that out and rip us off. They'd go into the CIF department at night, transfer a quarterly savings account to their own CIF numbers and then back after having made from $10,000 to $12,000 over a weekend."

He said there was an audit trail but it was "voluminous and difficult to find."

His firm partially solved the problem by assigning operator sign-on codes, building up an authorization file, and restricting the number of people who can go into the file and change things. "It will be a continuous process as all of us get ripped off a little more."

Vulnerable with IBM

A speaker at the same session, Peter S. Browne, president, Computer Resource Controls, Rockville, Md., had this encouraging comment to offer: "If you have IBM systems you're vulnerable to systems programmers, and there's no way you can get around that."

V. M. Dissmeyer, executive v.p. and cashier, Northwestern National Bank of Minneapolis, Minn., who moderated a NACHA session, said customers fear that authorizing direct payments to an organization would give that organization access to their account information. He told of a customer who balked with the statement, "There's no way I'm going to let Con Ed get within 200 feet of my checking account."

Hollis of Chase suggested a "comprehensive blanket authorization agreement" for preauthorized payments which would include "a not-more-than limit on personally originated transactions," and which could easily be extended to cover additional debits without requiring a complete new legal document.

"Additionally," he said, "an optional override feature which a consumer can easily invoke—for any given month—is recommended in order to meet their (the customers) requirements to stay in control."

Lynn J. Ellins, Midwestern Regional Counsel, J. C. Penney Co., Inc., had some other problems with preauthorized payments. He said Penney's receives more than 50,000 preauthorized automatic payment notices from banks each year which contain customer name and dollar amount only. "That's 50,000 exception items per year." The store has to attempt to tie the information to customer account number and item purchased. He said there also are problems when customers authorize payment in time to avoid a finance charge but the banks notify late and the store imposes the finance charge. "We get the complaints and resolve them with refunds."

OCR-A needed

Ellins believes banks that are hoping for EFT tied into POS systems will have to put OCR-A, the standard marking approved by the National Retail Merchants Assn. (NRMA) on their cards because "it's less expensive (than magnetic stripes) and readable to our customers." He also believes the Personal Identification Numbers (PIN) assigned by banks to customers who wish to debit their accounts to make a purchase, pose a problem for retailers. "They're supposed to be entered by the customer on a pad shielded from an employee's vision. This means an extra device, an extra step, and slow down of the check-out process."

Ellins told the bankers: "We ought to be talking to each other a little bit more."

If retail EFT poses problems, it also provides opportunity, as least as is indicated by the experience of the C. R. Anthony Co., a department store chain headquartered in Oklahoma City, as detailed at the ABA conference by Willis J. Wheat, senior v.p., marketing, Liberty National Bank and Trust Co., Oklahoma City.

Liberty, with its correspondent banks, started what it calls its "Checokard" program in November of 1975. In November of 1976 it expanded the program from an ATM network to become Oklahoma's first POS operation using the on-line NCR 279 financial teller ter-

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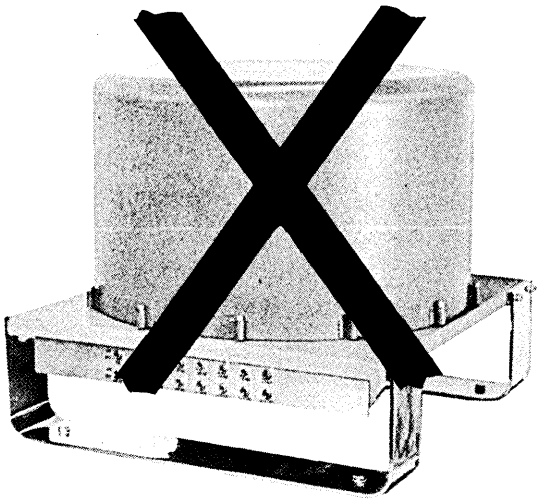

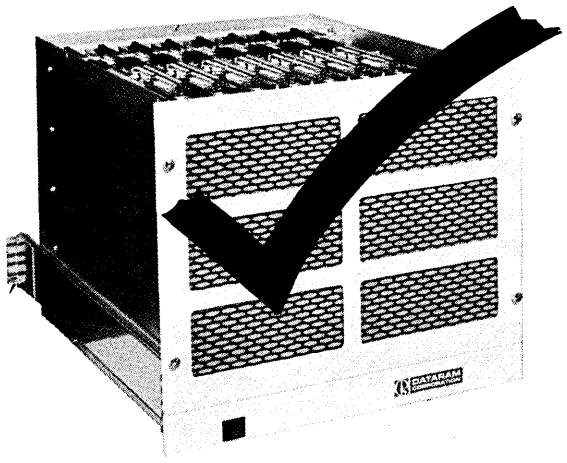

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minal in 17 Anthony's stores.

"We have been monitoring the Checokard program very closely," said Wheat, "and are frankly pleasantly surprised by customer acceptance, particularly with the high ratio of deposits to withdrawals through the POS's.

More traffic

Average purchases since last November has remained steady, he said, at approximately $20. "But of more significance, Anthony's just completed a customer survey which reflects that 22% of all Checokard customers are coming to their store because of Checokard. This, of course, means that the stores are receiving increased floor traffic because of Checokard. And that is the name of the game for Anthony's."

Liberty's venture into EFT and POS was facilitated by the Oklahoma legislature which permits banks to establish remote EFT facilities anywhere in the state.

In other parts of the country, EFT projects are meeting a variety of forms of opposition.

The Nebraska Electronic Transfer System (NETS), a statewide network organized to serve some 66% of the states commercial banks, which specifically solicited the Dept. of Justice's opinion two years ago, finally has received it. The DOJ objects to NETS because of its size, its structure, and its provision for mandatory sharing of terminals.

And the Justice Dept. has gone to court in Denver with a civil antitrust suit against the Rocky Mountain Automated Clearing House Assn. charging that the ACH's blocking thrift institutions from participation "will restrict the ability of thrifts to compete with Clearing House members."

For corporate customers

An EFT area not terribly vulnerable to legislative and regulatory attack is cash management for corporate customers. William J. Deane, v.p., Shawmut Bank, Boston, sees this area as "the entry point for electronic banking."

Speakers at his session talked of computer to computer communications between corporate customers and banks. Leonard A. Goodman, second v.p., The Chase Manhattan Bank, predicted a time "in the near future" when corporate representatives will sit at a terminal to draw on lines of credit or repay loans. A corporate cash management system, he said, also will include analytical services.

Not everything at the New Orleans conference was EFT related. Bank of America told of its joint venture with NCR (May, p. 266) to develop a document handling system called Bancr (pronounced Banker), which is based on image processing technology.

And one of the most popular booths in the conference's exhibit area was that of American Bank Note Co. which introduced "Money in Motion," a high speed currency handling system which automates counting, denominating, sorting, deposit verifying, fitness sorting, genuineness detection, banding, record keeping, and proofing. It demonstrated the device in a highly secure booth, proving that banking still has to do with real cash money.

—Edith Myers

Companies

CDC: A New Firm for Education

Good things come in threes.

Control Data Corp. in early May, five days after its annual meeting, announced a corporate reorganization in which three operating entities were created: education, computer operations, and financial services. Four years earlier the company also staged a reorganization in which three entities were created: computer systems, marketing, and peripherals. (The financial services operation still was run separately as Commercial Credit Corp.)

Later, Paul G. Miller, president of the marketing operation, became president of Commercial Credit and marketing was shifted to Robert M. Price, president of the computer systems organization. In the latest move, Price receives further responsibility as head of computer operations which now include the peripherals company, whose president has been Thomas G. Kamp. Kamp continues as president but reports to Price instead of CDC chairman and chief executive officer, William C. Norris.

Successors?

Norris, who has held that post since the company was founded 20 years ago and who has been in the computer business 30 years, is 65. And although he seems prepared to continue for some time, at the request of the CDC board, the new shifts raise some speculation about his eventual successor. In the running are:

—Robert Price, 46, who has been with the company 16 years. Before joining CDC, Price, a North Carolinian who has a masters degree in applied mathematics from Georgia Institute of Technology, worked with Standard Oil of California, General Dynamics, and the Univ. of California Radiation Laboratories at Livermore where many of CDC's serial No. 1 computers are installed. Price once headed the company's services operation, later its computer systems and services, and now its entire computer operations.

—Paul G. Miller, 54, who has been with the company 14 years. He is an electrical engineer and a graduate of the U.S. Naval Academy who joined the company as a marketing specialist and later became president of the marketing company, a new post. He was promoted to president and chief executive officer of Commercial Credit, the firm's Baltimore-based finance and insurance subsidiary, in January in a move seen by many observers as linking Commercial Credit's association with smaller businesses to CDC's small business computer offerings. Also, the company's Plato educational services were being placed in Commercial Credit outlets throughout the nation.

—John W. Lacey, 47, president of the newly created education group. A native of England who joined CDC 17 years ago

CDC'S PRESIDENTS: From left, Robert M. Price, Paul G. Miller, and John W. Lacey.

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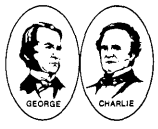

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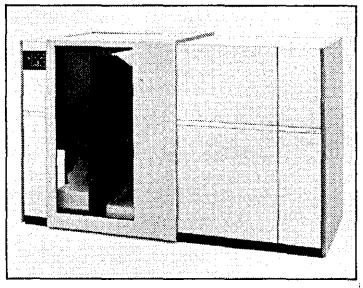
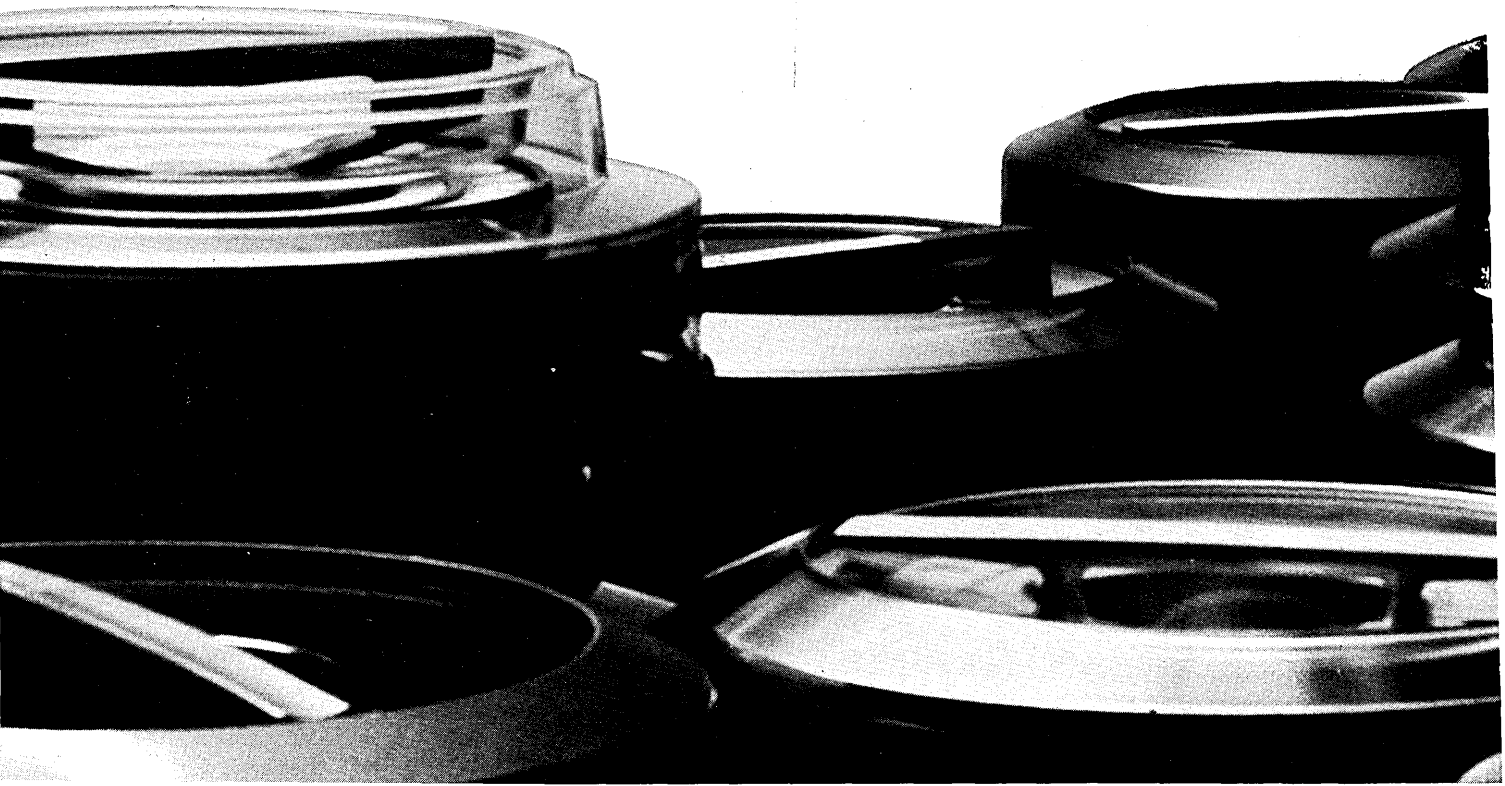
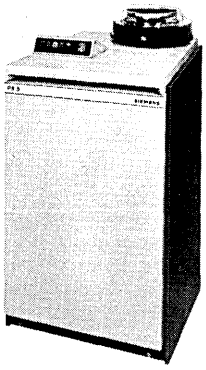
Siemens ND 2 is the ultimate in hardcopy peripheral systems. It uses a laser and electrophotography to print up to



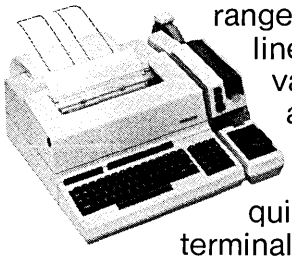
21,000 lines/min. on plain paper, and outputs approximately 8,800 12-inch sheets/hour. A forms overlay feature, that eliminates the need to preprint computer paper, is available.

The life of ND 2's photoconductor drum is an unparalleled three million copies...and the drum is user replaceable.





Siemens PS 5 disk storage drive, with an average positioning time of 23 ms, is expandable from 72 to 144 to 300 to 500 MB without cabinetry changes. Users can upgrade easily and your parts inventory stays small. The PS 5 is extremely rugged and reliable with a proven MTBF of 2500 hours, including the first hour of operation. At 500 MB it's the largest capacity disk unit available and the most economical per MB.



The PT 80 terminal features printing speeds of 30 to 90 characters/second and a range of 72 to 132 characters/line. In addition, it offers a wide variety of type faces and the ability to adjust to all common paper sizes.

Its compact design and quiet operation make the PT 80 terminal ideal for use in offices, banks, EDP centers, etc.

To learn more about how Siemens can satisfy your growing data appetite, call or write Richard Mizrahi, Siemens Corporation, 3 Computer Drive, Cherry Hill, N.J. 08034 (609) 424-2400.

SIEMENS

CIRCLE 150 ON READER CARD

after eight years of service with the British foreign office, Lacey has a masters degree in physics from Oxford Univ. As a senior v.p., he's headed the company's corporate plans and controls operation for the past four years and previously supervised a number of operations that CDC acquired in its hectic growth days of the '60s.

A newcomer

Lacey, of course, is a newcomer in CDC's sweepstakes for the top job. As head of education activities, his operation takes in such activities as the 20 Control Data Institute schools that previously were under Price; some 30 learning centers in major U.S. cities that are equipped with the company's PLATO computer-based instructional delivery systems that provide individualized education for business and industry. That operation mainly was the domain of Miller's Commercial Credit operation. Finally, he takes over the operation of complete computer systems for delivery of computer-based education and leased terminal access to Control Data's international PLATO network and courseware, which is pulled out of a number of CDC operations.

"The formation of one entity to manage our education business is a milestone in our rapid growth in this exciting field," said Norris last month when the reorganization was announced. Norris has long been a believer in CDC's role in education services, and once at a meeting for New York securities analysts lambasted those who disagreed with his contention. Shortly after that speech, in January 1972, the company's v.p. for finance, Harold H. Hammer, who opposed the education ventures, resigned. Hammer was the financial genius who put together CDC's merger with Commercial Credit.

The future of Kamp, 51, as a potential CEO isn't to be ruled out. However, Norris said in the 1976 annual report that the peripherals operation was "hampered by continued price competition in business products and by weaker foreign currencies which squeezed profit margins on peripheral equipment." The peripherals company, though, is doing well, having progressed from a customer base of 215 when it was launched to more than 600 in 1976 and 720 expected this year. Most of the new customers are in the minicomputer market with its huge appetite for the variety of disc products made by the peripherals company.

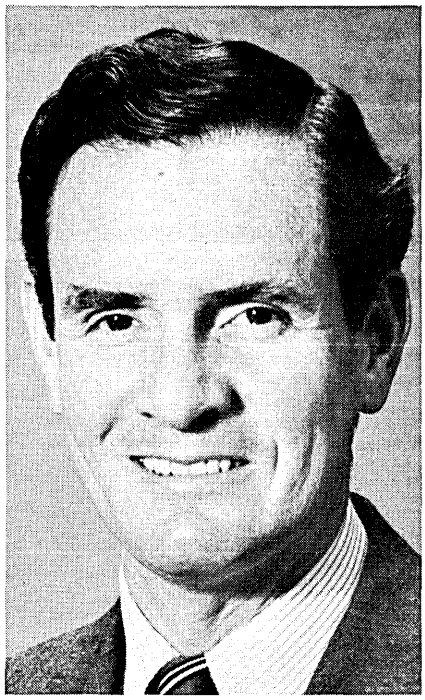
Norris said the consolidation of computer operations "is a further recognition and reinforcement of the growing success of our corporate strategy, which is based upon services, supported by our computers and peripheral equipment." What he might have meant: if anything seems weak consolidate it.

That's the way the baron of Bloomington has always operated. ❋

"We're Not a Grocery Company"

"We've been thought of as a grocery company," said Donald F. Brosnan who would like to change all that for MSI Data Corp., Costa Mesa, Calif., which he joined last July as president and chief operating officer.

Brosnan joined MSI after 18½ years with Honeywell Information Systems,



DONALD F. BROSNAN
After 18½ years with Honeywell

the last eight of which were spent as v.p. and general manager of HIS in Canada.

He noted that supermarkets currently account for 50% of the data entry terminal manufacturer's market "and we have a high penetration in supermarkets, almost to the saturation point." Growth for MSI, he feels, has to come from other sources.

MSI, since it announced its first product in 1968, has installed more than 58,000 terminals worldwide. The first product, the MSI 100, was conceived for supermarkets as a means of electronically recording order information directly from shelves and transmitting that data over phone lines to a central computer facility for processing.

The company expanded its marketing to other industries and data gathering applications, but supermarkets continued to provide its major business.

In 1970, the firm introduced Source 2001, a handheld keyboard attached to a cassette recorder. In 1972 came Source 1100, which records data in its internal memory, eliminating the need for the recorder. This was followed in 1973 by the Source 2100 which incorporates an illuminated display of the data being entered.

The capability of the Source 2100 was enhanced in 1974 to include an ability to wand both an MSI-modified Plessy bar code or the grocery industry's Universal Product Code (UPC).

All great things for the grocery chains.

Next item was "disappointing"

In mid-1976, in something of a departure, MSI introduced its 7600 accounting data entry terminal. It collects accounting information and does a limited amount of editing. It has been sold by MSI's existing marketing staff. Results to date have been "disappointing."

Brosnan feels the 7600 requires a different type of salesman than do the portable data entry terminals. "We need data processing-oriented sales people," he said, "people who can talk to data processing managers."

The company currently is building a staff of such salesmen, beginning with the hiring in April of William B. Patton, formerly a senior marketing executive for HIS, as v.p., marketing. Along with Brosnan, Patton joins another ex-Honeywell exec at MSI, Charles Bush, named v.p., operations, last March. Bush had been director of manufacturing for the minisystems and terminal operation of HIS' U.S. Information Systems Group in Boston.

"I'm not trying to raid Honeywell," Brosnan emphasized. "I'm just looking for the best people I know, and I just happen to know a lot of Honeywell people."

Succeeded Bowers

In assuming the presidency of MSI, Brosnan succeeded William J. Bowers who was named chairman and chief executive officer. Bowers succeeded Frank A. Grisanti as chairman. Grisanti is president of the firm Grisanti & Galef, Inc., known for its ability to turn around troubled customers.

If MSI was troubled, largely as a result of dropping its Astros line of point-of-sale (POS) systems for supermarkets, it doesn't seem to be now. Brosnan called the fiscal year ended last March "the recovery year." The company reported the best year in its 10 year history. It earned $2,756,519 or $1.40 per share on revenues of $34,259,094. In its previous year the firm earned $938,805 or 48

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cents per share from continuing operations on revenues of $31,213,991 but, after a charge of $1,564,354 for the discontinuance of the Astros line, the company had a net loss of $625,549.

Astros wasn't a total loss. One supermarket chain in British Columbia still is using it, but Brosnan would like to see this stopped because MSI is committed to supporting the installation and "you've got to know our expertise in this is going to slip."

All other installations were taken out and MSI sold the hardware, including some Computer Automation Alpha minicomputers, to Newman Corp. of Ann Arbor, Mich., which simply removed the equipment from an MSI warehouse to another warehouse in Orange County and sold it at what is guessed to be an "enormous profit" by Brosnan. "But it was the easiest thing for us to do."

And MSI hasn't forgotten about its supermarket customers. Its newest product, the MSI/77 was introduced in April at the Supermarket Institute conference in Dallas. It is, again, a handheld, lightweight, data entry terminal.

This one can be programmed, uses inexpensive, disposable batteries, and continuously retains its memory. Brosnan said it incorporates CMOS solid-state memory and is designed for use in applications requiring a high degree of portability and a low-to-medium volume of data input. "CMOS provides a high degree of efficiency of data storage because of the extremely low power consumption," he said. Power for the unit is provided by four "AA" penlight-type batteries. These, Brosnan explained, provide up to 64 hours of key entry operation, eliminating the need for battery recharging. He said battery or power failure has been responsible for most of MSI service calls to date.

Management

Productivity of Managers Studied

Management productivity, rather than worker productivity, is the subject of a research program being conducted in Arizona.

The program is the work of the Productivity Institute of Arizona State University's College of Business Administration in Tempe under a grant from Program Products, Inc., Montvale, N. J., and The Tanner Companies of Phoenix, a $60 million per year construction company.

A research study team headed up by Dr. Leslie D. Ball and Dr. Steven D. Wood of ASU is studying, under the grant, the effect of using a reporting and retrieval software package on general management's information use, and the effect of that information use on management productivity.

Initial results, said Wood, "indicate that management has become (as a result of using the package) more aware of what information is being maintained by Tanner's data processing center, and has become more concerned with data accuracy. And they are developing a more favorable relationship with the dp staff."

Maurice Tanner, president of the construction firm, said he has come to feel that information availability could determine if the firm is profitable or not.

Effect of a veto

"We often can't wait for a programmer to write a program for us. When President Carter vetoed the Central Arizona Project, we had to know quickly how that would effect us. I think that, in the future, our most effective managers will be those who know where the information is and how to get at it quickly."

The Central Arizona Project involved construction of nuclear energy plants in Arizona which, like those proposed for a number of other states, will not be constructed as a result of a presidential veto. The use of the reporting and retrieval package enabled Tanner to reevaluate its materials requirements in light of the White House action.

Program Products has supplied a research team, which includes Ball, Wood, two Arizona State doctoral students, three Tanner executives, and one undergraduate student, with temporary use of a software package called the Data Analyzer. It has been installed on Tanner's IBM 360/40.

In addition, Program Products provided training for the team members, for executives at Tanner, and for Tanner's data processing staff.

Ball said Tanner is contributing partial time of more than 40 executives in addition to making a cash contribution to the $20,000 study. He said the project, started with a training session conducted by Barry Cornell of Program Products in mid-April, is the first of its kind in the country. It is due to conclude in mid-October with results to be published in late November.

Ball said there is "increased concern for recent declines in productivity in American industry. While worker productivity has been studied extensively, little research has been conducted on management productivity. We believe managers could spend more time managing if they could acquire the specific information that they need when they need it, rather than waiting for a periodic standard report to be produced by the data processing center."

Wood said some line managers at Tanner "have indicated that two or three hours' work in putting together a Data Analyzer request for data have saved as much as a week's work or more in assembling the same information."

People

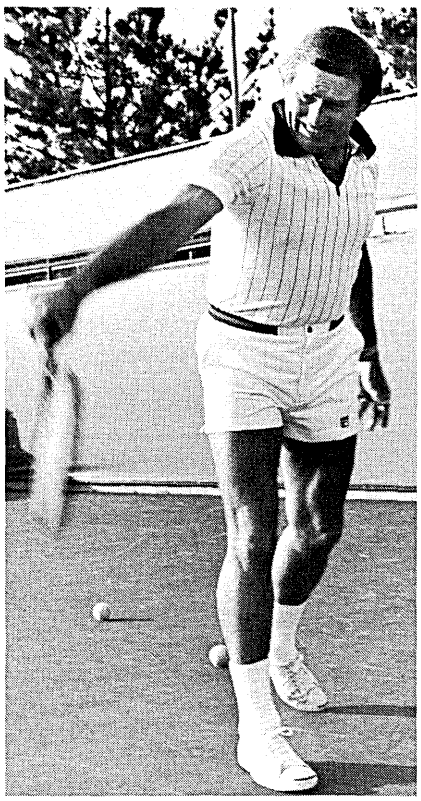
Tennis Anyone?

Hal Kurth started two things in '67. He started playing tennis and he started a company, Peripheral Equipment Corp., now Pertec Computer Corp.

And, as the numbers of the years are reversed, so were Kurth's startups in '76. He again started in a new business with purchase of the Calabasas Park Tennis Club. He also took up a new avocation—computers, to be specific, microprocessor-based computers.

Kurth was "quasi-retired" for four years after leaving Pertec in 1972. During that time he became interested in the things that could be done with programmable calculators. He was doing "some consulting" at the time and found them useful in this work.

Ultimately he purchased a $5,000



HAL KURTH
Now he's having fun with computers—and tennis

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PROCESSOR	6/16	NOVA 3/4	PDP-11/04
Data Type Lengths (bits)	4,8,16,	16	1,8,16
Instruction Word Length (bits)	16,32	16	16,32,48
General-Purpose Registers	16	4	8
Hardware Index Registers	15	2	8
Maximum Memory Available (KB)	64	64	56
Directly Addressable Memory(KB)	64	2	56
Automatic Interrupt Vectoring	Standard	N/A	Standard
Parity	Optional	Optional	N/A
Cycle Time (nanoseconds)	600	800	725

PRICE	6/16	NOVA 3/4	PDP-11/04
8KB Processor	$2200	$2600	N/A
16KB Processor	$2800	$3200	$3795
32KB Processor	$4000	$4400	$4995
Multipy/Divide Hardware	$ 950	$1400	$1820

Interdata's 6/16 wins the battle of the specs.

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What's more; all these hardware features enhance the nimble 6/16's performance. Its cycle time is only 600 nanoseconds, compared to 800 for the Nova and 725 for the 11/04.

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Canon ST 320 (from Canon Business Machines Inc.) which he used in financial forecasting. At first it was just play. "I built models of businesses. I wanted to know why anyone would invest in anything. Why buy stock? Would there be return on equity? What was the leasing business all about?"

Eventually, he explains, people began to ask "would you do it for us." He tells of one friend who happened to call him about something entirely different and just happened to ask, "What are you doing?" Kurth, at the time was playing with the Canon machine doing a financial forecast. He told his friend, who happened to need such a forecast for a meeting he'd scheduled in New York with potential investors. The friend got his forecast .... and his money.

Came the Revolution

Then, says Kurth, "came the microprocessor revolution." He began, he says, "to realize how much more powerful these devices could be, and wanted to know what could be done with them." To "better understand what they could do," he purchased an Imsai 8080 microprocessor-based computer (from Imsai, San Leandro, Calif.). From this he built a system in late 1976, at the same time as he was negotiating to buy the tennis club.

He put his system to work for his club when he took over its operation last Jan. 1. In mid-April, he was expecting it to be fully on-line by the middle of this month. In addition to the Imsai cpu, he's using a Diablo multiterm printer, a Lear Siegler crt, and a floppy disc from Icon, a division of Pertec.

He's doing general ledger for the club, employee time scheduling, and expected to have accounts receivable on it this month. He's got plans for many more applications and is considering putting terminals in the club's bar, restaurant, and pro shop. "But then, with the price of processors coming down, I might just put processors in those locations and get tapes from each one each night."

Kurth has written most of the software for his system. He said a big problem was the fact that although the system had a disc operating system, his programs, written in a "simple BASIC," couldn't talk to the disc operating system and couldn't talk to the files. He had an associate working on interface software to accomplish this in mid-April and expected this would be complete before the system would go on-line. This, he said would make possible on-line updating of files.

He said his employee time scheduling is saving him time and money. He doesn't do his own payroll. He has only 15 employees, many of them part time, so he doesn't see this as a profitable application for his computer. "I leave that to the Bank of America."

$40 against me

But keeping track of time is another matter. Hours worked by his employees are far from rigid. Before the computer, all information was taken from time cards. It required two people checking the time cards before passing on the data to the bank. Even then, he notes, "I checked once and found the total was $40 off against me."

He doesn't feel this can happen with the system totaling hours. A clerk enters information from cards to the system once each week using about one-half hour's time. The system is programmed to spot errors and comes back with error messages to an unlikely input. Since the workday at Calabasas Country Club starts at 7 a.m., if the clerk inputs a 6 a.m. starting time for an employee, the system responds "that must be p.m., try again." Another error message takes care of out-times that are earlier than in-times. "I can't have left before I got

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here, try again."

Kurth is having fun with his system. He wrote a text editing program for it. In mid-April, he was preparing a mailing to 100 pro tennis players inviting their participation in a pro-am tournament in June. He had it set up so all a clerk would have to do was key in the names and a personalized two page letter would be generated.

Kurth actually has two identical systems, the one he is using in his club and one his associate is working with developing interface software, and hopefully will be working for future software for a company he plans to start.

He feels he can put together and sell systems similar to his to other small businesses in his immediate area. "I could do a few million a year in business and never sell more than 10 to 15 miles from here." Calabasas is located in an affluent Los Angeles suburban area in the western end of the San Fernando valley. He said his systems would be priced from $10,000 to $20,000 depending upon the sophistication needed.

No name yet

He said he will incorporate his new company in California. He hasn't decided on a name for it yet though he did facetiously suggest ... "Pertec 2." He allows as how "if I've thought of this, others must have too, but I've got the capital."

He didn't always have it. Raised on a farm in Iowa, he joined the Navy after high school graduation as an alternative to accepting an athletic scholarship to a small Iowa college because "I didn't want to be a coach."

The Navy treated him to two years of electronics school, discharging him after four years of service as a full-fledged electronics technician.

He worked in this capacity for one and a half years at the Convair division of General Dynamics in San Diego, after which he decided "the only way I could do the things I wanted to do in electronics was to get a college degree." He got one in two years and two months from California Polytechnic Institute in San Luis Obispo, Calif. Armed with the degree, he went to work for Ampex Corp. in corporate research and did graduate work at Stanford Univ.

When Ampex bought Telemeter Magnetics in 1961 and formed Ampex Computer Products in Culver City, Calif., Kurth was transferred to this operation to work on digital tape transports. He still holds several patents resultant from this work.

TI development

From Ampex he went to Texas Instruments in Houston, where he headed up an effort to develop tape transports for TI's seismic computers, transports that could be carried on the back and could withstand rugged environments.

Next came Dataproducts Corp. where he served as chief engineer and director of engineering for a year. Then he founded PEC. "That's when I first became interested in financial forecasting," he recalls, "although at PEC we did it manually."

He said PEC was profitable from the very beginning, doing $400,000 in its first fiscal year (actually nine months) and earning $17,000. The second year the firm earned $120,000 on $2 million in business, in the third, $800,000 on $9 million, in the fourth, $1.9 million on $21 million, and in the fifth, almost $2 million on $23 million. "I'd forecast it closely," he said. Kurth changed the name of the company to Pertec when it went public in June 1971. The company subsequently was renamed Pertec Computer Corp. (September 1976, p. 187). Kurth resigned from the firm in December 1972 following a period of management dissention.

During the time he was running Pertec, he didn't have much time for tennis although he bought a house in Bel Air with a tennis court so that he wouldn't have to go far to play. When he resigned from Pertec, he decided to sell the house. "It was costing me $50,000 a year to run it and I was afraid I'd have to work to keep it up. I didn't want to work. I'd averaged 80 work hours a

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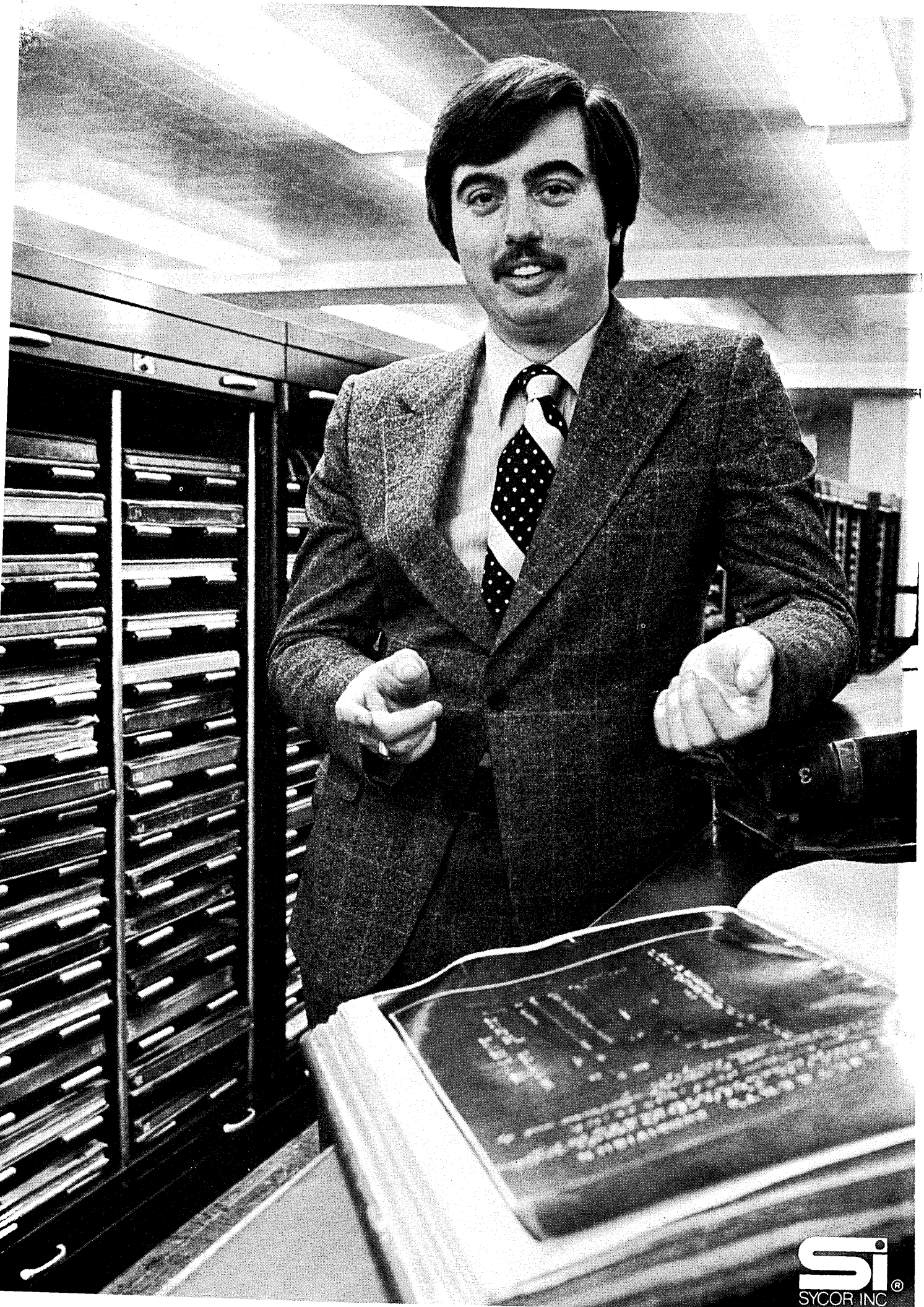
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week in the years between leaving the Navy and leaving Pertec."

So he sold the Bel Air house and moved to Calabasas Park where he upped his tennis playing to about 40 hours per week. He was a member of the Calabasas Park Tennis Club for three and one-half years before becoming its owner. "It was going downhill," he said.

Since taking over the club, he's added 45 new members, giving it 400 today. But he's decreased his tennis playing time to some 15 hours per week. ❋

Communications

U.S. Data Communications Revolution Is About to Explode Worldwide

The data communications revolution that erupted in the United States is about to explode worldwide. Detonating this explosion is a fledgling international data network which has been aborning for several years now. When full-blown in several years, it promises to provide universal worldwide service in parallel with the older, established operations of the worldwide telephone and telex networks.

Helping to lead this worldwide communications campaign is Telenet Communications Corp., the Washington-based packet switcher which earlier this year launched its first foray into the international data communications arena. As a precursor to this move, the company last summer began offering service to Canada through a link-up with the Trans-Canada Telephone System. Similarly, Mexican service was started up in February through an interconnection pact with Teleinformatica de Mexico, S.A. (TIMSA), which has its own packet switched set-up.

Telenet, founded in 1972 by Bolt, Beranek, and Newman Inc., began operating its domestic packet switching network in August 1975. Expanding service from the initial seven backbone cities, the net has grown to cover 50 cities with hook-ups to 35 more projected by year-end, and to more than 100 by 1978.

As the company has blossomed geographically, so has its user base. Approximately 130 host computers are connected to the Telenet network, with 250 to 300 host links expected by the end of this year. With all this growth, revenues could be expected to rise. That's what the as-yet unprofitable company is hoping. Backed mainly by BB&N, which has a 37% stake in the company, Telenet estimates that it will be breaking even by year-end. Revenue from the new international side could also make the company's financial situation brighter.

Company will make it

While some data communications doomsayers, in light of Data Transmission Co.'s untimely demise, are still skeptical about Telenet's chances of success, most believe the company will make it. All agree that packet technology, with its service utility approach, is cost-effective and efficient. The computer-based technology, pioneered by the Defense Dept.'s Advanced Research Projects Agency in its ARPANET network, allows heterogeneous computers and terminals to communicate with each other.

Specifically, packet switching permits data transmission among these disparate remote computers and terminals. The network itself consists of AT&T-leased (Dataphone Digital Service) lines which interconnect computers in Telenet's nationwide switching offices. These computers receive customer data over leased and dial-up lines, breaking it into packets, each having up to 128 characters. The packets are then separately addressed and computer-routed through the network to the destination Telenet office where they are reassembled into a complete message for transmission to the customer's computer or terminal.

International more complex

That's basically how Telenet's domestic network operates. Internationally, things become a little bit more complicated. In international data transmission, certain interfaces are required. Chief among these is X.25, a packet mode protocol which was okayed last October by the Consultative Committee on International Telephone and Telegraph (CCITT), the international telecommunications standard setters. Designed as a device-independent interface, X.25 allows the link-up of host computers and terminals to worldwide packet nets. Providing full duplex and flow control capabilities, the protocol will be used in Japan's packet system, in Canada's DATAPAC packet network, and in all the European systems being set up by the various Postal Telephone and Telegraph (PTT) authorities.

All countries with packet set-ups, including the U.S.'s Telenet, will have to contend with these complex but neces-

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sary interface issues. The benefits from this standardization drive are obvious. With universal standards, the worldwide expansion of data communications networks becomes far easier and far more efficient.

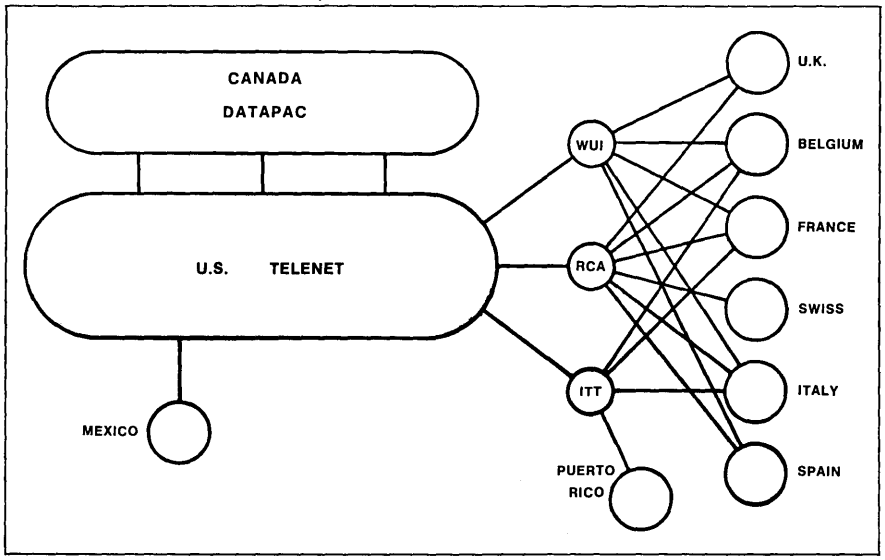
In preparation for this global communications outreach, many countries, especially in Europe, have been taking the packet plunge. The French PTT is setting up a public packet switching network to be called TRANSPAC. Slated to be operational late next year, TRANSPAC initially will support around 1,500 users. In Spain, the Spanish National Telephone Co. (CTNE) has been operating a packet-type service on a limited basis. But future plans call for broader public communications service to more than 5,000 terminals throughout Spain by 1978.

In addition to DATAPAC, another public packet net is scheduled to be built in Canada. Called INFOSWITCH, the network is backed by Canadian National/Canadian Pacific Telecommunications (CN/CPT). Japan is also in the packet race. The Japanese phone company, Nippon Telephone & Telegraph Corp., has developed a prototype system which is expected to go into commercial operation in the late 1970s and will be dubbed DDX.

But the biggest and boldest packet project is underway in Europe. PTT's in nine European Common Market countries have banded together to develop a multinational European packet switched network. This set-up, known as Euronet, will begin operation this year as a private network, but will offer public services at a later date. Also in Europe, the British Post Office has installed and is testing its public Experimental Packet Switching System (EPSS).

It was in conjunction with the British Post Office that Telenet was planning its initial service to Europe. But that agreement hasn't panned out, and as a result the company has struck up deals to use the international record carriers (IRC's) as middlemen to get the overseas service started.

Over the past few months, Telenet has made several international interconnect deals with third parties. In February the company joined forces with RCA Global Communications Inc., followed



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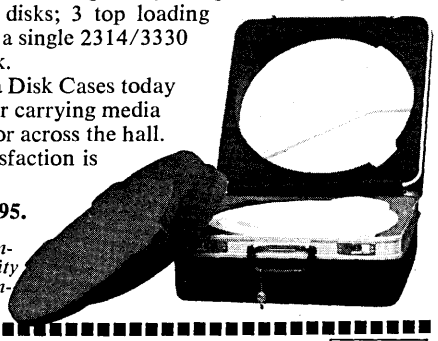

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in March and April by the same type of agreements with ITT World Communications and TRT Telecommunications Corp. All three will provide the overseas data transmission facilities and gateway switching gear to link Telenet's domestic net with packet switching facilities abroad. Another similar interconnect pact was hammered out last month between Telenet and WUI.

Despite earlier squabbles with the IRC's, Telenet president Larry Roberts declares that they "now are really our partners." And indeed they have to be since the company is locked by necessity into an almost symbiotic relationship with them. In order to get the overseas link, Telenet basically works through international record carriers, each of which operates in different modes in different countries. The IRC's, which do all the negotiating with the PTT's or other authorities, allow Telenet to tap that communications service they've set up. The resulting packet service then becomes available to Telenet's domestic subscribers through these IRC-established arrangements with the various countries.

Through operating arrangements like this, Telenet will have access to eight countries sometime this year. They include the United Kingdom, France, Belgium, The Netherlands, Switzerland, Italy, Spain, and Puerto Rico. (Service has already started in the U.K., Puerto Rico, and France.) International rates will be based upon hourly interconnection charges plus packet or character charges. Prices have already been set for the company's Puerto Rico, France, and U.K. service, but final rates for the other European countries have yet to be determined, although they are expected to approximate the U.K. and French rates.

Anyway, that's what Telenet is optimistically saying. In private, the company worries that the PTT's are pricing international packet service far too high. While most of the PTT's domestic packet prices are in the same ballpark range as U.S. and Canadian charges, their international rates are much steeper. Telenet's Roberts speculates that one of the factors in these higher prices is telex. What they're afraid of, he explains, "is a sudden diversion of a lot of their revenue ... to some lower priced, higher speed (telex) service."

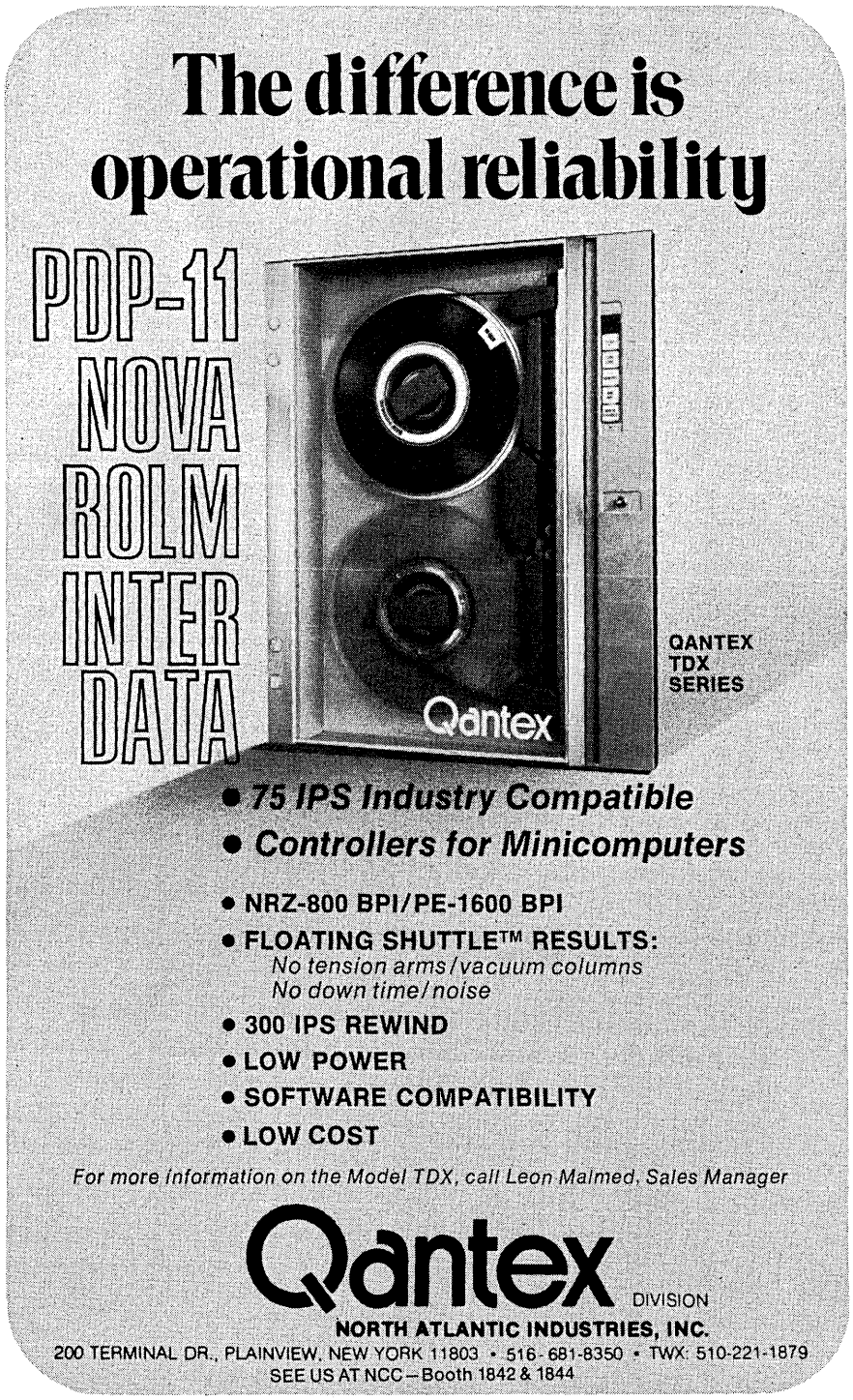
But Roberts doesn't see this happening because of several makeshift measures already in force. Nevertheless, he is concerned about the Europeans' "tendency to achieve a fairly high price" on international service. While no firm fees have been formed for packet service to foreign countries, individual countries, he notes, "are making up their minds on the prices they would like."

Roberts hopes those prices will be reasonable. If they run too high, it could, he concedes, cut into the company's overseas user base. With charges "in the range of $20 an hour, we see most of the market drying up," he confides. "The Europeans have set the initial tariff at $21 per hour for the character- oriented tariff. We hope that it will come out reasonably less than that for the packet-oriented tariff." Roberts' best guess for this "reasonably less" rate is $10 to $15 per kilopacket. (A kilopacket consists of 1,000 packets.)

Direct relationship

The relationship between tariffs and traffic is a direct one. There's "a continuous decrease in traffic as you increase the tariff. So we have pushed for as low a tariff as possible because we believe it will generate more traffic, revenue, and influence on the domestic service as well," Roberts says.

The company views its overseas venture as an "augmentation" of this domestic service. It's hoping that its foreign expansion will be "a strong incentive"for people to get on the domestic Telenet network. "It clearly adds,"



CIRCLE 131 ON READER CARD

Roberts maintains, "another dimension to our business which is helpful in terms of future competition and strength." It also provides an additional source of revenue. Over the next three years, the company estimates the overseas service will pull in $5 to $8 million per year in revenues.

Users' needs also must be considered. As Roberts pragmatically points out, not having access to foreign cities "is like not having San Francisco on the network. It's a major requirement of users who have offices all over the world," he insists.

The two biggest general markets for Telenet's international service, according to Roberts, are service bureaus or data base companies that want to sell worldwide and multinational firms with overseas branches, sales offices, or correspondence. These U.S.-based multinationals, which want to share their computer wealth with their overseas offices, make up the largest chunk of the demand for the Telenet trade.

Most of the original requests for the international link, Telenet planning v.p. Stuart Mathison says, came from the company's existing customers. The firm has since queried other potential client companies to test the water. So far, Mathison claims, "the demand is substantial" for the overseas volume-priced service.

Overseas, the story is different. The largest number of requests the overseas PTT's have had for the U.S. packet switched service has come from foreign libraries which want access to U.S. data bases. Roberts acknowledges that this is only "a very small part of the demand."

Despite Europe's computer lag, the data communications pace abroad has picked up tremendously. It's the domino principle at work, Roberts says. "Each country," he explains, "sees the possibility of transit traffic through other countries if it does nothing. So they all start moving when another country does." An even bigger motivating factor is Euronet.

"Euronet," asserts Roberts, "is a forcing function on all the countries to move toward data service." The reasons are basically economic—countries could lose additional data communications revenue if they don't have service. "So by the time Euronet is operational, you can pretty well guarantee," Roberts predicts, "every country involved in that network will have some sort of international service."

On a worldwide scale, Roberts sees up to a dozen countries being interconnected to data communications networks by the end of this year. By the end of next year, a dozen more of the larger countries and a smattering of smaller ones as well will have link-ups. And by the end of 1979, he claims that most of the world's nations will be folded into this international telecommunications family. As for packet switching, the self-styled entrepreneur-technician says that this service "will be available to virtually anybody anywhere within a couple of years."

To explain the basis for his prognostications, Roberts cites the rapid progress that's been achieved in standardization of telecommunications technology. "There is a tremendous growth building up ... in terms of interest and support of international (data communications) services. There are standards developed for synchronous and asynchronous services so that each country can have a single piece of equipment that can talk to equipment in every other country in a standard protocol, independent of which manufacturers' box is used.

"That capability to have a standard box has been the biggest thwarting factor in keeping foreign administrations from getting into data communications. Now, with that capability, with that strength of standardization ... there's a very rapid movement throughout the world to have universal data service—packet switched most likely with circuit switched interconnections—so that in a very short period of time a user anywhere in the world should be able to have data communications service to any other user anywhere in the world."

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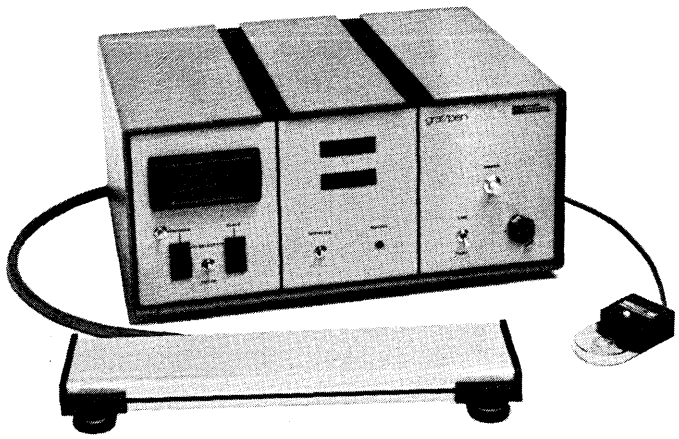

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CIRCLE 133 ON READER CARD

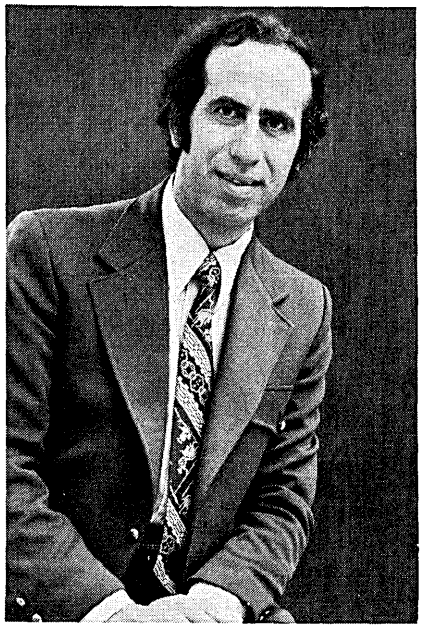
News in Perspective
BENCHMARKS . . .

Sycor Deal Off: Sycor Corp. will not buy into three European firms which are distributing its 400 series of distributed data entry and processing systems. The Ann Arbor, Mich., firm had signed a memorandum of understanding to acquire a majority interest in the holding company that owns two of the three firms, Computer Machinery Co., France, and Computer Machinery Deutschland GmbH, and a minority interest in the third, Computer Machinery Co. Ltd., United Kingdom (March, p. 176). A Sycor spokesman said acquisition negotiations were terminated because the parties couldn't agree on acceptable terms. Distribution agreements with the three European companies for the 400 series remain in effect through Dec. 31, 1978.

Siemens Plans Purchase: Siemens AG, a major creditor of debt-ridden Litronix, Cupertino, Calif., said it is negotiating to buy the optoelectronics manufacturer, pending approval of a plan to be submitted to a bankruptcy court. Bruce Blakkan, Litronix president, said the company has been actively engaged in pursuing acquisition possibilities for some time, and is continuing to engage in discussions with other companies, including Honeywell, Inc., which have expressed an interest in acquiring all or part of Litronix. The firm earlier withdrew from the personal calculator and digital watch markets and began operating under an informal moratorium on payment of past-due obligations. Formal bankruptcy proceedings have not been initiated.

Nixdorf Infusion: Nixdorf Computer AG will pay $22 million to purchase Entrex Corp. (May, p. 264) and will infuse an additional $8 million over the short term into the merger of the Burlington, Mass., data entry manufacturer with its U.S. subsidiary, headquartered in Chicago. Heinz Nixdorf, president of the German company, said the capital infusion will come to $80 million by 1980 when he hopes the combined operation, to be known as Entrex Inc., will have reached a sales goal of $100 million. Donald Fedderson, Entrex president, will be president of the new subsidiary. Nixdorf said the combined operation will have a single consolidated product line and that "eventually 80% of the machines sold in the States will be produced in the States."

President Again: Jessie I. Aweida, chairman and chief executive of Storage Technology Corp., is once again president of the Louisville, Colo., firm following resignation from that job of Victor A. Casebolt. A company statement said Casebolt resigned "because of recent shifts in responsibilities among members of Storage Technology's senior management group, with which he did not concur." Aweida stepped aside as president in 1975 when he brought



JESSIE I. AWEIDA

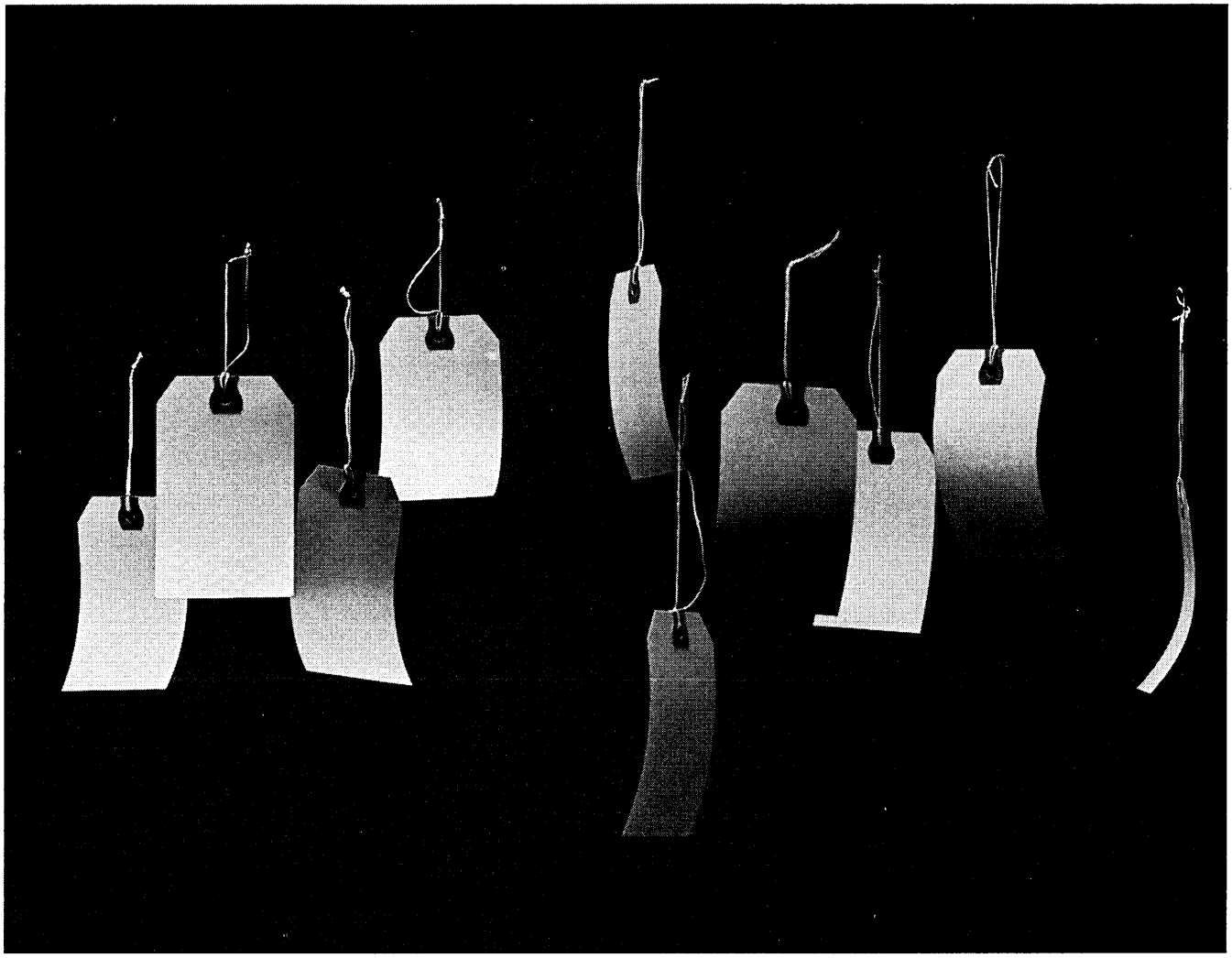
Casebolt into the firm. Casebolt had been general manager of utility and process automation and instrumentation at General Electric. When Casebolt joined STC, Eugene E. Prince, executive v. p. of operations, and James K. Dutton, executive v. p. for field operations, left the company.

Healthy Response to 3033: IBM's recently announced 3033 computer is enjoying instant success with some 2,000 letters of intent to order the machine from customers worldwide. The latest order—letters of intent for 85 machines—has come from AT&T and is worth more than $300 million on an if-sold basis. AT&T's director of data systems, Robert Santos, said the 3033s, many of which would be rented, would replace 370/168s, but would have no impact on AT&T's recent agreements to acquire Amdahl 470V/6 machines. He said a minimum of 12 Amdahl units will have been installed within the company by the end of this year. Santos also said the 72 processors were to go to the Bell System's operating companies around the country, and that 13 would go to its subsidiaries, including Bell Labs and Western Electric.

For Continued R & D: California Computer Products, to avoid cutting back on research and development, renegotiated $45 million in bank debt, reducing payments to be made between now and June 1978. An agreement in principle has been reached by CalComp and Citibank, Manufacturers Hanover Trust, First National Bank of Chicago, and Wells Fargo Bank, allowing CalComp to skip a $2.5 million payment that was due March 31. Instead of quarterly payments of $2.5 million, CalComp will pay $1 million on June 30, $1 million Sept. 30, $2 million Dec. 31 and March 31, 1978, leaving $36.5 million for later payment. George M. Canova, chairman and president, said payment amounts after June 1978 probably will be set at that time after discussion with the banks. Canova said the payments were cut to allow more money for product development.

CDC's IBM-Compatible Line: Control Data Corp. has released prices, availability data, and specifications for its long-awaited line of cpu's which are plug-compatible with IBM's 370/135, 138, 145, and 148. Development of the machines, dubbed Omega 480-1 and Omega 480-2 by CDC, originally was started by Cambridge Memories Inc. (February, p. 142). Development was completed by IPL Systems, Bedford, Mass., which is building the machines. The 480-1 comes in four memory levels — 0.5, 1, 1.5, and 2 megabytes and the 480-2, in two configurations of one and two megabytes. CDC claims a 10% to 100% performance improvement over the four IBM models at purchase prices 5% to 30% less than comparable 138 and 148 machines. Control Data said operational tests have shown that IBM software available for the 370 systems, with the exception of time-dependent coded programs, will run without modification on equivalent Omega configurations.

Xerox Reorganization: Xerox Corp. has formed a new Business Systems operating unit in El Segundo to market present systems products and to develop office systems for the future. The group is headed by John C. Lewis as president. Lewis had been president of the discontinued Xerox Data Systems. Existing Xerox units which make up the new group include the Office Systems Div. in Dallas; Data Systems Div., El Segundo; and Daconics, in Sunnyvale, Calif. Products include non-impact computer printers, individual word processing systems, and facsimile products as well as shared-processor word processing systems (individual word processing terminals linked to a small computer). ❋



How much do sluggish performance and IPLs cost you every day?

A bundle.

Resolve is the *only* really complete product that will help you reduce or eliminate problems that cause lost productivity.

It will give you back 10% to 30% of your CPU for more work and increased throughput. And it will give you this increased computer productivity every day, day-in, day-out.

Resolve helps you solve real-time problems that cause sluggish performance and IPLs. It helps insure that system resources are distributed to critical jobs and solves operational problems in job and DASD space management.

It will automatically give you early warning messages when serious problems are developing so you can minimize or avoid them.

And, since your computer operation isn't *just* like everyone else's, you can easily add your own Resolve functions to address problems unique to your installation.

If you're tired of paying the daily price of sluggish performance and IPLs, find out more about Resolve.

It will pay *you* dividends on every shift.

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Boole & Babbage

Operations Division, Boole & Babbage Inc., 850 Stewart Drive, Sunnyvale, California 94086.

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LOOK AHEAD

(Continued from page 16)

To come up with this extraordinary system which IAC is dubbing BYTERON, the institute is planning on a $10 million development effort which will take two to three years. But to get the technology down pat, IACers need some live experience with the UNICON (unidensity coherent light recording) terabit (10^{12} bit) originally developed by Precision Instrument Co. (PIC). The groups chosen to provide this experience are, naturally, federal agencies with mass storage requirements. Zeroing in on these potential users, the institute began pitching the system to the Feds last month. So far, the U.S. Geological Survey and the Army Engineering Topographic Labs are the only two "which have expressed interest," according to an IAC spokesman. However, various other agencies he adds, are expected to participate in the BYTERON project.

Described as an archival write-once memory system, the technology uses a modulated laser beam to record bits on plastic strips coated with metal. Touting the technique, the IAC spokesman claims "it's the only technology that's exhibited a capability to be scaled up to allow memories in the 10^{15} bit range."

BUBBLES FOR SMALLER STORAGE

Bubble memories will continue to be an industry hot button for some time to come. By the end of this year, observers say, the $200 Texas Instruments chip that packs 92K bits in effervescent form will be available for $40. And they look for a ten-fold increase in capacity at the same $40 price sometime next year.

In a market study by Small Business Systems, Palo Alto, Calif., that is due out in July, it will be noted that a competing technology, the disc drive, is also expected to drop in price, largely on the basis of the use of thin-film technology in the read-write heads; it purportedly allows a three-fold increase in bit packing densities. Says researcher Howard Bogert, "What's the smallest amount you could spend to get some bits? That's where the bubble is the strongest." Which is to say the bubble may be most competitive in applications calling for smaller storage capacities.

SOMEDAY A SEARS CATALOG AND MICROFILM VIEWER FOR FREE?

Those who feel the future of microfilm use hinges on users being able to view microforms cheaply took heart last month with a $54 "Fichette Viewer" shown at the National Micrographics Assn. conference in Dallas. Shown by Microform Communications, Ltd. of England, the 16mm viewer is the size of a portable tape recorder. It holds cassettes and microfiche forms and projects them in black and white and in color on the inside of the case that carries the 2 x 4 1/4 x 6-inch viewer.

In October the company will begin seeking U.S. dealers, after it fills orders for 24,000 viewers from the U.K. Army, a chemical company, and a painting company--the last company using it for paint salesmen to display samples on microfilm in color. The company says dealer prices will range from $60 to $100, but in larger quantities the price will drop to $54--which is about half the price of microfilm viewers offered in the U.S. Maybe someday--the Sears catalog comes as a box of microfilm and a viewer for free?

RUMORS AND RAW RANDOM DATA

Silicon gulch rumors suggest that the expected new line of minicomputers from National Semiconductor will have a bit/slice micro architecture and the unexpected ability to run Digital Equipment Corp.'s PDP-11 software, either with an emulator or perhaps even utterly compatible hardware...Adapso's suit against Citibank's emergence into the service business came about after preliminary discussions between the two organizations broke down. Citibank, which originally said fees would be 50% below the going rate, now claims charges represent full processing costs plus a reasonable profit. "It's not a loss leader," a bank spokesman says...We hear talks between Datatrol, a Hudson, Mass., subsidiary of Applied Devices Corp. and Addressograph-Multigraph concerning sale of A-M's Amcat credit authorization terminals line to Datatrol have bogged down almost to the point of discontinuance... Paul Nadler, professor of Business Administration at Rutgers Univ., who makes an avocation of "looking at banking," did so last month at the American Bankers Assn. Operations and Automation Conference in New Orleans, and told those attending, among other things, "You'll never become president of your bank. You don't talk the same language. You promise too much and you don't know what's going on in the rest of the bank."

Getting and keeping timeshare business:

Remote computing services and batch service bureaus face a number of problems.

Problems which, if not solved, could mean the beginning of the end for most of them.

Maybe even your company.

Batch, but only batch.
There's no denying the demand for on-line services. (Look how some of the remote computing services have prospered.)

So there's the problem of adding a timeshare capability. At low cost, so you can offer a low-cost service. But with the capability to grow with your business.

There's the problem of security for proprietary software and data. The problem of delegating control of system resources, without losing overall control. The problem of accounting for system use—especially use of added-value software. And the problem of knowing what is happening anywhere in the system, at any time.

Solving these problems could make you successful in timeshare as well as batch.

Remote, but losing business.
For remote computing services, keeping customers is often the biggest problem.

After a time, many customers begin to feel they're putting out too much money for your service. They check out your competitors. Or think about an in-house system.

Finding a way to extend your services downward in cost could turn your biggest problems into even better customers.

Small, or just starting out.
You may already have a small timesharing company. Or you're planning to start one. Your first problem is finding a computer you can afford. One that's also a real timesharing computer. With the management features the big timeshare computers offer.

Solving this problem could make your small company a big success.

Problems solved here.
These problems you're facing in your firm, timeshare or batch, large or small, can be solved with the computer made by us:

Basic Timesharing, Inc. We're the computer manufacturer with timeshare experience. We understand the unique problems of your business.

And that's what has helped us produce a computer so uniquely right for the timesharing business.

The BTI 4000 Interactive Timesharing System.

A remote computer's computer.
The BTI 4000 was built from the drawing board up for timesharing. To maximize operational capabilities. To minimize operating costs. To give you more.

You can start for just $35,950. For that you get a ready-to-go system with 10 megabytes of storage and 8 ports—just add terminals.

You also get BASIC-X, an unusually powerful extension of the BASIC user language, enhanced for business programming.

You get hierarchal account organization, allowing you to "sublet" portions of the system. Which lets you earn income without overhead, while still maintaining total control.

You get protection for your proprietary software that allows *you* to sell systems with your software on them—and still keep your software proprietary.

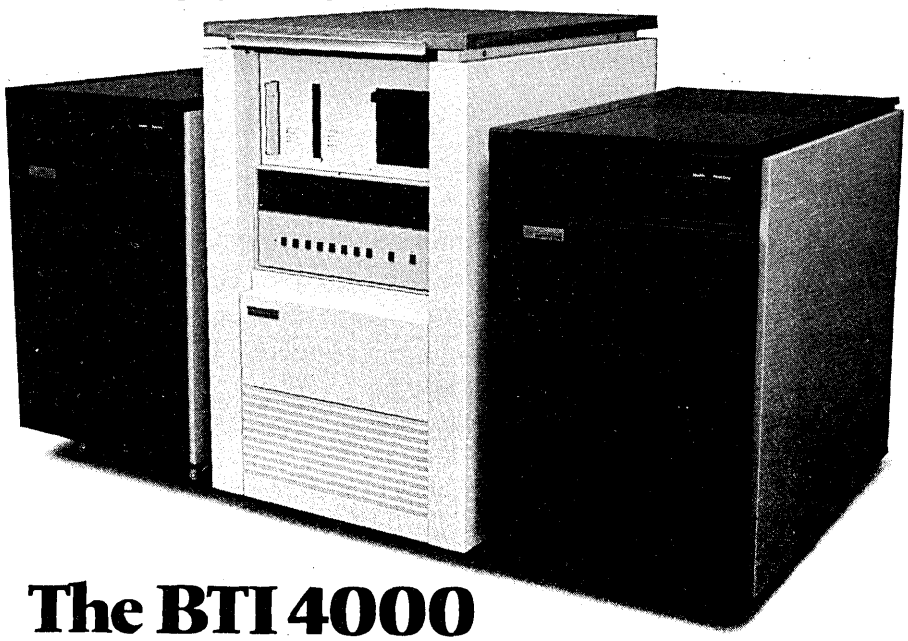
You get continuous system availability, because software housekeeping can be performed with users on-line.

You get room to grow, because the BTI 4000 is a modularly-expandable system. Add disk storage to 400 megabytes; expand user capacity to 32 ports; add peripherals like industry-compatible magnetic tape and a line printer.

And you get around-the-clock, on-line support for all your systems, no matter where they're installed.

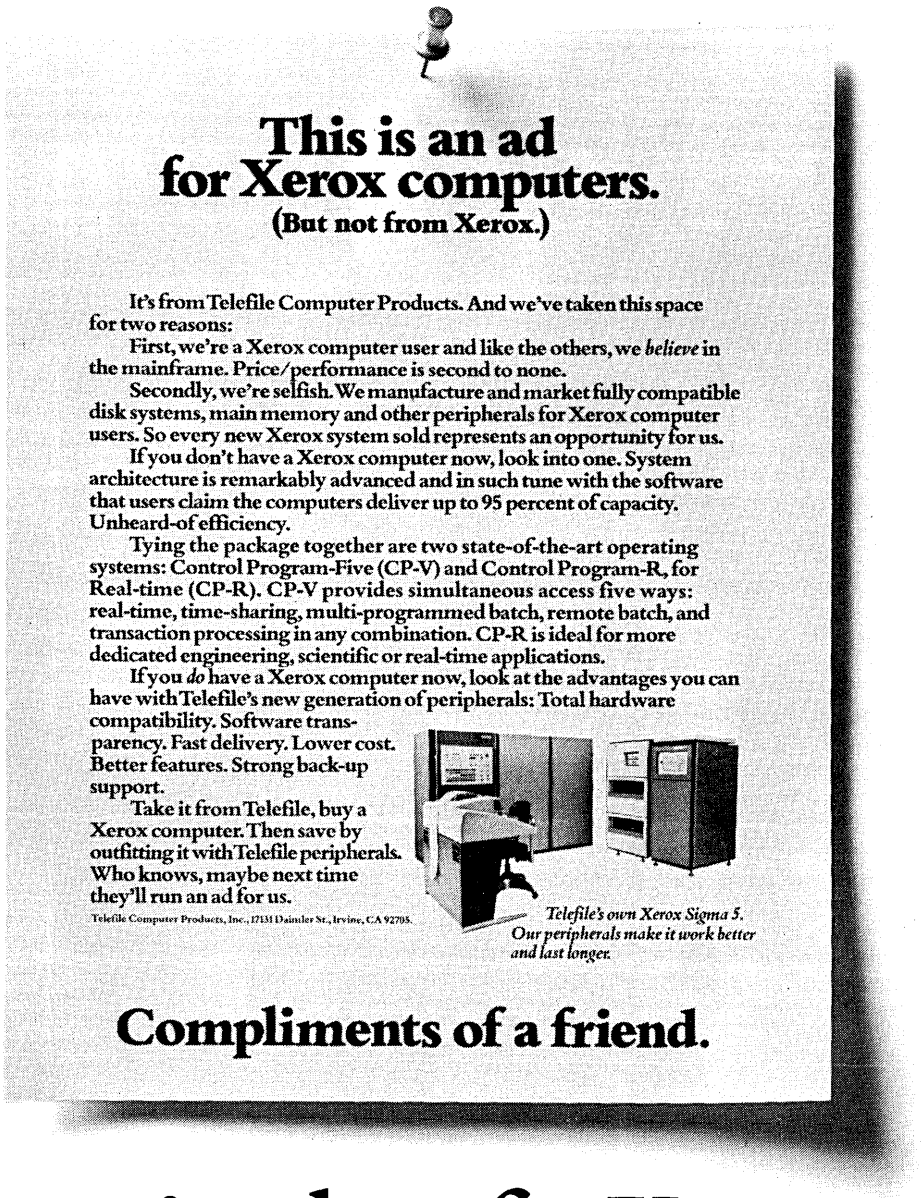
The BTI 4000. To help you get more timeshare business, and keep the business you have.

Get the complete details today.



The BTI 4000 Means Business.

Basic Timesharing Inc., Headquarters: 870 W. Maude Avenue, Sunnyvale, CA 94086. Sales Offices: East: Cherry Hill, NJ (609) 662-1122; Midwest: Minneapolis, MN (612) 854-1122, Chicago, IL (312) 298-1177; West: Sunnyvale, CA (408) 733-1122, Anaheim, CA (714) 533-7161



What we've done for Xerox users, will now be done for Univac.

Xerox computers aren't getting older. They're getting *better.*

And that's all the more remarkable since Xerox *hasn't built one in years.*

Computer Enhancement is the reason.

It's a new industry being pioneered by Telefile. Applying latest technology, we revitalize computers so they can do more work faster. It may mean faster memory or peripherals. Or simply "black boxes" that extend a computer's capability beyond previous design limits.

Take Xerox. Since early 1975, when our ad appeared, Telefile has announced over 24 new Xerox-compatible products.

Compact main memory, high speed printers, communication processors, solid state RAD's, array processors, and on and on.

Most have powerful performance, reliability, and cost advantages over the Xerox units they replace. More important, they're available.

Recently, we announced a new mass store facility that brings "Winchester" disk drive technology to Xerox users – something previously available only to IBM users.

Telefile has even taken over complete system maintenance at some sites. Our service network now stretches to over 20 cities and it's growing monthly.

And now to give Xerox users room to grow, Telefile is embarking on the development of *two new microprogrammed Sigma mainframes* for introduction in 1978. One will run four times faster than Xerox' biggest machine, yet cost only about half as much.

That's computer enhancement. To Xerox users it means a way to take their computer investment and superior software into the 1980's in style.

Univac users, you're next.

Telefile

Enhancing computers is our business.

This is an ad for Univac computers.

(But not from Univac.)

It's an unsolicited testimonial from Telefile Computer Products. And we've taken space again for two reasons:

First, for sheer number crunching and handling of large data bases, Univac computers are in a class by themselves (how else could they thrive under a quarter century of IBM competition?).

Secondly, there are hundreds of *older* Univac installations that could benefit significantly from Telefile's computer enhancement capabilities.

Key to Univac's success has been its evolutionary approach to systems design. The new 1100 Series machines are direct descendants of the Univac 1108, first installed in 1964 and still running strong.

But as 1108's and other models have grown older, remarkable evolutionary advancements in memory, peripheral and mass storage facilities have grown up around them. One way users could upgrade was to change out the mainframe into a gleaming new model. Univac makes it easy by keeping the software compatible.

Think of Telefile as being *counter-evolutionary.* We reverse the tides of time by applying new memory and accessory design to computers hobbled by the past.

Take our new fully compatible add-on memory for Univac computers. By taking advantage of latest technology, it runs faster, takes up less floor space, and runs on only one-third the power of the Univac memory it replaces. No software changes are required. And costs *are cut about 70 percent.*

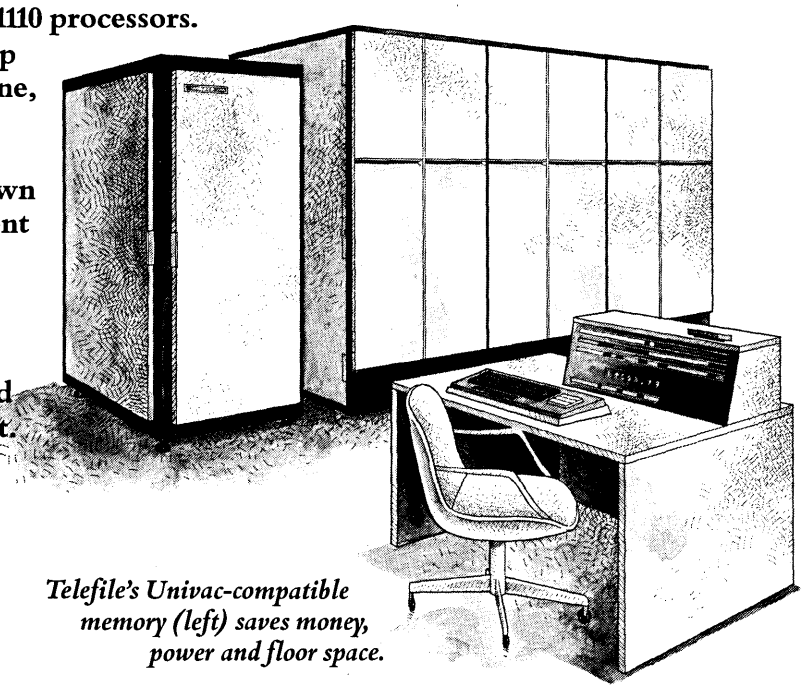
We currently offer unitized memory for 1110, 1100/40 and 1106 processors; and multi-modular memory for Univac 494, 1106, 1108, and 1110 processors.

Both memory types are currently up and running on Univac computers. On one, overall system throughput has been boosted by a remarkable *30* percent!

But this is just the start. Coming down the line are a solid state drum replacement and disk systems that leapfrog 3330 technology. Not to mention some other exciting developments we'd rather not mention right now.

We don't expect Univac to run an ad for Telefile, but someday the users might.

Write: Telefile Computer Products, Inc.,
17131 Daimler St., Irvine, CA 92714.
Phone: (714) 557-6660.



Telefile's Univac-compatible memory (left) saves money, power and floor space.

Compliments of Telefile.

hardware

Off-line

Scientists at IBM's San Jose Research Laboratory recently combined two existing technologies--lasers and liquid crystals--to build a new type of display for computer terminals. Black-on-white characters are formed by a deflectable laser moving across the back of a liquid crystal cell formed by sandwiching viscous crystals between sheets of glass. Two computer-controlled oscillating mirrors deflect a continuous wave laser beam across the back of the display cell, producing a scanning pattern. The beam is turned on and off to produce characters formed on a 7 x 9-dot matrix. The display retains images, without refresh circuitry, until erased by an audio-frequency voltage applied to the plates that confine the crystals. Form overlays can be displayed on the screen by inserting slides (b/w or color) into the terminal. Built to demonstrate its feasibility, the device displays information at 20 cps rates.

Seymour Cray, who makes an avocation of building huge, state of the art number crunchers, must be happy: the Los Alamos Scientific Laboratory has renewed its lease on a CRAY-1 system, the Dept. of Defense has agreed to install two of his supercomputers, and the Council of the European Centre for Medium-Range Weather Forecasts has authorized its director to conclude a leasing contract for a limited CRAY-1 system. The Europeans also agreed in principle on the acquisition of a full CRAY-1 as the main computer in their permanent computer system.

CalComp says it has installed the "largest mass data storage and retrieval system ever built" at an Army dp center in St. Louis. Nearly 100 feet long, the model 7100 Automated Tape Library will store up to 1.5 trillion bytes on 8,351 thin-line reels of mag tape.

The outfit that broke the $20 price mark for L.E.D. digital watches has done it again. Texas Instruments says its model 503 sports/youth watch will carry a suggested retail price of $9.95. Eat your heart out, John Cameron Swazey.

IPL Systems, Inc., has delivered the first two production models of its IBM 370-compatible cpu's to Control Data.

Smart Terminal-Controller

This smart terminal-controller contains three microprocessors which provide file management, editing, and communication control, and a flexible-disc drive. The "Smarts" controller works with any terminal in the vendor's product line; users can tailor systems to their specific requirements. It supports concurrent operations; for instance, the operator can enter data to the diskette while a remote computer polls the terminal for previously entered data.

With a single English-word command, operators can create, delete, duplicate, print a file, or key in data. They can select files for transmission or local printing. Prestored formats can be called to prompt the operator through a variety of applications.

The controller has a 26-command text editor. Operators can search, delete, or substitute by character, data string, line, or entire paragraph/pages. Sections of data may be separated into a separate file for later insertion.

Communications are under microprocessor control. Operators can call, identify themselves, assign send and receive files, change stop and turn codes, set-up for automatic answer, or terminate a call with a single command. Communications are currently 1200 bps asynchronous ASCII; faster speeds are anticipated.

The floppy system can store more than 270,000 characters in up to 60 operator-named files on a single diskette. The controller dynamically allocates disc space. A dedicated micro buffers all disc I/O.

The Smarts controller can be had in a variety of terminal configurations, with a present maximum of one command console and one local printer. The controller has four ports, two for communications at 1,200 bps, the remaining two for the console and printer.

Prices for a Smarts-controlled terminal system start at $235 per month on a three-year basis. That includes the controller, a keyboard printer, a 1200 bps modem and maintenance. Deliveries will begin in the third quarter. WESTERN UNION DATA SERVICES, Mahwah, New Jersey.
FOR DATA CIRCLE 270 ON READER CARD

Channel Adaptor

Univac 1106 and 1108 users can now use this vendor's 6420 tape subsystems to replace Uniservo 12, 16, or 20 subsystems. This is made possible by the vendor's 6876 channel adaptor, which performs the same function as Univac's Multiple Subsystems Adaptor. The adaptor supports all data formats available under Univac's software. An operator-selectable EBCDIC or ASCII translator is provided on the 6876. The channel adaptor supports a combination of 7- and 9-track drives; densities range from 200 bpi to 1,600 bpi. The 6878 sells for $18,500; two and three-year leases are also offered. TELEX COMPUTER PRODUCTS, INC., Tulsa, Ok.
FOR DATA CIRCLE 295 ON READER CARD

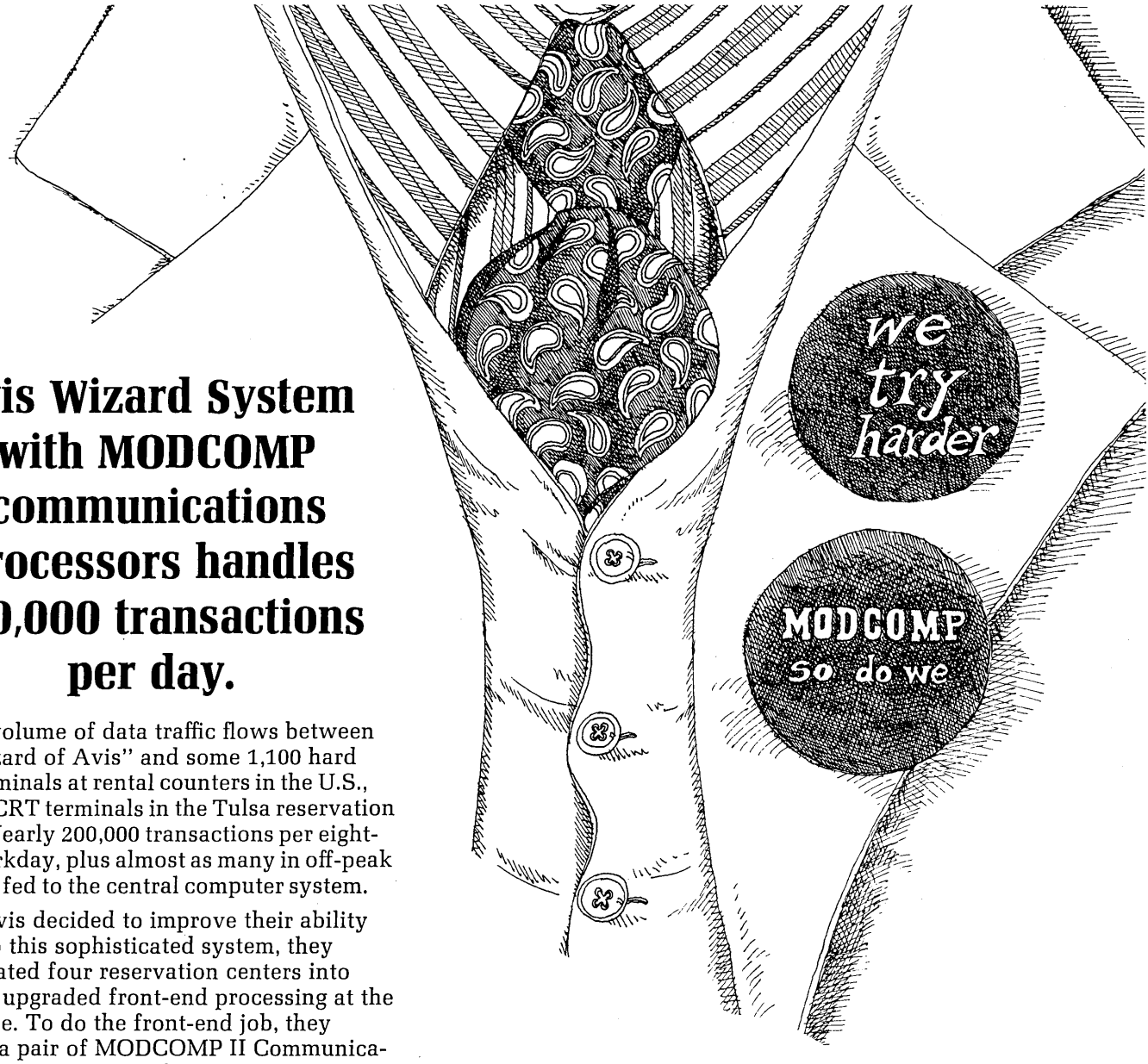
Computers

There are three additions to this firm's 8000-series of computers. Two of the new computers can be had with firmware for either batch or virtual machine operations, the remaining machine is available with batch firmware only.

The smallest of the three new machines is the N-8350, a disc-based family of systems offering cassette I/O and a crt console. The N prefix indicates software compatibility with the firm's Century series. It's available with 32K bytes to128K bytes of memory. The N-8350 has a 1.2-microsecond processor. Rentals start at $2,210 per month and purchase prices start at $69,650 for a 32K system with 10 megabytes of disc, and a 150 1pm printer. First deliveries will begin next month.

Next in line is the 8450, available as either the Century-compatible N-8450, or the V-8450, a virtual machine. An interactive version, the I-8450, is expected later this year.

The 8450s have 112-nanosecond processors. The V-series use from 384K bytes to one megabyte of memory. Monthly rentals begin at$4,075 and purchase prices begin at $142,250 for a processor with 384K bytes of memory. Deliveries will begin in the third



Avis Wizard System with MODCOMP communications processors handles 200,000 transactions per day.

A huge volume of data traffic flows between the "Wizard of Avis" and some 1,100 hard copy terminals at rental counters in the U.S., and 175 CRT terminals in the Tulsa reservation center. Nearly 200,000 transactions per eight-hour workday, plus almost as many in off-peak time, are fed to the central computer system.

When Avis decided to improve their ability to talk to this sophisticated system, they consolidated four reservation centers into one, and upgraded front-end processing at the same time. To do the front-end job, they selected a pair of MODCOMP II Communications Processors — one for processing, and one for backup. Each has 128K bytes of four port memory, and its own fixed head disc for program loading which can be switched to either CPU.

Both MODCOMP II's have two switchable 128-channel Universal Multiplexer controllers, configured as 100 asynchronous and 28 synchronous channels.

Currently Avis is using one synchronous channel at 40.8 KBPS to feed the 360/65 host computer, and five synchronous channels at 7200 BPS and 4800 BPS dedicated to remote field concentrators. Eight 2400-BPS synchronous channels are reserved for direct backup of communications with the reservation center in the event of concentrator failure. Two 1800-BPS and 28 1200-BPS asynchronous terminal circuits are serviced directly by the MODCOMP II.

The entire system is supported by MODCOMP's MAXCOM Communications executive, to which Avis added software test features for message trace, I/O trace and program trace.

Cutover to the new system went off with minimum problems, thanks to the flexibility of the MODCOMP equipment. As for reliability, the MODCOMP equipment has been running with 99.7% uptime.

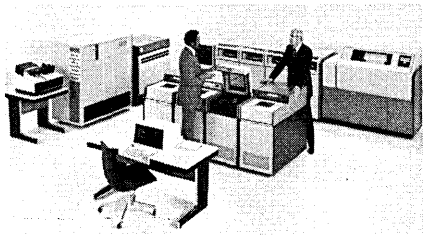
When you're planning to implement a new data communications network, or to upgrade an existing one, call on us. High-throughput, high-performance hardware and software are our specialties — for distributed processing systems that range from small to large, including remote batch terminals, concentrators, front-end processors, message switching, packet switching capabilities. Modular Computer Systems Inc., 1650 W. McNab Road, Fort Lauderdale, Florida 33309 (305) 974-1380.

MODCOMP

The communications specialists.

quarter of 1978. N-series memory sizes range from 128K bytes to one megabyte. A 128K byte N-8450 will rent for $2,475 per month, or sell for $90,900. Fourth quarter deliveries are planned.

Hottest of the new processors is the 84-nanosecond 8560, also available in virtual and Century-compatible versions. The processor uses emitter-coupled-logic, has up to five I/O trunks, and can use up to 1.5 megabytes of main memory. The virtual V-8560 has a minimum memory requirement of 384K bytes. Purchase prices start at



$237,050. The smallest Century-compatible 8560, the N-8560 has 192K bytes of memory. It rents for $5,030 per month, and has a purchase price of $195,200. Both versions will be available for fourth quarter deliveries.

The three processors can use a variety of NCR peripherals, including disc drives, mag tape units, terminals, and MICR sorter/readers. All three may be programmed in COBOL, NEAT/3, FORTRAN, and BASIC. The 8450 and 8560 also support RPG. All of the new systems are designed to operate within a complete communications architecture the firm plans to announce this summer. NCR CORP., Dayton, Ohio.

FOR DATA CIRCLE 278 ON READER CARD

Smart Color Graphics

The Micrographic terminal, based on a Z-80 microprocessor, offers graphics and alphanumerics in either black and white or color.

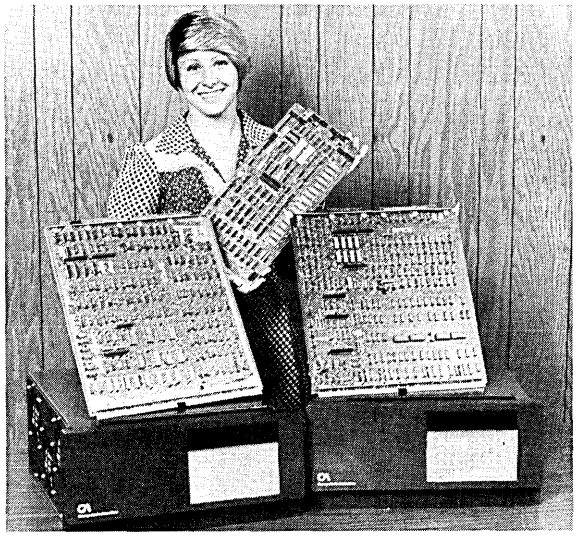
The unit's screen, an industrial quality monitor, displays 2,000 characters in 25 lines of 80 characters, Graphics resolution is 512 elements by 256 lines. Black and white screen size is 14-inches, color measures 13 inches. The Micrographic isn't limited to seven standard colors; the user can select eight each of a possible 64 colors in both graphics and alphanumerics. The system also has composite, split, or dual screen capabilities.

The terminal's internal operations are completely controlled by the Z-80 micro, with up to 28K bytes of PROM and 16K bytes of RAM. The PROM-based control software can be user-developed, or purchased from the vendor. The vendor's software provides tty compatibility and graphics functions (vectors, conics, plots, bar charts, etc.) as commanded by ASCII text strings sent from application programs in the host computer.

The unit's keyboard generates 128 ASCII codes. It has a 61 key typewriter keypad, 12 key cursor/function pad, 12 key numeric pad, 16 key special function keypad, and a total of 40 functions.

Communications, via an RS232C or 20ma current loop interface, can occur

product spotlight



Minicomputer Family

The Naked Mini-4 isn't a quartet that plays the nudist camp circuit. It's this company's latest line of 16-bit minicomputers for oems. With prices starting at $645 for the smallest member of the family, a single LSI 4/10 packaged as a computer-on-a-half board with 4K words of memory and no power supply, these processors might make designers look twice before opting for a microcomputer.

The Naked Mini-4 family comprises the LSI 4/10, 4/30, and 4/90. All are 16-bitters, with up to 64K words of addressable memory, five I/O modes, 10 addressing modes, and a common, basic instruction set of 90 operations. The LSI 4/30 has an additional 17 instructions for a total of 107, the LSI 4/90 adds 30 instructions to the basic set for a total of 120. Operating speed is dependent on the memory used: the optimum cycle times for the 4/10, 4/30, and 4/90 are 4 usec., 2 usec. and 1 usec respectively. Each processor includes stack processing and multiply/-divide instructions.

The new family is said to offer a 25% to 40% price advantage over the predecessor LSI-2 and LSI-3 series; more registers, faster memories, and the new instruction set improve performance, the firm adds. The manufacturer doesn't expect many of its customers using the earlier series in existing products to switch processors. The lines don't use the same instruction sets, but there is sufficient commonality to allow the vendor to write a conversion program.

New memory offerings include single card RAMs in increments of 8K, 16K, 24K, and 32K words with a choice of cycle times of 550 or 700 nanoseconds. Battery backup is optional. There are also new half-card core modules in 4K and 8K word increments, with cycle times from one to three microseconds. You can also use previous memory products, such as 850 or 1,200 nanosecond core, 850 nanosecond RAMS, and combinations of RAM, ROM, and EPROM (up to 10K words) on a half card.

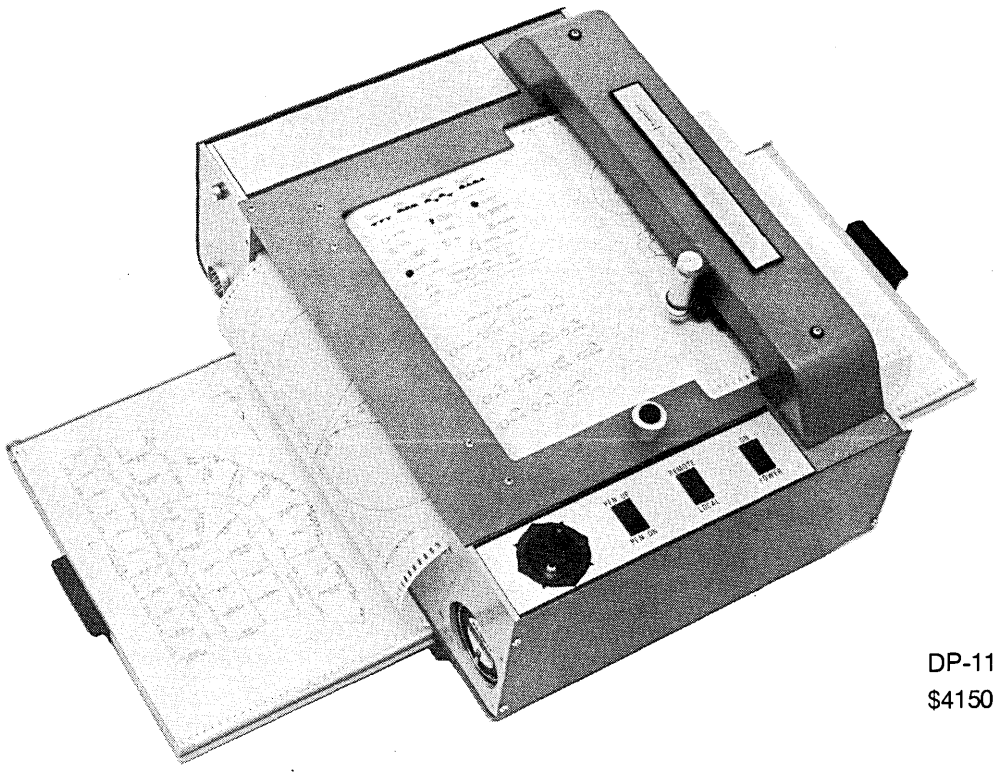
The firm's distributed I/O system (DIOS) uses "intelligent" cables to control I/O. The standard I/O distributor has eight channels, the DMA I/O distributor has four channels. Intelligent cable interfaces are offered for many peripherals, including crt's, ASR-33 teletypewriters, card readers, RS232C modems, and line printers. Disc controllers are available for IBM-compatible floppies, and rigid discs ranging in capacity from 5 megabytes to 80 megabytes.

Unbundled software includes a modular operating system (pick the pieces you need), two assemblers, utilities, and language processors for FORTRAN IV, BASIC, and PASCAL.

A packaged LSI 4/10, with 4K words of memory, chassis, operator's console, and power supply, sells for $995 in unit quantity. A typical LSI 4/30 sells for $2,995, and includes 16K words of memory, chassis, power supply, and console. The LSI 4/90, with 64K words of 550-nanosecond RAM, chassis, operator's console, and power supply, sells for $9,950. The company says it can give you 30-day delivery and the industry's only one-year warranty. COMPUTER AUTOMATION, INC., Irvine, Calif.

FOR DATA CIRCLE 268 ON READER CARD

New
Super Fast/Super Quiet CØMPLØT® Digital Plotter



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at program-selectable data rates ranging from 110 bps to 9,600 bps. Communications may be synchronous or asynchronous, in either character or block mode. A variety of peripherals may be attached to the terminal.

A basic terminal with 4K bytes of RAM and no PROM sells for $4,700 (black and white), or $5,400 (color). Pricing for the vendor's control software isn't firm at this time, but it looks like it will fall in the $500 to $1,000 range. Deliveries are scheduled to begin next month. RAMTEK CORP., Sunnyvale, Calif.
FOR DATA CIRCLE 274 ON READER CARD

Time-sharing Computer

The Model 500 provides multilanguage time-sharing capabilities to up to 63 simultaneous users. The vendor sees its primary competition coming from DEC's System 20.

The virtual memory operating system allows user programs of up to 32 megabytes. The 500 supports all of the vendor's language processors, which include FORTRAN, COBOL, BASIC, RPG II, and a macro assembler. All may run concurrently. A CODASYL-compliant data base management system is also offered, as are utilities and editors.

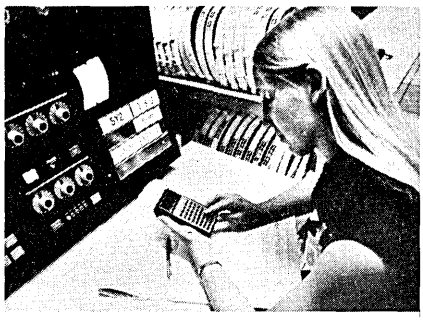
Semiconductor (MOS) memory sizes range from 128K bytes to 8 megabytes. The system can support up to 2.4 billion bytes of disc storage. The 32 bit processor uses a bipolar cache memory.

The vendor says that one of its systems capable of supporting 26 computational and graphics users will sell for about $311,000, while a comparable DEC System 2040 would sell for about $495,000. A full-blown Model 500, capable of supporting 63 users has a price of about $570,000, compared to a DEC System 2050, priced at $835,000, the vendor adds. Deliveries are scheduled to begin next month. PRIME COMPUTER, INC., Framingham, Mass.
FOR DATA CIRCLE 296 ON READER CARD

Hexadecimal Calculator

Four years ago, this firm introduced its SR-22, a small desk-top, four-function hexadecimal calculator which sold for $350. Now the firm has its "Programmer," a hand-held calculator that works in hexadecimal and octal as well as decimal. It sells for $49.95.

The Programmer has parenthesis nesting to four levels, and bit-level operations (SHIFT, AND, OR, and Exclusive OR). Negative numbers are represented with a two's complement code; a one's-complement key is provided for



programmers of computers that use one's-complement arithmetic.

The calculator initially is being test-marketed on a direct mail basis. TEXAS INSTRUMENTS INC., Dallas, Texas.
FOR DATA CIRCLE 273 ON READER CARD

I/O Typewriter

The microprocessor-based Rotary II prints at 15 cps. It talks to the outside world in ASCII via an RS232 interface. Fully buffered, the unit can send and receive at 110, 134.5, 150, and 300 bps. Because it is microprocessor-based, it is compatible with various line disciplines.

In the off-line mode, the unit can function as a standard office typewriter. The Rotary II uses interchangeable Selectric typeballs. The unit sells for $2,125, with quantity discounts available. Deliveries are scheduled 60 days ARO. CPT CORP., Hopkins, Minn.
FOR DATA CIRCLE 272 ON READER CARD

Micro/Minicomputers

The United States Department of Commerce announces two major exhibitions of significant importance to the European market which feature micro/minicomputers, systems, peripherals, software, and services.

In order to maximize U.S. participation, these exhibitions will be timed to permit companies to take part in both events.

The first of these events will be held at the U.S. Trade Center in Stockholm, affording participants an opportunity to reach one of Europe's most significant growth markets for micro/minicomputers.

The second event is SYSTEMS' 77, in Munich the largest single computer exhibition held in Europe. It will provide access to the world's third largest market for micro/minicomputers.

For additional information on these two exhibitions, details concerning the U.S. Pavilion, and participation in either or both events:

Micro/Minicomputer Exhibition
United States Trade Center for Scandinavia
Stockholm, Sweden
October 10-12, 1977

Systems '77
United States Pavilion, Munich Fairgrounds
Munich, West Germany
October 17-21, 1977

Call or write the Project Officer:

Mr. Dwight L. Umstead
DIBA/BIC Room 1015-C
United States Department of Commerce
Washington, D.C. 20230
Tel: (202) 377-4414

CIRCLE 142 ON READER CARD

Microcalculator

Coding floating point arithmetic on a microprocessor certainly isn't as easy as pushing the keys on a calculator. That's why this firm designed a scientific calculator that foregoes a keyboard in favor of eight I/O lines that operate at microcomputer logic levels. Connect the calculator to one of the micro's I/O ports and the micro can push the buttons and get back the result with up to 12-digit accuracy.

The microcalculator interfaces directly with most 8-bit interface devices, including the Motorola 6820, Mostek 3820, MOS Tech. 6530, and Intel 8255, the manufacturer states. The lines that simulate keystrokes also carry the 14-position (sign, 10-digit mantissa, sign, 2-digit exponent) result back to the microprocessor. You can also have the calculator return a 12-digit result with floating decimal. A bank of LED's also display the result.

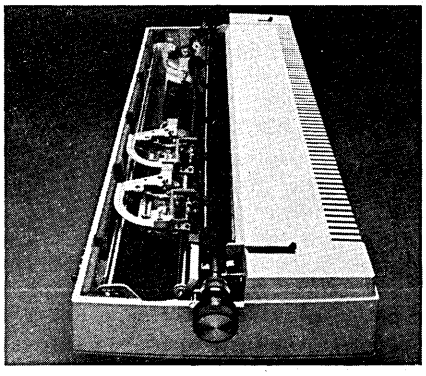
The calculator uses reverse Polish notation. It has a four-level stack and 10 operational registers. Operations include logarithms, exponentiation, trig functions, and standard deviation, in addition to the four arithmetic operations. Four metric conversion constants are included as are constants for pi and e. This isn't a high-speed arithmetic unit, the manufacturer points out; addition and subtraction take 690 milliseconds, and the slowest operation, raising 99 to the 50th power, takes 2.7 seconds.

The Microcalculator Model 85 sells for $189, and this includes membership in a users group, periodic applications notes, and a complete users manual. ARTISAN ELECTRONICS CORP., Parsippany, New Jersey.

FOR DATA CIRCLE 269 ON READER CARD

Printer Mechanism

Take two of this firm's popular daisywheel print heads, set them five and a half inches apart in registration with each other, and give them a print area 26.3 inches wide (15.3 inches shared),



and you've got the Sprint Micro 3 TwinTrack printer mechanism.

The two print heads operate independently and concurrently. Using two different printwheels gives you 192 different characters. When used in this manner, the unit's maximum operating speed is 45 cps. Using identical printwheels ups the print rate to 75 cps.

Each print mechanism is driven by its own microprocessor. A line buffer lets the mechanisms look ahead to determine which printwheel needs to be used for a particular letter, symbol, or sign.

Using different printwheels provides several interesting possibilities. You can mix fonts, say a simple sans serif and an italic, to prepare manuscripts. Or you might use a technical font and prepare scientific manuscripts, or print an English and a French version of the same document, side by side.

Single units sell for $2,725; at 250 units, the price drops to $2,115. Current availability is 90 days ARO. QUME CORP., Hayward, Calif.

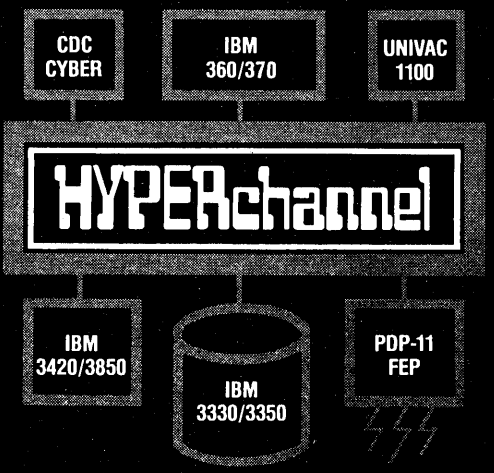
FOR DATA CIRCLE 276 ON READER CARD

Mini Add-on Memory

Here's a 4K byte CMOS memory board that packs its own battery back-up capable of retaining memory contents for at least 96 hours after a power failure or system shut down. It's for oem's to configure into minicomputer systems. Jumpers on the board can change it from a 4K byte configuration into a 2K x 16 bit word module.

Dubbed the in-8100, the memory stores data in an array of this manufacturer's 5101 CMOS static RAMS.

Can your systems talk to one another... efficiently?



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CIRCLE 127 ON READER CARD

hardware

Each in-8100 module has a resident standby power supply consisting of a battery charger, flat nickle-cadmium battery, and an interface that puts the memory on standby power when it senses loss of system power. During a normal operation, the module draws 1.7 ampere maximum current from a single 5-volt power supply.

The in-8100 has a TTL-compatible bus interface which provides 16 bi-directional data I/O lines, 16 address inputs, and control lines. Read access time is 720 nanoseconds. Read and write cycle times are both 770 nanoseconds.

Available from stock, single units sell for $800. The price drops to $720 in lots of 10 to 24. Additional discounts are available. INTEL MEMORY SYSTEMS, Sunnyvale, Calif.

FOR DATA CIRCLE 271 ON READER CARD

Microfiche Reader

"The Portable" is a 13-pound microfiche reader contained in an attache case. It can operate on 110 volt power or from optional self-contained batteries.

Fiche carrier size is 4 x 6-inches; dual carriers are an option. The self-contained viewing screen is optionally available in two sizes: 11 x 14-inches, and 11 x 11-inches. The screen is inside the attache case lid; wall projection is possible by removing the lid.

Drop-in lenses select standard magnification factors of 24X, 30X, 36X, 42X, or 48X.

Immediately available, "The Portable" microfiche reader lists for $249 in standard configuration. ADDRESSOGRAPH-MULTIGRAPH CORP., Bruning Products Marketing Group, Schaumburg, Illinois.

FOR DATA CIRCLE 275 ON READER CARD

Smart Facsimile

It typically takes four to six minutes to send a facsimile transmission of a one page letter. At least it did before the Express 9600 came on the scene. This new transceiver can send a page in less than 30 seconds.

While the office facsimile machines we're familiar with scan an entire page, sending signals representing white spaces, grey areas and black images, the Express 9600 scans only for black and white. A microcomputer digitizes the page, using a modified Huffman code which compresses the data. This compression saves the time that would otherwise be wasted transmitting solid white or black areas of the document.

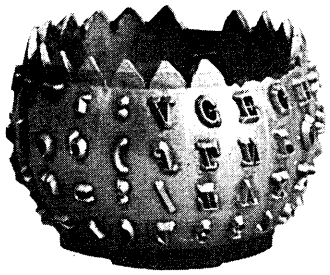
The Express 9600 meets proposed CCITT international standards for compatibility. It can also send and receive simultaneously, automatically feed mixed-size documents, automatically dial and transmit at preset times (without an operator), and it can exchange messages with other transceivers without operator assistance. It also doubles as an office copier.

A potential application for the device is in word processing. Interfacing the unit to an office's word processing system would allow printing of graphics and signatures, as well as rapid communication between geographically separate company divisions.

Base rental price for the Express 9600 is $295 per month, with additional changes depending on usage. 3M BUSINESS PRODUCTS SALES INC., St. Paul, Minn. ❋

FOR DATA CIRCLE 277 ON READER CARD

DON'T THROW IT OUT!



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CIRCLE 114 ON READER CARD

DECwriter II	DECwriter III
LA36 PRINTER TERMINAL 10-15-30 CHARACTERS SECOND REMOTE OR CONSOLE USE 132 PRINT POSITIONS	**LS120 TELEPRINTER** PRINTS 180 CHARACTERS SECOND 300, 1200 AND UP TO 9600 BAUD INCLUDES KEYBOARD, EIA INTERFACE, SELF-TEST MODE AND OTHER FEATURES
$1,645 each	**$2,995 each**
DECscope	**DECprinter I**
VIDEO DISPLAY TERMINAL MODEL VT52 24 LINES 80 CHARACTERS NUMERIC PAD • HOLD SCREEN MODE SPECIAL FEATURES	**LA180 HIGH-SPEED PRINTER** 180 CHARACTERS SECOND 132 PRINT POSITIONS INTERFACES AVAILABLE
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DECwriter III	275 month	150 month
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DECprinter I	250 month	135 month

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CIRCLE 136 ON READER CARD

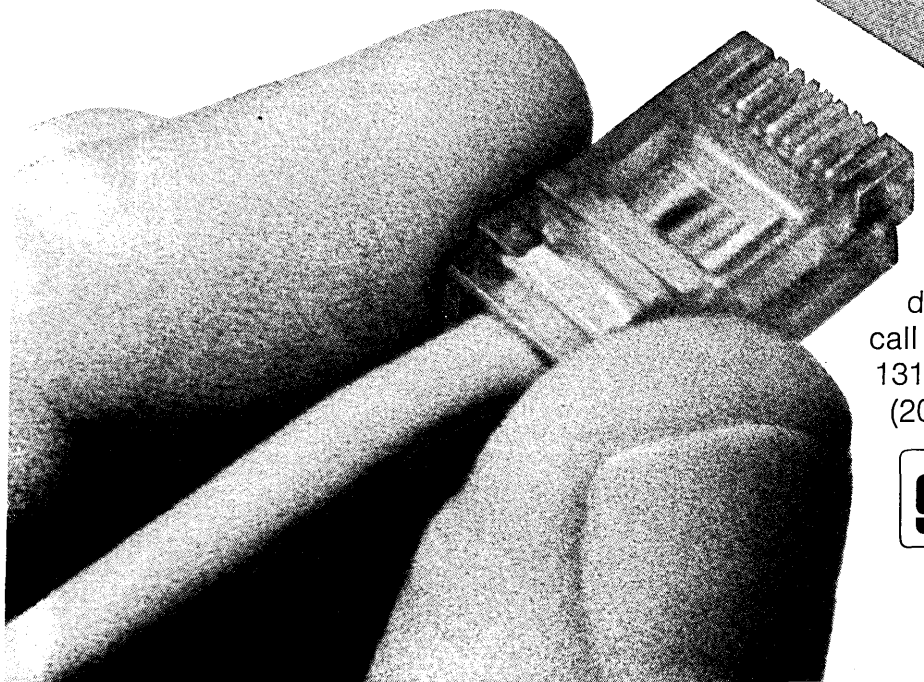
Announcing the GDC connection.

Now. FCC-registered plug-in modems for direct connection to the public telephone network.

GDC offers easy, cost-cutting connections to telephone lines, with a series of modems designed for direct connection without the use of DAA's. Three do-it-yourself plug-in arrangements are available for permissive, fixed loss and programmable connections. We also offer data couplers for users who still have modems which require DAA's.

Of course, GDC has an outstanding line of modems with a proven reputation for high reliability and superior performance. All modems have advanced large scale integrated (LSI) circuitry, plus built-in local and remote diagnostic capabilities. They're compact and fully compatible with Western Electric 103, 113, 202, 201 and 208 data sets.

GDC has total data communications expertise, from designing to manufacturing and servicing. In fact, no one offers more datacomm products, systems or services between your computer and terminal than GDC.



For a fact sheet on FCC-registered plug-in modems or anything else that has to do with data communications, write or call General DataComm Industries, Inc., 131 Danbury Road, Wilton, CT 06897. (203) 762-0711.

General DataComm Industries, Inc.

CIRCLE 53 ON READER CARD

software & services

Updates

You won't find this record in your local music store, and it won't make number one on the hit parade, but it will probably be popular with computer hobbyists. The record in question is a 45 rpm disc containing such all-time favorites as a 4K BASIC, binary loader, and two memory test programs for the Motorola 6800 microcomputer. Produced by Eva-Tone, the record encodes the programs at 300 bps using the Kansas City Standard format. It's bound in the May issue of Interface Age, a hobbyist magazine. The reader just needs to zip out the disc, put it on his turntable, and connect the speaker leads to his micro's cassette tape interface. Future recordings will feature programs for Intel 8080 and Zilog Z-80 based microcomputers.

Salaries for dp personnel, financial executives, and accountants have hit all-time record highs in 1977, according to a study by Robert Half Personnel Agencies. The study shows dp salaries up an average of 4.4% over last year. Programmers with one or more years of experience in medium sized installations show an 11.5% increase. Large installation dp managers show a 4.8% increase. Corporate controllers of firms with a volume of up to $5 million chalked up a 19.5% increase.

After spending over $1 million on a project to develop expertise in computer communications, the Canadian National Research Council and the Univ. of Waterloo have released the results of the project to real-world users. The University has agreed with William G. Hutchison and Co. Ltd., to allow the Toronto-based consulting firm to act as its agent in obtaining commercial contracts. The university's work covered: simulation and analysis of computer communications systems, network traffic studies, distributed processing, and low-cost terminals and communications equipment.

DATAMATION will run a survey of alternative sources for hardware maintenance services in the near future. If your firm performs maintenance on dp-related equipment, please write for a questionnaire to Technology Editor, DATAMATION MAGAZINE, 1801 S. La Cienega Blvd., Los Angeles, Calif. 90035.

Distributed Processing

A combination of model software and hardware features now make it possible to connect this vendor's 3000 series II processors in a distributed processing network. Distributed System/3000 consists of plug-in circuit boards and software extensions to the computer's basic operating system, MPE.

Rather than burden the applications programmer with writing code for communications, the vendor has taken advantage of a basic design philosophy within MPE: all I/O is handled by the file system. To change an existing program, say an inventory report generator, so it will take input from inventory files at remote System/3000 sites, the user need only tell the operating system that the file exists at the remote site. No recompilations are required.

Under DS/3000, users can perform interactive processing on remote systems. For example, sitting at a terminal connected to system A, a user can establish a link to system B, and then proceed to use the editor on system B.

Programs on systems linked by DS/3000 also have the capability to "talk" to each other.

Any 3000 in a network interconnected by DS/3000 can simultaneously interchange data with as many as seven other 3000s. As long as no system is required to access more than seven others at any time, there is no practical limit to the number of nodes in a DS/3000 network. All 3000s can communicate with larger mainframes via IBM 2780 emulation, so DS/3000 networks share that ability.

The additional hardware supports a maximum line speed of 2.5 megabits per second over hard-wired coaxial lines. On telephone lines, the maximum data rate is 9600 bps.

DS/3000 makes provisions for accounting and file security. To gain access to a remote system and its files, user and account names valid to the remote site must be supplied.

Unlike IBM's SNA, which has an implicit master/slave relationship even between identical nodes, DS/3000 allows the user to treat each node as an equal. Although not yet implemented, it is expected that an SNA-compatible option will be forthcoming. It is probable that the software interface will hinge on MPE's file I/O philosophy.

The vendor intends to make DS/3000 comply with the CCITT X.25 packet message switching standard.

Software for DS/3000 sells for $9,000 plus $75 per month for maintenance. For modem links, each interconnection requires a 30055A Synchronous Single-Line Controller ($2,000) at each end. Hardwired coaxial links need a 30360A Hardwired Serial Interface ($2,300) at each end. Customer installations are to begin this month. HEWLETT-PACKARD CO., Palo Alto, Calif.

FOR DATA CIRCLE 289 ON READER CARD

DOS Enhancement

This package, Multi-Maint, offers DOS users operational flexibility and improves scheduling procedures by allowing the LNKEDT and MAINT programs to catalog and update system libraries from any partition at any time.

The package's LNKEDT facility supports cataloging to the system or private core image libraries from any partition. It can also link and catalog to a private core image library which may be assigned across partitions.

The MAINT capability supports all maintenance functions except CIL condense to the system or private core image, relocatable, and source statement libraries, from any partition.

Multi-Maint uses a DEQ/ENQ facility which allows LNKEDT and MAINT runs to take place concurrently in multiple partitions.

The package is said to install in minutes without user modifications. It's available now for a monthly rental of $75. UNIVERSAL SOFTWARE INC., Brookfield, Conn.

FOR DATA CIRCLE 265 ON READER CARD

ERISA

Here's an ERISA (Employee Retirement Income Security Act) record-keeping and reporting package, written in RPG II, said to be transportable to virtually all small business computers. In addition to handling Act reporting requirements, the package can also maintain and report information for compliance with the Equal Employment Opportunity aspects of the Civil Rights Act of 1964, and the Occupational Safety and Health Act of 1970.

Known as ERISA/3, the package creates and updates a vendor-designed personnel data base. An unlimited number of reports may be created from the data base. The ERISA/3 package includes all necessary programs, formatted source forms, and data base layouts, together with installation and on-site training.

A typical system capable of supporting ERISA/3 comprises a 16K IBM Sys-

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- Permits creating and updating TOTAL and IMS data bases as well as retrieval.
- Allows concurrent processing of conventional data files with IMS or TOTAL data bases.
- Supported in both batch and on-line environments.

IMS users such as *American Airlines, Dow Chemical, TWA, American Can, The Hartford, Union Carbide;* and TOTAL users like *Combustion Engineering, Northwestern Mutual Life, Anheuser-Busch, Corning Glass Works, Eli Lilly* and *Holiday Inns* are a few who agree ASI-ST and data base belong together. In addition, ASI-ST provides an unequalled return on investment by maximizing the productivity of both man and machine. Since ASI-ST fully supports conventional data files as well as complex data bases, these benefits are not restricted to IMS and TOTAL users. To obtain more information contact:

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software & services

tem/3 with any high-speed disc, card, or diskette input device, and line printer. Purchase price for the package is $3,500. ALPHA SYSTEMS, INC., Framingham, Mass.
FOR DATA CIRCLE 262 ON READER CARD

Evaluation Services

Here are five packaged services for dp users, manufacturers, marketing men, and investors.

For investors and dp users planning a major vendor commitment, the "quick study" provides an overview of a company, its personnel, products, resources, and competence. It's a one day, on-site analysis with a written report, priced at $500 east of the Rockies, $750 in the West.

Companies seeking to acquire products or other companies in a particular technical field can use the "acquisition analysis," which provides identification of potential acquisitions and evaluations of the companies and their products, market position, and financial strength. Top candidates are identified and evaluated on-site. This service goes for $3,900.

The "oem buyer analysis" finds attractive markets and potential oem's for a client product. The $3,900 service includes on-site evaluation of the top candidates.

"Equipment evaluation" is for users considering equipment purchases, vendors wanting a critique of their equipment, and acquirers needing to understand the quality of the product they are acquiring. Existing installations and customers are investigated in this $2,700 service.

"Competitive analysis" includes an analysis of the client's product, a complete survey of all competitive companies, and analysis of their products and markets. This service goes for $2,700.

Prices quoted for these services do not include transportation costs. There is a 10% discount if more than one package is purchased, including this firm's EDP Efficiency Analysis and its EDP Security-Contingency Survey. BOWERS ENGINEERING CORP., Fairfield, Conn.
FOR DATA CIRCLE 264 ON READER CARD

Enhanced DIBOL

Users of DEC's Datasystem 300 family may like this firm's DIBOL interpreter which allows multiterminal program development, more terminals, and larger programs.

Running under COS350, this inter-

SR. PROGRAMMER ANALYST

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software spotlight

Burroughs Software

This four year-old, Houston-based consulting firm sounds promising: its five founding partners are all Rice Univ. graduates with backgrounds in computer science, math, business, and/or engineering. And they guarantee their work. "If the system ever fails to meet its specifications, we will correct the deficiency in our office at our expense, provided only that the programs have not been modified without our approval."

The firm's hardware experience spans from mini to maxi computers. In addition to big machines from IBM, CDC, and Univac, they're now branching out into the Burroughs B7000/B6000 line with a variety of packaged programs. If you don't see what you want, you still might want to talk to them; their business is consulting at $25 per hour, plus expenses.

The firm's line printer graphing package draws line or bar graphs on common character printers. Several functions may be plotted on the same graph. The only data required to print a graph are the graph's size (in columns and lines), the data points to be displayed, and the labels to be shown on the graph. The package is implemented as a set of system intrinsics callable from FORTRAN, COBOL, and ALGOL. The package sells for $2,000.

If you run a B6700 shop and you need a computer accounting package, the Resource Accounting and Cost Allocation system, RACA, may fit the bill. RACA lets you account for computer usage and associated services. System resources include cpu time, lines printed, and memory integral. External resources are selected by the organization. The B6700 charge code mechanism is used and RACA relies on data logged by the MCP where possible. No modification to Burroughs-supplied software is necessary, although some intrinsics must be added. It may be desirable, however, to modify some system software for enforcement in WFL of the use of authorization codes, assumption of default charge-codes, and printing report summaries. RACA sells for $5,000.

The firm also offers a job scheduler (delivery in three months, price is $2,000), a text-formatter for word processing ($2,500), and a parser generator (price negotiable depending on intended application). All of these packages may be leased or rented. SOFTWARE RESOURCES, Houston, Texas.
FOR DATA CIRCLE 267 ON READER CARD

preter takes advantage of reentrant code to reduce memory usage. Coupled with virtual memory techniques, the vendor says this brings increased throughput (up to three times), reduced disc contention, and the ability to use a greater number of terminals (possibly double, depending on the application).

The vendor sees its market as being twofold. Small users with one system can meet growing needs and add applications without adding hardware, and large users can get additional performance with smaller systems.

The package, which has yet to get a final name, sells for $3,000. INFORMATION ACCESS SYSTEMS, INC., West Caldwell, N.J.
FOR DATA CIRCLE 263 ON READER CARD

Series/1 OS, Applications

This firm was one of the early entries into the IBM Series/1 marketplace, with software, hardware, and turnkey systems. Its latest offerings include a swapping operating system and nine applications packages.

The operating system, SVM, is a subset of the firm's earlier TSS/1 system. It includes disc swapping, password security, user defined named files, and a user interface module for defining a unique command library. Deliveries are slated for July. The operating system has a license fee of $5,000.

The application programs run under SVM. They are: order entry/invoicing ($1,700); inventory management ($1,400); payroll ($1,400); sales analysis ($1,300); accounts receivable ($1,100); accounts payable ($1,100); general ledger ($1,100); product definition and costing ($1,300); and medical billing ($3,600). To run these packages you'll need at least 32K bytes of memory, a 9.3 megabyte disc, and a floppy. SPAN MANAGEMENT SYSTEMS, East Providence, R.I.
FOR DATA CIRCLE 261 ON READER CARD

Fortran String Handling

People continue to reinvent the wheel, and probably always will. However, if the wheel you need happens to be string-handling FORTRAN subroutines, you might consider investigating this package before you commit a programmer to the task.

The package, known as STRING70, consists of ANS FORTRAN IV subroutines, which provide string handling functions on variable length character strings. Table-oriented operations are also included.

String operations include comparisons, moves, searches, concatenation, insertion, deletion, and fills. Table-oriented functions provided include binary searching, and insertion and deletion of table entries.

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STRING70 can be used on a variety of computers including the DEC PDP-11, PDP-10, Data General NOVA, General Automation SPC-16, Interdata, IBM 360/370, and System/3, the vendor says. The package is available for a one-time lease of $70 and is supplied in source deck form with supporting documentation. SOFTWARE'70, Anaheim, Calif.
FOR DATA CIRCLE 259 ON READER CARD

File Maintenance

Users of Burroughs, HIS 6000/Systems, and those with IBM systems supporting TSO can use this product to interactively input, update, or examine sequential disc files. The ANS COBOL program, known as Q5UPDT, can function as a standalone system or as an optional module with the vendor's interactive query language, Query 5.

The program works under control of a dictionary which describes the format of the file and the fields in its records. Features include: the ability to work with binary, packed, numeric, or alphanumeric fields; decimal point alignment; handling signed fields; selection of records or sets or records for data handling; the ability to create new records by following prompts for each field; handling multiple record types; and locate, list, change, or delete fields or records based on multiple conditions.

Priced at $4,995, Q5UPDT is available now. AZREX INC., Burlington, Mass.
FOR DATA CIRCLE 258 ON READER CARD

Communications Utility

Users of INTERCOMM's dynamic data queuing feature can perform a number of maintenance functions on their queues with this utility program.

The Dynamic Data Queuing Utility can: reorganize queues when space becomes fragmented; dump and restore queues for backup; list the extents, status, and attributes of queues; scratch or rename queues; copy data residing in a queue to a sequential file for processing by a program that has not been written to access dynamic data queues; close queues that have been left open due to the abend of a batch program; and print the data records from queues.

The program may be licensed for $2,500. DIVERSIFIED PROGRAMMING SERVICES, San Francisco, Calif.
FOR DATA CIRCLE 260 ON READER CARD

RT-11 Enhancements

This enhancement to DEC's RT-11 (version 2C) operating system is said to increase operator convenience and increase system capabilities. The package, RT-11X, provides a user-definable command language, extended error diagnostics, programmable console terminal characteristics, a semiresident printer spooler, and corrections to all known bugs in the operating system.

The print spooler (using ¾K for low-speed printers, 1¼K for high speed) can run as a pseudo-foreground task of the single job monitor, running the printer at maximum speed. This saves 6K core over DEC's foreground/background spooler, the vendor says. A compatible version runs under the foreground/background system.

The monitor command *filename* causes the system to enter batch mode and execute commands from the named file. When finished, the system returns to the monitor.

Other features include: support for PASCAL and the forthcoming MAINSAIL compilers; most error messages now report in full words, rather than abbreviations; all CUSP's provide a help command; and solutions to the BATCH TIME/$DATA problem, and all SPR corrections.

A binary license for RT-11X has a one-time fee of $200; an object license is an additional $150. Multi-cpu licenses are $1,000 for binary, and an additional $500 for source code. You

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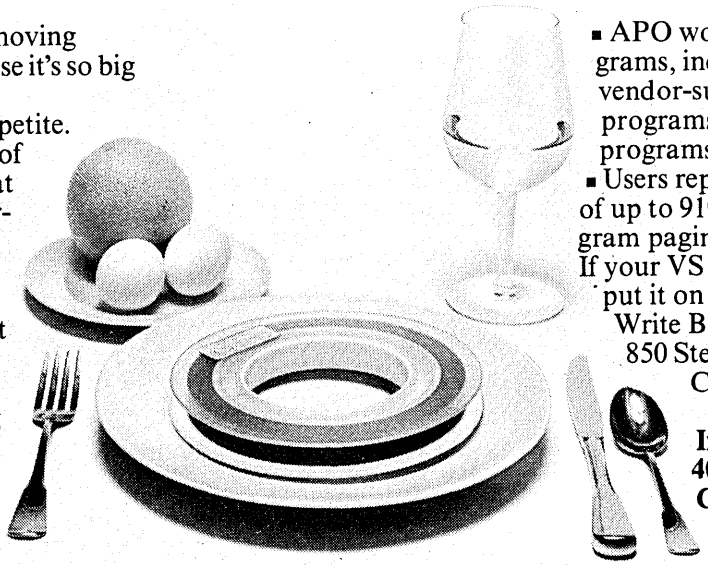

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must show proof of an equivalent license from DEC. Delivery is 30 days A.R.O. LIFE SUPPORT SYSTEMS GROUP, LTD., Portland, Ore.
FOR DATA CIRCLE 294 ON READER CARD

Word Processing

The ARISTOTAL package brings numeric tabulation capabilities to word processing. It works with this firm's PCS/TEXT on-line text editing and word processing system.

ARISTOTAL's command repertoire includes arithmetic processing of numeric data, sorting multiple fields simultaneously, inserting user-defined data (such as totals and subtotals), selecting data by either fields or whole lines, and converting single-column data into multiple-column outputs. The package operates in background mode while other text processing activity is taking place at the terminal.

The package is available as a service on the vendor's dual 360/65 system. In one application, a 1,700 line data base (8 items per line) containing information on, appropriately enough, word processing operator performance was processed by ARISTOTAL to produce seven reports. The price per report ranged from $8 to $9.50. The most expensive report covered performance by operator (on each job), and entailed sorting the data, inserting operator names, and calculating totals and subtotals. PROPRIETARY COMPUTER SYSTEMS, INC., Van Nuys, Calif.
FOR DATA CIRCLE 292 ON READER CARD

NBS Data Encription

The SAFEGARD III data encryption/decryption package implements the federal data encryption algorithm adopted by the National Bureau of Standards. It is claimed that approximately 10^{70} operations would be necessary to decrypt a coded message without prior knowledge of the key.

Written in operating system-independent assembler for the System 370, the package is callable from COBOL, PL/1, FORTRAN, or Assembler Language programs. The package requires about 4K bytes.

A source code copy of SAFEGUARD III, documentation, and usage examples have a one-time license fee of $950. Perpetual maintenance is included. The package is available now. COMPUTER LINGUISTICS INC., Albany, New York.
FOR DATA CIRCLE 293 ON READER CARD

Mailing List

MAIL is a CICS on-line terminal management system for maintaining hierarchial categorized name and address data bases. The program lets the user add, delete, or update category descriptions and individual fields in the name and address records via an on-line IBM 3277 Mod 2 terminal. Labels may be printed in a variety of sizes, and constant data may be inserted on the labels if desired. Labels may be selected for printing based on single or multiple categories; they may be sorted on any or all fields. The package is available for all versions of CICS and is priced at $6,500. Lease/purchase plans also are offered. SOFTWARE MODULE MARKETING, Sacramento, Calif.
FOR DATA CIRCLE 290 ON READER CARD

Series/1 Software

Series/1 is getting vendor-supported software. A real-time operating system, FORTRAN IV, a program preparation system, and a mathematical and functional subroutine library are scheduled for October release. PL/1 is slated for April 1978 release, and enhancements to the previously announced Control Program Support will be available in July.

The disc-based Real-time Programming System allows multiprogramming in one or more fixed partitions. It provides supervisor services, data management, communications, and utility functions. You can get it for a one-time charge of $1,200 or a monthly license fee of $20.

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time Programming System and the Program Preparation Subsystem. It provides support for sensor-based scientific and engineering applications. The FORTRAN IV compiler and object library can be had for a one-time charge of $864, or a monthly license fee of $14. The FORTRAN IV real-time subroutine library for execution of real-time programs has a one time charge of $288, or a monthly license fee of $5.

The Program Preparation System, consisting of a job stream processor, text editor, macro asembler, and an application builder, runs under the Real-time Programming System. It allows program development concurrent with real-time program execution. It's available for a one-time charge of $1,104, or a monthly license fee of $18.

A set of mathematical, conversion, and error checking routines make up the Mathematical and Function Subroutine Library. It has a one-time charge of $408, or a monthly license fee of $7.

The PL/1 compiler adheres to the ANSI PL/1 standard, with real-time language extensions. The compiler has a one-time charge of $2,784, or a monthly license fee of $46. The PL/1 transient library has a one-time charge of $288, or a monthly license fee of $5.

Enhancements to the Control Program Support include added resource management of I/O equipment and an indexed access method. The enhancements have monthly license fees ranging from $1.50 to $6. License fees are waived after 24 consecutive payments. INTERNATIONAL BUSINESS MACHINES CORP., General Systems Div., Atlanta, Ga.

FOR DATA CIRCLE 266 ON READER CARD

Sorting

This sort package, a functional replacement for DEC's SORT V07-1A, offers PDP-11 RSTS/E users two nice advantages: being written in assembler, it runs about 50 times faster than DEC's sort, and it can be called from a BASIC-Plus program by executing the statement E%=FNS% ("filename," *number-of-records, record-length, number-of-header-records).* Although the package, Sort-1 has been available for about six months now, the ability to invoke it as a subroutine from a BASIC-Plus program has just been added. Sort-1 can sort over 1 million 16-byte records, another advantage over DEC's BASIC-Plus sort.

Sort-1 only replaces the sort/merge parts of DEC's sort routine. Users can use DEC's extract and reorder routines, or they can use routines they have developed in-house.

The package runs under version 6B of RSTS/E without modification. Price is $500 including complete operations and installation manuals. OREGON MUSEUM OF SCIENCE AND INDUSTRY, Portland, Ore.

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Autocoder to Cobol

Running Autocoder on a 7070 or 7074 emulator? Or maybe you've got one of these machines and you're thinking of an upgrade? This may be the ticket for you: an Autocoder-source to either DOS or OS ANSI COBOL translator that is said to handle 90% of the conversion. The translator runs on 360s and 370s under DOS or OS.

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CIRCLE 155 ON READER CARD

letters

(Continued from page 22)

This is in refreshing contrast to the profusion of intimidating esotericism.

PETER KUSHKOWSKI
Northeast Utilities Service Company
Hartford, Connecticut

Readout responses

In your March "Editor's Readout" (p. 59), you quoted E. F. Shumacher as saying that "from the employer's viewpoint, human labor is a cost item to be reduced to a minimum or automated out of existence."

Speaking as an employer, this is simply not true. In the United States, and in other countries as well, the amount of productivity increase required is largely determined by the actions of the various government bodies.

For example, government employees amount to a very large overhead per productive worker. From the Marxian point of view, as well as from my capitalist point of view, the coal miner in the mine is a productive, important person, while the 20,000 federal employees soon to be working in the Federal Energy Agency are parasites supported by the backs of the working class.

Government actions such as the "investment tax credit" give the employer a tax rebate on machinery used to put people out of work. This is a government, not an employer, policy.

In the U.S., where almost all of the goods are produced by private industry, massive increases in productivity are required to support the increasing nonproductive sectors of society.

At a Board of Directors meeting, one considers corporate growth and net return after taxes on the stockholder's equity. One does not announce cheerfully the ability to lay off the loyal employees whose work produces the profits.

MORTON H. MEHR
President
Measurement Systems Inc.
Norwalk, Connecticut

I really enjoyed your March "Editor's Readout," which should bring more people in touch with E. F. Schumacher's viewpoints. Having discovered him only recently myself, I was particularly interested in the same characterizations of work you quoted. His provocative and simply worded observations may be useful as we general citizens start mulling the alternatives we face.

Also, to connect such heady ideas more closely to our computer world, I quote from another section of *Small is Beautiful*: "What is it that we really

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require from the scientists and technologists? I should answer: we need methods and equipment which are cheap enough so that they are accessible to virtually everyone; suitable for the small-scale applications; and compatible with man's need for creativity."

These words of Schumacher's could have an almost literal application to the current explosion in computing for the people via small computers and terminals. For similar ideas from another thinker, see Vannevar Bush's "Memex Revisited" (1967) quoted in the March 1972 issue of ACM's *Computing Reviews*.

DAVID MONROE
Dobbs Ferry, New York

Conversion completed on time

In her article in the April issue ("Conversion: A Dirty Word in Government," p. 150), regarding the Environmental Protection Agency's (EPA) conversion from an IBM 360/50 to a Univac 1100, Linda Flato reports that: "The conversion project, which is two years behind schedule, has cost overruns totaling $5 million."

The facts are that Dataware Inc., acting as a subcontractor to Univac, had completed the conversion according to contract during the third quarter of 1974, and had received payment in full totaling less than $400,000.

After this phase of the project was completed, the IBM 360/50 was scheduled to be removed during the fourth quarter of 1974. The next phase (phase II) was originally planned for upgrading systems with modifications that had been deferred during the initial conversion, along with moving certain applications to a data base environment. Phase II was to be undertaken by Univac and a facility management group that had taken over the operation of the facility. As I recall, both phases I and II were planned at the very outset of the conversion project.

In checking with responsible people within Univac and the EPA who were involved with the project, we have been assured that the story is incorrect as it relates to Dataware's involvement in the EPA conversion.

WILLIAM J. KRIER
President
Dataware Inc.
Buffalo, New York

Solved?

The letter headlined "Solved!" in the April issue (p. 21) is a good example of a bad problem in the data processing field, e.g., problem clarity. There was much documentation of the variables, but not one comment on the executable code. The code was a fitting example of the type eight programmer of Norman Grabowsky's categories of programmers (What Kind of Programmer Are You?" March, p. 134). The solution may be right, but I would hate to modify any program that was coded in this way.

THOMAS F. SPENCER, CDP
Medicenter of America, Inc.
Memphis, Tennessee

Insensitive interview practices

They mean well, but the know not what they do! It's certainly true that industry and government recruiters are trying very hard to hire women and minority candidates, but some of them are so insensitive that they may do more harm than good.

I few weeks ago I had an informal discussion with the students in my advanced programming class about their plans for next year. Several were graduating and had met with a number of recruiters who came to the campus to interview interested candidates; a few had already visited industrial or government installations.

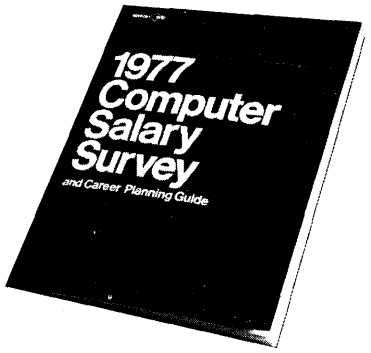
The women in the group were particularly incensed about the ineptness and insensitivity of the people they had met; and while the problem is obviously not new, I invited them to let me have some examples so I could call this to the attention of those who might be able to do something about the situation.

Then they gave me some direct quotes: "We don't just hire women so that the Equal Opportunity Employment Commission sees that we have them. They have to meet all the requirements that everyone else does," and "I have three women working for me. Judging from their performances, a woman can work as well as any man . . . When we hire someone, however, we hire them as professionals. We don't want someone who comes in, works for a few years, gets married, has kids, and leaves."

It's very important to bear in mind that the people we're talking about here are professionals in every sense of the word, and to suggest to them that they are being hired because of extraneous considerations may well be taken as an insult. They may in fact lose interest in the organization, since it could very well foretell their relationship with others in the organization after the initial welcome. A little soul-searching and recruiter training may well be in order.

BERNARD A. GALLER
Associate Dean and Professor of Computer and Communication Sciences
University of Michigan
Ann Arbor, Michigan

Just Out! The New



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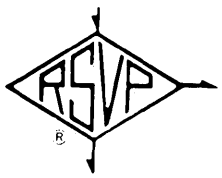

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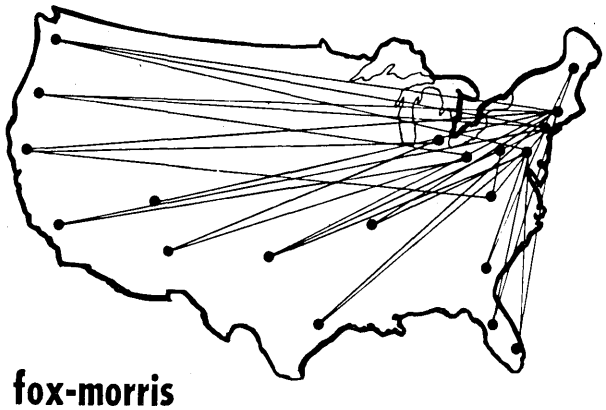

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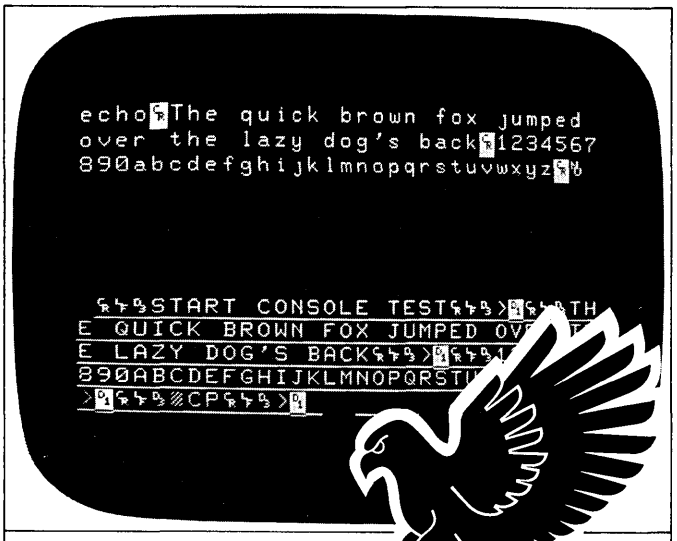

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Who Is Best for That Overseas DP Job?

Do foreign-born U.S. nationals make better employees for American companies in their "native" country than employees who are U.S. natives?

Periodically trade journals carry advertisements from European firms or European subsidiaries of American firms which attempt to recruit programmers, systems analysts, systems engineers, and others for work in Europe. These ads often appeal specifically to former nationals of the respective country. In my opinion, these ads are based on the *false* assumption that a former national will be better suited to work in his former home country than somebody who has never laid eyes on the country in question.

The language barrier is the first problem that occurs to people when they consider relocating overseas. The foreign-born naturalized American citizen at first sight appears to be ideally suited for an overseas assignment. He or she speaks English, understands American ways of doing business, speaks, reads, and writes at least one if not more foreign languages, and supposedly understands the quirks and customs of his native land. Does this really better qualify him or her as an overseas employee? Often enough it doesn't. Four separate cases I know of personally bear this out.

Four case histories

Case one involved a German-born systems engineer recruited in the Los Angeles area. He had had at least one tour in Holland before accepting an assignment to return there. This time, he lasted three months there before returning to the States. He felt that the company had misrepresented the job he was supposed to fill. True, the job had changed because the customer's requirements had changed, but I doubt that he would have left a stateside company quite so easily under similar circumstances.

Case two is that of a young programmer, also German and also recruited in the Los Angeles area. The only reason he lasted 18 months in Germany was that his contract stipulated that if he left earlier, the company would not reimburse him for his moving expenses back to the States.

As fall turned into winter in Germany, he actually would become misty-eyed contemplating pictures of the house he sold—with swimming pool—in L. A. His complaints about living and working conditions in Germany began the week he arrived in Frankfurt, yet he had grown up in the Frankfurt area.

The third case is that of a Dutchman, also recruited in the L. A. area, who served out his "sentence" in Holland. (That is how he referred to the two years he had agreed to stay.)

Case four also concerns a Dutchman who, for the full length of his stay in Holland, maintained a running battle with a neighbor over the noise his own Dutch washing machine made. He returned 18 months, to the day, after arriving in Holland.

In each of the above cases, the individuals had believed that they would be better suited to fill their jobs overseas than a native-born American; and the company that recruited them had believed the same. Each person had planned to stay overseas for much longer than it turned out. None stayed beyond 24 months, and then only because of a contractual commitment.

Of course native-born Americans get disgruntled here and overseas too. I remember the case of a senior programmer, a native American, who didn't even bother to notify his

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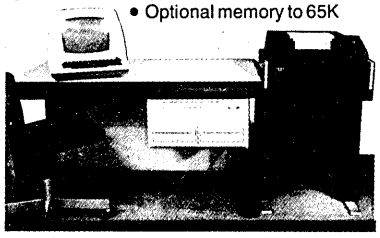

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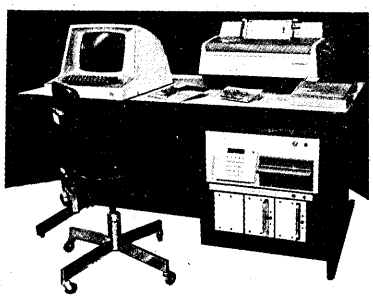

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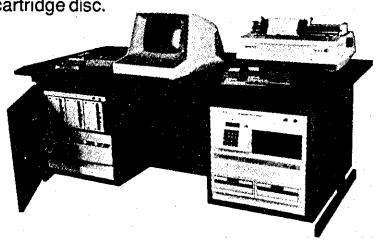

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company that he was leaving the foreign country. He mailed in his resignation when his ship docked in New York.

But why are the foreign-born U.S. nationals, who are often the bright hope of their employers, so difficult to retain overseas? The answer is a subtle one. Foreign-born U.S. nationals have at least once in their lives, either through force of circumstances or through personal choice, pulled up stakes and changed countries. A move based on personal choice is frequently the result of dissatisfaction with prevailing conditions in the original country and the anticipation of freer, or at least more convenient conditions in the U.S. The fact that these people were available for recruitment in the U.S. indicates that they preferred life in the States to life in their native countries.

Then why do they accept offers to go right back to the same conditions they left 5 or 10 or 15 years before? Time has much to do with it. Just as my office-mate in Holland on a dreary rainy morning remarked, as he regarded his now worn out galoshes which he had owned but not used in California for years: "Now I remember why I moved from Boston to California 10 years ago." So it is with the foreign-born U.S. national returned to his native country. He suddenly is exposed again to all the same reasons why he left in the first place, only now his problems are aggravated. His wife more often than not is a native American. In the U.S. she could manage the children, the schools, the shopping, visits to the doctor, relations with the neighbors, etc. Now she must depend on her husband for all of these things. He of course is deeply involved in his new job and even may be out of town for days or weeks, leaving her to fend for herself.

The ugly (naturalized) American

He has his own problems of coping with conditions which have changed from what he remembers. In fact he has a good deal of unlearning to do. New laws are on the books, new regulations are in use, customs have changed. People will expect him to know these things. Because he speaks and acts like a native does not necessarily mean he is informed like a native. Nobody will expect an obviously native-born American to ever fully comprehend the peculiarities of German or Dutch customs, and people will go out of their way to help a foreigner. The native-born but naturalized American in his native country cannot claim such forbearance from his former countrymen, and therefore experiences rudeness and frustration where his American born colleague may find help and courtesy.

The native American abroad for the first time will less often make comparisons between what he observes as new and different and what he remembers from home. He will more readily accept things as simply different, "quaint" perhaps, but without qualifying comparisons. The naturalized American put back in his native country is continuously stimulated into making comparisons.

After all this is said, how can the original question be answered? Personal experience causes me to answer with a qualified "No." Success or failure on a job, whether in the U.S. or overseas, is more a function of the individual's ability to cope with problems than his ability to converse fluently in a foreign language. Accepting, and being accepted in another country may often be easier for the employee to whom the new country is truly new.

—Reiner E. Baer

Mr. Baer has had more success in his overseas jobs than the case histories suggest he should. Presently a communications systems engineer for Ford Aerospace Communications Corp., in Colorado Springs, he was born in Germany and has worked for subsidiaries of American firms in that country and in Holland.

What makes General Electric's new UPS a breakthrough in reliability?

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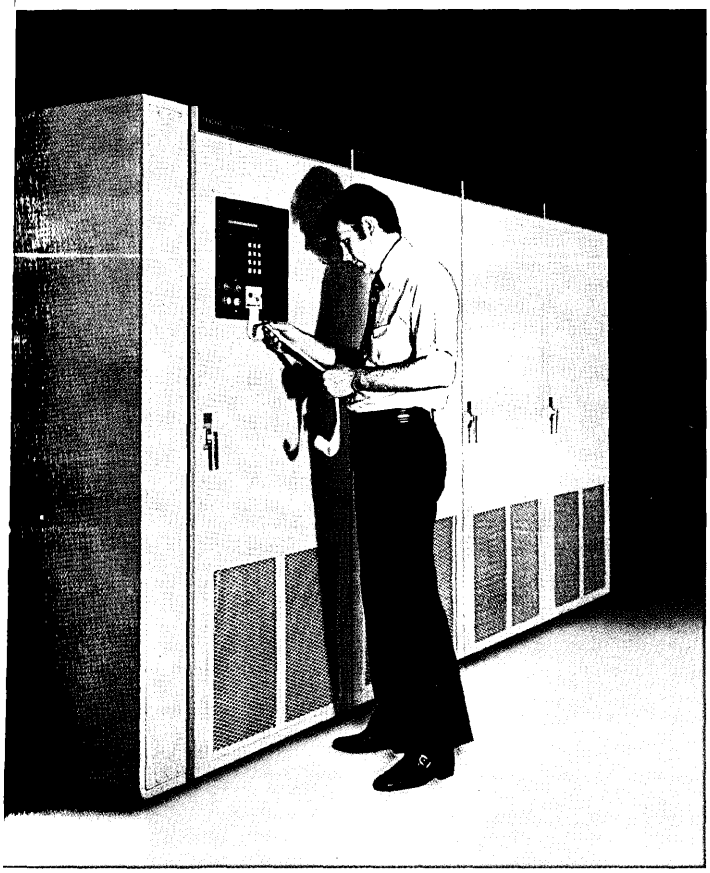

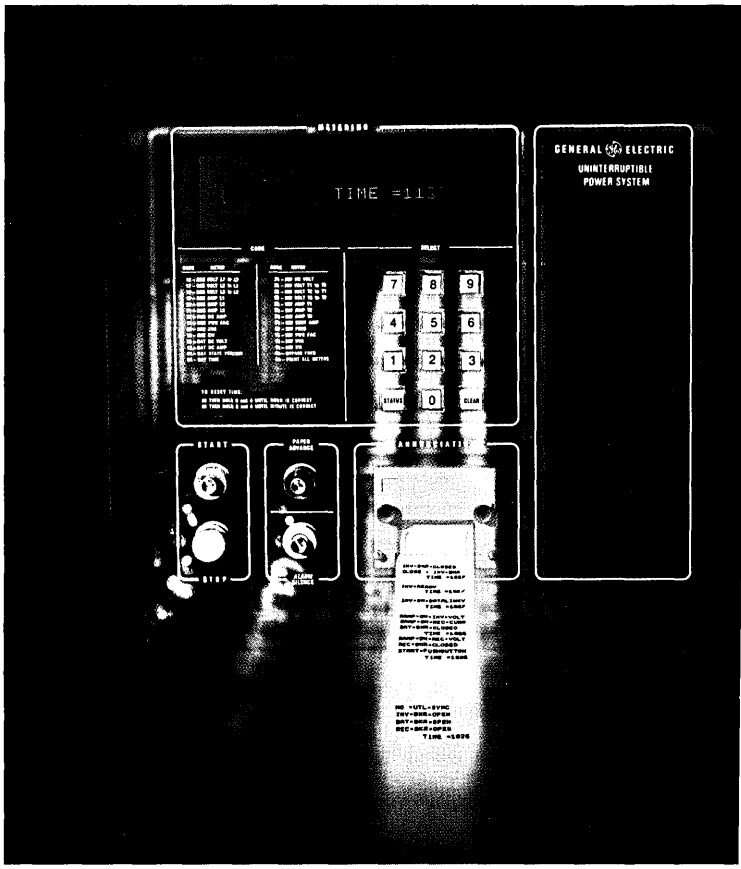

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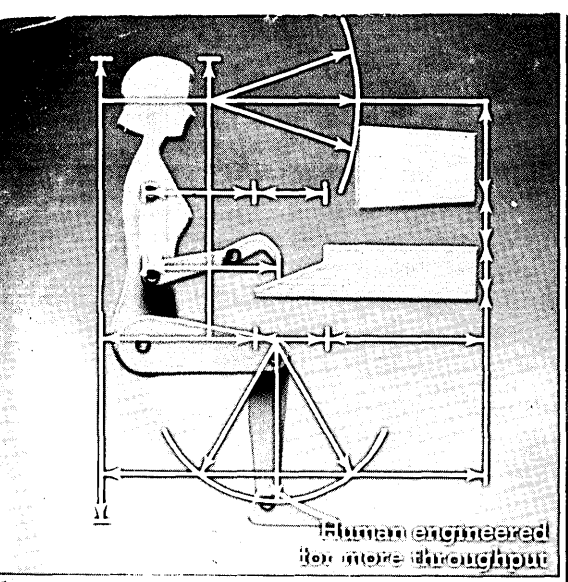

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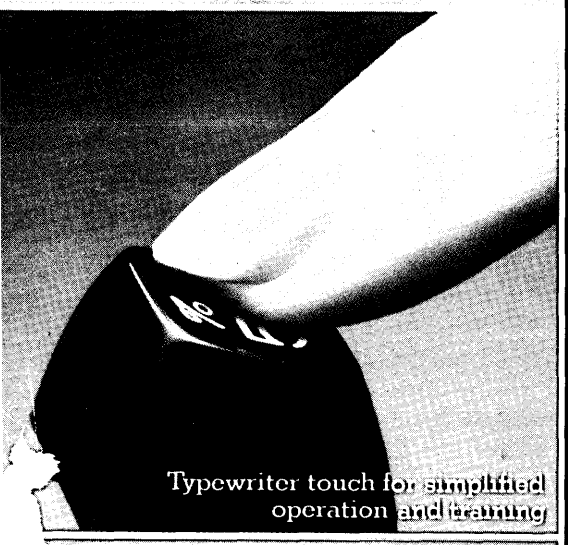

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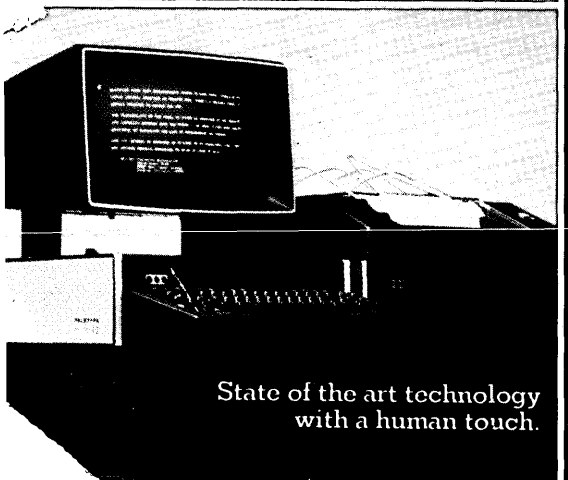

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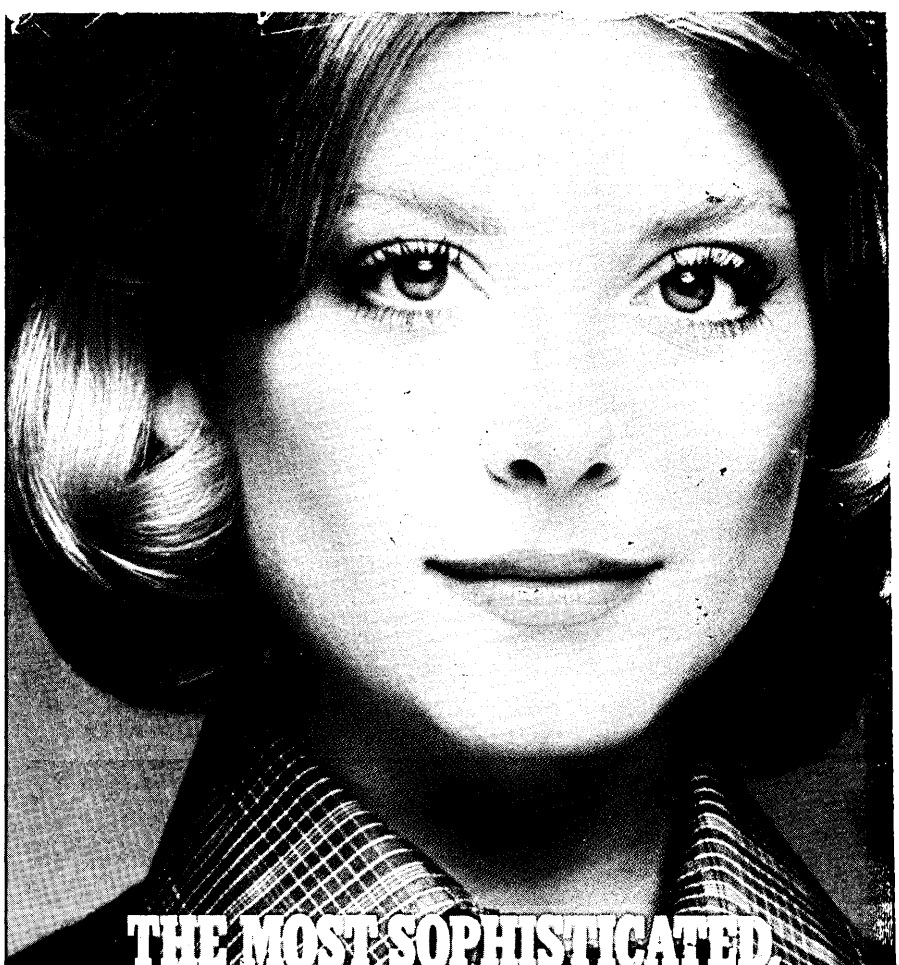

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After all, throughput is as much a function of operator performance as it is of advanced CMOS technology.

That's why we positioned the tube so it's a comfortable 19" to 21" from the operator. The tube isn't in a fixed position, either, but tilts through 20° to adjust for lighting conditions and individual viewing preferences.

To eliminate eyestrain, a specially darkened and etched glass is used on the screen to diffuse surface reflections and increase contrast by 100%. Even the large 7 x 9 display font is designed for legibility, with a flicker-free refresh rate of 60 times/second. Plus generous spacing between characters and lines increases readability even more.

Keyboard controls aren't just grouped by function so they look right, we made them "feel" right, too. Not only do they fit the fingers, they also duplicate the touch and feel of office typewriters.

As you can see, we think the best way to impress you with our model 40 product line is to make sure your operator is impressed. For more information, write: Teletype, 5555 Touhy Ave., Skokie, IL 60076. Or call: 312/982-2000.

TELETYPE

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CIRCLE 3 ON READER CARD