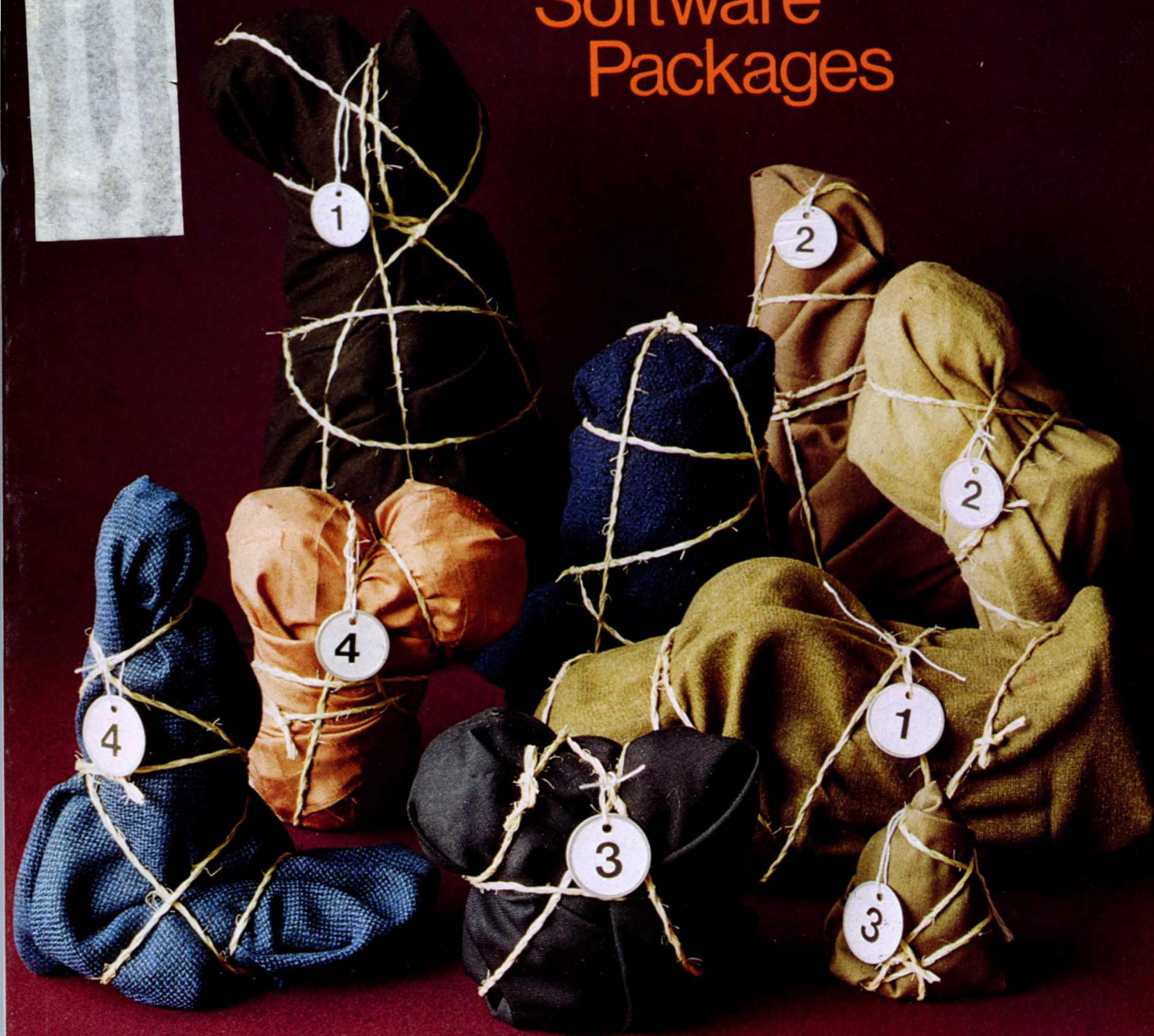


Evaluating Software Packages



Software package ratings, page 138. Also: interactive graphics, data processing in Brazil, and software reliability...

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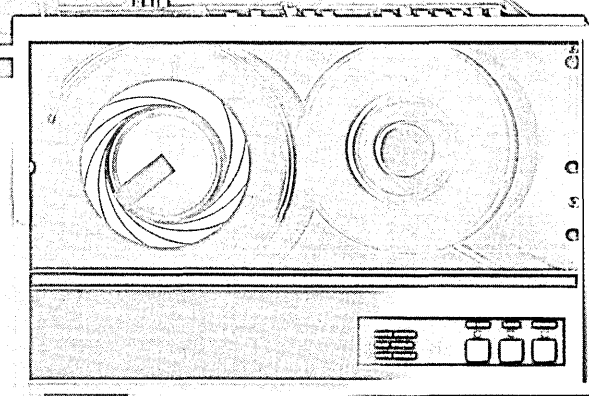
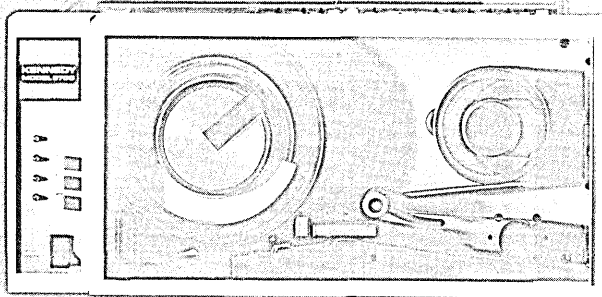
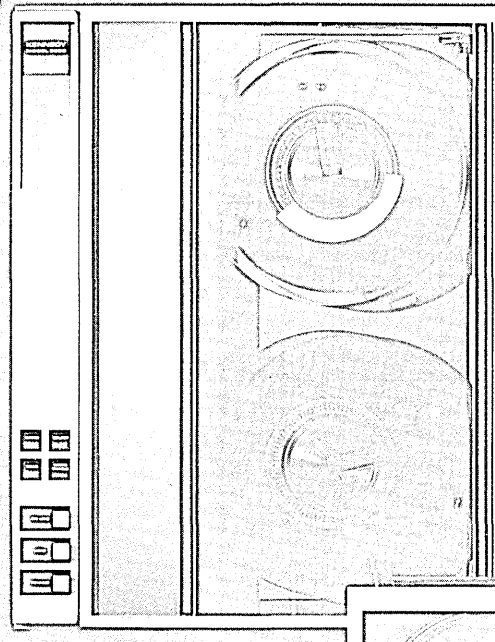
1. We've added a position arm anticipatory sensing system. It's a linear, non-contact position sensor, requiring no lamp source and assuring performance for the life of the machine.
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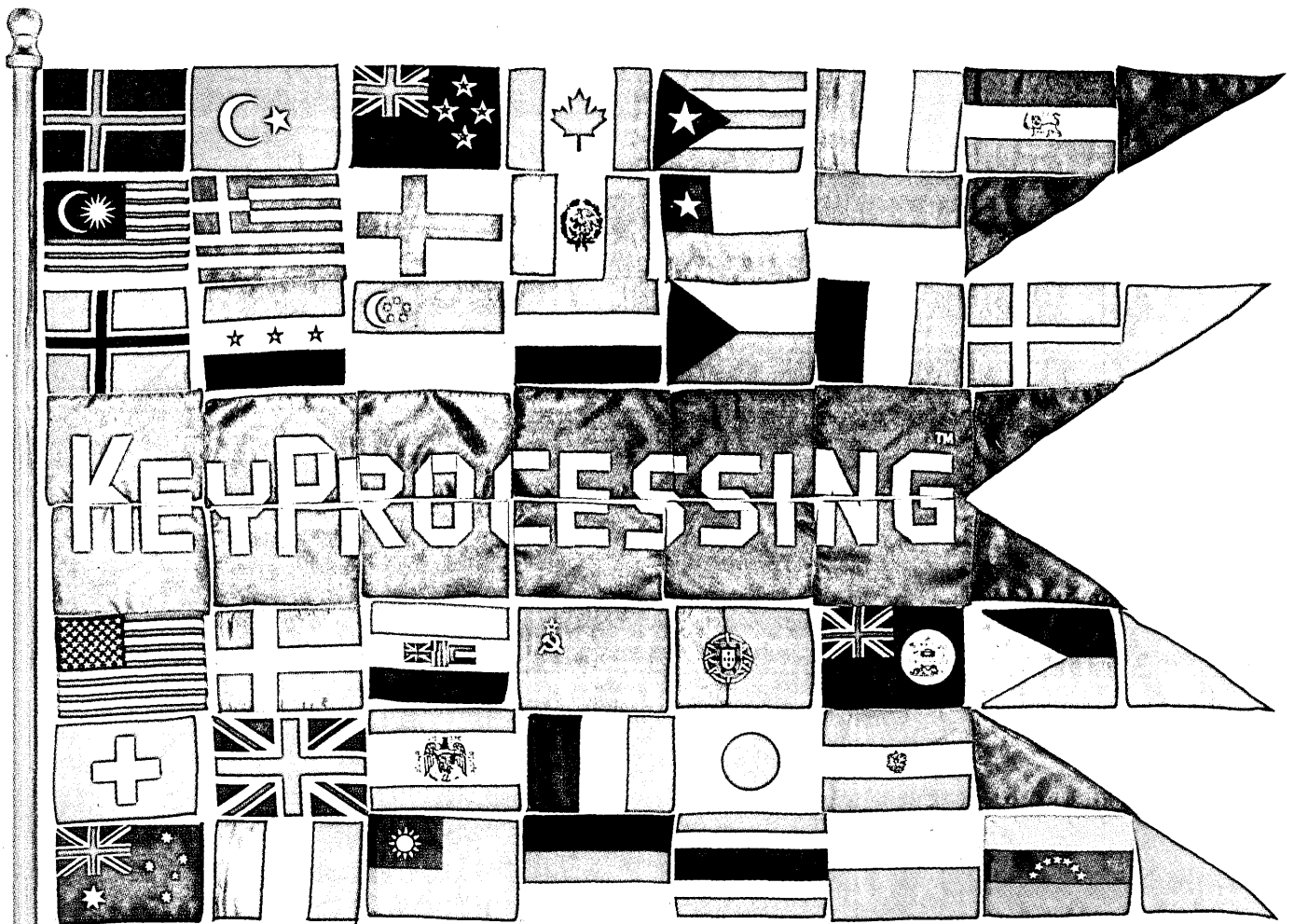
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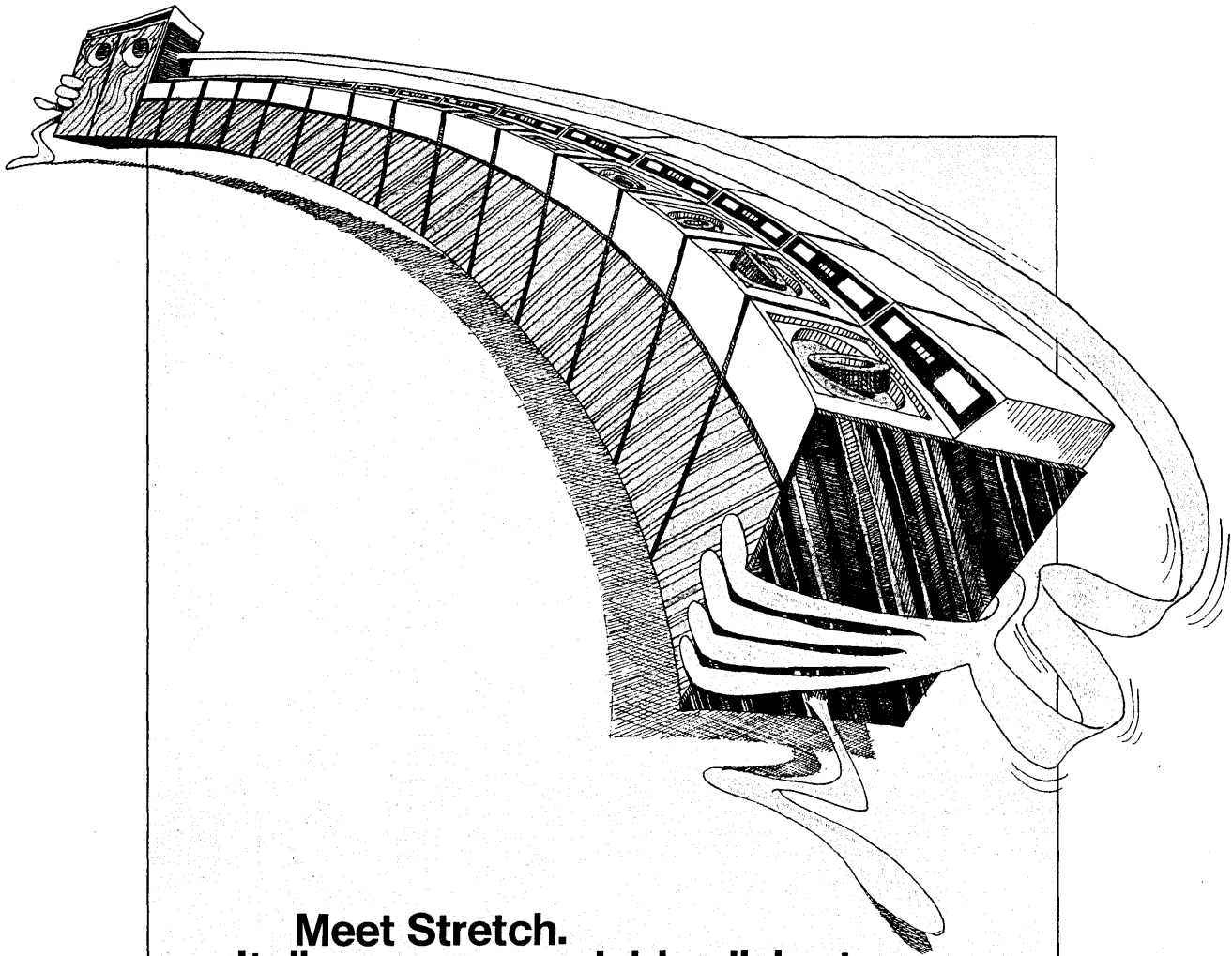
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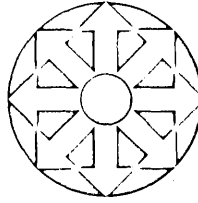
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VOLUME 21 NUMBER 12

This issue 133,000 copies

DECEMBER 1975

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Long considered expensive toys, interactive graphics systems may have just turned the corner toward becoming practical tools. Systems now in use justify themselves in saving time, eliminating redundancy, and reducing errors. Recently announced turnkey systems should prove to be cost savers as well.



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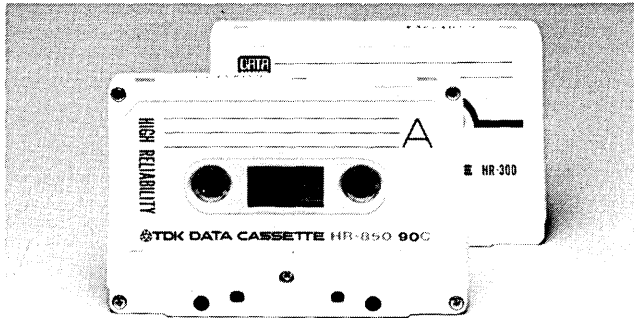
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187 ADVERTISERS' INDEX

ABOUT THE COVER. The survey in this issue is intended to take some of the guesswork out of software package selection by revealing what is under the package "wrappings." Cover by Barbara Benson.

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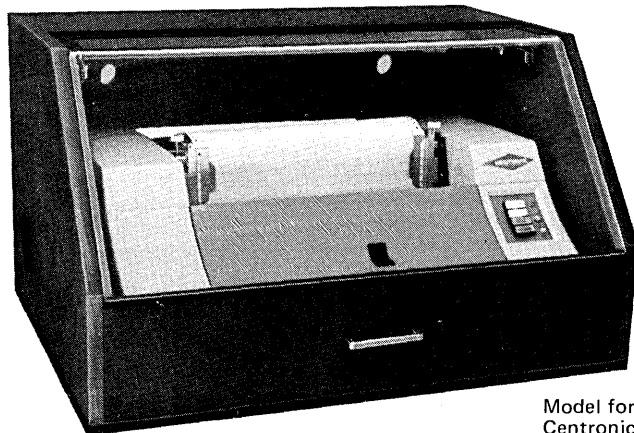
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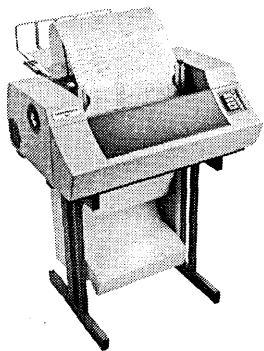
Computer Configuration _____

Time was when high speed printing meant a high speed line printer.

Times have changed.

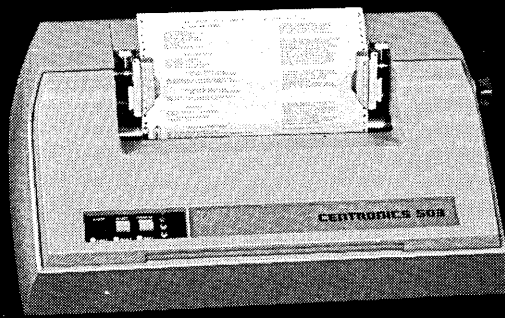
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letters

Communicating by degrees?

I have some comments to share with respect to Mark Wallis' letter ("Don't burn that sheepskin yet," Oct., p. 7).

For the most part, I agree with Mr. Wallis. If I don't know the person applying for a job, I place a great deal of importance on whether or not he has a degree, and for the very reasons Wallis listed: it shows the ability (1) to set one's sights on a long range goal and attain it, and (2) to put up with a lot of "manure" on the way and succeed in spite of it.

However, I disagree that "it is difficult for a person to attain a degree without being able to communicate his thoughts satisfactorily, both in writing and orally." Most of our educational institutions have not stressed the importance of communication skills. I draw this conclusion from the several years of having the sad experiences of seeing potentially talented people (degree or no) being pushed aside or passed over because they were not able to communicate well.

E. E. GRIFFITH
Staff Consultant
Compata, Inc.
Woodland Hills, California

... As a non-degreed person and a technical writer, I have had to sift, sort, and merge through various scraps of technical information forwarded to me from *graduate* engineers. To make sense out of some gibberish, to edit verbose fog, to make clear and concise sentences from poorly organized facts is a daily challenge. This has happened in more than one company.

RONALD V. REGAN
Computer Programmer/
Technical Writer
Whitesboro, New York

Structuring in Cobol

In recent articles in *DATAMATION* and elsewhere a great deal has been said about the difficulty of writing "structured" code using COBOL or FORTRAN. In our company we have used COBOL for writing "structured" code for about two years. We find COBOL a workable language for "structured" coding, but only two deficiencies keep it from being completely satisfactory.

First I should explain that what we call "structured" code is not GOTOless code. We do restrict GOTO statements to branching downward and to not leaving a group of performed paragraphs. This is a satisfactory substitute

for formal structuring since this code can be converted to a formal structure by inspection.

COBOL is deficient in the area of an inline WHILE-DO construct. This could be easily remedied by permitting NEXT-SENTENCE to replace the first paragraph name of a PERFORM para-1 THRU para-2. . . . sentence, and permitting control after the perform to flow to the next paragraph following the THRU paragraph. We also would like to be warned about any GOTO which branches upward in a manner similar to the warnings produced by the IBM compiler for GOTO's out of the range of a PERFORM.

Clearing up these minor deficiencies appears to us all that needs to be done.

DONALD J. NEWMAN
Advisory Systems Representative
Software International
Andover, Massachusetts

Don't license programmers!

Re: Kraft and Weinberg's Forum, "The Professionalization of Programming," (Oct., p. 169).

The legal and medical professions' licensing shows the beneficiaries to be lawyers and doctors—not consumers. Licensing will only serve to close the programming field to newcomers, and at a time when it is finally becoming

more accessible to women and minorities. Let's open the field, not close it.

Furthermore, as a programmer for over 15 years, I strongly object to the authors' charges of incompetence. To my way of thinking, poor programming is caused by a combination of poor training and poor management. The programs I've written that I'm least proud of were done in haste for customers who, through poor planning, needed them "yesterday."

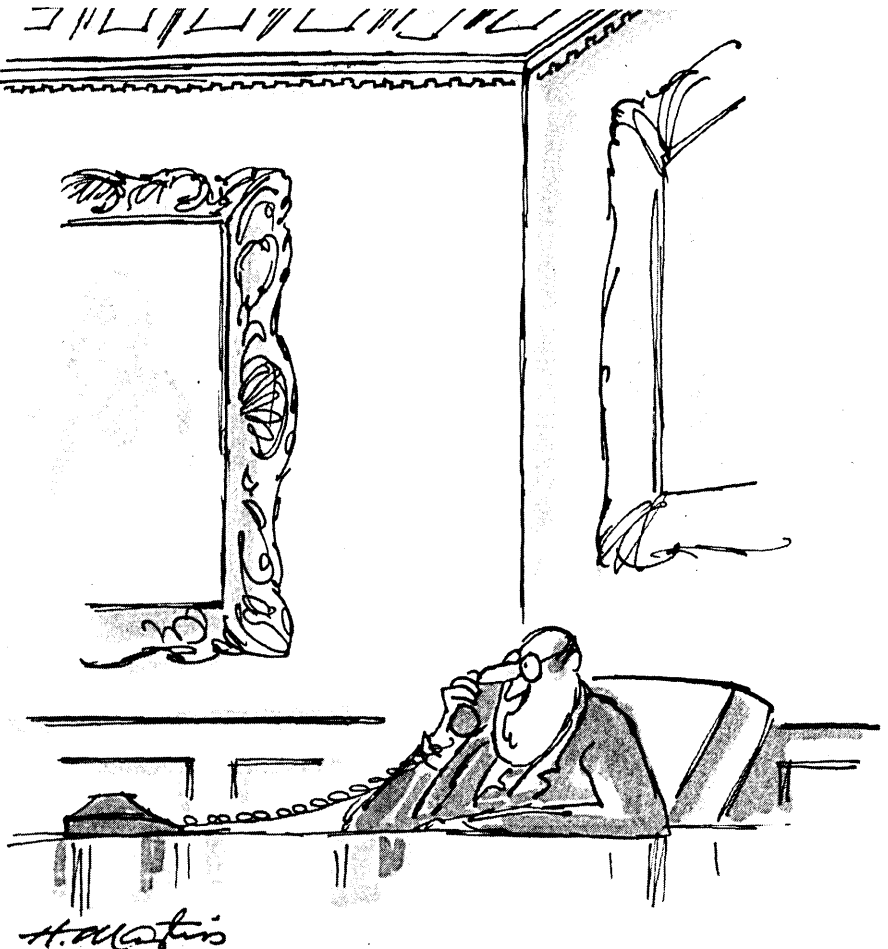
I put the blame squarely on teachers and managers for programming errors, not on working programmers who are trying their best in "speed up" environments.

HENRY NOBLE
Seattle, Washington

Real-time on his hands

In your October People section, there is a short article on Mr. John Cool (p. 11).

As an inmate of the Oregon State Penitentiary, I am highly indebted to Mr. Cool and his efforts on our behalf. I must point out an error in the article, however. The machine which Mr. Cool procured for us—we no longer have it, by the way—was an SDS model 910, not a Sigma 3. Although the 910 is now something of a vintage ma-



"Eddie, this is J.B. and I'm just calling up to wish you a very, merry bah humbug and all that!"

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letters

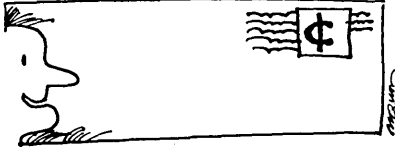
chine, I have learned much from it and have much to thank Mr. Cool for.

RAYMOND HADDON
*Inmate Programming Student
Oregon State Penitentiary
Salem, Oregon*

Nurdic activity spotted

Concerning S. A. White's "On Diginurds" (Oct., p. 72), some of the effects of these phenomena are reflected in a document given to me during my first week in data processing over 11 years ago, entitled "A Compendium of Certain Natural Laws Applicable to E.D.P." Here are the contents:

"1. If something can possibly go wrong, eventually it will. (This is Murphy's Law.)



2. When everything possible has gone wrong, things will probably get worse.

3. It is foolhardy to assume that jiggling X will not diddle Y, however unlikely.

4. All assumptions are false. This is especially true of obvious assumptions.

5. The question is always more important than the answer.

6. The necessity for providing an answer varies inversely with the amount of time the question can be evaded.

7. The minimum time needed to complete any project is exactly equal

On First Looking Into White's Diginurd

Much have I travelled in the realms of Nurd,
And many goodly Quirks and Murphys seen;
Round many visiting vips have I been
When Failure in fealty to Mammon purred.
Of one wide expanse have oft I heard
That clean-clipped Diginurd ruled as his demesne:
Yet did I never breathe its pure serene
Till I heard White speak out loud and absurd.

Then felt I like some watcher of the skies
When a new planet swims into his ken;
Or like lofty Von Neumann when with eagle eyes
He stared at his automaton—and all his men
Winked at each other with a wild surmise—
"Zeitgeist," cognoscenti of Digi-Zen.

(Pardon the theft of Keats' demesne
But mundane prose seemed too profane.)

J. P. RIGANATI
Yorba Linda, California

to the maximum time available to work on it. (This is Parkinson's Law.)"

Of course, applications of these natural laws to other areas are common (e.g., the variant of Murphy's Law which states that in the production field, "A dropped tool will always land where it can do the most damage"—known as the Law of Selective Gravitation, and certainly a prime example of nurdic activity). I also recollect years ago reading an article dealing with "the perversity of inanimate objects," in which ordinary household appliances were discussed; this may now be seen more clearly as evidence of nurds at work.

In fact, I would bet that even a brief investigation into human history would reveal a great deal of interference by these unseen parasites; perhaps primeval nurds have evolved to match mankind's evolving technology. . . .

JOHN A. VELONIS
Delhi, New York

. . . S. A. White's article caught my attention and so fascinated me that I wanted to learn more (or less) about the subject of nurds and related topics. However, I was unable to find any trace of the two references mentioned by Dr. White. . . . It occurred to me that perhaps these references are also governed by Nurd Theory; specifically, acting like the transmuted illogic function IF, these references exist only IF no one tries to find them.

I would appreciate your assistance in this matter, for IF you can locate the references, *MAYBE* I will be *ALWAYS/NEVER* in your debt for *WHAT* you have done.

TED C. BJORK
*Dp Programming Officer
Puget Sound National Bank
Tacoma, Washington*

NEW

COMPUTER ARCHITECTURES AND NETWORKS:

Modelling and Evaluation

Proceedings of an international workshop organized by IRIA, Rocquencourt, August, 1974.

edited by E. GELENBE and R. MAHL.

1975 470 pages.
US \$32.95 / Dfl. 85.00.

Papers presented at this workshop examine the main trends of research into, and applications of, the modelling and measurement of computer systems. They cover: modelling methodology, deterministic scheduling problems which arise in multiprocessing or real time systems, probabilistic models and performance measurements of novel or classical computer architectures, performance measurements and models of existing operating systems, computer network performance, and applications to system design.

DATA BASE MANAGEMENT

Proceedings of the IFIP Working Conference on Data Base Management, Cargèse, Corsica, France, April 1974.

edited by J. W. KLIMBIE and K. L. KOFFEMAN.

1974 433 pages.
US \$27.75 / Dfl. 72.00.

Papers presented at the meeting and summaries of the discussions are contained in this book. Particularly outstanding features are: a discussion on the equivalences of the DBTG and relational approach; several different views of the data modelling problem; several theoretical treatments of implementation problems (data equivalence, access path selection, data base editions, concurrency, integrity etc.); some articles on existing DBTG implementations.

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Make room for the Dataproducts 2550 horizontal-font printer.

Until recently, the IBM 1403 train printer has been the industry standard for quality printing at 1100 lines per minute (LPM).

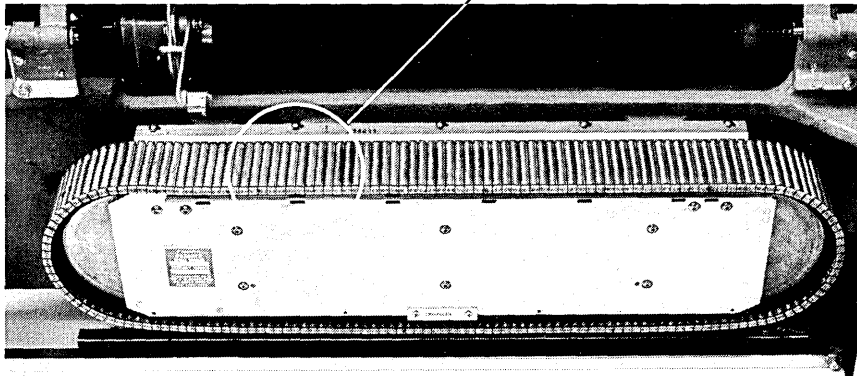
But now the 2550, with the Charaband® print drive, sets a new standard at 1500 LPM.

Or, 36% faster than the 1403.

Horizontal Font Printing

The Charaband is a horizontal-font carrier that offers all the advantages of train printers, and eliminates the disadvantages of sliding friction.

The 2550, combining the Charaband with our patented Mark IV hammer, offers a highly reliable friction-free print mechanism.



In short, consistent, straight-line, high quality printing.

Reliability Plus

The Charaband is driven on a roller bearing system to eliminate sliding friction and lubrication systems.

And, unlike train printers, very little wear occurs in the print mechanism.

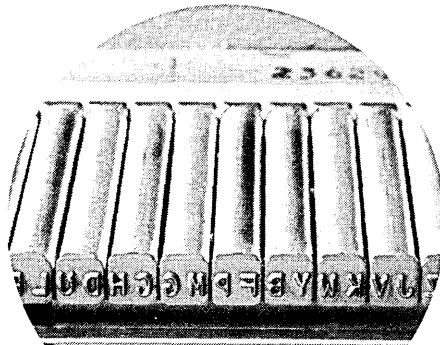
Reliable operation— equals much less down time.

On-the-job Flexibility

The Charaband carries two complete fonts—one on each side.

The fonts are reversible.

The 2550 also offers replaceable character-type modules that don't require a cartridge readjustment.



A 90° swing-open gate for easy access to Charaband, ribbon and paper.

And simplified controls built into your own "quietized" cabinet.

The 2550 Costs Less

It costs less than the 1403.

Yet, its exclusive Charaband design is a clear-cut improvement in line printer technology.

How do we do it?

Simply by specializing.

Dataproducts is the leading independent printer manufacturer in the world.

And by concentrating in one technology, we are able to make a better printer.

For less than the competition.

Our 2550 Charaband printer is 1500-LPM proof of that claim.

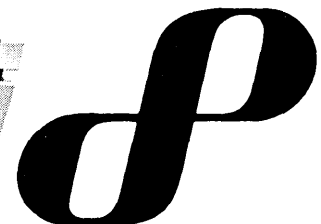
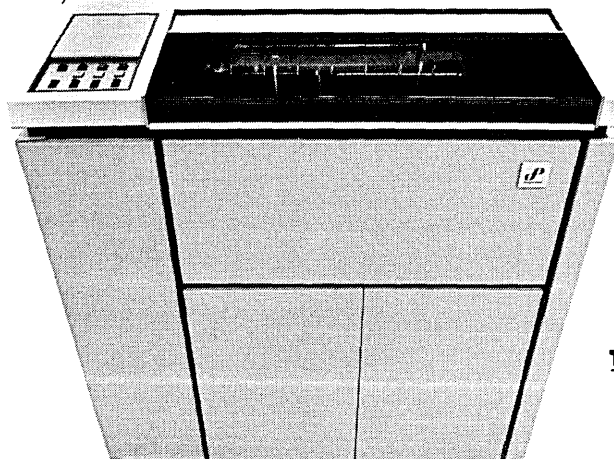
Interface Compatible

The 2550 can be interfaced with almost every major computer system that requires high-speed performance.

So we invite you to call or write for full information and specs.

Remember, Charaband horizontal-font, 1500-LPM speed, less down time and less money.

Little wonder the former industry standard has to move over.

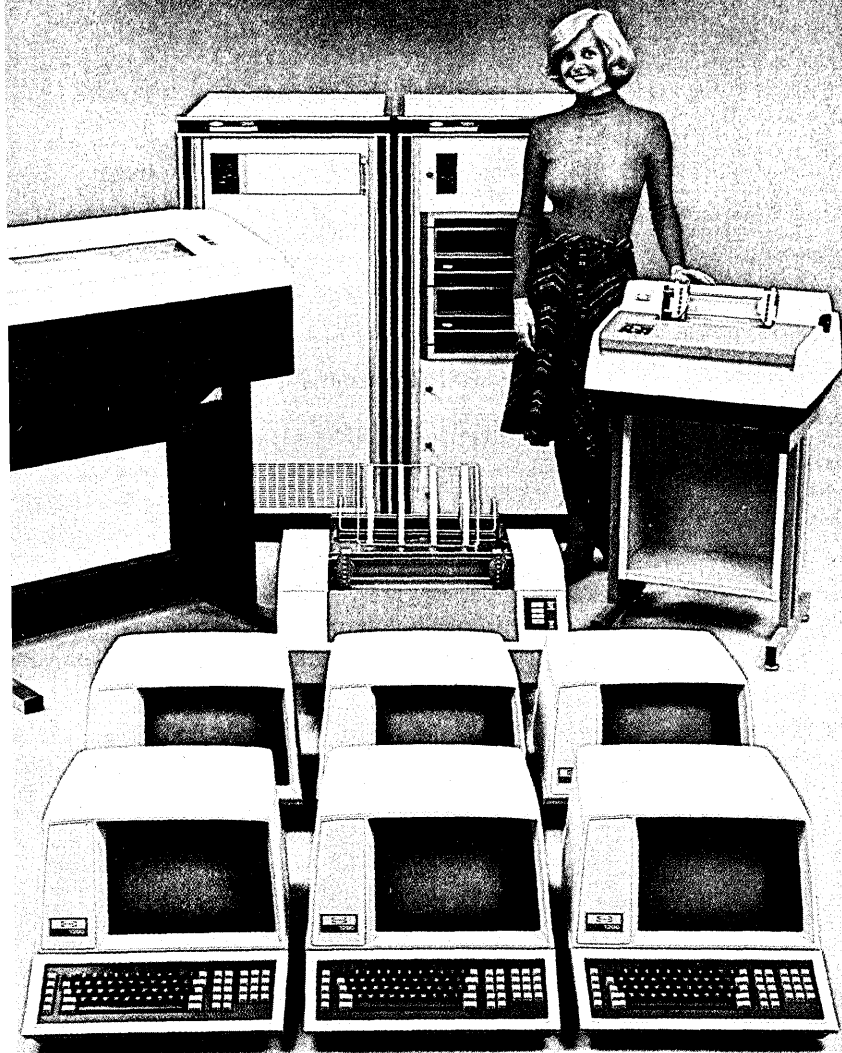


Dataproducts
The Line Printer Company

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Raytheon's new PTS/1200 distributed processing system gives companies with extensive branch operations new independence from centralized information handling.

The versatile, cost-effective PTS/1200 system allows remote sites to perform their own:

- source data entry and pre-processing, including editing and validating;
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- unattended two-way communications, either in point-to-point or multi-point networks;
- stand-alone batch processing — and disc storage up to 20 million bytes of capacity;
- fast, flexible report printing, in many formats;
- 3270 terminal emulation on-line with 360/370 computers.

Ready-to-use software gets your data up fast — and you can program your own applications easily. The system can utilize up to 24 terminals simultaneously. It reduces computer line costs and forms costs, expedites data retrieval and reports, improves productivity and requires minimal operator training.

A demonstration says it all.

To arrange that, write to Raytheon Data Systems, Marketing Department, 1415 Boston-Providence Turnpike, Norwood, MA 02062 — or telephone 800-225-9874 (toll-free). When you build better information processing systems... **the Word gets around.**

INTELLIGENT TERMINALS, MINICOMPUTERS AND TELECOMMUNICATIONS SYSTEMS

RAYTHEON DATA SYSTEMS

RAYTHEON

CIRCLE 62 ON READER CARD

people

Personalizing Terminals



JOHN W. FAIRCLOUGH
Lots of opportunity to influence new things.

Until 1972 IBM's terminal offerings were mostly general purpose. In recent years, though, the company has gone the other way. One of the men who influenced the change, John W. Fairclough, talked recently of the company's new directions shortly after he returned to England to head the company's U. K. Laboratories, Ltd. at Hursley after 11 years on assignment in the U.S.

Fairclough was a co-developer of what he calls the "industry systems" approach to terminal development while he headed IBM's research lab in Raleigh, N. C. The other developer was Earl Wheeler who was heading IBM's Kingston, N.Y., labs.

"Although there was a market (for general purpose terminals), Earl and I believed there was a growing market for the personalized, particularized terminal, for people with no knowledge of data processing. So eventually we were able to create an industry systems organization and a series of terminal-based industry systems."

"Missions" for specific industries grew up and began to be apportioned: Raleigh took primary responsibility for distribution applications. Kingston began working on

banking systems and the conversion of old equipment for health, printing/publishing and local government applications. Endicott studied manufacturing and process industries; Poughkeepsie, education and transportation; and Los Gatos, cash dispensers for banking systems. (That has now grown into a full scale mission for self-service devices across a broader range.)

Hursley, which had been working primarily on small to medium size mainframes, disc storage and PL/1, handed the mainframe mission on to IBM West Germany and PL/1 back to the U.S., and shifted its missions to industry systems for insurance and utilities, worldwide, with a desultory World Trade mission for local government.

Fairclough's concept involved pushing standardization down to a level of chips and components so that the company could have an assortment of "mix and match" elements with which to personalize terminals and at the same time presumably keeping the overall volume high enough to satisfy IBM's expectations for profit. Wheeler and Fairclough set the standards first by forming an industry-oriented organizational structure. Once it was started, the terminal development groups all over IBM fell into line, using the standard "little engines" or "building blocks" (Fairclough avoids using the term "microcomputer.") Thus all the industry systems so far announced, and those yet under wraps, are using the same basic elements.

Now back in England as managing director of the Hursley Labs, Fairclough resumes the same post he held there when projects such as

the SCAMP computer (once offered as an alternative to the 360 concept) were underway in the late '50s and early '60s. But he now has additional responsibilities as a senior member of the management team of IBM's new System Communications Div. headed by Bob O. Evans.

He works in what one IBMer calls "the nicest office in all of IBM," in a fine old Queen Anne building set in rustic countryside. The floor-to-ceiling windows in his large office frame the rolling hills of Hampshire. Winchester Cathedral is just out of sight over the hill.

In spite of the beauty of the surroundings and the convenience of a new home just across the road, it seemed too serenely remote for a man fresh from the excitement of IBM's upper regions. Why did he return to England? "I was an assignee in the U.S.," he answered. "I really had to decide where I lived." Though he enjoyed his work in the U.S., Fairclough notes that at Hursley, "there's lots of opportunity to influence new things." He's on a plane every six to eight weeks for the U.S. in his position with the System Communications Div. and SCD president Bob Evans comes to Hursley three or four times a year.

The wearing effect of travel is a challenge Fairclough says multinational organizations are going to have to face in the future: "How to use the brains and management skills they have effectively, where they are, without having to bring them together in one place." He sees satellite communications as one tool. "But it really comes back to human factors—getting people to work together." *

"Like The Picture of Dorian Gray"

Convinced during the mid 1960s that computer terminals could one day become almost as numerous as automobiles, Sam Irwin, president of Sycor Corp., began a search of industrial areas where such numbers of products could be inexpensively manufactured. Perhaps the choice of the Detroit area (specifically Ann Arbor) would surprise some people, but when Irwin explains it, it makes sense.

"There's very little difference between a brace in one of our terminals and a fender bracket, for example. Also, southeastern Michigan technology is second to none when it comes to practical problems such as matching the paint on plastic components with metal, or other

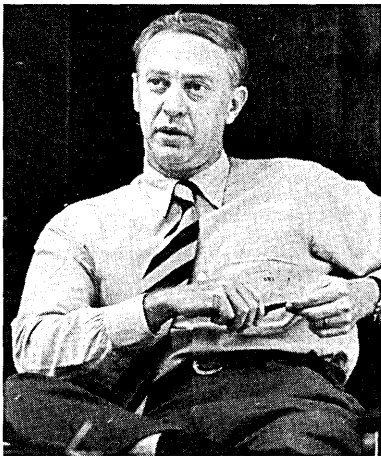
plastic parts. We use dies as large as a 4' x 4' cube—and you can't find those just anyplace. And our vendors are used to working with large orders and delivering on time. It takes a lot of load off the manufacturing operation to be able to count on this." Irwin claims the emphasis on manufacturing capability is responsible for the fact that less than 15% of Sycor's manufacturing cost is for labor. The company is currently building approximately 1,000 intelligent crt terminals a month.

Irwin's application of automotive assembly line techniques in an electronics industry predates the 1967 formation of Sycor. In 1956 he joined the Holley Carburetor Co. in

(Continued on page 12)

people

DORIAN GRAY . . . Detroit. Holley was interested in diversifying its business, and Irwin convinced them that building line printers was as close as anything to what Holley had been doing because of the high number of repeatable parts used. In 1960, he formed Inteledata Co. to concentrate on high-speed computer printing. The company became part of Telex Corp. in 1961. Much of it became Telex's Data Systems Div. in Minneapolis. Irwin worked with the division with a group in Detroit. This division was acquired in 1962 by Dataproducts Corp. (then Data Products). Irwin has an experimental version of the Dataproducts printer hammer in his office.



SAM IRWIN

Automotive techniques for computer terminals

Despite a schedule that includes getting up at three in the morning to head for Sycor's corporate offices, Irwin likes to claim he has nothing to do with anything that will affect the company for the next six months. "I like to think about what financial steps to take, what our plant layout should be, how the plant fits future products, and so on. I'm inverted, I guess. I'd rather know about what people are going to want next than what they want now. We have lots of capable people for handling now."

On the automated office concept, where terminals, filing systems, and communications are all integrated, Irwin says: "It's coming, certainly, but I expect it will be evolutionary, not revolutionary. IBM will undoubtedly have a very good system. We'll have another. They may have the optimum design for a 49 story Union Carbide building, and we may have the best set-up for a small battery distributor, for instance.

There will always be certain things we can do well—we'll make sure of it."

Asked if being the president of a \$40 million a year firm and seeing his product concepts proven, is *fun*, Irwin paused. "For me it's like a movie I once saw entitled "The Picture of Dorian Gray." The entire film was in black and white except for just a few color sequences. For me the color comes in accolades for

our products, or in situations such as getting off a plane in Europe and seeing our products coming off another plane.

For relaxation, Irwin engages in off-shore sailboat racing. "I've been charged by other board members that I sabotaged radio equipment aboard my yacht while on six day races on the Great Lakes. This is absolutely untrue and I will deny it," he said with a broad smile. *

Computers for Hospitality

Mary Ann Furniss is a Southerner who believes in the tradition of Southern hospitality.

She's also a mathematician and a computer scientist who has acquired in her working years an expertise in information storage and retrieval.

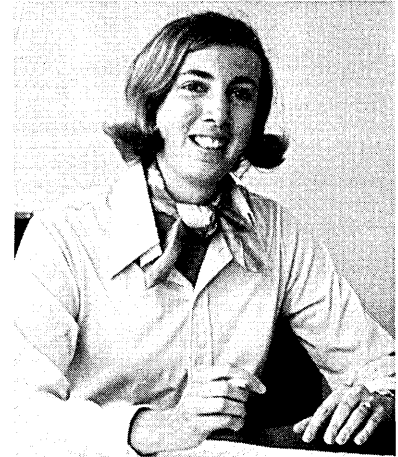
Now she's bringing the two together. She's the new director of the Center for Data Base Services for Holiday Inns, Inc. It's a new job with a new group and Furniss likes the challenge. "It's exciting and fun. I'm learning a lot about the food and lodging business."

In mid-October the group was still trying to establish its objectives but its major charter was in place: to provide a data base which would serve Holiday Inns' three major operating groups: Worldwide Systems, Food and Lodging, and Hospitality. The Center for Data Base Services is funded by all three groups but is under the direct supervision of Worldwide Systems.

Raymond Schultz, senior vice president for marketing of the Worldwide Systems Div., to whom Furniss reports, was, she says, one of the primary instigators of the new operation she heads. The center is the first group function to serve the three divisions. "It's a real experience trying to coordinate three divisions and get them working together. I think we're succeeding," she said.

Furniss' working background is a far cry from the hospitality industry but she says she's applying the same techniques with the same success. A native of Hamlet, N.C., she holds a B.S. degree in mathematics from Weshampton College of the Univ. of Richmond, Va., and has attended the Graduate School of Computer Science at the Univ. of North Carolina. Before joining Holiday Inns, she was supervisor of administrative computer systems at the Univ. of Tennessee Center for the Health Sciences in Memphis. She also is a

former director of data processing activities for the North Carolina Science and Technology Research Center—a regional information center for the National Aeronautics and Space Administration—and has served as aerospace technician with the Goddard Space Flight Center in Greenbelt, Md.

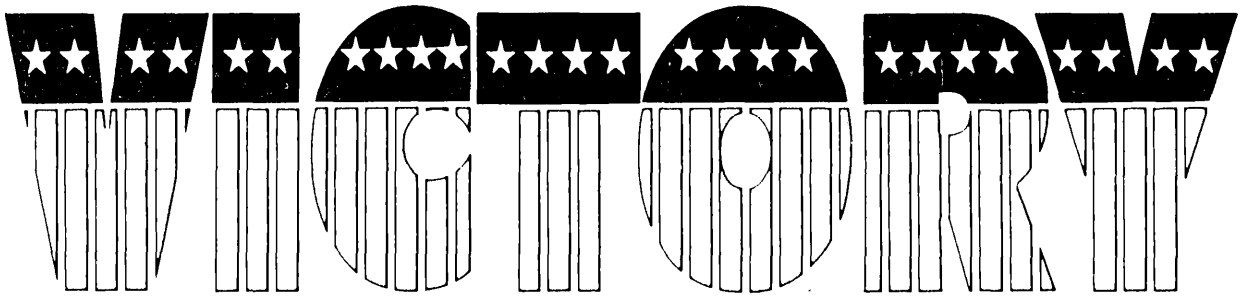


MARY ANN FURNISS

Learning food and lodging

Her first efforts in her new job have been aimed at the building up of a comprehensive data base. "We're gathering all the information we can on all the inns." Holiday has more than 1,700 inns internationally. Information being collected includes the physical characteristics of the inns, the structure of the buildings, who owns them if they are franchises, percent of ownership, whether they are roadside or downtown inns, and what kind of market each innkeeper thinks he serves. "Up till now," says Furniss, "we've had all those inns out there and not much information on them."

Currently Holiday Inns has three IBM 360/50s, one of which is dedicated to the Holidex reservation system. "Yes," says Furniss, "there are still a few 50s around." But they're looking at new equipment. . . . hopefully, hospitably. *



SyncSort wins all the gold medals in the "Great Sorting Olympics!"

(Better luck next Olympiad, IBM.)

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Find out how to sort for less.

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Which sort on the market today is really best? Which one uses the *least* amount of system resources to do a sorting job?

We found out by running a series of extensive—and expensive—tests we call the "Great Sorting Olympics."

In planning Sorting Olympiad I, we set two goals:

1. Unmask some of the misconceptions and myths that surround sorting.
2. Measure the exact amount of CPU Time, I/O Activity, and Elapsed Time that every sort on the market consumes.

First, we gathered the leading competitors from the Wide World of Sorts—our own SyncSort III-and-a-half, IBM's PEER/ICEMAN (SMI-5740), their older sort (SMI-5734), and a fourth contender from a minor sorting power.

Next, we asked three computer installations in the East, Midwest and West to provide the "tracks." They were to choose the files to be run and make the evaluation of the results. No hanky-panky. At one center, all four sorts were put through their paces under exactly the same conditions. At the other two places, SyncSort was matched against the IBM sorts.

Finally, we did something that's never been done before on the playing fields of sorting. We brought in a hardware monitor to judge the events.

SMF analysis wasn't good enough. It doesn't tell you what's really happening in a sort and it helps spawn those myths we referred to above.

By the time the dust settled, Whitlow's anthem had been played three times and SyncSort III-and-a-half had walked off with Gold Medals for:

- Least TRUE CPU TIME. SyncSort used 31.8% less than the average of the other three sorts.
- Least I/O Activity. SyncSort used 32.2% less than the average.
- Least Elapsed Time. SyncSort used 33% less than the average.

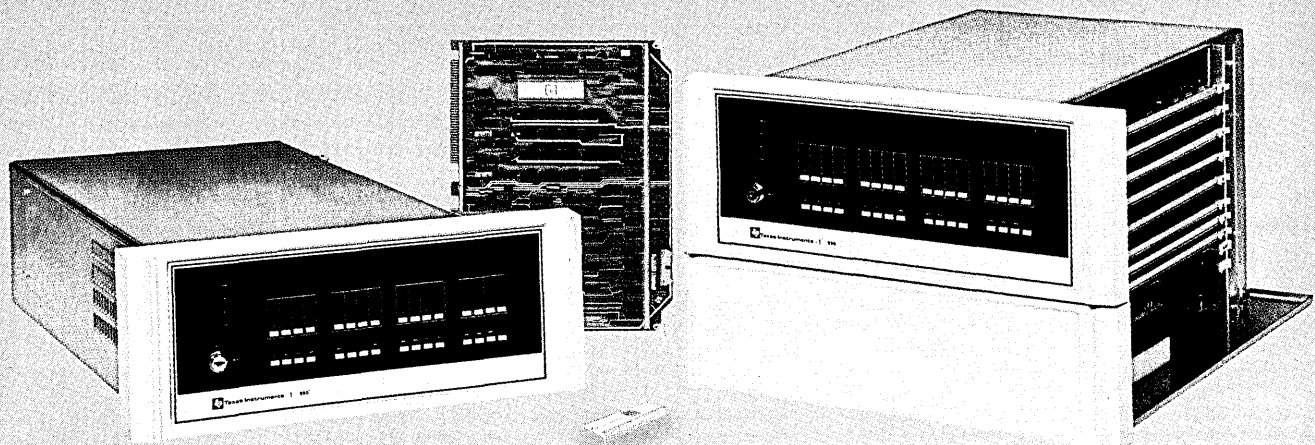
Proud? Sure. But not exactly surprised. We knew we had the best sort all along. But what did surprise us was how much new information we discovered about how other sorts really operate.

We discovered, for example, that other sorts use *twice* as much CPU time in the supervisor state as they do in the problem state. If one of our competitors tries to sell you a sort package, be sure to ask him if he's measured that aspect of his sort with a hardware monitor.

Or ask him if it's true that you can reduce channel time or device busy time by reducing EXCP's. He may not be aware that that's one of those sorting myths.

Why not call us today? We wouldn't want you to be misled because you didn't have the latest facts on sorting.

Meet the new 990 Computer Family from Texas Instruments



**Introducing the 9900 Microprocessor
and 990 Series Micro/Minicomputers**

Upward Compatible Software and Downward Competitive Prices

At TI, we've started a new family tradition in micro/minicomputers with the 990 computer family . . . a new tradition based upon a heritage of semiconductor leadership.

The 990 computer family sets new price/performance standards because of an important milestone in MOS technology . . .

The TMS 9900 single-chip, 16-bit microprocessor.

Powerful enough to be the heart of a full minicomputer, the TMS 9900 is also the best microprocessor going for terminals, machine monitoring and control, and a host of OEM applications.

All in the Family

The same company . . . Texas Instruments . . . makes every member of the family, and makes every member software compatible, from the bottom up. The new Model 990/4 microcomputer and Model 990/10 minicomputer use the instruction set of the TMS 9900 microprocessor. This means that software developed for the low-end computers will be compatible with the higher performance models. And, users can expand their systems with a minimum of interface and software adaptation.

The TMS 9900 Microprocessor

The TMS 9900 is a 16-bit, single-chip microprocessor using MOS N-channel silicon-gate technology. Its unique architecture permits data manipulation not easily achievable in earlier devices. With its repertoire of versatile instructions and high-speed interrupt capability, the TMS 9900 microprocessor provides computing power expected from a 16-bit TTL computer.

The Model 990/4 Microcomputer

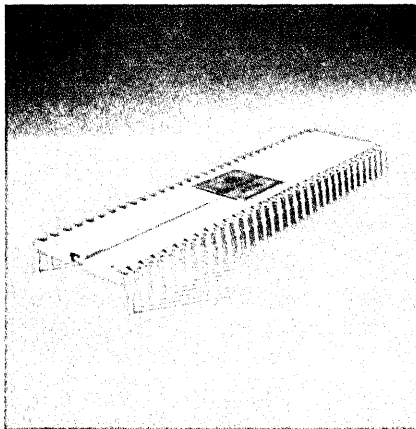
It's a complete computer on a single printed circuit board using the TMS 9900 as its central

processor. The 990/4 is ideally suited for terminal control, peripheral device interface control, and as a CPU for OEM customers.

In addition to the TMS 9900 microprocessor, the 990/4 microcomputer contains up to 8K bytes of dynamic RAM, up to 2K bytes of static RAM and/or PROM, eight vectored interrupts, front panel interface, real-time clock input, two I/O buses for low- and high-speed devices, and optional ROM utilities.

With the 990/4, you can select a low-cost OEM package, a 7-inch or 12¼-inch rack-mountable chassis, or a table-top enclosure . . . and memory expansion to 58K bytes.

Price: The Model 990/4 microcomputer with 512 bytes of memory is only \$368 without chassis and power supply. This same model with 8K bytes of memory is only \$512*.*



State-of-the-art TMS 9900 microprocessor . . . 16-bit, single-chip CPU with minicomputer instruction power.

The Model 990/10 Minicomputer

The most powerful member of the family is the Model 990/10 general-purpose minicomputer. The 990/10, a TTL implementation of the 990 architecture, provides the high-performance speeds demanded in many applications.

A memory mapping feature providing memory protection and privileged instructions supports memory expansion to two million bytes. And TILINE**, an asynchronous high-speed I/O bus, supports both high-speed and low-speed devices. Chassis options are the same as those for the 990/4.

Price: With 16K bytes of memory, chassis, power supply and programmer's panel, the Model 990/10 minicomputer is only \$1968.*

Built Better Backed Better

In addition to the family of compatible hardware, Texas Instruments backs you with complete software and support. *Standard software packages include memory-resident and disc-based operating systems; FORTRAN, COBOL, and BASIC compilers; and program development packages with utilities.* And, for you to develop application programs for the 990/9900 family, we offer *cross support on timesharing networks* and standalone software development systems. One is a low-cost system using the 990/4 . . . the other is a disc-based system using the 990/10. And, a *prototyping system* is offered for TMS 9900 users to develop custom software and firmware modules.

TI supports you with training and applications assistance, plus an installed nationwide service network backed by TI-CARE†, our automated remote diagnostic, service dispatching, and real-time field service management information system.

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The "Winchester" Data Module is a completely self-contained unit, incorporating heads, spindle, and recording surfaces in a protective factory-sealed pack. You've heard of the advantages of this new technology . . . complete security from environmental contamination, improved high-density storage, and incredibly fast access. Now you can enjoy this premium performance without paying a premium price.

Here are the facts, in brief:

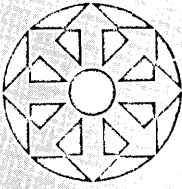
- Complete compatibility with 3340 drives
- BASF-guaranteed Zero-Error performance
- Now available in two configurations. . . . The 1335 Module, with 35 million-byte capacity, and the 1370 Module, with 70 million-byte capacity
- Our 1370F Module, with fixed head and quicker access, will be available later.

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

You're already paying for BASF quality..you might as well have it.



CIRCLE 12 ON READER CARD



LOOK AHEAD

COMPETITION FOR THE IBM 5100

Digital Equipment Corp. is making great hay about opportunities in the education market for its new low-priced microprocessor-based time-sharing system, but privately the company is said to be counting on a huge end-user market to develop.

The DEC LSI/11-based system supports up to four terminals at a price of less than \$5K per terminal. DEC is hoping the equipment will serve as an alternative to IBM's 5100, which DEC thinks costs twice as much for half the performance. On the subject of the 5100, DEC got a chance to see the Big IBM Servicing Machine in action recently. The story is that DEC's 5100 went "down," its power supply failing. Not only did IBM servicemen respond quickly, but new parts were sent out from Wooster, Mass. by taxi on a half hour ride to the DEC plant. Presto: the 5100 was up and running again.

SEL IS FARING WELL WITH 32 BIT MACHINE

The long hard struggle to turn Systems Engineering Laboratories of Ft. Lauderdale, Fla., around may be bearing some fruit. Not only has the company delivered some new systems, but we understand that there is an order backlog of more than \$5 million for the 32-bit SEL 32. Moreover, the machine is beginning to show up at sophisticated users' sites. Five machines for Mississippi Power and Light Co., for instance. Still, those lucrative big oem orders remain elusive, even though the firm's management believes the SEL 32 can compete in both price and performance with the popular 16-bit minis. Insiders say the SEL 32 is going out in larger average configurations than anticipated: \$100,000 rather than \$70,000.

TRADE SECRETS JUDGMENT IMPACTS OTHERS

Customers using Digital Computer Control's D-116 minicomputer have been surprised that Data General hasn't been making much of a sales rush on them in the wake of DG's trade secrets victory over Digital Computer (p. 130). The best explanation is that Data General doesn't want to string out its delivery schedule.

Some users could be in a bind by the decision, which DCC says it will appeal. Entrex and Nixdorf Computer have been using the D-116 in their data entry systems and now not only is their source of supply for the machines in doubt, but the firms could be vulnerable because DCC licensed them to build equipment. A Delaware court ruled that DCC stole Data General plans and the court was preparing to issue an injunction halting DCC from making equipment designed from the Data General plans in question. Data General has also filed a patent violation case against DCC and, should Data General win that case also, then all users could be vulnerable. DCC has vigorously denied the Data General charges.

GOVERNMENT LAWYER WAS AN IBM ENGINEER

One Justice Dept. attorney who doesn't have much trouble understanding all those IBM technical charts is Joseph H. Widmar, co-counsel for the government's antitrust case against IBM. Widmar worked for two years, from 1956 to 1958, as an engineer at IBM's Poughkeepsie, N.Y., plant. After resigning from IBM, Widmar went to law school and eventually ended up in the Justice Dept. Mention of Widmar's past employment with IBM was contained in transcripts of a session in the judge's chambers.

AMDAHL A YEAR AWAY FROM BREAKING EVEN

At year-end a number of hardware vendors are bullish. A terminals company says business has been growing nicely since the National Computer Conference in May. Advanced computer designer Gene Amdahl, whose Amdahl Corp. will deliver six systems this year, now reveals plans for shipping an additional 25 to 30 of the powerful 470V/6 machines in calendar '76. Amdahl Corp., he adds, should reach the break-even point, in terms of total investment to date, early in 1977.

Helping the cause are lease financing arrangements the firm has with DPF,

LOOK AHEAD

Inc. for commercial customers during '76, amounting to \$160 million, and a \$20 million commitment from First Municipal Leasing Corp., Denver, for state and local government and state university contracts. These lease contracts, says Dr. Amdahl, can be recorded by the firm as cash sales for virtually the full sales price.

IT'S ALL IN HOW YOU TIME IT

"If we had started at any other time, we wouldn't have made it," Data 100 president Ed Orenstein frequently tells reporters of his company's remarkable success in the remote batch terminal field. The Minneapolis company was formed two years before the 1970 recession knocked the feet from under many firms that had started up as IBM competitors. And it was also at a time when the concept of communications-based data processing was catching on.

The company now may be timing perfectly the introduction of its newest product--the model 77 dual station key-to-diskette data preparation system that competes head-on with a communications-based model of the IBM 3741 floppy disc line--the 3741, mod 4. Data 100 claims an edge over IBM in its model 77's software, its 3780-like communications discipline and the fact that it comes with an impact printer. Added to that is IBM's current push to promote the concept of floppy disc-based data preparation. IBM has started to install diskette readers with the 3776 models of its batch terminals and also is selling 3540 diskette readers with large IBM systems. Although card readers come with all such equipment, the company obviously is pushing the floppy disc concept.

Data 100, which will begin shipping the equipment in the spring, already has some orders from among the 1,200 companies where its remote batch terminals are installed.

HANGING IN THERE

Ripples in the magnetic tape storage market haven't rocked the boat of tiny Gulliver Technology Corp., Los Angeles, which last summer introduced a 6250 bpi tape drive (August, page 72). Dan O'Neill, president, said Gulliver is growing (up to 12 people) and is on target. They're testing the first unit and acquiring parts for the next four. Production will begin in April. And O'Neill isn't bothered by the fact that larger California Computer Products scrapped its development of a 6250 bpi drive last month or by hints that Storage Technology Corp., the only other independent offering 6250 bpi drives, is having troubles (p. 130). "Response to our product has been fantastic," said O'Neill. "The only frustrating thing is we have to move slowly and can't offer earlier delivery.

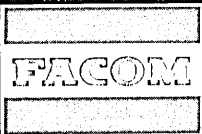
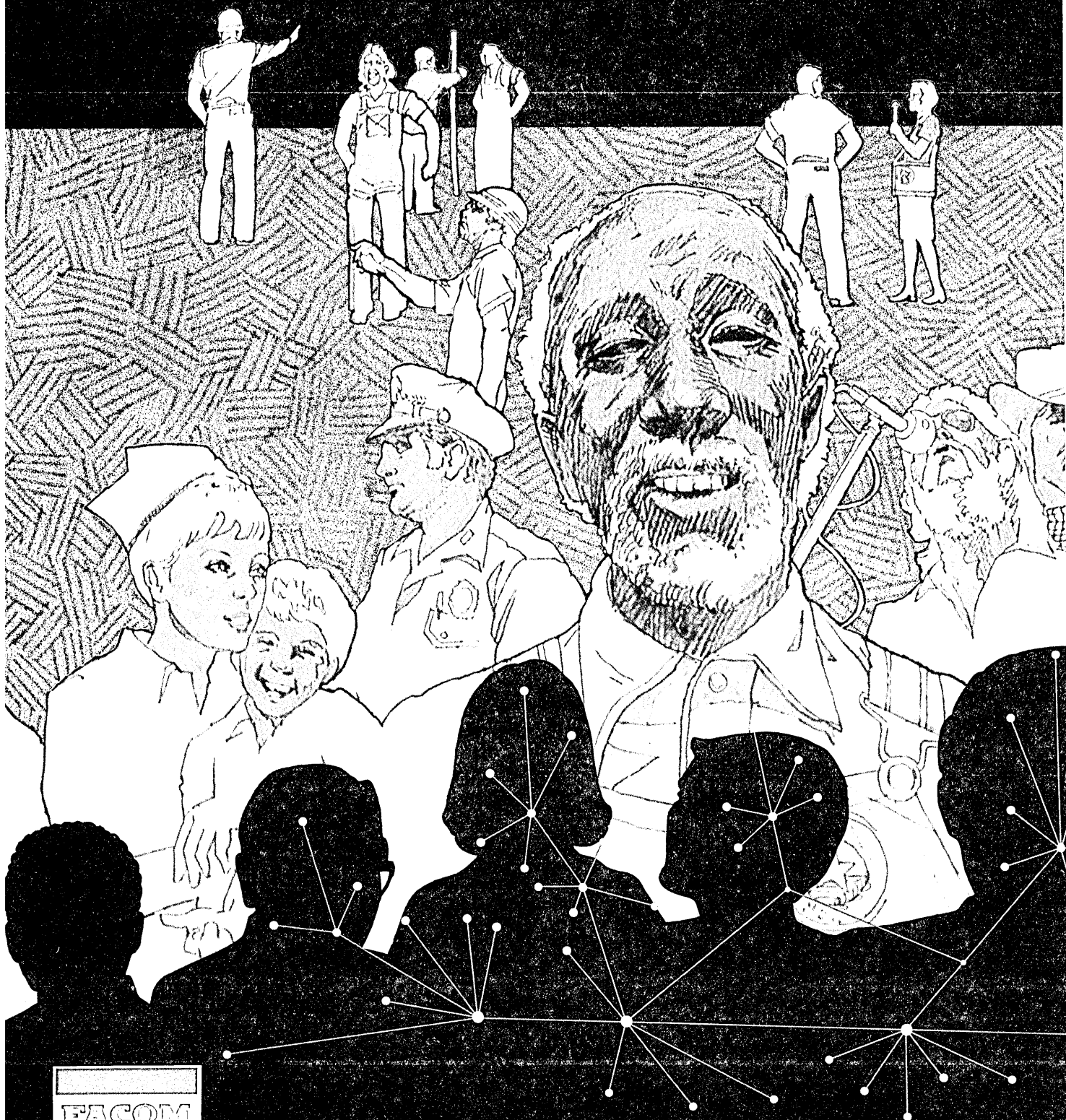
A spokesman for O'Neill's former employer, Ampex Corp. says his company decided two years ago to stay out of the IBM compatible market-place for tape drives and instead to concentrate on "high technology tape engineering," particularly in the instrumentation market for military, geophysical and telephone switching applications. It recently merged its tape engineering operation into the instrumentation engineering operation. However, it still will develop tape drives for the oem market such as the TMA and TMB products for minicomputer makers and systems houses.

NEW COMPANY FOR TYMSHARE?

Speculation that Tymshare Inc., Cupertino, Calif., will form a separate value added company for communications services offered on its Tymnet network is answered by Tymshare president, Tom O'Rourke, "It's all up to the FCC." If the FCC decides to go along with a contention by Telenet Communications that Tymshare's purely communications "joint-user" service is illegal then Tymshare will form a new company but O'Rourke doesn't like the idea. "That's the easy way to go." He agreed with former Tymshare executive, Max Beere, now with TRW, who said formation by Tymshare of a separate value added company subject to FCC regulation would be "sad because regulation stifles."

(Continued to page 132)

Finding jobs for more and more people... Fujitsu is on-line.



MAIN PRODUCTS Electronic, Computers & Peripheral Equipment (FACOM) Telegraph & Data Communication Equipment Remote Control &

Fujitsu is on-line finding jobs for more and more people. Fifteen years ago the Japanese government asked us to build a system which would make it easier for people to know when and where jobs open up. We responded by setting up an on-line network throughout the entire country.

Now, by simple punching a card, a man who is a thousand miles away in Okinawa can learn whether or not there's a position open for him in Tokyo.

We're the connection between employer and employee, too. Companies use our services to

recruit personnel from all over Japan.

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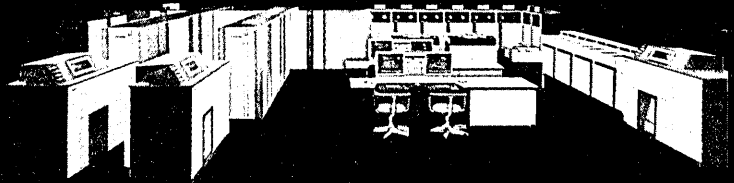
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communications equipment of all kinds. And we're uniquely experienced in meshing the two into tailor-made data communications systems.

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FUJITSU LIMITED

Communications and Electronics
Marunouchi, Tokyo, Japan



CIRCLE 45 ON READER CARD

calendar

JANUARY

3rd ACM Symposium on Principles of Programming Languages, Jan. 19-21, Atlanta. Papers on automated debugging, automatic programming, compiler design and implementation, special applications, and software design are among those to be presented. The meeting is sponsored by SIGACT and SIGPLAN. Fees: \$37.50, members; add \$5 for nonmembers or post Jan. 5 registration. Contact: Prof. William Grosky, School of Inf. and Computer Science, Georgia Inst. of Technology, 225 North Ave., Atlanta, Ga. 30332.

3rd Annual Symposium on Computer Architecture, Jan. 19-21, Clearwater, Fla. A tutorial on microprogramming precedes the two-day conference sponsored by the IEEE Computer Society and the special interest group on computer architecture of the ACM in cooperation with the Univ. of South Florida. Sessions cover design evolution, hardware descriptive languages, multi/microprocessor, performance evaluation and modeling, and network design, among other topics. Fees (until Jan. 12): Jan. 19 tutorial, \$45, members; \$60, nonmembers; symposium, \$30, members; \$40, nonmembers; \$15, students. Contact: Oscar N. Garcia, College of Engrg., Univ. of So. Fla., Tampa, Fla. 33620, (813) 974-2948.

"On-Line Systems, 1976-1986," Jan. 19-21, and "Data Base Systems," Jan. 21-23, Washington, D.C. These conferences are sponsored by the American Institute of Industrial Engineers. "On-Line Systems," a technological update and forecast, will discuss the impact of miniaturization, and new data transmission networks, including satellites, among other topics. "Data Base Systems" focuses on problems in design and administration, the state of the art and future trends, and the impact of Codasyl. Fees single conference: \$295, teams \$195; combined fees for both conferences, \$445, teams \$330. Contact: Dept. OLIS, AIE Seminars, P.O. Box 25116, Los Angeles, Calif. 90025, (213) 826-7572.

FEBRUARY

4th Annual ACM Computer Science Conference, Feb. 10-12, Anaheim. The conference will feature short reports on current research in computer science, as well as tutorials, book exhibits, an employment register, and special sessions before and after the main meeting. On Feb. 9 the L.A. chapter of the ACM and the National Bureau of Standards will sponsor the West Coast FORTRAN Forum; discussion will center on the proposed American National Standards X3.9-19XX FORTRAN revision. Contact: Donald Reifer, Aerospace Corp., P.O. Box 92957, Los Angeles, Calif. 90009. A joint technical symposium on Computer Science and Education is planned for Feb. 12 and 13. Contact: Ron Colman, Calif. State Univ., Fullerton, Calif. Employment register information: Orrin E. Taulbee, Dept. of Computer Science, Univ. of Pittsburgh, Pittsburgh, Pa. 15260. Conference fees: \$25, members; \$30, nonmembers; \$5, students. Contact: Julian Feldman, Dept. of Information and Computer Science, Univ. of California, Irvine, Calif. 92664.

DATACOMM/76, Feb. 16-18, New Orleans. Application, tutorial and general interest sessions on data communications are planned, with presentations directed to managers in dp, communications, datacomm, and business and financial areas. Exhibits will feature hardware, software and services. Fees: \$95, three days; \$50, one day; team discounts. Contact: DATACOMM/76, 60 Austin St., Newtonville, Mass. 02160, (800) 225-8960, toll-free.

IEEE Int'l. Solid State Circuits Conference, Feb. 18-20, Philadelphia. The emerging role of LSI and microprocessors will highlight keynote addresses during this meeting, which will feature 75 papers, 17 day sessions, and 10 evening sessions, covering design, performance, testing and application of solid state circuits and systems. More than 1,200 representatives from the U.S., Europe, and Asia are expected to attend. Fees: \$40, members; \$50, nonmembers; add \$10 for on-site registration. Contact: Lewis Winner, 152 W. 42nd St., New York, N.Y. 10036, (212) 279-3125.

2nd Int'l. Conference, Software Engrg. for Telecommunication Switching Systems, Feb. 18-21, Salzburg. Scope of this conference includes management of software design and production, problems of implementation and maintenance, multiprocessing systems, and support software. Contact: The Manager, Conference Dept., IEE, Savoy Place, London WC2R OBL.

COMPCON 76 Spring, Feb. 24-26, San Francisco. This 12th international conference sponsored by the IEEE Computer Society will focus on "The Next 5 Years: Evolution or Revolution." A one-day tutorial on Feb. 23 will be on "Unique Aspects of Microcomputer Applications." Fees: tutorial, \$50, members, \$65, nonmembers; conference, \$50, members; \$65, nonmembers; \$10, student members. Add \$10 after Feb. 13. Contact: Jon E. Petersen, COMPCON 76 Spring, IBM, R62/123, 5600 Cottle Rd., San Jose, Calif. 95193.

MARCH

INTERFACE '76, March 29-31, Miami Beach. The program committee composed of data communications users, suppliers, and consultants from industry and academe has scheduled 100 speakers for this fourth presentation of the original data communications conference and exposition. Cosponsored by DATAMATION, the conference spotlights new approaches to fundamentals and advanced techniques, information on the latest data communications equipment and services, and workshops to deal with methods, systems, and procedures for planning, implementing, and managing a data communications network. Fees: \$95, three days; \$50, one day; team discounts. Discounts on hotel accommodations are available through the INTERFACE '76 office. Contact: INTERFACE '76, 160 Speen St., Framingham, Mass. 01701, toll-free (800) 225-4620; within Massachusetts, (617) 879-4502 (collect).

ON THE AGENDA

NRMA, Annual Convention, Business & Equipment Exposition, Jan. 11-14, New York; 3rd Int'l. Congress on Computers in Industry, Jan. 29-30, Paris; WINCON '76, 17th annual convention, Aerospace and Electronic Systems, Feb. 18-20, North Hollywood. *

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

HOW TO GET YOUR PACKAGE THERE AS FAST AS IF YOU CARRIED IT YOURSELF.

It's as easy as 1, 2, 3.

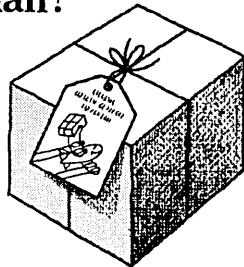
1. Bring your small package to United's passenger check-in counter 30 minutes before flight time. Pay the charges.

2. Phone your addressee. Give him the flight number, arrival time, and receipt number.

3. Thirty minutes after arrival, the package can be picked up at the baggage claim area.

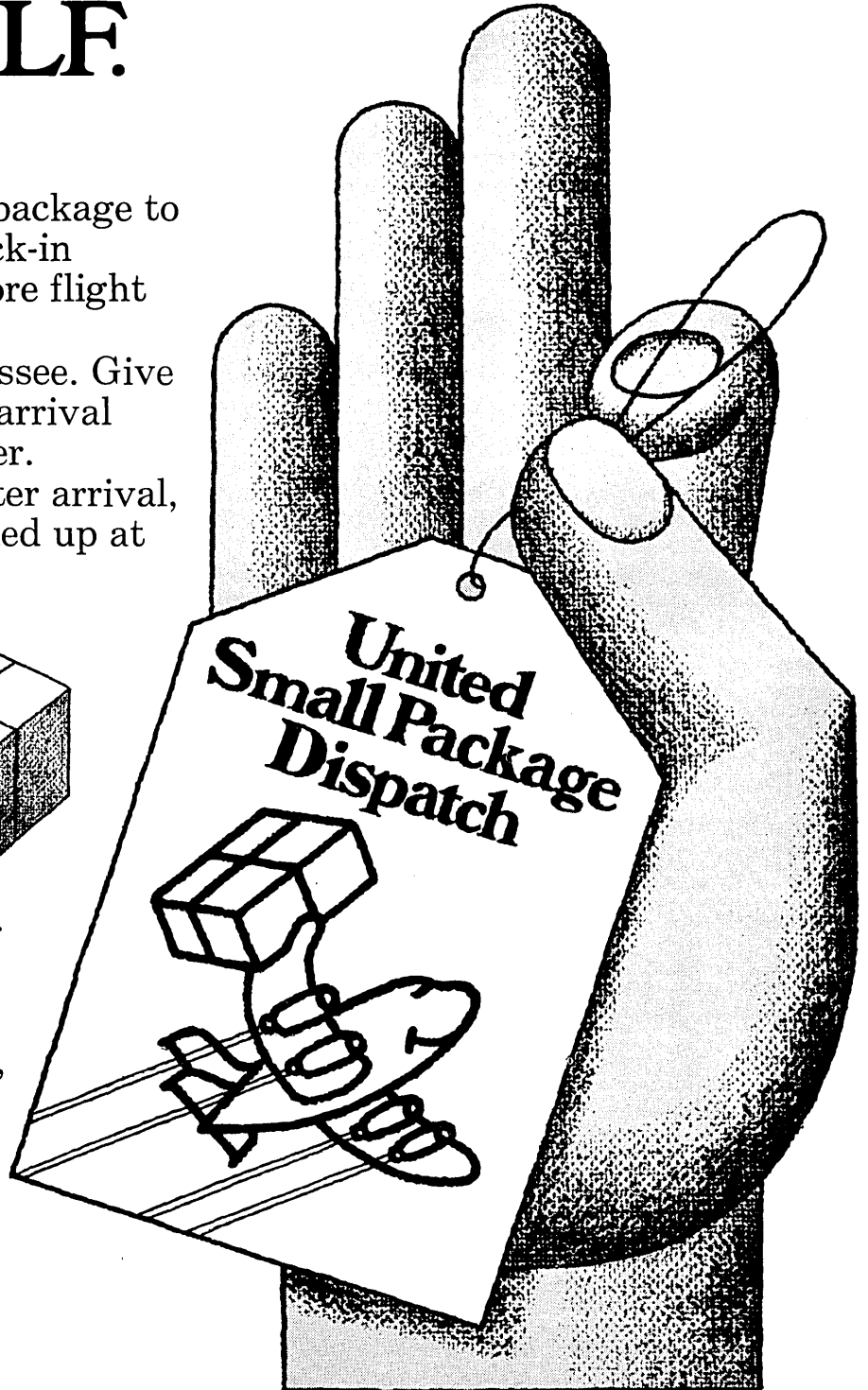
How big is small?

Up to 50 pounds in weight, up to 90 inches in total dimensions (length, plus width, plus height).



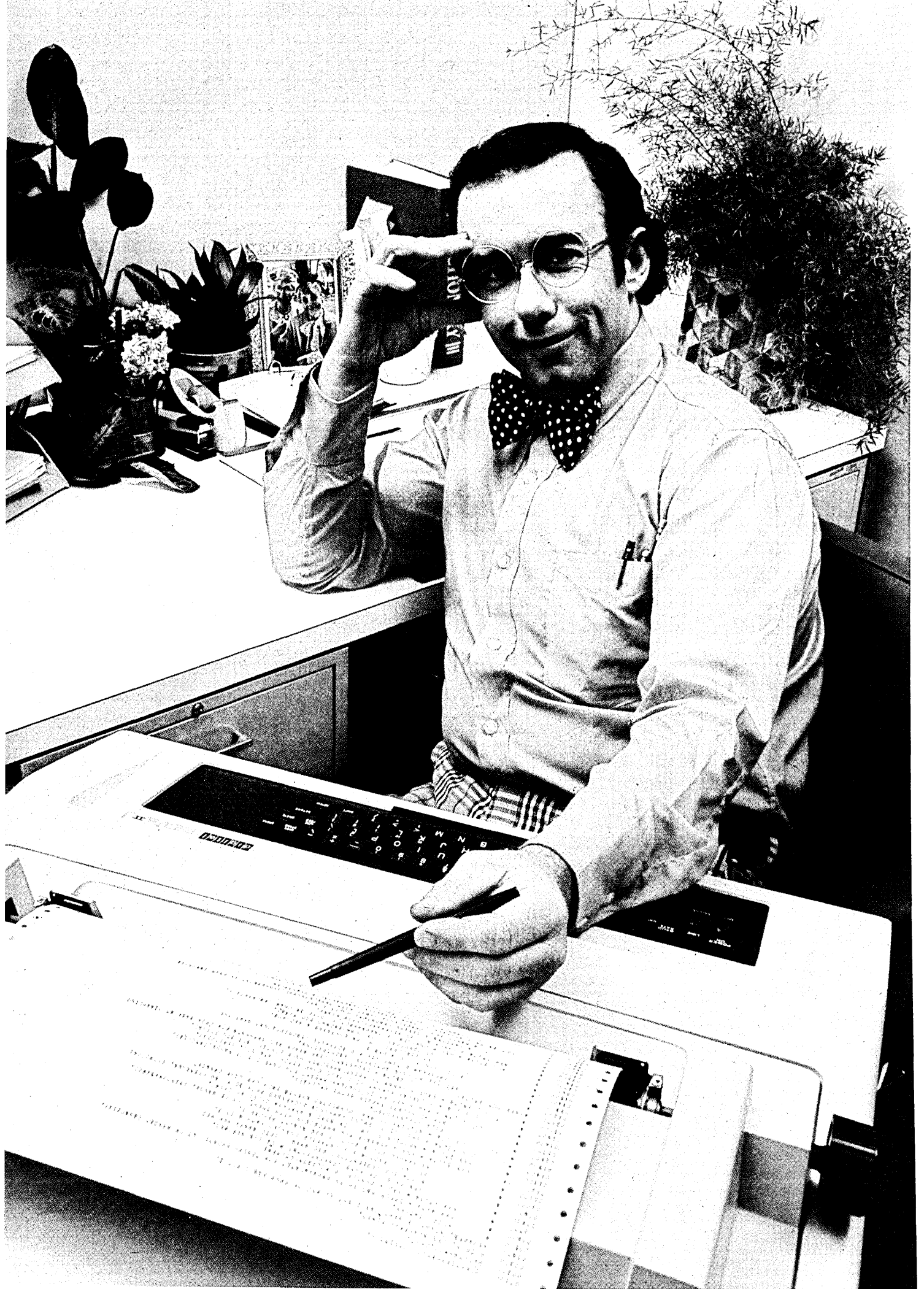
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Things like film, computer tape, samples, medicine, advertising material, blueprints . . . or the briefcase you forgot to take on your business trip.



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But that's not all. The DECsystem-10 can do interactive, batch, remote batch, on-line EDP, real-time and transaction processing, and can be used for networks and hierarchical

systems too. Because the DECsystem-10 is a truly flexible big computer.

It can handle from 640K to 20 million characters of memory. It offers COBOL, FORTRAN, ALGOL, APL, BASIC, and MACRO, complete with de-bugging aids. (There's even a new low-cost APL terminal.) It offers you both virtual and cache memory and an advanced Business Instruction Set. It has complete systems software — MCS, DBMS, a file management system, and our famous TOPS-10 operating system — all supported by us, instead of you.

Best of all the DECsystem-10 costs about half what other big systems do. And it's backed by Digital's experience with over 50,000 computer installations worldwide.

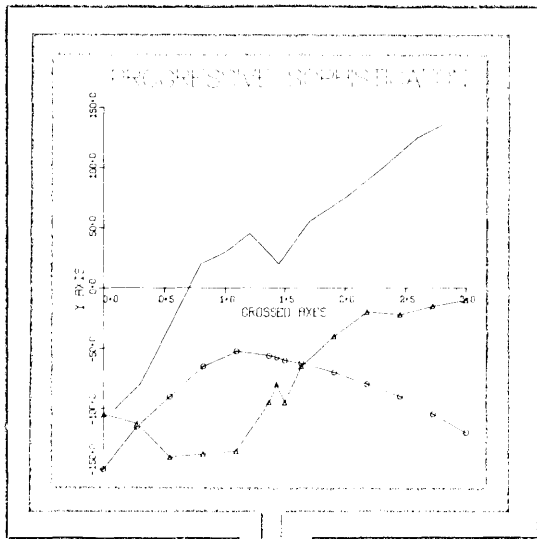
To find out how organizations like yours are using the DECsystem-10, simply call or write for our new "How I Got More Computer for Less Money" brochure.

You really can't afford not to.

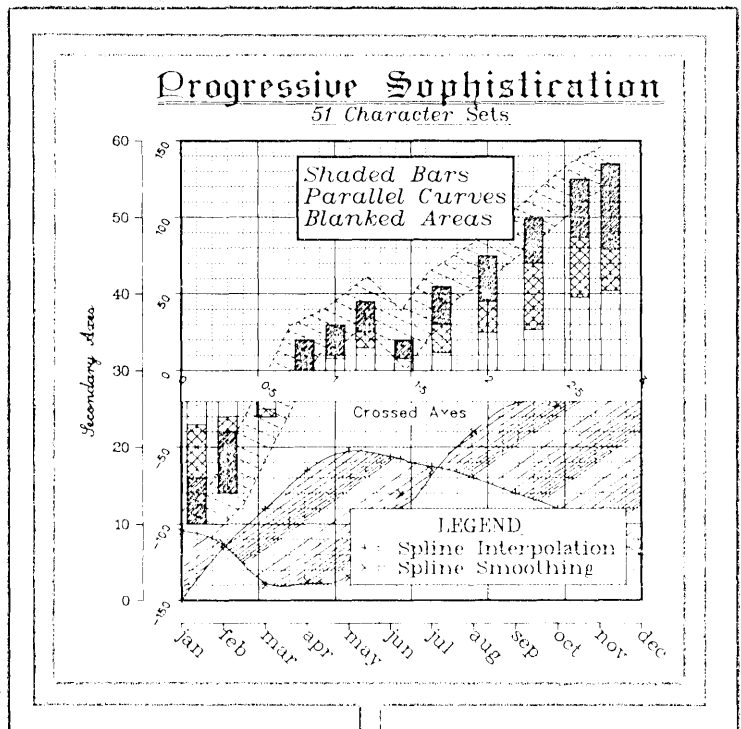
Digital Equipment Corporation, Marlborough, Mass. 01752, 617-481-9511, ext. 6885.

digital

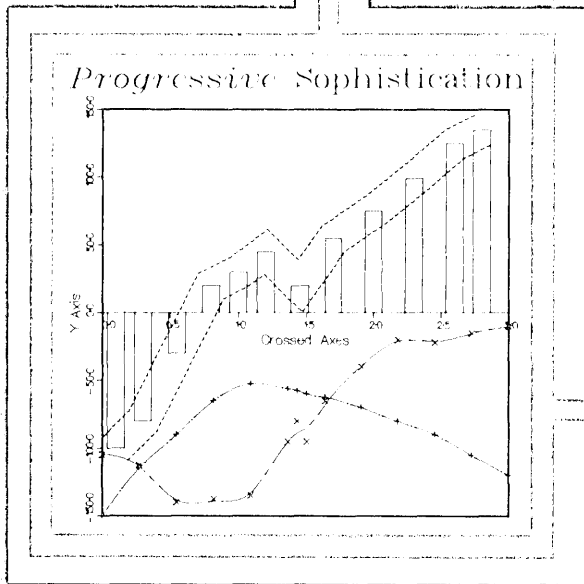
DECsystem-10.



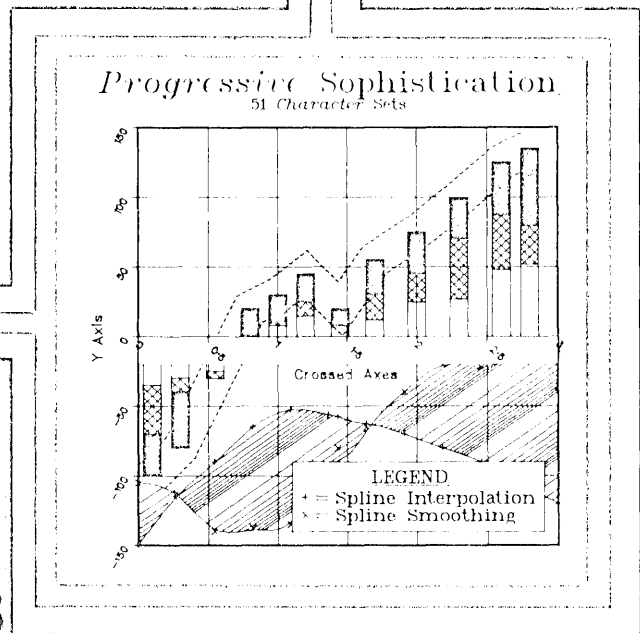
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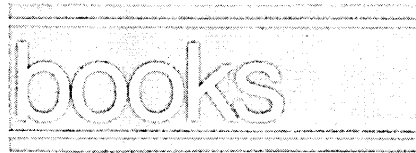
Integrated Software Systems Corporation

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The Hague, Holland
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On the Feasibility of Software Certification

by R. E. Keirstead

(A report prepared for the National Science Foundation by Stanford Research Institute; #PB245213/AS.)

National Technical Information Service, U.S. Dept. of Commerce, 5258 Port Royal Rd., Springfield, Va. 22151 (1975)
133 pp. \$6.25 (\$2.25 microfiche)

The report has seven chapters (29 pages) followed by three appendices (39, 14, and 47 pages respectively). It is well-written—motherhood statements are commendably scarce—and is quite illuminating as a picture of both the present state of the art and the American political/industrial scene. (It is this mixture that makes the report somewhat unbalanced; while the technical problems of software certification are certainly international, the discussion of how a certification institute should get its revenue is more parochial.)

For the local political scene it contains a warning that should be repeated here: "Currently, there is some concern that formal or legal requirements for certified software may be imposed before the means for certification are available. Such requirements, without the technical means to accomplish certification, can only lead to disillusionment with certification, to the detriment of the entire software industry." Amen.

In stating our current inability to certify software, the report is healthily explicit. However, its analysis of the causes of this inability is too superficial to fully justify its specific recommendations. The last appendix mentions the as yet insurmountable difficulty in verifying sizable programs "written in conventional programming languages with rich sets of primitives." After such a remark, one must make up one's mind: is there any hope that realistic verification techniques will become available that can cope successfully with such "rich sets of primitives"? The remainder of the report—and I am far from amazed—gives very little support for that hope.

Having identified conventional pro-

gramming languages as one of the real culprits precluding verification, one could propose to exclude from the certification activity such programs that, on account of the way in which they have been written down, must be classified as "unverifiable," a suggestion that could take a much deserved swipe at the popularity of these programming languages. The report has not done so; its author seems more concerned with the certification institute being politically acceptable. In view of the political/industrial scene, this omission is not surprising. It is, nevertheless, depressing, because, as a result, much of the document deals with how to make the best of a bad job.

The report shows a misunderstanding of the proper role of high level programming languages, which may be at the root of many of our current problems. This is shown most clearly in: "The current state of formal proof . . . requires the proof to be developed at a representational level far removed from the pattern of bits that is the executable program in a real computer environment." (I have learned to become very suspicious when the word "real" is used in this sense.) Clearly the author sees the pattern of bits as the programmer's final target, and the high level language and its compiler as a software tool, as a means for generating that pattern of bits. But for a user, this is a very impractical interface. The semantics of his high level programming language should be so well-defined that he can totally disregard the compiler and the bit patterns it generates as irrelevant aspects of the implementation. Unless programmers learn to separate the definition of a programming language from its possible implementations, very few programs worth certifying will be written.

This hilarious suggestion is only quoted for the reader's amusement: "The solution appears to be to extend the sequence that begins with machine language, procedure-oriented language, problem-oriented language. Increasingly higher levels of expressive language are needed plus far more exotic compilers to go back down the levels."

Finally, because "every program of consequence is probably incorrect," the author suggests that we "consider other attributes of programs in determining certifiability." Is this courage or cowardice? Is this wisdom or folly? Will this be to the advantage or

to the detriment of "the entire software industry"? I think I would prefer readers to answer these questions for themselves, hopefully after they have read the report concerned and have an overview of the numerous and varied issues involved.

—Edsger W. Dijkstra

Prof. Dr. Dijkstra is professor of mathematics at Eindhoven Univ. of Technology in The Netherlands, and has been a Burroughs Research Fellow since 1963. His new book, "A Discipline of Programming," is scheduled for spring publication.

BOOK BRIEFS . . .

Human Choice and Computers
Enid Mumford and Harold Sackman, eds.
American Elsevier Publ. Co., Inc.,
52 Vanderbilt Ave.,
New York, N.Y. 10017 (1975)
358 pp. \$35.50

A group of computer technologists, trade unionists, and social scientists met in Vienna in April 1974 for the Conference on Human Choice and Computers sponsored by the International Federation for Information Processing (IFIP). These proceedings open with the theme papers on Issues of Human Choice, which include "The Human Being and the Automation," "Design of Computer Systems," "Trade Unions and Computers," and "Computers and Social Options." Other papers support the conference belief that "deliberate human choice and continuing social accountability" should determine the role of computers in social affairs.

Computers and the Learning Process in Higher Education
by John Fralick Rockhart and
Michael S. Scott Morton
McGraw-Hill, 1975
356 pp. \$17.50

This report prepared for the Carnegie Commission on Higher Education is an assessment of what the computer can and cannot do in contributing to learning. Decreasing costs for the use of computers in instruction is having an effect on opposition, but faculty members and institutions continue to present formidable resistance to the concept. This book brings the reader up-to-date on what is happening in the field, with specific examples of schools that have experienced using computers for instruction.

Benchmarking: Computer Evaluation and Measurement
Nicholas Benwell, ed.
Halsted Press, 1975
190 pp. \$20

This book is a compilation of papers and group discussions which took place in Cambridge during "Benchmarking '74," the first conference dedicated exclusively to this subject. Manufacturers, consultants, research-

source data

ers, and users present a variety of opinions on this procedure for measuring computer power. Inclusion of conversations following each presentation illustrate some of the differing points of view.

Computer Mathematics
by Clifford L. Conrad, Nancy J. Conrad, and Harry B. Higley
Hayden Book Co., Inc., 50 Essex St.,
Rochelle Park, N.J. 07662 (1975)
224 pp. \$13.95

This programmer-oriented text tries a new approach by presenting traditional mathematics in formal and algorithmic terms for students of computer technology. Basic operations of arithmetic, logic, and array arithmetic are expressed in "simple formal languages" called Numeric Calculus, Logic Calculus, and Array Calculus. Other dp concepts such as flowcharting, algorithm construction, and logico-arithmetic characteristics of existing programming languages are also covered. This book requires only high school algebra as a prerequisite.



IBM and the Industry

A number of reprints of our regular feature, "IBM and the Structure of the Industry," recording reader commentary on the topic over a seven month period, are still available—but the supply is limited. DATAMATION, Los Angeles, Calif.

FOR COPY CIRCLE 201 ON READER CARD

System/32 Manufacturing

An evaluation of the IBM System/32 and the Manufacturing Management Accounting System (MMAS) Package are available in two separate reports. The reports suggest key questions for users to think about, including how to select packaged software for a small business computer. Price for both reports: \$10. MANAGEMENT INFORMATION CORP., 140 Barclay Center, Cherry Hill, N.J. 08034.

History of Word Processing

A large two-color wall chart on the "History of Automatic Typing/Text Editing" shows the suppliers in the field, along with those who have dropped out of the market. Original dates of entry are listed. Automatic typewriters, mechanical text editing

machines, time-shared text editing, shared logic systems, and display systems are shown. The chart is published by Frost & Sullivan, Inc. Prepaid price: \$2. OFFICE MANAGEMENT SYSTEMS CORP., 37 E. 72nd St., New York, N.Y. 10024.

Flight Information Display

What has been done in airport display of flight information, and what is yet possible? These questions are answered in the 24-page monograph, *A Guide to Flight Information Display Systems*,

TIME	FLIGHT	DESTINATION	VIA	GATE	DEPARTS
07:00	SV 874	BOHRAJ - KARACHI		04	ON TIME
07:15	SV 968	DAHASCUS - AMMAN		05	ON TIME
07:20	TW 411	NEW YORK - ROME		08	07:45
07:35	PA 002	TOKYO - TEHRAN		07	ON TIME
07:45	SV 741	CASABLANCA-TRIPOLI		06	ON TIME
08:00	LH 537	FRANKFURT - ATHENS			DELAYED
08:15	SV 839	KHARTOUM		04	ON TIME
08:35	BA 751	LONDON			CANCELLED
09:00	SV 810	MUSCAT - DHAHRAN		05	ON TIME
09:15	SV 750	DUBAI		07	ON TIME
09:25	ME 277	FREETOWN - ABIDJAN		03	10:10
09:30	ME 365	PARIS - BEYROUTH		01	ON TIME
10:10	SV 681	AMSTERDAM-FRANKFURT		08	ON TIME
10:15	SV 841	ASHARA - PORT SUDAN		02	ON TIME
10:20	AF 123	PARIS - CAIRO		06	11:50
WEDNESDAY 3:28:21					

which is liberally illustrated and offered as a tool for general systems design. Director of Communications, CONRAC CORP., 330 Madison Ave., New York, N.Y. 10017.

Directory of Software

The monthly updated, loose-leaf *Datapro Directory of Software* provides information on software products and vendors. The approximately 500 pages contain product profiles with users' software ratings, and the directory is indexed¹ by product name, vendor, hardware, and application. In addition to the monthly updates, subscribers also get a 4-page monthly newsletter, *Datapro Software News* which analyzes and interprets current developments in software; if subscribed to separately, this newsletter is \$42/year.

Still another benefit to directory subscribers is a telephone/mail consultation capability. Subscription: \$230/year (\$190 until Dec. 31 or for Datapro subscribers). There is also a 60 day trial subscription for \$10. DATAPRO RESEARCH CORP., 1805 Underwood Blvd., Delran, N.J. 08075.

Data Base Management

A practical review, in non-technical format, of data base management systems and the problems of implementing, evaluating, and administering them, is the subject of the *Auerbach Guide to Data Base Management*. Included is an introduction to system components, their functions, and their interactions. The responsibilities of the administrator and evaluations of such systems as Total, IMS, IDMS, and System 2000 are covered. Price: \$24.95. AUERBACH PUBLISHERS INC., 6560 No. Park Drive, Pennsauken, N.J. 08109.

Health Industry Dp

The market for health care-oriented computer systems and services was \$460 million in 1974. It will reach \$1 billion in 1978. A 150-page report analyzes this market, and includes a forecast of the nature, size, opportunities, and trouble areas through 1984.

The report notes a trend toward small in-house computers like the IBM System/32 in smaller 75 to 300 bed hospitals. Data collection and data entry are of prime concern, and hospitals are seeking low cost, easy-to-use terminals that can be placed throughout the hospital for immediate data capture.

Computerized hospital management systems is the most competitive segment, with more than 40 service bureaus, the major computer manufacturers, and medical system houses selling turnkey systems. Price: \$600. FROST & SULLIVAN, INC., 106 Fulton St., New York, N.Y. 10038.

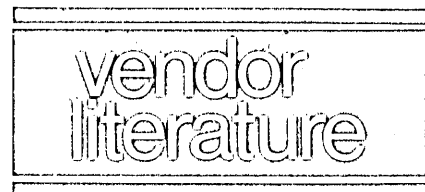
FOR DATA CIRCLE 203 ON READER CARD

Executive Compensation

A 120-page executive compensation study presents this organization's sixth biennial survey of current practices and trends in compensating chief executive officers and financial and accounting management. Executive job descriptions are given, and classifications by major industry groupings, special industries, and geographical regions are made. Trends in salary and bonus levels are tracked, and many detailed tables are supplied. Price: \$30. FINANCIAL EXECUTIVES INSTITUTE, 633 Third Ave., New York, N.Y. 10017.

Optical Readers

All About Optical Readers, a 36-page report, presents a user survey of the performance of these devices. More than 130 users rated 175 optical character, mark, and bar code readers; while they are well satisfied with overall performance and ease of operation of current products, they see need for improvement in reliability and maintenance service. Price: \$10. DATAPRO RESEARCH CORP., 1805 Underwood Blvd., Delran, N.J. 08075.



Cybernet Software

A library of applications software available through this vendor's Cybernet data services network is described in a brochure. Brief descriptions of 29 programs are given for use in structural

(Continued on page 37)

HEWLETT-PACKARD**COMPUTER ADVANCES**

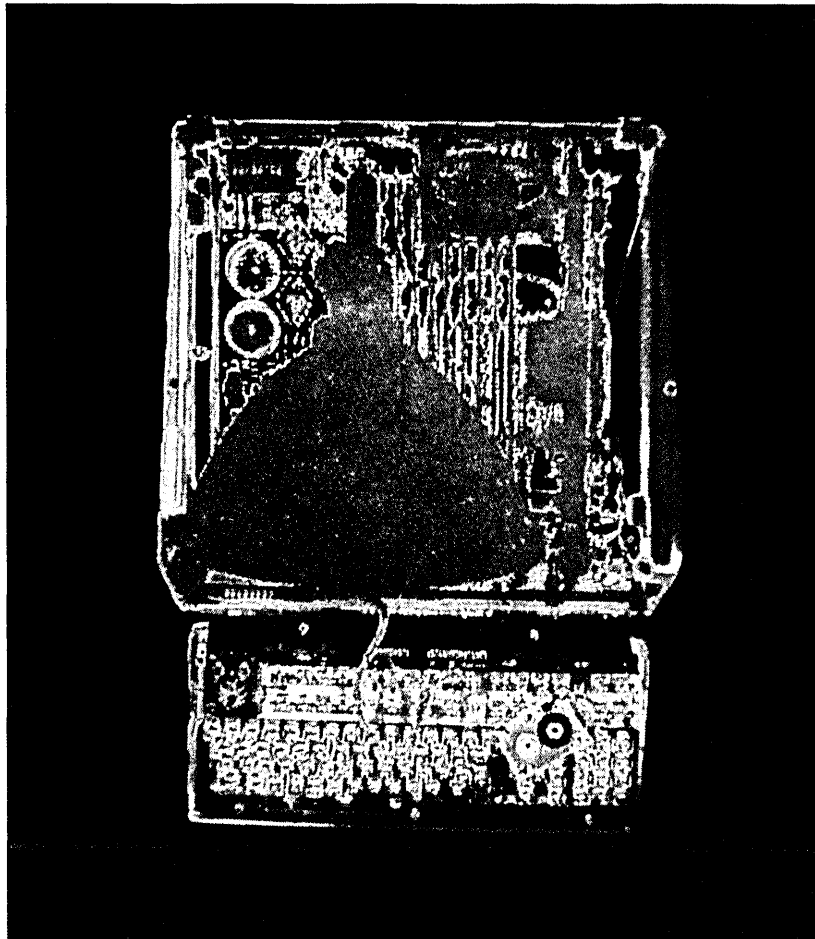
The HP 2644 Mini DataStation may well help change the character of data entry, programming, inventory, point-of-sale and other disciplines dependent on real-time editing, formatting and filing of data. This unique microprogrammed display terminal combines powerful interactive editing with dual cartridge, integrated local storage and peripheral capabilities—

**THIS ADVANCED TERMINAL
MINIMIZES YOUR DEPENDENCE
ON A COMPUTER**

all in one compact, economical, easy-to-use unit. No longer must you take up expensive computer time with routine editing and error correction.

Instead, at the end of the day, the fully formatted and corrected data can be dumped to the CPU from a magnetic cartridge, rather than at operator speeds. And, your ability to keep work flowing is protected by the Mini DataStation's ability to continue operation even when its host computer is down.

The Mini DataStation's own peripheral capability provides you further



Color derivation from X-Ray courtesy Stanford Technology Corp.

**Terminal
Cont.**

independence from the computer. Up to five option slots are available with multiple data paths allowing data to be transferred between display, cartridges, keyboard, an optional printer, or RS-232C serial output interface. This is accomplished at rates up to 2400 baud for ASCII, or 9600 baud for binary data.

One of the breakthroughs that made the Mini DataStation's stand-alone capability possible is an unusually precise, shirt-pocket-size cartridge capable of storing up to 110,000 bytes. Engineered to strict specifications, these cartridges incorporate full-width data recording, to bring the bit loss rate down to a remarkable 1 in every 10^9 bits. This same precision also minimizes problems with cartridge interchangeability.


Each Mini DataStation can use two cartridges and can operate in either character or block mode. Data is stored in variable lengths at a density of 800 bpi formatted in either ASCII or binary.

You can conveniently insert and delete characters and keep track of data fields on the display with a built-in cursor sensing and positioning control. Programmable field protection helps the operator avoid misplaced data entries by allowing you to prohibit access to certain fields. And, you don't lose information the minute it goes off the screen. Off-screen character storage with scrolling or page select controls lets you bring the data back. Other keyboard controls can establish a positional memory lock to retain operator instructions or headings, while data is entered below, or display control codes for convenient error tracing. And, you can call up any form your company uses in seconds.

Users of the Mini DataStation will enjoy the high resolution screen. The clarity of the 9x7 dot matrix screen has to be seen to be appreciated. Not only is a sharp, readable Roman Alphabet displayed, but up to four 64-character sets of type and symbols are available, eliminating the need for awkward graphic approxima-

tions. Other useful features, such as inverse video (black on white), blinking, half-bright and underlining are available in any combination needed.

And the Mini DataStation is as easy to maintain as it is to use. Flip open two latches and inside you will see that we have chosen modular single-bus architecture. Maintenance is as fast as popping out the old module and plugging in the new, with hardly a pause in your operations. A built-in go/no-go test feature allows the operator to quickly verify the operating condition of the terminal.

We know that the Mini DataStation will meet many of your needs. Not simply because of its capabilities, but because these capabilities are available at a realistic, affordable price. If you would like to know more about how you can break free of the computer-dependent terminal, circle "A" on the attached reply card. 



HP's new 2644A terminal uses a pocket-size cartridge to provide stand-alone capability.

INNOVATIONS IN DISC TECHNOLOGY

A DISC FOR DEMANDING OEM'S

The fact that HP's compact 7905A disc drive has both the fastest access and the widest operating range of any interchangeable drive available is no coincidence. Both features are unique contributions to the need for quickly accessed, yet reliable data in the less than ideal operating environments OEMs encounter in scientific and industrial applications.

Consider the problems faced at field or remote sites. Typically in this situation, equipment is being driven by mobile motor-generators with power frequency tending to wan-


der and high RFI being generated. In such an environment, the 7905A will operate anywhere between 47Hz and 66Hz to compensate for power variances. At the same time, an electronically commutated DC motor eliminates all belts and pulleys, reducing parts failure and RFI. And cartridge interchangeability is guaranteed from 50° to 104°F at altitudes up to 10,000 feet.

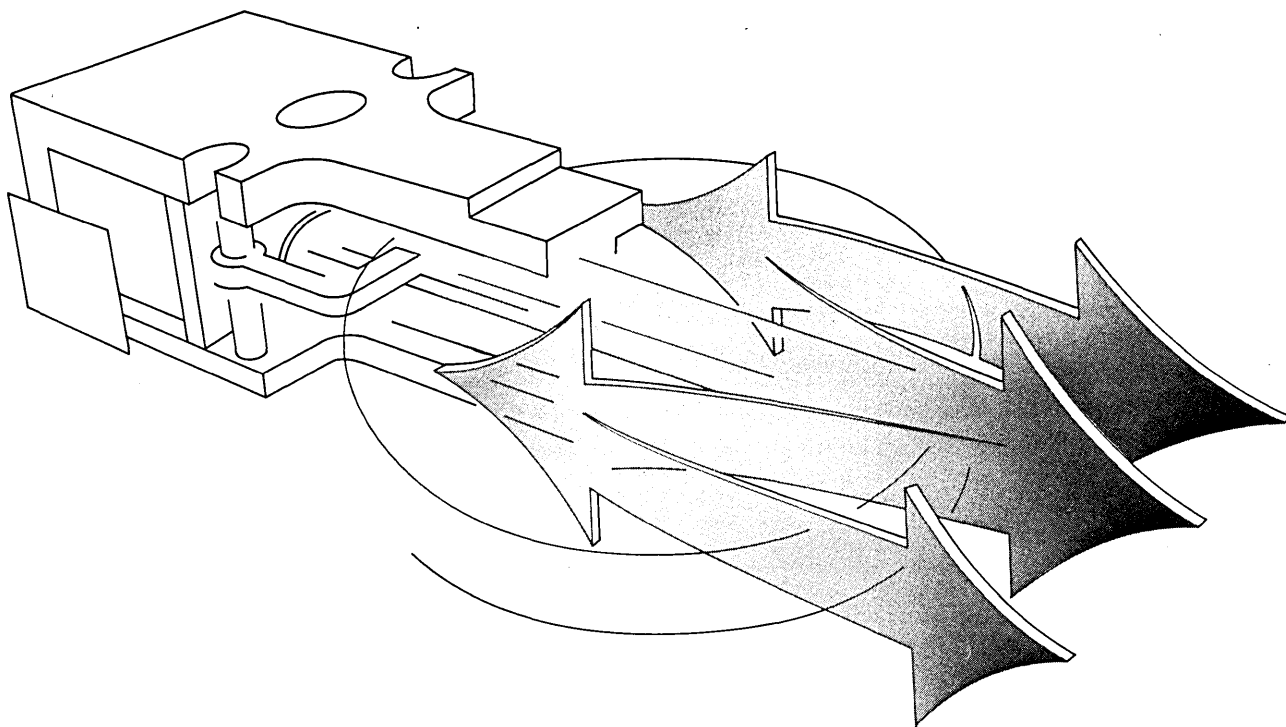
The 7905A can store 15 million bytes on each drive. Average access is a remarkable 25ms, and you can use up to eight drives per control unit, making it ideal for any system requiring fast access to large amounts of data.

In remote locations, or anyplace where accurate on-line data is critical, the 7905A incorporates Error Correction Code (ECC) hardware. This

feature allows the user to correct up to 32 contiguous bits of error per sector, or 48 times per track. Plus, automatic track and cylinder switching allows more throughput by cutting down interrupts to the CPU.

And, helpful to keeping servicing costs at a minimum, there is a plug-in Disc Service Unit which permits head alignment without an oscilloscope.

To find out how our disc can help you build more reliability and speed into your product, just circle "B" on the attached card. 



The precise engineering of the 7905A's moving heads provides a remarkable 25 ms access time to 15 million bytes of data.

GETTING MORE WORK OUT OF REAL-TIME

More. More. More. Whether you're in production, research or new product development, the pressure is inevitably for "more." For many of you, getting more work out was the major reason for bringing in a computer in the first place.

Times change. If your computer is now the bottleneck, the problem could lie in an inadequate operating system. If you've been thinking that this is the price you have to pay for the economy of using a minicomputer, we have some good news for you.

RTE-III.

RTE-III is HP's Real Time Executive III, the latest and most powerful addition to a large family of graded HP operating systems. You might call it the multi-solution operating system.

It's multi-programming. In a real-time environment, more of your

people can get more work done. Editing, compiling, testing and debugging can go on concurrently without interrupting the execution of real-time programs.

It's multi-terminal. More people can use the computer from more locations. Waiting in line is minimized, if not eliminated.

It's multi-batch. The ability to handle multi-stream batch lets you get full benefit out of your processor around the clock. You get not just output spooling, but input spooling as well, a boost to efficiency that's never been available for a minicomputer before.


It's multi-language. You can use the language you want to use—or use several languages at the same time; even call a program in one language with a program in another. Choose from FORTRAN IV, ALGOL, Assembly language and HP's unique Multi-user Real-Time BASIC, the interactive programming language that lets anyone write useful, powerful programs with only a few days training.

Obviously, RTE-III is more than just another foreground/background operating system. At its heart is a memory expandable to 256K words

that provides space for as many as 64 32K word partitions. This ability to house as many as 64 programs in active memory drastically reduces the need for swapping, making response as much as a hundred times faster.

It puts you in control. You assign programs to specific partitions during system generation. Or, if you prefer, you assign priorities matched to the relative urgencies of your programs and let RTE-III's Dynamic Memory Management allocate memory automatically.

In the end, it means faster throughput, more work accomplished, a cost-effective answer to the continuing demand for "more" from you and your staff.

We have some very comprehensive literature on RTE-III. It should be in your file. Circle "E" on the attached card for your copy. 

HOW TO RUN LARGE SUBROUTINES AT MICROPROCESSOR SPEEDS

Microprogramming is the time short-cut that works. It can speed up execution of repetitive calculations by as much as 95 percent and allows you to customize your processor hardware to a specific application for the duration of the microprogram.

Now HP opens new horizons for microprogramming with a 1024 word Writeable Control Store (WCS), four times the user-microprogrammability previously offered. Now, even large subroutines can run at microprocessor speeds.

Since WCS is dynamically


alterable, it offers you the flexibility of storing microprograms on disc or in main memory and transferring them to the WCS card as needed.

Each WCS board contains 1024, 24-bit words of semiconductor RAM memory with a cycle time of 325 nanoseconds. WCS also provides access to 12 additional high-speed scratch registers for data manipulation and status to increase programming efficiency.

You can also burn frequently used routines into PROM chips which, in turn, are attached to an HP User

Control Store Board (UCS) installed in the microprocessor section of the computer as a permanent part of its processor instructions. Up to 2,056 words of RAM can be stored on a single UCS board.

Both WCS and UCS come documented with driver and I/O utility programs. Microprograms are callable from FORTRAN II, FORTRAN IV, HP Assembly language, ALGOL and HP extended BASIC.

If the idea of speeding up critical routines appeals to you, circle "C" on the reply card for more information. 



ACCURATE SOURCE DATA ENTRY, THE EASY WAY

Getting data into a computer is easy enough these days. The problem and the expense is getting it right—the first time.

Hewlett-Packard has a novel solution. It's HP's new Source Data Entry package (SDE) which operates on HP's 2000 Access System, servicing 16 to 32 terminals. SDE significantly reduces the common sources of operator data entry error. It allows you to generate single- or multi-screen forms, check errors and edit without using complex programming languages.


The difficult and costly effort of writing programs to do these jobs has been done for you. SDE includes four built-in program modules for range checking and data type checking. There's even a feature that allows highly repetitive data to be directly supplied from tables with a single key-stroke, increasing both the speed and accuracy of data entry procedures.

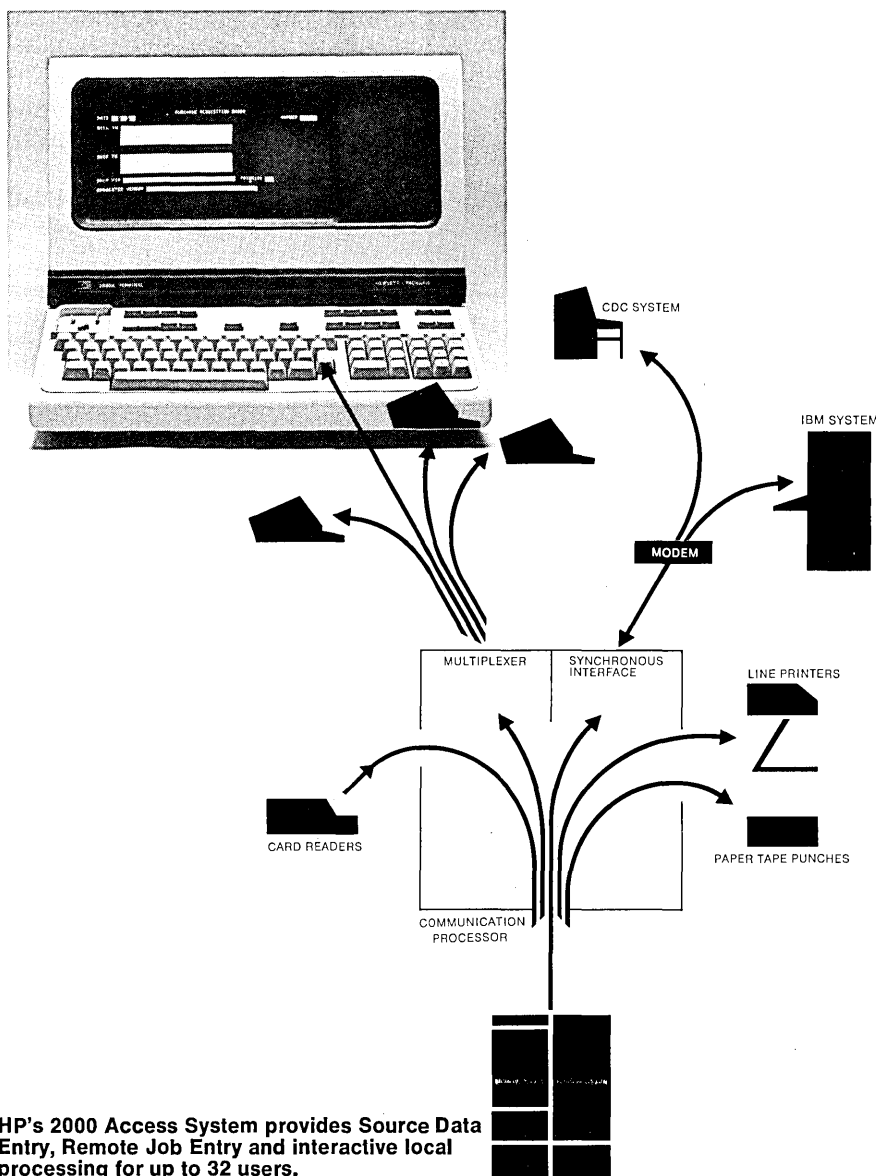
You design the forms. You establish the error-checking parameters. Simply. Quickly. For the more sophisticated user, SDE/2000 can be linked to user-written application programs to function as an efficient front-end module to reduce the cost and time for implementation of data entry applications.

Imagine the savings, the increased flexibility, the greater throughput that SDE might make possible in your application.

It saves money in another way, too. Each terminal can share an extensive family of local peripherals, thus avoiding the expense of redundant hardware.

SDE is the newest enhancement to the 2000 Access System. It operates concurrently with the system's "transparent" multi-terminal RJE capability, servicing IBM 360/370 or CDC computers. Or, it can use the 2000 Access System's 128k byte, dual-processor capacity as the basis for a stand alone interactive processing system serving up to 32 users.

To find out more about SDE and 2000 Access, take the easy way yourself and circle "D" on the reply card. 



HP's 2000 Access System provides Source Data Entry, Remote Job Entry and interactive local processing for up to 32 users.

SOLVING THE PROBLEMS OF SUCCESS

Malkin and Pinton Industrial Supplies
Accelerates Customer Orders

Malkin and Pinton are running a successful business in Vancouver, Canada. Their customers are getting good service and they are growing 20 percent a year. That is precisely the problem.

By the end of 1974, they had 6,000 customers for a complex line of fasteners, abrasives, power tools, shop and forestry products. They were managing an inventory of 25,000 items. Like many distributor environments, order clerks must check availability, price, discounts and updates to quantities on hand. Doing business called for five sets of customer files, kept in four separate departments. A single order involving one back order generated 21 separate pieces of paper—a river of 2.5 million copies in a year.

It was a manual system; a complex system; but a good system. The problem was they had simply outgrown it. Their analysis showed that it was extremely labor-intensive and involved considerable duplicate information—all necessary to maintain accuracy, but all operating to multiply the opportunity for error and impede fast customer service.

Success had brought them to capacity operation. A new solution was called for, one that would improve service without adding (or eliminating) people.

First they considered electronic accounting machines, but they could only do part of the job and would create queuing problems.

Some kind of computerization seemed the only viable alternative. Outside service bureaus and time-sharing approaches carried built-in delay factors and the certainty that as business grew, so would their expense.

In the end, an in-house computer system seemed to be the only practical solution. Batch? No. Its inherent time lag would actually make service worse and input errors would still be able to multiply before the system caught them.

A terminal-oriented data base management system seemed to be the



When you have 6,000 customers and 25,000 products, good service is essential.

only approach that would retain the best of their manual system, eliminate its problems and improve service.

Such a system would have to meet a number of objectives if it was to take over smoothly from their existing manual system. It would need: on-line multi-terminal capability for fast response, data base management to eliminate redundancy, multi-language capacity for efficient program-writing, the ability to operate in real-time to avoid processing delays, flexibility for short- and long-term changes in the company's requirements, a reasonable price and the availability of local service.

This was the list of qualifications met by the HP 3000CX they purchased. As Gary Nordman, their Systems Development Manager put it, "The (HP 3000's) combination of hardware and software and relatively low cost simply met all our requirements."

The HP 3000CX has been installed and is well into its first year of operation. The 11 terminals Malkin and Pinton purchased with the system are distributed throughout the company in operating departments such as sales, pricing and purchasing. Twenty-one more can be accommodated, some slated for their five branch offices. No changes will have to be made to the system to accommodate them.

HP's IMAGE 3000 data base management system has proven to be


an optimum solution to the problem of duplicate files. Unlike traditional file management, data is entered only once by the department responsible for it. For example, a clerk in the credit department enters credit data to a customer data base accessed by an order-entry clerk. Since only the responsible department can change its own information, errors are minimized and strict accountability is maintained.

Most programming is being done in HP's System Programming Language (SPL), the high level language in which the operating system is written, which makes custom-tailoring it to Malkin and Pinton's particular needs a relatively simple process. At the same time, the multiprogramming capability of the 3000CX allows other programs to be written in the most appropriate language for each problem whether it is SPL, COBOL, FORTRAN, BASIC or RPG.

As an on-line system, data is checked as it is entered. If errors show up, the individual who originated the information is still there to correct the data. Added to the single entry benefits of IMAGE and the restricted access that is possible through IMAGE's protected data items, maintaining correct records is dramatically simplified.

By choosing the HP 3000CX, a system whose flexibility, sophistication and features could readily be tailored to their needs, the goals of better service and increased work output from the same staff have been handily met.

But what about the future? There will be changes. New programs will be added. Management is just beginning to make use of the system's extensive capability to generate a wide variety of management reports for increased control and profitability.

Should you be considering the benefits of a terminal-oriented data base management system? Circle "F" on the attached card and we'll send you detailed literature on HP's powerful 3000CX series computers. 

HEWLETT  PACKARD

Sales and service from 172 offices in 65 countries.
1501 Page Mill Road, Palo Alto, California 94304

source data

analysis, electrical/electronic engineering, nuclear fuel management, graphics design, project control, data base management, and other fields. CONTROL DATA CORP., Minneapolis, Minn. FOR COPY CIRCLE 206 ON READER CARD

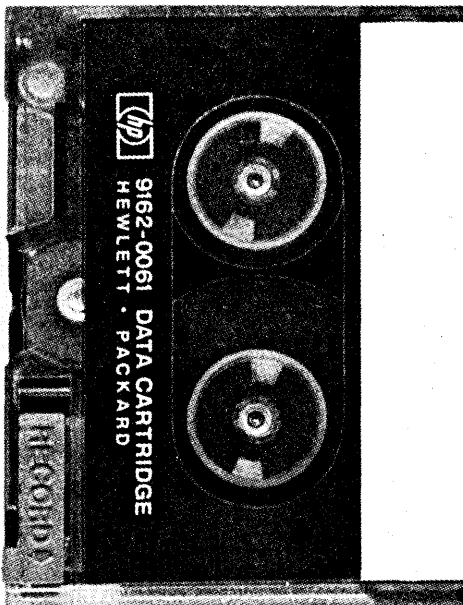
Software for Students

"HP Math" is a brochure which describes this vendor's math software applications for schoolchildren. Basic arithmetic skills for students from elementary through higher grades are covered, as well as remedial work for adults. Student drills are part of the package. HEWLETT-PACKARD CO., Palo Alto, Calif.

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Intelligent Crt Terminal

The HP 2644A Mini DataStation is described in a multicolored brochure. This intelligent crt terminal has up to 220 Kbytes of storage throughout two tape drives that use a pair of mini

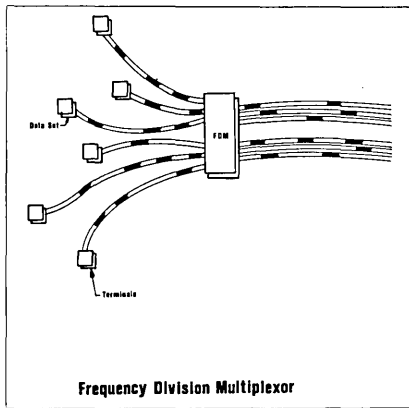


cartridges (one is shown in actual size). Special features include high resolution display, computer interfacing, plug-in modularity, and editing. HEWLETT-PACKARD CO., Palo Alto, Calif.

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Telecommunications Tutorial

Notes from this distributor's seminar series, "Telecommunications from the Terminal User's Viewpoint," although admittedly salesy, provide a good tutorial on the subject. Liberally illustrated, these notes in brochure form explain basic terms like "modem" and proceed to explanation of interactive



Frequency Division Multiplexor

time-shared networks using multiplexors, concentrators, and front-end processors. Data sheets on a number of products are included, and comparison features and prices on modems from Bell and Vadic, for example, are detailed. MOXON ELECTRONICS, Irvine, Calif.

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Printer Terminal Manual

A 40-page manual for this vendor's Carousel 300 printer terminal describes and explains the 30-character per second serial impact printer. The brochure is well illustrated with photographs and diagrams, and the features of the printer terminal are described in detail. INTERDATA, Oceanport, N.J.

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Business Dp System

A 12-page illustrated brochure, *Data-share for Total Business Data Processing*, describes this vendor's field data entry, editing, preprocessing, and other equipment which comprise the "Data-share System." Central processing and peripheral units are listed, and the Datapoint 5500 processor which provides up to 16 remote work stations with a variety of dp capabilities is discussed. DATAPOINT CORP., San Antonio, Texas.

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courses

\$2 Dp Workshops

Perhaps the only cheap thing left in New York is a variety of two-hour workshops on 22 information technology categories. The price is a low \$3 for each session, and \$2 if registered in advance! These sessions are especially attractive for newcomers to the field. Among the topics are COM (Computer Output Microfilm) software, operations, and applications; index and filing technology; selling microfilm to top management; and more. This facility

also has a variety of equipment (micrographics, dp, filing, word processing, etc.) on display where the prospective user can browse without hearing a sales pitch. Hurry, while the New York we know and love is still there! METROPOLITAN INFORMATION TECHNOLOGY CENTER, 1 Park Ave., New York, N.Y. 10016.

Management Home Study

Prime/Audio/III is the latest in a series of self-instruction courses dealing with management problems. Entitled *Planning and Organizing for Productive Work*, the course teaches planning and controlling, setting objectives, long and short range planning and scheduling, and improving productivity. The two prior courses in the series are *Constructive Discipline on the Job* and *Labor Relations and the Supervisor*. Complete instruction packages include cassettes, workbook exercises, and a final exam. A cassette tape recorder/player may also be purchased separately. Price: \$60 each (\$50 each for AMA members). AMACOM, Dept. PA3C, 135 W. 50th St., New York, N.Y. 10020.



International Opportunities

A monthly newsletter, *International Electronic Trade Opportunities*, is an international clearing house of information divided into five sections: product lines wanted, product lines available, buyers sought/product tenders, manufacturing licenses offered, and manufacturing licenses sought. No names or addresses except for countries appear in the newsletter, but up to six contacts are free to the subscriber, with additional contacts at \$5 apiece. Subscription for 12 issues: \$65. ELMATEX INTERNATIONAL, 3640 Sepulveda Blvd., Los Angeles, Calif. 90034.

Bottomline

A quarterly, *Bottomline*, published and edited by Larry Welke, has as its goal "to make you, the reading executive, confident in your managerial competence for the direction and use of your EDP installation." In handsome format the first issue features profiles of persons in the field and a "biography" of Paul Armer, a well known industry figure, as well as articles on privacy, software, and the status of the industry. Subscription: \$10/yr. INTERNATIONAL COMPUTER PROGRAMS, INC., 1119 Keystone Way, Carmel, Indiana 46032. *

We'll give them a run for the money!

Inquire.[®]

Bigger is better? That sounds like a lot of IMS to us.

But if you believe that there is something truly ingenious about a low cost, single system DBMS with almost unlimited freedom of application and expansion, then you've come to Inquire[®].

Advanced Concept

With Inquire, data bases can stand by themselves. Or be linked dynamically. Data element relationships are made when a data base is used, rather than when it is built, giving data base designers and users unique flexibility.

Inquire DBMS is as comfortable with transaction-oriented applications as with analytic applications. Personnel and inventory control can be handled as easily as market research or text look-up.

Off and running

Thanks to Inquire's Multi-File, there is no need to predetermine data base relationships. New applications can be rapidly installed, as they evolve. Data base security is intact; information remains recoverable and accountable.

Management reporting is then immediately available—right from

the instant of data base creation. Inquire offers a new perspective from the start.

We speak your language

Inquire understands plain English.

Allows both programmers and non-programmers easy access. Now the user is free to deal with the content of the data base, without worrying about how to get there.

The Command Query Language assists the user with comprehensive diagnostics; a macro facility for pre-storing command strings; and interactive prompting!

Speaking of interfaces

Inquire's Host Procedural Language Interface (PLI) allows COBOL, PL/1, FORTRAN, or assembler programs data base access via multiple keys. PLI is written as a set of re-entrant modules—permanently resident and shared by all users. Of course, Inquire's PLI is multi-thread; acts independently of data organization and storage techniques.

Speaking of structure

Inquire employs a partially inverted hierarchical or network data structure. Any number of data elements can be quickly searched, following a path of least resistance.

And search time does not directly increase with data base size.

Double Whammy

Besides giving you a super DBMS, Inquire possesses superior multi-key retrieval and report generation capabilities. Batch or on line with the same language. That's twice as much—twice as fast!

Single us out

Now that you know us better, you can see just how ingenious we are. Inquire DBMS means business. And economy. And speed. All you want in a DBMS and more.

So, instead of talking turkey with our competition, come speak English with us. Give Bob Schreier, our VP of Information Management, a call at 703-578-3430. Or write Bob at: Inquire, Infodata Systems Inc. 5205 Leesburg Pike, Falls Church, Virginia 22041. He'll be happy to discuss the future with you.

Inquire[®] at Infodata Systems

The new package from the leader:

Precision Graphics at an alphanumeric price.

Not just graphing. Graphics from the graphics specialist. The key is information capacity. Tektronix' new 4006-1 offers far and away the highest output density of any terminal in its price range: 1024 X by 780 Y viewable points; 2590 alphanumeric on screen characters.

It's all you'd expect from the company serving all your graphic needs . . . priced competitively with most alphanumerics.

Immediately compatible with most mainframes. Thanks to proven interfaces. Time-tested software. Great new usable software packages. And expert maintenance anywhere in the world.

And rely on Tektronix to do it right. The 4006-1 is our biggest breakthrough towards making the power of graphics affordable for everyone. Just \$2995

for openers. Lease price \$150 per month on a two year lease, includes maintenance. Plus peripheral options like our 4631 Hard Copy Unit for up to four 4006-1's, with 8½" x 11" copies, and 4923 Digital Cartridge Tape Recorder. And as fine a package of technical support as you'll find for any terminal anywhere.

Check it out: we're graphic leaders for some mighty good reasons. Your local Tektronix Sales Engineer can give you the whole story. Or write:

Tektronix, Inc.
Information Display Group
P.O. Box 500
Beaverton, Oregon 97077



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*U.S. Domestic Price Only

TEKTRONIX

Your real time software is no place for INSECTUS-PROGRAMMA.

Insectus Programma, more commonly referred to as software bugs, can cost you money. These pests eat away at your profits and productivity by causing program development delays and costly system down-time. Not to mention the inconvenience.

The only known cure for Insectus Programma is time. Over a period of years, virtually all bugs can be removed from a software system; but how can you afford to wait that long?

When we designed the new SEL 32 minicomputers, we included the most extensive, reliable line of software available...software originally developed for the SYSTEMS 85/86 computers.

What does that mean to you? Plenty!

It means that you'll see big cost savings, through quicker application implementation and increased programmer efficiency. That's because our software

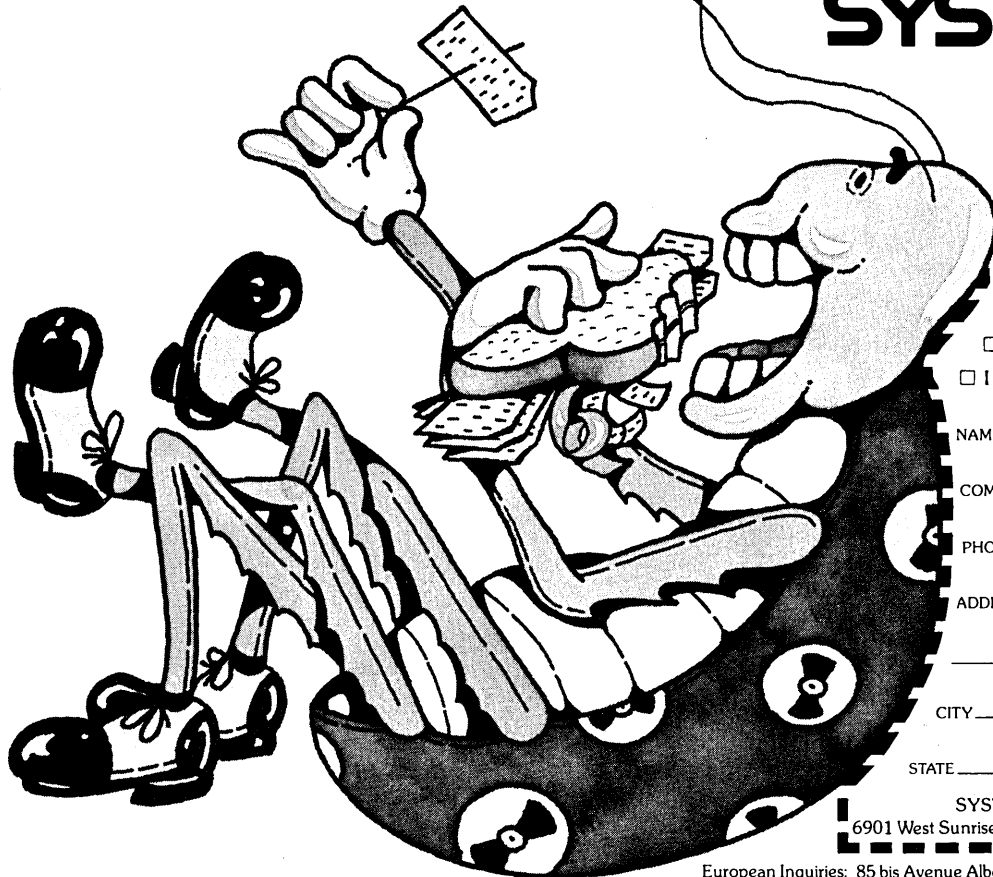
is virtually bug-free, completely documented, and fully supported. It got that way through five tough years in the field in hundreds of applications.

It means you don't have to worry about obsolescence. That's because SYSTEMS 32 software has a true 32 bit heritage, flexible enough to meet your future needs. The nucleus of our flexibility is provided by our powerful, disc-based Real-Time Monitor, a true multi-programming operating system.

Whatever your needs, we have the solution, like the extended FORTRAN IV Compiler, Process Control Executive...and a Terminal Support System that provides comprehensive services for multiple terminal users.

If Insectus Programma is bugging you, put it on the endangered species list...look into the SEL 32 Minis.

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83



At last, a system that makes credit verification as simple as it should be.

Ideally, credit card and check verification should be a simple "yes" or "no" proposition.

Unfortunately, at a lot of banks, supermarkets and other retail outlets, it's a complicated, time consuming process.

To solve the problem, Bell has designed the fast and simple to operate Transaction* telephone system.

The system includes the Transaction telephone terminal, the switched network, and 407 type data station interface. Plus, the data base computer.

The terminal itself is intended as the remote telephone in a digital inquiry-voice answer system. It has a single slot through which automatic dialing and bank or credit cards are passed. (If it's a check, the user keys in the account number.)

The Transaction telephone automatically

enters customer and user information by reading the magnetically encoded ABA Track II stripe found on the back of most major bank and credit cards. It also fully buffers all of the data input.

Sequential instruction lights guide the user through the simple data input procedure. While the data is being entered, the telephone dials the number of the data base needed for verification. All of the buffered information is then sped through the switched network and the 407 type data station. Customer information is withdrawn, and an audio or visual response is relayed to the user.

In addition, the terminal can be used as a regular telephone. And it's available in Touch-Tone® or rotary.

For the surprisingly low cost and complete details, contact your Bell Account Representative.

*Trademark of AT&T Co. ® Registered trademark of AT&T Co.



The Transaction Telephone System.

Another part of the Bell System's end-to-end data commitment.

Here's a money-saving combination that you can bank on

Westinghouse software users include some of the largest, most demanding companies in the world. Like Colgate-Palmolive, General Motors, PPG Industries. They expect the most from their software. That's why they bank on Westinghouse:

DISK UTILITY SYSTEM

WESTI

DOKUMNTR

JOB ACCOUNTING SYSTEM

1. DISK UTILITY SYSTEM

DOS and DOS/VS program that increases your computer's productivity

Runs up to five times faster than others
Gives you 13 exclusive features
Uses less storage space
Self-relocating
Verifies data copied/restored

2. WESTI

DOS/VS teleprocessing interface that manages: terminals • user core areas • display format files • application programs • disk work space • user work areas

Reduces core requirements
Installs in as little as three hours
Improves system efficiency
Increases system flexibility

3. DOKUMNTR

An automated approach to documenting: technical abstracts • course material • user manuals • maintenance handbooks

Produces standard documentation
Simplifies revisions and indexing
Saves proofing time
Saves time on main

4. JOB ACCOUNTING SYSTEM

A system that helps you get more from existing resources

Identifies program reruns

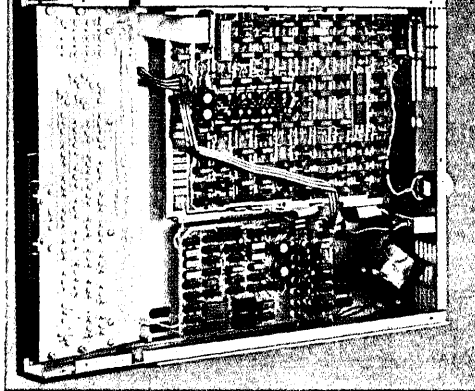
Identifies overload
Examines operator/computer performance
Reduces memory partition idle time

Don't take our word for it

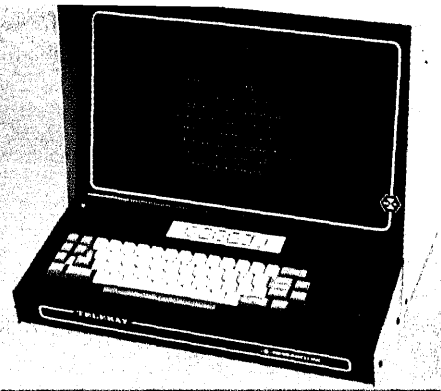
Prove these claims on your own hardware. Call us today at 412 256-5583 for more information. Or write Westinghouse Electric Corporation, OSP, 2040 Ardmore Blvd., Pittsburgh, Pa. 15221.



Westinghouse helps make it happen



TELERAY APL... AND OTHERS
 OF THE WORLD'S MOST
 RELIABLE CRT TERMINALS
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 ▽ | φ [] ' [] H _ H - / ^ T ⌈ I
 TRUE OVERSTRIKE



The "Fewer Belly Aches" CRT Goes APL

Here's the newest addition to the growing TELERAY family of "gutless wonders" . . . the Series 3900 . . . following in the same tradition that produced the Series 3300 TTY replacement and the full-ASCII Series 3700 with single-logic-board, plug-in-chip simplicity.

The 3900 is really three terminals in one—APL, full ASCII, and upper-case TTY. Its display clarity is unusually sharp—the result of several interacting features: a high resolution monitor, 15-inch CRT, and TELERAY's switchable wide-character format (over 1/4 inch high and wide).

The 3900 displays TRUE APL overstrike characters, with ASCII mode overstrike optional. It operates scroll-up, with bottom-line data entry and bot-

tom-line cursor controls. And, except for the bell tone, it gives you totally quiet operation—no fan.

Best of all, it is priced lower by far than any APL terminal in the world . . . like under \$2500—for one.

Standard Features:

- APL/ASCII Typewriter-Pairing Keyboard
- APL and Full-ASCII Character Sets—Computer Switchable
- True APL Overstrike and Underlining
- 15-Inch, High-Resolution CRT
- 1920 Characters (24 x 80)
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Dual Data Rates, to 9600 Baud
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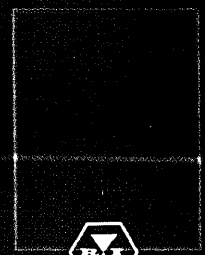
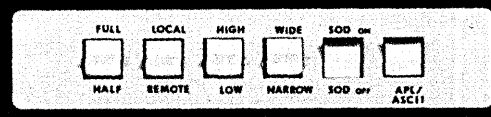
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CIRCLE 66 ON READER CARD

TELERAY 3900



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*1920 Characters is an option available at additional cost.

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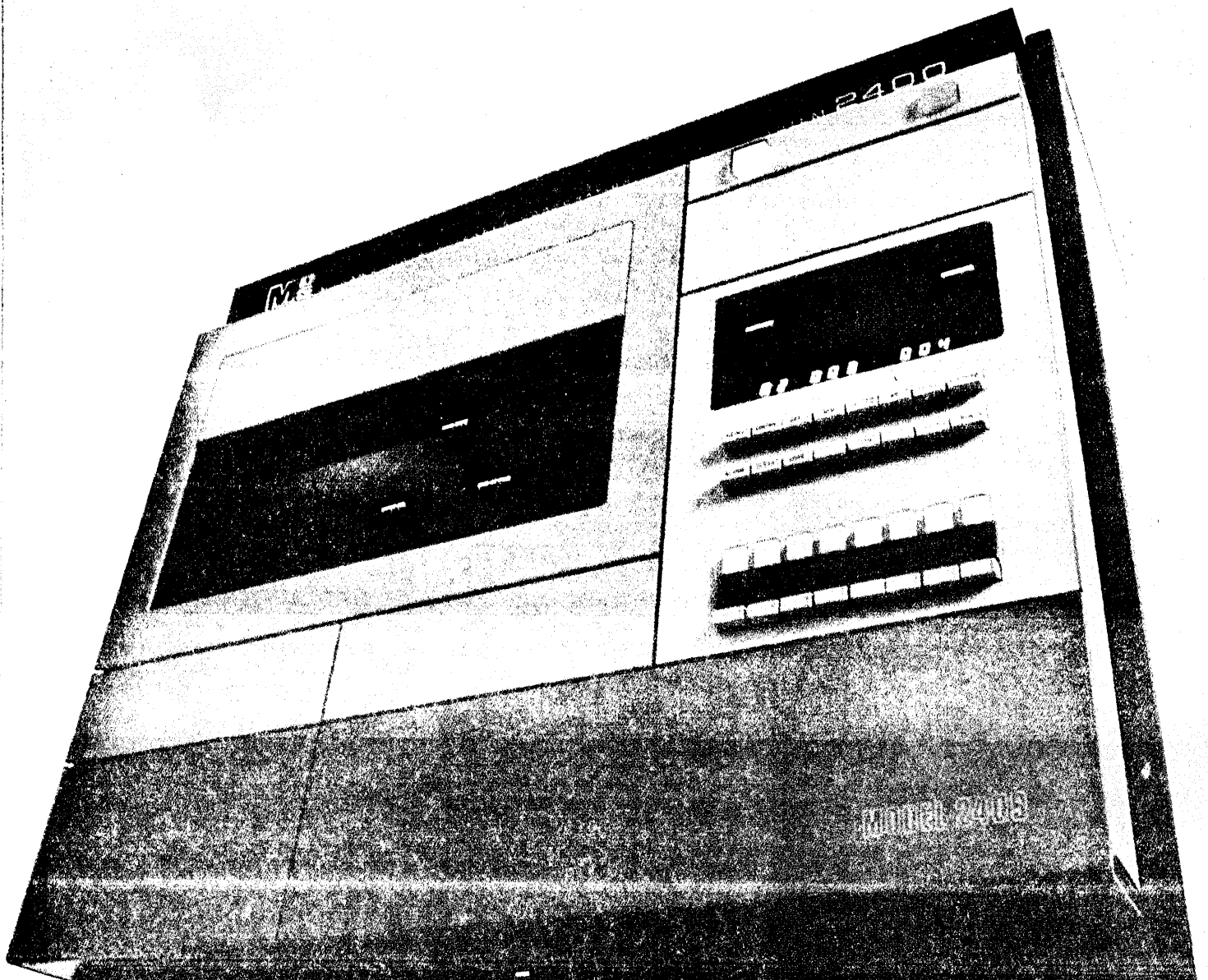
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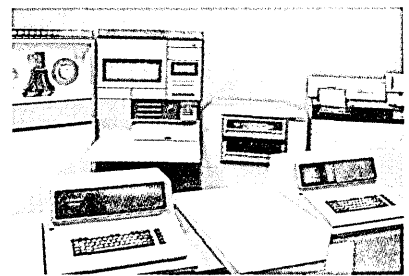
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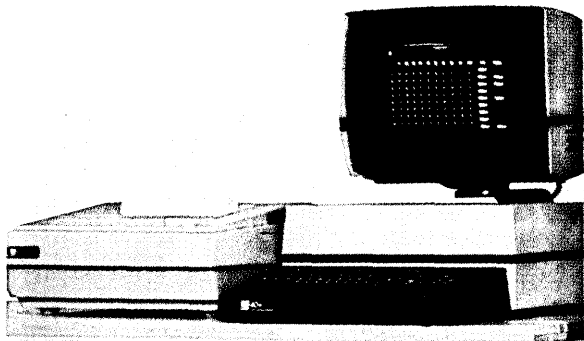
See our new artist at work. Call or write California Computer Products, Inc., DA-12-75, 2411 West La Palma Avenue, Anaheim, California 92801. Telephone (714) 821-2011.



CALCOMP

In data communication systems, ICC helps you put it all together.

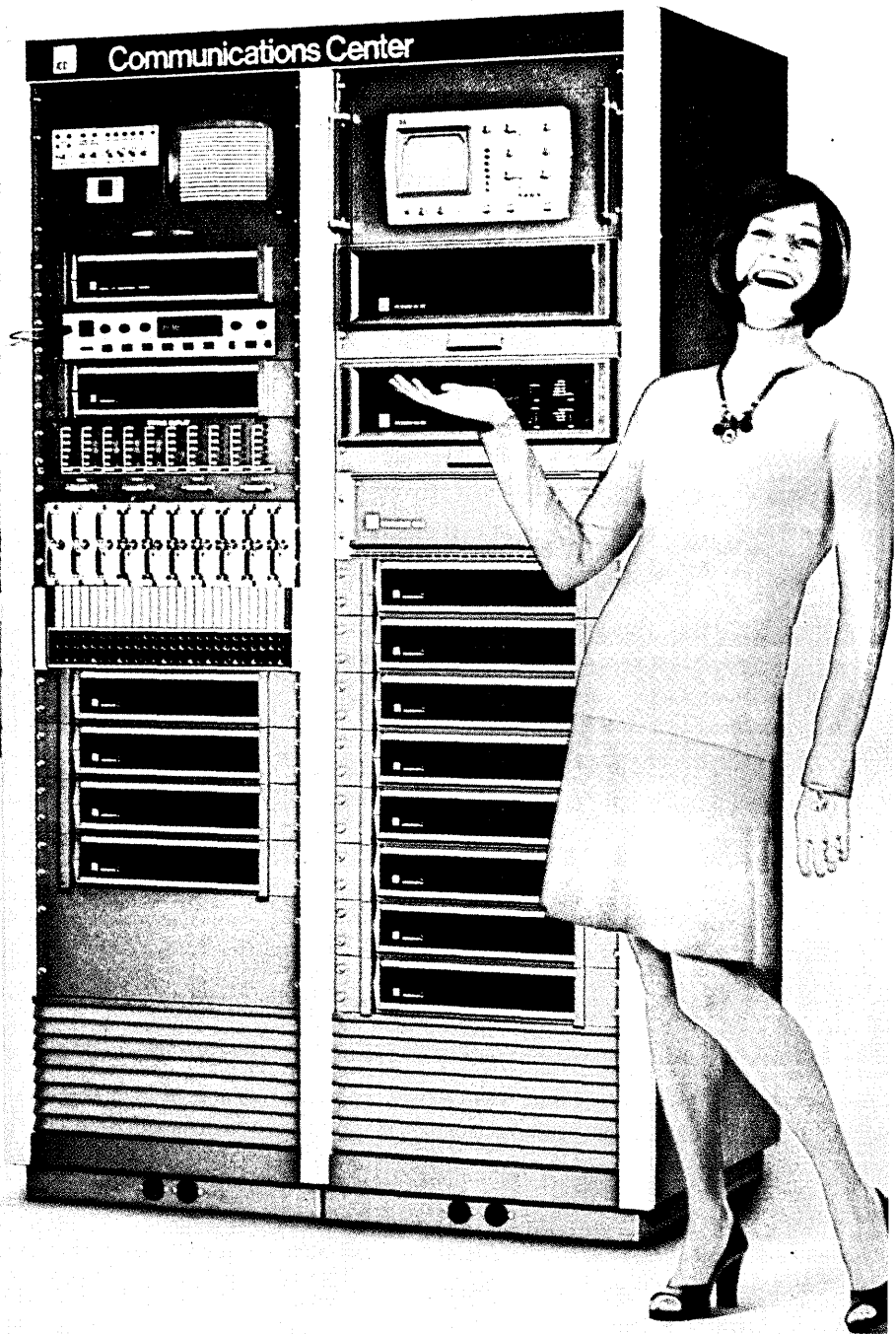
ICC believes that data communication systems have one main objective — to deliver your data when and where you want it, in the form that you want it . . . *economically*. That's why we build modems that offer you extra system flexibility. With features like self diagnostics, automatic line equalization, and remote test. And multiport design that lets you combine several data channels on one line.



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CIRCLE 29 ON READER CARD

STARAN translates a satellite's winks into wheat forecasts.

Every time the Landsat satellite winks, it takes a picture. And by analyzing these pictures, crop forecasters will attempt to determine wheat acreage.

But the job of digesting the billions of bits of data in these images can give even powerful conventional computers indigestion. That's why NASA uses Goodyear's STARAN® associative parallel array processor.

Ordinary digital computers process only one or a few discrete

points of an image at a time. But the STARAN system combines content addressability with parallel array arithmetic to process hundreds, or even thousands, of image points at once.

And because this unique capability dramatically speeds operations, massive improvements in image throughput are possible. That's why the STARAN processing system is unmatched in its ability to solve problems requiring operations

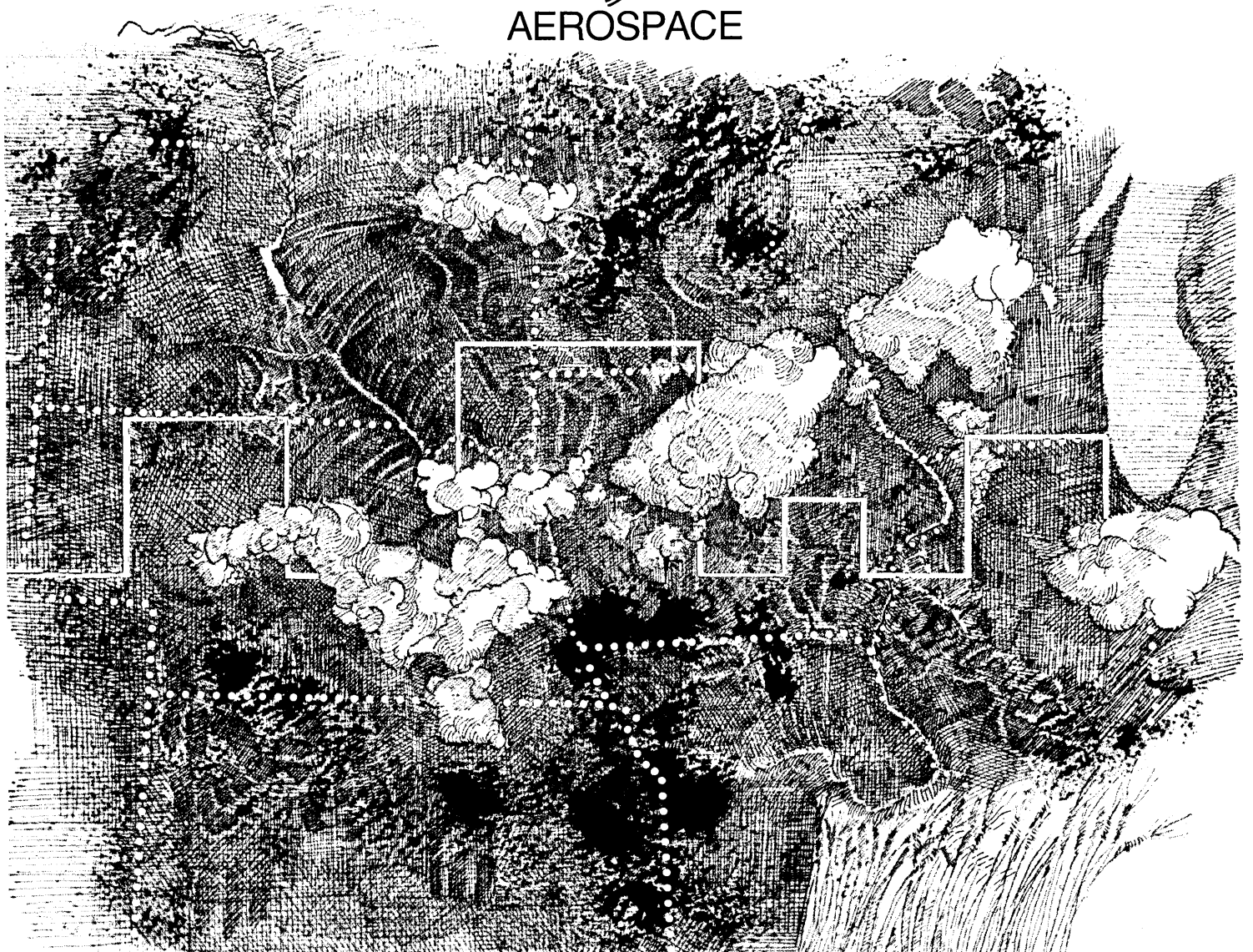
on many similar data streams or high-speed searches of many similar file records.

So before you invest a lot of money in an image processing system, invest a little time. Look into STARAN. The more severe your requirements, the more money it may save you.

For complete information, just write to Wayne Brubaker, Goodyear Aerospace Corporation, Akron, Ohio 44315. Or call him at (216) 794-3631.

CIRCLE 72 ON READER CARD

GOODYEAR
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Editor's Readout

John L. Kirkley, Editor

Too Little Too Late

After more than a year's delay, we finally have a National Commission on Electronic Fund Transfers.

President Ford's procrastination in appointing the non-statutory members has left the group with less than one year to do its work . . . and most commissions take a year just to work out a compatible meeting schedule and decide who gets the prune danish.

Membership on this potentially short-lived body is composed of bankers, retailers, financiers, state officials and the like. Although EFTS is a computer-dependent innovation, no one from the computer industry was appointed to the commission—and there were several highly-qualified hats in the ring.

And so we have an underqualified committee with not enough time to do its work.

It probably wouldn't matter much if this were just another run of the mill commission contemplating the usual piffle. But electronic funds transfer is going to radically alter the basic fabric of our society. As a recent Office of Telecommunications Policy study stated, these systems will affect the lives of all of us "as powerfully as the adoption of the automobile affected the lives of our grandparents." Much more is needed than the present ill-considered, half-hearted effort.

For openers, Congress should extend the commission's life. At the same time, a representative of the computer industry, wise in the ways of data processing technology and computer networking, should be appointed to the group.

Governmental myopia can sometimes be tolerated. This is not one of those times.

Open Before Christmas

Although the holidays are still a few weeks away, this issue contains an editorial stocking-stuffer that we think you'll appreciate.

Wrapped up on pages 138-154 are approximately 4,000 user ratings of over 200 software packages. The ratings reflect the user's evaluation of each package's throughput efficiency, ease of use, and other important characteristics.

To our knowledge, this issue's ratings represent the largest such listing of actual user reactions ever attempted. And it also represents an acknowledgment of a software package industry that has moved out of its fledgling phase; an industry with an increasing number of helpful, reliable products being produced by companies that intend to be around for some time to come.

Data processing budgets for 1976 reflect the acceptance of these packaged solutions to the dp managers' problems. The average installation will spend 20% more for software during the new year.

If you're considering acquiring a software package, we think you'll find the ratings and the vendor index a handy reference package in its own right.

Unlike that handpainted tie from your Aunt Harriet in Chicago, this is one present that you may find some use for in 1976. *

Interactive Graphics Comes of Age

by Eric Teicholz

Continuing reductions in size, cost, and complexity are causing a population explosion in interactive graphics systems.

Imagine an architect first designing a building and then immediately being able to walk around and through it before the building is even built. He could walk up to windows and doors, examine them and make appropriate changes if they did not meet his design criteria.

This story is not a fantasy. Dr. Ivan Sutherland, first at Harvard and then at the Univ. of Utah, designed and built a head-mounted display consisting of two miniature crt's mounted in a pair of goggles and mechanically connected to a computer. As the architect turns his head, the computer knows precisely what is being looked at and will generate stereo views of the build-

ing as if the designer were actually inside it.

Today, designers have a unique tool that makes it possible to realistically simulate a three-dimensional environment and to make design changes in a faster and more accurate manner than has ever previously been the case—interactive computer graphic systems. Whereas computer graphics had its origin in line drawing (pen on paper) machines, companies representing the "cutting edge" of graphic technology, such as those started by Dr. Sutherland (Evans & Sutherland, Computer Corp.), now make it possible to design three-dimensional figures dynamically using gray tone or color displays.

Some history

Interactive graphics has been with us since the early '60s when Ivan Sutherland developed "Sketchpad," the first interactive system for computer aided design. Early developmental efforts, like GM's DAC-1 system, tended to be based on large, expensive, and specialized hardware. Many early experiments in computer aided design were actually of greater value for promotional rather than practical purposes. The systems and applications software usually demanded dedicated central processors, and incidentally were in many ways incompatible with the newly emerging time-sharing services that required low cost graphics

Vendor	Applicon	Auto-Trol	Bendix	Calma	Computervision	Digital Equipment (Redac System)
1st delivery	Model 700—1970 Model 800—1974	1973	1972	1971	1969—1970	1971
Primary applications	Integrated circuits Printed circuits	Drafting Printed circuits	Drafting, Printed circuits, and Mapping	Integrated circuits Printed circuits	Integrated circuits, Printed circuits, and Drafting	Integrated circuits, Printed circuits, Architecture and Garments
Primary input & edit devices	<ul style="list-style-type: none"> digitizer tablitzer with optional plotter crt with tablet and keyboard magnetic tape 	<ul style="list-style-type: none"> digitizer with keyboard/display interactive crt with cursor Teletype ASR 33 magnetic tape 	<ul style="list-style-type: none"> digitizer crt with keyboard Teletype ASR 33 magnetic tape 	<ul style="list-style-type: none"> digitizer with keyboard/display crt with tablet and keyboard Teletype ASR 33 magnetic tape 	<ul style="list-style-type: none"> digitizer/plotter crt with tablet and keyboard Teletype ASR 33 interface to larger computer 	<ul style="list-style-type: none"> 17-inch crt with light pen Teletype ASR 33 or Decwriter magnetic tape
Maximum input stations	Model 700: 4 plus two other devices Model 800: 5 plus three other devices	6 stations and two plotters	4 stations	6 stations with three plotters and one tape	4 stations	4 crt stations
Processor	Basic station: PDP-11/05 with 24K Additional stations: PDP-11/05 with 8K	Varian 620L/200	Basic station: Nova 1200 with 24K Additional stations: Nova 1210 with 24K	Nova 1220	Nova	PDP-15/76 dual processor with PDP-15 and PDP-11
Typical system cost	\$122,000	\$126,895 with flatbed plotter	\$91,290	\$131,000	\$110,000 ± 10% with digitizer/plotter but no drum	\$109,800 hardware \$ 50,000 software
Expansion cost	\$18,000—\$36,000 depending on size and display	<ul style="list-style-type: none"> digitizer station \$12,500 crt station with thumbwheel, x-y cursor & keyboard \$11,500 	Station with digitizer, crt/keyboard, ASR 33 and Nova 1210 \$35,000	<ul style="list-style-type: none"> station with crt and tablet \$24,000 digitizer station \$34,000 	digitizer/plotter \$32,000—\$40,000	not applicable

*Most of the market estimates and tabular data used in this article are from International Technology Marketing, Inc., Newton, Mass., with which the author is associated.

displays and low cpu overhead.

By the late '60s some changes took place in the computer graphics industry. Computer manufacturers began to realize the economic and technical potential of the interactive graphics market and more readily supported graphic requirements in their hardware design. As computer memory technology advanced, hardware costs came down, resulting in the emergence of still smaller and faster machines.

The greatest impetus of all for graphics came from the development of storage tube crt's that were both inexpensive (in the \$3-\$10,000 range) and could be used as terminals over telephone lines communicating with remote time-shared cpu's.

Storage crt's draw pictures on a display surface in a random fashion and the displays remain on the screen until they are erased. The storage tube, unlike its predecessor, the more conventional "refresh" crt, is not used with a display list or menu and can separate memory from display processing requirements—thereby freeing the graphics program from dependency on bandwidth, buffer size and phosphor decay rates. However, to be expected, the storage tube pays a price for these characteristics: because its pictures are not refreshed 30 to 60 times a second and are drawn in an unstructured (random) manner, storage crt's require high "driving" voltages to produce the required beam deflections,

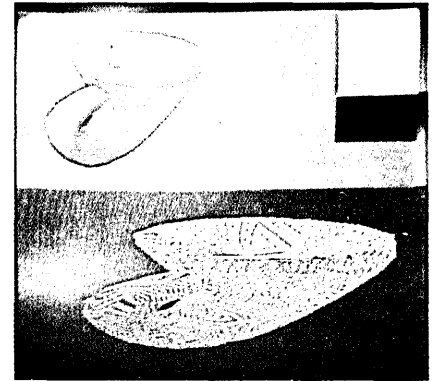
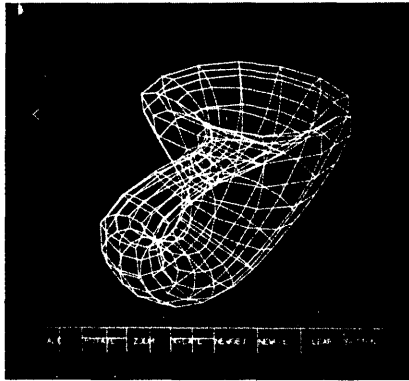
and therefore have relatively slow drawing speeds—especially if used over voice-grade telephone lines to a remote central processor. Finally, a large class of interactive graphic procedures that are available on the refresh crt (such as selective erasure) are omitted from the storage tube user's repertoire.

In the past five years, the computer industry has been changing at an ever-increasing pace. We have seen the development of intelligent terminals (often containing their own graphic processors); the development of integrated turnkey systems that combine hardware, software, and service from a single source; a rapidly expanding minicomputer market (which will be

about \$1.24 billion in 1975); a less mature microcomputer market; and larger and faster mass memories.

It is difficult to establish categories for interactive graphic modes of operation. Rather the modes can be represented by a continuum: At one end is the user who communicates with a remote computer using only a storage crt as a terminal. This user pays a little over \$200/month for the rental of the terminal and can perform only relatively simple graphic applications because of the data transmission limitations of telephone lines. A reasonably complex picture, for example, can take over 10 minutes to generate if sent over voice-grade telephone lines.

At the other end of the spectrum are



Evans & Sutherland's "Picture System" (from which these photos were taken) and others like it allow designers to work in gray tones or color or both. There are less than 200 such sophisticated (and relatively expensive) systems in use, primarily in basic research, aerospace modeling and simulation, and computer aided design.

Dimensional Systems	Gerber Scientific	GCA/Hampshire	Macrodata	M & S Computing	United Computing
1972	1973	1973	1970	1972	1974
Drafting and Mapping	Integrated circuits Printed circuits	Integrated circuits	Integrated circuits	Integrated circuits, Printed circuits, Drafting and Mapping	numerical control, mechanical design, drafting
<ul style="list-style-type: none"> digitizer with menu and ASR 33 crt with tablet and keyboard Teletype ASR 33 magnetic tape 	<ul style="list-style-type: none"> digitizer/plotter keyboard/display crt/stylus Teletype ASR 33 magnetic tape 	<ul style="list-style-type: none"> digitizer crt terminal crt with cursor and tablet Teletype ASR 33 magnetic tape 	<ul style="list-style-type: none"> digitizer crt, tablet, and keyboard Teletype ASR 33 magnetic tape punched cards 	<ul style="list-style-type: none"> storage crt stylus or cursor data tablet digitizer keyboard 	<ul style="list-style-type: none"> storage crt cursor control keyboard magnetic tape
4 stations	6 stations	8 stations	4 total: two crt and two digitizer	8 total	4 stations
Lockheed SUE	Basic station: H-P 2100A with 12K Additional stations: H-P 2100A with 12K	PDP-11/40 with 24K	Interdata 70	PDP-11	General Automation SPEC 1665 with 32K
\$114,500	\$120,000 with crt/ stylus station	\$160,000	\$130,000	\$100,000	\$150,000
40x60 tablet and crt \$26,000—\$28,000	<ul style="list-style-type: none"> digitizer/plotter \$50,000 keyboard/display \$40,000 crt/stylus station \$70,000 	<ul style="list-style-type: none"> edit station \$30,000 digitizer station \$40,000 	<ul style="list-style-type: none"> digitizer station \$15,000 crt, tablet, and keyboard \$25,000 	digitizer, two crts, keyboard, and data tablet \$25,000	\$16,000/terminal

INTERACTIVE GRAPHICS

state of the art refresh-type systems consisting of sophisticated self-contained, standalone units, with two- and three-dimensional, and sometimes even color, graphic capabilities. These single-station systems contain large processors and are capable of continuous dynamic motion, zooming, perspective generation and other sophisticated functions. The costs of the display processors alone usually start in excess of \$125,000.

Finally, in the middle of the spectrum, are the family of graphic systems called intelligent terminals. These contain various degrees of self-contained computational capabilities and cost anywhere from \$8,000 to \$75,000.

The leading manufacturer of the storage crt is Tektronix, which has over 10,000 terminals in the field representing a little less than 90% of the total market. Uses encompass just about every application but can be approximated as 75% scientific and 25% business. Many of the business applications are provided by time-sharing companies such as Cyphernetics which not only support the storage crt but offer valuable econometric data bases as well.

The leading manufacturers of state of the art systems are Evans & Sutherland, Adage, and Vector General. Together, there are probably less than 200 such systems in use. Because of their unique capabilities (and because of their price), most are used for basic research (in universities and research centers), modeling and simulation (in the aerospace industry) and, to an increasing degree, for computer aided design applications.

The graphic community has not yet reached a consensus regarding the direction of future technological developments. Because of the developments mentioned above, in combination with emerging high speed digital telecommunications networks, however, raster scan or television compatible graphics (which structures data left-to-right and top-to-bottom) very likely will eventually predominate. Many research (MIT, Universities of Utah and North Carolina) and development efforts (Xerox, Datadisc, Evans & Sutherland) seem to point towards the primacy of tv-compatible graphics.

There are many factors that will facilitate movement in this direction: television sets provide a low cost terminal, and there are approximately 120 million television sets in the U.S. of which almost 50% are in color. Raster scan video memories are lowering in cost and have low power re-

quirements. Gray tones and color outputs are readily achieved on raster scan (tv) displays. Finally, raster scan technology has the potential of merging computer graphics with picture processing technology, thereby making possible the mixing and manipulating of photographic images with computer-generated displays.

Mini-based turnkey systems

One of the more successful recent achievements in the computer graphics industry has been the emergence of minicomputer based integrated turnkey systems. The typical system will cost approximately \$125,000, and consists of a graphic input station (digitizer, tablet, function keys, joystick or keyboard), an output station (flatbed, drum, light beam, microfilm or electrostatic plotter), an interactive crt work station, a large secondary mass memory (disc, tape or drum) for storing large data bases, the mini and, in some cases, a communications interface to a remote processor.

Software for turnkey systems include both systems and applications capabilities for at least two-, and sometimes three-dimensional, graphic data bases. Table 1 compares some characteristics of turnkey systems as developed by their major producers. Although the hardware varies greatly

from system to system, they are all alike in that both hardware and software support is provided by the same company.

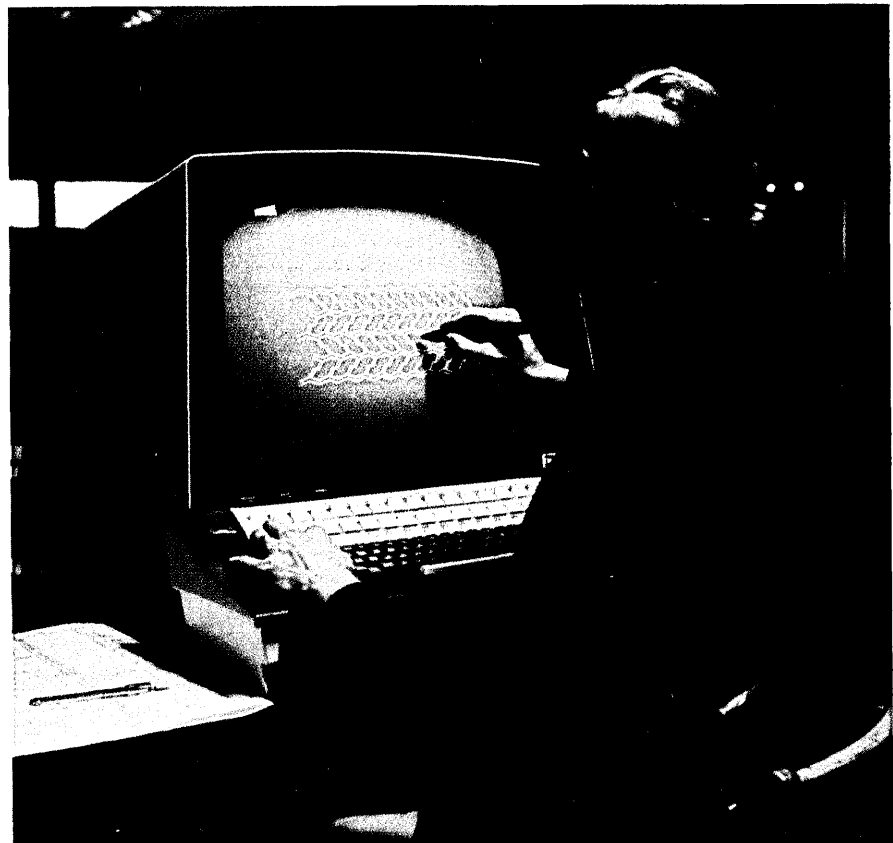
There are now about 500 systems in operation. Of these, almost half will have been sold in 1975. In five years the number of systems in use will have doubled.

The current size of the turnkey system market (1974 figures) as split up by the same vendors is as follows:

	\$ millions
Applicon	\$10.0
Auto-Trol	1.0
Bendix	2.0
Calma	4.5
Computervision	13.0
DEC/Redac	2.0
Dimensional Systems	0.3
Gerber	1.0
Hampshire	0.5
Macrodata	1.5
M&S	0.2
United Computing	0.5
<u>Total</u>	<u>\$36.5</u>

The figure is still relatively small, corresponding to only about one-third of the figure for non-interactive graphics products and services, but it is growing.

Also interesting in those figures is that only Digital Equipment, of all the major hardware manufacturers, makes



Firestone Tire and Rubber Co. uses a Sanders/900 system for applications like tire tread design. Larger systems like the 900 are usually found in companies with sales over \$50 million that can take advantage of multi-shift usage.

one of these systems, and that three vendors (Computervision, Applicon and Calma) share over 75% of the market. Computervision alone has over 200 systems in the field, reportedly.

Today's applications

Most integrated systems are used for applications related to electronics (75%), drafting (15%), and cartography (5%), with architecture, engineering, plus university and government research making up the remaining 5%. The latest published and forecast figures for sales of turnkey systems by industry are:

	\$ millions	
	1975	1978
Electronics	\$58	\$150
Drafting	12.5	60
Mapping/cartography	7	20
Architecture/engr	2.5	3
Govt/univ research	3.5	7
Totals	\$83.5	\$240

Electronic applications encompass design and layout of wiring and cir-

as 3D drafting capabilities are required for manufacturers' applications in the ordnance, chemicals, refining, machinery and metal products industries. Unfortunately, such systems are extremely sophisticated and complicated to use. Consequently there are only about 25 3D systems in use today. Response thus far has been a "wait and see" attitude. Progress is being made but it will be another year (or two) before the required system flexibility, file response and access criteria are achieved.

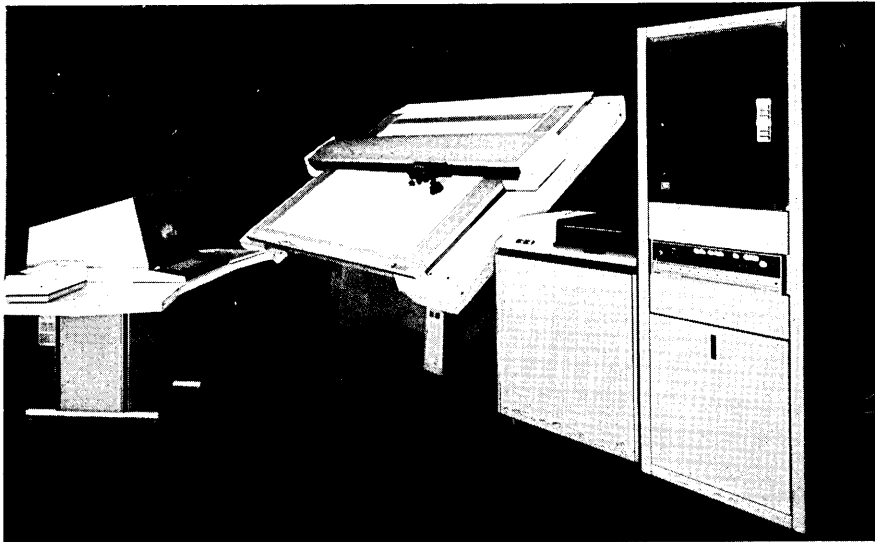
Computer mapping applications have enjoyed a rapid growth primarily because of the increased availability of geographic and statistical data bases such as census files. Furthermore, the forthcoming national conversion to the metric system will necessitate the re-drawing of millions of base maps which can best be achieved by computer. General purpose mapping software is also readily available and, except for topographic maps, extremely high accuracy output is usually not

by W. Barkley Fritz and Charles R. Lansberry which follows these pages, describes how interactive computer graphics is being used at the Sun Shipbuilding and Dry Dock Co.)

Tomorrow

Integrated graphic systems of the future will become smaller (in terms of standalone capabilities) and less expensive than present systems. New systems will be designed for use with a host computer and will provide general local picture processing capabilities such as data base creation, graphic editing and interrogation, file formatting and the like. It will not only be easy to enter the geometry and topography of data base components, but attributes (such as cost, manufacturer, color, etc.) will be assigned to components as well. When this happens, and when such a system is available for under \$50,000, entire new classes of users and new application areas will open.

Turnkey systems have proven to be a viable and lasting force in the graphics market. Psychological barriers to their use that existed just a few years ago have largely been overcome. Skepticism has been replaced by respect and a sincere desire that machines will be able to assume an ever-increasing role in performing the drudgery of repetitive graphic bookkeeping chores. Only 10 years ago designers were primarily interested in automating the design process and in "pushbutton" engineering. Today, successful applications encompass a spectrum of activities from conceptualizing designs to production. Emphasis is on man-machine interaction rather than on man or machine action alone. It is this approach that has produced the most successful results to date and will continue to do so in the near future. *



Computervision's "Designer System" includes a console, plotter/digitizer, disc, mag tape, and minicomputer. Approximately 200 of the turnkey systems have been put into the field, according to the manufacturer.

cuits for printed circuit, integrated circuit, and hybrid circuit production. The predominating application is the generation of artwork master and automated machine controls for the production of PC boards and for process masks used in IC production. A principal advantage of graphic systems here (as for all application areas) has been the ability to create and store graphic data bases which can be easily recalled and revised by computer (the 'big eraser' concept).

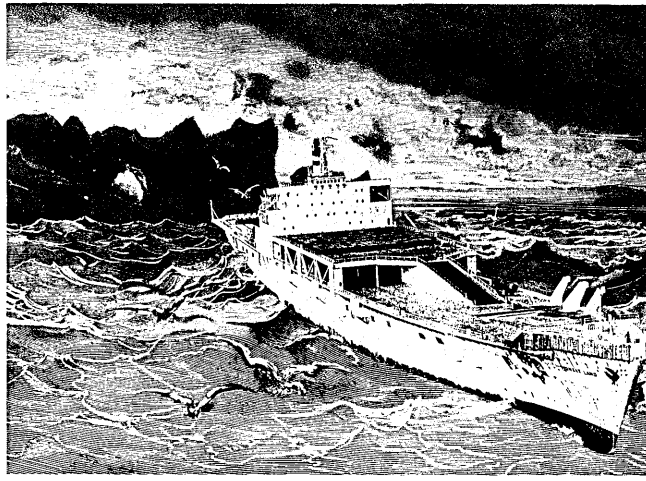
Two-dimensional general purpose drafting for electrical, mechanical and piping systems has been commercially viable for some time. Most developmental work in drafting for electrical, schematic and mechanical work relates to three-dimensional data base systems

required. At present, Applicon estimates that approximately 20% of its systems are used for mapping and engineering construction.

To date, most users of standalone interactive systems are large companies whose sales are over \$50 million. These are the companies who achieve the greatest cost benefits from multi-shift usage. Feedback from the user community indicates that benefits from integrated systems include shorter production times, design standardization, establishment of graphic data bases, improved accuracy and greater design flexibility, especially in terms of making design changes. Of all these, design standardization and data base establishment seem to be the most commonly noted. (As an example, the article



Prof. Teicholz is associate director of the Laboratory for Computer Graphics and Spatial Analysis at Harvard Univ., where he teaches in the Graduate School of Design. He was a member of the study team at International Technology Marketing, Inc., which produced the reports from which some of these findings were taken.



Ship Modeling With Interactive Graphics

by W. Barkley Fritz and Charles R. Lansberry

The payoff comes from eliminating redundancy, error checking, post processing—and most of all, from saving time.

The Sun Shipbuilding and Dry Dock Company is a complete integrated manufacturing complex located on nearly 200 acres along the Delaware River in Chester, Pa. It currently employs over 4,100 people. The yard began operations in 1916 and has since launched and delivered more than 600 ships. Included in recent construction was the widely publicized “ocean mining” ship, the Hughes “Glomar Explorer,” responsible for lifting a large portion of a Russian submarine from the bottom of the Pacific Ocean.

In June of this year, Sun Ship launched the world’s largest and fastest Roll-on/Roll-off trailer cargo ship. In November 1975 it launched a new type double hull “ecological” tanker. This ship has been dubbed an ecological tanker because its unique double bottom and double side shell structure provides an effective solution to the problems of oil spills resulting from damage to the single hull structure of conventional tankers where the oil cargo and the water are separated by only a single sheet of steel. An interactive graphics illustration based on work

performed for the ecological tanker is discussed in the body of this article.

With the variety of these new hull forms, Sun Ship engineers have been faced with many unfamiliar problems. The use of the finite element analysis technique (a technique for determining the stresses and strains of material under load) enhanced by effective interactive graphics has provided Sun Ship with the tools to handle these new design problems in an efficient and relatively error free manner by eliminating or reducing redundancy, error checking, and post processing.

Terminal support

To support the heavy industrial complex that Sun Shipbuilding is, extensive use is made of a large array of problem solving and computer processing facilities. These capabilities are made available via terminal access to a dozen computer networks providing use of IBM 370/168, CDC 6600, Honeywell 600/6000 series, and Univac 1108 computer systems. Among the vendors supplying this network com-

puter service are McDonnell Douglas Automation, Utility Network of America, Data Corp., Boeing Computer Services, Control Data, United Computing Systems, University Computing Company, Rapidata, Honeywell Information Systems, and Sun Services. Though the computer power is not in-house, the effective Sun Ship application software capability had been in the process of development and evolution for the past 20 years.

Major application programs support many program areas such as naval architecture (ship hull characteristics, speed/power, etc.), marine engineering (heat balance, pipe stress and flow, etc.), structural engineering, production planning and industrial engineering, and marketing. Like many of these other application programs, Sun Ship’s varied use of interactive graphics are separate “ad hoc” efforts to resolve specific problems.

The total cost of the computer load being processed involves an expenditure in excess of \$30,000 per month. Over 100 individual requests for computer service are processed daily. Al-

though this load would seem to justify a moderate size in-house computer, Sun Ship had chosen the terminal route to service. The flexibility thus provided permits the selection of the most effective programs and those services which offer the best performance without the drawback of the fixed overhead, relatively high capital requirements, and fixed costs associated with an in-house computer facility. This approach also leaves open the option of introducing a dedicated mini-computer or microprocessor for a selected application whenever a clear financial advantage exists for such action.

Access to these computer networks is provided by a variety of computer terminals. The bulk of the computer load is processed by three remote job entry (RJE) terminals, currently a Data 100/78, an IBM 1130, and an IBM 3780. Each of these batch terminal systems contain card reading and line printing capabilities along with teleprocessing features which enable easy access via conventional dial-up telephone lines to the various remotely located large scale computers. Essentially any terminal can connect to any of the services. The IBM 1130 has standalone processing capability and also serves as the control device for the Gerber 522 4x5-ft. flatbed plotter. In addition to the batch terminals, a variety of slow speed interactive terminals including the Hazeltine 2000 and ASR 38 Teletypes are in use at several Sun Ship locations.

The new method

The newest computing service at Sun Ship, first introduced in August 1974, is interactive computer graphics. The interactive graphics software presently used by Sun Ship is FASTDRAW II, a McDonnell Douglas Automation Co. (McAuto) proprietary time-sharing system which interfaces with the structural program STRUDL and several other application programs. Access to FASTDRAW II is by means of a normal time-sharing multiplexed local dial phone call.

The graphics terminal hardware used at Sun Ship includes a Tektronix 4014 storage tube terminal, a Tektronix 4953 digitizing tablet, and a Tektronix 4631 hardcopy unit. The current cost for the leasing of this equipment, including maintenance services, is approximately \$1,000 per month.

The digitizing tablet is particularly useful in the model generation process. The full complement of FASTDRAW II's model creation and display commands are listed on a clear plastic menu overlay that fits on the digitizing tablet. The commands are quickly and accurately

executed by simply touching the appropriate command box on the menu with the digitizing pen. The structural model to be analyzed can be completely generated on-line using the terminal, the digitizing tablet, and the data generation commands.

The hard copy unit is used to reduce the amount of conventional plotting required in an analysis, thus eliminating manual drafting or extensive use of the large Gerber plotter. The hardcopy unit produces an 8½x11 inch copy of any image displayed on the terminal in a matter of seconds. The quality of the reproductions is very good.

Fig. 1 is a finite element model of a typical structural bracket used in the construction of Sun ships. These brackets are used to reduce stress concentrations in areas where major structural members of the hull intersect at right angles. The original used for this illustration was produced by the hardcopy unit. The numbers in the figure refer to node numbers. It is important to note that while the Gerber flatbed plotting unit is seldom used to provide graphs from the same data, it can easily be made a part of the system by simply pressing the IPF command box on the digitizing tablet to create an Intermediate Plot File (IPF). The file thus created can then be transferred to the IBM 1130 and used to drive the Gerber. Because of the speed of the Tektronix hard copy device, however, this step is seldom necessary.

The state of the art in current use of interactive graphics at Sun Ship is such that these systems do not tie in directly to the numerical control machines and

the plasma arc plate burners. This is an obvious next step, however, and indeed represents one important consequence of the direction which is being taken toward more effective use of our integrated data bases.

At the present time, only a relatively small percentage of the overall design process takes advantage of interactive graphics.

Our need for graphics

The challenge of designing new types of ships and analyzing new requirements for ship structural details presents structural problems to the naval architect and the marine engineer that, until recently, he has had little experience with. The structural engineer is also being called upon to help analyze these problems. Fortunately, the development during the past ten years of matrix methods of structural analysis, including the finite element technique, has provided the structural engineer with powerful analytical tools to solve these problems using computers.

For complex and highly redundant structures such as ships, the biggest drawback to efficient application of the finite element method is the effort required to generate and check input data, and the time to plan and provide for the presentation of the output in an easily interpretable format. The simultaneous development in recent years of interactive graphics software and relatively inexpensive graphics terminal hardware has given the engineer the means to eliminate these drawbacks.

Complex structural analyses, whether they be three-dimensional space frame models or two- or three-dimensional finite element models, require the input of large amounts of data to define the problem. The time required to generate and code information such as joint coordinates, member incidences, and element incidences can be substantial if done manually, particularly for the three-dimensional model. Not only is the manual approach time-consuming, but it is also prone to errors.

Modeling time cut in half

The generation of a structural model using interactive graphics provides a means for the computer generation of detailed drawings, and the identification and coding of hundreds of node points as well as element and member incidences. Key punching several hundred (or even thousands of) cards, and the required verification of this data is eliminated when interactive graphics is effectively exploited.

With interactive graphics, the user can quickly identify and correct model errors via graphical model playback. Errors in input nodes and elements

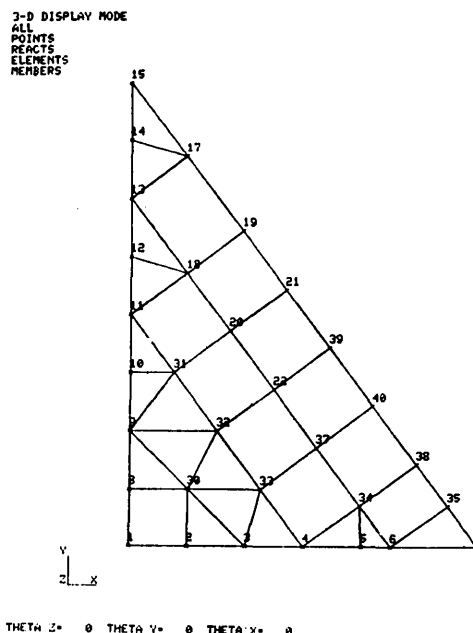


Fig. 1. Hardcopies of display images like this one of a typical structural bracket are adequate for most purposes. When required, a Gerber flatbed plotter drawing can be made without reentering the input.

SHIP MODELING

stand out clearly on a plot of structure displayed on a graphics terminal, particularly when the graphics software allows the user to automatically rotate and view the model from a variety of positions. Such capability minimizes the chances of a faulty input model.

As a preprocessor, interactive graphics reduces elapsed time by allowing the user to quickly generate and thoroughly debug his model. Experience at Sun Ship has shown that about 60-70% of the manhours required for a typical finite element analysis are involved with the generation of bulk data (e.g., numbering and coding of nodes, members and elements, as well as creation and checking of geometric plots). Depending on the particular problem being solved, interactive graphics has reduced the manhours required for model generation and checking by 45-80%.

The output associated with a finite element analysis is also voluminous. Graphics provides a means for reduction of output data into a meaningful visual presentation. This presentation is also in a format suitable for the report required for evaluation and approval of new structures. Element and nodal numbering displays, deflected figures, and plots of principal stresses can save substantial amounts of time in the interpretation of results when properly displayed on a graphics terminal. A deflected picture of the structure superimposed over the undeflected figure condenses the printed deflection output into a single display.

How it works

At Sun Ship, interactive graphics has been used primarily as a preprocessor for model generation and debugging. Graphics has also been used to some extent as a post-processor for effective display of output. The example given in what follows is typical of the applications where interactive graphics technology has been found useful. The finite element approach is used in the illustration and applied to static, ship-structural analysis.

Sun Ship is currently involved in the design of several new types of ships. One of these new ships, now launched, is the ecological tanker. The design of structural details for this tanker represents, perhaps, one of the most important aspects associated with the development of the overall hull girder strength and integrity. One such structural detail is shown in Fig. 2. The figure is a sketch of part of the cross section of the hull at the longitudinal centerline bulkhead showing the dou-

ble bottom transverse member (a beam running across the width of the ship at the bottom), the vertical bulkhead web (a vertical stiffener providing bending stiffness to the longitudinal bulkhead), deck transverse beam (a beam running across the width of the ship under the deck), four corner brackets, and miscellaneous stiffeners. The problem involved obtaining the performance of a plane stress finite element analysis of this detail to determine the effectiveness of the planned design.

A rough sketch of the finite element mesh to be used to model the detail was prepared by hand for use as a guide during the interactive graphics session. The details of the sketch are entered into the system using the digitizing tablet (Fig. 3) to generate the model shown in Fig. 4. The model contains 456 node points, 442 beam members, and 407 rectangular and triangular constant strain finite elements. (Fig. 4 is a photograph taken directly of the graphics terminal screen.)

Generation of the model began by creating the first element in the lower left-hand corner of the double bottom transverse member (Element 1). This element was then duplicated in the ver-

tical direction five times. The resulting column of six elements was then duplicated the required number of times in the horizontal direction to complete the bottom member. Similar procedures were used to generate the deck transverse beam, vertical bulkhead web, and miscellaneous stiffeners. The four corner brackets were generated by using the *define element* command of FASTDRAW II.

The *define element* command allows the user to build a complex model by piecing together substructures which have been previously generated. Since some structural details frequently re-occur in the design-analysis cycle, model generation time can be reduced by storing these details on-line as standard shapes. Corner brackets are common structural details in ship construction. The data file of standard shapes at Sun Ship includes the four corner brackets shown in Fig. 3. These brackets were added to the model by simply recalling them one at a time from storage, defining each as an element, and then attaching the element at the appropriate location on the model. Each standard structural shape is stored as a data file of relative node point coordinates, member and ele-

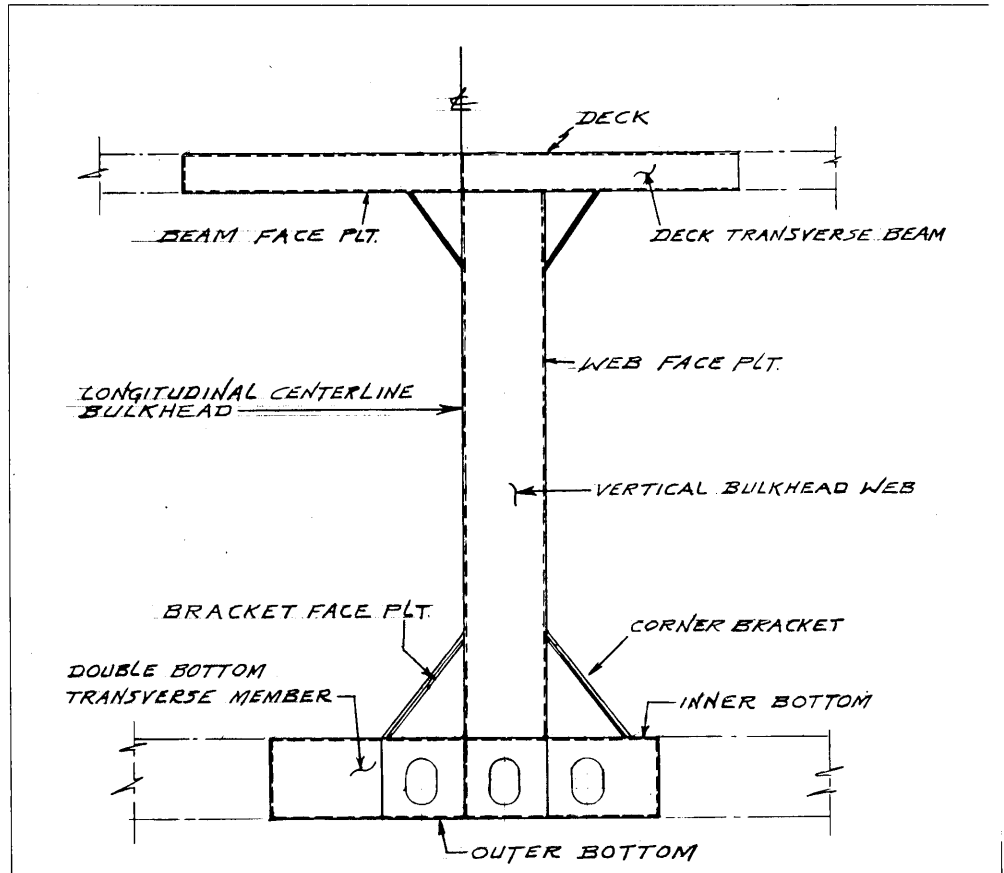


Fig. 2. The first step in the design process is to produce a sketch of the part being studied. Sketches can be much rougher than this one.

ment incidences, and member and element types.

The finite element model of the structural bracket given in Fig. 1 is actually the standard shape used to generate the corner bracket in the bottom right hand corner of Fig. 4. The ability of a good interactive graphics package to recall and modify a model file to conform to the particulars of a specific analysis makes the concept of storing standard shapes quite advantageous.

The real saving is in time

The following time and cost figures include the effort required to generate, check, and correct the model shown in Fig. 4 (i.e., bulk data generation and checking). For the manhours included, a figure of \$25 per hour was used for engineering and \$10 per hour for keypunching:

Time to generate computer model and check = 13 hours

	<i>Cost</i>
Terminal usage	\$130
Computer usage	\$600
Structural engineer—13 hours	\$325
TOTAL	\$1055

Time to generate manually and check = 38 hours

The manual method has a slight edge in cost:

	<i>Cost</i>
Scaled Sketch of Model—6 hours	\$150
Numbering of nodes, members and elements—3 hours	\$ 75
Coding of nodes, incidences, etc.—20 hours	\$500
Keypunching & verification—5 hours	\$ 50
Generation of three plots of model on gerber	\$105
Checking by engineer—4 hours	\$100
TOTAL	\$980

The cost of using interactive graphics is still slightly more expensive than a straight manual approach using the assumption that no errors requiring rework are made in using either technique. The elapsed time, however, is reduced by 1/3 using the computer assisted technique, thereby significantly increasing the efficiency and productivity of the individual structural engineer as well as shortening the cycle time for investigating new structural approaches. Of further significance to

an economic justification of interactive graphics is the fact that the cost of manpower is continuing to increase significantly year by year while the cost of computer services is still continuing to decrease. Costs for network services are quite competitive and as interactive graphics software becomes more widely available, computer service costs are expected to be further reduced. (Ignored in this discussion is the actual computer processing for the STRUDEL, NASTRAN, or similar structural programs themselves.)

It is important to note that the motivation to go to interactive graphics was the requirement to increase the accuracy of the input in order to reduce the number of computer runs and to reduce the design cycle time. The near break-even cost picture for data preparation was an unexpected side benefit.

Some problems encountered

There have been a few problems in our experience with interactive graphics which should be mentioned. Currently the communications rate as implemented is a relatively slow 30 characters per second. For some complex models, this slow line speed is responsible for causing a large percentage of

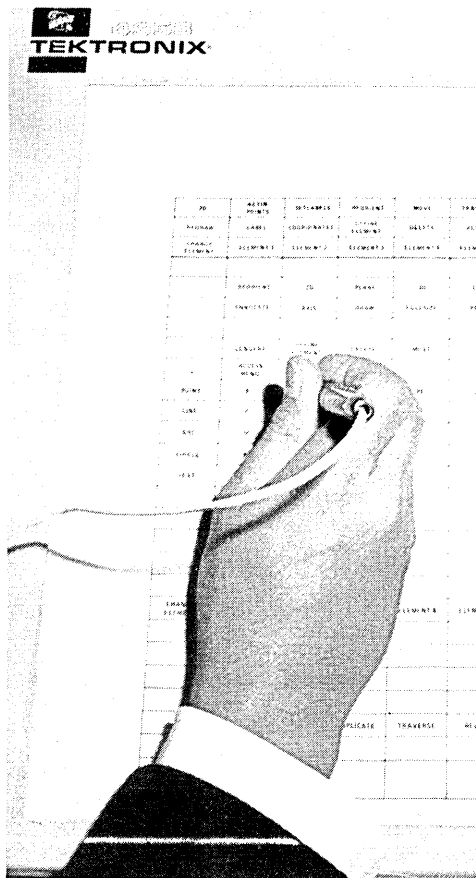


Fig. 3. Step two: The designer defines geometric elements and their positions by touching the digitizing pen to the appropriate command box on the menu.

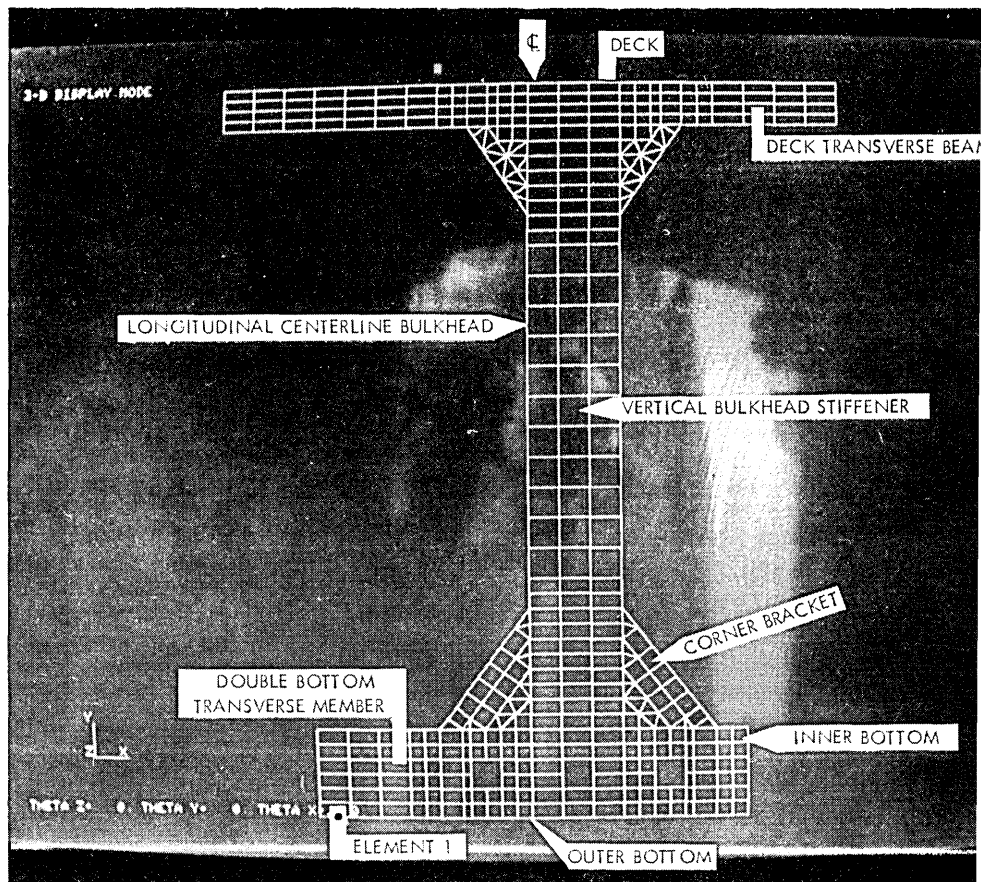


Fig. 4. After a single element is defined using the digitizing tablet, it can be easily regenerated in the image. Element 1 in the lower left-hand corner (a rectangular box) was duplicated in the vertical direction five times. The resulting six-element column was then duplicated in the horizontal direction to complete the bottom member.

SHIP MODELING

the graphics costs, both for system connect charges and wasted manhours while the structural engineer waits for a redraw. For video graphic terminals in a time-sharing environment, faster response time is desirable. The alternatives of improved communications or possibly in-house systems are being considered.

Phone line problems have been thought to cause loss of files or portions of files, and sometimes even to result in incorrect input. In addition, inconveniences caused by the engineer's inability to connect to the remote computer because of phone problems can be disconcerting, especially when he has a "rush job." Should our demand for graphics service increase much beyond the current 25-30 hours per month, it will be possible to justify a dedicated line to the computer, thereby eliminating the phone problems and perhaps improving the response time.

Computer down times and/or "system full, try again later" messages can be just as disconcerting as phone problems. Experience at Sun Ship, however, has been that both phone and computer problems are within expected service levels and can be tolerated. Sun Ship operates on a construction schedule that is sometimes not more than a few days ahead of its design completion schedule. The ecological tanker, for example, was designed, built, and launched all within 1975. The keel was laid for the world's largest Roll-on/Roll-off trailer ship, the S. S. Great Land, in December 1974. The ship was in service by September 1975. Such schedules place emphasis on rapid turnaround on all aspects of our operations including computer service, and provide impetus to the overall justification of the interactive graphics approach. This mode of operations leads to a requirement for an expected service level or up-time of at least 95% during a normal 8 a.m. to 9 p.m. service day. During this period, the goal is to turnaround all batch jobs in under two hours, and interactive graphics sessions usually of 15-30 minutes require individual command response of 5-15 seconds depending on the specific operation requested.

The programs involved are major design programs involving, e.g., the processing of large systems of linear equations in STRUDL coordinated with interactive graphics software. Large computer networks having large core storage capability seem to be required although, of course, allocation of por-

tions of the system to front-end or back-end minicomputers is quite feasible. While requirements for such service continue to evolve, little attention is being spent on suboptimizing portions of the program or attempting to bring modules of the evolving system to in-house facilities.

Problems with the present in-house graphics terminal hardware have thus far been minimal. When a problem has occurred, the service to correct it has been very good.

Conclusions

Although the finite element STRUDL-FASTDRAW II application is the example cited for description in the article, Sun Ship is also using the McAuto interactive graphics interface with other computer-aided analysis and design programs. Of particular value in some recent work has been the interactive graphics enhancement of TRIFLEX (a proprietary piping flexibility analysis program developed by AAA Technology and Specialties Co.) for an on-line visual portrayal of shipboard piping. Again, as in the STRUDL usage, the value of the display has been a shortening of the elapsed time required in the design cycle at a satisfactory cost.

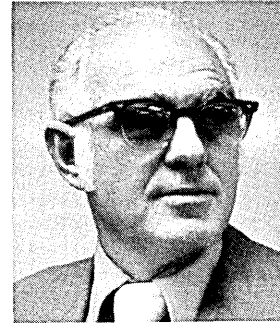
Interactive computer graphics has on the whole been an effective and efficient aid in the design and analysis cycle. Experience at Sun Ship has demonstrated the ability of interactive graphics to reduce significantly the time required for bulk data generation and checking. The use of interactive graphics and the finite element method has been instrumental in realizing the designs of new classes of ships such as the ecological tanker with its complex double bottom and double side shell structure.

The economics are currently satisfactory, and it is believed that the cost aspects associated with interactive graphics will continue to improve as increased competition is realized in the area of graphics in the computer network service industry. Of critical importance now, and incidentally ignored in the time and cost comparison section, is the fact that the use of interactive graphics eliminates most of the computer runs made using incorrect input data. By improving the quality of the input, the approach presented thus saves considerable computer costs.

In addition, as engineering manhour costs continue to rise, the use of graphics will become even more attractive as a means of data generation and model checking. The rapid developments taking place in the graphics hardware industry itself also seem to indicate a continued reduction in the cost of graphics equipment and a simultaneous increase in capabilities.

Graphics use involves a learning process both on the part of management and the engineer. Engineers at Sun Ship are enthusiastic in their response to the use of the system. A few hours of in-house training are required to initiate the inexperienced user to the current system, and this in-house training has often been augmented by one-day seminars conducted by the network service. Soon after his introduction to graphics, the engineer becomes aware of the power of this tool in the design-analysis cycle. Graphics increases the engineer's productivity by reducing the amount of time required to complete an analysis.

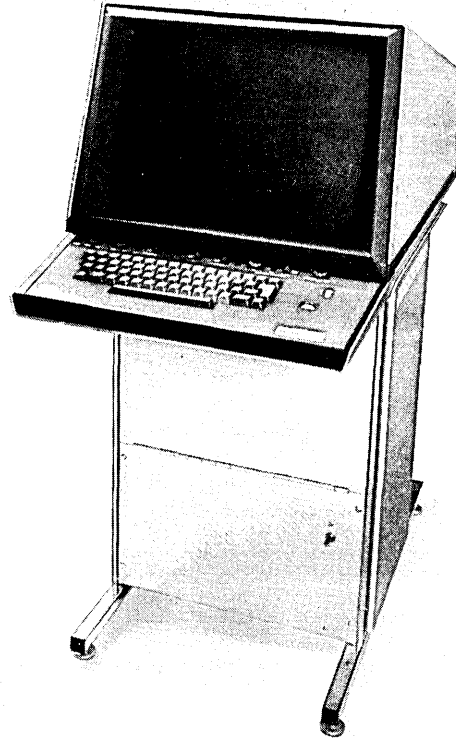
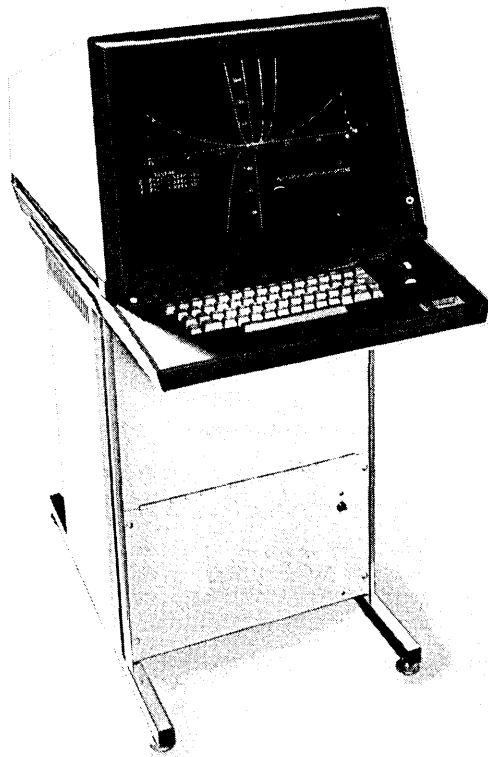
Finally, one of the side benefits of interactive graphics, and an important one from the engineer's standpoint, is its ability to make more interesting the task of data generation and checking. No longer is this a boring and time-consuming job; rather, it quickly becomes a challenge to the creativity of the engineer. For the future, the full potential of interactive graphics systems appears limited only by the imagination and ingenuity of the user. *



Mr. Fritz is manager of the Engineering Computer Center at Sun Shipbuilding and Dry Dock Co. Previously with Westinghouse, his activities included computer programming and engineering analysis, direction of computer resources and data management systems, and management of business systems and services.



Dr. Lansberry is a structural engineer in the Hull Sciences Dept. at Sun Shipbuilding, and an adjunct professor of engineering at Widener College.



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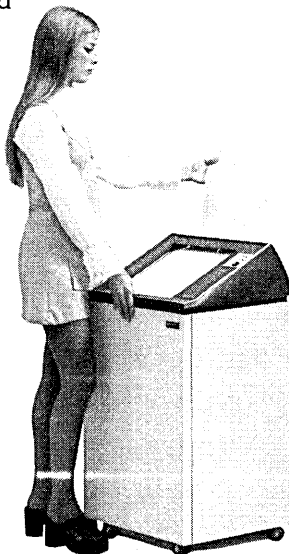
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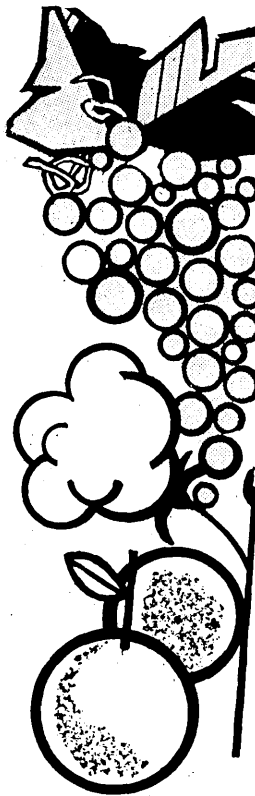
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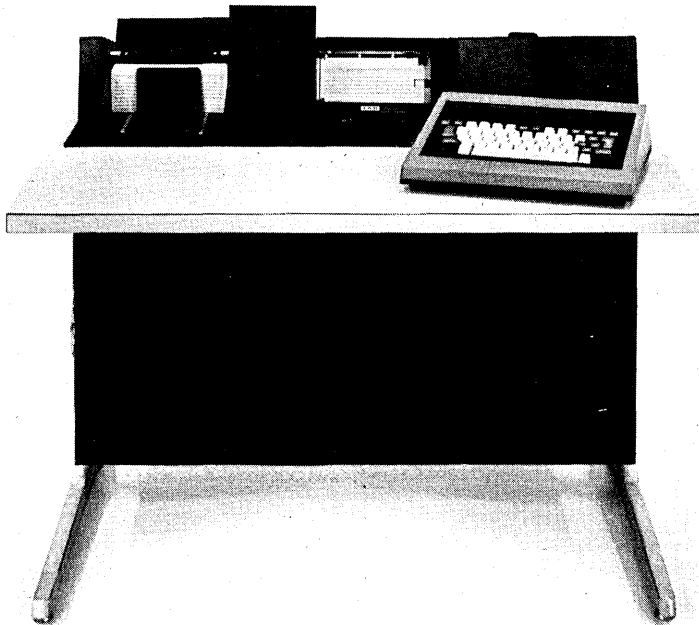
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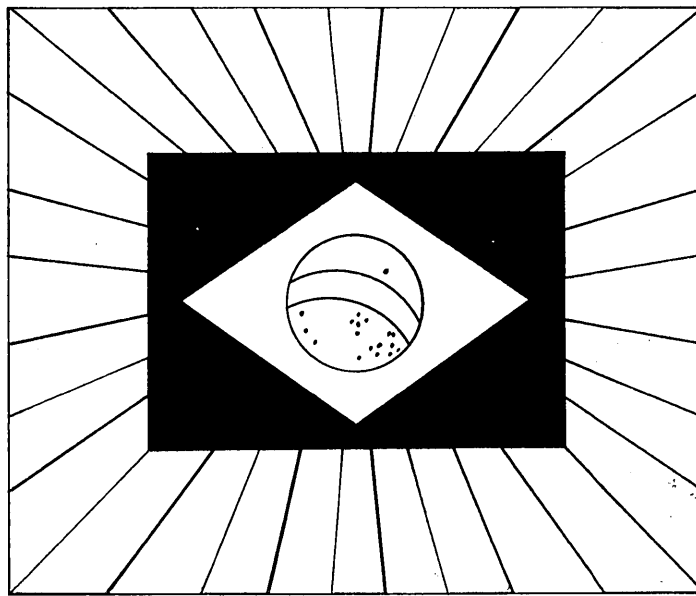
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Brazil 1976—Another Japan?

by G. B. Levine

Import duties drive the prices of computers up by 50-90%, and still 30% more machines are installed each year. The situation is like Japan's was ten years ago.

The idea of comparing the data processing environment in Brazil to that of Japan may at first seem far-fetched. It is not.

There is in Brazil a growing and dynamic demand for data processing and data collection systems, for mini-computers, and for add-on peripherals. There is an urgent need for software, for engineers, for systems analysts. And there are U.S., European and Japanese companies here to assist their Brazilian counterparts to fill the needs.

How is this like Japan? A look at Table I shows that, in terms of population, Gross National Product, computer base and growth rates, the Brazil of today has a strong resemblance to the Japan of 10 years ago. There are also a number of qualitative similarities. First, Sao Paulo, the industrial capital of Brazil, is very much like Tokyo: 8-10 million people; dynamic, energetic, fast moving and hardworking population; smoggy, polluted; dense traffic and wild drivers.

Also, INPI (Instituto Nacional da Propriedade Industrial), in Rio, carefully regulates the flow of technology into Brazil, by controlling royalties and technical assistance fees. Try to get more than a 5% royalty for 5 years maximum, and you are likely to find INPI unyielding.

If that doesn't remind you of Japan's MITI (Ministry of International

Trade & Industry) in 1966 (5% and 5 years), then you weren't doing business with Japan at that time.

Another similarity is in importing. CACEX, the Banco do Brazil, controls the import licenses from abroad. Any computer firm which tried to get an import license in 1966 in Japan knows how applications were pigeonholed, or delayed for technicalities. And Brazilians report that CACEX has been known to reject documents where a period was inadvertently inserted instead of a comma.

Lest one carry the comparison too far, it should be noted that there are also some significant differences between Japan '66 and Brazil '76.

In the computer arena, Japan began with a large inventory of well educated and sophisticated engineers and technicians, built on a foundation of extensive education and near total literacy.

Brazil has yet to achieve this happy state.

Japan had, in '66, six national computer mainframe companies (since reduced to two consortiums: Hitachi-Fujitsu-Mitsubishi and NEC-Toshiba). Brazil in '76 still has no indigenous computer manufacturing, the closest approach being a minicomputer joint venture involving Ferranti of the U.K. and DIGIBRAS.

And in terms of government policy, Japan in '66 was welcoming foreign computer licenses to Japanese companies, though the terms were strictly controlled by MITI. Brazil's INPI also allows licenses but its tightening controls are tending to make such licenses very unattractive.

MITI, in '66, prohibited foreign majority control of Japanese enterprises in the computer field, and in fact made even minority positions difficult to

ANOTHER JAPAN?

	Brazil 1976	Japan 1966
Population	110 million	100 million
Gross National Product	\$80 billion	\$120 billion
10-year average annual real growth in GNP	~10%	~13%
Computers installed (over \$30K)	1,400	1,600
Annual growth in computers installed	30%	30%
Landed cost of an imported computer as % fob price	154%	135%

Table 1

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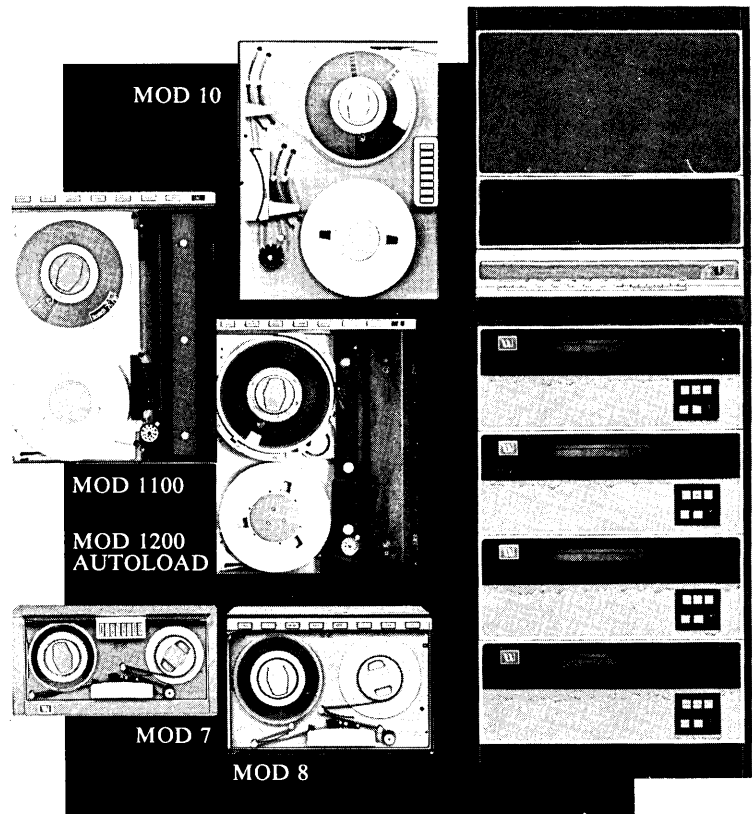
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BRAZIL 1976

achieve. Brazil's government, in contrast, encourages direct foreign investment in computer manufacture, and permits 100% foreign ownership, though there is an increasing swing toward the encouragement of local participation.

One must also admit that the GNP comparisons conceal the fact that Brazil's output includes heavy agricultural and mineral components, while Japan's was far more industrially oriented.

The computer market

The number of computers installed places Brazil in the first 10 or 15 countries. And the number of new installations is growing faster than in most of the other leading nations, so one can expect the country's ranking in the computer sweepstakes to rise, possibly to 8th by 1980.

Table 2 shows the distribution of computers in Brazil by size. The annual growth rate has been running about 30%, though 1975 deliveries slowed somewhat.

Table 3 shows the market share by manufacturer. As in most parts of the world, IBM is the market share leader, accounting for some 70% of the units and 75% of the installed value. Although IBM makes part of the 370/145 in Brazil, and exports these to the rest of the world, most of that company's share of installed machines is covered by imports.

Table 3 also shows good market penetration by Burroughs. Industry authorities attribute this to the firm's excellent local management and to their early strategy of offering a very powerful software along with extensive software support, and an extensive and effective maintenance program.

One thing missing in Brazil is the systems house, dedicated to offering specialized solutions to classes of users such as hospitals, schools, paper mills, etc. Such companies, able to assemble hardware on an oem basis and combine it with specialized software, are sorely missed.

Minicomputers

Minicomputer usage in Brazil is taking off. In one year, the number of units in place grew from 1,000 to almost 2,300. Almost all the demand has been satisfied by imports, so far, but this is sure to change in the very near future. Several of the leading U.S. firms are actively pursuing plans to manufacture minis in Brazil, some in the form of joint venture with Brazilian partners.

Similar plans, though perhaps a bit farther in the future, will involve mini-

peripheral and data entry companies. As in the case of larger computers, the limited availabilities of software, applications, and systems capabilities, are a drag on the rapid expansion of mini-computer usage. The very high cost, and rapid turnover, of engineers, technicians and dp managers is also a limiting factor.

The minicomputer market in Brazil is stimulated by the large number of small to medium size users, and has been dominated until recently by the Burroughs L Series, and the B 700. Together these machines accounted for some 65% of the minis sold through 1974, although the L Series can best be described as accounting machines. In any case, Burroughs has established a substantial production line in Sao Paulo for the "L."

The main push in minis today seems to be coming from DEC, Hewlett-Packard, and Datapoint.

The user

What is it like to manage a data processing operation in Brazil? First of all, you can probably get any cpu you want, from a local sales office. Just as in the U.S., you can begin by calling your friendly IBM, NCR, Burroughs, Honeywell, or Fujitsu salesman.

But there the similarities may end. For example, the cost to the Brazilian user of dp equipment is not only high, but volatile. Until recently, the tariff was 10%. After payment of assorted taxes, freight, customs clearance, and insurance, the equipment probably

cost 151% of the U.S. price.

However, in September Brazil imposed the requirement that each application for an import license had to be accompanied by a six month deposit, bearing no interest, of the full value of the import. A number of computer companies then raised their price to Brazilian customers by some 11% to compensate for this extra cost. And in mid-October, the basic tariff on dp equipment jumped from 10% to 40%. Brazilians will now be paying about 192% of the U.S. fob price.

The preceding description of import costs is generally valid but there are some variations. For example, if the imported item is a fixed asset, and if the importer retains title for at least 12 months, some of the tariff is not assessed. On the other hand, some government agencies have been known to waive their right to exemption from the tariff and taxes in order to eliminate the waiting period for approval from CACEX.

Another difference between the U.S. manager and his counterpart is that the Brazilian expects more assistance and support from the dp supplier. The customer-supplier relationship tends to be deeper, and more enduring in Brazil, perhaps primarily because the user has few other alternatives for the assistance he needs.

One reason for the dependence on the manufacturer is that systems engineering, or software houses are practically unknown in Brazil, though the first ones are beginning to surface.

BRAZILIAN COMPUTER CENSUS

Size of computer	July 1975*	July 1976**
Very large (Over \$1,200,000)	61	80
Large (\$600,000 to \$1,200,000)	82	95
Medium (\$180,000 to \$600,000)	332	365
Small (\$30,000 to \$180,000)	1,053	1,250
	1,528	1,790

*CAPRE estimates **Mentor estimates

Table 2

MARKET SHARE BY MANUFACTURER*

MANUFACTURER	SMALL	MEDIUM	LARGE	VERY LARGE
Burroughs	12%	23%	8%	14%
Mohawk Data Sciences	2	1	—	—
Hewlett Packard	6	—	—	—
Honeywell Bull	5	14	4	5
IBM	61	52	87	81
NCR	5	2	—	—
Siemens**	1	3	—	—
Singer	1	—	—	—
Univac	5	4	—	—
All Other	2	1	1	—
Total	100%	100%	100%	100%

*Source: CAPRE, 1974

**Since this data was published, Siemens has left the Brazilian market and Fujitsu has moved in strongly, but in the main the percentages remain similar.

Table 3

BRAZIL 1976

Some earlier attempts to import specialized applications packages from the U.S. have not worked out well, even after modifications for the Brazilian environment. Brazilian observers feel that their business and industrial methods are different enough that a better approach would involve a team of U.S. and Brazilian specialists working together to create specific applications for Brazilian hospitals, Brazilian banks, Brazilian hotels, etc.

The users in Brazil have had very little experience with plug-compatible peripherals. This is partly due to the shortage of people familiar with the concept. But also, many of the major U.S. firms who sell such equipment do not yet have sales or service organizations in Brazil. The result again is a much greater dependence on the cpu supplier to provide the full system, and the subsequent support.

As a dp manager there, you would also find it difficult and expensive to recruit qualified personnel. Salaries are high, by Brazilian standards:

DP Manager, 370 Series	\$3,500 (U.S.)/month
DP Manager, System/3 Sr. Systems	\$1,400 to \$1,700

Engineer or Analyst	\$500 to \$2,000
Programmer, COBOL	\$350 to \$500
Programmer, RPG	\$300 to \$600
And fringe benefits add another 10% to these totals.	

As a user, two organizations would be important to you. One is CAPRE, the commission for coordination of dp activities. Associated with the Secretariat of Planning of the Presidency of Brazil, CAPRE's mission involves the coordination, development, and rationalization of dp usage, especially within government. Its activities include taking a periodic census of the computer industry publishing a quarterly information bulletin, and providing a technical training program.

The other important organization is SUCESU, the computer users association. SUCESU has been described as the main channel for information interchange among dp users and manufacturers. It holds monthly meetings in various cities, performs salary surveys, and is affiliated with IFIPS.

Some of its 6,000 users have expressed a wish for more deeply technical sessions than SUCESU provides, but others are content to have the opportunity to share problems with fellow users.

The future

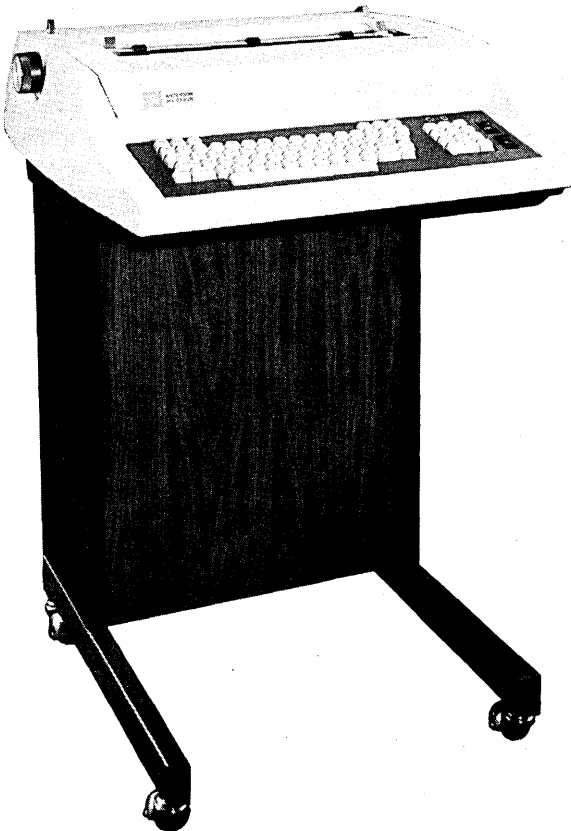
No one in Brazil doubts that the economy will continue to outperform the rest of the world. Forecasts of computer sales growth range from a relatively conservative 15% per year, to an optimistic hope that the 30% rate of recent years can be resumed.

One thing everybody agrees on—an increasing percentage of Brazil's dp requirements will be produced in Brazil. Foreign makers can choose between wholly-owned subsidiaries, joint ventures, or licenses but if they don't get "in" soon, they will find they are "out" of an important market. *



Mr. Levine is president of Mentor International, an international market research firm he founded in 1963 to assist high technology companies in developing overseas sales and branches.

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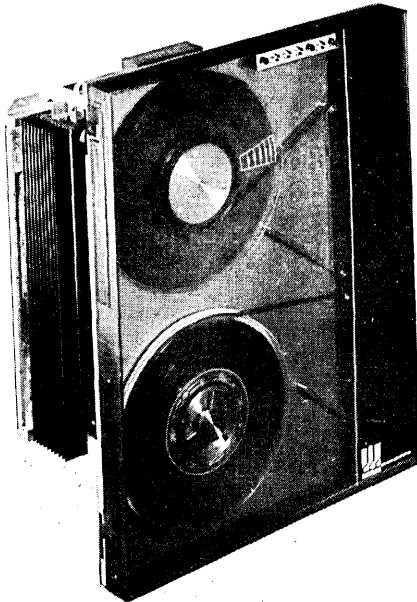
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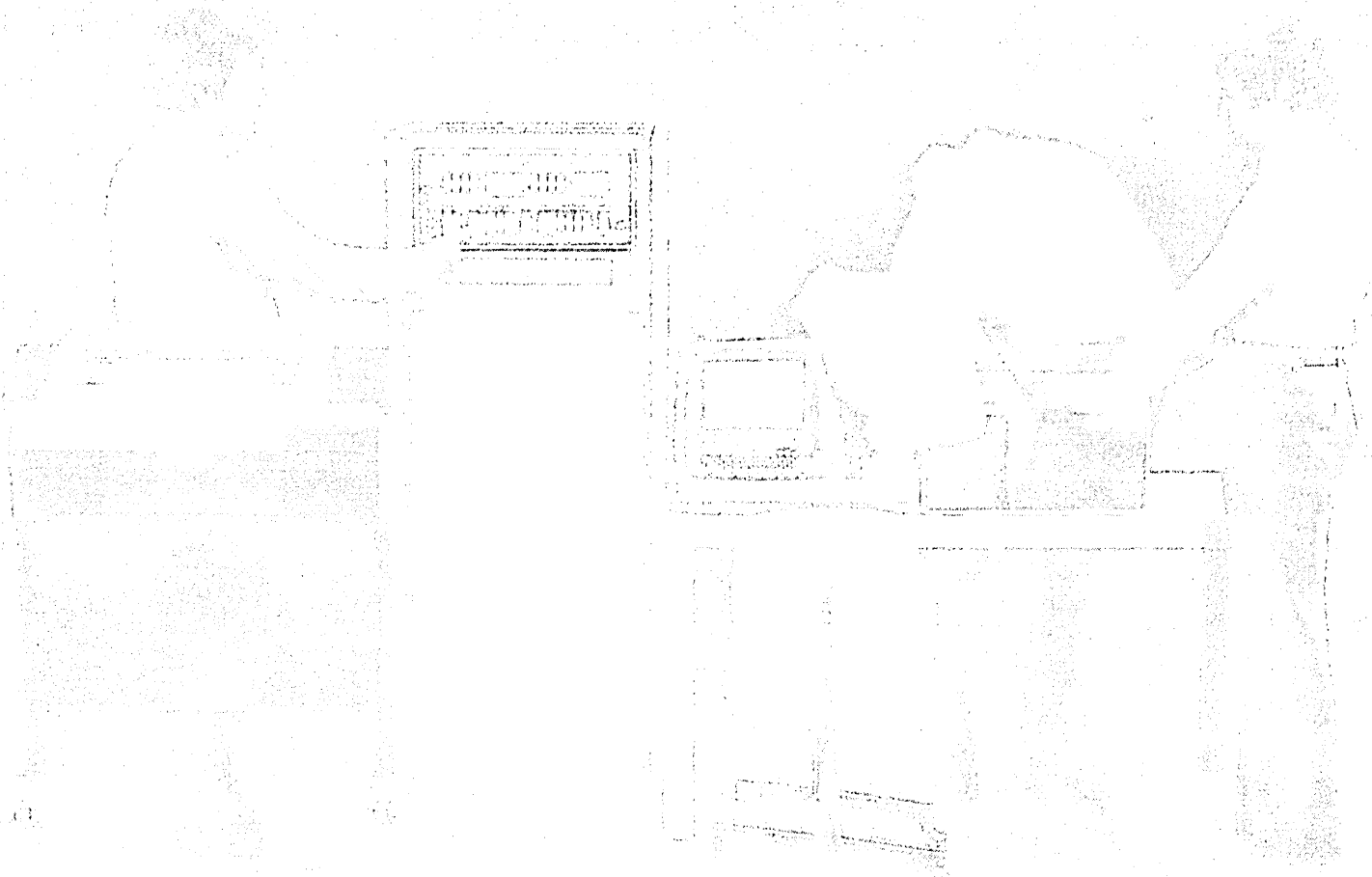
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The Communications Network Snarl

by Louis Pouzin

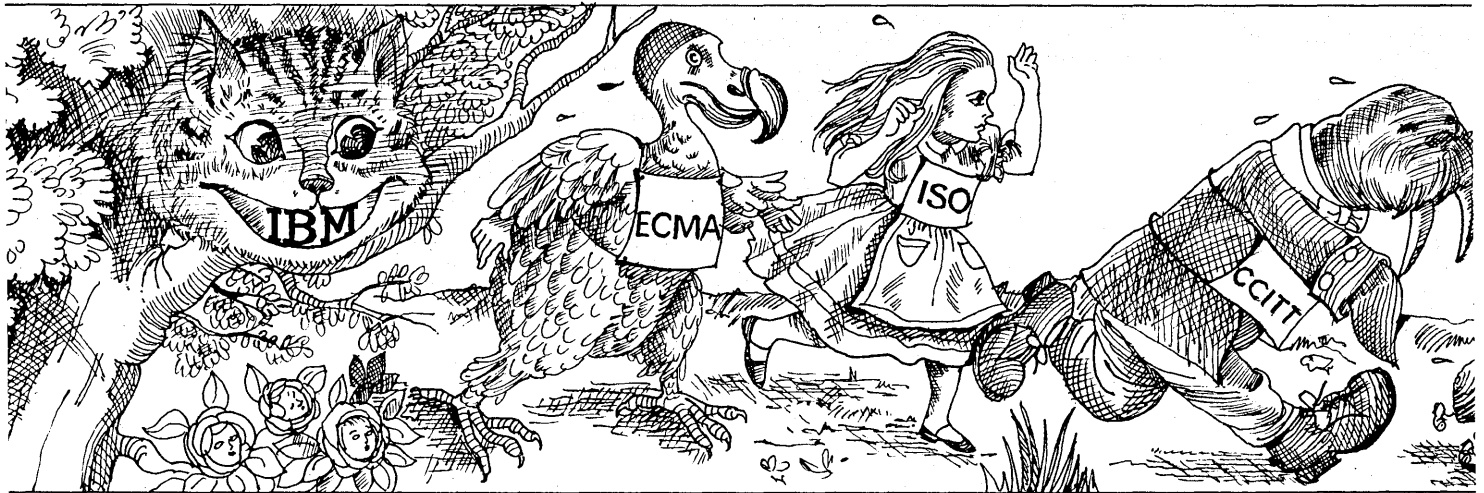
Like the flag and motherhood, no one will say "no" to communications standards—but no one says "yes" either.

It seems as though it happened way back when, but it was only in 1972 that the first network of heterogeneous resources became reasonably operational. Since then what's happened? Now, less than three years later, networks are political issues at corporate or government levels. In hush state-

fashion sizzling in the U.S., the old carriers feel it's better to play it safe and stick to the traditional business. Once the new specialized carriers have burned their fingers, the others will just pass by.

In Canada, data communications are provided by competitive monopo-

etc. At last, some experts identified wildcat networks as a serious disease, which called for prompt relief. Hurriedly they churned up antibodies out of sanitized homegrown nets, and made VANity a national sin. With new public facilities in the pipe and a bag of regulations, the situation should go



ments, communications and computer organizations leak their feelings that the other guys had better mind their own business. Since they are big, and more or less monopolies, each scrambles at shaping the world into specific designs before the others do it.

Lost in the turmoil is the user. He has no strategy, no power. He thinks the big brothers know what they're doing. No doubt, there are some who do.

Take for example our beloved friend IBM. They got hooked on the idea of getting into the communications field. And they really mean it. Are they going to market telephone services, or communications based dp services? How about both! Intelligent Bell Machines.

But what are the common carriers doing? It varies. With the antitrust

lies, say a duopoly. In Europe, national monopolies make the rules, and the difference. There are also international carriers, whose policies are mainly tied up with their mother countries'.

Wildcat networks

Away from the bloody competition of the computer industry, the carriers enjoy a legally captive customer base. At least that's what they were used to. But this brave old world is no longer the same. Raised in a permissive society, folksy people got to making up wildcat value-added networks. The network cottage industry is booming. Ads read like this: put a computer in your VAN.

To some carriers it smacks of the flu. Keep warm, stay in bed, and watch the football game. Others treat it with a strong will: it shall not be permitted,

back to normal. Or should it?

More insidious are the EVAN's (elusive value added nets), which sell dp on Main Street, communications on the back streets, or any combination of both depending on who's asking. Skirting the regulations, they are out to make multinational carriers come alive, under no government eye.

To top it all, there comes the SNARING (referring to IBM's System Network Architecture). Phase 1: let the customers have it. Phase 2: take over network management. Phase 3: Wire up the whole thing worldwide, and sell the service.

Let's play "inside-IBM," just for fun. No way to get a larger share of the market, with those darn antitrust gnomes. Thanks to incompatibilities, new terminals sell new computers. But old ones turn up on the secondhand

market, and that's bad. Why don't we keep all that gear and take a swing in the service business? They couldn't sue us for awhile. If other computer makers wither out, it's their fault then, since we've left them alone. And once the EVAN's have squeezed the last cycle out of their hardware, what will they do? Well, think.

Forgetting about IBM's Jaws, one thing remains: networks expand so as to fill the territory available to them. This is indeed a recent extension of the famed Parkinson's Law. In recognition of this observed phenomenon, network strategists keep busy. Geographical borders being pretty much frozen, one might think there is nothing left for national monopolies to worry about. Not quite, some prods keep them on their toes.

Private nets? Oh yes, they are legal. And embarrassing, if only because they tend to grow large enough to become potential private carriers. Since they are on vantage ground in skimming traffic, the game is to juggle line tariffs so as to force them out, once public nets are operational.

International traffic is a money-maker. The next decade should send it

handful of them.

Wherever he turns, the customer is cornered by salesmen of brand X or Y. Reputedly, competition is for the benefit of the customer. There is just one hitch: network X is definitely not compatible with network Y. As soon as the contract is sealed, the customer is SNARED. For how long? Networks don't die.

As we know too well, common carriers are old hands at working out international agreements. One can call almost any phone in the world, and very often hear the other party. But for some reason TWX and TELEX are still on cool terms. American and European modems don't make it together. But given time and patience, it will certainly be fixed.

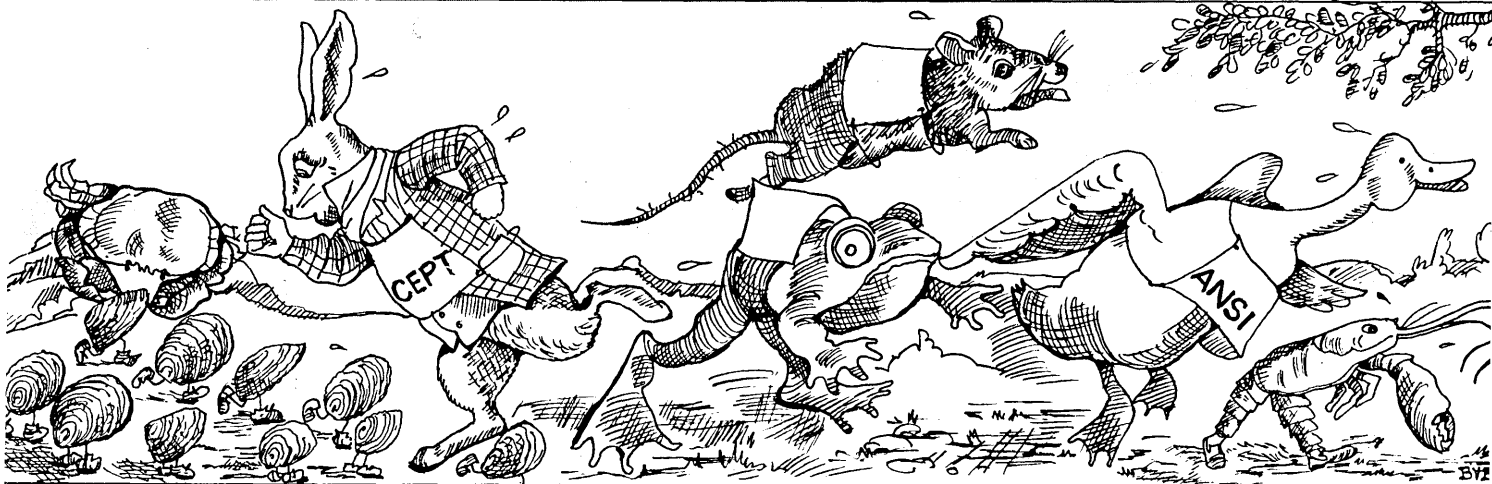
The computing world is a bit different. EVAN's or computer manufacturers are very careful to spare the customer any kind of interface problems he would face in going to a competitor. Obviously, the best way to protect the customer is to have incompatible systems, languages, protocols, terminals, etc. This means a stable customer base, planned obsolescence, and more predictable revenues.

ing gradually to a homogeneous set of hardware and software. Does that mean standards, or monopoly? It looks as if we have no other alternatives.

Let's go make standards

Standards are like the flag and motherhood. We should have some, shouldn't we? Benefits are obvious: the customer would retain a permanent freedom to select products he feels more suitable to his needs, whether new or old, brand X or Y, as long as they come with standard interfaces. Small manufacturers would be able to sell components of heterogeneous networks. So let's go make standards.

The problem is there is no worldwide ministry of standards. Instead, a maze of organizations—representing professions, nations, continents—attempt with mixed success to gather a consensus for claiming a piece of the action. In the area of data communications, most large organizations have come to work out their private standards, usually derived from their specific applications, e.g. World Weather Organization (wwo), International Civil Aviation Organization (ICAO), International Airlines Transport Asso-



skyrocketing. Competition is going to rage between carriers to lure in packets flying over. Not much different from airlines. Are we going to see charter nets spruce up and carry data at rock bottom tariffs?

EVAN's are the real threat. Nowhere is there a clear border to fence them out. They don't challenge data carriers. They just dissolve the boundary between communication and processing. Isn't communication a limited form of processing, after all? Even though the carriers will probably protect their monopoly, end users will rely on EVAN's for all practical purposes. Then who will carry the day?

In case EVAN's don't really make it, we are left with a crowd of private nets, small and large, for dp applications. Where will customers get them from? Computer makers. Hardly a

As long as the market penetration is relatively insignificant, every species of network will probably succeed for a while, assuming an adequate capital supply. In this expansion period, customers will still be restricted to limited scale resources. Since they have always been captive of their communications service supplier, they probably will take it lightheartedly. A second period should follow, mainly geared to milking netted customers with new services, improved terminals, large scale interconnection. That's consolidation.

In our advertising-oriented society, getting more, farther, faster, is taken as desirable, therefore salable. Networks are already a communication tool for corporations. They are becoming an essential link with the customers. In the consolidation period, worldwide access and compatibility will sell, lead-

ciation (IATA). They had no other choice, as no suitable standards were available.

At the world level two organizations dominate the official standard scene: Comité Consultatif International Télégraphique et Téléphonique (ccITT) and the International Standard Organization (ISO). The former is the technical arm of the International Telecommunications Union (ITU). The latter is a federation of national standardization bodies, such as ANSI in the U.S., and AFNOR in France.

ccITT and ISO fix their common boundaries. As representing primarily common carriers and PTT's (Post, Telephone, and Telegraph organizations, the national institutions which supply both Post Office and telephone services in Europe), ccITT is responsible for matters pertaining to data

NETWORKS SNARL

transport. Practically speaking, ISO is controlled by manufacturers who are concerned with interfaces between public data communication facilities and their own products. At times, subjects are so intertwined as to make boundary-setting an exercise in hair-splitting. As no single authority is in position to cast tie-breaking votes, these organizations have developed a good neighbor policy over the years. Members of CCITT are active in ISO, and vice versa.

In Europe, two other bodies are directly concerned with data communications. One is Commission Européenne des Postes et Télécommunications (CEPT), the other is European Computer Manufacturers Association (ECMA). CEPT is what it says: European PTT's. It is not known *officially* within CCITT circles, except that the same people are in both organizations. ECMA is also what it says, i.e. IBM, Honeywell, Univac, and Burroughs, as well as ICL, Siemens or Philips. Positions taken by ECMA reflect ANSI's or DPMA's.

National organizations like AFNOR are also stuffed with ECMA or CCITT people who make sure that ISO is receiving only sensible suggestions. To sum it up, a limited number of traveling commissioners heartily celebrate the anniversaries of the happy standard family. The only grey spot is that we have no standards.

Well, not quite true, thanks to another active group, often called De Facto. In other words, wait and see what IBM is doing. No wonder, what IBM is doing is good for IBM. It may be good for others too, like GE, RCA or Xerox.

Where's the user?

A noticeable absentee from the standard scene is the user. Obviously, he is not needed, since his interests are the major concern of everyone else. He tends to think this is none of his business since experts upstairs know better than he does. There should only be happy users.

In case some users are not so happy, they may feel helpless in the face of the big-timers. Indeed in the standard Who's Who, what counts is power, not ideas. Nevertheless some historic accidents may be worth pondering. COBOL and CAMAC (standard interfaces) have shown how muscle and determination can bring manufacturers to compliance. Were the U.S. Navy set to define its own standards, say USNA, what would happen?

The arguments for not setting standards go something like this: Standards

are not mature. It's too early. And so on. Unquestionably, not all standards are mature. But enough experience has been accumulated for some standards. The best evidence is that IBM, Univac, Burroughs, DEC are busy making commercial products on their own standards which they are not going to give up. PTT's and common carriers are putting up national networks, but international communications require standards, don't they?

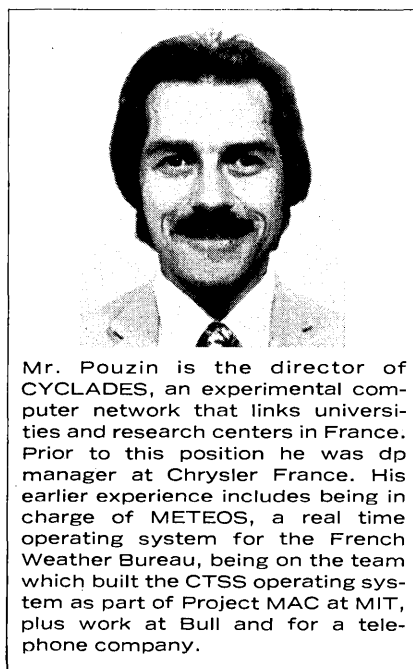
Complete compatibility between any kind of equipment, operating systems, and data carriers, is not likely to happen soon, or ever. But a few basic levels of commonality are desirable and feasible:

1. line procedure
2. packet format
3. end-to-end protocol
4. virtual terminal
5. file transfer

Various other standardizable services should follow: getting help, job status enquiry, data retrieval, etc.

Here is where we stand near the end of 1975: a line procedure, HDLC (High Level Data Link Control) is practically standardized by ISO as a syntax. Practical implementations are yet undefined. A working group (WG 6.1) of IFIP has proposed a packet format and an end-to-end protocol. But IFIP power is only intellectual. And a small group of carriers is attempting to force a "virtual circuit" protocol through CCITT. The remaining items are still at an early stage of discussions within informal groups.

Hardly a landslide. Not even impressive. Isn't it possible that networks are too vital for the economy to be left in the hands of standard officialdom? *



Mr. Pouzin is the director of CYCLADES, an experimental computer network that links universities and research centers in France. Prior to this position he was dp manager at Chrysler France. His earlier experience includes being in charge of METEOS, a real time operating system for the French Weather Bureau, being on the team which built the CTSS operating system as part of Project MAC at MIT, plus work at Bull and for a telephone company.

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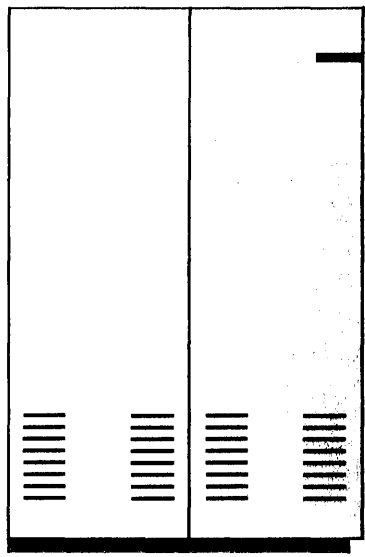


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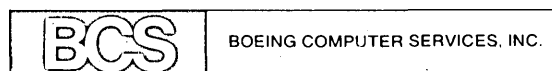
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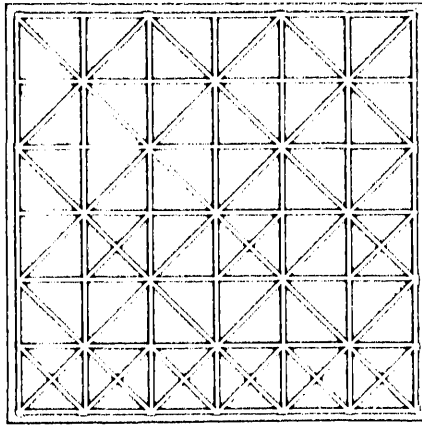
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Languages for Reliable Software

by Jacob Palme

Features can be built into languages to enhance the reliability of the programs they produce.

Programming languages can aid in guarding against two factors of unreliability: (1.) faulty or unreliable software, and (2.) careless or malicious programmers.

One way of getting more reliable software is to check and test every item of the program thoroughly. But no software except very small programs can ever be completely checked and tested. We must therefore design software so that

1. it is easy to check and test, and
2. it checks itself when used so that errors both in input data and within the program are discovered before much damage is done.

The checking and testing of software is done by computer, by humans, and by humans and computer working together. Computer checking can be done either at compile time or at run time. Checking at compile time can be cheaper, especially for programs to be used in heavy production work, but run time checking is often necessary and worth its cost. Note that even with interpretive systems, much checking can be done before run time to avoid run time overhead.

A strong argument for compile time checking rather than run time checking is that the latter may come too late to avoid a catastrophe. One could draw an analogy between compile time checking and preventive aircraft maintenance, and between run time checking and flight recorders.

Computer hardware today is often

designed in a way which makes run time checking unnecessarily costly. Microprogramming and new hardware may therefore make run time checking more profitable in the future. (Suggestion: Introduce a "defined" bit associated with each word in the memory to avoid unintentional use of undefined words).

What kind of software is easy to test and check for both human and computer? To check a program, both human and computer must grasp the flow of control and of data in the program. This is much easier to do if the program and data are divided into modules with a small defined interface between them. A programming language can be designed so that the compiler helps to ensure this modularity. (This will be discussed later.)

Language restrictions

If the compiler and run time system are to be able to detect programming errors, some restrictions on the programmer are necessary. A language system with good facilities for automatic error detection must have many restrictions. In fact, the ideal programming language for a given task would be one which allowed only those constructs necessary for the given task and nothing else!

A simple example: in many applications calculations are made with data which can only take certain values. Mass for example can never be nega-

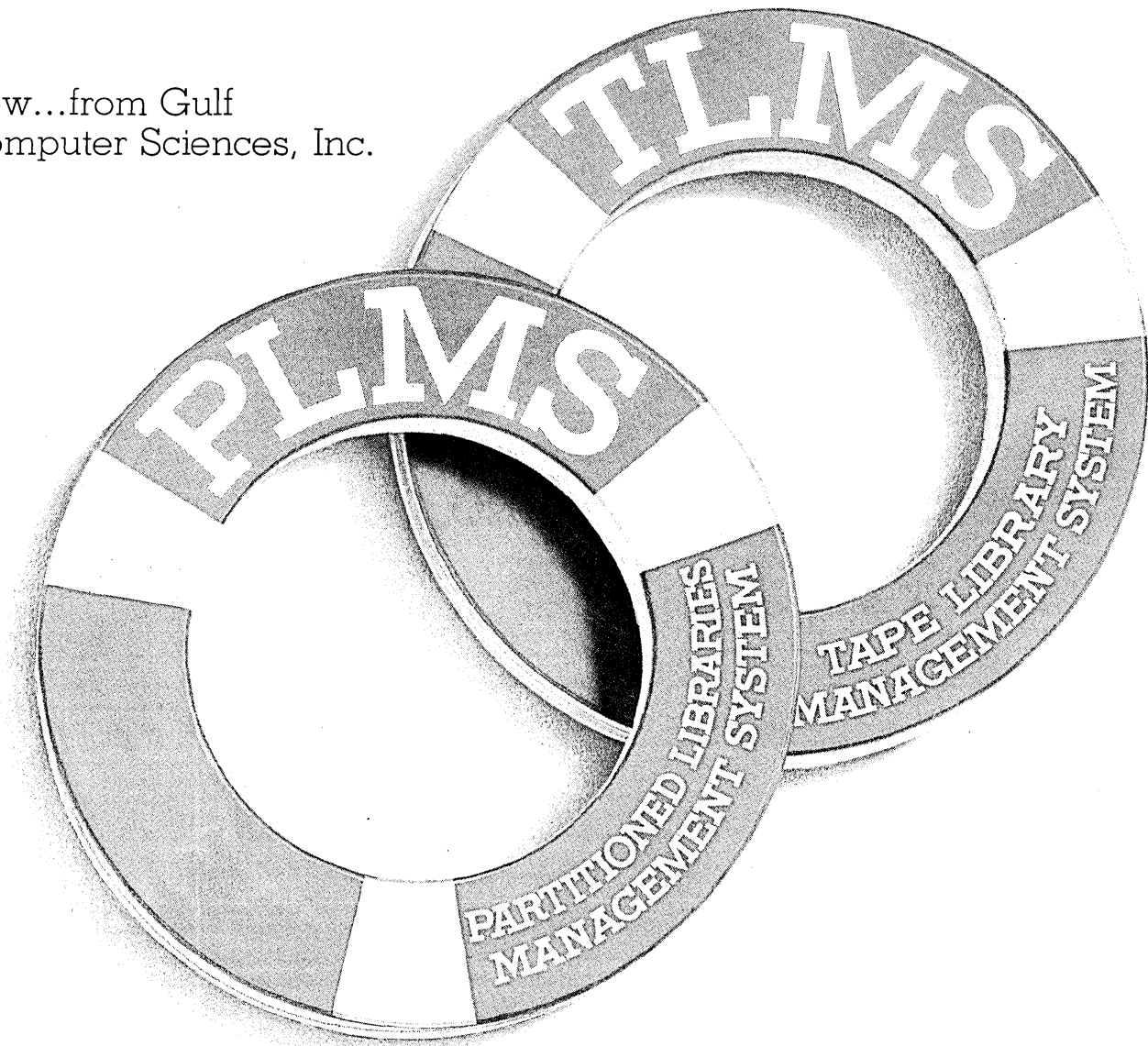
tive; the contents of a container must always be between certain lower and upper limits. In most existing programming languages, REAL variables are used to store such data. But REAL variables can be negative. However if only POSITIVE REAL variables were allowed, then the compiler and run time systems could detect many programming errors.

Allowable constructs would vary from application to application. Therefore there must be a way in which the language can be matched (i.e., restricted) to the application. In the earlier example this would be done by constructs in the language to create new data types like POSITIVE REAL, OR REAL BETWEEN 0 AND CONTAINER CAPACITY.

As another example, suppose we wish to introduce the new data types RECTANGLE and CIRCLE. A rectangle is defined as an object which has the properties *width*, *length*, and *area*. A circle has the properties *radius* and *area*. The programmer must then be protected from making the error of finding the *radius* of a rectangle. And this checking should be done at compile time.

On the other hand, there may be a need for a programmer to refer to an object which is sometimes a rectangle and sometimes a circle. In most languages (like ALGOL 68 or CS-4), this requires a run time check every time it is used to see if it is actually a circle or a rectangle since both have this proper-

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ty area defined.

In SIMULA 67, a construct is introduced whereby certain types (in SIMULA called classes) can be extensions of other objects in a way which avoids these unnecessary run time checks. In SIMULA, you first define the class *plane object*, and then define *rectangle* and *circle* as extensions of the class *plane object*. Rectangle can thereafter be further refined, for example into the extended concepts *floor* and *ceiling* of a room.

This method not only makes much more of the checking possible at compile time, but also is a very natural way to structure a program. A basic geometric package may define rectangles and circles, and a building extension of the package may define floors and ceilings. Different modules of the program may define the geometric concepts and their use in a particular application area.

Those checks which must be made at run time should if possible be explicit to the programmer. For example, trying to use an ordinary integer as index to a limited vector is actually a case of implicit type-conversion from an ordinary integer to an integer limited to the vector range. Such conversions would require explicit conversion statements in the program.

As another example, if there are several cases, with different actions legal in each case, then a statement like the INSPECT of SIMULA or CASE of PASCAL introduces an explicit run time check. In SIMULA, the compiler also checks that the code written into each case is actually legal for that case.

Undefined constructs

In many programming languages, there are certain program constructs which can sometimes cause "undefined" results, and unpredictable things may happen at run time. A programming language giving high reliability should of course avoid such undefined constructs.

In many languages, the use of a variable which has been allocated but not initialized gives "undefined" effects. There are two ways to avoid this. One is to enforce initialization of all data at allocation time (this is done in SIMULA and CS-4), and another is to check at run time that every variable used has been given a value. The latter method is very costly on most existing computers.

Another undefined effect in many languages is misuse of a pointer (reference) variable, used as if it pointed to something, although it does not. Such errors often cause the whole program

to run wild and crash. PL/I and TACPOL have bad protection against such errors. But even ALGOL 68 and CS-4 can have such errors. In ALGOL 68, a pointer can be made to refer to a field which is deallocated when a block is left. Thereafter, this pointer refers to something undefined. In CS-4, the free statement can be used to deallocate something that other pointers still refer to. Only a very costly run time check can avoid such errors.

Protecting program modules

Another aspect of reliability has to do with modularity. In a programming language to be used for large program packages, there is a need for a mechanism whereby the program package can be divided into modules with defined interfaces, and another mechanism to ensure that the communication between the modules conforms to this interface.

We regard it as natural that an operating system should check requests put on it from user programs, and that an interpreter should check commands to it. We are requiring more and more that application packages check how a program uses them. In large complex systems, the code to do all this checking, mostly at run time, is large and time-consuming. We would thus gain not only reliability, but also efficiency, by moving this checking into a pre-execution compiling stage.

Requirements on such a system might be:

1. The modules should only communicate through the defined interface.

2. All data transmitted between modules must conform to data definitions.

3. A module must be able to keep some of its parts hidden from the outside, so that other modules cannot access those parts directly.

4. The programmer's freedom should not be unduly restricted, thus a module need be not only a procedure, but also a data structure, or a data structure combined with a package of procedures. Not only single variables, but also data structures must be transferable across the module interfaces.

5. Several modules must be combinable to a higher order module which looks from the outside like a single protected module.

6. A module should be separately compilable.

7. As much of the security checking as possible should be done at compile time, since at run time it is inefficient and often cannot give such readable error diagnostics as at compile time.

Many existing language systems have very bad module protection. An example is most FORTRAN systems. A

module in FORTRAN can be either a static data block (the COMMON block) or a subroutine. The only parameters transferable to a subroutine are single variables, arrays, or subroutines. Most FORTRAN compilers do not check the consistency of COMMON blocks between modules, nor do they check the parameter types between calling and called module. This is a very common cause of difficult-to-find programming errors in FORTRAN.

Most ALGOL systems have better protection, but usually the only separately compiled module allowed is a procedure, and only variables and arrays can be transferred to it. The parameter type checking at calls to separately compiled procedures in ALGOL is usually done at run time, which is slow if much data is to be transferred to a short routine.

A basic requirement for security is the module protection between the high level language and the machine. If this protection does not work, then any programmer can intentionally or by mistake use the deficiencies to get around the protection.

A simple example: if a programmer is allowed to index an array outside the array bounds, he can in this way address parts of the computer memory which should not be available to him, or which should be available only through the protected interface gates between modules.

Most PL/I and FORTRAN systems have very bad protection for this. A programmer can very easily—intentionally or by mistake—address memory in illegal ways, not only by exceeding array limits, but in PL/I also by misusing list structure pointers, which is even more dangerous.

To test this I wrote a typical list structure application program and introduced five typical small programming errors. The IBM PL/I Optimizing system could only diagnose one of the five errors correctly. For the other four, the program ran wild. When it was finally stopped, it was trying to read or write in the operating system believing this to be part of the user program data area.

The four constructs which caused PL/I to run wild were:

1. Trying to deallocate data, and thereafter continue to use it;

2. Trying to look at a data structure as if it had been another, different data structure;

3. Making mistakes when trying to look at the similar parts of two partly similar data structures.

4. Trying to use an integer as a pointer.

When the same program was written in SIMULA 67, all errors were discovered immediately by the compiler. The

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reason why SIMULA 67 gives good security is that the language is designed in such a way that a program containing illegal constructs is discovered immediately, usually at compile time. Each data structure element has to be defined in SIMULA, and the compiler checks that the element is used in the correct way. If a user tries to use an integer variable as if it had been a list structure pointer, then this is stopped at compile time in SIMULA while the error often cannot be found even at run time in PL/I except with special restricted checkout compilers.

This experiment shows that a programming language standard should not be a permissive one. A permissive standard only requires that the compiler treat correct programs in a correct way. In addition the standard must require that the programming language system reject all programs which are not legal. Basically, the computer should appear to the programmer as if it communicates only in the high level language. The programmer should never need to know that there are lower levels, and all errors should be discovered and diagnosed at the level of the high level language. SIMULA and a few other programming languages satisfy this requirement.

Interrupts and parallel processing

Certain programming languages include ways to cope with hardware or software interrupts caused within the program or from the outside. These constructs may be necessary for certain applications, but they are not good from the reliability viewpoint. It is a well-known fact that wide-ranging GOTO-statements are dangerous because they leave the normal flow of control in a way which is difficult to check. Interrupts are even more dangerous, because they leave the normal flow without even any explicit GOTO statement. An interrupt may occur for example inside a sequence of statements updating some data which has been only partially updated. If the interrupt routine changes the data being updated, then when the updating is resumed, dangerous things can happen.

If interrupts are at all allowed within a programming language, their use should at least be as restricted as possible. Some languages, for example PL/I, TACPOL, CS-4, include the ON CONDITION construct which may encourage programmers to use interrupts where they are not necessary.

Certain languages contain facilities to allow several processes to run simultaneously, as if part of the program

was executed on several asynchronously running cpu's. This is very dangerous from a security viewpoint, if two of the processes simultaneously update the same data.

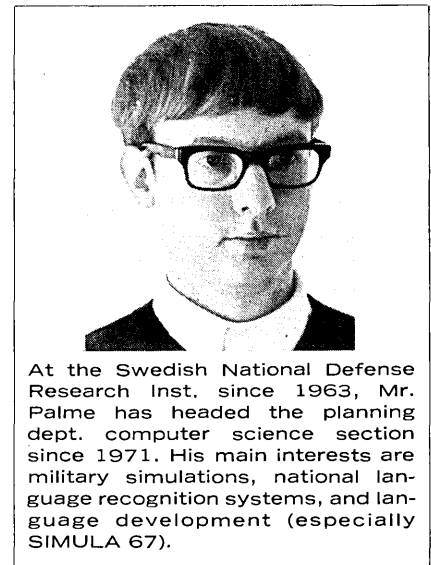
The idea of two asynchronously running processors is a typical example of something undefined. The order of execution of the statements in the processes are undefined. And as has been said, undefined constructs in a programming language are bad for security.

If a program is actually only going to be executed on one cpu, then there is no need for parallel processes in which the order of execution is undefined. One can as well use quasi-parallel processes, as is done in SIMULA, where the order of execution is defined in the language, and where control can pass from one process to another only at points in the program where this is explicitly stated.

If the program is to be executed on several cpu's, then the program should be organized so that as little data as possible is accessible to processes on both cpu's at the same time. This is possible if the data in the language can be divided into data modules in a way which makes it easy for the programmer to regulate which program modules have access to which data areas at which time.

Conclusion

Reliability requires that the constructs of a programming language do not cause undefined effects, that the compiler is not allowed to make assumptions of what a programmer means, that a programmer is allowed to further restrict the constructs and the module interface, and that the compiler is made to do most of the checking, even of programmer-defined restrictions. *



At the Swedish National Defense Research Inst. since 1963, Mr. Palme has headed the planning dept. computer science section since 1971. His main interests are military simulations, national language recognition systems, and language development (especially SIMULA 67).

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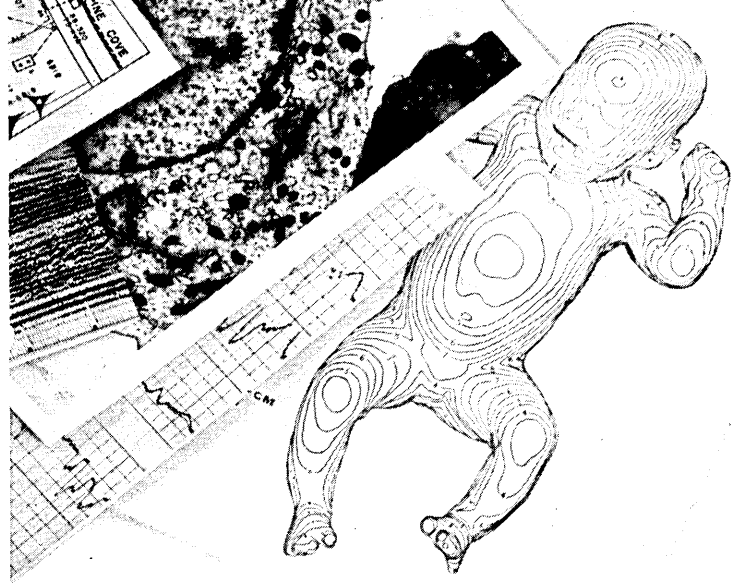
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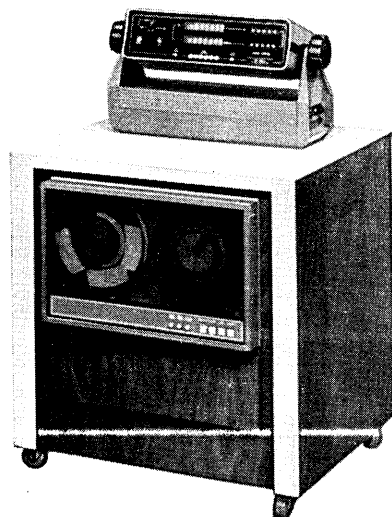
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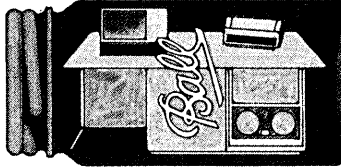
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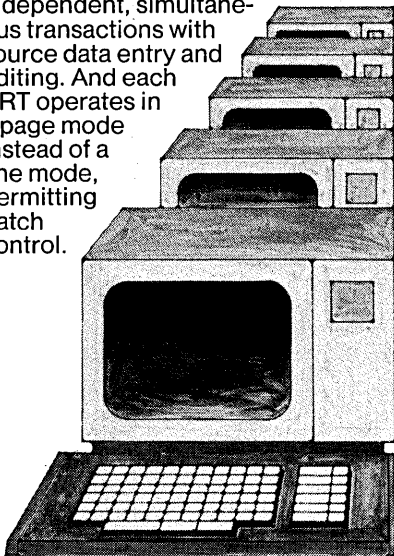
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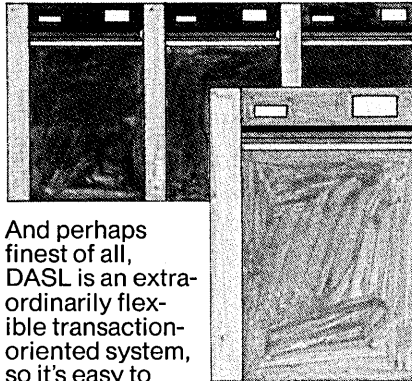
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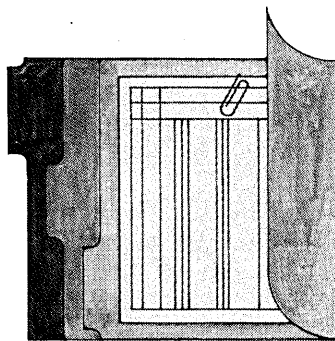
DASL has over 250 commands, supports up to 400 MB of on-line storage and utilizes an efficient and powerful ISAM file access technique.



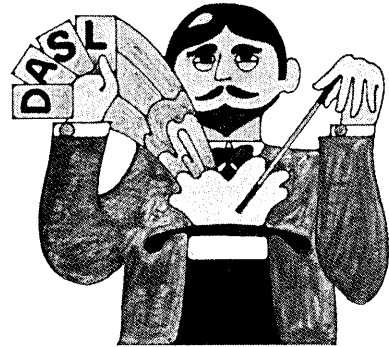
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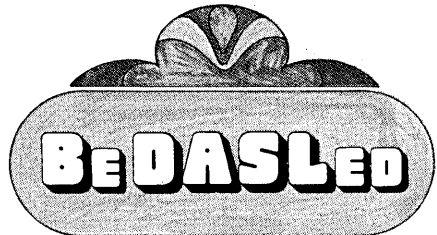
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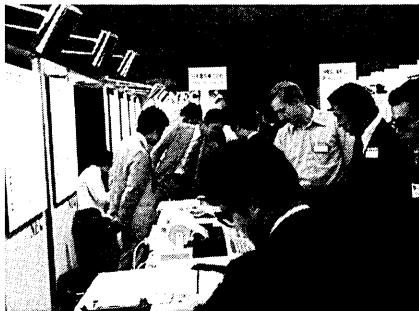
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2nd U.S.A.-Japan Computer Conference

Microprocessors reared their pointy little heads at exhibits, while more esoteric computer science subjects dominated the technical program of the Second U.S.A.-Japan Computer Conference, in Tokyo, on August 26-28, 1975.

A commuter ticket issuing system by Oki Electric Industry Co., Ltd. stole the show at the exhibition. A person keyed in his name (for identification) and birth date (for fare computation). Then, pressing a key for the point of origin caused a bank of displays to cycle around to the fares for all destinations. Selecting a destination then caused a ticket to be printed, which before it saw the light of day had been laminated in plastic. Always a line of souvenir seekers.

Panafacom attracted interest with its 16-bit microprocessor. Nitsuko showed a service station POS system. Other companies displayed wares such as printers, minicomputers, a liquid crystal display, LSI components, etc. Intel Japan was prominent, but for slick marketing IBM Japan took the



prize, with bilingual promotion of time-sharing services and 37XX devices. In all, there were about 30 exhibitors.

The technical program featured recent work in computer science and innovative computer applications. Most of it was real-world, but Stanford Univ. was represented by James Moorer who is researching transcription of musical sound by computer and by Ed Feigenbaum who taught how to find Koala bears in eucalyptus trees. The theme for the technical program (and generally for the conference) was the bi-national exchange of information on disciplines of common interest.

The technical sessions were well attended, partly because the continuous bilingual translation (via portable receivers) worked very well. The conference also featured a people-to-people program, a social program, pre-conference symposia, and post-conference technical tours. The NHK (public) Broadcasting Center tour, for instance,

included coffee (or tea) and petits fours, and a close-up look at the videotaping of Japan's most popular soap opera, in addition to the technical stuff.

The conference was attended by about 150 from the U.S. and by almost 900 from Japan, the total of over 1,000 being about the same as for the First U.S.A.-Japan Conference two years ago.

The conference headquarters was the Tokyo Prince Hotel, also the site of the exhibits and sessions, and home base for part of the American contingent. Tourist class travelers stayed at the Imperial Hotel, also a first class western style hotel, which probably has the better shopping arcade and is within walking distance of the restaurants and stores of the Ginza district.

While the conference itself ran August 26-28, the travel arrangements from the U.S. covered August 18-30, so much vacationing was accomplished. Those who left Tokyo early for the hinterlands fared well. Particularly if they tried a Japanese Inn. However, several people attended pre-conference symposia August 20-22 and left for Kyoto Saturday the 23rd, only to spend the day in the Nagoya train station when the Bullet Train service was stopped by a typhoon.

The language barrier occasionally is a problem, but English is the second language in Japan and the people are very helpful, sometimes giving you directions when all you want to do is stand and look. In any case, you'll never starve, as you can always go into a restaurant, drag a waiter out to the display case, and point at what you want.


Japanese drive on the left side of the road, so forget about renting a car. Taxis work fine. Half of the Tokyo car population is taxis. The subway/train system is good but not trivial for foreigners. Honda and Kawasaki must export all of their big bikes, as the only big machine seen was a Harley ridden by a Ginza traffic cop.

Eventually, you may tire of shrines and temples, but not of the pleasure of being able to walk any street of the world's largest city, at any hour of the day, and not worry about getting mugged.

—F. John Postas


Now an independent consultant working on a message switching system related to electronic funds transfer, Mr. Postas' previous experience includes several years in design and programming for Compata, Inc.

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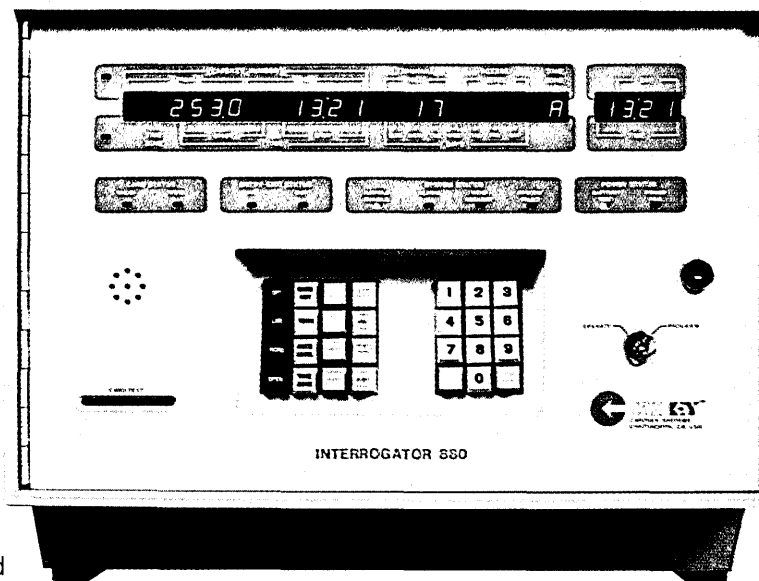
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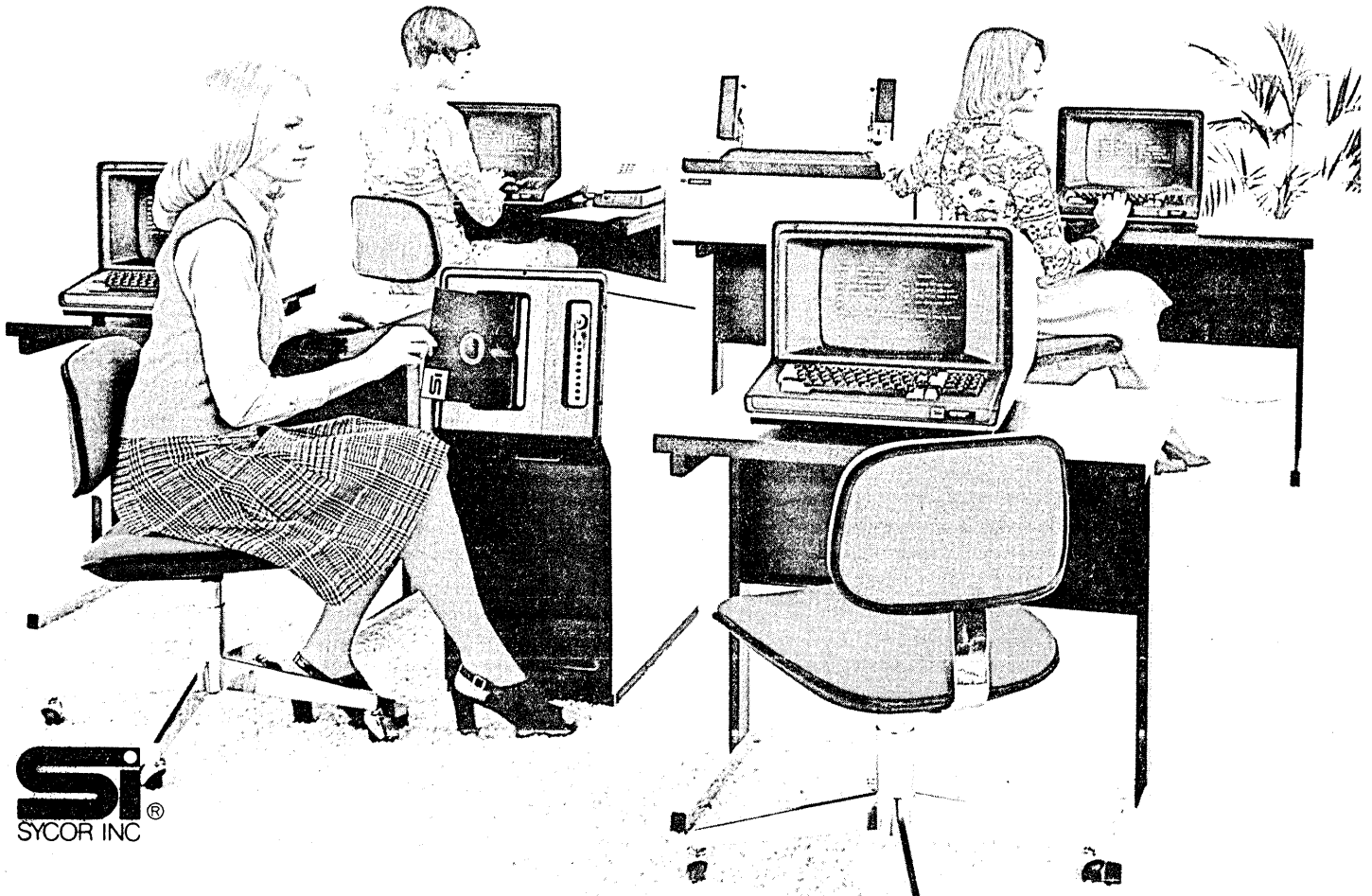
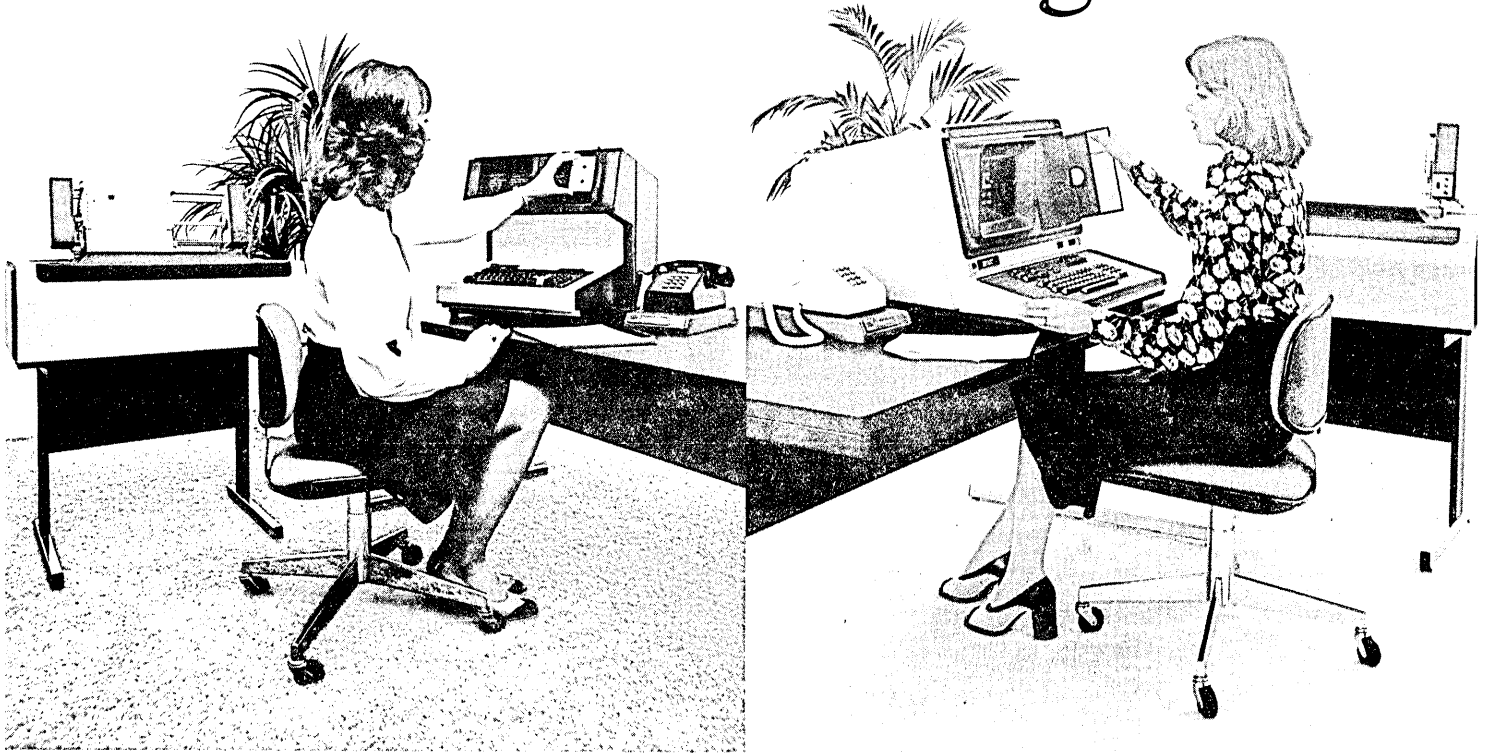
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115327	5/30/75	PRO		21441		3,990.81	3,990.81
115328	5/30/75	PRO		21442		2,491.71	2,491.71
115329	5/30/75	PRO		21443		88.52	88.52
115330	5/30/75	PRO		21444		2,627.48	2,627.48
115331	5/30/75	PRO		21445		530.37	530.37
115332	5/30/75	PRO		21446		7.60	7.60
115333	5/30/75	PRO		21447		120.00	120.00
115334	5/30/75	PRO		21448		102.04	102.04
115335	5/30/75	PRO		21449		1,502.98	1,502.98
115336	5/30/75	PRO		21450		116.11	116.11
115337	5/30/75	PRO		21451		286.95	286.95
115338	5/30/75	PRO		21452		1,648.98	1,648.98
115339	5/30/75	PRO		21453		341.94	341.94
115340	5/30/75	PRO		21454		1,943.03	1,943.03
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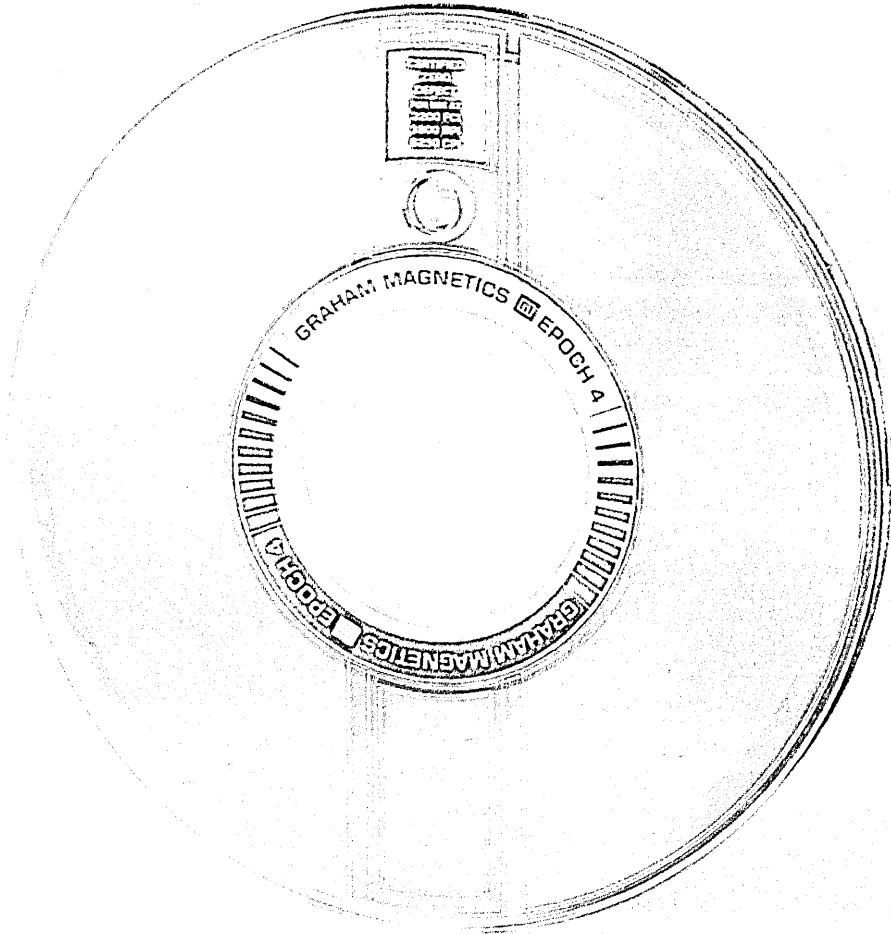
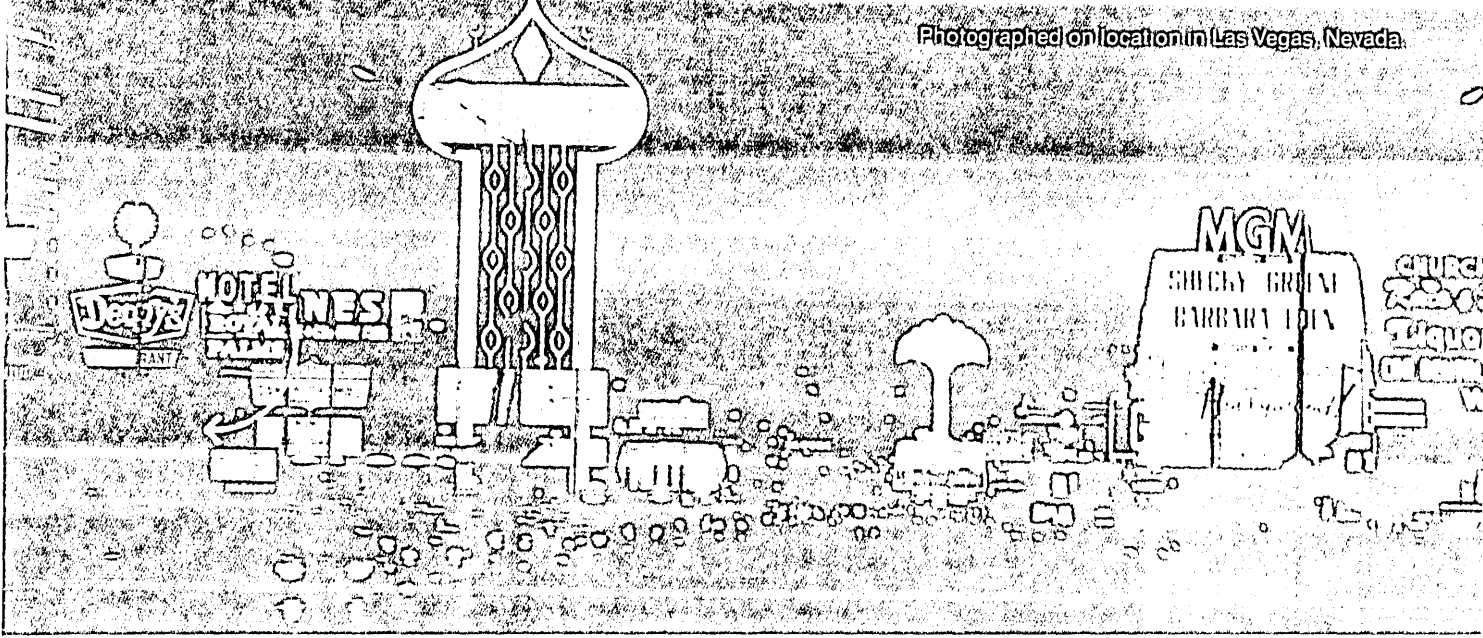
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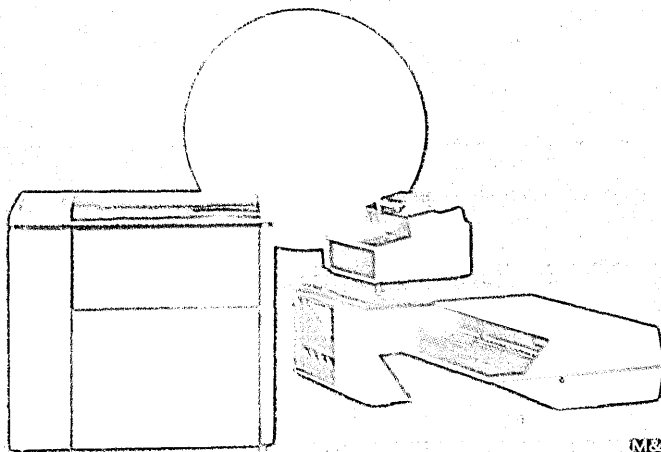
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The 1970s: A Period of Pause and Appraisal

by Edward K. Yasaki
Senior Associate Editor

We are on our way to technological goals which we aren't certain we want to reach.

The decade of the '50s saw an ascendance of such physical technologies as space exploration, nuclear power, computers, and communications systems. The '60s brought to the fore social technologies and the mistaken belief that social problems could be solved by the application of earlier technologies. "All we needed were more and better analysts, more modeling, more programming," says Roy Amara, president of the Institute for the Future, Menlo Park, Calif.

Amara says maybe the '70s will be

seen as a period of pause and appraisal.

Reasons for such a pause and for concern on the part of scientists and technologists alike were advanced by speakers at the recent International Conference on Cybernetics and Society in San Francisco (Sept. 23-25), sponsored by the IEEE Systems, Man and Cybernetics Society.

In a session titled "Technology and Goals: 1975-2000," chaired by Louis Fein, Willis W. Harman of Stanford Research Inst. observed a growing challenge internationally to the legitimacy

of science, technology, commerce, and even to many aspects of government. He cited Third World demands for a new international economic order, saying, "It's pretty clear what that means . . . a suspicion has developed that somehow the system has divided us into the screwers and the screwees. And it's getting to a conflagration point."

Leadoff speaker Amara said the '70s will not be characterized by pessimism, but neither will we be as naive as in the last two decades, thinking that technology can be used to solve social ills.

A SWEEPER CART, SOME SPARE PARTS, AND A MICROPROCESSOR

Two experimental computer-controlled mobile robots, under development at the Universities of Wisconsin-Milwaukee and at California-Berkeley, were described at the conference on cybernetics and society. Both are in the form of carts, rolling around on wheels, and both are being fitted with an arm and a camera eye, as well as a communications transmitter/receiver.

The Wisconsin robot, named Ralph, has been operational and, by this month, should possess a six-degrees-of-freedom arm. It receives commands from a human operator through a 48K Modcomp 225 minicomputer that, in turn, communicates with an onboard Motorola 6800 microcomputer. The latter, in addition to serving as a communications interface between the robot and the operator, can also override human commands when those instructions overlook the presence of some physical barrier that could result in damage to the machine. There are onboard sensors

that detect these things, transmitting this information to the operator.

Ralph, made from scraps and donated parts, stands but three feet tall, a mere 18 inches in diameter. The latest arm, a second attempt, cost only \$125 for the parts. For visual sensing, there's a diode matrix camera that's to be fitted with a digital memory so that scenes can be stored and transmitted to the mini at low bandwidth rates.

The authors of the paper on Ralph, Neil Leverance and Richard Northouse, say that robots with "a sufficient level of autonomy" do not exist. They add: "A general purpose, completely independent, sophisticated robot does not appear to be immediately realizable."

Jason, the UC-Berkeley robot, is a few months shy of completion, if any university robot can ever be described as completed. Here again low-cost, donated parts are being used, but they include a donated solar panel for experimental use

outdoors. More recently they also obtained an electrical sweeper, the chassis of which might be used for a Jason-like robot that operates in a factory warehouse environment.

With both Ralph and Jason, one of the ideas is to study the possibility of a robot operating remotely from its operator, even though the two may be separated by some type of hazardous environment. Jason has a microcomputer that handles this telemetry, and has been designed to interface to almost any remote computer. To date, the friendly fellow has been connected to an HP-3000, CDC 6400, a PDP-10, and to the ARPA network.

But plans are to fit Jason with a multi-cpu microcomputer with interleaved memory, 32K bytes of memory, plus a tape cassette. It would handle simple control problems as in navigating and avoiding obstacles, as well as some speech recognition. There also is to be an onboard CCD camera. *

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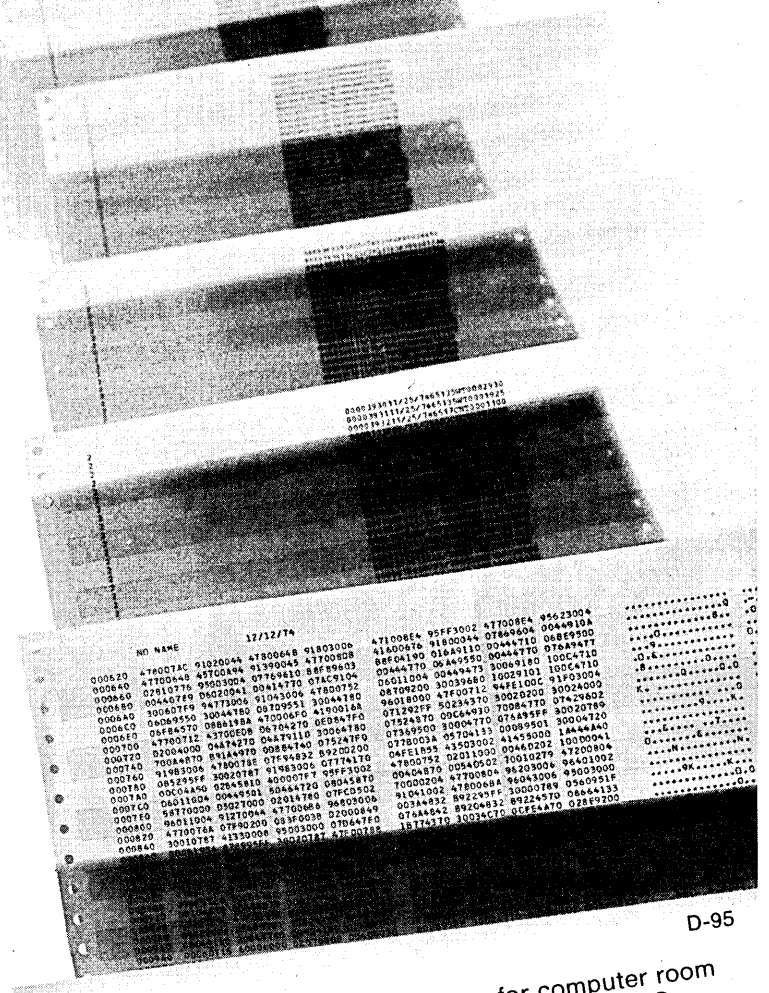
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000236	04F8450	084118A	4700060	417001A	9601800	47F0012	44E100C	93F0304
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THE 1970s

But he said dozens of critical issues have arisen. He chose to talk about four of them.

Technology and social ills

In developed countries, he said, technology has contributed to a great deal of alienation by opening up a variety of choices for values and goals while also creating uncertainty about those same values and goals. We are also confronted with a fast rate of change in society, he added. The question raised is whether we can continue to develop and use technology while also minimizing these effects.

Continuing, Amara said technology often acts to diminish person-to-person contact. The automobile, tv, and the telephone were cited as examples. With these physical artifacts, he said, a sense of community is not built up or is not there to begin with.

Speaking of relations among nations, he said technology often produces a concentration of wealth. It does this by changing considerations in economies of scale, divisions of labor, and the existence of cartels. These things existed before technology,

Amara explained, but technology developed them into "more grotesque forms," resulting in a wider gap between developed and developing countries. "We face wars for the redistribution of wealth," he asserted.

Finally, he said technology results in large concentrations of power, primarily the power of government at the national level. This accumulation of power becomes necessary because of the mobility of people and the resultant difficulty of governing them except at the national level. And it grows at the expense of local power, of citizen participation, and of democratic government. Amara said it thus produces big government at a time when that complexity demands more local control.

He suggested three components of a strategy to cope with these problems. He urged first that we use the term technology monitoring, not assessment. We need indicators—of alienation, of concentrations of power and wealth, and the diminution of person-to-person contact, he added. Second, he urged greater public participation "because technology is too important to be left to technologists." We need to make the issues understandable to the public so that they can participate in the setting of goals. And third, Amara said, we need to continue to explore and experiment, but do so with much

more humility than in the past.

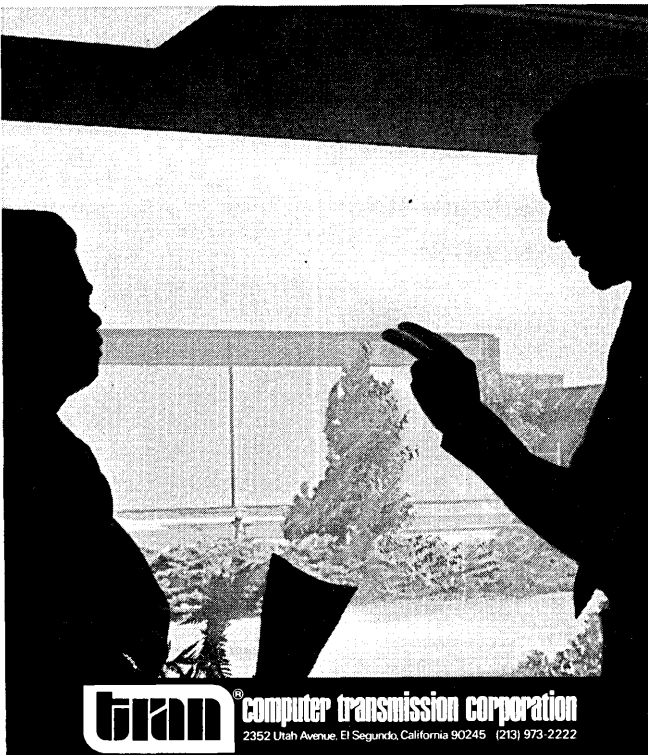
Challenging existing institutions

In a similar vein, SRI's Harman spoke of challenges to the legitimacy of existing institutions and mores. He cited the call for a more frugal society, the obverse of which is a society more conserving of natural resources, and for a more equitable distribution of those resources. He mentioned also challenges to the past role of the U.S. in the world, as well as labor's demands for meaningful work, for a share in management, and for higher wages.

Harman, who is director of the Center for the Study of Social Policy at SRI, said there's good reason to think there's a pattern in all this. And in the past when this pattern was present there had also been lead indicators that it was coming. Some lead indicators today, he observed, include alienation, a feeling of purposelessness and loss of community, rise in the rate of violent crimes, use of police force to put down social disorders, rise in the rate of mental illness, rise in public acceptance of hedonistic behavior (particularly sexual), the acceptance of lax morality in public affairs, interest in noninstitutionalized religious cults and practices, and decreased trust in institutions.

In the past, he added, these patterns led for example to the fall of Rome, the

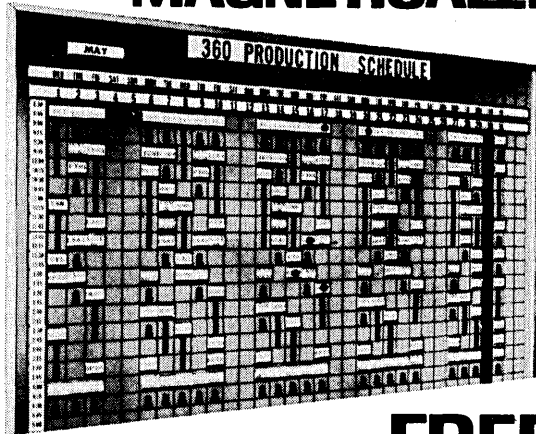
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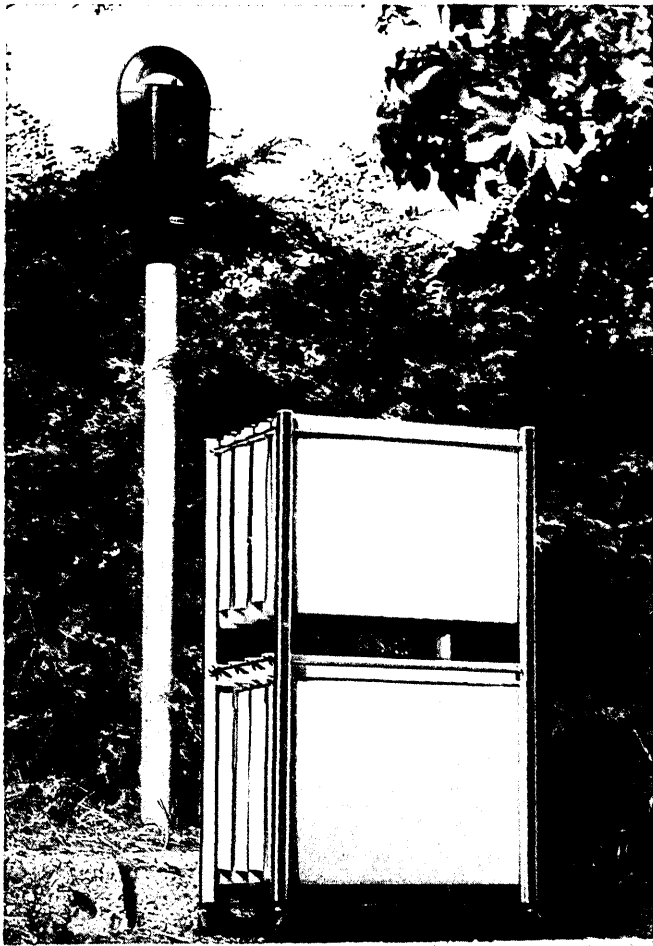
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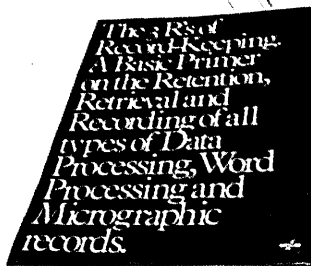
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THE 1970s

industrialized revolution, the Protestant reformation, the Western democratic revolution, and the Russian communist revolution.

He explained that legitimacy of an institution rests on three foundations. One, is it duly constituted, was it put together in some legitimate way? (In this context, people are questioning whether multinational corporations with their concentration of economic power are duly constituted and representative of the people they impact. Then, too, there are challenges to the concentration of intellectual power in the hands of manipulative technologists.)

Second, does an institution have adequate guiding moral principles? And third, is it effective in achieving the goals it claims to be attempting to achieve? (Here, people ask whether it makes sense to go endlessly in the direction of replacing humans by machines when, in fact, one of the most serious problems of society is that we're running out of meaningful social roles for citizens—in which they feel they're playing a valuable and contributing part. That's more than economic unemployment, Harman observed, but involves also psychological

nonparticipation. "Does it make sense to go further and further in industrializing everything—food production, dating, aesthetics, health care?" he asked.

So, people are beginning to question "whether we have in the past and can in the future manage and control technology as it impacts society."

No less comforting was Ruth Davis of the National Bureau of Standards, who provided yet another view of the dilemma. She said science and technology, in parallel, have produced the greatest change in our lives.

"And since the effects of science and technology cannot be measured in terms of incremental changes in our lives, the best we can do is to try to set the pace at which we allow science and technology to change our lives or its products to come into existence."

The impact on the individual

She observed that the sciences and technologies we're trying to control today interact with people far more than the old ones, such as astronomy, high-energy physics, and biochemistry. "They (the old ones) didn't look like they were going to replace us, do better than we, change us individually, do something that we don't understand," she explained.

Davis said she finds today "a na-

tional monumental hangup" on what the new roles should be of these interactive sciences and technologies relative to the never-understood role of man as an individual.

"We have a national concern . . . whether computers are just a primitive first step in a line of succession, leading to improved intellectual specialization, or whether they're just the end product of computer science," she said. And there's concern, too, whether we need improved intellectual specialization. "By that I mean any kind of specialization that allows us to do tasks better than we've done before or tasks that we couldn't do before that require some sort of intelligence," she continued. "Maybe we couldn't do them before because it would be hazardous to people . . . or because they required the kind of memory retentivity that people didn't have." She said this applies to such fields as microbiology, genetics, mathematics, and cybernetics.

Davis also conjectured that things like robots and specialized banks of superior genes "are the next steps in this line of succession to a goal that we don't know yet whether we want to achieve." She said we are not prepared, emotionally or intellectually, to make this decision. And yet we're funding research and developments in those fields. *



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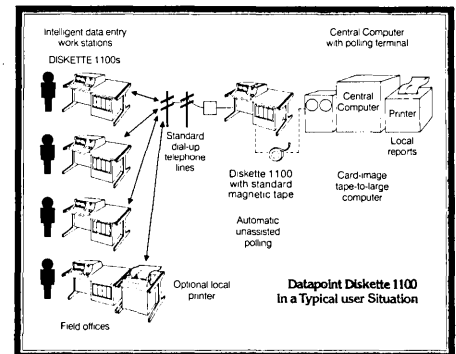
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Communications

The Long Wait Could be Longer

FCC will allow direct attachments to telephone company networks—maybe.

It's been a seven year wait.

Finally in the late fall, the Federal Communications Commission ordered the American Telephone and Telegraph Corp. and the nation's other telephone common carriers to let independently-made modems be connected directly to their dial-up network. The order permits users of such equipment to do away with the protective connecting arrangements which they now must lease at extra cost from the carriers. It also gives the non-Bell suppliers a much bigger share of the market for modems—devices used in the transmission and reception of digital data over voice grade transmission lines.

But in mid-November, it appeared that the FCC decision would be taken to court. This could delay establishment of the new program considerably. Otherwise, users would be able to connect directly to the dial-up network beginning next April 1.

A little longer

The possibility of further delay doesn't bother one supplier, who said, "we've waited seven years for this decision, so I guess we can wait a little longer if necessary. The important thing is that deButts (John deButts, AT&T's board chairman) has been backed into a corner and there's no way he can wriggle out of it."

(The "seven-year wait" is a reference to the commission's 1968 Carterfone Decision, which abolished AT&T's previous total ban on the connection—direct or indirect—of customer-provided modems and voice terminals. That policy was replaced with the present one, requiring the use of telephone company-supplied connecting arrangements for "foreign attachments.")

Specifically, the commission's decision, adopted in late October, establishes a plan for certifying and directly connecting all terminals except private branch exchanges (PBXs), main station telephones, key telephone sets, and coin telephones.

Alternatively, the plan provides for connecting non-certified terminals, exclusive of the above types, through pro-

TECTIVE built-in circuitry, or separate protective connecting arrangements. The order includes a detailed set of technical specifications which the terminals, protective circuits, and connecting arrangements must comply with in order to be certified. They must also be "registered." They must be given an I.D. number signifying that they have passed the certification test.

Certification will be required on a "type-acceptance" basis—meaning that only one unit of a particular device model, rather than all units, has to be tested. The supplier will be able to perform the test or have an outside lab or consulting engineer do the work—provided the test documentation is submitted to the FCC and approved before the device is attached to the dial-up network. The commission said it retains the right to test the actual device if it isn't satisfied with the documentation.

Pay later

Telephone company-provided modems, along with those made by independents, will have to be certified and registered before being connected directly to the network. But already-installed modems supplied by the telephone company are excluded from this requirement. The FCC will charge suppliers for certifying and registering their equipment, but the amount hasn't been set. It will be the subject of a later ruling.

One result of the order, says an FCC source, will be to force abandonment of certification programs already established in California and in the territory serviced by the Rochester, N.Y., Telephone Co. The New York Public Utilities Commission will have to modify a similar scheme which it proposed recently for use throughout the state.

Problem of appeal

There is a chance the FCC's new order will be nullified by a case now pending before the U.S. Circuit Court of Appeals in Richmond, Va. In 1973, the North Carolina Utilities Commission (NCUC) proposed a regulation that, in effect, would bar the direct or indirect

attachment of customer-provided terminal equipment to the North Carolina intrastate dial-up network. Telerent Leasing Co. was one of the suppliers directly impacted. Nebraska later issued a basically-identical ruling.

The North American Telephone Association (NATA), a trade association of independent telephone equipment makers, then asked the FCC to cancel these two state regulations.

NATA claimed they violated the Carterfone Decision. The FCC obliged early last year. In a ruling generally referred to as the "Telerent Decision," the commission concluded that, "There is no interstate message toll telephone service either offered or practically possible except over exchange plant used for both intrastate and interstate . . . service . . . It appears . . . evident . . . that in those instances where the rendition of interstate . . . service is dependent upon plant facilities . . . also used for . . . intrastate services, the federal role must be controlling."

The North Carolina commission together with NARUC—the National Association of State Regulatory Utility Commissioners—plus AT&T and carriers then took the Telerent decision to the appeals court in Richmond, Va. That's where the case is now. One close to the case says it's possible, but not probable that the FCC decision will be overturned. If it isn't, the commission's preemptive right to control interconnection of terminal equipment to the dial-up network probably will be firmly established.

But a small army of lawyers is involved in this battle, and some of them almost certainly will find other grounds for challenging the commission's new policy. One logical challenger is NATA, because the FCC order bars independent telephone equipment makers from connecting their equipment directly to the dial-up network. The FCC's commissioners tried to soften this blow by stating that they aren't opposed to direct connection of such equipment, only that they want to wait for further comment on the question.

But FCC Chairman Richard Wiley, in a speech to NARUC shortly after the in-

terconnect order was announced, indicated clearly that the commissioners meant they don't see any valid *technical* reasons for barring direct connection of telephones and PBXs. The question of *economic* harm is the subject of a separate proceeding, he pointed out. Although Wiley deprecated the idea that direct connection of independently-made telephone equipment will seriously harm the carriers—he referred to claims of such a relationship as “unsubstantiated allegations”—it seems clear that the commission's final decision on whether to allow direct connection of telephone equipment is several months away. All of which may impel NATA to hurry things along by asking a court to block implementation of last month's order.

IBM may also try to block the new policy. The company told the commission a few months ago that a certification program run by either the states or the federal regulators is technically unnecessary and too hard to administer. Wiley, in his NARUC speech, was apparently thinking of this when he said the new policy “permits the FCC to focus only on that very limited portion of the terminal containing the protective circuitry, and consequently reduces the time and expense of the ministerial burdens accompanying registration. Moreover, it avoids the necessity of reviewing complete terminal blueprints where proprietary information may be involved (this was another fear expressed by IBM), since only the protective circuit diagrams need be submitted.”

No decision on appeal

The likeliest foes of the FCC's direct connection order are NARUC and AT&T. Asked whether Bell would request reconsideration of the order, and/or take it to court, an AT&T spokesman said, “we haven't decided.” This comment came shortly after the company issued a statement sharply criticizing the commission's decision. The statement seemed to be laying the foundation for an appeal.

The commission's plan is “replete with technical and administrative shortcomings,” said AT&T. It's “deficient in numerous aspects of network protection . . . that the National Academy of Sciences deemed essential in its report submitted five years ago at the commission's request.” Bell's “protective module” (APCM) plan, by comparison, complies “fully with all essential elements of protection prescribed by NAS and permits “the direct connection of customer-provided ancillary and data equipment,” so “we are at a loss to understand why this proposal was not adopted (by the FCC) in full.” That approach, besides being “a more effective technical solution . . . would be more economical and simpler to administer.”

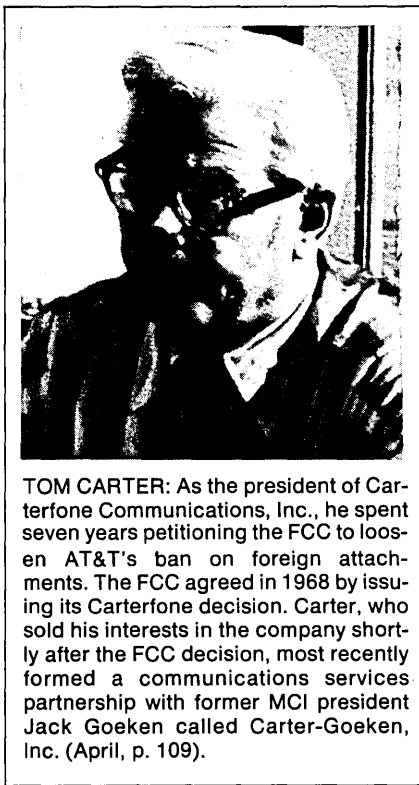
AT&T added that “there is no logic

whatsoever” in the decision to register carrier-provided equipment. The carriers “traditionally have accepted end-to-end responsibility for the integrity of the network and have maintained the highest quality standards in the world.”

Regarding the direct connection of PBXs and telephones, Bell said “it seems apparent . . . the commission has prejudged the matter, even though (direct connection of this equipment) will raise problems even more serious than those posed by ancillary . . . equipment.”

The statement also criticized the FCC for issuing the new policy before completing its investigation of the economic impact of competition on the telephone carriers (Docket 20003). “Finally, we are increasingly concerned that regulatory decisions to inject competition into a closely-regulated industry are being made in a piecemeal fashion.”

Paul Rodgers, NARUC's general counsel and administrative director, said his organization probably won't protest the



TOM CARTER: As the president of Carterfone Communications, Inc., he spent seven years petitioning the FCC to loosen AT&T's ban on foreign attachments. The FCC agreed in 1968 by issuing its Carterfone decision. Carter, who sold his interests in the company shortly after the FCC decision, most recently formed a communications services partnership with former MCI president Jack Goeken called Carter-Goeken, Inc. (April, p. 109).

FCC order unless strong sentiment develops within the membership.

[A source within the California PUC reported such sentiment already exists. This individual helped persuade NARUC, at its recent meeting in Boston, to seek legal review of an FCC order upholding Southern Pacific Communications in a fight with the California and Oklahoma commissions. The basic question there was whether the FCC can countermand state regulations which are imposed on an intrastate circuit that is connected through a CCSA switch to an interstate message path. The FCC decided the answer was “yes.”

[NARUC insists, however, that the commission overreached itself. The resolution adopted at Boston will attempt to “vindicate the statutory responsibility of state regulatory commissions to regulate intrastate communications within their respective states.”]

The same basic jurisdictional issue is posed by the FCC's certification/registration decision, said our source. The commission's order is “a direct invasion of states' rights and violates section 221 (b) of the Communications Act, which reserves to the states regulatory authority over local exchange telephone service.”

—Phil Hirsch

Everybody Wants to Communicate

AT&T is going after the data communications market.

New? No. But the way Ma Bell is doing it is new for Ma. Its new (one year old) marketing organization is organizing on an industry by industry basis.

Roger Moody, vice-president, industry marketing for AT&T told the recent National Retail Merchants Assn.'s dp conference that “we're going to understand your business.” He told retailers that the Bell system had four studies going on in general merchandise retailing.

Moody has a background in retail systems. Before Bell (he joined in May '74) he was with Litton Sweda; before that with Nuclear Data's retail point-of-sale effort which eventually was purchased by Bunker-Ramo, and before that, with IBM's early retail efforts. So, if he says Bell is going industry by industry, and he tells retailers, he probably means it.

Bell is listening

He's part of a really new marketing organization which Bell has been putting together for more than a year. “One of its charters was that more than half the staff come from outside the Bell system.” But Moody's very much in the system now. His overall message to retailers last month was, “Bell is listening . . . and is ready to meet your total communications needs.”

He said a big part of data communications, “a litany which is communications processing,” was rejected by the Bell system way back when the means changed from electro-mechanical to electronics. “We've changed that decision,” said Moody. “We're in the communications processing piece of data communications.”

Moody offered retailers everything they might need in data communications. He wasn't the only one.

Bob O. Evans, president of IBM's System Communication Division, touted his company's SNA (systems network architecture) as the be-all, end-all and



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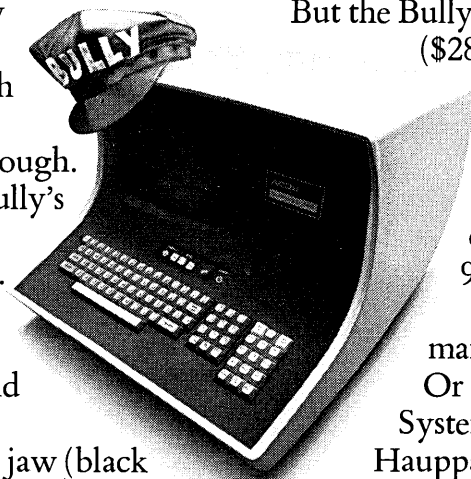
The ref wanted to stop the fight. But the Bully landed a roundhouse punch (\$2800 price tag with OEM discounts of over 30%) that made the decision unnecessary.

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news in perspective

cure-all. He said today's needs call for a terminal architecture that is consistent and can support distributed intelligence. "SNA is such an architecture."

Max Beere of TRW wasn't so sure about that. "We don't want to do something that will lock us out of being able to utilize the technologies of the future," he told the retailers' conference. He pointed out that the Canadian government has prohibited "any protocol that will tie in or tie out any vendor's terminals."

And then there is Sam Harvey of Singer Corp. to whom none of the above makes any difference. Harvey is looking forward to a "whole new level of communications people on this planet." His level would have IBM, AT&T and the Postal Service joining forces. *

Security

Computer Criminals Beware!

The law enforcement community is taking a closer, harder look at computer crime and maybe a more hard nosed look as well.

When Phillip Wynn, a deputy district attorney in the Los Angeles County District Attorney's Major Fraud Section was quoted in the *Los Angeles Times* as saying his section was putting staff members through a "crash course" in computer technology, he received calls from "law enforcement jurisdictions all over the country" wanting to know how this was being done. "They were interested in doing something similar."

Actually Wynn says "crash course" is not the proper term for what is being done in the Major Fraud Section. "It's an on-going thing with seven or eight of us giving it as much time as we can." They are working with volunteers from the computer industry and with members of the county's data processing department to "gain a general familiarity with computers and how they work from the time a programmer takes over an assignment. We want to gain familiarity with the terminology and the technology."

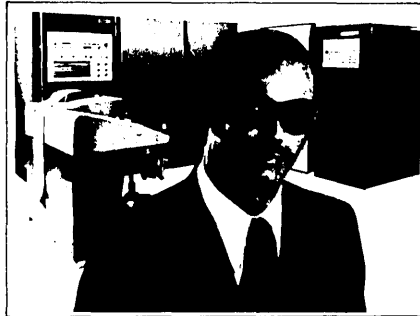
Training at the FBI

A similar concern for computer training has been evidenced by the Federal Bureau of Investigation which has begun conducting special training sessions in computer technology for its special agents and its accountants.

John T. Hall, an FBI Special Agent in the Bank Robbery and Fraud Department for the Los Angeles Office, says

there's "a problem of attitude" when law enforcement is confronted with computer crime. "We've got to generate a new attitude."

"The law enforcement community views computer related crime quite differently than it does violent crime. They



tend to see it as a civil matter." This kind of attitude, he said, even pervades in the courts where a judge finds it hard to view as a criminal a defendant who might have a background similar to his own. "But that's what he is and he's accountable."

The impetus for the educational efforts of Deputy District Attorney's Wynn's office was an investigation into an alleged computer time theft by a Los Angeles man. Wynn believes it's a first

in that it's an alleged theft of "pure time, nothing else, and there are no laws that clearly cover this."

Special Agent Hall would agree. He said law enforcement faces serious problems when it gets into the area of tangible versus intangible theft.

In the Los Angeles case in which Wynn is involved, Marvin Henry Maki, 42, is charged with grand theft and forgery in the tapping of a computer belonging to a former employer. Helping the Fraud section with technical aspects of its investigation are Tymshare Inc. and Manufacturers Data Systems (MDSI) of Ann Arbor, Mich., both alleged victims.

MDSI is a service bureau operation which uses Tymshare's Tymnet network. Each MDSI customer has a code word to get him into the service bureau's computer.

Maki left a job as an engineer for MDSI last June when he took an executive job with the W and R Tool Co. in North Hollywood, Calif. After that time MDSI representatives in England and France began to notice that they were being billed for computer time they weren't using.

An investigator in Wynn's office said it was determined that codes assigned to these representatives had been used in calls placed to the computer through Los Angeles telephones from June through October. A search warrant was

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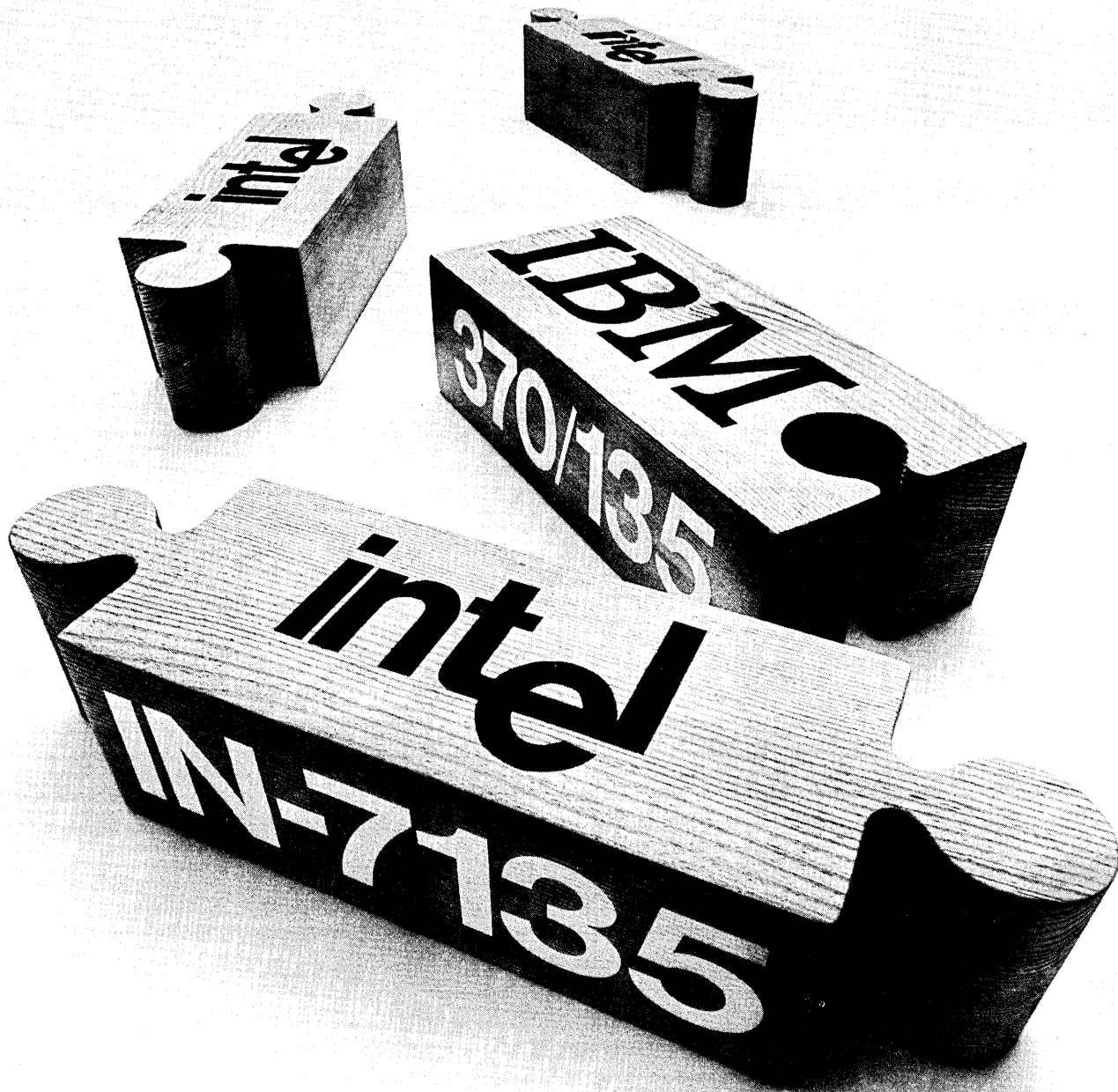
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news in perspective

obtained for Maki's home in Canoga Park and his office in North Hollywood where evidence was obtained which led to the grand theft and forgery charges.

Maki is charged with using the MDST computer to produce a numerically punched tape that was used to run W and R's tool manufacturing machines. Maki is estimated to have used the computer for 143 unauthorized hours for which the charge would have been \$15,000. A preliminary hearing was scheduled for Dec. 9.

The FBI's Hall would like to see more cases brought before the court. "There's a conspiracy of silence," he said.

A panel of computer crime experts at an ADAPSO conference in October agreed that the majority of computer related crimes "never surface" largely because the victims are embarrassed so the perpetrators are told to go away.

Special Agent Hall deplored the fact that a young man (Jerry Schneider, Feb. 1973, p. 121) who ripped off the telephone company for \$1 million would get 40 days in jail while an ordinary thief, stealing to pay hospital bills, could spend five years or more in jail for theft of a lot less.

With the ordinary thief, Hall said, it's usually a "have to" situation. With the computer criminal it's generally "want to." He said the motivation can be "nothing more than a challenge to beat the system."

Hall said even organized crime is getting into the act. "We have some cases pending involving organized crime. Early stages of investigation indicate that certain types of systems information is being sold on the street." He emphasized that organized crime's involvement is "not at the level of the actual fraud but at the level of exchange."

Both Hall and Wynn feel the best way to beat computer crime is to prevent it. "But that's the job of industry," said Wynn, "and we can't police private industry."

Hall feels the important thing is that "technicians and systems should be controlled by management and not the reverse. He feels computer technicians tend to consider themselves computer professionals and "too often their loyalty is to their profession rather than to their employer."

Wynn expects the attention to computer crime in his Major Fraud Section will grow because "the potential for computer crime is so tremendous."

He said there is a section within his section called medical/legal with two full time staffers and a full medical library. "Why not computer/legal?"

—Edith Myers

Banking

Too Many Cooks or Maybe One

It's "in" to talk about "banking-of-the-future" these days but the only agreement seems to be that it will be a lot different than it is today.

Also clear is that the cast of characters will change. Not so clear is whether it will be larger or smaller. Possibly the newly named National Commission on Electronic Fund Transfers (Nov., p. 135) will get a handle on this.

One thing the commission undoubtedly will look at is the "too many cooks" problem: that of the vast numbers of state and federal regulatory bodies that have jurisdiction over the various sectors of the financial industry. And most of the cooks have representatives on the commission.

The Postal Service

A government agency which doesn't but which has a definite stake in EFT development is the U.S. Postal Service. The service's Research and Development arm has been studying EFT for

more than two years, concerned over the potential revenue loss from all that "clean first-class mail" involved with billing and bill paying. Envelopes used for billing and bill paying are generally scanable and therefore easy and inexpensive to handle. They are said to account for some 60% of USPS revenues.

USPS has issued a Request for Proposals (RFP) for a "system definition" of an Electronic Message Service system (EMS) which would enable it to continue participating in some way in funds transfer exchanges.

Also not represented on the EFT Commission and desirous of a "piece of the action" is the Association of Data Processing Service Organizations, (ADAPSO) Inc. In fact, "A Piece of the Action" was the title of an EFT briefing at ADAPSO's 43rd Management Conference in October in San Diego.

Session moderator, Bernard Goldstein, vice president of corporate development of Tymshare, Inc., deplored the fact that no one from the computer industry was named to the commission (Nov., p. 148). ADAPSO had written to President Ford requesting such an appointment.

"President Ford said no to ADAPSO," said Goldstein. He suggested this could be because "he envisions the commission as a battleground for financial institutions."

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Goldstein said small banks wanting to participate in EFT have three ways to go: correspondent banks, bank co-ops, and third party services. "I believe a competitive disadvantage awaits them which restricts us (service organizations) as well."

A large pie

Roger Hotte, vice president, Datasab Systems, told the ADAPSO session he expects EFT transactions will be taking place at two million locations in the U.S. by 1980. "It's a large pie. Plan now. Don't wait."

One service organization that is planning now is Midwest Advanced Computer Services. Bill Fletcher, its president, told the ADAPSO group: "We gross less than \$2 million a year and we've already spent \$1 million getting ready (for EFT)."

The kinds of things Midwest is doing include: providing interfaces for many foreign terminals; developing a vehicle for tracking sources of transactions; working on a central information file; and studying the types of unmanned teller terminals available.

"It's up to us," Fletcher warned. He described what he called "one large New York bank's strategy." It's a ten point program with the first five already accomplished:

1. Implement a central information file.
2. Introduce a combined or universal statement.
3. Introduce an automatic overdraft.
4. Issue plastic cards containing customer information file numbers.
5. Install 5,000 on-line terminals in branches and retail outlets.
6. Develop a point-of-sale program for retailers by way of selling computer services and leasing terminals.
7. Attract direct deposits of payrolls.
8. Expand services state wide by lobbying and by acquiring small bank retail programs.
9. Obtain branching authority in other states by lobbying for reciprocal branch banking.
10. become involved in the acquisitions of insurance companies, mortgage companies and the like.

Better cooperate

"This bank already has spent \$50 million in launching this program," said Fletcher, "and retailers have similar strategies. Montgomery Ward has said if you don't cooperate we'll do something on our own."

Los Angeles area Savings & Loans are doing something on their own. The Federal Home Loan Bank of San Francisco had planned to set up a switching system to link EFT systems put in place by California Federal Savings, Glendale Federal Savings, and Gibraltar Savings.

The San Francisco Home Loan bank oversees s&Ls in California, Arizona, and Nevada. In September it said it would seek Federal Home Loan Bank Board approval for a pilot system linking the three Southern California institutions. It never sought the approval and now it won't.

In the interim the Justice Dept. wrote to the FHLBB in Washington urging it not to sponsor computer networks, but to leave such developments to private industry. The FHLBB issued a statement of agreement.

But the California s&Ls are going ahead through Savings Association Central Corp., a jointly owned corporation now working on plans for a state-wide system. Systems Development Corp. was to have received a \$500,000 contract from the San Francisco Federal Home Loan Bank. It was considered a likely candidate for a similar award from Central Corp.

So perhaps only the names will have been changed.

A scenario which would drastically reduce the names involved in the game of banking has been developed by the Federal Reserve Bank of Cleveland. Called "Scenario for a Federal Reserve

System in the year 2000," it details reasons for single agency control of all financial organizations—banks, savings & loans, credit unions, and others. The report defines "bank" as "any corporation or other organization engaged in the business of accepting deposits of money and making loans or investments."

Undoubtedly it would be a super agency with super powers should it come to be. Maybe a super cook?

—E.M.

Standards

Voting Begins On Card Standard

Voting on a proposed third track standard for credit cards began in November among members of an International Standards Organization (ISO) subcommittee (SC1). The ballots are supposed to be counted in January. If there are no negative votes, which appears likely, the proposal will be referred to the subcommittee's parent group, Technical Committee 68 (TC68) for a final vote. That one takes six months.

Meanwhile, the American Bankers Association is preparing a proposed U.S. third track standard containing

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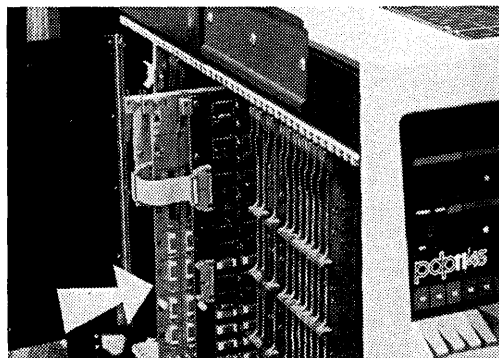
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news in perspective

language identical to the ISO document. The ABA proposal is likely to reach the American National Standards Institute in January.

Final approval of both documents will end a protracted struggle between commercial banks and savings and loan associations over the bit density of the third track, and whether it should be dependent on the already-standardized second track. The proposed ISO standard provides that the third track should normally be dependent, but adds that "independent use of track 3 is an alternative mode of operation, permitting both on-line and off-line interchange based on mutual agreement between interested parties."

The ISO proposal specifies that the third track must conform to a proposed specification now percolating up through one of the organization's other technical committees (TC95); it's known officially as Addendum 1 to ISO Standard 3554 and describes the physical characteristics of a standardized third track. A 210 bpi bit density is among the characteristics covered by Addendum 1. This proposal probably will be sent to the members of TC95 for their final vote in January. It will be at least six months more until the results of the ballot are known.

The French reportedly will oppose Addendum 1 because the magnetic stripes on their credit cards have a different width; thus, to comply with the proposed standard, the French would have to modify their credit card reading and encoding equipment. But an ISO source says he expects the French objections to be overruled, and the addendum to be adopted as a standard, before the end of next year. *

Time-sharing

An Industry in Transition

If time-sharing users aren't immediately ordering IBM's 5100 portable computer, they certainly are thinking of it as a partial alternative to time-shared computers.

The computer giant announced last fall it was aiming the machine at "problem solvers in business, engineering and scientific disciplines" (November, p. 71). Shortly afterwards, a time-sharing users association whose members primarily are in that "problem solver" class, said it would begin looking at problem solving applications using products such as the 5100.

The 900-member Assn. of Time-Sharing Users (ATSU) said, "Our thrust



HILLEL SEGAL
President, Association of
Time-Sharing Users

is increasingly oriented toward applications and problems that we might be able to best solve in an interactive manner with a computer, and less toward the fact that they must be solved strictly on a time-shared computer."

And one of the association's members, Time Sharing Resources, a Great Neck, N. Y., APL time-sharing firm, in mid-November began offering leases for the purchase-only 5100. The

company said it had arranged for a New York bank to pick up the paper on payout leases of three, four and five years. TSR president Joseph F. Hughes said his company's only financial return would be in the investment tax credit on its purchases of 5100s for lease. But Hughes said the possibility of expanding its time-sharing service for 5100 users was the chief purpose of the leasing offer.

Hughes said he hoped to have signed up a few prospects by mid-December, even though only two of the 60 customers TSR serves in the New York region had expressed any interest in using the 5100 in conjunction with TSR's 360/75-based time-sharing service. Though not ruling out an eventual "marriage" of 5100-type products and time-sharing, Hughes finds that prospects instead seemed to consider the IBM offering as a pretty good data entry device.

"It has an excellent tape transport mechanism and full editing can be done on the crt screen," Hughes said. So, he says, it could find a place in small business applications as a sort of remote job entry station.

How it's selling

Some industry sources think IBM has fallen short of its 5100 sales goals. Internally, the company hoped to have placed some 1,500 machines before

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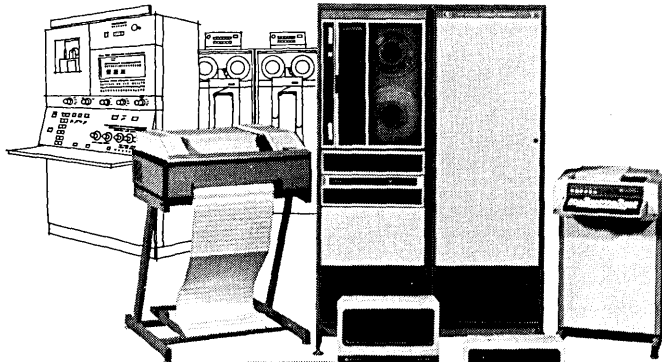
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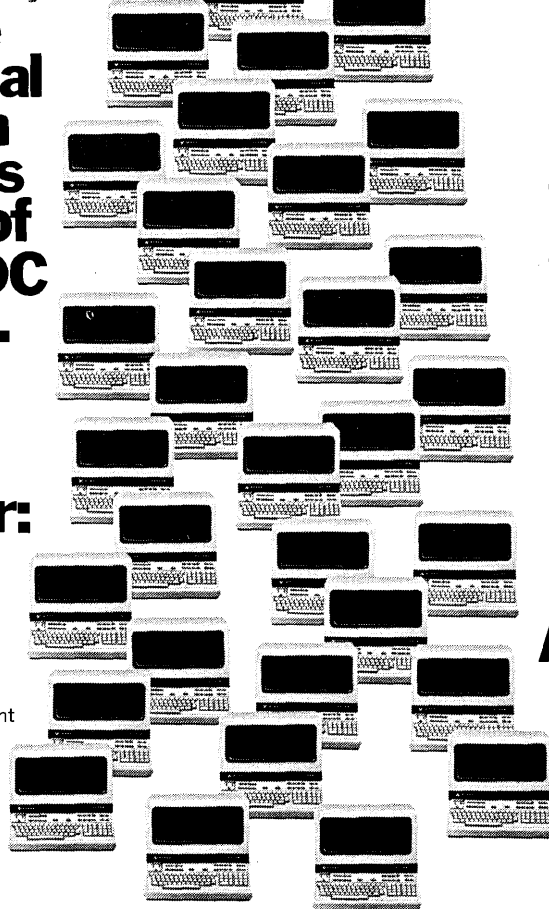
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year-end through its 120-man dedicated sales force. Based on present order volumes, it isn't expected to sell more than half of that number. IBM declines to comment on this speculation, although some IBM salesmen have admitted informally they're not certain exactly where their prospects lie.

Despite that somewhat disappointing reception (which easily could be corrected by additional versions of the 5100 or a more concentrated sales effort), time-sharing users have come to realize that all their applications don't necessarily have to go on a time-shared computer.

Hillel Segal, a founder and now president of the time-sharing users group, ATSU, says he's found that users seem more interested in finding applications for solving problems than in the kind of computer or service to be used in the solution. When it was formed 15 months ago, the association indicated it wanted to keep its vendors honest by conducting surveys that would provide its members with such caveats as "processing costs, frequency of downtime and liability under service contracts." (November '74, p. 12).

Work with vendors

"We've mellowed since then in the viewpoint of what we want to accomplish," says Segal, who is a financial analyst with the Hertz Corp.'s Rent a Car division in New York. "We won't be activists concerning our vendors. We'll work with them."

That might be a reasonable approach in these times. The number of companies offering time-sharing services has been pared drastically to a more manageable number since the glamorous early '70s when there were 200 time-sharing companies. Segal said a recent survey by his association could turn up only "35 or 40" firms offering conversational time-sharing.

A recent study by the business magazine *Forbes* identified "50-odd companies" of which it said 20% were losing money and 10% were barely breaking even.

Business is growing

Yet, according to many studies, the use of time-sharing is increasing. Quantum Science Corp., the New York firm which annually surveys the services industry, says revenues of firms offering conversational time-sharing will reach \$518 million this year, compared with \$447 million a year ago. But a considerable portion, says Quantum's Charles Vargo, will be going to the large service companies with big networks and hosts of applications.

Says ATSU's Segal: "More and more

people coming out of college after having been exposed to time-sharing are becoming more and more vocal in asking their employers to try out these techniques of time-sharing. Work that has been done manually or on in-house computers is going to the time-shared services."

However, Segal continues, this doesn't always help the smaller firms. "Small time-sharing companies may get a client for one application. When the client wants another application and the small firm can't offer it, he'll go to the big ones and the big ones may get both jobs."

Signing up

It is understandable, then, that users and vendors are anxious to communicate with each other. Since it was formed a year ago last September, ATSU has recruited 900 members who pay \$45 a year to participate in activities of chapters that have been formed in 13 U. S. cities and to receive a monthly newsletter and two directories the association will begin distributing in February.

One is a directory of time-sharing companies and the other is a listing of

time-sharing applications available from the suppliers. The directories will be issued in loose-leaf form and will be updated throughout the year.

Of its 900 members, 700 represent users in some 600 companies. (Segal estimates that there are "several thousand" companies in the U. S. that use time-sharing extensively). The other 200 members are associate members who represent about 100 vendors of terminals, software and time-sharing services, this last group representing the 35 to 40 companies ATSU has identified as time-sharing houses.

Its headquarters are at 210 Fifth Ave., New York 10010.

—Tom McCusker

Training

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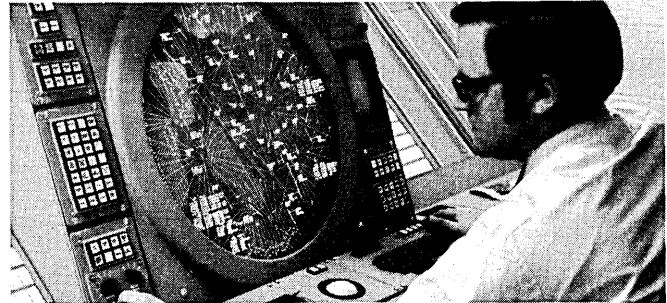
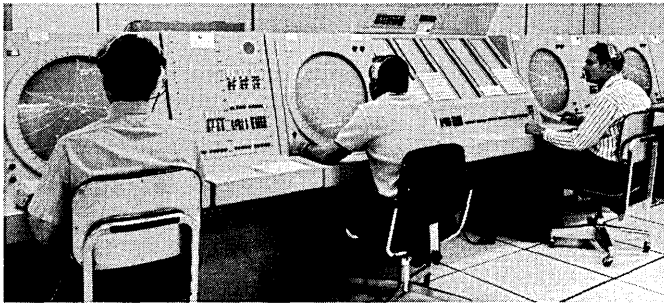
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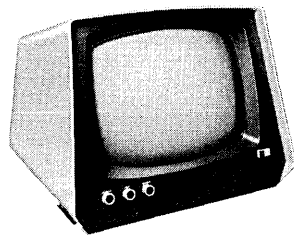
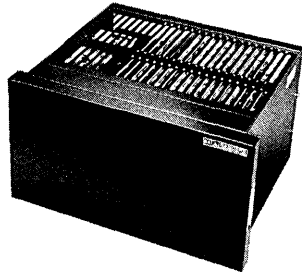
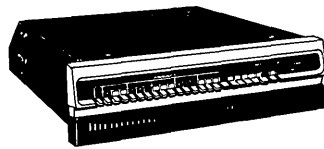
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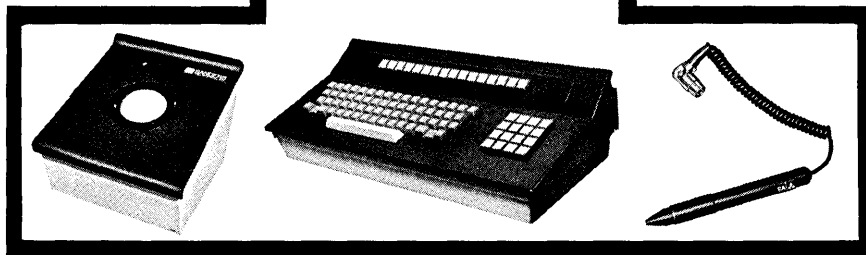
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news in perspective

9-month course, preparing for graduation ceremonies last Oct. 30, and looking forward to their first jobs in data processing—consisted of paraplegics, quadriplegics, and the legally blind. They are the first crop of entry-level program-



SCOTT LUEBKING
Interrupted Ph.D. work to train severely physically handicapped

mers to blossom from a California Dept. of Rehabilitation program for the severely physically disabled. Of the seven, four already had been tested by a review committee set up by people in the local business community to pass upon their technical competence. Even before the course was completed, the four had passed.

The students, not all of them confined to wheelchairs, range in age from 25 to 45. Some have never had a job, and two have master's degrees—one in physics and one in history—but couldn't find jobs.

Steve Marigan, a 27-year-old quadriplegic (all four of his limbs are affected to some degree by paralysis), was the first to receive a job offer, one he was still considering a full two weeks before graduation day. Marigan is completing, as well, his final semester of work on a B.A. in business management at San Francisco State Univ. And, at the same time, he and a partner have a vending machine business. Referring to the 9-month course, he says, "I didn't do as much homework as I should have."

Marigan is one of an estimated 3 million severely disabled and blind individuals in the U.S. A resident of San Francisco, he has been commuting across San Francisco Bay to Berkeley, where classes have been held at the Center for Independent Living. This nonprofit organization, serving the blind and severely disabled, estimates a target

population of 30,000 just in the five adjoining communities it has been working with.

The Rehabilitation Act of 1973 (Public Law 93-112) reaches out to provide the handicapped with the same rights previously extended to minorities and to women. Under the law, companies receiving more than \$2,500 under contract from the federal government must make a reasonable, good faith effort to recruit the qualified handicapped. They also must not discriminate against them in promotions. And, of course, they must assure that their facilities can accommodate, for example, employees confined to wheelchairs. The companies, it's understood, eventually will have to have plans, goals, and timetables for such a program. At the time the law was passed, it was said that there were some 12 million handicapped, employable people between the ages of 16 and 64—this according to the 1970 census.

IBM's Steven L. Jamison points out that a number of states are taking parallel action, adding the physically handicapped to a growing list of people who cannot be discriminated against in the various aspects of employment. Jamison is vice chairman of the Assn. for Com-

puting Machinery's Special Interest Group on Computers and the Physically Handicapped. SIGCAPH earlier this year held a conference on computing careers for deaf people. It even provides interpreters for the deaf at ACM national conferences, and urges dp managers to send their deaf professionals.

The instructor knows

The instructor of the 9-month class in Berkeley, Scott Luebking, graduated Phi Beta Kappa in math from Knox College in Illinois, and interrupted his work toward a doctorate to take on this teaching assignment. Injured in a diving accident five years ago, the 24-year-old Luebking is now a quadriplegic. His co-instructor, 22-year-old Neil Jacobson, has had cerebral palsy from birth, and yet he, too, is a Phi Beta Kappa, having received his B.S. in computer science from Hofstra Univ. in New York City. The Brooklyn-reared Jacobson is working on his thesis for the Ph.D. program at the Univ. of California in Berkeley.

Their course dealt with the fundamentals of flowcharts and computer programs, machine organization and business dp concepts, including files, table handling, editing, updating, and reporting. Students initially were exposed to BASIC, which is on the system at the Lawrence Hall of Science on the U.C.-Berkeley campus.

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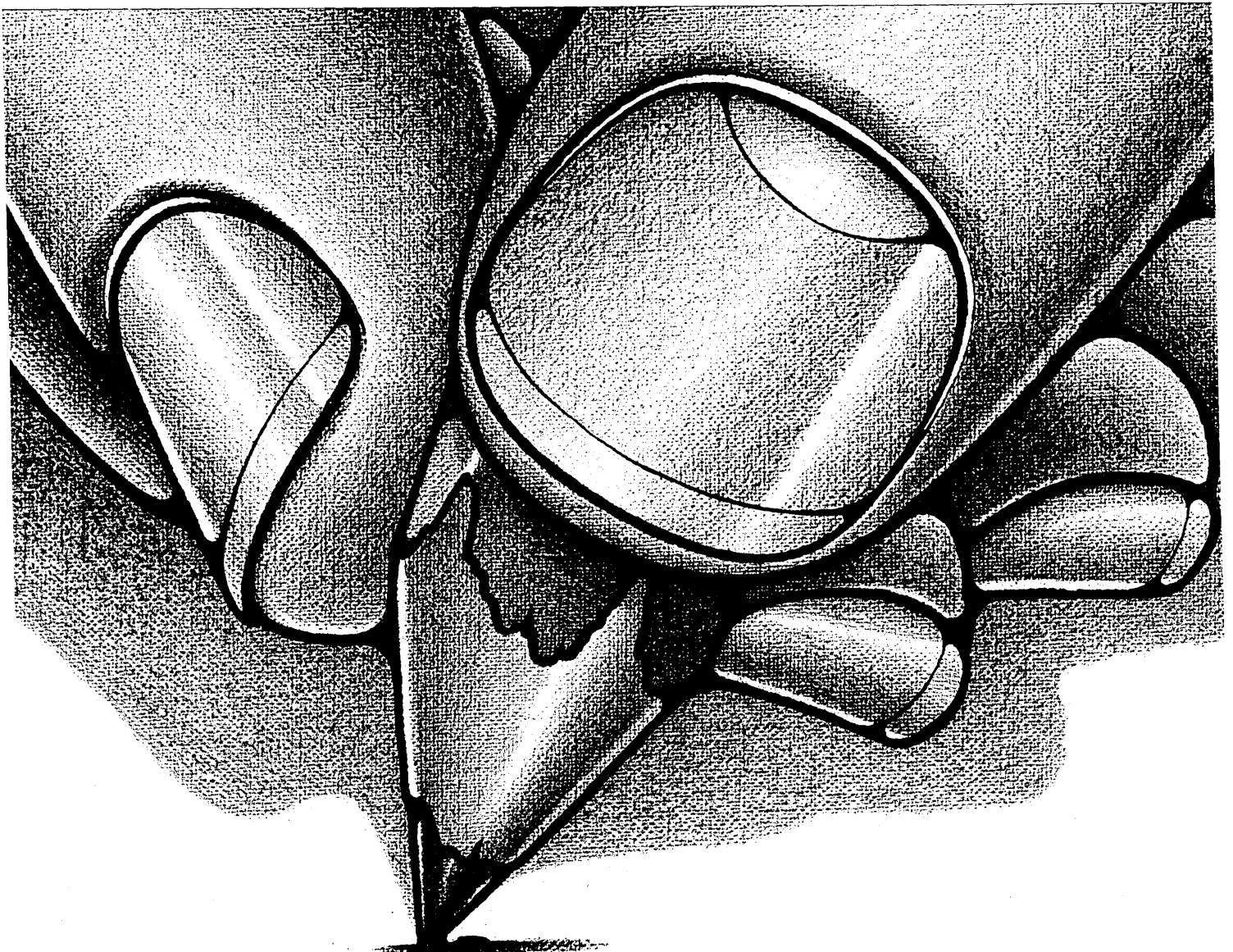
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news in perspective

"BASIC's a good educational language," says Luebking. "I've done histograms on it and stuff that people swear I did in FORTRAN." They then went to COBOL, covering also 360 assembler language and JCL. Through terminals, they also were able to get to the Control Data 6400 at the campus computer center, and had periodic access to the IBM system at Del Monte Corp.

Business helped

In all instances, the instructors say, the local business community was very cooperative. Luebking spent a week at Fireman's Fund, the insurance firm, and Jacobson a similar time at Del Monte to better understand working conditions. For weekend instruction on JCL, they were able to use the videotapes of Crocker Bank. Says Luebking, "Neil's and my background have been in scientific programming. And local business people have been good about sort of looking over our shoulders to see that we don't teach things that aren't going to be useful to the students." Jacobson adds, "That's probably one of the strongest points of the program. We have a lot of the businesses working with us to make sure that what we teach is what the students will use when they get out there."

Indeed, the 9-month course went over so well that a second-year continuation grant has been awarded by the state Dept. of Rehabilitation. Classes open in January, and applicants are being accepted from throughout the state. From Southern California, too, members for a business advisory committee are being sought.

The Bay Area program can be traced back to an earlier project in Virginia where, since June 1973, IBM has been working with that state's Dept. of Vocational Rehabilitation and the Woodrow Wilson Rehabilitation Center in Fishersville. A model system for training and placing the homebound handicapped in dp was established, but entering students were required to have job commitments before beginning training.

Some doubts

In the spring of 1974, IBM representatives came West and talked with a California Dept. of Rehabilitation district administrator in San Francisco. "For a considerable time, we in this particular area were somewhat skeptical because we did not see that the wage rates were going to be comparable to what would be needed in order to make it practical for a quadriplegic to go to work," says John Velton, assistant district administrator in Oakland, Calif.



NEIL JACOBSON
Fewer hangups than the
non-handicapped

In the fall of '74, it was decided that if five students could be located for this training program, they would go ahead with it. The Dept. of Rehabilitation got two people on loan from IBM to help set up the program, lined up vocational psychologists to test each interested stu-

dent, and began a search for a local contractor to take on the teaching job.

Wisely, the assistance of local business people, mostly from computer using organizations, was solicited. "We decided that this would be an essential factor if we were going to have a successful project," explains Velton. At two breakfast meetings, in Oakland and across the bay in San Francisco, they met and formed a business advisory committee. This was divided into three subcommittees: business, technical, and placement.

The business committee supplied classroom speakers and arranged tours of local computer facilities. The technical committee advised on the curriculum and provided speakers, while the placement committee supplied speakers on the employment interview process, preparation of resumes, and how best to present themselves for the interview, as well as arranging interviews with prospective employers.

People in the disabled community tend to think that business people don't care for them, Velton says. "But in this situation they found that the businessmen are deeply committed to helping anyone who's making a strong effort to help himself."

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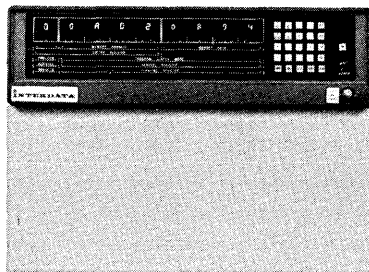
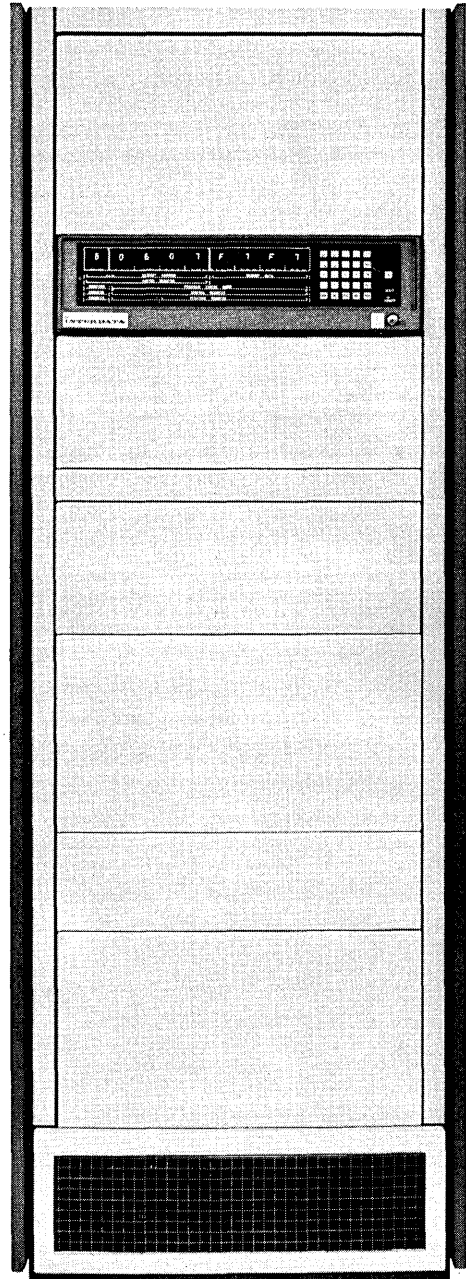
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news in perspective

in Berkeley's Center for Independent Living, they must commute to their classroom. CIL, a self-help agency for the disabled, believes in developing an ability among the disabled to live independently, that it is wrong to "ghettoize" them, and that it is better for them to get out into the community. "We've tried to maximize their independence so that, hopefully, the day they graduate from the course they would be able to go to work without any additional adjustments or changes," says Velton.

In search of students for the first class, they contacted about 60 individuals, tested 30 to 40 of those who showed interest, and picked 13 for the class. The few who have withdrawn from the program learned that they lacked the capability to continue or found that their interests lay elsewhere, not in programming.

The Center for Independent Living, in Berkeley, was selected to undertake the instruction under a \$50,000 contract. It had disabled personnel who could both teach and serve as role models for the students, and it had the expertise in providing counseling, housing assistance, transportation service, and

other support services for the blind and severely disabled in Berkeley and adjoining communities.

"One of the things we're hoping to teach these people is how to deal with their own transportation and their own care," says Luebking. "We're gradually getting people involved with arranging their own transportation." People confined to wheelchairs ideally need a van and sometimes a driver, too. Employers of the graduates of this course, it is pointed out, will not have to concern themselves with their transportation to and from work. Luebking worries that some of the students might have difficulty, at the beginning, putting in a full 8-hour day. But Jacobson doesn't feel that way, saying they now put in five and a half hours daily in class and have homework assignments to complete in the evening.

The instructors, both confined to wheelchairs, also feel that they serve an important function in their relations with prospective employers. The two have been meeting constantly with members of the various committees. In their initial contacts, it seems, some of the business people backed away

from the pair, not certain how they should behave toward them and careful about what questions could properly be broached. But that concern and reticence soon vanished when it became apparent that Luebking and Jacobson have fewer hangups than many non-handicapped people. The pair also raised and answered questions about the personal aspects of life in a wheelchair. "We're teaching the prospective employers about disabled people," says Luebking. "So it's like we're breaking the way for our students."

—Edward K. Yasaki

International

Market in Mexico: El Dorado For Some

For U.S. computer manufacturers, who sometimes like to think in extremes, Mexico City is either El Dorado or the Treasure of Sierra Madre.

To minicomputer manufacturers, it looks like the city of gold of El Dorado while to dp mainframe manufacturers, Mexico City and, indeed, the entire country of Mexico must conjure up memories of the unhappy loss of the Treasure of Sierra Madre.

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In a sense, all this is a reflection of the situation in the U.S.—dp mainframe shipments are in a period of temporary stagnation and the mini business is booming—but the whole scene is exaggerated in Mexico.

“Not only is the whole mini and controls business taking off,” says Fernando Rodriguez-Montero, “but, for many people in Mexico, the minicomputer is the right machine now for dp, too.” Rodriguez-Montero, a former president of IBM de Mexico, is currently president of Informatica Nacional S.A., a Mexican firm that represents eight U.S. companies in Mexico including minicomputer manufacturer, Interdata.

“We think we’ve been successful in offering an alternative to the major mainframe companies,” adds Rodriguez-Montero, who noted that his firm had just marketed two Interdata systems valued at \$200,000 each. The Interdata 732s interface with IBM and Control Data equipment, he said.

Complex and dynamic

The Mexican computer market is a complex one. It is whipsawed by currency considerations, a high level of governmental involvement, a rapidly growing economy, and a recession. But, most important of all, the Mexican computer market is growing and dynamic.

The slowdown in mainframe shipments from the U.S. may be temporary, since the Mexican government has quietly put a lid on government dp purchases because it is said to feel that the government had “overcomputerized.”



There have been no official decrees or statements on the matter, but dp business has dried up since July when the government was said to have tightened up on new acquisitions of dp mainframe equipment.

“Things are slow right now,” says Robert D. Clark of the U.S. Trade Center in Mexico City. “But we’re hoping they will open up after January 1.”

Clark, whose Commerce Dept. unit

works to encourage U.S. trade in Mexico, monitors Mexican trade regulations and practices with the idea of stimulating shipments of U.S. gear into Mexico.

Manufacturing plans

To date, Mexico has little in the way of computer manufacturing, but the country definitely has big plans for the future. Mexico’s general hope is to encourage large U.S. computer companies to manufacture in Mexico. The government, however, requires that the manufacturing operations be at least 51% owned by Mexicans.

One big enticement for foreign computer manufacturers is that once a plant is built in Mexico, the government closes its borders to competition, giving the new manufacturer what is in effect a monopoly—unless and until another manufacturer decides to establish manufacturing facilities in Mexico. The most sophisticated large scale manufacturing in Mexico is being carried out by—who else?—IBM, which makes electric typewriters near Mexico City.

Another type of manufacturing is the so-called “maquillaje operation,” in which U.S. computer and electronics firms manufacture labor-intensive products along the U.S. border in Mexico and then ship the finished product back

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news in perspective

to the U.S. Many firms, such as Cambridge Memories and Burroughs, take advantage of the border operations, but they have little impact on the actual Mexican computer market.

The future of the "maquillaje operation," moreover, is in doubt because Mexican labor wages have been rising at a rapid rate of 20 to 22% a year and manufacturers are beginning to look elsewhere in Latin America for inexpensive labor.

Users are sophisticated

In many ways, Mexican computer users are surprisingly sophisticated, particularly in Mexico City, where most governmental operations are centralized, and in industrialized Monterrey where the per capita concentration of computers is the highest in the country.

The data communications market is also regarded as a booming market and the Mexican telephone system is a good one and is generally regarded as better than most European systems. For example, the Mexican phone system, Telefonos de Mexico, has two microwave networks—one serving the East Coast; the other serving the West Coast.

While the minicomputer market is impeded by the stringent and complex import restrictions that hamstring the dp firms, the mini market, nevertheless, looks bright in Mexico. The Digital Equipment Corp., the leading U.S. mini manufacturer, finds the Mexican market attractive.

"The Mexican market is typical of the



whole South American market," says a DEC spokesman. "We're getting a lot of education applications and a lot of small business applications."

When DEC was contacted, the firm had just sold mini-based systems to a petroleum distributor, a fish processing operation, and to the 2,500-student Tijuana Institute of Technology. A PDP-11 went to the Tijuana location where it will be used for a wide variety of applications including program development, student instruction in COBOL and BASIC and for general administrative

applications

Informatica Nacional's Rodriguez-Montero believes the data communications and minicomputer segments will continue to enjoy the fastest rates of growth in Mexico. He points out that the government is beginning to disperse some important operations—like taxation and social security agencies—in different regions in the country with the result that there will be more opportunities in distributed processing and data communications.

"We're optimistic about the future," says Rodriguez-Montero. "Mexico has a steadily growing economy, a developing middle class, and the government seems to have begun to have brought inflation under control during the last six months."

Besides representing a cluster of U.S. computer and electronics firms, Informatica Nacional has begun to manufacture equipment designed by U.S. firms in an old IBM plant that Informatica Nacional has leased. The first products to be manufactured are Milgo modems. Ronald F. Morrison, vice president of Informatica and a former director of marketing for IBM's Caribbean Area, says Informatica has plans to manufacture other products designed by U.S. firms.

—W. David Gardner

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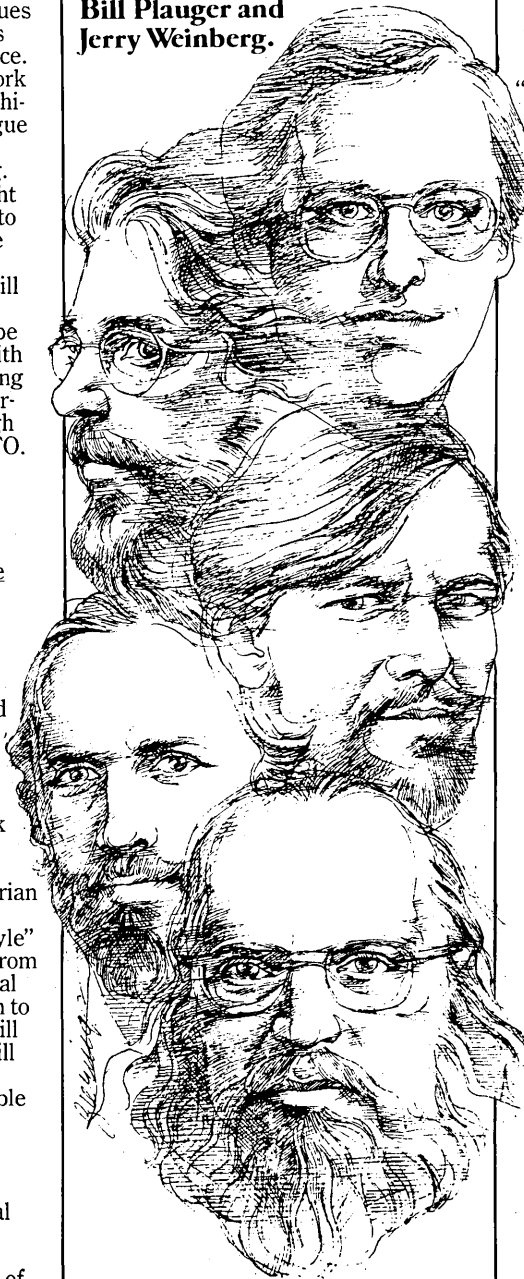
Larry Constantine—co-author of "Structured Design" in the *IBM Systems Journal* and co-author of *Structured Design*. Larry will speak on structured design and its impact on structured programming.

Bill Plauger—co-author with Brian Kernighan of *The Elements of Programming Style*, "Programming Style" "Examples and Counter-Examples" from the *ACM Computing Surveys* special issue on programming, and the soon to be published *Software Tools*. Bill will speak on programming style and will emphasize that eliminating GOTO statements does not ensure a readable program.

Tom Plum—co-author of "IF-THEN-ELSE Considered Harmful," "Teaching Structured Programming...by Example," and "Remedial Programming." Tom will serve primarily as moderator.

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news in perspective

Who Will Market the Unidata Machines?

Apparent dissolution of Europe's three-company computer partnership, Unidata, has sent the partners and their governments scrambling to chart their now disparate futures in the computer industry.

The decision last May 12 of one partner, Compagnie Internationale pour l'Informatique, to merge with Compagnie Honeywell Bull prompted the first defection late last summer when N. V. Philips of the Netherlands said it was pulling out of the general purpose computer business (October, p. 130).

West Germany's Siemens, the third partner, continued to reaffirm its intentions to remain with the full line designed for the Unidata effort to compete with giant IBM in the European computer market. (Sperry Rand Corp.'s Univac division was rumored to have visited Siemens to discuss a possible joint venture. And in Paris this fall, sources close to CII indicated that the CII-Honeywell Bull combine, at least in France, would continue to market three of the Unidata computers, the models 7.720, 7.730 and 7.740.)



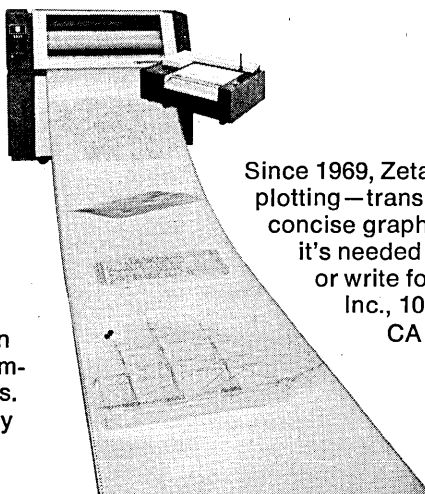
NO SALE: Demonstrators at a recent computer show in Paris waved placards denouncing the merger of France's CII with Honeywell Bull. One read: "We don't want to be sold to the Americans."

Not feasible to EEC

In Brussels the European Economic Community, despite all its protestations, was accepting the grim reality that a truly "European" competitor against IBM's dominant position was not feasible. Its dreams had been defeated by overwhelming nationalism and under-

whelming funding. In an early summer bulletin the EEC said "Europe is now faced with either massive funding to maintain even a certain market share or with maintaining a minimum competence in the mainframe market, while seeking out new but related growth markets in the computer field." The lat-

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ter was the EEC choice. Generally, those markets include everything but the larger mainframe—"terminal, peripheral, and minicomputer manufacturers, the semiconductor industry and various service companies such as bureau and systems, software and consultancy houses."

It will be many months or years before all the effects of the CII-CHB merger (due to be finalized last month and consequent abortion of Unidata will be seen. Siemens' vice-president of finance, Klaus Muller-Zimmerman promised the financial publication *Barron's* that Siemens will stay in "computers and in every other promising field associated with electricity, no matter how many other companies quit." The \$7.2 billion Munich-based company has continued to suffer huge losses in the computer business. It grossed \$400 million in dp sales last year and lost \$73 million. It expects to lose another \$40 million in 1975 and may remain in the red in 1976.

In fact Philips disclosed in a memorandum on its withdrawal from two-year-old Unidata that in 1974 the partners forecast that "very high uncovered costs would have to be taken into account in the first four years (up to and including 1978) and thereafter, irrespective of government subsidies in Germany and France." They realized that they would have to integrate their facilities and their management. The disintegration of Unidata would not seem to help Siemens improve that picture, since presumably it must reassume all the development, marketing, software, and other responsibilities that its partners had.

Profitable, or else

Gerhard Sorg, a commercial analyst for the computer operation's marketing division, says that despite Muller-Zimmerman's optimism in the *Barrons* article, he knows that the computer operations have been told to become profitable, or else. Sorg, who was on a trend-seeking tour of the U.S. computer industry this fall, is vague over the meaning of "or else," saying simply "we will be profitable, or at least breaking even." Siemens computer operations, he suggests, actually do better than indicated, since they provide computers within Siemens at cost and give technical services to the various divisions at no charge. Hence the parent company saves considerably by having an in-house manufacturer.

Sorg said Siemens' plan for profitability in the computer business is simple: don't spread the operations too thinly. It will drastically cut back peripherals development, going outside to Storage Technology and Control Data for tape and disc drive printers. It will not offer new operating systems, but instead will

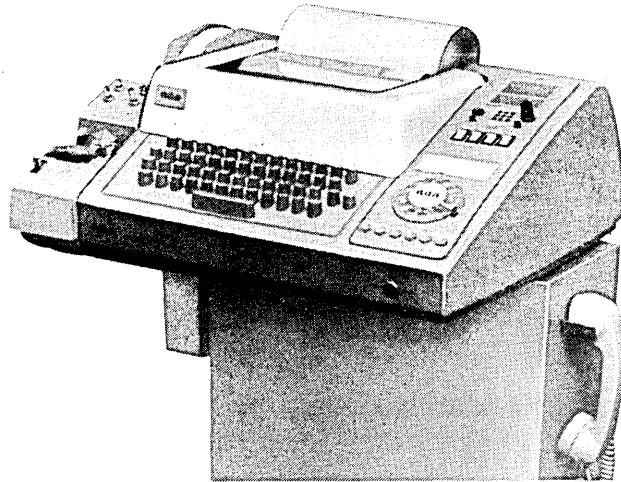
develop enhancements to the two systems it now offers: the BS 1000 and BS 2000. Siemens will stick to the present line of mainframes, but concentrate on software applications that are more directly tailored to the needs of prospective customers (as opposed to the more generalized offerings of IBM).

Keep Unidata line

Related to all of this are its plans to pursue the Unidata line, which Sorg describes as offerings of the three partners to which are added "modes" of each other's computers. For instance, Siemens' model 230 medium scale computer has a CII and Philips mode that

makes its instruction set compatible with CII and Philips' offerings, and therefore is called the Unidata 7.730 (similar to the IBM 370/125). The Philips Unidata 7.720 machine has a compatible instruction set with the Siemens-made model 220.

Sorg said Siemens can make the entire Unidata line. It probably will introduce a more powerful version of the low end 7.720 (of which he said 100 are installed). The 7.740 is developed and manufactured by CII, but CII had some production snags and Siemens filled the first orders with a stripped-down version of the Siemens-developed 7.750, so it can be assumed Siemens can continue



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to supply the 7.740. New offerings in the first quarter of 1976 will be the 7.760 (370/155 range) and 7.770 (IBM 370/165). Beyond that will be a new line, which Sorg insists will be compatible with future IBM offerings.

Being twice burned—as an RCA licensee and Unidata partner—Siemens is reported by other sources to be leery of other entangling alliances. Univac, most often mentioned, is reported to be willing to discuss minority interest in a computer partnership within Europe. There is room in the Univac line for some of the Siemens/Unidata equipment, especially in the 7.740 and 7.750 range, and Univac could initially solve Siemens' need for big computers with which to upgrade its customers.

Plans in France

As the CII-Honeywell Bull merger approached finalization late last month, a source close to CII said the merged companies would continue to market the Unidata models 7.720, 7.730 and 7.740 in France as well as the full Honeywell line. Honeywell's small business systems, level 61 and 62, will be marketed side by side with the 7.720. Although Philips, which developed and manufactured the 7.720, has said it will no longer manufacture this equipment after existing orders are filled, this source claims that CII-HB will "keep this product in the line and who will make it has been solved."

The level 64, a Honeywell Bull development for Honeywell Information Systems, "will be dedicated to upgrading HB users," the source said. "The new customer prospects will be pitched to buy the 7.730, 7.740 and IRIS 50." Presumably the source was referring to the IBM customer as the predominant new prospect, since the 7000 line is IBM-compatible. The source had no information on how CII-HB would obtain the 7.730, since that was a Siemens development.

The 66 an upgrade

The Honeywell level 66 system would be "dedicated to go to new accounts within the private sector," as well as being provided as an upgrade to existing Honeywell system users. The IRIS 55 and 80 will be offered to the government and government-controlled companies.

This source claims that this market plan is more logical than would be thought by those who feel the Honeywell line should supplant all CII products. He claims that the CII operating system IRIS-8 is used by more firms in France than HIS's GCOS. He noted that 125 of the CII IRIS 80s are installed or on order in France, about equal to the 126 Honeywell level 66s and 6000s in

or on order there. He claimed that the library of application software for the CII line is "more European-oriented" than Honeywell's. ("To get a change made to their software, you must call Wellesley.") Then he reemphasized that the IBM-compatibility of the 7000 line gives the new combine a great chance to crack the IBM market. In France, "Honeywell is living on old accounts."

HB could not verify this plan before the merger was finalized, but its existence indicated some important questions and problems faced by this new

combine. The first is the anti-American bias. Despite the majority French ownership of the new combine, the French feel that the strings will be pulled from the U.S. "We don't want to be sold to the Americans," said a sign at the Communist party demonstration at the recent SICOB business exhibition in Paris. As has been their tradition, they were calling for nationalization of HB and now, CII-HB. It is also evident that the CII and HB employees are not yet unified in spirit, especially since many at CII came from Honeywell.

The economic reality is that somehow the two firms will have to eliminate redundant facilities and people. Honeywell itself has already suffered from that

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problem for years, despite the fact that it purchased GE computer operations outright. Considering the high emotion surrounding the CII-HB merger, the problem will be compounded. The Communist demonstration at SICOV was quite amicable, but the threat of nationalization can be real if the blending isn't handled right. One of the demonstrators, asked how CII-HB can be profitable or even survive if it must carry duplicate facilities or personnel, replied, "We are talking about people, not machines. If people are out of work, who cares?"

—Angeline Pantages

Privacy

Law Would Cover "Secondary" Users

A new privacy protection bill, covering police department and similar data banks, has been drafted by a House Judiciary subcommittee. In late November it was expected the bill would be voted up to the full committee. One novel feature is a section devoted to "secondary use." It directly restrains what can be done by organizations and individuals

with dossier data they obtain from law enforcement agencies.

Private as well as public secondary users are covered. Previous bills, by comparison, attempted to control secondary use only indirectly—for example, by limiting access to data bank files.

The House bill also imposes a number of new record keeping requirements on suppliers and users of dossier data. It gives the states extensive control over the operation of criminal justice information systems, and restricts the federal role.

One provision says the Justice Dept. cannot require the states to support such systems on dedicated computer or telecommunication facilities. This language responds to a tidal wave of criticism from the states which has engulfed even the White House. The states contend that shared facilities can provide adequate security at far less cost.

(The Justice Dept. already is backing away from its insistence on dedicated systems. Under a regulation issued last summer, each state was supposed to submit a privacy protection plan by the end of this year covering its criminal justice records. The plan had to include a dedicated computer to massage the

dossiers. This month, the Justice Dept. held the first of a series of hearings on a proposed revision of last summer's pronouncement, which would allow use of shared computers. The revision establishes a new deadline—next spring—for submission of the plans, and allows each state to determine, largely on its own, how to keep the records secure.)

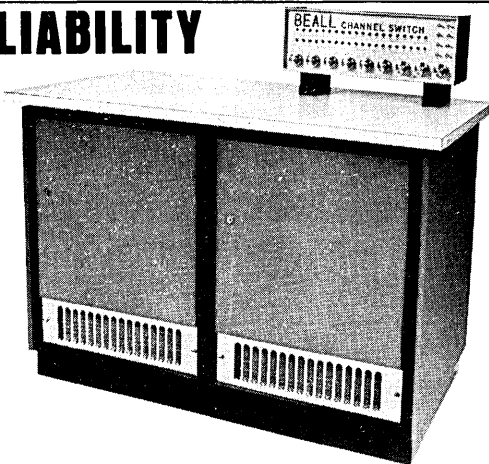
Additional records

The other key provisions of the new House bill (which had not yet been given a number):

—A criminal justice agency obtaining arrest record information from another such agency would have to keep track of who asked for it, what data was obtained, why it was requested, and how the information was used. These "request records" would have to be kept for three years. A similar audit trail would have to be maintained on dossier data "accessed by patrol units (from automated systems.)"

—Criminal justice agencies using automated systems to exchange any kind of sensitive information on individuals accused or convicted of breaking the law would have to sign detailed, written exchange agreements. The type of information traded, and the individuals having direct access to the files, are among the items that would have to be spelled out. A non-governmental agency granted access to criminal justice information

RELIABILITY



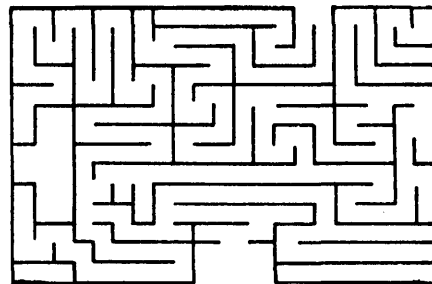
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would have to sign a similar pact.

—With a few exceptions, dossier data could not be disseminated automatically for “noncriminal justice purposes.” A state or federal statute or executive order would have to be adopted first. And in each case, the authorized “requestor . . . has the obligation to put individuals who may be the subjects of such records on notice that such information may be requested.” This is one of the direct controls imposed by the bill on secondary users. The other is a section prohibiting such users from disseminating criminal justice information—directly or through intermediaries—or employing it illegally in any other way.

Putting justice in its place

—The bill says the Justice Dept. cannot “own, operate, manage, or control the telecommunications services and facilities necessary” for exchange of law enforcement information between the feds and the states. This is a reference to a protracted battle between the FBI and the states over control of the National Law Enforcement Telecommunications system (NLETS), a low-speed data network operated by the states. The FBI wants to take over the system and upgrade it. The states, fearing federal domination, oppose the takeover. The dispute was recently referred to President Ford for a decision. Presumably, the language in the House bill is aimed even more at him than at the Justice Dept. There is a similar restriction in S2008, a related privacy protection bill now pending in the Senate.

CCH downgraded

—Another provision in the House bill reduces federal control over state/local criminal justice information systems by allowing the FBI to keep detailed records in its Computerized Criminal History (CCH) file only on persons charged with federal crimes. Now, CCH encompasses records on single-state offenders as well. (It also includes an index to the criminal history records held by some states. The House bill would allow the index to be retained.)

—Notable by its absence from the House bill is any mention of a federal commission to regulate state and local law enforcement data banks. This commission is a major feature of the Senate bill.

—The House legislation imposes a one-year prison term, a \$10,000 fine, or both on any “present or former officer or employee of an agency subject to this act” who violates it. But these penalties are imposed only on an officer or employee who “knowingly” makes an illegal disclosure of information. Establishing such intent is generally pretty difficult.

There are also civil penalties, which include fines and award of a plaintiff’s

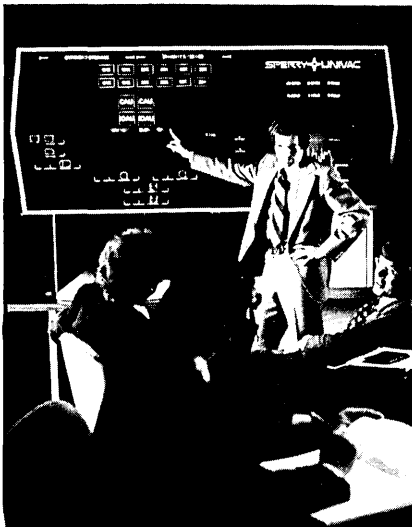
court and legal fees. But “good faith reliance on the provisions of this act . . . shall constitute a complete defense” against most of these penalties.

—P.H.

Mainframers

Soft Lights and Music

What must certainly be one of the most sophisticated benchmarking facilities anywhere in the world was dedicated last fall by Sperry Univac at its Eagan (St. Paul, Minn.) facility. No other manufacturer is known to have a



system as comprehensive as the Sperry Univac BMD-1100 system, which uses hundreds of miniaturized electronic probes (potentiometers) mounted in assortment of Univac mainframes and peripherals to monitor system activity. In addition to the system’s obvious importance to current Univac users considering expanding or upgrading their systems, more than 100 specialists familiar with the workings of IBM, Burroughs, Honeywell, and other systems can modify job streams taken from these systems for comparison runs on Univac equipment.

At the heart of the benchmark facility, built entirely in-house by Univac after looking at what was available from other vendors, is a Univac 1616 mini from its federal systems division. Users can ask the console operator for specific graphs of system activity, which are shown on a seven-color crt display, and then change requests dynamically (as the run is in progress) to get answers to such questions as “what is the percentage of cpu activity; how busy are the channels when the cpu is busy; etc.” Within minutes, system configurations can be modified to show the effects of more (or less) memory, an additional channel, or whether a second processor would benefit a system more than addi-

tional memory or channel. Runs are recorded for “instant replay” and subsequent analysis. Collected data can be displayed over time periods ranging from two minutes to more than two hours. Perhaps not of as much use (but sexy and impressive all the same) are lights hidden in the system diagram boxes on the display screen shown at the front of the room. Every time a device is accessed, the lights reflect this activity, giving impressive evidence of system activity.

Univac intends to use the new benchmarking facility to woo potential customers for its 1100 systems from the ranks of IBM, Burroughs, and Honeywell small- and medium- scale users. The benchmarking system is “free” for prospects who would consider converting to a Univac system if it could be shown that the price/performance gains to be realized would be worth it in the customers’ eyes. Univac, while noting that “it hasn’t won every benchmark,” claims reception to the service has been excellent, and that at any given time, anywhere from 10 to 30 benchmark projects were being handled, many from non-Univac sites. Univac declines to divulge how much was spent on developing the benchmarking equipment, or how much it spends to operate it.

—Michael W. Cashman

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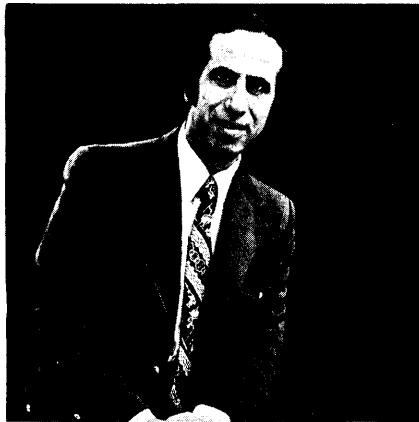
Room at the Top: Joseph Flavin has departed Xerox Corp. to become top man at Singer Co. replacing Donald P. Kircher, 60, who has been on a leave of absence since mid-September and who, the company said, is resigning for health reasons. Flavin was the third ranking executive at Xerox as executive vice president and president of international operations. He gave as one of his reasons for taking the Singer job: "Very few opportunities ever come to run your very own show." He told a press conference his mandate from the Singer board was "we'll support you in anything reasonable you want to do." He said he hasn't made any decisions on the fate of the business machines division, said to be for sale, but said he feels Singer's basic business, which he defined as sewing machines, is "a very sound business." Flavin said "I've spent my life with two top companies, Xerox and IBM . . . Singer's the same kind of place." Now he's at the top of one of the top.

"Call to the Colors": Walter Bauer, president of Informatics, Inc., characterized his keynote speech to the 43rd Management Conference of the Association of Data Processing Service Organizations (ADAPSO) as a "call to the colors." He was calling for relief from "the IBM threat." He warned the group of service bureau and software company representatives that the agreement between IBM and Control Data Corp. which keeps IBM out of the services field for six years, will be over by January 1978 and "We need IBM in data services like Custer needed Indians." He cautioned against looking for too much help outside of the computer industry, noting that "8.9% of the trust portfolio of Chase Manhattan Bank is in IBM stock." Bauer feels the Computer Industry Assn. (CIA) "may be the only effective force operating today to achieve competition in the data processing industry." He doesn't want IBM broken up "into parts" and believes IBM is going to suggest this and probably has a plan for it." And, he said, "we don't need a CAB (Civil Aeronautics Board) for data processing. What we need is a carefully considered, long term consent decree which probably would be good for 10 years. The 1956 decree really did help."

Narrowing the Lines: Capital-limited California Computer Products has halted development of a 6250 bpi tape drive. CalComp president, Lester Kilpatrick, told stockholders that "Operating in a positive cash flow mode must take precedence over revenue and prod-

uct growth . . . CalComp has narrowed its product lines to the memory and graphic areas where our strength is the greatest." He said CalComp will continue manufacturing its 1040 and IBM 3420-type drive, and has no plans to cut back on its Automated Tape Library which can use tape drives of various manufacturers. But no new tape drive products are planned.

"A Focus on Future Products": Jesse I. Aweida, a co-founder and president and chief executive officer of Storage Technology, Inc. since its inception in 1969, has dropped the job of president to "focus on future products and planning." He will continue as chief executive. New president of the Louisville, Col., mag tape and disc storage systems manufacturer is Victor A. Casebolt who joined STC from General Electric where he had been general manager of utility



JESSE I. AWEIDA

and process automation and instrumentation. The presidential shift was a part of a major reorganization of STC's top management. Executive vice-presidents Eugene E. Prince and James K. Dutton have left for positions with other firms. John J. Mehalchin, treasurer, said Prince was in line for the presidency but "it didn't work out."

Digital Computer Will Appeal: A Delaware chancery court found that Digital Computer Controls Inc.'s D-116 is "substantially identical" to Data General's Nova 1200 and based on the improper use of Data General design drawings. The court said it would issue a permanent injunction barring Digital Computer from using logic designs of either the Nova 1200 or the D-116 to make computers identical to the Nova 1200. Digital Computer will appeal. The Fairfield, N. J. firm said it expects to be able to continue to make "its full product line," including the D-116 minicomputer that was at issue in the trade secrets lawsuit brought by Data General. It said too that if any damages are awarded to Data General it is expected

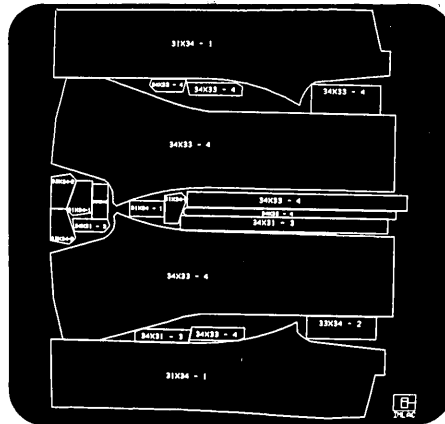
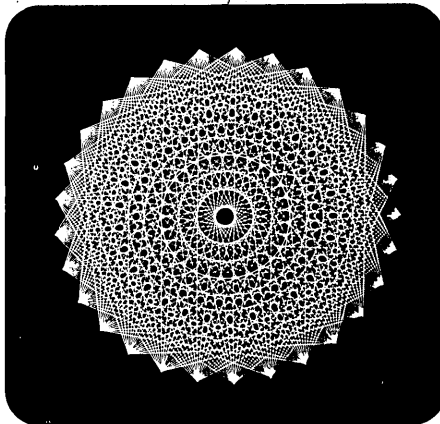
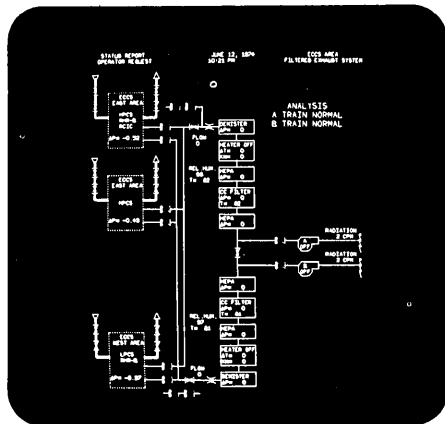
they will not exceed \$100,000. The issue of damages is to be taken up in a separate trial. Digital Computer's appeal will be to a Delaware supreme court.

Last to Go: Data processing staff people are among the last to be fired during a recession, said a New York City executive search firm. The Josten-Wolf Group said a survey it completed showed that while six out of ten U. S. companies were forced to cut payrolls since June 1974, fewer than four out of ten reduced the number of information systems personnel. In fact, said John Davis, a senior partner in the firm, more than one out of three companies increased the size of their information systems staffs in the same time period. Top management, Davis explained, "is increasingly dependent on the information systems for both daily operating and long-range planning data. This need to know makes companies more reluctant to cut data processing staffs than staffs in other areas of the company."

Second Cyber 170 Down Under: Control Data Corp. shipped its second Cyber 170 machine, a model 173, to the South Australian Institute of Technology where it will serve as the central computing facility for seven colleges. The first 170 machine shipped, a model 172, went to the National Institute of Agrarian Research in Madrid, Spain, in July. At the South Australian Institute of Technology, the Cyber 173 will be the central processing unit for SAENET, an educational network established by the South Australian Colleges for Advanced Education. Seven remote data entry stations and more than 100 terminals will be included in the initial network to serve some 14,000 students in the participating colleges.

Wider Career Paths: Opportunities for senior data processing managers to move into general management positions are increasing, says the Diebold Research Program, based on a survey it conducted among some 200 industrial, service and financial corporations. Joseph Ferreira, director of the research program, said that although only 25% of the data processing managers questioned said that their predecessors had been promoted outside the dp division or moved laterally into the mainstream of general corporate management, more than 40% now see valid opportunities for their own promotion outside data processing. Very few of the chief executive officers questioned, said Ferreira, saw any reasons why senior data processing executives should not be promoted to very senior corporate positions. *

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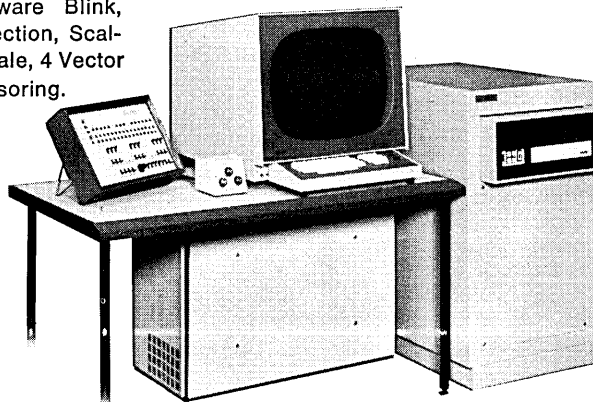
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LOOK AHEAD

(Continued from page 18)

A LETTER TO THE MAYOR

The city of Seattle, Wash., spent almost a year evaluating facilities management (FM) as an approach to its data processing requirements. The city decided it was a good approach, one that could save it \$3.5 million over five years. It issued an RFP and was about to award a contract when a letter to the mayor put them right back where they'd started a year earlier. The letter was from a representative of one of the two contenders for the FM contract, Boeing Computer Services. The other, the contender the city favored, was Computer Sciences Corp. The BCS letter charged that the city had leaked information on its bid to CSC. John Elliot, assistant budget director for management information systems for the city, said he doesn't believe there was any kind of leak. "But there was an appearance of something wrong." So the city council threw out both bids before the report on the FM evaluation was even complete. The council now is doing what it did a year ago, considering three alternatives: re-bidding for an FM contract, continuing with a city-managed operation, or going to a jointly-managed facility with King county. The original FM request was drawn up predicated on a sharing with the county which has excess capacity in the form of a 370/155 it now wants to sell. It will put this machine up to bid Dec. 15. The mayor of Seattle still wants FM and has asked the council to approve a 1976 budget which would cover four months of continuing in-house operation, then takeover by an FM contractor. It's in the hands of the council now.

PLANNING WITH BASIC

Many of the 200 financial analysts who answered an ad for a position in the corporate planning office of Four Phase Systems, Inc. complained that the company's requirement in the ad for "BASIC programming competence and experience is using a computer" was ridiculous and unnecessary. Nevertheless, the ad which ran in mid-November editions of the Wall Street Journal and the San Francisco Chronicle turned up about 20 persons with computer capability, says the Cupertino, Calif., company's manager of corporate planning and control, Joe Riley.

The practice may not yet be widespread, but Riley thinks it makes sense to merge financial analysis with programming. In computer-assisted financial analysis there are mechanical parts (programming) and judgment parts, Riley explains, and the programmer understands only the mechanical part. Four Phase, which now uses service bureaus, soon will begin using its own in-house computer, a Four Phase model 470.

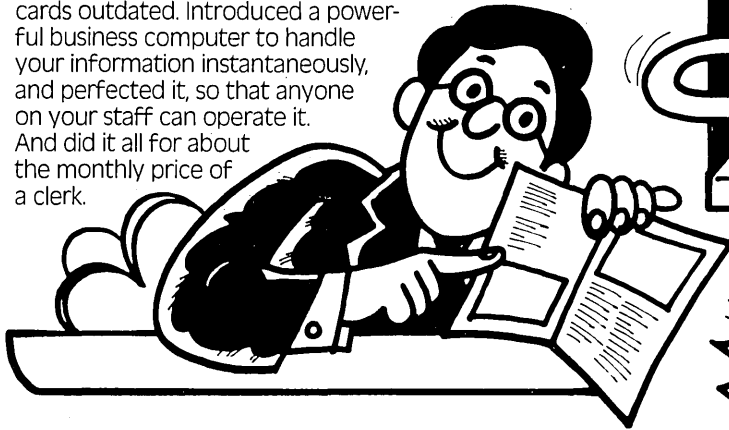
RUMORS AND RAW RANDOM DATA

AFIPS would like to have more women on the National Computer Conference program next June in New York as speakers, panelists and referees of papers. The association issued a press release last month and also wrote to 800 women members of the Association for Computing Machinery. The coordinator, Anita Cochran of Bell Labs, says the response has been "excellent"...Security Pacific National Bank, with some 500 branches throughout California, is talking to management of major California supermarket chains and is expected to announce plans soon for installation of remote terminals in one or more chains...A Wall Street Journal report on the many consumer objections to electronic funds transfer (EFT) noted an interesting twist in the Pillsbury Co. which has 1,500 of its employees eligible for direct payroll deposit. The story quotes a computer shift manager for Pillsbury as fearing that computer errors could tangle his financial affairs. Although a third of the eligible Pillsbury employees have accepted direct deposit, only two of the 35 members of this man's department have gone along.

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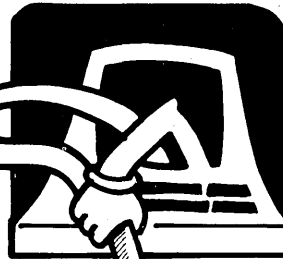
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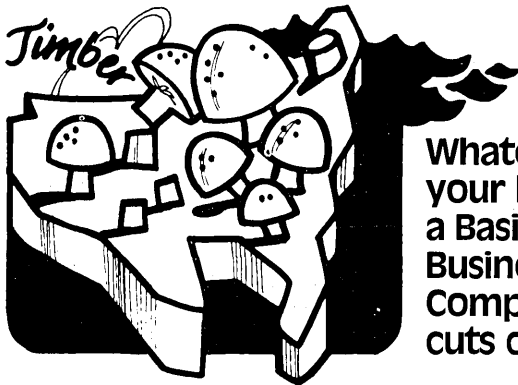
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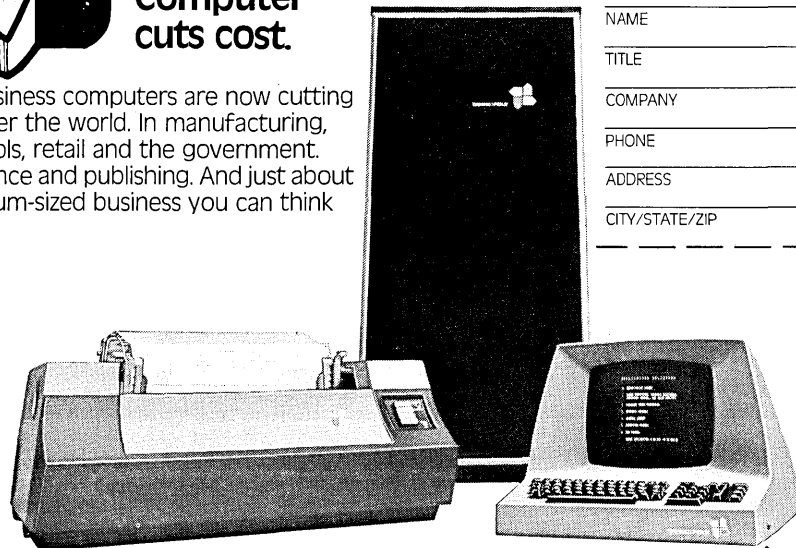
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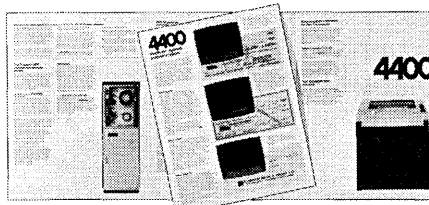
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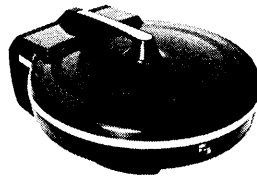


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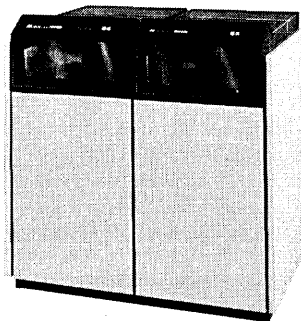
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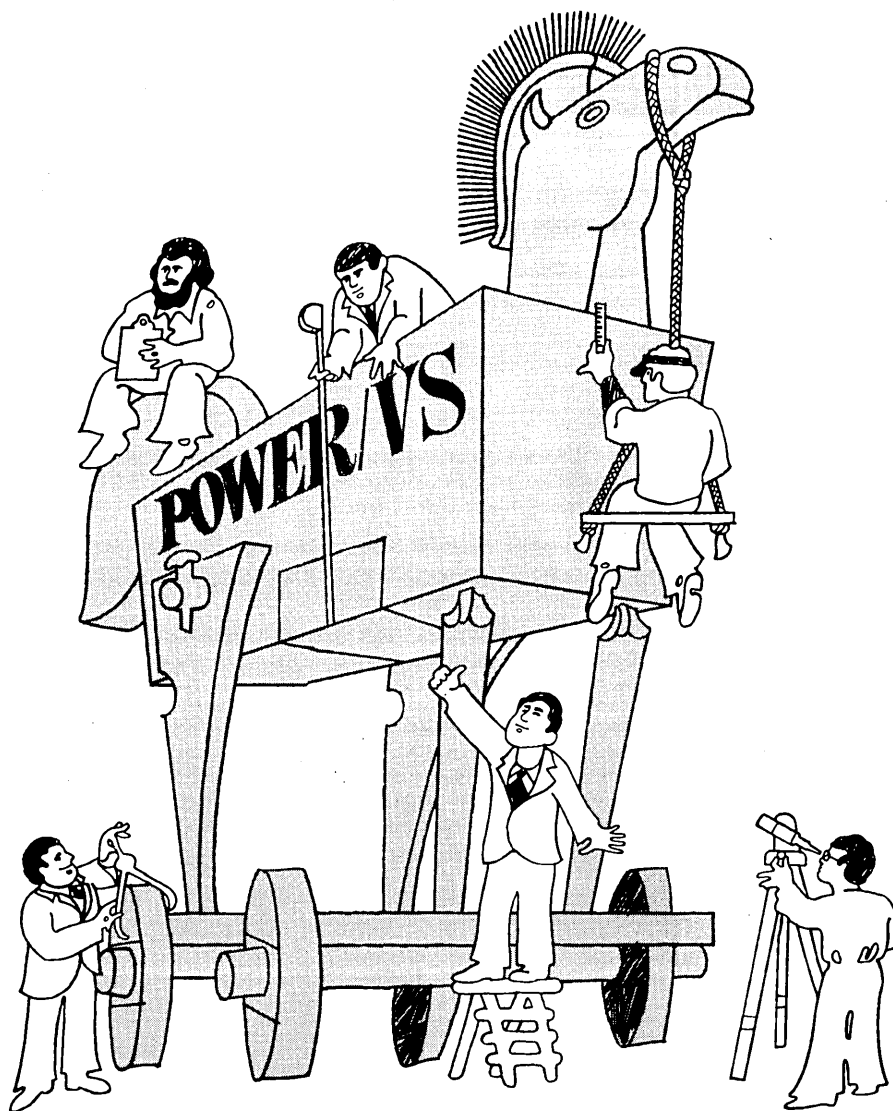
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User Ratings of Software Packages

by Daniel J. Tanner

Are the vendor's claims accurate? Does the software product have hidden flaws? Is the documentation any good? Can I rely on the vendor for support? Here's what the users say about 211 common software products.

Systems packages lead applications packages in users' overall satisfaction; software budgets are climbing at a rate of 20% yearly; and documentation, technical support, and training are noteworthy weaknesses shared by a large proportion of software suppliers. These are some of the conclusions that can be drawn from the survey of software package users recently conducted by DATAMATION and Datapro Research Corp.*

Presuming that the way to find out what users of proprietary software products think of those products was to ask them, data processing managers across the country were polled directly, and the compilation of their responses is presented here. The conclusions above were only some of the findings of the research. Another interesting one was that users generally rate software packages from independent vendors more highly than they rate packages from their equipment suppliers. And that means a great deal for the software industry.

There was a day, not very long ago, when the idea of purchasing software, especially from anyone but a mainframe vendor, was risky at best. There were hundreds of packages available, but the products and their vendors were unproven. For a while, software vendors seemed to be dying off as quickly as new ones were born to replace them. A potential buyer of software had to wonder whether the vendor would even be around next month to support the product. Technical support and documentation were often sketchy and in some cases nonexistent.

For all of these reasons, when a user did decide to go outside for a software package, he often selected software available from his mainframe manufacturer instead of better, more efficient, and lower-cost systems offered by the independents. At least the user had some level of assurance that the company would be around to honor the contract.

But those days are gone. The software business is, today, a legitimate and thriving one in its own right. Our survey clearly showed that computer users are increasing their expenditures for

proprietary software every year. Some of the more successful software houses have tripled or even quadrupled their sales in the past few years. Most predict that this trend will continue.

Meanwhile, users are becoming more and more aware of the economic and other advantages of obtaining proprietary software. The risk now is minimal, and is usually offset by a risk of equal proportions that confronts a company developing a system in-house. At least when a proprietary software package is purchased, the cost and (hopefully) the installation time are fixed. And that's certainly more than can be said for in-house development efforts.

The "not invented here" syndrome, which plagued the software industry for so long, is dying. Granted, it is not dying quickly or easily, but it is showing a progressively fainter heartbeat. Users are increasingly aware that the use of proprietary software, when compared to the cost and uncertainty of in-house development, has a legitimate place in almost every dp installation.

Trends for the future

There are definite trends in the kinds of software that will be first accepted, too. Users of large and small systems alike, for example, are planning to install data bases and on-line capabilities. Additionally, the computer is increasingly trusted as a tool for financial planning and the all-important functions of accounting and reporting. And more and more often, users' plans call for placing crucial financial information in data bases and for providing on-line inquiry, retrieval, and update capabilities.

But nothing in these trends foretells doom for the "traditional" packages. Most of the ambitious plans belong to users who are already running successful installations and tend to be present users of the separately priced compil-

ers, librarians, utilities, sorts, etc. And thousands of other installations remain a fertile field for the marketers of these "everyday" software aids. Also, a high proportion of the survey respondents are still looking for such straightforward applications packages as accounts receivable, accounts payable, and payroll.

But just because the software industry as a whole has come into its own, it doesn't follow that every package is clean, cost-effective, well supported, or adaptable to every installation. Even packages from highly reputable vendors may be lacking in some respects.

Before putting his money on the line for separately priced software, a user deserves to know—and should demand to know—how that software is performing in other user installations. This article, containing directly comparable ratings by the users of 210 popular software packages, provides that kind of information.

Why use proprietary software?

There are many reasons why a user may wish to obtain a proprietary software package. The main ones are:

- avoidance of an in-house effort,
- standardization,
- improvements in the speed or efficiency of program execution,
- improvements in the control, speed, or ease of system operation, and
- the resultant cost savings from any or all of the above.

Avoiding an in-house effort is often one of the best reasons for acquiring a package. But it may also be the most difficult one to rationalize within your own company. First, you have to convince management that the money and/or the time that will be spent for the package is less than the amount that would be required for in-house development. This is often difficult to prove, especially since time and cost estimates for system development nearly always tend to be overly optimistic.

Second, you must confront the fact that avoiding an in-house effort may mean avoiding the hiring of additional programmers, and, in a few cases, actually reducing the size of your existing

Detailed results of the survey described in this article are contained in "User Ratings of Proprietary Software," a 36-page *DATAPRO 70* report available for \$10.00 from Datapro, 1805 Underwood Boulevard, Delran, New Jersey 08075; (609) 764-0100.

programming staff. Needless to say, this isn't going to go over well with your programming staff. It's no wonder that programmers often refer to proprietary software as "out-house" efforts.

Then, after you've gotten over that hurdle, you must convince management and programmers alike not to be taken in by the "not invented here" syndrome. Many people still believe that nothing from outside can possibly be as good as something they develop themselves. And, in some cases, they may have half a point. General-purpose *systems* software can frequently be installed without any modification required to make it fit the installation. But this is usually not true in the case of *applications* software.

In the survey, 490 users of 70 applications packages responded to our question "Did the package require modification?" Only 16% replied "No," whereas 29% said "Yes, by the vendor," and 55% said "Yes, by the

user." In numerous cases, both vendor and users made modifications.

It should also be borne in mind by prospective users of proprietary *applications* packages that vendors often either cannot afford to support or modify packages installed outside of a small geographic region, or may even be vending packages with the explicit understanding that modifications are not a part of their standard deal.

Thus, the buyer of applications software (and often systems software, too) must keep in mind that frequently he will have to allocate some time, manpower, and other resources to the installation of a proprietary software package. This must be considered in making the decision of whether or not to buy.

Standardization is often a good reason for a user—especially a user with multiple computer systems at various sites—to purchase proprietary applications software. This can guarantee that a particular application, such as ac-

counts receivable, will be processed the same way regardless of location.

Additionally, standardization on one or more computer sites can be achieved through the use of proprietary systems or operations software, such as library systems, documentation aids, languages, shorthands, and some accounting and reporting systems. Proper standardization can improve communication among personnel and systems, enable data to be transferred among systems, and permit simplified, standardized maintenance of programs.

To make sense as a purchase, proprietary software used to improve the execution speed of a common application must save the user at least as many dollars worth of computer time as it costs to be worthwhile. Prime examples of packages designed to do this are sorts, utilities, data manipulators, report writers and generators, language optimizers, and data base management systems.

Some proprietary software packages

How IBM Measures Up

The 103 software packages rated by six or more users are supplied by IBM and 48 other vendors, a few of whom are also equipment vendors. But 26 of the 103, or 25% of these most frequently rated packages, are provided by IBM. (Digital Equipment Corp. is next, with six packages in this group, followed by University Computing with four, Applied Data Research, Pansophic Systems, Programming Methods, and Westinghouse, each with three, and 13 companies with two each.)

Thus, for these 103 packages, it seemed appropriate to compare the overall Weighted Averages earned by IBM in each of the seven rating categories with those of the other suppliers. On the basis of 1,584 ratings for non-IBM packages and 801 ratings for IBM packages, the ratings are:

	Non-IBM	IBM
Overall satisfaction	3.4	3.1
Throughput/efficiency	3.2	2.9
Ease of installation	3.3	2.9
Ease of use	3.3	3.0
Documentation	3.0	2.9
Vendor technical support	3.0	2.8
Training	2.8	2.7

Even though the non-IBM group includes six computer vendors, the averages for IBM were lower in all of the eight categories.

But what do these differences of a few tenths really mean? It may be helpful to examine the percentages of "excellents," "goods," etc., in the Overall Satisfaction category to see:

	Non-IBM	IBM
Excellent	52%	30%
Good	39%	54%
Fair	7%	13%
Poor	2%	3%

Now we can see that more than half of the respondents rating non-IBM packages called their Overall Satisfaction (in our opinion, the most important rating category) "excellent," compared to only 30% of those rating the IBM packages. What's more, only 9% of the ratings on non-IBM packages were less than "good" in this category, compared to 16% of the ratings on IBM packages.

Ratings expressed in terms of weighted averages have a purpose, and that purpose is concise, convenient ranking. But different distributions of scores can yield the same weighted averages. Here are the response distributions by percentage for each of the other six rating categories on the 103 most widely used packages:

	Non-IBM	IBM
Throughput/ Efficiency:		
Excellent	42%	20%
Good	44%	53%
Fair	11%	22%
Poor	3%	5%
Ease of Installation:		
Excellent	50%	28%
Good	36%	41%
Fair	11%	21%
Poor	3%	10%
Ease of Use:		
Excellent	47%	31%
Good	41%	47%
Fair	10%	17%
Poor	2%	5%

Documentation:		
Excellent	32%	26%
Good	43%	47%
Fair	20%	20%
Poor	5%	7%

Vendor Technical Support:		
Excellent	32%	28%
Good	43%	39%
Fair	18%	22%
Poor	7%	11%

Training:		
Excellent	21%	18%
Good	47%	42%
Fair	24%	28%
Poor	8%	12%

Those figures support much of what we said at the outset. The independent vendors as a group (with a few other mainframe makers thrown in) have packages that are rated more highly by users than does IBM, and software suppliers in general are relatively weak in Documentation, Technical Support, and Training. But even in these categories, the non-IBM suppliers lead IBM. Frankly, we found this surprising. After all, isn't IBM's size supposed to confer upon it a unique capability for customer support and training? And aren't IBM's documentation standards high, strict, and well-followed?

The difference seems to be that smaller vendors can—and must—be more responsive to user needs; it's the factor that's most likely to make or break them in the industry. Also, IBM has one problem that the others usually don't have: the need to keep up support for superseded but still widely installed packages (such as GIS and BOMP). *

USER RATINGS

are designed to speed or ease the way in which a system is operated. By their nature, they may also serve to standardize system operations. Additionally, there are packages designed to improve the control management has over computer operations. The various operating system enhancements, accounting packages, library systems, documenters, some reporters, and even some sorts and utilities fall into the group providing services in all of these areas.

Cost justification for many of these packages, like that for standardizing packages, can be difficult to assess. Often, a trial is the only way to judge. Can a shift be eliminated when the package is used? Are costly operator errors being reduced? Is the number of production job reruns going down? Are deadlines being met when they weren't before? Do you need an evaluation of whether the deadlines themselves are reasonable? (There are packages for that, too.)

What the numbers mean

The listings of user ratings in this article describe 210 packages from 92 vendors as rated by 2,819 users. Ratings were actually collected on many more packages than those included, but since it did not seem to be objective to rate packages according to what only one or two users thought about them, no package listed has been rated by less than three users.

Since people who acquire a software package can be expected to be biased in its favor, the opinions of prospective users who tried and *rejected* packages were given equal weight in the ratings. Also, since a consensus of 20 or 30 users (or "triers") should be more reliable than a consensus of, say, half a dozen, the actual numbers of respondents rating each package has been included in the presentation.

What all this means to the prospective software buyer is that by reading the listings he can determine to a considerable degree of confidence just what the strengths and weaknesses of a common software package are considered to be. Actually he can tell more than that. If a single vendor has more than one package rated here, the prospective user can tell something about the vendor, too.

Users were asked to rate the packages they were using in seven subjective categories: 1) Overall Satisfaction, 2) Throughput/Efficiency, 3) Ease of Installation, 4) Ease of Use, 5) Documentation, 6) Vendor Technical Support, and 7) Training, if applicable. Each category could be rated as

excellent, good, fair, or poor.

We then translated the users' ratings for each package into a weighted average for each category. The averages were computed in a straightforward manner similar to most college grading systems: "excellent" was weighted as 4, "good" as 3, "fair" as 2, and "poor" as 1. Then, the average was calculated by dividing the sum of the products by the total number of responses in the rating category.

Once the ratings were determined, some packages looked like really commendable products and were accorded two kinds of distinctions. Those packages which were rated by six or more users were placed on an "Honor Roll" if they met the following somewhat arbitrary but useful criteria: (1) they scored at least 3.5 in overall user satisfaction; and (2) they scored at least 2.8 in every category measured (actually, the Training category was not

THE 1975 SOFTWARE HONOR ROLL

Package	Vendor
ALLTAX	Management Information Service
ASAP	Universal Software, Inc.
Dump/Restore/Plus & Virtual Disk Utility	Westinghouse Electric Corporation
DYL-250	Dylakor Software Systems, Inc.
EPAT	Software Design, Inc.
Fast Dump/Restore	Innovation Data Processing, Inc.
Foresight	Foresight Systems, Inc.
1130/FORTRAN	DNA Systems, Inc.
GRASP	Software Design, Inc.
IMSL	International Mathematical & Statistical Laboratories, Inc.
KOMAND-DAS	Pace Applied Technology, Inc.
LIBRARIAN	Applied Data Research, Inc.
Optimizer/Optimizer II	Capex Corporation
PAN*SORT	Pansophic Systems, Inc.
PANVALET	Pansophic Systems, Inc.
PPE	Boole & Babbage, Inc.
Quickjob I, II, & III	System Support Software, Inc.
RELO-PLUS	Universal Software, Inc.
RPG II (for System/360 or 370)	IBM Corporation
1130/SORT	DNA Systems, Inc.
SYNCSORT	Whitlow Computer Systems, Inc.
UCC ONE (TMS)	University Computing Company
UCC TWO (DUO)	University Computing Company
WATFIV	University of Waterloo
WESTI (Teleprocessing Interface System)	Westinghouse Electric Corporation

HONORABLE MENTION LIST

Package	Vendor
BIT-FACS	American Valuation Consultants, Inc.
BOMP (for Level 62 systems)	Honeywell Information Systems, Inc.
CYTOS	DNA Systems, Inc.
DIOPEN (for System/360 & 370)	IBM Corporation
DISKPLAY	Boole & Babbage, Inc.
DISSPLA	Integrated Software Systems, Inc.
DOS/RS	Dearborn Computer Leasing Company
DUCS	C F S, Inc.
Financial Information & Control System	Management Science America
FMAINT	Software Design, Inc.
GBA DUMP	GBA International
General Ledger (NCR Century)	NCR Corporation
INQUIRE	Infodata Systems, Inc.
PSTAT	Princeton University
QCM	Duquesne Systems, Inc.
Save/Restore	Oxford Software Corporation
TSO (for IBM 1130)	DNA Systems, Inc.

counted; our rationale was that training is not always an explicit part of the deal on a package and users rated the category only when they thought it applicable for them).

An "Honorable Mention" section was constructed for packages that met the same criteria but which were rated by less than six users. We felt that since we couldn't be quite as confident in the ratings computed, those packages should not appear on the same list.

In selecting these packages for special attention, two extremely uncomfortable problems arise. The first and more obvious one is where do you draw the line? The second problem has to do with the complexity of a package; it is simply much easier for a small, simple package to meet its goals.

A number of highly regarded packages had only *one* user rating keeping them from Honor Roll or Honorable Mention distinction. For example, IBM's System/3 Disk Sort, IBM's DOS DITTO, Dylakor's DYL-260, Pansophic's EASYTRIEVE, IBM's System/360 and 370 FORTRAN, Cullinane's IDMS, IBM's IRP for System/3, Burroughs' NDL, Applied Data Research's PI SORT, Digital Equipment's RSX-11M, Oxford Software's SPRINT, and SPSS's Statistical Program for Social Sciences could each have made the Honor Roll *if a single user had made a rating change in a single category*. Clearly, these 12 packages are also outstanding.

Three packages that did not meet the Honorable Mention criteria also happened not to have a single user rate any category less than "Good." The three were IBM's System/3 Card Utilities, Arthur Andersen's MAC PAC-3, and Applied Data Research's METACOBOL. These packages, each with 100% of the users who rated them calling them "Excellent" or "Good" in every category, are certainly worthy of the consideration of prospective users.

Perhaps the ultimate answer is to categorize programs and present the ratings of the programs in each functional category in juxtaposition. Fine, but who decides just how to classify all the complex, multifunction packages currently on the market? But we won't beg the issue; we'll try it. Let's compare the ratings supplied by five or more users on their Overall Satisfaction with data base management systems. They are:

Package & Vendor	Excel.	Good	Fair	Poor	Avg.
ADABAS	5	3	1	0	3.4
DBOMP	4	20	10	1	2.8
DL/1	1	18	7	3	2.7
GIS	0	2	5	1	2.5
IDMS	6	2	2	0	3.4
IMS	5	20	8	2	2.8
Inquire	4	1	0	0	3.8
System 2000	3	7	3	0	3.0
TOTAL	51	53	12	0	3.3

December, 1975

Now, which is the best? Have you considered your needs? Will it run on your computer system? Under your operating system? Can it interface your files? Your data communications monitor? The languages you use? Can you afford it?

Unfair to big packages?

Related to that size and complexity problem, no package for data base management appears on the Honor Roll (although ADABAS, IDMS, and TOTAL all came close and INQUIRE earned Honorable Mention). Perhaps a DBMS is by its very nature too complex to please enough of the people who provide the ratings.

It appears that the most straightforward systems, especially among applications packages, have the best chances to earn Honor Roll Distinctions. Could it be that applications packages, report writing and retrieval systems, and similar programs are obtained mainly to please those outside the data processing department? If so, their acquisition may tend to position these packages with two strikes against them at the outset: they don't serve the dp department directly and are thus viewed as overhead, and they offend by being invented elsewhere.

If packages over 50K in size were given a 0.1 handicap, that is if they could score just 3.4 instead of 3.5 in Overall Satisfaction, several more products would be accepting laurels. The measly little 0.1 keeps IBM's 360 FORTRAN, Cullinane's IBMS, and SPSS, Inc.'s SPSS off the Honor Roll. It also keeps Cambridge Computer Associates' CROSSTABS, Computer Information Management's DATACOM/DC, Management and Computer Service's DATAMACS, and Applied Data Research's ROSCOE off the "Honorable Mention" list.

In spite of all the bemoaning about the unfairness of it all, the two lists of highly rated products are highlighted because they do deserve special recognition. The ratings are there for anyone ambitious enough to want to make his own list using his own criteria.

What's important?

In the end, what's really important is whether a package is good or bad for what the prospective user needs. And there are three tools to help him judge. First, the ratings give a good indication. Second, each package listed has a Reader Service number; circle that number on one of the reader service cards bound into this issue and we'll ask the vendor to send you more information about that product. Third, a Vendor Index is presented at the end of the package listings for those who want to go directly to the source. We encourage you to use all three tools.

While you're at it, you might keep in mind these suggestions supplied by the users whose opinions are represented:

1) Don't expect something for nothing in a software package; no package does everything automatically.

2) Beware of contracting for a package before it's written, and don't be misled by an initial low price; you could end up paying a much higher price later.

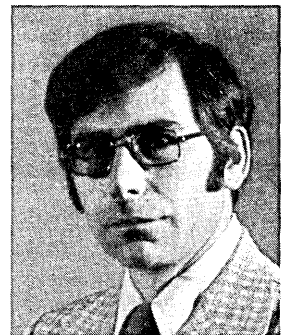
3) Try to insure that your installation has a qualified data processing, software, or applications manager who can effectively interface the users within the company and the suppliers of software.

4) If you're going to invest in performance measurement tools, be able to define in advance what you're looking for and what actions you'll take in each event.

5) Recognize that while a package that is bought will only cost about one-fifth as much as it would to develop in-house, it may still cost two to four times its purchase price to install in a manner that conforms to your standards; but don't fail to recognize that these costs can still be a lot lower than in-house costs.

6) Remember that selection and installation of a vended package takes as much planning as an in-house effort.

7) Look for independently vended software to accomplish objectives beyond the capabilities of your in-house staff. And finally, we add this observation of our own: Don't, as many of our survey respondents did, consider the cost of in-house modifications to a proprietary package to be zero; you're only fooling yourself if you do.



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Users' Ratings of Software Packages

The list that follows summarizes the survey results on 210 proprietary software packages rated by three or more users. The rating in each category is expressed in terms of the Weighted Average calculated on a scale of 4 for "excellent," 3 for "good," 2 for "fair," and 1 for "poor."

Honor Roll and Honorable Mention packages are highlighted in blue

Accounting IV	Users reporting	16	Documentation	4.0	Users reporting	8
Informatics MARK IV Systems Co.	Overall satisfaction	2.6	Vendor technical support	3.2	Overall satisfaction	2.7
<i>Does general ledger and reporting; interfaces payables and receivables.</i>	Throughput/efficiency	2.5	Training	3.0	Throughput/efficiency	3.0
Users reporting	Ease of installation	2.1	CIRCLE 311 ON READER CARD		Ease of installation	2.4
Overall satisfaction	Ease of use	2.8			Ease of use	2.5
Throughput/efficiency	Documentation	2.9	Accounts Payable (Century)		Documentation	2.7
Ease of installation	Vendor technical support	2.4	NCR Corporation		Vendor technical support	3.1
Ease of use	Training	2.7	Users reporting	3	Training	3.0
Documentation	CIRCLE 307 ON READER CARD		Overall satisfaction	4.0	CIRCLE 316 ON READER CARD	
Vendor technical support	Accounts Payable (S/360 or 370)		Throughput/efficiency	3.0		
Training	IBM Corporation		Ease of installation	2.7	ADABAS	
CIRCLE 303 ON READER CARD	Users reporting	3	Ease of use	3.7	Software AG	
	Overall satisfaction	3.0	Documentation	4.0	<i>Data base management system for IBM 360/370 (any operating system), Univac 9000 (dos), Siemens.</i>	
Accounts Payable	Throughput/efficiency	2.5	Vendor technical	3.5	Users reporting	9
Certified Software Products	Ease of installation	3.0	Training	2.5	Overall satisfaction	3.4
<i>For card- or disc-oriented IBM System/3; written in RPG II; has cash analysis reporting.</i>	Ease of use	3.0	CIRCLE 312 ON READER CARD		Throughput/efficiency	3.1
Users reporting	Documentation	2.0	MMS Accounts Payable		Ease of installation	3.9
Overall satisfaction	Vendor technical support	3.0	Software International Corp.		Ease of use	3.3
Throughput/efficiency	Training	3.0	<i>Data base-oriented accounts payable for any IBM 360/370 with 64K and two discs.</i>		Documentation	2.5
Ease of installation	CIRCLE 308 ON READER CARD		Users reporting	3	Vendor technical support	3.0
Ease of use	Accounts Payable		Overall satisfaction	2.3	Training	3.3
Documentation	Infonational, Inc.		Throughput/efficiency	3.0	CIRCLE 317 ON READER CARD	
Vendor technical	<i>In ANSI COBOL for most mainframes.</i>		Ease of installation	2.7		
Training	Users reporting	12	Ease of use	2.7	ADPAC	
CIRCLE 304 ON READER CARD	Overall satisfaction	2.9	Documentation	2.0	Adpac Corporation	
	Throughput/efficiency	2.3	Vendor technical support	2.3	<i>Programming system featuring concise commercial language.</i>	
Accounts Payable	Ease of installation	2.7	Training	2.5	Users reporting	6
Educational & Administrative Systems, Inc.	Ease of use	2.8	CIRCLE 313 ON READER CARD		Overall satisfaction	3.2
<i>For IBM 1130 or compatible systems.</i>	Documentation	3.0	Accounts Receivable (System/3)		Throughput/efficiency	3.3
Users reporting	Vendor technical support	3.1	IBM Corporation		Ease of installation	3.5
Overall satisfaction	Training	2.5	Users reporting	8	Ease of use	3.3
Throughput/efficiency	CIRCLE 309 ON READER CARD		Overall satisfaction	2.6	Documentation	2.3
Ease of installation	Accounts Payable		Throughput/efficiency	2.6	Vendor technical support	2.7
Ease of use	Management Science America (MSA)		Ease of installation	2.3	Training	2.5
Documentation	<i>In ANSI COBOL for IBM 360/370.</i>		Ease of use	2.8	CIRCLE 318 ON READER CARD	
Vendor Technical support	Users reporting	4	Documentation	2.9	ALLTAX	
Training	Overall satisfaction	2.8	Vendor technical support	2.9	Management Information Service	
CIRCLE 305 ON READER CARD	Throughput/efficiency	3.0	Training	2.7	<i>COBOL subroutine for performing tax calculations.</i>	
	Ease of installation	2.0	CIRCLE 314 ON READER CARD		Users reporting	29
Accounts Payable	Ease of use	2.3	Accounts Receivable		Overall satisfaction	3.7
Honeywell Information Systems	Documentation	2.3	Infonational, Inc.		Throughput/efficiency	3.5
<i>For Honeywell Model 58 and Level 62 systems.</i>	Vendor technical support	2.5	Users reporting	3	Ease of installation	3.4
Users reporting	Training	2.0	Overall satisfaction	3.0	Ease of use	3.7
Overall satisfaction	CIRCLE 310 ON READER CARD		Throughput/efficiency	3.0	Documentation	3.4
Throughput/efficiency	Accounts Payable		Ease of installation	3.0	Vendor technical support	3.5
Ease of installation	McCormack & Dodge Corporation		Ease of use	3.3	Training	2.8
Ease of use	<i>In ANSI COBOL for most systems.</i>		Documentation	3.3	CIRCLE 319 ON READER CARD	
Documentation	Users reporting	5	Vendor technical support	3.0		
Vendor technical support	Overall satisfaction	3.4	Training	2.3	AMIGOS	
Training	Throughput/efficiency	3.2	CIRCLE 315 ON READER CARD		Comress, Inc.	
CIRCLE 306 ON READER CARD	Ease of installation	3.2	MMS Accounts Receivable		<i>Replacement for IBM's ISAM access method on IBM 360/370.</i>	
Accounts Payable (System/3)	Ease of use	3.2	Software International Corp.		Users reporting	4
IBM Corporation			<i>In ANSI COBOL for IBM 360/370.</i>			

Overall satisfaction 3.3
 Throughput/efficiency 3.5
 Ease of installation 3.3
 Ease of use 3.3
 Documentation 3.0
 Vendor technical support 2.8
 Training 3.0
 CIRCLE 320 ON READER CARD

APG 7

IBM Corporation

High-level program support for sensor-based IBM System/7; has PL/1 subset, runs on 16K System/7 with a disc.

Users Reporting 3
 Overall satisfaction 2.7
 Throughput/efficiency 3.5
 Ease of installation 3.0
 Ease of use 3.0
 Documentation 2.3
 Vendor technical support 2.7
 Training 2.2
 CIRCLE 321 ON READER CARD

APL

IBM Corporation

Terminal-oriented problem-solving language; interpreter-based for System/360 and 370; now a language for IBM's new 5100.

Users reporting 3
 Overall satisfaction 3.3
 Throughput/efficiency 2.3
 Ease of installation 2.3
 Ease of use 3.3
 Documentation 3.0
 Vendor technical support 2.0
 Training —
 CIRCLE 322 ON READER CARD

ASAP

Universal Software, Inc.

Spooling supplement for IBM 360 dos.
 Users reporting 50
 Overall satisfaction 3.5
 Throughput/efficiency 3.5
 Ease of installation 3.5
 Ease of use 3.5
 Documentation 3.1
 Vendor technical support 3.2
 Training 3.0
 CIRCLE 323 ON READER CARD

ASI-ST

Applications Software Inc.

Data management system for IBM 360/370; can be batch or conversational.
 Users reporting 8
 Overall satisfaction 2.9
 Throughput/efficiency 3.0
 Ease of installation 3.1
 Ease of use 2.8
 Documentation 3.1
 Vendor technical support 2.5
 Training 2.6
 CIRCLE 324 ON READER CARD

ATMS (Advanced Text Mgmt. Sys.)

IBM Corporation

Conversational time-sharing method to display, edit, and update text on any IBM 360/370;

os version has STAIRS/vs interface.
 Users reporting 4
 Overall satisfaction 3.3
 Throughput/efficiency 2.8
 Ease of installation 3.3
 Ease of use 3.0
 Documentation 3.0
 Vendor technical support 3.0
 Training 3.3
 CIRCLE 325 ON READER CARD

AUTOFLOW/AUTOFLOW II Applied Data Research, Inc.

Complete program development system, but best known as a flowchart generator.

Users reporting 16
 Overall satisfaction 2.4
 Throughput/efficiency 2.5
 Ease of installation 2.9
 Ease of use 3.1
 Documentation 2.9
 Vendor technical support 2.4
 Training 2.2
 CIRCLE 326 ON READER CARD

BASIC (for PDP-8)

Digital Equipment Corporation

Four versions for the PDP-8: 4K, 8K, os/8, and "Industrial."

Users reporting 3
 Overall satisfaction 2.0
 Throughput/efficiency 2.0
 Ease of installation 3.0
 Ease of use 2.7
 Documentation 3.3
 Vendor technical support 2.7
 Training 2.0
 CIRCLE 327 ON READER CARD

BASIC (for HP 2000 & 21MX)

Hewlett-Packard Company

Users reporting 3
 Overall satisfaction 3.7
 Throughput/efficiency 2.5
 Ease of installation 3.7
 Ease of use 3.7
 Documentation 1.8
 Vendor technical support 3.3
 Training 2.5
 CIRCLE 328 ON READER CARD

BASIC (System/360 & 370)

IBM Corporation

For time-sharing use under ITF or TSO.

Users reporting 4
 Overall satisfaction 3.3
 Throughput/efficiency 2.8
 Ease of installation 2.8
 Ease of use 2.0
 Documentation 2.3
 Vendor technical support 2.8
 Training 3.2
 CIRCLE 329 ON READER CARD

Bill of Material Processor

Honeywell Information Systems

For Honeywell Level 62 systems.

Users reporting 3
 Overall satisfaction 3.7
 Throughput/efficiency 3.0
 Ease of installation 3.0
 Ease of use 3.7

Documentation 3.3
 Vendor technical support 3.5
 Training 3.3
 CIRCLE 330 ON READER CARD

Bill of Material Processor (S/3)

IBM Corporation

Users reporting 57
 Overall satisfaction 3.2
 Throughput/efficiency 2.7
 Ease of installation 2.7
 Ease of use 2.9
 Documentation 2.9
 Vendor technical support 2.6
 Training 2.4
 CIRCLE 331 ON READER CARD

BioMed

Univ. of California at Los Angeles (UCLA)

Statistical computing for medical and other applications.

Users reporting 3
 Overall satisfaction 3.0
 Throughput/efficiency 3.0
 Ease of installation 2.3
 Ease of use 2.5
 Documentation 3.0
 Vendor technical support 2.3
 Training —
 CIRCLE 332 ON READER CARD

BIT-FACS

American Valuation Consultants

Book, insurance, tax fixed asset control system for IBM 360/370 under DOS, OS, or vs.

Users reporting 4
 Overall satisfaction 3.8
 Throughput/efficiency 3.0
 Ease of installation 3.5
 Ease of use 3.5
 Documentation 2.8
 Vendor technical support 3.5
 Training 3.3
 CIRCLE 333 ON READER CARD

CalComp Plotter Software

California Computer Products

Software routines to control digital plotters manufactured by CalComp.

Users reporting 6
 Overall satisfaction 3.2
 Throughput/efficiency 3.3
 Ease of installation 3.3
 Ease of use 3.2
 Documentation 3.0
 Vendor technical support 2.6
 Training 2.5
 CIRCLE 334 ON READER CARD

CAPS-11

Digital Equipment Corporation

Entry-level cassette operating system for PDP-11.

Users reporting 3
 Overall satisfaction 2.3
 Throughput/efficiency 2.3
 Ease of installation 2.0
 Ease of use 1.7
 Documentation 1.7
 Vendor technical support 1.0
 Training —
 CIRCLE 335 ON READER CARD

Card Utilities (System/3)

IBM Corporation

Six MFCU functions and data recorder program for Model 10; four are available in disc-based versions for other System/3 models.

Users reporting 3
 Overall satisfaction 3.3
 Throughput/efficiency 3.3
 Ease of installation 3.7
 Ease of use 3.5
 Documentation 3.5
 Vendor technical support 3.5
 Training 4.0
 CIRCLE 336 ON READER CARD

CARS-2

Computer Audit Systems, Inc.

Computerized audit and reporting for ANSI COBOL systems.

Users reporting 3
 Overall satisfaction 2.7
 Throughput/efficiency 2.3
 Ease of installation 2.0
 Ease of use 2.0
 Documentation 2.0
 Vendor technical support 2.7
 Training 2.5
 CIRCLE 337 ON READER CARD

Certificates of Deposit Accounting

Florida Software Services, Inc.

Banking package that handles cd's and runs on IBM 360/370, System/3, Burroughs, NCR, & Honeywell mainframes.

Users reporting 7
 Overall satisfaction 3.1
 Throughput/efficiency 3.0
 Ease of installation 3.0
 Ease of use 3.2
 Documentation 3.2
 Vendor technical support 2.5
 Training 2.0
 CIRCLE 338 ON READER CARD

CFMS

IBM Corporation

Chained file mgmt. system that is the 360 OS equivalent to DBOMP for DOS systems. Requirements Planning System is an option.

Users reporting 3
 Overall satisfaction 2.3
 Throughput/efficiency 2.3
 Ease of installation 2.0
 Ease of use 2.3
 Documentation 2.7
 Vendor technical support 2.3
 Training 2.7
 CIRCLE 339 ON READER CARD

CICS

IBM Corporation

Data communications monitor; versions exist for 360/370 DOS, dos/vs, OS, & OS/vs.

Users reporting 136
 Overall satisfaction 3.1
 Throughput/efficiency 2.8
 Ease of installation 2.4
 Ease of use 2.8
 Documentation 2.8
 Vendor technical support 2.9
 Training 2.8
 CIRCLE 340 ON READER CARD

CIF (Central Information File)
University Computing Com-
pany

Multi-bank, multi-branch central customer information file for IBM 360/370.

Users reporting	3
Overall satisfaction	2.3
Throughput/efficiency	3.3
Ease of installation	2.7
Ease of use	2.7
Documentation	3.0
Vendor technical support	2.7
Training	3.0

CIRCLE 341 ON READER CARD

COBOL (System/3)

IBM Corporation

An ANSI subset without sort or report writer.

Users reporting	4
Overall satisfaction	3.5
Throughput/efficiency	2.8
Ease of installation	3.0
Ease of use	3.5
Documentation	2.8
Vendor technical support	2.0
Training	1.7

CIRCLE 342 ON READER CARD

COBOL (for System/360 & 370)

IBM Corporation

Users reporting	79
Overall satisfaction	3.2
Throughput/efficiency	3.1
Ease of installation	3.3
Ease of use	3.5
Documentation	3.3
Vendor technical support	2.9
Training	2.7

CIRCLE 343 ON READER CARD

COBOL (for 1130 system)

IBM Corporation

Users reporting	23
Overall satisfaction	3.2
Throughput/efficiency	3.0
Ease of installation	3.0
Ease of use	3.4
Documentation	2.9
Vendor technical support	2.4
Training	2.5

CIRCLE 344 ON READER CARD

Commercial Loans

Automated Financial Systems, Inc.

Accounting system for banks; runs on IBM 360/370 or Burroughs B3500; tracks collateral, has history and analysis modules and on-line inquiry.

Users reporting	4
Overall satisfaction	1.8
Throughput/efficiency	1.8
Ease of installation	2.5
Ease of use	2.5
Documentation	2.5
Vendor technical support	2.0
Training	2.2

CIRCLE 345 ON READER CARD

Commercial Loans

Florida Software Services, Inc.

Accounting system for banks. Runs on nearly any COBOL system; has variable interest calculations and reporting.

Users reporting	4
Overall satisfaction	3.0
Throughput/efficiency	2.0
Ease of installation	3.0
Ease of use	2.5
Documentation	2.5
Vendor technical support	3.0
Training	2.0

CIRCLE 346 ON READER CARD

Comput-A-Charge

Value Computing, Inc.

Job accounting & billing, written in ANSI COBOL, runs on most mainframes.

Users reporting	13
Overall satisfaction	3.1
Throughput/efficiency	3.0
Ease of installation	3.0
Ease of use	2.6
Documentation	2.5
Vendor technical support	2.8
Training	2.6

CIRCLE 347 ON READER CARD

COS-300

Digital Equipment Corporation

Commercial operating system for DEC PDP-8-based Datasytem 300s.

Users reporting	3
Overall satisfaction	3.7
Throughput/efficiency	3.0
Ease of installation	3.3
Ease of use	3.3
Documentation	2.7
Vendor technical support	2.0
Training	3.0

CIRCLE 348 ON READER CARD

CROSSTABS

Cambridge Computer Associates

Tabular statistical reporting system with retrieval option for any IBM 360/370.

Users reporting	5
Overall satisfaction	3.4
Throughput/efficiency	3.8
Ease of installation	3.7
Ease of use	2.3
Documentation	3.5
Vendor technical support	3.3
Training	4.0

CIRCLE 349 ON READER CARD

CUE (Configuration Usage Evaluator)

Boole & Babbage, Inc.

Evaluates peripheral device usage on IBM 360/370 under OS or OS/vs.

Users reporting	3
Overall satisfaction	3.3
Throughput/efficiency	3.3
Ease of installation	4.0
Ease of use	3.3
Documentation	2.3
Vendor technical support	2.7
Training	2.0

CIRCLE 350 ON READER CARD

CULPRIT

Cullinane Corporation

Output processor and report creator system for IBM 360/370 (any operating system) or Univac Series 70.

Users reporting	8
Overall satisfaction	2.9
Throughput/efficiency	2.6
Ease of installation	2.9
Ease of use	3.0
Documentation	2.8
Vendor technical support	3.0
Training	3.0

CIRCLE 351 ON READER CARD

CYTOS

DNA Systems, Inc.

Conversational operating system for IBM 1130 and compatible systems.

Users reporting	5
Overall satisfaction	3.6
Throughput/efficiency	3.2
Ease of installation	3.4
Ease of use	3.0
Documentation	3.0
Vendor technical support	3.8
Training	3.3

CIRCLE 352 ON READER CARD

The Data Analyzer

Program Products Incorporated

Information retrieval & reporting on any IBM 360/370; has interfaces for IBM's IMS & Cincor's TOTAL.

Users reporting	14
Overall satisfaction	2.9
Throughput/efficiency	2.4
Ease of installation	3.2
Ease of use	3.2
Documentation	2.5
Vendor technical support	2.3
Training	2.6

CIRCLE 353 ON READER CARD

DATA-MAN

Data-Man Ltd.

File manager and report retrieval system for any IBM 360/370.

Users reporting	4
Overall satisfaction	2.8
Throughput/efficiency	2.3
Ease of installation	2.5
Ease of use	2.8
Documentation	2.8
Vendor technical support	3.3
Training	2.5

CIRCLE 354 ON READER CARD

DATACOM/DC (also known as GMT)

Computer Information Management

Generalized multi-tasking macro-regenerative data communications monitor for any IBM 360/370.

Users reporting	5
Overall satisfaction	3.4
Throughput/efficiency	3.4
Ease of installation	3.4
Ease of use	3.2
Documentation	3.2
Vendor technical support	3.8
Training	3.5

CIRCLE 355 ON READER CARD

DATAFORM

Datapoint Corp.

Specialized form of CTOS cassette operating system for Datapoint systems, with emphasis on data entry.

Users reporting	3
Overall satisfaction	2.5
Throughput/efficiency	2.5
Ease of installation	3.0
Ease of use	3.0
Documentation	2.5
Vendor technical support	2.5
Training	—

CIRCLE 356 ON READER CARD

DATAMACS

Management & Computer Services

Creates test files for COBOL programs on IBM 360/370.

Users reporting	5
Overall satisfaction	3.4
Throughput/efficiency	3.2
Ease of installation	3.6
Ease of use	3.6
Documentation	3.2
Vendor technical support	3.2
Training	2.5

CIRCLE 357 ON READER CARD

DBMS-10 (Data Base Mgmt. System)

Digital Equipment Corporation

CODASYL-based DBMS for DEC system-10 or DEC PDP-10; hosts COBOL and FORTRAN.

Users reporting	3
Overall satisfaction	3.0
Throughput/efficiency	3.0
Ease of installation	3.7
Ease of use	2.3
Documentation	2.3
Vendor technical support	3.0
Training	3.0

CIRCLE 358 ON READER CARD

DBOMP

IBM Corporation

Data base organization & maintenance processor utility for IBM 360/370.

Users reporting	35
Overall satisfaction	2.8
Throughput/efficiency	2.6
Ease of installation	2.2
Ease of use	2.4
Documentation	2.4
Vendor technical support	2.6
Training	2.1

CIRCLE 359 ON READER CARD

DFAST

Oxford Software Corporation

Allows System/360 and 370 DOS and OS/vs users to automatically allocate and share disc space.

Users reporting	10
Overall satisfaction	3.4
Throughput/efficiency	3.3
Ease of installation	3.4
Ease of use	3.3
Documentation	2.4
Vendor Technical support	2.9
Training	2.2

CIRCLE 360 ON READER CARD

Throughput/efficiency 3.0
 Ease of installation 3.2
 Ease of use 3.4
 Documentation 2.6
 Vendor technical support 2.5
 Training 2.0
 CIRCLE 381 ON READER CARD

**Fast Dump/Restore
 Innovation Data Processing, Inc.**

Disc-to-tape dump/restore utility for IBM 360/370 OS or OS/VS.
 Users reporting 16
 Overall satisfaction 3.6
 Throughput/efficiency 3.6
 Ease of installation 3.5
 Ease of use 3.5
 Documentation 3.1
 Vendor technical support 3.1
 Training 3.0
 CIRCLE 382 ON READER CARD

**FASTER L/C
 IBM Corporation**

A minimal telecommunications monitor for IBM 360 DOS that is a generation earlier than MTCs; the acronym L/C means "low core," a relative term.
 Users reporting 3
 Overall satisfaction 3.0
 Throughput/efficiency 2.7
 Ease of installation 2.7
 Ease of use 3.0
 Documentation 2.7
 Vendor technical support 2.0
 Training 2.3
 CIRCLE 383 ON READER CARD

**FASTER M/T
 IBM Corporation**

A program like FASTER L/C preceding, but with multithreading (hence, the acronym M/T), and offering mixed IBM 2260 and 3270 terminal support not found in the L/C version.
 Users reporting 4
 Overall satisfaction 3.2
 Throughput/efficiency 2.7
 Ease of installation 3.0
 Ease of use 3.0
 Documentation 3.5
 Vendor technical support 2.5
 Training 2.2
 CIRCLE 384 ON READER CARD

FICS (Financial Information & Control System)

Management Science America
Data base-oriented financial control & reporting system for banks & bank holding companies; runs on IBM 360/370, Burroughs, & Honeywell COBOL systems.
 Users reporting 4
 Overall satisfaction 3.5
 Throughput/efficiency 3.3
 Ease of installation 3.3
 Ease of use 3.7
 Documentation 3.5
 Vendor technical support 3.2
 Training 3.5
 CIRCLE 385 ON READER CARD

Financial Control System

University Computing Company
A host of on-line & batch packages for IBM 360/370, mainly used in large banks; includes general ledger.
 Users reporting 10
 Overall satisfaction 3.2
 Throughput/efficiency 2.8
 Ease of installation 2.8
 Ease of use 2.9
 Documentation 2.6
 Vendor technical support 2.9
 Training 3.0
 CIRCLE 386 ON READER CARD

**Fixed Assets
 American Appraisal**

For most COBOL systems.
 Users reporting 5
 Overall satisfaction 2.8
 Throughput/efficiency 2.6
 Ease of installation 3.0
 Ease of use 3.0
 Documentation 2.4
 Vendor technical support 2.2
 Training 2.2
 CIRCLE 387 ON READER CARD

**Fixed Assets
 Infonational, Inc.**

For any ANSI COBOL system over 64K.
 Users reporting 3
 Overall satisfaction 3.3
 Throughput/efficiency 2.0
 Ease of installation 3.0
 Ease of use 2.0
 Documentation 3.0
 Vendor technical support 3.5
 Training 3.5
 CIRCLE 388 ON READER CARD

**Fixed Assets
 Management Science America**

For 64K or larger IBM 360/370 or Burroughs B 3500 or larger COBOL systems; interfaces company's General Ledger package.
 Users reporting 5
 Overall satisfaction 2.4
 Throughput/efficiency 2.2
 Ease of installation 1.6
 Ease of use 2.4
 Documentation 3.0
 Vendor technical support 2.4
 Training 2.2
 CIRCLE 389 ON READER CARD

**Fixed Assets
 McCormack & Dodge Corporation**

Users reporting 9
 Overall satisfaction 2.8
 Throughput/efficiency 2.5
 Ease of installation 2.5
 Ease of use 2.6
 Documentation 2.8
 Vendor technical support 2.4
 Training 2.3
 CIRCLE 390 ON READER CARD

**FMAINT
 Software Design, Inc.**

Replacement for IBM's DOS or DOS/VS 360/370 MAINT utility;

runs in any partition.
 Users reporting 4
 Overall satisfaction 3.7
 Throughput/efficiency 3.7
 Ease of installation 3.6
 Ease of use 3.7
 Documentation 3.2
 Vendor technical support 3.5
 Training 3.5
 CIRCLE 391 ON READER CARD

**Foresight
 Foresight Systems, Inc.**

Statistical forecasting system written in FORTRAN.
 Users reporting 6
 Overall satisfaction 3.5
 Throughput/efficiency 3.0
 Ease of installation 3.5
 Ease of use 3.5
 Documentation 2.8
 Vendor technical support 3.2
 Training 3.2
 CIRCLE 392 ON READER CARD

**FORTE
 Burroughs Corporation**

Disc file management system for Burroughs B 1700 and up.
 Users reporting 3
 Overall satisfaction 2.7
 Throughput/efficiency 3.0
 Ease of installation 2.7
 Ease of use 3.0
 Documentation 1.7
 Vendor technical support 1.7
 Training 2.0
 CIRCLE 393 ON READER CARD

**FORTE II
 Burroughs Corporation**

Enhanced version of FORTE; generates COBOL source code that can be catalogued.
 Users reporting 3
 Overall satisfaction 3.0
 Throughput/efficiency 2.5
 Ease of installation 2.0
 Ease of use 2.0
 Documentation 2.5
 Vendor technical support 3.5
 Training 3.0
 CIRCLE 394 ON READER CARD

**FORTRAN (PDP-8)
 Digital Equipment Corporation**

Available in three PDP-8 versions: 8K paper tape, 8K OS/8, and 8K OS/8 FORTRAN IV.
 Users reporting 4
 Overall satisfaction 2.7
 Throughput/efficiency 2.7
 Ease of installation 3.5
 Ease of use 2.7
 Documentation 2.5
 Vendor technical support 2.5
 Training 2.5
 CIRCLE 395 ON READER CARD

**1130/FORTRAN
 DNA Systems, Inc.**

Users reporting 20
 Overall satisfaction 3.7
 Throughput/efficiency 3.6
 Ease of installation 3.3

Ease of use 3.8
 Documentation 3.3
 Vendor technical support 3.3
 Training 3.5
 CIRCLE 396 ON READER CARD

**FORTRAN (System/360 & 370)
 IBM Corporation**

Users reporting 9
 Overall satisfaction 3.4
 Throughput/efficiency 3.7
 Ease of installation 3.4
 Ease of use 3.6
 Documentation 3.0
 Vendor technical support 3.1
 Training 2.2
 CIRCLE 397 ON READER CARD

**GBA DUMP
 GBA International**

Utility to replace IBM's 370 DOS/VS DUMP transient.
 Users reporting 5
 Overall satisfaction 3.8
 Throughput/efficiency 3.8
 Ease of installation 3.8
 Ease of use 3.8
 Documentation 3.2
 Vendor technical support 3.7
 Training 3.7
 CIRCLE 398 ON READER CARD

**General Ledger (B 1700)
 Burroughs Corporation**

Users reporting 10
 Overall satisfaction 2.3
 Throughput/efficiency 2.4
 Ease of installation 2.2
 Ease of use 2.8
 Documentation 1.8
 Vendor technical support 2.1
 Training 2.0
 CIRCLE 399 ON READER CARD

**General Ledger (System/3)
 IBM Corporation**

Users reporting 19
 Overall satisfaction 2.4
 Throughput/efficiency 2.4
 Ease of installation 2.4
 Ease of use 2.4
 Documentation 2.3
 Vendor technical support 2.4
 Training 2.6
 CIRCLE 400 ON READER CARD

**General Ledger
 Infonational, Inc.**

In ANSI COBOL to run on most mainframes.
 Users reporting 7
 Overall satisfaction 3.3
 Throughput/efficiency 2.8
 Ease of installation 3.0
 Ease of use 3.1
 Documentation 3.6
 Vendor technical support 3.0
 Training 2.6
 CIRCLE 401 ON READER CARD

**General Ledger
 Management Science America**

In ANSI COBOL to run on most mainframes.
 Users reporting 23

IRP (System/3)
IBM Corporation
Inventory and requirements planning.
 Users reporting 12
 Overall satisfaction 3.3
 Throughput/efficiency 2.9
 Ease of installation 3.1
 Ease of use 3.1
 Documentation 3.2
 Vendor technical support 3.0
 Training 2.8
 CIRCLE 423 ON READER CARD

JAS/3 (Job Analysis System/3)
IBM Corporation
Critical path method project planning and supervising for disc System/3 Model 8, 10, 12, or 15.
 Users reporting 3
 Overall satisfaction 3.0
 Throughput/efficiency 3.7
 Ease of installation 1.7
 Ease of use 2.3
 Documentation 2.0
 Vendor technical support 2.3
 Training 2.5
 CIRCLE 424 ON READER CARD

JASPER
Datachron Corporation
Job accounting and performance analysis for IBM 360/370 DOS, DOS/VS, or EDOS.
 Users reporting 6
 Overall satisfaction 2.2
 Throughput/efficiency 2.5
 Ease of installation 3.2
 Ease of use 2.8
 Documentation 2.0
 Vendor technical support 3.0
 Training 2.0
 CIRCLE 425 ON READER CARD

Job Accounting Reporting (DOS)
Johnson Systems, Inc.
Job accounting & report generation on IBM 360/370 DOS or DOS/VS.
 Users reporting 12
 Overall satisfaction 3.1
 Throughput/efficiency 2.5
 Ease of installation 3.3
 Ease of use 3.1
 Documentation 3.0
 Vendor technical support 3.1
 Training 3.0
 CIRCLE 426 ON READER CARD

Job Accounting Reporting (OS)
Johnson Systems, Inc.
Job accounting and computer utilization reporting for IBM 360/370 OS or OS/VS.
 Users reporting 10
 Overall satisfaction 3.4
 Throughput/efficiency 2.4
 Ease of installation 3.4
 Ease of use 3.3
 Documentation 3.0
 Vendor technical support 2.8
 Training 2.0
 CIRCLE 427 ON READER CARD

Job Monitor
Westinghouse Electric Corporation
Job accounting for IBM 360/370 DOS or DOS/VS.
 Users reporting 7
 Overall satisfaction 3.1
 Throughput/efficiency 3.1
 Ease of installation 2.9
 Ease of use 3.1
 Documentation 2.6
 Vendor technical support 2.7
 Training 2.8
 CIRCLE 428 ON READER CARD

KOMAND - Data Acquisition System
Pace Applied Technology, Inc.
Job accounting and resource utilization measurement system for IBM 360/370 & OS/VS.
 Users reporting 8
 Overall satisfaction 3.5
 Throughput/efficiency 3.5
 Ease of installation 2.9
 Ease of use 3.3
 Documentation 3.6
 Vendor technical support 3.1
 Training 2.8
 CIRCLE 429 ON READER CARD

LIBRARIAN
Applied Data Research, Inc.
Source program maintenance on any IBM 360/370 using COBOL, FORTRAN, PL/1, or BAL.
 Users reporting 96
 Overall satisfaction 3.7
 Throughput/efficiency 3.5
 Ease of installation 3.6
 Ease of use 3.6
 Documentation 3.4
 Vendor technical support 3.1
 Training 3.1
 CIRCLE 430 ON READER CARD

LILA
Network Data Processing
Life Insurance Logistics Automated, in COBOL for most systems.
 Users reporting 6
 Overall satisfaction 3.0
 Throughput/efficiency 2.5
 Ease of installation 3.2
 Ease of use 2.5
 Documentation 2.5
 Vendor technical support 2.8
 Training 2.5
 CIRCLE 431 ON READER CARD

LIBFIL
Group/3 Div., Informatics, Inc.
Copies programs from library to disc file on System/3 5444 or 5445 discs; an improvement over IBM's \$MAINT.
 Users reporting 3
 Overall satisfaction 3.0
 Throughput/efficiency 2.3
 Ease of installation 2.7
 Ease of use 2.7
 Documentation 2.7
 Vendor technical support 2.5
 Training —
 CIRCLE 432 ON READER CARD

Life 70
TCC, Inc.
Management information system in life and health insurance industries for home & field office administration, corporate planning; runs on IBM 360/370 and Univac Series 70.
 Users reporting 3
 Overall satisfaction 3.3
 Throughput/efficiency 3.3
 Ease of installation 2.3
 Ease of use 3.0
 Documentation 3.7
 Vendor technical support 3.7
 Training 3.7
 CIRCLE 433 ON READER CARD

MAC PAC-3
Arthur Andersen
System/3 manufacturing planning and control.
 Users reporting 3
 Overall satisfaction 3.3
 Throughput/efficiency 3.0
 Ease of installation 3.5
 Ease of use 3.5
 Documentation 4.0
 Vendor technical support 3.5
 Training 3.5
 CIRCLE 434 ON READER CARD

MARK IV
Informatics MARK IV Systems Co.
Data management system for any IBM 360/370; options include IMS, DL/1, & TOTAL interfaces.
 Users reporting 54
 Overall satisfaction 3.2
 Throughput/efficiency 2.8
 Ease of installation 3.4
 Ease of use 3.3
 Documentation 3.3
 Vendor technical support 3.0
 Training 3.0
 CIRCLE 435 ON READER CARD

Maxi-Lib
Maxima System Group
Source program library system for any IBM 360/370 with 32K partition.
 Users reporting 5
 Overall satisfaction 3.4
 Throughput/efficiency 3.6
 Ease of installation 3.2
 Ease of use 3.2
 Documentation 2.4
 Training 2.5
 CIRCLE 436 ON READER CARD

METACOBOL
Applied Data Research, Inc.
COBOL programming aid with extensive macros, for any IBM 360/370.
 Users reporting 3
 Overall satisfaction 3.0
 Throughput/efficiency 3.0
 Ease of installation 3.0
 Ease of use 3.0
 Documentation 3.5
 Vendor technical support 3.5
 Training 3.5
 CIRCLE 437 ON READER CARD

Minicomm
Programming Methods Co.
Display monitor that competes with IBM's entry-level CICS.
 Users reporting 14
 Overall satisfaction 3.6
 Throughput/efficiency 3.4
 Ease of installation 3.4
 Ease of use 3.6
 Documentation 2.6
 Vendor technical support 3.0
 Training 3.1
 CIRCLE 438 ON READER CARD

Minimiz
The Automated Quill Inc.
On-line bookkeeping and accounting system for 24K RDOS Data General Nova or Eclipse systems.
 Users reporting 4
 Overall satisfaction 2.3
 Throughput/efficiency 2.5
 Ease of installation 2.8
 Ease of use 2.5
 Documentation 2.0
 Vendor technical support 3.0
 Training 2.3
 CIRCLE 439 ON READER CARD

Mortgage Loans
Florida Software Services, Inc.
Multiple-bank mortgage loan system for IBM 360/370, NCR Century, Burroughs, and Honeywell 6000 computers.
 Users reporting 3
 Overall satisfaction 3.3
 Throughput/efficiency 2.7
 Ease of installation 3.3
 Ease of use 3.7
 Documentation 3.7
 Vendor technical support 3.0
 Training —
 CIRCLE 440 ON READER CARD

Mortgage 70
Sys Con, Inc.
Multi-bank mortgage loan system for any IBM 360/370 COBOL system.
 Users reporting 3
 Overall satisfaction 2.0
 Throughput/efficiency 2.7
 Ease of installation 1.7
 Ease of use 2.0
 Documentation 2.0
 Vendor technical support 2.0
 Training 2.2
 CIRCLE 441 ON READER CARD

MRP (System/3)
IBM Corporation
Materials and requirements planning.
 Users reporting 7
 Overall satisfaction 3.0
 Throughput/efficiency 2.9
 Ease of installation 2.7
 Ease of use 2.7
 Documentation 2.4
 Vendor technical support 2.0
 Training 2.5
 CIRCLE 442 ON READER CARD

vs, and other large systems.
 Users reporting 5
 Overall satisfaction 3.6
 Throughput/efficiency 3.0
 Ease of installation 3.5
 Ease of use 3.4
 Documentation 3.0
 Vendor technical support 3.7
 Training 4.0
 CIRCLE 464 ON READER CARD

Quantitative Computer Measurement (QCM)

Duquesne Systems, Inc.
Measures computer utilization, does cost analysis and billing on IBM 360/370 os or os/vs.
 Users reporting 3
 Overall satisfaction 4.0
 Throughput/efficiency 3.3
 Ease of installation 3.3
 Ease of use 4.0
 Documentation 3.7
 Vendor technical support 4.0
 Training 3.3
 CIRCLE 465 ON READER CARD

QUERY (System/3)

IBM Corporation
Inquiry to a data base via disc.
 Users reporting 3
 Overall satisfaction 2.3
 Throughput/efficiency 2.0
 Ease of installation 2.0
 Ease of use 3.0
 Documentation 3.5
 Vendor technical support 2.5
 Training —
 CIRCLE 466 ON READER CARD

Quikjob I, II, & III

System Support Software, Inc.
File management and report writing system for any IBM 360/370; three versions handle 1, 2, or more input files respectively.
 Users reporting 11
 Overall satisfaction 3.5
 Throughput/efficiency 3.3
 Ease of installation 3.6
 Ease of use 3.7
 Documentation 2.9
 Vendor technical support 3.2
 Training 2.8
 CIRCLE 467 ON READER CARD

RDOS

Data General Corporation
Real-time disc operating system for Nova or Eclipse computers.
 Users reporting 3
 Overall satisfaction 3.0
 Throughput/efficiency 2.7
 Ease of installation 3.0
 Ease of use 3.3
 Documentation 3.3
 Vendor technical support 3.3
 Training 2.5
 CIRCLE 468 ON READER CARD

RELO-PLUS

Universal Software, Inc.
To allow cataloging of a program in core image library, execution in any IBM 360 DOS partition.

Users reporting 6
 Overall satisfaction 3.5
 Throughput/efficiency 3.7
 Ease of installation 3.3
 Ease of use 3.5
 Documentation 3.2
 Vendor technical support 2.8
 Training 3.0
 CIRCLE 469 ON READER CARD

Requirements Planning (System/3)

IBM Corporation
For manufacturing applications.
 Users reporting 3
 Overall satisfaction 1.3
 Throughput/efficiency 1.3
 Ease of installation 1.0
 Ease of use 1.3
 Documentation 1.7
 Vendor technical support 2.7
 Training 1.0
 CIRCLE 470 ON READER CARD

ROSCOE

Applied Data Research, Inc.
Remote os conversational environment for program testing (in COBOL, FORTRAN, or PL/I, JCL syntax checking, or os data set management; runs under IBM 360/370 OS/MVT or MFT-HASP, or on os/vs systems.
 Users reporting 5
 Overall satisfaction 3.4
 Throughput/efficiency 3.5
 Ease of installation 3.7
 Ease of use 3.2
 Documentation 3.2
 Vendor technical support 2.8
 Training 3.2
 CIRCLE 471 ON READER CARD

RPG II (System/3)

IBM Corporation
Output-oriented programming language for report program generation.
 Users reporting 42
 Overall satisfaction 3.3
 Throughput/efficiency 3.2
 Ease of installation 3.5
 Ease of use 3.6
 Documentation 3.1
 Vendor technical support 3.3
 Training 2.6
 CIRCLE 472 ON READER CARD

RPG II (System/360 & 370)

IBM Corporation
Output-oriented programming language.
 Users reporting 53
 Overall satisfaction 3.5
 Throughput/efficiency 3.4
 Ease of installation 3.5
 Ease of use 3.6
 Documentation 3.4
 Vendor technical support 3.1
 Training 3.1
 CIRCLE 473 ON READER CARD

RSTS

Digital Equipment Corporation
Resource-sharing / time-sharing

operating system for PDP-11.
 Users reporting 9
 Overall satisfaction 3.1
 Throughput/efficiency 3.2
 Ease of installation 3.3
 Ease of use 3.4
 Documentation 2.4
 Vendor technical support 2.5
 Training 2.8
 CIRCLE 474 ON READER CARD

RSX-11D

Digital Equipment Corporation
Advanced real-time operating system for PDP-11/35 and up.
 Users reporting 8
 Overall satisfaction 2.3
 Throughput/efficiency 2.1
 Ease of installation 2.3
 Ease of use 2.1
 Documentation 2.0
 Vendor technical support 2.3
 Training 2.3
 CIRCLE 475 ON READER CARD

RSX-11M

Digital Equipment Corporation
Subset of foregoing (RSX-11D); operates on PDP-11/04 and up.
 Users reporting 7
 Overall satisfaction 3.4
 Throughput/efficiency 3.0
 Ease of installation 3.0
 Ease of use 3.1
 Documentation 2.9
 Vendor technical support 1.9
 Training 2.5
 CIRCLE 476 ON READER CARD

RT-11

Digital Equipment Corporation
Foreground / background disc operating system for real-time DEC PDP-11.
 Users reporting 11
 Overall satisfaction 2.7
 Throughput/efficiency 2.6
 Ease of installation 2.5
 Ease of use 2.5
 Documentation 1.7
 Vendor technical support 1.5
 Training 1.6
 CIRCLE 477 ON READER CARD

RTE II

Hewlett-Packard Company
Real-time executive operating system for HP 21MX and 2100 series.
 Users reporting 9
 Overall satisfaction 3.0
 Throughput/efficiency 2.9
 Ease of installation 2.6
 Ease of use 2.7
 Documentation 2.3
 Vendor technical support 2.2
 Training 2.6
 CIRCLE 478 ON READER CARD

RTOS

General Automation, Inc.
Real-time operating system for SPC-16 and SPC-16-based systems.
 Users reporting 3
 Overall satisfaction 3.0

Throughput/efficiency 3.0
 Ease of installation 2.3
 Ease of use 3.3
 Documentation 1.3
 Vendor technical support 2.7
 Training 2.0
 CIRCLE 479 ON READER CARD

Save/Restore

Oxford Software Corporation
IBM 360/370 DOS or DOS/vs disc utility, library condenser, etc.
 Users reporting 3
 Overall satisfaction 3.7
 Throughput/efficiency 4.0
 Ease of installation 3.7
 Ease of use 3.7
 Documentation 3.3
 Vendor technical support 3.0
 Training 4.0
 CIRCLE 480 ON READER CARD

SIM 14

Dearborn Computer Leasing Co.
Simulator for IBM 1401, 1440, or 1460 computers on any IBM 360/370; replaces hardware emulator.
 Users reporting 4
 Overall satisfaction 3.5
 Throughput/efficiency 2.3
 Ease of installation 3.2
 Ease of use 3.5
 Documentation 2.5
 Vendor technical support 3.2
 Training 2.7
 CIRCLE 481 ON READER CARD

SLICK

NCI, Inc.
Source program librarian for IBM 360/370 DOS or DOS/vs; os version under development; also maintains object code, JCL, data files, and text.
 Users reporting 3
 Overall satisfaction 3.0
 Throughput/efficiency 2.7
 Ease of installation 3.0
 Ease of use 3.0
 Documentation 3.0
 Vendor technical support 2.7
 Training 3.0
 CIRCLE 482 ON READER CARD

Score

Programming Methods Co.
Multi-purpose COBOL program generator for most mainframes.
 Users reporting 9
 Overall satisfaction 2.7
 Throughput/efficiency 2.9
 Ease of installation 3.0
 Ease of use 3.0
 Documentation 3.1
 Vendor technical support 2.7
 Training 2.9
 CIRCLE 483 ON READER CARD

1130/Sort

DNA Systems, Inc.
Sort program for the IBM 1130 and compatible systems.
 Users reporting 11
 Overall satisfaction 3.9
 Throughput/efficiency 3.9

Ease of installation 3.9
 Ease of use 3.6
 Documentation 3.5
 Vendor technical support 3.6
 Training 3.5
 CIRCLE 484 ON READER CARD

Sort (System/3)
IBM Corporation
 Users reporting 20
 Overall satisfaction 3.2
 Throughput/efficiency 2.8
 Ease of installation 3.4
 Ease of use 3.2
 Documentation 2.8
 Vendor technical support 3.1
 Training 2.8
 CIRCLE 485 ON READER CARD

Sort (System/360 & 370)
IBM Corporation
Disc-based sort.
 Users reporting 70
 Overall satisfaction 3.3
 Throughput/efficiency 3.2
 Ease of installation 3.4
 Ease of use 3.4
 Documentation 3.2
 Vendor technical support 3.1
 Training 3.1
 CIRCLE 486 ON READER CARD

SPRINT
Oxford Software Corp.
Spooling supplement to IBM 360/370 DOS & DOS/vs.
 Users reporting 26
 Overall satisfaction 3.4
 Throughput/efficiency 3.5
 Ease of installation 3.4
 Ease of use 3.4
 Documentation 3.0
 Vendor technical support 2.8
 Training 2.3
 CIRCLE 487 ON READER CARD

SPOOLER
Boothe Management Systems, Inc.
Replacement for IBM's POWER spooler.
 Users reporting 3
 Overall satisfaction 2.3
 Throughput/efficiency 2.7
 Ease of installation 3.0
 Ease of use 2.7
 Documentation 2.5
 Vendor technical support 2.0
 Training 2.5
 CIRCLE 488 ON READER CARD

STAIRS
IBM Corporation
Multi-user storage and information retrieval system for IBM 360/370; can use CICS or IMS as supervisor; for text data bases.
 Users reporting 4
 Overall satisfaction 2.7
 Throughput/efficiency 2.5
 Ease of installation 2.5
 Ease of use 3.5
 Documentation 3.0
 Vendor technical support 2.8
 Training 3.0
 CIRCLE 489 ON READER CARD

Statistical Program for Social Sciences
SPSS, Inc.
Statistical work in the social sciences on IBM 360/370, Univac 1100, CDC 6000, or Xerox Sigma 9 systems.
 Users reporting 15
 Overall satisfaction 3.4
 Throughput/efficiency 2.9
 Ease of installation 3.4
 Ease of use 3.5
 Documentation 3.4
 Vendor technical support 2.8
 Training 1.5
 CIRCLE 490 ON READER CARD

Stock & Bond
The Equimatics Company
Investment management and portfolio control, primarily for financial industry; runs on IBM 360/370 under os.
 Users reporting 3
 Overall satisfaction 2.7
 Throughput/efficiency 3.3
 Ease of installation 2.3
 Ease of use 3.0
 Documentation 3.3
 Vendor technical support 3.0
 Training 2.7
 CIRCLE 491 ON READER CARD

STRATA
Touche, Ross & Co.
Audit programs for any IBM 360/370 or Burroughs B 2500 to B 4700.
 Users reporting 4
 Overall satisfaction 3.2
 Throughput/efficiency 3.2
 Ease of installation 3.0
 Ease of use 3.5
 Documentation 3.0
 Vendor technical support 2.5
 Training 3.2
 CIRCLE 492 ON READER CARD

SWIFT
GBA International
Data communications monitor for small to medium IBM 360/370, DOS or DOS/vs.
 Users reporting 4
 Overall satisfaction 3.5
 Throughput/efficiency 3.2
 Ease of installation 3.5
 Ease of use 3.5
 Documentation 2.5
 Vendor technical support 4.0
 Training 3.2
 CIRCLE 493 ON READER CARD

SYNCSORT
Whitlow Computer Systems, Inc.
Efficient os or os/vs disc & tape sorting on IBM 360/370.
 Users reporting 23
 Overall satisfaction 3.6
 Throughput/efficiency 3.7
 Ease of installation 3.5
 Ease of use 3.6
 Documentation 3.2
 Vendor technical support 3.4
 Training 3.1
 CIRCLE 494 ON READER CARD

System 2000
MRI Systems Corporation
Generalized data base management system for IBM 360/370, Univac 1100, & CDC 6000 or Cyber systems.
 Users reporting 13
 Overall satisfaction 3.0
 Throughput/efficiency 2.4
 Ease of installation 3.2
 Ease of use 2.8
 Documentation 2.8
 Vendor technical support 2.9
 Training 2.7
 CIRCLE 495 ON READER CARD

TASK/MASTER
Turnkey Systems, Inc.
Data communications monitor for IBM 360/370.
 Users reporting 25
 Overall satisfaction 3.1
 Throughput/efficiency 3.0
 Ease of installation 2.7
 Ease of use 3.1
 Documentation 2.4
 Vendor technical support 2.6
 Training 2.5
 CIRCLE 496 ON READER CARD

TDS
Honeywell Information Systems
Allows terminal users, especially executives, to interactively retrieve and manipulate data contained in batch data bases on the company's 6000 and Series 60 systems; the acronym means transaction-driven system.
 Users reporting 3
 Overall satisfaction 3.7
 Throughput/efficiency 4.0
 Ease of installation 3.5
 Ease of use 4.0
 Documentation 2.0
 Vendor technical support 2.5
 Training 3.0
 CIRCLE 497 ON READER CARD

TLMS
Gulf Oil Computer Sciences, Inc.
Tape library management system for IBM 360/370 OS and OS/vs.
 Users reporting 5
 Overall satisfaction 3.6
 Throughput/efficiency 3.6
 Ease of installation 2.4
 Ease of use 3.0
 Documentation 3.0
 Vendor technical support 3.0
 Training 2.2
 CIRCLE 498 ON READER CARD

TOTAL
Cincom Systems, Inc.
Data base management system for most mainframes.
 Users reporting 116
 Overall satisfaction 3.3
 Throughput/efficiency 3.1
 Ease of installation 3.3
 Ease of use 3.3
 Documentation 3.3
 Vendor technical support 2.7
 Training 2.9
 CIRCLE 499 ON READER CARD

TSO
DNA Systems, Inc.
Time-sharing operating system for IBM 1130 and compatible systems.
 Users reporting 5
 Overall satisfaction 3.6
 Throughput/efficiency 3.6
 Ease of installation 3.6
 Ease of use 3.8
 Documentation 2.8
 Vendor technical support 3.6
 Training 3.0
 CIRCLE 500 ON READER CARD

TSO
IBM Corporation
Time-Sharing Option for IBM 360/370 OS/MVT or OS/vs2; supports Code & Go FORTRAN, ITF-BASIC, and ITF-PL/1.
 Users reporting 3
 Overall satisfaction 3.0
 Throughput/efficiency 3.0
 Ease of installation 3.0
 Ease of use 3.0
 Documentation 3.0
 Vendor technical support 2.7
 Training 2.7
 CIRCLE 501 ON READER CARD

UCC ONE (also known as TMS)
University Computing Company
Tape management system for IBM 360/370 OS or OS/vs.
 Users reporting 17
 Overall satisfaction 3.8
 Throughput/efficiency 3.5
 Ease of installation 3.1
 Ease of use 3.4
 Documentation 3.1
 Vendor technical support 3.0
 Training 2.5
 CIRCLE 502 ON READER CARD

UCC TWO (also known as DUO)
University Computing Company
Aid for conversion from DOS or DOS/vs to OS or OS/vs on IBM 360/370.
 Users reporting 11
 Overall satisfaction 3.5
 Throughput/efficiency 2.9
 Ease of installation 2.9
 Ease of use 3.2
 Documentation 3.1
 Vendor technical support 3.1
 Training 2.6
 CIRCLE 503 ON READER CARD

UCC TEN
University Computing Company
Data dictionary manager & control statement generator for IBM's IMS.
 Users reporting 6
 Overall satisfaction 3.2
 Throughput/efficiency 3.0
 Ease of installation 3.0
 Ease of use 3.5
 Documentation 2.4
 Vendor technical support 2.6
 Training 2.0
 CIRCLE 504 ON READER CARD

UNIX**Western Electric Co., Inc.**

Multi-user time-sharing system for DEC PDP-11/40 and up; supports several languages; can replace DEC's RSTS.

Users reporting	3
Overall satisfaction	3.7
Throughput/efficiency	3.3
Ease of installation	3.3
Ease of use	3.0
Documentation	1.7
Vendor technical support	2.2
Training	—

CIRCLE 505 ON READER CARD

Versaplot**Versatec, Inc.**

Supports the company's electrostatic printers and plotters on nearly any byte-oriented FORTRAN minicomputer.

Users reporting	5
Overall satisfaction	2.8
Throughput/efficiency	2.4
Ease of installation	2.4
Ease of use	2.4
Documentation	3.0
Vendor technical support	2.7
Training	—

CIRCLE 507 ON READER CARD

VORTEX**Varian Data Machines**

Varian omnitask real-time executive operating system for the company's 620 and V70 computers (VORTEX II for memory-mapped cpu's).

Users reporting	5
Overall satisfaction	2.8
Throughput/efficiency	2.2
Ease of installation	2.4
Ease of use	2.4
Documentation	1.8
Vendor technical support	2.0
Training	2.0

CIRCLE 509 ON READER CARD

WESTI (also known as Teleprocessing Interface System)**Westinghouse Electric Corp.**

Display monitor for 2260 & 3270 terminals on IBM 360/370 DOS & DOS/vs.

Users reporting	24
Overall satisfaction	3.5
Throughput/efficiency	3.4
Ease of installation	3.5
Ease of use	3.4
Documentation	3.4
Vendor technical support	3.5
Training	2.9

CIRCLE 511 ON READER CARD

Utilities (System/3)**IBM Corporation**

System/3 utility programs (not further classified by survey respondents).

Users reporting	4
Overall satisfaction	3.0
Throughput/efficiency	3.2
Ease of installation	3.7
Ease of use	3.2
Documentation	2.7
Vendor technical support	3.5
Training	2.5

CIRCLE 506 ON READER CARD

VIDEO**IBM Corporation**

Crt-oriented on-line data entry system for IBM 360/370.

Users reporting	5
Overall satisfaction	2.8
Throughput/efficiency	2.6
Ease of installation	1.8
Ease of use	3.2
Documentation	2.4
Vendor technical support	2.6
Training	2.5

CIRCLE 508 ON READER CARD

WATFIV**University of Waterloo**

Fast, in-memory FORTRAN compiler for IBM 360/370.

Users reporting	9
Overall satisfaction	4.0
Throughput/efficiency	4.0
Ease of installation	3.7
Ease of use	4.0
Documentation	3.3
Vendor technical support	3.0
Training	2.0

CIRCLE 510 ON READER CARD

Work Ten**NCI, Inc.**

Creates IBM 360/370 COBOL programs and documentation from standardized input forms filled in by programmers.

Users reporting	3
Overall satisfaction	2.7
Throughput/efficiency	2.7
Ease of installation	3.0
Ease of use	3.3
Documentation	2.3
Vendor technical support	2.7
Training	3.0

CIRCLE 512 ON READER CARD

Vendor Index

Listed below, for your convenience in obtaining additional information, are the full names, addresses, and telephone numbers of the 92 vendors whose packages are mentioned in this article.

Adpac Corporation

120 Howard St.
San Francisco, CA 94115
(415) 981-2710

American Appraisal, Inc.

525 East Michigan St.
Milwaukee, WI 53201
(414) 271-7240

American Valuation Consultants, Inc.

One North Broadway
Des Plaines, IL 60016
(312) 297-6100

Applications Software, Inc.

21515 Hawthorne
Torrance, CA 90503
(213) 542-4381

Applied Data Research, Inc.

Route 206 Center
Princeton, NJ 08540
(609) 921-8550

Aquila BST, Ltd.

P.O. Box 10
Stock Exchange Tower
Montreal, Quebec,
Canada H4Z 1A4

Arthur Andersen & Company

69 West Washington
Chicago, IL 60602
(312) 346-6262

Atlantic Software, Inc.

Lafayette Building, Suite 910
Fifth & Chestnut Sts.
Philadelphia, PA 19106
(215) 922-7500

Automated Financial Systems, Inc.

Suite 420
One Bala Cynwyd Plaza
Bala Cynwyd, PA 19004
(215) 667-1000

The Automated Quill, Inc.

3501 South Corona
Suite 7
Englewood, CO 80110
(303) 761-2722

Boole & Babbage, Inc.

850 Stewart Drive
Sunnyvale, CA 94086
(408) 735-9550

Boothe Management Systems

555 California St.
San Francisco, CA 94104
(415) 989-6580

Burroughs Corporation

Burroughs Place
Detroit, MI 48232
(313) 972-7000

California Computer Products, Inc. (CalComp)

2411 West La Palma Ave.
Anaheim, CA 92801
(714) 821-2541

Cambridge Computer Associates, Inc.

222 Alewife Brook Parkway
Cambridge, MA 02138
(617) 868-1111

Capex Corporation

2613 North Third St.
Phoenix, AZ 85004
(602) 264-7241

Certified Software Products

3140 Harbor Lane North
Minneapolis, MN 55441
(612) 546-8919

CFS, Inc.

P.O. Box 662
Brookline, MA 02147
(617) 731-3474

Cincom Systems, Inc.

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

Computer Audit Systems, Inc.

80 Main St.
East Orange, NJ 07052
(201) 736-9720

Computer Information Management Company

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

Comress, Inc.

2 Research Court
Rockville, MD 20850
(301) 948-8000

Comtech Laboratories, Inc.

135 Engineers Road
Smithtown, NY 11787
(516) 231-5454

Condata, Inc.

1809 Walnut St.
Philadelphia, PA 19103
(215) 569-4240

Cullinane Corporation

20 William St.
Wellesley, MA 02181
(617) 237-6601

Data General Corporation

Route 9
Southboro, MA 01772
(617) 485-9100

Data-Man Ltd.

Box 9234
Bow Valley Square II
205 Fifth Ave.
Calgary, Alberta,
Canada T2P 2W4
(403) 266-6358

Datachron Corporation
174 Fifth Ave.
New York, NY 10010
(212) 675-5333

Datapoint Corporation
9725 Datapoint Drive
San Antonio, TX 78284
(512) 690-7000

Dearborn Computer Leasing Co.
4849 North Scott St.
Schiller Park, IL 60176
(312) 671-4410

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

Diversified Data Systems, Inc.
2601 Fairview Ave.
Tucson, AZ 85705
(602) 792-3205

DNA Systems, Inc.
1258 South Washington
P.O. Box 1424
Saginaw, MI 48605
(517) 793-0185

Donovan Data Systems, Inc.
666 Fifth Ave.
New York, NY 10019
(212) 586-0055

Duquesne Systems, Inc.
1511 Park Building
355 Fifth Ave.
Pittsburgh, PA. 15222
(412) 281-9055

Dylakor Software Systems, Inc.
16255 Ventura Boulevard
Suite 808
Encino, CA 91436
(213) 995-0151

Educational & Administrative Systems, Inc.
P.O. Box 3057
Greenville, SC 29602
(803) 294-2021

The Equimatics Company
United Fidelity Building
1025 Elm St.
Dallas, TX 75202
(214) 744-4342

Florida Software Services, Inc.
711 Semoran Boulevard
Fourth Floor
Altamonte Springs, FL 32701
(305) 831-3001

Foresight Systems, Inc.
(a subsidiary of United Computing Systems, Inc., which is a subsidiary of United Telecommunications Company, since August 1, 1975; prior to that, Foresight was a subsidiary of Johns-Manville)
1901 Avenue of the Stars, Suite 585, Century City
Los Angeles, CA 90067
(213) 277-2722

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

General Automation, Inc.
1055 South East St.
Anaheim, CA 92803
(714) 778-4800

Group/3 Division, Informatics, Inc.
(a subsidiary of the Equitable Life Assurance Society of America)
21050 Vanowen St.
Canoga Park, CA 91304
(213) 884-6678

Gulf Oil Computer Sciences, Inc.
P.O. Box 2100
Houston, TX 77001
(713) 228-7040

Hewlett-Packard Company
Data Systems Division
11000 Wolfe Road
Cupertino, CA 95104
(408) 257-7000

Honeywell Information Systems, Inc.
(a subsidiary of Honeywell, Inc.)
200 Smith St.
Waltham, MA 02154
(617) 890-8400

IBM Corporation
Data Processing Division
1133 Westchester Ave.
White Plains, NY 10604
(914) 696-1900

IBM Corporation
General Systems Division
P.O. Box 2150
Atlanta, GA 30301
(404) 256-7000

Infodata Systems, Inc.
30A State St.
Pittsford, NY 14534
(716) 578-3430

Infonational, Inc.
6626 Convoy Court
San Diego, CA 92111
(714) 560-7070

Informatics MARK IV Systems Co.
(a subsidiary of the Equitable Life Assurance Society of America)
21050 Vanowen St.
Canoga Park, CA 91304
(213) 887-9121

Innovation Data Processing, Inc.
Clifton Executive Plaza II
925 Clifton Avenue
Clifton, NJ 07013
(201) 777-1940

Integrated Software Systems Corporation
4186 Sorrento Valley Boulevard
Suite N
San Diego, CA 92121
(714) 272-5606

International Mathematical & Statistical Laboratories, Inc.
7500 Bellaire Boulevard
Sixth Floor
Houston, TX 77036
(713) 772-1927

Johnson Systems, Inc.
1651 Old Meadow Road
McLean, VA 22101
(703) 893-8700

Arthur S. Kranzley & Company
1010 South Kings Highway
Cherry Hill, NJ 08034
(609) 795-1515

Management & Computer Services, Inc.
790 Valley Forge Plaza
Valley Forge, PA 19482
(215) 265-2190

Management Information Service
145 Franklin Turnpike
Ramsey, NJ 07445
(201) 327-8510

Management Science America (MSA)
3445 Peachtree Road
Atlanta, GA
(404) 262-2376

Maxima System Group
1475 Powell Street
Emeryville, CA 94608
(415) 654-6030

McCormack & Dodge Corporation
One Wells Avenue
Newton, MA 02159
(617) 965-3750

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

NCI, Inc.
6075 Roswell Road, NE
Atlanta, GA 30328
(404) 252-9474

NCR Corporation
South Main & K Streets
Dayton, OH 45479
(513) 449-2000

Network Data Processing
321 Third St.
Cedar Rapids, IA 52407
(319) 365-8691

Oxford Software Corporation
1567 Palisades Ave.
Fort Lee, NJ 07024
(201) 944-0083

Pace Applied Technology, Inc.
2990 Telestar Court
Falls Church, VA 22042
(703) 573-9131

Pansophic Systems, Inc.
709 Enterprise Drive
Oak Brook, IL 60521
(312) 986-6000

Princeton University
Computer Center
87 Prospect Ave.
Princeton, NJ 08540
(609) 452-6042

Program Products Incorporated
95 Chestnut Ridge Road
Montvale, NJ 07645
(201) 391-9800

Programming Methods Co.
(a subsidiary of Informatics, Inc., which is a subsidiary of the Equitable Life Assurance Society of America; prior to October 1, 1975, PMC was a division of GTE Information Systems, Inc.)
1301 Avenue of Americas
New York, NY 10019
(212) 489-7200

Software AG (of North America, Inc.)
11800 Sunrise Valley Drive
Reston, VA 22091
(703) 620-9577

Software Design, Inc. *
800 Mitten Road
Burlingame, CA 94010
(415) 697-3660

Software International Corp.
(affiliate of Manufacturing
Management Science)
2 Elm Square
Andover, MA 01810
(617) 475-5040

SPSS, Incorporated
National Opinion Research
Center
6030 South Ellis Ave.
Chicago, IL 60637
(312) 753-1545

Sys Con, Inc.
126 Ottawa Avenue, NW
Grand Rapids, MI 49502
(616) 451-8471

System Support Software, Inc.
1132 Donson Drive
Dayton, OH 45429
(513) 435-9514

TCC, Inc.
3429 Executive Center Drive
Austin, TX 78731
(512) 345-5700

**The Computer Software
Company**
6517 Everglades Drive
Richmond, VA 23225
(804) 276-9200

Time Share Corporation
3 Lebanon St.
Hanover, NH 03755
(603) 643-3640

Touche, Ross & Company
1633 Broadway
New York, NY 10019
(212) 489-1600

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

Universal Software, Inc.
136 White Street
Danbury, CT 06810
(203) 792-5100

**University Computing
Company**
(subsidiary of the Wyly
Corporation)
UCC Tower
P.O. Box 47911
7200 Stemmons Freeway
Dallas, TX 75247
(214) 637-5010

**University of California at
Los Angeles (UCLA)**
Department of Biomathematics
Room AV111
Los Angeles, CA 90024
(213) 825-5697

University of Waterloo
Supervisor of Technical
Products & Program
Distribution Computing Centre
Math & Computer Building
Waterloo, Ontario, Canada
N2L 3G1
(519) 885-1211, Extension
3268

Value Computing, Inc.
300 West Marlton Pike
Cherry Hill, NJ 08034
(609) 429-4200

Varian Data Machines
(subsidiary of Varian
Associates)
2722 Michelson Drive
Irvine, CA 92664
(714) 833-2400

Versatec, Inc.
2805 Bowers Ave.
Santa Clara, CA 95051 *
(408) 257-9900

Wang Laboratories, Inc.
Wang Computer Services
Division
836 North St.
Tewksbury, MA 08176
(617) 851-4111

Western Electric Company, Inc.
General Manager, Patent
Licensing
222 Broadway
New York, NY 10038
(212) 571-2691
(marketing UNIX, a package
originally developed and sold
by Bell Telephone Laboratories)

Westinghouse Electric Corp.
2040 Ardmore Boulevard
Pittsburgh, PA 15221
(412) 256-5583

**Whitlow Computer Systems,
Inc.**
560 Sylvan Ave.
Englewood Cliffs, NJ 07632
(201) 568-9700 *



"That's Farquarson, our old vice president in charge of Management Information Systems. He couldn't get the hang of our new system so we had to find a new slot for him."

© DATAMATION ®

ASI/INQUIRY

The IMS DB/DC QUERY LANGUAGE



ASI/INQUIRY is an IMS DB/DC query language that operates completely as an interactive Message Processing Program. The design of ASI/INQUIRY is such that the *structure of the data base is transparent to the user*. Moreover, one need not have familiarity with DL/1 segment logic or the complexities of multi-pathing. Extremely rapid response time is assured.

MAJOR HIGHLIGHTS

- End-user oriented
 - Easy-to-use language
 - Requires no knowledge of IMS
 - Comprehensive diagnostic messages
- Rapid response time for even the most complex queries
- Dynamic priority scheduling to maximize system performance
- Availability of default as well as user-defined screen formatting

ASI/INQUIRY has been fully operational for over six months, and is currently installed in multiple sites here and in Europe.

In summary, ASI/INQUIRY represents the state-of-the-art product in an IMS DB/DC environment. It is the only system combining an easy to use language, complete user flexibility, and rapid response time in a single package. If you want to start answering "What if" immediately, call or write today for further information.



The Software Manufacturer

Applications Software, Inc.
Corporate Offices
21515 Hawthorne Boulevard
Torrance, California 90503
(213) 542-4381

OUR SHORT DROPS COULD BE A WHOLE LOT CHEAPER THAN YOUR LONG HAULS.

If you're thinking of expanding your communications network, then a Cable & Wireless leased circuit system is what you need. If you're already running a leased circuit there's more than a chance that if you let us look it over, we could make it a lot more cost-effective.

And, if you're a company whose major interests are in the Far East or the Middle East we could

certainly save you money.

Cable & Wireless have the computer-switching centres which can pick up your messages and transmit them more cheaply.

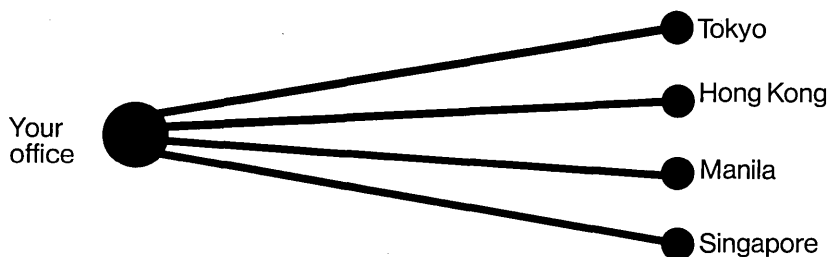
Our switching centre in Hong Kong, for instance, means that your traffic can be passed through there and routed on by a 'short drop' to, say, Tokyo and Manila at a tremendous saving in cost against a 'long-

haul' system direct from your head office.

Similarly, our switching centre in Bahrain can cut your costs in the Middle East.

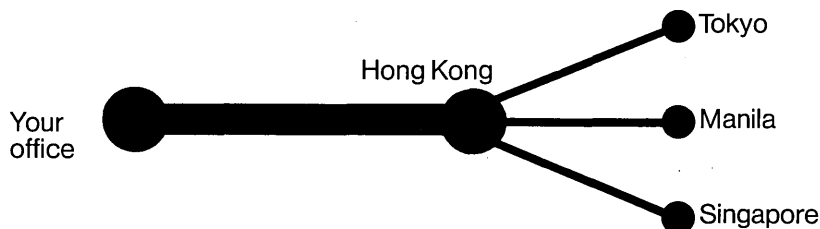
But there's a lot more to it than that, and we'd like to explain it to you.

If you think you'd like to listen, contact us at the address below. We'll send you literature, or have someone call.



THE LONG HAUL.

This system could be costing you much more than it need!



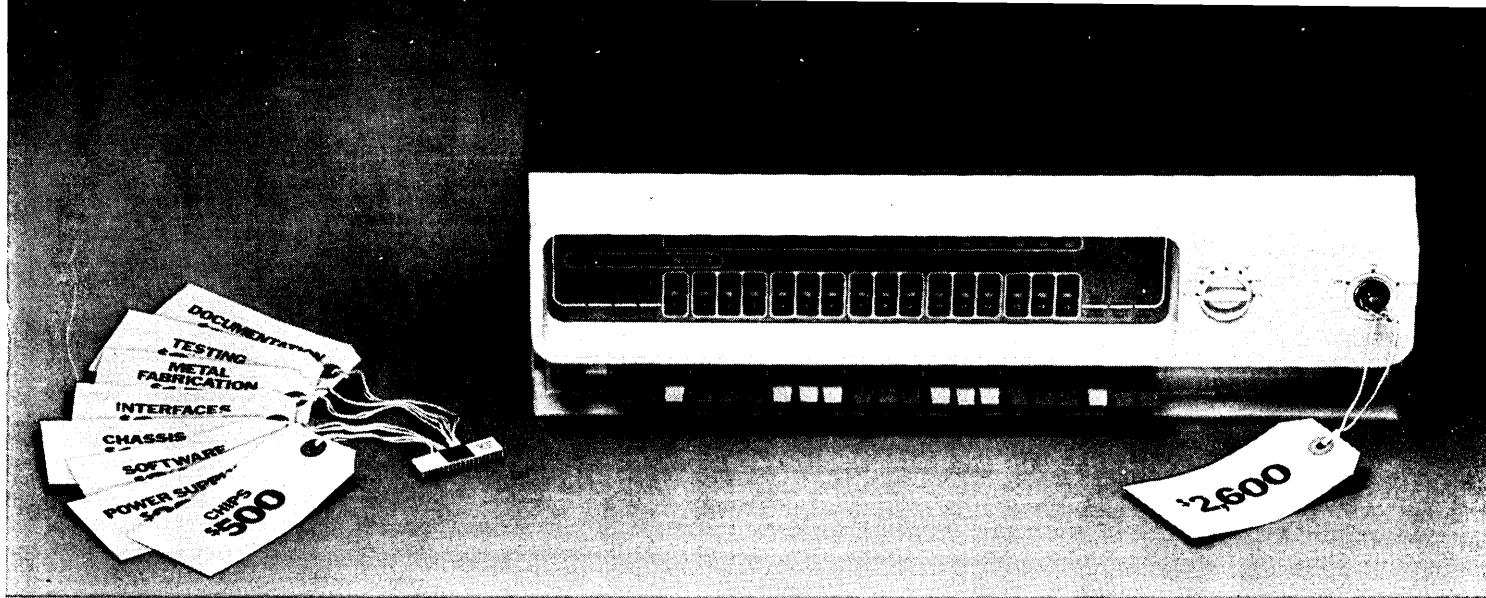
THE SHORT DROP.

A Cable & Wireless leased circuit using short drops like this could cost you much less than you think!

 **CABLE &
WIRELESS**

Keeps you in touch with the world.

Cable & Wireless, International Commercial Dept., Mercury House, Theobalds Road, London WC1X 8RX. Tel: 01-242 4433. Telex: 23181.
U.S. Office: Cable & Wireless (NYK) Inc., Graybar Building, Suite 2020, 420 Lexington Av., New York 10017. Tel: 212-889-9020. Telex: 12094.



Has your \$500 micro ended up costing more than our \$2,600 mini?

If you've had to spend a lot of money on a low priced micro, you may be in a position to appreciate the cost advantages of a higher priced computer.

Our \$2600 Nova 3*.

When you buy a Nova 3, you don't have to put as much into it to get it to do your job.

You don't have to create your own operating systems. Nova 3 is software compatible with our other Novas. So you get to use all the existing Nova operating systems, language processors and utilities.

And you don't have to worry about performance. Nova 3 executes instructions in 700 nanoseconds using MOS memory. And its sophisticated architecture lets you use up to 128K Words with the optional Memory Management Unit.

You don't have to buy more

computer than you need. Nova 3 has the broadest range of compatible configurations you can get in an OEM minicomputer line. There's a 4 slot Nova 3. A 12 slot Nova 3. (It has an optional expansion chassis that gives you 12 more slots of I/O.) And you can configure multiple processor Nova 3 systems.

You don't have to worry about Nova 3 availability. We're manufacturing virtually every part of the Nova 3. Including the silicon gate N-channel MOS RAM memories. (They're coming from our Sunnyvale, California facility.)

And you don't have to go it alone. Because when you buy a Nova 3, you can get all the support Data General offers an OEM.

Write or call for the Nova 3 brochure. It may persuade you to buy more and spend less.

*\$2600 is the single unit price for a 4K MOS memory Nova 3. Before the OEM and quantity discounts get figured in.

DataGeneral

Nova 3: The biggest thing to ever hit the OEM market.

• Data General, Dept.L-5, Route 9, Southboro, Mass. 01772 (617) 485-9100. Data General (Canada) Ltd., Ontario. Data General Europe, 15 Rue Le Sueur, Paris 75116, France. Data General Australia, Melbourne (03) 82-1361/Sydney (02) 908-1366.

CIRCLE 68 ON READER CARD

hardware

Off-line

It would seem ridiculous for a coffee truck to show up outside your plant one morning with floppy discs next to the breakfast rolls, wouldn't it? But a new (Calif.) corporation, called Datavan, is starting a similar service together with Memorex Corp. Datavan has purchased six large camper-sized vans and will regularly call on dp centers to offer services such as ribbon re-inking, disc and tape cleaning, etc. A full line of Memorex media will also be on board as will a coffee urn, we're told....

Diva, Inc., Eatontown, N.J., has reduced prices on its minicomputer disc line. DEC, Data General, and Interdata users can now get 27.3 megabytes of disc pack storage for \$13,600 and 82.1 megabytes for only \$17,400. Prices include all interconnecting cables, terminators, emulator formatter, and diagnostic software.

The one thousandth model 2640 crt has recently rolled off the Hewlett-Packard production line in Cupertino, Calif., less than a year after announcement. (See Nov. '74, p. 146.)

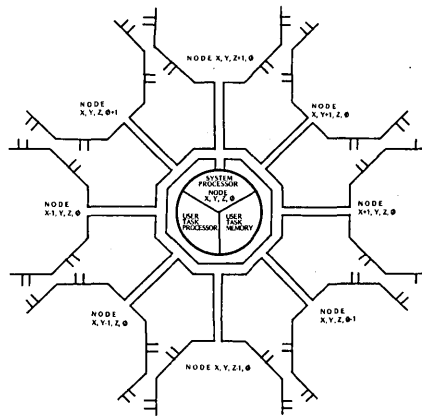
Tektronix' latest graphics announcement, the 4051, has an interesting feature that will probably be copied by other manufacturers. The optional plotter does double duty as a digitizer, thus offering another way to get information into the system. Tektronix claims it's a first.

Ball Brothers, the company that made its mark with home canning jars years ago, and has since diversified into ski resorts and aerospace, has recently purchased the Caelus 412 disc drive product line. Formal announcement is slated for early next year.

Let's Make This Perfectly Clear Dept: The \$225 price mentioned for Digi-Log's latest terminal (Oct., p. 148) refers only to the monitor, and is not the price of the entire terminal (though it's not much more than that!) The five-inch monitor is an alternative to the more expensive 12-inch unit marketed in the past.

E-Systems, Dallas, has obtained patents for an ocr device capable of reading any mail bar code the eye can see for a lower price than any other device on the market, says the company.

product spotlight



IMSAI HYPERCUBE NODE

Microprocessor Array

The HYPERCUBE is the first product to be announced that points the way to the computer architectures of the next several decades, if you agree with the consensus of computing experts. The price performance of microprocessors is so good that it just makes good sense to arrange them in arrays and overlap their performance. Certainly there will be some claims that may or may not be lived up to, and there will undoubtedly be teething problems, but arrays of small processors do offer some attractive monolithic systems—both hardware and software.

There are three models of this product, called the HYPERCUBE, the HYPERCUBE II, with 16 processor nodes (2x2x2x2 array), the HYPERCUBE III with 81 processor nodes (3x3x3x3 array) and the HYPERCUBE IV with 256 nodes (4x4x4x4 array). Each "node" in the array uses not one but two Intel 8080 processors and communicates via shared memories with eight adjacent nodes. One processor in each node is dedicated to system overhead and communications tasks, leaving the second processor completely free to execute user code. It's claimed that this functional separation makes system crashes caused by user software impossible. Each node of the HYPERCUBE has an execution rate of one million in-

SUPPLEMENTAL DATA
The following matrix summarizes the capabilities and cost of the three HYPERCUBE configurations announced:

	HYPERCUBE II (Order 2)	HYPERCUBE III (Order 3)	HYPERCUBE IV (Order 4)
Aggregate instruction executions per second	16 million	81 million	256 million
Aggregate programmed I/O Capacity per second	4 megabytes	20 megabytes	64 megabytes
Aggregate DMA capacity per second	32 megabytes	162 megabytes	512 megabytes
Number of I/O device controllers attachable	96	216	384
Number of Concurrently Operating tasks	16	81	256
Standard User Program Memory Size	256K bytes	1 megabyte	4 megabytes
Optional Fully expanded User Program Memory	1.2 megabytes	5 megabytes	16 megabytes
Cost	\$80,000	\$400,000	\$1,280,000

IMSAI HYPERCUBE CAPABILITIES AND COST

structions per second, a direct memory access capacity of two megabytes per second, and 16K bytes of user program memory, expandable to 64K. For the HYPERCUBE III these figures add up to a system with an aggregate instruction rate of 81 million executions per second, a DMA capacity of 162 megabytes per second, and a total user program memory of 1.2 megabytes, expandable to five megabytes.

There is an operating system called the HYPERCUBE Operating System (HOS) which resides entirely in the nodal microprocessors dedicated to system operation. HOS supports all associated I/O device controllers and provides for all internodal user and system communications. In the HYPERCUBE III, HOS supports 81 independent user tasks in parallel, providing full intertask communications while simultaneously communicating with up to 216 I/O device controllers. This contrasts with the design of the ILLIAC IV, where programs must be broken up and parcelled out to the independent processors.

What the manufacturer calls four dimensional architecture gives each node eight independent data paths to HOS, assuring failsoft internodal communication. Any data path or communication link interruption is detected by HOS and a new optimum

The Elite 1520A Video Terminal.

New from Datamedia.

Conversational. The Elite 1520A speaks your application language, and is ideal for interactive programming, data entry, information retrieval and simply anyplace the need for data communication is important.

Expandable. The Elite 1520A offers the standard 64-character ASCII set displaying 1920 alphanumeric characters in a 24-line/80-character format, and is optionally expandable to a 128-character set, including upper and lower case. And now, APL/ASCII switch-selectable capability.

Separable. This newest video terminal from Datamedia is a stand-alone unit, with the display and keyboard separated for greater applications flexibility.

Compatible. It's plug-compatible with Teletypewriter* Models 33 and 35, either via a standard RS232C or an optional 20 mA current loop interface. Data rates from 50 to 9,600 bps may be accommodated.

Economical. No matter which performance yardstick or competitive unit you stack it up against, the Elite 1520A's \$1555 price (\$1655 with upper and lower case option) in quantities of 1 to 9 (20% lower in quantities of 100) is tough to beat.

Reliable. Our practical design approach is the answer, and our list of users worldwide of other proven Elite video terminals can tell you what reliability is all about in a CRT. Or we can tell you.

Available. The Elite 1520A is not one of those announced-today, promised-tomorrow, delivered-someday products. It's here. It's available.

NEW!
APL/ASCII

Phenomenal.



Datamedia Corporation

7300 N. Crescent Boulevard
Pennsauken, New Jersey 08110
TEL: 609-665-2382
TWX: 710-892-1693

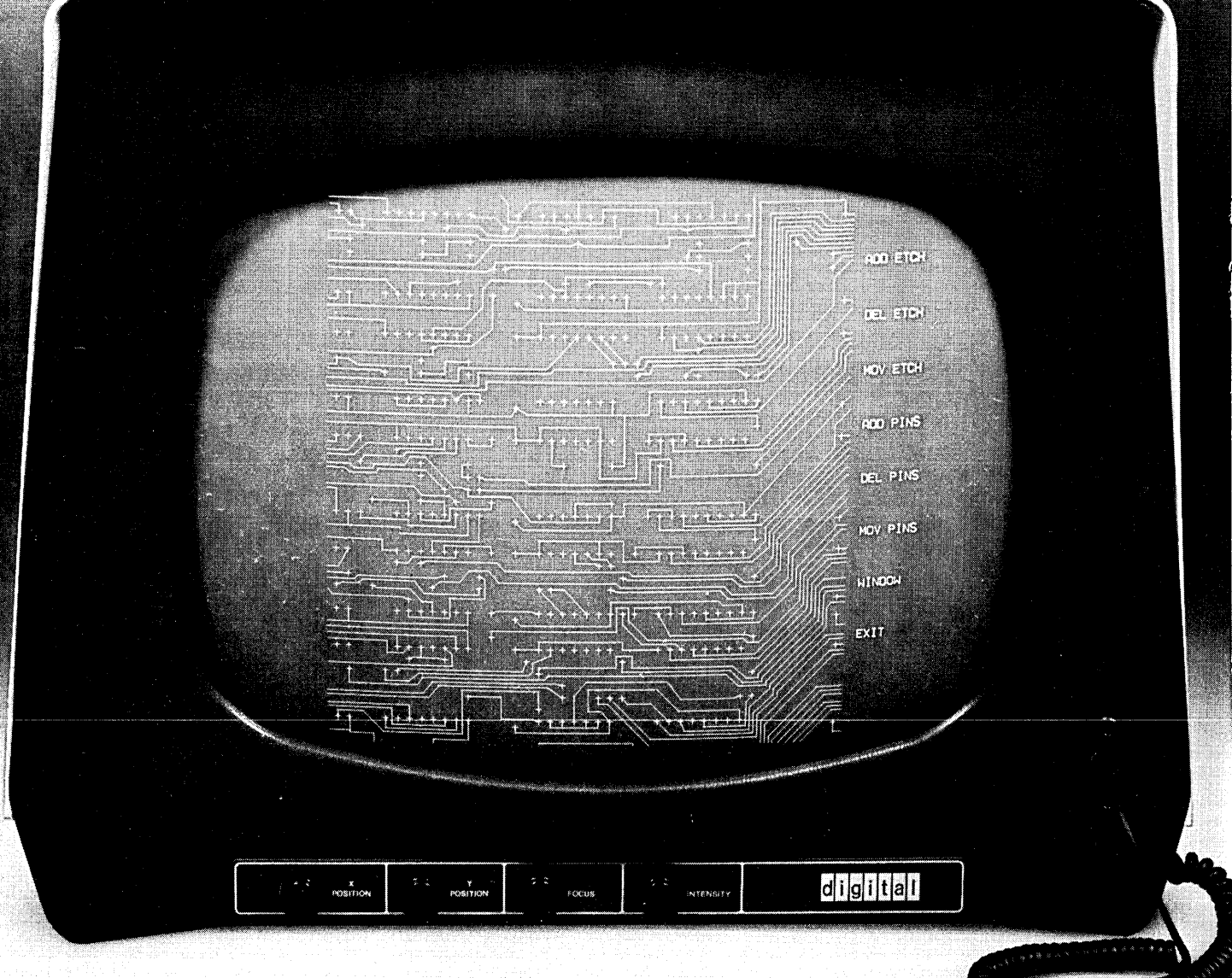
138 Duvall Lane
Gaithersburg, Md. 20762
301/948/1670

5456 McConnell Avenue
Suite 150
Los Angeles, Calif. 90066
213/397/3556

CANADA
Datamex, Ltd.
Ontario/Quebec

* Teletypewriter is a registered trade name of Teletype Corporation, Skokie, Illinois

CIRCLE 46 ON READER CARD



Digital's PDP-11 just improved its image.

Introducing the VS60, Digital's high-performance graphics system for the 11 family.

You're looking good if you start off with a great mini-computer like Digital's PDP-11. Adding VS60 high performance graphics is one way to look even better.

With the VS60, you get a 21-inch CRT with light pen and a display processing unit with hardware vector and character generators. You also get sub-routining with automatic stacking, scaling and 2-D translation standard. Subscripting and superscripting — standard. Plus upwards compatibility with over 500 VT11 graphics terminals already installed.

And the VS60 gives you something no other high-performance system offers — the Digital name plate. It means full line compatibility with 6 different PDP-11 processors. 60 different peripherals. And 2 different operating systems, RT-11 and RSX-11. With RSX-11 software, the VS60 can be configured as a satellite terminal called the GT62.

A Digital name plate also means you get one source for all your equipment. Plus the support represented by a worldwide sales and distribution network of over 3,500 software and service specialists in 36 countries.

So if you're interested in high performance graphics, look at the big picture. Look at performance, flexibility and support. Then look up your Digital sales

representative. Or write for our brochure. Digital Equipment Corporation, Marlboro, MA 01752. (617) 481-9511, Ext. 6937. European headquarters: 81 route de l'Aire, 1211 Geneva 26. Tel: 42 79 50. Digital Equipment of Canada, Ltd.



digital

hardware

alternate path selected with the break being accounted for by HOS.

Obvious applications for the HYPERCUBE include on-line information storage and retrieval applications, time-sharing networks, large scale message switching, array processing, network control, real-time interactive data reduction, program compilation, process control, simulation, and possibly artificial intelligence and text searching. The HYPERCUBE II is priced at \$80K, the HYPERCUBE III at \$400K, and the HYPERCUBE IV at \$1,280,000. Delivery is being quoted at 90 days ARO. IMS ASSOCIATES, INC., San Leandro, Calif. FOR DATA CIRCLE 214 ON READER CARD

Flatbed Plotter

Both line and photoplotting capabilities are offered with the AP53 Graphic Plotter that features interchangeable heads and removable panels that adapt the equipment for either function in less than three minutes. High photoplotting speeds up to 10 times faster than conventional photoplotters are claimed. Average speed during "painting" is 10 ips. At all other times, i.e., when the head moves to a new position or when used for line plotting, speeds go up to 40 ips. The AP53 draws a 33x45-inch drawing on either conven-



tional or photosensitive media. Another nice feature of the plotter is an aperture plane that contains up to 144 apertures on four changeable plates. The machine's fiberoptic bundle can be rotated 180° in increments of 1°, which means that a plate need not have a particular aperture duplicated in different orientations. The positioning accuracy is 1 mil/foot/axis, holding 5 mil accuracy over the total plotting area. The unit is available for both on-line and off-line hook-up with prices starting at \$70K. APPLICON INC., Burlington, Mass.

FOR DATA CIRCLE 217 ON READER CARD

Mini Communications

Interdata has come up with a gadget called the Quad Synchronous Adapter,

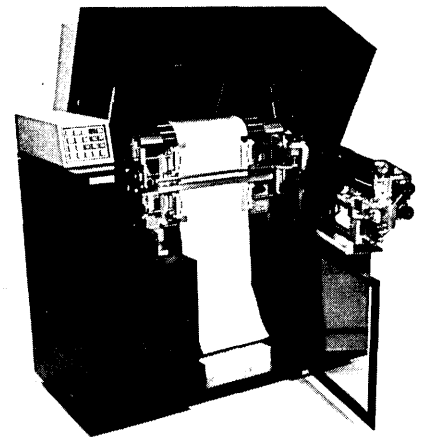
which, in effect, simplifies interfacing of four synchronous lines between its 16- and 32-bit processors and several new communications protocols, including IBM's Synchronous Data Link Control (SDLC), High Level Data Link Control (HDLC), and Advanced Data Communications Control Procedure (ADCCP). One version of the QSA communicates in traditional Bisync (Binary Synchronous Code), and can be upgraded to communicate with Bisync and the three new protocols, the prices being \$1,600 and \$2,600, respectively. One obvious use of the QSA would be to have it accommodate communication lines under program control regardless of whether the protocol was Bisync or SDLC, for example. INTERDATA, INC., Oceanport, N.J.

FOR DATA CIRCLE 216 ON READER CARD

Line Printer

This company, renowned for its card reader products, has decided to tackle the line printer market. Its first model looks like a winner. The doc 2250 operates at 2250 lines per minute using a 48-character set across 132 columns, making it one of the fastest units available. The 2250 contains its own power supply and control logic. Other standard features include fully-buffered print lines, interchangeable character arrays, a universal character set buffer

that allows any character set to be used, vertical forms control buffer, a powered forms stacker accommodating forms from 3 to 24 inches, acoustically-insulated powered cover, resident microdiagnostics, etc. It's clear that the doc 2250 has been developed as an



oem alternative to IBM's 3211 line printer. Options include a 150 print position line. The 2250 is priced at \$32,500 before quantity discounts. DOCUMENTATION, INC., Melbourne, Fla. FOR DATA CIRCLE 215 ON READER CARD

Customizable Terminals

This manufacturer has developed a family of customizable terminals, rang-

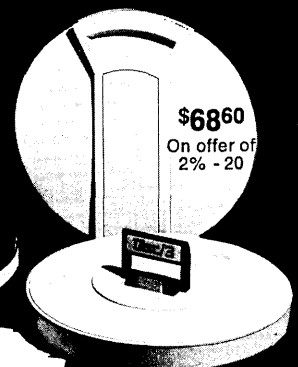
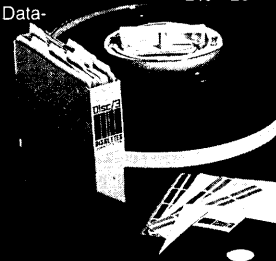
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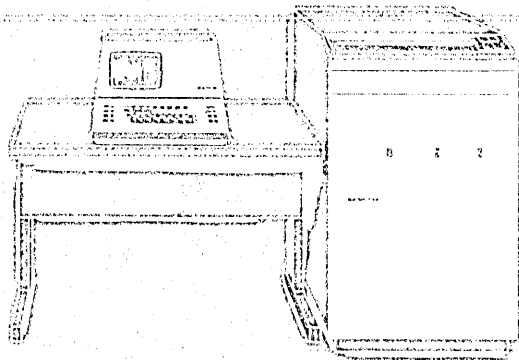
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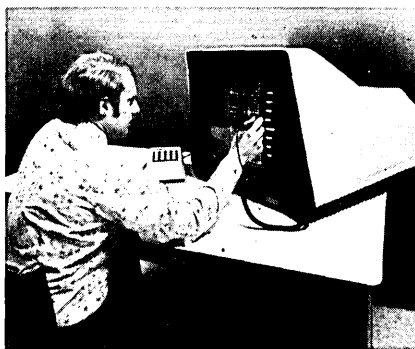
ing from a standalone limited alphanumeric keyboard with single line display, to one-line (16-, 32-, and 80-character) displays with complete keyboards. The terminals can be interfaced to badge readers (Hollerith or magnetic stripe), strip printers (21 or 34 columns), cassettes, 3M cartridges, floppy or hard discs, etc. The Burroughs display can include display roll right/left, cursor control, etc. The entire ASCII set is available. Prices range from \$900 to \$3K each, depending on customization. VMF INDUSTRIES, INC., Bayshore, N.Y.

FOR DATA CIRCLE 218 ON READER CARD

Graphics Subsystem

The vs60 graphic display subsystem is designed as an add-on for any PDP-11 computer, ranging from the small PDP-11/04 to the PDP-11/70. The vs60 comprises a 21-inch (53 cm) crt, light pen, and a display processing unit. The system is intended for applications in computer-aided design and rapid, high-density data display, electronic and mechanical engineering, chemical and molecular modeling, and architecture.

The first configuration to use the vs60 is the GT62, an intelligent graph-



ics terminal. This configuration includes the vs60, a PDP-11/10 minicomputer, a free-standing ASCII keyboard, and provisions for communication links. The GT62 is priced at \$47,500; the vs60 at \$38,800. DIGITAL EQUIPMENT CORP., Maynard, Mass.

FOR DATA CIRCLE 219 ON READER CARD

Integrated Micro to Mini Line

Texas Instruments isn't the first minicomputer manufacturer to see the market possibilities of offering a compatible range of computing power, ranging from microprocessor level through minicomputer performance, but the firm's tremendous advantage of making its own circuitry means it will always be building some of the more cost effective gear around.

The 990 series consists of the TMS

9900 microprocessor, the model 990/4 microcomputer, and the model 990/10 minicomputer. Also included in the announcement are software development aids, developmental support on time-sharing networks, and a prototyping system.

The TMS 9900 is a one-chip, 16-bit microprocessor that uses N-channel MOS silicon-gate technology. It's claimed that the combination of a versatile instruction set and a high-speed interrupt capability endow the 9900 with the performance of a 16-bit TTL mini. Oem's interested in developing programs for the 9900 can access assembler, linking loader and simulators on the National CSS, Tymshare, and GE time-sharing networks.

The next unit is the 990/4, a complete microcomputer on a single pc board that uses the TMS 9900 as its central processor. Both the 990/4 and the 990/10 mini are available in several chassis configurations: a low-cost oem package; a 7-inch (6-slot), or 12¼-inch (13-slot) rack-mountable chassis; or a tabletop enclosure. A programmer's front panel console is also available for both chassis.

The 990/10 mini is a TTL implementation of the 990 architecture that provides higher performance levels demanded of more sophisticated applica-

(Continued on page 169)

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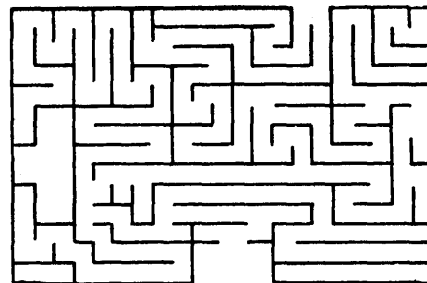
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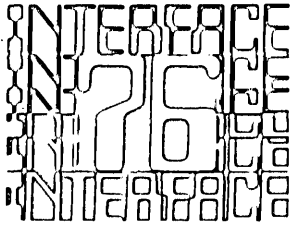
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	9:00	10:00	11:00	12:00	1:00	2:00	3:00	4:00	5:00	
MONDAY	Keynote						Applications: Banking, Securities, Insurance, Manufacturing, and Process Industries			
		DataComm School #1 Fundamentals for Managers					DataComm School #2 Comm Services & Interfaces			
		Network Planning: Objectives, Justification, Budgeting, and Staffing					Network Implementation: Design, Vendor Selection, Installation, and Maintenance			
		Hosts, Front Ends, and Minis	Data Base and Comm Software				Couplers, Modems, and Multiplexers	Transmission Services		
		Who's Ahead in Transmission Services					Worldwide Nets Require Diplomacy			
							We're Going to Point of Transaction			
							Consultant's Corner			
	EXHIBITS OPEN 10:30-5:30									
		Applications: Retailing, Wholesaling, Transportation/Distribution, Service Industries, Computer Services						Applications: Banking, Insurance, Manufacturing (Repeat Sessions)		
		DataComm School #3 Comm Processors and Software						DataComm School #4 Terminals and Terminal Systems		
	Network Management: Involvement, Accountability, Payback and Expansion						Network Implementation (Repeat Session)			
	Network Planning (Repeat Session)						Hosts, Front Ends, and Minis (Repeat Session)	Data Base and Comm Software (Repeat Session)		
	CRT's and Teletypewriters	Remote Batch, Data Entry and Satellite Systems					DataComm Software Needs Standards Management			
	Protocols or Promises for Productivity						Terminals Grow into Minis via Micros			
		Data Base Management Decentralizes Again					Consultant's Corner			
EXHIBITS OPEN 10:00-5:00										
TUESDAY	Applications: Utilities, Government, Law Enforcement, Health Care and Education						Applications: Government, Law Enforcement, Health Care, Education (Repeat Session)			
	Applications: Retailing, Service Industries, Transportation, Distribution, Computer Services (Repeat Session)						Maintenance: Managing with Distributed Computing			
	Common Carrier Interconnect Policy Update						CRT's and Teletypewriters (Repeat Session)	Remote Batch, Data Entry and Satellite Systems (Repeat Session)		
	Network Management (Repeat Session)						Carriers Are Offering Package Deals			
	Couplers, Modems and Multiplexers (RS)	Transmission Services (RS)					Five-Year Planning for Data Comm			
	Keys to Privacy in DataComm						Consultant's Corner			
		Data Entry is Still in Transition								
	EXHIBITS OPEN 10:00-5:30									
	WEDNESDAY	9:00	10:00	11:00	12:00	1:00	2:00	3:00	4:00	5:00



thorough understanding of the role that specific products and services play in data communications along with advice on evaluation and selection.

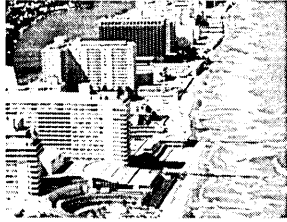
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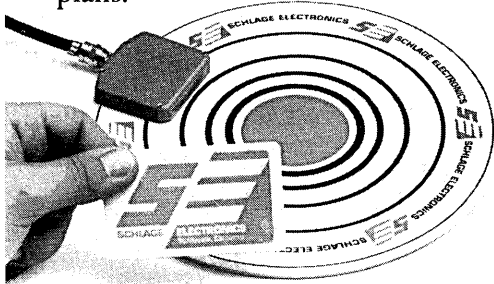
The Schlage Access Control System consists of the Sensor Discs, one for each entry; the Command Key Cards, one for each individual; and one Control Unit which contains the power supply and electronics to activate the individual electro-mechanical locking devices at each entry. Monitoring, recording, and programming units are available for installations requiring even more sophisticated security.

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hardware

tions. The important thing to remember is that the systems share the same instruction set, making it relatively easy for designers to interface various models of the 990 series. There are numerous options for the various models, including up to 58K bytes for the 990/4 and a memory mapping feature for the 990/10 that provides memory protection and privileged instructions and support for memory expansion up to two megabytes.

The 990/4 is priced at \$368 with 512 bytes of memory, \$512 with 8K. The 990/10 mini is priced at \$1,968 with 16K bytes of memory. Prices are based on orders of 50. Deliveries commence during the first quarter of 1976. TEXAS INSTRUMENTS, INC., Houston, Texas.

FOR DATA CIRCLE 223 ON READER CARD

Remote Batch Terminal

IBM has a new entry in the remote batch terminal arena. It's called the 3777 and it more than doubles the fastest printing speed previously available with the 3770 series of general purpose terminals. The terminal's printer, a new model of the 3203, can operate with any of 15 different type sets. The printer can achieve a speed of 1,000 lpm with a 48-character set, compared with the medium-speed 3776 communication terminal's maximum printing speed of 400 lpm. The 3777 can communicate with a virtual storage 370 at up to 9,600 baud over non-switched teleprocessing networks using SDLC. It can operate at the same speed under binary synchronous line control and is available with a switch that eases the change between the two protocols. There are three choices of card readers: previously announced models that operate at 150 and 300 cpm, and a new model, the A3, that runs at 400 cpm. The 3777 is available with one or two console-mounted diskette units. Optional data security features include an operator identification reader for magnetic stripe ID cards and a mechanical keylock to help prevent unauthorized use. A typical terminal, including the 1,000 lpm printer, A3 card reader and appropriate attachment for communications features rents for \$1,565 on a 24-month lease. First shipments won't reach customers until the third quarter of 1976. IBM CORP., White Plains, N.Y.

FOR DATA CIRCLE 220 ON READER CARD
(Continued on page 170)

NCR

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Analysis and simulation of microcomputer systems and evaluation of alternate approaches, both in hardware and software. Will be required, with minimal guidance, to prepare simulation programs using SIMSCRIPT language. From the results, will be required to prepare specifications and functional requirements for microcomputer systems. In later stages of development, will be required to evaluate systems and hardware/software modules.

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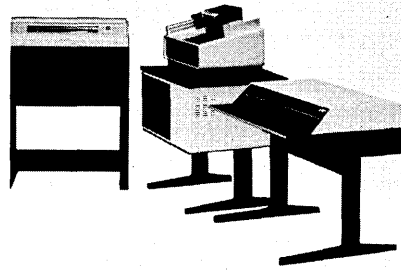
CIRCLE 124 ON READER CARD

hardware

Remote Batch Terminal

The System 525 intelligent remote batch terminal offers a lot of features for the price, it would seem. The unit communicates at speeds up to 4800 baud with a 300 cpm 80-column card reader and 300 lpm line printer. Other peripherals available include a tty, crt, and 100-285 cpm card punches. The 525 emulates most popular remote batch terminals including the Burroughs bc1100, The Univac 1004, the CDC UT200, Honeywell 115, and the IBM

2780, 3780, and 360/25 using HASP. The basic system (300 cpm



reader/300 lpm printer described above) rents for \$615/month on a one-year lease (\$550/month on a

three-year contract), including maintenance. The price is \$19,990. M&M COMPUTER INDUSTRIES, INC., Orange, Calif.

FOR DATA CIRCLE 213 ON READER CARD *

Data Entry

Inforex is the industry leader in small key-to-disc installations, and with its new model 1300, will try to expand that base to an even smaller class of customer—of which there are probably many. The 1300 supports from one to four data entry keystations, a 5,000 record disc drive, an 800-bpi tape drive, and four operator stations. A three-year lease on the configura-

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— permits human judgement unlike automatic optical data entry systems, permits human judgement to intervene when needed.

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— widely applicable currently used for such diverse purposes as planning radiographic treatment in medicine and as entering part numbers in order processing and inventory control.

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tion is \$683/month, including maintenance. Both Inforex synchronous and binary synchronous communications, at speeds up to 9600 baud, are offered with the 1300. INFOREX, INC., Burlington, Mass.

FOR DATA CIRCLE 222 ON READER CARD

Crt Terminal

The model B-R-B video terminal displays 1280 ASCII dot-matrix characters in 16 lines of 80 characters. The unit features selectable standard baud rates from 110-9600, RS-232 serial data interface, backspace capability, detachable keyboard, half- and full-duplex



operation, and composite video output. The B-R-B is available in a board only model for OEM's, in custom designs, and as a suitcase unit. The unit shown is priced at \$875. WINTEK CORP., Lafayette, Ind.

FOR DATA CIRCLE 221 ON READER CARD *

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CIRCLE 32 ON READER CARD

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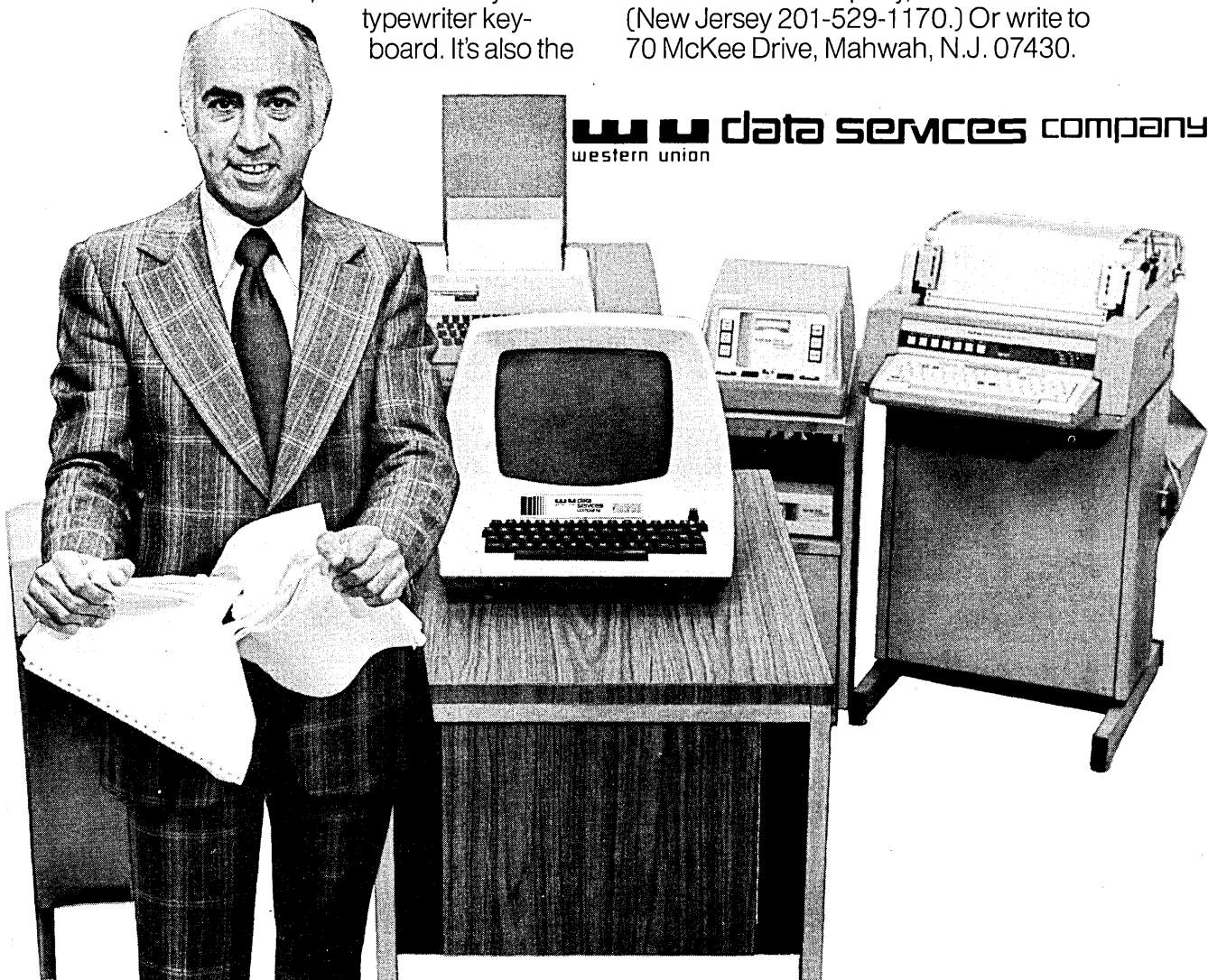
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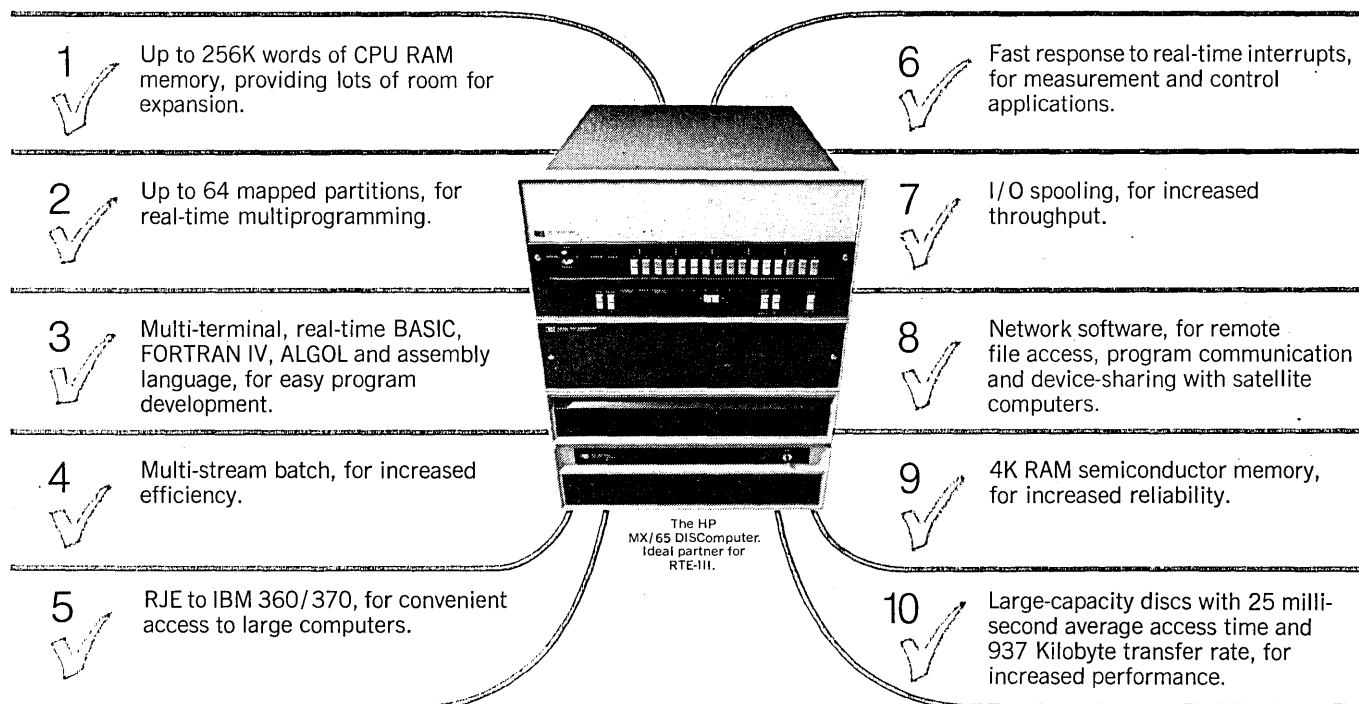


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Updates

With 175,000 vehicles and \$350 million in operating expenses to monitor, the Bell System has enlisted the aid of a new computer program developed in-house called MOVIMS (Motor Vehicle Information Management System.) MOVIMS tracks operating expenses for the life of a vehicle, from purchase to retirement. Generated reports show monthly, year-to-date, and cumulative expenses per vehicle, garage, district area, and company. Other reports can be prepared to aid in administrative tasks such as registration and excise taxes. It is estimated that MOVIMS could save the Bell System up to \$6.5 million annually.

A research grant of \$120,000 has been awarded Informatics Inc. by the National Science Foundation Office of Science Information Service, for a study defining the development of computer-based crises information systems. The work will be performed at the company's Rockville, Maryland headquarters. According to Richard C. Lemons, president of Information Systems Co., an operating unit of Informatics, "The nation has entered an era of social crises in many areas, such as energy, crime, pollution, and privacy. It is vital that all relevant knowledge be brought to bear on the problem areas as quickly as possible to meet the needs of legislators in creating new national goals and reordering program priorities."

Integral Systems, Inc., a software and systems consulting firm in Flemington, N.J. that specializes in higher educational institutions, has just finished a Human Resources system for the Univ. of Pennsylvania. The system replaced three existing payroll systems and a personnel system that were being used to handle the university's 13,000 employees. Top-down techniques in both the implementation and installation phases of the system are credited for the relatively painless installation and customer satisfaction.

Howard Bromberg, President of International Computer Trading Corp., a San Francisco software house, is rather sensitive to charges that programmers spend money like drunken sailors. "That's absolutely untrue," claims Howard. "Drunken sailors spend their own money."

Relational Data Base Time-sharing Service

Relational data bases have been the topic at many computer conference sessions in recent years, but the MAGNUM product is very likely the first commercial usage of the technique. Briefly, relational data bases can be thought of more in terms of logical organization of information than as hardware boxes storing unrelated information in unique files. The advantages of the approach, which should certainly be applicable to all data base users, are a reduction in file sizes (identical data need not be stored in multiple files), simplified maintenance, and reduced complexity.

Eight English commands are at the hand of the MAGNUM user, sitting at a conversational terminal. Any operation that cannot be accomplished by using these eight commands can probably be handled by creating a program procedure out of MAGNUM's high-level procedure language. The vendor estimates that the time required to design and get a data base up and running is

typically reduced by 60-65% of the time normally required using earlier systems. Also, data base maintenance, which might normally take as much as half the time and resources of an installation, can be reduced to about 15%. Field tests have been completed, and MAGNUM is now available as a time-sharing service to medium and large organizations. TYMSHARE, INC., Cupertino, Calif.

FOR DATA CIRCLE 211 ON READER CARD

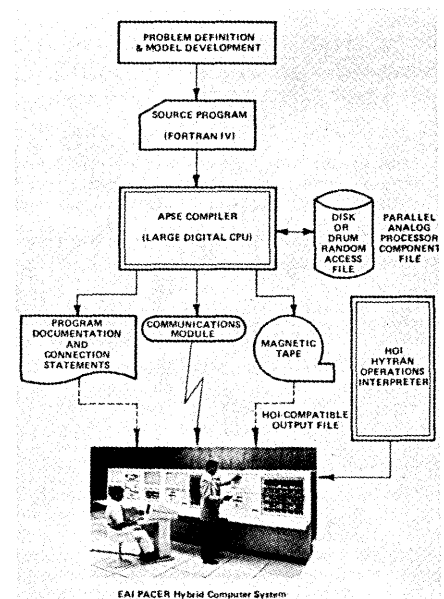
Bill of Materials Conversion

The developers of the very successful IDMS data base management system have come up with a no-cost option to assist users of IBM's BOMP, DBOMP, Material Requirements Planning (MRP), and CFMS (Chain File Management System) packages in developing applications under IDMS. BOMP "Bridge" consists of a manufacturing bill of material prototype program, the bridge program to interface IBM's bill processor retrieval programs to the IDMS data base, and a documentation

software spotlight

Hybrid Computing

This company, a leader in the hybrid computing field, has addressed one of the problems that has helped restrict the use of hybrid computing techniques—that of the tiresome manual preparation for computing runs. With its proprietary product ECSSL (pronounced "excel"), most of the drudgery is gone. The package runs on many cpu's with at least 32-bit words (among them the 360/40, 44, 50, 65, 370/165, ICL 1905, 1909, Univac 1108, Honeywell GE615, Xerox' Sigma Series, CDC 6600, and EAI's own 8400). All the necessary analog and digital programs required for the continuous system simulation run are generated, and in addition, the patch board set-up is defined, and panel switch settings are generated. The basic language for specification is FORTRAN or FORTRAN-based dialects. An additional bonus of



ECSSL is that it extends the scope of analog/hybrid computation facility to digitally-oriented specialists not having prior analog computation experience. All in all, the development should make it easier to use one of the more interesting computing modes. ECSSL is priced at \$10-15K, depending on the amount of user training required. ELECTRONIC ASSOCIATES, INC., West Long Branch, N.J.

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GO TOGETHER

More IMS and TOTAL installations have chosen ASI-ST to implement data base applications than any other product. ASI-ST's dominance in data base environments is easily explained:

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- 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 relational data bases, these benefits are not restricted to IMS and TOTAL users. To obtain more information contact:



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December, 1975

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package to assist in using the programs and bringing up applications. The ANSI COBOL programs run on IBM 360 and 370 hardware, and the conversion time from BOMP, DBOMP, MRP, or CFMS applications is said to be minimal. IDMS prices start at \$40K. CULLINANE CORP., Wellesley, Mass.

FOR DATA CIRCLE 212 ON READER CARD

Structured Programming

It's official: one of the first attempts to build a truly useful FORTRAN "restructuring engine" is now a finished product (see Aug. '74, p. 120.) S-FORTRAN is an extension to the FORTRAN language that has constructs for nested IF's, DO WHILE, DO UNTIL, DO CASE, internal procedures, and ways to handle abnormal returns and arithmetic IF's in a structured manner. S-FORTRAN operates as a high-speed preprocessor for a FORTRAN compiler and produces code that is matched to the requirements of the target compiler (IBM 360/370 or Univac 1100 series) to obtain relatively high execution efficiency. The package is available for a

one-time charge of \$2K. Versions of S-FORTRAN for other computer systems are under development. CAINE, FARBER & GORDON, INC., Pasadena, Calif.
FOR DATA CIRCLE 224 ON READER CARD

CPA Services

This nationwide computer services company which has specialized in data management systems for business for years, is announcing COMPASS for Professional Accounting Systems and Services. COMPASS is a system of time-sharing programs that permit certified public accountant firms to add to their accounting and management services as well as monitor in-house time and billing, general ledger reporting, project accounting, and staff scheduling. The sales pitch is that now any medium or small CPA can log onto a system developed in conjunction with the most successful large CPA firms in the country and use the same systems and a small fraction of the development cost. COMPASS includes a time and billing system, general ledger, project accounting, and a staff scheduling system. There is no initial fee or monthly minimum for COMPASS usage, either, with billing based on how much the customer has actually used. COMPASS is currently on the air nationwide. COMSHARE, INC., Ann Arbor, Mich.

FOR DATA CIRCLE 227 ON READER CARD

Microcomputer Applications

DEVELOP-80 has been used by this manufacturer to develop system software for the Intel 8080 microprocessor that includes a BASIC interpreter, a text editor, monitor and utilities. The program is now available to other firms using the Intel product and having access to a Digital Equipment Corp. DecSystem 10 mainframe. The package consists of a macro assembler, an 8080 simulator, a modified version of the DDT debugging package, and various support programs. The principal virtues of DEVELOP-80 are said to be the cross reference assembly listings it generates, its high speed simulator, symbolic debugging capability, and execution profiles for speed optimization.

The simulator portion of DEVELOP-80 is coded in machine language and runs only about five times slower than the 8080 itself, which differs with FORTRAN simulators that tend to use far more cpu time. Other features include halts on references to nonexistent memory locations and jumps to the debugging package. Also included with DEVELOP-80 are programs to produce object tapes in INTEL compatible or ALTAIR compatible format. The ALTAIR is this manufacturer's low-cost microcomputer that uses Intel 8080 chips. DEVELOP-80 is priced at \$750. MITS, Albuquerque, N.M.

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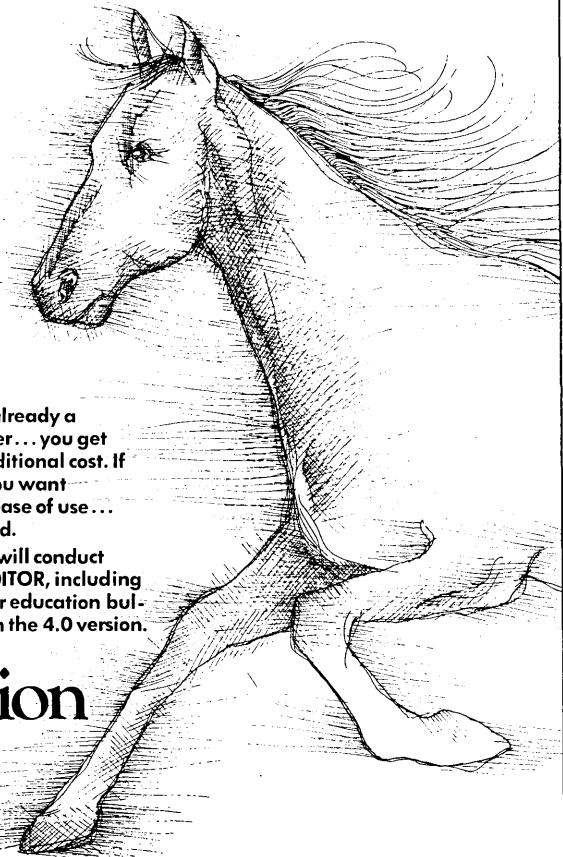
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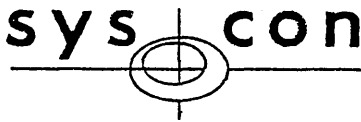
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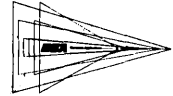
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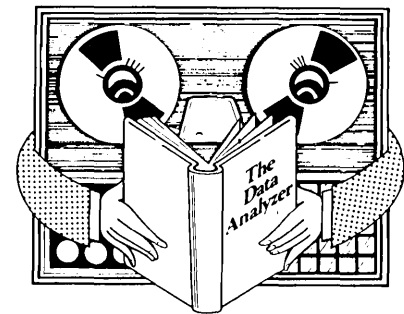
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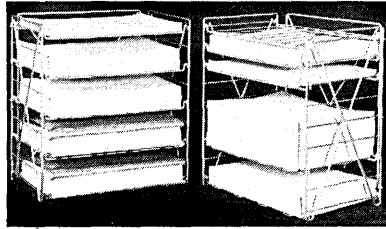
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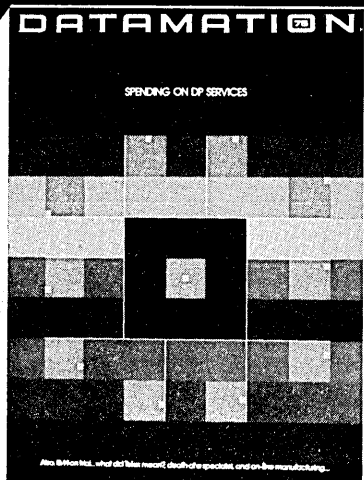
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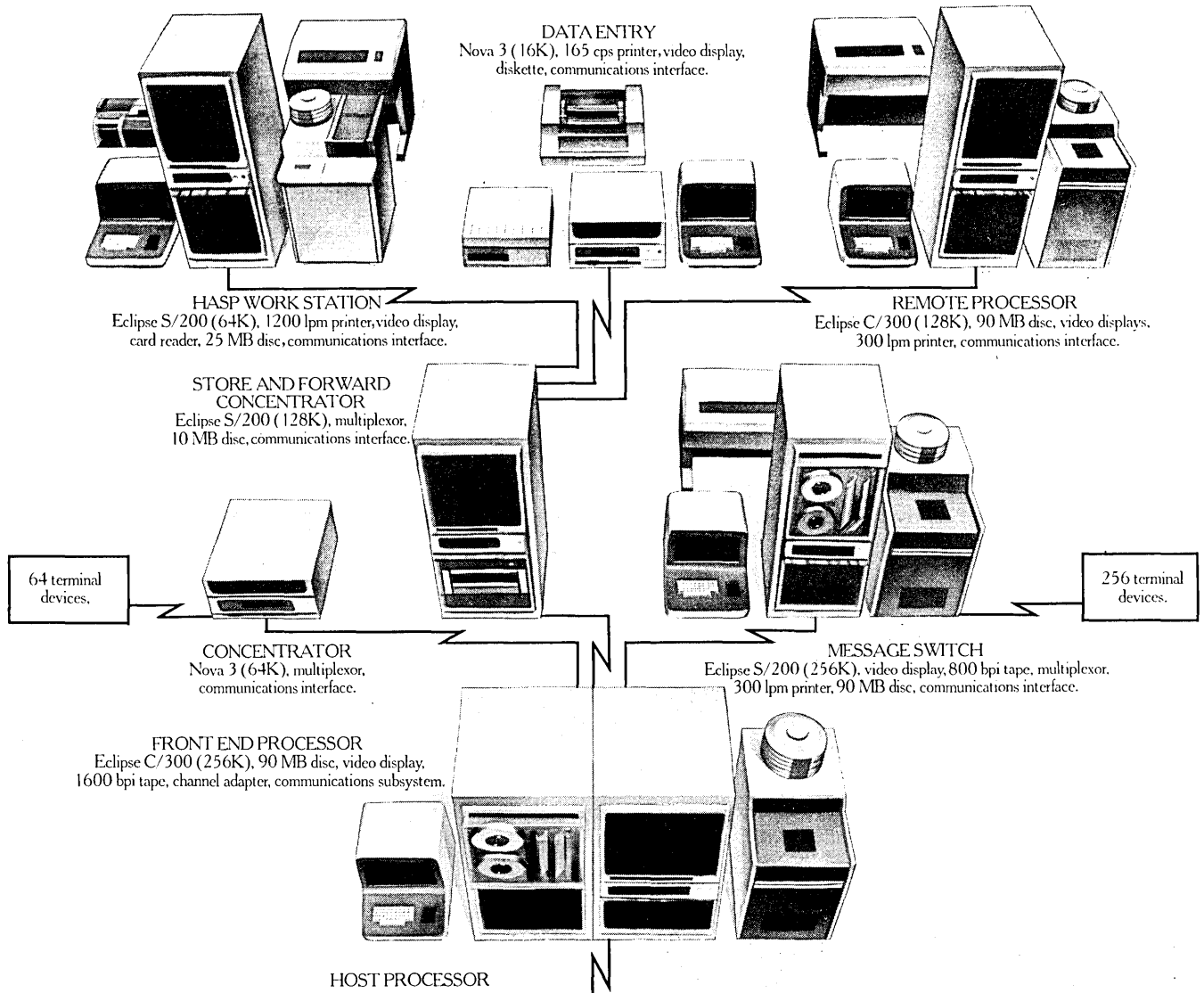
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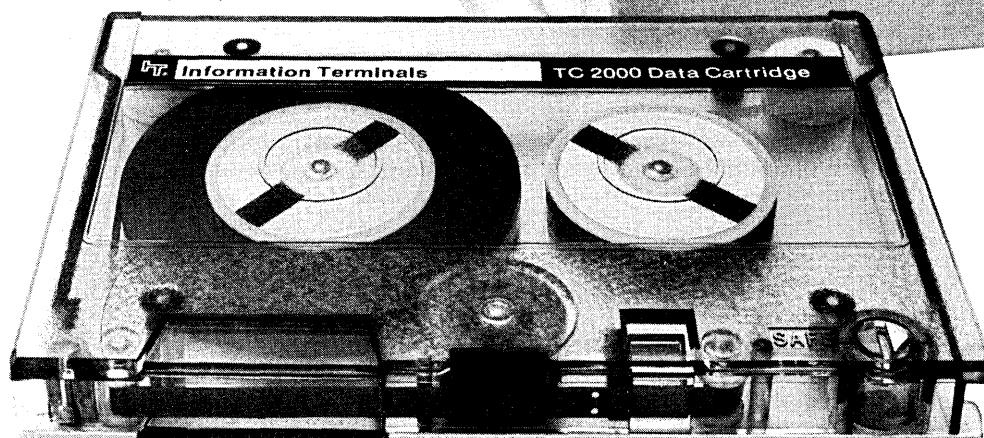
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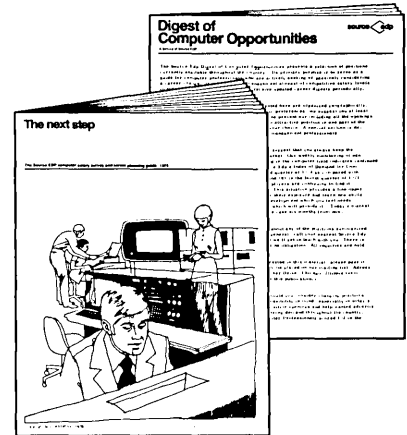
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You've Come a Long Way, Baby

In the last few months, many survey articles have been published concerning the status of women in computing. They contain the usual clichés, make the usual points, and fall short of providing any help to the woman who aspires to improve herself, or to the manager (usually male) who wishes to help her advance.

In my consulting business, I become closely involved with about 12 clients a year. I work as a troubleshooter, a systems designer, and as a management consultant. I'm treated as a member of the management team, expected to adopt and abide by the operating principles of the client organizations, and I'm frequently at the right place at the right time when decisions are being made. I'd like to distill some of this experience to help women who are trying to get ahead.

A decade of movements

In the last 10 years we've lived through several movements all aimed at improving the status of women. They've burned their bras, raised their consciousness, organized for the common good (whatever that is), and generally made a lot of noise. Most managements I've seen treated all this with benign neglect.

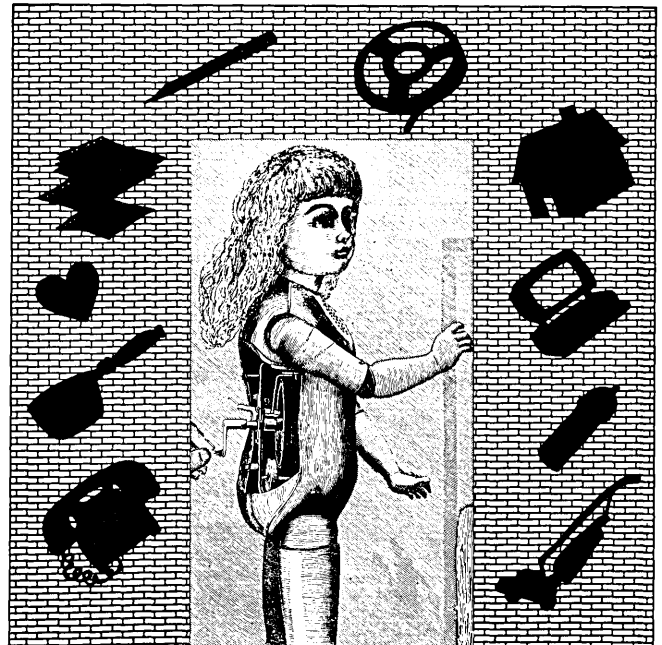
The most significant movement in the last 10 years has been the slow pursuit of legal equality. The federal laws passed in 1964 took six years before anybody noticed them, and eight years before management started to take them seriously. But the last two or three years have seen some real changes. Job descriptions are being rewritten to remove any residual bias. Employment ads indicate that equal opportunities are available, and, in fact, in many cases equal opportunity does exist.

However, now that the opportunities are available we're suffering from a paucity of qualified female candidates. One of my clients, a large West Coast industrial firm, recently staged a major recruitment advertising campaign to build a new group, and received 800 resumes. Only 15% were from females. When we are promoting from within, we have similar problems. Since we don't have many women in

supervisory ranks, we don't have many women candidates who are qualified for managers' jobs.

Reverse discrimination doesn't work

Now some believe we should rectify past wrongs (if we have been guilty of wrongs in the past) by making an extra



effort to seek out qualified women, jump them in salary a couple of levels, and push them into management to make up for the statistical imbalance that exists. To do so would harm the movement to a greater degree than imaginable. Consider the following case.

One of my clients has been active in establishing equal opportunity for some time, and half of his programmers are females. With one or two rare exceptions, these are solid

herself all her life for that success. She is outspoken without being raucous, has a fine sense of humor, but what's most important to her employer, she has the skills necessary to get the job done.

It's an opportunity to fail, too

Another friend of mine who works for a California-based government contractor is not so successful. She had the education, but not the seasoning. She had held a staff position for several years and had apparently been successful. She was in the forefront of several women's and professional groups, and when the time came for a promotion, she was the logical choice. Unfortunately the project she inherited was in trouble. She knew it was in trouble. She had even been in on the audits that had taken place before the previous project manager was relieved of his responsibilities. However, when she took over the project, she let business continue as usual.

She was very sensitive to the desires of the work force, and she slowly started making changes for the better. If we had 30 months to produce the product, she might have made it, with an harmonious work force to boot. However, we had some immediate deadlines. The boat was sinking. Pressures were terrific and decisive management action was required. In the few months she was in charge, the pressure got to her. After one particularly exhausting set of meetings,



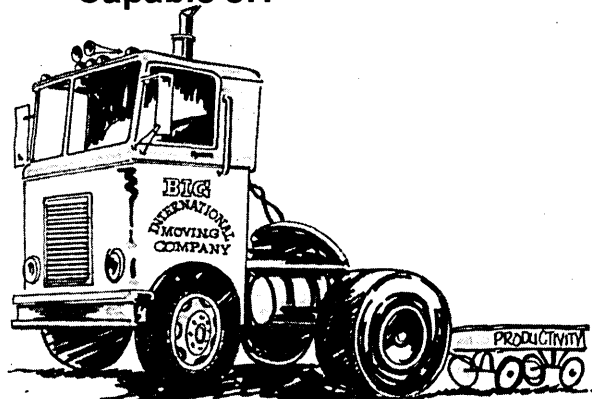
she said to me privately, "I don't have to take all of this. I can go back to school and my husband will pay for it."

She had a husband and several kids, and they constituted one of her distractions and one of her afflictions. She didn't need that job and she didn't take the decisive action one would have taken had one seriously been dedicated to producing for her employer. It took 120 days for her to be relieved. She had held her own, but she hadn't turned it around. When the situation showed no signs of dramatic improvement, she was eased out and a tough minded SOB dedicated to success replaced her.

In some ways that's what equal opportunity is about. A woman may get an opportunity to succeed or fail, but before she accepts that opportunity, she should soberly assess whether she is ready to make the move or not.

With all the push for equal opportunity, I see more formalism occurring in the personnel administration of my clients, in hiring, interviewing, and post-hire evaluation. The formalities of personnel administration have also extended into formal job descriptions. One of my larger clients (staff of 600, half of them programmers) has prepared job de-

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descriptions for every job. These describe the activities the incumbent must perform, the skills that person should possess, and the likely experience and background the person should have to be thoroughly seasoned.

Advice to the ambitious (of either sex)

Those of you who aspire to more responsibility, be you male or female, be well advised to see if your employer has such a set of job descriptions. If they are available, request a copy of the description for your current job, take it home, and do some introspective analysis:

Is your formal education equal to that of your colleagues, or should you be taking some night or extension courses from your nearest university?

Do you handle people well? Can you get them to do what you want? If not, a good book on personnel administration plus some astute observation may improve your acceptance.

How do you express yourself? Do you have good thoughts in your head and a big lump in your throat? If so, being active in a business or professional club, a Dale Carnegie course, or a stint with the Toastmasters may dissolve that lump so your thoughts can get out.

Can you express yourself on paper? Do your good proposals get rejected? Perhaps you think logically but your writing doesn't show it, or you belabor the trivia and neglect to emphasize the important points. If you have good ideas and can't sell them, you need to improve your writing skill. This is harder than just taking a course or learning a new programming language because you need a friend who will critically review what you've written before you publish it. Find someone whose writing you admire and ask him to help you. Review his style and see how he develops technical points and makes his recommendations appear natural. Naturally you have to choose a friend who is a better writer than you are, and your friend has to have time to read your draft copies and comment constructively.

If you aspire to a position in management, are you acquainted with the tasks managers perform that technicians do not? What do you know about planning, budgeting, project management, technical audits, or status assessment? If you have weaknesses in these areas, collect some past plans and reports from the files, read through them at your leisure, and note which ones seem to be particularly outstanding. Then go see the authors and ask them if they have any reference material you could borrow, a personal checklist they might lend you, or a course they might recommend. It takes a little humility to ask a person for help, but that's the way to grow.

Ask yourself if you have the seasoning and experience the boss expects. Be frank with yourself and write down any deficiencies you may have. Then in the course of the next few months, find an opportunity to discuss these deficiencies with your immediate boss and together come up with a program for gleaning the experience or education you lack. It will take quite a bit of ego to do that—to go up to your boss and say, "I don't think I handle people very well and do you know of any books, seminars, or short courses I could take to learn to be more effective?" but it will be worth it.

In some cases your deficiencies may be technical, and that makes them easier to deal with. If you don't know PL/I, you can learn. There are some good books out on JCL. If you don't have any feel for computer operations, you can ask for a temporary assignment so you can learn what is going on.

All in all, if you aspire to promotion, you can work off your deficiencies, become fully qualified in your current job, and then seriously contemplate what you should do to be



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selected for the next job you choose.

Accentuate the positive

In many cases I find women fail to exploit the skills they have. While sweeping generalities are always risky, I've usually found the gals can write better than the guys can. Furthermore, the ability to think logically appears to be independent of leadership experience or early training. Consequently many women are very competitive with the fellows in debugging.

Now I'm not counseling a secondary role for you ladies, but your boss is more interested in getting the work done than he is in having his social consciousness raised. If you can do something well that he needs done badly, you get brownie points. Enough brownie points will make you a candidate next time there is an opportunity for promotion or you request a job which will round out your experience profile.

The computer field needs middle management badly. Qualified persons of either sex move up if they are well rounded technically, and thoroughly seasoned. I don't mean to imply that all bias is gone and that there are no chauvinists among us. A woman must still be outstanding to be considered "equal" to her male counterparts. But I think the first phase of the women's movement is passing and the time has come for them to prepare technically and emotionally for promotion, to learn how the game is played, and then to make damn sure they are the most qualified before they think about raising too much hell.

—Robert L. Patrick

Aside from consulting, Mr. Patrick is also a contributing editor to Datamation.

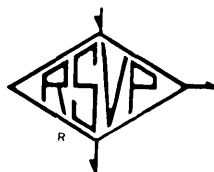
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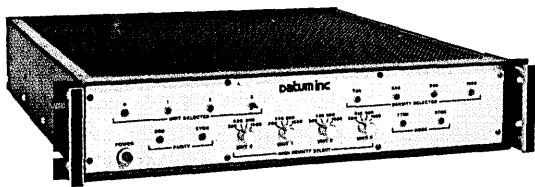
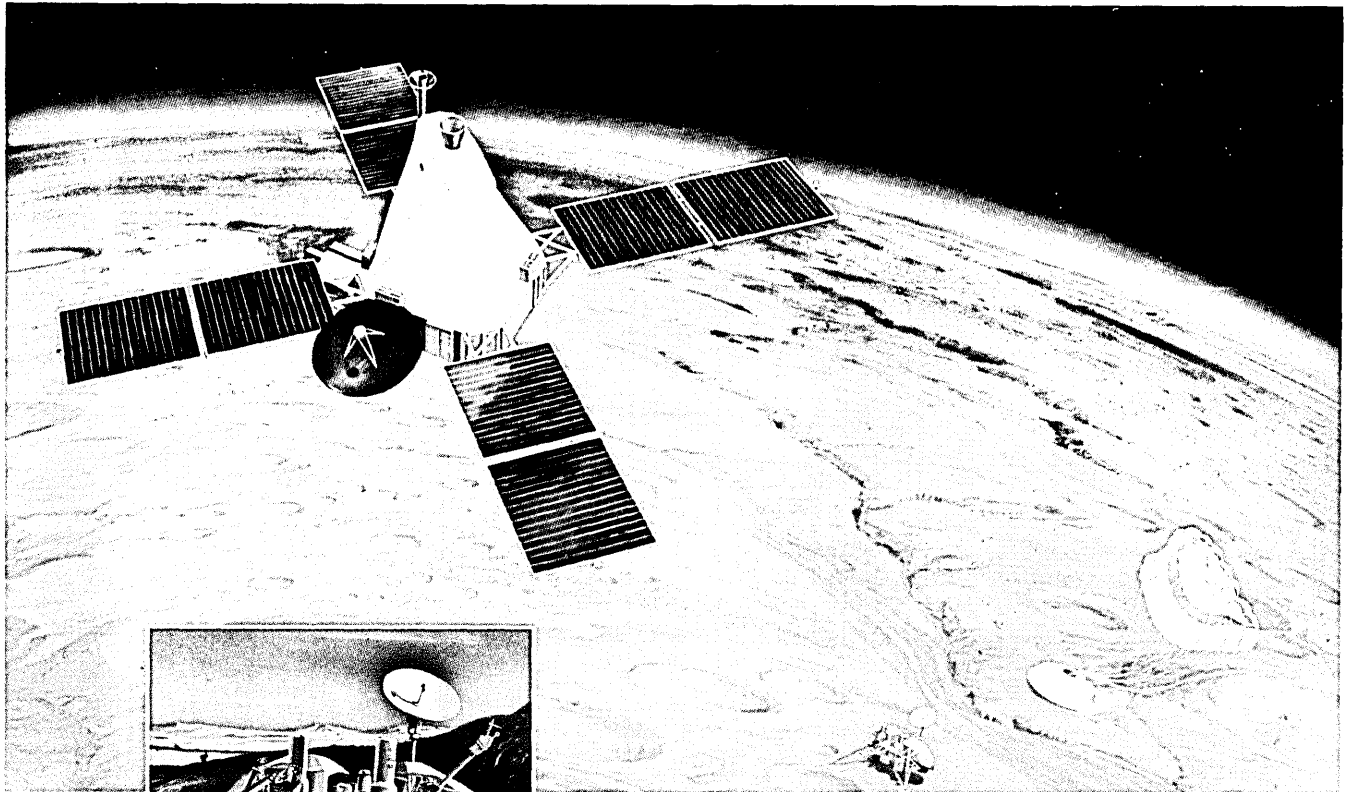
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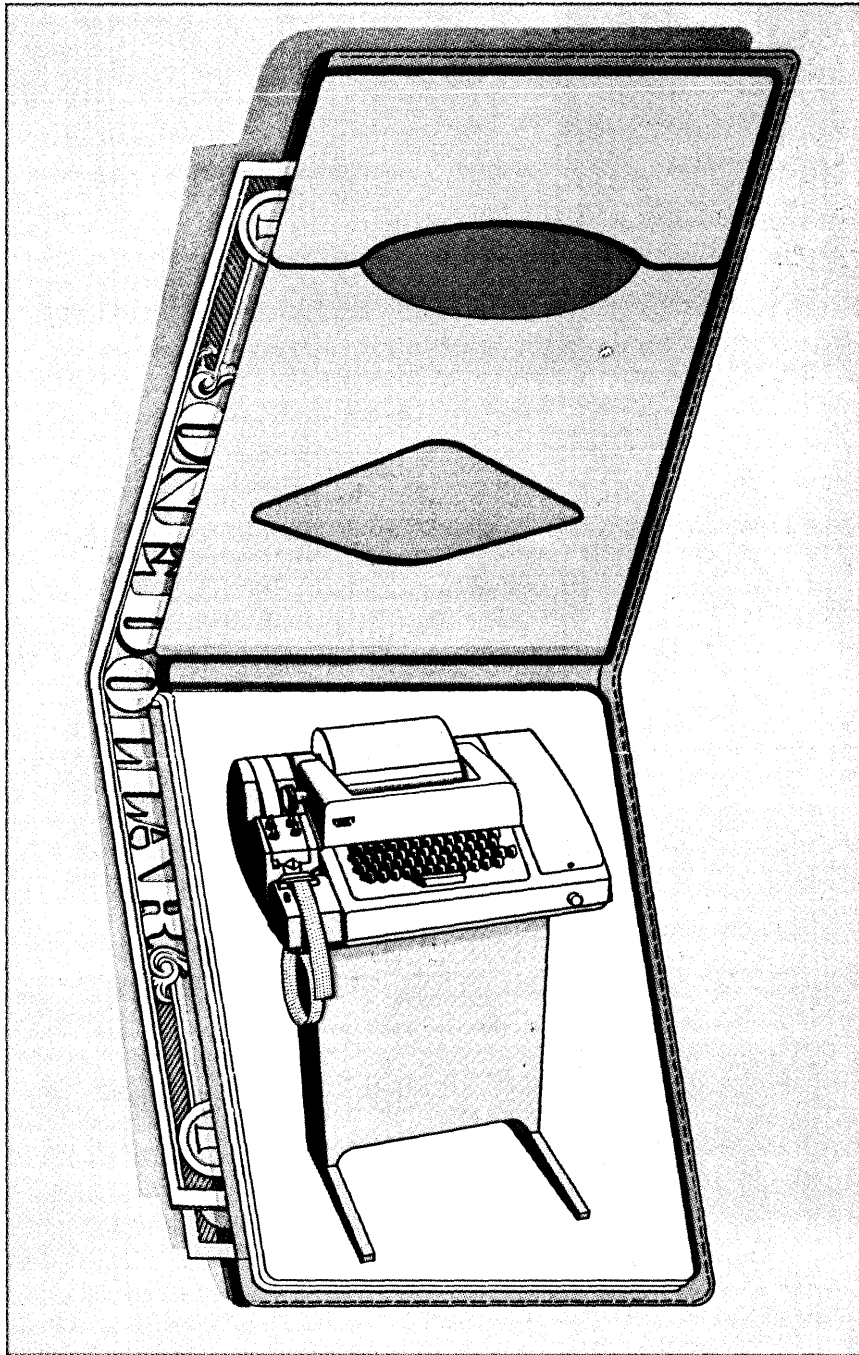
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