# DATAMATION '73®

March

DATA PREPARATION Also... Japan revisited, a read/write laser memory, catches in your lease contract...

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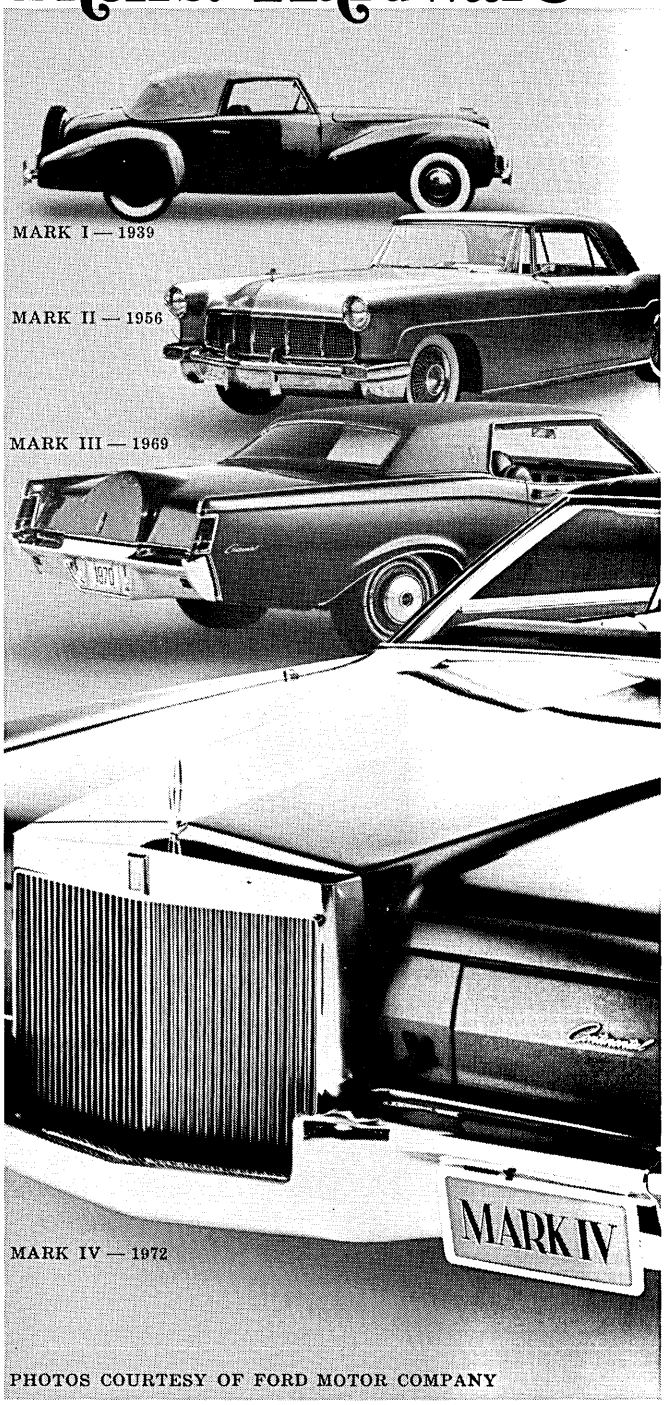


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CIRCLE 1 ON READER CARD

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CIRCLE 4 ON READER CARD

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- ☐ Model 300 for speeds up to 300 baud.
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- ☐ 80-, 118- or 120-column carriage width.
- ☐ Friction feed, pin feed or tractor feed.
- ☐ Horizontal tabulation.
- ☐ Vertical tabulation.

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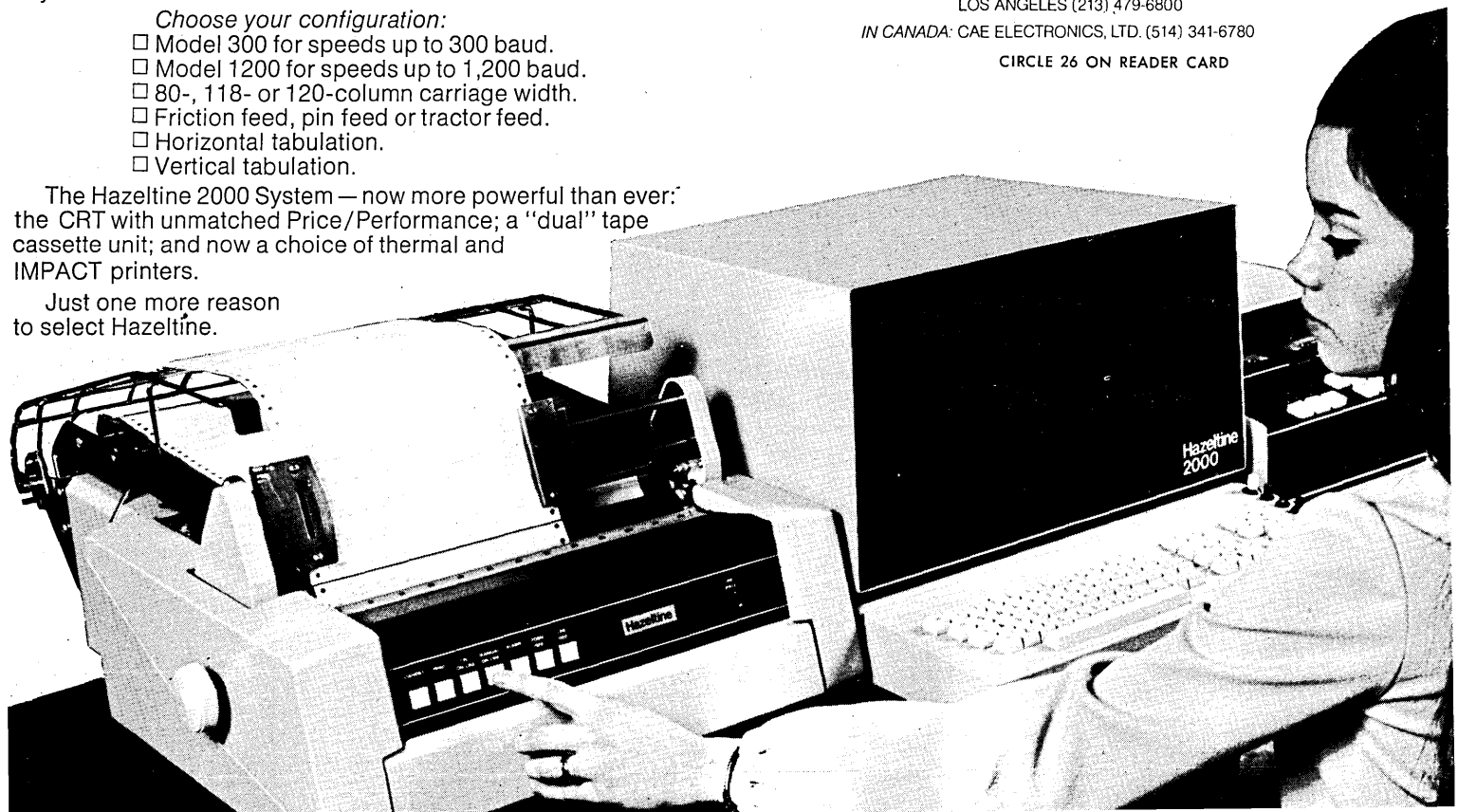
CIRCLE 26 ON READER CARD



DATAMATION®

MARCH, 1973
volume 19 number 3
This issue 139,100 copies

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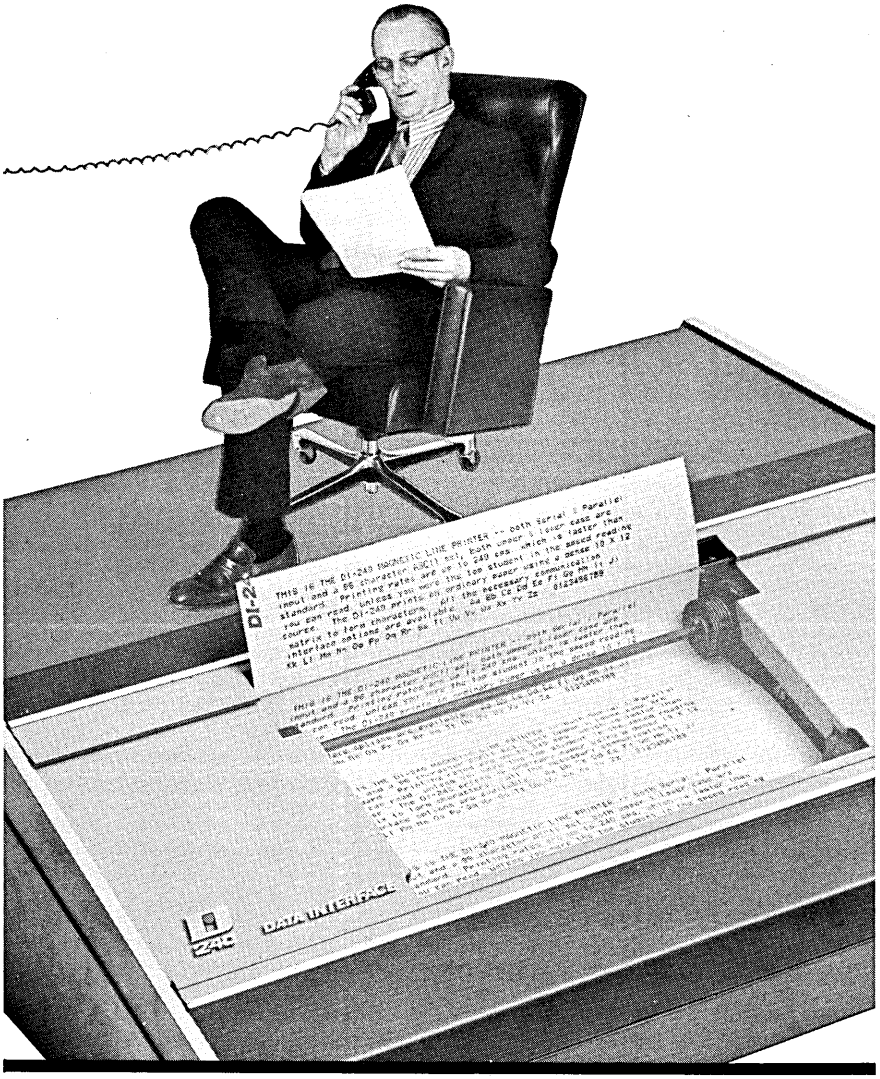
# The Data Interface 240 Magnetic Printer . . . . .




## prints out 3,300 characters before you can dial long distance.

It does it so quietly, it doesn't disrupt your phone conversation. The DI-240 Magnetic Printer prints data at rates up to 240 cps.—serial or parallel (serial input meets EIA Standard RS-232, parallel input compatible with TTL Logic).

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The DI-240 Magnetic Printer: remarkable, really.

For complete printer—individual cost—$4,100. *Write or call:*

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CIRCLE 83 ON READER CARD



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# Something to worry about...

**The Problem of the Marked Foreheads.**

A data-processing manager wanted to find out which of his three programmers, Mel, Bob and Joe, was the brightest.

He seated the three of them around a circular table so each could observe the other two.

The manager, explaining that he planned to paste a little sticker on the forehead of each, asked the three programmers to shut their eyes.

Then he told them that the stickers would be marked with either a circle or a circle with an X.

The challenges: if any of the programmers saw a circle with an X he should raise his hand, and that as soon as a programmer knew what kind of circle his forehead bore, he should fold his arms.

As soon as all eyes were closed, the data-processing manager proceeded to label each programmer's head with a circle with an X. Then he told them to open their eyes, whereupon each immediately raised a hand.

After a few moments, Mel folded his arms.

The manager asked Mel what kind of circle he had on his forehead.

Mel answered "a circle with an X."

By what reasoning did he make his deduction?

**Advertising Paragraph.**

While you're pondering Mel's response, here's something else to think about — a computer tape you don't have to think twice about using: Capitol/Audev 6400.

New Capitol/Audev 6400, as its number implies, has 6400 fci capacity — at least twice that of your present tape. Still, it performs at any system density: 556 bpi, 800 bpi, or 3200 fci; (and is ready for tomorrow).

It's also a quiet tape; providing improved read/write performance without oxide shed, and with virtually no head wear even at speeds up to and exceeding 200 ips.

What's more, each reel of Capitol/Audev 6400 is 100% certified and with the guarantee of no first pass permanent errors at the specified system density.

For full information about problem-free Capitol/Audev 6400, and for the answer to the problem of the Marked Forehead, write today to: Dept. 14, Audio Devices, Inc., 100 Research Drive, Glenbrook, Conn.

## to pass the time you won't spend worrying about Capitol/Audev computer tape.

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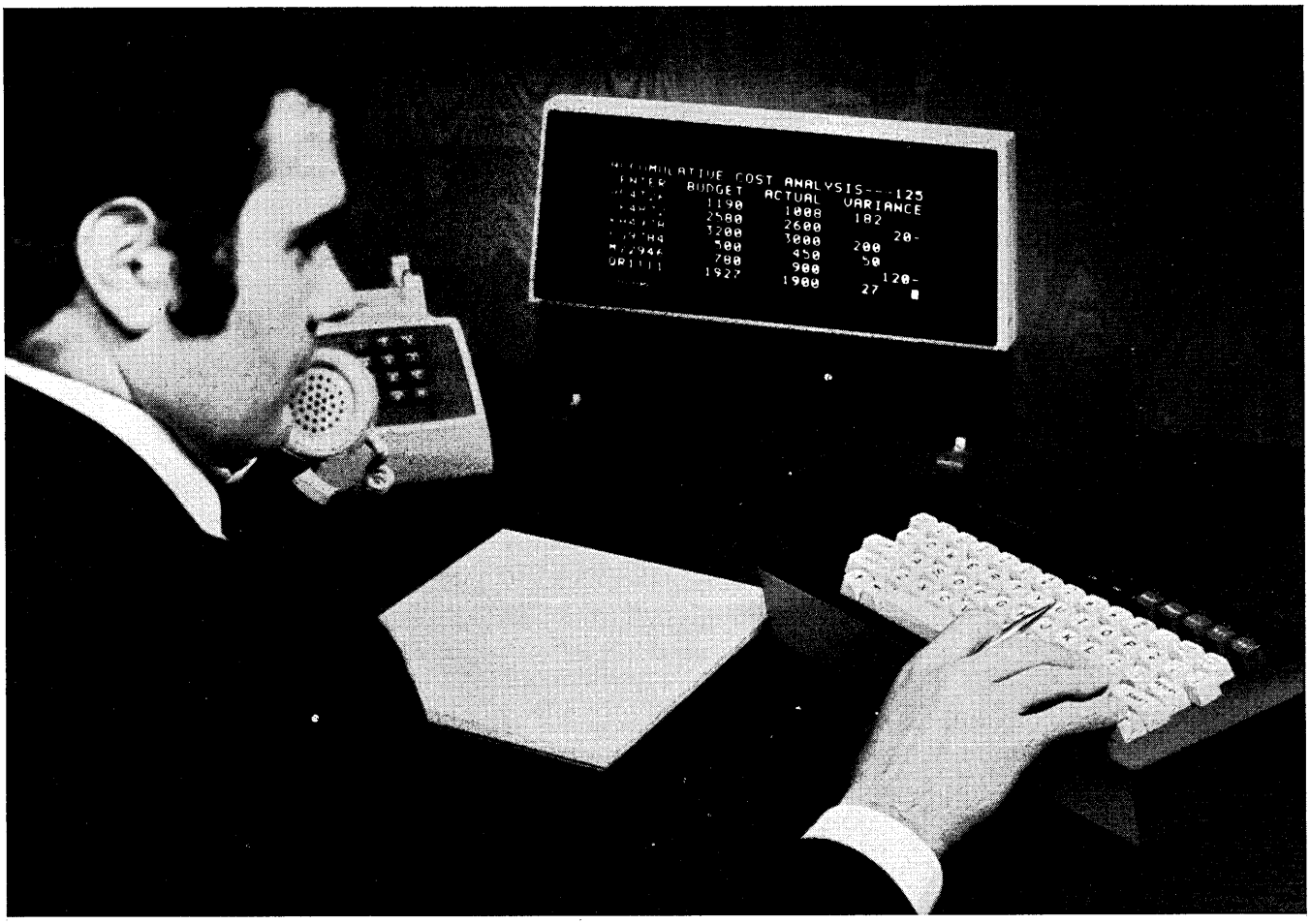



## with Burroughs TD 700 Input and Display System.

The new TD 700 is as easy on the eyes as it is on the budget.

It uses Burroughs SELF-SCAN® technology to display data in large, clear characters that are easy to read—even from a distance.

It's low in cost. TD 700 economy, compact size and modularity open up new areas of application in hospitals, financial institutions, hotels and motels, manufacturing plants, order entry departments, credit authorization departments, remote data entry departments, and even executive offices.

The TD 700 also introduces new flexibility in data input and display systems—

- Because it's compact and modular, it can be installed almost anywhere.
- A broad choice of optional features lets you "build" the input and display system that fits your particular requirements best.
- It can be mixed with other Burroughs terminal systems because it utilizes common data communication procedures. The TD 700 also offers data transmission speeds from 75 to 9600 bps.

For more details about this exciting new development in on-line data input and inquiry display, call your local Burroughs office today.

Burroughs

# Look Ahead

## IBM PREPAID THE PRICE

More on CDC's windfall in the out-of-court settlement with IBM: Documents filed with the Securities and Exchange Commission reveal that IBM prepaid $25 million of the $30 million it agreed to give the Minneapolis company in R&D contracts over five years. The annual interest could reach $2 million. CDC planned to do the R&D anyway, so its startup costs are minimal.

Closer examination of IBM's Service Bureau Corp. indicates its position was improving sharply at year's end and its annual profit rate was running considerably higher than the $3 million reported. Some of the gain is traced to a trimming of SBC's employment rolls, a trend that is expected to continue under CDC management.

IBM also paid an interest-bearing $26 million in "fringe benefits" for the 1,700 SBC staffers it released with the subsidiary's sale to CDC. It appears the computer colossus was anxious to settle the CDC antitrust suit and to render CDC's automated index and information retrieval system inoperable to the Justice Dept. in its suit against IBM.

## DISKETTE: THE CUSTOMER'S SOMETIMES RIGHT

In deciding to market its 3740 "diskette" data entry system in the U.S., IBM bent to the will of its 92 largest customers. A secret survey revealed that the majority preferred going towards magnetic recording media and away from punched cards. Results of the survey, published in IBM's "Sales and Systems Guide to the 3740/3540," indicated that another factor for announcing the system in the U.S. was the high degree of interest in data entry on the part of the trade press.

The 3740 impacts IBM's massive keypunch base, but it has announced a commission arrangement that encourages salesmen to lay off its 129 buffered keypunch.

Well-established key-to-disc manufacturers view the 3740 as IBM's endorsement of the concept of a clustered magnetic storage medium. And they see some fall-out sales for themselves as IBM salesmen attack the rest of the IBM keypunch base. Most important, though, the independents feel the 3740 just isn't up to snuff in price/performance, explaining that their orders in World Trade countries continued to increase in the wake of IBM's announcement of the equipment last fall (see Nov. '72, p. 152). They do admit to a brief four- or six-week hiatus in orders last fall while customers evaluated the 3740 in Europe.

One independent key-to-disc manufacturer is even calling the 3740 "IBM's key-flop system." IBM, though, has ways of erasing composure and smugness from independent manufacturers, and the key-to-disc makers aren't immune from Big Brother's actions. For instance, a simple price cut could make life miserable.

## NCC: WILL IBM COATTAILING HELP?

The National Computer Conference, at writing, boasted that 85% of its 690 booths had been sold out. The effects of the IBM return to the list of exhibitors had not yet been felt, as compatible competitors (Telex, Memorex, CalComp, and Itel) and incompatible competitors (Honeywell and Univac) were still nay-saying or fence-sitting.

CDC, NCR, Xerox, Ampex, Data Products, Cambridge Memories, and

# Look Ahead

Fabri-Tek have signed on for big space. Burroughs still seemed not to be convinced that NCC isn't just an oem show, as its only booth order was for the electronics and components divisions.

As in recent JCCs, it seems the biggest footage will be occupied by minicomputer and miniperipheral companies. Meanwhile, the Dept. of Commerce has been bombing users in Europe and the Far East with leaflets promoting the NCC and the wonders of devaluation.

## GROSCH SEEKS GHOST JOB

The staid if not austere American Federation of Information Processing Societies is looking for a new executive director, now that Dr. Bruce Gilchrist prepares to leave sometime around October, the end of his five-year contract. He'll undoubtedly stay on to oversee the successful completion of the first National Computer Conference in June. In the meantime, a select committee of professional society honchos is looking for a successor. First to throw a hat in the ring is the renowned unsinkable, (Dr.) H.R.J. Grosch. His chances appear less than outstanding: he's definitely not staid; and he's openly argued for the death of the metasociety he now hopes to head.

## RUSSIA: EVALUATING DEVALUATION

At press time, ICX, dp equipment marketing specialist in Eastern Europe, was on the verge of signing a "plus $1 million" contract with Russia covering purchase of three medium-scale U.S. computers, including a mini, terminals, disc and tape units, reports Dale Lewis, president of the Washington-headquartered firm. The equipment will come from five U.S. manufacturers.

The Soviets want to evaluate the gear's compatibility with their Riad EC-1030, 1040, and 1050. ICX hopes to begin shipping in May. Three follow-on contracts are likely; total value of all four is "over $4 million." The Soviets are "thinking about" similar evaluations of German and Japanese systems, apparently in preparation for mass buys. Lewis says the recent dollar devaluation saves the USSR $100 million on its recent grain purchase; he thinks they'll spend a big chunk on dp equipment, but fears we may lose out because of U.S. export control policies, which remain unchanged despite passage of liberalizing legislation last year.

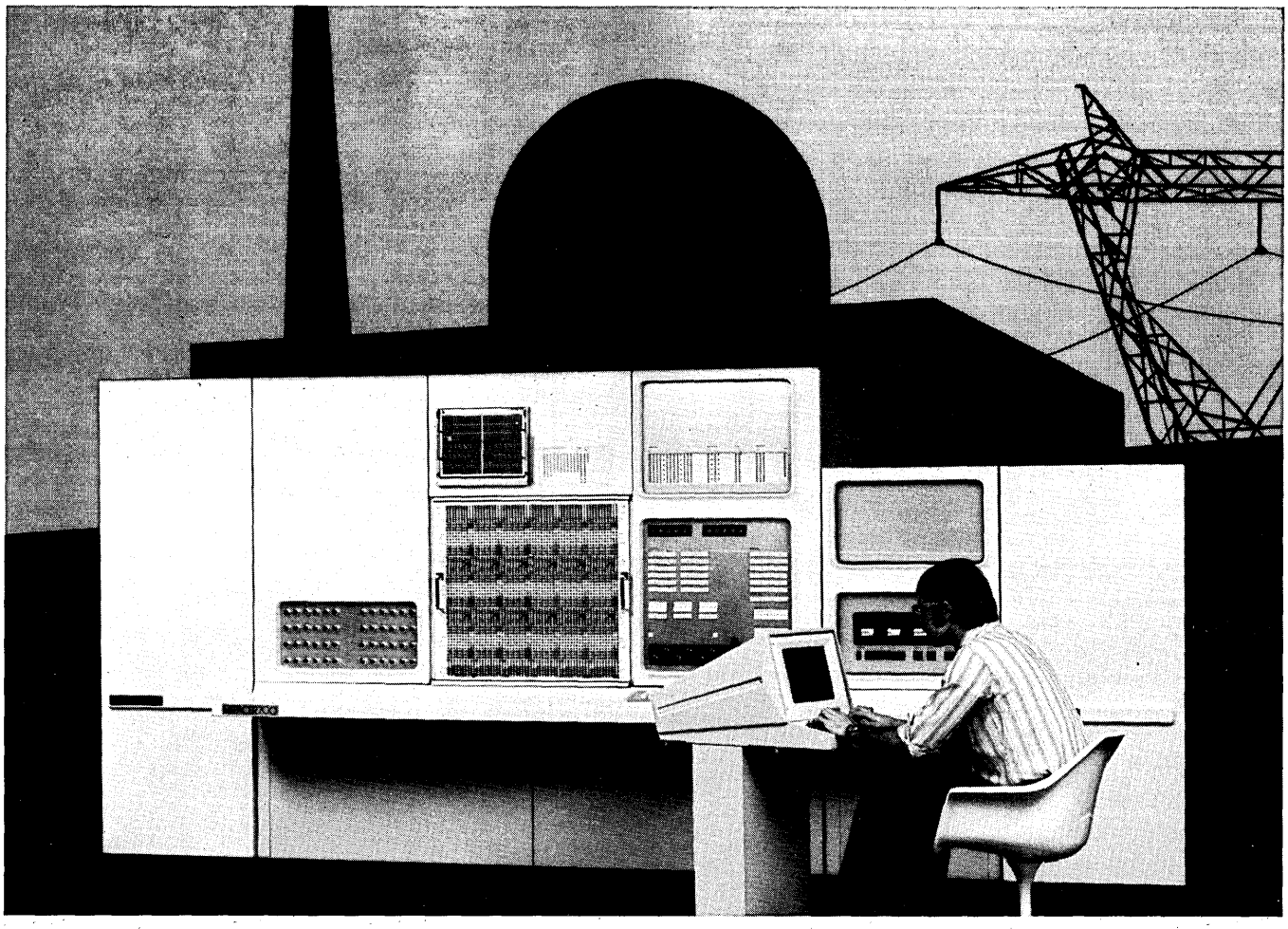
## CALIFORNIA'S SOFTWARE TAX PROBLEM: A COP OUT?

It's a "cop out," says Paul Rosenthal of California's latest piece of proposed legislation on that state's celebrated software tax issue. Rosenthal, of Adapso's software industry group, talks of AB 69, a short bill, just a half page long, that extends a law passed last June to free software from taxation in California for two years.

Excepted by the law, however, are "basic operational programs." To computer users, these are programs that come with computers and which always have been taxed along with the hardware. To the state, though, they could also include programs developed by users in-house, and these have never been taxed before. It's all up to the decision of the county tax collector, and he's confused enough, the opponents contend.

User representatives who pressed for a bill to clarify the issue are disappointed that AB 69 still fails to define the kinds of programs that are subject to county taxes. Some say it will be amended before a vote. Rosenthal claims the only recourse for users

(Continued on page 161)



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**The new PACER™ 700 just acts like one.** This new computer system can simulate a full-scale nuclear power plant or other large physical systems. In real time. Or faster than real time. For design, analysis and operator training. At a cost that is just a small fraction of any other form of simulation.

Because our PACER 700 series of systems combines new, fourth-generation, stored-program digital processing with high-speed parallel processing.

So it'll take on practically any group of multivariable processes you might think of putting together—on line or off.

And you can wind up with far more solutions for scientific and engineering design problems—per day and per dollar—than with any alternative computing system.

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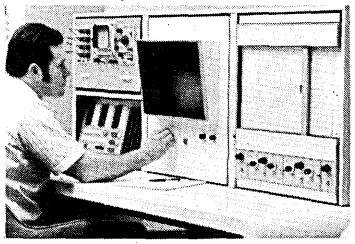
And we can help you get even more out of your system. With software that may be all but ready-made for your project. We have the most comprehensive and useful library available. And we've got thousands of applications in the file to prove it.



Our 700 system definitely doesn't look like a power plant, but it, like all PACER systems, is a computational powerhouse and well worth looking into. For details, call or write today.

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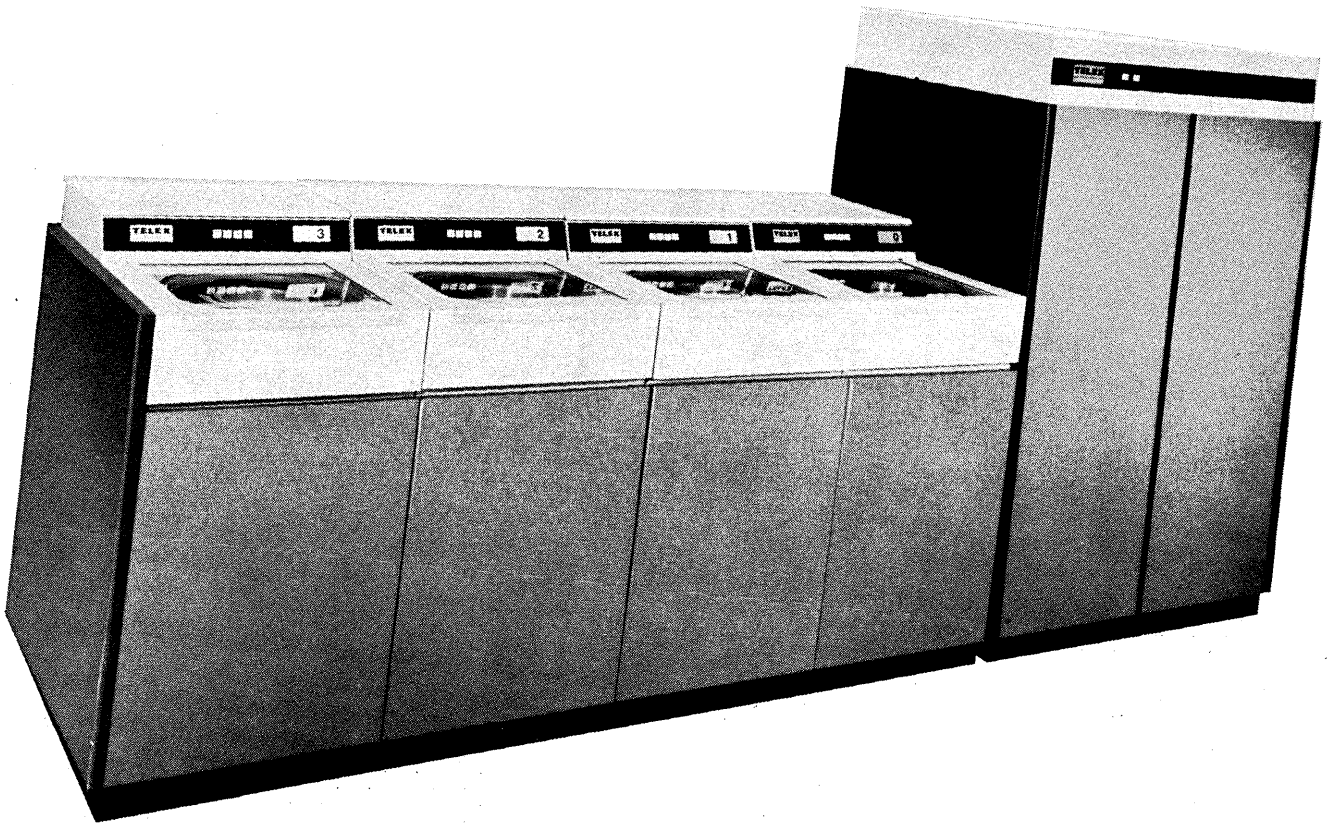

# The Preferred Peripheral Company offers both the leading edge of state-of-the-art technology and the cost savings of the leading independent.

Utilizing the most advanced data recording technology in the industry, the TELEX 6330 Disk Storage Subsystem offers outstanding through-put advantages via industry standard features of Rotational Position Sensing (RPS) and command retry. In addition, the TELEX 6330 subsystem has an advanced functional capability which frees the controller during the format write operation. This advanced capability, secondary disconnect, can yield greater through-put compared to a standard 3330 subsystem.

The 100 megabyte capacity of each TELEX drive is achieved by the use of 404 cylinders per pack with 19 tracks per cylinder and 13,030 bytes per track. The TELEX closed-loop servosystem and electromagnetic actuator use the latest technology solid state electronics. These technologies provide the user with average access times 10% faster than the 3330 (27ms vs. 30ms) and track-to-track access times 30% faster (7ms vs. 10ms).

The TELEX 6830 Storage Control Unit is functionally compatible with the block multiplexor channel of the System 370 and is also available for the System 360 Model 65 and above. This advanced control unit utilizes the latest technologies in MSI and LSI circuits to lengthen component life, minimize service time and insure increased availability. Self-contained microprogrammed diagnostics speed isolation of potential failures and allow for drive failure analysis concurrent with normal control unit operations.

All of these advantages are available at substantial cost savings and backed by the largest and most experienced field service network in the peripheral industry.

The TELEX 6330 Disk Storage System, delivered in October of 1972, is available for immediate delivery.

If you are looking for genuine economy combined with advanced technology, look to TELEX for System 370 and 360 peripherals. You will find that the TELEX product line comprises the broadest range of peripherals in the independent industry...Tape, Disk, Printer and Memory Subsystems. Get the complete story from your TELEX representative.

**PLUG IN A TELEX 6330 DISK STORAGE SUBSYSTEM.**

**SUMMARY: The TELEX 6330 Disk Storage Subsystem is functionally compatible with IBM System 370 or System 360 Model 65 and above. Capacity of 100 million bytes per drive, and up to 32 drives per controller provides users with a maximum of 3.2 billion bytes of storage per subsystem. Average access time is 10% faster, and track-to-track accessing is 30% faster than the 3330 system. Using standard 3336 disk packs (or equivalents), the TELEX system also features convenient waist-high loading plus low power consumption and low heat generation. All of these features are available at substantial savings.**

where the difference begins

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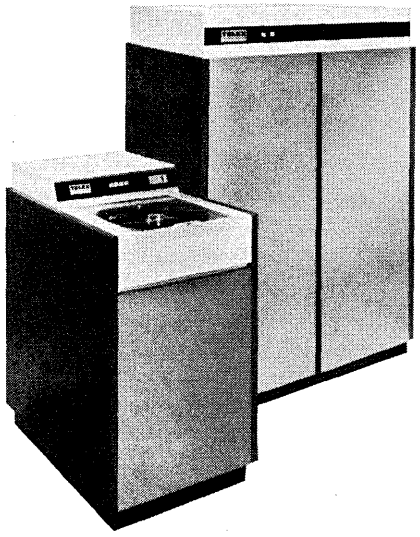

**Ask your TELEX representative about the TELEX total system lease plan.**

# The Concentration of Knowledge
# The Crystallization of Technology

As the concentration of the learning and culture of the world resulted in the encyclopedia, so the crystallization of modern technology has produced the computer—now indispensable to handle the enormous amount of information and data necessary in an enterprise in this modern world.

The wide range of FACOM computers, developed by Fujitsu's unique technology, includes easy-to-use models to meet the needs of any business enterprise, however large or small.

Such diversified fields as business processing, data communication and technical calculations can be handled by the most-popular FACOM 230 Series, which includes 8 models from the 230-10E to the ultra-large 230-75.

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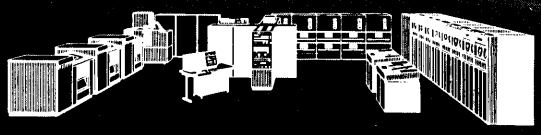
For educational purposes, there is the specially developed FACOM Mate. And, for mini computer users, the FACOM U-200 and FACOM R-E. There is also a wide range of peripheral equipment and full software for each member.

This completes the FACOM Family, fifteen members with unique characteristics—the crystallization of Fujitsu's technological and engineering capabilities.



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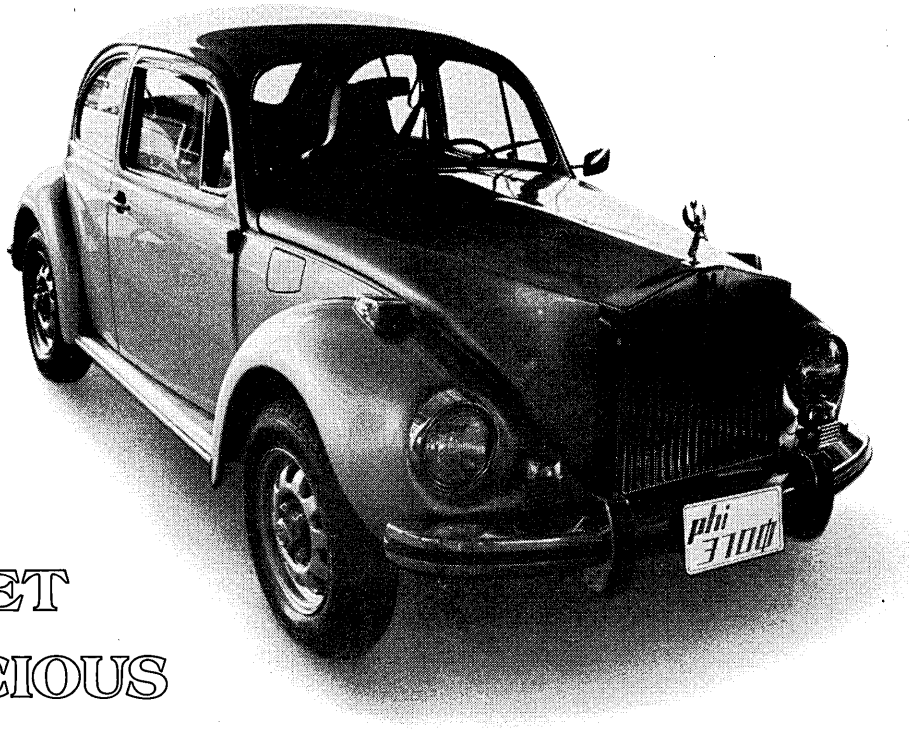


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# Calendar

## MARCH

**Meeting on the Optical Storage of Digital Data, March 19-21,** Aspen, Colo. Of interest to technical specialists in optical storage, industrial and government users of mass memories, and those who are interested in learning of present and future developments. The role of optical storage will be discussed. Fee: $40. Contact: Optical Society of America, 2100 Pennsylvania Ave., N.W., Washington, DC 20037.

**ACM SIGFIDET Seminar, March 29,** New York City. The Assn. for Computing Machinery's Special Interest Group on File Description and Translation will meet to discuss the distinction between information systems and data management systems. The sessions, of interest to management and computer professionals, are: "The Implications of Data Management Systems to Information Systems Design" and "Two Approaches to Data Management System Acquisition." Fee: $12, SIGFIDET members; $15, others. Contact: Bernard Plagman, Computer Planning Dept., Federal Reserve Bank of New York, 33 Liberty St., New York, NY 10045, 212/732-5700, X8318.

## APRIL

**International Business Forms Industries Annual Meeting, April 1-4,** Colorado Springs. For chief executives and line management in sales, finance, production, and personnel. In addition to management development, other topics to be discussed are Eliminating the Confusion about Small Computers, Planning and Metrication, and a preview of the forms industry's long-range forecast, "Perspective, Vol. III." Fee schedule: $175, attendee from member company; $125, additional attendees of member company; $225, others. Contact: Edwin Masten, IBFI, 1730 N. Lynn St., Arlington, VA 22209, 703/527-6000.

**Southwestern IEEE Conference and Exhibition (SWIEEECO), April 4-6,** Houston. Session topics include aerospace and electronic systems, automatic control, circuit theory, computers, design automation, digital communications, digital systems, industrial electronics, information theory, optimization, simlation, systems science and cybernetics, and technological effects on society. Registration: IEEE members, $10; others, $20; proceedings, $5. Contact: Dr. Hayati Balkanli, Lynes Inc., 7042 Long. Dr., Houston, TX 77017.

**National Microfilm Assn. 22nd Annual Conference and Exposition, April 10-13,** Detroit. The educational portion of the convention will cover micrographics from the fundamentals through sophisticated systems applications in three separate tracks, each designed for a different level of expertise. For registration information: NMA, 8728 Colesville Rd., Silver Spring, MD 20910.

**Prolamat '73, April 10-13,** Budapest, Hungary. Second International Conference on Programming Languages for Numerically Controlled Machine Tools, sponsored by IFIP and IFAC. Session topics, each followed by discussion, are: Interactive, Conversational, and Graphic Programming; Using NC Programs and Integrated CAD/CAM Systems; Implementing NC Programs; Surface Description Programs; Technological Programming and Production Control; CNC, DNC, and Post-Processing. Contact: Prolamat '73, Budapest 112, P.O. Box 63, Hungary.

**Assn. for Educational Data Systems Annual Convention, April 16-19,** New Orleans. Sessions will be directed either toward educators-teachers, counselors, principals, and administrators or toward technicians-programmers and system analysts. The sessions will be classified according to Administrative, Instruction, and Planning and Management. Accompanying exhibition. Fee schedule: $35, members; $45, others; add $5 after March 19. Contact: P. L. McCreary, Jr., Bossier Parish School Board, 2500 Viking Dr., Bossier City, LA 71010, 318/746-6890.

**ISA Joint Spring Conference, April 24-26,** St. Louis. Approximately 70 divisional and joint technical sessions of The Education Committee and the Analytical Instrumentation, Chemical and Petroleum Industries, and Process Measurement and Control Divisions of the Instrument Society of America. Vendor exhibits on Tuesday and Wednesday. Registration: $30, members; $35, others. Contact: William P. Lynes, c/o Durkin Equipment, 2384 Centerline Ind. Dr., St. Louis, MO 63122.

**ASIS Mid-Year Regional Conference, April 26-27,** Minneapolis. Held in conjunction with the Fourth Symposium of the Minnesota Chapters of the American Society for Information Science and the Special Libraries Assn. The ASIS-LSA symposium will focus on group discussions on the theme of "Forecast for Information Service: a colloquium surveying the state-of-the-art, research, and educational implications for library/information systems specialists." The ASIS Regional Conference part of the program will consist of short contributed papers to be presented in "rap sessions." Fee: $45. Contact: Jack King, Library, Hamline Univ., St. Paul, MN 55101, 612/641-2373.

**CSMA Data Communications Seminars, April 27** (Chicago), **July 20** (New York City), **Oct. 18** (Washington, D.C.), **Nov. 16** (Los Angeles). Each seminar will be broken down into two workshops: Basic Data Communications Design Concepts, and Advanced Data Communications System Design. The basic course will include an introduction, facilities, communications codes, basic data transmission, system component selection—modems and terminals, basic data systems analysis, and applications considerations—followed by discussion. The advanced course covers digital transmission systems, wideband services, multiplexors, concentrators and switchers, data concentrators and multiplexors systems applications workshops—systems analysis concepts and applications considerations, followed by discussion. Fee, including materials and luncheon: $65, members; $75, others. Contact: Communications Systems Management Assn., Suite 1003, 1102 West St., Wilmington, DE 19801, 302/658-4117.

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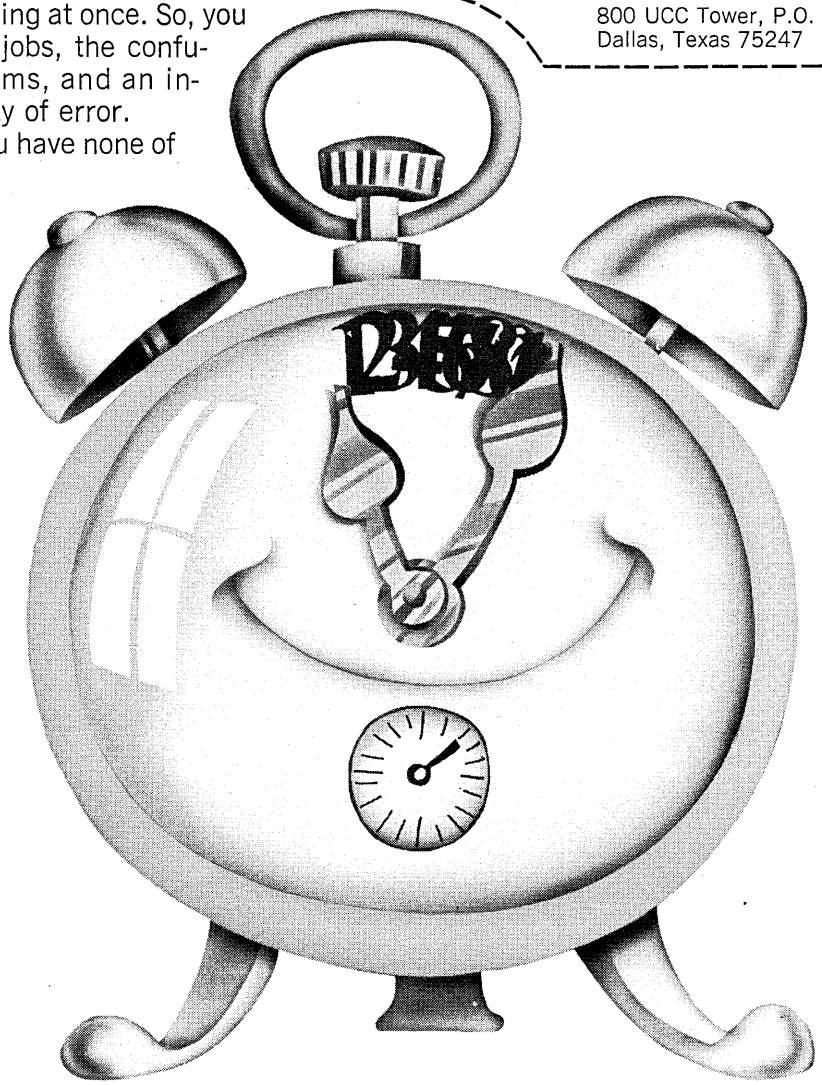

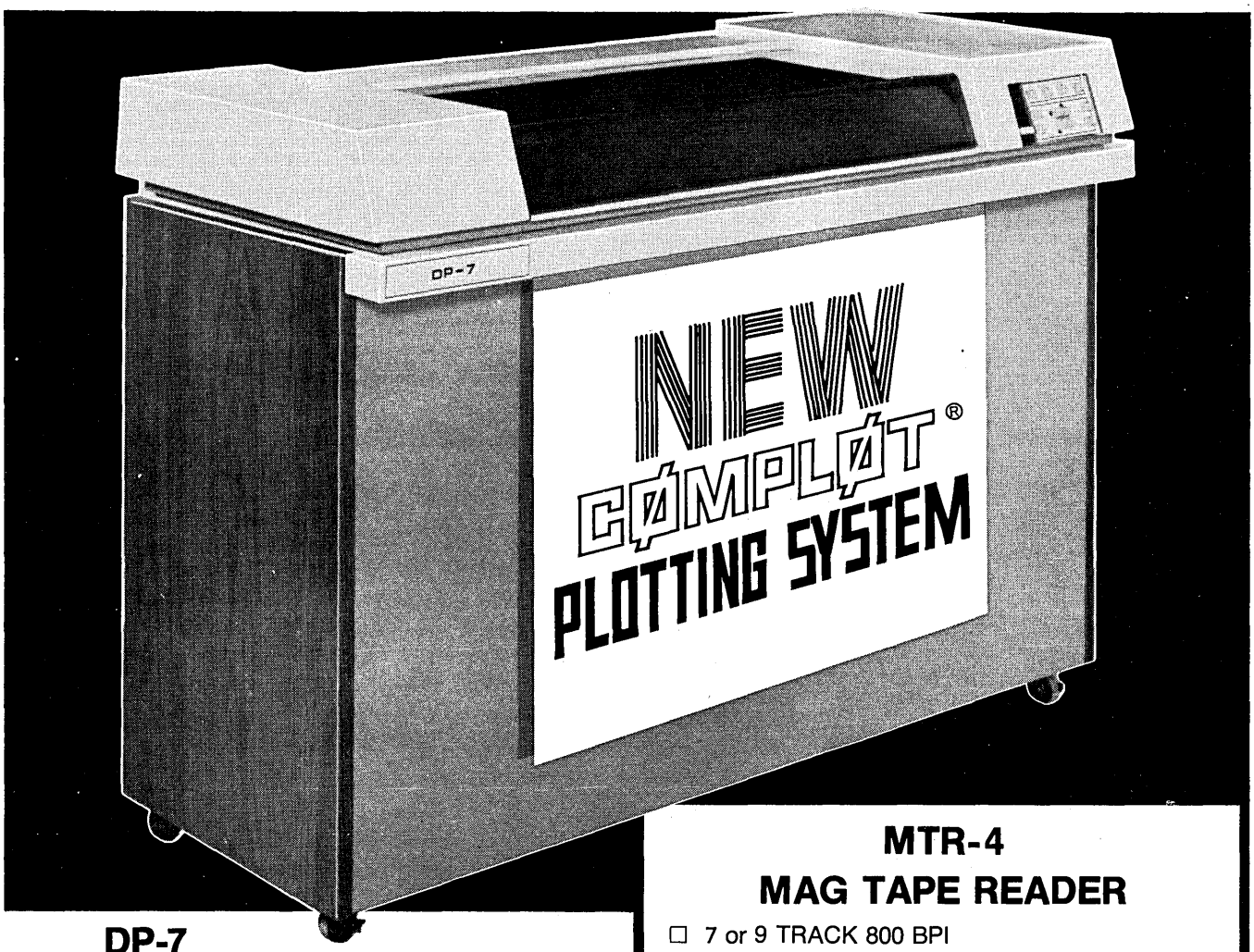


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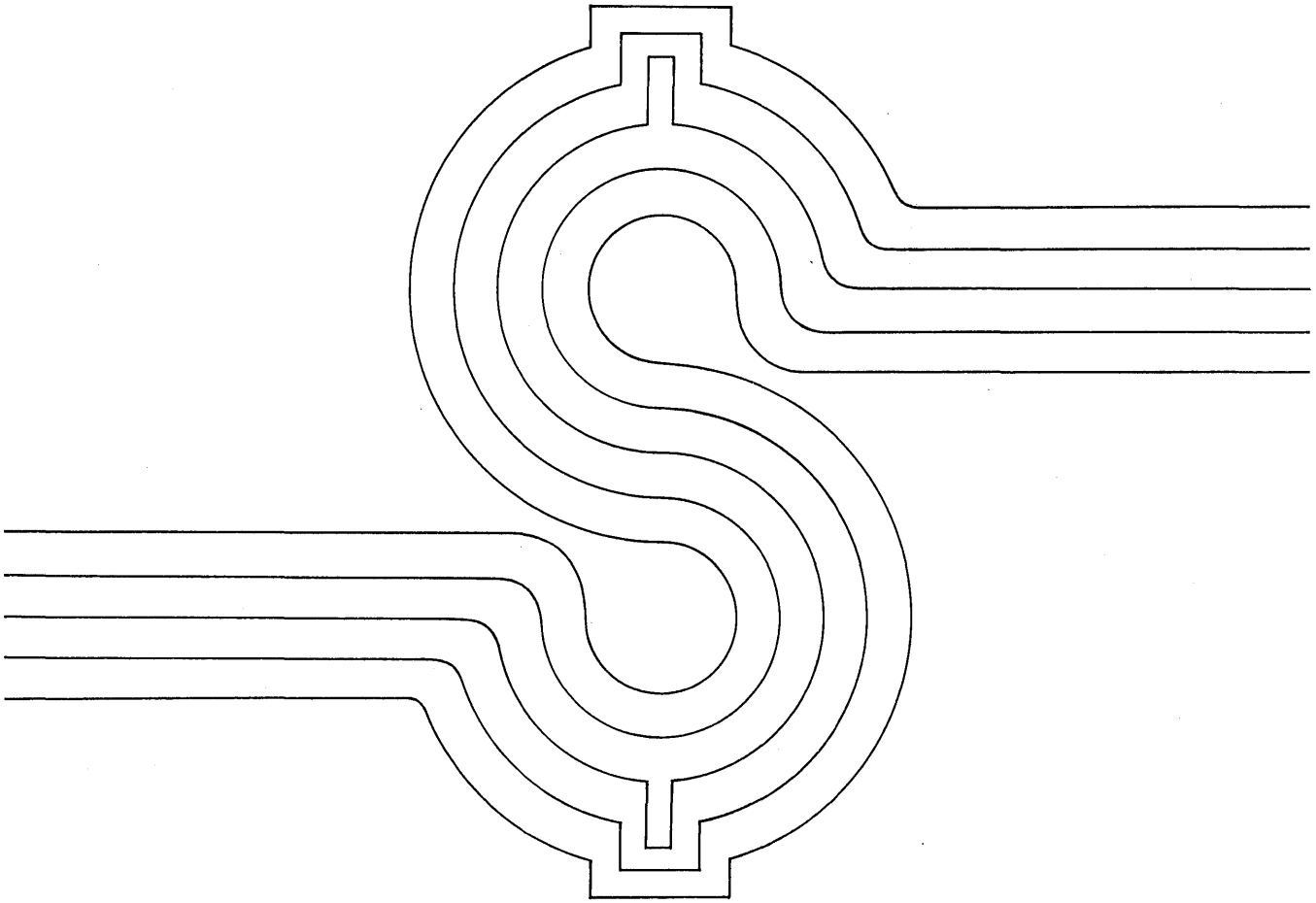

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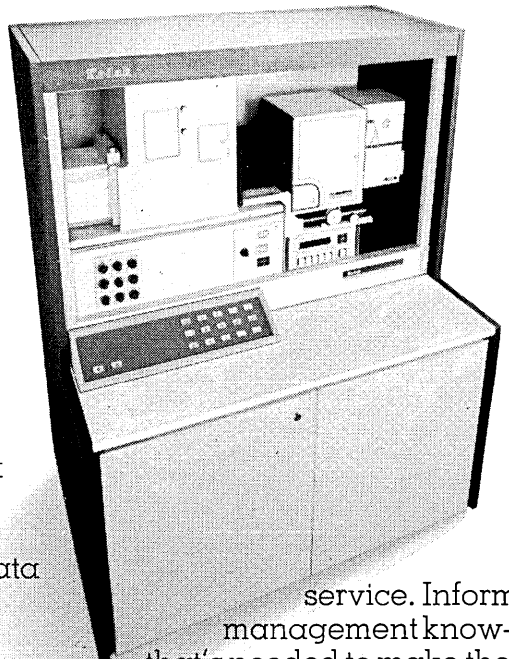

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# Letters

### Pure propaganda

The article, "Data Communications: Putting It All Together," by Richard L. Deal and P. C. Wood (Dec., p. 72), recalled to mind a line from Parkinson's Law: "Only a little thought is needed to convince us that the perfect advertisement would attract only one reply." After three articles Mr. Deal and Mr. Wood finally conclude that data communications is too complex for mere mortals, and a consultant should be contacted.

While that point may not be so wrong, the list of attributes which the consultant should have sound curiously autobiographical of the authors. Some marketing is tolerable (and expected) in articles written by people in private business, but this article is pure propaganda. While there were many interesting notes contained in the three articles on data communications, I would personally have preferred articles covering specific technical points in detail. It seems wasteful to have waded through the previous two articles to reach the conclusion in the third article that the rest didn't really matter anyhow.

FRED L. FORMAN
*Arlington, Virginia*

### The new do

We have just noted with interest, and a certain amount of horror, Fred Thorlin's "What's New With DO?" (Dec., p. 142) and are left wondering when ANSI will standardize the brontosaurus. Will it be warm-blooded? There are, we feel, several reasons for the X3J3 work on the DO statement being useless and wasteful:

1. FORTRAN is now 16 years old and has evolved to a point where FORTRAN IV has standards that have for several years been widely accepted and approved. Any attempt now to extend the language as FORTRAN IV will serve only to jeopardize the stability of the current FORTRAN IV; if FORTRAN is to be extended, it should be only as a new language—FORTRAN V, for example.

2. The work of ANSI to this point has been very commendable in that standards now exist for many varied items used throughout the industry. We feel, however, that it is not ANSI's place to create new items to standardize—it should only attempt standardization of existing items.

3. The apparent philosophy of Thorlin and X3J3 is that FORTRAN is a good programming medium, if only it hadn't all these little nuisances in it—the "obvious" solution being to continue shoring up the standard until the language is "nice" to use. This philosophy seems to ignore totally that 12 years of experience with structured programming since the ALGOL 60 report was published. The world has a lot to learn from the structured programming school of Dijkstra, Floyd, Burstall, et al; these people have been saying for years far more than what ANSI is now trying to force onto FORTRAN.

In conclusion: ANSI has done and can do excellent work, but rewriting the FORTRAN standard at this time is not only silly but a futile pastime, in view of the alternatives.

MICHAEL R. COLLINS
D. HUGH REDELMEIR
*University of Waterloo*
*Waterloo, Ontario*

### Thanks anyway

While we appreciate mention of our new 4400 KeyScan data entry system in Look Ahead in the December issue (p. 7), the information given was incorrect.

I don't know where the "up to 12 keystations" came from, as nothing we have released at any time specifies such a limitation. The system can have up to 32 keystations. Any one of them can serve as either a system control console, a supervisory key/disc station, or as a key/disc production station.

Another item mentioned which we find objectionable is the implied limitation of the system to banks and retailers. In addition to those, we have 1973 deliveries scheduled to credit card systems; many different types of manufacturers; municipal, county, and state governments; publishers; insurance companies; utilities; security dealers; and distributors.

JOHN R. BELOW
*Cummins-Chicago Corp.*
*Chicago, Illinois*

### Mess call

I am, as a politician once said, 1000% in agreement with Mr. Butterworth's letter in the February issue (p. 23). The "cosmetic" impression that my short article (Nov., p. 82) gave is corrected, I believe, in our soon-to-appear book, *Structured Programming Using PL/C*. But then, he guessed that.

The article was assuming something which it probably shouldn't have assumed—that other people follow the practices we teach, so that programs are not a mess to begin with. Under these circumstances, a little "cosmetic" work at the end pays big dividends, for it is the professional way to do things —just as it is for an author, a surgeon, a cabinet-maker, or any other professional craftsman.

One of the most difficult things to teach people who have been badly trained as programmers or managers is how to recognize when a program should be thrown out. We might apply Mr. Butterworth's lovely maxim, "you can't document a mess," to the problem by observing further, "if it's not documentable, throw it out."

Also, of course, the process after debug is not strictly beautification. We are working more now on the basis of various "refinement" stages planned into the programming process, so the programmer doesn't think he is finished when he has found the "last bug."

But "refinement" easily turns into nit-picking, which may even introduce additional bugs—bugs which we call in the book "nit-picker's nits."

I think Mr. Butterworth's letter contributes something important to the article.

G. M. WEINBERG
*Binghamton, New York*

### The better half

In "NRMA 14th Annual Information Systems Conference" (Dec., p. 81), specific mention was made in the leading paragraph to which we take exception. Namely, the "genie" responsible for the economic saving of some $123,000 for Sam Solomon Co. was a system of Pitney Bowes-Alpex terminals and a System/3 computer. This statement bypassed what we feel was the most important side of the case history presented at the conference. The fact that Abacus Corp. developed and installed a highly sophisticated software systems package making possible a total merchandise system and a full line of merchandise reports as follows:

1. 30-Day Activity Report with Model Stock Order and Transfer recommendations built in based on the status of item.

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4. Open order report by department or vendor.

5. Monthly/Seasonal/Annual Item performance by status report.

6. Exception reports to include Best Seller report by Classification.

In addition to the above merchandise system, a full accounting system was integrated into the total package. One of the "firsts" noted in the presentation was the entrance of payroll and receiving information through the PBA terminals. All this has been accomplished at Sam Solomon's and had been running for over 90 days when announced.

The system is running on a 32K

# letters

computer, thereby minimizing equipment cost as well as reducing the number of support personnel. Abacus Corp. had the responsibility of equipment selection and evaluation for the client, and we agree with Mr. Schwartz's comments that the software requirements are on a par basis with hardware. This is particularly true when doing a big job on a small system.

VINCENT A. WATERMAN
*President*
*Abacus Corp.*
*Somerset, New Jersey*

### Cassette standards

The Forum in the January issue (p. 147) concerns Standard ECMA-34 for 3.81mm (commonly called eighth-inch) magnetic tape cassette phase encoded at 32 bpmm (approximately 800 bpi). I was astonished to read a contribution of such poor level in your publication. It is just a collection of affirmations supported by no figure.

It is not my job to present a defense for N.V. Philips—they manage quite well even without me—but to pretend that they "dictated" a standard to ECMA, "which accepted in good faith," is a preposterous claim. The draft was developed during two years of hard work during which intense exchange of working documents with the corresponding ANSI committee allowed taking care of many comments and objections. It was duly discussed and voted upon at the General Assembly of ECMA. Since the issue of ECMA-34 in September 1971, further work and practical experience have led to the preparation of a first revision, which will be issued this year. Also in ISO (International Organization for Standardization) a corresponding draft international standard will be processed with the support of both ANSI and ECMA. To maintain that ANSI "fell in with this bad solution . . . against their own best judgment" because they are "sensitive to the possibility of being accused of being noncooperative" is the height of absurdity for anyone having ever dealt with an ANSI committee, and on the top of it, not very kind to the members of the group nor to their professional ability.

But Ms. Berezin knows obviously all the answers, as she lets everybody know that what is needed is high reliability at very (sic) low cost. Really?

D. HEKIMI
*Secretary General*
*European Computer Manufacturers Association*
*Geneva, Switzerland*

### Friendly competition

It is hard to decide whether to respond to your bright-eyed pessimism or to your morbid hilarity (Jan. Editor's Readout, p. 41).

Perhaps I detected what must be the first kind word ever published about Cal Elliott. If that was the intention, good.

I don't know if ACM and IEEE will merge into ACME (Association to Comfort Misunderstood Engineers?). I'm certain they (it) will not continue to ignore DPMA considering the joint effort to establish the Computer Foundation.

My hope is that DPMA and ACM become more competitive, but not less friendly, competing to prove each does more for its members and the profession than the other. That may put heads on some of the flock, maybe even falcons' heads.

JOHN K. SWEARINGEN
*Las Vegas, Nevada*

Mr. Swearingen is a past president of DPMA and cochairman of a committee to establish the Computer Foundation.

### Common goals

Perhaps had you spent a little less time with Howard Cosell and staring out your window at the snow on the mountains (Do you really live in an ivory tower?) and got around to some of COMMON's meetings, you would not accuse all user groups of never growing up. Your allegations smack of the same trite sensationalism we have come to expect from some of the pulp weeklies.

I don't recall too much coverage about user groups in your otherwise fine publication. To slur groups of hard-working dedicated people as you have in your "Editor's Readout" (Jan., p. 41) shows you see only what you want to see when you examine a user group.

I hereby invite you to examine COMMON (hopefully in an objective manner) and decide for yourself if user groups are the sophomoric sillies you claim. If you find they are not, you could always claim your editorial started them back on the straight and narrow. Maybe you won't learn any new "tech weenie" buzz words or secret passwords, but you will get to observe concerned individuals sharing information and helping one another.

JAMES C. DECK
*Executive Vice President*
*COMMON*
*East Chicago, Indiana*

The allegation was a bit broad. More specifically, we feel that users put more into their associations than they get out and that the manufacturer gets more out than he puts in. Particularly, the reluctance of user groups to let outsiders know what it is they are

*(Continued on page 158)*


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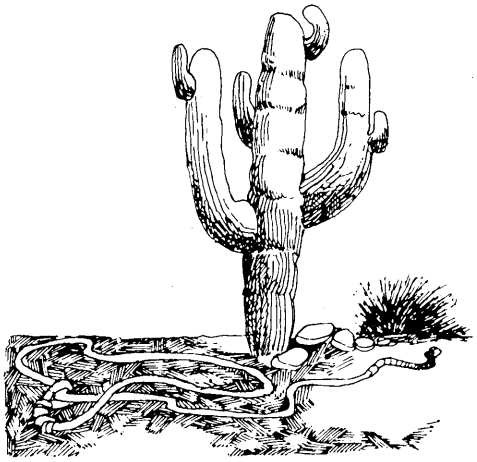

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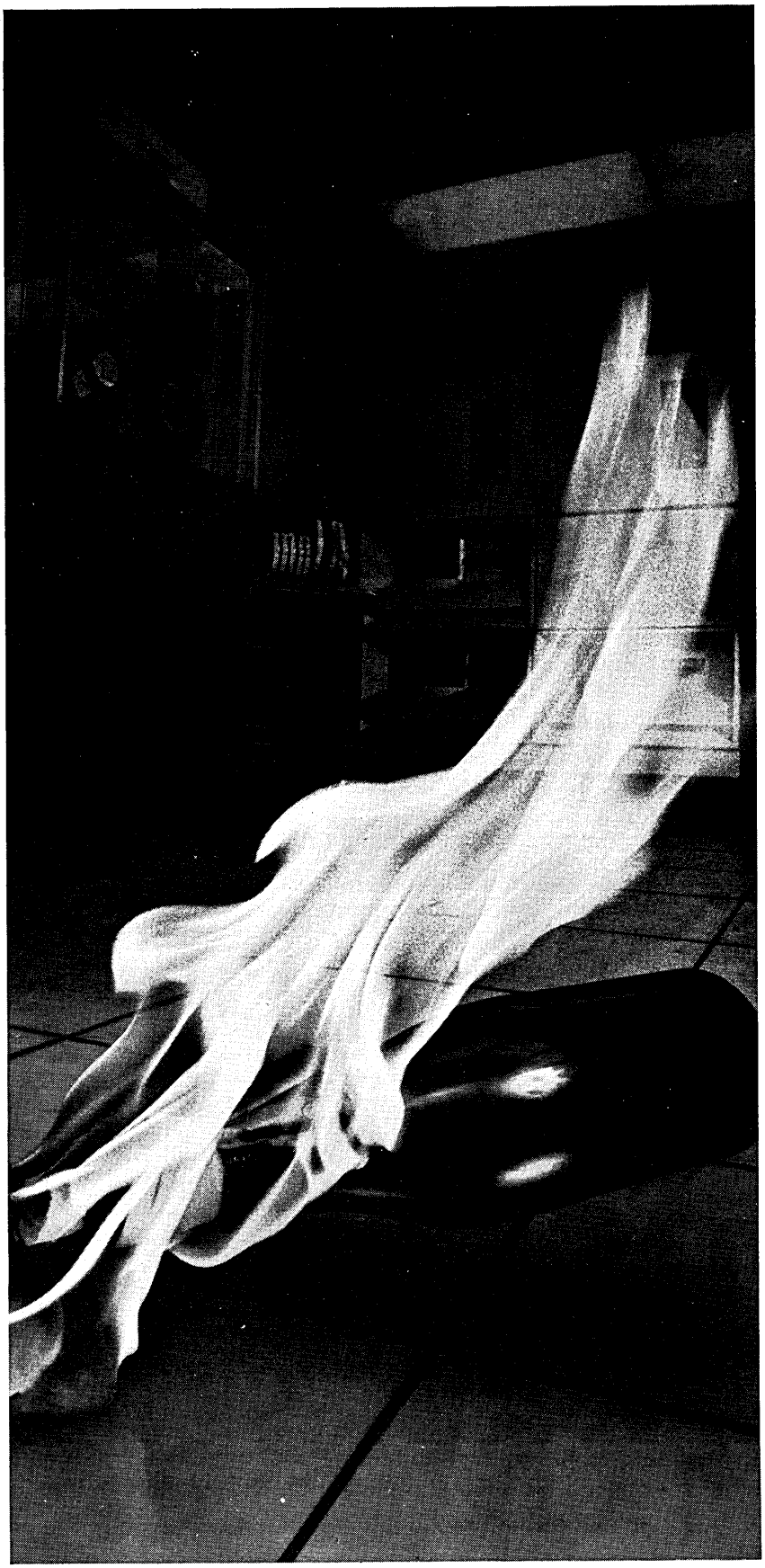

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## with a minicomputer controller that fits on this page!

If you've got to cram more memory into your mini system, the DD-14 lets you add discs at a price your customers can afford and with reliability they demand. DIVA has made such disc add-ons practical.

The DD-14 is an IBM 2314 type single spindle drive. Transfer rate is 312,000 bytes/sec. and capacity is 29 million bytes. Total system price is $12,800! At this price/performance, why even consider a limited 10 million byte 2310/5440 type system for your customers?

### TOTAL SYSTEM FEATURES

**Controller:**

It's small enough to fit inside any mini! Reliability of this controller? 38,000 hours MTBF.

**Software:**

DOS compatible I/O drivers for almost any mainframe are available as an option.

**Dual Word Buffers:**

You can transfer one word at a time or two at a time. This gives you up to 8 microseconds latency in the CPU for Direct Memory Access. You can use today's high performance discs with older minis. Impossible without the DIVA controller!

29 million bytes not enough? Then add another drive at $7,600. It gives you 58 million bytes. The total price is $20,400. We call it the DD-14/p.

If you need up to 4 drives per controller, these can be easily added in the field. DIVA's Overlap Seek feature means that you can increase throughput by accessing multiple drives simultaneously.

Where do you get the most bytes for your buck? You can buy this 2314 type system from DIVA. You can pay twice as much for the same system from Data General. You can pay three times as much for the same system from DEC. The same system!

Do your customers need still larger drives? DIVA delivers, and supports, IBM type drives as well. They are priced just as competitively as the DD-14 we've been talking about, and they're IBM media compatible, too! This means that for the first time your customers can freely interchange disc packs between their DIVA systems and IBM 360 systems.

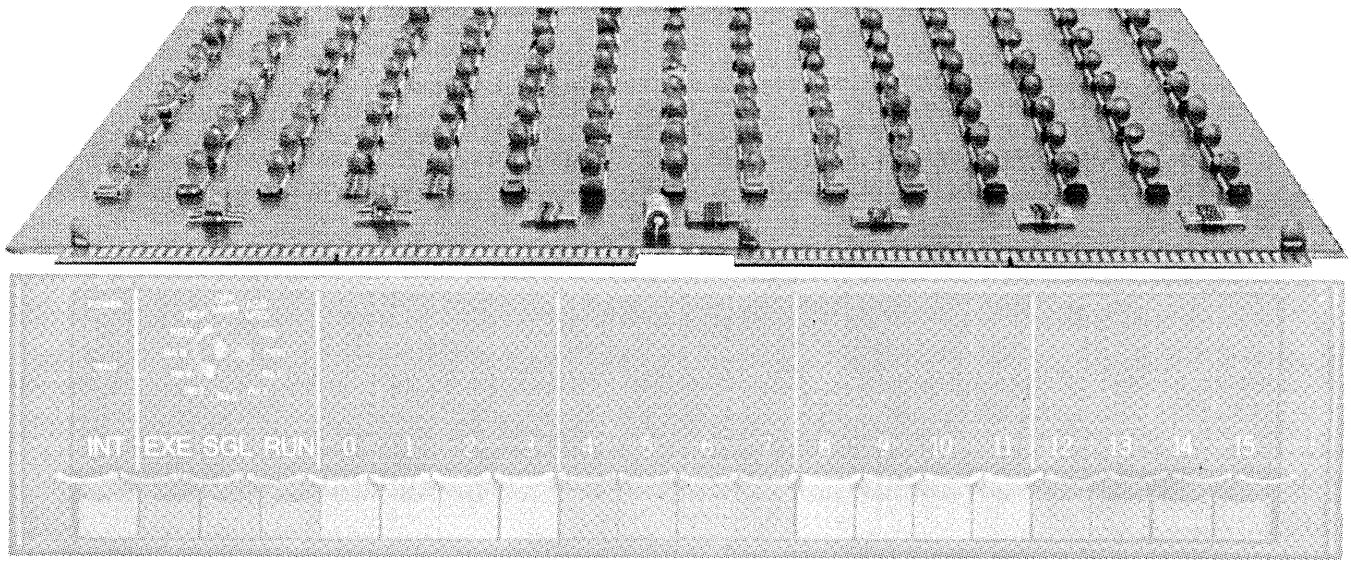
Let's look at track records. DIVA has delivered more large disc controllers for more minis than any other manufacturer. DIVA disc systems are used for credit checking and medical data processing and text editing and batch processing and graphic design and point of sale terminals and . . . we're just getting started!

*European sales, service, and maintenance by Technitron.*

DIVA

*industry's source for disc systems*

**DIVA, Inc.** 607 Industrial Way West,
Eatontown, N. J. 07724
(201) 544-9000



# DATA GENERAL ANNOUNCES FORTRAN 5.

**PIGS LOOK SLOW.**

Strictly as a compiler, our Fortran 5 is probably the slowest on the market. Several times slower than our own Fortran IV.

But appearances are deceiving.

At run time—when speed means something—our Fortran 5 turns out to be a superfast, big computer Fortran.

Fortran 5 compiles slow and runs fast because its incredibly thorough, multi-pass compiler optimizes "globally"; that is, it examines each program statement, not only internally, but also in terms of every other statement in the program.

The result is amazingly efficient, fast-executing code.

**PIGS ARE THE SMARTEST ANIMALS IN THE BARNYARD.**

Our Fortran 5 is a compatible superset of almost every other Fortran—IBM level H, ANSI Fortran IV, Univac Fortran V. It includes all their features, plus some.

It's a multi-tasking compiler, so a program can pursue several related but asynchronous tasks simultaneously.

It has an exhaustive set of incredibly precise diagnostics that tell exactly what's wrong and where, in English.

Finally, when it's time to run an application program, Fortran 5 is smart about tailoring a run-time package to include only essentials. That means a program written on a 64K brute might run in only 8K.

**PIGS TURN GARBAGE INTO PROFIT.**

Our Fortran 5 isn't fussy. With all its features, global optimization, and diagnostics, it can turn anybody's Fortran programs into object code as efficient as machine language.

The resulting programs execute fast enough even for real-time applications like process control or nuclear research.

So even inexperienced programmers can write software in Fortran that previously could be written only in machine language, by the most sophisticated programmers

**PIGS ARE BIG AND HAIRY.**

When you get Fortran 5, you get a great big minicomputer. It'll have at least 28K 16-bit words of main memory (up to 128K with our Memory Management and Protection unit); Real-time Disc Operating System; our fast new Floating Point Processor; mass storage; and high speed I/O devices.

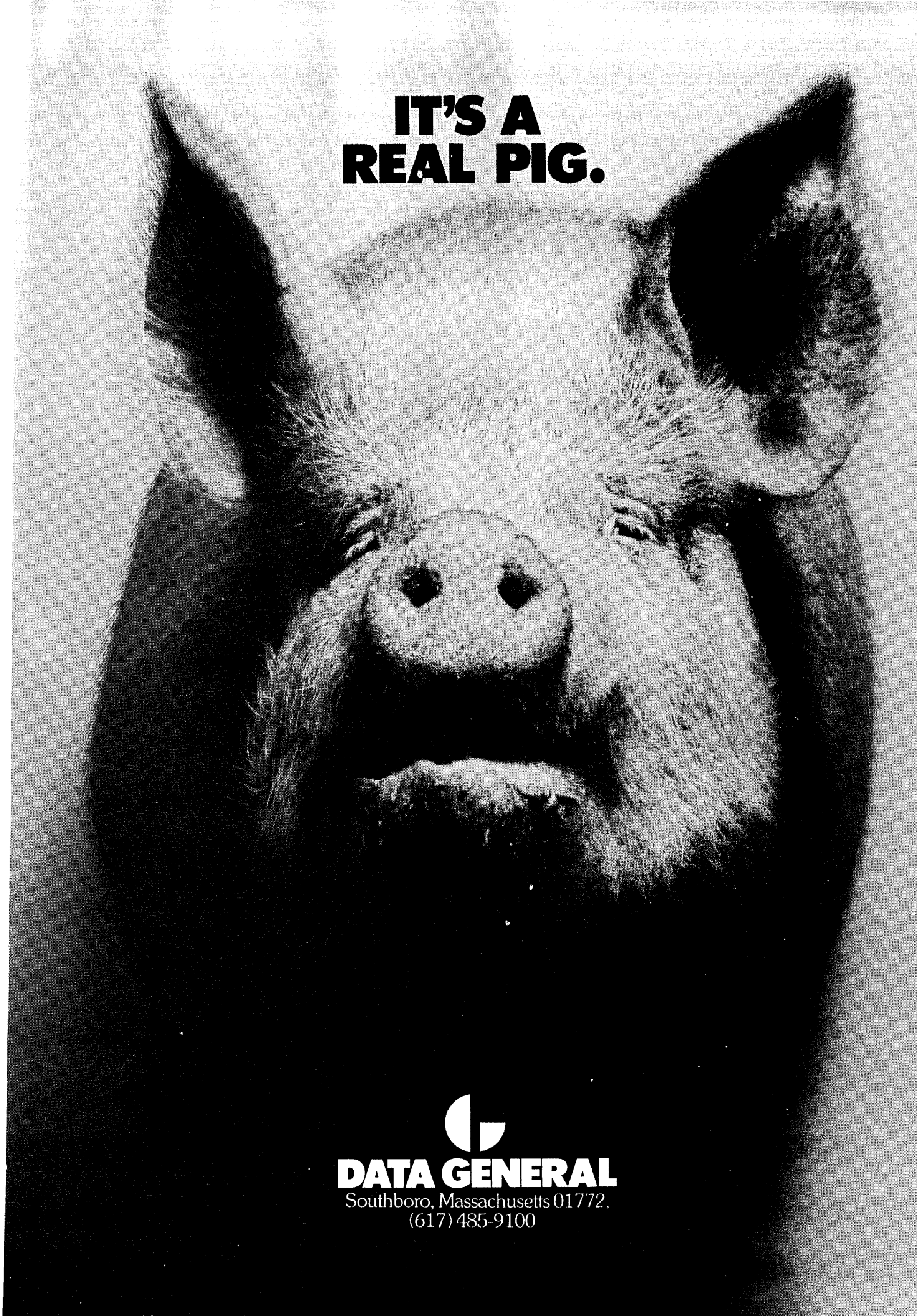
With all the right hardware, the software is available free.

**PIGS ARE PIGGY.**

We had two objectives for Fortran 5: first, make it so comprehensive that every Fortran user would want to try it; second, make it fast enough for applications previously limited to machine language programming.

That way, we figured we could hog all your business.

For more information on Fortran 5, write or call any Data General sales office.

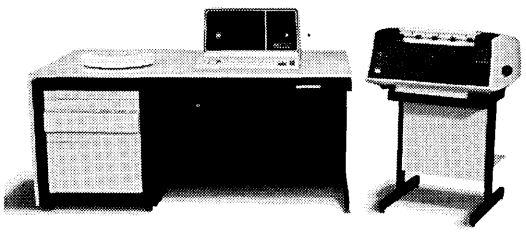

IT'S A
REAL PIG.
DATA GENERAL
Southboro, Massachusetts 01772.
(617) 485-9100

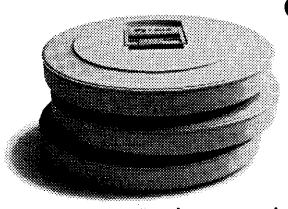
# You design software for end users. We have the systems they need.

Why stop at selling or leasing software systems to end users? Now you can offer them complete minicomputer package systems.

This way they'll be able to get everything they need from you. And you'll be able to get everything you need from us.

**Wider choice of peripherals** We offer a full line of peripherals to go with our SUE and MAC minicomputers: IBM compatible 5440 disks, CRT/keyboards, printers from 100 cps to 600 lpm, magnetic tapes, cassettes, punched card devices and paper tapes. Anything your customer needs. And when his needs change, so can the system. Easily. Even by factors of 2 or 3.





**Complete software tools** To make your programming burden lighter we offer a full set of software tools: Fortran, assemblers, utilities, RTOS, sort/merge, DOS and RPG/SUE. That last item is 98% compatible with RPG II by the way.

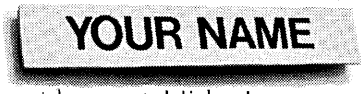
And we're the only company we know of that unconditionally warrants all our software for a full year.

**Maintenance too** We'll handle any and all problems your customers might have, promptly and expertly, anywhere. (We recently solved a problem in Bangkok, for instance.) And we'll do it by contract or on call, either way you want it.

We also offer training classes in maintenance as well as in programming.

**Add it up** So what you'll have is a more salable package to offer an end user. Everything he'll ever want or need in a minicomputer system, right down to the enclosures. (Which we'll put your name on, if you wish.)

Everything ready and working from the minute it's wheeled in his door.



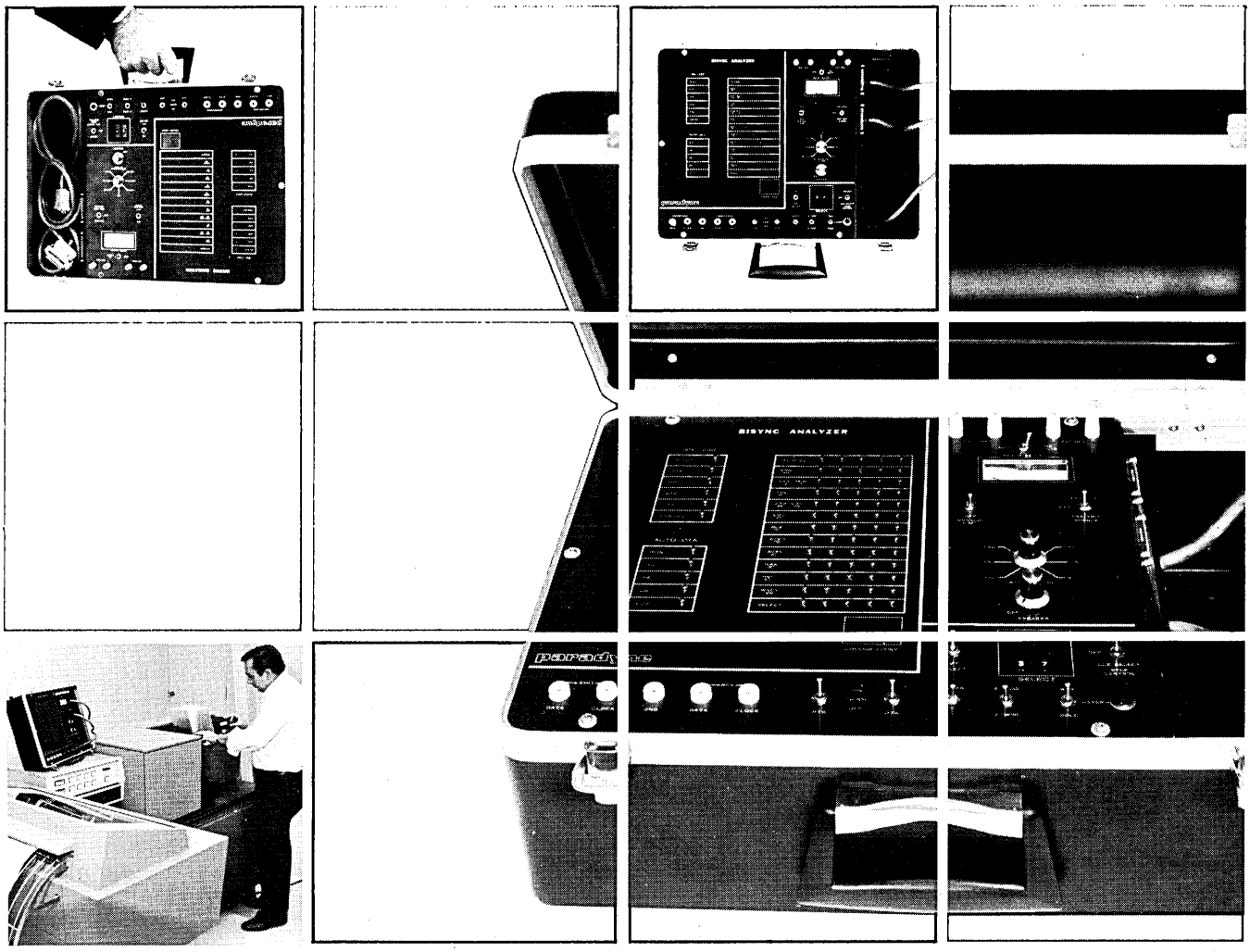

And you'll be dealing with an established, reputable company. One that will be there when you need us.

Let's talk. Call the number below, collect, or write us at 6201 E. Randolph Street, Los Angeles, California 90040.

# Let's talk.

See SUE systems on the Computer Caravan.

CIRCLE 46 ON READER CARD




# immediate fault isolation in your BSC communications links!

Data communications trouble-shooting is a frustrating business at best. While your vendors are busy blaming each other's equipment—you're caught in the middle. And your system is still down, often for weeks—resulting in an aggravating time and money waste.

Now—with Paradyne's BISYNC Analyzer—you can stop all that fingerpointing and start solving data communications problems. The BISYNC Analyzer captures, stores and displays key control sequences of the dialog passing through your communications channel—and immediately locates the source of the fault.

Now the information you need to correct problems in your communications links is at your fingertips, instantaneously, with the Paradyne BISYNC Analyzer. The BISYNC Analyzer comes complete with Interface Tester, Auto DAA Interface, Analog Tester and a Speaker to listen-in on the line signal too. And, Paradyne's BISYNC Analyzer captures and stores ASCII and/or EBCDIC line control characters. All this problem-solving versatility in just one briefcase.

Get out of the middle of the fingerpointing game. Start solving your data communications problems, instantly. We'll rush you a brochure that will show you how. Just write or call.

paradyne

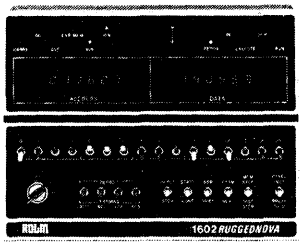
**8550 Ulmerton Road/Largo, Florida 33540/Telephone (813) 536-4771**



CIRCLE 41 ON READER CARD

# Introducing the new, faster Rolm 1602 Ruggednova..the world's toughest computer.

## Tough enough to meet Mil Specs E-5400 airborne environment and E-16400 shipboard environment with a more powerful interrupt structure, expanded instruction set, extensive I/O interfaces, proven software and upward compatibility with Data General's Nova Series.




Here is the most complete mil spec computer system you can buy. The heart of the 1602 is a 16-bit, rugged and powerful microprogrammed processor with a 1 microsecond core memory cycle time . . . but the total package is a lot more.

### MORE SOFTWARE THAN ANY MIL SPEC COMPUTER

**Our licensing agreement with Data General Corporation allows us to provide you with a wide selection of proven and documented software. Any program written on the Nova will operate on the 1602 Ruggednova. Our software set includes assemblers, compilers, debugging aids, utility routines, math libraries and powerful operating systems. And to get your software started immediately, we have a 1602 assembler that runs on the Nova series of machines.**

This snow cat carries a Ruggednova interfaced with two radar systems to help map the Canadian glacial fields.

### OVER 30 GENERAL-PURPOSE INTERFACES

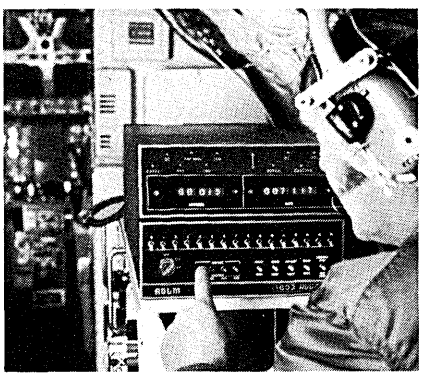
Most military computers are required to interface with more kinds of devices than any other class of computer. That's why Rolm makes available a wide selection of general purpose I/O interfaces for the 1602. These range from serial and parallel digital interfaces to communication interfaces to D/A and A/D converters . . . all the way to NTDS interfaces. They can give you an edge when you go after those contracts. No design costs. No technical risks.

### AN EXPANDED INSTRUCTION SET SAVES YOU TIME

Military applications place more rigorous demands on computer execution time and memory requirements than do commercial applications. That's why we expanded the 1602 instruction set beyond the basic Data General set. This gives you increased computational and memory reference capabilities plus reduced program storage and execution time. New instruction types include: stack-oriented instructions, exclusive and inclusive "or," n-bit shift capability, signed and unsigned multiply-divide, double precision arithmetic, a powerful new file search instruction and a special interrupt branching and nesting feature.

### A UNIQUE APPROACH TO YOUR SPECIAL INTERFACES

**The 1602 is designed so that you can place your special interface inside the chassis. We can provide you with I/O cards with room for 42 integrated circuits and 55 pins to connect your interface to the outside world or other cards in the chassis. You don't have to design a rugged chassis or power supply, plus your interface is qualified to Mil E-5400 and Mil E-16400 by similarity. One of our customers followed this approach in totally packaging an Omega Navigation Set within a Ruggednova chassis.**



Ruggednova, shown above, is aboard a Sabreliner jet performing data acquisition and navigation functions for atmospheric research.

### MEETS MIL SPECS E-5400 AND E-16400

The 1602 has been designed to meet Mil-E-5400 airborne environments, Class II; Mil-E-16400 shipboard environments, Class I; Mil-Std-461A electromagnetic interference and Mil-S-901 for high impact shock. It has an operating temperature range of −55° to +95°C case temperature, at altitudes from sea level to 80,000 feet. It meets shock specifications of 15 g's with 11 ms duration and vibration tests of 10 g's, 5 to 2000 Hz. Then there are the requirements for humidity, sand and dust, salt spray, salt fog and fungus. The 1602 meets or exceeds them all . . . to become the world's toughest computer.

### A FULL LINE OF PERIPHERALS

We can provide you with peripheral devices in every major category . . . fully integrated and documented. These include tape and disc storage units, communication interfaces, line printers, and paper tape equipment . . . plus software that enables you to easily use these devices.

### PROVEN IN OVER 300 APPLICATIONS

Ruggednovas have been used in over 300 applications in the past 3 years. The software has been used in over 4,000 systems. These range from helicopter transportable communication systems to shipboard fire control to scientific exploration on a snow cat. If it moves, it should be a Ruggednova.

### ATTENTION PROGRAM MANAGERS

The Ruggednova is a complete package of hardware and software. Now, let's talk about the support package you get at no cost. These are items which can reduce your budget and design risk at the same time. We can give you detailed reliability reports, provide two weeks of training, supply a complete documentation package and top it off with a 90-day warranty. We also give you a "how to" software manual, individual software write-ups, and full diagnostic software. And you don't have to worry about qualification tests . . . we are doing them for you. All of this adds up to savings and success for your program.

**ROLM**
CORPORATION

18922 Forge Drive, Cupertino, CA 95014
(408) 257-6440 • TWX 910-338-0247

**REGIONAL SALES OFFICES:** Los Angeles 213-784-8500; Palo Alto 415-965-2224; Washington, D. C. 301-652-0900; Boston 617-237-5752; New York 914-297-9533.

**DOMESTIC REPRESENTATIVES:** Kansas 913-362-0919; Minnesota 612-491-5400; Missouri 314-895-4100; Texas 214-233-6809; Washington 206-762-2310.

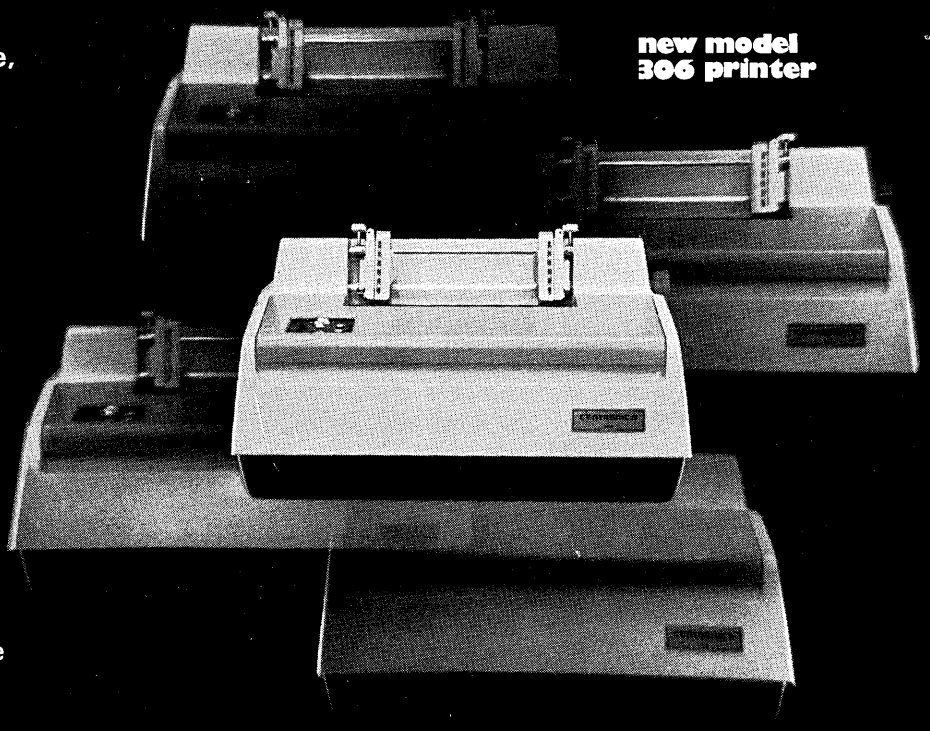
# the centronics phenomenon: a 100 char/sec, 80-column printer for $1995. another first!

**Unbeatable price/performance ratio!** At $1995, the new Model 306 is the fastest, low cost 80-column impact printer you can buy. It's one-half the price of our popular 101.

**At 60 to 150 lines per minute,** the 306 offers a wide range of interfaces for a variety of systems and data communication applications. The 5 x 7 dot matrix print head produces an original plus up to 4 clear carbons—always with perfect fixed vertical/horizontal registration. It changes to elongated boldface characters on command. And feeds paper conveniently from behind or below the printer. The 306 is plug-to-plug compatible with all Centronics printers and our CRT terminal too.

**About Reliability.** Many of the same field-proven modules from our other printers are used in the 306. Thousands of Centronics printers are in operation throughout the world.

**The 306:** price, performance—and it's in production—now!
For full details, phone or write.




**CENTRONICS**

centronics data computer corp.
one wall street, hudson, n. h. 03051
telephone (603) 883-0111
central region: (513) 294-0070 (ohio)
western region: (714) 979-6650 (calif.)

CIRCLE 12 ON READER CARD

HEWLETT hp PACKARD

Hewlett-Packard
16399 West Bernardo Drive, San Diego, California 92127

Please send me a free copy of "The Story of Computer Graphics."

Name_____

Title_____

Company_____

Address_____

City_____

State_____ Zip_____

Plotter Application_____

If you're still wading through reams of computer data and drawing your own charts and graphs, take ten minutes to read our new book: "The Story of Computer Graphics."

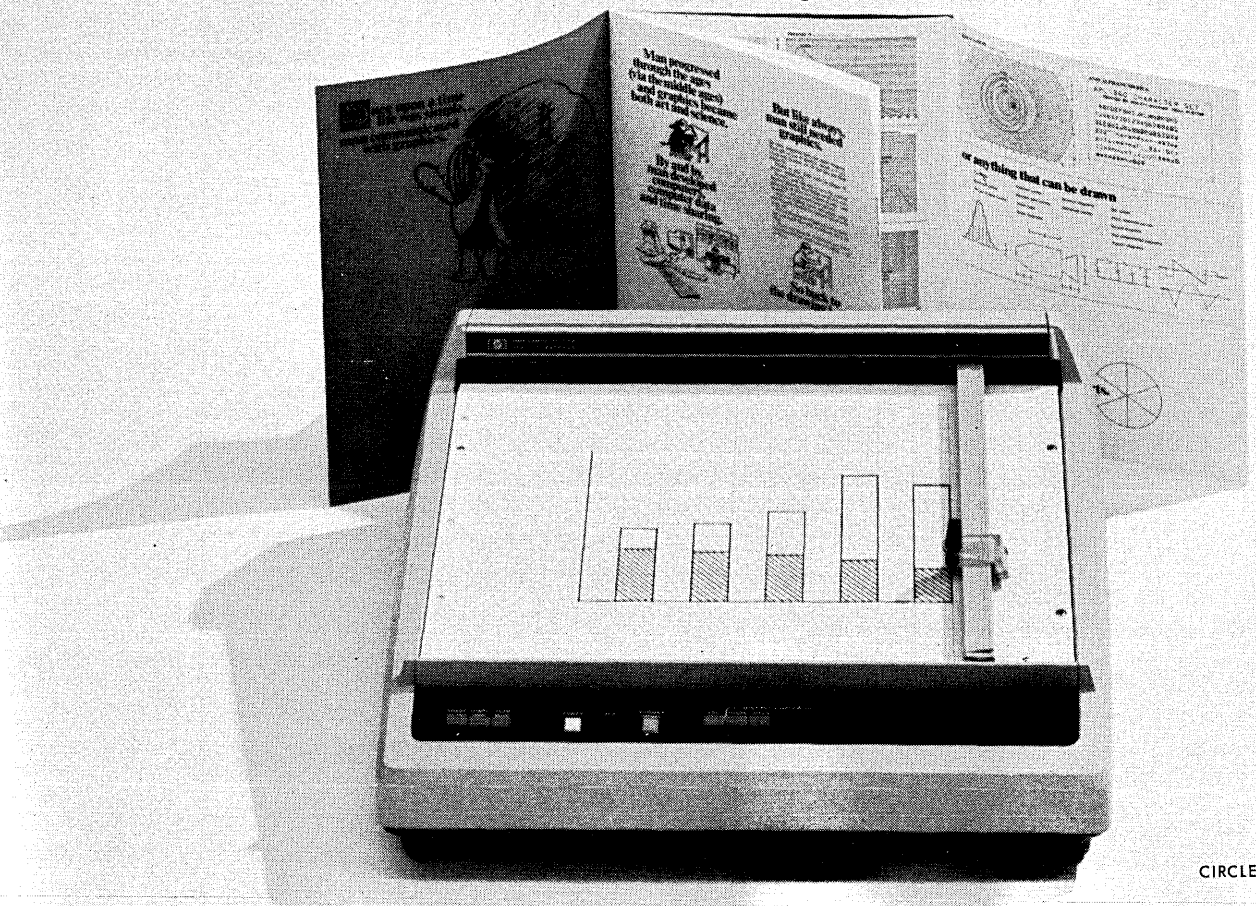
You'll learn how H-P's 7200 Series Graphics Plotter can transform the output of your terminal into concise, meaningful charts, curves and graphs... directly from the keyboard, paper tape, cassette or a card reader. With no special operating or programming/language needed on your part.

Now that our new high speed model is available, there's a 7200 Graphic Plotter for everybody... for every terminal. And it's so easy to set up, understand and use that our storybook has a short-form order blank on the last page. You can buy, rent, or rent to buy, by mail.

Use the coupon above to order your free copy of "The Story of Computer Graphics." It's full of sample graphs and illustrations. There's even a full size fold-out of the 7200 Graphic Plotter. Hold it up next to your terminal and see how uncomplicated life can be.

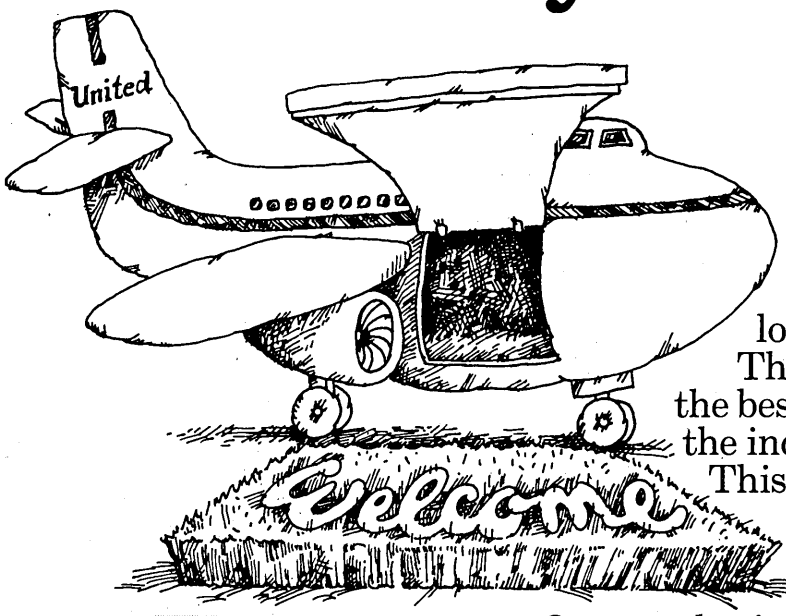
# H-P's simple little $3,300 Graphic Plotter can uncomplicate your life.

## Send for the big new picture book that shows you how.



CIRCLE 29 ON READER CARD

# United's special treatment means your shipment has a home away from home.

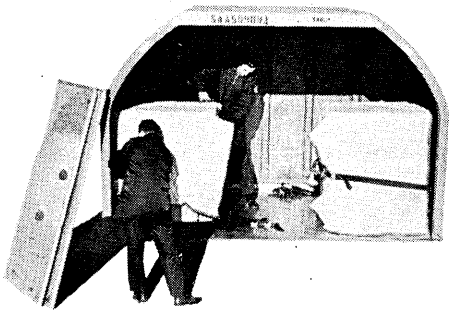



You'd expect a friend to look after your things. So we do. That's why we're the people with the best record for safe handling in the industry.

This means your shipment will get where it's going. In one piece. No matter how specialized your needs.

Our people give computers and strawberries the kid-glove treatment. Then there are race horses. Rare serums. Gold. You name it.

Talk to a friend who cares. Call United.



**We coddle computers** with our "Soft Touch" container system. It's damage-free delivery for any delicate equipment you want to ship.

**We bird-dog your shipment** from the moment you call. That's how our people can fly more freight with less loss and damage than anybody.

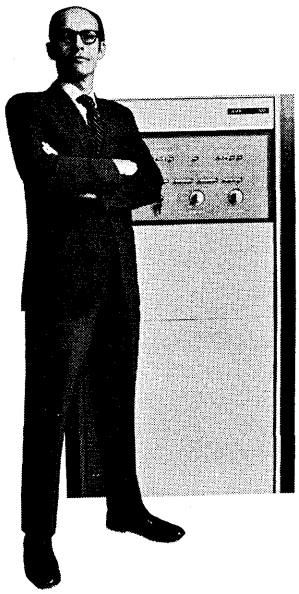
**We guard** your high-value and in-bond shipments in our special Security Rooms.

**United Air Lines Jet Freight** *No. 1 in the U.S. sky*

FORECASTING
PRODUCTION CONTROL
TELEMETRY DATA
TESTING AND CHECKOUT
DATA ACQUISITION
MESSAGE SWITCHING
DATA COLLECTION
PROCESS CONTROL
SIMULATION
LABORATORY DATA
NUMERICAL CONTROL
PAYROLL
INVENTORY CONTROL
ACCOUNTS RECEIVABLE
HOSPITAL ACCOUNTING
PATIENT RECORDS

# XEROX ANNOUNCES A COMPUTER FOR COMPANIES WITH MORE DATA THAN MONEY.

# THE 530.



You can stop running your mini into the ground.

Meet the brand new Xerox 530. The most powerful general-purpose computer in the mini price range.

It even has a better price/performance story than the Xerox Sigma 3. And some features the Sigma 3 doesn't have. Like floating point. Field addressing up to 16 bits.

It also has field-proven operating systems and languages.

Our new computer is perfect for lab experiments, simulator control, process control, communications, quality control, product testing and a dozen other applications.

The Xerox 530 is for lease or sale now at remarkably low prices.

Get all the facts. Write or call today. We'd like you to be as excited about the 530 as we are.

Xerox Corporation, 701 South Aviation Boulevard, El Segundo, Calif. 90245. Or call your local Xerox computer sales office.

XEROX

XEROX® is a trademark of XEROX CORPORATION.

# "If you need more than one terminal you need to mix and match terminals."

More than one data terminal means you have a system.

And when you have a system, chances are you need more than one type of terminal to meet your system's variety of data load conditions.

That is why we have developed a wide choice of terminal configurations: 62 models with 112 options. And that means you can use a mix of different terminal models, each matched to the specific requirements of each location in your system.

That way you'll be able to optimize your system's cost performance. Moreover, we'll help you make the right choice for each drop.

Our wide line of data terminals starts with Model 33's and 35's. Then we offer a whole series of the most reliable 30 c.p.s. terminals available.

Plus our new MSR terminal with magnetic tape buffering capability.

And we support our customers' terminals with our unique maintenance program, Termicare.®

So if you need more than one terminal, get them from someone who gives you a choice, implements your system, maintains and services your terminals.

You can reach that "someone" at 800-631-7050 (N.J. 201-529-1170), or write to 16 McKee Drive, Mahwah, N. J. 07430.

"Art Kirscht, our chief engineer, has 174 ways to satisfy your system's needs."
Z. V. Zakarian, President.

western union data services company

# COM...We solve the problem with no solutions.

That's right. No liquid or powder solutions needed for processing microfilm. The 3M Electron Beam Recorder COM System features 3M Dry-Silver microfilm, which is developed by heat, not messy chemicals or toners. And that solves the problem of having to purchase, pour or dump extra supply items into your COM system. What's more our Dry-Silver process cuts labor costs as much as 50%, compared with conventional processing.

But this is more than an efficient processing unit. It prints up to 20,000 lines per minute directly on microfilm, ready for instant viewing or copying (another benefit of Dry-Silver technology).

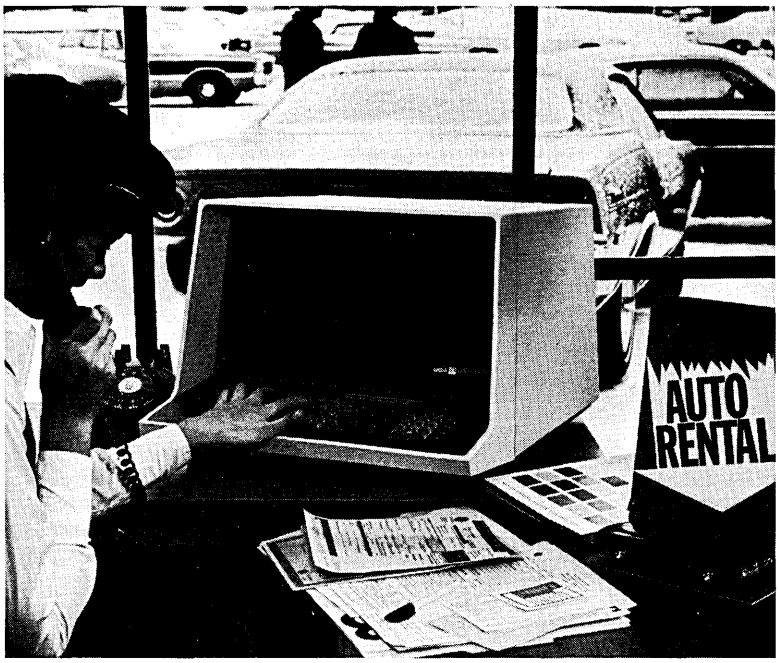
Overall, the 3M EBR can increase substantially the time your computer is available for computing. And decrease substantially your costs of original information production, records duplication and information storage.

Best of all, the 3M EBR is compatible with your computer. Ready for a COM solution with one less problem? It's time to call us.

# The age of microfilm is here... 3M COMPANY

CIRCLE 53 ON READER CARD

**For a national department store chain,** with heavy mail-order business, Sanders display terminals produce swift, accurate confirmation of customer credit and expedite all kinds of order entry, retrieval and process-control operations. Sanders system components are widely known for their reliability and cost-effectiveness.

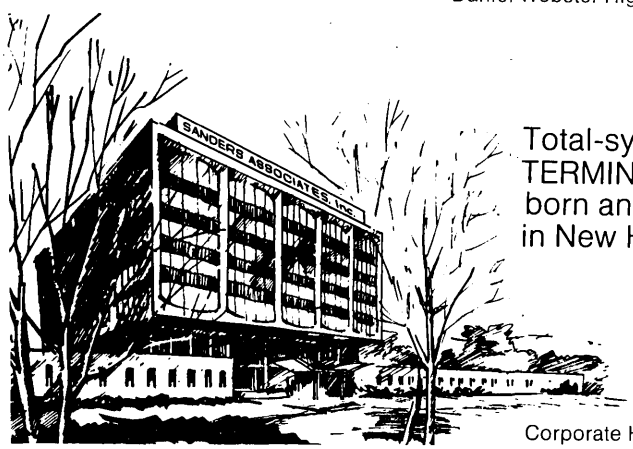



**For two major car rental firms,** Sanders data terminals link hundreds of reservation counters with central processing points regarding rentals, car control, check-outs, check-ins and other operations activities. Sanders systems are highly flexible . . . can expand easily as more sophisticated requirements develop.

Sanders **Terminalogy** offers a total-systems approach to your EDP problem. Get the full story. Call your nearest Sanders sales/service office . . . or call our National Sales Manager at 603-885-3727.

# COOKIE JARS AND RENTED CARS

SANDERS
DATA SYSTEMS, INC.
A Subsidiary of Sanders Associates, Inc.
Daniel Webster Highway-South, Nashua, N.H. 03060




Total-systems
TERMINALOGY . . .
born and bred
in New Hampshire.

Corporate Headquarters

# 100 million bits without an error!

## EPI's new STR™-200 Digital Cassette Recorder.

Now, at last, a digital cassette recorder that gives you everything you're looking for—all in one compact, convenient package. Portability. Battery operation. And above all, *reliability.*

It's the new STR-200 from EPI. Repeated tests show its bit error rate to be well below one soft error per $10^8$ bits!

The secret is in the new STR recording technique—Speed Tolerant Recording—perfected and patented by Electronic Processors, Inc. STR eliminates the need for ultra-precise drive mechanisms and produces a single-track, self-clocking recording that is compatible with any digital computer system.

The STR-200 is a replacement for your paper tape punch/reader. Other STR-200 advantages include high information density (2 million bits per cassette), an ability to accept or play back data at 125 characters per second, and a reusable recording medium that maintains data sequencing at all times.

Yet the STR-200 costs only $495 (two for $920)...far less than other systems with lower capabilities. For more information on the STR-200 and Speed Tolerant Recording, send in the coupon. Or phone us at 303/798-9305.

☐ Send me literature on EPI's new STR-200 Digital Cassette Recorder.

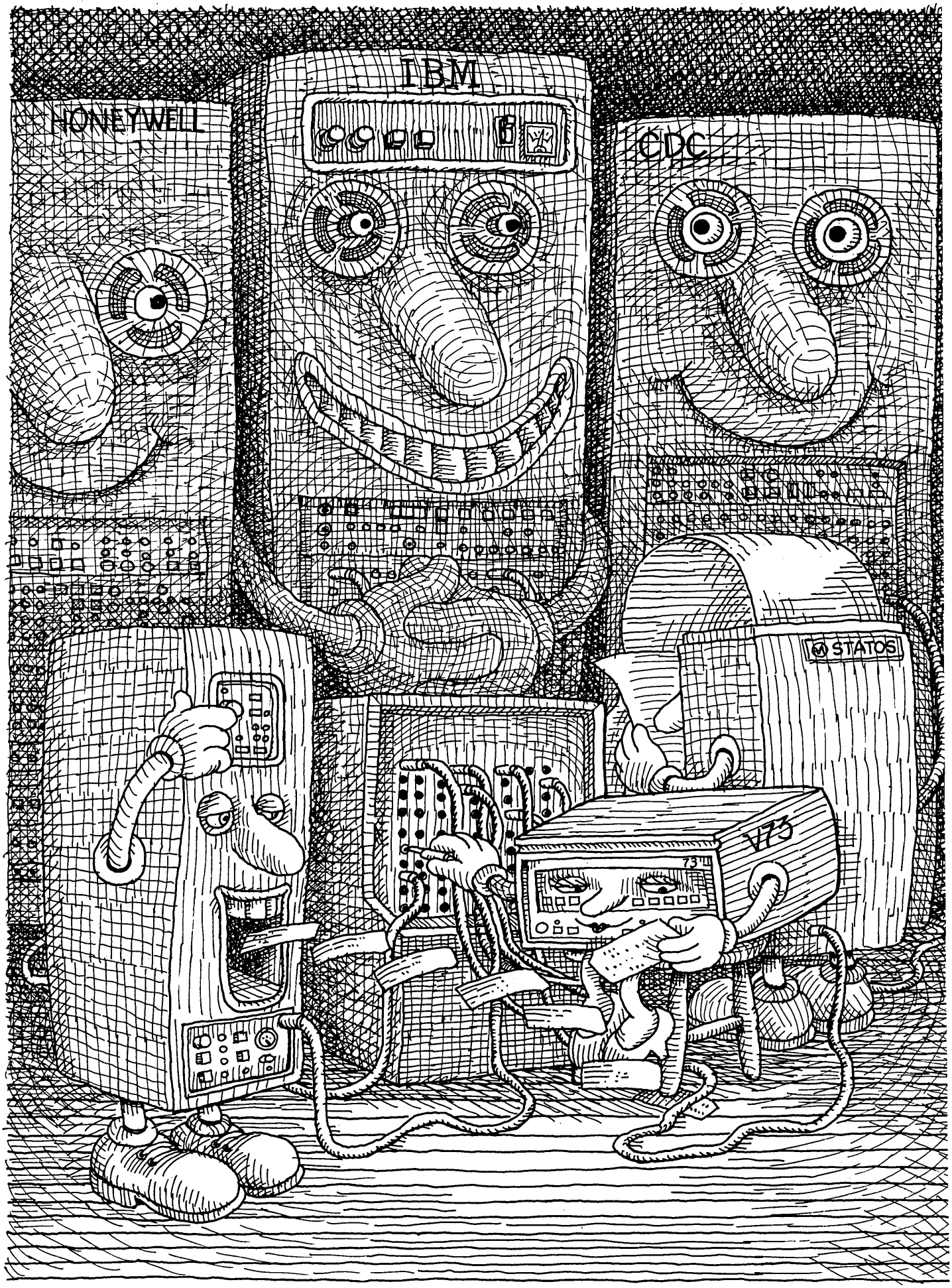
☐ I'd like to talk to a sales engineer.

My requirement will be
☐ Immediate
☐ 6 Months
☐ 1 Year

**ELECTRONIC PROCESSORS INCORPORATED**
A Subsidiary of Samsonite Corporation
5050 South Federal Blvd., Englewood, Colorado 80110

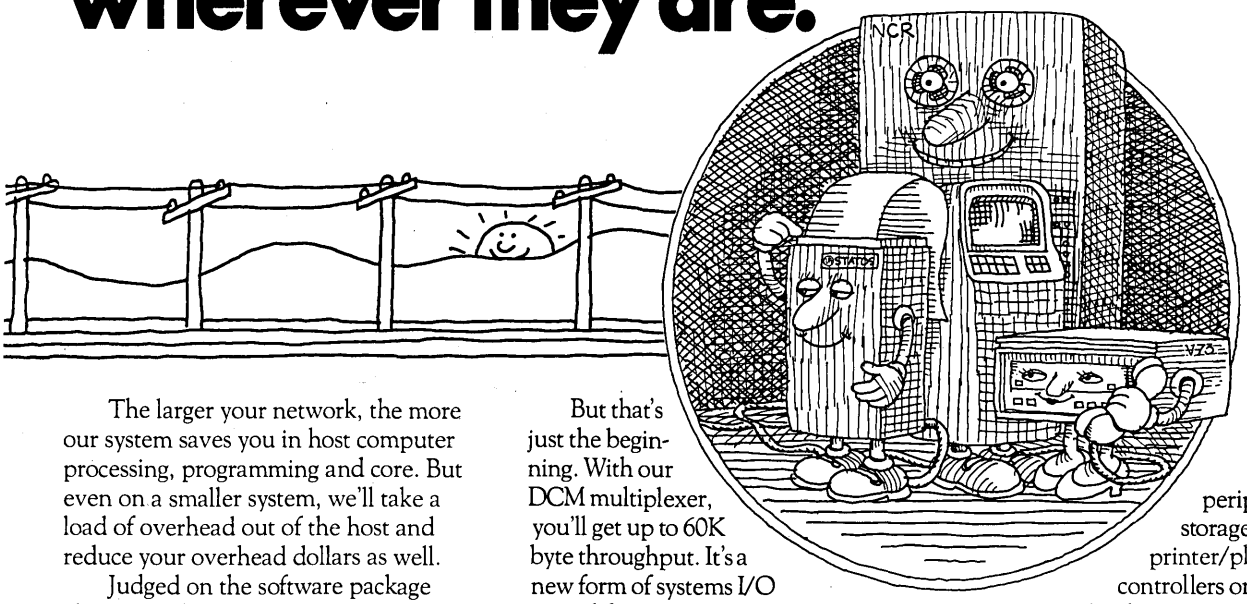
Name _____
Title _____
Company _____
Address _____ Phone _____
City _____
State _____ Zip _____

CIRCLE 28 ON READER CARD


IBM
HONEYWELL
CDC
STATOS
V73

# Our data communications systems take a load of overhead off the big computers...

# wherever they are.

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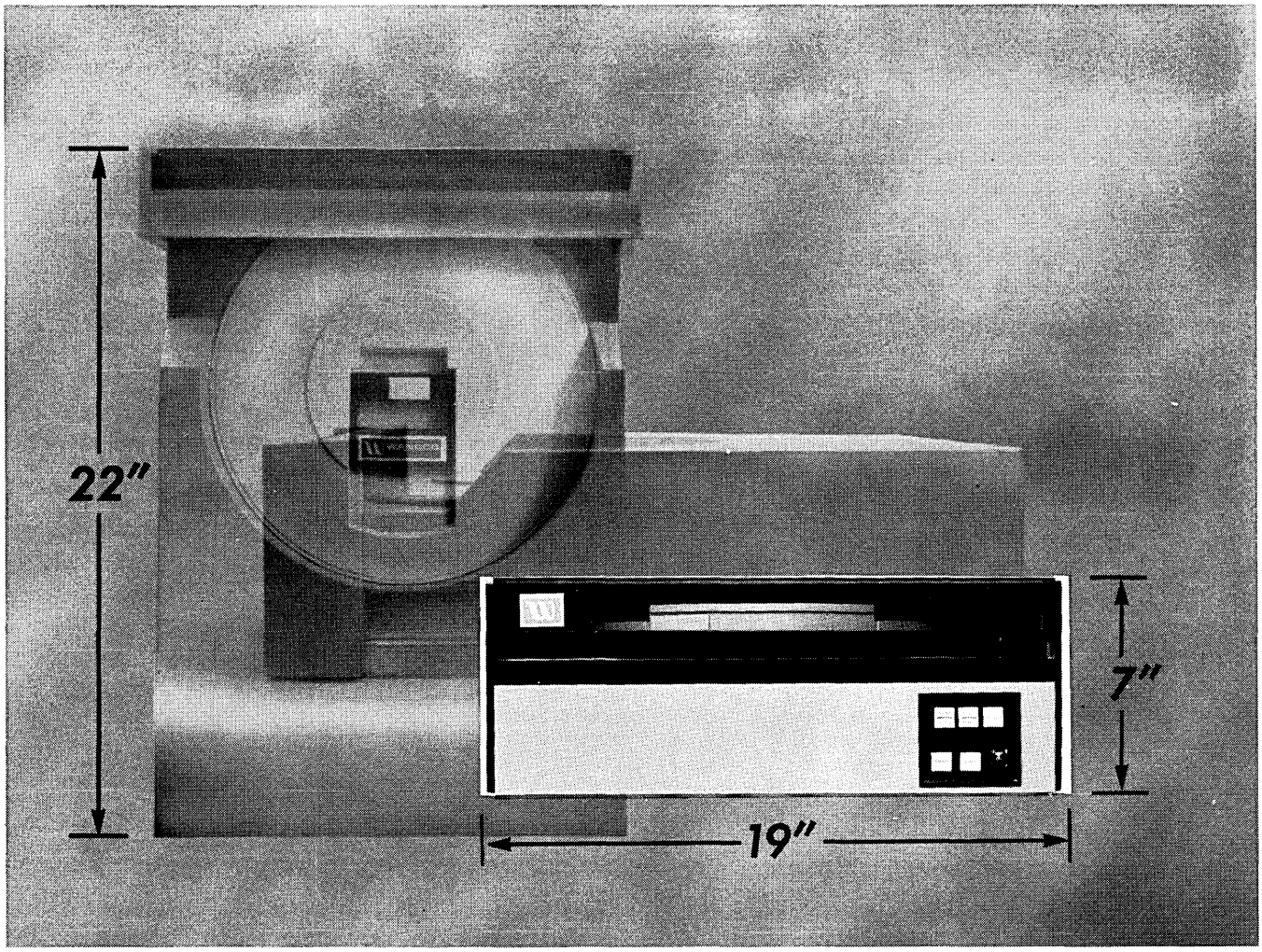


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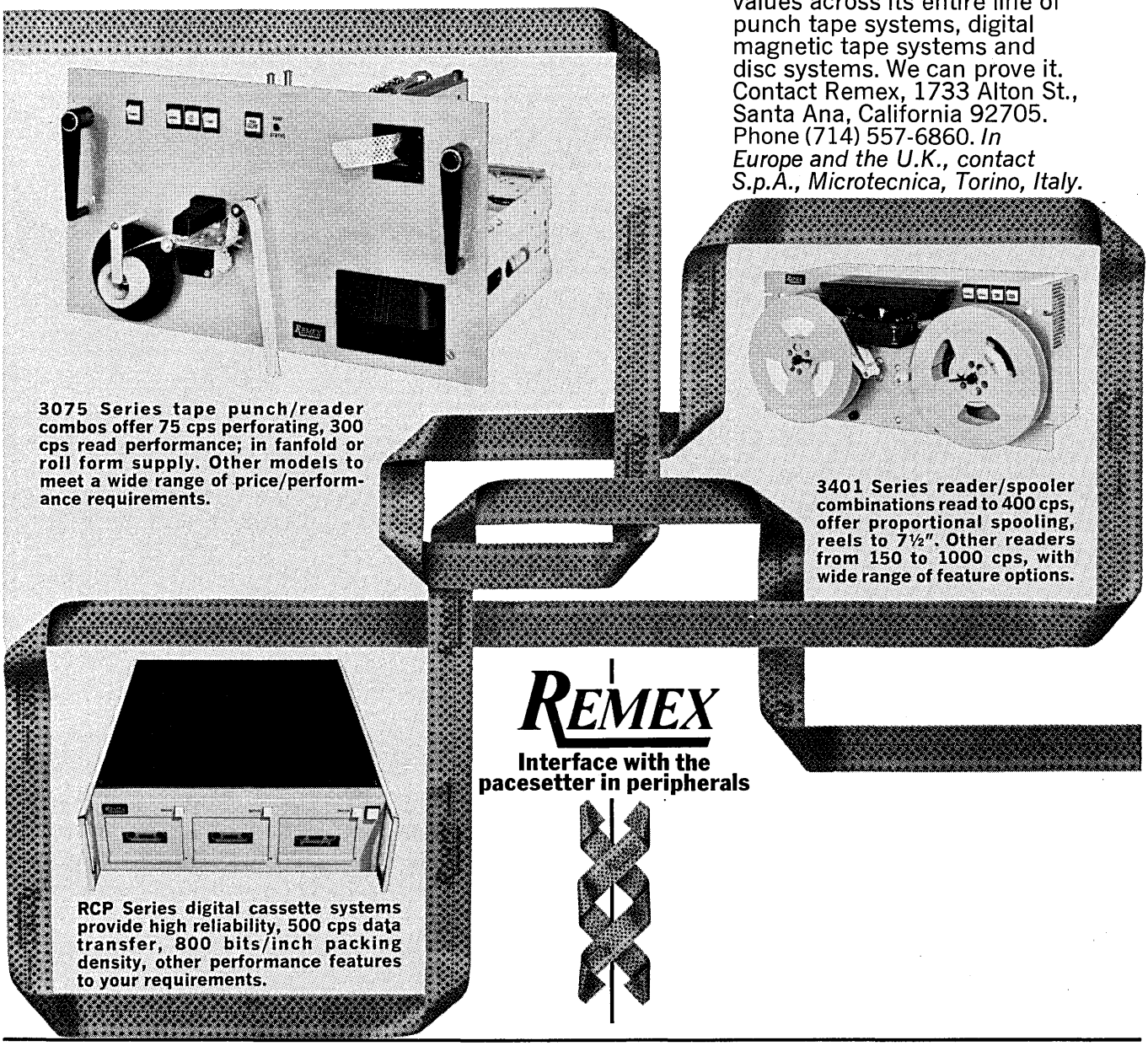

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# Advances in Data Entry

by Lawrence Feidelman and George B. Bernstein

Management has only recently come to realize that data entry accounts for 40 to 50% of the data handling dollar. Data entry now takes a disproportionate toll of corporate resources in terms of increased personnel requirements, extensive response times and the consequence of erroneous input.

The technology required to significantly improve computer data entry is here—but the means of employing this technology is still lacking. Data entry has matured to a point where it must be considered a total system rather than a series of isolated equipments. This article describes the data entry system in terms of its hardware, software and the people who use them; people are more significant in data entry than in any other part of the data processing system.

Data entry should be considered as a system; it is comprised of much more than equipment selection. Data entry involves personnel considerations, data preparation procedures, forms design, equipment communication and computer interface.

There are now three general types of data entry systems: keypunch; keypunch replacements; and source data automation.

## Keypunch

The keypunch is still the most common form of data entry device. Data is received in printed, typed or handwritten form either in its original format or on special punched card transcription forms. The keypunch operator must then punch cards in a specific format. To assist the operator, a control card is initially made up to prescribe the fields to be punched and skipped. To "assure" accuracy, the data is usually entered a second time by a verifier to check for errors. With newer buffered keypunch machines, the keying operation is faster, and limited card edit checks are performed. In fact, with the large number of IBM System/3 sales, the 96-column buffered keypunch is destined to become a major type of data entry equipment.

From a system viewpoint, the keypunch is a very slow means of data entry. It requires a rigid format and is costly when used in a multi-keypunch installation. However, established usage of the unit record concept in existing system designs, the ease of punching small jobs, ease of data insertion, personal psychological (resistance to change) factors and System/3 sales will keep the keypunch operation secure.

## Keypunch replacement

The need to increase the efficiency of the keypunch operation and lower data entry cost without changing data preparation procedures led to the development of keypunch replacement systems. Data is received by the operator in the same form as in the keypunch system. Keypunch replacement equipment, however, offers more sophisticated format and edit functions that both assist the operator in verification and the original data preparer in validation.

There are four types of keypunch replacement equipment:

*Stand alone.* Stand-alone devices are independent units with sufficient logic and hardware to place keyed data onto magnetic tape. A keypunch style of keyboard is used, making the switch easy for the keypunch operator. The only essential difference is that data is placed onto magnetic tape rather than punched cards. The stand-alone device also has controls for editing and validating the data. In order to reduce tape-setup time, the tapes produced from a number of units are merged into a single tape by a pooler. Keyboard-to-tape units have a speed advantage over the keypunch through the elimination of mechanical card movements. However, introduction of the buffered keypunch has eroded their speed and cost advantage.

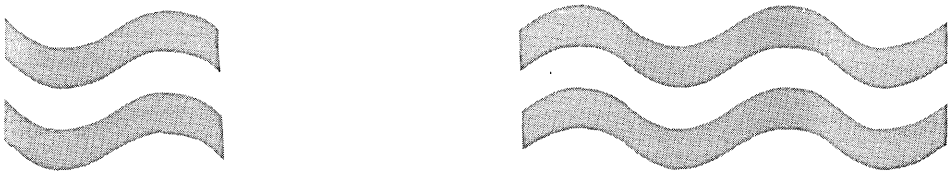
*Central collection.* The central collection arrangement is a multistation keyboard-to-tape system consisting of many keyboard consoles connected to a magnetic tape unit by means of a controller. This controller may be a special-purpose device or a minicomputer. Such a configuration permits a 2-6 keystation arrangement to operate more economically than comparable numbers of stand-alone units. In addition, the central collection arrangement provides sophisticated editing features.

*Shared processor.* The shared processor or keyboard-to-disc system is designed for a 5-128 multikeyboard arrangement. The keyboards are controlled by a minicomputer that places keyed data temporarily onto a disc prior to transmission to a computer-compatible magnetic tape. Under the shared-processor concept, the system, rather than the operator, reformats the data. The system also performs sophisticated error checks and editing. An important additional feature is random access of data. The shared processor, however, requires at least 6-8 keystations to compete effectively with other methods of data entry. Smaller keyboard-to-disc arrangements, similar to the IBM 3740, are expected to meet the needs of the 5 and under keypunch user.

*Optical character readers.* Although not expressly designed to serve a keypunch replacement function, optical character readers, in tandem with typewriters, have been employed as direct replacements for the keypunch. A typing pool is substituted for the keypunch installation. Typists using typewriters equipped with special OCR fonts prepare the data for computer input. The use of typists rather than keypunch operators offers these advantages:

1. Increased speed—12,000 strokes/hour vs. 8,000 strokes/hour.
2. Increased accuracy.
3. Typists are more plentiful than keypunch operators.
4. Proofreading replaces card verification, reducing verification costs.
5. Data is typed in the same format as presented to the operator.

The OCR system requires high quality typing, typing in specific locations on the paper, neatness and training in the use of single-application ribbons.



Also, special forms must be designed. The most significant cost element is the OCR reader. The system designer must determine the trade-offs of OCR systems versus keyboard entry systems. These trade-off considerations will be discussed later.

## Source data automation

Source data automation (SDA) represents a revolutionary approach to data entry. The object here is to capture data at its point of generation, thus eliminating all unnecessary retranscription. Since the data is captured at the source, the man/machine interface becomes the critical factor. This interface can take such forms as:

*Keyboard entry.* Keyboard-to-tape/disc systems may be placed at the source and connected to the computer via communication lines. The keyboard is usually typewriter style rather than keypunch type. The operator types data for human use while simultaneously recording it in machine language onto tape or disc. The magnetic tape or disc can store a day's work. The unit is later polled and transmits the data during non-busy hours. A recent popular keyboard-to-storage terminal arrangement, known as the intelligent terminal, includes a microprocessor or minicomputer at each terminal. The intelligent terminal functions as a complete keyboard data entry system performing verification and validation at each station. Although higher in cost (i.e., $100 to $150 per month), the intelligent terminal can result in savings in data preparation and communication costs via its own data base usage.

Use of an alphanumeric crt display terminal offers on-line real-time access to the computer system's data base and processing power. This permits inquiries to be made and short messages to be transmitted. The alphanumeric display terminal has had such applications as ticketing and stock quotations. The crt terminal is expected to replace teletypewriters as the major time-sharing system terminal and to become a major means of order entry.

Other means of keyboard data entry at the source include the pushbutton telephone, portable data recorder, industrial data collection devices, adding machine with magnetic tape attachment and the new point-of-sale equipment. Each of these shares the characteristic of requiring little operator training while automatically editing, validating and machine-encoding at its point of origin.

*Optical readers.* Another advanced concept is to directly capture data from the original typewritten or printed form generated in the regular course of business. The data read is converted into machine language and recorded on magnetic or paper tape or directly communicated to the central processing system. Optical readers may also read pencil mark (optical mark readers) or special bar codes (optical bar code readers). Some optical character readers can read handprinting, numerics and limited alpha/special character sets.

*Voice input.* Although relatively new, voice input equipment now exists that permits persons to enter selected spoken words. The obvious advantage of eliminating any hand preparation is proving valuable in quality control, baggaging and POS systems. Voice input opens up a new spectrum for data entry.

*Magnetic readers.* Primarily, magnetic ink readers are used to read the numeric E-13B type font appearing on bank checks. Magnetic readers are also currently applied to read binary encoded data imprinted on embossed cards.

*Multimedia.* The combining of keyboard-to-disc and optical readers into one data entry system represents the proper evolution in design of a complete data entry system. Such a system permits the user to combine keypunch replacement and SDA applications in a single system and prevents the shoehorn approach. This new multimedia system will be expanded to include all different types of data entry equipment under minicomputer control. Such a configuration results in significant gains in flexibility, expandability and avoidance of technical obsolescence to the data entry system designer.

## Data entry selection

The selection of a particular data entry system is simplified when the type that has proven most economical, efficient, and practical for specific applications is known. The deciding factor of the data entry operation should be design of the whole data processing system. It must meet the organization's input, processing, and output needs. Implementation of a data entry system without regard to its effects on the total data processing system and the organization's personnel will result in a needless expenditure of time and money.

A series of system factors for data entry design to consider prior to selection are:

1. *Input Characteristics*
   - Type of input medium.
   - Characteristics of medium (size, width).
   - Forms requirements.
   - Character set or font requirements.
   - Type of information.
   - Method of input (real-time or batch).
2. *Output Characteristics*
   - Output codes.
   - On-line vs. off-line.
   - Method of output—tape, computer, cards, etc.
   - If computer output is used, any secondary outputs such as printed documents.
   - Compatibility with other equipment.

## Speed

Speed should be specified in terms of both inherent and actual speed of characters processed per minute. The latter is a function of the medium, manual or automatic controls, mechanical movement, buffering, verification of data. For example, OCR speed should be expressed in documents read per minute. The speed of the data entry device expressed in this manner reflects the data volume handled.

Differences in the arrangement of character sets and keyboards of various manufacturers will affect perfor-

mance. Factors include standardization, ease of data entry, placement of controls for editing and error correction and removal of data entry medium from the device. Also, special indicators such as crt's in OCR units for error control should be evaluated.

### Performance and cost

Reading ability is only one aspect of equipment performance. The other aspects are reliability and maintenance. Reliability should be examined in terms of data error rate and mean time between failure. Maintenance relates to repair time, cost and manufacturer's service procedure. The last point is quite important but, unfortunately, often overlooked in equipment purchase.

Cost of data entry equipment must be examined on a system basis. Areas to consider include:

- Purchase or lease of basic equipment.
- Auxiliary equipment costs.
- Programming costs.
- Costs for implementation and maintenance.
- Costs for special transcription equipment and/or special forms (the latter being extremely important in OCR).
- Varying amount of replaced equipment required to do the same job.
- Operator training.

### Software/systems considerations

- Programming language.
- Specification of editing and software routines.
- Input/output specifications.
- Data verification.
- Data validation.
- Administrative statistics.
- Interfacing with other data entry systems.
- Configuration—single vs. multi-unit arrangement.
- Site of source data preparation.
- Equipment interfacing.
- Off-line vs. on-line.
- Special data handling procedures.
- Real time vs. batch processing.

### Real world considerations

The first part of this article has presented the data entry state of the art and its system design considerations. The second part will show how these techniques can be applied and discuss the future of the data entry field.

We have discussed the data entry system in terms of its system design techniques. Here, we give a case study showing how data entry should be considered as part of the data processing system.

*Problem*: The Blue Baron Airlines supports 150 aircraft worth $400 million. Its supply system carries a $105 million inventory of about 85,000 items. Its annual "sales" are over $90 million. The firm's inventory control function is carried out with the assistance of an in-house third generation computer system. Procurement operations take place in three major phases:

1. Requirements routines—an automated item ordering system, which is a series of routines recommending quantities.
2. Procurement documentation—the recommended buys are evaluated by item managers, technicians and fiscal personnel. Purchase documentation is completed by a staff of buyers.
3. Asset and obligation recording —data is abstracted from the procurement documentation and entered into the automated files.

Management is convinced that operational savings can be achieved through a more efficient data entry system. The firm has assigned Mr. Banks the task of determining the proper data entry strategy.

*Approach*: Mr. Banks convenes a team of analysts to determine requirements for the new data entry system. The team is divided into two parts: One group investigates the information flow and gathers system volume statistics; the other group examines the characteristics of current and future data entry equipment.

*Findings of the information flow group*: Investigations centered on the procurement documentation phase. The group noted that output from the requirements routines took the form of a printout to assist in the manual review process and a mat printout for incorporation into the procurement documentation. These two printouts were incorporated into a purchase folder. Further entries were made as the folder was passed between inventory managers, technicians, fiscal and

## U.S. Steel's Shared-Processor Application

As users of data processing systems are aware, the cost of data entry not only represents a substantial portion of total edp expenses but is also one of the few areas of data processing in which management can exert some measure of control over costs.

One major company that has made a comprehensive study of data entry operations is United States Steel Corp. USS, like virtually every other data processing user in 1969, prepared data via keypunch. To reduce data entry costs, and at the same time provide a modern data entry system that could be utilized throughout the company for many years to come, USS decided to switch from keypunch to the Inforex shared-processor data entry system.

This decision was based on a lengthy evaluation of three data entry methods: keypunch, key-to-tape, and shared processor. A basic target was established at the outset of the evaluation process: a reduction in costs of 26%. In the three years that USS has been using the Inforex system, this percentage reduction has been consistently achieved.

The decision to focus cost reduction efforts on the data entry end of the system was based on the fact that people, or labor costs, accounted for about 90% of all data preparation costs, with cost of the hardware representing only 10%.

Despite their size, U. S. Steel regards itself as being relatively typical of dp users. In 1969, their edp operations at a number of locations around the country ranged in size from only three or four keypunch machines to a total of 64 at the largest location. In approximately 40 different locations, they had some 655 pieces of data entry equipment and 715 operators. In addition, no location handled fewer than 100 separate applications.

The USS evaluation team embarked on a program of benchmark testing of the equipment they felt was acceptable. The benchmarking was performed both in-house and outside, using USS operators wherever possible, and including the same applications on all equipment involved. The measurement criteria included operator training and operator performance on the equipment, as well as the operators' reactions to the equipment.

According to U.S. Steel, benchmark testing of the Inforex shared processor system showed more than a 40% improvement in data throughput for one of their largest single applications, as opposed to a 20% improvement using the key-to-tape system.

By the summer of 1972, the USS installation comprised forty 1301 systems, each capable of handling eight keystations. At the present time, USS is in the midst of a program of conversion to the Inforex 1302 system in some locations. This larger, more versatile system accommodates up to 16 keystations. □

procurement personnel. Formal documentation was a request for quotes and contracts. Eight typists prepared approximately 40 documents per day. The typists made up a cover sheet based on the folder entries, added the mat, and indicated applicable legal clauses by typing an X beside specified clauses on preprinted mats. Following approval, the documentation was forwarded for duplication and distribution to vendors and in-house files. One copy was forwarded to a transcription section where data was manually abstracted, keypunched and keyverified as input to update automated asset and obligation files.

*The analysis group noted the following shortcomings:*

1. Duplication of data entered during the evaluation process.
2. Lost time and effort during file circulation.
3. Lost procurement files.
4. Inefficiencies in typing procedures.
5. A three-week backlog in document preparation.
6. Duplication costs were increased by inclusion of preprinted clause mats vs. tailored lists of applicable clauses.
7. Difficulties in keeping preprinted clause mats up to date with the changes made by the legal staff (approximately 30% of the inventory, close to 175 clauses per year, was being made on a nonscheduled basis).
8. Excessive costs and tendency to transcription errors of the data entry system for updating automated files.
9. Management operates with a handicap in that it must make its decisions without an up-to-date picture of its assets and obligations.
10. A separate reporting system must be maintained to give management information on the status of individual procurements and procurement workload.
11. Additional staff must be used in the fiscal department to prepare a separate accounting of obligations because the automated files are months behind.
12. Use of paper copies of procurement documentation and support data was found to be inefficient as a procurement history file.

*Findings of the data entry state-of-the-art group:* This group was not content with merely selecting a system to meet present requirements. They felt it essential to anticipate and prepare for future requirements. In addition, appreciating the dynamic nature of the current data entry field, they insisted that care be taken to avoid selecting a system that would soon be obsolete.

By plotting the future of computer data entry as it would affect Blue Baron Airlines, the team was able to decide on the type of data system to use as well as a program for implementation. The following technological assumptions were the bases for their plan:

1. Advent of source data automation (SDA) making possible low-cost data entry terminals that can be operated easily by persons with little training.
2. Software developments permitting close machine interaction by casual users rather than skilled operators and facilitating the use of display terminals.
3. Low-cost computer systems making small computers possible throughout the system.
4. Multilevel computer and terminal networks with some processing done at the terminal, some at first-level computer (geographically close), some at second-level computer (farther away and more powerful), etc., with all processing done at the lowest possible level in the network.
5. Hierarchical memory systems permitting efficient and economical storage of data based upon data volatility.
6. Microforms used increasingly for storage of hard copy information, accompanied by economical, space-saving methods to handle them.

These assumptions plus a cost/benefit analysis led to a three-phase program:

*Phase I:* A separate, limited data entry system with the following characteristics would be implemented for the procurement function:

1. The heart of the hardware system is a modular small computer that handles job entry, preprocessing of input, and remote batch processing and is capable

## Bar Code Reading

An example of capturing source data without keystrokes is the "reading wand." Since the keyboard system frequently only copies data for its subsequent return to a data base, copying that same data by running a light pen over a coded label is a whole lot quicker.

Industry utilization of bar code reading has been hampered by the difficulties of producing the label. The retail industry is a prime candidate for bar code technology because they can take advantage of large label runs or induce the retail product manufacturer to include the bar code pattern with his other printing. But label to label variations of low volume runs were impractical to produce, and it wasn't surprising that industry in general didn't pursue this technology with gusto.

Interface Mechanisms, of Seattle, Wash., reasoned that a computer-driven bar code printer would bring "wand reading" within the grasp of general industry. After developing such a printer, they also developed an unusually rugged optical reading wand.

The Intermec printer produces black and white parallel bar codes plus human readable characters on self adhesive labels or pin tags. Input can come from virtually any data interface, or from a keyboard attached directly to the printer. The size of the unit is not much larger than a wide carriage electric typewriter.

The print mechanism that creates the coded bars and human readable characters employs a rotating wheel which can be customized to meet various application needs. A wide range of codes and character sets is possible. Speed of printing will depend upon the code pattern, resolution and number of digits required; for retail applications 150 to 200 labels per minute is typical. Labels can be written for either handheld light pens or noncontact scanners, or both. Virtually every data processing operation that employs turnaround records can take a fresh look at bar code.

Data capture via bar code is a big step toward real-time integrated data processing. Data capture and the physical movement of property may be simultaneous events. The step of making a redundant interim record (which is subsequently keypunched) is avoided. Keypunching is reduced to accommodating exceptional transactions or the entry of new data.

In manufacturing, as work in process moves through its various stages of manufacture, storage, and ultimate distribution, pertinent data is collected by using a light pen reader at each reporting station.

For those manufacturers who are concerned with maintaining individual records on each item of inventory, bar code should prove useful in linking the movement of physical property to the management information system. □

of acting as a satellite to the large-scale system.
2. Five crt terminals for procurement document preparation.
3. Disc-pack auxiliary memory for local files and user programs.
4. Magnetic tape for data transfer between systems.
5. A file of procurement clauses stored on disc, updated as the legal department submits changes.
6. Contracts and requests for quotes incorporating data from the review file, magnetic tape input from the requirements routines, and identification of specified clauses developed at crt terminals.
7. A magnetic tape of full-blown procurement documents in computer output microfilm (COM) format.
8. Microfilm as a medium for reproduction of vendor copies (on paper) and as a storage and retrieval medium for contract history.
9. Magnetic tape to automatically update the asset and obligation files.

*Phase II:* A separate, source data automation system with the following characteristics would be established for the procurement function:

1. Data entry devices appropriate for each task placed at the point where procurement evaluation occurs.
2. The satellite system communicating directly with the large-scale cpu through telecommunications, making high-level processing and master files accessible.
3. Automated final operations on the satellite system operated by a reduced fiscal staff who set decision rule controls and handle exceptions.
4. Automated clerical functions, including development of contract and request for quote formal documentation.
5. Real-time access to information on any specific procurement action and on procurement workload, with no separate reporting system required, available to the manager responsible for procurement.

*Phase III*: The satellite subsystem concept would be applied to all basic functions of the firm. The data processing system would take on the following characteristics:

1. A small number of large-scale computer systems, geographically decentralized, serving as data processing utilities for the firm.
2. The data processing system as a multilevel computer and terminal network (described in the technical assumption listed above).

## Conclusions

Earlier, a series of 12 shortcomings was cited as the output of the analysis group. Phase I provides alleviation to problems cited as items 4, 5, 6, 7, 8, 9, and 12. Phase II provides additional savings in these areas plus items 1, 2, 3, 10 and 11. Phase III spreads these benefits to the remaining functional areas of the firm's operations.

The Blue Baron Airlines, which might have gone blindly into a limited approach to data entry, decided to implement a set of essential applications now and to begin preparations for a new concept in system design. The firm designed the basic software package for Phase I on a commercial time-sharing system. A one-terminal pilot operation permitted the analysis team to develop cost/benefit data for equipment justification and resulted in experienced typists familiar with the application plus terminal operation experience. The firm decided it would limit its investment in the interim system through the use of a one-year lease arrangement.

## Future of data entry

At present, progress in the area of data entry is of an evolutionary rather than revolutionary nature. Although many new and varied data entry techniques exist, the keypunch, with an installed population of over a half million units, still performs 80 to 85% of all data entry work. The market is deluged with more than 300 different types and brands of equipment, each with varying combinations of features. These devices are aimed at a particular profile of user, data entry volume, response time requirement and type of application. Unfortunately, most manufacturers still attempt to sell pieces of equipment rather than a system.

The data entry market is growing rapidly with annual sales expected to exceed $2 billion by 1975. Within this annual sales figure, keypunch equipment will have sales over $350 million. However, keyboard-to-storage systems, via both its central processing and terminal arrangements, will approach keypunch as the major data entry equipment. Optical readers will also show strong sales with a trend toward lower-cost, special application oriented systems. The newly developed multimedia keyboard/reader system, which marks the first complete data entry concept, will be a primary reason for increased OCR sales.

Major growth is anticipated in the use of terminals for remote data entry and for application-oriented data entry systems such as point of sale and factory data collection. In both cases, the evolution to integrated data entry/processing systems is evident.

The trend in the second half of the seventies will be toward decentralization of data handling, resulting in more frequent interface between the casual user and the data processing system. Input to the computer will no longer be solely the province of the trained operator. A prime challenge for the system designer will be to develop data preparation and data entry procedures that can be easily employed at the source by operational personnel. Successful implementation of such data entry systems makes simplified procedures essential. □

Mr. Feidelman is president of Management Information Corp., consultants and publishers of Data Entry Today, Optical Readers Today, EDP Facility Evaluator, and Forecast 80: Data Processing. He is also an instructor for the Institute for Advanced Technology, where he conducts seminars on such subjects as data entry and optical character recognition.

Mr. Bernstein is special assistant to the director, Research and Development Div., Naval Supply Center. He is also chairman of the OST Working Group on Micromedia under the auspices of the Executive Office of the President, Office of Science and Technology. He collaborated with Mr. Feidelman on some of Management Information Corp.'s publications, has a BA from Pennsylvania State and an MBA from George Washington Univ.

**Keypunch replacement equipment can be a big help but the ideal solution would combine data capture, preparation, and entry**

# Whither Data Entry?

by Philip H. Dorn, Contributing Editor

The edp world has spent many years and many dollars translating marks on paper into digitized information; little if any attention has been paid to the immensely more difficult problem of capturing the data at its source. A conservative estimate holds that three or four times the amount of money spent in data preparation is spent in obtaining the data. It is typical of the edp community to expend enormous efforts to solve the wrong problem.

This article briefly describes today's proliferating data preparation world and explores some of the technical and managerial problems intrinsic to data gathering. A potential direction worth serious exploration will be examined as a future alternative.[1]

## The world today

While over 500,000 card punch machines are in use, recent developments suggest that routine orders for more card equipment are a thing of the past. There appear to be a number of methods for processing data into machine readable form that have viable economics in one or more situations. Examining the alternatives shows the wide variety currently available.

Solutions range from the almost totally automatic MICR encoding schemes used by banks to the optical mark readers that are only updated versions of devices used 30 years ago. Each technique has its usefulness, its place in the spectrum and its cost justification in a particular application.

Scanners can be divided into three classes, the magnetic ink scanners (MICR), the bar encoding scanners used mainly in point-of-sale (POS) terminals and the optical character recognition (ocr) scanners in use for very high volume applications.

The MICR solution is effective in the banking community; it has not caught on elsewhere since no other industry group has the high degree of internal self-regulation and enforceable standards. The banking people performed a notable service by creating and enforcing the use of MICR; without it the body of financial data would long since have drowned in a sea of paper.

Widespread installation of POS devices is just beginning but already a wide variety of terminals exists, many built for recording data on tape cassettes similar to standard audio cassettes.[2] Scanning simple encoded symbols allows a clerk or register operator to keep an accurate-to-date tally of inventory, goods sold and transaction volumes. Symbol printing is comparatively simple, the logic in the scanning device is elementary and the scanner is easy to operate. Simple cassette-to-magnetic-tape converters already exist.

Cassette techniques merge data entry and data gathering. The requirement for thousands of terminals within a system enables vendors to keep unit costs low; complex devices are not a part of the POS world. Some units are connected to traditional cash registers, but those used for inventory work are apt to be of the stand-alone variety.

Present POS status suggests an explosion will occur within the next two years as systems now in final development become operational and the retail industry, a holdout against innovation, succumbs to technology. It is predictable that before the end of the decade the number of POS terminals will exceed all others combined.

The big, expensive scanners that have been in use for years are limited by cost and complexity to applications with rigid formats and very high volumes, such as processing credit card charges and airline tickets. More recent installations include retail inventory ticket processing and a certain amount of well-defined sales data. These high speed machines have always been off-line devices recording output on magnetic tape. The use of minicomputers as control units suggests that future scanners may be on-line using the minicomputer to avoid the problems of timing the movement of the documents.

A well-known problem remains excessive document rejection. The quality of the input document is critical to a paper-handling machine; if the paper has been crunched, dampened or otherwise mishandled, the rejection rate is apt to be enormous. Unfortunately, documents must be handled and cannot be expected to reach the input station in pristine condition. Rejection rates as high as 30% have been encountered; when above 5% the equipment cost validation may disappear due to manual handling costs.

One solution to the rejection problem is rarely considered—an operator in the processing loop. If rejection can be expected, equipment can be built to display the unreadable document, permitting a clerk to correct or manually reject with a minimum of fuss while the system continues to accept good documents. Perfect scanning is impossible outside of laboratory conditions, but it remains for the manufacturers to engineer their hardware on a philosophy of expecting bad data.

Although scanning proponents have said that "The common notion that ocr is too expensive for most computer users is a myth,"[3] the fact is that only a handful of user installations have any scanning capability.

Key/tape was a mid-1950s invention which fell into limbo and was startlingly resurrected in the late 1960s as a major data preparation device.

If key/tape only eliminated machine room card handling it would have been an improvement over punching cards. Given the additional characteristic of allowing longer input records and caus-

[1] Some of the material presented here was first given at a meeting of the Diebold Research Program—Europe in Paris, Nov. 23, 1971.

[2] One problem which holds back the wider use of cassettes is the lack of standards in bit patterns, recording densities, label specifications, etc.

[3] Dr. David Shepard, president of Cognitronics and holder of perhaps half of all U.S. patents granted in scanning.

ing improved productivity, key/tape devices represent a true step forward.

Key/tape is easy to install and requires a minimum of operator retraining. A user noted that "An unexpected benefit is that operators tend to think the new units are more sophisticated; as a result they are more conscientious in their jobs."[4]

A variation on key/tape is key/cassette, replacing the magnetic tape recording with cassette tape recording. This technology is dropping rapidly in price and the use of multiple cassettes, one for recording and one for control, permits complex operator actions while retaining all the control of more elaborate systems.

Key/disc systems became feasible when minicomputers, keyboard components and discs became off-the-shelf items in the late 1960s. The 1971 recession thinned the ranks of the manufacturers but those who survived have thrived. Curiously, only Honeywell among the major mainframe vendors has entered this market so far.

Conceptually, nothing complex is involved; data is entered at an IBM 029-compatible keyboard, checked against a format program and stored on disc. Records are sequenced within a batch and batches may be chained together. When the supervisor wants output, the action to produce a magnetic tape is nothing more than a few simple commands followed by the batch numbers. The output tape may appear with header and trailer labels and in any desired format. Depending on the equipment used, the data may be sorted or rearranged to one extent or another, optionally verified, range-checked, hash-totaled or otherwise manipulated for the convenience of the program against which it is to be passed.

Key/disc systems are more expensive than card machines, but compensatory personnel reductions are usually available and with salaries and benefits more than 65% of the cost of a data entry operation, the dollars will even out.

If staff is reduced, can the workload be handled? No common agreement exists on the improvement factor to be expected but such statements as "40% increase in throughput,"[5] "50% cost reduction over the previous key punching operation,"[6] and "a 25% increase in throughput has been realized with equivalent dollar savings"[7] appear common.

Key/disc systems appear to be here to stay; few users are willing to hang data entry operations on their main computers and suffer the outages inherent with large scale general purpose systems. Minicomputer systems appear infinitely more reliable than their bigger brothers.

The simplest new input device is the buffered keypunch. Although Univac has sold well over 25,000 of these units, now that IBM has blessed the concept by introducing the 129/159 sales will rapidly increase further. Some less-well-known input devices might include on-line mass spectrometers, tablets used for sensing hand drawn curves and patterns, scanners which digitize line drawings, and digital clocks.

Factory automation offers many special entry devices such as badge readers, clocks, punches, keyboards, prepunched cards and the like. Although interesting and worth a look, they are not generally classed as data entry devices. The rugged construction designed for use in harsh environments and with heavy-handed operators should be examined by all entry system designers as sound human engineering of hardware.

This brief excursion to the hardware world shows merely the tip of the iceberg; new devices and techniques appear regularly. Prices of all devices have been dropping steadily since the first teletypewriter was hooked to a computer and recent trends in electronic circuits indicate that the price curve is continuing downward.

Programmable terminals that approach the power of a stand-alone business computer have been omitted from this discussion; there are too many of them and they are used in too many ways. How to class a machine used as a programmer's terminal on one day and an accounts payable system the next? These systems are the new swing devices, part computer and part terminal, but in all cases growing rapidly in use.[8]

## The problem

With all this available hardware few systems have yet been built to successfully solve a data entry problem for real users. It is axiomatic that hardware alone cannot and will not solve any problem, just make it more expensive to fail. Cheap and reliable devices exist. Central processors have become cheaper and more reliable. Even programming is no worse than five or ten years ago. There is clearly a missing link.

Before generalizing the problem a brief case study is needed. Here is the Wondrous Widget Manufacturing Corp., a typical medium sized consumer products company of international repute. Wondrous employs salesmen to handle their 2,000 products to 15,000 customers; as might be expected, the bulk of the profit comes from 150 items sold to 1,000 customers.

Widgets come in many styles, models, colors and shapes. Each salesman has to know his customers' buying preferences, cash situation and inventory position.

Wondrous has an edp department. Originally an arm of the corporate treasurer (Harvard '23), recently the department has been attached to a nebulous organization called Management Services and the formerly independent divisional and in-plant computers have been consolidated into one center.

A new consultant has been brought in to consolidate the many related subsystems and bring order into the separate operations. Actually he is supposed to be looking at the creation of an on-line corporate data base with several hundred terminals but being a shrewd consultant he has reduced the problem initially to discovering the data flow through Wondrous.

His next move is to consider the problem as one common to all corporations so that he can call for help from the team working at the Kludge Kontainer Kompany. They have discovered that the loop involving orders, inventory, production forecasting, distribution and finally orders again, appears to be common to all consumer products companies. This tidy closed cycle is well-known and well-documented; hundreds of batch processing programs have been written to control various phases of the operation. In the consumer goods world, most systems appear to bypass the total problem and are content to solve an easily isolatable segment.

It is observed that a salesman marks appropriate numbers and letters on an order form. The order is transmitted, usually by mail or a phone call, to an office where an input clerk cleans up the mistakes, verifies the customer's name, address and credit rating and forwards the order to a warehouse or shipping point. From here on the process diverges but at Wondrous, when the merchandise is in stock, the order is picked and shipped and a copy of the shipping order forwarded to the billing department so that an invoice can be mailed. If Wondrous were more sophisticated, copies of the order might go to the plant for production forecast-

[4] Don Jensen, director of management information services for Cook County Circuit Courts.
[5] Ron Manella, assistant to the edp manager, new Hampshire Life Insurance.
[6] Charles Bold, assistant vice president, Wells Fargo Bank.
[7] John Mahoney, Inforex Corp. (a manufacturer of key/disc equipment).
[8] Such machines, built by Burroughs, Litton and Nixdorf among others, are difficult to categorize but very interesting to use. Their potential appears unlimited.

ing, to the warehouse for inventory restocking, to the salesman to keep track of his billings and to the edp department for sales analysis programs.

An objective analysis of the process soon reveals the number of times a particular data item is transmitted. The amount of manual handling is staggering: from salesman to shipment of goods, dozens of clerical employees will examine the documents and scan the data. The separate computer systems that could be defined include, for example, order entry, shipping, inventory control, forecasting, billing, sales analysis and commission plan. (Wondrous is a consumer products company; examples could easily be generated in other industrial categories.)

From a systems viewpoint, the process is an utter jumble of overlapped responsibilities, manual processing, repetitive handling and compartmentalization where integration is required. As the order moves along, each step adds to the miniature data bank; no step eliminates any of the data. It appears to be a reflection of the human characteristic to have everybody want to know everything whether germane to the task or not.

In all of this the computer people who might help are sitting idly waiting for a piece of paper to fly into the data entry room where it can be keypunched, verified and forwarded to the machine room. Then, after processing, it is destroyed rather than captured. The whole process reeks of the creation and destruction of data no matter how redundant the action may be.

The obvious commonality between all these active steps is a piece of paper stating clearly that 10 dozen blue widgets, model A-5, at $5.25/dozen need to be shipped. This plus a shipping address is really all the raw data required. It is easy to enter this data; can it be gathered right from its original creation?

## Existing solutions

In pre-computer days the normal method for gathering data was a common communications instrument, the human voice. Perhaps a shout across a room "Where is the order from Wondrous, it didn't get here?" or a call to a salesman "If you Wondrous people don't deliver, we'll take our business elsewhere" or a complex communicative decision "We don't have any blue widgets in stock but those customers down there always take red ones."

What single element can be applied to connect all these components? The simple instrument that sits on everybody's desk, the telephone. How has the problem been solved? It hasn't!

The solution starts with a telephone, a data transmission device capable of forwarding half a million bits of information during a three-minute connection. Connect these millions of phones to each other through a switching center—not through banks of unintelligent relays but through the use of a programmable digital computer. Add mass storage, a place to put things away for later use. Connect the entire assembly to a general purpose computer of the common commercial variety. Finally, add devices such as teletypewriters, scanners, badge readers, crt's and the rest described previously.

What can a system of this nature do? Data can be gathered up at the place it originates, transferred rapidly to a collection facility, stored until needed and then forwarded to a computer for processing. If the data is too raw for processing, it is an easy side connection to add a number of terminals with editors. Functionally the system is little more than a giant message gathering and switching system but, in terms of what it does, it is a far cry from the conventional systems in use today.

Use of a computer as a switch implies the logical capability for connecting many types of devices with widely varying characteristics, codes, transmission speeds, line disciplines, addressing, etc. The commonality of having a central system offers the power to set a single system standard, to make the six-bit character into an eight-bit byte or turn ASCII into EBCDIC. Use of a computer means that any terminal can talk to any other, that data can be held overnight or forwarded immediately, duplicated for safekeeping or locked up from prying eyes.

What sort of hardware can do the job outlined above? Perfectly ordinary, off-the-shelf hardware which exists today; nothing that has been described requires anything even remotely resembling a breakthrough. Western Electric builds and installs a general purpose computer, but they call it an Electronic Switching System (ESS) and stoutly deny it is a computer. IBM builds an automated PBX (2750/3750); they won't even admit it exists in the U.S. although one is reputed to be installed at an IBM Pennsylvania location. IT&T builds a similar device in Europe although little has been heard of it in the U.S.

Certainly the terminals are available, certainly the computers are available—what software problems exist? As far as can be seen, there are absolutely no problems; there is nothing more complex than the software used in today's message switching systems or the real-time data acquisition systems. Most of what has been described already exists; what is missing is the drive to get the job done.

The weakness in this solution is that a merger between two rather different technologies is required for multipurpose communications systems to be feasible. Telephony and computer science have had little in common to date. Telephone people think that edp types are wildly radical, heedless of specifications, totally undisciplined and unwilling to think past a year or two. Computer professionals think the telephone men are stodgy, technologically backward, bent on creating monopolies and always worrying about the future at the expense of the present.

If the cultural differences are severe, the political and governmental barriers are even stronger. The national telephone organizations have shown no hurry to participate in advanced systems. Although repeatedly prodded by users and such organizations as the OECD,[9] European PTT's are in no hurry to permit casual and easy interconnections. In the U.S., the great leap forward of Carterfone has been axed back to begrudging and worm-like progress by invention of the Data Access Arrangement, a device of questionable technical value but considerable importance in slowing down the interconnection of non-Bell equipment.

## The final word

The edp community, the group with a special interest, has shown little or no concern with data gathering. Getting the data in the door and paying for its acquisition have not been traditional edp responsibilities; only after data appears at the dp center does the edp manager get into the act in a budgetary and a technical sense.

However, top management is beginning to call for total systems, for true solutions beginning at the creation of the data. For the first time, edp managers are becoming aware that things are happening out there where the users live that may affect their empires. The first time that an edp manager gets stung with data acquisition costs, his eyes will be opened to the possibilities of the type of systems solution described in earlier sections of this paper.

Data gathering costs have been somebody else's problem. Until they become a total edp concern the problem of how best to find, collect, forward and store data will continue to be overlooked. If the problems were really looked at carefully and understood, it would be apparent that a good deal of money has been spent to buy a solution to little more than 20 or 25% of the problem, namely data entry. The remainder is still there awaiting a solution while clerks make marks on paper and users pay the bill. □

[9] Organization for Economic Cooperation and Development, an organization formed by European Foreign Ministers to promote many types of cooperative development.

**Shared-processor systems are now in use for long-distance transmission of data ready for entry at central computers**

# Remote Data Entry at Burlington Northern

by Harry H. Coolidge

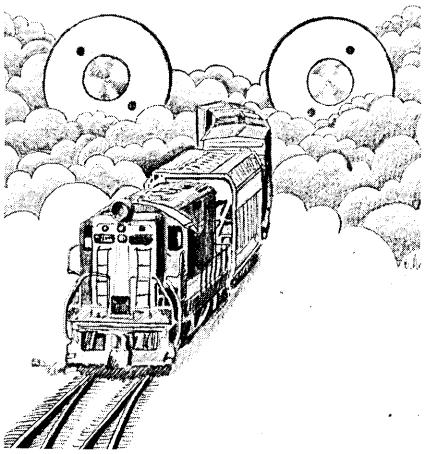
Burlington Northern, Inc., headquartered in St. Paul, Minn., is, in essence, a new corporation formed by the merger of four railroads: the Great Northern, Chicago Burlington & Quincy, the Northern Pacific, and the Spokane, Portland & Seattle. Each previously operated as a separate business with distinctive accounting, data processing, and data preparation systems.

Burlington's new geographic routes also presented major problems in consolidating operations. With major centers in Chicago, Omaha, Seattle, and Portland, Burlington faced not only the vast mileage problem but also the most severe winters annually faced by the U.S. These two problems compounded the normal data collection problems for payroll.

Increasing the complexity of the data entry problems of the Burlington Northern was that 12 different unions were involved, many with varying pay rates, as well as employee fringe benefits. Burlington's 45,000 employees are now paid every two weeks, with 50% of these employees paid from daily time cards.

The large number of employees, union situation, and Interstate Commerce Commission (ICC) regulations, combined with the scattered accounting offices along Burlington's 25,000 miles of track, made it necessary to evaluate some type of source data entry system to solve payroll and other applications.

During 1970, a thorough study was made of various methods of data entry and data communications. Results of this study indicated that the best method available was to utilize the key-to-disc concept. The study also determined that the key-to-disc system should be expandable to a data communications system with real-time source data entry to solve data entry problems at a remote site. Burlington



Northern believed that such a system could solve most of the data entry problems for the next three years.

Burlington Northern had previously used several data communication systems which included card readers to transmit data from punched cards originating in the field. The Northern Pacific and Great Northern were using Teletype, Univac DCT 2000s, and IBM 1050s transmitting cards from remote locations, and the CB&Q had Teletype and IBM 1050s in the field, again for data transmission. While this method solved the problem of getting data to St. Paul quickly, it arrived unvalidated. So, when errors in payroll data were detected, the headquarters staff had to call the outlying district office (or time data collection center, as it is now called), ask someone to look up the source document, repunch the card, and transmit the data again.

### Time-dependent

Railroads require a fast turnaround on most jobs, especially payroll, not only because of union time limits but also ICC regulations. With the remote accounting offices, a great deal of overtime was involved—10 p.m. was not an unusual time for the data transcription department to finish work. In most cases, however, the raw payroll source was physically transported to St. Paul—by railroad, mail, and company plane. Often the time cards were delayed because of weather.

Data transmission is no longer a problem after converting to the GCS System 2100. In January of 1971, the first two of six 2100s were installed, with the balance of the systems installed in late 1971 and 1972. Five 2100s are in St. Paul, two of which are dedicated solely to remote source data communication; three are assigned to batch operation, which includes car movements and customer accounting. The sixth GCS 2100 is located in Seattle, Wash., and processes west coast customer accounting.

Of the two systems dedicated to remote source data communication (payroll), data communication terminals (keyboard and crt display) are located in six remote sites:

Chicago, Ill.—nine terminals and

printer
Willmar, Minn.—seven terminals and printer
Seattle, Wash.—three terminals and printer
Whitefish, Mont.—six terminals and printer
Omaha, Neb.—five terminals and printer
Portland, Ore.—six terminals and printer

The 2100s for these source data communication terminals are in St. Paul and perform the function of a controller. There is no central work done on these controllers except from a supervisor's standpoint—controlling and scheduling work flow. The GCS 2100 allows terminals in the field to communicate directly with the controller in St. Paul. This solved the source data entry applications at the remote as well as the central site.

Each remote site also has a printer used as a means of communication with the headquarters system supervisor . . . that is, to instruct the remote site operators to begin or to stop sending data, or other instructions as necessary. A message batch is assigned and each remote site can enter or re-enter it with a message. The remote site operator gives a job a batch complete instruction; the supervisor, seeing the message batch complete, transfers the batch to the printer and/or tape. This also gives the remote sites hard-copy records of their transactions with the central site.

The source terminals are assigned to handle all payroll data entry for the district accounting offices. The sophistication of job handling at the remote site is the same as at the central data processing site. Edits give immediate verification of payroll data; once the data is written on disc, revision or edit correction may be made from the remote site. Special edit and check functions are performed, giving additional lead time in preparing payrolls, freeing the IBM 360 in central processing from error listing and balance checking.

Each of the district accounting offices had a number of keypunches. For example, Portland replaced its 10 keypunches and card reader terminals with six GCS 2100 terminals. Three payrolls are now being processed at the Portland remote site.

Although the data is entered remotely, payroll checks are written in St. Paul. Payrolls are now completed up to five days earlier with no overtime required. By taking advantage of System 2100's remote site capability, Burlington Northern has much greater control over its payroll jobs than previously.

The reporting of waybills, or freight revenue statistics, is another application which has been converted. These reports indicate if Burlington Northern is the receiving, shipping, or intermediate carrier. The resulting figures are sent to the ICC for freight accounting and other required information. The statistics are also used to report state taxes for data files for Burlington Northern management and for corporate planning purposes.

## Customer accounting

Customer accounting, another large application on the System 2100, is processed in St. Paul and Omaha, as well as in Seattle where a separate system with 16 terminals replaced 20 keypunches. The input data is keyed from various types of waybills and traffic reports. Customer accounting is now done much more efficiently than before, allowing Burlington Northern to reassign personnel to other production areas. The error listing was reduced about 80%, attributable mainly to the system's editing features and the fact that operators do not have to key from the same document several times. The 2100 has multiple formats so the operator keys data only once, and the system reformats it into several different formats. Previously, the data would have to be keypunched six or seven times.

Another control point in customer accounting is that the operator always works under a fixed format. The format is established and cannot be changed. With keypunching, an operator could alter the program card, placing the dollar amounts in different columns, which often resulted in incorrect invoices being issued to customers. And keypunch operators were also required to perform many functions manually which slowed the work and increased errors.

## Savings

Burlington Northern has been able to realize significant tangible and intangible savings with the GCS 2100 system. These include recognized savings available with key-to-disc systems, equipment rental savings, reduced operator costs, and reduced supply costs. Burlington Northern also estimates a $2.50 savings per error on items which would have to be recycled if they were detected by the 360. On one in-house system, the railroad found it had reduced the number of items which had previously been recycled by approximately 3,000 errors a month—from the work of just 16 operators. By correcting these errors at the source, a savings of $7,500 per month was realized on only one system.

In addition to these savings at the central site, there has been a reduction in cost and time at the remote areas. With the successful implementation of the source data entry terminals, Burlington Northern has been able to reduce equipment rental costs at the remote accounting offices and save payroll preparation time at the St. Paul headquarters.

Although Burlington Northern has incurred significant line costs (over $7,000 a month), these costs have been more than offset by the savings referred to above. However, the railroad has a microwave communications network operational, which will allow elimination of line costs as the remote sites are converted to the microwave network.

Now, almost three years after Burlington Northern management decided to implement source data entry and the subsequent decision to install GCS 2100s, we can again consider improving our data entry. Six systems are now being used with a total of 125 terminals; of these, 41 terminals are in use as source data terminals at remote sites.

Three major improvements in the system will be implemented in '73:

1. *Communications.* To reduce costs, our remote terminals will begin to be converted to the corporate microwave communication system.
2. *Teleprocessing.* The 2100s will be expanded to operate on-line with our 370s to provide teleprocessing, as well as on-line data inquiry from the 2100s while accessing 370 data bases.
3. *Operating system.* A new GCS 2100 operating system will be implemented providing better supervisory control, reducing downline tape handling and editing, and simplifying operator methods.

Data preparation is now an integral part of the Burlington Northern data processing system and can be pointed to with pride as one of the most advanced and efficient in the country. □

Mr. Coolidge is assistant director, data production, at Burlington Northern, Inc., and has been working in data processing since 1957. He was previously manager, office services and data processing, for Hoerner Waldorf Corp. He has a BA in business administration from the Univ. of Wisconsin and is a past president, Twin City Chapter, of the Society for Advancement of Management.

**Of the keypunch-replacement equipment now available, shared-processor key/disc systems are proving cost-effective in large volume applications such as this one**

# Before and After at Occidental's Medicare Administration

by Peter D. Mills

In the fall of 1970 Occidental Life Insurance Co. of California had ample reason to be satisfied with the way it was handling its Medicare Part B Supplemental claims under contract with the Social Security Administration.

Claims were being processed promptly at competitive costs. The quality of its services was generally recognized as high: each claim was subjected to a number of validation measures designed to assure its legitimacy, accuracy, and equity to the claimant. The company was successfully contributing its insurance expertise on a nonprofit basis to an important public program.

However, looking ahead we in Medicare Administration could see that some changes were necessary if we were to continue to have a cost-effective operation.

The volume of claims was rising steadily, due to the combined effects of increasing Medicare eligibles and a trend toward an increase in the types of benefits. And we found ourselves paying a premium price to meet these increased demands. The cost of outside keypunching and keyverifying needed to handle work overloads was rising at an unacceptable rate—from $15,000 a year in 1968 to $27,000 and $42,000 in 1969 and 1970.

To arrest this rather alarming trend and keep full management control over our operations we decided to do all our data conversion in house. However, our manpower projections showed that to do this would require an almost equally alarming growth in the number of keypunch operators—from a combined day and evening shift total of 60 in 1970 to 105, 127, 153, and 182 in successive years through 1974.

Tripling our staff in this way would, in turn, set off a chain reaction of other unwelcome consequences: more machines, more space problems, more recruiting problems, more training problems, and more tens of thousands of cards to handle every day.

The solution to our problem, we realized, was not more production, but more productivity per operator and machine. Our challenge was to improve our throughput without increasing staff. Since we felt we were performing with a high degree of effectiveness with our card-punching methods, our only alternative was to turn to an all-electronic system.

We explored various keypunch replacement systems, and in January, 1971, we installed a key-to-disc system to handle the overload of our keypunch operation and, at the same time, to evaluate the system in a real-life environment. Based on the very significant results of the evaluation, it was obvious that we should replace our card-punching system in normal production with a key-to-disc system.

## Justification for the change

In the real workaday world, many "reasons" come into play as suitable "justifications" for a management decision. Cost savings is surely one. But so are less tangible factors such as the manager's desire for control over his operation, employee morale and the general tone of the work environment, and a natural thrust toward finding that "better way" of doing things. No doubt all of these factors—and others, too—influenced our decision-making at Occidental's Medicare Administration.

In our case, the formal go/no-go decision to change was based on the following criteria:

1. Can we absorb work overloads formerly sent outside, and at a significant cost savings?
2. Can we handle normal production without increasing staff or floorspace?
3. Can the system continue to be cost-effective as it grows with our expanding workload?

For about a year prior to our final decision we had been exploring alternatives to our existing system, which used IBM 029 keypunches and 056 verifiers. Summarizing our evaluations:

1. Buffered keypunches were not acceptable because they did not eliminate punched card handling, and at the time of the investigation were not readily available.
2. Key-to-tape systems were not acceptable because of their pooling procedures; further, we did not feel that their verification methods would be satisfactory to us.
3. On-line crt data entry offered many attractive potentials for our applications, but would require considerable system changes that we were not ready to implement.

4. Optical character recognition (OCR) was excellent in theory but not yet versatile enough for our applications.

5. Computer-controlled key-to-disc offered the possibility of an easy transition to a more modern technology using our existing staff, supervision, facilities, and general workflow patterns. Importantly for us, this technology would not require any changes in any other areas of Medicare Administration.

After evaluating several key-to-disc manufacturers, we selected Computer Machinery Corp. (CMC), a nearby Santa Monica firm, for our evaluation test. All of our evaluation objectives were wrapped up in this proposition:

If, using eight CMC units over a three-month period, our productivity could be brought up to the level of 18,000 60-character records per day, we would be able to bring our overload work in house and save approximately $16,000 in service bureau costs. These levels of productivity and cost-effectiveness would amply justify changing over our entire data conversion operation.

The test results were affirmative, and over the next four weeks we replaced our keypunches and verifiers with CMC units (which they call Keystations).

## The conversion experience

As we went from the test and evaluation phase into full production with key-to-disc, we continued to have good reason to be pleased with our decision:

1. At the peak of our claims-handling "season" (January to March) the new system completely absorbed our work overload at a significant cost savings.

2. By the end of the third week of production usage of the new equipment, our operators were handling as many claims per hour as they had on the old equipment.

3. By the end of the fourth week of production operation, we had moved out all of the card-punching machines except two, which we kept for small irregular jobs.

4. After a year's experience, in two consecutive months we measured productivity gains of 49% and 43%, compared to the same months in the previous year.

5. Over the year, our output volume increased 40% without any increase in floor space.

Besides these measurable results of the changeover, we realized a number of intangible benefits—some of them hoped for, others coming as pleasant surprises:

1. Management control was enhanced.

2. Training problems were drastically reduced.

3. Personnel turnover was no longer a factor in management planning.

4. The work situation was transformed from a noisy machine-bound factory environment into a prestige office setting characterized by more attractive equipment, more interesting work routines, and even better personal grooming.

Of course, when you go to a key-to-disc system you have to deal with more than just the card-punching replacement units. A total system consists of a basic system plus various optional components. The equipment complement of our system was as follows:

*Basic system:*

Two CMC 9 KeyProcessing Systems, each including a supervisor's console with a built-in computer and magnetic tape unit, plus a freestanding magnetic disc unit, an ASR 33 teleprinter, and system software. Each system supports up to 32 Keystations.

*Options:*

Keystations with status and record position displays on built-in panels. A Keystation can be used for verifying as well as writing (punching) records. By the end of the first year we had installed 38 Keystations.

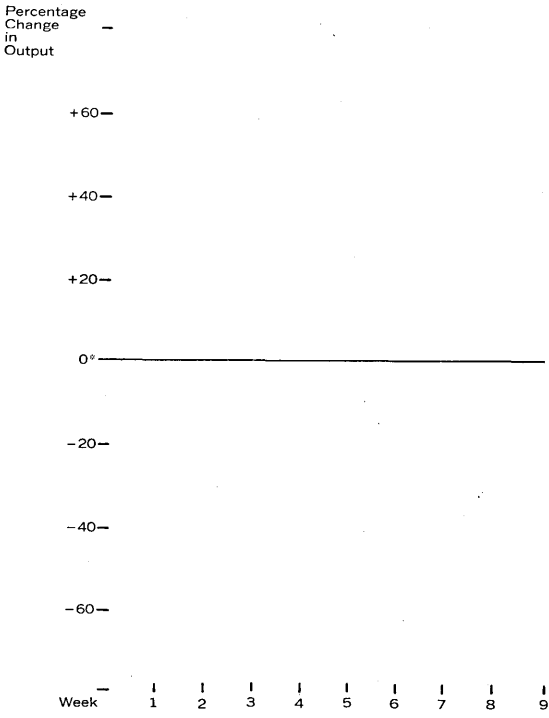
A duplex control unit, which permits us to connect any Keystation to either one of the two supervisor's consoles. Thus, when one console is down for preventive or corrective maintenance servicing, up to 32 Keystations can be plugged into the other console. Besides its obvious value as a redundant control capability, the duplexing arrangement allows us to shift work from one system to the other in order to adjust workflow.

Management report generators for analyzing shift activity and operator performance.

Before installation, our data conversion supervisor, Inell Browning, had spent many hours at CMC in formal training and informal "hands-on" sessions with the new system. Before any equipment arrived at Occidental, she understood the system. And she liked it. She saw it not only as a personal challenge, but also as an opportunity for career growth. I stress her involvement because I am convinced it was essential in the successful transition to the new methods.

Probably the main uncertainties in a changeover of the type we are discussing center on the learning curve. How long does it take to match the performance of the old system, and how long to realize the full potential of the new one?

Fig. 1 compares our productivity on the CMC system during the test and evaluation period with what we had




*Keypunch level: Average number of records keyed and verified per week (based on Dec. 1970 equivalent).

Fig. 1. Learning curve on Key Processing System

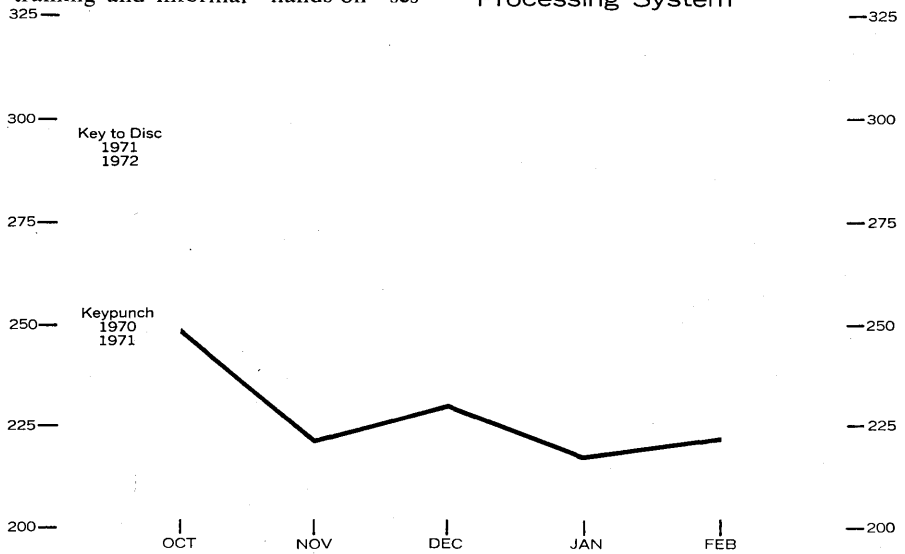



Fig. 2. Productivity comparisons (number of claim records processed per man hour)

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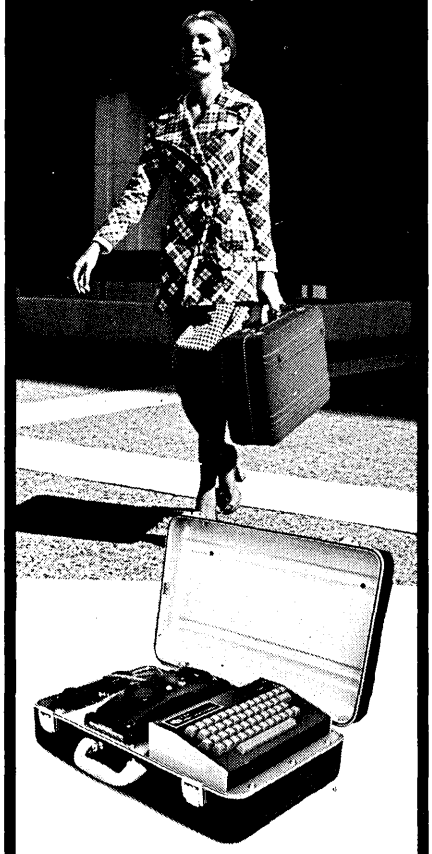

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CIRCLE 101 ON READER CARD

## Before and After . . .

been doing on the card-punching equipment. For these comparisons we used operators with a representative range of skills. Some were new employees with no more than high school typing experience. Others were relatively inexperienced keypunch operators, and still others were skilled operators. Performance under the old system had remained constant for many months; this provides our "0" reference level. We went from −64% to −1% in the first three weeks. By the fifth week we had hit a level of +34%. At the end of the twelfth month (not shown on the graph) the comparable figure was 49%.

We installed the new equipment in four phases, the first of which was the test and evaluation period. Thereafter, we phased in Keystations and removed keypunches and verifiers. By the end of the fourth week we had replaced 23 keypunches and 17 verifiers with 30 Keystations. By the end of the sixth week all training was completed. Concurrently, we reduced our staff, including day and night shifts, from 73 to 53. Fortunately, there were no personnel problems because the planned phase-over took into consideration normal attrition and intracompany transfers.

### Cost-effectiveness

The goal of Occidental's changeover from a card-punching to a KeyProcessing System was to reduce the cost of converting hand-written forms filled out by claims examiners to magnetic tape records ready for processing on our IBM 360/65.

During the first full year of experience with the new system, our conversion cost went from 27 to 19 cents per claim, a 30% drop.

Productivity increases account for most (25%) of those savings. The remaining 5% came from eliminating the costs of punched cards and card-to-tape conversion, which in one month amounted to $2,200. Fig. 2 plots the productivity differences between the old and new systems over comparable five-month periods.

While it is intuitively obvious that higher productivity will tend to bring down the cost of production, the *net* benefit gained depends on the *cost* of achieving the higher productivity. In key-to-disc systems this cost depends, in turn, on the specific system configuration and its utilization.

In either keypunching or KeyProcessing Systems, personnel costs far outweigh equipment costs.

In analyzing our two-shift KeyProcessing System, the monthly cost of the basic system and the system options can be apportioned among the Keystations as follows:

| | |
|---|---|
| Keystations and operators | $ 950 |
| Prorated system costs (38 Keystations) | $ 94 |
| Total per-unit costs for Key-Processing | $1044 |
| Total per-unit costs for key-punching | $ 857 |

The $187 difference between the two costs ($1044 less $857) gives a 22% per-station cost increase which had to be offset by higher productivity. In January and February of 1972, a year after the beginning of the trial phase, we measured an average 46% increase in productivity, giving us a net cost savings of 24%. When we add the 5% gain due to the elimination of cards and card-to-tape conversion, we have a figure (29%) which agrees closely with the directly measured cost-per-claim reduction of 30%.

In "bottom line" dollars-and-cents terms this reduction meant that our costs in the last six months of 1971 were $56,029 less than they would have been under the old system. Incidentally, this amount was almost twice the potential savings that had been anticipated in the CMC proposal.

The foregoing approach to cost analysis points up an interesting feature of key-to-disc systems, i.e., that the per-station cost goes down as the system is loaded toward capacity. With our two-system configuration and utilization, the per-station cost differential will have naturally declined by about 5% when we add our 64th Keystation, the maximum that two basic systems will support.

So, even without any further gains in productivity, we look forward to continuing cost reductions as our workload increases and our system grows. □

Mr. Mills has been associate Medicare administrator at Occidental Life Insurance Co. of America since January, 1970, responsible for the accounting and office services subdivision. He has been at Occidental since 1959 and has been associated with Medicare since 1966, when he began working on the operational and system development phase. He was raised and educated in England.

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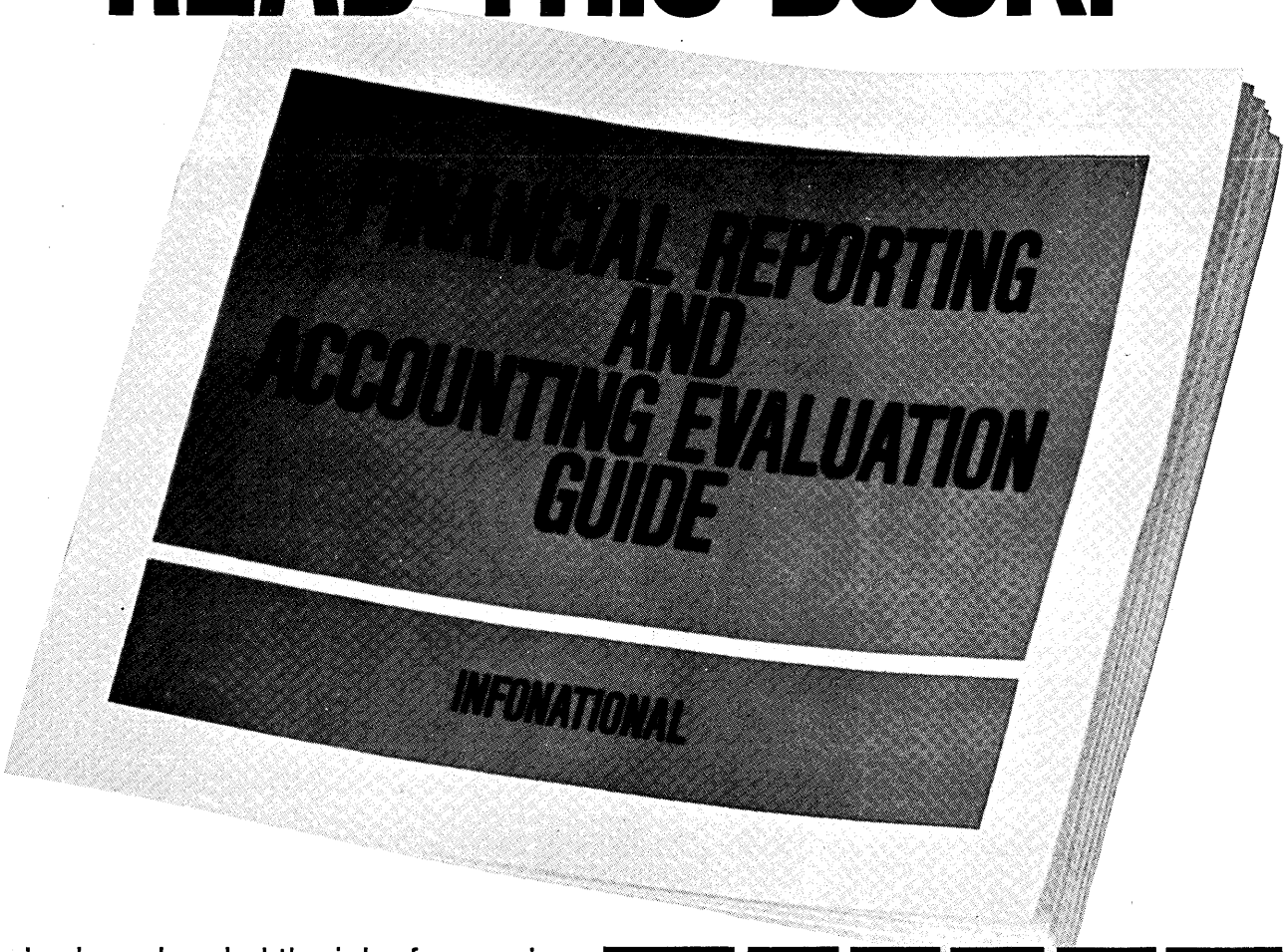


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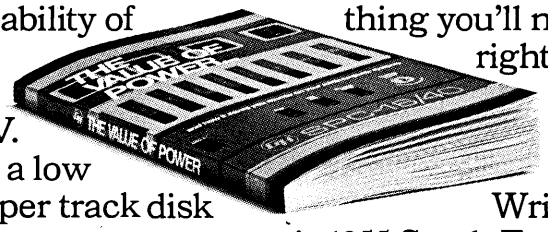



# General Automation



CIRCLE 21 ON READER CARD

**A quick review of current computer activities in Japan, including Hitachi's new large-scale virtual memory machine**

# Japan Revisited

by Edward K. Yasaki, San Francisco Bureau Manager

After a two-year absence, a revisiting journalist finds Tokyo to be even more congested, more expensive, and doubly thick with pollution, both from noise and smog. Too closely resembling the West, there's a bustling feeling that belies the fact the nation has only begun to pull out of a two-year business recession. Judging by the patronage at overpriced bars, restaurants, and nightclubs, one would assume the country was enjoying the exhilaration of boom times when, in actuality, the economic growth rate has been curbed considerably. People are talking now of a rise in the gross national product, after subtracting for inflation, of a "mere" 10% a year for the next few bleak years.

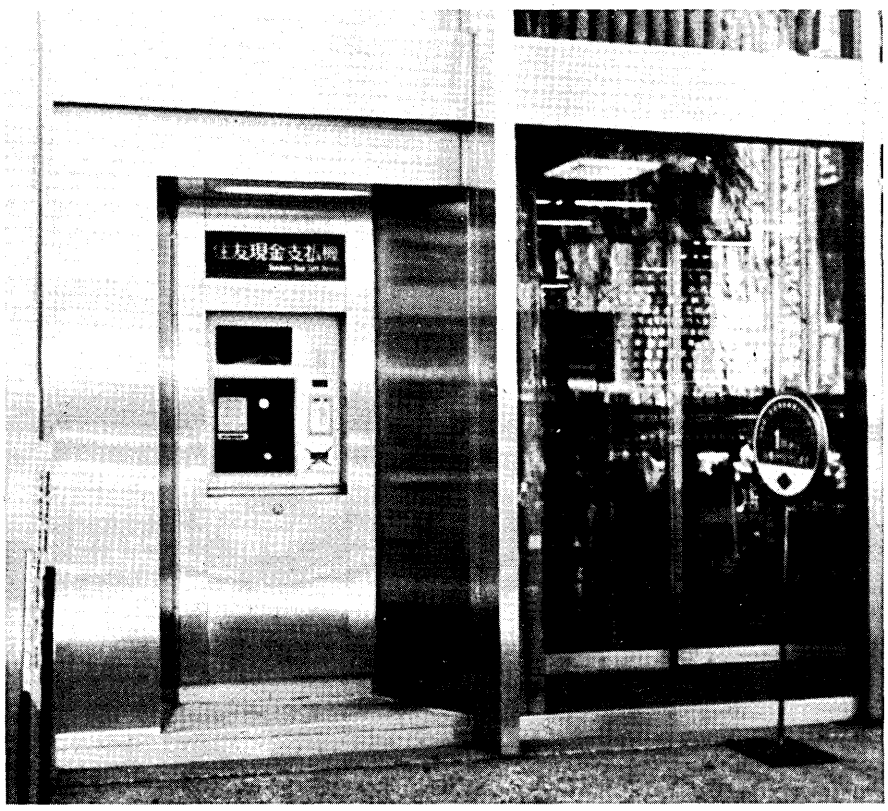
The contrast can be seen in computer shipment figures of Japanese mainframe manufacturers over the last several years. Shipments during fiscal 1968, which ended March 31, 1969, were up 78% over the previous year. For the following 12-month period, they were up almost 34%, jumping another 62% during fiscal '70, but increasing by only 4.3% during the last full year. This does not indicate a saturated market, however, but rather is said to stem from users' desires to wait for the 3.5 or 3.75 generation, a status ascribed to IBM's 370s. Now that it's been blessed by IBM, virtual memory will probably be a feature of a number of new computers from the likes of Fujitsu, Hitachi, and Nippon Electric.

Facilities management is still a new concept there, one that certainly has not particularly caught the people's fancy. But Tokyo-based Computer Applications Co., perhaps that country's second largest software house, has entered the FM business, adding some unusual twists that probably would work only in Japan. According to CAC president Shigeru Okubo, the FM company does not hire experienced personnel except for those in the management ranks. Instead of taking on the computer center's dp staff, it recruits high school and college graduates from the nation's hinterlands and provides a three-month training in social and business courtesies, as well as the technical aspects of the work. The dp staff with the company that no longer has its own computer center, unlike those in the U.S., is merely dispersed within the parent organization wherever the individual's experience can best be applied. Thus, the paternalistic system of lifetime employment is not upset.

## Customers part owners

Recruiting and training expenses are paid by the client companies, which must become stockholders in the FM company, Japan Systems Services Ltd. The minimum equity interest is 5%; the maximum is 10%. These customer/shareholders then receive quarterly financial statements, enabling them to see both that the price they pay for the service is reasonable and that their company is financially sound. As of late last year, Mr. Okubo had signed up four customers, all of them outfits that CAC had performed work for in the past.

CAC, which also has a subsidiary engaged in urban analysis and such things as air pollution analysis models, sees a big future in software packages. Users are gradually accepting this concept, says Okubo, who figures the company would have Informatics'



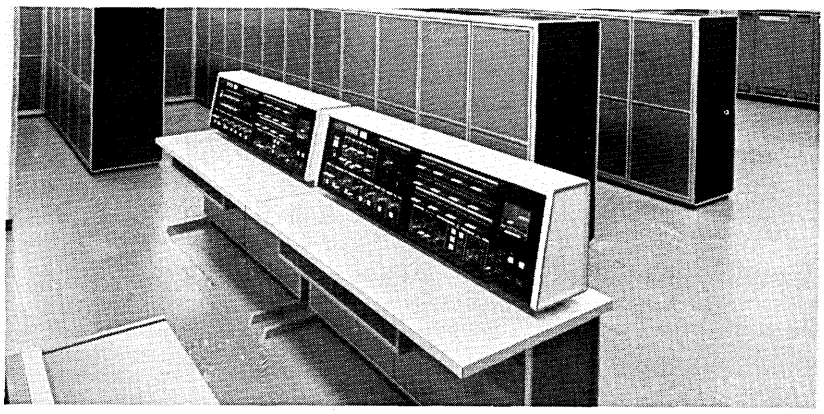
This cash dispenser, made by Omron Tateishi, is used by the Sumitomo Bank. Mounted on an outside wall, it allows customer cash withdrawals at any time of the day or night.

Mark IV file management system installed at the sites of 10 customers by the end of '72 and an additional 20 during '73. His firm also has an arrangement with Carus AG in London to sell its packages in Japan. Included are a sort package, a spooling program, and one for project analysis and control.

Evident in the policies of Okubo's Japan Systems Services Ltd. is a willingness to undertake the expense of recruiting and training and adding to the pool of skilled labor, a practice that certainly benefits the industry and the nation. But altruism aside, it also enables the company to hire employees at a lower pay scale and to train them as they like. Still, nationally, industry wages continue to rise annually at a 15-18% rate, no different from the situation two years ago.

As always, job-hopping remains anathema to most people, although it appears to occur more among programmers. Yokohama-based Com-Stute Inc., which performs custom programming and software conversion services for clients in both Japan and the U.S., has a programmer with excellent credentials (including graduation from Tokyo University, which is given a four-star rating in resumes) who left his former company because it insisted on promoting him to a management position despite his stated desire to continue programming. Lately, one observer noted, there has been a noticeable willingness among programmers and those in executive posts to switch jobs. Allied with this trend, if it can be called that, is a recent interest in forming venture capital groups, but such moves to fund the establishment of new companies are not really perceptible yet.

By contrast, standing out prominently like a 50-watt wait light on a console, is an increasing militancy among some labor unions. In the past, Japanese unions—which are organized along company lines, rather than by craft—have been only for show. They have called infrequent "strikes" that last for the duration, say, of the lunch hour. In such a setting, one is surprised to learn that a branch in Tokyo of an American bank was actually closed down temporarily by its union of employees. And the bankruptcy of Nippon Software Co., formerly the nation's largest, purportedly can be blamed mainly on the misdirected militancy of its union. Programmers chose to strike against the company while working at the facilities of client firms, not only delaying completion of contracts, which is sin enough, but also openly defying management in full view of its customers. Such indiscretions, especially serious in Japan, led to the loss of repeat business. Another factor leading to the demise of Nippon Software was the completion of the government-financed large-scale computer, most of the software for which was this company's responsibility. This contract had represented about half the company's revenues.



Only last July, the Japanese government ended its funding of a project designed to upgrade the nation's computer technology. It spent 10 billion yen (some $33 million) over a six-year period, and one of the products was a large-scale computer. Research and development of the mainframe was performed by Hitachi Ltd., which was also responsible for the hardware-dependent software. But the operating system and the FORTRAN, COBOL, and PL/I compilers were produced by the now-defunct Nippon Software. Now, six months later, Hitachi has announced its own large-scale processor, the Model 8800. In fact, it reportedly has delivered two of them to Tokyo University (see photo). The 8800 is said to have "a maximum performance of 5 million instructions per second and a maximum memory capacity of 8 megabytes." Other features include 32K bytes of high-speed cache memory, the use of virtual memory with both segmentation and paging, and a single operating system handling up to eight main memory units, four processors, and eight I/O processors. □

### Bypassing checks

Japan has long been considered a checkless society, very few people having a checking account. Gas and electric bills, at least in metropolitan areas, are nonexistent. Utility companies send reels of mag tape to banks for automatic payment. And the movement now is toward the automatic deposit of paychecks in the bank of the employee's choice. Since banks have their own on-line systems, the individual can withdraw funds from any branch of his bank. To facilitate this further, they are beginning to install cash dispensers at each branch, making it possible for the depositor to withdraw funds at any time of the day. The large Sumitomo Bank, for example, which has some 180 branches and 2500 terminals on-line to huge NCR systems in both Tokyo and Osaka, has opted for cash dispensers from Omron Tateishi. Other makers of such devices are Fujitsu and Oki. It is Fujitsu that recently contracted to supply almost $5 million worth of on-line cash dispensers to LeFebure Corp. of Cedar Rapids, Iowa, a subsidiary of Walter Kidde & Co. More than 300 units are to be supplied over a three-year period.

Banks such as Sumitomo, which is the nation's third largest, use leased phone lines for data communications. By law, a company leasing such a circuit had not been allowed to connect to a third party, which meant that only the phone company could sell a remote-access service. But the government has acceded to pressures, and the lines are now available to others wishing to get into the service business. There are four speeds available in the leased lines, now called special communication circuits: 50, 200, 1200, and 2400 baud. Plans are to extend this upward. The dial-up circuits function at up to 1200 baud.

Along with this change, unfortunately, one of the country's last remaining bargains becomes less so. A local phone call that formerly cost a mere 7 yen (less than 3 cents), regardless of the length of the conversation, is now restricted to three minutes for that price. And it applies to calls within a radius of some 18 miles.

But considering that cab fares in Tokyo are on a par with those in the U.S., that dinner prices are also about the same, if not higher, and bar bills easily exceed those here, the cost of a phone call in Japan continues to be very low. Anyone who sees Japan on $5 a day just has to stay out of Tokyo. The farther the better. □

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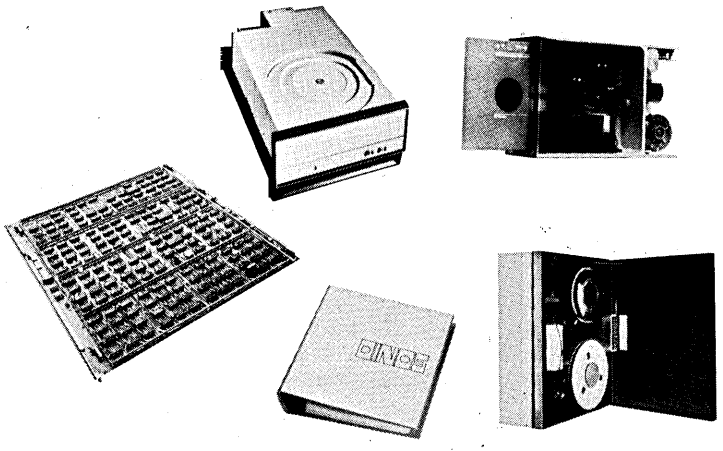

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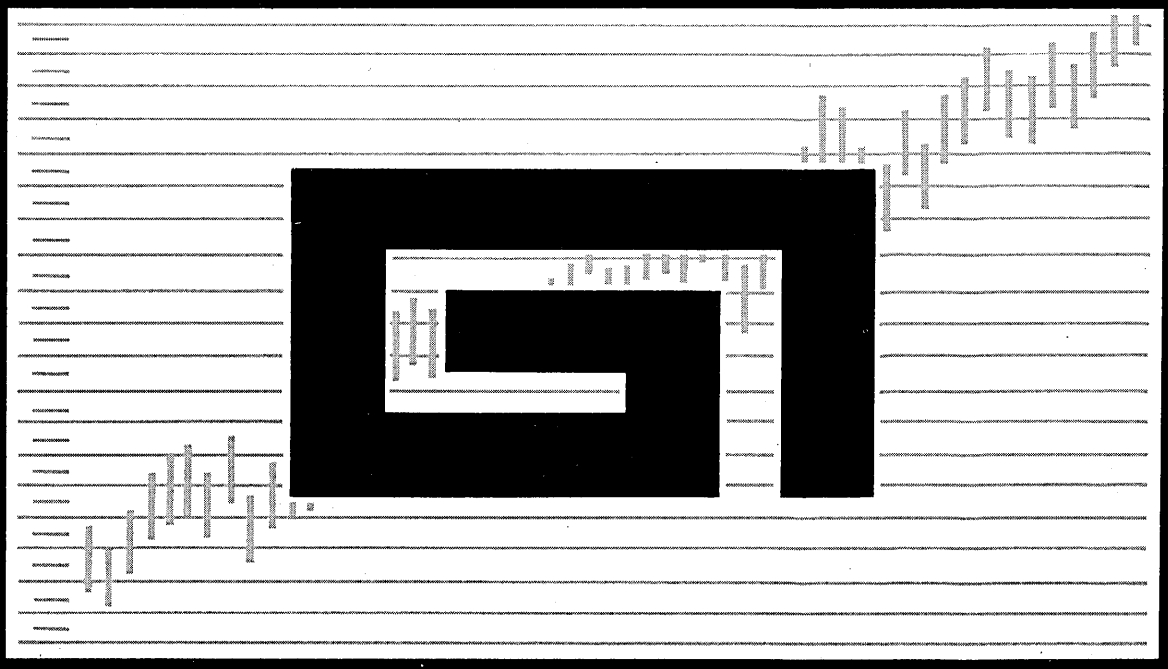
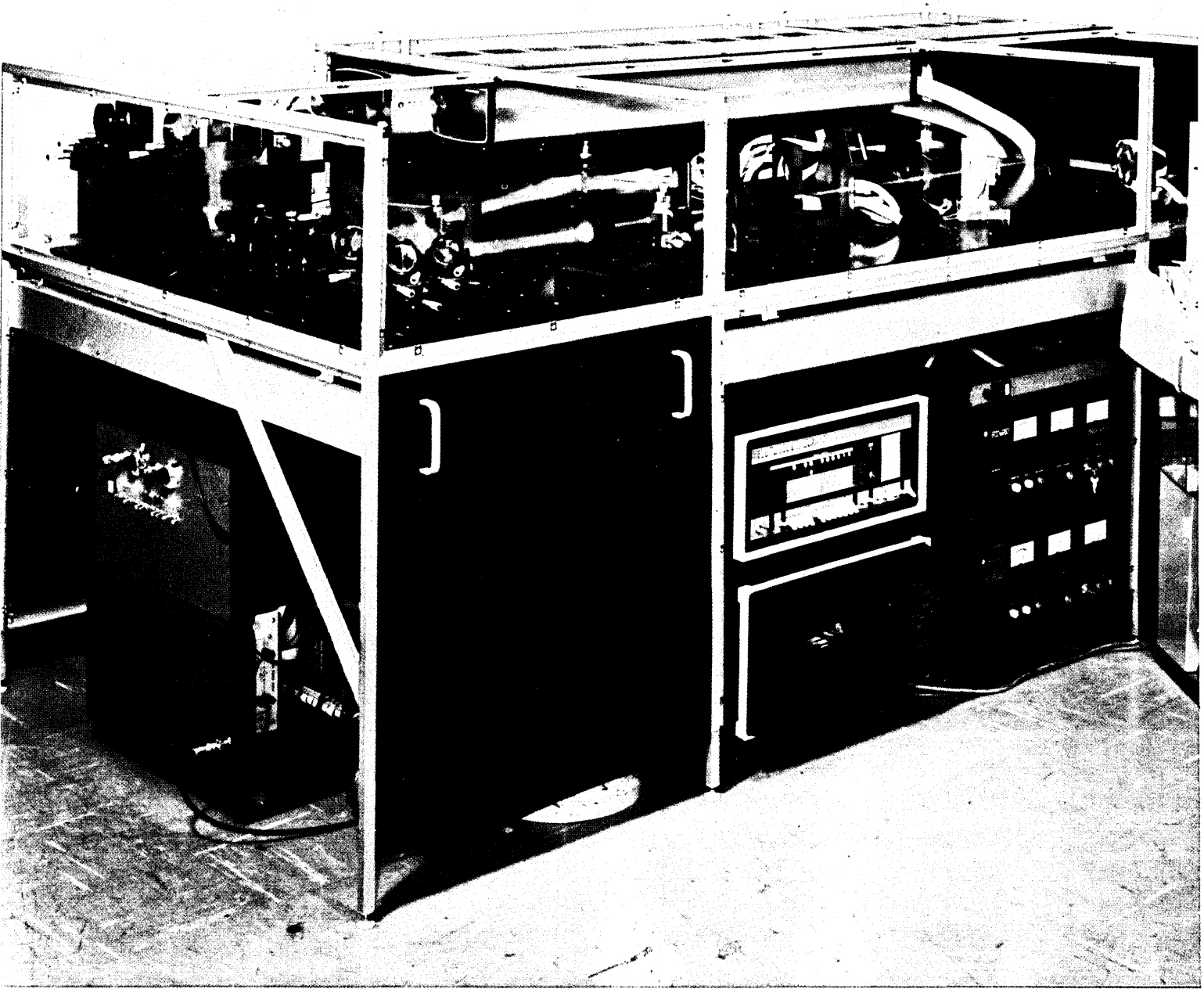


CIRCLE 19 ON READER CARD

An operational holographic memory delivered to NASA by Harris-Intertype may be the forerunner of faster, lighter, cheaper mass storage

# A Read/Write Optical Memory



# System

by Michael W. Cashman, Products Editor

Somewhere between the second and third generation of computers, on-line information storage requirements started to go up dramatically. The typical dp shop today stores hundreds of times as much information in data bases as it did 10 years ago, and processes it with operating systems which would have overflowed the largest memories on second-generation computers. With more—and more complex—applications continually being implemented it's likely that peripheral storage needs will continue to increase.

But computer rooms are already bulging with oversized, noisy, power-hungry (in an electrical sense), electromechanical peripheral storage devices. It is clear that some sort of technological relief will be needed before on-line storage requirements increase another tenfold. Scientists have told us for years that optical techniques might be used in large, fast, and relatively inexpensive storage devices, but to date there hasn't been much to show in the way of "lightware."

## Disc and drum alternatives

All that seems to be changing, however. With notable modesty, a subsidiary of Harris-Intertype Corp. has quietly delivered a random-access, read/write holographic memory to NASA's Marshall Space Flight Center. This is a significant development for a number of reasons, but here are two. It's the first such system we know of *to be delivered,* and its current operational characteristics warrant its consideration for certain applications in the near future. The developer, the Harris Electro-Optics Center of Radiation, believes that continued work will almost certainly lead to a line of replacement products for contemporary disc and drum peripherals later this decade.

The mass storage system, in its present configuration, is considered by NASA and the supplier as a preliminary stage in the development of a more advanced system—one that will store a trillion bits and be small and light enough for use aboard an orbiting space station. The memory of the delivered system can be used as 400,000 bits of dynamic storage, arranged in a 5x5 matrix of 25 unique files, or as 13 million bits of archival storage. A 20x20 matrix of dynamic memory is under construction. Basically, information is stored in the memory by modulating electrical pulses onto a light beam, creating holographic representation of the data, and storing it on a special material. To retrieve the information, the process is reversed. In order to alter one single bit in the file, the file's entire "picture" must be recreated.

To describe the speed of the memory it is necessary to describe the operation in a little greater detail. To deflect the light to the desired file (analogous to the access time of a conventional moving-head disc unit) currently requires approximately 4 usec. The contents of the file, 16K bits, can then be transferred in approximately 1.6 msec, or a data rate of 10 megabits. To make the medium receptive to recording currently requires several seconds; however, recent laboratory developments have brought this time down somewhere into the millisecond range.

## Performance comparison

To put the performance figures of the mass storage memory in its current level of development into perspective, it is useful to compare it to a contemporary electromechanical device. The IBM 3330 moving-head disc storage subsystem is a highly developed peripheral capable of storing 800 million bytes (roughly 6.4 billion bits), accessing them on the average in 30 msec, and transferring them at 806 kilobytes/second. It can be seen that

## Technical Description

The major system components shown in the diagram are the lasers, the acousto-optical beam deflector, the block data composer, the recording material, and the photodetector array. The electronics needed to drive, synchronize and control these components are not shown. The PDP-8 minicomputer in the preceding photograph is not an integral part of the system. It's used to monitor memory performance.

Although two laser beams appear in the photo and system layout, only one is used for the dynamic storage. (The reason for the two will be explained later.) The purpose of components such as the collimating assemblies, the $\lambda/2$ plate, shutters, the electro-optic modulator, beam height adjuster, glan air prism, achromatizing subassembly, fresnel rhomb, and other devices on the system layout is to shape, guide, split, and in general control the movement of light between the data-manipulating components of the system.

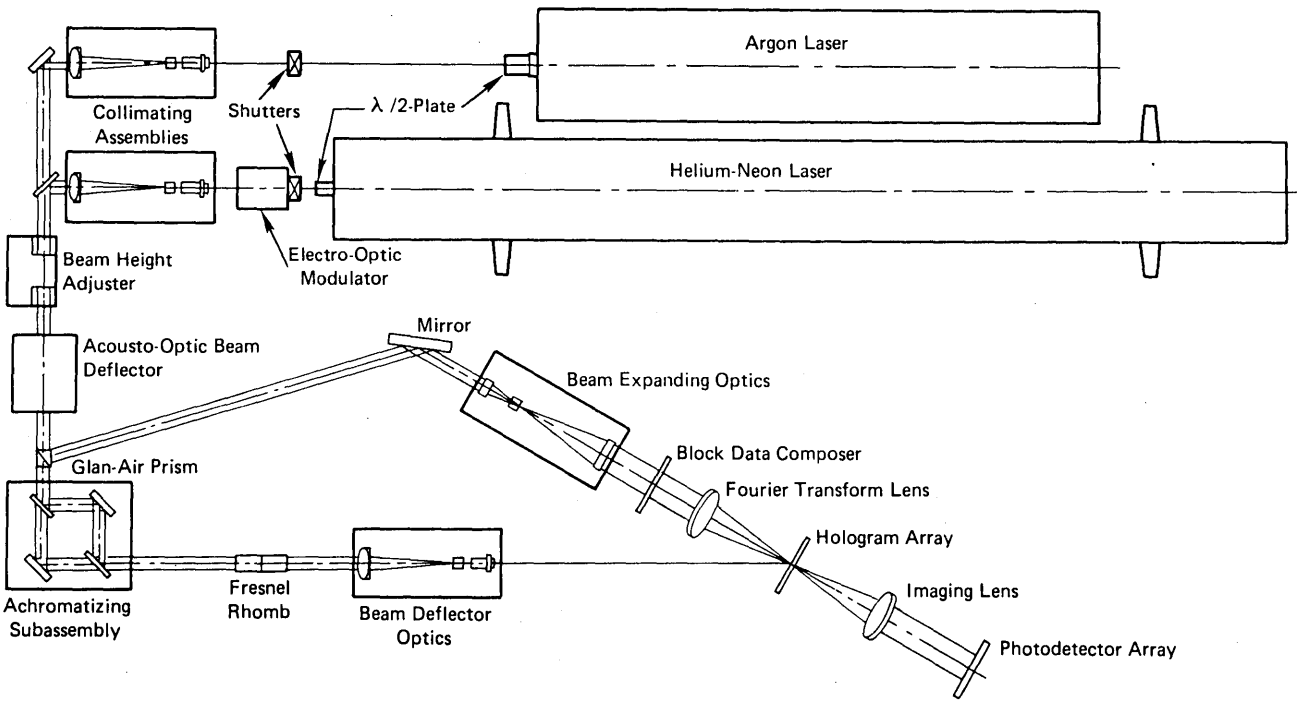
Information enters the memory serially through a modem or teleprinter, where it is loaded into the block data composer. This component consists of a 128x128-point array of ferroelectric ceramic material that converts the electrical pulses into light, each point in the 16K point matrix representing one data bit. The block data composer can accommodate input rates up to one megabit, meaning that it could be attached to a computer—which NASA intends to do.

To write the memory, the acousto-optic beam deflector is commanded to deflect the light beam to a selected portion of the hologram. This takes about 4 usec. The contents of the block data composer are then exposed to the laser beam, with the information being modulated onto the beam. The beam then passes through a lens, creating a Fourier transform of the information. The image falls onto the recording material, and a hologram is created at this point by the intersection of the light coming through the beam deflector (the reference beam) and the beam of light carrying information from the block data composer.

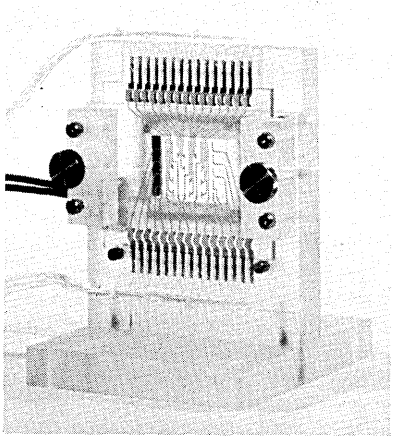
To read information from the hologram, a single laser beam is used. The acousto-optic beam deflector is again aimed at a selected portion of the hologram matrix. The beam passes through the holographic material and reconstructs the stored information on the photodetector array located behind it. Under program control the data image is converted back into digital form. The time required to transfer the 16K-bit image from the hologram onto the photodetector array and transfer the data out of the array is approximately 1.6 msec, with a data rate of 10 megabits.

In order to describe the erase process it is necessary to describe the recording material. The four-level medium has a transparent glass substrate. On it is deposited a thin coating of a selected electrode structure, either chrome/gold or tin oxide. Atop this layer is placed a layer of photoconductive material. The top layer is a thermoplastic that softens at a given temperature. This sandwich section is approximately two inches square and is divided into 25 segments (a 5x5 matrix). Each of these segments holds the entire content of the block data composer, yielding a dynamic memory capacity of 409,600 bits. A memory plane under construction contains 400 segments (a 20x20 matrix) for a dynamic storage of 6.5 megabits.

To make the material receptive to recording, a positive electrical charge is placed on the top layer. On the unit NASA has, this requires several seconds. However, Radiation has developed a new technique that brings this time down into the millisecond region, enormously enhancing the practicability of the system. The tin oxide layer on the substrate has a negative electrical charge. The laser beam carrying the information from the block data composer, and the interference



(reference) beam are then both flashed on the recording material. The top layer heats to approximately 70°C, whereupon it softens. The positive charges atop the thermoplastic material tend to push it toward the negatively charged lower material, deforming the top layer into the Fourier transform of the



The heart of the memory is a two-inch square section of transparent recording material capable of storing 409,600 bits of dynamic storage, or 13 megabits of read-only storage.

information image. To erase the information, the material is heated to a higher temperature, allowing the charges to dissipate and surface tension returns the surface to its original state. The current material can repeat the read/write/erase cycle several thousand times before it must be replaced.

Different types of lasers have unique light frequencies, and the reason that both an argon and helium-neon laser are shown is that in the read-only mode two holograms are contained at each of 400 (20x20 matrix) locations. Two unique light frequencies are used to recover the data, giving a read-only capacity of 13 megabits. Improvements in recording materials may one day make it possible to store many information files on a common portion of the recording medium. Materials having this property are called thick-phase materials, and they already work in the laboratory, so it may not be much longer until multiple laser frequencies can be used as another way in which to expand the memory's capacity. □

## A Read/Write Optical Memory System

the holographic memory, though having a vastly inferior capacity, has access times and transfer rates considerably faster than the 3330. There don't seem to be any physical laws that must be breached to expand Radiation's memory capacity to the trillion-bit level, which is considerably more than the 3330's. And it should be pointed out that the total sum of money expended on the laser memory to bring it to this point in its development is approximately $500K—little more than the cost of a single 3330 disc system. While it is hard to speculate what the cost of holographic storage devices will be when they appear, a conservative estimate on the part of Radiation places the cost per bit competitive with what the cost per bit for disc and drum units will be when the holographic products are available.

### What the future holds

There is, to be sure, much work—and frustration—ahead in learning how to effectively use something as radically different as this mass memory. For example, there are now problems coming up with a reliable block data composer (see technical description). More research must be done on storage materials; the current medium can be used through only several thousand read/write/erase cycles before it must be replaced. And the memory hasn't been hooked up to a computer yet, though the interface that will make that possible is under development. Still, the Ann Arbor, Mich., laboratory continues to find solutions to the technical problems encountered. Both Radiation and NASA are cautiously optimistic about the product. That's significant in NASA's case, for though its budget continues to be a prime target for administration cuts, it feels the memory project to be important enough to continue supporting it.

Here are two more reasons we believe that this development is a very significant one. Some form of optical storage will doubtless be used on future computers, and it's just possible that this memory will serve as the model for them. Perhaps most significant of all, the development comes from a firm whose primary expertise is not in computers, but rather in optics. This suggests that future computer vendors may well be firms like Kodak, Polaroid, or Harris-Intertype Corp. □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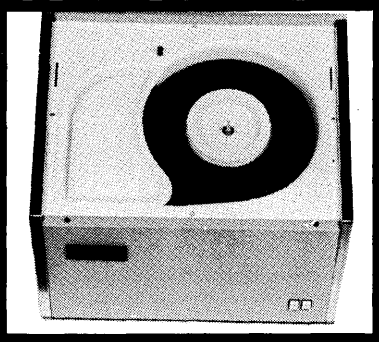

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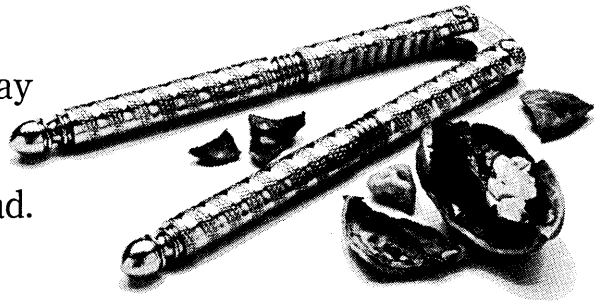

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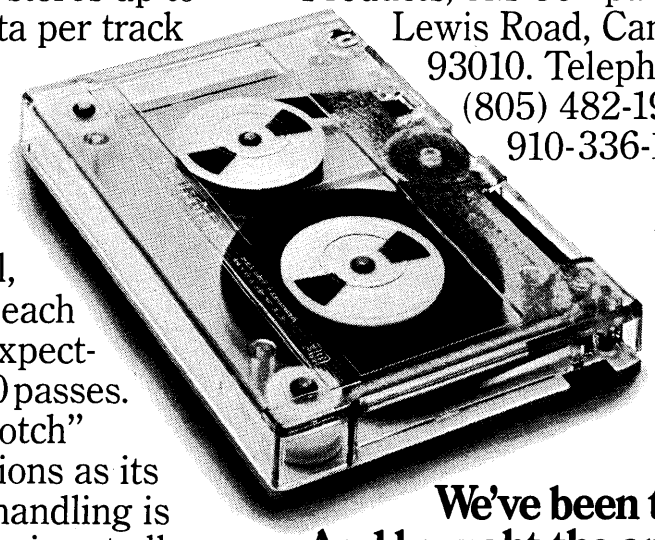

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# Long Live the Data Administrator

by R. C. Kurz

Take heart, computer people! You won't need to change professions, give up your challenging work, or abdicate your electronic throne of mysticism. Management, in all probability, is about to do it to itself again.

Remember those good days when your employer said, "I don't care how you do it . . . Just get it done!"?

Remember when just the mention of "nanoseconds," LSI, or "real-time" was met with an uncomfortable squirm of bewilderment and a "Well, you boys work it out somehow by the stockholders' meeting."?

Do you software implementors remember when the local branch would call with, "I've got 200 FORTRAN programs to convert by this afternoon. It means $7 million to the company."?

In just a short time, my friend, that same crowd—who insisted upon being mystified in lieu of learning, who listened to the first five minutes of your presentation before leaving the meeting, and who then persisted in misrepresenting you, your work, and your ideas to the corporation and to its customers—will start to commit the same sins again. The names will change, but the story will be strangely familiar.

The era of Data Base, Integrated File Structures and Data Administration is upon you. Committees, ad hoc groups, task forces, and individuals are busy in-house, outside, intercompany and internationally describing and building a bag of tools to organize data "any way you want it." Properly utilized these tools will, they say, eliminate redundancy and enhance the direct access of precisely the information you want, the way you want it.

Already terms spawned from this research are bandied about by corporation presidents, vice presidents, controllers and university professors. Just as in the 1950s and early '60s no two of these individuals mean the same thing when they use the terms, but whatever they mean, they agree it is vital. Boardroom conversations bristle with "pointers," clank with "chains" and are thoroughly landscaped with "trees" of diverse orientation.

Current magazine articles and management opinions would send you off in search of a new "black art" or "cottage craft." They warn:

"You're a dying breed . . ."

". . . and programmers will be like mailboys . . ."

"We don't plan to have any programmers."

". . . don't study computer science, but . . ."

They all fail, however, to describe the new high priest, the new craftsman, the owner record of their corporate information set . . . the Data Administrator.

To understand how he will come about, you must peer into the near future at an actual user of the concepts, the A&H Fletzing Corp.

A&H is a relatively small organization of only two or three hundred employees, most of whom are manufacturing types. They have built a sound reputation throughout the Midwest primarily for their ability to fletz ruggles—both the straight and the warped ruggle.

About 20 years ago, Adam Rock, then president and board chairman of A&H, transformed the company into the most forward-looking, modern ruggle-fletzing organization in the country. A&H actually sought to be, as Rock used to put it, ". . . on the leading edge." A&H, under Rock's leadership, switched completely to COBOL in 1959, invented and implemented their own scientific programming language and compiler in 1961, and applied random access techniques to their three-record VIP file very early on.

Simon Stone, current president of A&H, inherited the helm after Rock succumbed to an inexplicable but violent attack of peptic ulcers seriously complicated by a nasty fall from his ninth floor office suite. Mr. Stone vowed, at that time, to maintain A&H's pioneering posture despite the obscene caricatures of it circulated at the last stockholders' meeting.

In keeping with his promise, Stone, upon hearing of an integrated file environment as a means of purging redundancy from his interactive management information system—and not even listening when told that he didn't have an interactive system—decreed that A&H would again assume its traditional position, this time by calling in the data base boys. A few top level meetings, a cocktail party, and a photograph of Stone signing a contract were all it took to cast the die.

The 16K Glomfeltz mainframe would be replaced by a one-million-byte Model 9 with a swapping drum, a half dozen or so disc units and lots of crt's for inquiring about things. Most of the programming staff could be phased out since the high-level inquiry language provided with the Glomfeltz 9 system was to be used by management, not programmers. A few technicians would be retained to look after the chains, pointers, trees, bushes and whatever else was needed to keep the data base intact; but essentially, as Stone himself put it, "At last, management has regained control of its own information."

Installation was completed with customary Glomfeltz ease. Engineers buzzed in and out of A&H for a few weeks and soon Mr. Stone found himself with his very own crt right there in his office. He learned to demonstrate the efficiency of his new integrated environment by inquiring about his own social security number and his wife's maiden name. He did so with proud fascination each time any visitor would stop by. They were awestruck.

Some months had passed before Stone, in the midst of an impromptu demonstration before one of the ruggle suppliers, chose to ask the system to display his current job assignment in addition to his now standard inquiries.

"No relationship" was the response. "I'll get the boys from data processing up here to explain that. Must be a bug," he thought. "Better yet, I'll go down there myself. I haven't seen the place since the cocktail party after we signed the contract with Glomfeltz."

"Data Processing isn't here any more, Mr. Stone," answered the receptionist on the third floor. "They moved into the old warehouse we used to store unfletzed ruggles during the Vietnam War."

Mr. Stone, unsettled by the unpublicized relocation, made his way over to the once-abandoned warehouse. Sure enough, there was a recently painted sign, "Data Administration—Building #1." The place had been spruced up some, painted lavender in fact . . . and the freshly resurfaced parking lot appeared to have more than the normal distribution of Porsches, Corvettes, and trail bikes of varied national origin.

Entering, he was greeted by a lovely miniskirted thing replete with beads and headband. "Hey, Mr. Stone, what brings you here?" She had recognized him from his picture on the front page of "Up the Ruggle-fletzer," the union newspaper.

"A 'no relationship' message on my crt," he replied somewhat shakily.

"Oh, then you'll want to talk to the guru," she giggled. "His real name is Onan Ramesh, but we call him 'guru'. He and his groups are charged with effecting data relationships in the corporate information structure, you understand."

"His groups?" Stone asked.

"Yes that's why we had to move over here. This place is really very nice, but the new buildings will be even lovelier."

"New buildings?" Stone began to pale.

"Sure, the Data Administration Complex. Haven't you checked the Organization Structure Manual lately? Shame on you, Mr. Stone." The girl unfolded a neatly printed chart.

She continued, "Each Data Interaction Manager has a minimum of six senior analysts assigned to him. The place is just buzzing with activity now. I know you'll be thrilled by our growth potential. Almost all of the old programming group is back. You go right down the hall now . . . the second office on the left. I know Mr. Ramesh can help you."

Stone began to perspire as he walked down the hall, turned left at the second office, parted the beaded curtain, and stepped into a dimly lit cubicle.

"Mr. Ramesh?" he asked, eyes watering from the incense.

"Who are you?" The young bearded man was seated in full lotus on the floor. He kicked a smoking hibachi as he untangled himself to stretch.

"I'm Simon Stone, president of A&H."

"Oh! Hi, Simon. I was just here conjuring up a really complex data relationship. Listen to this . . . I think it might be possible to connect almost all of the fragmented data caches, or at least the unique ones, to the operations hierarchy . . . each with its own pointer leading directly to the demographic chain."

"What will that buy us?"

"At least four more disc units," he answered. "What can I do for you?"

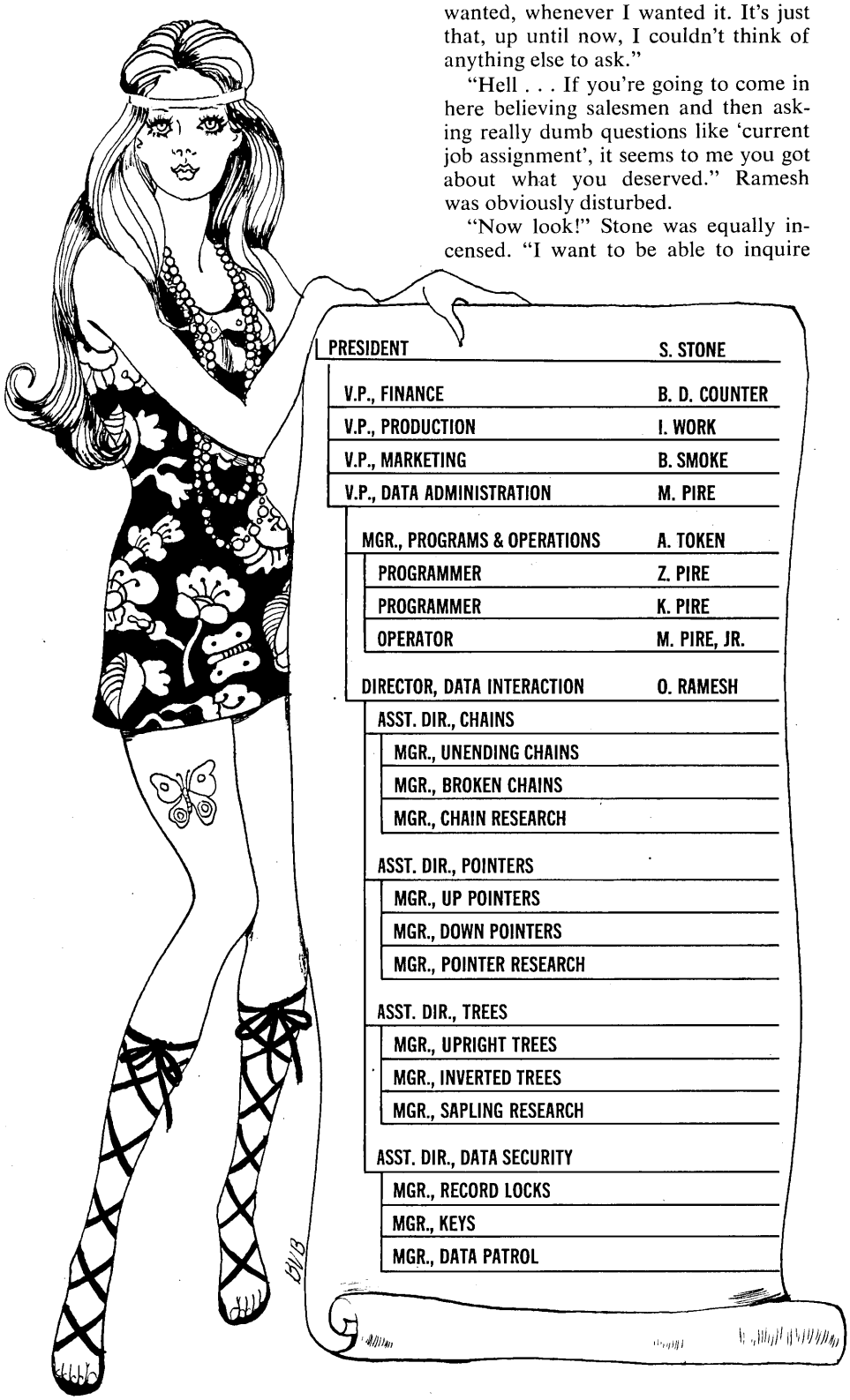
"Well," Stone began unsteadily, "I got this 'no relationship' message when I inquired through the crt in my office. I usually ask for just my own social security number and my wife's maiden name, but this time I also asked for my current job assignment."

"Who, in God's name, would have thought someone would ask for job assignment?"

"That's not the point," Stone insisted. "The Glomfeltz salesman said that I could get whatever information I wanted, whenever I wanted it. It's just that, up until now, I couldn't think of anything else to ask."

"Hell . . . If you're going to come in here believing salesmen and then asking really dumb questions like 'current job assignment', it seems to me you got about what you deserved." Ramesh was obviously disturbed.

"Now look!" Stone was equally incensed. "I want to be able to inquire



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about current job assignment. I don't care how you do it . . . just do it!" He tramped out in a shower of beads and proceeded to return to his office mumbling, "He can take one of his pointers and . . ."

Ramesh grabbed his French Provincial phone. "Get me Mr. Pire right away . . . Hello, M. P.? This is Ramesh. Old man Stone was just in here asking . . . no . . . demanding a new data relationship. We'll have to get the consultants back in from Glomfeltz and you can contact the people out at the university about it. They might want to apply for an NSF grant or something on it. Listen, if they balk at all, tell them we think they'll get three or four dissertations and a master's thesis or two out of this one . . . By the way, when are they breaking ground for the D.A. complex. I've got a chance to hire 50 analysts from Shlompmeir and Associates. They're phasing out their programming section to make way for that new integrated data management program they bought. I bet we lose a bunch of data administrators to them as soon as they get that rolling . . ."

So, Computerman, rest easily. Be alert. Don't sell your imported surfboard. Go ahead, finance the half interest in that massage parlor. The chances are good that you have nothing to fear but a title change . . . that is, unless you really believe that your management takes time to learn from the past, to pay close attention to the present, and to plan realistically for the future. ☐

Mr. Kurz is a systems project manager in the Management Information Services Department of the Southern Railway System. A graduate of Xavier Univ., he was with NCR for 10 years. He is a past chairman of the Programming Language Committee for CODASYL and present chairman of the newly formed Data Description Language Committee.

Form leases issued by vendors serve only one function—protecting the vendor

# Beware the Standard Lease

by Robert A. Bucci

The premise of this article is that the printed form leases issued by computer vendors do not in any way, shape, or form protect the vital business interests of the user community. Stated another way, computer leases are about as fair to the user as a standard real estate lease is to the tenant.

I intend to show by analyzing a typical computer lease that *what the user gets he doesn't need, and what he needs he doesn't get.* In the course of this analysis, it should become obvious to the reader that computer leases are memorable because of the absence of needed provisions rather than the presence of same.

I will now highlight some of the salient provisions of a typical lease:

*Price escalation:* There is a provision that the lessee is subject to price escalation each year up to a stated maximum, yet nothing is said about price reductions. You are contractually committed to increases but have no assurance that the benefit of a general price reduction will be passed on to you.

*Extra usage:* Payment of the total basic monthly rental entitles lessee to a maximum of 200 hours of use. For any usage over 200 hours you are subject to lessor's extra usage rate *then in effect.* This is totally open ended; you don't know by looking at the contract what that rate is now, and you don't know what it may become. As a practical matter, competitive factors will most likely keep extra usage rates at a reasonable level. The point, however, is that to rely on competitive factors to keep your costs in bounds is *no substitute for good contracting practices.*

*Commencement of charges:* The lease provides that "charges for each item of equipment commence on the date such item is installed and ready for use." The significance of this provision is that although the system you have bargained for is not installed and ready for use, you may be subjected to rental charges because individual items of equipment have been installed. This would be fine were you leasing individual items of equipment, but you are leasing a system! And, unless that system performs the function for which it is intended and is capable of being put to productive use, there is no logical reason why you should be paying rent.

Also, *observe carefully* that the commencement of rental charges is predicated solely on the installation of items of hardware—yet in a bundled situation you are contracting for more, *much more,* than hardware, i.e., software, maintenance, systems support, training, education, etc.

*Transportation charges:* The lease states that transportation charges to and from lessor's factory are lessee's responsibility. Note that even if the equipment were defective and had to be replaced, you would be contractually obligated to pick up transportation charges. Now, in fairness to vendors, I can't imagine any of them sticking you for transportation charges in such a situation, but *it could happen.*

> . . . although the system you have bargained for is not installed and ready for use, you may be subjected to rental charges . . .

*Installation and supplies:* "Installation facilities shall be furnished in accordance with lessor's installation instructions" and "all supplies are to meet lessor's specifications." Note that the installation instructions and supply specifications are nowhere to be found in the contract. By agreeing to these provisions, you have agreed to meet specifications you haven't seen and to follow instructions you haven't received. Is that any way to run your business? You bet it isn't!

*Remedial maintenance:* The contract provides that "lessor shall always be responsive to the maintenance requirements of lessee." Now, doesn't that sound nice? But what does it mean? If your friendly maintenance man answers your crisis phone call, is he "being responsive"? Or must he actually show up on site? Or, does "being responsive" mean that the vendor's service personnel will remedy the malfunction within a reasonable period of time? The counseling point is obvious. Spell out clearly what it is you expect of the vendor and reduce it to writing. You'll be amazed at how reasonable computer vendors can be when prodded.

*Programming aids and software:* This is perhaps the most important area of exposure the lessee may face. Unless adequate safeguards are incorporated into the contract, lessee may find itself in breach of contract for failure to protect the confidentiality of lessor-provided software, for failure to follow lessor's copyright instructions, or for using the software in a nonpermissible manner. And, note that lessor may "recall its software if it is of the opinion that its rights in such software are in jeopardy." If you're not careful *you may be left without software.*

*Warranties:* The contract provides that there are no warranties, express or implied, including but not limited to the implied warranties of merchantability and fitness for a particular purpose.

1. You have no assurance that the computer will be free from defects in design and manufacture.
2. No assurance that it will be repaired or replaced without charge if such defects exist.
3. No assurance that it will perform a particular function.
4. No assurance that it will perform any function.
5. You don't even have the assurance that you're getting an average computer.

What an anomaly! You decided to

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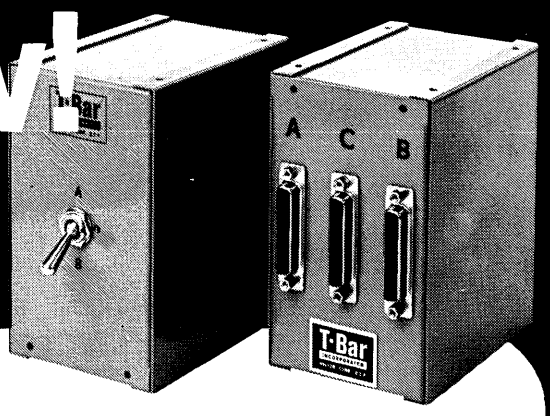


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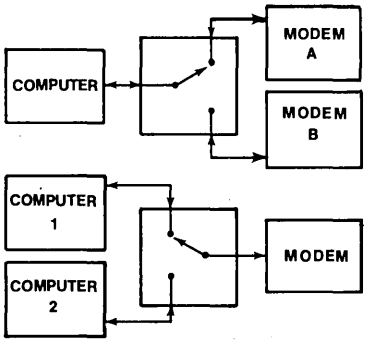


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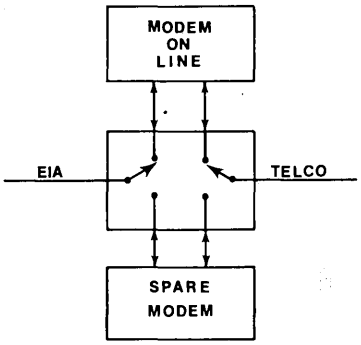


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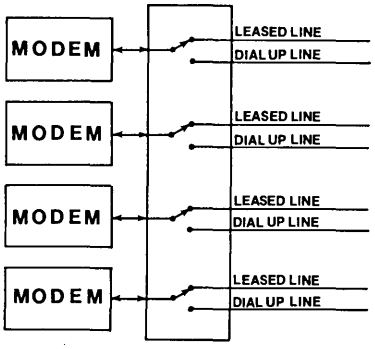


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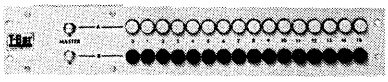

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10. Backup

In conclusion, I would like to emphasize that businessmen have a duty to their corporation to protect its assets and not to waste them; and lawyers have an obligation to forewarn their clients of the nature and extent of the business risks to be undertaken. Neither fulfills nor discharges that duty satisfactorily by accepting a form computer lease. □

Mr. Bucci is legal counsel for ITT's Communications and Systems Div. and was previously legal counsel for the eastern marketing operation, Honeywell Information Systems, Inc., responsible for computer contract negotiations. He is a member of the New York and Massachusetts Bar and has a BS from Manhattan College and a JD from Fordham Law School.

CIRCLE 82 ON READER CARD

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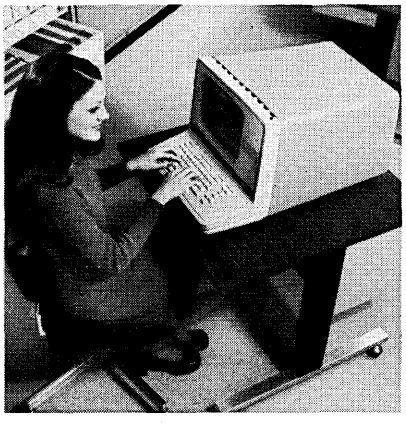

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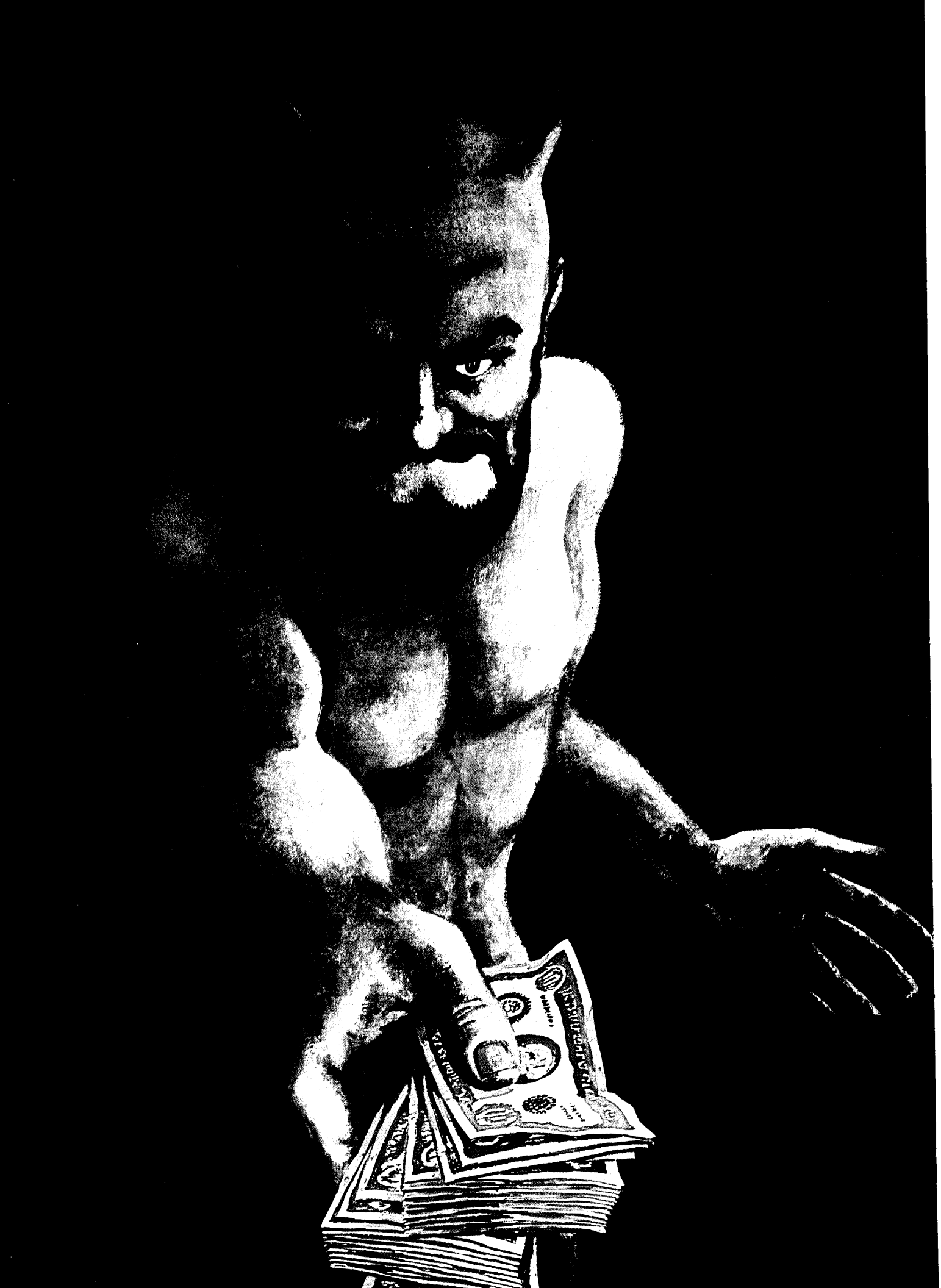

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CIRCLE 10 ON READER CARD

**The New York betting system gets all the news coverage, but there are many others elsewhere and they present interesting systems considerations**

# Automation of Off-Track Betting

by Norris S. Goff

The glitter of revenue to be derived from government-sponsored off-track betting on horse races is appealing to state and local authorities across the country. New York City first took the plunge under authority of state legislation, opening its first betting office to the public in March, 1971. In so doing, the city followed a trail blazed by New Zealand more than 20 years ago and since traversed by several others, most notably the various states of Australia.

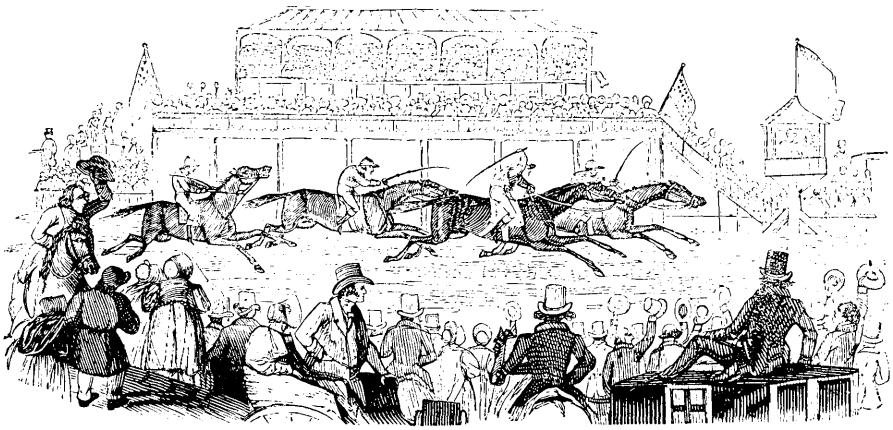
In the U.S., numerous state, county, and city governments have passed legislation, or soon will, which will bring off-track betting into many localities. Most, and probably all, will expect to be served by an automated system. The methods of obtaining automated services will vary. The tendency appears to be toward contracting for the total service, rather than buying a system, and paying the contractor a percentage of gross receipts. There is a long history of on-track operations based on this concept, in which the contractor agrees to be liable for his errors, e.g., calculating the wrong payment rate and paying too much money to the winners.

All off-track betting systems defined to date are nearly identical from the functional viewpoint, and no dramatic new directions are expected. The size and configurations, on the other hand, will vary tremendously. Consider, for example, the characteristics of four regions which have, or expect to have, off-track systems (Table 1):

The principal mode of operation is to establish a number of local betting offices throughout the region where bets are placed and winnings are paid. Usually the betting office is open from early morning to late evening. The betting authority establishes which tracks are to be covered on a day-to-day basis, and this information is made available to the public through local newspapers and postings in the betting offices. Bets may be placed until just prior to race time (presently one hour before in New York) on races at all tracks covered by the day's programs.[1] "Advance betting" is sometimes conducted on special races, such as the Kentucky Derby, meaning that bets may be placed prior to the race day. The betting office customer (called an investor in Australia—and of course his winnings are dividends) is issued one or more tickets describing his wagers. He can exchange the tickets for cash if he wins. Some systems restrict payment to the office which issued the ticket.

Most systems also include a telephone betting service. The customer is obligated to open an account and have sufficient money on deposit to cover his bets. He can then bet by phone (but not across state lines in the U.S.), and his winnings are posted automatically.

Amounts bet on each race must be collected at one place and collated into "pools" before race time. The pool values are forwarded to the respective racetracks to establish the opening on-track odds, unless the off-track authority is going to make book, which is usual for out-of-state and foreign races. After each race is decided, the payment rates are calculated according



| Region | Area (Sq. Mi.) | Population |
|---|---|---|
| New York City | 320 | 7,800,000 |
| Maryland | 10,577 | 3,100,000 |
| Queensland, Aust. | 667,000 | 1,800,000 |
| Orange County, N.Y. | 829 | 218,000 |

Table 1

[1] This is a major departure from on-track procedures where the totalizator equipment only supports betting on one race at a time, thus restricting betting for each race to the half-hour or so between races.

to pari-mutuel rules, allowing a percentage off the top for operations and revenue. Payment authorization is then forwarded to the various betting offices and telephone account updating is activated.

## The case for automation

Nonautomated off-track betting systems have been operating successfully for a long time, and even today more bets are taken manually than by machine. However, rising labor costs are forcing the authorities to look for cheaper ways to do the selling and pooling. Victoria, Australia, initiated a betting office automation program more than four years ago following successful automation of telephone betting, and put its first on-line office into service just ahead of New York. New South Wales and Canberra followed suit. Western Australia has partially automated, employing a computer for pooling but without on-line selling. Queensland, Southern Australia, and New Zealand are also approaching automation from various directions.

Last year a study was made for the Totalisator Administration Board (TAB) of Queensland, Australia, to determine whether automation of that state's operations would be economically sound. It was established that immediate cost savings would result from full on-line operations in the Brisbane metropolitan area. The labor costs currently required to perform bet pooling in that area would be totally eliminated. The experience in other states of introducing selling machines with keyboard inputs indicated a 20 to 25% potential reduction in selling labor. The combination of these savings would more than offset the costs of automation of the metropolitan offices. (Optical character recognition devices have been proposed—unsuccessfully—to off-track authorities in several instances and theoretically could further reduce selling costs.)

The countryside, though, was a different story. The cost of on-line communications to distant offices, which typically are also low-volume offices, proved to be greater than displaceable labor costs. (Queensland is two-and-a-half times as big as Texas.) This condition could change in 10 years if labor costs continue to rise as they have in the recent past, but that is too speculative to prejudge. However, a compromise is available which promises to be worthwhile immediately. The present manual pooling involves a hierarchy of operations; e.g., remote selling offices phone their collated pools to regional offices which in turn combine the pools into regional summaries and forward them to Brisbane where composite tallies are made. The installation of a Telex terminal in each selling office, with dial-up directly to the computer, will more than justify elimination of the regional office and Brisbane pooling operations, and provide better service at the same time. The selling offices would continue to collate their own pools. When betting is closed on a race, they would dial the computer and type in their pools on-line.

Assuming the above approaches, the resulting bets estimate was that a true return of 48% annually on investment in automation would be realized over a 10-year system life. Even greater savings would be expected in a similar situation in the United States due to higher labor costs, while communication and computer facility costs are comparable.

## Anatomy of an automated system

An automated off-track betting system is several kinds of classical systems rolled into one. That is not to say that it needs to be overly sophisticated; on the contrary, most of the requirements can be met in a simple and straightforward way. This is no doubt partially attributable to the fact that the requirements can be stated more definitely at the outset of a development project than is often the case with other systems. Nevertheless, the author found that when the environment was conducive to an orderly and rational effort, the engineering of a system to meet all the different requirements can be truly fascinating.[2] From the perspective of the engineer, the system is all of these things:

1. A real-time interactive data entry, data management, and inquiry system, including on-line updating.
2. A telecommunications system.
3. A financial accounting system with high demands for security and recoverability.
4. A specialized application with its own set of unique attributes.

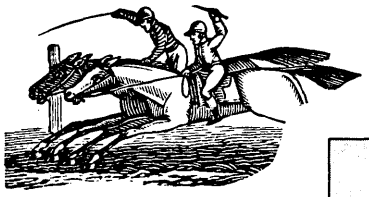
The principal system components are shown in Fig. 1. A variety of implementation approaches has been taken in which emphasis varies on the degree of automation in the different areas. For example, New York required several automated race-track interfaces for forwarding pools to the on-track equipment and receiving payment data in return; all of the Australian systems employ a printout and a telephone for this purpose. Some authorities allow telephone account deposits and withdrawals to be made in betting offices, necessitating on-line updating; others consider this a business office operation conducted principally by mail, with overnight batched updating.

## Equipment

The New York system employs two IBM System/360-50 processors, each with 512K bytes of core storage. Each processor may access a common LCS module of 1 million bytes. Direct-access storage requirements are met by two 2314 disc storage devices, both of which are accessible by either processor. All telecommunications are routed through one of two 2703 controllers.

The processors used in other systems include dual IBM System/360-44s in New South Wales, dual Univac 9400s in Canberra, and a mix of Control Data 1700s and 3300s in Victoria. Two used Control Data 3100s, replaced by the 3300s in Victoria, were recently purchased for use in New Zealand.

When a bet is successful, the ticket



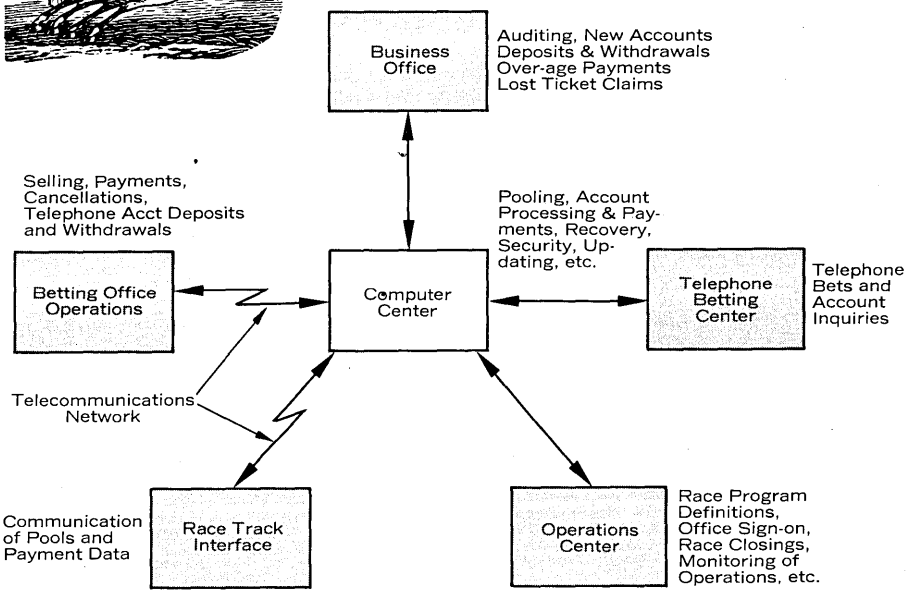



Fig. 1. Schema of the principal system components

[2] That was not the case in New York City where there was continuous pressure stemming from the city's impossible, politically motivated schedules; e.g., total development in three months.

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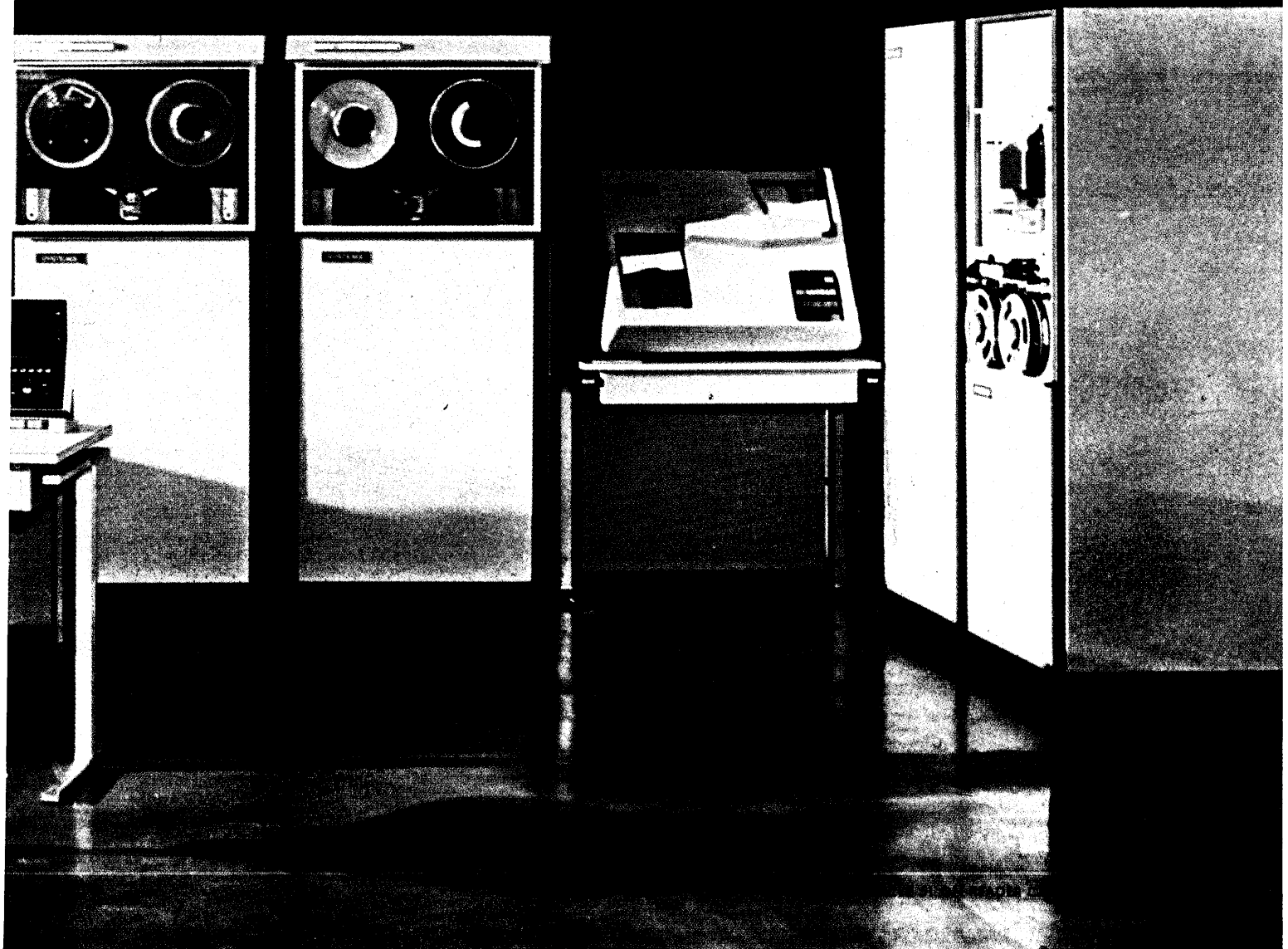
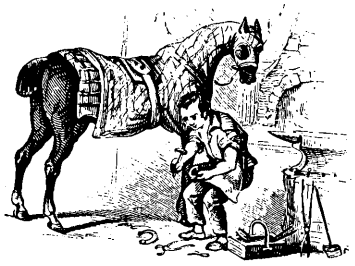


becomes the claim for payment; in fact this is its primary purpose. There are two factors to keep in mind in considering ticketing techniques. Payment at any office (not necessarily the one where the bet is placed) is always desirable, and usually demanded of an automated system. Secondly, reasonable precautions must be employed to assure that each ticket paid is genuine.

Manual systems normally require that a bettor return to the office where a bet is placed, to collect his winnings. Usually a carbon copy of each bet is retained. Following each race, the offices are notified of the winning horses and the payment rates. In Australia, a novel and inexpensive means is used of communicating this information to the offices; announcement is made over local radio stations. Then a massive paper-shuffling operation takes place, in which copies of all winning bets are identified, and the rest are discarded. When a winning bet is presented for payment, positive security is achieved by matching the ticket with its copy.



A primary decision to be made in designing an automated system is whether to retain a unique record of each bet, thus facilitating a degree of security comparable to that of the manual system described above.

At least one system has been built which does not keep an individual record of each bet. This is the "Rimfire" system built by Control Data of Australia for the Victorian TAB. When a bet is placed, a coded representation of the bet is printed on the ticket in addition to information intended for the bettor. All bets having the same characteristics have the same coded number printed on them. Thus the number is not unique. When the results of a race are known, then the identity of successful entries in each pool, the payment rate for each, and the total dollar amount of winnings to be paid on each are entered into the system. This information is retained along with similar information for other races. The procedure followed in paying winning bets is to re-enter the coded representation of the bet which was printed on the ticket. A relatively quick look-up is performed to validate that the bet was a winning bet, and to determine the amount of the payment. The system keeps a tally of the amount remaining unpaid in each pool. Payment will continue to be authorized until the net unpaid balance for the pool has been reduced to zero, or is insufficient to pay the winnings on a given ticket. This technique requires relatively little record-keeping; however, it relies upon the clerk to recognize attempts to submit counterfeit tickets for payment. If one had the means to copy a legitimate winning ticket, he could take each copy to a different office for payment and no rejection by the computer would occur until the total authorized amount had been paid.

The more popular technique is to keep an individual record of each bet placed. Each record must be identified by a unique serial number, with that number being printed on the ticket.

Some systems, including the New York system, assign the ticket number in such a way that it corresponds to the address of the bet record, allowing it to be used as an index. Bet records which have been paid are so indicated and returned to their original storage locations. Those not paid on the day of the race are maintained in a separate indexed file. As part of the daily shutdown procedure, a sequential pass is made through the current day's bets, picking out winners which have not been paid. The amount to be paid is calculated and added to the record, making it unnecessary to retain the race results, and the record is added to the indexed file. Sequence in this file is maintained on ticket numbers, which remain unique because they include the date, but are no longer usable for addressing. At the present time a relatively high proportion of the bets remains unpaid at the close of each day, and the full benefit of the address-related ticket numbers is not realized. The ratio will probably change if the Off-Track Betting Corp. begins making payments immediately following each race as originally intended. These bet files are depicted with other principal files of the New York system in Fig. 2.

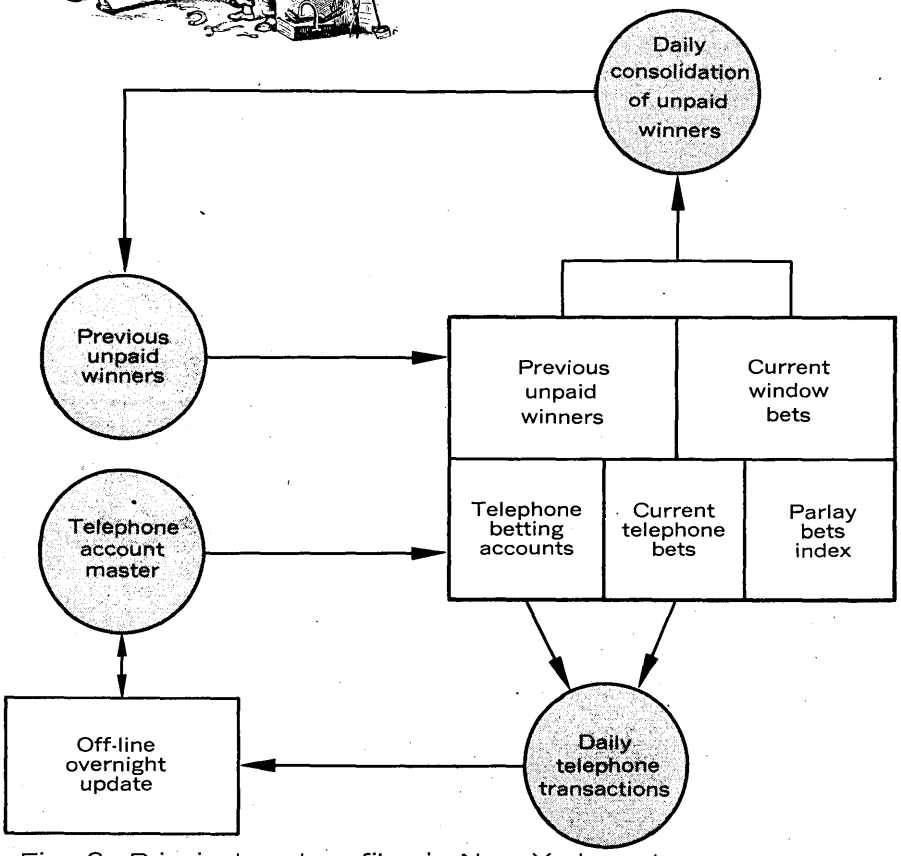



Fig. 2. Principal system files in New York system

An interesting technique has been devised, but not yet implemented, by the Western Australia TAB to overcome the deficiencies of the two-file approach. Their plan is to have a single "perpetual" file large enough to contain all of the outstanding bets which could potentially accumulate at one time, including both the current day's bets and all winning bets remaining unpaid from previous days. They plan to cycle through this file, reusing the locations made available by losing and paid bets. The ticket number will include the bet record address, and will remain valid for indexing as long as the bet is in the file.

In summary, maximum use of the computer to assist in the payment of bets appears to add little load to a computing system beyond increased accessing of storage. Normally payments are made by the same clerks who sell bets. Each clerk usually has a terminal available. The terminal has communications capacity dedicated to

its use. If, in fact, these facilities are not used to aid in the payment process, they would be sitting idle while calculations are done manually. Automatic matching of ticket numbers by the computer does in fact create an increased file accessing load, but the Western Australia idea appears to overcome most of this disadvantage. Furthermore, computer-aided ticket matching appears to be the only technique that meets both of the criteria set forth at the beginning of this discussion; that is, payment at any office is facilitated, and maximum security is achieved. Table 2 summarizes these alternatives:

### Telephone betting

Telephone betting is an interactive process which usually employs terminals with alpha-numeric crt displays. Typically there is a telephone switching unit, which routes calls to an available clerk, and automatic equipment to record all voice communications. The caller provides his account number, which is entered on the terminal. The system retrieves the account record and displays private identification supplied when the account was opened. If the caller knows this combination of letters, he is allowed to place bets up to the account balance.

| Manual Payment | Payment at Any Office | Security |
|---|---|---|
| On face value | Yes | No |
| By ticket matching | No | Yes |
| Computer-Assisted Payment | | |
| Bet re-entry | Yes | No |
| Automatic matching | Yes | Yes |

Table 2

Telephone bets are pooled together with those made in betting offices. They are treated differently with respect to payment. Winning bets are identified automatically, and winnings are credited to the accounts. (The New South Wales system also treats cash bets this way, forwarding winning reports out to the offices at which the bets were placed.)

### Parlays: a special case

Parlay bet processing is presented as an example of numerous "special" bets offered in various localities. The parlay is actually a series of individual bets on successive races, each dependent on the success of the previous. Reexamination of the parlay bet is required promptly after each race, so that winnings can be calculated and gotten into the next pool. A separate index to parlay bets is maintained to enable their quick identification and accessing. The index contains sufficient status data on each parlay bet so that only those properly involved in the current process are accessed. The timing of this process is critical, and so long as pools are closed well in advance of post time, parlays on consecutive races are not possible. In the New York system, an automatic delay is built in to hold up pool transmission until parlay processing of previous races is finished.

### System reliability and backup

Rarely can the economic impact of a system breakdown be felt as immediately as in a wagering system. Furthermore, lost revenues are not recoveable; that is, very little extra money will be bet tomorrow as a result of being unable to bet it today. Those responsible for buying wagering systems are usually prepared to pay well for reliability.

The subject of reliability and backup is too extensive to discuss comprehensively in this paper. We shall address the techniques which have been used to provide central computer reliability and backup in support of the principal system functions.

It is universally agreed that placing bets is the most critical function. Depending on applicable laws, forwarding of pools to the race track might also be critical. Payment of winning bets is important to the betting public, but less so to those responsible for system operations.

The most elaborate approach to allowing for central computer failure is to provide a redundant central computer to take over in the event of failure. This approach offers the best failsafe system and, given an uninterruptible power supply, can provide uninterrupted computer support except in rare cases. In order to be effective, each central computer must be able to receive all inputs, must maintain duplicate files or have access to common files, and must be cognizant of the state of the other machine.

This approach was taken both in New York and in New South Wales, but in much different ways. In the New South Wales system, each processor receives and processes all inputs. This technique has the disadvantage of requiring that each computer be able to handle the total load without degradation, but the simplicity of it makes it more desirable than the technique employed in New York.

The New York system is designed to share the processing load between the two computers, while either is capable of picking up what the other is doing, with expected degradation. Each application program is responsible for posting the progress of transactions through the system. If either processor detects a failure in the other, it is able to continue processing the transactions which have started, and pick up the additional communication lines on its own 2703.

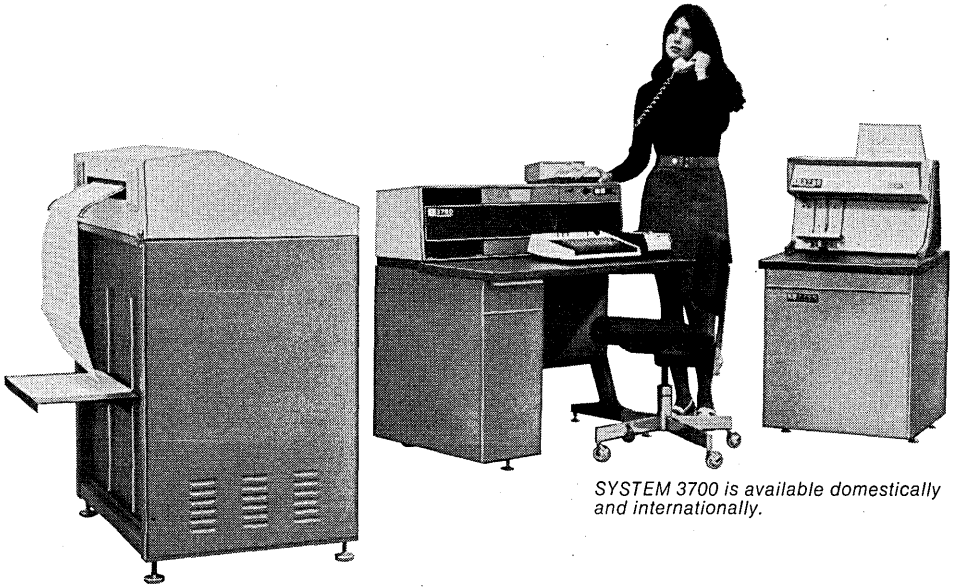
An alternative to central computer redundancy is to design the system in such a way that acceptable degradation occurs when the central computer fails, and do not back it up. Redundant concentrators or front-end processors (with adequate capability to carry on critical functions) can be provided for substantially less cost than a redundant central computer. It is not difficult to support betting without the central computer. Whether or not this is a feasible solution for a given system probably depends on the volume of pools which must be forwarded to the race tracks. Specific degradation resulting from a central computer failure would be approximately as follows:

1. On-line payments cannot be supported without the central computer, as it is the keeper of records pertaining to unpaid bets. If desired, payments could be made on face values of the tickets, with file updating to follow.
2. Large-scale pooling could not take place. One would not likely provide either adequate core nor direct-access storage in line concentrators to enable pooling except on a limited basis.
3. Telephone betting could be carried on only if account and balance validation were compromised.

A recent cost analysis of this approach, versus the New York and New South Wales solutions, indicates savings on initial hardware costs of more than $1,000,000. □

Mr. Goff is now a consultant to the U.S. Dept. of Agriculture for the design and procurement of a national computer center and telecommunications network. He was previously with Computer Sciences Corp., where he was in charge of initial software development for the New York City off-track betting system, planning for the Johannesburg system, and design of a state-wide system for Queensland, Australia.

# The Sensible Terminal



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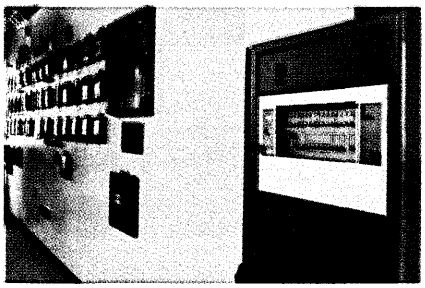

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# News in Perspective

IBM continues to enhance and modify its 370 line, page 91. The latest modifications include dual processors and more real--if not virtual--memory...

It's clear that the Justice Dept.'s resources--money and talent--are dwarfed beside those of IBM in the antitrust case, page 101. So other ways to control IBM's dominance of the computer industry now receive added attention...

Financially troubled peripherals maker Memorex Corp. was overdue for a reorganization. But when it happened, page 105, the man who has presided over its ups and downs--founder Larry Spitters--was still there, stronger than ever...

A small peripherals company, loaded with former RCA talent, begins nipping at the edges of the Univac-owned RCA computer base, page 109...

New York's Off-Track Betting Corp., which bet that someone could do it better, hedged before bouncing Computer Sciences Corp., page 117...

A would-be entrant to the field outlines the economies of networks connecting specialized computers of different makes, page 121. Other firms also contemplate forming similar networks fashioned after the Defense Dept.'s Arpanet.

*Procurement*

## Burroughs Agrees to Allow Foreign Attachments—But with Reservations

Burroughs Corp. threw in the towel last month and agreed to let independent peripheral makers attach their gear to Burroughs systems leased under the General Services Administration's Adp Schedule (formerly known as the Federal Supply Schedule).

That, at least, is one interpretation. Another is that Burroughs hasn't really conceded anything because of "all the Mickey Mouse qualifications" written into its agreement, as one independent peripheral maker puts it.

The contract requires Burroughs to provide "pertinent interface information to the government," but only "to the extent same is available to Burroughs." The feds are obligated to pay for this information and must negotiate the price "outside the scope of this contract" if no "established commercial prices" exist. Also, the government must "abide by, and enforce any proprietary or confidential limitations imposed by Burroughs."

According to one source, "anyone of these provisions could give Burroughs a legal, if not legitimate, basis for refusing to disclose interface information."

Ever since 1969, the feds have been trying to make computer system interfaces more compatible with independently made peripherals. Hopefully, this would expand bidding opportunities for independents, produce more competition when installed systems are upgraded, and lead to better prices. Private users, as well as those inside the government, presumably would benefit in the process.

The first major stab at this goal was a study launched by the National Bureau of Standards, aimed at developing a set of hardware interfaces capable of mating any particular system's I/O channel and/or devices with independently manufactured peripherals. After that effort fizzled, NBS drafted a report recommending that system makers disclose interface specs when announcing some of their new systems. The mainframe industry has greeted this proposal with something less than mild applause. In fact, a behind the scenes effort is now under way to file the NBS report on the most inaccessible shelf that can be found in the federal bureaucracy. All this leaves the GSA contract clause as the only viable means of getting bids from independent suppliers when substitute or additional equipment is needed for systems already being leased from a mainframe supplier.

So far, GSA has negotiated annual supply contracts with IBM, Honeywell, Control Data, and Univac, as well as Burroughs. (Xerox, the only major holdout, was expected to sign up before the end of last month.) In each case, the contract permits the feds to attach independently made peripherals and to secure related technical information. But, as with the Burroughs contract, there are loopholes, at least potentially, which may make each of these "foreign attachments" clauses meaningless.

Even without loopholes, the direct affect of the foreign attachment clause will be limited to those procurements covered by the Adp Schedule contract. Basically, this means single-system ac-

## Selling the Feds: How They Line Up

GSA reported last month that it awarded approximately $951 million worth of adp contracts (hardware and bundled software) in FY'72. The comparable figure for FY'71 was $795 million and for FY'70, $675 million.

There were some significant shifts in the shares won by individual suppliers.

IBM, which received 50% of the FY'70 total, won 46% in '71 and 29% in '72. Burroughs' share rose slightly, from 2.64% in '70 to 3.6% in '72, and so did Honeywell's. In 1970, Honeywell and GE together received 7.6% of the total adp contract awards. In 1972, Honeywell received 10.8%. Control Data's share was the same in '72 and '70 (16.2%), while Univac's slipped from 13.2% to 12.2%.

Most of the business lost by IBM apparently went to "other firms." Their share rose from 4.3% to 25.2% during the period, indicating the growing use of minicomputers within the federal establishment. □

quisitions. They still represent a majority, in dollars, of the dp equipment procured under the GSA authority, but the percentage is decreasing rapidly.

According to figures released by the agency last month, "schedule" procurements comprised 83% of the total in FY'70, 76% in FY'71, and about 53% in FY'72. The rest were conducted separately either by GSA or users under a delegation of authority from GSA.

Before foreign attachment language can be added to non-schedule contracts, further action by GSA, and possibly others, will be required. But the agency apparently isn't eager to take another big step very soon. "GSA has advised us that action to include the new clauses in outside (non-schedule) contracts is being deferred pending assessment of its success in getting the clauses into the schedule contracts," Controller General Elmer Staats said last December in a letter of Rep. Pierre duPont of Delaware. DuPont has been inquiring about a foreign attachment hassle involving Burroughs. the Air Force, and one of his constituents, Sci-Tek, Inc., Wilmington, Del., an independent terminal supplier (Jan. '73, p. 101).

Last month, a GSA source indicated it would be difficult to add the foreign attachment clause to existing non-scheduled lease contracts when they come up for renewal. So apparently, if and when GSA ultimately does try to amend non-schedule leases to allow use of independently made peripherals, the effort will be limited, at least initially, to new contracts. Mainframers with leased systems already in place will remain free to bar the use of foreign attachments.

This policy will mean that Sci-Tek, which has been trying unsuccessfully since 1970 to obtain interface data from Burroughs, will have to wait a while longer. Sci-Tek has a new RJE terminal it wants to sell to the Air Force for use in the Phase 2 system, a worldwide network of some 300 B3500 computers. Sci-Tek says the terminal could save the taxpayers a lot of money. But no objective test is possible because Sci-Tek wants to interface directly with the B3500's I/O channel, bypassing the controller, and Burroughs refuses to supply the required information.

Sci-Tek has complained to GAO, Congress, and GSA. Officials at GSA say the dispute with Burroughs was one of the major factors that led them to demand foreign attachment privileges in this year's negotiations on the Adp Schedule. There's a certain irony in that fact, since the Phase 2 system is being leased under a non-schedule contract and thus isn't covered by the new clause.

**—Phil Hirsch**

*Mainframers*

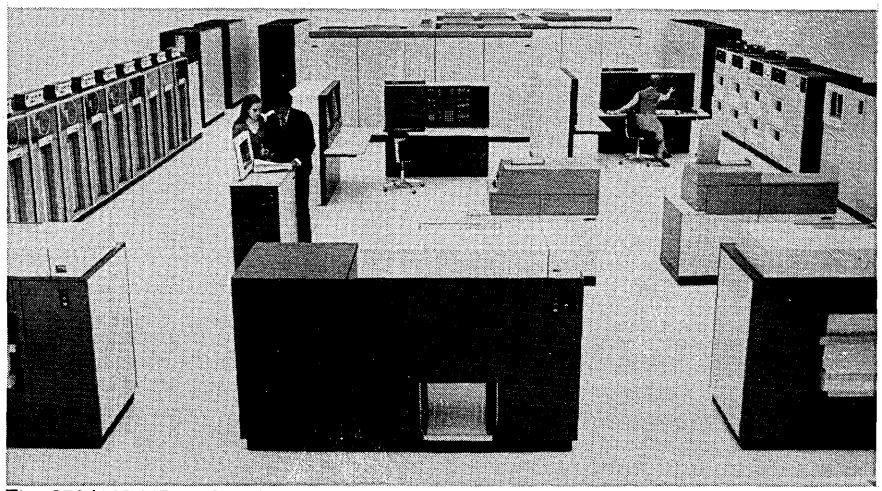
# IBM's February Announcement: Lots for Virtually Everybody

IBM continues its spate of product announcements that are of significance not only to its own user base, but equally to other major manufacturers, and perhaps most important to plug-compatible peripherals manufacturers trying to keep up with the grey giant's technology changes. The latest goodies, announced on the first day of last month, included the following hardware and software:

1. A doubling of the real memory sizes for the 370 models 158 and 168.
2. Dual-processor versions of the 158 and 168 models.
3. Five new models of the popular 370/145, one with double maximum memory previously available.
4. Modifications to os/vs2, including new instructions.
5. New versions of IMS and CICS.
6. A new virtual telecommunications access method called VTAM.
7. The 3704, a much smaller version of the recently announced 3705 communications controller.
8. A doubling of the number of 3330 disc units and 3333 controllers that can use a single direct-access attachment, plus other modifications.

### Real memory expansion

Under analysis, doubling the maximum memory limits on the 158 and 168 models is perhaps the most interesting part of the package, coming as it does just six months after the virtual memory announcement. Model 158s can now have up to 4 megabytes of memory, and the 168's limit has gone



The 370/168 MP is, for all practical purposes, the new top-of-the-line for IBM. Though IBM claims that the model 195 is still a product, it would be a rare user who wouldn't appreciate the backup potential of the 168 MP in applications important enough to require the power of a 195.

The 3704 is the baby brother of the 3705 announced last year. Both the 3704 and the 3705 can now be used as remote communications concentrators. Both products are programmable only via 370 systems.

up to 8 megabytes—equal to Control Data's supergiant STAR computer.

The efficiency of past virtual memory systems was found to principally depend on the ratio of real to virtual storage (called the folding ratio). A system with 4 megabytes of real memory attempting to support 16 megabytes of virtual memory has a folding ratio of 4:1, which is somewhat high, but might be possible under very favorable circumstances, i.e., strict installation standards requiring every job to be modularly coded. Messrs. Kurtz Cuozzo recently recommended (see February, p. 52) that folding ratios of 1.3 to 1.5 might be a good place for typical installations to start in considering how large a virtual memory can reasonably be supported.

Folding ratio considerations have been compounded with release two of os/vs2, since the new operating system can theoretically accommodate more than 1,500 active jobs, *each* of which can be as large as 16 megabytes. Release one of vs2, like vs1, was limited to a total virtual memory size of 16 megabytes.

Our guess is that os/vs2 users attempting to realize the monitor's full potential will have to dip into the additional memory allotments contained in this announcement.

A 158 with 3 megabytes of memory rents for $47,300 per month. An additional megabyte raises the rental only to $52,500. The difference of $5200 per month is less than the rental of either model of the 2305 and its associated controller. The purchase price of the last megabyte is $229,800, which figures out to 2.7¢/bit. Similarly, a 5-megabyte 168 rents for $81,625, with a full 8 megabytes renting for $97,225. These prices are for the cpu and memory only. Deliveries begin in March of next year.

### OS/VS2 release two

The cornerstone of the announcement is the second release of the OS/MVT equivalent for virtual memory systems, as it makes it possible to tie the 158 and 168 models into "tightly coupled" or "loosely coupled" systems. A tightly-coupled system is a true dual-processor computer. It uses a single copy of the operating system and supporting system software, and the entire resources of the configuration are available to, and managed by, both processors. For example, though there is only one copy of the software routine that supports the paging function, both cpu's cooperate in executing it. The only two tightly coupled systems in IBM's current lineup are the 158 MP and 168 MP (multiprocessor).

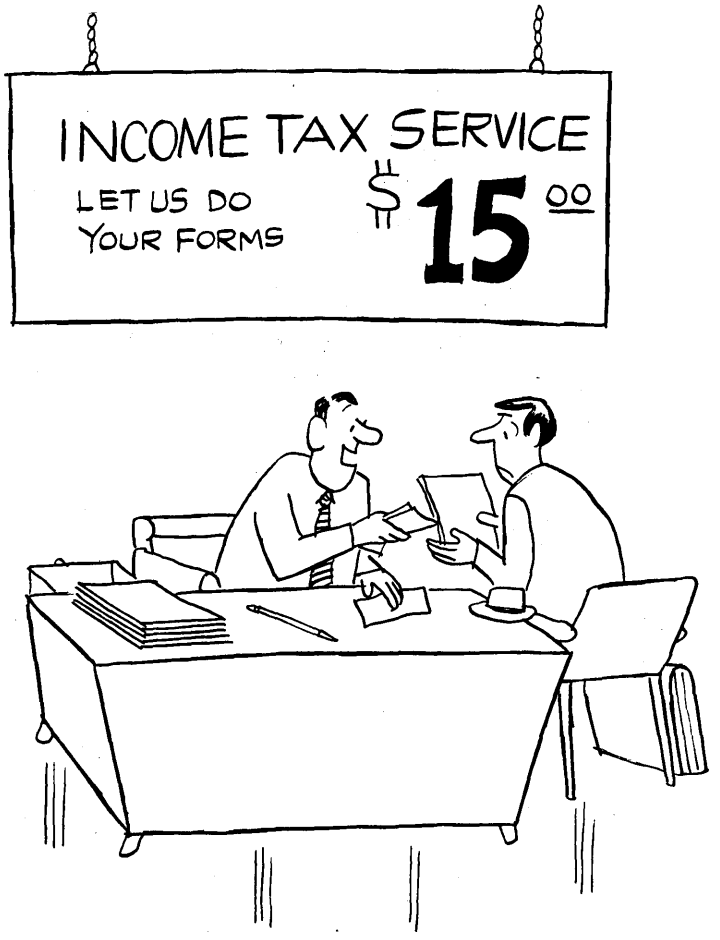
In loosely coupled systems, each cpu operates on its own distinct job stream, unable to access another cpu's storage or help with its active job workload. The coupling is in the ability of a "global" (control) processor to pass jobs to other cpu's (as well as help with the workload itself) and share the peripheral resources among systems. This is the familiar ASP (attached support processor) coupling used by a number of current large-scale 360 and 370 users.

Under os/vs2 release two, up to four systems can be loosely coupled, and these systems can be single- or dual-processor systems, with the largest potential loosely coupled system being four 168 MP systems, and the smallest, two 1-megabyte 370/145s. (Any 158 or 168 MP system can be configured as a loosely coupled system when desired, but these are the only two models that can be tightly coupled.) Each loosely coupled system can be attached through channel adapters to up to seven additional cpu's, and any IBM computer above the size of a 1-megabyte 370/145 running os/vs2 or the old os/MVT can be attached in this manner for a total grid of 32(!) computers.

This makes for some interesting configuration possibilities, but perhaps the most representative may be 145 models attached to purchased 370/155 and 165 systems. This configuration brings virtual storage capability to purchasers of those systems who didn't like the $200K and $400K upgrade charges.

There are four new privileged instructions in os/vs2 release two that allow the two processors in tightly coupled systems to talk to each other and to coordinate management of four loosely coupled systems. There are three new general instructions: compare and swap (a three-operand instruction); a clear I/O command that appears to perform the same function as the manually performed select reset channel feature used to free peripheral devices that had lost contact with the cpu; and a mnemonic titled insert and set program status word (PSW) key. Graceful degradation of peripherals (or even a processor) is a big feature claimed for os/vs2 release two in both tightly and loosely coupled systems. Peripheral devices can be taken off-line dynamically to perform maintenance.

The dual-processor 158 MP and 168 MP models will allow IBM to compete more aggressively for contracts requir-

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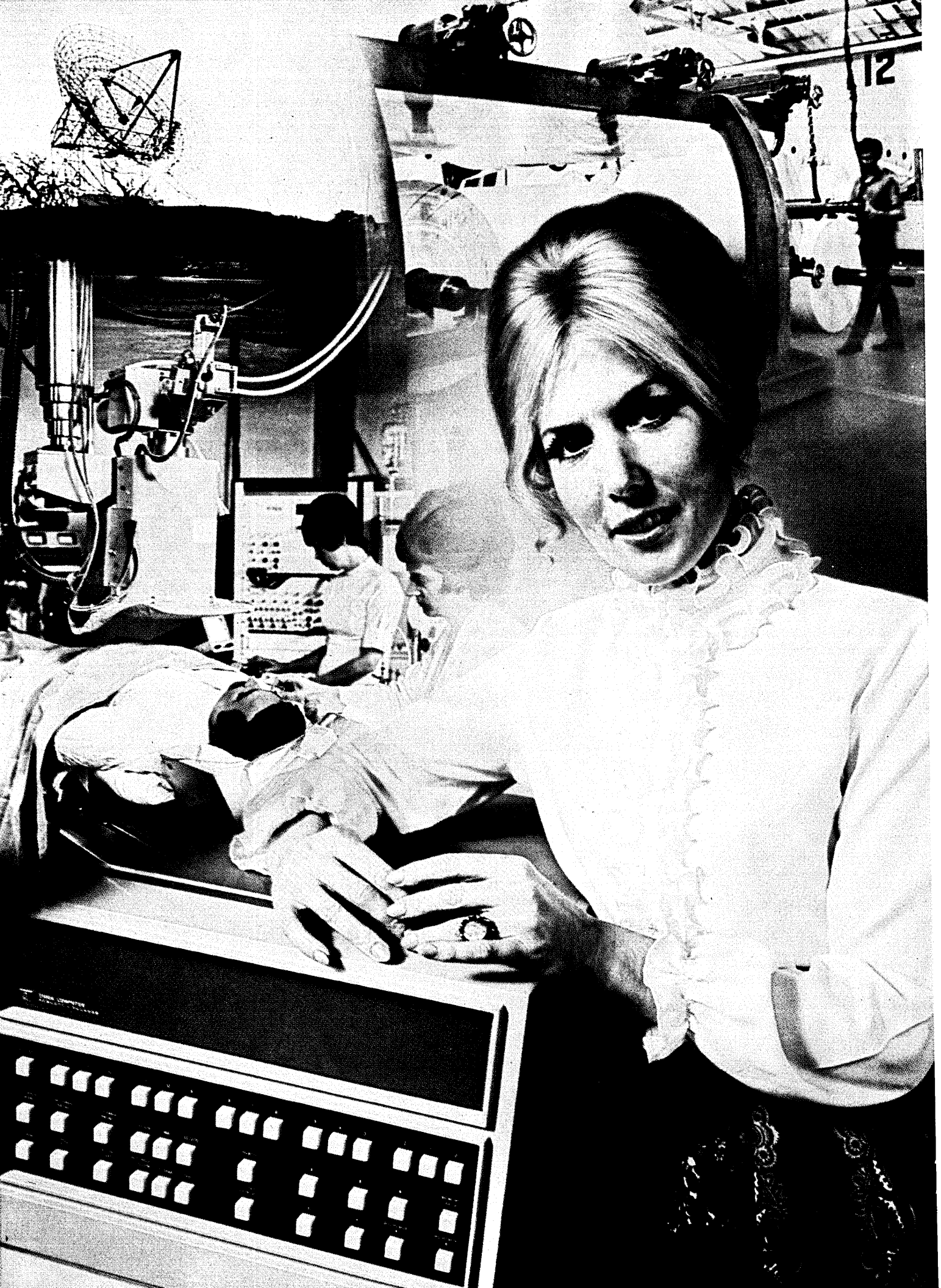

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ing backup processors. In the past, these awards have principally gone to Burroughs and Honeywell. It's interesting that just after peace was declared between CDC and IBM in the antitrust case, IBM announces very large dual-processor computers that certainly compete in power with large CDC machines. A couple of rules regarding tightly coupled systems: 370 model 158 cpu's must have the same amount of memory attached to each processor, while the model 168 does not have this restriction; two separate 158 or 168 models can be upgraded in the field to become tightly coupled systems for an additional monthly rental charge of $8,020 and $16,620, respectively, for the hardware necessary to couple them. The monthly rental for a typical 158 MP system ranges from approximately $108K for 1 megabyte of memory, to around $200K for 8 megabytes. The purchase prices for the 158 MP range between $5 and $9 million, with 168 MP models selling for between $11.4 and $16.2 million. IBM says the model 195—in either 360 or 370 dress—is still a product, but users looking for a machine of that power would do well to give the larger 168 MP models a thorough evaluation. The graceful degradation features on the dual-processor models is a good selling (oops, *renting*) point. The dual-cpu 370s will be available next March.

### 370/145 changes

The 370/145 model line-up has been considerably altered. There are replacements for the 256K, 384K, and 512K models, and two new configurations of 768K and 1 megabyte—fully as much as was available on the 360/65, although we tend to think of the 370/145 as a medium-scale computer, while the 360/65 was a large-scale computer in anybody's book.

A new memory technology is used in 145 systems larger than 256K. The first 256K has the 128-bits-per-chip monolithic bipolar memory that all 145s have used to date. Above that level, 1,024-bits-per-chip memory is used that has slightly improved performance over the original circuitry, but which probably will not affect system performance appreciably. That explains the "new" 384K, 512K, 768K, and 1-megabyte models. The fifth model is the 256K model. It differs from the old 256K model only in that, for purchasers only, there will be no "conversion charges" for attaching additional memory.

The denser circuitry makes it possible to put all the 145's memory into the cpu, which IBM is quick to point out reduces the floor space requirement; and the memory uses less power, which reduces environmental conditioning considerations. Perhaps the new technology is also responsible for dropping the system price for a "new" 512K model down to $813,800, compared to $939,800 for the old model. The redone 145 line-up also seems to reduce, if not kill altogether, independent memory manufacturers' enthusiasm for developing replacement products for the 145 models. The only market left to them is the number of machines (perhaps several thousand) that have already gone out the door with memory not imbedded in the cpu, though the amount that can be added to those systems has now been more than doubled.

Changes have been made to the ubiquitous IMS (Information Management System) and CICS (Customer Information Control System) programs so that they will operate more efficiently in a virtual memory environment. These changes insure that often-used control tables stay resident in real memory. The current versions of these programs will run "as is" in virtual memory systems. There have also been some pricing adjustments. Both portions of the old IMS, the data base management and data communications language components, rented for $1175/month. These have been combined in IMS/VS and rent for $1550. A DOS/VS entry-level version of CICS rented for $200, with expanded-feature versions renting for $500/month. These, too, have been combined and rent for $350/month. The virtual versions of CICS for OS/VS1 and OS/VS2 have gone up in price to $750/month, compared to $700/month under OS/360.

### VTAM

The principal feature of VTAM (Virtual Telecommunications Access Method) is that it allows a user to dynamically connect and disconnect with any application program, obviating the need to dedicate terminals to specific application programs. Since it does not handle line control, VTAM assumes the presence of either a 3705 communications processor, or the next product in this announcement, the 3704. Functionally, VTAM is like TCAM (Telecommunications Access Method), which combined the device support of BTAM (Basic Telecommunications Access Method) with the multiple applications support of QTAM (Queued Telecommunications Access Method).

The 3705 communications controller announced last year was a relatively

*(Continued on page 100)*

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large-scale unit that left a considerable gap between itself and users of less sophisticated communications networks who could get by with 2701 and 2702 boxes. These users, who couldn't justify stepping all the way up to a 3705, will probably take a much harder look at the 3704, which has 16-64K bytes of programmable storage (from 370s only), line speeds ranging from 45.5 to 50,000 baud, up to 32 low-speed lines, two 50-Kilobaud lines, duplex-mode transmission up to 7200 baud and half-duplex up to 50,000 baud. Memorex is probably the company most affected by this announcement, as it has had considerable success replacing 270X boxes with its models 1270 and 1271.

The 3704—and for the first time the 3705—can now be used as remote network concentrators for collecting information from a number of low-speed lines and shipping it to the cpu for processing over a high-speed data link. Rental on the 3704 ranges between $740 and $1630 per month on the 24-month extended-lease plan. First shipment of the 3704 with emulator programs for the 2701 and 2702 controllers is scheduled for May. The first shipments of the network control program that allows the 3704 to be programmed through the 370 host cpu are scheduled for November.

### 3330 disc system hook-up changes

There are three new features that affect both how, and how many, 3330 disc storage subsystems attach to host cpu's. The first one, called the 3333 string switch, allows a 3333 disc controller and its associated 3330 drives to be switched dynamically under program control between two direct-access attachments. The second feature permits four 3333s and their associated 3330 disc storage units (up to 32 drives) to be controlled by a single direct-access attachment. The third feature, called the remote switch attachment, allows attaching the 3333 string switch to the integrated storage control on the new 158 MP and 168 MP models, up to 64 drives in all. The string switch rents for $200/month; there is no charge for the 32-drive expansion feature, but it requires a control store extension in the disc controller that rents for between $300 and $600/month. The remote switch attachment is gratis. All of these features are field-installable, starting in August of this year for the first two features and October for the string switch attachment feature.

### User reaction

Initial reaction among users we paneled was one of caution. Most of them are still trying to make plans in the wake of the redirection of the 370 line into virtual memory six months ago. One user, Bill Barencik of Proprietary Computer Systems in Los Angeles, termed the new announcements "potentially exciting" but said that they left too many questions unanswered, such as how efficient the new dual-processor models will be, and how software overhead has been affected by release two of os/vs2.

Another IBM user at a large bank, who didn't wish to be identified, shared these thoughts. "They (IBM) are trying to push all users our size, with a leased 155 and 165, into multiprocessing, not necessarily tightly coupled pairs, but maybe loosely coupled, like ASP. Yeah, we'll move up—we have to, and they know it." Most users liked the graceful degradation features of the coupled systems.

Still, there seems to be an awareness (suspicion?) among users about the advantages of coupled systems, and IBM might be confronted with more benchmark requests than it has ever faced. One can't help but wonder how


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the throughput of one 8-megabyte 168 MP would compare with the work put out by 8 uncoupled 1-megabyte 145s—for less money. Perhaps this concern was voiced best by our banking user. After listening to the IBM representatives making the product pitch, he told them: "As a stockholder, I want to thank you for what you have done to me as a user."

**—Michael W. Cashman**

*Antitrust*

## Taking IBM to Court Expensive Business

The high cost of doing legal battle with IBM—perhaps the prohibitively high cost—was revealed with the announcement earlier this year of the surprise settlement of the IBM-Control Data case, and therein may be some lessons on the Justice Dept.'s case against IBM.

On the conservative side, it cost CDC $15 million to begin preparing its case. On the other hand, the Justice Dept.'s entire antitrust division has an annual budget of less than $13 million.

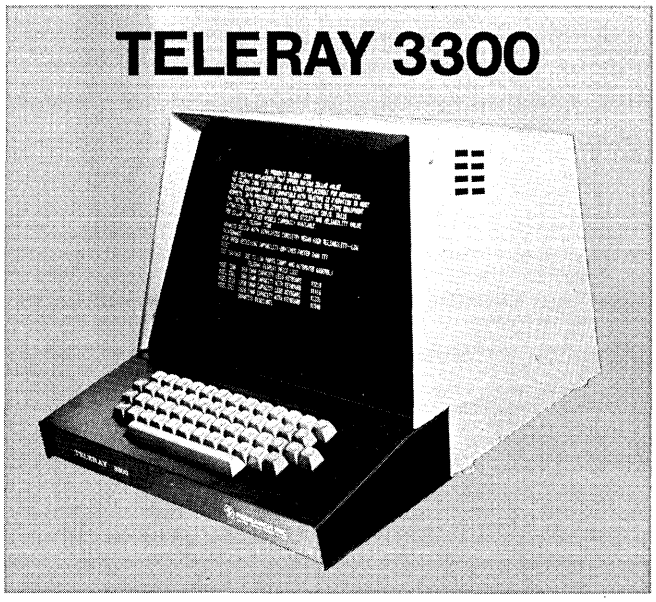
The economics become more revealing with closer comparison of the cost of preparing the respective CDC and Justice Dept. cases against IBM.

First of all, the $15 million CDC was paid by IBM for preparing its case is a conservative figure. In a statement by an attorney for IBM, it was observed that CDC's "costs and expenses of litigation, including the fees and disbursements of its counsel," were estimated by CDC at between $15 and $20 million. Moreover, these figures were given in August of 1972—with the actual trial date then set for more than 12 months away. And the expenses of preparing a case for trial and then the actual trial costs would make this figure substantially higher.

On the other hand, with its $12.8 million budget, Justice's antitrust division has some 140 active cases that are either in pretrial, trial, or appeal stages. Also, the division is investigating some 400-500 additional cases, and, beyond that, is busy generally enforcing the land's antitrust laws.

In view of the above, there has been increasing interest recently as to whether the Justice Dept.'s resources are adequate for preparation of a strong case. The Justice case was also crippled by the measure in the IBM-CDC settlement which resulted in the destruction of key parts of a CDC-prepared data base and retrieval system that accessed IBM documents.

Besides losing access to the key segments of the data base and information retrieval system, it has been learned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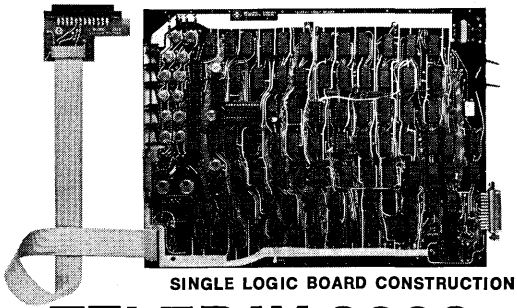

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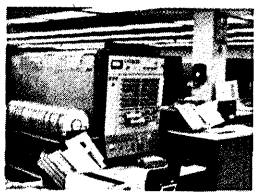

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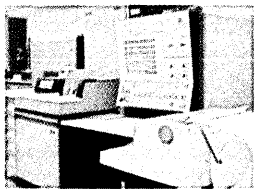

**Model 22** – extended from 24K to 64K.
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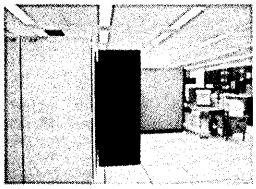

**Model 50** – extended from 512K to 768K.
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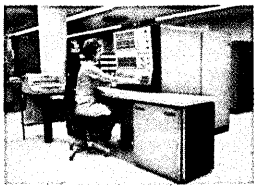

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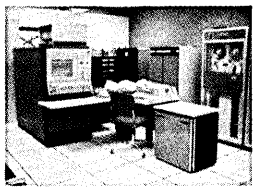

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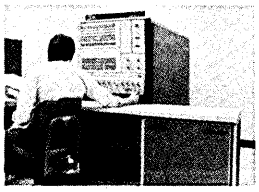

**Model 30** – extended from 32K to 64K.
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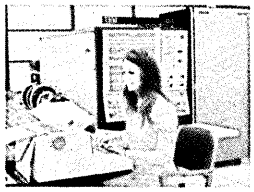

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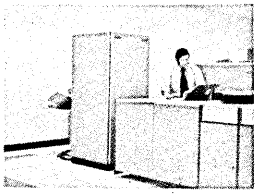

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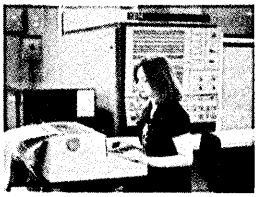

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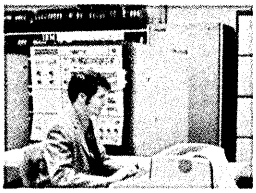

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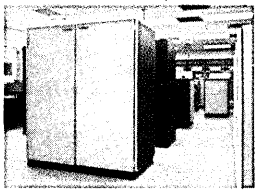

**Model 50** – extended from 256K to 512K.
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# news in perspective

that the Justice Dept.'s key in-house expert on the computer industry, an attorney who had followed the case for more than two years, has been off the case since early last fall because of personal reasons. It is evident that his loss has been felt by the repeated statements by Justice Dept. attorneys handling the case that they do not understand the computer industry and need more time to prepare the case.

At any rate, hopes are no longer so high now for swift legal relief against IBM, and there is an increasing new interest in legislative relief—namely in the form of the Industrial Reorganization Act that was to be filed by Sen. Philip Hart (D. Mich.), chairman of the Senate's Antitrust and Monopoly subcommittee.

Sen. Hart took notice of the dilemma of pursuing antitrust suits against IBM when he recently observed that it took Control Data $3 million to prepare its data base and information retrieval system while the Justice Dept.'s entire antitrust budget is less than $13 million. Hart proposes the establishment of a commission to study seven different industries and propose methods by which monopolies in these can be disbanded. He lumps computers and communications together as one of these. The initial hearings on Sen. Hart's legislation are scheduled to be held later this month. And while these are expected to be of a general nature, the subcommittee is expected to dig in more deeply on these specific industries in future months.

### Related developments

Elsewhere on the antitrust front, a motion by the Telex Corp. to set aside some of the CDC-IBM settlement was denied by Federal Court Judge Philip Neville in St. Paul. Telex had complained that key segments of the data base and information retrieval system developed by Control Data were illegally destroyed. In his ruling, Judge Neville also denied Telex's petition that some of the data base be reconstructed, and also denied a Telex request that the two mainframe companies be held in contempt of court for destruction of the materials.

The judge, however, ordered that neither CDC nor IBM should henceforth "destroy, obliterate, conceal, transfer, or lose possession of, or in any way render unusable, any documents obtained from the other party or from third parties" that they still possess in the IBM-CDC suit.

IBM commented on Judge Neville's ruling by saying: "We are pleased that the Telex motions against IBM were denied by Judge Neville." The Telex antitrust case against IBM is scheduled for trial next month.

Not so pleased was the Computer Industry Assn., an eight-company organization made up mainly of peripherals makers, which produced an eight-point plan for "early relief" for the industry. It said that without the index "the government will require even longer to prepare its case than before."

Among other proposals, it asks that steps be taken early to release IBM customers from paying penalties when they cancel leases with the company; to require IBM to publicize its sales statistics; and to stop IBM's "predatory pricing," in which it lowers prices in one product line to "eliminate" competition, while offsetting this by raising prices in related product lines. The association also asks that IBM be forced to make public at an early stage the engineering information for attaching accessory equipment to new products.

The Assn. of Data Processing Service Organizations (ADAPSO) adopted a similar stand in a position paper asking that IBM's software marketing and development activity be separated from its hardware operations. The paper, prepared by ADAPSO's affiliated Software Industry Assn., asks that "the entire new IBM software organization receive information on new IBM developments only at the same time that it is released to independent software companies."

It also seeks to have the IBM software organization release "comprehensive" software interface specifications to independents at the same time it releases it to the IBM hardware organization.

It said its position was aimed at restraining IBM's "continued control over the software products and services market." It said IBM software should be priced so that it reflects all associated costs separate from its hardware and yields a profit.

**—W. David Gardner**

## 60-Day Wait Asked in Consent Decrees

Another bill aimed at the Justice Dept.'s antitrust suit against IBM has been introduced by Sen. John Tunney of California. Hearings are scheduled this month before a Senate Judiciary subcommittee.

"The Antitrust Procedures and Penalties Act" would inject a 60-day waiting period between the time a proposed consent judgment is filed and the time it is supposed to go into effect. During this period, the Justice Dept. must pre-

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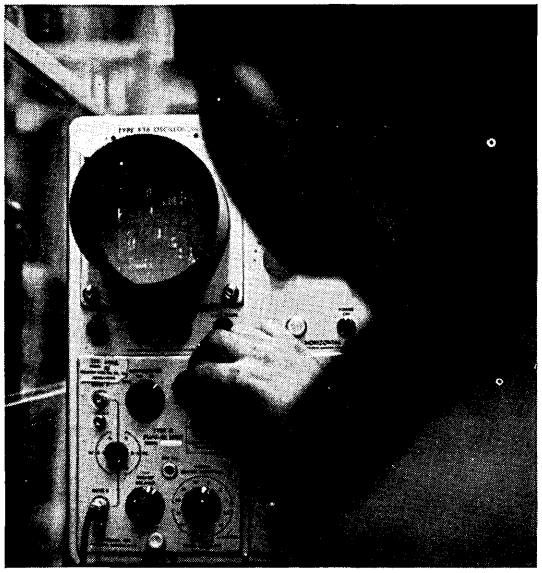

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pare an "impact statement" covering six major points related to the proposed agreement, including its effect on competition, "remedies available to potential private plaintiffs damaged by the alleged violation in the event the proposed judgment is (finally adopted)," and a "description and evaluation of alternatives to the proposed judgment," including their anticipated effects on competition.

Similar legislation was introduced late in the last Congress, but it was never reported out of committee.

The notion is not new. Last summer Federal Judge David N. Edelstein ordered the government to publicize widely the terms of a settlement of an antitrust case brought against two trade groups that were accused of having conspired to block the sale of foreign-made steam boilers in the U.S. by denying the foreign products safety certificates that are required by law in many places. Judge Edelstein is also presiding over the Justice Dept.'s antitrust suit against IBM in the U.S. District Court for the Southern District of New York.

In the case against the trade groups, Judge Edelstein ordered a 60-day waiting period for interested parties to comment. His order also required the government to publish advertisements detailing the terms of the proposed settlement in seven consecutive issues of the *New York Times* and the *New York Law Journal.*

The judge said his order to widely publicize the terms was an "historic first." Until the early '60s there was no opportunity for third parties to participate in antitrust settlements. Robert F. Kennedy, when he was attorney general, adopted a procedure for announcing settlements 30 days before they became final. But the only way a settlement was publicized formally was through a Justice Dept. press release.

Sen. Tunney's bill would require that the "impact statement" be published in the Federal Register and "furnished to any person upon request."

During the 60-day period, the attorney general must accept relevant written comments from the public, and at the close of the period, the Justice Dept. must file a response to all the comments with the district court that is considering the case. This response must also be published in the Federal Register.

The bill establishes several guidelines the court must use in deciding whether a proposed consent judgment is in the public interest. These include the effectiveness of the judgment in terminating the alleged violation, and whether the enforcement provisions are adequate. The court is also authorized to hold extensive hearings before deciding whether to okay the agreement. Witnesses, including "interested persons or agencies," can be called, and the court is explicitly allowed to review whatever comments the public has submitted to the attorney general.

Other major provisions:

1. Each defendant must give the court "a description of any and all written or oral communications by (him), or on (his) behalf . . . with any officer or employee of the United States . . . relevant to the proposed consent judgment." And prior to final district court action on the judgment, the defendant must certify this requirement has been met.

2. Penalties for criminal violation of the antitrust laws are increased from $50,000 to $100,000 for individuals and to $500,000 for corporations.

3. Technical changes are made in existing law, aimed at permitting immediate Supreme Court review of consent judgments which have great public importance.

In introducing this year's bill (S782), Sen. Tunney, who is cosponsoring the measure with Sen. Ed Gurney of Florida, said ". . . it calls for the first substantial change in the nation's antitrust laws in two decades" and is aimed at preventing "the concentration of political power that sometimes goes with concentrated economic power."

More than 80% of the civil antitrust suits brought by the Justice Dept. are settled by consent decrees, Tunney added. Because these decrees carry no admission of guilt, "private parties who may have been damaged . . . are left to their own resources . . . to recover damages." They usually can't afford to do this, he said. Consent decrees may also produce an inadequate remedy and foreclose further review of a defendant's suspect practices," he added. His bill is aimed at closing these loopholes.

The initial hearing on S782 will be conducted by the Senate Judiciary Committee's antitrust and monopoly subcommittee.

*Companies*

## Spitters of Memorex in Charge Again

Even with the abrupt departure last month of executive vice president D. James Guzy, the story at Memorex Corp. continues to be the company's president and board chairman, Lau-


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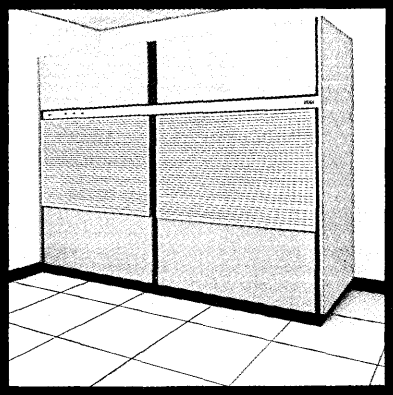

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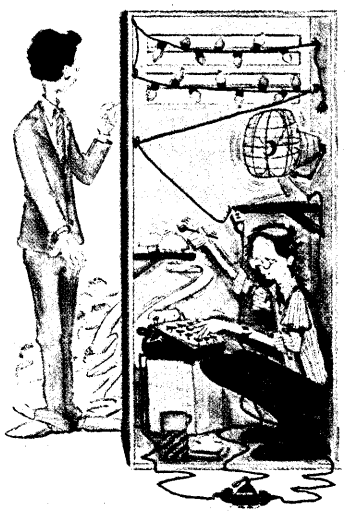

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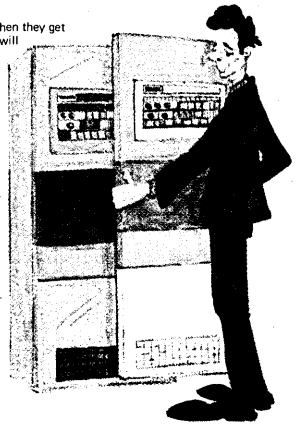

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We've learned our lesson about minicomputer introductions.

Interdata
2 Crescent Place, Oceanport, New Jersey 07757

Gentlemen:
Maybe you have learned something.
☐ Send more information.
☐ Let's talk. And bring me a "What You See Is What You Get" button.

Name_____ Title_____
Company_____
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INTERDATA

New Jersey headquarters – (201) 229-4040. In Canada – (416) 678-1500. In Great Britain – 01-902-3202. In West Germany – 0811/160031.

We've learned a lot in the last 5 years. Mostly from the biggies who used to delight in kicking a little sand in our face once in a while.

We learned that when you introduce a new family of processors, for example, you'd better have a bona-fide new family of processors. And not made out of cardboard, either. So we waited until we'd built the Interdata New Series before we introduced it. People believed us. And we're not about to forget that.

When it came to pricing, we learned just like everybody else – the hard way. By getting our pants taken off in the marketplace a few times. That's something you just don't forget. Same about making promises you can't keep. We can't afford to forget that.

We even learned a lot about OEMs. Very smart. Won't pay for a lot of bells and whistles they don't really need. So we designed a special mini just for OEMs. The Model 74. Good but cheap and upward compatible with our other minis – just like the man wanted. If we ever forget that, we can kiss our OEM business goodbye.

And we learned a lot more along that hard road up.

# What the industry taught us about minicomputer pricing.

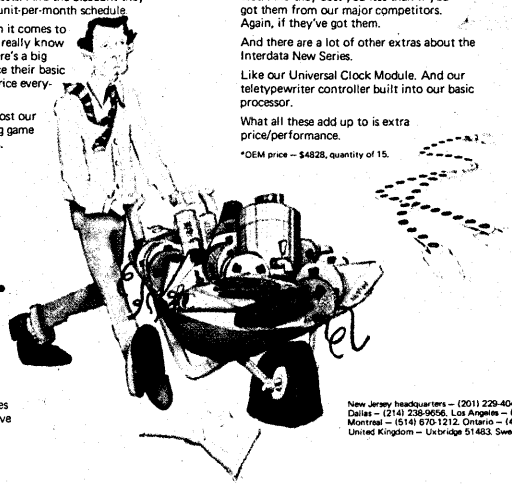
## We've learned the hard way.

Step right up, fans. Here's the greatest little dollar-saver to ever come down the pike. Cycle times too fast to measure. Memory 'til it won't quit. All for a price so amazingly low that it defies the laws of economics.

Terrific. Until you realize they're talking about a processor so stripped down it won't even hum by itself. Its assembly may be your next do-it-yourself project. Except for the tic-tac-toe game, the software won't work without 16 KB more memory and enough peripheral gear to triple your costs. And the discount they used was based on a 1000 unit-per-month schedule.

No question about it. When it comes to minicomputers, some guys really know how to play price. And there's a big difference in how they price their basic processors and how they price everything else.

We ought to know. We've lost our knickers in the trick-pricing game often enough to be experts.



## Promise them anything.

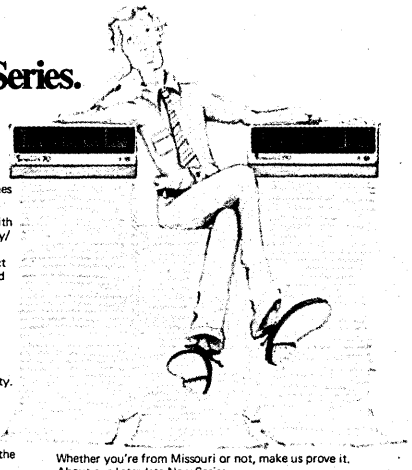
We've learned that you can make a lot of promises.

About delivery, for example. "For a customer as important as you, we'll cut our 9-month shipping schedule in half." About documentation. "We don't have all the manuals yet, but we'll work that out together." And about customer engineering. "Of course we'll assign a full-time man to the Isle of Wight."

But what we've really learned is we don't have to make promises we can't keep. We don't do business that way. We just don't have the stomach.

# Introducing the Interdata New Series.

## What you see is what you get.



What you get from Interdata when it comes to pricing is something extra. Extra value.

Extra processor facilities, for example. With our Model 70,* you get hardware multiply/divide. Built-in 32-bit floating point arithmetic. Privileged instructions. 4 direct memory access ports. Automatic I/O. And 16 general registers.

All for no charge. With other manufacturers, these facilities either cost you extra or are not even available.

From Interdata you get extra reliable memory modules designed in-house for each specific model. With or without parity. With or without automatic memory protect. And they cost you less than if you got them from our major competitors. Again, if they've got them.

And there are a lot of other extras about the Interdata New Series.

Like our Universal Clock Module. And our teletypewriter controller built into our basic processor.

What all these add up to is extra price/performance.

*OEM price – $4828, quantity of 15.

Whether you're from Missouri or not, make us prove it. About our Interdata New Series.

We're ready to demonstrate for you now. Not 9 months from now. We'll even run a benchmark for you.

You could well end up with the best minicomputer price you've ever had. From the minicomputer company who's learned its lesson about pricing.

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Like how to make true DC processors instead of modifying GP processors for Data Communications people. Like how to put a well trained and equipped service network in place before we beat the bushes in East Oshkosh. Operating systems like RTOS, DOS, BOSS and a telecommunications operating system RTEX. And like how to put together a family of software packages that really work before we started peddling them.

Some of our lessons were painful. Maybe that's why they stick. Maybe it's because we know if we hadn't learned, we never would have made it.

And maybe because we plan to grow even faster, we know we'll have to learn a lot more than we know now. And get a lot smarter about how to do a better job for our customers.

Will success spoil Interdata?

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rence L. Spitters.

One of four cofounders of the firm incorporated in 1961, Spitters is the only one to remain. And in that span, he has seen some 22 vice presidents leave. But the unexpected resignation of Jim Guzy, believed by many to be in line to succeed Spitters, was a surprise. Even former executives of the company acknowledge that Spitters depended to an inordinate extent on Guzy, and Jim was "the only one he ever listened to." As one former colleague of the two, neither of whom could be reached for comments, said: "He would listen to Guzy and not take the advice of people who were infinitely more knowledgeable."

Why, then, did Guzy leave?

The conjecture most often mentioned was that Spitters wanted to get back to the operation of the business. Each day, he reportedly found himself with a lesser control. States one observer, most of the key executives at Memorex until recently were hired through Guzy, not Spitters. It was Guzy who got the company into the peripherals and the systems businesses—or at least who talked Spitters into it. It was Guzy who got the publicity for his uninhibited jabs at IBM. But it was Spitters who had to deny with each organizational change that Guzy was being groomed as his replacement.

### Don't con him

Currently, no successor is in sight for the 46-year-old chief executive, who is an intense, bright, and energetic person. Perhaps constantly thinking of the business, he has had a number of traffic mishaps—accidents and violations. Even those who profess no love for him acknowledge readily that Spitters is a perfectionist, a methodical and exacting person, "a genius with the accompanying idiosyncracies," and "behind those small glasses, a very tough man." He is said to be accommodating but very impatient with wasted time. "I'd never try to con him," states one con man, who adds: "I always found him fair, but that's where some other people's evaluations of the man conflict with mine."

LAURENCE L. SPITTERS
The board always votes 9-0.

But can Spitters resume control of his company? Yes, says one of his former vice presidents. "Spitters can review a business plan better than anyone I've ever known . . . I think he is better qualified to run the company than Guzy." He adds, "I have no personal fondness for Larry, but he is one of the most talented executives I've ever come across. He's *good*." On the other hand, he notes that Spitters doesn't understand the motivation of people. In the past, he was able to do this with financial rewards. "In the earlier days, you could time executive departures by looking at when their stock options came due."

That financial carrot, of course, is no longer there. What probably hurt the company's stock more than anything else was the sharp rap delivered by the SEC over the company's accounting practices. Spitters, in addition to


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This new concept scanner reads hand-print or machine-printed numerics. And ordinary pencil marks as well.

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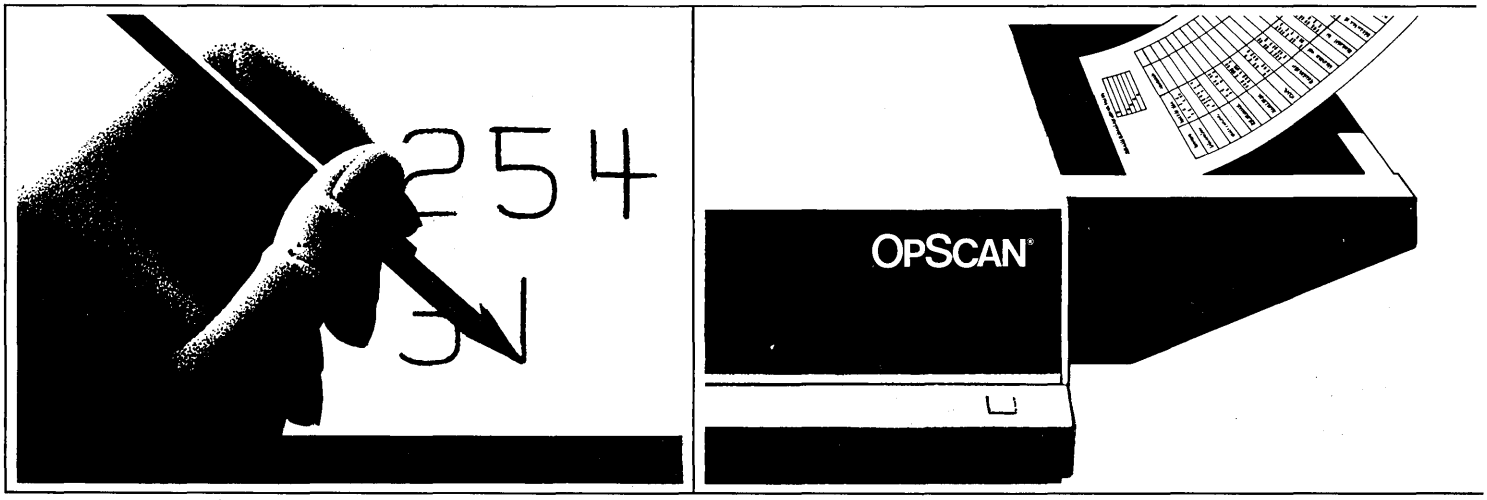


the company, was charged personally. And Larry, who holds a law degree plus an MBA from Harvard, told several people that it was all a bum rap, that he could've challenged the securities commission's ruling. But company lawyers advised him against it, saying it would take a lot of time and money.

**What he likes best**

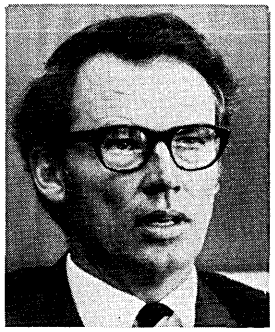
Both his meticulous, methodical nature and his ability to relax on the job are illustrated by lengthy sessions he often has. Give Larry a project that turns him on and he'll devote many hours to it, working Saturdays and Sundays until it's complete—even for something that most people admit no chief executive should be concerning himself with. "But like most people," said a former associate, "he does the things he likes to do best. I think we're all guilty of that."

But he apparently excels at his board meetings, where he arrives extremely well prepared. Several years back, he was heard to say that there has never been a vote by the board that wasn't totally in favor of his proposals. He so ably answers questions posed to him that the vote has always been 9-0 in favor of his presentations.

Even at business meetings, which there were a lot of, Spitters just sits and takes notes for an hour or two while everyone else talks. Then he takes over, asking very intelligent, probing questions on gaps left in anyone's presentations.

A night person, someone who works more effectively in the evening than in the morning, Spitters in the past has been known to work erratic hours—but long. He might come in at 10 a.m. and work through to the next morning. He might do that for a couple of weeks, but then he wouldn't show up for the next two. Currently, according to a company spokesman, Larry is in at 8:30 and works each evening until 9:00. Does he take work home? "With eight kids at home, it's not likely he'd get anything done," it's observed.

**—Edward K. Yasaki**



TOP MEN AT MEMOREX: John J. Kramer, vp and general manager, computer equipment products business; J. Garrett Fitzgibbons, general manager, media products business; E. Douglas Larson, vp and general manager, equipment products operations.

## Nipping Around Univac's Edges

Not only mainframers knock at the doors of RCA computer users these days. A 90-man Cherry Hill, N. J., peripherals company now is in the act seeking to alienate the strange affection that began 15 months ago when Univac acquired the RCA customer base in what was called the "buy of the century" (July '72, p. 85).

Unlike other peripherals firms that seek to enhance IBM 360s with 370-like peripherals, two-year-old Formation, Inc., peddles the idea of enhancing RCA computers with 370-generation attach-


# Interfaces with standard hardware

Numerous outputs—modem, keypunch adapter, cassette, magnetic tape, printer and CRT—make the scanner extremely versatile. And it may be used on-line too.

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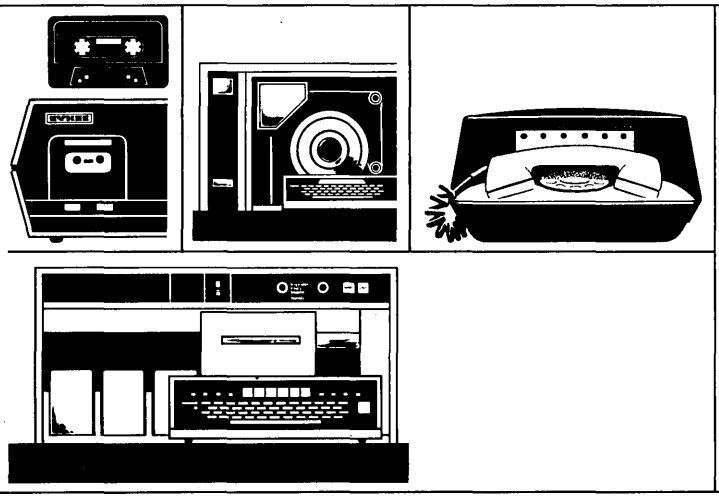

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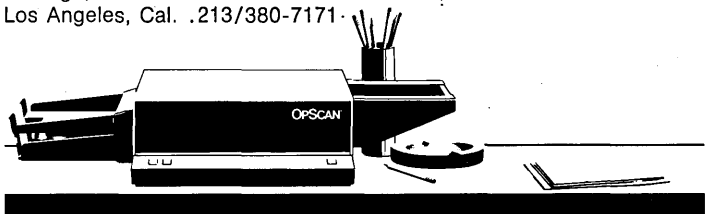


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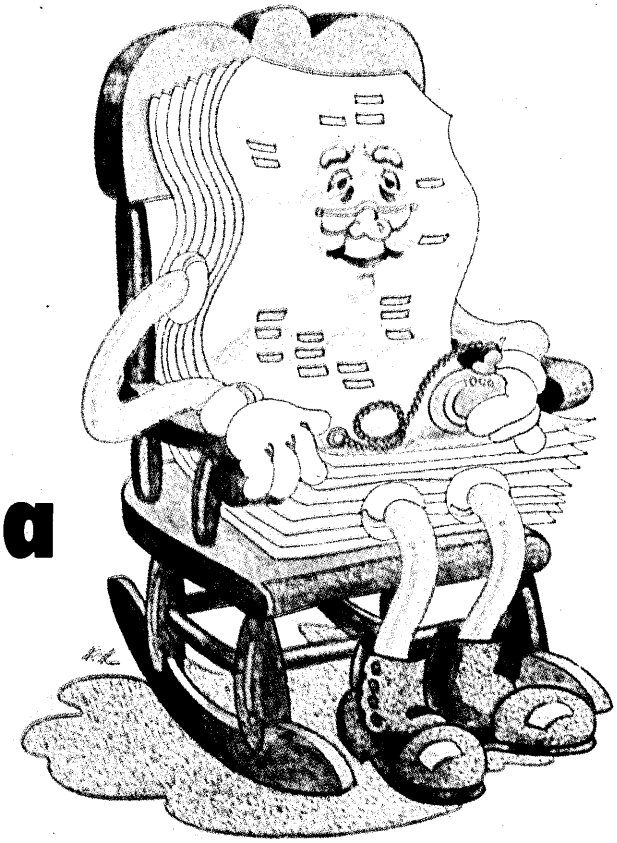
CIRCLE 90 ON READER CARD

# You're right.

# Retiring an old friend should never be a hasty decision.



You're used to the punch card and its pokey, unbending ways. People have been adapting data to it longer than you or your computer have been around.

But right there is the real Achilles heel.

Everybody's data just isn't the same as two cards in a punch.

We saw that early on, as well as the greater throughput you can get with key-to-tape.

Mohawk Data started with the stand-alone Data Recorder, and we've never stopped teaming it with options.

We pioneered cluster key-to-tape systems.

We went on to key-to-disk with tutorial CRT display in our System 2400.

Point is, today we're the only supplier who has all the options key-to-tape.

We've got choice, not a challenge.

Instead of force-fitting you to a single line of hardware, we've got all the hardware to tailor a system to you. Your documents, your volume, your locations, all the formats you need.

So take the time to hear your options.

After all, you're after the most in throughput with the least in equipment, people and space. We became the Peripheral Power by showing an awful lot of people how.

Call our nearest sales office. Or write for our new brochure that describes a choice, not a challenge.

Mohawk Data Sciences Corp., World Headquarters, Utica, N. Y. 13503.

CIRCLE 40 ON READER CARD

MDS®

**The Peripheral Power**

ments. So far, they've penetrated eight installations—not a large base, but an influential one.

Formation builds controllers that interface 3420-type tape drives and 3330-type disc drives with everything in the RCA line from the 3301 computer through the Spectra and New Series models, now called Series 70. The company is loaded with ex-RCA engineers, planners, and marketeers whose experience goes back to the Bizmac.

Among them are president Arthur Beard, formerly chief engineer of RCA's computer division; Karl Kozarsky, vice president of business planning, who was product planning manager on the 3301 among other posts; Bob Jenkins, vp for tape products with RCA from Bizmac days; and marketing vp Art Mendelson, who had been involved in mass storage planning and marketing.

Their efforts, which also include maintenance of purchased RCA computers, spell some trouble for Univac's plan of bridging RCA customers over to Univac—not IBM—systems. And they spell joy for the RCA user. Even when Formation loses out on a contract, the customer usually picks up added discounts from Univac in the battle.

### Telex systems

So far Formation has installed or on order 46 tape controllers to interface over 400 Telex tape drives to RCA systems. It has contracts for disc controllers for over 40 Telex-supplied disc drives. Formation says it is not limited to Telex systems, but so far either one or the other has been prime contractor in the orders involving Formation systems.

The reason for these sales is not only price, which runs one-third to one-half less than list price for the RCA peripherals, but also added performance. While Univac has announced it will put 196 and 320KB tape drives on the large models 6 and 7, the RCA user has lived with drives operating at a 120KB transfer rate. The 3420 offers the 320KB transfer rate and many other features lacking in the older drives, and Formation will link it to the older and smaller systems in the line without software modification, emulating the RCA drives. In the case of the 3301, the 3845 drives that came with that system are now very difficult to obtain.

Univac has announced a 624KB disc drive for the 6 and 7 models, similar to the 3330, but the rest of the systems use 2314 type drives and the RACE file. While some older cpu's are limited in the disc capacity that they can address (the 3301 can only go to 180 megabytes), with Formation's system they can still get the advantages of the 800KB transfer rate and 27 msec access time of the 3330.

### Maintenance too

But Formation is not only nipping at Univac revenue through peripherals. It is also offering to do full system maintenance for purchased RCA systems. So far it has long-term contracts to maintain 26 3301s and 2 Spectras. If reported figures of 300 purchased RCA systems are correct, Formation has snatched away maintenance revenue for 10% of that base. Those 26 3301s represent 40% of the 65 now installed. Formation is after the rest and has entré to 19 more because it has sold peripherals for use with them.

All Formation's current business is with eight customers. Its first client, a utilities company, has contracted with Formation to maintain 20 3301s and 2 Spectras. In addition, it is casting out its old tape drives, replacing them with 20 Formation controllers (which emulate the RCA drives) and 191 Telex tape drives. Some of those are being used in 10 multiprocessor configurations Formation is building for the firm to handle applications its tape-oriented 3301s aren't designed for. These are based on the PDP-11/45 and handle communications, on-line inquiry, data base maintenance, and media conversion. It says that with these mini-based systems, it beat out bids by IBM with 370/135s and Univac with Spectras and New Series 6 models.

Another utilities company just ordered 180 tape drives and 19 controllers. The U.S. Army Tank Automotive Command in December awarded Formation a long-term contract to maintain six 3301s and 90 RCA tape drives. Two controllers and 10 Telex drives have gone to the U.S. Naval Air Station in San Diego, and currently Univac and Formation are vying for a contract to maintaining its two 3301s. In fact, because of Formation's existence, several Naval stations will force current supplier Univac to compete for maintenance of six or seven 3301s.

Wally Law, dp manager of the San Diego installation, notes that it was in a bind last year because it needed more tape drives for its 3301s and found that Univac couldn't supply them. Because users are a close-knit group, he found out about the quiet Formation through its first customer, the utilities company noted earlier.

### Keeping a low profile

This engineering-oriented firm has been quiet about its achievement for a number of reasons, one of which is to control its growth, and the other has to be to maintain a low profile while it nips around Univac's edges. Formation currently has offices in eight cities in five states and has orders that will take it into 16 cities and 11 states by the end of the year. It also has plans for new products and is currently looking at extending its products and services to other non-IBM computers. The idea is to enhance second- or third-generation systems that are being obsoleted by the manufacturer or that are bound by inadequate peripherals—a non-trivial market.

*(Continued on page 116)*

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# The new TermiNet* 1200 Printer

Moving high volumes of data in your communication system with conventional printers creates unnecessary costs. Equipment costs. Operator costs. Line costs.

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The same engineering and manufacturing technology that made the TermiNet 300 printer (10, 20, 30 cps) so successful is built into the TermiNet 1200 printer, and at only a 30% increase in price. Most options are interchangeable and no extra operator training is required.

Find out more about General Electric's answer to efficiently moving high volumes of data — the TermiNet 1200 printer. Write Data Communication Products Department, Section 794-05, P. O. Box 4197, Lynchburg, Virginia 24502.

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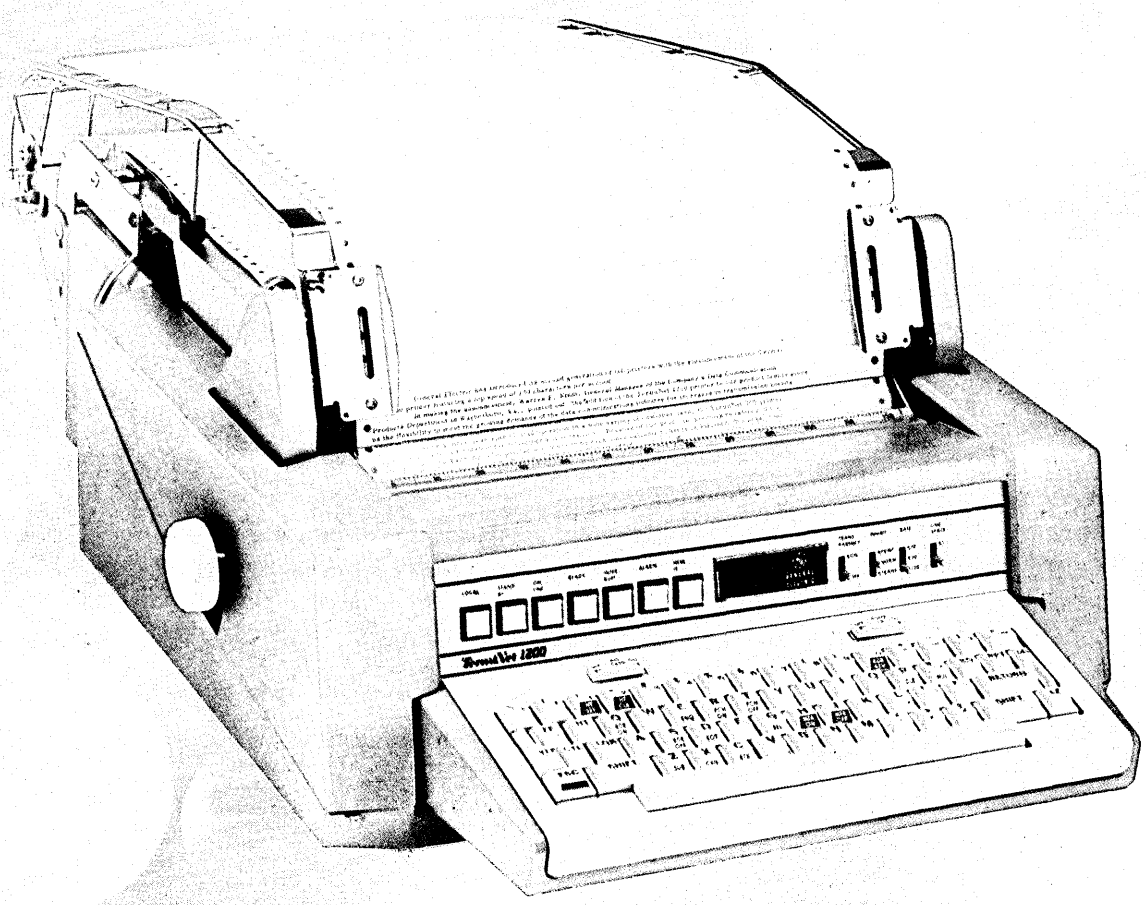
Replaces 12 conventional printers
Reduces operator costs
Reduces line costs



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Eliminate the pokey old punchcard. Go directly to magnetic media. You'll increase throughput 15% or more, and the bundle you save will be in both people and equipment costs.

Good ideas have a habit of growing. And the newest in a full spectrum of MDS key-to-tape capabilities is System 2400 key display.

The tutorial CRT not only tells inexperienced operators what to do, it lets them see they re doing their work right. What's in it for you is quicker, cleaner data entry.

But data entry only scratches the surface on System 2400. This one can be a dedicated cluster of up to 20 positions, sure. It can also be a communications terminal. What's more, it can off-load the mainframe for editing and sorting and printing.

And now, with the boost in available core to 65k, System 2400 can be all of the above. You can configure yourself out of a lot of problems and into some real savings all at the same time.

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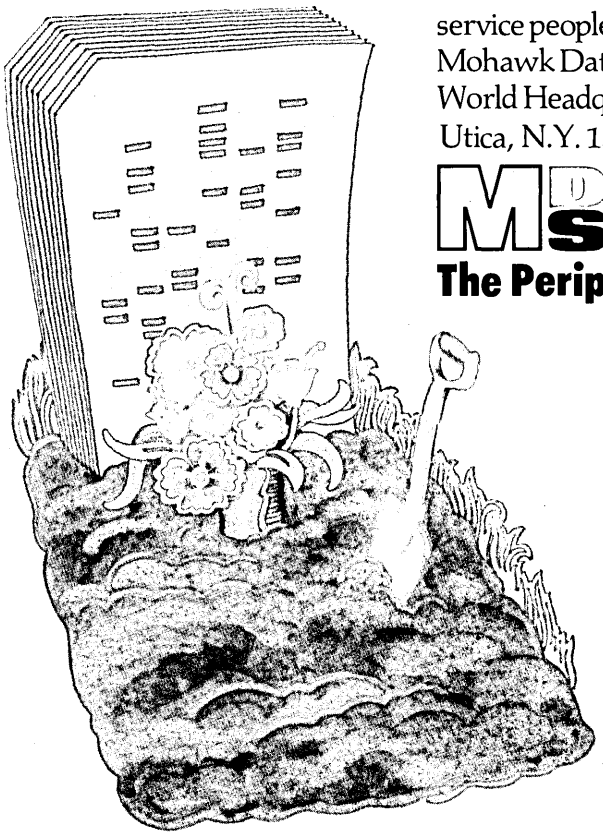

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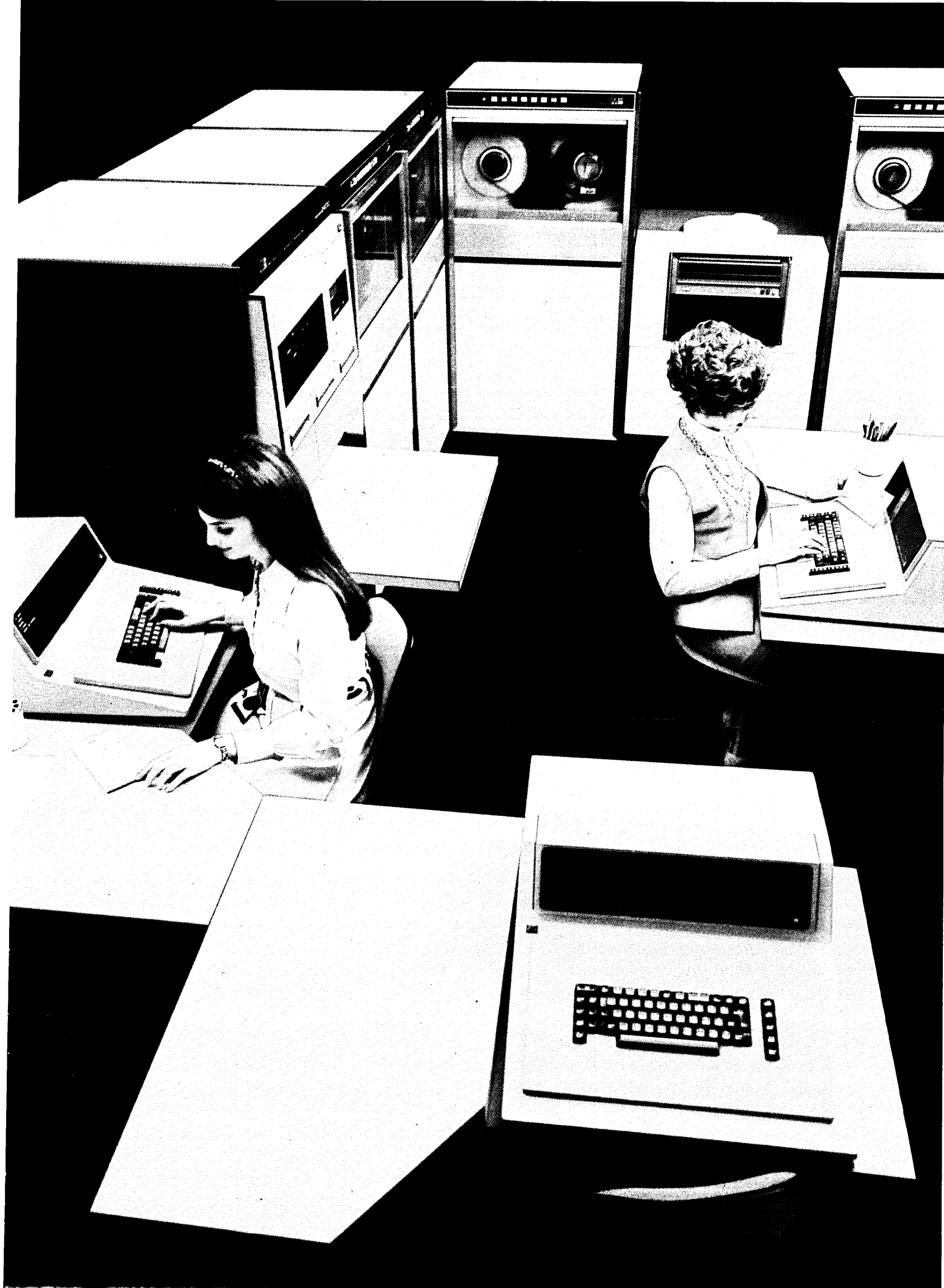
# You've never had a better reason to eliminate the expensive middleman, the punchcard.



*Hospitality Industry*

## Bullet Biting Not All Bad

Compass Computer Services "bit the bullet" back in September 1971 and digested it well.

Compass, which began as a joint venture of Transamerica Corp. and Hilton Hotels to develop an on-line reservations system for the Hilton Hotel chain, was probably one of the most vulnerable of the RCA customers hit by the Sept. 17, 1971, announcement. Compass had designed its system around two RCA 2s and had just taken delivery and started testing on the first 2. Its decision to dump the RCA computers wasn't made instantly but almost. (See Oct. 15, '71, p. 8.) "We talked to RCA," said Pat Morrison, Compass president, "but their assurances were not firm enough." Compass rescinded its contract with RCA in November 1971. "The change was costly and time consuming but turned out for the best."

The firm decided almost immediately on some kind of 370 equipment and quickly settled on dual 145s. The communications controller was a bigger problem. "We couldn't find anything to parallel the RCA controller we were going to use, which was a combination programmable device and hard wired," said Morrison. "There was the IBM 270X gear, hard wired, and at the other extreme, a variety of completely programmable processors. We had a lot of people come in and pitch us with penciled notes and promises of modification but, after our experience with RCA, we didn't want to be part of a development cycle."

### One with manuals

Compass finally decided on the Control Data 1700 because "it had the full range of line adaptors we needed, was off-the-shelf hardware which had been out there for awhile, and came with manuals, not penciled notes."

And so, with two 145s and two 1700s in a computer center in Dallas, the Hilton reservation system moved into a production mode in January, approximately one year later than Compass' original target date but with, according to Morrison, greater growth capability than they would have had with the RCA 2s.

Compass did pilot runs on the system in September and October of last year. Installation of the last of 325 on-line terminals was completed in December, and the system was formally accepted by Hilton. The first production month, January, was a busy one, Morrison said, with the system handling 82,000 transactions in the first two weeks and "way more than a million in the whole month."

All communications lines come in to the primary 1700 (the second, like the second 145, is back-up). The system has 11 dedicated lines and, for the bulk of its traffic, uses a mix of WATS service. It also has dedicated lines to Hawaii and Puerto Rico, but these are Teletype-grade and not connected to on-line terminals.

Although its computer center is in Dallas, Compass' administrative headquarters are in Long Beach, Calif.; and whether they stay there or are moved to Dallas depends upon whether or not the company wants to stick with hotel reservations systems or move into other fields. Now that the system has been accepted by and is operational for Hilton, Compass is looking for other hotel chain customers and has "several proposals outstanding." Hilton owns 20% of Compass, which is operating as a

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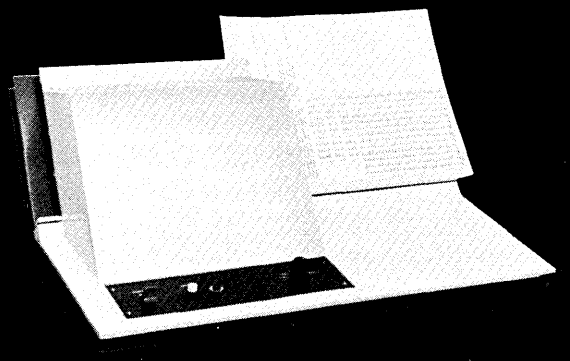

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DATUM PERIPHERAL EQUIPMENT DIVISION

CIRCLE 76 ON READER CARD

subsidiary of Transamerica. In addition to hotels, Compass is "pursuing the motel market" and is looking into applications for their system in motor freight.

"Ours is an inventory-type system much like airlines reservations systems," said Morrison, "more than an availability system as are most reservation systems for hotels." In addition to making and confirming reservations, the system generates rack slips and folio documents for the hotels and has a complete convention management package which "creates a small hotel within a hotel," blocking off X number of rooms with a special structure, and treating those rooms as a separate hotel.

The Compass system currently is handling some 100 Hilton Hotels and Inns on-line. In addition it can provide reservations at Hilton International properties through interaction with a TWA computer center in Kansas City. TWA owns Hilton International.

Why Dallas as the site for the computer center? Morrison said they picked the city for three reasons. First, it's in the center of the country, which helps in communications costs. Second, it has a Hilton reservations office and a fair sized Hilton Hotel as well as an Inn for pilot testing. And third, "we knew we wouldn't be the only 145 in town."

The center, in fact, is in the IBM building in Dallas, which makes for excellent service. They haven't been as lucky with Control Data, but then, says Morrison, "Dallas isn't exactly a hub of activity for them."

"We talked to other 1700 users," said Morrison, "and got raves about reliability. One, Ticketron (controlled by Control Data), called its (the 1700) reliability fantastic. We weren't that lucky but then I guess a lot depends upon the individual maintenance organization."

Terminals for the Compass system are from Terminal Communications, Inc., Raleigh, N.C. Reservations offices have crt's only, while hotels have both crt's and hardcopy printers which are modified IBM Selectrics.

Morrison said they were surprised at how easily hotel and reservations office personnel adapted to the system but attributes it, in large part, to the fact that "we trained the trainers." They brought at least one hotel front office type from each hotel in the chain to Dallas for a four-day orientation. "Then they went back and introduced the system to the hotels using their own language, taking the mystery out of it."

**—Edith Myers**

*On-Line Systems*

## The King of OTB Is Dead...?

When Computer Sciences Corp. stumbled badly with New York's Off-Track Betting system and Ticketron and American Totalisator were brought in to help out, OTB gave CSC an added task. That was to build a big switching system which, among other things, would allow OTB to switch its betting terminals from one supplier's system to the other in case of failures. On a balmy Sunday in January, that switching system turned into the final instrument of CSC's destruction at OTB.

In a secret, dramatic move, OTB senior vice president Jerry Paul arranged that all terminals would be switched to the AmTote system for a test run that day. If it worked, CSC and Ticketron would be out, and AmTote would have the whole contract. The 101 betting parlors were manned around the city, and a mythical 10 tracks ran 10 mythical races that day. The system developed "a little glitch" at 6:30 that evening. OTB had to find out why before midnight and make its decision; it wouldn't be difficult to switch back to CSC's gear in time for


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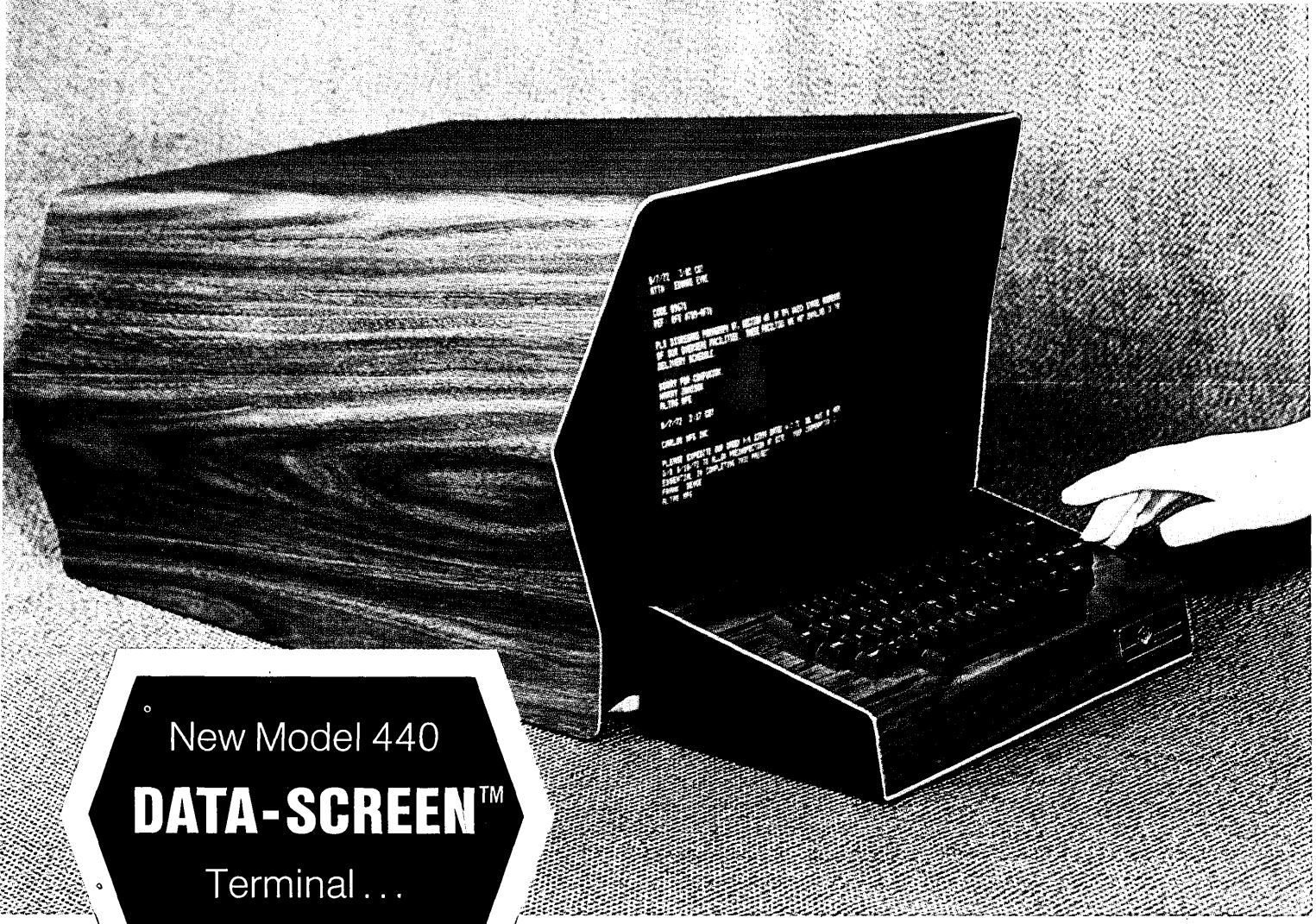

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the Monday betting traffic. By 11:30, an error in the tape prepared on horse scratches was discovered. "Go AmTote" was the decision.

An OTB employee, meanwhile, had sat in a lonely motel room in Virginia—armed with a letter giving Computer Sciences 30 days' cancellation notice. Paul called him at 11:45, and the next morning CSC had the letter, most surprised that the guillotine had fallen that quickly, but not very surprised that more than two years of heartache and bickering between the two organizations had finally come to an end.

### A parting miss

The gesture of eradicating CSC almost the *minute* it was possible was perhaps symbolic of the troubles between the two. And so was the last disaster CSC left behind: OTB discovered on Monday that somehow the CSC files of unpaid winners for 29 of the previous 30 days had been clobbered. "They even died with their dirty underwear on," was Paul's final comment on his ex-supplier.

As it expected, OTB is saving $250,000/month by eliminating two of its three vendors. In December 1972, it paid CSC $229,000, Ticketron $186,000, and AmTote $10K (for the telephone betting system). In April, when the two vendors are completely out, OTB's bill will be $175,000.

The AmTote win is a big plus for minicomputers, small software teams, and extensive knowledge of the application. Its system will comprise a master/slave configuration of 12 Varian 620/L-100s. The master will use five 620s to handle 200 on-line betting terminals each (more than 600 terminals are now installed); a sixth mini will process totals, keep track of winners and calculate shares of revenue. Data is stored on two five-megabyte drums. The identical slave configuration (as opposed to a duplex back-up which is on-line) will receive the betting data after the master processes it. It can be brought up "in a few minutes" if the master system fails.

### Slow starter

Ironically, AmTote had stayed away from the OTB opportunity originally, merely making a token proposal, because it lacked terminals suited for off-track betting. But it had had extensive experience in betting applications, having installed its Varian-based Duplex Tote system "on-track" at 45 race tracks around the country. It had watched the faltering CSC system and come in with a proposal to handle telephone betting in mid-'72. It won that contract and was given the go-ahead in July to try to develop a system for the entire contract. International Computing Corp. in Bethesda, Md., had been AmTote's software subcontractor in the on-track systems and developed the software for the OTB system—never using more than seven people on the effort. AmTote paid for and owns the software. It will undoubtedly be used for Connecticut's betting system that AmTote currently is negotiating.

Ticketron, which was praised by OTB for its efforts, seemed to have been entrapped by the system that had given it the entry to OTB when CSC was in trouble. It ran into problems with the overworked 1700s and planned to upgrade to CDC-3000 series systems, but the time to delivery and cost were too great compared to AmTote.

Computer Sciences walks away with "several million" for its efforts. And that included the development of software, the sale to OTB of more than 1,000 terminals that were intended (and written off) for the defunct Computicket, and the building of that switch for self-destruction.

**—Angeline Pantages**

*(Continued on page 121)*


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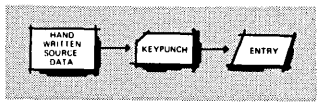


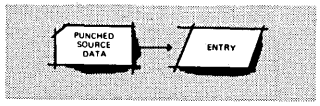


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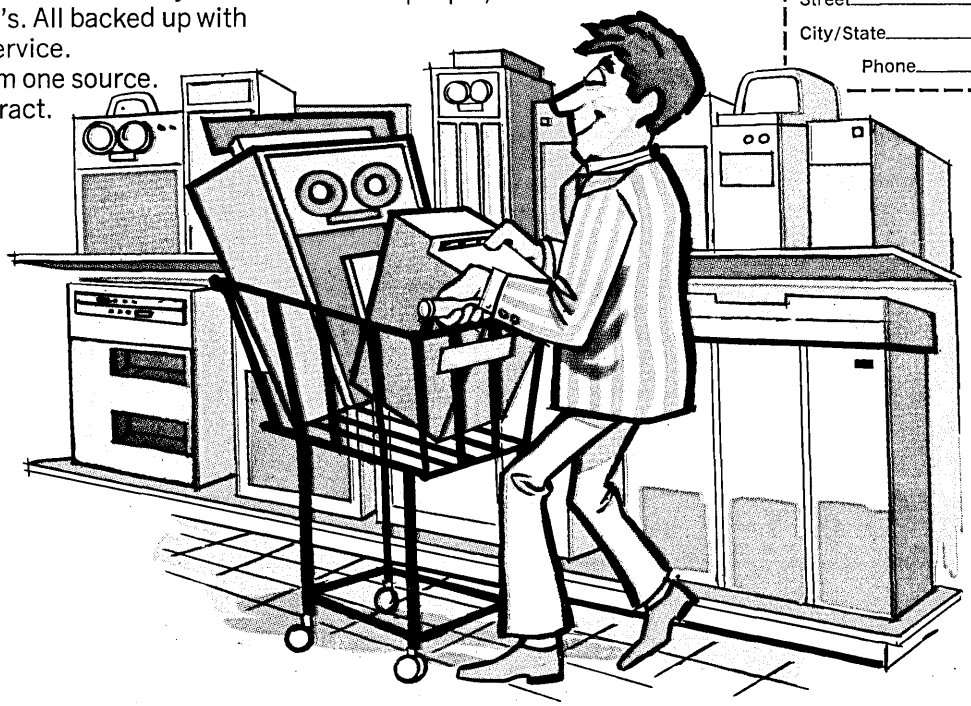

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## DP Services Ruling Pleasing to Most

A Federal Communications Commission ruling of 1971 that greatly affected the fortunes of dp service bureaus appears to have weathered an appeal in court to the satisfaction of its opponents.

A panel of the Second Court of Appeals, in a unanimous decision, partly upheld and partly overturned the FCC's ruling that provided for maximum separation between regulated and unregulated activities of common carriers. The decision followed what is called the Computer/Communications Inquiry.

The court upheld the commission order prohibiting common carriers from offering commercial data processing services through subsidiaries whose activities are subsidized by the carriers. The court said the commission also was right to bar carriers from marketing their affiliates' dp services. But the court cancelled a related provision forbidding a carrier's dp subsidiary from doing work for its parent or using the parent's corporate name.

A spokesman for the Computer and Business Equipment Manufacturers Association (CBEMA) said he was happy with the decision. "It affirms our argument that the FCC can't legally regulate the data processing industry. The commission, in 1971, indicated that it might have such power, but wasn't choosing to use it at that time."

In a "news bulletin" CBEMA said, "Essentially the Court arrived at the same conclusions as CBEMA."

Herb Marks, attorney for the Assn. of Data Processing Service Organizations (ADAPSO), said that "On balance, the decision has very favorable aspects but we haven't determined our next move." Jerry Dreyer, ADAPSO's executive vice president, was "pleased, overall, because the court firmly endorsed maximum separation (of carriers and their commercial dp operations) and fair pricing."

*Networks*

## Several Firms Eye ARPA-Type Network

For more than a year, the Defense Dept.'s Advanced Research Projects Agency (ARPA) has wanted to convert its huge ARPA Network into a commercial service. The plan, according to Dr. Larry Roberts, who developed the huge project that connects many specialized computers of different makes, was to put the federal interest up for bid to a commercial operator in about a year (see April '72, p. 106).

If the agency carries through its plan to sell Arpanet, the successful bidder will have several competitors. A six-man company in Waltham, Mass., has applied to the Federal Communications Commission for authority to set up its own commercial version of the network. Two others, Telecommunications Networks, Inc., and Telenet Communications, Inc., were also considering applying for FCC approval. Tymshare, Inc., of Cupertino, Calif., said it already operates a similar service for users of its Tymnet system.

In its application to the FCC, Packet Communications says it could transmit huge files of data at a fifth or less of the price charged under Bell tariffs.

In the proposed network, customers' computers would be interconnected, and data would be assembled into


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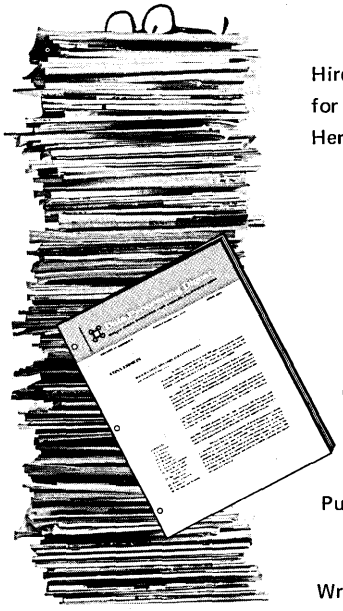

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packets of information. These packets would be switched under control of packet switching processors (PSP) throughout the network. To users, the advantage over private line methods is that the subscribers do not have to be concerned with communications equipment such as modems, concentrators, and multiplexors.

In operation, the packet switching processors accept messages from computers, subdivide and reformat the messages into packets, and route them toward PSP's serving the destination computer. When a PSP receives packets, it does error checking and then reassembles them into messages. The company says the end-to-end transmission process, including the store-and-forward functions of the PSP's, adds no more than an average of 0.5 seconds to the roundtrip communication delay.

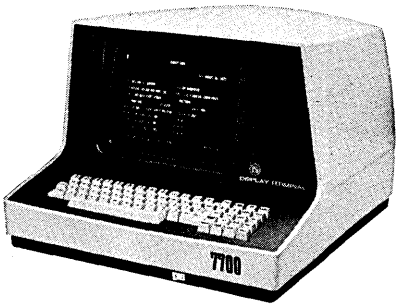
Existing terminals and computers rarely use more than 10% of a particular circuit's capacity, and in many cases, less than 1%, according to the company's application. It says "experience with the ARPA network indicates packet switching can increase resource utilization efficiency to as high as 80%."

It lists several examples of cost savings for users of such a "resource-sharing" network. One example involved transmission of a 10-million-bit file on a 2KB per second dial-up line for a distance of 1,000 miles. It said the cost would be about $195, based on present Bell tariffs, with nine hours of transmission time and assuming 15% line usage efficiency and daytime rates. On a leased wire, the same transmission once each day would cost about $66 and take two to three hours to transmit. This assumed a speed of 4800 bps, 25% efficiency, and full duplex facilities. PCI compared these costs with its proposed network where the same data could be transmitted in 4-20 minutes at a charge of $20-40, depending on the monthly data volume from the transmission point.

PCI was formed last July by Lee Talbert who is the president and treasurer. He later was joined by Ralph Alter, operations vp, and Stephen Russell, engineering vp. The three men left Bolt, Beranek and Newman, which did most of the Arpanet systems work for the Defense Dept. BBN owns Telenet, one of the other firms considering forming a similar network.

Alter says PCI hopes to get FCC approval this summer and begin transmitting data in a year. It would serve 20 cities by 1975 and 57 cities by '78. The channels would be leased from established carriers, with PCI supplying the communications software and hardware. Capital requirements were estimated at $25-30 million over a 3-4 year period. It said the money would be raised through public and private placements. Letters of interest from an investment bank and a commercial bank were attached to the application.

Although the proposed network is "conceptually similar" to the government-funded Arpanet, Alter contends that the technology is in its public domain and "theoretically should be available to us and to others." He said he has been reassured informally of this by the Defense Dept.

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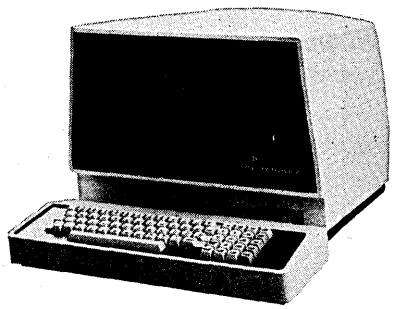
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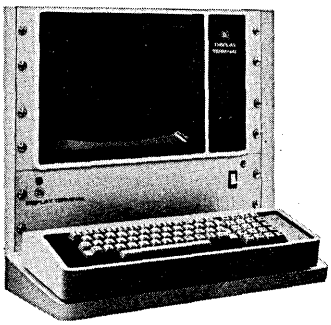
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*Communications*

## Bell Seen Easing Interconnect Ban

Liberalization of AT&T's interconnect restrictions appears imminent.

An FCC source said the phone company "very soon" will amend its interstate message toll tariff (No. 263) allowing some users of independently made terminals to access the interstate network even if their installations don't

meet all of AT&T's present requirements. But the terminals will have to satisfy intrastate requirements to qualify for the special consideration, and, at the moment, Rochseter (N.Y.) Telephone Co. is the only intrastate carrier offering better interconnect terms than AT&T.

California, though, may not be far behind. The California Public Utilities Commission in January ordered General Telephone of California to supply "an interface without protective features" to directly connect a call diverting device produced by Com-U-Trol Inc. And in another case the state agency ordered both General and Pacific Telephone to allow direct connection of a device produced by Phonetele, Inc., whenever the carriers are unable to supply a connecting arrangement within 30 days. The California PUC will review the Phonetele decision this month. In the meantime, the company has taken the issue to the state's supreme court asking authorization of direct connection for all its installations. Phonetele's equipment restricts outgoing phone calls to certain area codes and prefixes.

The FCC's common carrier bureau drew upon the situations in Rochester and California to bring some pressure to bear on Bell to ease its interconnect policy. In a December letter to AT&T, the bureau asked the company to give consideration to establishing 30 days as a universal standard in interstate tariffs and to providing for temporary connection whenever this time period cannot be met. It also told Bell it could no longer totally bar use of customer-provided terminals that include network control signaling. The New York Public Service Commission made such terminals legal for Rochester Tel customers, the bureau explained, "and it is assumed (Rochester Tel) customers . . . will engage in interstate as well as intrastate communications."

*International*

## Barclays Loss a Blow for Burroughs

Burroughs took a body blow with a decision by Barclays Bank in the U.K. to replace three B6700s with two IBM 370/165s (see Jan., p. 9), and to switch a B5500 installation to IBM processors.

Reason given by both Barclays and Burroughs was that the bank had abandoned plans to go to an on-line real-time operation for which the Burroughs machines were configured in favor of on-line batch, and all its batch programs were written for IBM equipment.

The loss in the British banking sector, however, is of particular importance. There are four main bank groups handling the vast majority of current account banking. They are nationwide businesses with branch offices in every main street. Barclays, for instance, has 2,400 accounting branches which are being brought on-line. These branches will retain more than 3,000 Burroughs TC500 terminal processors. The TC500 was specifically developed for British banks.

This was the state of Burroughs' business in British banks early last year:

*Barclays:* Three B6700s plus TC500s for a total value of more than $50 million.

*Midland Bank:* Two B6700s and TC500s valued at more than $30 million.

*National-Westminster Bank:* TC500s worth more than $25 million.

*Smaller banks and savings organizations:* A battery of B2500 and 3500 processors and TC500s, worth another $25 million.

This gives some idea of the lucrative nature of the British banking scene, which is nearing completion of a changeover to on-line operations. Not surprisingly, the big four banking groups have a major influence on the procedures and standards adopted by


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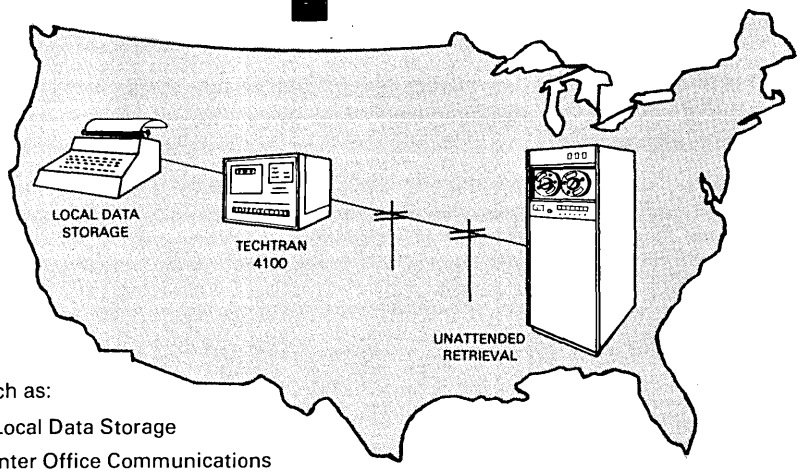


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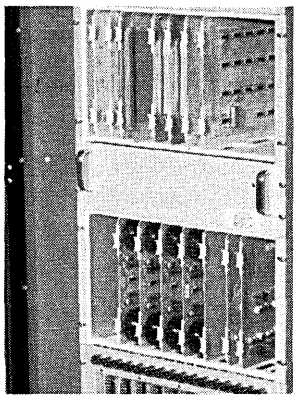

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other computer users. This influence affects things like standards for information exchange of payroll data for automatic monthly payment into an employee account. As a general rule, banking is not a market in which mistakes go unrecognized.

### Looking back

Some of the background to the Barclays situation suggests that the bank is not entirely blameless. Data processing in the banking market has evolved in an interesting way. The dominant office equipment suppliers, with accounting machines, for years were NCR and Burroughs. The spectre of IBM did not loom until comparatively recently. An IBM subsidiary has been operating in the U.K. for less than 20 years. But, when IBM did arrive, it made an early and successful bid for the initial computer business in banks. Until five years ago IBM had a seemingly impregnable position in the banks, and it was largely from this lush base it built its U.K. business to a point where it has a 55% hold on the market.

Burroughs won its B6700 and TC500 contracts from under IBM's nose. This caused a wound that brought trouble shooters from Armonk to shake IBM (U.K.) management until teeth dropped out.

IBM lost out through its own inflexibility. Burroughs had developed the TC500 to specifications of a U.K. interbank research group. It was designed and produced in Scotland where Burroughs is well established in this scale of production. Most of the banks were excited when the Burroughs equipment emerged, and IBM made the astonishing decision not to offer anything more than an existing slow, modified terminal. Bank executives made it clear they were irritated at the attitude adopted by IBM *after* it had achieved a dominant position in the bank market.

This irritation must partly explain the intense interest displayed by some British banks when Burroughs produced the B8500, the machine which ultimately was replaced for banks by the B6700. Burroughs had no European or U.K. know-how for implementing an 8500-scale commercial installation and had had precious little experience in the States. Yet contracts were signed well before there was any documentation in the U.K. to write a simple program for the machine.

The following is a quote from a computer manager to banking executives at the time of a B8500 order: "Branch management and staffs will

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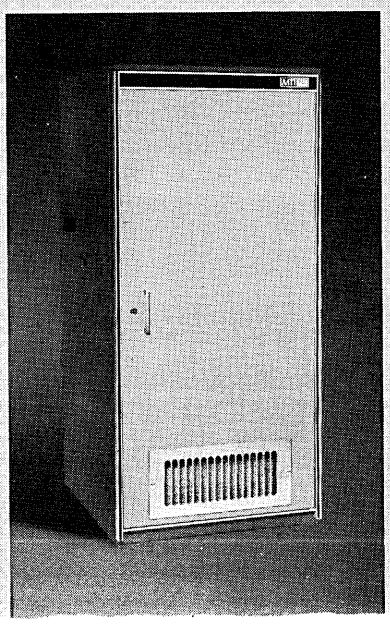

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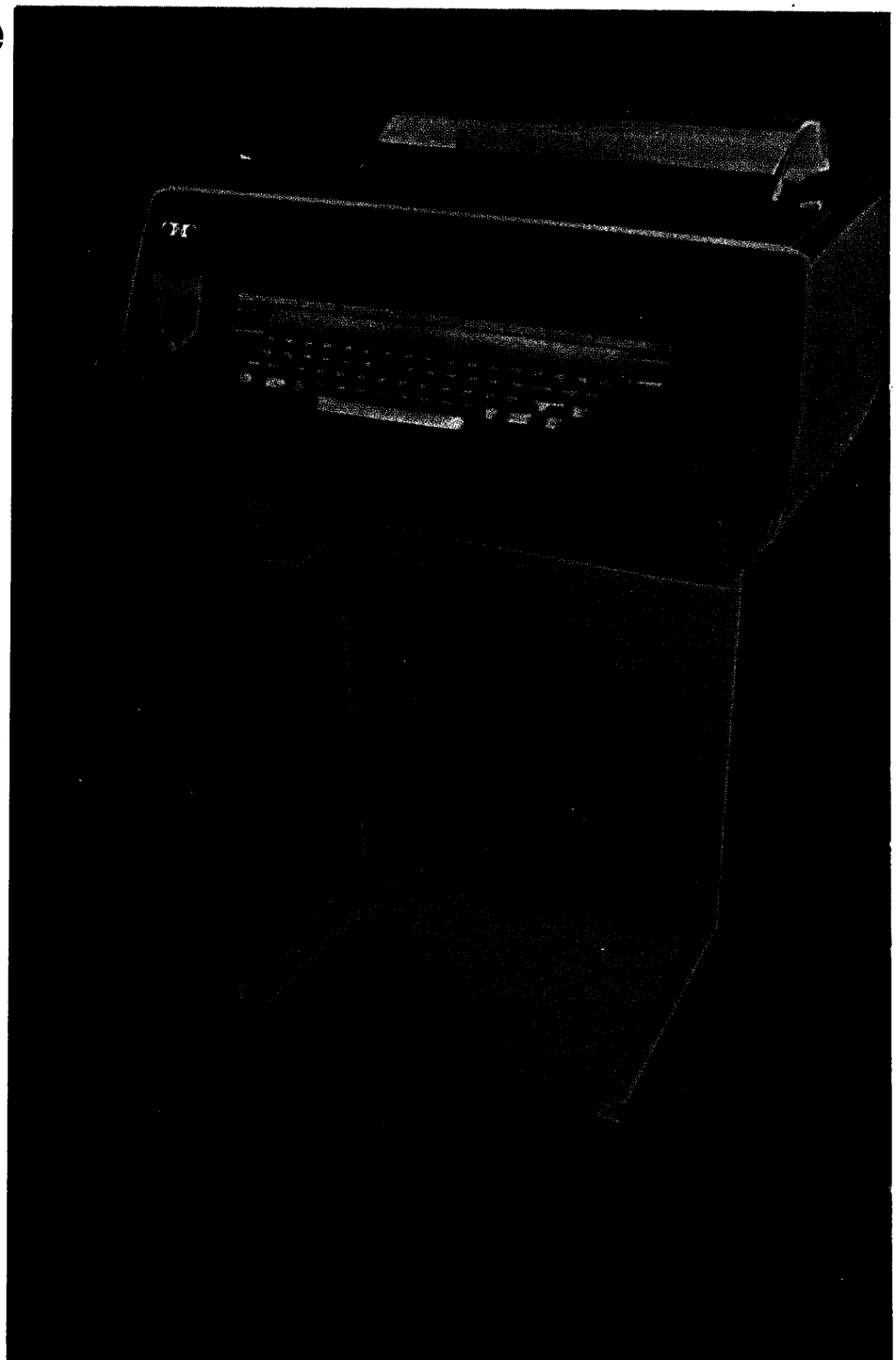

Our new model 38 eight-level data terminal is anything but ordinary.

Because it's loaded with big machine features.

Like a 132 character printing format on a 15-inch wide platen. It's designed to handle computer print-out paper so you can eliminate time-wasting reformating procedures. And for added versatility, there's a simple modification kit that permits you to use standard friction-feed rolls, too.

More big machine features? The model 38 prints both upper and lower case, in two colors, for maximum visibility and clarity in data presentation. And the four-row keyboard generates all 128 ASCII characters.

Speed? The model 38 moves data at 100 words per minute. For on-line speeds up to 2400 words per minute, it interfaces with the Teletype® solid-state 4210 magnetic tape data terminal.

The model 38 is flexible enough to fit into practically any switched or private-line system. That's why there are three interface options available. You can select from a built-in, factory-tested modem; a current interface; or an EIA interface.

You also get a choice in receive-only, keyboard send-receive, and automatic send-receive configurations.

Finally, the model 38 was designed to offer plug-to-plug compatibility with just about anything—including the model 33.

You'd think that all these big machine features would carry a big machine price tag, right?

Wrong.

We priced the model 38 so low it can be used economically in most applications—even in low usage locations where terminals couldn't be justified before. To offer real-time system up-date, data entry and retrieval, and inquiry response throughout your operation.

It takes more than manufacturing facilities to build the machines Teletype Corporation offers. It also takes commitment. From people who think service is as important as sales. In terminals for computers and point-to-point communications.

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CIRCLE 78 ON READER CARD

# Your computer deserves a faster plotter!

**The pen . . .** It's not hard to understand why man used it in the first plotter. He had drawn with one for a thousand years. And it served him well.

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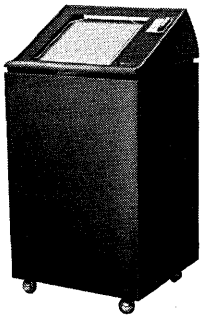
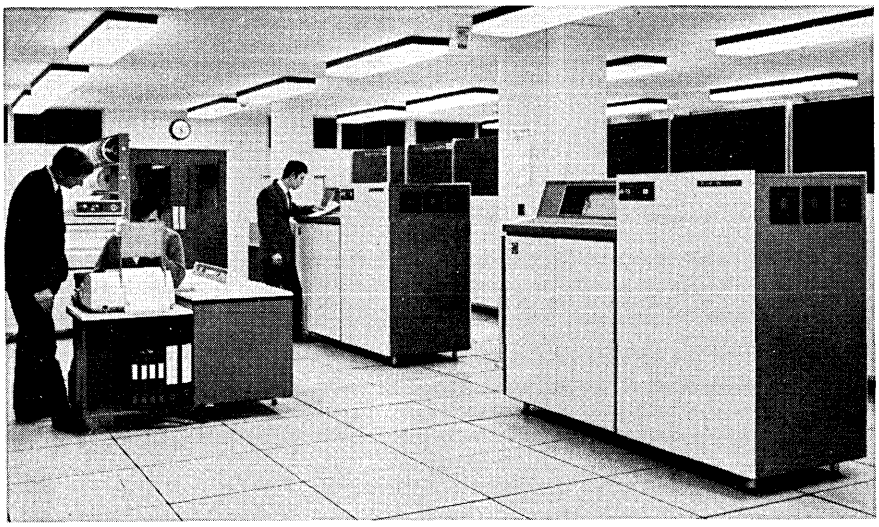
VERSATEC



**Matrix — the largest selling Printer/Plotter in the world.**

CIRCLE 58 ON READER CARD

# news in perspective



LAME DUCK Burroughs central computer at Barclays Bank soon may have a new home.

want to know the safeguards provided for them if they are made dependent on equipment outside their offices. In the USA, this was provided in the early real-time savings banks installations by duplication. It is an expensive insurance. Happily, the new generation of machines, of which the B8500 is an example, is of high reliability. They employ techniques of defense against breakdown by procedures that are described by terms like 'diagnostic' and 'self-heal.' If a failure occurs, the machine can locate a fault and reorganize itself to bypass the faulty unit. At the same time, the maintenance engineer is advised what to do."

Aspects of operating systems and data communications management were equally optimistically explained. Of course, with the benefit of hindsight, different decisions probably would have been made. Apart from its own staff, Barclays had some of the best recognized software house advice. Significantly, the last review, which led to rejection of the B6700s, was prepared by a former IBM consultant.

Burroughs is faced with finding a new home for the three 6700s if Barclays itself can't find some use for them, and Burroughs said last month that was still a possibility. Then there are rumors that Midland Bank might take them cheaply. Midland's scale of on-line operation is slightly smaller than Barclays'.

**—Pearce Wright**

## "Buy Europe" Still Just a Slogan?

The nine-nation European Economic Commission is expected to complete before summer its recommendations for a stronger European computer industry. It is no secret that it will ask the member governments to provide this support by allocating a minimum proportion of their expenditures on equipment from European-owned companies.

Of the estimated $3.12 billion spent annually in Europe for computers, more than $2.5 billion goes to American-owned companies. The remainder tends to go to computer firms within these countries to the exclusion of other European nations. This is notable in Germany, France, and Britain. Some say this latter policy infringes the Treaty of Rome under which the European Economic Community was formed; but it has never been challenged formally because interference could have harmed further an already fragile industry.

Nevertheless, the EEC has decided these restrictive measures are making things worse and that corrective measures are in order.

Pierre Bourguignon, EEC director of industrial, technological and scientific affairs, spoke of the need for a European policy at a conference early this year in London organized by the Software Houses Assn. He said national preferences in the public sector, expressed or implicit, were not compatible with the treaty. It was unthinkable that the commission could allow them to remain a permanent feature of policy. The culprits in the commission's eyes were Britain, France, and Germany.

His reference was to the explicit computer preference policy in the

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*Penril's 4800B-1 modem pictured above has been selected by the U.S. Internal Revenue Service for use in its nationwide data communications network.*

CIRCLE 8 ON READER CARD

U.K., an implicit one of recommendations in France, and an intriguing situation in West Germany where no official preference is said to exist but where procurement policies operate as if one did.

At the same conference, Pierre Adouin, Délégué Ajoint à l'Informatique, Ministry of Industrial and Scientific Development, France, said formation of a European multinational company was the only strategy against the inexorable development of IBM. He said by 1980 a European group could be second only to IBM. But there would be no European computer industry with an assured future if ICL did not join. ICL's addition to the group with Compagnie Internationale pour l'Informatique (CII) of France, Siemens of Germany, and Philips of Holland should make a strong competitor.

**Five-year plan**

Attempts to achieve this union have caused many heartaches. The necessity for it was described in detail in 1968 by a group that prepared a report for the EEC. This created the climate for direct discussion between the European manufacturers; ICL was invited to these preliminary negotiations long before Britain joined the EEC; and the idea of joint development of large-scale computers was promoted.

Negotiations continued until 1971 when ICL was still uncooperative. So CII went ahead with an agreement to unite computer interests with Siemens. This was accepted more than a year ago, and Philips quickly offered to join the group.

A year later, Philips still hasn't signed, and the only progress between CII and Siemens came with the transfer last January of the French computer activities of Siemens to CII and the German activities of CII to Siemens. The prospect of producing a common range of computers and cutting duplication by merging manpower and technical resources seems as dim as ever.

The various maneuvering has been against a background of intense political pressure. Even in the U.K. the government makes loud noises about the hopes for a European industry, and the great contribution possible from Britain.

However, ICL appears even less likely to entertain the idea than it did four years ago. The new range of ICL machines in the offing allegedly follow a distinctive ICL concept of keeping away from a direct mimic of IBM, while allowing enough compatibility for conversion of customers. Firm arrangements are being made with peripheral suppliers from the U.S. All of which keeps ICL remote from the CII and Siemens developments of essentially European versions of IBM product planning.

**—Pearce Wright**

*Law Enforcement*

## GAO Enters Crime History Conflict

Opponents of the way criminal history files violate privacy have received indirect support from the powerful General Accounting Office of Congress. The watchdog of federal spending has advocated turning off money to criminal history exchange systems that are funded by the Law Enforcement Assistance Administration unless these systems improve the reporting of arrests and dispositions.

The recommendation is contained in a recent GAO report to Congress. The Justice Dept., which administers the program, has replied that it has remedied this problem. It says the LEAA now requires mandatory reporting when the state system becomes operational. But


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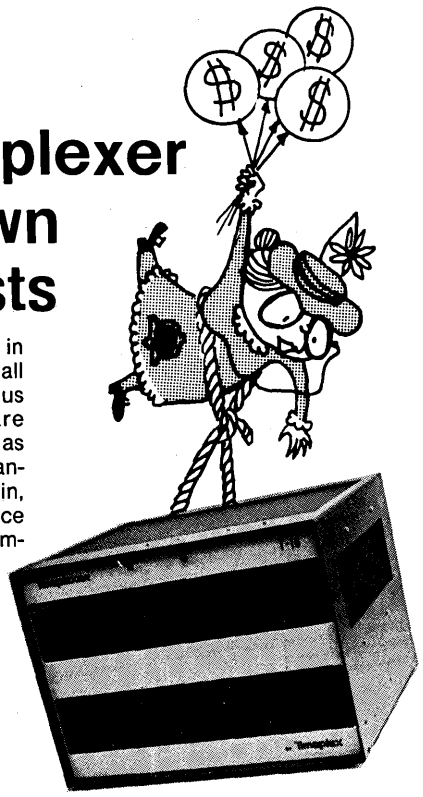

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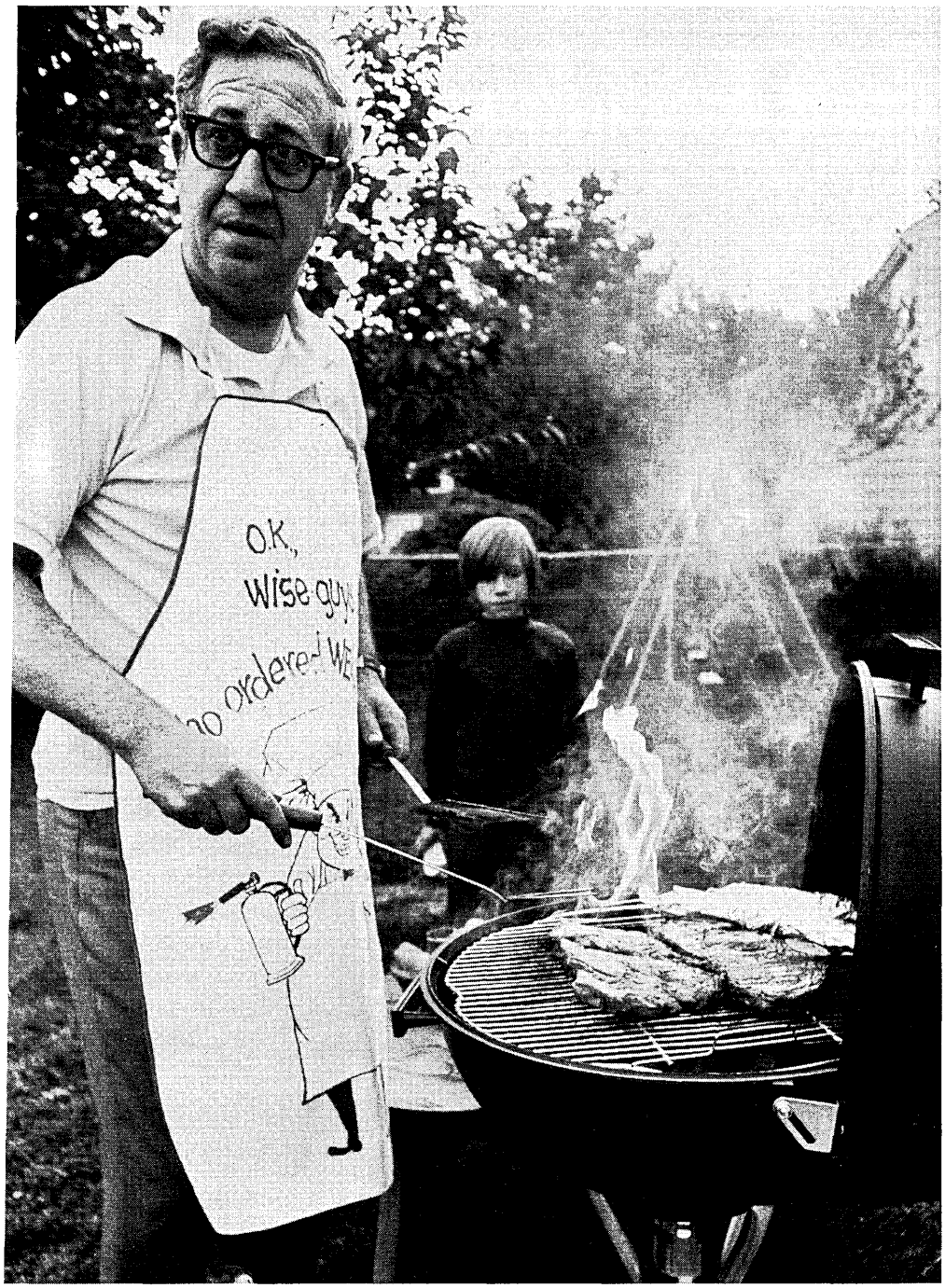
CIRCLE 103 ON READER CARD

# God bless 'em, they know what a system is.




They didn't try to sell me a miracle box plus a bag of software promises. Just the opposite, in fact.

These boys did the hard part first—built a family of software stronger than most small computers ever get: DOS, RTOS, Fortran IV, Macro assembler, IOCS, and more. The entire DOS is written in Fortran. The Fortran compiler is so efficient you can use Fortran as the system programming language.

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Look at it another way: When you buy a Prime 200 you get 100 per cent state-of-the-art capability, software and hardware. In my book that's better than watching the hardware grow old while the software catches up.

The PRIME 200 16-bit computer raises a lot of interesting questions for which we have prepared detailed answers. Let us send them to you. Prime Computer, Inc., 17 Strathmore Road, Natick, Mass. 01760. (617) 655-6999.

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## small computer

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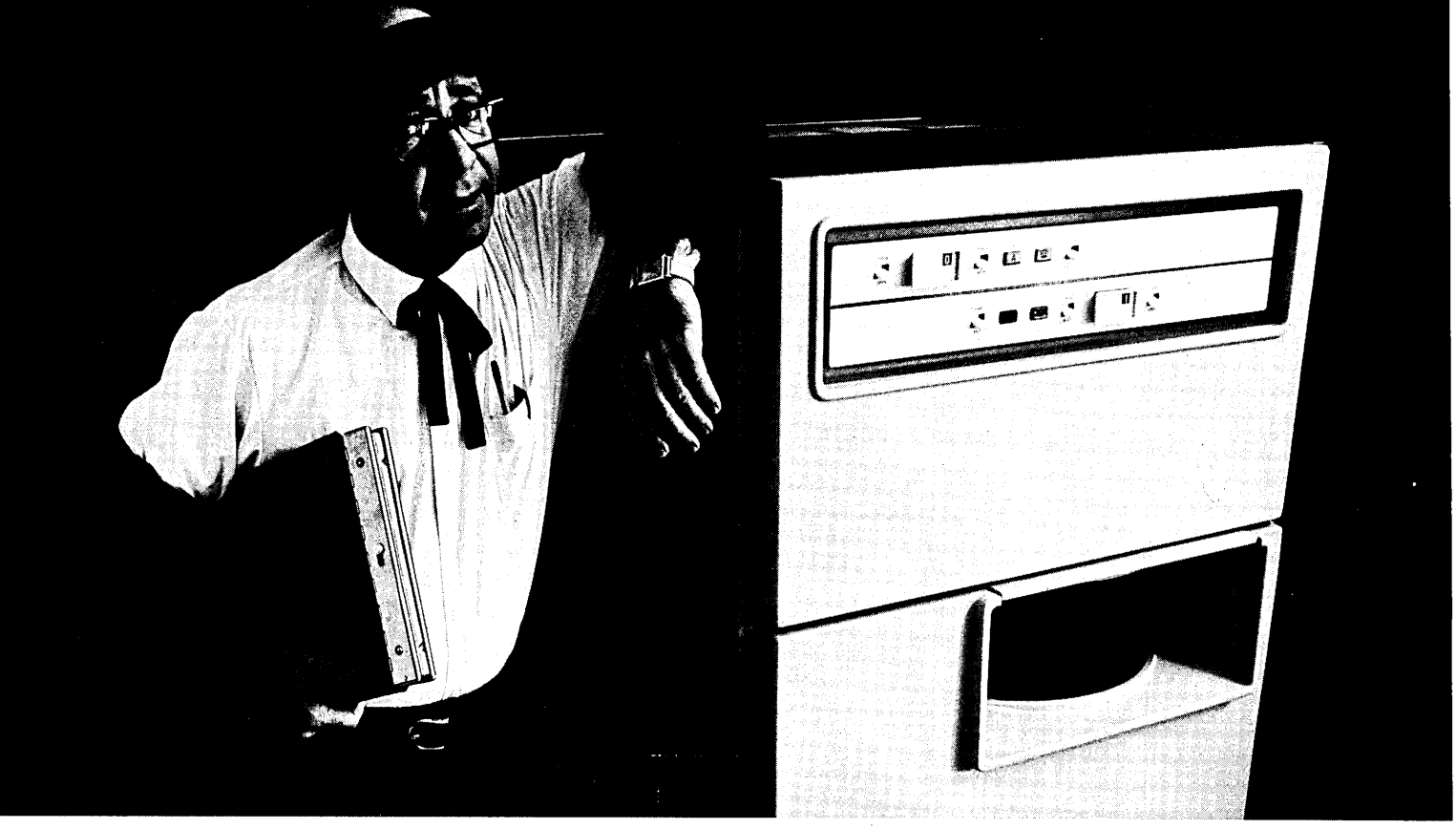

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But if you prefer to lease, check to see if you're leasing from us. If not, you're still spending too much.

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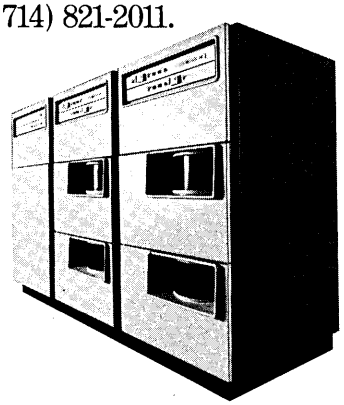

CALCOMP

GAO fired back that it believes this is too late to ensure accurate criminal history data.

Without data on arrests, and on disposition of the cases, the system's value to law enforcement or court officials "will be diminished," the report says.

Deficient reporting is not the only problem facing LEAA's computerized systems, the GAO contended. No one seems to know exactly how much an operational criminal history exchange system will cost. GAO recommended that until the Justice Dept. requires these states to supply additional cost information, the attorney general should not authorize any "substantial additional expenditures for the system."

As of June 30, 1972, LEAA had awarded about $4 million to develop a prototype criminal history exchange system (Project SEARCH) and to help 20 states participate when the system became operational, GAO reported. Substantial additional funds will be required by federal, state, and local governments before the system can become operational in all 50 states. Citing Justice Dept. estimates, the report said the number of user terminals, now amounting to about 6,500, would increase to more than 51,000 when all states are participating.

Meanwhile, on Capitol Hill, Rep. Peter Rodino, chairman of the House Judiciary Committee, also was asking about the cost effectiveness of the LEAA program. His committee is scheduled to look into the matter this month.

Criminal history file gathering has come under fire from various civil liberty organizations, the most recent in Colorado (Jan., p. 122). In a suit brought by the Colorado American Civil Liberties Union, the state's supreme court made it illegal to store or transmit criminal history information on persons arrested for criminal acts but never convicted. Observers feel the entrance of the influential General Accounting Office will focus added Congressional attention on the privacy aspects of the LEAA-funded systems.

*Research & Development*

## Bill Spells Out Invention Rights

A bill establishing the rights of employees and employers to inventions which the former developed while in the service of the latter was introduced in Congress last month by Rep. John Moss of California.

Basically, it requires an employee who develops a "service invention" to notify his employer, who then has three choices: he can claim exclusive rights to the invention and reimburse the employee accordingly (a negotiation procedure is detailed in the bill); he can decline exclusive rights but retain "right of first refusal to acquire an exclusive or nonexclusive license to practice the invention"; he can give up all rights, in which case the employee's work becomes a "free invention."

A "service invention" is one which "has grown out of the type of work performed by the employee, or is definitely based upon experiences gained during his employment." All others are "free" inventions.

"Nearly 80% of all patents issued in America are the result of disclosures made by employed persons who derive no direct benefit from their discoveries," Rep. Moss said. "But over the years, as economic benefits have decreased, so have the number of patent applications. As a result, the U.S., which used to lead the world in the

2260 DUCS 3270

We are pleased to announce the availability of DUCS-V (Display Unit Control System - Version 5). DUCS-V will concurrently support both the IBM 2260 Display Unit as well as the IBM 3270 Display Station in a local environment. The 3270 Display Stations are simulated in 2260 mode with no alteration necessary to the user's programs. The basic DUCS-V Program (2260 support only) is a licensed program product available from C F S, INC. for a monthly lease fee of $25.00. The DUCS-V 3270 simulator feature is also a licensed program product available for an additional $15.00 per month. The 3270 Simulator may be added to any DUCS-V System subsequent to the initial installation of DUCS-V without user reassembly or linkage editing.

DUCS-VI will be available during the 3rd quarter of 1973. Version 6 will support both local and remote IBM 3270 Display Systems providing users with a convenient means of utilizing the enhancements of the IBM 3270 System.

Requests for DUCS-V should be submitted to C F S. License agreements, DUCS-V abstracts and other details will be sent by return mail. Inquiries may be directed to Mr. Richard K. Goran.

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CIRCLE 97 ON READER CARD

Did you know that the lowest priced, highest quality, 1100 lines-per-minute print station in the world, is the I.B.M. 1403-N1 Printer being driven by a PDP-8 through a Spur 1403 Controller? A look at the prices involved will quickly convince you.

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|---|---|---|
| PDP-8 | under | $4,000 |
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| Spur 1403/PDP8 Controller | | 10,260 |
| I.B.M. 1403-N1 Printer | under | 34,000 |
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All of the fine features of the 1403 and PDP-8 are available to the user, along with added improvements. For instance, the Spur Controller does not slow print throughput when confronted with an invalid code. The instruction repertoire of the PDP-8 to the printer is vastly extended through the use of sub-functions.

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CIRCLE 60 ON READER CARD

number of patent applications per capita, has now fallen to sixth place."

The Moss bill (HR2370), in preparation for several years, is modeled after the "West German law of employed inventors."

## Benchmarks

**Tooth and Nail:** The Assn. of Data Processing Service Organizations (ADAPSO) is escalating its war against what it calls unfair or illegal practices in the sale of data processing services. President Tom O'Rourke said responses from members indicate "this problem is one of the key economic issues in the computer services industry. Our membership welcomes and encourages fair competition," he said; "however, it will fight tooth and nail competition from organizations who use monopoly positions and power developed in other lines of commerce to restrain free trade and competition in our industry." O'Rourke said ADAPSO will serve as a clearing house for evidence of unfair or illegal marketing problems and will do whatever it lawfully can to assist members actively fighting the problem before administrative agencies, Congress, or in the courts.

**Branching Out:** Itel Corp. will move into the mortgage guaranty insurance field if a proposed acquisition of First National Indemnity Co. of Texas is approved by its directors and shareholders and those of First National's parent firm, FNIC Investors, Inc. An agreement in principal for the acquisition also is subject to the approval of the Texas Commissioner of Insurance. Until now activities of San Francisco based Itel have been restricted to computer products, data processing services, and equipment leasing.

**Easing Out:** Wabash Magnetics, Inc., is easing out of the computer business. Its subsidiary, Wabash Computer Corp., is still operating in Phoenix but in a "phase-out mode." What we're doing, said Wabash Computer president George Dashiell, "is a compromise between complete divestiture and what RCA did." The firm is filling back orders but not accepting new orders and is trying to sell either parts or the whole of its business, which consists of disc and disc pack test and cleaning equipment, a head-per-track memory, and a manufacturers representative organization. Its time-sharing network division was sold off to Allen-Babcock Computing last November. Dashiell said the decision to phase out the computer company was made in favor of doubling the capabilities of Wabash Tape Co., another Wabash Magnetics subsidiary of which he also is president. He expects the phase-out to be complete by mid-year.

**RCA Computers Still Sell:** Sperry Univac said it shipped $130 million worth of its Series 70 (formerly RCA) computers during 1972. Most of the shipments were added to existing installations or replaced older Series 70 processors. Univac still lays claim to more than 90% of the former RCA customer base. (See p. 109.)

**Japan Users Meet:** Marketers of the ASI-ST file management system, developed in the U.S. by Applications Software Inc., recently held what was billed as the first meeting in Japan of a software users group. In the eight months since marketing there began, some 20 installations have been chalked up, according to ASI president Don Sundeen. And that's almost 25% of their worldwide total of more than 80 valued at $2 million—a number that took the Hawthorne, Calif., firm some three

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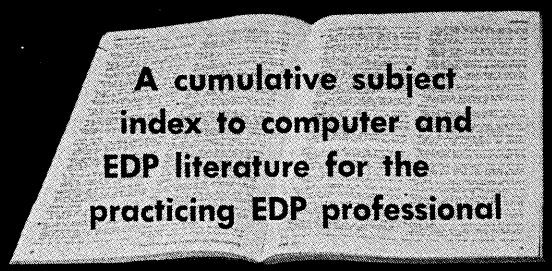


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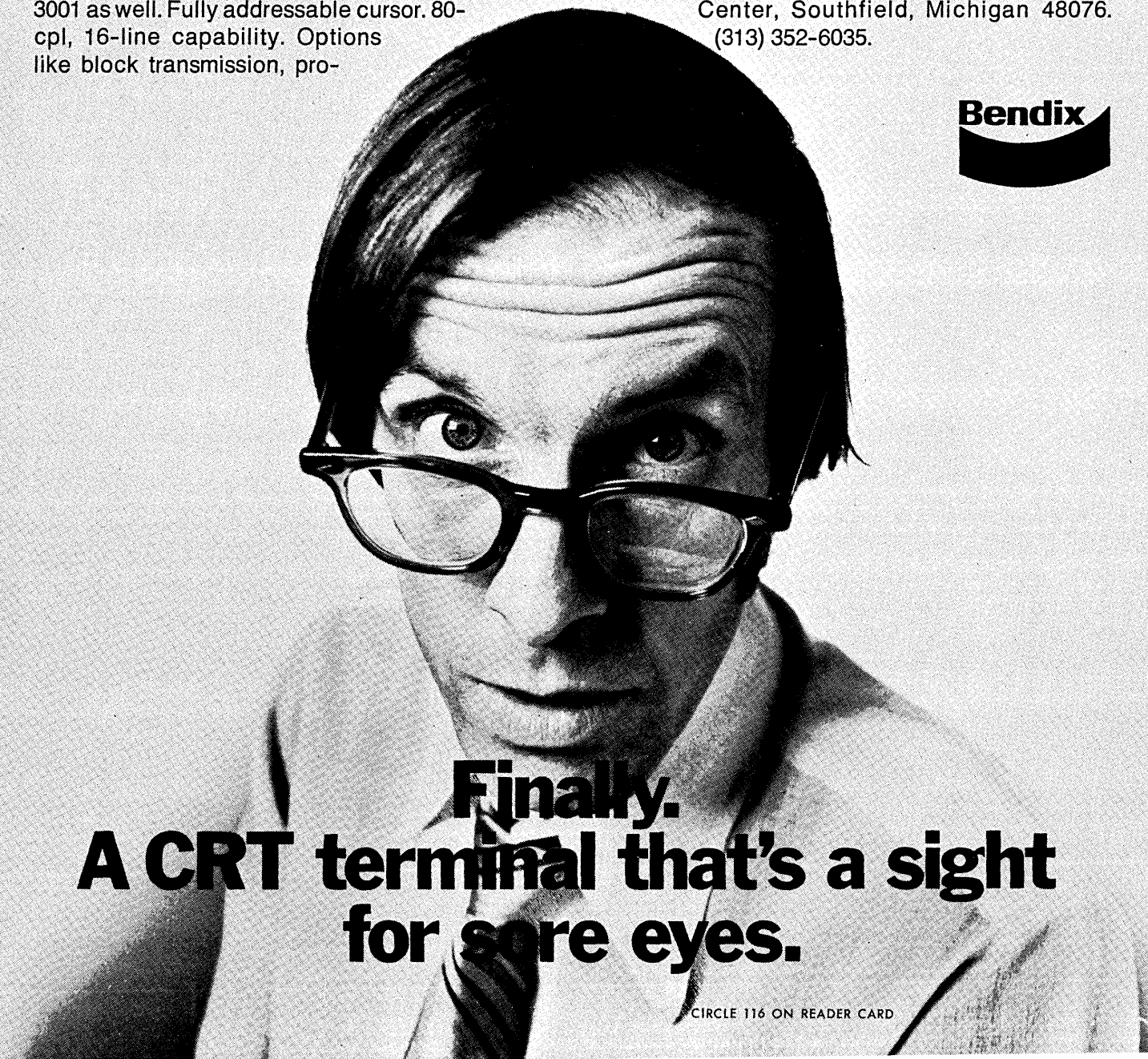
CIRCLE 75 ON READER CARD

It's the Bendix 3001 CRT Communications Terminal, and it boasts one of the biggest screens in the business. You get 25 to 50% bigger characters. Results? Large, crystal-clear alphanumeric display that's very easy to read.

There are other features you'll like about the 3001 as well. Fully addressable cursor. 80-cpl, 16-line capability. Options like block transmission, protected field and printer interface. ASCII is standard, but other code sets are available. The 3001 is just one of many computer terminals available from Bendix. Like to put it to work for you? Simply contact Interactive Terminals Corporation, a Subsidiary of The Bendix Corporation, Bendix Center, Southfield, Michigan 48076. (313) 352-6035.

Bendix



# Finally. A CRT terminal that's a sight for sore eyes.

CIRCLE 116 ON READER CARD

International Computer Programs, Inc., conducted a study which showed that 60 proprietary software products passed the $1 million mark in gross sales in 1972. ICP decided to honor the products and the companies which produced them at a series of Million Dollar Award parties. Among those honored were (left to right above) R. Nelson Carnes, Mechanics Research, Inc., for STARDYNE, a structural analysis package; Paul Dali, Computer Sciences Corp., for a payroll package and a commercial loan package; Don Sundeen, Applications Software Inc., ASI-ST file management system; Bob Chapman, Centurex Corp., a commercial loan package; Len Simon, United Computing Corp., UNIAPT, automatic parts tooling package; and John Postley, Informatics Software Products Co., Mark IV file management system.

years to achieve. Not surprisingly, the Japanese user organizations tend to be large, prominent firms, such as Japan Air Lines, Sanwa Bank, and Shell Oil of Japan. But in a nation of users said to be resistant to the idea of paying for software packages, preferring instead to develop their own, ASI's sales to date indicate a bullish interest in data base and file management applications.

**Upkeep Insurance:** Tymshare, Inc., Cupertino, Calif., time-sharing company which in December purchased 23 Xerox 940 computer systems it previously had leased, has moved into a position to care for its newly acquired property. Tymshare has entered into an agreement to merge with Valley Computer, Chatsworth, Calif., a company engaged in computer maintenance and the refurbishing and reconditioning of used computer equipment. Valley also is the largest independent supplier of parts for the Xerox 900 series.

**Of Growth and Survival:** Data communications growth in the '70s will see the number of general-purpose computers operating in a communications-oriented environment climb from 35% of the total installed to 70% by 1980, accompanied by a "severe shakeout" among the smaller producers of interface hardware, says a study released by Frost & Sullivan, Inc., New York City technological market research firm. Titled "The Data Communications Market: Modems, Multiplexers and Communications Processors," the study predicts the market for these types of equipment will peak in about three to four years, when units installed will continue to increase but prices will have fallen dramatically, leading to a decline in total revenues.

**360 Virtual Storage:** The Computer Lessors Assn., whose member companies own more than 2,000 IBM computer systems, want to know what virtual storage can do for their 360 systems. The CLA has commissioned Compata, Inc., to study and report on costs and companies who will be providing virtual storage capability for 360s. Compata will determine the state of the art, catalog techniques being considered, and identify possible suppliers. □

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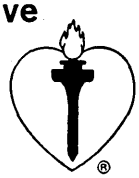

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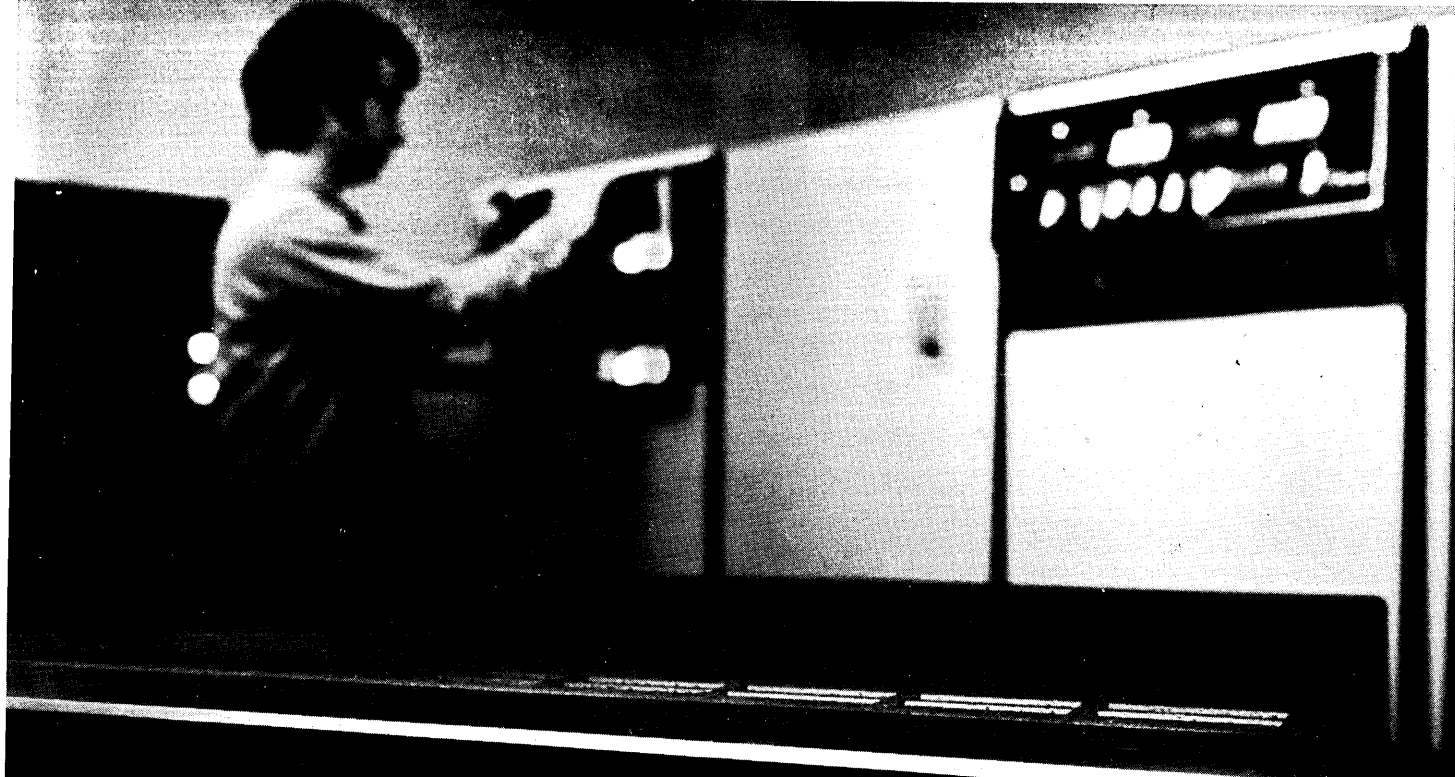

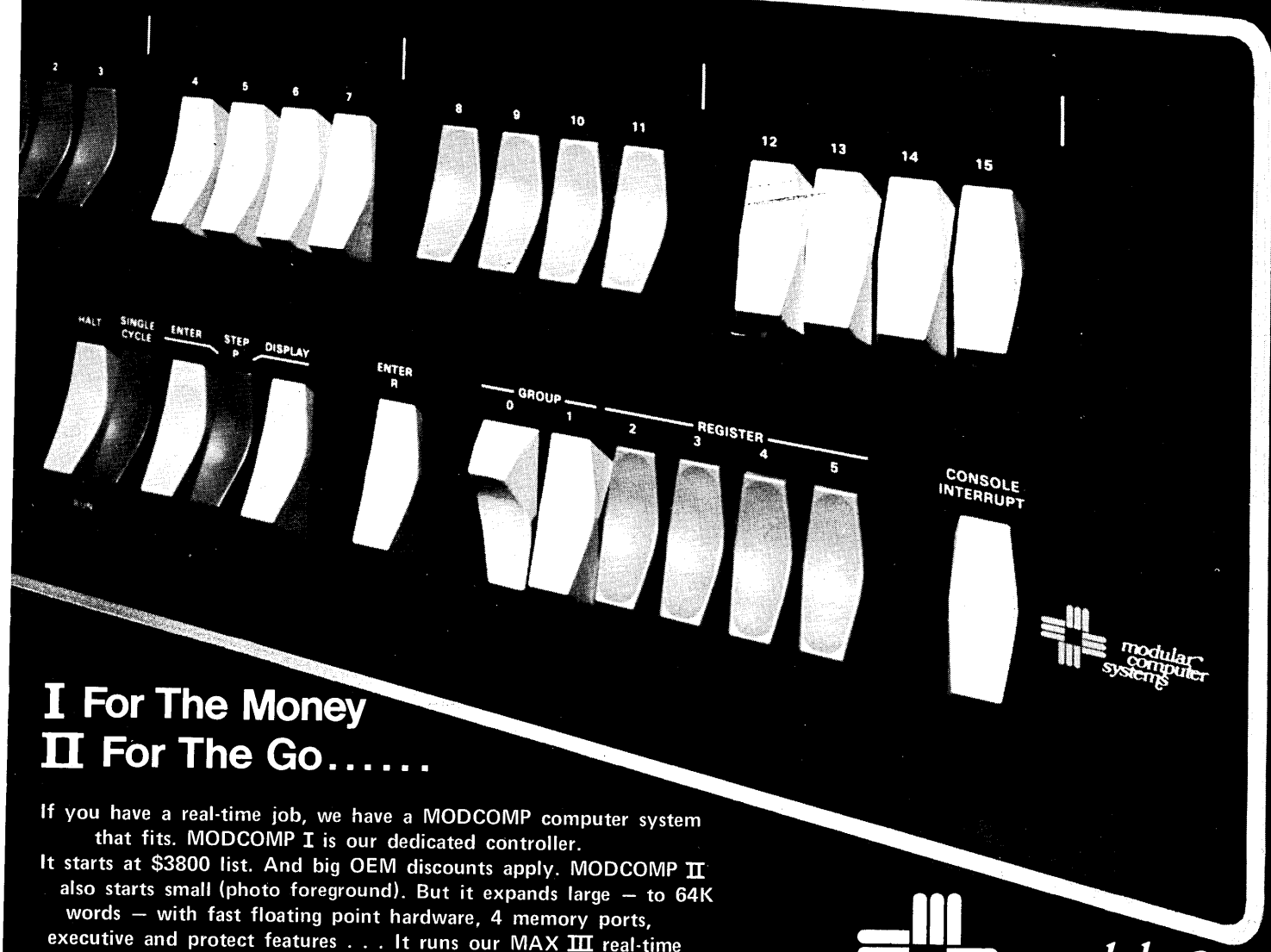


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CIRCLE 31 ON READER CARD

# Hardware

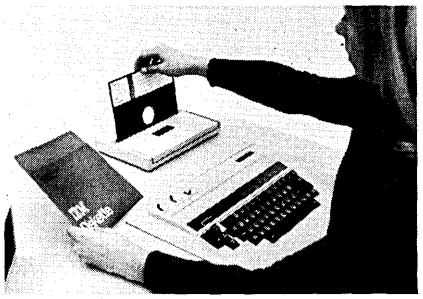
Norwegian computer manufacturer A/S Norsk Data-Elektronikk has survived one of the largest procurement competitions ever to come to our attention by capturing an order for 24 NORD-10 minicomputers. The computers will be used to control a very powerful atom smasher now under construction in Geneva, Switzerland, by CERN, the European organization for atomic research. Of 88 manufacturers in 12 countries, including France, Germany, and the U.S., invited to preliminary sessions, 24 manufacturers qualified for the project, and 13 submitted offers. The NORD-10 16-bitter is said to have bested such competitors in benchmarks as the Digital Equipment Corp. PDP-11/45.

Threshold Technology's voice recognition system, originally intended for use as a supermarket checkout system (see June, '72, p. 104), has been attached to a Data General Nova minicomputer in the United Air Lines terminal at Chicago's O'Hare International Airport to help route baggage. Bags ticketed in the usual manner move along a conveyor belt toward the aircraft boarding areas. An operator along the belt reads either the flight number or destination into a headmounted microphone. The digits 1 through 10, eight cities, and certain special control words comprise the vocabulary of the VIP-100 system. A visual display verifies that the input was understood, and the conveyor unloads the baggage at the appropriate gate for flight service crews to load aboard the correct aircraft. We hope. Trans World Airlines will soon install a similar system at Kennedy International Airport in New York City.

A Honeywell 6000 three-processor configuration undergoing checkout at the Phoenix manufacturing center recently stalled during tests when faulty connections between processors started causing "noise" problems in the memory access ports. The problem was solved, but not before being listed on the system performance log as "Port Noise Complaint."

## Data Entry System

The approach IBM has taken in the design of its first data entry system is indeed interesting. For while even the basic data entry stations of the 3740 system use a variation of the floppy disc called the diskette, in function they perform what key-to-tape systems do. But enough options are available to permit expanding the 3740 up to a large key-to-disc or direct data entry system. What seems apparent is that, once again, the marketing department has been instrumental in the development of a device that will appeal to a large number of users. There are other



interesting features, too, but first a description of the individual system components.

The basic module is the 3741 data station, which generates 128-character records. It comprises a keyboard said to be nearly silent in operation, one diskette drive and a 240-character visual display arranged in six lines of 40 characters. Two of these lines are used for operator guidance. A second diskette drive is optional, and so is communication capability to any IBM product that observes binary synchronous communications protocol. The 3741 can also communicate with the 3747 data converter described later.

The other work station is the 3742. It shares its microprogrammed control unit with two operators working at two keyboards. The 240-character display is also shared; mirror optics are used so that each operator sees three of the six entry lines. An option permits data to be copied from one of the diskette drives to the other and then merged back onto the first diskette. The standard record length is 128 bytes; 80-bytes/record formatting is field installable.

The 3747 data converter is a stand-alone, off-line device that converts diskette data to standard-size computer tape at a rate of 300 128-character records per minute. The 3747 automatically feeds, reads, and stacks diskettes from an automatic loader. An option allows this process to be reversed: data to be dumped from the tape back onto the diskettes. Also optional for the 3747 is communications capability between it and the computer.

A 40-cps matrix printer, the 3713 is an option that attaches to the 3741 data station. In addition to providing hardcopy record of the data entered into the 3741, it can also be used to print selected data coming over the lines on 3741s equipped with the communications option.

The 3540 diskette I/O unit attaches to any of the channels present on 370 models. The 3540 can read up to 3,600 diskette records per minute, and write up to 2,200 records on to its one or two diskette drives, each with an automatic hopper/stacker capacity of 20 diskettes. Under program control, diskettes are automatically fed from the hopper, mounted on the drive spindle, read or recorded, removed from the spindle, and stacked.

The diskette itself measures eight inches in diameter and comes in a sealed plastic jacket with a small slot in it so the read/write head can access it. Weighing only an ounce, the diskette can store nearly 250,000 bytes, or 1,898 128-character records.

With all the hardware boxes and options available, it's hard to say what a typical configuration will look like, but here are some prices to go by. A "home office central location" system consisting of two 3741 data stations, eight 3742 dual data stations, and a 3747 data converter rents for $1975/month on a two-year lease. That's approximately $110 per keyboard. The 3740 diskette I/O unit rents for $455/month on the same length lease, but won't be available before next January. The rest of the 3740 data entry system gear goes to the field during the next quarter. IBM CORP., White Plains, N.Y.

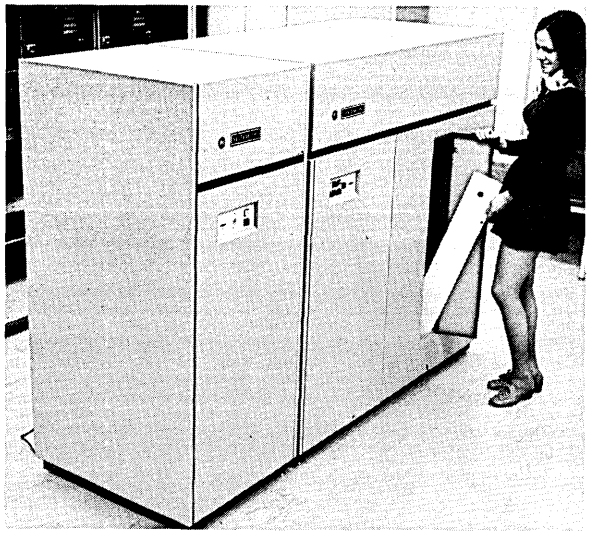
FOR DATA CIRCLE 244 ON READER CARD

## Tape Stripper

The magnetic tape stripper is for medium to large tape libraries automating this function. The operator dials in the number of feet of tape to be stripped (up to 1,200), and the unit automatically spaces to this section of the tape. The operator then presses a button for a very sharp blade to slice the first section of tape into scraps just a few inches long. The entire operation takes only about two minutes. The cutting blade is well protected from the operator, and vice versa. The stripper sells for $890 and is available in approximately 30 days. DATA PRODUCTS CORP., Woodland Hills, Calif.

FOR DATA CIRCLE 246 ON READER CARD

# product spotlight



### Commo Controller

The CYBER 1000 can be used either as a store-and-forward message switcher, or as a data preprocessor to handle all communications control, message traffic blocking and unblocking, etc. As with almost everything Control Data builds, the 1000 is a large-scale unit, with the standard complement of 512 line ports. This number can be expanded to well over 1K. The standard line speed is 9600 baud, and 50 Kilobaud can be specified as an option. A magnetic tape subsystem and an operators console are also offered for the 1000.

A variety of terminals, computers, and other devices can communicate through the 1000. This interface capability is provided in the form of TIP's (terminal interface packages), a combination of hardware and software. Remote terminal interface packages are available for many common teletypewriters, including IBM terminal equipment.

Redundant copies of all message traffic are stored on disc, and a system of checkpointing is used to track each message as it passes through the system. Prices for the CYBER 1000 range from approximately $250,000 to more than $1.2 million, depending on exact configuration. Monthly rental ranges from $100 to $170 per communication line. The CYBER 1000 is available 6-18 months ARO depending on customer requirements. CONTROL DATA CORP., Minneapolis, Minn.

FOR DATA CIRCLE 250 ON READER CARD

### Storage Protection

The threat of damage to information recorded on magnetic tape has increased dramatically since airports started using magnetometers to check luggage and shipping containers, claims this firm. It offers a number of various shape and size containers for one or more magnetic tape reels. A special shielding called Techshield N is used to protect the tapes. Pricing starts around $20 per container. RIBCO SHIELDING PRODUCTS, Los Angeles, Calif.

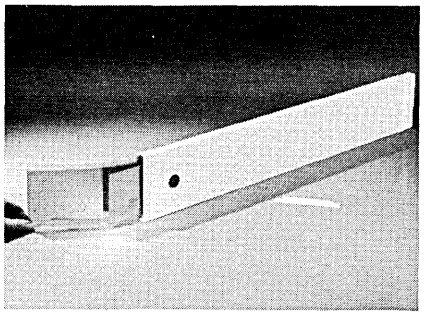
FOR DATA CIRCLE 251 ON READER CARD

### Video/Digital Terminal

Insurance companies and law enforcement agencies have been storing document images on videotape for ready retrieval and display on a crt terminal. Now, makers of the Videofile system offer a dual-purpose terminal that displays not only tv-stored images but also computer-generated data. With it, the user can retrieve, display, enter, edit (optional), and get hard copies of either digital data or graphic images. One can browse through pages of document

### Archival Storage

Even if an installation must reorganize some of its data base or tape library files to take advantage of the system 190, the time and effort involved could be well worth it, as the archival data storage system has such an attractive cost-per-bit figure. The 190 is, to a large extent, based on previous Precision Instrument product offerings, but



the firm continues to find ways of decreasing costs and increasing performance.

A typical system would consist of a control unit with its own minicomputer, a read/write unit, and several read-only units. Since this memory has its own intelligence (in the controller), it can be used as a stand-alone system complete with display terminals.

The basic recording medium of the 190 is a polyester sheet that measures approximately 5 x 31 inches and comes in its own carrying case. To write data on the strip, the operator loads the sealed case into the front of the read/write unit, where the data sheet is automatically extracted from the container and mounted onto a rotating drum. Information is written by vaporizing areas of a thin metal coating on the strip. During this process, light is reflected from the strip and is monitored in real-time to provide read-while-write verification. To read data, light is reflected from a previously recorded pattern. It takes no longer to mount the recording strip than to mount a disc pack or tape, it's claimed. The read-only units (up to seven of them) are used for information that doesn't have to be altered.

The read/write unit can access any track in 220 msec and transfer the information from it at 400,000 bytes/second. The read-only units have access times of 145 msec and transfer rates of 800,000 bytes/second. The total capacity of the system is approximately 2.2 billion bytes.

There are several different software interfaces available. For archival storage, the 190 runs under control of TEM (tape emulator method) and responds to standard I/O tape commands. Commands sent from the host cpu that do not apply to the 190 (such as set parity or change density) are ignored.

Under the direct access method (DAM), the 190 controller receives a key (such as a sort key) from the host cpu. The controller then searches the file to find that matching data.

With ASM (automatic spooling method), the 190 responds to all the tape commands as it does under TEM, but additionally can spool data directly to another device, probably a disc, without the cpu having to take part.

Pricing for high-technology items is usually a letdown, but in this case it isn't. A typical 190 system, consisting of a model 191 control unit, one model 192 read/write unit, and a model 193 read-only unit, would be something less than a $100K, including interface. The largest system, with three times the capacity of an IBM 3330, costs less than an IBM 2314-type drive. Deliveries begin in about seven months. PRECISION INSTRUMENT CO., Palo Alto, California.

FOR DATA CIRCLE 243 ON READER CARD

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ments, which appear on the 1,280-line screen, and jump at will to digital display. With a resolution some four times that of a tv image, the screen holds 54 lines of 72 characters each, or almost 4,000 characters. The terminal also provides an optional ability for

data editing from the keyboard, and the automatic, unattended storage of computer-produced data files onto videotape, a process dubbed computer-output-video. Delivery date is approximately 90 days aro, and prices range from $6-9K, depending on associated video buffer requirements. AMPEX CORP., Redwood City, Calif.

FOR DATA CIRCLE 245 ON READER CARD

### Small-scale System

Xerox has announced a small, general-purpose computing system that seems to contain a lot of nice features for its low price. Among these features are independent external processors to do I/O with a minimum of cpu intervention, a priority interrupt structure with up to 40 levels, and the ability to have both the hardware and software diagnosed over dial-up phone lines. The machine organization is basically 16-bit words, starting with 8K and expanding in 8K increments up to 64K. The memory cycle time is 800 nsec. Standard arithmetic includes extended arithmetic, with double-word instructions and hardware multiply/divide. Floating-point arithmetic with 9-digit computational accuracy is optional. The standard instruction set has 67 commands, with another seven optional for floating-point capability, and eight more on tap for doing addressing up to 16 consecutive bits without regard to field location or memory word boundaries.

Software for the 530 is compatible with that used on the 16-bit Sigma 3,

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which this product will probably replace. Operating under the real-time batch monitor (RBM), the 530 can do multiple real-time jobs in the foreground while concurrently running batch processing in the background. A

number of language processors are available, including ANSI FORTRAN IV, extended SYMBOL, RPG, SORT, DEBUG, and a scientific subroutine library. A typical 530 would be a system with a line printer, disc storage unit, card reader, and console. This configuration, available in the third quarter, is priced at $62,900 and can also be leased. XEROX CORP., El Segundo, Calif.

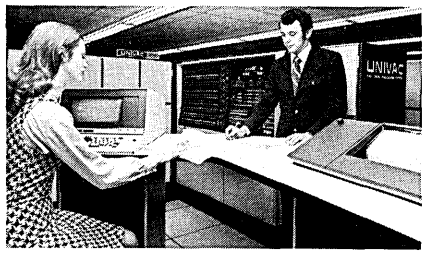
FOR DATA CIRCLE 247 ON READER CARD

### Large-scale Computer

The 1110 1X1 configuration (one processor and one memory bank) is a very significant product for Univac. Its price and performance put it in competition with Univac's own 1108 (which the 1110 1X1 will supersede someday); but more importantly, the firm believes that the system doubles its potential customer base. The reason the 1110 1X1 was not announced with the initial group of 1110 systems (on 11/10/70) appears to be because Univac wanted to have an extensive list of benchmark comparisons on hand to show how the 1X1 compares with its true competitor, the IBM 370/155 and 158. Univac now thinks that if it can get you to benchmark the 1X1, you'll buy one.

All the byte manipulation is done in the hardware on the 1110 series, meaning there is no software overhead price to be paid by users not wishing to convert their file structures when moving to the 1110s. The basic configuration starts with a cpu with an effective instruction rate of 300 nsec, or 1.4 million operations/second. It operates on a 32K 36-bit word plated-wire memory with a read cycle time of 320 nsec and a write cycle time of 520 nsec. This memory can be expanded up to 256K. Behind this memory is an extended core storage box ranging in size from 128K (minimum) through several increments to more than one million words. An input/output access unit (IOAU) is expandable from 8-24 channels. This controller has an aggregate data rate of four million words/second. A full range of peripherals is offered.

The 1100 operating system is based



on EXEC 8 and permits simultaneous multiprogramming in FORTRAN, COBOL, ALGOL, JOVIAL, RFOR (Reentrant FORTRAN), BASIC, CFOR (Conversational FORTRAN), assembler, and PL/I. A comprehensive set of applications programs is available.

A basic 1110 1X1 consists of 32K of main storage, 128K of extended storage, four tape drives, two 8440 disc drives, and a 9300 subsystem for controlling a card reader and line printer. This configuration rents for $36,300 per month on a one-year contract. UNIVAC, Blue Bell, Pa.

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### APL Terminals

Here are two more hardcopy terminals for APL users to consider. The first model in the 1030/APL series is the model A. It knows 96 ASCII characters and because of this it will probably receive the most attention from users currently using Teletype Corp. teleprinters. The model B generates EBCDIC codes for 88 characters and is intended as a replacement for the IBM 2741 terminal. Printing across 80 columns is done thermally. Both models

weigh only 22 pounds and can fit under an airline seat.

Standard features include switches for controlling the print speed (10, 15, and 30 cps), the transmission mode (half- and full-duplex), and the parity (even and odd). Optional are a lower case keyboard pedestal, an acknowledge/not acknowledged (ACK/NAK) keyboard, 10-key numeric pad, and answer-back. The terminal prices start at $3350 and can be rented for $150/month on a one-year lease. Deliveries have just begun. COMPUTER DEVICES INC., Burlington, Mass.

FOR DATA CIRCLE 249 ON READER CARD

### Flowcharting Templates

For those of you who have been longing for flowchart templates constructed of thick plastic material like those offered back in the late '50s, we have good news. This company manufactures two sizes of templates constructed out of 1/10-inch thick plastic that contain all 37 ANSI and IBM standard symbols, one measuring 4¼ x 11 inches ($16.95), and the other a pocket model measuring 2⅞ x 7¼ inches that is priced at $15.95. The small template symbols are 20% smaller than the current IBM standard, while symbols on the large templates are 20% larger than usual. Additional features include individually routed and beveled edges said to eliminate smearing, separation of the programming symbols from the system programming ones, and embossing of identification on the templates for an additional $1.75. The templates come in vinyl carrying cases. HEXCO, INC., Houston, Texas.

FOR DATA CIRCLE 254 ON READER CARD

### 370 Memories

Control Data is offering monolithic semiconductor memories for all models of IBM's 370 series announced to date, except the model 125. The lineup starts with a 48K box for the model 135 that rents for $695/month on a two-year contract and goes up to the full four-megabyte limit of the 370/168. A typical sale would be a 512K increment for the model 155 and 165 systems, priced at $198K, or $4330/month, again on a two-year lease. Maintenance is available worldwide through CDC. Availability of the 33100 series is as follows: models 155 and 165, now; model 145, June; model 135, August; model 158, December; and the model 168, next February. CONTROL DATA CORP., Minneapolis, Minn.

FOR DATA CIRCLE 255 ON READER CARD

### Disc Storage

The 8424 removable disc pack subsystem is offered to Univac 9700, 1106, 418 III, and 494 users. From one to four dual-spindle disc units attach to the controller, with each disc pack capable of storing 58 million bytes, 10 million 36-bit words, 25 million 18-bit words, or 16 million 30-bit words, depending upon which machine it's attached to. The 8424's specifications read like those of upgraded IBM 2314


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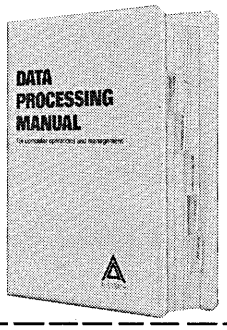


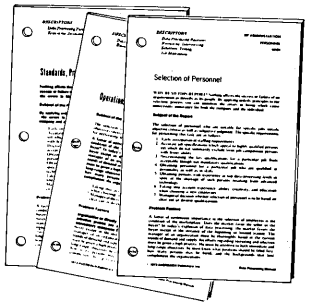

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Delta Data Systems

CIRCLE 77 ON READER CARD


# hardware

subsystems offered by the plug-compatible manufacturers a couple of years ago. The 8424 has the same recording density (2200 bpi), number of tracks (406), average access time (30 msec), and transfer rate (312 KB/second). An 8424 disc storage subsystem, consisting of a controller and one dual-spindle drive, rents for $2365/month on a one-year lease, including maintenance. UNIVAC, Blue Bell, Pa.

FOR DATA CIRCLE 256 ON READER CARD

## Business Calculator

A little over a year ago, Hewlett-Packard introduced probably the most exciting electronic consumer product since the transistor radio, the H-P 35 calculator (see Feb. '72, p. 94). At

$395, it came closer to making the power of a true computer available to the public than anything seen before it, but it was really an electronic slide rule, with built-in functions. This model, the H-P 80, is a variation on the H-P 35 that is biased toward complex business and financial applications. While it may not sell as quickly as the 35 did (we hear that over 70,000 have been delivered), it will doubtless be a successful product in its marketplace.

The principal difference between the 80 and the 35 is that the 80 has had the most commonly used financial equations implemented in its MOS/LSI circuitry. There is even a 200-year calendar resident (1900-2099) allowing the user to calculate such things as the bond yield between any two dates. The accuracy of the answer is one penny in a $1 million transaction, and like the H-P 35, the H-P 80 can handle numbers as large as $10^{99}$, positive and negative. The display can show up to 15 characters, including a 10-digit mantissa, a decimal point, the sign of the mantissa, a 2-digit exponent, and the sign of the exponent. There are four operational registers and automatic decimal point positioning. The weight and the price are the same as the H-P 35: 9 ounces and $395. Deliveries begin immediately. HEWLETT-PACKARD CO., Palo Alto, Calif.

FOR DATA CIRCLE 257 ON READER CARD

## Optical Mark Reader

The 5098 optical mark document reader takes manually fed pencil-marked and preprinted data from prepared forms, assembles it into ASCII alphanumeric characters, and formats it for asynchronous transmission over dial-up phone lines. The unit reads 6 lines/inch and up to 13 characters per line from any size document (but no smaller than 4¼ inches wide). The transmission rate can be 10, 15, 30, 60, or 120 characters/second, and the standard interface supplied is RS232C. The 5098 is available for delivery within 45 days. DATUM INC., Anaheim, Calif.

FOR DATA CIRCLE 258 ON READER CARD

## Digitizer

The DG-10C is a general-purpose electronic grid digitizing system that can convert any type of graphic data, such as that on strip charts, scope traces, graphics, photographics, etc., and output ready for computer processing. The on-line unit and software support package permit the digitizer to operate with most computers having a FORTRAN IV compiler. The off-line version can record its output on a variety of devices, including the IBM 029 keypunch, a paper tape unit, 7- or 9-track tape, etc.

An adjustable table measures 42 x 60 inches. Switches on the cursor are used to control the system, and the readout unit includes a five-digit X-Y axis coordinate display. The accuracy is ± .005 inch, and the resolution is .001 inch. Prices for the basic on-line system start at approximately $15K, and delivery is three to four weeks. COMPUTER EQUIPMENT CORP., Rockville, Md.

FOR DATA CIRCLE 259 ON READER CARD

## Large-scale Plotter

The series 2000 flatbed plotters are probably the largest such products made. The smallest model has a work area measuring 6 x 10 feet, and this table can be expanded up to 6 x 20 feet. The primary customers for plotters of this size are thought to be designers of automobiles, ships, and airplanes (a full-scale side view of the Wright Brothers craft will probably fit). The patented Sawyer motors are used to move the drafting head, which is designed to accept liquid and dry pens, scribe tools, and photo heads. The pen up/down time is 10-15 msec, the resolution is one mil, and the accuracy over the total drawing area is ±

.005 inch.

The 2000 series is available in both on-line and off-line versions. Prices start at approximately $65K for the smallest table and go up to approximately $150K. A number of software packages for both versions are available. Delivery is 60-90 days. XYNETICS, INC., Canoga Park, Calif.

FOR DATA CIRCLE 260 ON READER CARD

### Low-Cost Terminal

The 180B is a visual display/data inquiry terminal that can be used in a variety of applications. In less than the size of a cigar box are packaged electronics that control a 16-key data entry and inquiry keyboard, and an eight-character display that enables the operator to verify input and can accept eight digits of data coming back from the computer. The 180B generates a unique character code that is only understood by a controller, the model 2020. This programmable unit is used to convert this unique code to any code a user desires, including ASCII and EBCDIC. Up to 96 terminals can talk simultaneously with the 2020.

The 180B is offered both to oem's and as a component in turnkey banking and retailing applications. The 2020 controller is priced at $13K, and the 180B is priced at $250. Availability is 90 days. CREDIT SYSTEMS, INC., Colmar, Pa.

FOR DATA CIRCLE 253 ON READER CARD

### Data Entry Printer

The model 1310 matrix printer is Mohawk Data's response to users of its Data-Recorder key-to-tape equipment who wanted a faster printer than the current 15-cps unit but didn't need a fast, expensive line printer. The 1310 seems to fill this gap nicely. It prints its 64 character ASCII set across 132 columns at 100 cps, 10 characters to the inch. The carriage accommodates one- to six-part forms from 4 to 14⅞ inches in width. A simple cable connection is all that is needed to attach the 1310 to the Data-Recorder. The printer sells for $7400 and rents for $185/month. Deliveries begin next month. MOHAWK DATA SCIENCES CORP., Herkimer, N.Y.

FOR DATA CIRCLE 252 ON READER CARD

### PDP-15 Memory Option

The multi-port option is offered on this manufacturer's PDP-15 computer memories that allows up to four "users" (be they processors, crt terminals, high-speed data acquisition devices, etc.) to share a block of the memory on a hardware-defined priority basis. The unit accepts memory address requests from the various "controllers" and maps these addresses to a predetermined memory block. If two requests are received simultaneously, access is granted to the port with the highest assigned priority. The memories are available in sizes up to 128K 18-bit words. The multi-port option adds $4K to the price of any storage increment. Delivery is approximately 60 days. DIMENSIONAL SYSTEMS, INC., Lexington, Mass.

FOR DATA CIRCLE 261 ON READER CARD

### S/3 Optical Scanner

Optical Scanning Corp., a manufacturer of ocr equipment, and Decision Data Computer Corp., a major supplier of 96-column card equipment, have teamed up to interface some of their respective products, thus offering the System/3 user expanded information input capability. The OpScan 17 document reader automatically scans documents and converts them into 96-column cards on Decision Data's 9601, 9610, or 9660 data recorders. These three combinations range in price from $12,950 to $19,220, excluding maintenance. The units can also be rented for $360-$575/month, including maintenance. Delivery is approximately 75 days. OPTICAL SCANNING CORP., Newtown, Pa.

FOR DATA CIRCLE 262 ON READER CARD □


**BUSINESS APPLICATIONS PROGRAMMER**

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# Software & Services

Computer services industry sales revenue for 1973 will exceed $3.5 billion, says Adapso executive vp J. L. Dreyer. Predicting a pretax profit of 7%, compared to about 4.5% in 1972, Dreyer sees batch processing accounting for 44% of the work volume; on-line processing, 25%; software, 16%; and facilities management, keypunching, OCR, and COM accounting for the final 15%. It's anticipated that 1,900 firms will generate the $3.5 billion figure and will show a 27% increase in sales compared to 1972 figures.

A comparison of seven job accounting systems that analyze SMF (System Management Facilities) data on large IBM computers is available from Compata, Inc., 460 California Ave., Palo Alto, CA 94306. The 60-page report should be of value to organizations wishing to develop new job accounting systems or update old ones, and to end users looking for the appropriate accounting system for their needs. Billing algorithms and other fundamental features of job accounting systems are described, and each of the seven systems is discussed relative to these features. The price of the report is $95.

Assyst Inc., a Cincinnati-based builder of office information systems for insurance companies, claims to have had considerable success in this market primarily due to the quality of the software it delivers with the Cincinnati Milacron minicomputers. There is suspicion, however, that the program that most impresses potential customers is one that contains the performance of the two 1969 Superbowl football teams, allowing vicarious quarterbacks to match wits with the likes of Joe Namath.

DATAMATION is planning to survey software packages for the IBM System/3 in an upcoming issue. If your firm supplies program products for this computer, please write for a questionnaire to Datamation, 1801 S. La Cienega Blvd., Los Angeles, CA 90035.

## TSO Aid

Tab-Prompt is a compiler and run-time program that enables TSO users to build data files through interactive data collection sessions at TSO terminals. The user is "prompted" (cued) for each type of record and for each field's value. The files are collections of fixed-block records; within a given file all records are the same length. There may be up to 32 different record types, such as headers, trailers, supplements, etc. The maximum logical record size is 1,024 bytes.

Input is prepared on a simple tabular coding sheet similar to that used for RPG input, but the coding sheet is said to be simpler to use. The top line contains a termination code, DDname, program name, and optional comments. Subsequent lines describe data fields, which record-type they belong to, the type of data, its length, scale, default value, and value limit. All object programs contain an identification of the compiler version, the program name, the file name (DDname), 40 bytes of user-supplied comments, the Julian date, and the time of the run. There are a number of diagnostic messages to indicate sequence errors, input violations of file descriptions, etc. The compiler output format is set up for tty terminals or crt's with the same 72 character line length.

Tab-Prompt is priced at $3500 including a one-year warranty. Modifications, such as hexadecimal or floating-point data collection, can be performed, but will be individually priced. SEIDEL COMPUTER ASSOCIATES, Fallbrook, Calif.

FOR DATA CIRCLE 264 ON READER CARD

## Record Compaction

SQUEEZ/UNSQUEEZ is a 1,236-byte assembler language module that can be used to compress and expand character data containing strings of three or more blanks in COBOL, PL/I, and assembler language programs. The record to be squeezed can be up to 35,000 bytes in size. The developers claim that they have experienced a reduction of 42% in the amount of space required to store COBOL source statements. SQUEEZ/UNSQUEEZ is priced at only $49. COMPUTER SERVICES CORP., Southfield, Mich.

FOR DATA CIRCLE 268 ON READER CARD

## Terminal Rental Service

Users whose applications require occasional or periodic (i.e., month-end) processing of voluminous input or output which requires high-speed terminal service but whose average monthly volume is not enough to justify purchasing or even renting such a terminal may find this offer attractive. For $24 per hour this firm will rent you a Mohawk Data Sciences 2400 terminal. The terminal doesn't leave the vendor's New York headquarters. Rather, it is accessed by the user anywhere in the nation, over any major time-sharing service. To use the service, a customer provides the information to Advanced Timesharing Applications for input and registers as a high-speed service user with his or her favorite time-sharing vendor. (ATA works with General Electric time-sharing services if you don't have a favorite.) ADVANCED TIMESHARING APPLICATIONS, New York, N.Y.

FOR DATA CIRCLE 269 ON READER CARD

## CICS Program

PACER runs under IBM's CICS submonitor to extend its capabilities, furnishing the following support: reroutes transactions when a particular program develops problems; permits the modification of program control parameters on-line; allows the testing of several versions of a program using the same transactions; changes task priorities to meet user requirements; and permits alteration of task security levels due to changing circumstances. PACER can run with DOS/CICS versions 1.0 and 1.1, and OS/CICS releases 2.0 and 2.2. The price of $500 includes a users manual and an object deck ready to be link-edited into the CICS relocatable program library. ON-LINE SOFTWARE INC., New York, N.Y.

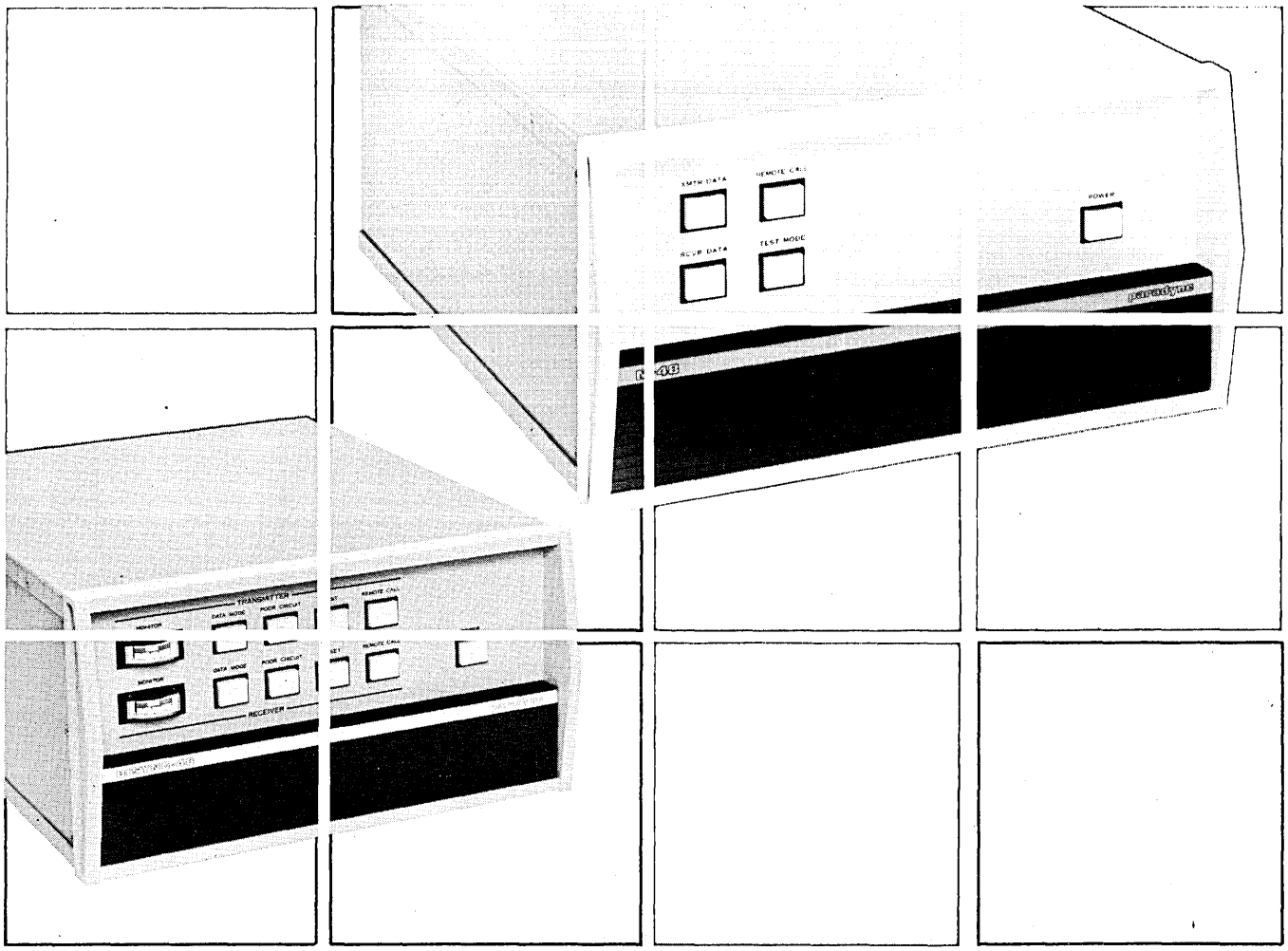
FOR DATA CIRCLE 266 ON READER CARD

## Cobol Revision Analysis

PREVIEW reads in COBOL source programs and diagnoses the impact of the imminent revision to ANSI COBOL on each statement. PREVIEW issues a diagnostic which answers for each statement: Is this statement in both the current and revised ANSI COBOL? Is this statement not in the current but in the revised standard? Is this statement in the current but deleted from the revised standard? Is the statement in neither the current nor the revised standard?

There is no charge for PREVIEW, but its developers think that you'll be interested in the program that created PREVIEW. It's called COBOL Standard Monitor (CSM), and it permits its users to define multiple subsets of COBOL, while at the same time placing restrictions on the use of one or more of the subsets.

*(Continued on page 149)*

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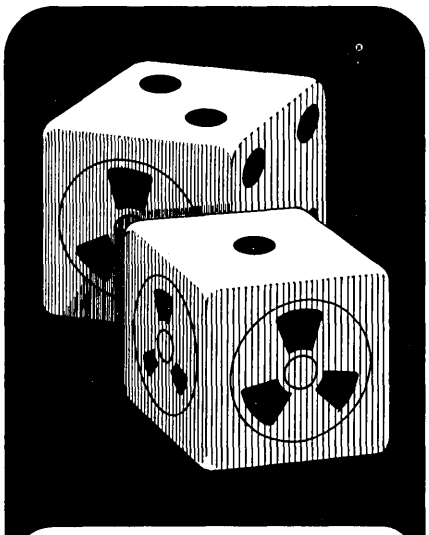

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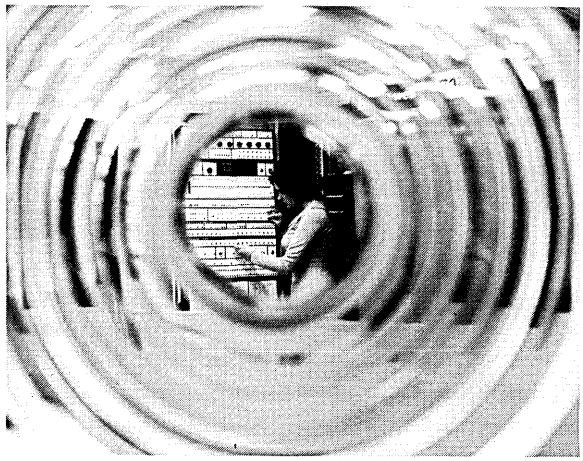
CIRCLE 402 ON READER CARD


# software spotlight



Rings of protection to shared data files are a key element in the Multics operating system.

## Commercial Multics

Multics is hardly a new software product, having been in various stages of development since its conception in 1964 as a "next generation" operating system. There have even been a few systems delivered, though to such installations as the Honeywell/Bull headquarters in Paris, the Rome Air Development Center in New York, Bell Laboratories, and the Massachusetts Institute of Technology—the latter two, together with General Electric, having been primarily responsible for its development.

But the complex system has been checked out enough now that Honeywell feels it can offer it as a commercial product to any installation needing its advanced features. This typical user is thought to be one who will exploit the Multics capabilities for efficient program development and for sharing data and programs in a controlled, secure manner among a community of users. That probably means that there won't be as many Multics (Multiplexed Information and Computing Service) systems delivered as the standard 600/6000 series monitor GCOS (nee GECOS).

Among the goals of the design team was to develop a computer utility, and by that was meant a system with the following features: 1) convenient remote terminal access as the normal system usage mode; 2) continuous operation analogous to that of the electric power and telephone companies; 3) the ability to allow growth or contraction of system capacity without the necessity of having to reorganize the system, or the programmer to reorganize his or her work; 4) an internal file system so reliable that users could entrust their only copy of programs and data to be stored on the system; 5) sufficient control of access to allow selective sharing of information, but methods and conditions of access beyond the control of a "guest" accessing the file; 6) the ability to structure hierarchically both the logical storage of information and the administration of the system; 7) the capability of serving large and small users without inefficiency to either; 8) the ability to support different programming environments and human interfaces within a single system; 9) the flexibility and generality of system organization required for evolution through successive waves of technological improvements and the inevitable growth of user expectations.

The hardware used to implement Multics is modified models of the large-scale 6000 series which will be called 6100 series. These designs are based directly on General Electric's 645, the first machine to run Multics. Among the more important features of this hardware is its total management of virtual memory, including linking of program segments and control of user file access. A typical small Multics configuration would include one 6180 processor with 192K 36-bit words, one million words of bulk core storage, 200 megabytes of disc storage, one I/O multiplexor, one Datanet 355 communications processor, five tape units, a card reader, card punch, printer, and small number of terminals. This system sells for $3,565,000. The Multics system is bundled with the price of the hardware, but comes with only one higher level language, PL/I.

Additional language processors for FORTRAN, BASIC, APL, LISP, and ALM (Assembly Language/Multics) are available, with rentals of several hundred dollars/month. FORTRAN rents for $350. First deliveries won't come before next year. HONEYWELL INFORMATION SYSTEMS, Waltham, Mass.

FOR DATA CIRCLE 263 ON READER CARD

# software & services

*(Continued from page 146)*

CSM then generates a monitor program to produce appropriate diagnostics for each COBOL source program it reads. IMI supplies the initial COBOL subset specification for each user, and the user can change the specification as his needs change. CSM sells for $4500, including a user manual and a short training course. INFORMATION MANAGEMENT INC., San Francisco, Calif.

FOR DATA CIRCLE 267 ON READER CARD

### Procurement System

POFUS (procurement follow-up system) is offered as an aid to procurement and production managers. The program supplies information that can be used to insure that materials required to meet production schedules are on hand, by providing information on parts orders and subcontracted assemblies. The principal functions of POFUS are represented in two management exception reports: a procurement late report, and a follow-up report. The late report identifies all late parts orders by material category and vendor. The follow-up report is termed a "pre-expedite" list that identifies by vendor all materials due to be delivered in selected time periods in the future. It can also be used as the starting point for calls to suppliers to confirm or update promised delivery dates.

POFUS is written in ANSI COBOL. It is currently operational on the vendor's Univac 1108 system where it requires approximately 32K words of storage to support time-sharing services. The package is also offered on a perpetual lease for $4500, and is supplied in either source- or object-deck form. A system application's brief and a user instruction manual are also included. SYSTEMS, SCIENCE, & SOFTWARE, San Diego, Calif.

FOR DATA CIRCLE 270 ON READER CARD

### Remote Batch Software

A communications package has been released by NCR that endows the Century 50 small-scale system with the ability to communicate in binary synchronous communications protocol to various IBM, Univac, Honeywell, Burroughs, and Control Data computers. The software is supplied in punch card form free of charge to Century 50 owners. In addition to the software, the 50 must have the basic hardware communications attachments, an I/O writer, and a data set that can communicate over dial-up lines. NCR supp'lies these, too. NCR, Dayton, Ohio.

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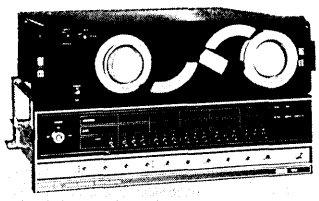

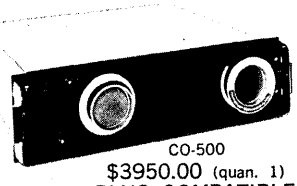

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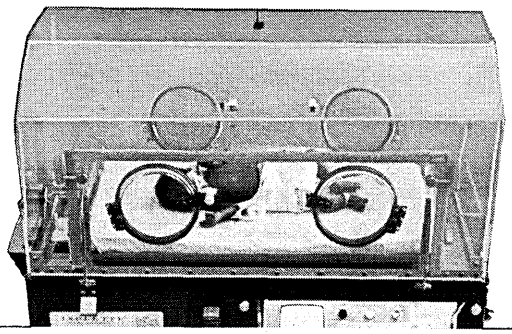

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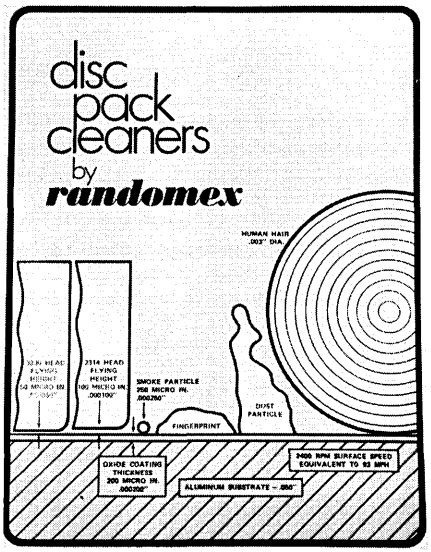
# Literature

### Dirty Discs?
Four-page brochure describes the operation and benefits of automatic disc pack cleaners. Cover chart shows the




size relationship between a human hair or fingerprint and the flying height of the 2314 or 3330 disc drive read/write heals. RANDOMEX, INC., Palos Verdes Peninsula, Calif.
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### Accessories
A 48-page catalog introduces new accessory equipment for tapes, discs, cards, System/3, etc., including the Bac-A-Rac high-density tape storage system and the "Swinger" disc storage. ENGINEERED DATA PRODUCTS, INC., Livonia, Mich.
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### New Newsletter
Free subscriptions are being offered to DATAPRO NEWSCOM, a monthly newsletter reporting and commenting on news and trends in the data processing industry. DATAPRO RESEARCH CORP., Moorestown, N.J.
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### Privacy Bibliography
The Assn. for Computing Machinery has published "Privacy and the Computer: An Annotated Bibliography" by Ronald E. Anderson and Ed Fagerlund of the Univ. of Minnesota. The nine-page bibliography consists of over 60 references representing a general review of privacy and the computer, 30 additional references focusing on computer and privacy within governmental information systems, references on hearings and other reports of U.S. Congress, and even a bibliography of bibliographies. Each reference is annotated with a description of the document. $1.50 ASSN. FOR COMPUTING MACHINERY, 1133 Ave. of the Americas, New York, N.Y. 10036.

### Data Entry Systems
Included in a literature packet are a general brochure on this vendor's data entry line and product brochures on the MDS 6400 and 1100 Data-Recorders, 9000/9200 Data-Recorder systems, and the 2411 key-to-tape systems. The MDS units record, verify, and correct data before transferring them directly from a source to magnetic tape via the MDS keyboard-memory-tape concept. MOHAWK DATA SCIENCES CORP., Herkimer, N.Y.
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### COSATI Progress Reports
The 9th annual report of the Committee on Scientific and Technical Communications contains summary reports of the committee and its panels and task groups for 1971, as well as progress reports submitted by member and observer agencies, a retrospective bibliography of COSATI-sponsored publications, membership roster, a glossary of acronyms used in the report, and an index. Order PB 212-500: $3 per copy, $.95 microfiche. NATIONAL TECHNICAL INFORMATION SERVICE, 5285 Port Royal Road, Springfield, Va. 22151.

### Remote Terminal
Bulletin describes a medium-size remote terminal for supervisory control systems which will accommodate up to 32 input/output cards, providing sufficient I/O capability for most control system applications. The bulletin describes field terminations and expansion capabilities and explains functional capabilities which include status/alarm inputs, latching status inputs, analog inputs, analog outputs, control outputs, pulse accumulation, gas flow accumulation, and net oil/gross fluid accumulation. HYDRIL CO., Los Angeles, Calif.
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### Used Computer Forecast
"Reader's Report," a newsletter which accompanies the winter edition of the 1973 "Computer Price Guide—The Blue Book of Used Computer Prices," presents a 10-year price level forecast of 360/30s and 40s, including analyses of 40 prices on a best-case/worst-case basis and a discussion of the effects of the "New Technology." The Blue Book provides current prices of used computers of most makes and models. TIME BROKERS, INC., Elmsford, N.Y.
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### Access Control Workbook
Problems and planning of electronic access control systems are covered in a 16-page workbook which gives comparisons of current access control systems and optional features, as well as survey forms and worksheets for planning and estimating customized systems. RUSCO ELECTRONIC SYSTEMS, Pasadena, Calif.
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### Microfilm Guide
The 1973 edition of the National Microfilm Assn.'s "Buyers Guide," listing products and services offered by 250 NMA sustaining members, is an introduction and a continuing reference to sources of supply for current and potential users of microfilm equipment, products, and services. The '73 guide includes sections covering automatic retrieval units, inspection apparatus, underground vaults, duplicators, and enlarger printers, and an expanded section for service companies. NATIONAL MICROFILM ASSN., Silver Spring, Md.
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### Equipment Rental
A four-page brochure describes a new rental program offering the economy of a long-term rental and the flexibility of a one-, two- or three-year cancellation option. Called Rental/Dividend, the program pays cash dividends in the form of rental refunds which are guaranteed and paid (or applied to future rental payments) at the time the rental contract is renewed. TELCO LEASING, INC., Chicago, Ill.
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### Table File Maintenance
An 11-page spiral-bound booklet describes the Generalized Table File Maintenance System (GTFM), an ôs utility system for generating, maintaining, and referencing data tables. The booklet covers applications, capabilities, utilization, control and security, optional features, installation support, and technical details. It is accompanied by a set of application notes on the use of the system in the insurance industry. COMPUTER SERVICES CORP., Southfield, Mich.
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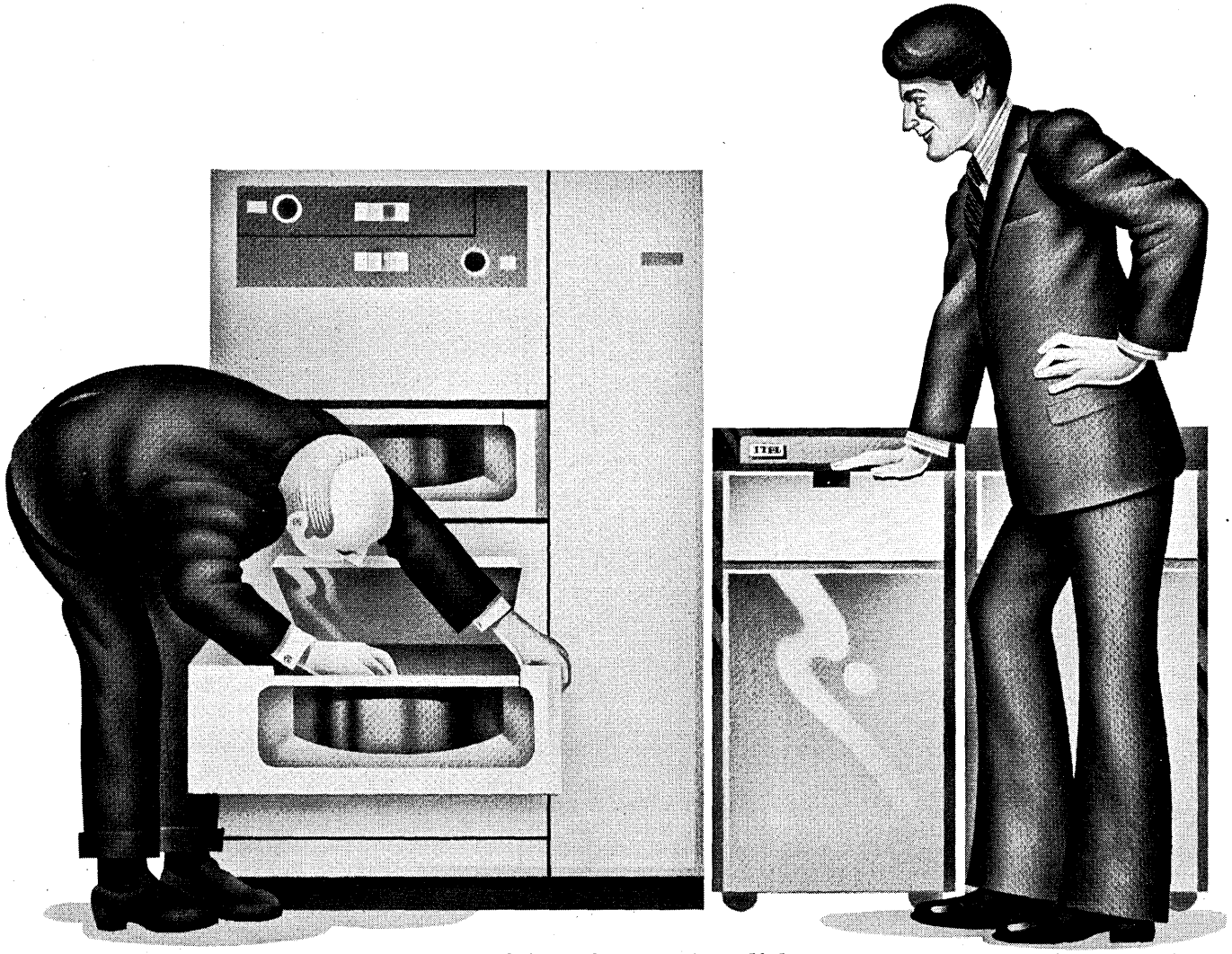


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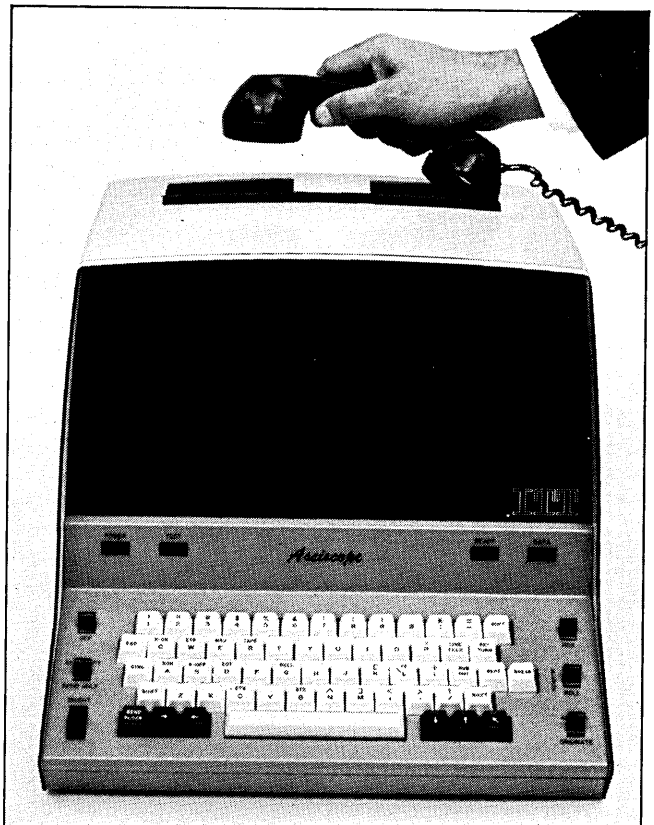

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# People

"Reduce all international trade barriers, let the old yankee trader take over, and you can end wars," says ALAN J. GRANT, new president of WEMA (formerly Western Electronics Manufacturers Assn.). Toward this end, WEMA, under Grant, will, he says, "continue to maintain a position of encouraging worldwide free trade." One planned activity is a Russian trade mission to Moscow. Grant, executive vice-president of Aerojet-General Corp., said WEMA in '73 also will work toward general acceptance of software as being "in the same position as handbooks and other data needed to operate machines." The organization has been in the forefront of a fight in California to keep software from being subjected to property tax.

Alan J. Grant

Other prime objectives of WEMA's new head man are implementation of a management-by-objectives system to provide a framework for measurement of group activity, and an acronym modification for better identification. WEMA no longer is strictly western or strictly for manufacturers. It numbers software and services companies among its full members and consultants, financial, and marketing firms as associate members. Grant feels the present acronym fails to convey this.

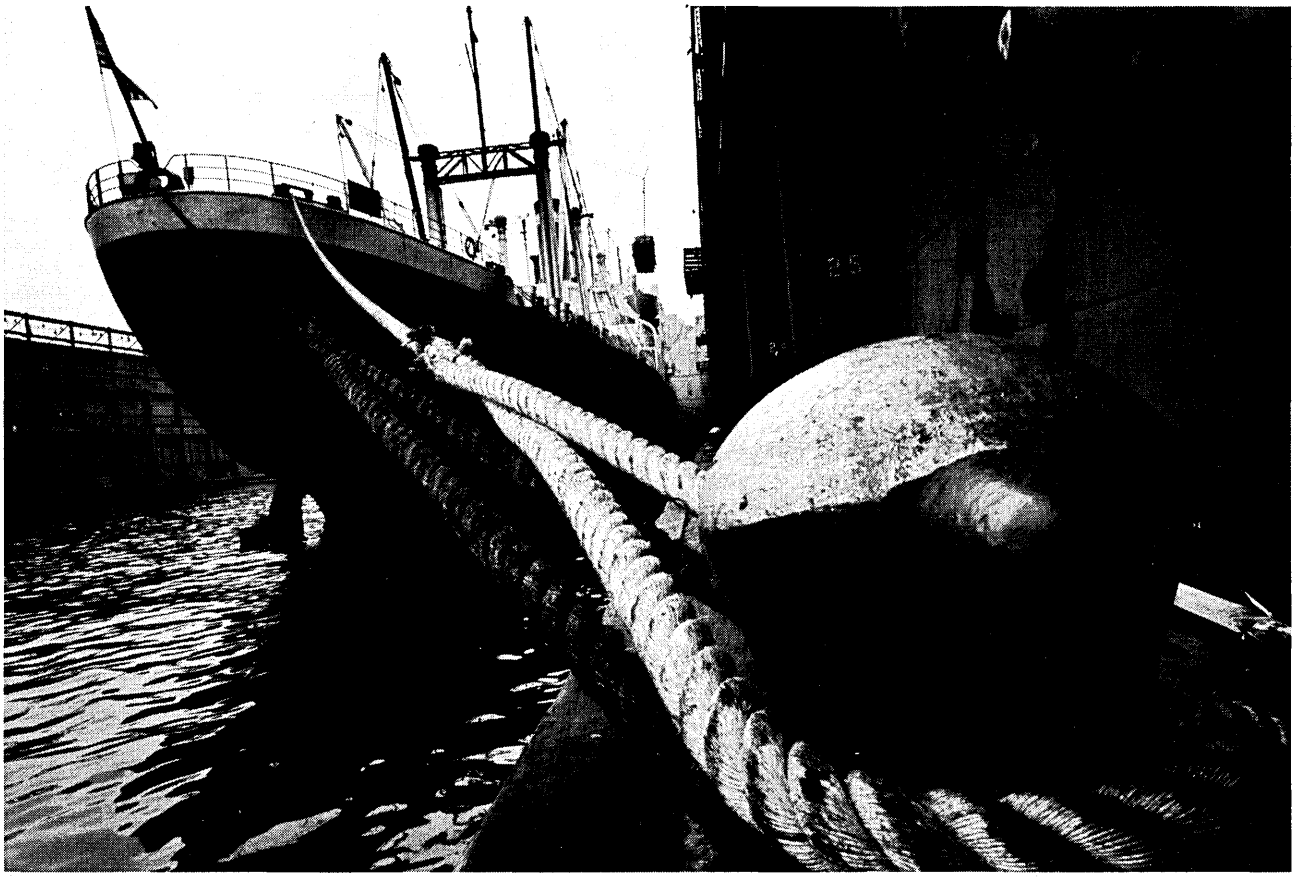
A former college professor, Grant moved into industry in 1949 when he joined the Aerophysics Laboratory of North American as a research scientist in a group which became the nucleus of North American's Autonetics Div.

SOL POLLACK likes California, and now he's back there after three years Back East. As director, consulting services, with Los Angeles-based Gottfried Consultants, Inc., he is dividing his time between L.A. and San Francisco doing consulting on organization analysis and planning, seminars and workshops for managers, market planning and strategy, and administrative methods and procedures. Pollack, a native of New York City, first moved to California, because he liked it there, 17 years ago. He worked for eight years with Rand Corp. as a senior operations analyst. Next came three years with North American Aviation's Space Div. as manager of operating systems and three years with Information Management Inc. as vice president, plans and programs, before he left the Golden State for three years to serve as director of computer based system design for the Management Services Div., S. D. Leidesdorf & Co.

Sol Pollack

Pollack is active in both the Assn. for Computing Machinery (ACM), of which he is treasurer, and the Data Processing Management Assn. (DPMA).

The technology of magnetic tape allows for much greater densities than currently are being used, according to NORMAN GRUCZELAK. Bit densities of 6,000 bpi could easily be achieved by his company, says the new president of Bright Industries Inc., Sunnyvale, Calif., but it would only serve to obsolete existing tape drives. With such packing, he explains, one could store a 1,000-character record in a tenth of an inch, but then have to separate such records by the



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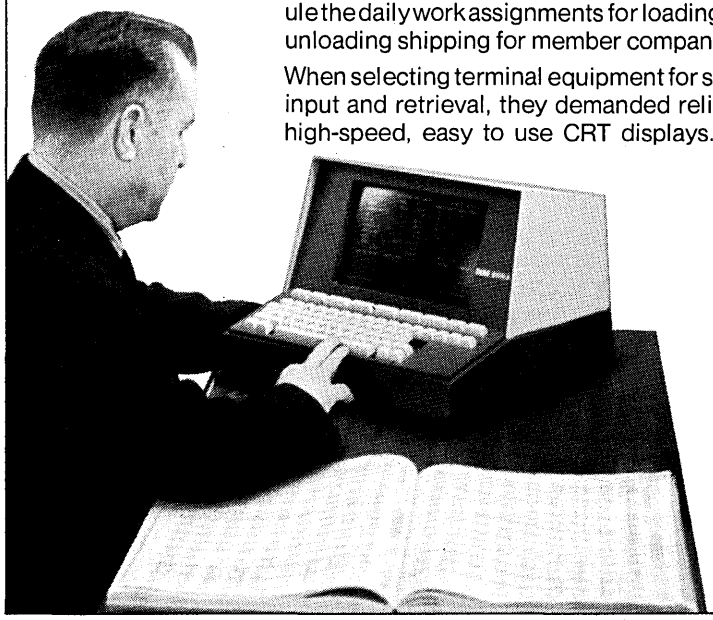

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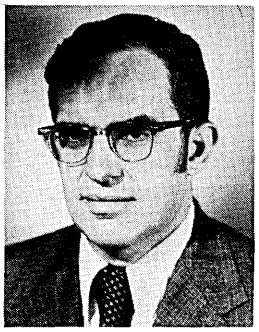
half-inch interrecord gap, and thus end up using only 20% of the tape. So, until a shorter gap becomes the norm, tape drive manufacturers like Bright are forced to follow the standard set by IBM.

Gruczelak, who joined a leaderless company recently acquired by Data Disc Inc., came from a competitor, Pertec. In the mid-'60s he was manager of peripherals at Texas Instruments, succeeding Harold Kurth, whom Norm had followed from Ampex. Kurth invited Norm to help get Peripheral Equipment Corp. (now Pertec) going, but decided instead in '68 to join Control Data at its Valley Forge facility. It wasn't until '71 that Gruczelak went to Pertec, only to find dissension in the management ranks. Had he joined Pertec earlier, he says in retrospect, "I might now be a millionaire."

ED KEARNS, ousted last December as president of Courier Terminal Systems by Courier's parent, Boothe Computer, which was taking a more active hold on management of the Phoenix firm, likes his new job as vice president of marketing for the Sperry Univac Communications and Terminals Div., which he called "the most autonomous division within Univac." He is in charge of all marketing for peripherals and terminal products produced by the Salt Lake City division. Principal thrust, he said, is "hanging our terminals printers and crt's onto IBM computers." While Kearns was at Courier, its annual sales grew from $250,000 to $12 million. His comment on that company's future: "It's rough for the small independent." Before joining Courier, Kearns was president, Systems Support Div., University Computing Co.; group vice president, Computer Sciences Corp.; and vice president, marketing support, and western regional manager, RCA Computer Systems.

Edward Kearns

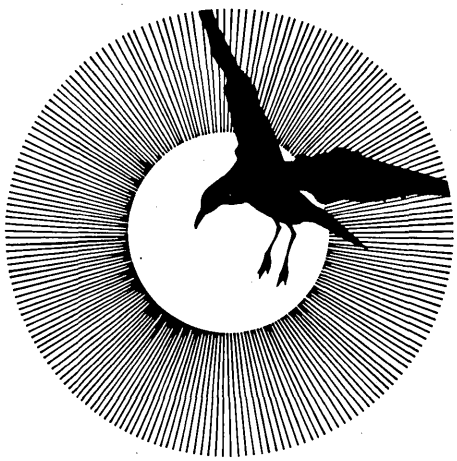
When BRUCE CURRY was going to Massachusetts Institute of Technology, he was aiming for a career in transportation. Then he got turned on by a course in quantitative statistics and became interested in data processing. His jobs after college went from one to the other. Now he's got both. He's the new vice president, management systems and services, for Hertz Corp., highly touted as No. one in a certain segment of transportation, and Curry would like to think they're No. one in their field in data processing, too.



Bruce Curry

Curry's first job after MIT was in transportation, with Ford Motor Co. This lasted a year and he switched to data processing, as an IBM systems technical representative. Then back to transportation with Dow Chemical in distribution and transportation studies . . . until they decided to get a 709, and he was made part of a group planning its use. They didn't get it, and he moved to Chrysler Corp., where he was part of a group that implemented the first commercial use of a 709. In Sept. 1959 he joined RCA Computer Systems, but he missed the pull-out from general purpose-computer business because he had transferred to the corporate staff in 1962.

When he transferred this year to Hertz, an RCA subsidiary, he left a staff position, happy to get back to a line spot. □

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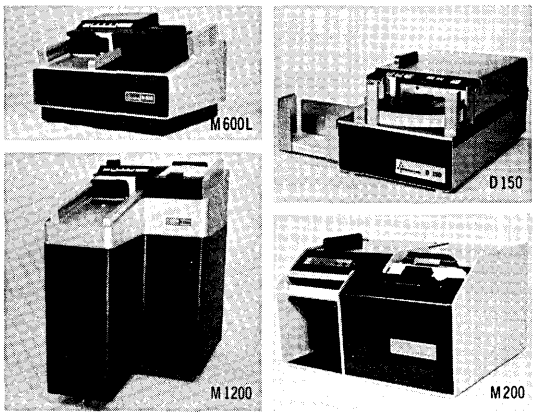


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# Books

**Modular Programming**
by J. Maynard

Auerbach Publishers, Princeton, N.J., 1972
100 pp. $8.95

Mr. Maynard's modest little book came to my attention recently because, in connection with an assignment, I needed to know more about its subject. Even now I feel as I did several years ago during a different assignment. Then, I needed to know more about the goals of my client's company. Of course, there was no formal statement of the company's purposes: *"Everybody* knows what the goals are," the president told me. What he meant, it turned out, was that *nobody* knew what the goals were.

What, then, *is* modular programming?

According to Maynard, "modular programming is a system of developing programs as a set of interrelated individual units (called modules) which can later be linked together to form a complete program." This definition is not very useful because it allows to be classified as being of modular construction many programs that ought not to be. Even Maynard's text shows his recognition of this inadequacy with an explicit counterexample.

Instead of Maynard's definition, therefore, I offer the following, a synthesis of my reading and my own experiences:

*Modular programming* is the act of creating programs of modular construction. A program is said to be of *modular construction* if:

1. It has been partitioned into (its) functional constituent parts (each part is called a *module*).
2. Its modules can be executed as independent programs.
3. Its modules stand in relation to each other in a hierarchy (of several levels).
4. Communication between pairs of modules in the hierarchy is always along vertical lines (i.e., two modules at the same level in a hierarchy are prohibited from direct communication with each other).
5. A *main* module (sometimes called the *root* or *control* module), at the top of the hierarchy, controls the execution of the program.

If there were a "theory of modular programming," it would treat, for example, of the partitioning of a proposed program: Into how many distinct functional modules can a program be partitioned? Is the partitioning unique? If it is not, how does one determine his preference for one partitioning rather than any other?

If there were such a theory, it would also ask and answer similar questions concerning the hierarchical structure of a modular program.

Such a theory would also enable a programmer to predict the performance of a particular modular design. Hence, it would at least imply the measurements of performance that would help to support the theory.

According to his publisher, the first part of Maynard's book "describes the theory behind modular programming . . ." That is outrageous, unadulterated balderdash! There is not one paragraph in the book that qualifies as theory (of anything).

The remainder of the book (all of it, that is!) "examines practical considerations" based on the author's experiences as programmer and consultant. Despite its many shortcomings (originally written in English-English, it seems not to have been edited for its American-English audience, and in some places I could not discern that an editor had even examined the text; it contains adjectival and adverbial forms which will cause a careful reader to challenge the author; its punctuation is atrocious; parts of its glossary I found insulting), a novice will be well rewarded for his apprenticeship and his investment of time and money. I would augment the book with a copy of Dick Canning's *EDP Analyzer*, Vol. 10, No. 7, July 1972, "Modular COBOL Programming," the bibliography of which should prove additionally helpful (Maynard provides no bibliography).

Maynard argues that modular construction facilitates program testing (and I agree with him), but he makes the common mistake of implying that a "debugged" program is also "correct." His publisher puffs this up by asserting that "testing procedures to achieve 100% modular program reliability . . ." are presented by the author. In fact, Maynard gives no advice on how to achieve this unattainable goal. As was made abundantly clear at last December's Fall Joint Computer Conference, there is not even agreement on what we mean by a reliable program.

I do hope that the appearance of *Modular Programming* will encourage other would-be authors to expand the literature.

—Robert M. Gordon


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## Book Briefs

**ACM 71: A Quarter Century View**

Association for Computing Machinery, 1133 Ave. of the Americas, New York, N.Y., 1971
64 pp. $11.50

This 9 x 17-inch book has been judged the best nonserial association publica-

tion for 1971 by the Print Designers of America. It contains a text by Prof. Rosen of Purdue Univ., "Software Developments" compiled by Cmdr. Grace Hopper, and over 100 illustrations from the archives of computer manufacturers and early customers.

**Minicomputers: Hardware, Software and Applications**

J. D. Schoeffler & R. H. Temple, ed.
John Wiley & Sons, Inc., 605 Third Ave., New York, N.Y., 1972
366 pp. $12.95 ($6.50 paperback)

The purpose of this book is to provide the user with an understanding of minicomputers and their application. It includes 47 reprinted papers, divided into eight sections: minicomputer hardware, minicomputer software, input and output devices, data acquisition applications, process control applications, discrete control applications, message switching applications, and organization of computer projects. Introductory comments and a bibliography are provided for each part. A short subject index is included.

**COBOL Support Packages . . . Programming and Productivity Aids**

by Stanley M. Naftaly et al
John Wiley & Sons, Inc., 605 Third Ave., New York, N.Y., 1972
182 pp. $12.95

This book represents the authors' collective thinking on the way COBOL should be used. It is intended for edp and programming managers, lead programmers, and others who have some influence on their organizations' strategies. It is also for compiler writers and software package vendors who may want to know what users really need. The material in this book appeared first as a series of articles in *Data Processing Digest* and has been revised and updated for this publication. Appendixes include COBOL aid packages by supplier in both tabular and textual form.

**Interactive Bibliographic Search: The User/Computer Interface**

Donald E. Walker, ed.
AFIPS Press, 210 Summit Ave., Montvale, N.J., 1971
311 pp. plus bibliography. $15

The transcripts of an AFIPS-sponsored workshop on "The User Interface for Interactive Search of Bibliographic Data Bases," held in January 1971, have been edited to make the proceedings as useful and informative as possible to someone who was not there. The workshop sessions focused on topics rather than papers and covered general design philosophy; command, query, and display structure; interaction of data base content and query language; user needs, feedback, and training; evaluation and design criteria; and development of a function/feature list for interactive bibliographic searching. □


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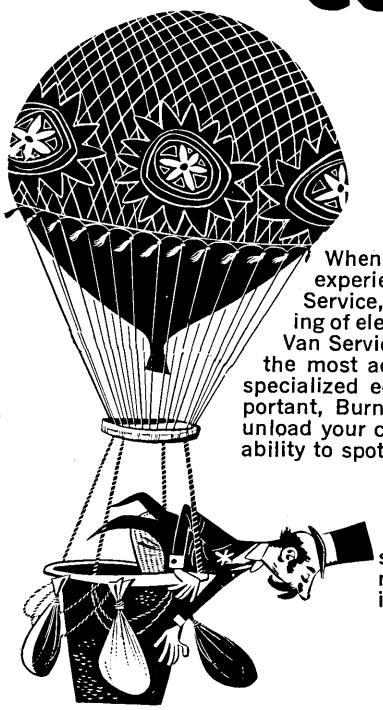

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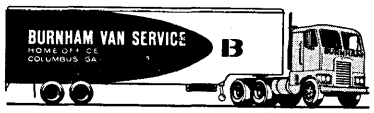


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☐ **Theory of Parsing, Translation, and Compiling: Vol. I Parsing**—Alfred V. Aho, Bell Telephone Labs., & Jeffrey D. Ullman, Princeton Univ. 1972, 592 pp. (013-914556-7) $17.50—Comprenhensive, self-contained treatment of compiler theory. Emphasizes parsing and its theoretical framework. For a course in compiling theory, senior or graduate level.

☐ **Theory of Parsing, Translation, and Compiling: Vol. II Compiling**—also by Alfred V. Aho and Jeffrey D. Ullman. 1/73, 480 pp. (013-914564-8) $16.50—A continuation of **Volume I**, this text completes the definitive work in the field of compiling theory. Includes problems and bibliographic notes at chapter ends.

☐ **Evaluation and Measurement Techniques for Digital Computer Systems**—M. E. Drummond, Jr., IBM, San Jose, Calif. 4/73, 352 pp. (013-292102-2) $14.50—Guidelines for installation of digital computers; effective and meaningful evaluation of performance, and ways to measure its efficiency.

☐ **Systematic Programming: An Introduction**—Niklaus Wirth, Eidgenössiche Technische Hochschule, Zurich. 4/73, 208 pp. (013-880369-2) $10.50—Computer programming based on clear definitions of basic concepts and on a methodological approach to the design of algorithms.

☐ **Managing a Programming Project**—Philip W. Metzger, Programming Management Consultant. 1/73, 224 pp. (013-550756-1) $12.00—To plan and manage a job involving computers and computer programming—covers job analysis, tools to use, how to organize people effectively, what documents to write, the pitfalls, and more.

☐ **Business Systems with Punched Card Data Processing and System/3 Model 10**—F. Robert Crawford, Consultant, Osprey, Florida. 1/73, 480 pp. (013-107698-1) $12.95—Practical applications of machine data processing functions. Introduces small computers and programming via IBM System/3 Model 10 and RPG II.

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# letters

*(Continued from page 22)*

doing suggests that this is true and betrays a narrowness of interest and goals we find appalling. But we'd love an apportunity to learn enough to be able to change our minds.

### Acne

Re "Convalescing" (Jan. Editor's Readout, p. 41): All told, I think the patient is doing rather well, particularly now that we've determined the disease to be adolescence, rather than wall-to-wall epilepsy. True, the child has had his share of pranks, foolishness, dumb moves—and just plain fun. But from other adults, he's learning to assume a more responsible role in the business society.

Our real fear more probably should be of premature arteriosclerosis setting in (sometimes referred to as hardening of the Armonks). Unless or until that happens, the patient will live a good life.

LARRY WELKE
*President*
*International Computer Programs, Inc.*
*Indianapolis, Indiana*

### The unsatisfied surplus

Robert H. Anderson has produced a splendid treatment of the future of the automated factory (Dec., p. 47). One cannot overemphasize his point that ". . . flexible automation of high-technology manufacturing is probably the most important response the U.S. can make to remain in the international trading community . . ." I would add that the long-range survival of the U.S. productive economy is in fact contingent on such a development and at a pace not too far behind other nations also contributing to the world market.

Where I would differ with Anderson in his implication that the only noteworthy social effect of this development—at least the only one mentioned in his article—would be in increased job satisfaction. He is correct in pointing out that the predominant factory jobs in the future will be programming, system maintenance, supervision, and management. However, there is no reason to believe that these types of personnel will come from the same ranks as those presently employed in manufacturing, and certainly there is strong reason to infer that the quantity of operating personnel will be radically reduced.

The primary motivation toward factory automation is the capability to produce products that can sell at a lower price than the equivalent product produced by conventional manufacture. The raw materials consumed in production by the two alternative processes are approximately equal in cost. The automated system requires a larger capital investment in plant and machine capability. Under most foreseeable contingencies, the per-unit depreciated capital cost transferred in manufacture will be at least equal to, and probably larger, for the automated system compared to the conventional system. Of course, the price reduction is achieved by a drastically reduced per-unit labor cost for the automated system. In fact, this is the criteria for feasibility of an automated system under any normal circumstances.

During the 20 years preceding 1970, the U.S. employed agricultural labor force decreased by approximately half despite a population increase of nearly one-third. The concomitant increase in farm productivity was accomplished largely through advances in agricultural mechanization. An analogous though much sharper reduction in employment might be expected to occur through factory automation.

The revolution in agricultural production produced large-scale social changes, presently most visible in the population exchanges that resulted in physically degenerating and crime-ridden urban centers and our sprawling, culturally stultified suburbs. The serious social effect of increased automation will not be simply a reduction of the total labor force, since this effect could be mitigated by various ad hoc remedies; e.g., decrease the working day, transfer of employment to "service" industries, early retirement, postponement of entry into the labor force by increased schooling, etc.

What is less amenable to ad hoc solutions is the increase of a population segment which is "surplus" to the productive processes; that is, an increasing number of people who have neither the inclination nor inherent capability to serve in " . . . programming, system maintenance, supervision, and management . . . "

Anderson is right in stating that computers will have a dominant role in future manufacturing technology. But it is unfortunate to ignore the very serious social effects that will occur if such development proceeds by ad hoc considerations that pay scant attention to the humane goals of society.

MELVIN KLERER
*White Plains, New York*

### Nomenclature needed

Continued reference to "independent peripheral manufacturers" in the media has led to considerable confusion in many segments of the computer market. The computer industry is now

at the point where there should be nomenclature to differentiate between the oem peripheral manufacturer and the plug-to-plug replacement peripheral manufacturer.

All "independents" are not in the business of replacing IBM peripherals. Many independent peripheral companies do not relate to IBM insofar as plug-to-plug replacement is concerned. WANGCO'S IBM "compatibility," for instance, relates only to the magnetic tape medium, its format, interchangeability of tapes, reel size, etc., and our market is the oem.

Other peripheral manufacturers, however, are seeking to replace IBM equipment on a machine-for-machine basis. Their objective is to plug peripherals into IBM computers at end-user sites. This equipment is, in almost all cases, leased to the user. The independent, such as WANGCO, sell outright to their oem customers.

Proper identification for these two facets of the burgeoning computer industry is as important, I believe, as the established identification of oem's and end users.

BEN C. WANG
*Chairman and President*
*WANGCO Incorporated*
*Santa Monica, California*

### Consorting in europe

In recent months the computer press, including DATAMATION (Sept., p. 134), has contained articles mentioning organizations offering "comprehensive European software product sales and support" to various non-European owners of software products. As representative of a European company actually selling software products on behalf of several producers, I would like to draw attention to a practice which has developed recently behind the imaginative copywriting of these organizations.

In summary, they mostly claim to be a "consortium of X companies in Y countries" and therefore to be able to offer the claimed services; and in a very few cases this is the case. More common are rather absurd claims (such as X>150 and Y=23 put out by a London answering service) and an overwhelming interest in the exclusivity and duration of the sales contract they attempt to negotiate, combined with a lack of sensible marketing plans.

The reason is that the so-called consortium has in fact no selling organization and is interested in the rights only so that it may resell them to third parties. A frequent outcome is then that the "broker" retains a large part of the seller's commission in return for very tenuous services, thereby forcing the retailer to operate with inadequate margins to assure support (and someone is always desperate enough to so operate) with a consequent adverse effect on the reputation of the product, the producer, and the software industry at large.

Provided all parties understand the situation and the resale terms are reasonable, the practice is entirely normal and represents an economical way to establish a network of agents. It should be noted that, once signed, the contracts of these "consortia" are hard to break. Since there is no single company able to offer effective representation throughout Europe, it is suggested that the owners of software obtain a clear statement of the consortium member in each country and their marketing plans, the lines of support and control, the distribution of commission between the members, and what is to be done in countries without representation before signing a contract conveying exclusive European rights to anyone.

In this way bona fide organizations that actually devote themselves to selling software can be distinguished from those interested in trading the rights to do so.

M. D. HARBISON
*Intersystems N.V.*
*Amsterdam, The Netherlands*

### Go east, young man

After reading your article on privacy in the December issue (p. 90), several questions have come to my mind:

To what level of detail are these mammoth data bases going to be compiled? To what end is the information going to be used? What *realistic* controls can be placed on the information to prevent people from accessing data for their own personal use? From where does the government or anyone else obtain the right to intrude in any way into the personal life of any individual without that individual's expressed consent?

It seems to me that the money being spent for these activities could be used to much more productive ends. For those involved in this activity: The job will be much easier if you can relocate; the data for your files has already been collected in Eastern Europe.

As a tool for social improvement, the direct mailer's technique seems to be much more than adequate to achieve objectives in this area. And it certainly seems to be a more legitimate method, in line with American tradition.

How many DATAMATION readers do you suppose favor a system with the potential for screening their personal mail and intruding into their private lives?

KENNETH S. SIWICKI
*Crystal Lake, Illinois* □


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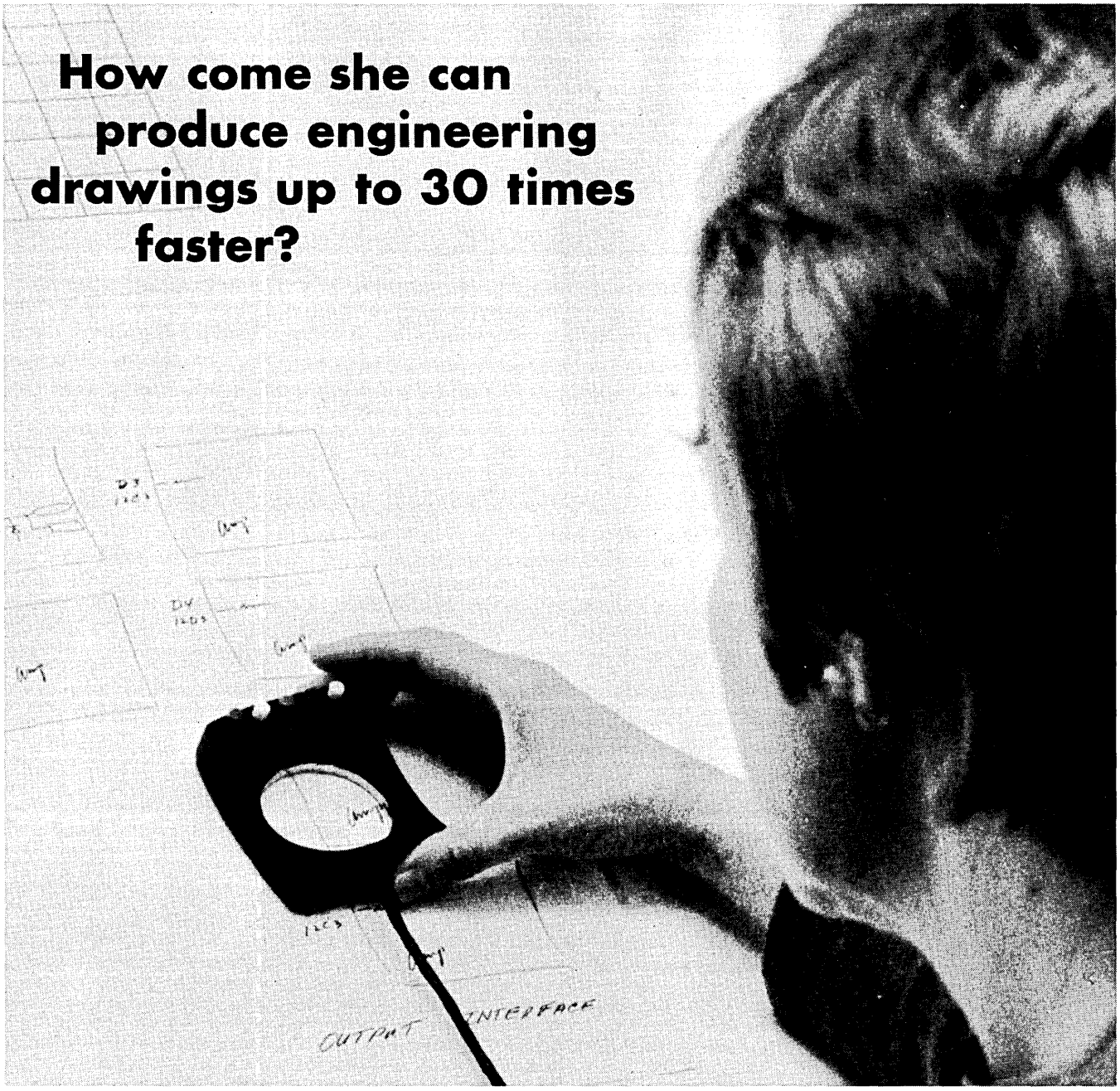


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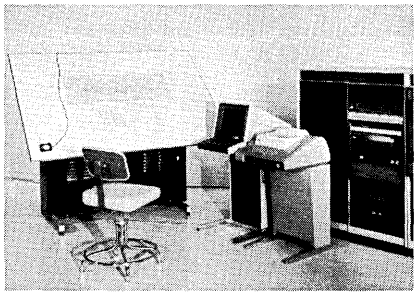

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# Look Ahead

(Continued from page 8)

will be to take the issue to California's Board of Equalization and the courts.

## IS IBM CHANGING CHARACTER?

Curiosity grows as to why IBM replaced the term "bytes" with "characters" in its most recent product announcement (p. 91). One possible explanation: The giant is slyly paving the way for the architecture of its new line, which could feature nine bits. The high-order bit could conceivably indicate whether the other eight were to be interpreted as extended binary (EBCDIC) or ASCII. One of the fun implications of this thought is that it would wipe out a lot of people planning new IBM-compatible lines...such as the new Siemens-CII-Philips consortium which has excluded ICL because the British giant is not IBM compatible.

## S/3s: MOVING ALONG, BUT NOT UP

Group/3, a Los Angeles-based association of IBM System/3 users, thinks $600 million will be spent this year on rental and other expenditures by users of some 20,000 machines installed or on order worldwide. The association's survey of a small sample of S/3 users also indicates some big users hesitate to move up to new IBM offerings. One installation, operating 420 hours a month with two 24K mod 10s and lots of discs and tapes, is an ideal candidate for a 370/125. But it won't move, claiming the conversion cost would top $250,000.

## TURNABOUT

At the Hughes Aircraft dp center near Los Angeles they're talking about the great finger-pointing incident. When new 3M tapes were damaged on IBM transports, the IBM customer engineers said the tapes must be faulty. So Hughes ordered 500 new tapes -- from IBM. The same thing happened, and Hughes called 3M. A media inspection team from St. Paul traveled to Los Angeles and spent a week analyzing the problem -- at 3M's expense. At week's end, 3M told Hughes and IBM which tape drives were causing the problems, and what adjustments were needed to solve them. No problems since.

## RUMORS AND RAW RANDOM DATA

Computer educator and author Fred Gruenberger, who contends that computing for the masses is almost here, next month will launch a monthly publication for them. Popular Computing, published out of Calabasas, Calif., will be aimed at students, hobbyists, and programmers. Gruenberger says projected '73 sales of 10 million desk-top calculators and 40,000 minicomputers would indicate computing is about to reach the masses...Will Herb Grosch, featured speaker at the annual DCA meeting in Los Angeles March 16, tell where he expects to work next?...In a company-wide contest to name its new employee publication, TRW Credit Data has selected The Credit Line, rejecting such seemingly appropriate offerings as The Tattler, TRW Whispers, The Informer, and The Snitcher... Inventor Don Oglesby, father of the Omnitec acoustic coupler and the Tally printer, seeks to salvage a 3M cartridge transceiver (TCT 300) recently announced by Wabash Computer Corp., now being dissolved (p. 134). Oglesby, Wabash marketing vp, and other key employees are seeking venture capital to market the product via a new company to be called Com-Phoenix...United Computing Corp., Carson, Calif., has developed a numerical control processor for the S/3, providing IBM easy entry into the large metal cutting industry.

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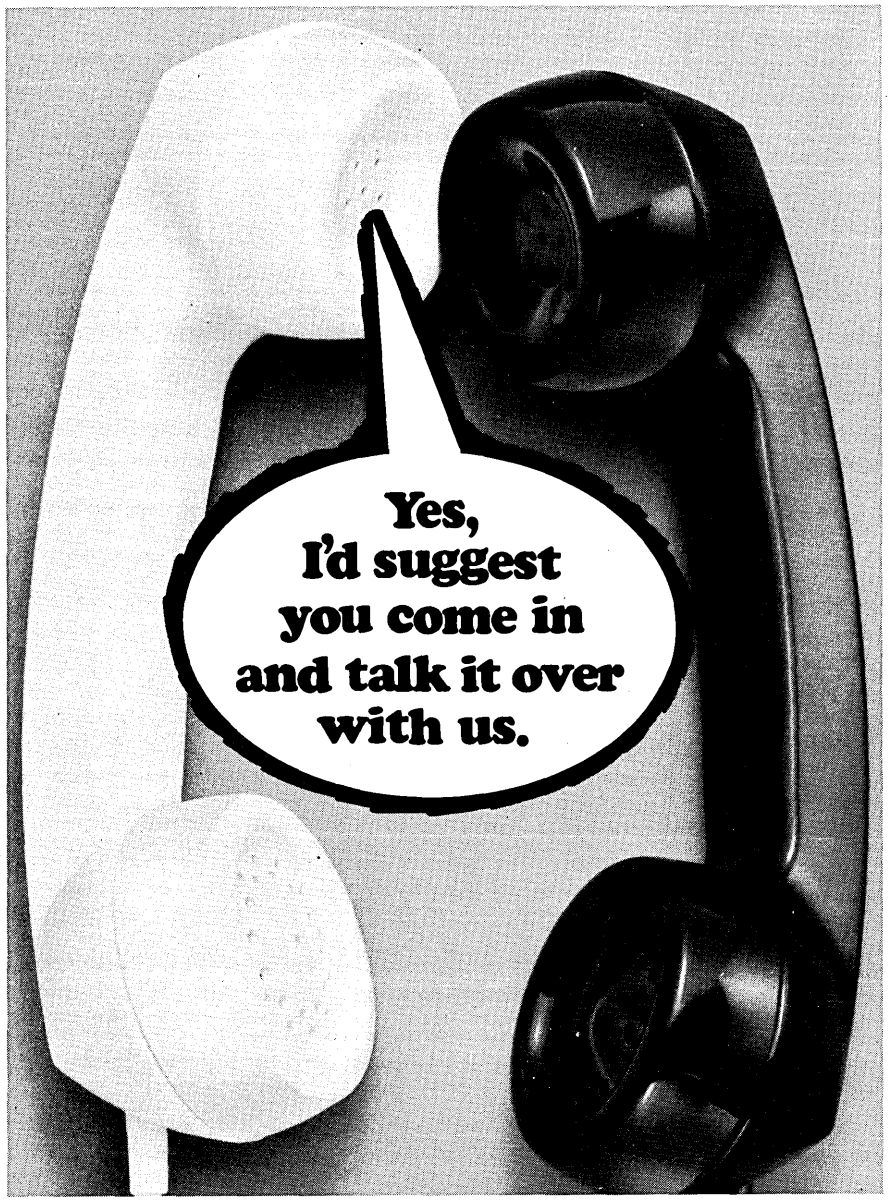


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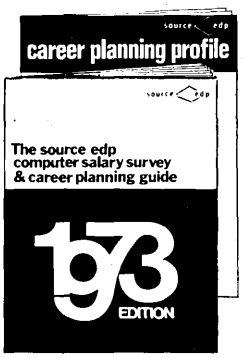


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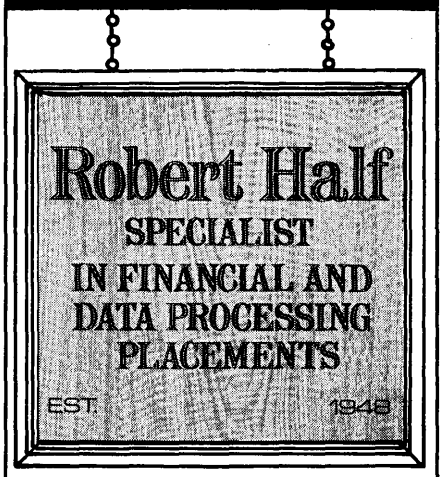


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**This forum is offered for readers who want to express their opinion on any aspect of information processing. Your contributions are invited.**

# The Forum

## On the Spelling of Programmer

I can't resist your invitation to comment on *programmer* versus *programer*. (See Letters, Oct. 1972, p. 25.)

The debate over the spelling of this word is but one manifestation of the ongoing struggle between the language purists who decry as corruption any new or different usage and those who argue that language conventions are mere pedantry, not consonant with the communication demands of our exploding technology. (The latter often appear to have the upper hand.)

These are, of course, the extreme positions, with the truth, needless to say, somewhere in between.

The challenge is to the communicators in our business—a role most of us assume from time to time—to strike the appropriate balance in their written communications. (Oral communications are another matter altogether.)

Here are some of the highlights of the battle to date:

We have created *to format, to access,* and *to spool* to generalize references to functions that have numerous specific implementations. At the same time, we have more or less successfully held the line against *to input* and *to output* as needless corruptions (with a concession to *outputted* as in, "Arnie Palmer outputted Lee Trevino on the 18th hole").

For economy of expression, we have created *I/O* (but not, curiously, *i/o*), which functions extremely well for us. A similar rationale has unfortunately yielded *thruput*, a barbarism whose sole justification is the saving of three keystrokes and their accompanying space—valid for highway markers but merely lazy, given its low frequency, in the text of our literature.

We have pretty much thwarted the trend of a decade ago to such usage as "This routine READs a record. . . . " To those who saw little harm in this we pointed out that it invited "the record is WRITEd," and what was then to preclude "before LOGOFFing"?

This was sufficient argument for most people, and to those who still think *XCTLed* is socko written communication we can only say, "we'll think it over."

On the other hand, we will soon be debating whether or not we should double the consonant when forming the past participle of *to sysgen.*

So we win a few and we lose a few, but to win any takes vigilance. A sense of history helps, too. Some of us antiquarians recently aborted a local attempt to substitute the acronym *CPO* (for *concurrent peripheral operations*) for *spool* because *spool* was "programmer jargon." (The evolution of *spool* aside, I'll take jargon over an acronym every time.)

In addition to the enormous demands of technology, the language in general use is expanding at a mind-boggling pace. Despite the anguish this gives the purists (the "data are" crowd), it is mostly healthy; but it, too, bears watching.

For instance, the current fad for dropping the hyphen in compounds came perilously close to giving us *macrooperation* and *macroinstruction.*

This is not merely an aesthetic question—consider the plight of the newcomer to the literature. To him, *batch* is still an undefined unit of measure in cookie production, *standalone* looks suspiciously like a Pacific Ocean bivalve, and if he is uninitiated in the niceties of classical Greek prefixes, Lord only knows what he will make of *macrooperation.*

Where the purists really get their day in court is where widespread misuse has served to destroy the utility of certain words and usages. A case in point is *comprise*; what limited utility it once had is, for all practical purposes, gone. I do not lament the passing of *comprise*—even used correctly, its significance was lost on half the audience.

What does concern me at the moment is the jeopardy in which we find the slash. This shorthand for the inclusive "or," eschewed in literary circles as a vulgarism suitable only to legal documents, has tremendous utility in technical communications, as exemplified by *I/O.* But our slash-happy industry has taken to slashing things willy-nilly in the name of embellishment. And the vogue taking shape on the horizon for the reverse slash will give added encouragement to our indiscriminate slashers, thus sounding the death knell of utility for all slashes.

### Programer and the level of noise

Now all of this, while fascinating, may not seem to you to be germane to the spelling applied to the writer of programs. Indeed it isn't when the latter is examined in isolation; but it is irresponsible to examine it in isolation, which I will now demonstrate.

The *we* of my earlier references to "we created" and "we thwarted" is that collection of people—in our context, loosely, the "data processing industry"—who have, by acceptance, sanctioned the *correctness* of a given convention of usage, spelling, or punctuation.

By sanctioning, we *create*; by withholding sanction, we *thwart.* Unsanctioned usage will persist, but it is not *accepted.*

Acceptance derives from several sources: widespread usage, authority, influence. In general communications, usage is the most important factor, but authority is very much in play (e.g., when in doubt, do it the way the New York

Times does), and influence also has a role (e.g., if Walter Cronkite says it that way, that's a correct way to say it).

In more specialized areas, correctness tends to associate with the most prolific source of the communications; in highly specialized areas, with the originator of the concept.

In any case, correctness is arbitrary; consequently, error is equally arbitrary.

Arbitrary error—unsanctioned usage—creates a "noise level" in the communication.

*Noise* does not apply to new or to different but well-considered usage; it applies to gratuitous deviation from a sanctioned usage that is adequate to the task. Some noise is inescapable; what is accepted by the American reader can be noise to the British reader, and vice-versa.

The impact of noise on the message is both cumulative and highly variable, depending on the nature of the communication, the degree of formality of presentation of the communication, and, most importantly, the reader's tolerance of error, which is wholly subjective.

Some readers don't notice it at all or, if they do, don't care; some are subconsciously niggled by it; and some recognize it and tolerate it very little.

For the latter two groups, noise can obscure if not totally destroy the content of the message. For the last group, an unduly high noise level will impair the credibility of the message and can even arouse hostility toward the author. Literary license is no defense in technical communications.

Now *programer* is not itself all that noisy, but the cumulative effect of a programer who thruputs his job shatters the message with a decibel level at or above the threshold of pain.

The noise level of error is further compounded by visual noise contamination, a particular problem in our industry because of the numerous occurrences of symbols in all capital letters, the highly specialized significance of punctuation marks, etc. The careful writer labors long to minimize this form of noise.

For example, italics are less noisy than quotation marks; as a result, italicization has gained acceptance as an alternative to quotation marks. This is a true case of a convention in transition, now accelerated by wider use of typewriters offering variable fonts. We can foresee the day when the use of quotation marks will be largely relegated to cases where the end of a quotation must be specifically delimited from the beginning of another, as in quoted conversations. Coincident with this change is the growing sentiment that foreign phrases in common use, e.g., "e.g.," do not require italicization.

Noise contamination of the message also grows with the size of the audience. Our pioneers, a clubby group, did not much care if the data was moved or MOVEd. The newcomer is not sure that they mean the same thing.

### A function of usage and authority

Now some will argue that I have not yet established that *programer* does not have correctness. This brings us back to acceptance being a function of usage and authority and influence; where authority can be said to exist, widespread usage of a different form does not necessarily constitute sanction. *Compatability* is not an acceptable alternative to *compatibility* no matter how often this industry misspells it; it's just widespread error.

Authority is fickle. In citing Webster's Seventh Collegiate, Ms. Malmstrup inadvertently weakened the case for *programmer*. The Seventh is based on Webster's New International III, which is widely considered to have abdicated all authority by recording usage without qualification as to sanction. One Rex Stout novel opens on Nero Wolfe in the process of burning a copy of WNI III. Indeed, it is WNI III that issued the coup de grace to *comprise*. (American Heritage attempts to preserve it, but cautions against any


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# the forum

expectation of success.)

In any case, it is not reasonable to expect dictionaries to provide authority for a dynamic technology; they are, after all, only checkpoint records of linguistic history.

So what does constitute authority in our business?

At the risk of oversimplification and recognizing that there are numerous exceptions, I'll say it defaults either to the one who is firstest with the mostest or, more often, just to the one with the mostest—who may sanction the usage of the firstest by adopting it for use in the mostest. Since it is most convenient for others to communicate in the most widely known terms, the sanction of the mostest is quickly reinforced.

Authority is not static, which is what permits growth. The identity of the source can shift, or the source can itself redefine correctness. Authority is readily lost through a failure to keep pace with need, or through precipitous, ill-considered redefinition. Any redefinition generates noise, at least temporarily.

Since any noise is destructive to the message, the decision to introduce even temporary noise must be made for more cogent reasons than the dubious aesthetic judgment of a few. *Programer* lacks cogency.

I would not care to be more specific about the particular authority associated with any particular convention because, given that visible authority often represents a hidden hierarchy of authorities, the *we* that confers sanction is sometimes *me*.

Ms. Malmstrup, you are a programmer—at least for the time being. When can I expect my $.05?

—Truly A. Donovan

Ms. Donovan works on technical publications for IBM.


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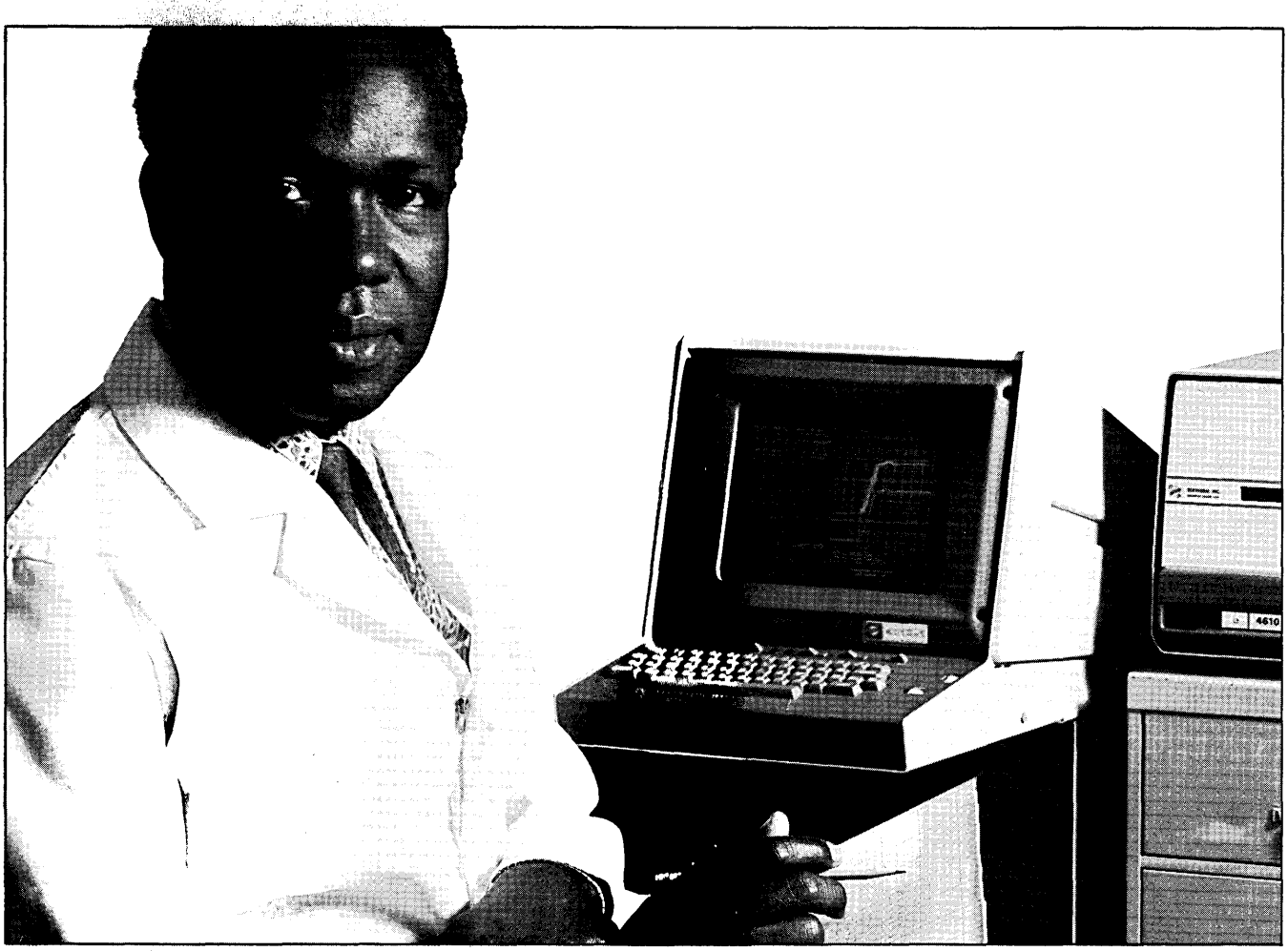


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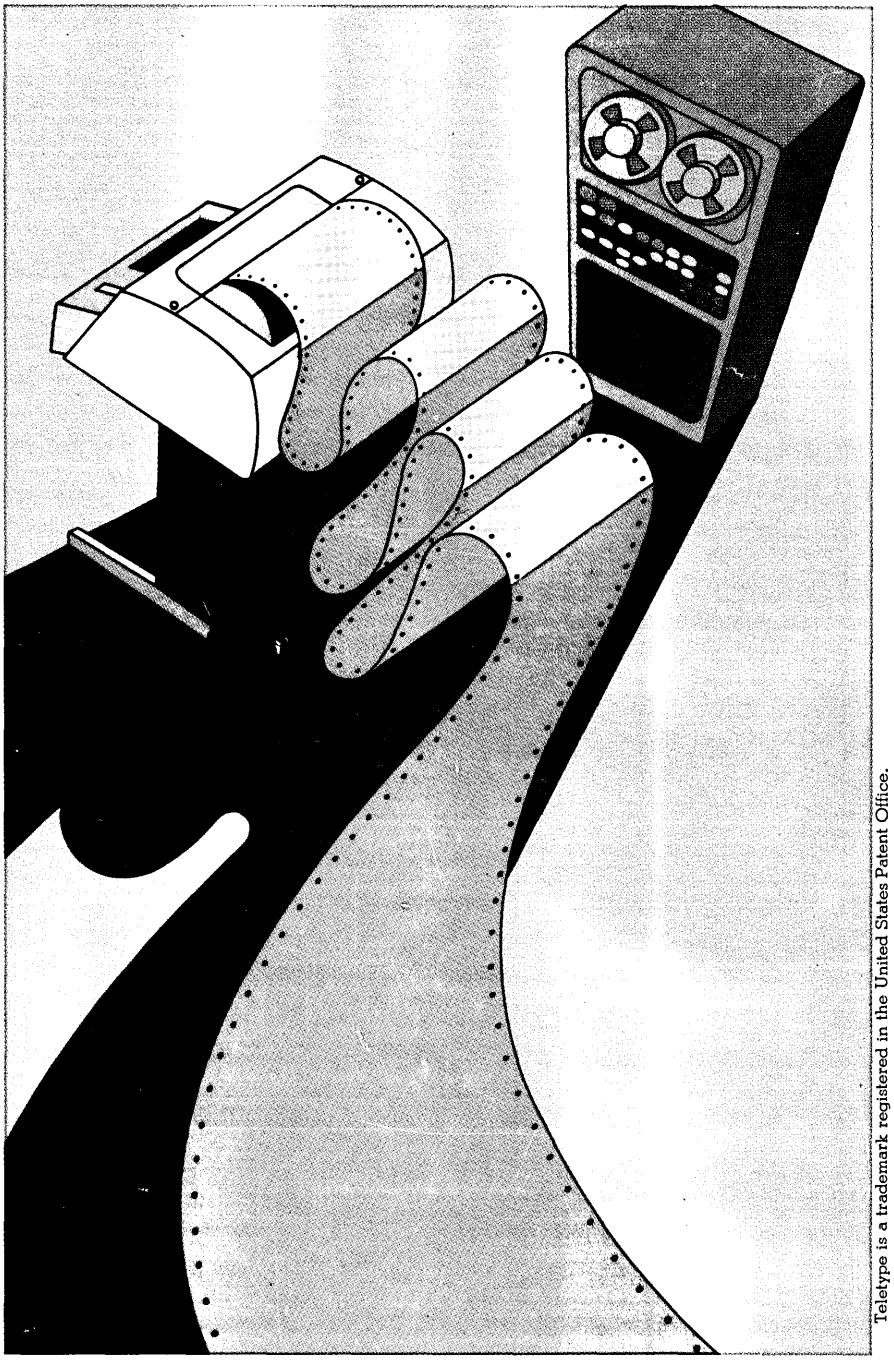

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