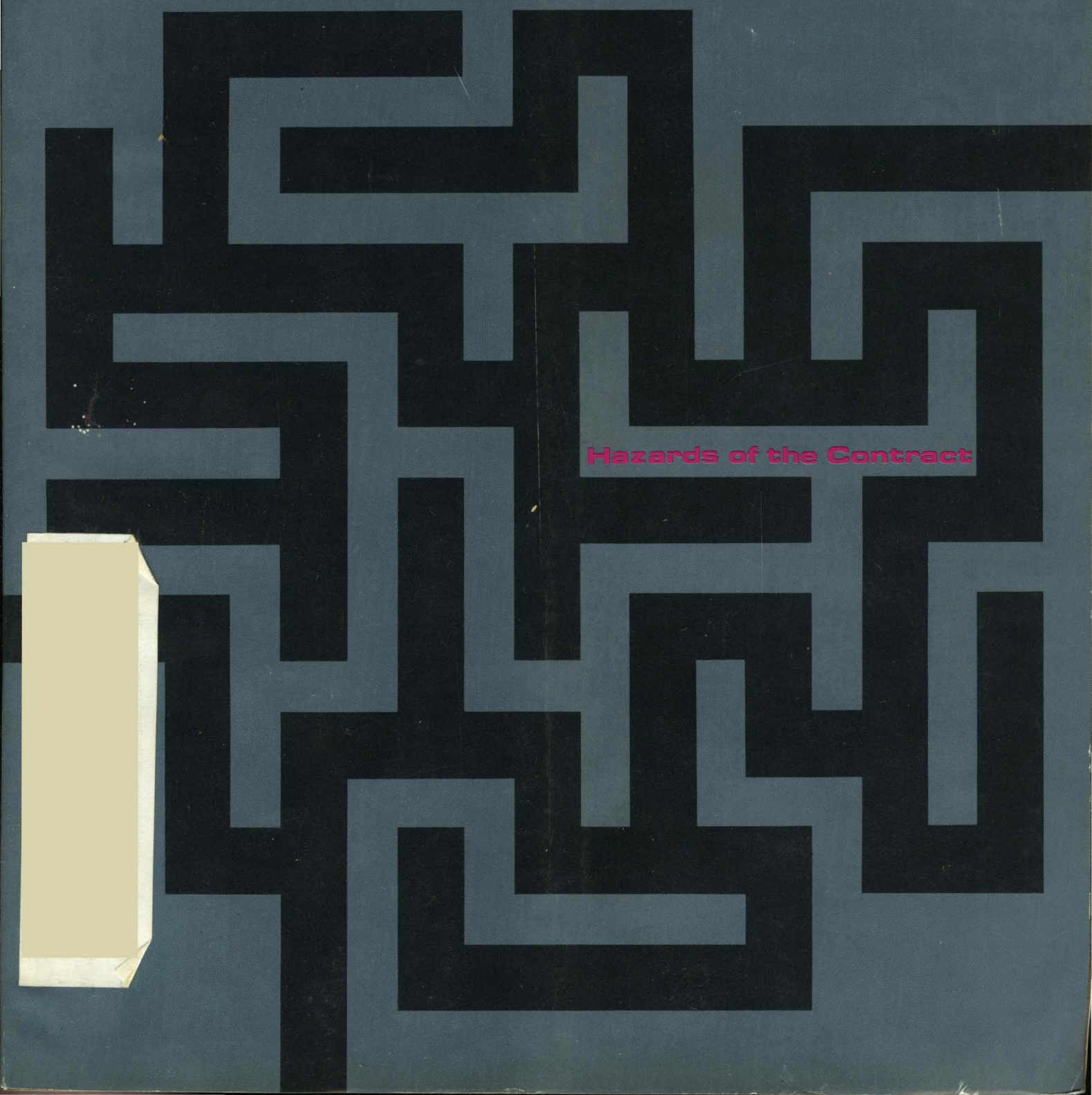
DATAMATION®

71

November 1



Hazards of the Contract

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VORTEX: a real-time operating system built to match and enhance the speed capabilities of the 620f. Hands down, it is the most powerful minicomputer package you can buy. The 620f is the minicomputer definition of "fast"; not just memory cycle time, but in total speed, the combination of memory cycle time, address modes and instruction set. And VORTEX takes it from there.

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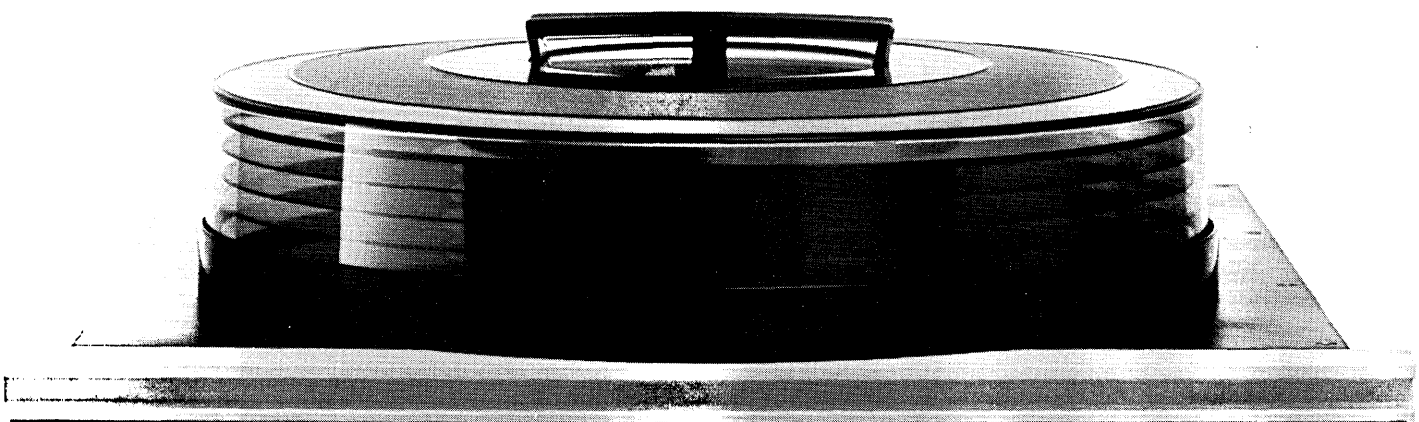
VORTEX partitioning of core and disc memories provides a floating balance between foreground and background according to need. Even in its minimum configuration, the 620f/VORTEX system is tremendously powerful and has strong competitive advantages over much more expensive computers; systems such as IBM 1800, CDC 1700 and XDS Sigma 3. In minicomputers, no one else even comes close.

Look into VORTEX. It is the most important development in minicomputer operating systems since programs moved out of hard wiring. Our literature packet will show you how and why. Send for it. And stay ahead of the revolution. Varian Data Machines, 2722 Michelson Drive, Irvine, California 92664. (714) 833-2400.

CIRCLE 1 ON READER CARD



varian data machines 620/f

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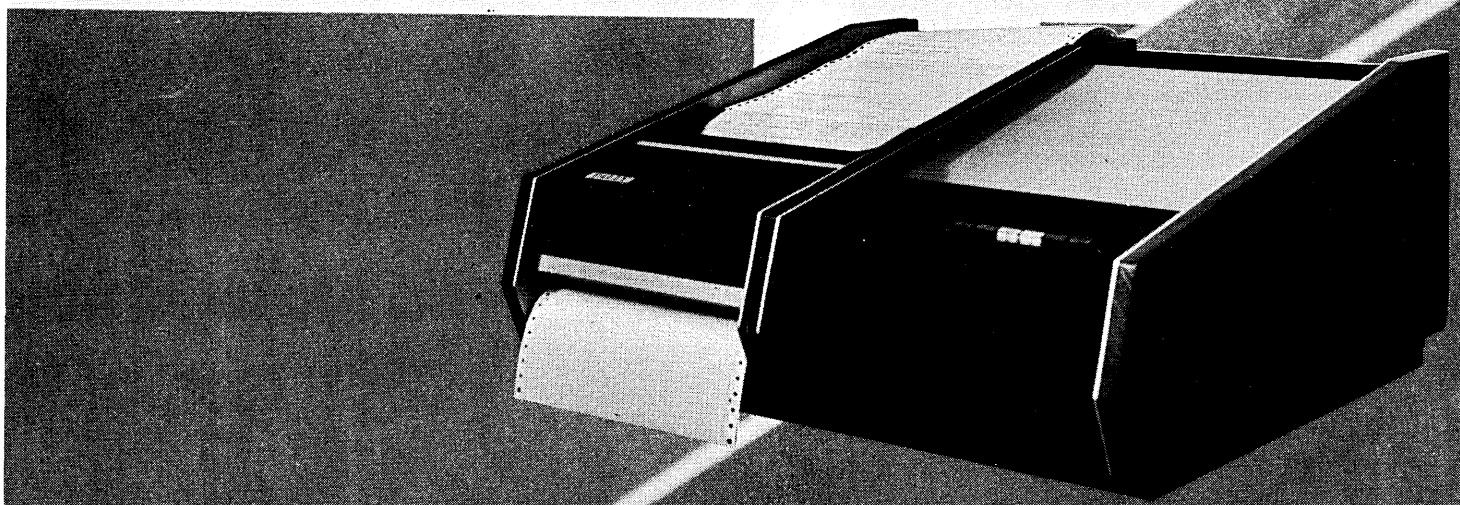

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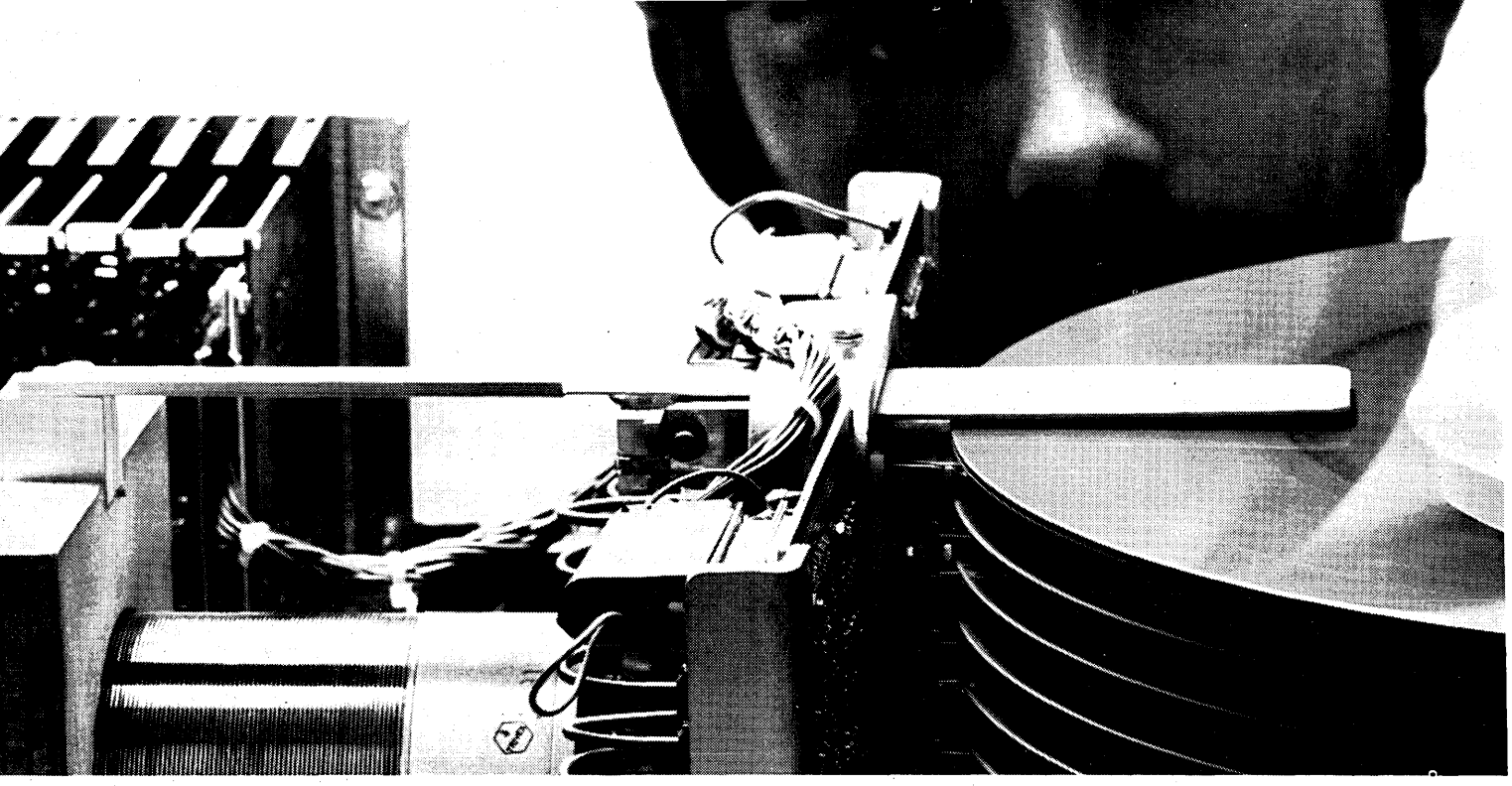

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Now look at the leases.

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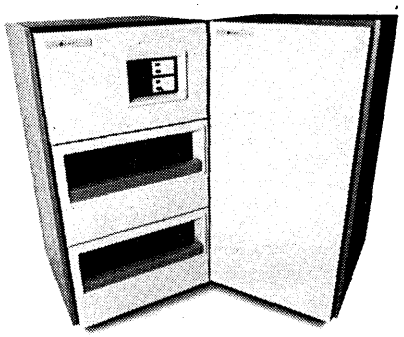

CALCOMP

DATAMATION®

NOVEMBER 1, 1971

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SOL SHERR. This first annual conference, held in Mexico City, was reported to be highly successful in all respects – from hotel accommodations to technical reports.

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MICHAEL W. CASHMAN. The world doesn't have to wait much longer for a computer expressly designed for hands-on microprogramming and two-level emulation. A look at the QM-1.

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What happened at RCA Computer Systems? One way to view it might be from the perspective of 29 years into the future. And it is from the year 2000 that Angeline Pantages views the circumstances of the sudden announcement of Dark Friday, Sept. 17, 1971, that signaled RCA's departure from the general-purpose computer business.

71 The Forum: Why MAC, MIS and ABM Won't Fly

H. R. J. GROSCH. There is a spectrum of computer applications, and the ABM is at the won't-ever-work end.

About the Cover

Both buyer and seller have a stake in finding their way through the contract maze. Some straightforward suggestions for avoiding wrong turns are offered herein. Design is by our art director.

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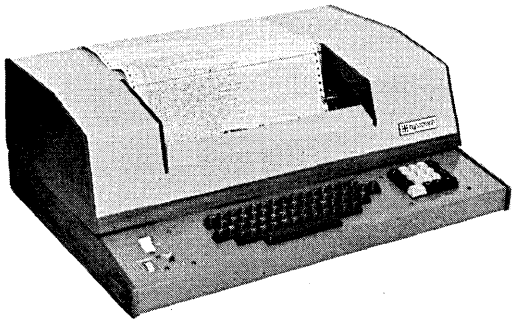

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CIRCLE 53 ON READER CARD

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NOVEMBER 1, 1971

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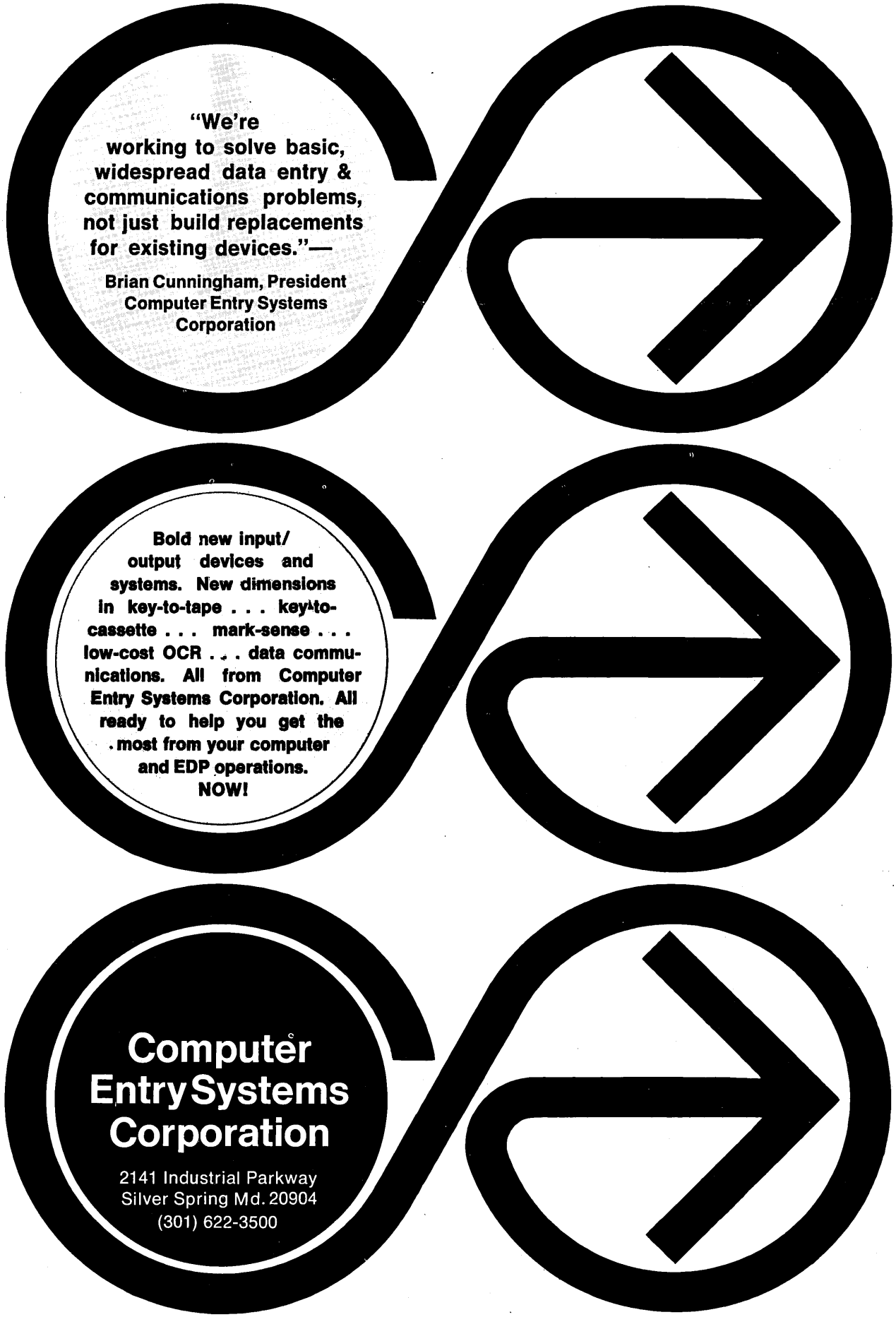

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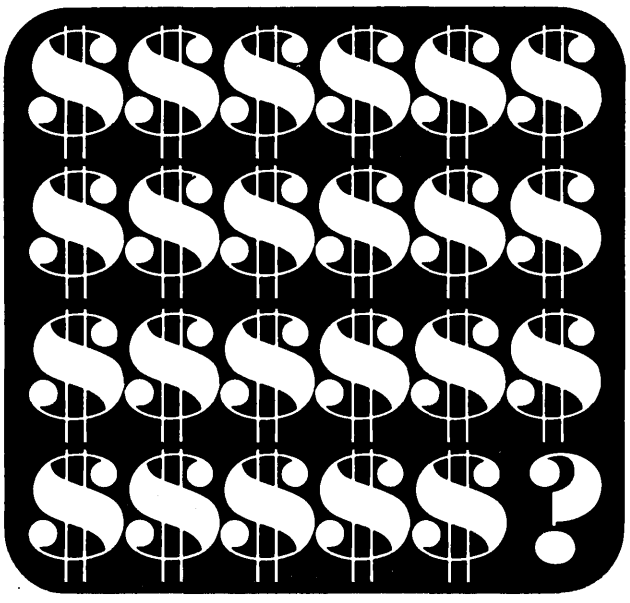
For more information, ask your Burroughs representative for a copy of our EDP-TABS brochure. Or write to us in Detroit, 48232.



Burroughs B

LOOK AHEAD

WILL IBM MARKETING GET REALLY ROUGH? MAYBE...

How unbridled can IBM's marketing aggression become? That depends on how well IBM's sales force has done in the waning months of '71, according to good sources. They're saying the giant couldn't stand many months like August, when it had a negative net sales revenue of 4,000,000 points. This loss relates to sales performance, not installed base revenues, so it doesn't immediately impact income and could, of course, have been made up since then. It means, logically, that in August IBM had a combination of order cancellations and net revenue losses on orders booked (i.e., taking out more equipment than would be installed) that exceeded "positive" by $4,000,000.

IBM, says a critic, has been selling the "microseconds" of the 370 and generalized packages--none of which excites today's user, "who wants to know how much money he can make or save with what you're selling him." IBM may ultimately have to make "gamblers deals" to that effect to get the customer to move, unless there's an improvement in the economic picture. Antitrust implications? "Hell, when you are trying to get the initial big machine rolling again, you don't pay any attention to them," the critic adds.

...BUT MEMORY FIRMS THINK IT WON'T--YET

Independent manufacturers of add-on 360 core memories think RCA's demise will slow down IBM's planned crackdown on them. They reason that IBM might hold back for a while on any sharp price cuts that could knock any independents out of business until the antitrust heat generated by the RCA debacle is off. Nevertheless, the independent core memory companies do expect IBM to lower the boom on them sooner or later. Just about everyone else is getting socked by IBM, they say, so why shouldn't they?

COURT ORDER QUESTIONS 2,700 COMPUTER COMPANIES

"4. List and identify each product which you offer or have offered for sale or lease" and for each give specifications, functions, revenue, and quantity by calendar year...and on and on it goes. By Oct. 20, 2,700 firms were to have answered this and nine other questions like it in a deposition sent by order of the Third U.S. District Court of Minnesota. The deposition was taken in behalf of the antitrust cases by Control Data and Greyhound Computer against IBM. It was composed by IBM and Greyhound. It was objected to by CDC and at least a few of the 2,700 firms that didn't relish the days it would take to lay bare their corporate souls, which they didn't want to do in the first place. Control Data went on record opposing the depositions, since it feels IBM's and other available records will show what IBM's market share is. A sample list of the firms also gives further clues to CDC's objections: It includes many kinds of companies with which IBM competes only marginally, and could distort the picture.

If the data is expertly handled and collated, however some think that it may not only resolve legal

questions, but also provide an invaluable service to this information-poor industry. John French, of IBM counsel Faegre and Benson, says the depositions will receive complete protective order of the court. He also noted that the order will be enforced; those not answering will be required to appear for an oral examination.

OMBUDSMEN SEEK PROBLEMS FOR THEIR SOLUTIONS

ACM claims its ombudsman program is a roaring success. Twenty-four of the 84 chapters have ombudsmen who will be available to help mediate the public's computer pique. But, if experiences in western cities are typical, the program faces much skepticism and indifference by its supposed beneficiaries. In San Diego, the district attorney won't return calls from ACM ombudsman David Bulman, and the head of the Better Business Bureau wouldn't see him until collared by chance one weekend when Bulman was house hunting and the BBB man's house was for sale. "He's still checking me out," says Bulman.

In Los Angeles, when ombudsman Dahl Gerberick called the BBB, he found its Virginia Lovett was so savvy in computers, the only thing he could think of asking her was to address the next meeting of the L.A. ACM chapter in November. She will. Gerberick offered help to others: The Pasadena Star News curtly replied they weren't hiring reporters; the ACLU said it doesn't get computer problems; the Legal Aid Society said the people it contacts can't afford charge accounts; and the Los Angeles Chamber of Commerce manager said the name ombudsman was "too aggressive" and suggested Gerberick "go talk with your lawyer."

Various action line projects show some interest, however. A station is talking with Gerberick in Los Angeles; and the Phoenix ombudsman, Oris Friesen, got his first assignment from the Phoenix Gazette's "answer line man." In San Diego, Bulman has high hopes of generating interest from the Evening Tribune action line reporter, "if only they'd stop forcing me to leave recorded messages which he never answers."

PAPERLESS BANKING TESTS NOW UNDER WAY

Paperless banking has arrived in California, where tests started last month on a system developed by Touche Ross & Co. for a group of banks and clearing houses called the Special Committee on Paperless Entries (Scope). The committee meets Nov. 29 to review these tests of the system to automate check clearing, which is to be implemented on a pilot basis Jan. 12 by the Federal Reserve Bank of San Francisco and the Automated Clearing House Associations of San Francisco and Los Angeles.

RUMORS AND RAW RANDOM DATA

Digital Equipment's DECwriter, a low-cost printer introduced a year ago, has not been a big success, and the firm is evaluating independently made printers... Secretive Dirks Electronics may soon be ready to unveil its Datastreamer computer--a radical departure in computer architecture--now that Hale Brothers venture capital firm has committed some funds.

Thrifty...not cheap

There's real thrift in using Ampex peripherals with your 360 or 370 computer. Ampex provides identical or better performance for less money with mainframe memory, disk drives, tape drives, and performance-enhancing extended memories.

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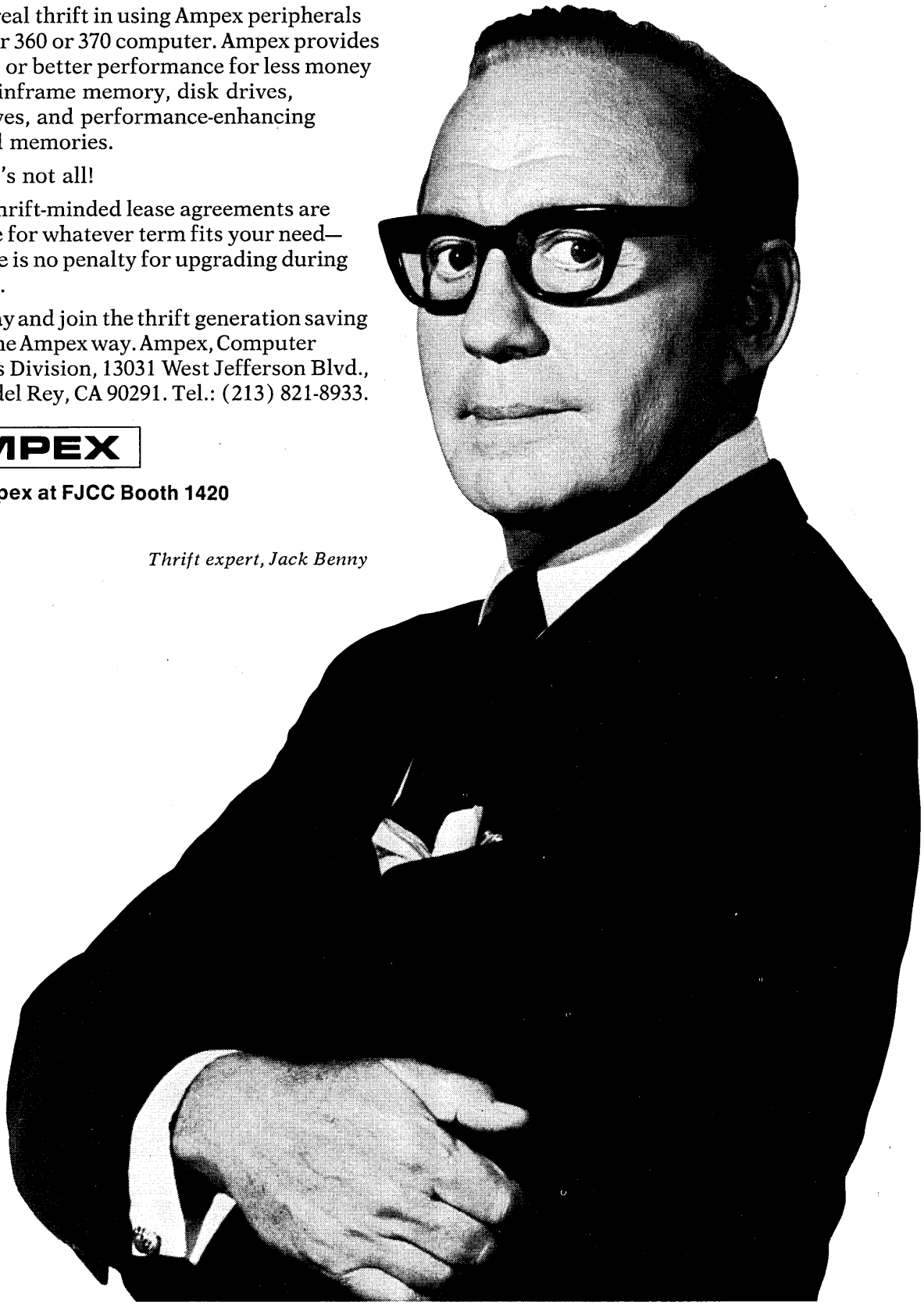
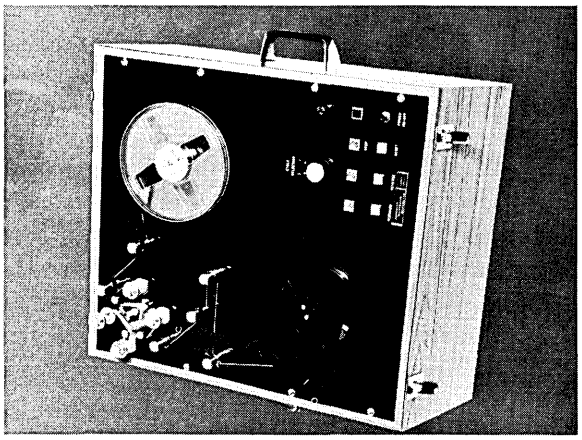


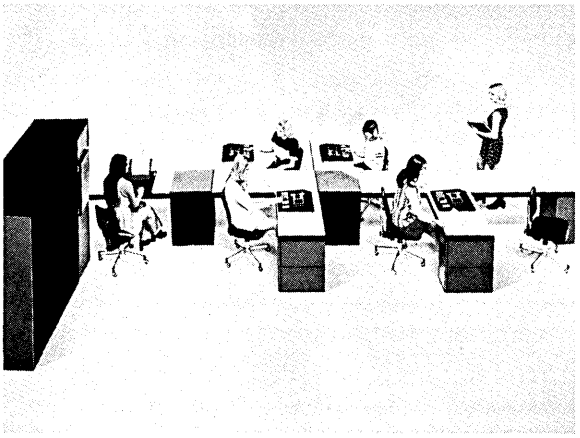
Thrift expert, Jack Benny

CANADA DATA:

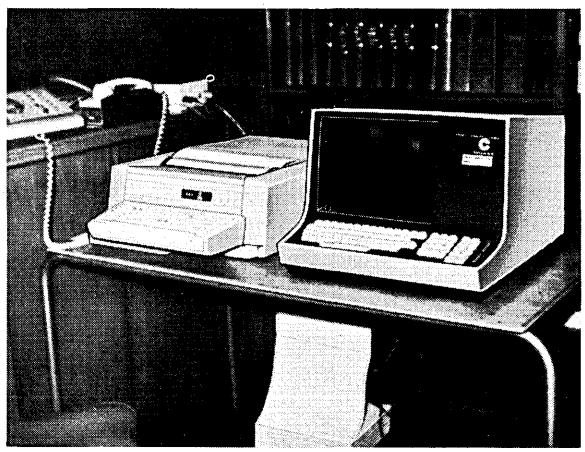
From the very beginning, Canadian companies welcomed the computer, and immediately set to work adding to its capabilities, refining its performance, and extending its benefits for shared use in business. Now see these new systems developed by Canada's sophisticated computer design industry at the Fall Joint Computer Conference in Las Vegas Nov. 16-18. If it's not possible to attend the Conference, mail in the coupon and we'll send you free information.



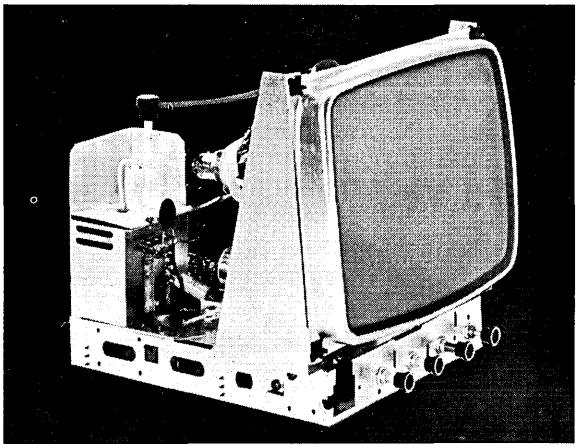
Ground tungsten carbide blades and silicon-impregnated tissues make the Magnetek 1 magnetic type cleaner from Advanced Transducer Systems Ltd., Rexdale, Ontario, 99 per cent effective in eliminating errors due to particle accumulation. Dry cleaning, a feature of all Advanced Transducer tape cleaners, extends tape life, reduces static buildup and assures tape purity.



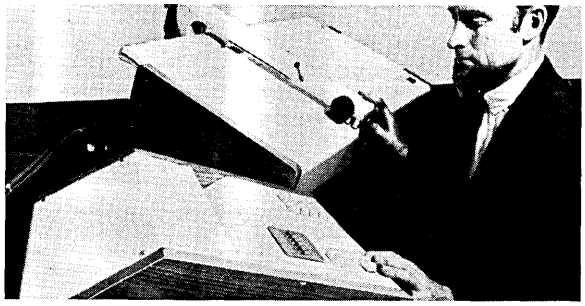
Consolidated Computer Limited, Toronto, Ontario, now has a whole family of those "incredible reducing machines"—the Key-Edit multiple station keyboard-to-tape data preparation systems that replace keypunch or single station key-to-tape devices. Newest additions are the Key-Edit 100/85 and 100/145 for greater input efficiency.



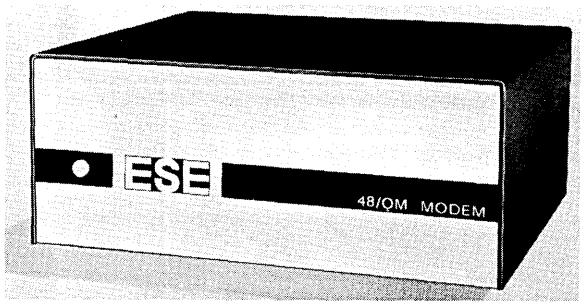
The newly developed information retrieval system from Education Research Foundation of Middlesex, London, Ontario, updates, consolidates and retrieves computer-stored data quickly and efficiently no matter what the data base. This non-profit company specializes in computer applications for schools and industry.



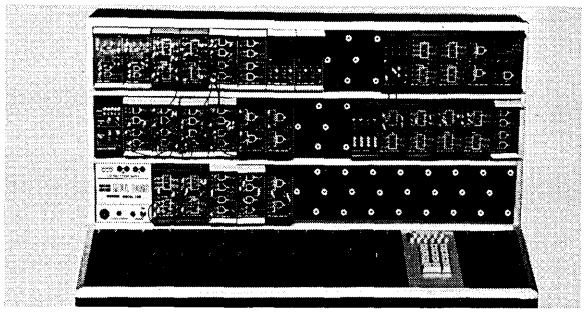
From Electrohome Limited, Kitchener, Ontario, audio-visual equipment specialist since 1907, comes this trimly styled video monitor chassis. Available with a nine, 11 or 14-inch screen, it means greater convenience and flexibility in data display terminal systems.



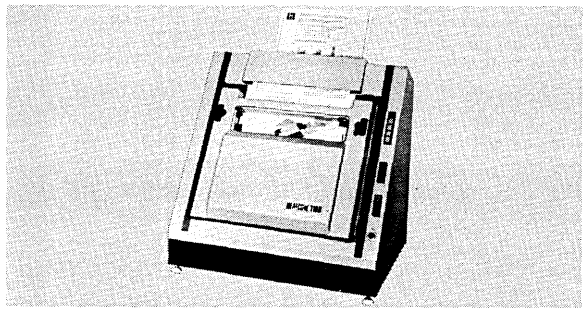
Many companies are looking to Electronetic Systems Limited, Downsview, Ontario, for the equipment they know will make their job easier—like this Model 11 Digitizer which collects graphic information and converts it directly to computer-compatible input. The Model 11 is fast, simple to operate and inexpensive, yet accurate to .01 inches.



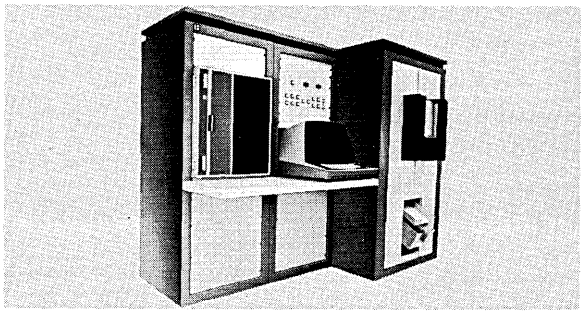
Latest innovation from ESE Limited, Rexdale, Ontario, is the 48/QM Modem which can signal at 98 per cent of the theoretical limit. ESE's experienced engineers have used specially designed filters which permit data transmission of 4800 bps in a channel bandwidth of only 1200 Hz over typical C2 conditioned lines without auxiliary equalization.



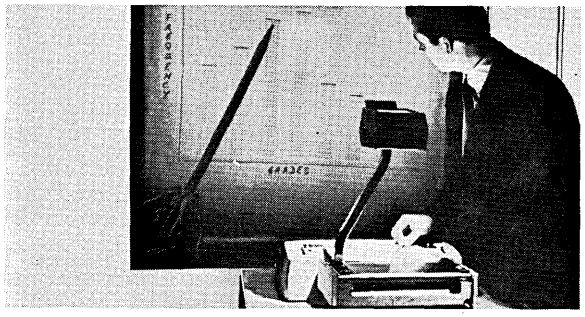
When Garrett Manufacturing Limited, Rexdale, Ontario, couldn't find a flexible, up-to-date lab trainer, the company decided to design one. The result was this MDL 1000 multi-purpose modular digital lab for demonstrating digital technology and bread-boarding complete digital systems. Teamed with Garrett's micro-computer, it is also an economical process control computer system.



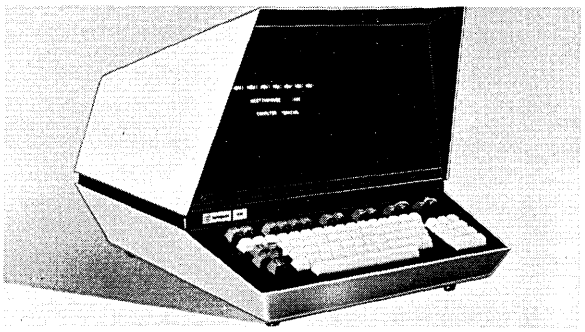
A policy of continual product improvement means top performance from the high-speed Model 1100 Alphagraphic printer designed and manufactured by Leigh Instruments Limited, Ottawa, Ontario. Easily maintained, the Alphagraphic handles data in standard 64-character ASC11 format in both alphanumeric and graphic modes.



Computers need data to do their job—lots of it, and accurate. A new kind of optical character recognition page input system from Litton Systems (Canada) Limited, Rexdale, Ontario, makes sure they get it. Designed to accommodate a wide variety of data processing systems, it eliminates keypunching and has built-in character correction facilities.



APL 360, the computer language for interactive systems designed by I. P. Sharp Associates Limited, Toronto, Ontario, is displayed here on the 2510T Teleprinter Projector which projects an image up to 144 sq. ft. I. P. Sharp Associates specializes in integrating hardware and software for total computer systems.



"Where today meets tomorrow" is the slogan of Westinghouse Canada Limited, Hamilton, Ontario, where innovation has been a company byword for 75 years. Newest product is the company's self-contained interactive 1600 CRT Terminal. Handsomely styled, it accommodates data synchronously or asynchronously at up to 9600 baud and displays up to 1600 characters.

Department of Industry Trade & Commerce, Ottawa, Canada.

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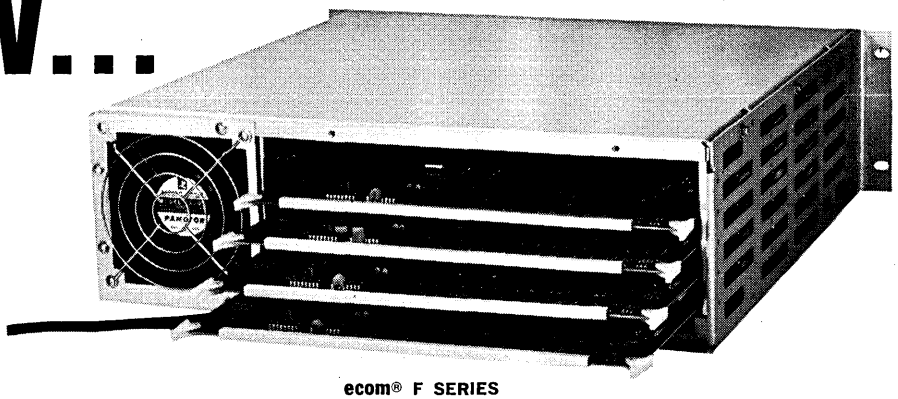

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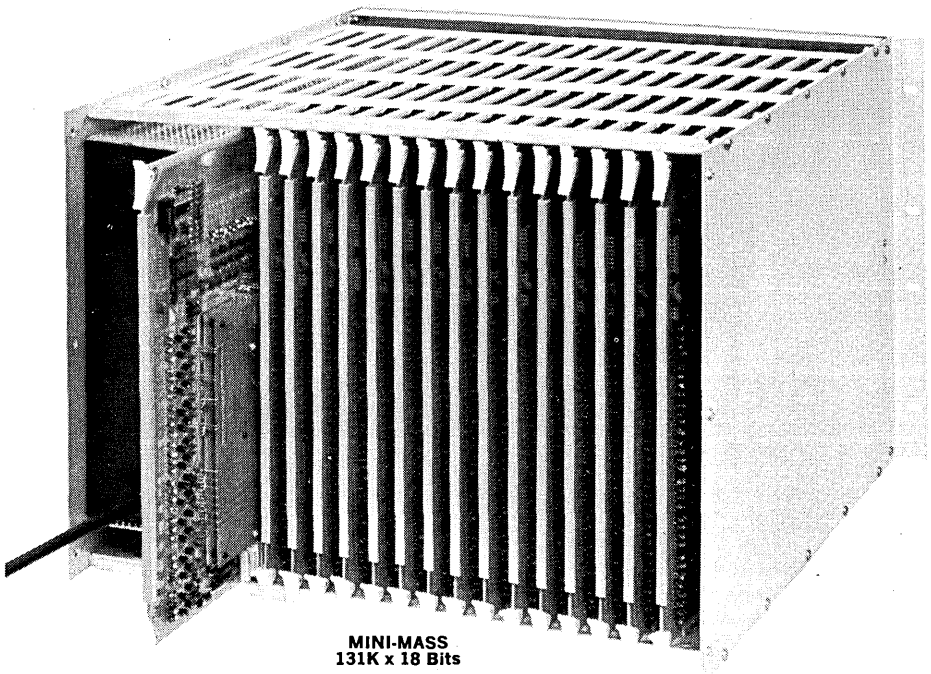

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CIRCLE 39 ON READER CARD

CALENDAR

DATE	EVENT/SPONSOR	LOCATION	CONTACT	COST
Nov. 1-2	1971 Transportation Data Coordinating Committee National Forum	Washington, DC	TDCC, Suite 309 1101 17th St., NW Washington, DC 20036	$60 $35, one day
Nov. 7-11	American Society for Information Science 34th Annual Meeting	Denver	ASIS 1140 Conn. Ave. NW, 804 Washington, DC 20036	$45, members $60, others $3, students
Nov. 10-12	19th Annual Public Utility Information Systems Conference	San Francisco	A. L. Peterson Edison Electric Institute 90 Park Ave. New York, NY 10016	$25-35
Nov. 12-13	Assn. of Computer Programmers and Analysts First National Conference	Gaithersburg, MD	ACPA Nat'l. Conf. 1971 P. O. Box 1752 Rockville, MD 20850	$30, members $45, others
Nov. 16-18	Fall Joint Computer Conference	Las Vegas	AFIPS 210 Summit Ave. Montvale, NJ 07645	$30, members $60, others $5, students
Dec. 5-8	International Business Forms Industries 4th International Forum	Hollywood Beach, Fla.	Program Director Graphic Comm. Center 1730 N. Lynn St. Arlington, VA 22209	$195
Jan. 6-7	ACM 4th Annual Microprogramming Workshop	Las Cruces, NM	J. Mack Adams Computer Science Dept. New Mexico St. Univ. Las Cruces, NM 88001	$70, members $80, others $50, students

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LETTERS

Microfilm ruled out

Sir:
After reading your Sept. 15 issue, I felt compelled to point out some of the problems that will be encountered if one follows the direction of Mr. Menkus ("Retention of Data . . . for the Long Term," p. 30).

On Sept. 9, I attended a seminar at the (Univ. of Illinois) Chicago Circle Campus, where the District Director defined the Internal Revenue Dept.'s position with respect to the new Revenue Rule 71-20. He made a statement to the effect that microfilm was not a valid retention media for tax purposes. He did state that IRS was currently reviewing the microfilm media, and may possibly in the future acknowledge this media as a valid form of data storage.

In Mr. Menkus' article he described the economics and justification for converting magnetic tape data to microfilm images. While this may be fine for those records that are strictly for internal use, it does not satisfy the Internal Revenue Dept.'s current requirements.

WILLIAM J. MULLIGAN
Chicago, Illinois

Irrelevant remarks

Sir:
As self-appointed "keeper of the archives" for DCA, I cannot help but take umbrage at the scurrilous attack on the DCA in your 1971-9-1* issue (p. 30).

So that your readers may judge for themselves the accuracy of the reporting in the article, let me point out a few of the errors therein. At the time of the first meeting, Bob Bosak was with Lockheed Aircraft Corp., not North American Aviation; the correct name of the hit of the show was Martin (not Morris) Needleman (he was playing the role of Morris Karnofsky, the world's oldest programmer); the correct form is Ms. Toni Schuman; and Bob Patrick didn't "announce" that Bob Berman was to be next year's chairman, but only nominated him—Berman was subsequently elected by acclamation.

The subtitle to your article contains the cruelest blow (as Forest says, "sometimes a magazine blows") of all when it advertises, "The DCA: its birth, life, and continuing demise." In some sense, death begins immediately after birth, but it is a false insinuation to imply that DCA is going downhill. (I'm sure that that cruel subtitle must have been the invention of one of DATAMATION's hateful editors—Dahl would never have done that.) DCA is not only in the black, but this year will show a net profit of 10% of sales. What other computer professional society (or magazine!) can make that statement? And its current ratio is infinite!

Since the article claims to cover the "life" of DCA, I feel that I must point out the significant role DCA played in the history of the computer field—i.e., DCA begat PACT** and PACT begat SHARE; and thus was born the computer user group movement. And DCA really was all R. Blair Smith's idea.

NAME WITHHELD

*Note that DCA has, by a vote of 1-0 of its Committee on Standards, decided to go along with the ANSI standard for expressing dates.

**What's PACT? Ask your friendly HAL salesman, or see JACM, October 1965.

IBM unmarketing strategy

Sir:
Barnet Wolff (Letters, Sept. 1, p. 13) is incorrect; OS/360 ISAM was not written by IBM trainees fresh out of school.

The original code was written in early 1965 by eight professional, experienced programmers (Gail Gleasner, Mike Rogers, Bob Sackaroff, Harriet Scholder, Vivian Small, myself, Bruce Wiley, and Bill Woolf) employed by then-prospering Computer Applications, Inc. Others with similar experience joined the yearlong, prematurely ended debugging task. In its late stages, the project was managed by DATAMATION's contributing editor, Phil Dorn.

Our project team was constantly aware that computer time and computer space—and development costs—exceeded expectations. We attributed this to the trade-offs required to keep ISAM generalized. At the time, we and our peers considered the coding rather efficient under the circumstances.

In fact, the project team proposed several significantly faster, smaller variations, with earlier availability. For example, BISAM's add-to-end function requires not only its own modules, but considerable in-line code. We proposed removing the code without impairing the function. (The user, if necessary, would create a data set with a false high-value-key record.) We also proposed that much in-line code could be eliminated from BISAM if the user always (instead of optionally) kept track indexes on separate DASD tracks from data records.

IBM rejected these and other proposals as feasible but unmarketable.

STEPHEN WERDENSCHLAG
Livingston, New Jersey

ANSI for standards

Sir:
We at Dartmouth find ourselves in substantial agreement with the article "The Case Against BASIC," by Jerry L. Ogdin (Sept. 1, pp. 34-41). In fact, we might have written the article ourselves, though if we had, we would have entitled it "The Case For a BASIC Standard."

It is not our intention here to discuss in detail the points raised by Mr. Ogdin. Rather, we wish to point out to your readers two actions which respond directly to his suggestions, although they were initiated long before the article appeared.

Work to establish a BASIC standard is currently being initiated under the auspices of ANSI/X3/SPARC. The effort is still at the stage of preparing a recommendation to SPARC that it establish a working committee to produce a BASIC standard. Substantive work on the standard itself could begin this winter, if the recommendation is approved.

At Dartmouth we have long recognized many of the problems raised by Mr. Ogdin. There have in fact been several versions of Dartmouth BASIC since the one to which he refers. The latest version was designed and implemented this past year. Documentation of this version of BASIC is available in two forms: The first is a user's manual, *The BASIC Manual,* Sixth Edition, 1971, University Press of New England, Hanover, N.H. 03755, $3.75 per copy; the second is a technical description of the syntax and semantics of Dartmouth

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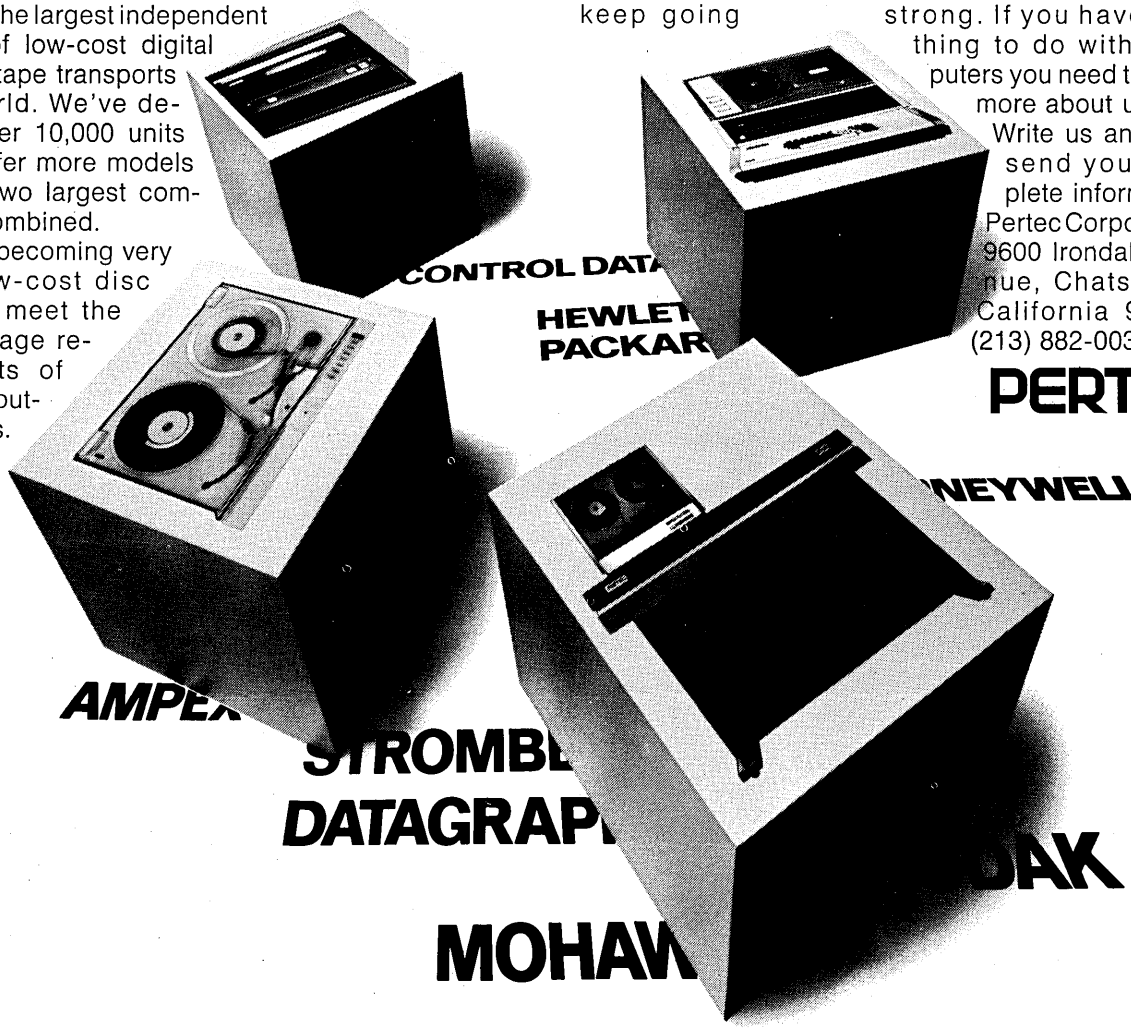


BASIC which includes a discussion of the reasons for the choices that were made in the design of the language and is available as Technical Memorandum TM028 from the Kiewit Computation Center, Dartmouth College, Hanover, N.H. 03755, $1 postpaid.
STEPHEN J. GARLAND
Hanover, New Hampshire

Galloping indifference

Sir:
I would like to suggest one of the reasons for the deterioration of BASIC. About two years ago when I was writing a BASIC-like compiler I wrote one of the originators of the language suggesting that a committee on standards be formed, preferably under the auspices of the ACM, for it was evident then that the language was galloping off in all directions. He never answered the letter.
ROLAND L. PORTER
Los Angeles, California

Tote toting

Sir:
A letter from Burt H. Liebowitz appearing in your Sept. 15 issue (p. 12) implies that the first application of electronic computers to the horse racing industry occurred in the 1960s. Actually, the first application was made in 1956; a modified Burroughs E101 computer was interfaced with the American Totalisator equipment to calculate win, place, and show payoffs. Only one such machine was modified; it was transported from track to track and operated on a trial basis for many years, extending, I believe, well into the sixties. I can speak with some authority on the subject, since I designed the special interface system before I left the E101 project in the fall of 1956.
DONALD T. BEST
Blue Bell, Pennsylvania

Basic ecology

Sir:
Being an advocate of using BASIC in education, I was very interested in Mr. Ogdin's article. I agree that the lack of uniformity in BASIC is a source of difficulty. It causes problems in transferring programs and programming techniques from one system to another. However, I do not believe that the existence of these problems constitutes a "case against BASIC." Rather, it is an indictment of those individuals and companies who have exploited BASIC for their own gain. I agree with all of Mr. Ogdin's proposals to insure that this will not happen again.

I disagree with Mr. Ogdin's conclusion that "BASIC has effectively been killed as an industry-wide language because no two compilers have even a semblance of comparability." I feel confident that in time a single uniform version of BASIC will evolve. An ad hoc study group within the American National Standards Institute's X.3 Committee has recently been formed to consider establishing a standard for BASIC.

In the meantime, there is enough similarity in the essential elements of all BASIC compilers for it to serve the purposes for which it was originally intended—introducing students and professionals to the computer, teaching them its "logic," and allowing them to write disposable programs without the necessity of extensive training or the help of professional programmers.
WAYNE J. MORSE
Urbana, Illinois

Reeves bombs out

Sir:
I am referring to Mr. Raymond J. D. Reeves' article in The Forum in the Sept. 15 issue (p. 71). I am pleased to see an APL function published in DATAMATION.

In reply to the only concise portion of the article, namely the BOMB function, I would like to suggest the following:

```
∇R←BOMBBLAST X;A;B
[1]
  R←(pX)pA\÷(A←B≠0)/B←,X
∇
```

This function constructs a vector of the non-character input, selects and reciprocates the non-zero elements, replaces the zeroes by the expansion operator, and restructures the result to the original dimension.
SAM W. REYNOLDS
Vestal, New York

Loop do loop

Sir:
In the generally fine article by Mr. Chris Larson on "The Efficient Use of FORTRAN" (Aug. 1, pp. 24-31) there exists one glaring example of inefficient FORTRAN coding. Consider the example (with CONTINUES added) used to illustrate the advantage of single dimensioned arrays equivalenced to multidimensional arrays for initialization purposes:

```
DO 35 I = 1,10          Loop initialization occurs    1 time
DO 25 J = 1,20          Loop initialization occurs   10 times
DO 25 K = 1,8           Loop initialization occurs  200 times
X(I,J,K) = 0.0          "Useful" statement occurs  1600 times
15 CONTINUE                   Loop closing occurs  1600 times
25 CONTINUE                   Loop closing occurs   200 times
35 CONTINUE                   Loop closing occurs    10 times
```

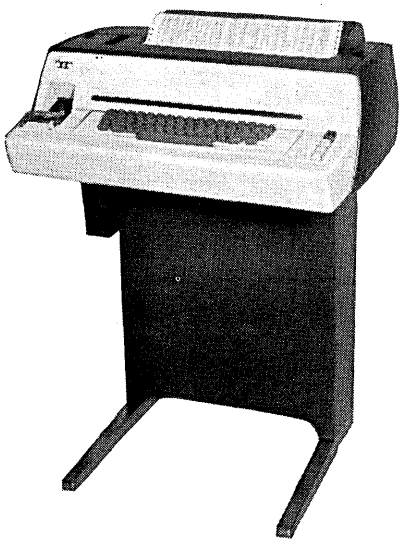
With the simple expedient of rearranging the loop structure so that they occur with increasing range, significant savings in execution time are possible, as follows:

```
DO 35 K = 1,8           Loop initialization occurs    1 time
DO 25 I = 1,10          Loop initialization occurs    8 times
DO 15 J = 1,20          Loop initialization occurs   80 times
X(I,J,K) = 0.0          "Useful" statement occurs  1600 times
15 CONTINUE                   Loop closing occurs  1600 times
25 CONTINUE                   Loop closing occurs    80 times
35 CONTINUE                   Loop closing occurs     8 times
```

The above is merely an extreme illustration of a general rule to be followed with nested DO loops—the nesting should occur with increasing range of the DO index.
ROBERT F. TEITEL
Washington, D.C. ■

Right! It's a new low-cost, wide-platen data terminal

It's the Teletype® model 38. And its capabilities go far beyond the wide format aspect of operation.



The new model 38 line design incorporates many of the things that made the Teletype model 33 so popular: It's a modular line. Exceptionally reliable. Extremely economical; costs very little for all of its capabilities. It's really a logical extension of the model 33 design concept and is system compatible with it.

. . . the important differences

```
1         2         3         4         5         6         7         8         9         10        11        12        13
1234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890123456789012345678901234567890123

      model 38 prints a 132 character line

                                    Generates all 128 ASCII code combinations

                                                                  Prints in two colors if desired

      PRINTS IN UPPER and lower case

                              Accepts standard 14-7/8" fan-fold computer stock

                                                                  Offers a variety of interface options

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                                                          On a price performance basis you won't find a better buy!
```

The model 38 prints 132 characters per line at 10 characters per inch. This wide format enables you to send and receive data using the same fan-fold computer paper stock used in your computer room. So you can move the data generated by your computer to any number of remote locations across the nation without time-consuming reformatting problems.

The model 38 generates *all 128 ASCII code combinations.* You can print the full complement of 94 standard graphics, including upper and lower case alphabet characters. And it provides all the functional control necessary for easier operation.

If you would like to input computer data in red and receive output data in black, or vice versa, the Teletype 38 terminal has this capability, too.

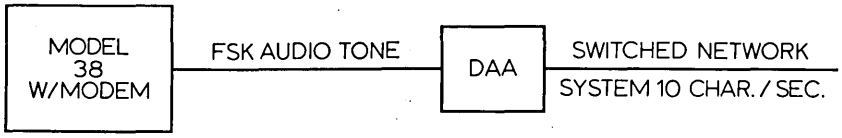
As you can see, the 38's format flexibility makes it easier to get your data in and out of the computer. And it broadens your on-line capabilities as well.

. . . the line is complete

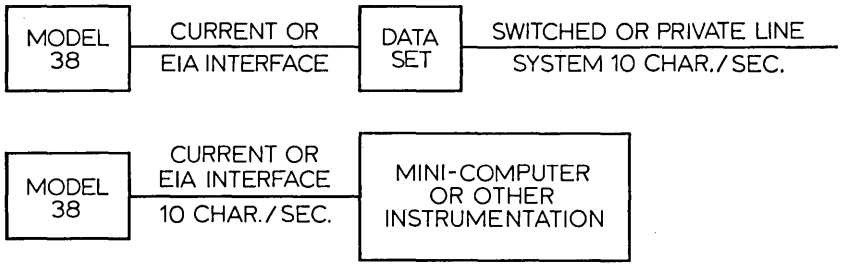
The Teletype 38 terminal is available in receive-only, keyboard send-receive and automatic send-receive configurations. Which means all of the reports, forms, and tabular material you generate can be moved *instantly* to all office, plant, warehouse, and sales locations that need the data using a terminal that best fits system requirements. Saving valuable time, and providing more efficient and profitable operation.

. . . plug to plug compatibility

The model 38 is available with several interface options, operating at 10 characters per second (110 baud).

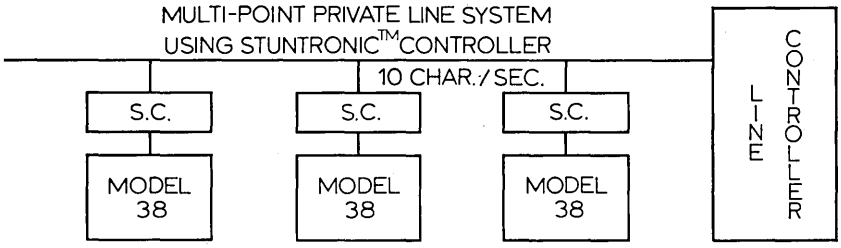


The terminal can be equipped with a built-in modem with simple two-wire, audio tone output which connects directly to the data access arrangement.



A second interface option is really two options in one. The set is equipped with both a voltage interface that conforms with EIA Standard RS-232-C *and* a current interface of 20 or 60 ma.

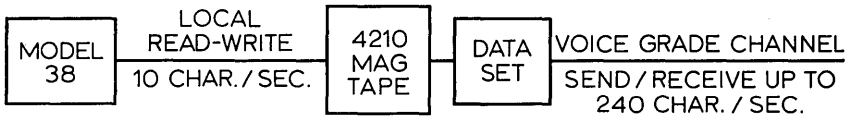
This means you can readily fit the model 38 into just about any switched network, private line or time-sharing system going without special "black box" engineering. Or use it to add maximum input/output capabilities to your minicomputer at a realistic price.



You can even use the model 38 in multi-point "selective calling" systems by adding a Teletype Stuntronic™ station controller.

. . . automatic send-receive operation up to 2400 words per minute

For systems requiring higher speed capabilities, the model 38 can be used with the Teletype 4210 magnetic tape data terminal. This combination provides on-line speeds up to 240 characters per second. The 4210 uses compact 3″ x 3″ x 1″ magnetic tape cartridges that hold up to 150,000 characters of data. Tape recording, editing, and correction functions are extremely simple.



If you are generating heavy-data loads in a teleprocessing or remote batch processing system, the on-line time saving aspects of this terminal combination are exceptionally dramatic. It is also possible to send or receive data on-line with the model 38 at 100 wpm using the optional built-in modem, if required.

So take a close look at this new wide-platen terminal offering. If you would like more information on the model 38, or any other part of the total line of Teletype data communications equipment, write: Teletype Corporation, 5555 Touhy Ave., Dept. 81-29, Skokie, Illinois 60076.

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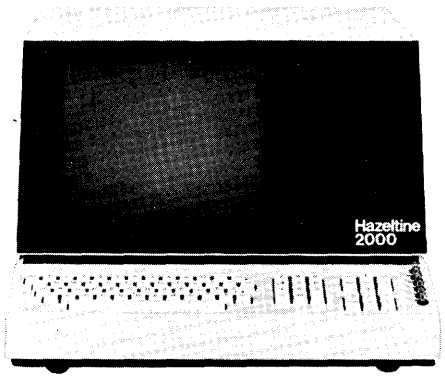

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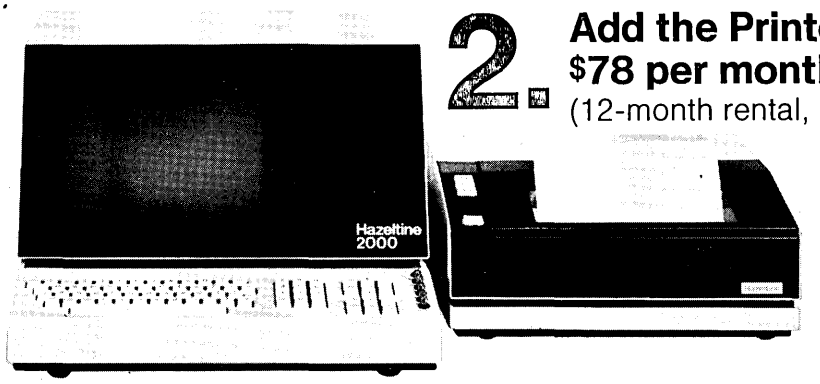

2. Add the Printer Unit for silent hard copy. $78 per month

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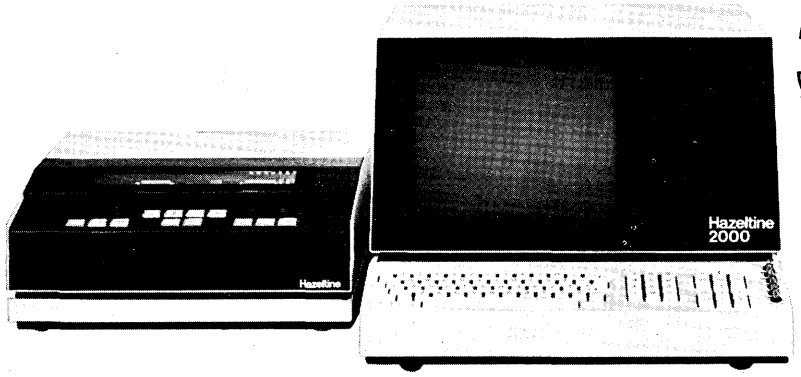
Provides users of the Hazeltine 2000 with a choice of modes —Conversational or Page (regardless of whether or not the terminal is on-line to a computer or communications system). Operating mode may be switch-selectable by the operator, or selected by the CPU under program control.

Conversational Mode—All data exchanged between terminal and computer is printed, the Printer Unit automatically assuming the baud rate of the terminal-computer system, at 10; 15; or 30 characters per second.

Page Mode—Prints only on command from the operator or CPU when meaningful data is on the screen. Using the powerful buffering capabilities of the Hazeltine 2000, printing occurs directly from the terminal's 2000-character core memory, permitting the screen to be filled, edited and then printed at 30 cps, regardless of the baud rate set for the terminal-computer network.



3. Or add the powerful, high-speed "dual" Tape Cassette Unit. $79 per month

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Use the Terminal/Tape Cassette System for on/off line data storage and retrieval, under operator control and/or CPU control, on RS-232B connections or hardwired to modem adapters of communications controllers and mini-computers. Operates in two basic modes.

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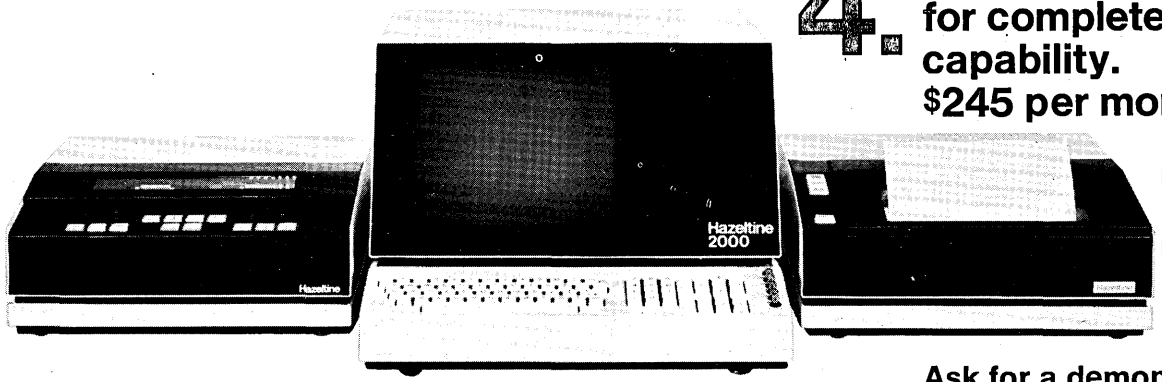
Page Mode—Pages (screensful) of data are recorded by the operator, who may edit before recording. Pages may be retrieved by the operator for review or transmission to the CPU. Additionally, either cassette may be selected, by CPU under program control, for recording or playback through the terminal.



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The computer industry's traditions of oversell and underachievement may be forcing a new realization of the importance of contract language

The Computer and

Attention has been drawn in recent months to a number of lawsuits brought against established members of the industry. Some observers view such lawsuits as heralding a new era in the computer business, an era in which users and buyers of computer equipment and services are less inclined to accept the self-serving declarations of the seller in defense of its nonperformance and more inclined to demand strict compliance with the letter of the contract. Others adopt a more conservative view, admitting to changes in attitude of the user, but dismissing the suggestion that such changes will measurably affect the course of dealing between seller and user.

Unfortunately, the government's understanding of what this language meant was not the same as GE's understanding.

All are in agreement, however, that we are seeing the close of at least one chapter in the history of the business. Users are no longer willing to submit to the failures and nonperformance of the manufacturer without complaint. Increasingly, the complaint will take the form of a demand either for an adjustment in price or for the supplying of additional services. At the least there is an increased awareness of the role the contract plays in the computer transaction.

Historically, computer manufacturers have succeeded in getting the user to accept its (the manufacturer's) terms and conditions. This practice will no doubt continue. In the future, however, one can expect less immediate acceptance and more negotiation of such terms and conditions. In this regard, the advice of at least one expert in the field is to secure the services of a qualified attorney at the earliest stage of the transaction. (See "Contract Caveats," by Robert P. Bigelow, DATAMATION, Sept. 15, 1970.)

Even without the aid of legal counsel, however, much can be done in the way of improving the standard of contracting found today in the industry. I have found one technique particularly valuable: During the course of drafting and negotiating a contract, consciously ask the traditional newspaper reporter's questions—Who, What, When, Where, Why, and How—to test the sufficiency and precision of the contract. The appropriateness of this newspaper technique to the drafting of contracts can be appreciated when you consider that a contract is a form of communication.

Two important characteristics distinguish the contract from other forms of communication, however. First, what is being communicated is the subjective intent or understanding of the parties, one to the other. Hopefully, the two understandings are consistent with each other and the parties have selected proper and apt language to reflect the understanding.

Secondly, unlike other forms of communication, a contract is potentially a legally enforceable expression of words backed by the enforcement power of the judicial system.

the Contract

by Robert B. Young

Given these distinguishing features, it is necessary for both parties to articulate their intent with as much precision and with as much completeness as they can muster. The technique offered by this writer (illustrated below) is simply one of a number of methods that can be used to achieve greater precision and completeness.

What. When General Electric Co. reintroduced its GE-600 system in early 1967, an agency of the United States government was among the first to place an order. The government agency ordered a GE-635 system and elected to rent it under the terms of the 200-hour use plan offered by GE in its Federal Supply Schedule price list. Both parties were in seeming agreement. The government wanted to buy and GE wanted to sell "operational use time" on a GE-635 system which was to be installed at the agency's headquarters. The parties stated as their understanding of operational use time as follows:

"Operational use time is the time during which the Central Processor is in actual operation and includes all intervals of time between the start and stop time of a program run. Operational use time excludes normal halts and machine halts."

Unfortunately, the government's understanding of what this language meant was not the same as GE's understanding. The difference came to issue over the meter that was installed on the system to measure "operational use time." The meter essentially was an elapsed-time indicator which monitored system power-on status. Because the GE-635 system is a large-scale multiprogramming, multiprocessing system, capable of performing remote batch, local batch, and time-sharing simultaneously, GE contended that the only meaningful measure of operational use time was system power-on time. Not so, answered the government. Their understanding was that they would only have to pay for the time that the system was in actual use and a program was being run. Furthermore, because the meter took into account all time from the moment the system was turned on until the time the system was turned off, the government contended that GE was in noncompliance with the following provisions of the GE Federal Supply Schedule:

The standard sale agreement of at least one manufacturer, Honeywell Information Systems Inc., excludes any specific mention of a delivery date.

"General Electric will install and maintain a time recording device at no additional charge which will be used to record Central Processor Use Time."

On its face, the terms and conditions were not entirely consistent. The government was supposedly buying operational use time, but the meter was metering "Central Processor Use Time." Imprecise language, although sometimes lost in the myriad and multitude of terms and conditions that escape a later interpretation, more often than not re-emerges to

become the subject of later contention. The example illustrates two pitfalls of contracting:

1. The parties failed to reach a meeting of the minds—*aggregatio mentium* if you are given to Latin expressions—on the "what" of the contract. What was it that GE wanted to sell, what was it that the government wanted to buy?

2. Whatever the parties thought themselves to be in agreement on, they failed to state it in precise and consistent terms. If an attempt had been made to achieve consistency, the issue might have been headed off before the fact, rather than after the fact.

As is the case in contract misunderstandings such as this, the issue was never resolved to everyone's satisfaction. The government eventually changed to the unlimited use plan offered by GE and meter readings were discontinued. Shortly thereafter, GE discontinued offering the 200-hour use plan on all new accounts, both government and nongovernment.

How. The "how" is inextricably tied to the "what." In the case of "operational use time" to be provided by GE on the GE-635 System, had the government asked GE how it intended to measure operational use time, the problem might have been avoided. By asking both the "what" and "how," a prospective buyer or user can develop greater specificity in the description of services or hardware to be provided. As a general rule, the more specific the contract is, the better off both parties are. The buyer has an easier time, in a lawsuit, showing that the terms of the contract were not met. The seller is better off in the reduced likelihood of a buyer expecting more from the seller than was intended.

From its earliest beginnings, the computer industry has been characterized by oversell. More often than not, such oversell was not so much a case of the seller deliberately misrepresenting his product, but rather a situation in which the zeal and hopes of marketing did not take into account the unresolved problems faced by engineering. By asking some of the questions underlying the "how," a prospective buyer or user can force the salesman or marketing representative to face up to some of the unresolved problems.

When. Traditionally, a contract for the sale or use of goods or services will include the magic words, "time is of the essence," if the parties intend to make time of performance provisions a vital part of the contract. Such a recital can be used in a subsequent lawsuit to support the allegation that the parties intended strict compliance with such matters as date of delivery or time of payment.

Computer contracts prepared by the computer manufacturers are often conspicuously devoid of such recitals. This is true even though, in many cases, timing is a matter of supreme importance. Indeed, the standard sale agreement of at least one manufacturer, Honeywell Information Systems Inc., excludes any specific mention of a delivery date. Instead, the agreement contains the following provision:

"Honeywell shall deliver the equipment, FOB point of shipment, in accordance with the delivery schedule which is mutually agreed to by Honeywell and the Buyer."

The Information Systems Equipment Div., General Electric Co., before its demise in 1970, was using a sale agreement which expressly stated a month and year of delivery, but which rendered the commitment a virtual nullity by the following clause:

"SELLER shall not be liable for delays in delivery or failure to manufacture or deliver (1) due to causes beyond its reasonable control, or (2) to Acts of God, acts of the BUYER, acts of civil or military authority, priorities, fires, strikes, floods, epidemics, war, riots, delays in transportation or car shortages, or (3) inability due to causes beyond its reasonable control to obtain necessary labor, materials or manufacturing facilities, or (4) delays in engineering or manufacturing occurring notwithstanding due diligence on the part of SELLER, nor for delays occurring by reason of changes, or unavailability of facilities, information, or material to be furnished by BUYER. In the event of any such delay, the date of delivery shall be extended for a period equal to the time lost by reason of the delay."

For the most part, asking "why" during the course of contract negotiations will have little effect upon the outcome of such negotiations.

In contrast, the federal government threatens the supplier with liquidated damages if the supplier fails to meet its promised delivery date. A typical government liquidated damages provision reads:

"If the supplier does not install all the equipment including the special features and accessories included in the same order with the equipment ready for use, before the installation date, the supplier shall pay to the Government, as fixed and agreed liquidated damages for each machine whether or not installed for each calendar day's delay beginning with the installation date, but not for more than 180 calendar days, $100, or 1/30 of the basic monthly rental charge shown in Price List for Section A, Item 132-1, whichever is greater."

Needless to say, the federal government has enjoyed a larger measure of success in compelling strict observance with delivery dates.

Who. The "who" is largely a determination which is made antecedent to the negotiation and execution of the contract. For the buyer, it is a mixed question, involving both technical considerations, such as the quality of equipment or services offered, and business considerations, price, for instance. For the seller, it is largely a question of credit.

Nevertheless, posing the question "who" at the time of contract negotiation and execution may alert the buyer or seller to possible deficiencies in the other party at a time when something can be done about such deficiencies. For instance, if the "who" is a seller who historically fails to meet its delivery commitments, the buyer may wish to minimize his risk by insisting upon a contract provision obligating the seller to pay liquidated damages in the event of its failure to make timely delivery. If the "who" is a buyer having marginal credit qualifications, the seller may wish to minimize its risk by insisting upon con-

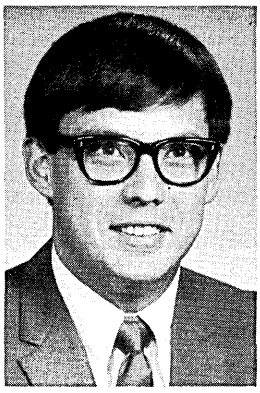
tract provisions such as a promise by the parent corporation guaranteeing payment by the subsidiary corporation, or the payment of a security deposit.

Where. The "where" is principally the concern of the seller and in the case of a computer system, the concern centers largely on site preparation. The computer system is a rather delicate piece of equipment. It imposes substantial demands upon environmental control equipment. If the demands are not met, computer equipment failure is likely to occur. As a result, the typical computer contract contains the following provision:

"Buyer will furnish, at its own expense, a suitable place of installation equipped with proper electric power and environmental facilities to permit operation of the equipment in accordance with Seller's equipment specifications."

Why. The "why" is a relevant and material consideration to be made by a prospective buyer in evaluating his need for the acquisition of new or add-on equipment or services. For the most part, however, asking "why" during the course of contract negotiations will have little effect upon the outcome of such negotiations except in the following instance. Occasionally, during contract negotiations, one party may insist upon a special contract provision, offering an innocuous reason for insisting upon the provision. The skilled negotiator will review in his own mind the various possible reasons underlying the other party's insistence upon the provision. Further questioning of the other party may ultimately lead the negotiator to the real "why," which may be of considerably greater significance than the reason originally offered.

There is differing opinion among observers as to whether there will be any significant new trends in the course of dealing between seller and user. This is largely a question of the competitiveness of the market place. And it must be recognized that the terms and conditions that emerge in computer contracts will continue to reflect the relative bargaining position of the parties. However, to the extent that precision and clarity is in the interest of both seller and user, irrespective of their relative bargaining strength, the foregoing tool is offered by this writer in the hope that it will at least point both the user and manufacturer in the direction of more precise and more complete computer contracts. ■



Mr. Young is an attorney for The Greyhound Corp., whose subsidiaries include Greyhound Computer Corp. and Greyhound Leasing and Financial Corp. Previously, he was with Honeywell Information Systems and the Information Systems Equipment Div. of General Electric He holds an LLB degree from the Univ. of Utah, a BS in mechanical engineering from the Univ. of Arizona, and is admitted to practice in Arizona.

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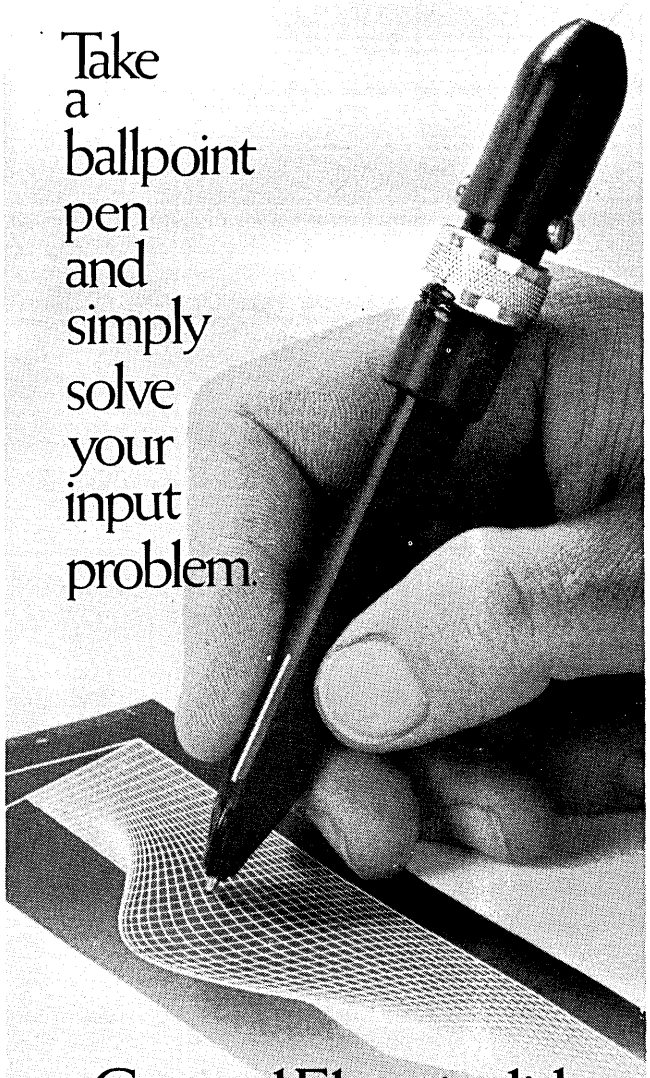

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CIRCLE 25 ON READER CARD

An interview with T. Vincent Learson and Frank T. Cary

Frank T. Cary, president, IBM.

T. Vincent Learson, chairman of the board and chief executive officer, IBM.

IBM: Changes at the Top

by Angeline Pantages, Features Editor, and Robert B. Forest, Editor

"Although I intend to remain reasonably active in the overall affairs of the corporation and will continue to participate with Vin and Frank in the Corporate Office and on the Management Review Committee, Mr. Learson will be the head man . . . "—Thomas J. Watson, Jr.

"Thank you, Tom. Good morning, IBMers . . . "—T. Vincent Learson
(From the June 29 announcement by telephone to IBM employees.)

Does the first change in continuous Watson management since the founding of the company portend changes in policy for IBM?

This was the central question we had in mind as we drove toward world headquarters on the divided four-lane highway that curves gently and precisely over the wooded slopes of downstate New York. Midway up a slope is a left turn lane, marked by a dignified sign: IBM.

A swing left, up another curve past rocky outcrops. Atop the hill huddles the faintly ominous square structure—the command center for one of the world's mightiest commercial armies.

On the way to our interview with Learson, now chairman and chief executive officer, and Frank T. Cary, the new president, we had considered some of the speculation that we had heard and read about the management changes. One rumor that is frequently heard is that Learson—now 59 and thus six years from retirement—would not serve that long but instead give way to Cary, perhaps in combination with George Beitzel or Gilbert Jones. But it is hard for those who know Learson to imagine him accepting a "caretaker" role. One ex-employee mentioned that the aggressive Learson is "extremely anxious to leave an impression on the data processing industry." (Not that he hasn't already: he has been with IBM since 1935, in corporate management since 1954, when he was elected a vice president, and president since 1966.)

Cary's ascension to the presidency was not a surprise, although he is less known to the public, having generally avoided the limelight, granting very few interviews. But he has been described by one insider as being "as tough as Learson, although outwardly less volatile, an excellent decision-maker who relies almost completely on a thorough analysis of facts rather than on intuition, and definitely a Watson man." Cary joined IBM in 1948, became president of the Data Processing Division in 1964, then vice president, group executive, and general manager of the Data Processing Group in 1966. He joined the Corpo-

rate Office and Management Review Committee in 1969 and was elected executive vice president in March, 1971.

As we approach the building to keep our appointment, it occurs to us that, like a fortress, it defies direct assault; long walkways lead the visitor parallel to one side, then on, around, and up—through sets of glass doors into a lobby that might have been designed by a machine. Large, cheerless and empty. The lobby of a 21st century ghost hotel? A blue-suited man enters through a side door from inside the building, starts toward us, then retreats. Comforting; an IBM executive has done something indecisive. Our host, a veteran IBM public relations man, arrives. He takes us upstairs, across a bridge over artificial nature displays, down a long, long corridor that passes dozens of offices with dozens of smiling secretaries.

"The last mile," says our host.

We are led into a waiting room and soon Frank Cary appears. He's almost six feet, cool, dignified, poised. He takes us down another hallway, then introduces us to Learson—a giant, tanned wrinkles and blue eyes.

Warned that Learson would not have much time to spend with us, we asked our main question early—would the structure of IBM be changed?

"We won't change anything drastically," Learson said. "As technology speaks, we'll change, but it will be a slow, evolutionary change and responsive to the marketplace. We formalized the staff and line organization in 1956, and no matter what happens staffs tend to get too big, so you trim it back—that's just good management."

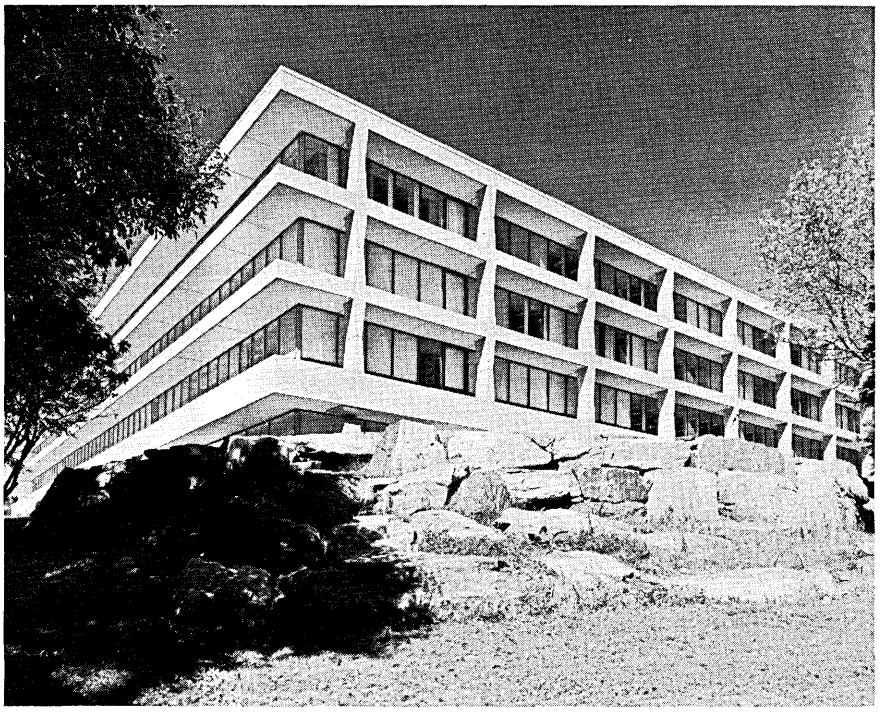
We then asked some other broad policy questions—before Learson got away: How about the long-range prospects for the 370, considering the rather poor net gains so far?

Learson said that IBM has shipped over 100 155s, some 165s and 145s, but it won't get into heavy shipments until this fall. But the 370 "is not really different in customer acceptance from earlier product lines."

Cary agreed that the 370 line has shown "less net increase" than the 360 but said that it is "too early to project that performance in the future . . . the 360 was introduced into a much more buoyant economy." Smiling at the understatement, he said: "Customers are increasingly cost conscious."

What about another round of conversion for the customers, we asked, considering that virtual memory machines are said to be due from IBM?

They declined to comment on new products, but Cary said that the 360 and 370 "opened up the possibility of introducing new technology for one part of the system without impacting the rest. The compatibility of the 370 with the 360 clearly demonstrates that we want to protect the customers' programming investment. We would have to see tremendous advantages to the customer" (before forcing him to convert for a new product).



IBM's command center, Armonk, N.Y.

It's time for Learson to leave. He's had an effect on us, perhaps because he seems to have a combination of traits that don't usually go together; he's intense and restless, but poised and thoughtful at the same time.

About to leave, he turns back and volunteers a

comment. DATAMATION has been essentially fair, he says. IBM doesn't always agree with us . . . but he thinks we have done a good job.

Left alone with Cary, a quieter and perhaps more controlled man than Learson, we get the impression he's much tougher than his photographs suggest—less benevolent wisdom, more carefulness and precision.

"What are the next big markets?" we asked.

Cary said that systems incorporating a data base and data communications have the most potential, but "these systems require a good deal of investment and many people are electing to postpone their development. The customer generally can't see as quick turnaround or payoff in implementing communications-based systems as he can in implementing batch applications . . . given current economic conditions, he's making discretionary decisions." However, he continued, the technology for such systems "continues to be developed, but not on a crash program basis. IBM is emphasizing applications development, which will make it easier for the customer to invest profitably in these systems."

As for related topics—minicomputers, time-sharing services, and in-house time-sharing systems—Cary said they all have "great validity and value . . . " but he noted that he had "no conviction" that some day there would be nothing but minis on-line to large-scale systems. Time-sharing services, though, have much more future than facilities management, he said, seeing no "great growth" for the latter.

Cary seemed to feel strongly about facilities management. "It's a certain admission," he said intensely, "that someone else can run the data processing better . . . It's difficult to justify to the board of directors."

Then, perhaps considering that he had emphasized the point too much, he smiled.

"I'm not trying to knock facilities management," he said.

We changed the subject to IBM's recent price adjustments. Wasn't there a contradiction inherent in raising prices on 360 and 370 processors because of "rising costs" just a few months after reducing prices, in effect, on peripherals?

Cary said that these two decisions were separate, that the industry has long had long-term leases at discounts, and that IBM had often studied the idea.

"Is it true that IBM puts its threshold of tolerance to competitive invasion at about 10%?"

"That's not true," Cary said. What was true, he added, is that IBM is out after all the business it can get.

"Do you ever worry about wiping out the competition?"

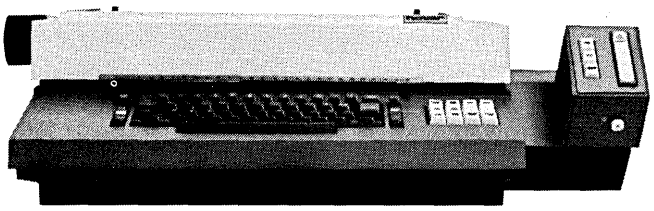
Cary was amused by this.

"I haven't had any nightmares about it," he said.

Before leaving, we asked a final question: What one word would Cary choose to describe his goals as the new president of IBM?

He thought a moment and found the right one.

"Excellence," he said. ■



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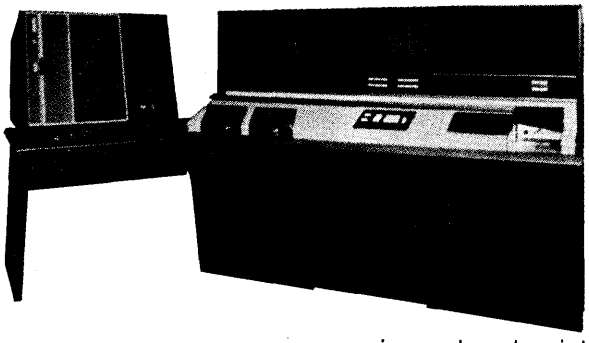

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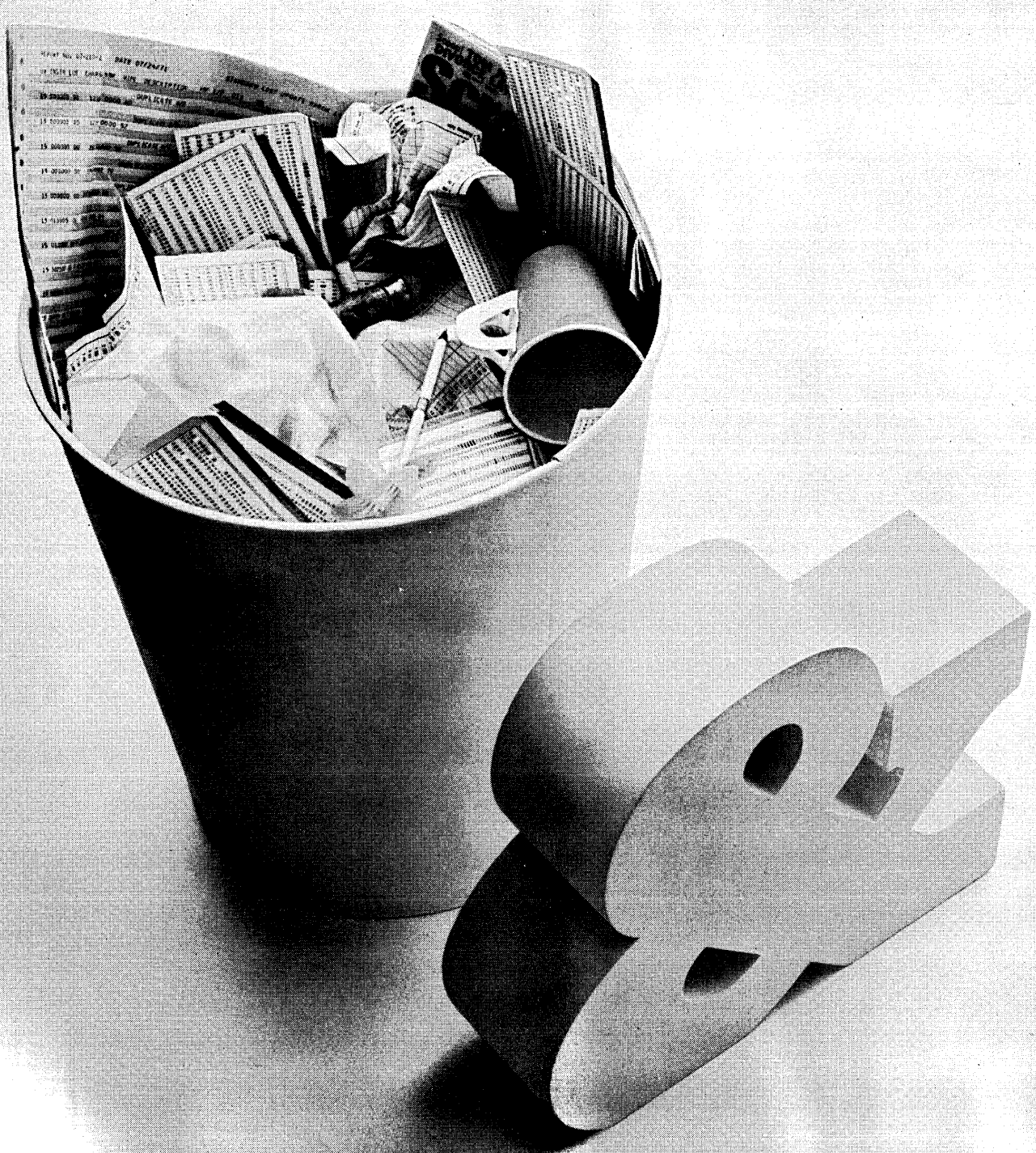

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Advantages of microprogramming have been reserved for the select few — usually computer designers. The QM-1 just may change all that

Microprogramming for the Many

by Michael W. Cashman, Assistant Editor

The QM-1 computer may be one of the most significant developments in many years in the computing field. One reason is that microprogramming, the *raison d'être* for the machine, is readily accessible to the user instead of being just a convenient method for the designer to use for instruction implementation. And the architecture, with six separate stores on several different levels, is unusual, as is a level of performance roughly equivalent to a 360/40 for a typical price of $150K.

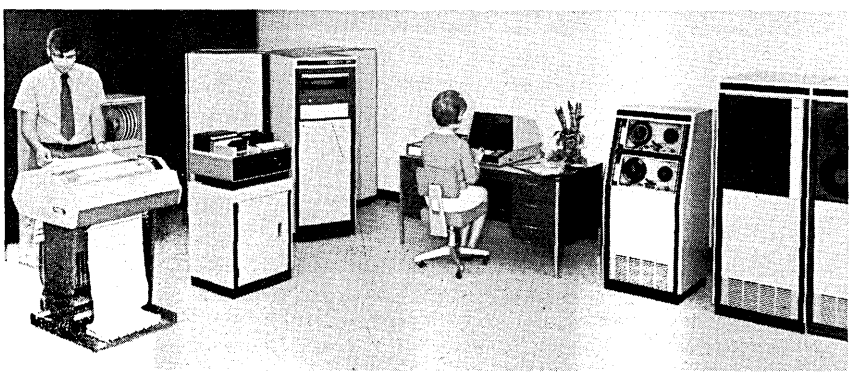
The design for the QM-1 was offered to Dr. Robert F. Rosin of the State Univ. of New York at Buffalo by Nanodata Corp. of suburban Williamsville. It came in response to a set of specifications shown to several manufacturers after the research team led by Dr. Rosin had rejected using several currently available microprogrammable computers for either design or cost considerations (see Sept. 1, p. 18). Rosin was fortunate in that he was able to participate in the design exercise of the new computer and finally see some of his ideas of how to build a computer realized. And Nanodata has come up with a machine that looks like it might be a very saleable item for commercial applications—particularly in process control.

Looking at the storage hierarchy from the inside out, we first find what is referred to as nanostore. Here a programmer lays out instructions which directly control the hardware by using up to 1K of 342-bit words cycling in monolithic semiconductor circuitry at 150 nsec. Commands to the hardware are executed at the clock rate of the machine, approximately 50 nsec, but the access time is almost always overlapped with instruction execution, so its speed is not apparent to the user.

The nanoprograms written in nanostore define the architecture and instruction set for the next level of storage—control store. It consists of 2K 18-bit words cycling at 150 nsec, expandable to 256K. Here the instructions and constants of an emulator are held, with data more often residing in main store.

Main storage is 750-nsec core that can be expanded from a minimum 16K up to 256K 18-bit words. It holds the programs of the machine being controlled and serves as a backing store for control store.

Anyone who likes to play with registers will love the QM-1. There are 32 16-bit registers constructed from 40-nsec monolithic circuitry called local store. It is mostly for general purpose use, but also does such things as hold a representation of the 18-bit microinstruction currently being executed. There are 32 more external registers to help with the I/O, also 18 bits in length, and finally, up to 32 5-bit registers for specifying bus attachments and other internal control functions.



The processor is divided into two modules, an 80-nsec arithmetic/logic unit, and a 40-nsec shifter. These two units cooperate to produce 16-bit decimal addition times on the order of 600 nsec. A second ALU unit, dedicated to interactive graphics support, may be added to the QM-1. Such an addition is said to be rather easy to accomplish, so conceivably a customer could have Nanodata design the second ALU to handle some function other than graphics.

There is a high degree of parallelism in the system. All register transfers are synchronous, with registers capable of being written and read simultaneously. Also, the control store can be written on the fly to change the emulator stored there, under user program control. The data paths, stores, and registers that the microprogrammer controls are uniformly 18 bits wide, simplifying their use.

Things look a little more conventional on the peripherals side of the QM-1, with a crt console to keep tabs on the system and a complement of disc, tape, and card gear available. Eight channels attach the peripherals to the QM-1, with an estimated aggregate data rate of 1 megawords/second.

Dr. Rosin's students are currently engaged in software development programs so that the QM-1 can be used by SUNY to explore the world of dynamic microprogramming. The rest of us need something more than that, and a real-time operating system, a general-purpose assembler, and the COBOL and FORTRAN languages are scheduled to coincide with the initial "commercial" deliveries scheduled for the middle of next year.

For now, the QM-1 will not help the harried dp manager get his payroll or engineering functions accomplished any faster or better than his current machine. But the knowledge gained in using the QM-1 may contribute to future machines.

At least Dr. Rosin is happy: "You can tell the world that this scruffy professor has **finally** found a machine to match his desires." ■

If our teleprinter's 3-speed shift doesn't convince you, its optional equipment will.

We made the GE TermiNet *300 Teleprinter just about the most versatile printer you can get.

Its top speed of 30 characters per second means data can be sent to your computer up to three times as fast as with conventional equipment.

That has to save money.

Its standard three-speed selector makes the TermiNet 300 Printer compatible with both the 10 or 15 characters per second rate of popular communication or computer terminals.

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Modular integrated circuitry makes this a teleprinter-of-all-trades, ready to handle tomorrow's needs as well as today's.

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We've also engineered a plug-in option to check for data errors; another to give you a built-in data set. Vertical tabulation and form feed is available plus remote *or* local horizontal tabulation for ultimate freedom in formatting output data.

Of course, the sticker price includes only those options you actually need.

Many companies have already proven the reliability of the TermiNet 300 Printer by specifying it in systems for time-sharing, management information, computer editing and formatting, repetitive printing, information retrieval and point-to-point business data exchange.

For a demonstration, contact your nearest GE Data Networks sales office. They're listed below and are ready to provide you with nationwide service.

Or give us a call; Dial 703-942-8161 and ask for TermiNet 300 Printer Sales.

General Electric Company, Communication & Control Devices Department, P.O. Box 4197, Lynchburg, Virginia 24502.

GENERAL ELECTRIC

CIRCLE 29 ON READER CARD

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Minneapolis, Minn. (612) 544-6699 Sacramento, Calif. (916) 927-0163 San Diego, Calif. (714) 297-2911 Waynesboro, Va. (703) 942-8161 Washington, D.C. (202) 393-3600 Wilmington, Mass. (617) 657-4800

What the industry taught us about minicomputer introductions.

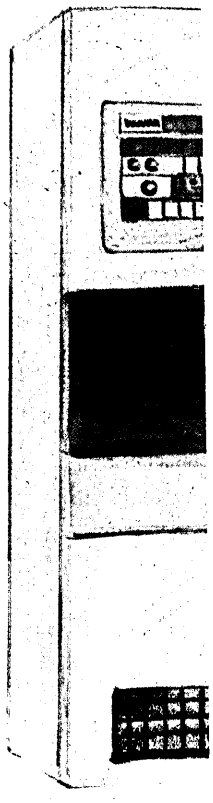
The gutless wonder.

Yessiree, fans, here it comes. Marvel of marvels. The greatest little number-cruncher yet. Every bell and whistle you've ever wanted. Split-billi-second speeds to boot. State-of-the-art everything.

Amazing. That anybody listens, that is. Because this little gem exists only in the dreams of the optimists in somebody's marketing department. Designing it and building it are details they'll worry about later.

Nine months from now — maybe — when they get around to making a real one, nobody will remember all those promises anyway.

Will they?



Just another pretty face.

This is how they introduce new computers that never were. And never will be. The old cosmetic trick.

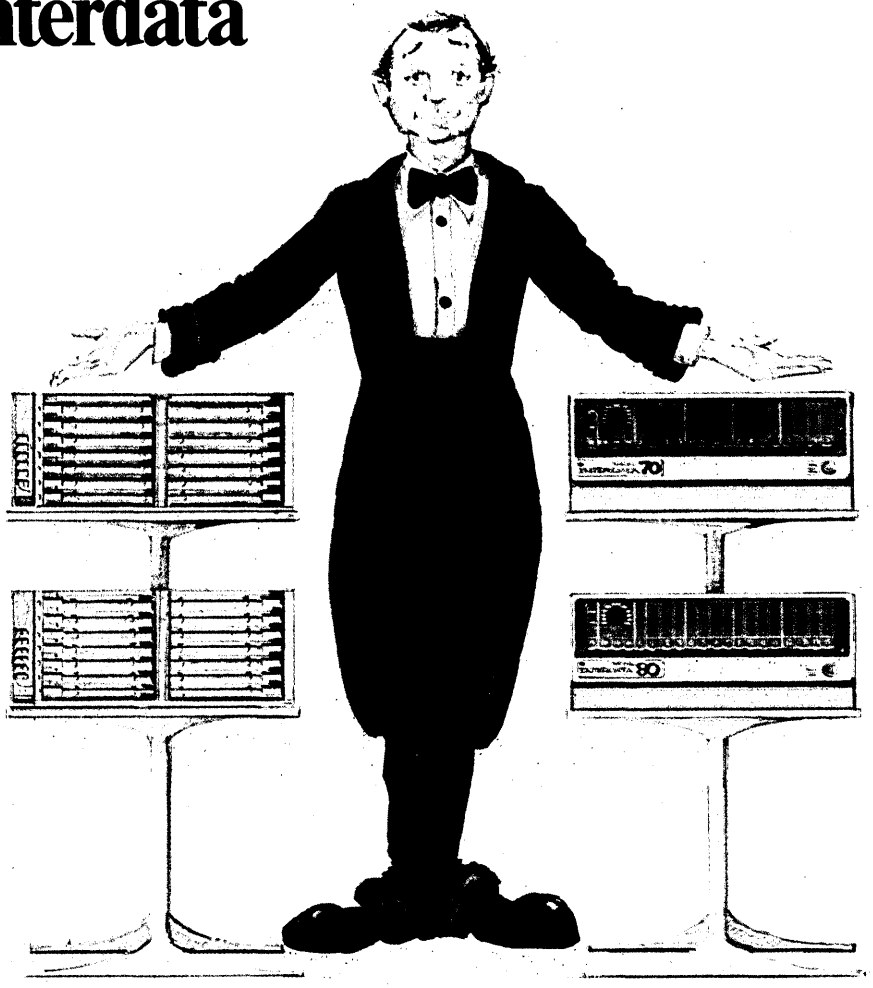
Simple, really. All you need is a few new lights. A few new buttons. A few new knobs.

And plenty of new paint.

Don't worry about what's inside those magnificent new skins. No sweat. It's all just beautiful. Right?

Introducing the Interdata New Series.

What you see is what you get.



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The Model 70* has a solid-state LSI read-only-memory, built-in multiply/divide and floating point hardware and 4 channels of DMA. So it's extra powerful and flexible.

It has 113 instructions and automatic I/O and 16 g-p registers and built-in interfaces. So it's extra easy to configure and use.

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*OEM price – $4828, quantity of 15.

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CIRCLE 45 ON READER CARD

The IBM System/3

Their free extras.

The NCR Century 50

Our free extras.

The basic bundle of support services. The things you need to get what you expect from a small business computer. Like a large selection of preprogrammed and pretested business applications, debugging, educational and support allowances, no less than three program languages: Fortran, Cobol and NCR's own NEAT/3, and an operating system from NCR that insures upward compatability. Those are the extras we're talking about.

But are they extras? They're what you need to get the most out of a small-business computer. So, with the NCR Century 50, those so-called extras become essentials. And that's why you get them free of charge with the NCR Century 50. What happens if you pay for all of them? You end up running a small-business computer at big-business prices.

Now, if you're considering a small-business computer, consider the alternatives. Take a look at what you get from us. Take a quick look at what you don't get from them, unless you pay for them. Then contact your local NCR Representative for a closer look at the NCR Century 50. Discover the newest reason why, more than ever, NCR means computers.

NCR

Computers and Terminals

CIRCLE 30 ON READER CARD

International Exposition for Latin America

Mexico is a country with considerable growth expectations in the computer field. There are presently 420 installations, mostly of small- and medium-size machines, with about 1,200 expected by 1974. One evidence of this activity is the meeting recently held in Mexico City by the Mexican Society of Electronic Computation and termed SICLA.

The importance of this meeting to Mexico was made evident by the presence at the opening of the President of Mexico, Luis Echeverria, accompanied by Society President Ernesto Jiminez Diaz, Presidency Minister Hugo Cervantes del Rio and Mexico City Mayor Octavio Senties.

SICLA is the acronym for Semana Internacional de la Computacion para Latino America or the First International Exposition for Latin America. This exposition and its associated technical meetings were held on July 27 to Aug. 1, 1971, at the Camino Real Hotel in Mexico City. The exposition and meetings were notably successful and should be the first of a series, perhaps rivaling the JCC's at some time in the future. Much praise is due the sponsoring technical society, Sociedad Mexicana de Computacion Electronica, A.C., and in particular its Director General, Emilio Ferstl, and his co-workers for the excellence of the technical program. This was organized in three parallel sessions during the morning and early afternoon, and single panel discussions in the late afternoon of each of three days. The speaker list was international, containing such notables as Dr. Arnold Kauffman of France, Dr. Richard Tanaka, Dr. Nathan Yagoda and Patrick McGovern of the U.S., and many others from Latin America such as Dr. Claudio Gutierrez of Costa Rica, Romulo Tromben and Richard Tamargo of Chile, and Alejandro Alvarez Guerrero and Dr. Jose Trevino of Mexico to name a few. The exhibition, well managed by Exhibition Management of the U.S., included such well-known companies as IBM, Hewlett-Packard, RCA, Mohawk, Burroughs, DEC and CalComp, as well as Olivetti and Philips of Europe. Mexican companies represented included Petroleas Mexicanos, BesCo (which does complete computer installations), and SEPA. The latter is a small, new, wholly Mexican-owned company which makes computer modules and small hybrid computers for educational and special purpose uses.

Attendance at the sessions was surprisingly good, considering the high cost of the sessions, ranging from $72 to $256. The exhibition was free and of course drew many more people than the sessions. Exhibitors expressed themselves as generally well-satisfied with the traffic. Several exhibitors expressed the opinion that the major market was for small business systems because Mexico is a country with many small businesses.

The Proceedings of SICLA are available and can be obtained from the Sociedad Mexicana de Computacion Electronica, AC, Yacatas 435, Mexico 12, D.F. One interesting talk which is missing from the Proceedings is "The Man and Computer Systems," by Dr. Arnold Kauffman. A unique feature of this talk was that it was given in French and translated only into Spanish. However, by diligent attention to the talk and private conversation with Dr. Kauffman it was possible to understand his main points—that underdeveloped countries must use the most advanced technologies to make up for lack of training, and that a three-track university system is necessary to give sufficient educational flexibility.

A final word about the Camino Real Hotel. This is a truly unusual hotel both as to decor and layout. Excellent accommodations were available at what, at least for this hotel, were reasonable rates, and the attention paid by society and hotel personnel insured a smooth-running and satisfactory show. Congratulations are in order for all involved in producing this excellent first computer meeting. —Sol Sherr

What does a company with 100 programmers gain from our general ledger system?

100 programmers.

And you can bet they'll all be involved in important projects. But one thing's for sure, whether it's one of our clients with 100 programmers or just one, their assignments won't include developing an in-house accounting system.

That's what we do for them. For a flat $12,500. Actually, we provide more than just a general ledger system. Ours is a management responsibility reporting system with up to 99 levels of automated consolidations. It budgets. It forecasts. If there's trouble ahead, our system pinpoints it in plenty of time for it to be corrected.

The beautiful part about it is that it's ready to go. You don't have to spend one dollar in computer time to develop it. Or a moment of your programmers' time to debug the system. You save time and money all around. And to an EDP manager, that's the name of the game.

Let us show you our system. And the list of our clients who use it. Banks, manufacturers and service businesses. Blue chip companies with billions in assets. You'll get the same attention they get. And you'll get a system immediately. At $12,500.

Call or write today. You have everything to gain. Starting with your programmers' time.

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CIRCLE 34 ON READER CARD

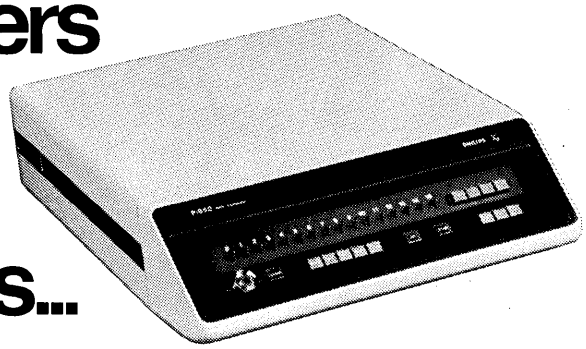
PHILIPS data systems

Our OEM mini computers speak 118 languages 243 dialects...

plus FORTRAN.

Philips offers a range of mini-computers, backed by the largest sales and service network of any electronics company in the world. OEM's will benefit from large volume Philips production, that gives prices as low as $ 1,800 for the P850, to quantity purchasers.

The P850, our smallest mini, has a 16-bit word, 3.2 microsecond cycle time 512 word memory (expandable). Punched tape I/O, teleprinter, card reader, display unit and magnetic cassette tape units are all available. Transfer rates are up to 50,000 words per second. Special options include interrupts, power failure/automatic re-start and a real time clock. Software includes a mathematical library, relocatable loader and



restricted assembler – impressive for such a small machine.

If you'd like to know more about getting a little Philips into your system, get in touch with OEM Marketing in:

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PHILIPS

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CIRCLE 44 ON READER CARD

1971 FJCC Preview

Only a few months ago, Las Vegas promoters began altering the theme of their advertising. Distracting billboards that once featured such come-ons as showgirls and prominent entertainers now blatantly advertise the attractions of gambling. Shows you how much insight they get from their market research. For some gratifying reason, organizers of computer conferences have taken a similar tack, playing down the technical aspects of computing and emphasizing what one hopes, at least, is the reason behind it all in the first place.

The theme of "Computers and the Quality of Life" has been set for this year's Fall Joint Computer Conference, which fittingly will be held in Las Vegas, Nov. 16-18. It thus continues the current—but hopefully not temporary—concern over the social aspects of computing, focussing as it does on "the use of computers to improve the quality of life." Interspersed with sessions supporting this theme will be the usual technical topics of current interest, like data communications, large scale integration, and terminals. But the sponsor, the American Federation of Information Processing Societies (AFIPS), has not overlooked ye olde standbye, a session on numerical methods.

Something for everyone? Perhaps not. But two Wednesday afternoon panel discussions could be interesting. One will look at computer structures—past, present, and future; and the other will look at the 20 years that have passed since the first Joint Computer Conference was held in Philadelphia.

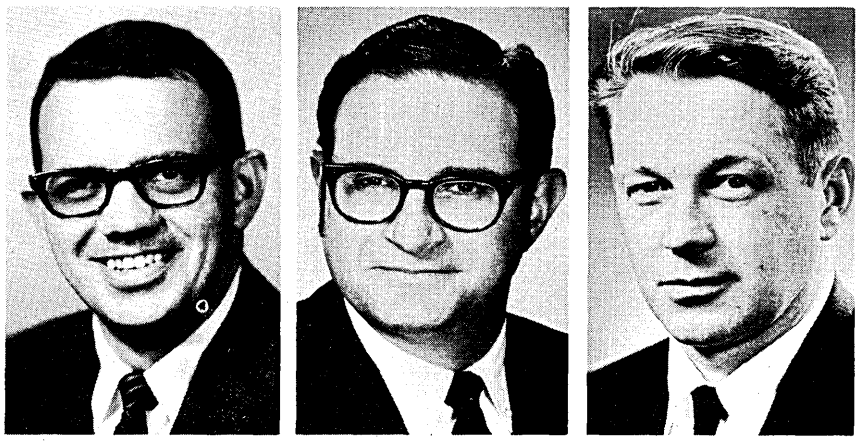
As usual, the keynote speaker will open the affair on Tuesday morning. He is Dr. Arthur G. Anderson, vp and director of technical assessment at IBM. In keeping with the conference theme, he states: "The scientific and engineering community has lived through a 20-year honeymoon of high status, great opportunity for personal growth, and youthful vigor. Now it has moved on to the problems of its marriage with society." Dr. Anderson will bring to the speaker's platform his observations after a year's study as a visiting fellow at the Center for the Study of Democratic Institutions. But this "marriage" to which he refers appears so far to be little more than a game of footsies.

Dr. Frank B. Ryan, former pro football quarterback who's now director of information systems for the U.S. House of Representatives, will discuss the design and acquisition of computer systems for the House in his luncheon address on Thursday. Ryan, appropriately, is also scheduled to be a panelist in a session on computers in sports. It's being chaired by Gerry Purdy, the author of an article on that subject in the June 1 issue of DATAMATION.

Other sessions fitting under the theme umbrella include the use of computers in emerging nations, in medicine and biology, law enforcement and criminal justice, laboratory automation, and in urban planning and development.

The conference will be held at the Las Vegas Convention Center. Registration fees are $30 for members of AFIPS societies, $60 for others; and for those interested only in the exhibits, there's a $10 fee. Anyone trying to reach an attendee during the conference can try the Convention Answering Service at (702) 734-2651. Prior to the show, that number can also be used for questions concerning the conference. ■

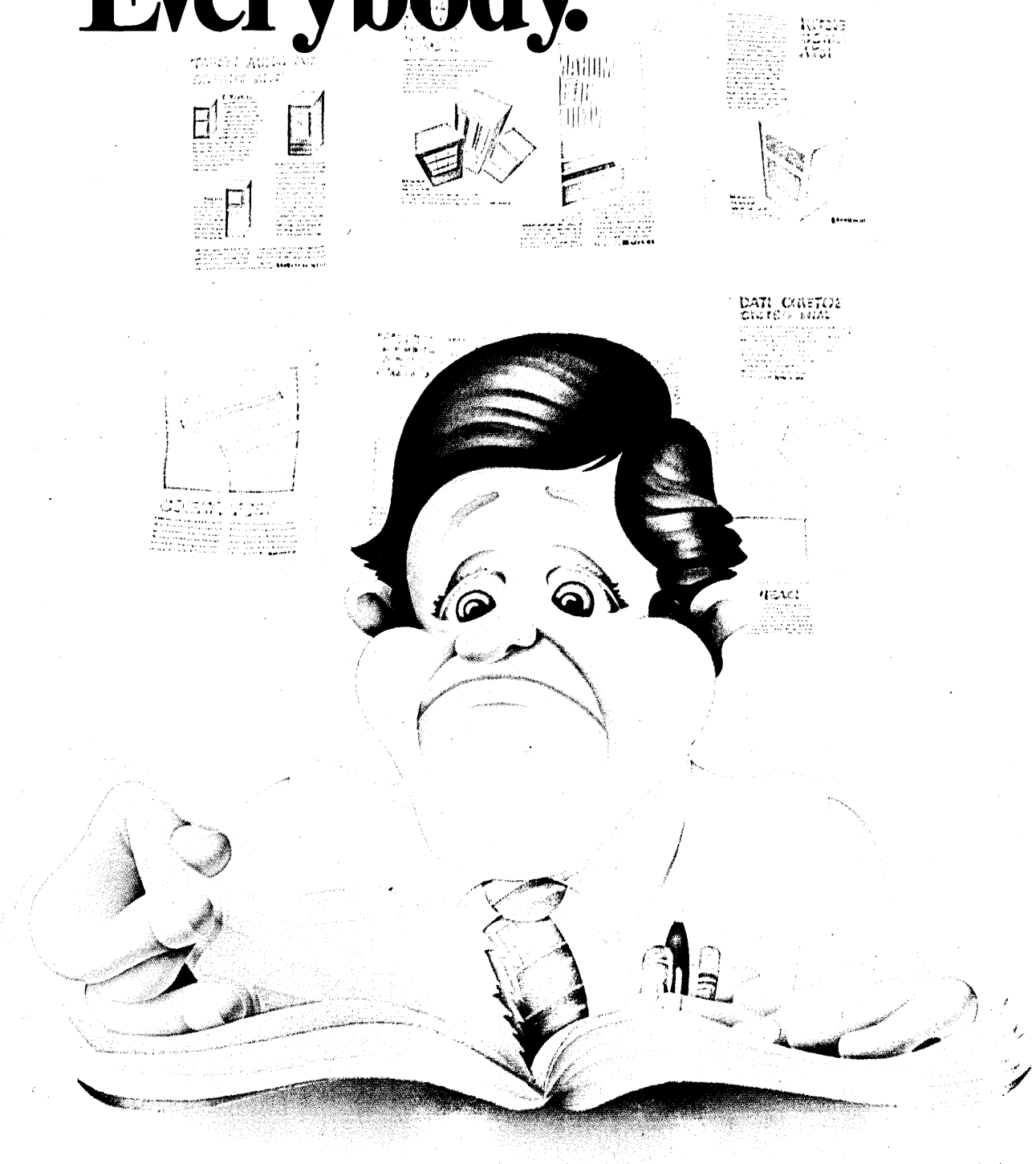
A preview of new product introductions at FJCC will be covered in a special section of our Nov. 15 issue.



FJCC participants, from left to right, are Ralph R. Wheeler, Lockheed Missiles & Space Co., general chairman; Martin Y. Silberberg, IBM Corp., technical program chairman; Arthur G. Anderson, IBM Corp., keynote speaker.

Who's got the best solution to your input

Everybody.



problem?

Take a look at all the promises of input utopia advertised in this magazine.
What do the ads say?
That input is probably the major problem in data processing today?
Okay. We'll buy that.
That keypunching is an obsolete, costly way to process data?
We'll throw in with them there, too.
That there's only one "best" way to end the input problem?
That's where we get off the bandwagon.

No input system is going to solve everybody's problem every time. EDP Departments may all look the same to management, but the people who have to run them know better.

So do we.

As you might suspect, we make input systems. Three, to be exact. CMC 5, 7 and 9. The size of the system depends on the size of the processing department.

The 5, 7 and 9 are KeyProcessing™ Systems. KeyProcessing is our name for keyboard data entry systems.

We admit that some mammoth corporations might just need one of those million-dollar electronic marvels of the input industry. Others would do better to keep punching along with what they've got.

What we'd like to do for you is what we did for Blue Cross of Southern California, Union Carbide, Continental Airlines, First National City Bank, Pacific Gas & Electric, the City of Los Angeles, the Pacific Coast Stock Exchange and others.

We showed them how our KeyProcessing System works. How it's faster and cheaper than key-to-tape.

How it can be phased-in overnight.

How keypunch operators can learn to use it in less than two days and become up to 50% more efficient.

How quiet it is.

How all the equipment we have in the field has averaged an up-time of 99.5% and reduced personnel turnover significantly.

How about it?

We don't promise to have the best solution to your input problem.

But, we just might.

Give us a call or write for more information.

CMC Computer Machinery Corporation, 2231 Barrington Avenue
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CIRCLE 49 ON READER CARD

PERSPECTIVE

an interpretive review of significant developments

RCA Computer Systems: "I Suppose You Could Call That Beginner's Luck"

(Anno Domini 2000): The only sound was the rippling of paper caught by the breeze that whipped through the broken windows of the abandoned building in what must have been a production area; components of primitive computer peripherals sat in various stages of assembly, covered with dust and corroding.

Off in a secluded room marked by "unauthorized personnel keep out" signs, what looked like a prototype of an old disc drive was surrounded by manuals titled 3330X.

In another wing, the posh decor implied executive offices, and strangely, the furniture and rugs looked little worn. A desk in the hall was littered with papers, stained brown — apparently by the coffee cup that had tipped over and still lay on its side. The papers were unsigned letters, dated Sept. 17, 1971.

Further down the hall, in an office marked "public relations," more paper was strewn on desks and floors. One was an undated press release which heralded the computer called RCA 1, "a $5,000/month system aimed at 360/20 and 30 users." Delivery, it said, would be in four months, presumably remarkable for that time.

A giant bulletin board on the wall was covered with advertisements. One read "head to head with IBM. A battle royal . . . we asked for it." Another, in a Sept. 1971 issue of Dun's Review, said "RCA is easier to do business with than IBM."

Bold-lettered quotations from men called A. L. Conrad, Robert Sarnoff, and L. E. Donegan, Jr., talked about "commitments." "Neither rumors nor setbacks will undermine our commitment to computers," said Conrad on July 12, 1971. A fine personal touch: "I heard that rumors about RCA selling its computer business had caused the president of a midwestern railroad to revoke his order for an RCA computer. So I picked up the phone and called him directly. I told him exactly what I've just told you. And I've now been informed that the order has been reinstated. I suppose you could call that beginner's luck."

The door out was jammed, stuck on a few copies of another release, dated that Sept. 17, from Sarnoff, chairman of the board: "Today I submitted to a special meeting of the RCA board of directors a proposal calling for a fundamental reorientation of RCA's efforts in the computer field . . . It involves three key decisions: one, for RCA to withdraw from the general-purpose computer business . . ." It didn't mention that president of a midwestern railroad . . .

☆ ☆ ☆

Even if everyone knew that RCA's Computer Systems organization was in trouble, no one expected the swift, devastating announcement that September day. With all that corporate commitment, publicly and to its employees; the new series deliveries that started in August; the move to Marlboro, Mass., and the ground breaking for another new building in June; the continuous hiring in certain departments; and the plans for new announcements — the move seemed a plague that had suddenly struck and wiped out almost 20 years of RCA effort in the business.

The only hope left is to sell, as Sarnoff charged RCA president Anthony Conrad to do. If it fails, the victims are 9,000 employees (as of Sept. 24); users in more than 1,000 U.S. installations; and the industry outside the IBM fortress, which must suffer the distrust RCA has unleashed.

A Slight Miscalculation

The reasons RCA sources and industry experts give for the withdrawal are many: disastrously erroneous bookkeeping, the me-too marketing strategy against IBM, overzealous spending and disproportionately high overhead, and a parent corporation with too many diversified interests — few of which depended on general-purpose computer manufacture in any way.

The immediate problems that led up to Sarnoff's announcement, as given by insiders, revolve around bookkeeping errors. In 1970, RCA reportedly had a high percentage of purchases (versus rentals)—60%. The revenue forecasters, we're told, erroneously counted purchases as rental revenues and projected expectations based on that — said to have amounted to a $10-20 million error. Hiring in turn was based on those projections. Discovery of this led to layoffs that began last April.

Bloated Bookings

Another problem was RCA's methods of booking orders and prospects. If a salesman was running shy of quota, he was paid commissions on his best prospect, that prospect being included in the bookings. Unfortunately, those bookings were not purged with any regularity, some potential orders being left on the books long after they ceased to be prospects. Too, RCA did not immediately purge companies who canceled or went out of business.

In July, Conrad sent Julius Koppelman to Computer Systems to act as financial vp and reportedly clear out the "water" in the bookings. Apparently, he found things worse than expected. For example, Reservations World, in August, was still on the books for two 45s, and the company had gone out of business many months before. This and other factors increased the '71 losses from an expected $30 million to $50-80 million, we're told.

The operation could report that sales were almost on target, however. Two of the new series systems were hitting almost 100%, we hear, and one was on the button. But RCA fell far short of the planned 60% orders from customers at new installations. Two-thirds, instead, were to RCA customers, many moving sideways from Spectras to similar, cheaper new models. The result was too little net revenue gain. In fact, in July and August, with the poor economy and the purging of the bookings, the entire sales force was making only 10% of quota (figured in net revenue gain). Some say August was a negative net revenue month for sales.

Although RCA was able to sell 61 new systems as replacements for

other vendor equipment, salesmen report that the going was increasingly tougher.

Creating a Mini-IBM

Under the tutelage of vice president and general manager L. E. Donegan, Jr., the ex-IBMer who tried to create a mini-IBM, RCA Computer Systems tried to buck its model with similar equipment; some software compatibility; virtual memory; an ambitious, bundled support effort; and various contract offerings. One salesman notes that the big gun for them was the six-year equity contract, with an option in which the rentals could count heavily toward purchase. RCA, however, flopped with its guaranteed conversion offering; with this, for a fee, RCA would convert a user's programs by a specified date and/or at a specified performance. Only one or two such contracts were signed. Perhaps if failed because RCA support personnel worked so hard for free to convert its users.

Virtual memory offered on the new 3 and 7 models was a plus for RCA, consultants say, and the currently available version of the Virtual Memory Operating System was given high marks by some users. The big problem was that this software effort cost far more than expected, say insiders.

Salesmen report that Donegan's marketing strategies did help them get in the door; but IBM's constant moves in equipment, pricing, and support made them impossible to buck. RCA had a strong intelligence operation gathering IBM information on the 370 line and had based the price and performance of the new series models 2, 3, 6, and 7 on that intelligence. But IBM surprised them with semiconductor memory and lower prices than expected in the 145 and 135; this hurt some. Then last spring, RCA raised its peripheral prices and was shocked when IBM decreased its prices and offered one- and two-year leases on peripherals — making RCA's system prices less attractive. RCA salesmen also claim that when IBM partially rebundled its systems engineering services (for installation planning and some software support), the RCA pitch that it was bundled lost steam.

Organizationally, Donegan was proud of saying that RCA was the "only non-IBM manufacturer being run by IBMers." Donegan himself had defected from IBM in 1969, not long after the time-sharing operation he headed, the Information Marketing Dept., was transferred to Service Bureau Corp. He was attracted by Sarnoff's repeatedly expressed desire to build a computer power and felt that he knew the way; use IBM's own marketing and organizational philosophies to fight it. RCA already had the IBM-compatible Spectra series. He drew with him cronies like Joe Rooney (RCA data processing division president), William Acker, and V. O. Wright (president of the systems development division), and set about creating a multilevel management structure exactly like IBM's. That mini-IBM strategy was his undoing, claim some RCA veterans. The structure wasn't scaled down, said one, so that it was incurring IBM-like overhead as well. Too, long-time RCA employees felt "stepped on" in the IBM takeover, and morale dipped. The disgruntled, passed over in appointments, left. But in all fairness, many new non-IBM employees felt there was an improvement; and users who had felt earlier that there was too much confusion in the reorganization found by last summer that it was running smoothly.

Summer Gloom

Donegan incurred, he felt, necessarily high expenses when he beefed up sales and support forces. The sales force increased from 160 in 1969 to 540 in 1970 and nearly 700 by August 1971. Donegan's goal was to increase RCA's market share from 4% to 7½% by the end of '71, and "you can't double your sales without doubling the sales force," he said in an interview late last year.

What Donegan felt was necessary spending, others called "spending money like it was going out of style." An RCA veteran said that "they were acting like Patton overrunning Europe, when they should have been acting like practical generals running an orderly retreat. They believed their own marketing fiction long after it was reasonable to do so, and built up a ridiculous inventory."

With all the errors, the dissension, the criticism, things looked gloomy late this summer. Sarnoff found that he would have to report to the board of directors that profitibility would certainly not come by '72 as projected. Perhaps not even by '75. In his announcement he said, "studies show that the mainframe business, which comprises the bulk of today's computer industry, will continue to grow, but at lower levels than previously projected. The severe pressures generated by a uniquely entrenched competition will correspondingly intensify.

"For RCA this means an attenuated timetable for achieving profitibility

THE FIVE DWARFS

It has long troubled us that everybody talks about the seven dwarfs in this industry but no one seems willing to identify them. Surely it's a little unfair that IBM is known far and wide as Snow White but the dwarfs have gone incognito.

Finally, it has come out that RCA is really that beloved little fellow Dopey. And the previous retiree from computerland, GE, is, or was, Sleepy.

So now there are five:

Sneezy — Univac is actually the company represented by this lovable character. Capable but fitful, given to sudden announcements, and then lapsing into fretful silence.

Happy — Honeywell, of course, is Happy — friend of little animals in the forest, always willing to lend a helping hand to other dwarfs when they stumble.

Doc — Burroughs, often the leader though not always acknowledged, continues steadily down the trail, pick on shoulder, trudging toward the mother lode.

Grumpy — Control Data, taciturn and solemn. Grumpy says: "I'll see you in court."

Bashful — NCR, sweet and coy, but sometimes Bashful leaps into his biplane and speeds across the sky trailing a banner.

But Hark! Who is that horrid-looking figure carrying the basket of apples? Can it be the Department of Justice?

—W.R.

For people who can't wait 90 days for their next data set.

The 48-hour alternative.

Forty-eight hours. Two days.

That's how long it takes to ship an Ultronic data set after receipt of order. Right off the shelf and into your system.

You can have just about any operating capacity you need, too. 300, 1200, 2400, 4800 bps. All operationally compatible with telephone company equipment and EIA Standard RS-232 interface.

Like to hear more? O.K. Let's take them one by one.

The 103/300 Data Pump is an asynchronous frequency shift keying data set that operates in simplex, full-duplex, and half-duplex modes. It transmits over both private and dial network voice-grade lines. Acoustical coupling is built right in.

Our Data Pump Series 202/1200 has something extra built in. Troubleshooting test switches which quickly tell you the source of any data transmission problems. Not that you'll ever have much trouble with an Ultronic 202/1200. It's completely solid state in construction. Transmission of up to 1200 bps is over unconditioned 3002 voice-grade telephone lines.

The Data Pump 201/2400 data set also transmits over 3002 voice-grade lines. Frequency shift keyed with duo-binary encoding, it has built-in test switches. It works even better than it looks. And that's saying a lot. Because the 201/2400 comes in an attractively designed beige and walnut case that is attractive enough to put on your desk.

No matter how you use it—point-to-point, multipoint, or for remote batch processing—the 203/4800 Data Pump is the workhorse data set with the capacity to do any job. It uses modified duo-binary coding to eliminate the d.c. component in the transmitted signal and compress the bandwidth, so more power is concentrated in the effective part of the spectrum. Short turn-around time provides efficient multipoint operation. Which means you can transmit error-free data and do it faster. Transmission is over standard Series 3002 lines with C2 conditioning. Operation can be two wire in simplex or half-duplex and four wire for half-duplex or full-duplex.

That's what we've got. In standard cabinets or in custom designed card modules in OEM quantities. And you can have any of them on lease—or own them outright.

You also get another benefit. Our own service organization. Some 250 technical experts in 56 cities all across the country. If something goes wrong, you won't have to go very far to get help.

We have everything you want in data sets. The same goes for the rest of your telecommunication needs. Time Division and Frequency Division Multiplexers, video and hard-copy terminals, plus the experience to put them together in a complete system.

Ask us. You won't have to wait around for an answer. Call Lee Shrout, Director of Marketing at (609) 235-7300. Or, write to Ultronic Systems Corp., Department DA-11, Box 315, Moorestown, New Jersey 08057.

☐ I can't wait! Send me____of Model _____data sets right away!

☐ I'm in a hurry, but I can wait a few days until your sales representative calls.

☐ No rush. Send me literature.

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Ultronic Data Sets

GTE INFORMATION SYSTEMS

in the general-purpose field, coupled with the requirements of a massive infusion of additional capital — probably in excess of $500 million between 1971 and 1976."

The writeoff would be $250 million after taxes in 1971.

So the bomb dropped, and since then RCA has been looking for a buyer. Donegan was reported to have been given 90 days to find one. Memorex, Westinghouse, and others were listed as prospects; and RCA busied itself the first few weeks after the move, preparing a presentation for them. Ed McCollister, vice president handling international liaison, was said to be in Europe talking to prospects like Philips, ICL, and again, Siemens.

Minus 9,000

RCA also laid off 2,000 employees by the end of the first week. These were administrative, production, engineering, and support people. A 666-man production layoff, planned earlier, also took place, and 800 more production people in West Palm Beach were given a week's furlough. The sales force of nearly 700 and the systems programming staff of 550 were kept pretty much intact.

This left the West Palm Beach plant with 2,036 people; the Marlboro administration and manufacturing facility with 1,560; the South Jersey plants and offices lost 485 people, leaving 1,579; the Needham, Mass., plant has 165 people; and the Lewiston plant, 160. Field marketing and support personnel were slashed by 670, leaving 3,700.

If anyone buys the operation it will get downwards of 9,000 people and a customer base that includes 1,096 domestic installations and an interest in 757 foreign, according to a May report by International Data Corp. Licensees Hitachi and Siemens have most of the foreign installations, but a buyer may also get a small staff of marketeers in London placed there just this summer.

RCA said it will retain a computer effort in specialized data communications for government and defense communications networks and specially designed business systems. No one knows what that means yet, and one observer opined it would be work for the government alone. Layoffs have already wiped out some qualified dp communications experts, so RCA is not being too careful.

The bright postscript to the black week that followed the announcement was that orders were the highest RCA ever recorded for a single week. Users, stuck with their systems and plans for expansion, made up their minds quickly about that additional equipment they were thinking of ordering.

In addition, RCA's marketing team got on the phone to find out what customers with firm orders were canceling. RCA reportedly had 150-200 orders for the new series, about 50 of which have been delivered. Only two canceled at that time.

User Uneasiness

But if that sounds like the RCA customer is taking the move with aplomb, he is not. If RCA can't sell the operation — and sell it to a stable, responsible firm — the user knows he has problems. The effort to sell RCA is keeping everything in limbo at writing, so users have no idea what kind of support Sarnoff meant when he assured them that "RCA intends to fulfill its contractual commitments." Users are not worried about hardware maintenance, but software support. Their fear is that most of the RCA software force will be gone soon.

Robert Farmer, dp director for Orange County, Calif., said the effect on their installation could be "devastating." They have two 45s installed and two 6s on order for 1972 delivery. "We need that extra capacity," he said, "and conversion to another vendor would be a big problem."

At least one user didn't wait for RCA to specify support, we hear. With a system on order, the head of a large company flew into New York to tell RCA executives that they had promised to provide him with systems engineers for six months and that RCA would keep that promise. Period. Another user, expecting to retain his Spectra equipment for a few years because of the programming investment, planned to enforce his contract unless it was more advantageous not to, meaning if RCA is willing to sell him the systems at a greatly reduced rate.

Very few contracts in the industry are written with clauses specifying software performance requiring constant updates and new products or hours of systems engineering time. RCA is therefore, probably not contractually liable in most instances. As with IBM when it unbundled, all the user can go on is the verbal commitment made by salesmen and the advertising campaign. This does carry some weight in the courts if suits become necessary. While lawyers say the user should, of course, wait for RCA to clarify its supports plans, he should in the meantime consult his attorney on both the verbal and contractual commitments.

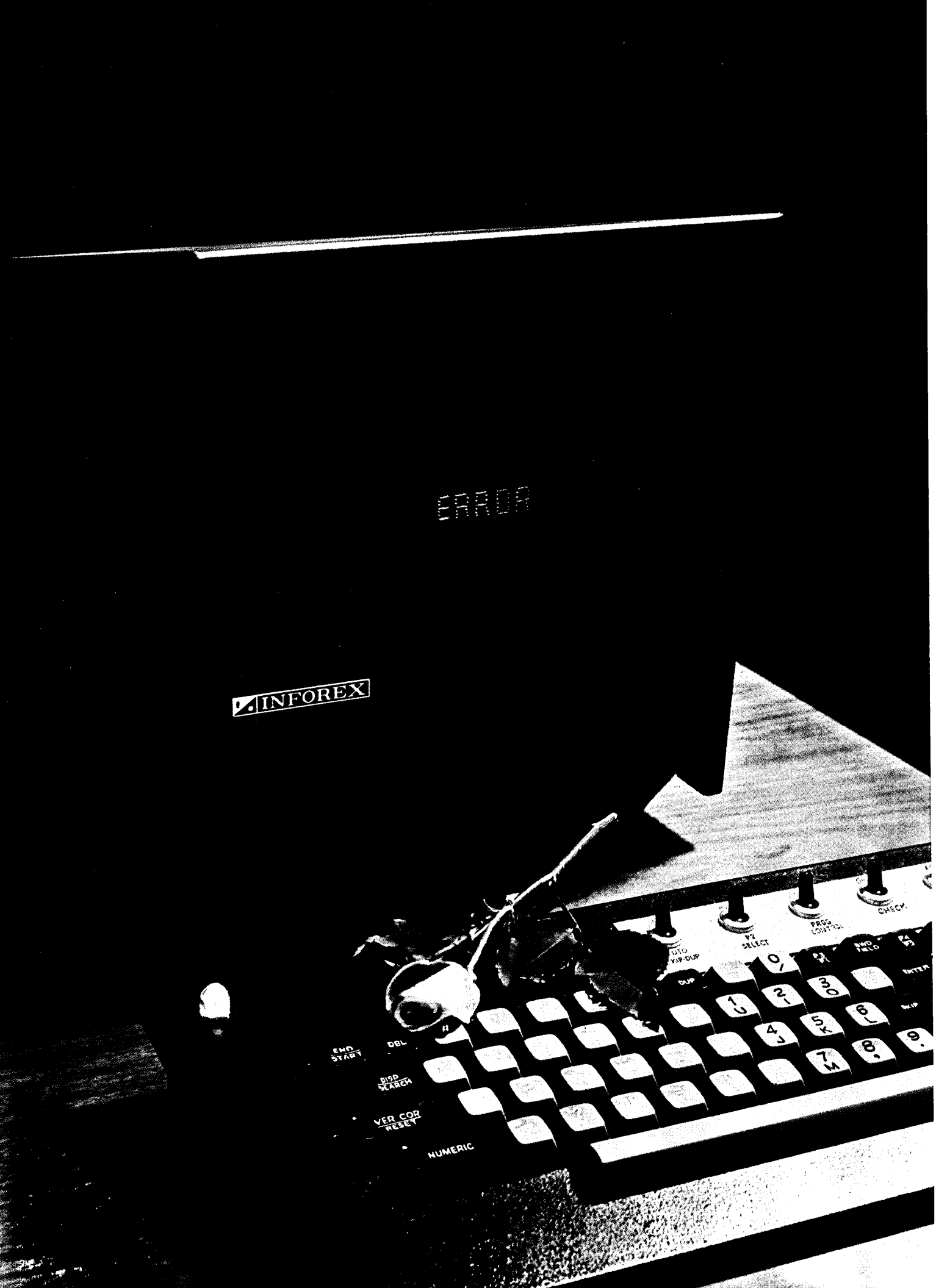
RCA data processing division president Rooney assured David Rau, president of the RCA Users Association, that top executives would be on hand to answer questions at the user meeting in San Francisco last week.

The two overriding questions for the industry are: what does the RCA dropout mean to the user and his attitude toward other mainframe manufacturers; and, quite relatedly, what are the antitrust implications for IBM.

With both RCA and GE throwing in the towel within the last 18 months, IBM is faced with the prospect of an unsolicited larger share of the market. Reports are that although it had no love for its IBM-stacked competitor and battled furiously against RCA in the field, it did not welcome the demise. Actually, IBM executives warned the sales force not to camp on RCA user doorsteps, but the warning came too late, since many of those users report their first visitors Monday, Sept. 20, were from IBM. One antitrust expert called the RCA failure "the best thing that happened. Now the government can see that IBM doesn't give a damn for antitrust laws and is out to push people out of business. This gives weight to divide them like Standard Oil and American Tobacco were, and I have a strong feeling IBM will be divided."

We asked if IBM could really be blamed for RCA's mistakes. He pointed out that IBM's peripherals price decreases hurt RCA as badly as it did the peripherals manufacturers, and opined, "it's a case of bigness is badness." Those strong comments are, of course, one school of antitrust thought; but regardless of what the opinions are, the RCA failure must have some impact on the thinking of the Justice Department.

—Angeline Pantages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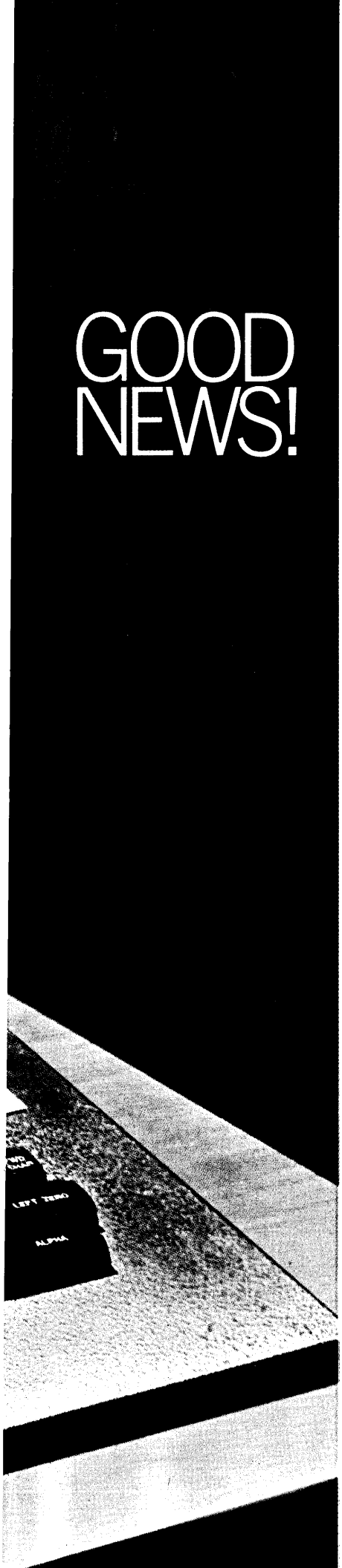

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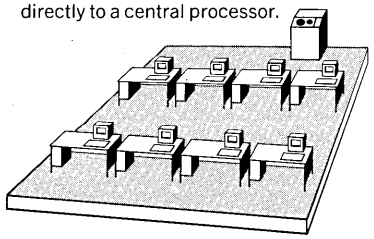

INFOREX

CIRCLE 31 ON READER CARD

NEWS SCENE

Data General Sues DCC; DCC Sues Data General

Data General Corp. and Digital Computer Controls, Inc., are both dynamic, young companies. Each came from nowhere to become factors in the minicomputer field. Data General is far along the road with its claim that it's the No. 2 minicomputer maker. But DCC is in there fighting, complete with public offerings and dramatic fluctuations in the price of its stock that would have been less noticeable in 1968 than they are now.

DCC's products seek to exploit a new market in minicomputers; they are compatible *replacements* for Digital Equipment Corp. and Data General minicomputers. This is apparently what sparked the suits. DCC, it seems, has announced a substitute Data General Nova 1200 called the D-116.

DCC's sales pitch to oem's is that their minicomputers are plug compatible replacements for existing minis but at lower prices and with greater reliability, plus faster speeds in some cases. Thus far the firm has delivered only one model, the D-112, a PDP-8 substitute, of which some 200 have been shipped, with no legal action from DEC resulting. DCC claims there is no basis for suits against themselves in that they violate no patents and their equipment is not *identical* to the machines it replaces, but compatible in the sense that RCA mainframes were IBM compatible.

Data General has charged, however, that DCC and its president John Ackley have unlawfully obtained blueprints, schematic designs, and other confidential information in order to produce and sell the D-116. Data General seeks to enjoin DCC from manufacturing and selling the D-116 to Data General's customers, which amounts to asking DCC to withdraw the D-116, especially since its only conceivable market is 1200 customers looking for a cheaper — and better, says DCC — substitute.

The Data General complaint seeks compensatory and punitive damages in an unstated amount and demands an accounting of DCC's profits from the alleged acts against Data General. DCC countered with a suit of its own, alleging that Data General's suit was intended to inflict injury on DCC and that Data General's officers are aware there is no basis in fact for its charges. DCC also seeks damages in an unspecified amount, plus punitive damages of $1 million.

Ackley explains his firm's counter claim on the basis that DCC obtained its information about the 1200 by buying one and taking it apart. Further, he says there could be no damages to Data General in that DCC has not yet delivered any D-116s; indeed, deliveries are scheduled to begin this month.

It is notable, however, that there have been rumors for some time that Data General would sue DCC, and that the latter's promotion of the D-116 has been rather low key. No D-116 product information was ever released to *Datamation,* for example, although the machine has been mentioned in DCC advertisements.

Whatever happens, these two mini makers have gone one more step forward imitating their big brothers by suing each other.

IBM's entry into the brokerage communications business gives a broker a grand total of 178 keys to push to call for data ranging from a customer's portfolio to current stock prices and to place orders that are automatically routed directly to the floor of the proper exchange.

IBM Enters Quotation Business

With the announcement of the IBM 3670 brokerage communications system, the giant has plunged into a business dominated by Bunker Ramo and GTE's Ultronic Systems. The two firms said they're confident they will prevail and note with relief that the IBM system is primarily hardware, rather than a service; a potential IBM user would have to provide his own data base or subscribe to services like those offered by BR and Ultronic.

The IBM announcement comes close after release of a new BR service called Market Decision System 7 which provides not only stock quotations, but performs certain trading computations as well. The new IBM system provides virtually every sort of information a registered representative could require through a desk-top crt terminal that sports *one hundred and seventy-eight* keys and can display up to 1,200 characters at a time. Printers and a controller also are provided. The system accesses mainframes through OS with TCAM (telecommunications access method).

Although Ultronic has not announced any new equipment recently,

Over 400 DATA 100 Terminals are already talking to 360's, 370's, 6600's, 1108's and Spectras

DATA 100 is the leading independent supplier of plug replacement batch terminals to users in government, education, industrial and commercial markets. Why? Because DATA 100 offers:

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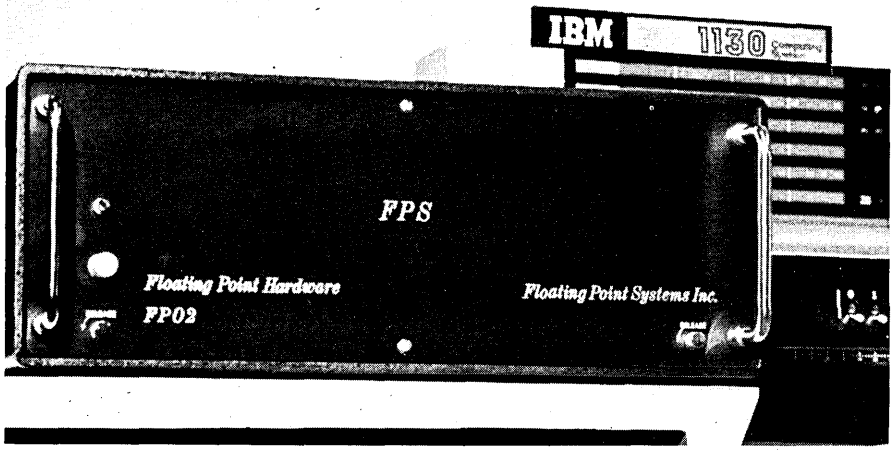
CIRCLE 47 ON READER CARD

Don't replace your IBM 1130. Speed it up.



Before you replace your IBM 1130 with a shiny new Whizbang 7, consider:

1. **Speed-up floating point functions**
2. **Install today/use tomorrow**
3. **No retraining/no reprogramming**

The 1130 has a lot going for it. Like mountains of field-proven applications software. DOS and peripherals. Programmers and operators already trained.

Only thing is, an 8-hour shift isn't enough sometimes to get things done. Sometimes 24 hours won't do it either.

Of course, you could get a new system: reprogram, retrain and spend a lot of money. Or you can update with Floating Point Systems. And go back to an 8-hour day (or less).

SEE YOU AT THE F.J.C.C. BOOTH #1131

Watch our Fast Fourier Transform (FFT) demonstration. Cost is under $16,000. Not the $40,000 or over you might expect.

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Digital Product Mktg.	713/626-2922	QPL	213/682-3705

Floating Point Systems Inc.

4377 S.W. 142nd Ave. Beaverton, Oregon 97005 (503) 643-1552

CIRCLE 23 ON READER CARD

it believes its hardware is competitive with the new BR and IBM systems.

The 3670 system was developed by IBM in cooperation with Merrill Lynch, Pierce, Fenner & Smith which ordered precisely 3,896 of the new terminals. Merrill Lynch is a big customer of BR and Ultronic with about an equal number of terminals in use from both firms.

The fate of these terminals is uncertain once Merrill Lynch takes delivery on the IBM equipment.

What happens to BR and Ultronic is also uncertain. But they've still got some planning time: the IBM systems won't be delivered for another year.

Burroughs, Univac Would Unplug the Independents

Independent equipment makers have been trying for a long time to capture a slice of the peripherals market monopolized by major systems makers — without much success. Last month another attempt was under way.

Principals are Sci-Tek, Inc., a Wilmington, Del., systems developer; Univac; Burroughs; the U.S. Navy; the U.S. Air Force; and last, but certainly not least, Rep. Jack Brooks of Texas, whose House Government Operations subcommittee plays a key role in determining federal dp policies and practices.

Univac has refused to let Sci-Tek connect an independently made, plug-compatible memory to an 1108 leased to the Naval Weapons Command at China Lake, Calif. Sci-Tek has also developed a satellite RJE terminal (actually a minicomputer with peripherals) for the Air Force's Phase II Base Level Standardization System which is supported by B3500s. A test-bed demonstration of this terminal is scheduled to begin shortly at Elmendorf AFB Alaska. Sci-Tek wants to connect directly to the I/O channel of the B3500, but Burroughs insists the new terminal must interface with the tape controller.

A spokesman for the Brooks subcommittee says he doesn't see how any lessor (both the Univac and Burroughs systems are leased) "can tell the government what it can and can-

not do. After all, who's paying whom?"

The feds "have a legitimate interest in obtaining cpu interface information," he argues, adding that federal dp users "should have the right to use the equipment in any way they see fit, so long as the equipment isn't damaged."

A Burroughs source says that if the Sci-Tek terminal bypasses the tape controller, thereby interfacing directly with the master control program, the result could affect the performance of the entire system, "and we would be responsible for any degredation." He was then asked whether the company would allow Sci-Tek to bypass the controller in the forthcoming test-bed demonstration, so that good and bad effects could be evaluated. The answer was that such an analysis would be too time consuming and expensive. It would cost "at least $100K," said our source, who emphasized the figure was an extremely rough estimate.

Sci-Tek implied strongly that Burroughs is less concerned about system performance than about winning a contract worth an estimated $9 million. The specs for this contract, covering procurement of satellite terminals for many of the existing Phase II sites, will be based on the forthcoming test-bed demonstration at Elmendorf. Sci-Tek's point is that if its terminal has to interface with the controller, Burroughs will have a much better chance of winning the follow-on with its own remote terminal (the DC 1000 series). If the controller is bypassed, however, Burroughs will lose this competitive advantage, and one controller, renting for $140/month, can be eliminated from the existing configuration.

The Air Force, so far at least, has sided with Burroughs. A spokesman denies that bypassing the controller would eliminate it because the unit would still be needed to provide reliability. He also says Sci-Tek incorrectly assumed when it won the RJE terminal design contract several months ago that the B3500 controller was supposed to be emulated. "Actually, as we understand the contract, it calls for Sci-Tek to provide a terminal that interfaces with the system through the controller," he explains. Sci-Tek denies this, saying that its intentions have been clear from the start to both the Air Force and Burroughs.

The Air Force recently asked Sci-Tek to modify its system to interface with the controller and is apparently willing to pay the extra costs involved. Asked why the government is so accommodating, the Air Force spokesman admitted that there is "some ambiguity" in the contract as previously signed.

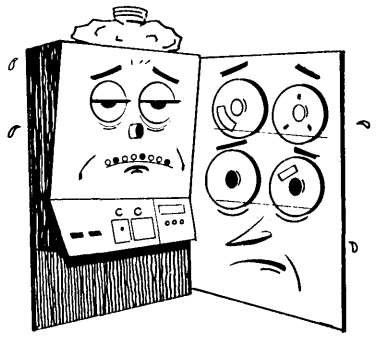
Sci-Tek, for its part, has agreed to interface with the controller. Meanwhile, officials of the company are looking for a way to interface directly. One possibility is for the Air Force to buy the B3500 system at Elmendorf — the one that will support the demonstration. The idea "looks attractive," said a DOD source outside the Air Force who is involved in the controversy.

The hassle between Sci-Tek and Univac arose after Sci-Tek, in answer to an rfp calling for enhancement of the existing 1108 system at China Lake, offered a software package, Speedpak, which reportedly increases the throughput of Exec 8 by 25-100% with the help of an allegedly plug-compatible extended memory made by Weismantel, Inc., Minneapolis. Weismantel currently is in bankruptcy court. University Computing Co.'s leasing division, which owns the China Lake system, recently acquired a "substantial interest" in Weismantel, says a source.

Univac, however, still retains the China Lake maintenance contract, and when queried by *Datamation,* declined to comment on the dispute with Sci-Tek beyond saying that its position had been fully explained to the Navy and to GSA. From other sources it was learned that Univac is concerned basically with how its system maintenance responsibilities will be affected if the Weismantel memory is connected to the China Lake 1108. Univac is also worried about degredation of system performance.

Just before we went to press, the Navy announced plans to issue a new rfp covering replacement of the 1108 in China Lake with a new system capable of providing the additional capability required. System maintenance responsiblities will be included. Independent hardware and software suppliers won't be able to bid on their own for this contract, but the Navy will encourage them to form joint ventures with each other and/or major cpu makers.

Wouldn't it be a shame if your computer system could perform better and you didn't know it?



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CIRCLE 54 ON READER CARD

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CIRCLE 8 ON READER CARD

Software Patent Case Going to Supreme Court

The Dept. of Justice will ask the Supreme Court to decide whether computer software is patentable.

It's received "a number" of complaints from industry and Congress regarding a recent decision of the Court of Customs and Patent Appeals (CCPA) concerning a program for automatically converting BCD numbers into binary form. The court, overturning an earlier patent office ruling, concluded that the program is patentable. It was developed by two Bell Telephone Laboratories engineers, Gary Benson and Arthur Tabbot.

A Justice Department spokesman declines to say who complained, but it is known that Rep. Jack Brooks of Texas wrote to the Attorney General earlier asking for a Supreme Court review of CCPA's Benson-Tabbot decision and that the inspiration for his letter came at least partly from the Information Industry Association, a Washington-based trade association whose members use dp to provide information services.

The Justice Department opposes patents for computer programs, said the spokesman, because of the "anticompetitive ramifications" and "the unfortunate consequences for users." He added that if the pending court action is unsuccessful, legislation may be introduced which would make software unpatentable. Rep. Brooks is a member of the House Judiciary Committee, which would have responsibility for such a bill.

The Benson-Tabbot decision is the latest in a long series of confrontations between the Patent Office, which thinks computer programs aren't patentable, and CCPA, which thinks they are. Basically, the argument involves the question of whether programs are "mental processes" and hence outside the scope of the patent statute.

CCPA stated its views initially in the Prater & Wei case two years ago (see April '69, p. 174), when it held that a process capable of being performed mentally may be patentable if it is carried out by a machine without human intervention. Subsequent CCPA decisions have attempted to establish a boundary between this new class of inventions and unpatentable "mental processes." The main contribution of the Benson-Tabbot decision is to reaffirm an idea stated earlier in more general terms: if it is reasonable to assume that a "mental step" process will be performed entirely on a machine, then the process is patentable assuming it meets other statutory requirements.

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CIRCLE 13 ON READER CARD

Software Firm Eyes Booming S/3 Market

Hardware will play a part in a software company's road back to profitability.

Applied Data Research, Inc., Princeton, N.J., software company, is going to enter the hardware distribution business in California, selling a card reader made by Bridge Data Products, Philadelphia. It is called the model 8063 and will be sold through Programmatics, ADR's subsidiary in Los Angeles. The reader is for the IBM System/3 computer and sells for $6000 with a lease price of $200 a

month, compared with IBM's price of $500 a month.

The arrangement also calls for Bridge Data to market Programmatics' System/3 Fortran compiler, PI FORT, to prospects in nine New England and mid-Atlantic states.

Programmatics president David Ferguson said PI FORT is the first of many software products his firm hopes to offer to a booming System/3 market which IBM said will grow to 25,000 installations. Some 6,000 will have been installed at the end of this year. He said Programmatics is counting on this vast market to help it achieve a better balance between proprietary package sales (now 10%) and contract programming (90%). Contract programming, he says, is highly competitive and thus marginally profitable, while development and marketing costs can be recovered more rapidly on software that is packaged and licensed to large numbers of users. Ferguson hopes to change his firm's revenue ratio to 50-50.

Programmatics' only other product is PI SORT, a sort package which it has licensed to some 60 customers. ADR sells the highly successful Autoflow. With some 1,600 installations it is the most widely distributed proprietary package in the software industry. ADR sells four other packages, including The Librarian, marketed with an assist from IBM, who agreed to sell it in South America and Asia when it settled ADR's $900-million antitrust suit out of court last year for $2 million in cash and marketing services. (See Oct. 1, 1970, p. 72.) Proprietary packages account for about 40% of ADR's sales.

The 12-year-old firm reported a $104,000 profit in 1969, but had losses of $226,000 last year and $310,000 in the first half of this year. A year ago it had all but signed to sell Programmatics to Computer Machinery Corp., the Los Angeles data entry firm; but the IBM cash settlement saved the Los Angeles subsidiary. This summer, however, financial troubles forced ADR to sell its computer centers in Washington and Princeton. Planning Research acquired the Washington center, and Cambridge Computer Corp. bought the Princeton facility.

A much better second half has been promised by president John R. Bennett who cites as one factor a large backlog of orders held by Programmatics. The subsidiary was formed in 1963 and, with a staff of 34, does system programming for computer manufacturers and some users, in addition to selling PI FORT and PI SORT. Last summer it installed a System/3 Model 10 computer at the Los Angeles office to demonstrate PI FORT and to develop other packages for the System/3 market. Ferguson won't discuss his plans any further than that, but he said they do not rule out other hardware marketing arrangements. Many software houses consider only development costs when pricing software, Ferguson said. Actually, marketing costs are even higher and must be figured into the price. He feels that it is too expensive to have highly trained salesmen marketing something that means only $100 a month in revenue. The addition of other packages and some hardware spreads the marketing costs out, he said.

Programmatics scored somewhat of a scoop when it introduced the PI FORT compiler last spring, a full year before IBM will have its version, due August 1972. The system is for companies using the S/3 for engineering and scientific computation in addition to business data processing. The lease price is $100 a month. Six have been sold so far.

All Marriages Aren't Made in Heaven

Many a fictional "ideal marriage" was initiated by an orphan.

This was, in a sense, the case last month when Cincom Systems, a Cincinnati-based software company, acquired Environ/1, a teleprocessing control package, from Itel/ISS, bringing about what Cincom president Tom Nies called an "ideal marriage" between Cincom's Total, a data base management system, and Environ.

The orphans in this story were Environ/1 users who were more than a little worried in mid-September when Itel/ISS announced it would discontinue marketing and supporting the package and didn't say anything about selling out to anyone else.

There were hints of abandoned users getting together in a breach of contract suit. There was talk among Itel/ISS employees whose jobs were threatened by the drop of the package of formation of a new company dedicated to marketing and supporting Environ. The customers liked the package, which was developed by Information Storage Systems before it was acquired by Itel Corp. this year to form Itel/ISS. Conjecture was Itel decided to drop the package because it didn't want to be in the software business.

One user, Gordon Zeller, responsible for the Environ/1 monitor at the Los Angeles Times, where it is used to do such things as compose the classified section, said: "We looked at every other teleprocessing control system on the market and decided Environ/1 was far ahead of anything else. We were impressed by the company's financial strength, too. It was obvious they weren't going to disappear overnight. We never thought they'd simply stop supporting the package." But that's what happened, almost.

Zeller and other users began to breathe more easily when the technical men who had been supporting Environ/1 continued to call on them — only all of a sudden they weren't from Itel/ISS, but from Cincom Systems.

Nies said Cincom had been looking for some time for a teleprocessing control package which could operate in a data base environment. They were made aware of Environ's availability by Environ users who also were users of Total, who said, "hey, you guys should get together." And so, the "ideal marriage" and no more orphans.

California EDP Consolidates: 45-36

The state of California has been attempting to consolidate its multimillion dollar edp operations for some three years now amid much debate over who should do it and how it should be done.

Last month it appeared things were getting done despite the fact the operations are under the interim control of a new unit of the Dept. of Finance and in spite of the impact on the state of the RCA announcement. RCA and IBM have about a 50-50 split of the major portion of state installations, and RCA equipment figures prominently in the long-range consolidation plan.

Seen as the most hopeful note last

month were actual planning meetings being held by agencies in Consolidation Group IV (fiscal and personnel) established in the state's long-range master plan under which the agencies began working together toward establishment of a data processing service center to provide services to the group members. These agencies — the state controller, state treasurer, state personnel board, state teachers' retirement system, public employees' retirement system, and the department of veteran's affairs — would hardly talk to each other on the subject of edp, said one observer; but now they've realized they're not going to be allowed to upgrade individually, so they're working together on a plan which should facilitate eventual development of an integrated fiscal and personnel information system.

Another hopeful note was the completion of consolidation of the Highway Patrol's AutoStatis (hot car) system into the Dept. of Justice system scheduled to be fully implemented on Oct. 1, despite the fact that RCA equipment is involved.

Beyond bringing the Highway Patrol system onto Justice's Spectra-based system, the future plans for the Justice center were clouded at this writing by the RCA announcement and a lack of specific information from RCA as to what the state could expect in the way of support.

Plans had called for the system to add a Spectra 70/60 before the end of the year and to upgrade an existing 70/45 to a 60. This would have accommodated the addition of the Highway Patrol system and implementation of the state's Criminal Justice Information System (CJIS). Justice can take on the Highway Patrol without the upgrades, said a state spokesman, "but as for CJIS, we'll have to wait and see."

However, plans were being implemented last month which would cut the number of computers in state government from 45 to 36, and only the Justice upgrade was in question. The Highway Patrol was getting rid of two IBM 7740s and one 360/30. The Franchise Tax Board was replacing two 360/40s with a 360/65. Both the California Youth Authority and the Dept. of Agriculture were giving up 360/20s and merging into two separate RCA centers — Mental Health in the case of CYA, and the Board of Equalization in the case of Agriculture. The Dept. of General Services was giving up an RCA 301.

The Dept. of Human Resources Development was scheduled to upgrade from an IBM 7080 and a 360/30 to equipment that had not been officially selected at this writing; but sources said it looked like it would be a 370. RCA reportedly spent some $90,000 trying to get this buy but lost out to IBM in benchmark tests conducted during the summer.

In the meantime, the Dept. of Finance, which was handed responsibility for state data processing in July when the Office of Management Services was budgeted out of existence, was "still in the formative stages as far as policy is concerned," but chief deputy director James Dwight said his department "intends to be action oriented in this field." Leading the "action" will be Lee Smith, on contract as chief of edp control and development.

NEWS BRIEFS

From Wellington's Dust Plymouth's Rock Rises

According to a company officer, the name for Plymouth Computer Systems, Inc., New York, was selected because the founders felt like pilgrims. However, their voyage seems mostly to have been from Wellington Computer Systems, a three-year-old firm that filed for bankruptcy reorganization under Chapter 11 last July, a month before Plymouth was formed. When no reorganization of Wellington was effected, Plymouth bought all its customer contracts, assets, and tangible properties, including the name Wellington, at the liquidation sale.

Plymouth, it seems, has substantially the same management, personnel, and business as Wellington, but some new backing from Heizer Corp., Chicago, a corporate development organization. With only 46 people, the new company is a far cry from the Wellington of old which once had 350. But in addition to its apparently successful consulting business, Wellington had also bought the Telemax reservations service, which may have been the proverbial straw. Plymouth is apparently in the clear now, shorn of Wellington's debts.

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CIRCLE 36 ON READER CARD

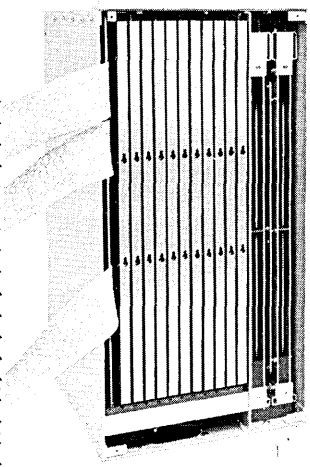
Automated Radiology

An automated radiological diagnosis system, under development over the last 10 years at the Univ. of Missouri Medical Center, bested a panel of 10 trained radiologists in a test diagnosis of 135 cases. The computer system diagnosed 73% of the cases correctly against 62% for the panel. Developed under $1.5 million in federal grants, the system uses an electronic scanner which can examine up to 1,024 spots along as many as 1,024 lines from top to bottom. Traditional 14 x 17-inch X-ray films are placed on the scanner and readings are recorded on magnetic tape and fed to the university's College of Engineering 360/50 which processes the data into a mathematical, two-dimensional array and enhances areas for further examination, ignoring those found to be normal or irrelevant. It automatically extracts key features found in the enhanced areas, processes the extracted features, and compares its findings with a decision-making format developed by the research team.

SHORTLINES

It's official. General Motors Corp. has placed the first commercial order for a Control Data Star-100 (Jan. 1, p. 17). The CDC announcement said GM will use the supercomputer "in advanced applications which involve many graphics display terminals." ... Univac opened a new distribution center near Chicago's O'Hare airport which it says will be capable of supplying computer parts and equipment to any customer anywhere in the world within 24 hours ... Honeywell Information Systems moved its Keyplex production operations from San Diego to Framingham, Mass., to permit manufacture in the California plant of components and assemblies for its 6000 series being built in Phoenix ... Computer Technology Inc., a 71%-owned facilities management subsidiary of University Computing Co., acquired last year from LTV Aerospace Corp., is being merged into the parent company ... In a similar move, Microdata Corp., Santa Ana, Calif., merged Micro Systems, Inc., into Microdata ... In what is believed to be the first takeover in the U.K. of one major software company by another, Logica has agreed to acquire the equity of the 1900 Group Ltd. ... In another U.K. first, a computer-based, real-time air cargo control system was placed in operation at London's Heathrow Airport, under control of two ICL System 4-72 computers ... Computer Automation, Inc., Newport Beach, Calif., minicomputer manufacturer, moved into the U.K. market with formation of a wholly owned British subsidiary, CAI, Ltd., in London ... The western hemisphere's oldest company, Hudson's Bay Co., headquartered in Winnipeg, Canada, is installing Canada's first computerized point-of-sale system, based on NCR 280 terminals ... And GTE Information Systems Inc. is expanding its marketing efforts in Canada to include sale of terminals and communications equipment through its Canadian subsidiary, Combined Market Quotations Ltd. ... Some 8,000 apparently healthy Teamster Union members are undergoing physical exams in Newburgh, N.Y., to determine if they really are. Tests are conducted in a computer-equipped "Health Mobile" in a program administered by International Compumedics Corp., Princeton, N.J., for the union, which furnishes them free as a welfare fund benefit ... CGA Computer Associates Inc., East Orange, N.J., acquired Nevis-Wallen Associates, Cleveland management consulting firm ... Pertec Corp., Chatsworth, Calif., created a new division, Pertec Peripheral Equipment, made up of Peripheral Equipment Corp. (PEC) and Computer Memory Devices, Inc. (CMD) ... Data Processing Financial & General Corp. has officially dropped that name in favor of the simpler DPF Inc. ... TRW Systems, Redondo Beach, Calif., has begun development of a computer-based management information system for the police department of the city of Glendale, Calif. ... California Computer Products, Inc., completed negotiations to acquire an additional 27.9% interest in Century Data Systems, Inc., bringing its total ownership in the disc drive systems subsidiary to 93.7% ... PRC Computer Center, Inc., a Planning Research Corp. company, acquired Pharmacy Computer Billing, an Encino, Calif., firm. ■

Zero In On Your Computer Needs Today — With Toko's Splitsecond Memory System



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CIRCLE 21 ON READER CARD

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BOEING ELECTRONIC PRODUCTS

CIRCLE 46 ON READER CARD

PRODUCT SPOTLIGHT

Security Monitor

The Data Sentinel system uses a minicomputer to monitor the job stream of large computer installations in an attempt to insure the security of information. It does this after a mathematical analysis of the job stream is done to establish performance parameters. Violations of parameter limits lead to alarms which are displayed at a guard's console. Alarms range from a deviation from a standard procedure, requiring only that the guard push a button if he thinks everything is in order, to an alarm that signifies that the Sentinel itself is being tampered with. An interesting feature of the system is that it conducts a random attendance check on the guard to make sure the system is manned at all times. An audit trail of operations is maintained on tape and in listing form. A typical system sells for $100K and can be rented for something under $3K/month. The BCA/Burns Data Sentinel is available 60-90 days ARO. BURNS INTERNATIONAL SECURITY SERVICES, INC., San Francisco, Calif. For information:

CIRCLE 511 ON READER CARD

Business/Scientific COM

The 4460 COM unit might become the most popular model ever marketed by this manufacturer because the unit is not biased toward either the commercial or scientific environment. An estimated throughput rate of 180 pages a minute (64 132-character lines/page) is recorded on 16 and 35mm roll film or 105mm fiche at 24 or 42X reduction ratios by the Universal camera. There are four programmable character sizes available to draw the 119-character set on the crt. Software includes routines for the host computer, business and graphics applications programs, and vector generation. On- and off-line models are available, with the basic price of an off-line model set at $150K. Deliveries are under way. STROMBERG DATAGRAPHIX INC., San Diego, Calif. For information:

CIRCLE 519 ON READER CARD

Crt Terminal

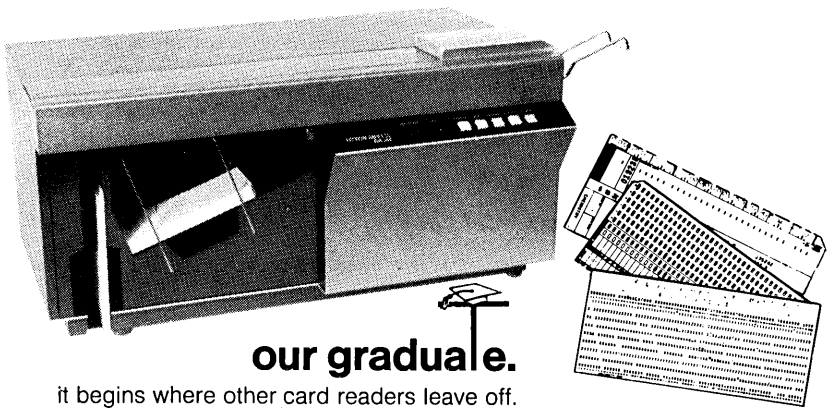
The 64-character ASCII repertory of the model 4380 tty-compatible crt terminal can be displayed in 10 or 20 lines of 40 or 80 5x7 dot matrix characters on the 60 Hz screen. Options to the basic unit include an integral modem, lower case characters, a light pen, and interfaces for other peripherals. Communication speeds up to 4800 baud in either parallel or serial models can be specified. The 4380 rents for $78/month on a contract that can be canceled on 90 days' notice. Extended lease and lease/purchase plans are also offered. BENDIX CORP., Southfield, Mich. For information:

CIRCLE 523 ON READER CARD

Store-and-Forward

Up to 64 asynchronous circuits using private phone lines, or switched TWX, TELEX, or WATS lines in any combination, can be accommodated by this firm's initial product in the digital telecommunications market. Called REDECOM, the unit also handles up to three synchronous circuits using the Binary Synchronous Communications mode to serve up to 512 terminals. REDECOM controls polling, performs message header analysis, message routing, error checking, code and line-speed conversion, message logging, status reporting, checkpointing, journalization, recovery, and retrieval. The software support is tailored to each installation, and the whole REDECOM package is supplied on a turnkey basis. The first installation—considered typical of those to follow—includes 16 asynchronous lines, plus two 85A1 lines, a TWX and a TELEX port, and two 2400-baud synchronous lines. It is priced at $250K and rents for approximately $6K/month, including maintenance. Availability of the REDECOM is 60-120 days ARO, depending on software requirements. REDCOR CORP., Woodland Hills, Calif. For information:

CIRCLE 521 ON READER CARD



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CIRCLE 37 ON READER CARD

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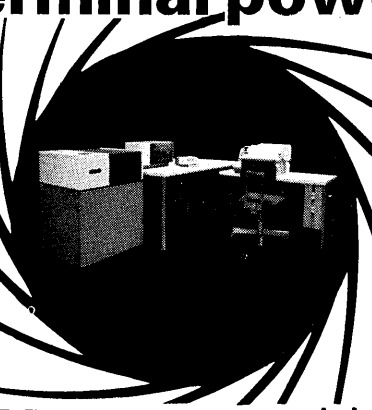

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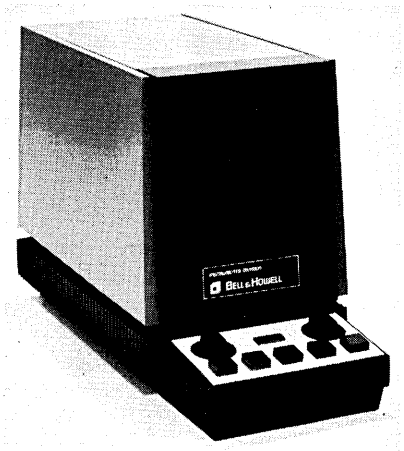
The model 240 cassette unit is actually a cross between a conventional tape drive and a cassette unit. A Philips or equivalent type of cassette is loaded into the 240, but the tape is automatically extracted from the cassette and placed onto a precision capstan, reducing tension and skew-



ing problems, and doing away with the need for pinch rollers, belts, levers, and other components. Single- and double-track models are available for operation at any speed between 2 and 20 ips, with a search and rewind speed of 50 ips. Options include two read/write speeds, dual gap read-after-write head, an automatic head cleaner, and others. Interfaces for many minicomputers are also available, and the 240 is offered both to oem's and end users. A single model 240 is priced at $1150. BELL & HOWELL, Pasadena, Calif. For information:

CIRCLE 515 ON READER CARD

Voice Data Modem

Billed as the "first modem capable of simultaneously transmitting significant quantities of data as well as quality voice" over the same telephone channel, the DVM 1300 features 1300-baud communication. It can operate in full-duplex mode over tielines and half-duplex over the dial network. The price is "in the $2K range in quantities." The firm would not release more specifics because of the price freeze, though they said the DVM 1300 would be marketed both to end users and oem's. Delivery requires about 90 days ARO. PHONPLEX CORP., Jericho, N.Y. For information:

CIRCLE 514 ON READER CARD ■

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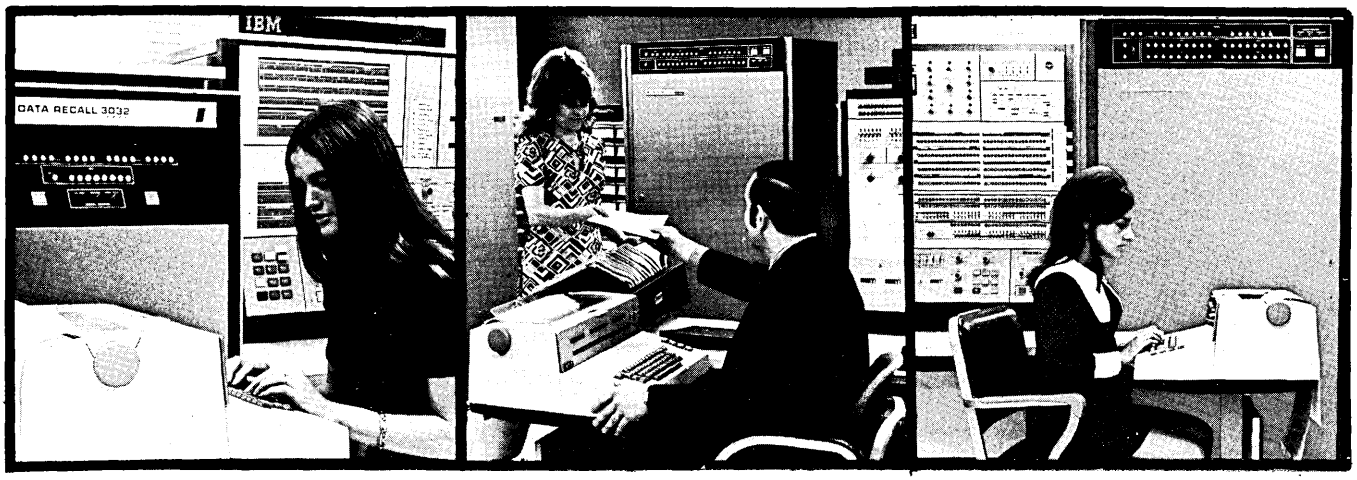

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FACIT

CIRCLE 35 ON READER CARD

Sorting

If the vendor's claims are true, Synchsort is such an efficient sort that a user couldn't afford not to buy it. The claimed improvement over IBM's SM-023 OS sort/merge program is on the order of 1.8:1 in speed; so at Synchsort's basic price of $5500 for five years, a user could save multiples of its cost in decreased machine time.

To accomplish such fast sorting, Synchsort uses what the vendor only describes as a "totally new concept" in sort techniques. It works similarly to conventional sorts in that the use of a random access device for working storage is retained, and it is written in BAL. A patent is expected to be applied for shortly.

The present version of Synchsort is contol card compatible with SM-023 and can operate with non-IBM storage units, which should result in even faster speeds. A DOS version is due soon. Although no versions for systems other than 360 mainframes are anticipated, the firm states that the Synchsort concept is universally applicable, and it would be willing to either sell the rights to the use of the Synchsort technique for application to other computers or modify the package for a fee to other vendors.

Minimum core required is 20K bytes plus twice the size of the larger of the input or output buffer. A three-month lease is available for a one-time fee of $480 for user evaluation. The vendor guarantees superior performance over any other sort, given at least 50K of core to work with. It's the product of a three-year-old, eight-man firm which previously confined its business to contract programming. WHITLOW COMPUTER SYSTEMS, INC., Teaneck, N.J. For information:

CIRCLE 509 ON READER CARD

File Processor

The Pro/Test file processor combines an input select feature with a generation capability so that—the vendor claims—almost any file and/or report can be used as a file conversion/correction utility, test data generator, generalized input editor, data set stripper, generalized report writer, etc. It's a load-and-go utility, requiring no compilation, and all manipulation is done in main memory. It runs under OS and DOS/360, and sells for $5500 or rents for $150 per month. SYNERGETICS CORP., Burlington, Mass. For information:

CIRCLE 501 ON READER CARD

Cross-tabulation

Marketab II is a cross-tabulation system written in COBOL and BAL to run under System/360 DOS with minimum 64K. It is intended primarily for use in market research. Marketab provides for 25-column, 60-row tables, horizontal and/or vertical percents, and printout on 8½ x 11, 11 x 8½, or 11 x 14 paper. Statistical calculations include weighted mean, standard deviation, variance, and standard error. The price is about $20K; rental is available. MNEMONICS INC., Darien, Conn. For information:

CIRCLE 502 ON READER CARD

JCL Library Control

The JCL Library Control System for 360 DOS permits an operator to create and maintain JCL on the SYSRES pack with both card and console call capability. It requires less than 2K core to call the required JCL and no storage for processing applications programs. Thus, JCL/LCS provides the next higher library level than the standard DOS libraries. It sells for $1200 and rents for $50 per month with 30-day cancellation. The package is delivered by mail. WESTERN RESERVE MFG. CO., Somerville, N.J. For information:

CIRCLE 503 ON READER CARD

File Management

GOSSIP is the name of this file management system, and it stands for Generalized Organizational System Summarizer and Information Processor. It is billed as a full-scale management information system comparable to SBC's Mini-MIS, performing such functions as file creation, updating, inquiry, sorting, subsorting, report generation to user format specifications, and calculation of new field values from existing ones. GOSSIP operates on both fixed- and variable-length records and can be installed on any system supporting the BASIC compiler. Since there are some 21 separate modules making up the system, pricing is complicated. A minimum system can be as low as $100/month, but more likely will be in the $300-400 range. MANAGEMENT SYSTEMS CORP., Denver, Colo. For information:

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Tape Library Control

The Tape Recall and Control Systems, TRACS, is a series of programs which provide library control by tape number. Each tape has a number, and each number has a location. TRACS produces daily update reports providing a "map" of the user's library: a listing, in order of job name, showing the location and generation and retention of all tapes. Other reports include a scratch listing, an inventory listing, retention analysis, and a master history tape which shows the number of times each tape has been used and indicates when it is due for cleaning. TRACS is written in COBOL and will be modified to run on any hardware supporting that language. It requires 35K bytes, plus a disc for working storage. The price is $5K. DATACHRON CORP., New York, N.Y. For information:

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Inventory Control

An elaborate inventory control system provides information on such items as raw materials, manufactured and purchased component parts, shipping stocks, and supplies. According to the vendor, it informs the inventory planner when and how much material to order, provides investment and service analysis with control reports that highlight capital tied up in excess stocks, and provides financial data which satisfy basic accounting requirements. All files are updated as transactions occur. The system, written in ANSI COBOL, requires 32K bytes and some disc storage capability. It presently runs on System/360 model 30s and up. The price of $25K includes two man-months of education. WESTINGHOUSE TELE-COMPUTER SYSTEMS CORP., Pittsburgh, Pa. For information:

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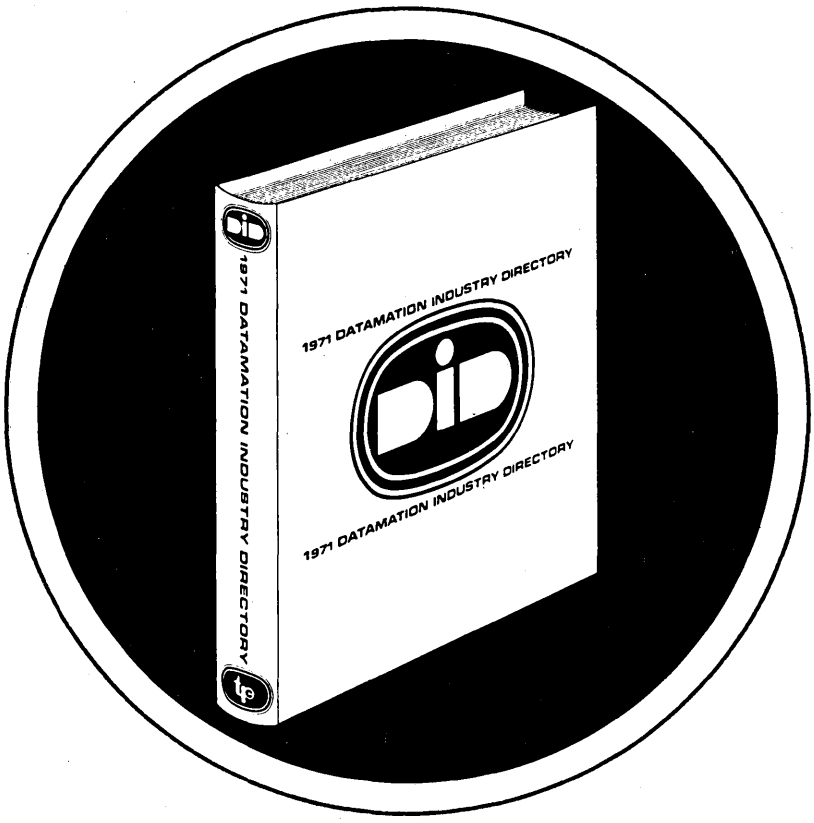

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PEOPLE

Arthur E. Peltosalo, GE corporate vp and troubleshooter, has left the information services business division, where he was general manager, to become group executive, power delivery. Succeeding him is **George J. Feeney,** a top GE technical manager, who had been serving as gm of the information networks department . . . **Jack D. Lee** has been elected vp of Pitney Bowes and head of its newly formed retail systems division. He has responsibility for the Monarch Marking Systems and Malco Plastics subsidiaries, as well as for the company's relationship with Pitney Bowes-Alpex, a joint venture that manufacturers the SPICE computerized point-of-sale system. Lee comes from Associated Merchandising Corp., where he was vp . . . Former executive vp **William P. Graham** has been elected president of EDP Technology Inc., to succeed **Sanford Greenberg,** a company founder, who went over to KMS Industries this spring as vice chairman. The two companies recently completed an agreement permitting KMS to acquire a 51% joint venture interest in EDP's EC11 technical training simulation system . . . **Dr. Harold Sackman,** formerly of the Univ. of Southern California, has been named to head a new department of computer science at Kansas State Univ., Manhattan . . . **Leonard Braun,** a management consultant, has been elected president of Granite Management Services to succeed chairman **Harvey Granat,** who had assumed the presidency this summer when **Arthur Sherman** resigned after less than two months on the job . . . **Donald O. Neddenriep** has been named vp, worldwide product development, for Univac, with responsibility for the development of all the division's hardware and software products. He had been director of the Philadephia Development Center, one of four such centers he now heads . . . Consultant **Edwin B. Heinlein** has joined National BankAmericard Inc. as director, systems development. He will have major responsibility for the development and installation of a nationwide bank credit card information processing system . . . **Donald M. Luby,** former director of marketing for Memorex, has been appointed vp-gm of Wabash Tape Corp., Huntley, Ill. . . . **George O. Thorson** will serve as interim president of Computer Access Systems, Phoenix, following the resignation, for reasons not stated, of **Gary L. De Seelhorst,** one of the company founders, who joined a Phoenix financial consulting firm . . . Army economist **T. Arthur Smith** has been named chairman of the newly authorized Defense Automated Data Systems Evaluation Committee of the Defense Economic Analysis Council . . . **Louis E. Schultz** has joined Peripheral Equipment Corp., Chatsworth, Calif., as product manager for the company's recently introduced disc drives for mini and small computers. He had been with Cogar Corp., where he was director of oem marketing for minicomputers and computer peripherals . . . **Jai Chun Kim** has been promoted to vp of operations for Computer Consultants Corp., New York City, and assumes overall responsibility for all company projects . . . **Liesa Bing,** secretary and general counsel at John Diebold Inc., has been elected to the additional office of corporate vp . . . Urban Sciences, Inc., Wellesley, Mass., law enforcement and transportation consultants, has appointed **William J. A. Bonwitt** manager, management information systems. Most recently, Bonwitt was market manager, government and education, for Honeywell Information Systems . . . **Richard Kelly,** chairman and president of Scientific Control Corp., announced the election of **John M. Coffee** as executive vp and **John Schrock** as vp of finance and administration and secretary. The two former Collins Radio Co. executives are expected to help Kelly bring the financially troubled computer and terminal manufacturer back to a more stable position in the market place . . . **David Shore** has been elected chairman and chief financial officer of Data Computer Systems, Inc., Santa Ana, Calif. . . . **W. Fred Fry** is the new manager of computer applications for Hughes Aircraft's Industrial Products Div. . . . **Ivar G. Blackberg,** former manager of manufacturing for Stewart-Warner Electronics, has been appointed manager of the division's Datafax facsimile communications systems . . . **Arthur H. Hausman,** Ampex exec vp, has been elected to the additional post of chief operating officer, a new position. **William E. Roberts** continues as president, chairman, and chief executive officer. ■

Your System 360 can run like a 370 at less cost.

A new report just published by AUERBACH indicates that many companies will find it wisest to stick with their IBM System 360 and upgrade it with independent peripherals, rather than switch to the more expensive 370.

Titled, "Trade in Your System 370 for a Hot System 360," the report says that some DP Managers can save as much as 20% by this method.

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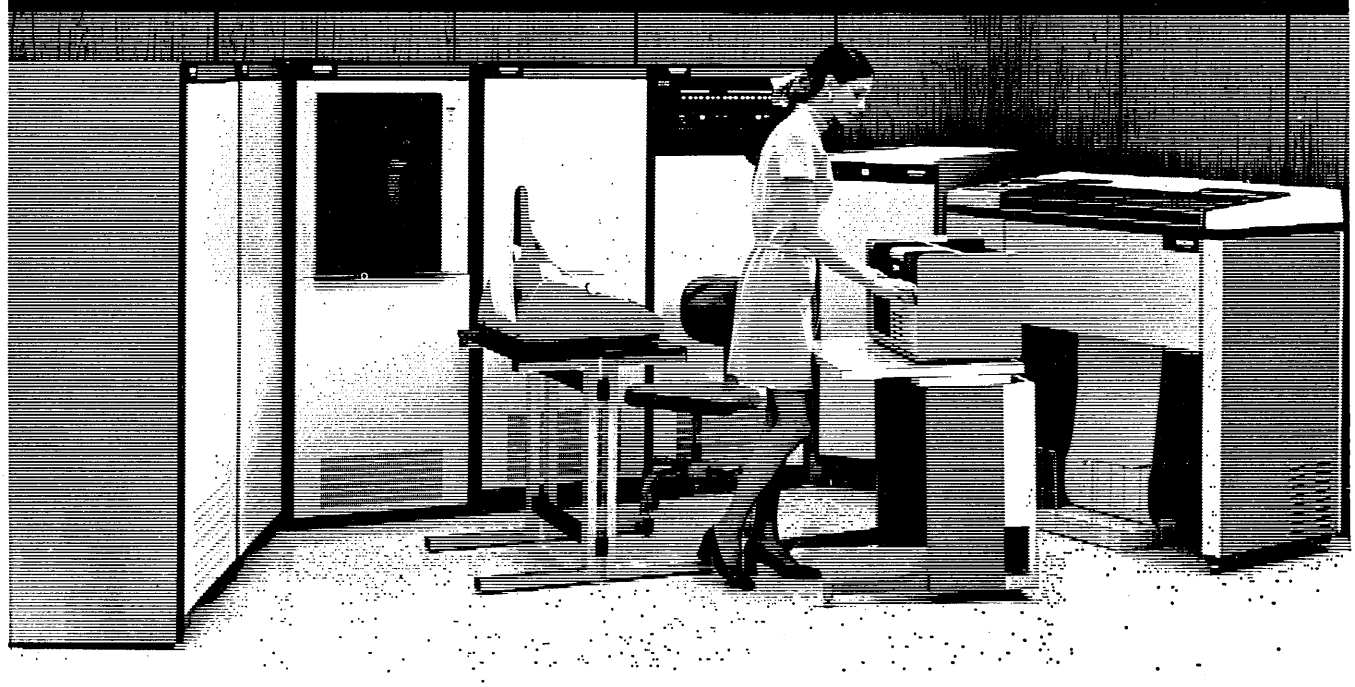


WORLD ROUNDUP

U.K. MULLS FATE OF ATC COMPUTERS

The ultimate fate of the combined military and civil air traffic control scheme in Britain, code-named Linesman-Mediator, is still a matter for grave speculation. With about $500 million spent over the last 10 years to reach the current rather unsatisfactory state of a system doing half the job intended, there are strong pressures for the replacement of the entire information processing part of the project. Some of the main British defense equipment suppliers--Plessey, Marconi, and Ferranti--have contributed the computer machinery as well as their more familiar hardware items: radar and communications equipment. One solution put forward for government control is for the dp to be absorbed by an IBM 9020 system. On the surface, it is a prospect that makes the U.K.'s major computer manufacturer ICL cringe, since they make no pretense about not being equipped to bid for this potentially lush contract. Yet again the attitude might be that IBM, or anyone else taking on the project, would be welcome to it and the consequences.

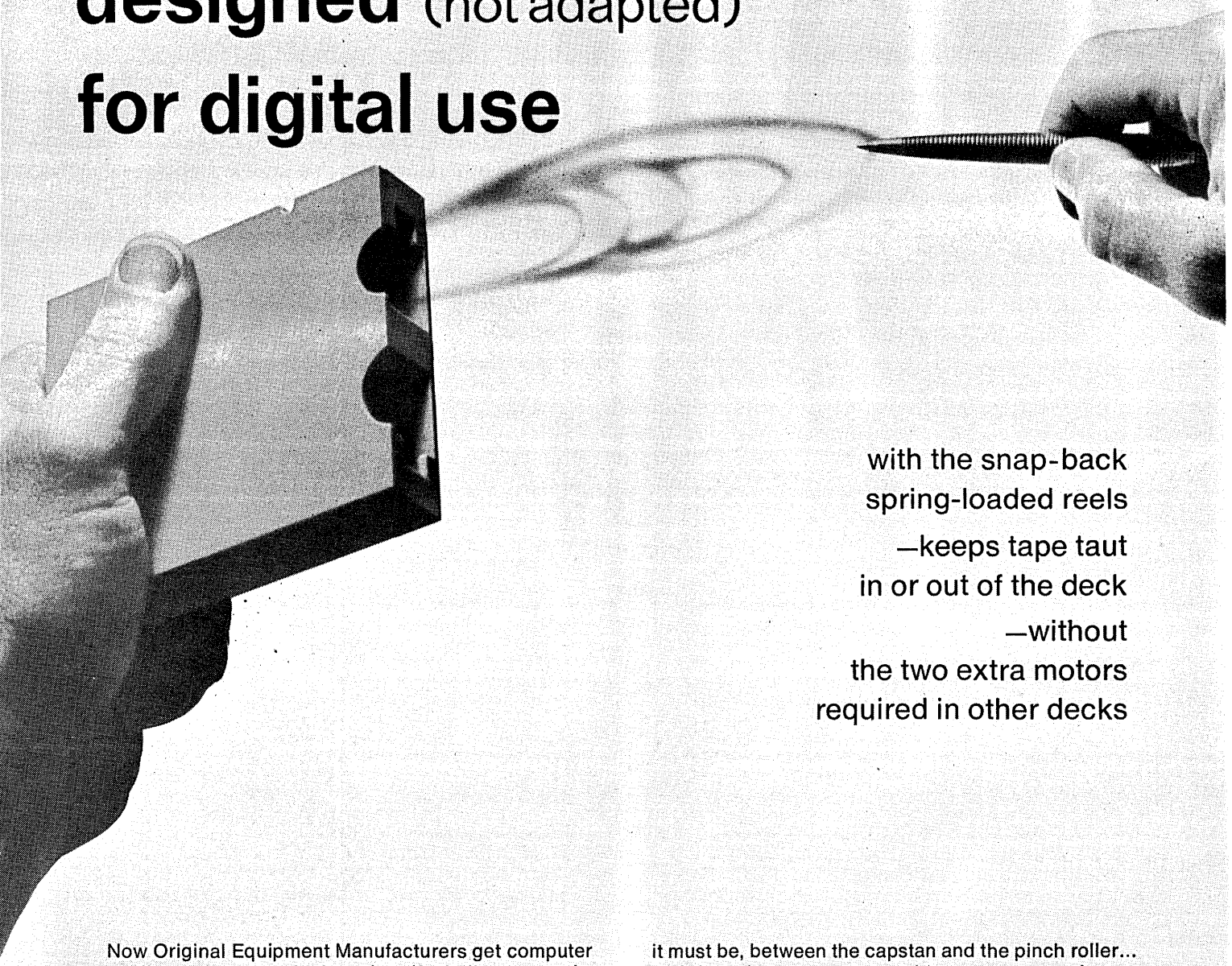
RCA THUNDER JOLTS EUROPE

RCA's abrupt departure from the market left some questions in Europe, particularly regarding technical licenses taken by ICL and Siemens for their own modified versions of Spectra 70. Both European manufacturers had made substantial engineering changes to obtain independence of RCA hardware and software development. Most technical exchanges had evolved from early formal agreements to informal contacts. To contain IBM, ICL moved toward independence some time ago with a decision to exploit a gap in the medium-scale range of machines. Since then an almost exclusively ICL processor has been introduced in this slot. The Siemens family of machines has been much more closely identified across its range with the RCA technology, and the test will come with the introduction of a new series.

MAINFRAME SHAKEOUT RATTLES JAPAN

With a thinning of the ranks in the U.S., can Japan be far behind? It appears not. That small nation has six major mainframe makers, a number considered too large by the Ministry of International Trade and Industry (MITI). One of the Big Six, Toshiba, which is a GE licensee, has approached Nippon Electric, a Honeywell (now HIS) licensee, to see if the computer operations of the two companies could be merged. The reception, we hear, was cool, although a consolidation is not ruled out yet. MITI favors it, but that agency couldn't care less whether firms pull out or merge. Said one observer: "It appears that one way or the other, Toshiba probably will shortly be out of the computer business." Of course, a third licensee, Hitachi, may now be behind the eight ball, following RCA's latest announcement. Hitachi, like ICL and Siemens in Europe, have ties with RCA Computers.

a tape cartridge and deck designed (not adapted) for digital use



with the snap-back spring-loaded reels —keeps tape taut in or out of the deck —without the two extra motors required in other decks

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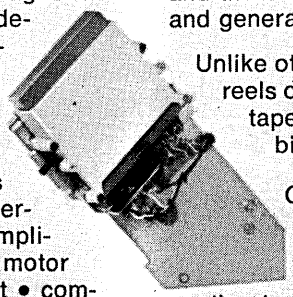

Cartridge loading is like putting bread in a toaster. With the tape under constant tension and the pinch roller inside the cartridge case, tape is always where it must be, between the capstan and the pinch roller... and there is no pressure pad to cause torque losses and generate or collect loose oxides and dirt.

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CIRCLE 7 ON READER CARD

The Forum is offered for readers who want to express their opinion on any aspect of information processing. Your contributions are invited.

THE FORUM

Why MAC, MIS, and ABM Won't Fly (Or, SAGE Advice to the Ambitious)

Let me carry you back five years to the first Stonybrook Conference. During one of those familiar panels on time-sharing or other then-fashionable idiocy, the undersigned, disguised as an irate veteran, arose from the audience to badger J. C. R. Licklider. Amid miscellaneous invective, I charged that various air defense computer systems had never worked, to which Lick replied, "We were never *attacked*!" I seem to remember that my brilliant, penetrating rejoinder was something like, "Aw, cummon!" But over the intervening IJSLF ("it just seems like forever"), I've developed a fair rationale.

First, let me emphasize that this has absolutely nothing to do with politics. It's honestly beside the point that DOD, or the formerly profitable giants of the military-industrial-MIT complex, sponsored the systems that did not, do not, will not, can never work. The argument applies just as well, unfortunately, to white-hat projects like welfare optimization.

The thesis is this: there is a spectrum of feasibility, from the very easily doable to the forever (yes, forever!) impossible. At the simple end there are clearly stated problems, using available and well-understood hardware and software in familiar modes. Such problems may be very large (utility billing for Con Edison, payroll for the French National Railway), but the amount of novel analysis is negligible, the problem statement is changed hardly at all during the project, and the definition of success is agreed to in advance and does not change while work is under way. We all see dozens of such applications around us: department stores, utilities, banks; engineering calculations; school records; at the extreme of size, the Internal Revenue Service and the Social Security Administration.

Of course, failures occur; we see them daily. Incompetence within, supplier greed without—these are always with us. But it certainly is fair to say that projects at this easy end of the spectrum should, and almost always in the end do, succeed. Whether the measure of success is speed, cost, consolidation of records, or whatever, all parties agree.

Now look at the middle of the spectrum. Here we have problems clearly stated and readily mathematized (airline reservations is a fine example), but subject to some change during the project. Nevertheless, change can be resisted in many cases (added customer luxuries), if not all (tax and regulatory matters). Success is understood pretty well, especially the speed or reliability sort of thing, but financial targets tend to waver somewhat, and public acceptance is mentioned more often than in the payroll sort of application. Above all, the intrinsic difficulties of the project, the system elements that have to be explored *de novo* and interlocked and tuned, make the time scale long enough that not only are the problem statements and the financial targets reluctantly allowed to change somewhat, but the available technology changes enough that some new hardware and software has to be substituted for the original complement.

SABRE is, of course, a perfect example. It pioneered, at least at the high level of sophistication aimed for; it stretched out over many years; new software methodology was reluctantly incorporated. And it barely worked; just a little less determination and just a little less exuberance in the national economy, and it would have been abandoned, IBM or not.

Another enormously expensive, but in the end enormously successful, case was the NASA Apollo program —the computer part, that is. Here the problem was relatively stable: the law of gravity, the lunar "terrain," even the vehicle configuration, held pretty still for the half-decade involved. But

the unbelievable equipment and personnel and software redundancies, the simulations, the thousands of practice runs and reruns, are well known; the price was high. I think it fair to say that, like SABRE in a more narrowly audited context, Apollo was right at the edge of the possible.

We improve, of course, and demonstrated successes help our confidence. In 1954 GE Louisville couldn't make an overly complex payroll program work; 15 years later, we put computer equipment on the moon! But when you consider the scale of Apollo, or even SABRE, the managerial and technical experience of the teams, and the reliability of the equipment, we haven't pushed the class of problem solvable per man and per dollar very far toward the difficult end of the spectrum in the last decade. I remember feats of programming in the fifties by people vigorous in the trade today, Dan McCracken and Don Shell and Harriet Meadow, and even feats of plugboard wiring in the forties!

Inspect now the far end, the impossible end, of the feasibility spectrum. Here we find that hecatomb called SAGE, and the other (*all* the other) command and control projects. We find the great corporate MIS systems —the automated board room, the self-optimizing model, the realistic management game. And, pardon my chuckles, if we turn over a few flat stones we may even find MULTICS.

These projects, and especially the military ones, are characterized far differently than the simple ones at the other end of the spectrum. The problem is not clearly stated. The definition of success is not agreed on between contractor and customer. The time scale is terribly long. The challenge of the initial problem is so great that only the very newest, most powerful, least easily realizable hardware and software can be considered; each new offering is immediately seized upon and examined for incorporation. This is true of the outer peripherals as well, the radars and the rockets and the management philosophies.

Above all, returning for the moment to problem definition, there is the element of full disclosure, of good faith. At the easy end of the spectrum, the customer gives the contractor complete information about the problem, and genuinely wants to cooperate in a mutual success. At the almost-impossible middle, the customer still tries his best on both counts; new facts, new competitive urges, new divergencies of motive do intrude, and overprofessionalism rears its ugly head. But at the impossible end, the problem statement is withheld. Russia and China keep their current and future capabilities and their attack and defense plans secret; the top management conceals from the would-be modeler how it actually functions; the MAC user invents new ways to subvert the data base and avoid charges.

At the impossible end also, the customer and the contractor have a complete failure to agree about the measure of success. Is it, as Lick implied, to *avoid* use? The scarecrow effect, SAGE proponents called it. Is it to utilize to the absolute limit our technical capabilities? Perhaps I'm being unwontedly kind, but I'll call that the MAC syndrome. Is it to satisfy, precisely, the most recent revision of a set of contract specifications? That's certainly the SDC concept. Or is it to genuinely solve the current, as-evolved real-life problem: really shoot down enemy missiles, really present the key data the top managers use to run the business?

Originally, SAGE was to shoot down subsonic Russian bombers, coming over the pole. By the time it disappeared from the news (but not from the DOD budget, alas!), the bombers had gone supersonic, been replaced by unmanned missiles, been replaced again by the ICBM; the trajectories had become more varied, suborbital, fractional-orbital—from all points of the compass. It's a wonder some resourceful RANDite didn't threaten us with TENTPEG (straight down) or GOPHER!

In summary, then, I claim that projects from the wilder shores, and especially command and control, never have been and never will be successful in the real-life sense. They may make a colonel into a general, fill sites with fantastic hardware, make the cover of *Business Week*, and even frighten the competition or the enemy (". . . but by God, sir, they frighten *me*!"), but they will not run a giant business or defend a country.

—H. R. J. Grosch

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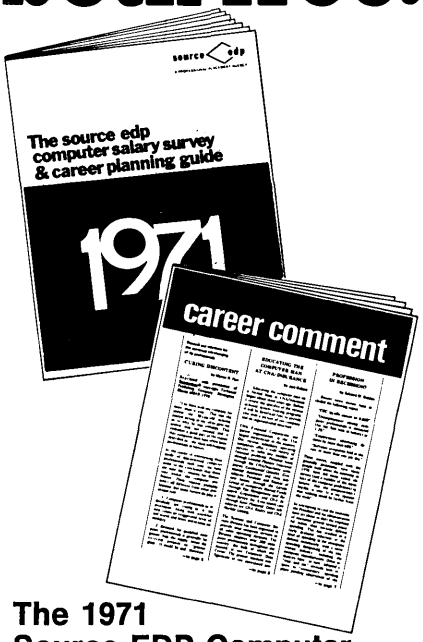

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CIRCLE 2 ON READER CARD

The Westinghouse 2550 Satellite Processor

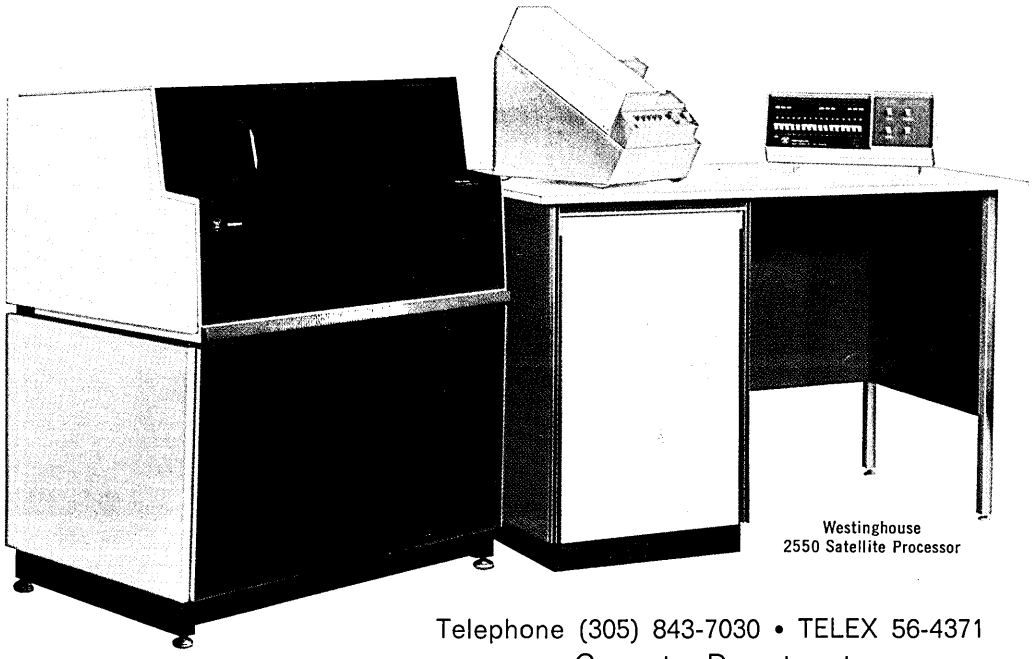
In announcing the Westinghouse 2550 Satellite Processor, the Westinghouse Computer Department introduced the industry's outstanding programmable terminal designed for remote and off-line data processing.

Feature after feature establishes that fact! Like the standard stand-alone software packages . . . whose modularity and flexibility permit the Westinghouse 2550 to be a versatile satellite processor for many different manufacturers' remote batch systems. Provided are the Executive Communication system, peripheral handlers, and Communication Formatter (COMFORM). COMFORM emulators allow the Westinghouse 2550 to emulate terminals including IBM 2780, IBM HASP 1130/360-20, UNIVAC 9200/1004, UNIVAC DCT-2000, CDC 200, BURROUGHS and others.

Hardware modularity further extends the versatility of the Westinghouse 2550 through a multitude of configurations which utilize the Westinghouse 2500 central processor, communication control console, data set adapter, card reader, card punch, line printer, and devices from the complete line of Westinghouse peripherals and options.

And because the Westinghouse 2550, in an off-line mode, performs all the functions of a Westinghouse 2500 computer, total system capabilities are vastly increased. Through use of this stand-alone computer feature, the Westinghouse 2550 customer has available programming packages including MONITOR II and MONITOR V executives, SYMBAL II assembler, BASIC and FORTRAN IV compilers, Report Program Generator (RPG), Utilities and Unit Diagnostics.

For the full story on the Westinghouse 2550 Satellite Processor and Westinghouse 2500 Computer product lines, services, and support, write, wire, call or visit your nearest Westinghouse Computer Department office or Westinghouse Computer Department, Orlando, Florida.



Westinghouse
2550 Satellite Processor

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CIRCLE 3 ON READER CARD