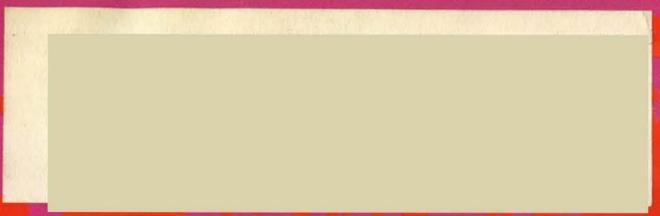


DATA MATRITION[®] 71

May 1

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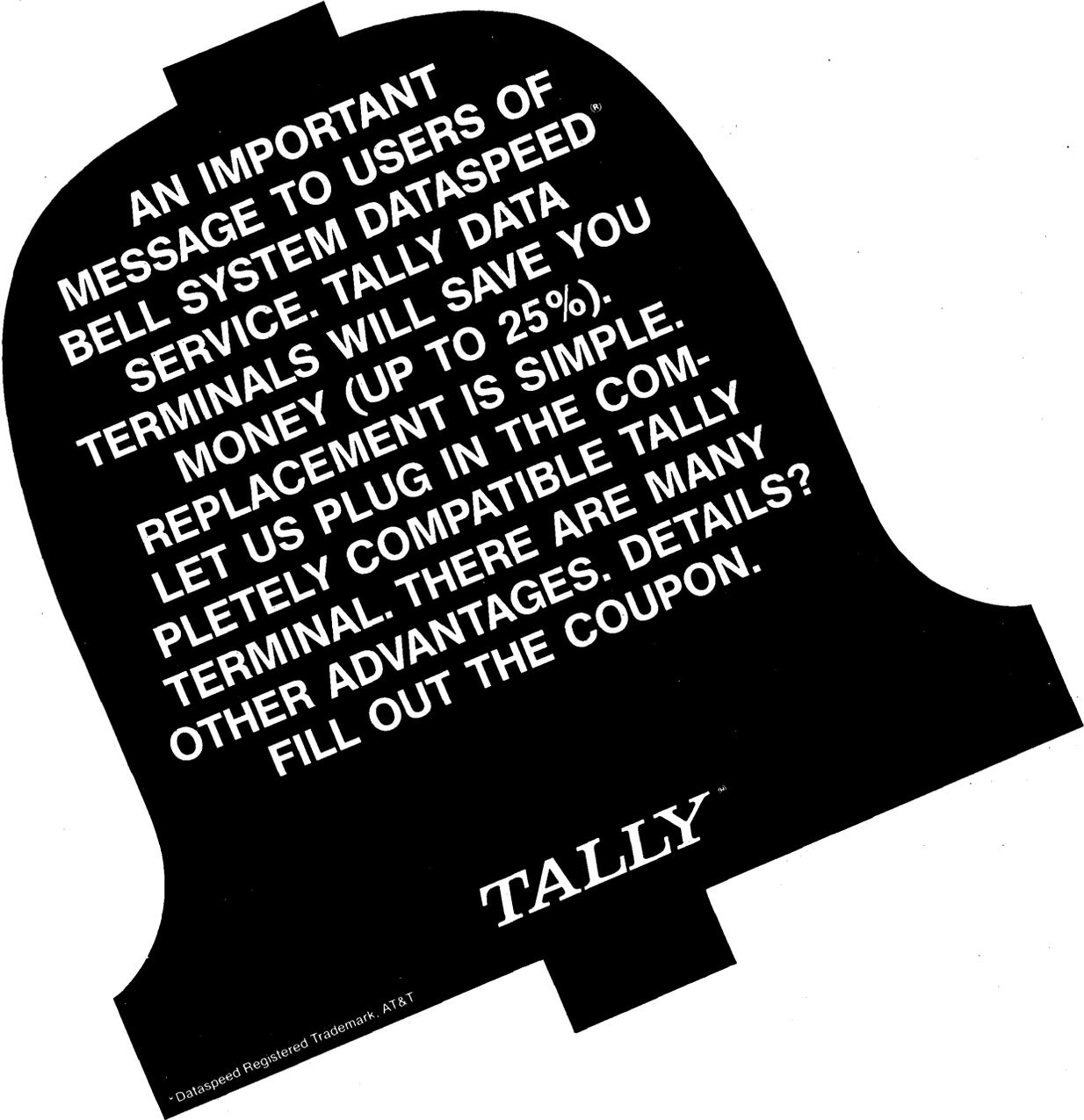
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optical memory systems



CIRCLE 47 ON READER CARD

DATA MATION ⁷¹®

MAY 1, 1971

volume 17 number 9

MANAGEMENT

28 Analysis of Common Carrier Tariff Rates

The tools offered in this article should help the communications designer to perform at least a first-order analysis reasonably rapidly.

GENERAL

36 Computing Signs to Help Train the Deaf

There is evidence that the deaf make above-average programmers, but training presents a formidable problem. Standard hand signs for computer jargon could be the solution.

42 Spring Joint Computer Conference

After a year of great technological change and an economic crunch that has changed the face of the industry, computer community people gather to take stock this month in Atlantic City. A report on what the conference will be like and essays by leaders of six sessions is featured.

COMMENTARY

52 Perspective

Frederick Adler, the venture capitalist, does well with his technology investments, despite the economic crunch . . . The hotel industry, long resistant to using data processing, has mellowed as such names as Hilton and Sheraton announce systems.

About the Cover

The annual spring trail leads back to Atlantic City again and the Spring Joint Computer extravaganza. This design of varicolored aisles by our art director is offered as one of the more pleasant forms of *déjà vu* associated with the season, the shore and the salt water taffy.

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MAY 1, 1971

volume 17 number 9

This issue 112,560 copies

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Business Publications Audit



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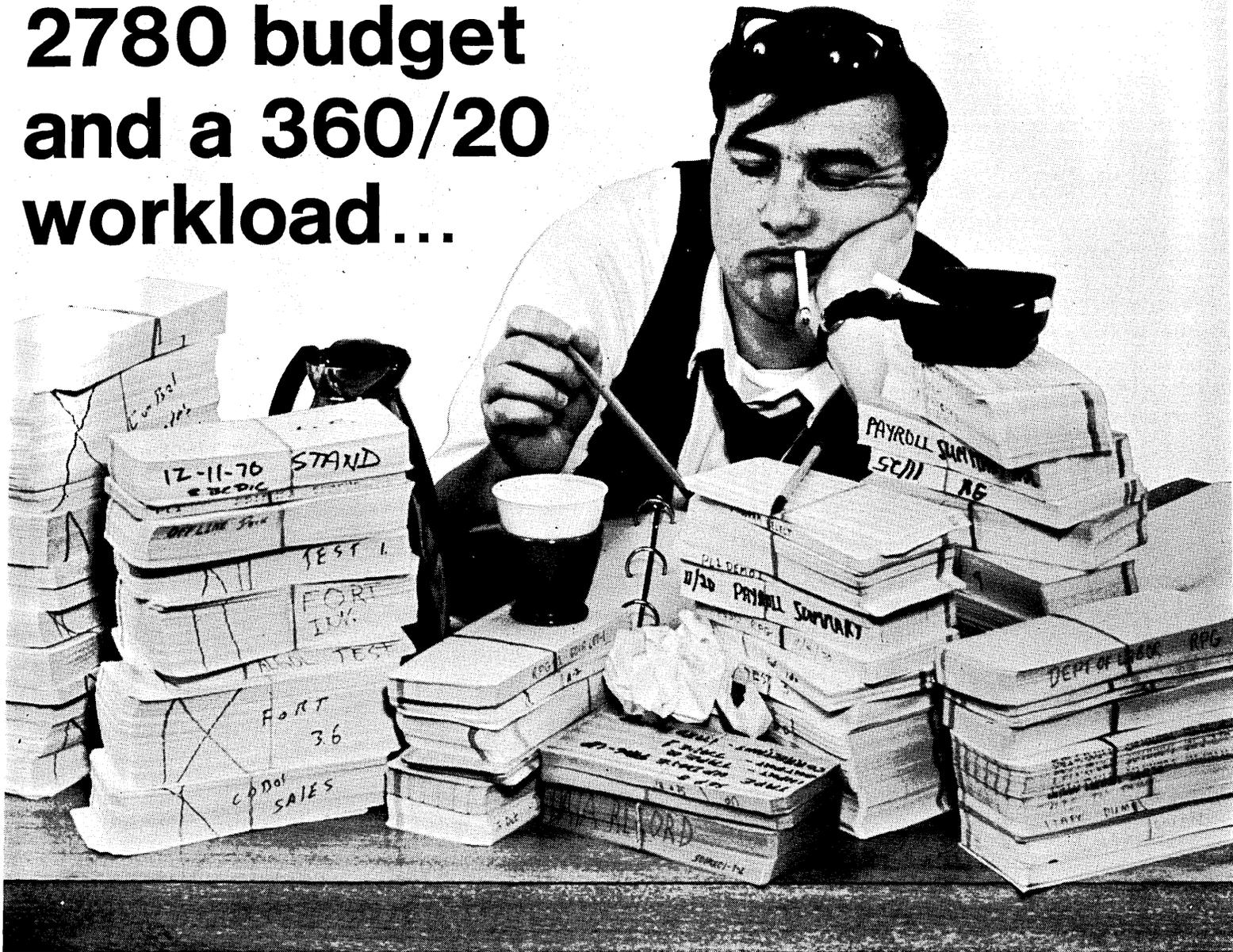


DATAMATION is published twice monthly on or about the first and fifteenth day of every month by Technical Publishing Company, 1301 South Grove Ave., Barrington, Illinois 60010; Arthur L. Rice Jr., President; Gardner F. Landon, Executive Vice President. Executive, Circulation and Advertising offices, 35 Mason Street, Greenwich, Conn. 06830 (203) 661-5400. Editorial offices, 94 So. Los Robles Avenue, Pasadena, California 91101. Published at Chicago, Ill.

DATAMATION is circulated without charge by name and title to certain qualified individuals who are employed by companies involved with automatic information handling equipment. Available to others by subscription at the rate of \$25 annually in the U.S. and Canada. Reduced rate for qualified students. Foreign subscriptions are on a paid basis only at a rate of \$38 annually. No subscription agency is authorized by us to solicit or take orders for subscriptions. Controlled circulation paid at Columbus, O. and Form 3579 to be sent to Technical Publishing Company, P.O. Box 2000, Greenwich, Conn. 06830. Copyright 1971, Technical Publishing Company. Microfilm copies of DATAMATION may be obtained from University Microfilms, A Xerox Company, 300 North Zeeb Road, Ann Arbor, Michigan 48106.

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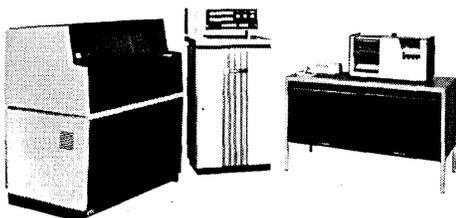
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CIRCLE 59 ON READER CARD

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Z.V. Zakarian, president,
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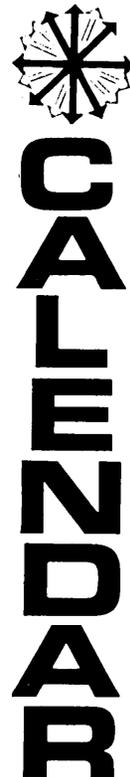
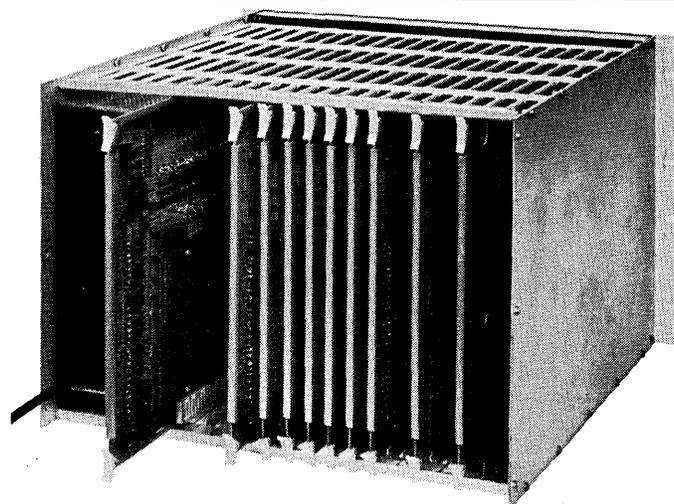
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DATE	EVENT/SPONSOR	LOCATION	CONTACT	COST
May 18-20	Spring Joint Computer Conference	Atlantic City	AFIPS 210 Summit Ave. Montvale, N.J. 07645	Preregistration \$20, members \$50, others
May 25-28	20th Annual Convention National Microfilm Assn.	Washington, D.C.	NMA Suite 1101 8728 Colesville Rd. Silver Spring, Md. 20910	Unknown
June 22-25	DPMA Conference & Expo	Houston	DPMA 505 Busse Highway Park Ridge, Ill. 60068	Unknown
July 26-30	International Computer Expo. for Latin America	Mexico City	Sociedad Mexicana de Computacion Electronica Yacatas, 435 Mexico 12, D.F.	Unknown
Aug. 3-5	1971 National Conf. of the ACM	Chicago	ACM 1133 Ave. of the Americas New York, N.Y. 10036	Unknown
Aug. 16-20	Jerusalem Conference on Information Technology	Jerusalem	Jerusalem Conf. on Info Technology P.O. Box 7170 Jerusalem, Israel	Unknown
Aug. 23-28	IFIP Congress 71	Ljubljana, Yugoslavia	IFIP Congress 71 Box 4197, Grand Central New York, N.Y. 10017	

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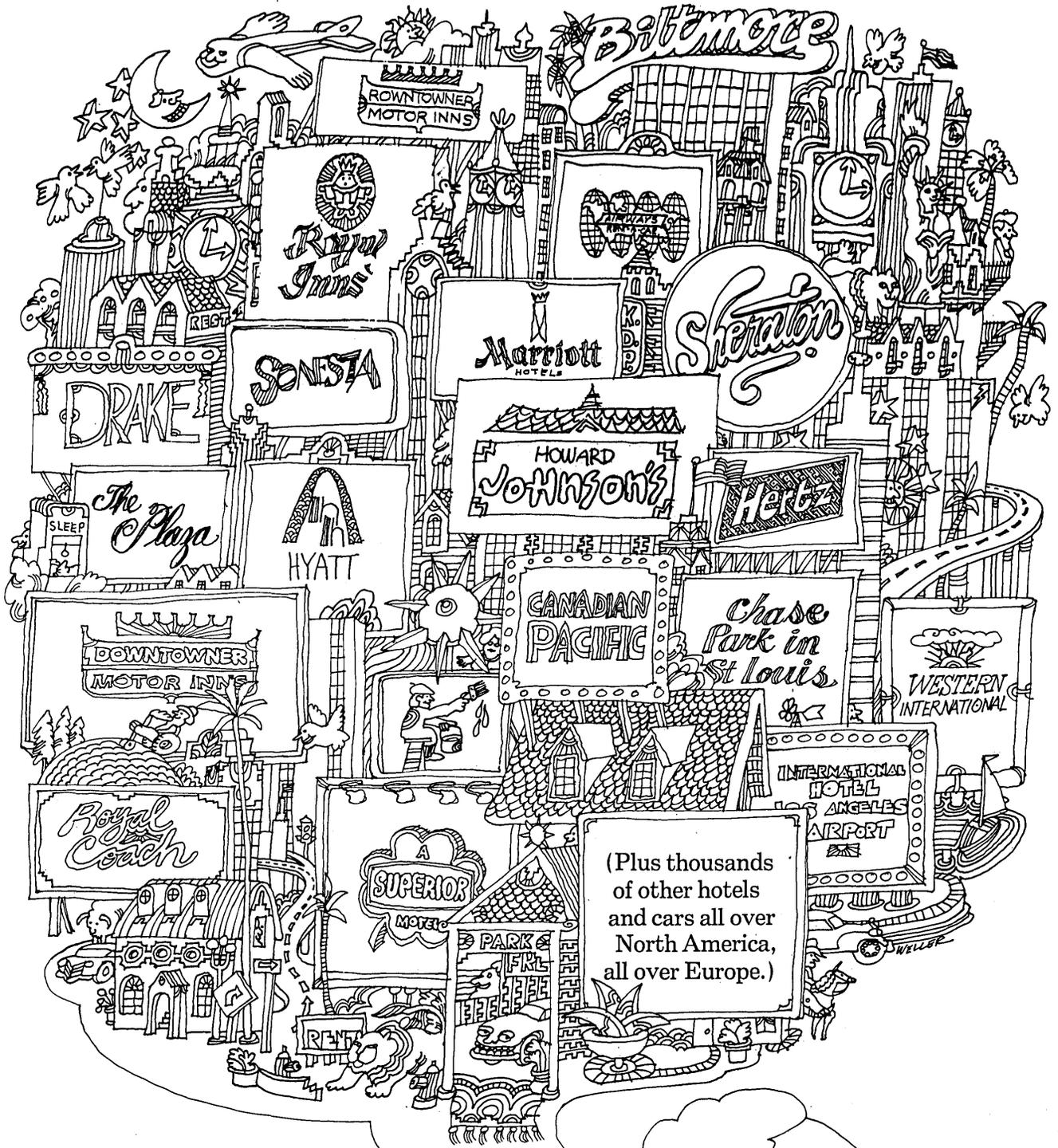
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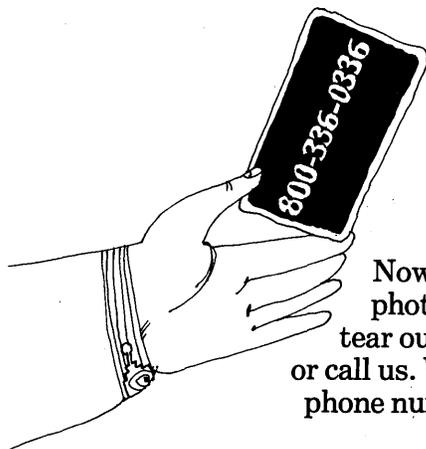


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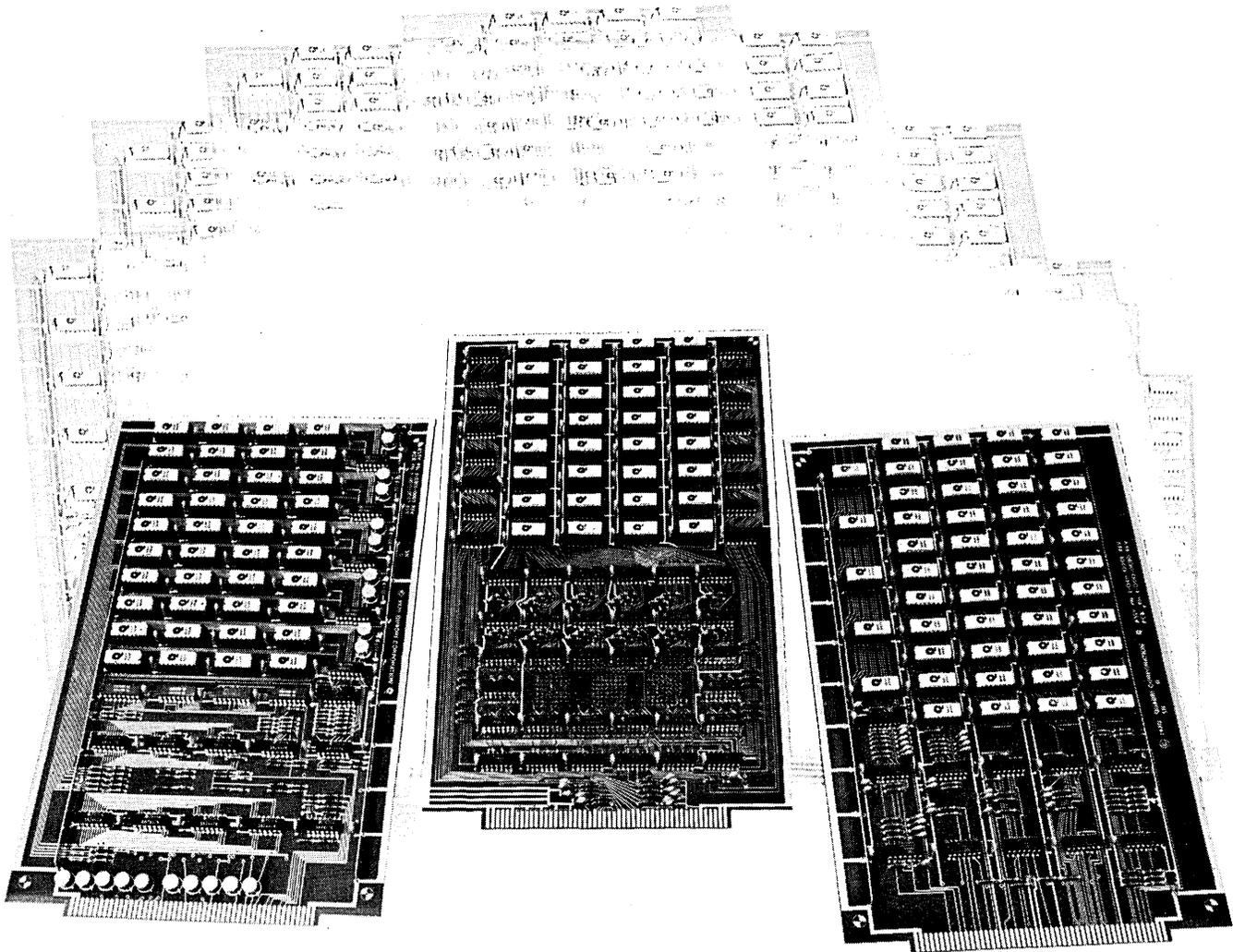
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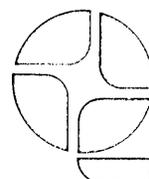
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LETTERS

Tag party

Sir:

In your issue of November 15th (pp. 129-131), F. Barry Nelson reported my comment that anyone could duplicate the new NCR color-bar merchandise tag with a Polaroid camera.

Since then, one of our technicians, for fun, altered several NCR tags, using as a color source a green pencil and a black Japanese felt-tipped pen. We tested these altered tags on the lone NCR register exhibited at a recent National Retail Merchants Association show in New York. The tags were accepted and the altered data printed just as predicted. Unfortunately, we did not try Polaroid duplicates.

Subsequently, in your issue of February 1st (p. 15), an NCR executive who was apparently unaware of this successful fraud in New York reported that the Polaroid camera "... and most other attempts to alter the color coded tag data content, will render the tag completely unreadable due to the extensive error checking designed into the NCR coding and reader system."

Our man stands ready to risk public ridicule demonstrating that NCR tags and credit cards can be duplicated with a Polaroid camera. There is, however, one serious obstacle: we cannot find an NCR sales office with this remarkable 280 register. Immediately following NCR's announcement of this product last autumn, we ordered one. Their promised delivery: two years. We suspect the only such register extant is the model NCR brings to retail exhibitions, and, for all we know, their tag maker is a draftsman out in Dayton with a ruler and a colored pencil.

WILLIAM R. BURKHART
President, Transaction Systems, Inc.
Palo Alto, California

NCR is installing its 280 terminals in Montgomery Ward and the Hecht Company, Washington, D.C. Try there.

Whelmed over

Sir:

Although I enjoyed reading about campus computers in your March 1 issue, I was overwhelmed by the ar-

gument given by Mr. Roberts for separate facilities (p. 28). His arguments are reminiscent of those of the old batch processor fans. I felt as if I were being propelled back into the past rather than reading a current DATAMATION.

I was also surprised by the lack of discussion about the successful time-sharing systems and regional computing facilities which have been developed on various campuses by National Science Foundation grants in the past three years. Oregon State Univ., Dartmouth, Univ. of Texas, North Carolina and Iowa, to name a few, have very successfully implemented regional computing facilities, some of which serve both "adp" (administrative) functions, and all instructional computing needs.

I hope your readers are not misled into believing that all the country's campuses are still in the dark world of batch processing and separate facilities. Most of the users who have



had the good fortune of working with a reliable time-sharing system would never return to the tedium of batch operation.

I also question Mr. Roberts' statement that academic researchers are more concerned with machine capability than machine reliability and stability. In a time-sharing environment, everyone is inconvenienced when the machine goes down, and reliability is very important to the individual user.

There are many universities that have successfully combined administrative and instructional applications on a time-sharing system, and I believe that this trend will continue in the future.

KAY PORTER
Oregon State University
Corvallis, Oregon

Telling a Fibonacci

Sir:

I might ask Paul Blackwell (Jan. 15 Letters, p. 11) whether he has investigated the Fibonacci series starting with 3.7. Many clues point to a far more remote antiquity for these most elementary number relations. In fact, they undoubtedly date back to minus infinity, B.C.

ELVIN LEE
Chicago, Illinois

Von wiseacre

Sir:

With reference to Mr. Paul Blackwell's interest in the applicability of the Fibonacci numbers to the planets, may I refer him to the following: My own paper entitled "Fibonacci Series in the Solar System," *Fibonacci Quarterly*, Vol. 8, No. 4, October 1970, and an excellent article by H. W. Gould, Department of Mathematics, West Virginia University, entitled "Cale's Rule for Planetary Distances," *Proceedings of West Virginia Academy of Science* (Vol. 37) 1965.

The presence of the Fibonacci numbers, which are closely related to a logarithmic spiral, have been proposed by Gould to originate out of von Weizsäcker's Theory that the solar system began as a solar nebula in which turbulent vortices were created that condensed into the sun and planets.

Marvin L. White, at the Space Physics Laboratory, AFCRL, Hanscom Field, Massachusetts, has recently developed vortex theory based on atmospheric circulations which counters the arguments which claim that angular momentum will not be conserved in Weizsäcker's model but will be dissipated into smaller eddies.

The Fibonacci numbers have come a long way since first applied to the rabbit problem!

BARRY A. READ
Major, Canadian Armed Forces
U.S. Army, Satcom Agency
Fort Monmouth, New Jersey

Host boast

Sir:

Your February 15th "Look Ahead" incorrectly stated that IBM System/7 can only be used with "large host

"n" Key Rollover. It remembers your every touch.

Our new "n" key rollover solid state keyboard has a memory like an elephant.

Data bits from the first key depressed are stored in our MOS memory until a second key is activated . . . even though the first key is still depressed. So any number of keys can be depressed without interfering with the sequence of data entry.

Which makes operator error practically nil. Tests have indicated up to 30% fewer errors than with two-key rollover keyboards.

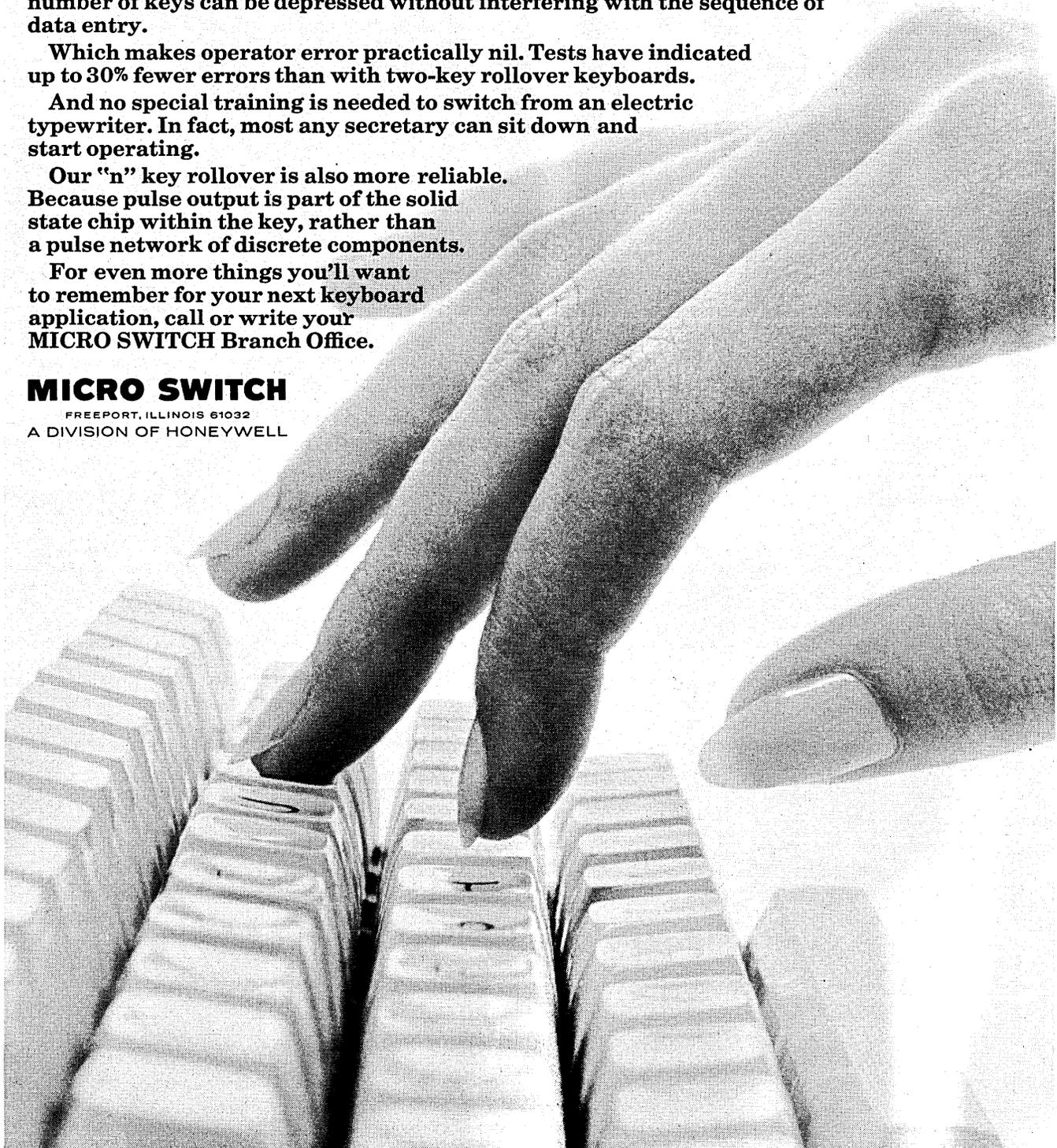
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Letters . . .

IBM machines."

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D. C. POTTER

IBM

White Plains, New York

Cute couple

Sir:

I have noted with interest a certain passage in the just-arrived March 15, 1971 issue. This passage is in "Look Ahead." It reads as follows: ". . . A well known, influential computer scientist active in standards work discovered to his horror recently that he couldn't figure out how to hook up to a time-sharing service via an acoustical coupler from his house. He has a Princess telephone. A standard dilemma? . . ."

I wonder if the telephone was actually something other than the Princess type. The Bell System has another offering, called a Trimline, and it may be that that particular telephone was actually the item in the computer scientist's home.

As far as I know, the Princess telephone is a standard Bell System 500 series, made more compact, and fitted with a standard 500 series handset. The Trimline telephone is somewhat different in packaging, featuring a telephone dial built into its handset. Incidentally, the Trimline is harder to couple into a modem than the 500 series; hence my inquiry.

It may be of interest to you to know that we here at Applied Communications Corp. are working with telephonic communication systems for the deaf. One of our products is PHONETYPE Terminal Unit; it is an acoustic/inductively coupled modem, enabling the operation of a teletypewriter in conjunction with an ordinary Bell System 500 series telephone. Many such units are now in use all over the U.S.A., in homes and offices where deaf people are located. At any rate, our equipment has been highly successful in operation, and the deaf owners concerned are deeply appreciative for this means of communication with each other.

Needless to say, I am wondering,

too, as to whether telephones are well standardized. In fact, I have had similar experience, with our acoustic/inductive coupled computer modem, that the above mentioned computer scientist had in trying to reach a time-share service from his telephone.

ROBERT H. WEITBRECHT

Menlo Park, California

Tuna in, Charlie

Sir:

In the letters section of the February 15th issue, Charlie Connoy states the number of operational Univac II computers should be revised upward to five. Sorry Charlie, but we turned the old prototype off 21 November 1969.

LEON D. MORRISON

Univac Federal Systems Division

St. Paul, Minnesota

Novel approach

Sir:

I am interested in studying the role computers and computer specialists play in contemporary literature. Some of the novels in which they figure prominently have been: 480, Killing Zone, The Tin Men, Giles Goat-Boy, The Literature Machine, Player Piano.

I would appreciate it if your readers could alert me to other works of this type.

L. MEZEI

Computer Systems Research Group

University of Toronto

Toronto, Canada

. . . your local serif

Sir:

In the current debate between the supporters of OCR-A and those of OCR-B, two vital points have been overlooked. The first point is "Why OCR?" Obviously OCR is to serve as a hard-copy communications medium for man-machine interfacing. For machine-machine interfacing, such hard-copy media as magnetic tape, punched cards, disc packs, and perforated tape have already been implemented and are all much more reliable in both generation and in reading than is immediately foreseen for OCR. For man-man interfacing, there are many type fonts already existing which are more pleasant and less distracting than even OCR-B, let alone OCR-A.

The second overlooked point is "Why automation?" The answer—apparently not obvious to everyone—is "To make things convenient." Many software systems and their designers and users have had much grief when tasks were automated merely because it was possible to do so, even though it was definitely inconvenient to do so. Convenience may be economic; it costs less to do the task by automation (costs including capital, the cost of extra time from increased paperwork, etc.). Convenience may be procedural: it is easier to do the task by automation. Convenience may be "operational": it is impossible to do the task without automation.

Before an OCR standard is adopted, it should be shown to improve the convenience of man-machine communication. If an OCR font does not improve the convenience of man-machine communication, there is no point in automating the task of having machines read printed characters. But there is a conflict between OCR-A and OCR-B: Procedurally, the former is convenient for machines and the latter is convenient for men. Further, the current technology makes OCR-A more economically convenient than OCR-B. What is needed is a scale of values to determine which font has the greatest overall convenience.

J. Rabinow asserted in the "Forum" (Feb. 1) that OCR-A is inconvenient to men only because it is new. This is not true. A font is easy to read only when its design does not distract the reader. An extensive text printed entirely in italics is tiring to read, yet italic is one of the oldest fonts. Anyone who is familiar with IBM reference manuals (prepared from machine listings) knows that extensive use does not make the font any less distracting. Mr. Rabinow seems to believe that a font which is currently feasible is defensible as a standard. This ignores the requirement that it be convenient. If OCR-B is not now procedurally convenient for machines (as is the case of OCR-A for men), then the technology has not yet advanced sufficiently for the use of OCR. In that case, no standard OCR font should be adopted until both font designs and technical advances present us with an OCR capability with high overall convenience for both sides of the man-machine interface. To adopt a standard now would freeze our underdeveloped technology to an inconvenient font.

DAVID ROSS

Canoga Park, California

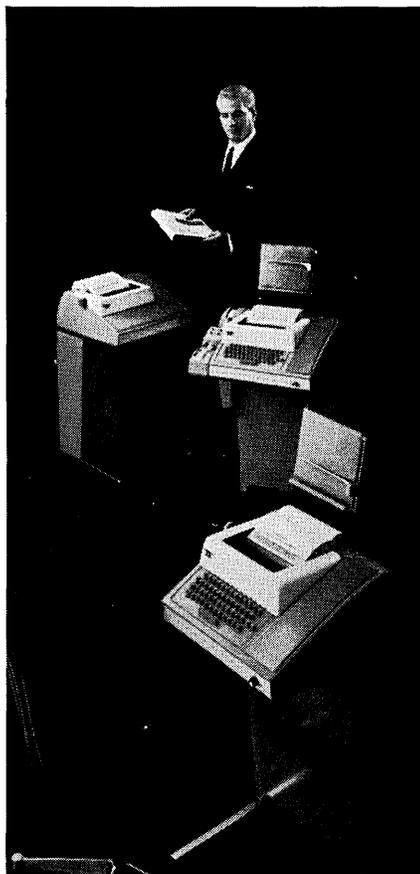


What happened
to the
model 19?

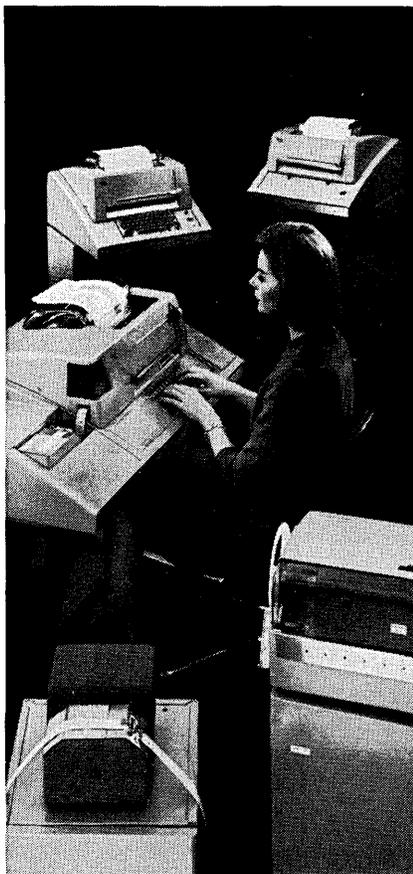
You're looking at some of the Teletype® basics used in building a data communications system. Printer, keyboard, tape sending and receiving combinations in a variety of speed capabilities. Teletype's modular design concept gives you the opportunity to extract the best terminal combination for system

needs today, and refine, add to, subtract and adapt as system modifications are called for. Just as important as the basics, are some of the things not obvious in the photos below. The logic devices, options and accessories that add almost limitless possibilities for making things happen exactly as

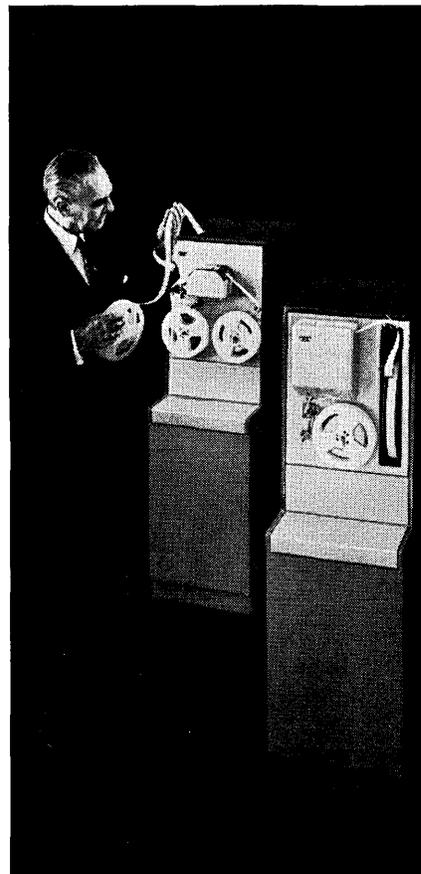
your system requires. We have some solid state logic devices that provide precise control of data traffic. That enable your computer to automatically poll data from a number of terminals and feed each terminal with processed data. There are error detection, correction and signal regeneration options to



model 33 series: An extremely economical 100 wpm terminal line. Has 4-row keyboard, uses 8-level ASCII code. The most widely used terminal in time-sharing systems today.



model 35 series: A rugged, heavy-duty line of 100 wpm terminals. Uses ASCII. Units in foreground are self-contained paper tape punch and paper tape reader.



Telespeed™ equipment: A line of high-speed tape-to-tape terminals capable of sending and receiving at speeds of 750, 1050 (shown above), or 1200 words per minute.

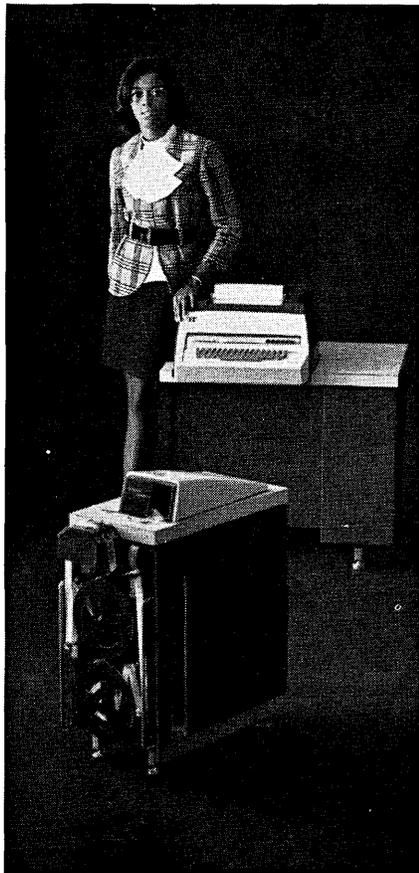
DATA COMMUNICATIONS

equipment for on-line, real-time processing

keep data flowing faultlessly. Options such as pin-feed platens and form feed controls that make it possible to fill multiple copy business forms on-line. And many, many more. What did happen to the model 19? Believe it or not, there are still some of these old, die-hard terminals around. And that's

another advantage your data communications dollar buys when you specify Teletype equipment. It lasts. Moves data reliably, economically, for a long time. On a price/performance basis, Teletype equipment is in a class by itself.

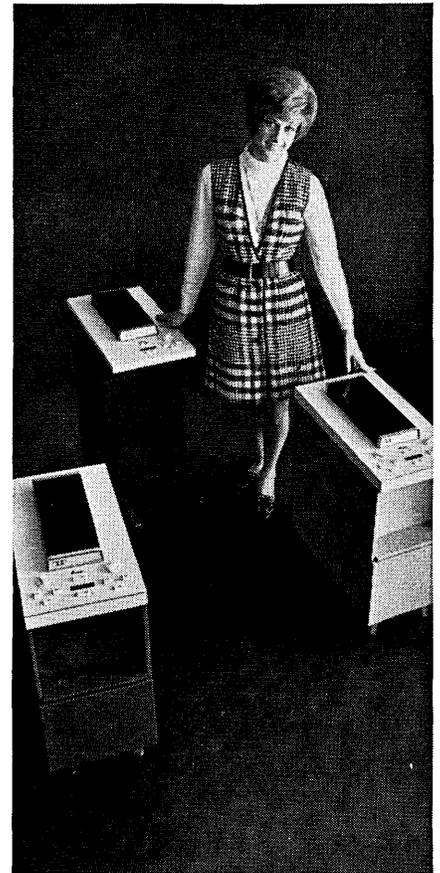
Teletype data communications equipment is available in send-receive capabilities of up to 2400 words per minute. If you would like specific information about any of the equipment described here, write: Teletype Corporation, Dept. 81-17, 5555 Touhy Ave., Skokie, Ill. 60076.



model 37 series: One of the most versatile heavy-duty terminal lines going. Generates all 128 characters of ASCII. Operates at 150 wpm. Prints in upper and lower case.



Inktronic® data terminals: A unique electronic, solid state terminal. Prints up to 1200 wpm. Forms characters through electrostatic deflection (no typebox). ASCII compatible.



magnetic tape data terminals: Use compact reusable tape cartridges. Operate on-line at up to 2400 wpm, and connect "locally" to lower speed Teletype terminals using ASCII code.

Teletype is a trademark registered in the U.S. Pat. Office

May 1, 1971

machines that make data move



CIRCLE 11 ON READER CARD

17

BURROUGHS B 6700

It's the most advanced business data processing system now available for service.

Because it provides:

POWER. One, two or three central processors. One, two or three input/output processors. Double-size main memory (up to six million bytes). Electronic exchange architecture.

MULTIPROCESSING. It's automatic. With any mix of programs. For flexibility and throughput.

DYNAMIC RESOURCE ALLOCATION. For "fail-soft" security and continuous operating efficiency.

COMPLETE SELF-REGULATION. The computer runs itself under Master Control Program supervision.

EXPANDABILITY. You can add equipment as you add the work. Any time. With no reprogramming.

DATA COMMUNICATIONS. Service for more than 3,000 lines. Without burdening the central system.

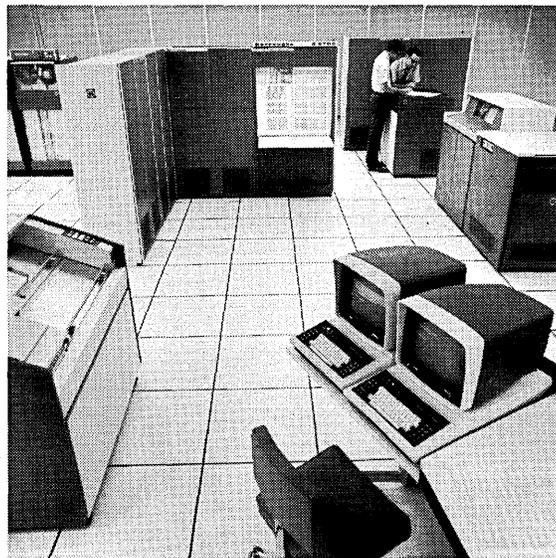
VIRTUAL MEMORY. No more limits on program size. It's independent, so programmers don't have to plan for it.

COMPILER LANGUAGE PROGRAMING. Exclusively. It makes program writing and modification a lot easier.

DISK STORAGE. Massive—with up to 72 billion bytes on-line. Fast—with access to any record in as little as 1/500th of a second.

These important systems design capabilities are ready for you now in the B 6700.

From the company that's recognized for leadership in systems design...



Burroughs 

LOOK AHEAD

LESSORS GROUP STUDIES 360 EXTENSION MOVES

The Computer Lessors Assn. is now mulling the report on means to extend the life of the IBM 360, completed in March by Compata, Inc. We hear it discusses the feasibility of the following: As is now actually occurring, the purchase from independent firms of bulk memory and main memory add-ons up to and beyond the machine's stated limits; expansion of the 360 instruction set to include the new 370 instructions; cpu modifications to permit use of new 370 peripherals, such as the 3330 disc drive; installation of cache memory on the model 65; development of universal controllers; and doubling the transfer rate and density of the 2314 disc drive. Down the pike, when IBM releases the 360-incompatible Advanced Operating System, lessors may consider modifying it for use on souped-up 360s. The lessors will have to contract for any of the above modifications, and some will weigh that cost against buying the high-purchase-to-lease-ratio 370s -- depending on the installation.

SOME LEASING FIRMS RECONSIDER 370s

A few leasing companies, because of the currently low prime interest rate, are bidding 370 contracts and more are seriously considering limited 370 buying. The contracts will be much longer than for 360s; some put the minimum at four years, others at six to eight years. Surprisingly, banks like First National City of New York are said to be going after "risk" leases of less than full payout. Meanwhile, although few expect independent maintenance firms to be able to compete with IBM for 370 service for several years, there are reports that some "large U.S. corporations" are studying the cost of entry into computer maintenance. It's high.

TELEMAX GROUNDS RESERVATIONS PLANS

Telex Corp. has lowered its sights. The reservations firm which once hoped to corner the airline reservations market through interface with its travel agents-based automated reservations system for hotels, motels, and car rental agencies, has given up all that to concentrate on railroads. Phil Fellows, dismissed last year as Telex president, was rehired by the company's new parent firm, Heizer Corp., reportedly because he was close to Railpax, the government-chartered passenger railroad company. Fellows worked in Washington for Intermodal Transportation, a consulting firm working on Railpax for the Dept. of Transportation. Sources say Fellows and Telex are devoting full time trying to get the contract to develop a reservations system for Railpax.

DOD WANTS UPDATE ON COBOL STANDARDS

Impatient with what it considers the inability of ANSI to "respond to our needs," the Dept. of Defense, through George W. Bergquist, deputy assistant secretary of defense, has called for the Air Force to investigate the feasibility of updating the DOD COBOL standard based on approved extensions made by the CODASYL COBOL development group since 1967. Citing

DOD's participation in the development of these extensions, Bergquist states in his memo of request that he is "most anxious . . . that DOD maintain a leadership position in the development and use of COBOL."

However, one ANSI participant points out that many of the CODASYL extensions to be considered are already in the ANSI standard or have been approved by X3J4 (the ANSI COBOL standardization committee) for inclusion. He says there has been only a "bare" participation by DOD in the ANSI effort and suggests that "if they would devote their energies to constructive participation on ANSI, we could get the job done (maybe)."

IF YOU CAN'T SELL EM:
JOIN EM

Tenet, Inc., was formed in Sunnyvale, Calif., in late '69 to build and market a time-sharing computer. Last month, lacking a first order for its Model 210 system and seeking a badly needed third round of financing in a market strongly resistant to anything involving time-sharing hardware, the company sought survival by plunging feet first into the time-sharing market by selling time on its first working prototype. Its first customer was Memorex Corp., Santa Clara, Calif., peripheral manufacturer.

MORE IBM FOR RCA

One of the last bastions of non-IBM leadership in RCA has fallen. The systems programming product laboratory has a new manager -- IBM veteran Patricia Gogins. She replaced vp Arthur Carroll, Jr., who moved up to head management information systems. In the process, the colorful Alonzo Grace, long-time manager for systems programming development, chose to depart.

RUMORS AND
RAW RANDOM DATA

IBM has reportedly firmed up a five-year trimback plan to account for changing markets and technologies, like the shift from core to semiconductor memories . . . Users are expecting the announcement of relocation features on the big 370s by the end of '71 and delivery by third or fourth quarter of '72. Too, the smaller siblings, the 135 and 145, are said to need only the change of a floppy disc to put their already built-in relocation hardware into action . . . At a recent meeting in Los Angeles of SHARE, the IBM users group, a company set up a hospitality suite in the Biltmore Hotel conference headquarters and placed invitations under the doors of SHARE participants. SHARE's officers persuaded the firm it was violating the user group's rules; so it left. In reserve, however, was a plan by the SHARE people to distribute the invitations themselves to habitues of Pershing Square across from the hotel who would have made a colorful gathering in the suite when the word of free booze got around . . . SHARE's insistence on keeping meetings IBM-pure is understandable. Of the 1,430 persons registered at the March meeting, 277 were from IBM and added \$16,600 in registration revenue to SHARE's coffers.

Sure, the Sycor 340 data communication system gives you clean source data capture.

Sycor 340. The one CRT terminal that does it all. Heart of the Sycor System. Trim. Tasteful. Yet figuratively bulging with the newest of proven, mass-produced modular microprocessor technology. All of it operator-oriented. So easy to learn and use that any regular office guy or gal takes to it quickly and can achieve high productivity without knowing a thing about data processing.

Entry by electronic keyboard onto magnetic tape cassettes permits data to be recorded about 30 per cent faster than it would be electromechanically. Sycor 340's unique automatic paging option handles even long or complicated forms by accepting them in small segments, or pages, easily scanned. Then, it automatically displays page after page of labels and field control characters, easy for the operator to follow. And (hallelujah!) no cards, no paper tape to mess with. Just compact cassettes that hold the equivalent of 1400 punch cards. Easy to load and to store. Thriftily re-usable.

You can interface the 340 with the Sycor printer and get all the versatility of high priced line printers. Use multipart, continuous, pre-printed forms for a host of applications.

Like order forms.
Remote invoicing.
Remote payroll checks.
Whatever.

Two 10-digit accumulators—a Sycor first, by the way—generate totals or subtotals for zero balancing, detecting keying errors in numeric data, without re-keying or verifying. Other error detection features include visual proof-reading from the CRT, programmed entry, format field and character checking, and check digit verification. Add and subtract operations give you automatic total and subtotal field computation and entry without re-keying on an adding machine. Result? Clean tape output—at the data source—that cuts delays and confusion, dramatically lowers mainframe processing costs.

But data capture is only a part of what you really want a terminal system to do for you, isn't it?

Sycor's modular system can be configured for batch communication, via the voice-grade public telephone network, for attended or lower-cost unattended operation. Sycor's binary synchronous procedures, with automatic retransmission that provides automatic error detection, and speeds of 1200, 2000 and 2400 baud, are compatible with S/360 hardware and software.

You can set up an off-line system that gives you the advantages, but none of the complexities, of teleprocessing, by using the Sycor 610 Communication Converter Station at your central office to record on, or transmit from, computer compatible magnetic tape.

That's another part, right?
Talk to Sycor.

100 Phoenix Drive, Ann Arbor, Michigan
313/971-0900

See the 340 communications terminal at Booth 2513 at the SJCC.

Si
SYCOR INC

Who says KeyProcessing™ is a better way to prepare data?

American Express Universal City Studios
Union Carbide Pacific Gas and Electric Co.
Blue Cross of Southern California Security Title Insurance Co.
Continental Airlines Pacific Coast Stock Exchange
City of Los Angeles Federal National Mortgage Assn.
First National City Bank

That's who.

They ought to know.

They punched a lot of little holes in a lot of little cards before they installed our system.

Why did they install our system?

Their reasons were different because their needs were different. But they all had one basic need. A more efficient way to get information into their computers.

And the KeyProcessing System, a totally new method of data preparation, is about as efficient as you can get.

It eliminates slow, mechanical hole punching. And all the card shuffling that goes with it.

And every operation, from up to 32 keyboards, is controlled by one small central computer built right into the system.

Actually, there's only one thing we don't have yet. A big name.

Unless you count American Express, Union Carbide, Blue Cross of Southern California, Continental Airlines, City of Los Angeles . . .



COMPUTER MACHINERY CORPORATION

2231 Barrington, Los Angeles, California 90064
New York • Washington • Chicago • Detroit • Dallas • San Francisco • Boston • Philadelphia • London • Paris

CIRCLE 71 ON READER CARD

Who says DataPrint™ is a better way to print data?

You will.

DataPrint is our computer-controlled way of easing your print-load burden—and saving you money.

With DataPrint, control of your printing operations shifts off line where it belongs. Your CPU has a better chance to do what it does best: compute. It no longer needs to drop everything while it tells your printer what to do.

DataPrint accepts data recorded on magnetic tape and disk. The small, easy-to-program computer for-

mats, edits, and processes the data for output on the industry's best line printer—the IBM 1403. Now you begin to see why DataPrint is so efficient, so versatile, so economical.

But the system's almost brand new. We've just begun to make deliveries. That's why we don't yet have a long list of big-name customers for DataPrint—like we have for KeyProcessing™. We will have soon though. To get your company listed, take step 1 now: write or call to ask about all the money-saving details. It's your move.



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CIRCLE 24 ON READER CARD

You've got the best computer for the job...

Why not buy the best plotting system?

COMPLØT.
with me!

Used in a time sharing mode, the PTC-4 Plotter/Teletypewriter Controller linked to the DP-1 Digital Plotter provides 11" wide reproducible graphs, charts, and drawings at a remote location—direct from the computer.



PTC-4 \$5900
DP-1 \$3500

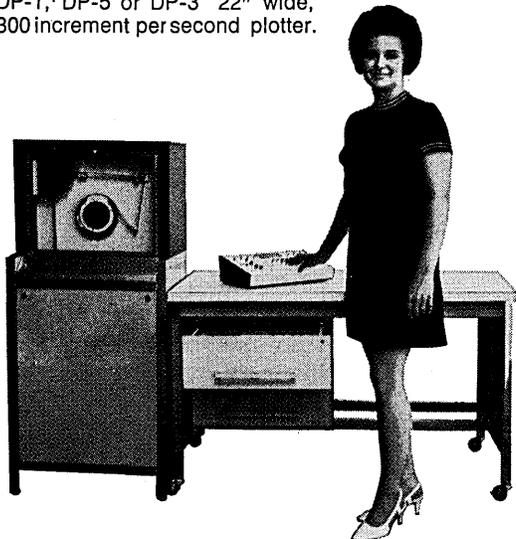


DP-5 \$11,000.

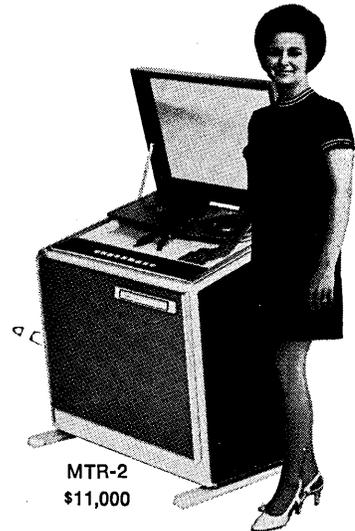
Plotting online is 4 times faster with the Ultra High Speed DP-5 Incremental Plotter. Designed for computer graphics, it plots at a continuous speed of 1200 increments per second. No special programs required. Step size is factory set at .005" or .0025".

Offline plotting in addition to computer I/O capability

The MTR-9 is a superior system offering faster plotting yet uses less computer time. New END-STEP™ MODE software reduces computer time and tape lengths by 10:1. Operates with any speed incremental plotter. Has high speed search with block selection. 7 or 9 track IBM format. Operates with the DP-1, DP-5 or DP-3 22" wide, 300 increment per second plotter.



MTR-9 \$21,000. DP-3 \$6,400.



MTR-2
\$11,000

Offline plotting is now an economic reality with the MTR-2 Magnetic Tape Reader. It operates with the DP-1, DP-3 and DP-5 Plotters to form a complete offline system. The MTR-2 accepts IBM compatible tapes.

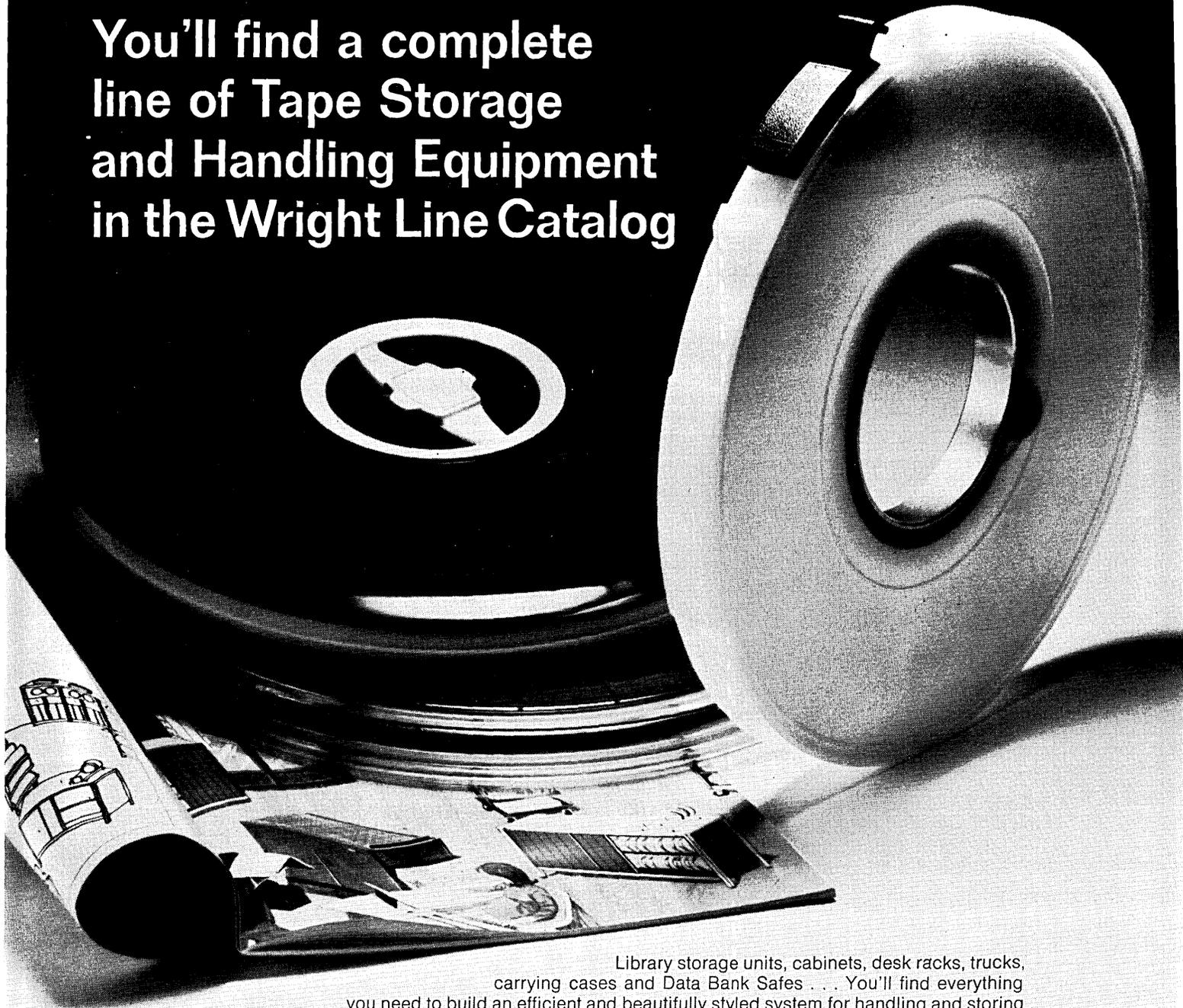
houston instrument

DIVISION OF BAUSCH & LOMB

4850 TERMINAL AVENUE, BELLAIRE, TEXAS 77401

(713) 867 7403 CABLE HOINCO

You'll find a complete line of Tape Storage and Handling Equipment in the Wright Line Catalog



Library storage units, cabinets, desk racks, trucks, carrying cases and Data Bank Safes . . . You'll find everything you need to build an efficient and beautifully styled system for handling and storing tape reels in Tape Seal® Belts, thin-line or standard canisters. Your Wright Line Catalog is the one complete source for information on Tape Storage and accessories for use in disk, eighty column and the new ninety-six column card systems.



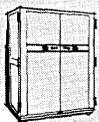
It's so easy to solve your data processing accessory needs with the Wright Line Catalog

1 Select from the catalog and mail or phone your orders directly to your local Wright Line branch office or main plant in Worcester. Wright Line's more than 60 offices are listed in the yellow pages.

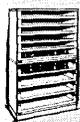
2 If additional information is needed when ordering or planning installations, call your local branch office and ask to have one of Wright Line's more than 125 field specialists call on you.

If you don't have a Wright Line Catalog, we'll be glad to send you one. Write or phone any of our offices or circle the readers' service number below.

Everything for data-processing except the computer.



DATA BANK SAFES



DISK PACK STORAGE



GOLD STAR FILES



TAPE STORAGE



SYSTEM/3 ACCESSORIES



DATA PROCESSING ACCESSORIES

WRIGHT LINE • A DIVISION OF BARRY WRIGHT CORPORATION, 160 GOLD STAR BLVD., WORCESTER, MASS. 01606

CIRCLE 48 ON READER CARD

"READY"

is one of many messages INFOREX gives your operators to increase data throughput.

HERE ARE SOME OF THE OTHERS:

CANCELLED
COLUMN ERROR
DBL KEY
END OF FILE
ENTER LABELS
EOT
ERROR
FIELD FULL
IN PROCESS
INTERRUPTED
INVALID KEY
JOBNAME BUSY
LABEL OVERFLOW
NAME USED
NO JCS
NO JCS END
NO PROGRAM
NO RECORDS
NO UPDATE
NOT IN JOBFIL
NOT READY
PROCEED
READY
RECORD < 16
REKEY
STAT NOT C
STAT NOT I
STORED
TAPE BUSY
95% FULL

We built these messages into the INFOREX Intelligent Key Entry™ System because we believe a truly responsive system can significantly cut data entry errors and simultaneously increase data throughput. For example:

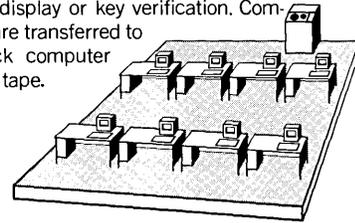
Our 125-character display screen does a lot more than provide a visual check on the operator's work. If she makes an error in procedure it tells her exactly what is wrong. Gives her the status of the job at any time. Issues instructions. Lets her resume work quickly and accurately after an interruption.

It helps the supervisor, too. She can use any station to check jobs in process or get a reading on each operator's performance and accuracy at any time.

Write for full data to help evaluate the Intelligent Key Entry System in your operation. We would also be pleased to have you check with present users on System performance and service. Write INFOREX, Inc., 21 North Avenue, Burlington, Mass. 01803 or INFOREX AG, Dornacherstrasse 210, Basel, Switzerland.

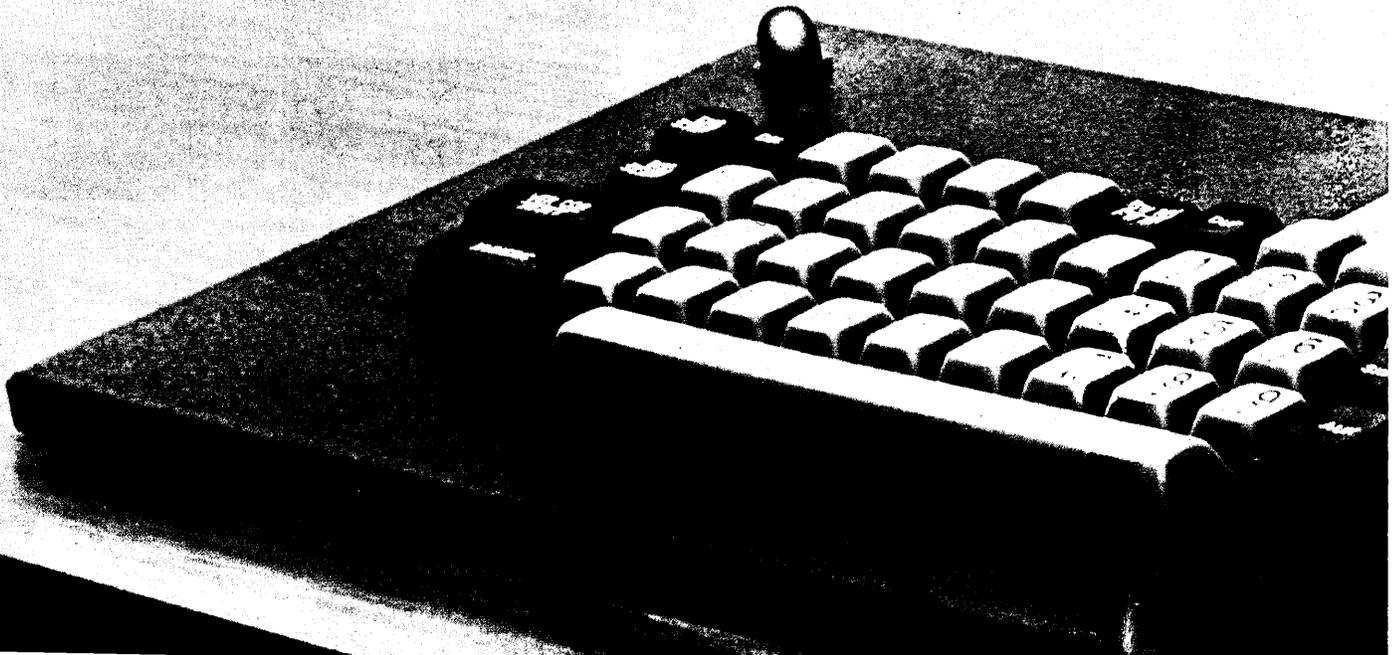
EIGHT KEYSTATION SYSTEM FOR \$120 A MONTH PER STATION

Up to eight keystations input to a memory and logic control unit capable of storing 128 program controls. Any keystation can simultaneously verify the work of any other by full record CRT display or key verification. Completed jobs are transferred to 7- or 9-track computer compatible tape.



 **INFOREX**

CIRCLE 31 ON READER CARD



READY



Tools for cutting through the complexity of the telephone rate structure

Analysis of Common

M With communications becoming an increasingly common feature of computer systems, data processing managers and their staffs are now faced with the task of evaluating common carriers and their services. In addition to the technical complexities of grafting digital equipment into the analog telephone system, there is the not inconsiderable problem of making informed price comparisons of various services offered. The rate structure of the telephone system is a complex affair whose complete details are not readily available. Granted, the WATS rates for service between a given state and any other state are available from telephone company representatives in that state, and the operator in a given city can supply the long distance rates from that city to any other. But neither of these sources is sufficient for full information about the various rates between points which are both distant to the inquirer. Such information is found in the files of the FCC, and presumably in certain telephone company files.

This paper contains a summary of the tariffs on file as of the end of 1970¹ for three types of voice grade service: (1) private line, (2) the dial-up network, and (3) WATS. Further it presents some techniques for making rapid rough cost comparisons of the different types of service.

1. AT&T has filed increased tariffs with FCC for some types of dial-up service, effective January 21, 1971. These rate increases mainly involve operator-handled calls and therefore should have negligible effect on this analysis.

The information presented herein, and the results based on the comparison techniques, are not meant to be used in lieu of quotes from the telephone company, but can be used for preliminary planning purposes, prior to contacting local operating companies for the specific costs of a planned data communication system.

Types of service available

Private line service. The private line service most applicable to data communications use is the type 3002 channel. Although basically of voice grade, this type of channel is somewhat better suited for data than dial-up connections, because its characteristics are better controlled. In addition, channel-conditioning arrangements are available for improving its suitability for data transmission. Such conditioning adjusts the frequency and phase response characteristics of the channel to meet closer tolerance specifications.

To the user, the effect of the different degrees of channel conditioning is roughly as follows:

1. Unconditioned or C1 conditioned lines allow 2000 to 2400 bps operation with modems using fixed equalizers.

2. C2 conditioning allows 4800 bps operation with modems using manually adjustable equalizers.

3. C4 conditioning allows 7200 to 9600 bps operation with some modems using adaptive equalizers. (The equalizers in the modem perform basically the

Carrier Tariff Rates

by Karl I. Nordling

same function as channel conditioning, that is, they attempt to compensate for deviations from nominal in the gain/phase characteristics of the channel.)

Private lines are leased on a monthly basis with unlimited usage and the rate is a function of straight-line distance. Private lines that connect more than two points are available; in these multipoint configurations the total mileage is equal to the sum of the

individual legs. In addition to the mileage charge there is a monthly charge for each "service terminal" connected to the line. Channel conditioning is applied at each exchange the line passes through. A two-point line would normally pass through two exchanges, a three-point line through three exchanges, and so on. The monthly rates are as shown in Tables 1, 2, and 3. *(Continued on page 30)*

Type of Line	Rate per Airline Mile per Month				
	First 25 Miles	Next 75 Miles	Next 150 Miles	Next 250 Miles	Add. Mileage
Half-Duplex	\$3.00	\$2.10	\$1.50	\$1.05	\$0.75
Full-Duplex	3.30	2.31	1.65	1.155	0.825

Table 1. Monthly mileage rates: Private Line Service.

Charge per Service Terminal	Monthly Charge	Installation Charge
First station in an exchange		
Half-duplex	\$12.50	\$10.00
Full-duplex	13.75	10.00
Each additional station on the same service and in the same service		
Half-duplex	7.50	10.00
Full-duplex	8.25	10.00
Note: Where an interchange channel-switching arrangement is provided, each station at the switching point requires a service terminal for each private line to which it is connected which can be operated as a separate-private line.		

Table 2. Monthly service terminal rates: Private Line Service.

Tariff Rates . . .

An additional type of leased line service of interest to the data user is the foreign exchange line. This in effect connects a user to an exchange other than his own, thus allowing toll-free calling to telephones served by that exchange. The rates for foreign exchange lines are the same as for type 3002 private line. Channel conditioning is not available.

Public switched (dial-up) network. The public switched network, or dial-up network, can also be used for data communications. As in the case of private lines, the unconditioned dial-up channel allows data transmission of approximately 2400 bps.

Since each dial-up connection may involve a unique combination of circuits, the telephone company does not guarantee the characteristics of dial-up channels. Therefore, to achieve high data rates on the dial-up network, the required conditioning, or equalization, must be performed within the modem. This is done most effectively with an automatic equalizer, which rapidly assesses the line characteristics and compensates for them at the start of the connection and then continuously adapts to any changes during the entire connect-time.

The rates for interstate dial-up network service are

Type of Conditioning	Monthly Rate
C1	
Two-point channel not arranged for switching per exchange	\$ 5.00
arranged for switching per exchange	10.00
Multipoint channel not arranged for switching per exchange	10.00
C2	
Two-point channel not arranged for switching per exchange	19.00
arranged for switching per exchange	28.00
Multipoint channel not arranged for switching	28.00
arranged for switching	28.00
C4	
Two-point channel for the first station in an exchange	30.00
for each additional station in the same exchange	9.75
Three-point or four-point channel for the first station in an exchange	36.00
for each additional station in the same exchange	9.75
NOTE: On a three-point or four-point channel, C4 conditioning applies only between one exchange (designated by the customer as the control point) and each of the other two or three exchanges. C4 conditioning is not available on channels with more than four points.	

Table 3. Monthly channel-conditioning rates: Private Line Service.

Rate Step	Rate Mileage	STATION—DDD							
		Day*		Evening*		Night*		Weekend*	
		Initial 3 min.	Each Add'l Min.						
1	1-10	\$.15	\$.05	\$.15	\$.05	\$.10	\$.05	\$.15	\$.05
2	11-16	.20	.05	.20	.05	.10	.05	.20	.05
3	17-22	.25	.05	.25	.05	.10	.05	.20	.05
4	23-30	.30	.10	.30	.10	.10	.05	.20	.05
5	31-40	.35	.10	.35	.10	.15	.10	.35	.10
6	41-55	.40	.10	.40	.10	.15	.10	.35	.10
7	56-70	.45	.15	.40	.10	.15	.10	.35	.10
8	71-85	.50	.15	.40	.10	.15	.10	.35	.10
9	86-100	.55	.15	.40	.10	.15	.10	.35	.10
10	101-124	.60	.15	.45	.15	.15	.10	.35	.10
11	125-148	.65	.20	.50	.15	.20	.15	.50	.15
12	149-196	.70	.20	.55	.15	.20	.15	.50	.15
13	197-244	.70	.20	.55	.15	.20	.15	.50	.15
14	245-292	.75	.25	.55	.15	.20	.15	.50	.15
15	293-354	.80	.25	.55	.15	.20	.15	.50	.15
16	355-430	.85	.25	.60	.20	.20	.15	.50	.15
17	431-675	.95	.30	.60	.20	.20	.15	.50	.15
18	676-925	1.05	.35	.65	.20	.20	.15	.50	.15
19	926-1360	1.15	.35	.70	.20	.25	.20	.65	.20
20	1361-1910	1.25	.40	.75	.25	.25	.20	.65	.20
21	1911-3000	1.35	.45	.85	.25	.35	.20	.70	.20

*Day, 8 am-5 pm, Mon-Fri; evening, 5-11 pm, Sun-Fri; night, 11 pm-8 am, daily; weekend, 8 am-11 pm, Sat and 8 am-5 pm, Sun.

Table 4. Interstate rates for dial-up service: Message Schedule I Rate, effective February 1, 1970.

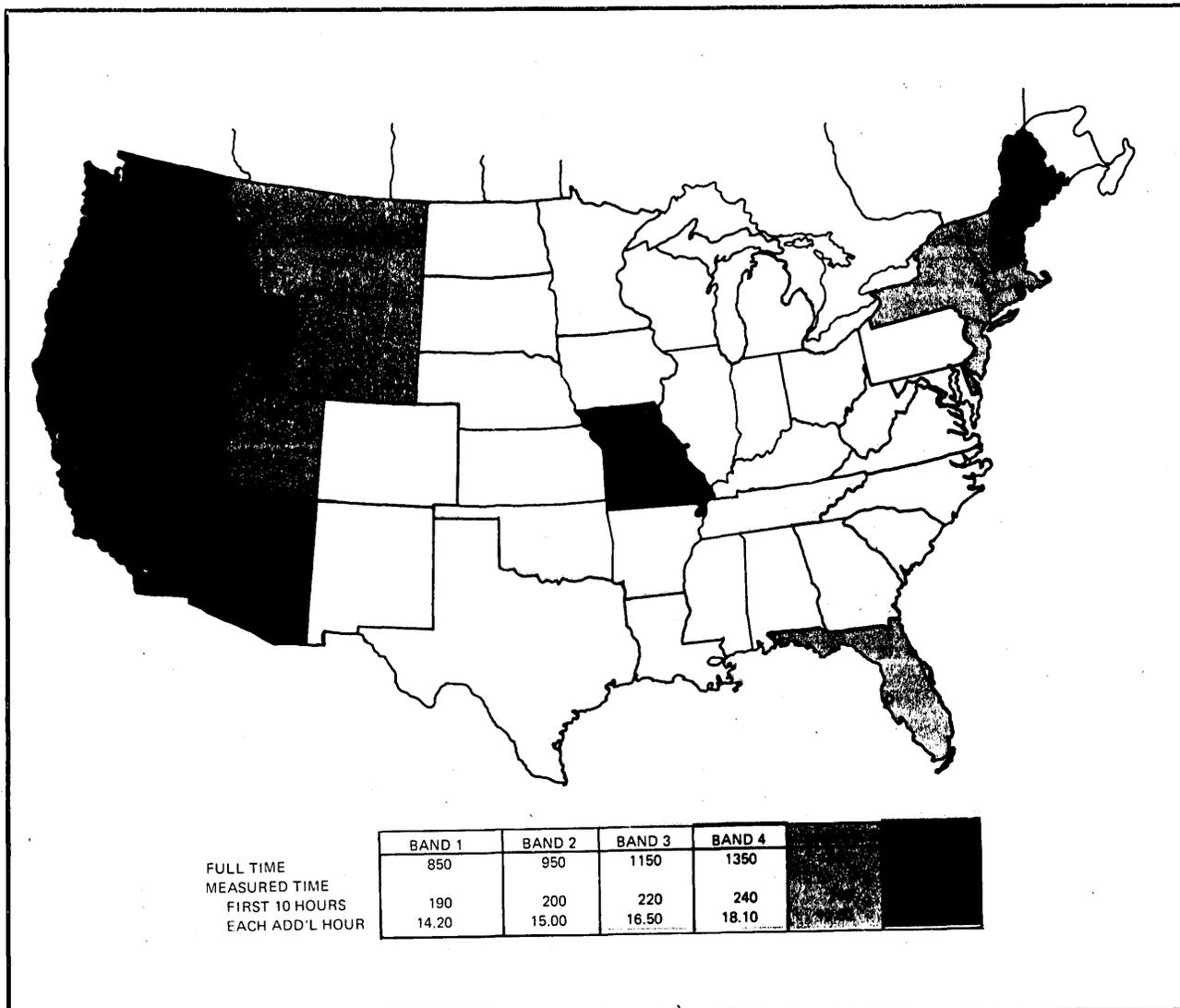


Fig. 1. WATS areas and rates in dollars per month for the state of Missouri.

shown in Table 4.

When using the dial-up network for data communications, a device known as a data-access arrangement is required to connect non-telephone company data sets to the network. This device rents for \$2.00 per month for basic manual operation. If the auto-answer feature is required the charge is about \$5 per month. When common carrier data sets are used, no separate data access arrangement is required.

Wide Area Telephone Service (WATS). WATS is essentially a system for buying telephone service in bulk quantity. By paying a fixed cost per month, the customer can make an unlimited number of calls to any telephone within a designated area. There are two types of service: measured WATS and full-period WATS. Measured WATS provides ten hours per month with an extra charge for every one-tenth hour of over-time. Full-period WATS provides unlimited calling within the designated areas for a fixed monthly rate.

The rate for WATS service is a function of the area covered. For this purpose continental United States is divided into six roughly concentric bands or service areas, around the customer's state. The bands, num-

bered 1 through 6, contain roughly equal numbers of telephones. Fig. 1 shows the WATS schedule for the state of Missouri. The FCC tariff governing WATS, FCC No. 259, covers interstate WATS rates only. Intrastate WATS is available in some states with rates set by state public utilities commissions.

The rate for each service area is for service to all phones within that area and within all lower numbered areas. The rates shown are for one access line, which means that only one connection can exist at any one time. For more than one simultaneous connection, additional access lines are required. The rate for each additional line is the same as for the first one.

Under the WATS arrangement, calls can be originated in only one direction, although once a connection is established, two-way communication is, of course, possible. Those WATS systems which permit a customer to originate calls to telephones in the WATS area are called Out-WATS; those that permit the customer to receive calls from telephones in the WATS areas are called In-WATS.

Data communications can be handled on WATS

Tariff Rates . . .

lines in the same way as on normal dial-up lines, although the characteristics of WATS channels may differ somewhat from those of the average dial-up channel.

Data communications can be handled on WATS lines in the same way as on normal dial-up lines; however, some precautions may be in order. WATS telephones are served by special central offices equipped to handle WATS. If the customers' local control office is not so equipped his access line will be routed to the nearest WATS office by way of the local office. The result is, in effect, an extra long local loop which is not guaranteed to meet the transmission characteristics of normal local loops intended for data use. The remedy, if one is needed, is to install a foreign exchange line to the WATS office.

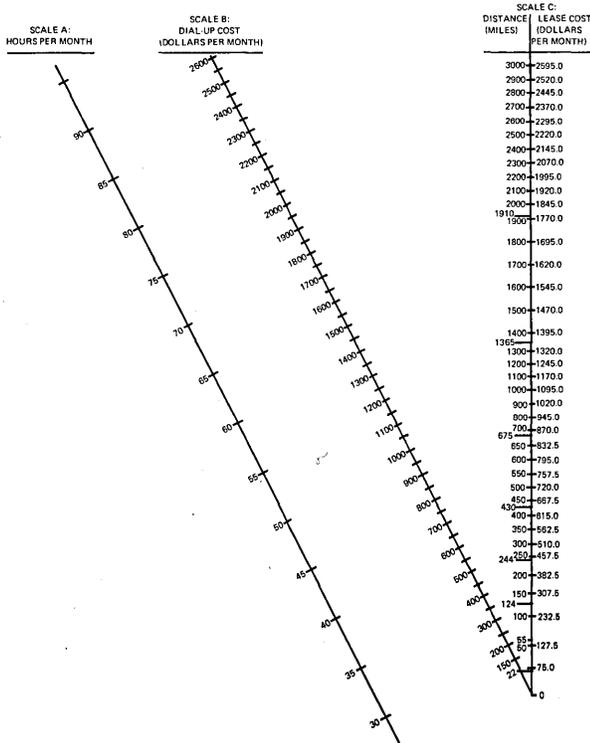


Fig. 2. Nomograph for determining dial-up versus lease costs.

The different types of service discussed in this paper are intended to meet different requirements. In general:

1. Private lines are intended for high volume traffic among relatively few points.
2. WATS is intended for high volume traffic between one fixed point and many, widely distributed, other points.
3. Dial-up service is best suited for low volume random traffic.

Depending on the exact circumstances of distance and usage, however, the best choice in an individual case may differ from these general rules. This section offers a number of aids for an approximate comparative analysis of the various services, based on the parameters of an individual case.

Private line vs. dial-up. The break-even point between leasing a line and using dial-up service is a function of distance and average length of call. Since

the minimum charge for a dialed call is three minutes, traffic made up of very many short calls would make the effective hourly rate higher than traffic primarily made up of long calls. For the following comparison, long-call traffic is assumed. Thus, the dial-up rates used are overtime rates, which apply after the initial three minutes. As shown in Table 4, these are divided into nine rate steps ranging from \$0.05 per minute to \$0.45 per minute. The nomograph in Fig. 2 can be used for a rapid, reasonably accurate, comparison of leased line versus dial-up costs. To use it, a straight line is drawn from the point on scale A corresponding to the distance involved, to the point on scale C corresponding to the expected monthly usage in hours. Where this line crosses scale B, the monthly dial-up cost is found. This cost can then be compared to the lease cost, shown on scale A. (The lease cost shown does not indicate charges for service terminals and channel conditioning). Depending on distance, the break-even point will be found in the range of 30 to 80 hours per month.

Private line vs. WATS. Whenever a network in-

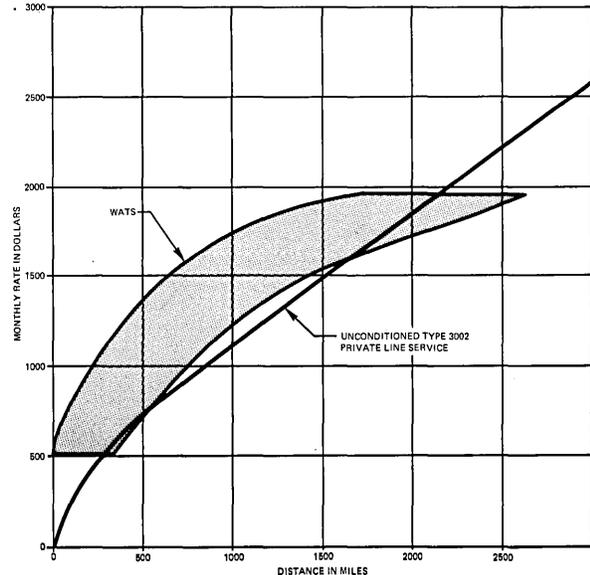


Fig. 3. Monthly rates as a function of distance for WATS and private line service.

cludes more than a few points, especially if the points are geographically widespread, WATS is the most economical service. Even in two-point service, in some cases, WATS can compete with private lines. Fig. 3 shows the monthly lease cost vs. mileage for type 3002 line, and a scattergram of monthly full-WATS cost vs. mileage. As shown, for distances over 1,700 miles WATS is competitive with private lines even on a point-to-point basis. For an approximate comparison in a specific case, read the private line cost off the curve in Fig. 3. The applicable WATS band and its monthly cost can be found from the cost chart in Fig. 4.

In this chart each color represents a different WATS band, or Service Area. The color at the intersection between the "State-A" row and the "State-B" column defines the WATS band in which "State-B" is with respect to customers in "State-A." The black color used in the intersections along the diagonal is used to

indicate that the chart does not apply to WATS service within a state. (Intrastate tariffs where they exist can be obtained from the local telephone company representatives.) The columns at the right of the chart list the monthly rate for each of the six bands for the various states.

To use the chart, the home state is found on the left side. That row is followed to the column which corresponds to the other state involved. The color at the intersection indicates the applicable WATS band. By following the same row to the intersection with the same color rate-column on the right, the monthly cost for the appropriate band of WATS service is found. To find the measured WATS rates use Table 5, which lists these for each band for each state. The first column in each band shows the charge for the first ten hours and the second column shows the charge for each additional hour.

The state subdivisions shown are defined in terms of area codes (above right).

Dial-up vs. WATS. The comparison between full-WATS and dial-up service is based on traffic level and traffic distribution. If traffic is made up of many

State	Area Codes
California	—N 209, 408, 415, 707, 916
California	—S 213, 714, 805, 815
Illinois	—S 309, 312, 815
Illinois	—S 217, 618
Michigan	—S 906
Michigan	—S 313, 517, 616
New York	—NE 315, 518, 607
New York	—SE 212, 516, 914
New York	—W 716
Ohio	—S 216, 419
Ohio	—S 513, 614
Pennsylvania	—E 215, 717
Pennsylvania	—W 412, 814
Texas	—E 214, 713, 817
Texas	—S 512
Texas	—W 806, 915

simultaneous calls, WATS is inefficient. If calls can be sequential, and monthly volume exceeds 50 to 70 hours, full period, WATS is typically more economical than dial-up service. Measured WATS is significantly more economical than dial-up only when traffic is made up of mostly short calls. For a more specific comparison, use the table in Fig. 4 (page 34) to determine monthly WATS cost between any two geographical points. Then use the table in Fig. 5 (page 35) to determine the hourly cost for dial-up service between the same points. Multiplying this hourly dial-up cost by the expected number of hours of usage per month,

SERVICE AREAS

STATE	1		2		3		4		5		6	
	1st 10 hrs	each addl hr										
Ala.	180	13.50	210	15.80	230	17.30	250	18.80	270	20.20	305	22.80
Ariz.	200	15.00	230	17.30	250	18.80	290	21.60	300	22.40	310	23.20
Ark.	180	13.50	210	15.80	230	17.30	250	18.80	270	20.20	295	22.00
Calif.-N	210	15.80	240	18.10	290	21.60	300	22.40	310	23.20	315	23.60
Calif.-S	220	16.50	250	18.80	290	21.60	300	22.40	310	23.20	315	23.60
Colo.	210	15.80	220	16.50	230	17.30	250	18.80	290	21.60	295	22.00
Conn.	130	10.00	180	13.50	240	18.10	280	20.90	300	22.40	320	24.00
Del.	130	10.00	180	13.50	220	16.50	260	19.50	295	22.00	315	23.60
D.C.	130	10.00	180	13.50	210	15.80	250	18.80	290	21.60	315	23.60
Fla.	210	15.80	240	18.10	250	18.80	270	20.20	290	21.60	315	23.60
Ga.	180	13.50	210	15.80	230	17.30	250	18.80	280	20.90	310	23.20
Idaho	190	14.20	220	16.50	250	18.80	290	21.60	300	22.40	310	23.20
Ill.-N	170	12.80	190	14.20	220	16.50	240	18.10	250	18.80	295	22.00
Ill.-S	170	12.80	200	15.00	220	16.50	240	18.10	250	18.80	295	22.00
Ind.	170	12.80	190	14.20	210	15.80	230	17.30	260	14.50	300	22.40
Iowa	180	13.50	210	15.80	220	16.50	250	18.80	260	19.50	290	21.60
Kan.	190	14.20	210	15.80	220	16.50	250	18.80	280	20.90	290	21.60
Ky.	170	12.80	190	14.20	210	15.80	230	17.30	260	19.50	305	22.80
La.	190	14.20	220	16.50	240	18.10	260	19.50	290	21.60	300	22.40
Me.	190	14.20	220	16.50	260	19.50	290	21.60	300	22.40	320	24.00
Md.	130	10.00	180	13.50	220	16.50	260	19.50	295	22.00	315	23.60
Mass.	130	10.00	190	14.20	240	18.10	280	20.90	300	22.40	320	24.00
Mich.-N	190	14.20	220	16.50	230	17.30	240	18.10	280	20.90	300	22.40
Mich.-S	180	13.50	210	15.80	220	16.50	240	18.10	280	20.90	300	22.40
Minn.	180	13.50	210	15.80	240	18.10	260	19.50	270	20.20	290	21.60
Miss.	190	14.20	210	15.80	230	17.30	250	18.80	270	20.20	300	22.40
Mo.	190	14.20	200	15.00	220	16.50	240	18.10	260	19.50	295	22.00
Mont.	210	15.80	230	17.30	250	18.80	280	20.90	295	22.00	300	22.40
Neb.	190	14.20	210	15.80	230	17.30	250	18.80	280	20.90	290	21.60
Nev.	180	13.50	220	16.50	260	19.50	295	22.00	305	22.80	310	23.20
N.H.	160	12.00	200	15.00	240	18.10	280	20.90	300	22.40	320	24.00
N.J.	130	10.00	170	12.80	230	17.30	270	20.20	295	22.00	315	23.60
N.M.	200	15.00	220	16.50	240	18.10	270	20.20	290	21.60	300	22.40
N.Y.-NE	170	12.80	210	15.80	230	17.30	270	20.20	295	22.00	315	23.60
N.Y.-SE	130	10.00	200	15.00	230	17.30	270	20.20	295	22.00	315	23.60
N.Y.-W	170	12.80	190	14.20	230	17.30	270	20.20	295	22.00	315	23.60
N.C.	180	13.50	200	15.00	220	16.50	250	18.80	290	21.60	310	23.20
N.D.	190	14.20	230	17.30	250	18.80	270	20.20	280	20.90	290	21.60
Ohio-N	170	12.80	190	14.20	210	15.80	230	17.30	280	20.90	305	22.80
Ohio-S	170	12.80	190	14.20	210	15.80	230	17.30	280	20.90	305	22.80
Okla.	190	14.20	210	15.80	230	17.30	250	18.80	280	20.90	290	21.60
Ore.	190	14.20	230	17.30	280	20.90	295	22.00	310	23.20	315	23.60
Pa.-E	130	10.00	180	13.50	220	16.50	250	18.80	290	21.60	310	23.20
Pa.-W	170	12.80	180	13.50	220	16.50	250	18.80	290	21.60	310	23.20
R.I.	130	10.00	190	14.20	240	18.10	280	20.90	300	22.40	320	24.00
S.C.	180	13.50	210	15.80	230	17.30	250	18.80	280	20.90	310	23.20
S.D.	190	14.20	220	16.50	230	17.30	260	19.50	280	20.90	290	21.60
Tenn.	190	14.20	200	15.00	220	16.50	240	18.10	260	19.50	305	22.80
Tex.-E	200	15.00	230	17.30	250	18.80	270	20.20	290	21.60	295	22.00
Tex.-S	220	16.50	240	18.10	250	18.80	270	20.20	290	21.60	295	22.00
Tex.-W	210	15.80	230	17.30	250	18.80	270	20.20	290	21.60	295	22.00
Utah	200	15.00	210	15.80	240	18.10	280	20.90	295	22.00	305	22.80
Vt.	160	12.00	200	15.00	240	18.10	280	20.90	295	22.00	320	24.00
Va.	170	12.80	180	13.50	210	15.80	250	18.80	290	21.60	310	23.20
Wash.	220	16.50	250	18.80	290	21.60	300	22.40	305	22.80	315	23.60
W.Va.	160	12.00	180	13.50	210	15.80	240	18.10	290	21.60	310	23.20
Wis.	170	12.80	210	15.80	230	17.30	250	18.80	260	19.50	295	22.00
Wyo.	190	14.20	220	16.50	240	18.10	260	19.50	290	21.60	300	22.40

Table 5.

	Area 1	Area 2	Area 3	Area 4
ALA	750	1050	1250	1450
ARIZ	950	1250	1450	1650
ARK	750	1050	1250	1450
CAL-N	1050	1350	1650	1750
CAL-S	1150	1450	1650	1750
COLO	1050	1150	1250	1450
CONN	500	750	1350	1600
DEL	500	750	1150	1500
D.C.	500	750	1050	1450
FLA	1050	1350	1450	1550
GA	750	1050	1250	1450
IDAHO	850	1150	1450	1650
ILL-N	650	850	1150	1350
ILL-S	650	950	1150	1350
IND	650	850	1050	1250
IOWA	750	1050	1150	1450
KAN	850	1050	1150	1450
KY	650	850	1050	1250
LA	850	1150	1350	1500
ME	850	1150	1500	1650
MD	500	750	1150	1500
MASS	500	850	1350	1600
MICH-N	850	1150	1250	1350
MICH-S	750	1050	1150	1350
MINN	750	1050	1350	1500
MISS	850	1050	1250	1450
MO	850	950	1150	1350
MONT	1050	1250	1450	1600
NEB	850	1050	1250	1450
NEV	750	1150	1500	1700
NH	600	950	1350	1600
NJ	500	650	1250	1550
NM	950	1150	1350	1550
NY-NE	650	1050	1250	1550
NY-SE	500	950	1250	1550
NY-W	650	850	1250	1550
NC	750	950	1150	1450
ND	850	1250	1450	1550
OHIO-N	650	850	1050	1250
OHIO-S	650	850	1050	1250
OKLA	850	1050	1250	1450
ORE	850	1250	1600	1700
PA-E	500	750	1150	1450
PA-W	650	750	1150	1450
RI	500	850	1350	1600
SC	750	1050	1250	1450
SD	850	1150	1250	1500
TENN	850	950	1150	1350
TEX-E	950	1250	1450	1550
TEX-S	1150	1350	1450	1550
TEX-W	1050	1250	1450	1550
UTAH	950	1050	1350	1600
VT	600	950	1350	1600
VA	650	750	1050	1450
WASH	1150	1450	1650	1750
W.VA	600	750	1050	1350
WIS	650	1050	1250	1450
WYO	850	1150	1350	1500

Fig. 4. Table for determining WATS rates for any state relative to any other state.

Tariff Rates . . .

	ATLANTA	BALTIMORE	BIRMINGHAM	BOSTON	CHICAGO	CINCINNATI	CLEVELAND	DALLAS	DENVER	DES MOINES	DETROIT	HARTFORD	HOUSTON	INDIANAPOLIS	KANSAS CITY	LOS ANGELES	MIAMI	MINNEAPOLIS	NEW YORK	OMAHA	PHILADELPHIA	PHOENIX	PITTSBURG	RICHMOND	ROCHESTER	SALT LAKE CITY	SAN DIEGO	SAN FRANCISCO	SEATTLE	ST. LOUIS	TAMPA	TULSA	WASHINGTON		
ATLANTA, GA.		18	12	21	18	15	18	21	21	21	18	21	21	15	21	27	18	21	21	21	18	24	18	12	12	15	24	27	27	27	18	15	21	18	
BALTIMORE, MD.			21	15	18	15	15	21	24	21	15	15	21	18	21	27	21	21	12	21	9	27	12	15	24	27	27	27	21	21	21	21	6		
BIRMINGHAM, ALA.				21	18	15	18	18	21	18	18	21	18	15	18	24	18	21	21	21	21	24	18	18	21	24	24	27	27	25	28	28	28		
BOSTON, MASS.					21	21	18	24	24	21	18	12	24	21	17	21	21	12	21	15	27	18	18	15	27	27	27	27	21	21	24	15			
CHICAGO, ILL.						15	15	21	21	15	15	21	21	12	15	24	21	18	18	24	15	18	18	21	24	24	24	15	21	18	18				
CINCINNATI, OHIO							*	21	21	18	12	18	21	9	18	24	21	18	18	18	18	24	15	15	18	24	27	27	15	21	18	15			
CLEVELAND, OHIO								21	21	18	12	18	21	15	21	27	21	18	15	21	15	24	9	15	12	24	27	27	18	21	21	15			
DALLAS, TEX.								18	18	21	24	*	21	18	21	21	21	14	18	21	21	21	21	21	21	21	21	24	24	18	21	12	21		
DENVER, COLO.									18	21	24	21	21	18	21	24	18	24	18	24	18	21	24	15	15	15	21	21	21	21	24	18	24		
DES MOINES, IOWA										18	21	21	15	12	24	21	12	21	12	21	21	21	21	21	21	21	14	14	14	15	21	15	21		
DETROIT, MICH.											18	21	12	18	27	21	18	18	21	18	24	12	18	15	24	27	27	27	18	21	21	15			
HARTFORD, CONN.												24	21	21	27	21	21	9	21	12	27	15	15	15	27	27	27	21	21	21	21	15			
HOUSTON, TEX.													21	18	14	21	21	24	21	21	21	21	21	21	21	21	21	24	24	21	21	18	21		
INDIANAPOLIS, IND.														18	24	21	18	18	18	18	18	24	15	18	18	21	24	27	24	12	21	28	18		
KANSAS CITY, KAN.															21	21	15	21	12	21	21	21	21	21	21	21	24	24	12	21	12	21			
LOS ANGELES, CAL.																27	24	27	21	27	15	27	27	27	18	*	*	21	24	27	21	27			
MIAMI, FLA.																	24	21	24	21	27	21	21	21	27	27	27	27	21	*	21	21			
MINNEAPOLIS, MINN.																		21	15	21	21	21	21	21	21	21	24	24	18	21	18	21			
NEW YORK, N.Y.																			21	9	27	15	15	*	27	27	27	21	21	21	12				
OMAHA, NEB.																					21	21	21	21	21	21	21	24	24	15	21	15	21		
PHILADELPHIA, PA.																						27	*	12	15	27	27	27	21	21	21	9			
PHOENIX, ARIZ.																							24	27	27	18	15	18	21	21	24	21	27		
PITTSBURG, PA.																							12	12	24	27	27	27	18	21	21	12			
RICHMOND, VA.																								15	24	27	27	27	21	21	21	9			
ROCHESTER, N.Y.																									24	27	27	21	21	21	15				
SALT LAKE CITY, UTAH																										18	18	21	21	24	21	24			
SAN DIEGO, CALIF.																											*	21	24	27	21	27			
SAN FRANCISCO, CALIF.																												21	24	27	24	27			
SEATTLE, WASH.																																24	27	24	27
ST. LOUIS, MO.																															21	15	21		
TAMPA, FLA.																																21	21		
TULSA, OKLA.																																	21	21	
WASHINGTON, D.C.																																		21	

*The rates between points within a state are not governed by FCC tariffs. For this information consult the local telephone company or the state public utilities commission.

Fig. 5. Daytime interstate dial-up rates in dollars per hour.

gives the monthly dial-up cost to be compared with the WATS cost.

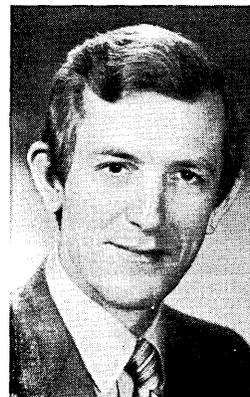
When comparing measured WATS with dial-up, or with full-WATS, note that where a customer subscribes to more than one measured time access line to the same service area, on the same premises, the initial measured time period will be on the product of ten hours multiplied by the number of access lines. The additional period, in such a case, will be the sum of the accumulated measured times of such access lines in excess of that product, computed in hourly periods and tenths of an hour or major fraction thereof. This computation is made separately for outward and inward measured-WATS service.

Conclusion

As this article suggests, telephone service is available in a variety of forms and with a very complicated rate structure. It is almost impossible to say before hand what type of service will be best for a given application. Each case must be analyzed in detail to determine the optimum type or combination of types. The tools offered in this article should help the communications designer to perform at least a first-order analysis reasonably rapidly.

From the data presented, we can conclude that dial-up service is more economical than private line for surprisingly high (50-80 hours per month) levels

of usage and that WATS is not much more expensive than private line, but still offers network-wide access capability while private line is limited to a few points. This comparison is based on the assumption that data rates on dial-up lines are comparable to those on leased lines. With 4800 bps modems for dial-up use, such as the Paradyne modem, now becoming available, this is a realistic assumption. ■



Mr. Nordling is director of product management for the Paradyne Corp. of Clearwater, Fla. In this capacity he is responsible for product planning, product definition, and field support material. Before joining Paradyne, he was with Control Data Corp., where he served as manager of product planning for the Analog Digital Systems Division, among other assignments. Mr. Nordling holds a BSEE degree from Heald's College and an MSE degree from the Univ. of Pennsylvania.

Standard signs for computer jargon may allow the deaf to compete as programmers

Computing Signs Help Train the Deaf

by Fred Gruenberger and Robert Teague

G Consider the person who is totally deaf. Of the several million such people in the United States, perhaps a quarter of a million are capable of gainful employment except for their handicap. They are usually as capable physically and mentally as a hearing person, but lack the ability to communicate which is vital to normal employment. Deafness is a far more serious handicap than blindness when it comes to the problem of interfacing with the unhandicapped world, because communication is possible only through the language of signs, or by lip-reading, or by written messages. Even though most deaf persons are not mute, they normally cannot use their voice since they do not know what their words sound like.

The *total* effort expended thus far for the deaf has been in the area of developing the language of signs, which has a vocabulary of some 2,500 words.¹ For concepts which do not have a sign, a manual alphabet is provided so the deaf person can "finger-spell" the needed word. The use of written messages, or the teaching of lip-reading, is dependent upon communication by signs, which requires that each deaf person have the services of an individual interpreter most of the time.

A large-scale effort to aid otherwise qualified deaf students has existed at San Fernando Valley State College since 1964, under the leadership of Dr. Roy Jones, Chairman of Special Education. Students in this program are attending regular classes with hearing students and professors, and are obtaining degrees; the number in June 1970 was 36 master's degrees, and 3 bachelor's degrees.

In 1969, deaf students began to appear in computing classes. Each student had an interpreter in the class to translate the lecture material and act as go-between in asking questions. The deaf student would sit in the front row, as close to the side of the room as possible. The interpreter would sit facing the student (with his back to the instructor). This seating ar-

angement allowed the student to watch the instructor, the chalk board and the interpreter simultaneously, and therefore, obtain the maximum information content possible. Due to the training the deaf have received in using their eyes for communication, they have tremendous peripheral vision, and miss little in the classroom situation. In addition to the interpreter, two or three students in each class volunteered to take notes with two carbons, so that the deaf student could concentrate on the lecture. To compensate the student note-takers, the second carbon was exchanged between them, giving each of them two sets of notes to study from. This proved important on occasion; because the students felt the obligation of taking good notes, they would sometimes miss part of the lecture. The second set of notes helped to fill in the gaps.

This time-tested procedure appeared to work well in most other classes, but seemed to be failing in the computing classes. The deaf students, who had potential equal to the rest of the class, were not doing as well as the hearing students; they were failing to grasp certain very basic concepts. The trouble lies in the language we use to teach computing. It is naturally rich in technical terms, and these terms have a precise meaning that is not normally conveyed by their English connotation. Since this language is so specialized, signs for computing terms have not been added to the language of signs as yet. Consequently, the student and his interpreter have to resort to finger-spelling the terms, and this can be extremely time-consuming. For example, the term "computer" and its variants may be used several dozen times during a 50-minute lecture, and must be finger-spelled, using eight different hand movements (see Fig. 1).

Add to this the usual tendency of computing lecturers to throw in synonyms like "central processor," "cpu," and "mainframe," and the flow of meaningful communication to the deaf student becomes seriously hampered.

The interpreters, madly trying to keep up with fast-moving lectures, could not be blamed for inventing signs with the student to speed up their work. This

1. Recently the telephone companies have announced a terminal device to aid the deaf. Its effects will not be felt for many years.

allows a concept to be communicated with a single hand movement, rather than with several.

This seemed like a wholly satisfactory arrangement, until a student made an appointment for extra help, and came without his interpreter. Carl Kirchner, who is in charge of the college's interpreting services, volunteered to substitute. During the session, it was discovered that the regular interpreter for that student was using for the computing term "program" the sign that means a theater program, and, even worse, was using the same sign for both "branch" and "loop." Action was called for.

Developing standard signs

Subsequent discussions among the experts called for developing a vocabulary of computer terms and systematically devising standard signs for those terms. As with any standard, these could not be dictated, but had to be developed through cooperation of the

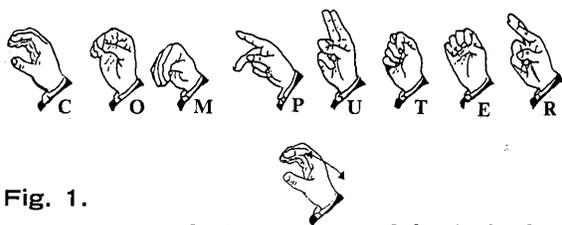


Fig. 1.

computer types, the interpreters, and the deaf, whose language is the language of signs. This "committee of the whole" approach, the number being nearly 25, proved inefficient. More time was being spent in teaching the committee the concepts, than was used to produce the signs. The procedure was modified to follow these basic steps:

1. Determine whether a sign already exists among the schools for the deaf or the deaf computer professionals.

2. Discover whether the deaf feel the existing sign is functional (we found only two that qualified).

3. Develop a sign for the needed term. This was done in one of two ways: (a) the sign was formed so that the very hand movement pictorially conveys the meaning, such as forming several small boxes to represent "storage," (see Fig. 2A), or (b) by adopting a closely related English term, such as making the sign for "order" with your hand in the form of an "I" for "instruction" (see Fig. 2B).

4. Field-test it with several interpreters in classroom situations.

5. Solicit feedback from the deaf community.

Using this approach, 30 signs for basic computer terms were developed over a two month period. Now there was the beginning of a vocabulary.

The real problem is the dissemination of the new signs, both to the deaf and to the interpreters, in such a way that they can be visualized and practiced by the potential users. The ideal medium is the motion picture. There are immediately some problems:

1. Will black and white film do the job, or will color help?

2. What color? What is the best combination of background color and dress color for the interpreter, to make each sign clear?

3. How shall the English meaning of the sign be conveyed on the film?

4. What is the proper speed of presentation? Would slow motion help? Would it be better to present each sign in both slow motion and normal speed?

5. Should each sign be shown from the point of view of the person reading it, as well as from the viewpoint of the person making it?

Pilot film

To test out all these variables, a pilot film was shot in January, 1970. Carl Kirchner served as the subject of the film. Thirty terms in computing (e.g., computer, branch, bit, loop, subroutine) were selected from a list of 300 terms. It was decided to present each term on screen in these segments:

1. The term is spelled out using the manual alphabet.

2. The term is presented as the person reading it (the student) would see it, and at the same time the English version appears on the screen on a card just below the interpreter.

3. The term is presented as seen from the rear, the way the person making it (the interpreter) will think of it. Its English version again appears on screen.

4. A short paragraph using all the new signs in context is presented at the end of the film for reinforcement.

Many combinations of background color and style and color of dress were tried (the resulting trial film is a bit jumpy in changes of color and format). It seems that a medium green background and a dark-colored (blue or black) sweater provide the best contrast for making the hand signs clear and distinct.

The pilot film was shot at sound speed (24 frames per second), although, of course, there is no sound track on the finished film. Deaf viewers and interpreters have preferred to view the result at silent speed (16 frames per second), which gives the effect of slow motion. Probably the best results would be obtained as follows, assuming that projection will be at sound speed. The first segment for each term (spelling it out in the sign alphabet) should be shot at 24 frames per second, but with the signer taking pains to spell slowly. The second segment should be shot at 30 frames per second, and the third segment shot at 36 frames per second.

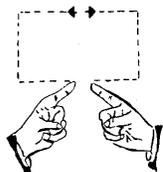


Fig. 2A.



Fig. 2B.



"Instruction"

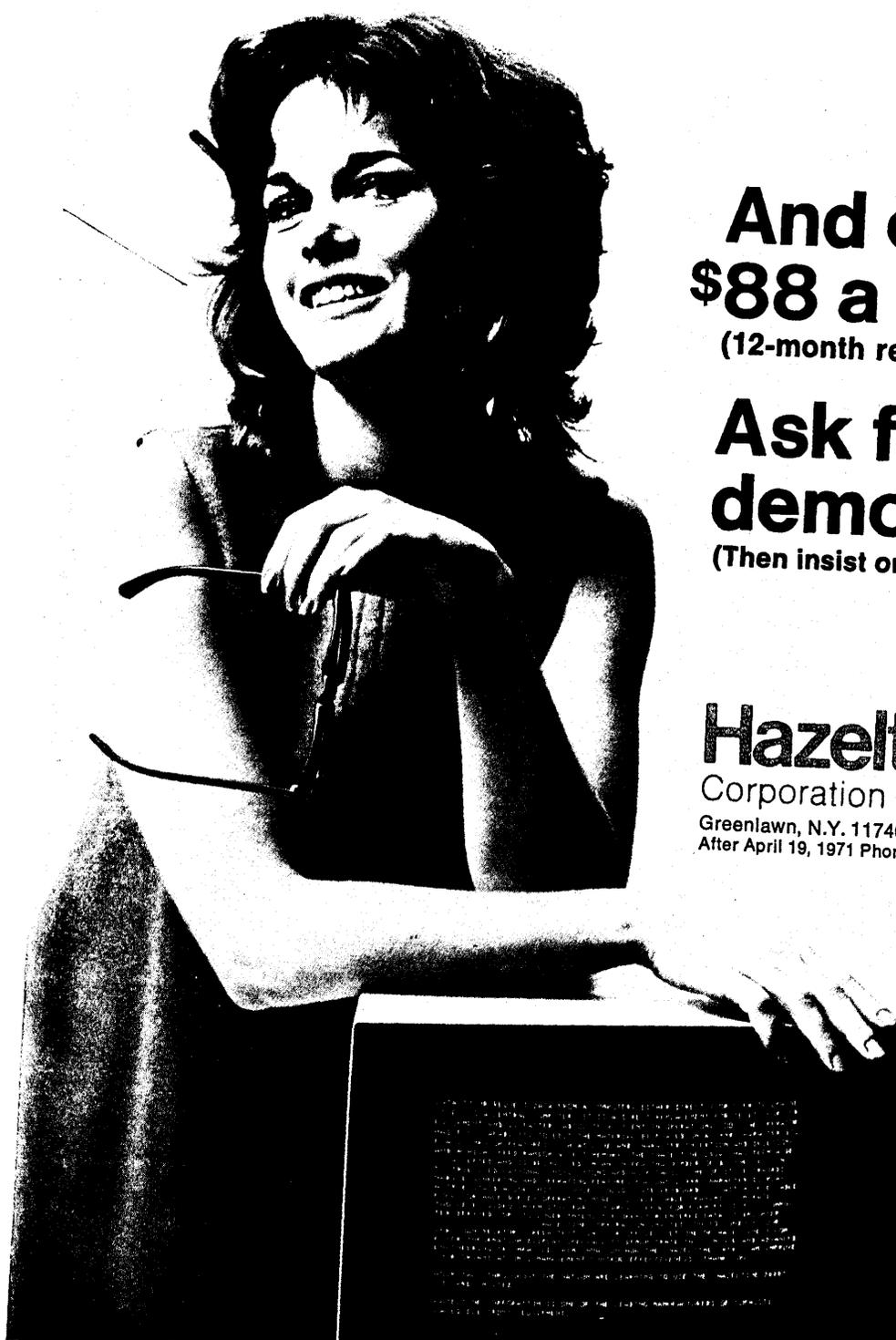
This procedure would seem to be somewhat wasteful of film, but there is a good rationale for it. Projectors are appearing on the market for 8 mm cartridge loops, battery operated and hand held, that operate only at 24 frames per second. The current machines (selling at around \$100) handle sound. The sound mechanism is singularly useless to the deaf, of course, and without the sound gear (which includes a magnetic pickup, amplifier, and loudspeaker) these devices should cost less. The personal projector can thus serve the deaf the same way as inexpensive tape

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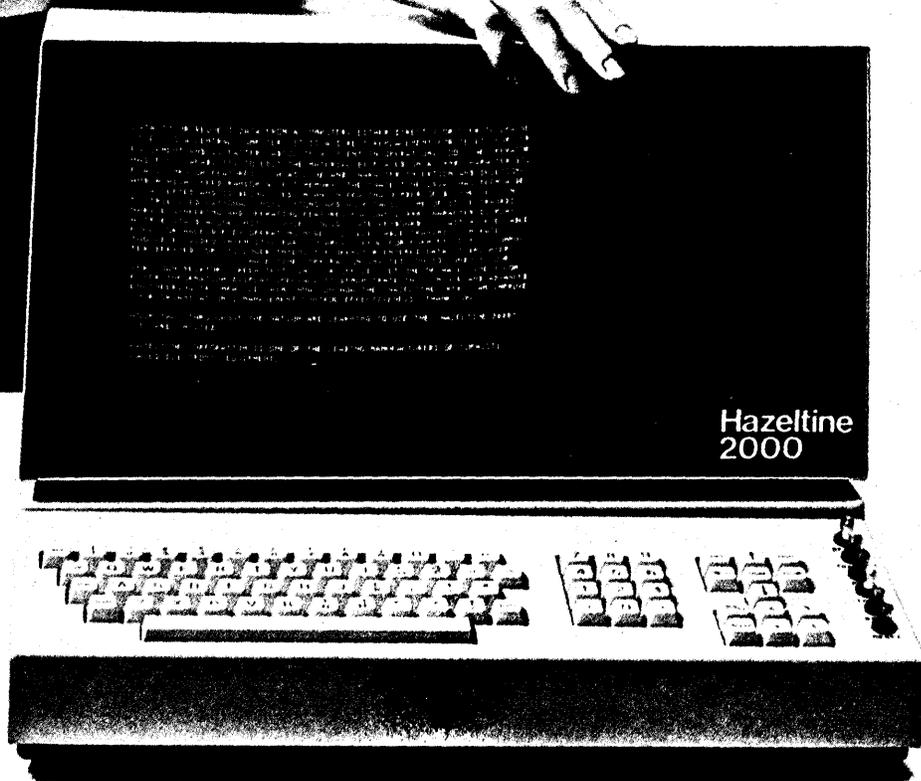


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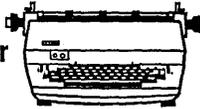
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CIRCLE 20 ON READER CARD

Computing Signs . . .

recorders serve the blind. In theory, using such a projector and a graded collection of film cartridges, a deaf person could acquire the technique of finger spelling, the language of signs, and a vocabulary in almost any technical field.

Ideally, a subject like computing should be taught by someone who knows the language of signs himself (and who knows computing, too), and to a class consisting entirely of deaf students. It would be too much to expect to bring these elements together. The number of knowledgeable instructors in computing who are also trained in the language of signs must be near zero. However, it is difficult to assemble a full class of deaf students; like everyone else, unless they are young, they are concerned with the task of earning a living. Since deaf students normally go to class with an interpreter, the scheduling problems are fierce—the student and the interpreter (both of whom probably work) must agree on a time.

Tremendous effort has gone into assistance for the blind, with the thought that blind people might become good programmers. Everything positive that has been said about blind students as a source of potential programmers applies with even greater force to the deaf. Once a deaf person is established in a job, he can communicate readily with computers without special gadgetry, and work undisturbed in noisy atmospheres. Their problems come at the other end; that is, in acquiring training.

Signs for all 300 selected computer terms have been devised. There remains the task of recording all these signs on film, and arranging for distribution of the films. (Even with that done, the deaf students will have been aided in just one discipline. Much the same effort should be expended in other disciplines—all the sciences, engineering, medicine, and English.) Perhaps, simply by increasing the vocabulary of technical terms, a neglected segment of our greatest natural resource can be aided in their education. ■



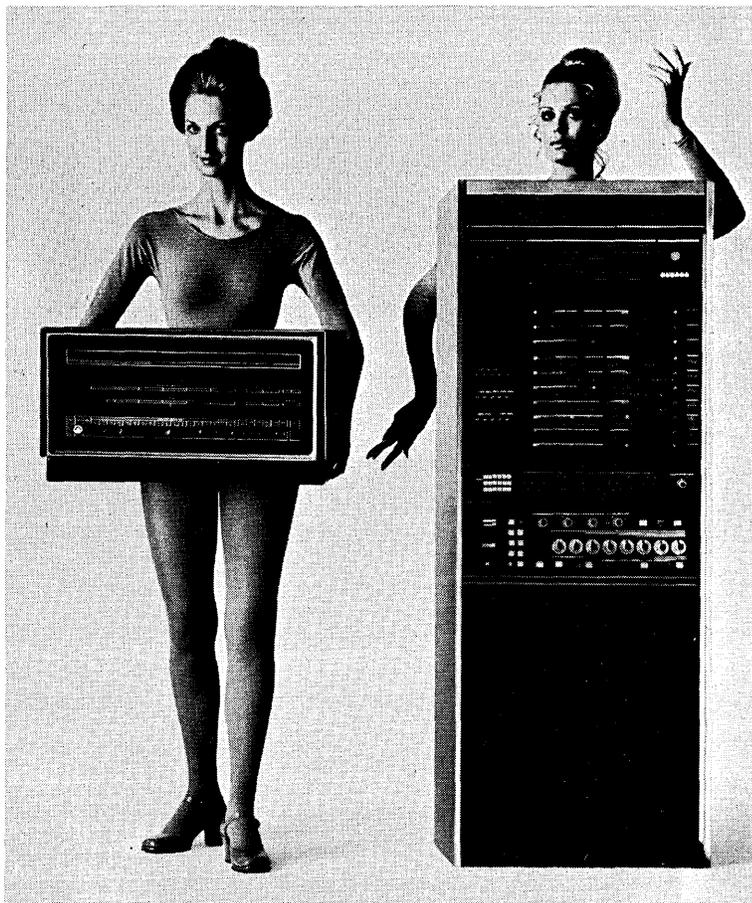
Mr. Gruenberger, who entered the computing field in 1948, is currently associate professor at San Fernando Valley State College, Northridge, Calif. He has an MS in mathematics from the Univ. of Wisconsin, where he was supervisor of the computing laboratory. He spent eight years at RAND and two at informatics before becoming a professor.



Mr. Teague is an assistant professor at San Fernando Valley State College, teaching computing. Previous experience includes positions with General Motors and the Univ. of Notre Dame. He has authored articles for Datamation and other journals, and a forthcoming book, Computing Problems for Fortran Solution. A member of ACM, he holds an MS from UCLA.

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ATLANTIC CITY
MAY 18, 19, AND 20

THE SJCC CONFERENCE PARTICULARS

*By the sea, by the sea, by the beautiful sea
You and I, you and I*

The Spring Joint Computer Conference is by the sea in hoary Atlantic City and its theme is "responsibility." The combination epitomizes the change in the computer business over the past few months. A decade and a half of aggressive increase of new companies, products, and people ended, underscored by the demise of some extreme examples of that increase—such as Viatron, a Fall Joint Computer Conference at Astroworld, and a period of tight money that put the industry as close as it has yet to come to being "on the beach." After all that a few days at the shore, specifically May 18, 19, 20, talking about responsibility, appraising business, and adjusting perspectives should be just the thing.

Accommodation to the change is evident. sj'71, despite an addition to Convention Hall that doubles the size of the main exhibit floor—no longer will anyone be put in the garage or basement—is not as big as sj'70. The number of booths has been reduced to 800 from 1,000 and AFIPS, when last asked, reported 195 companies would be using 650 for their exhibits. In '70, 950 of the 1,000 booths were taken.

A scan of the exhibitor list reveals fewer new companies—AFIPS said that unlike past jccs there is no waiting list for the space reserved for fledgling enterprise—and also fewer mainstays of the business.

Another adjustment to make is that the jccs are becoming end-user shows, which is one reason why Ampex has the largest exhibit area at sj'71. A spokesman for the company said that while oem contacts at the conferences have returned to past lev-

make a single contact.

Those who dislike too much change should find the technical sessions reassuring. The perennial (or are they bi-annual?) topics are being discussed—hardware design (as embodied in the Dinkiac I and other



Senator Sam J. Ervin
Luncheon Speaker

els—they fell off some in '69—end-user contacts began, increased enough to tide over the oem slack and have continued to increase. The oem apparently have gotten to the point of knowing exactly what they want and use the show to see if it's real, and



Sir John Wall
Keynote Speaker

gear), data networks, interactive systems, computer animation, graphic display (now computer pictorics), etc. There appears to be little relation in most of the 36 sessions to the "responsibility" theme. Fortunately, session one, moderated by Dr. H.R.J.

Grosch, will examine the theme "as it relates to the technical program" and current industry conditions. The session is titled "Computing Machines—Menace or Messiah?"

The most definite examples of the industry awareness of its social involvement are the handful of sessions on Computer Aided Management of Earth Resources, Responsive Government, Computer and the Electoral Process and Computation, and Decision Making and the Environment. The last—Session 26—is an ecology forum to be held on the evening of May 18.

Most pointed

Perhaps the most pointed comments on the computer industry's public responsibilities will come from Senator Sam J. Ervin, (Dem.) North Carolina. The chairman of the Senate Subcommittee on Constitutional Rights, which is currently holding hearings on privacy, will be the speaker at the conference luncheon, Thursday, May 20.

The conference theme will also receive support from Sir John Wall, chairman of International Computers, Ltd., and sj'71 keynote speaker. His talk, according to the sj planners, will be an analysis of the Amer-



Dr. Nathaniel Macon
Technical Program Chairman

ican and international computing milieu with special emphasis on the responsibilities and obligations of everyone in the computing field.

There will also be some outside analysis of the industry. A panel headed by Jules Bergman, science

editor for ABC News, is prepared to examine the computer industry's public image.

In a more practical vein sj'71 continues the industry survey sessions introduced at the FJCC in Houston under the title "The Broad Perspective." This spring they are renamed "The New Technology" and will include hardware design, data storage, diagnostics and recovery, systems software, file organization, and computer architecture.

In addition the technical program committee, headed by Dr. Nathaniel Macon of American University, has introduced three new groups of papers: Short Technical Notes, to cover the most recent developments of significance; Corporate Papers, exhibitor submitted write-ups of the equipment they are displaying; and Student Papers. The last will be handled by the R.E.S.I.S.T.O.R.S. (Radically Emphatic Students Interested in Science, Technology and Other Research) who will be holding a pre-college technical session in the Solarium of the Shelburne Hotel, from two to five p.m. on May 18.

Responsible radicals

The R.E.S.I.S.T.O.R.S. will not be the only representatives of the radical



Dr. Jack Moshman
General Chairman

fringe—though they are the only avowed members, possibly the most responsible, and probably will be the most numerous. For the over-thirty segment of the industry there will be the CPP (Computer Professionals for Peace), all 10 or 15 of them (based

on head count of CPPers attending industry functions; there are no membership figures), if the group accepts the sjcc Steering Committee's hospitality.

Dr. Jack Moshman, sj'71 general chairman, after a correspondence with CPP, initiated by the group's demands for participation in planning the conference, a booth on the exhibit floor, an open admission policy and a meeting between the CPP and his group, offered them a meeting hall free of charge in one of Atlantic City's hotels for a special session that would be publicized on the conference bulletin board and a meeting with himself and Dr. Richard Tanaka, AFIPS president. He also suggested the CPP zeal for social responsibility and participation in the computer industry should be channeled through SICCAS and similar professional association groups.

Should all this seem heavy fare for a few days at the shore there are the hospitality suites, the top of the Holiday Inn and the local hospitality program for light relief. The suites provide liquor and conversation—name your topic and get technical. The Top of Inn also has liquor and a view of Atlantic City's bright street lights or the ocean. Take your pick. Both are good for a contemplative drink.

The activists may get exercised by the hospitality program. This includes a night at the races—the trotters at the Atlantic City track—or a guided tour of the FAA facility at Pomona. The ladies get to go to lunch at Smithville Inn, some 15 miles up the pike and the local example of over-ressurrection of colonial America. And for those who still think they've missed something there is a post conference night on the town in New York City with transportation, theater and lodging included.

The boys that are giving us sj'71 are expecting 35,000 attendees. The exhibitors have some 40,000 guest registration cards to give away and those who don't receive one can take advantage of the "Exhibits Only" registration at \$10. Regular registration at the conference will be \$30 for members and \$60 for nonmembers. Those who had the foresight to register before April 30 saved \$10. The pre-registration discount is an innovation with sj'71. Students and military personnel, if in uniform, need pay only \$5 for registration.

... by the seaside, by the beautiful sea. ■

Designer's Choice

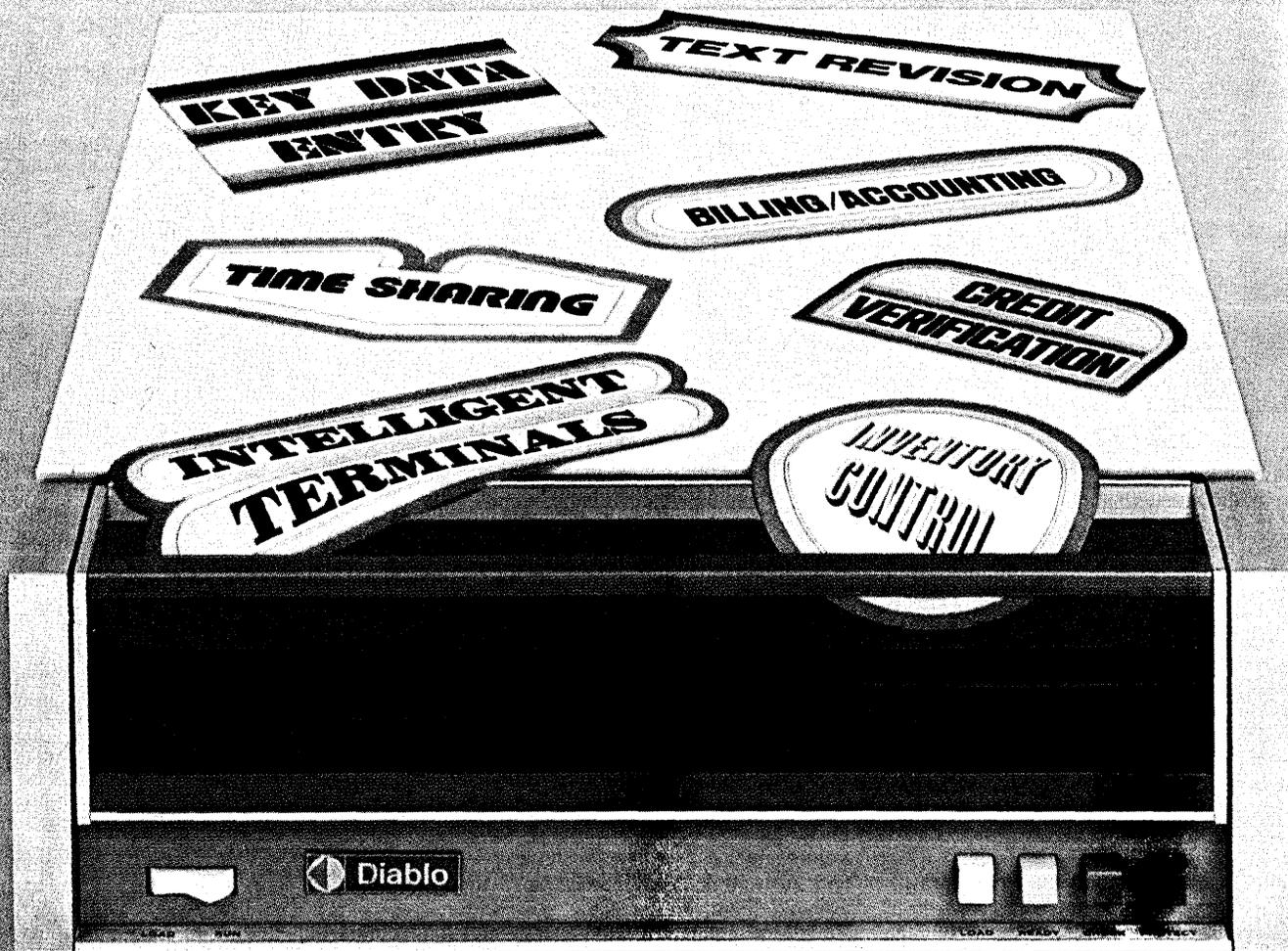
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CIRCLE 17 ON READER CARD



ATLANTIC CITY
MAY 18, 19, AND 20

Topical Sessions on the SJCC Technical Program

You have a choice of 36 subjects scheduled for discussion during the three-day Spring Joint Computer Conference this month in Atlantic City. Six which should draw standing-room-only attendance cover government, time-sharing, peripheral processing, overseas markets, the edp professional job market, and microprogramming. We invited the chairmen of these six sessions to write about their subjects. Their comments follow:

Government Moves to Identify Needs, Choices

At the heart of responsive government lies the fundamental problem of information. People need more information on the "why" of government's choices; and government needs more information on people's perceptions of its choices. Ideally, this process of exchange should be "interactive" so that the selection of government's choices and people's perceptions have the opportunity to modify, or learn from, one another. How has the profession come to grips with the information gulf between people and government? These are some of the significant trends, concepts and capabilities which have arisen:

Need vs. outlay analysis. Several government agencies have developed comprehensive social profiles of the U.S. Although slanted somewhat to the interests of the particular agency concerned, the data bases present a wealth of statistics on social need by county, city and state. The Office of Management and Budget annually produces a report of the outlays of all unclassified federal agencies by this same geography. With these data bases, it is now possible to perform

analyses of the distribution of social need versus the allocation of federal program dollars. If they are brought on-line, Congressmen and state legislators, planners at all levels of government, and the public will be able to ask complex allocation questions and receive detailed responses almost at will.

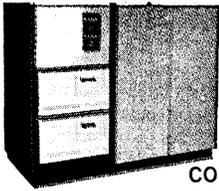
Policy oriented displays. Hundreds of computer-based studies have been performed without regard to the fact that few would or could be read by the policymaker. Now, a beginning has been made to present data concisely and succinctly through use of computer graphics. Colors and proportionally sized circles or squares are used to display geographic patterns of outlays and needs, and their interrelationships. Computer graphics, in combatting the maze of numbers which overwhelm the reader and often hide the real issues, is one of the most promising tools for the future.

Subjective data analysis. Computerized conferencing is one of the more promising of a variety of

SJCC PROGRAM AVAILABLE

A complete program of the Spring Joint Computer Conference, together with advance registration and hotel reservation forms, is available by writing: 71 SJCC, c/o AFIPS Headquarters, 210 Summit Ave., Montvale, N.J. 07645.

techniques that have been developed to gather the advice of experts of formulating policy. It makes it possible to hold "nonsimultaneous" meetings—meetings where the participants are not at the same loca-



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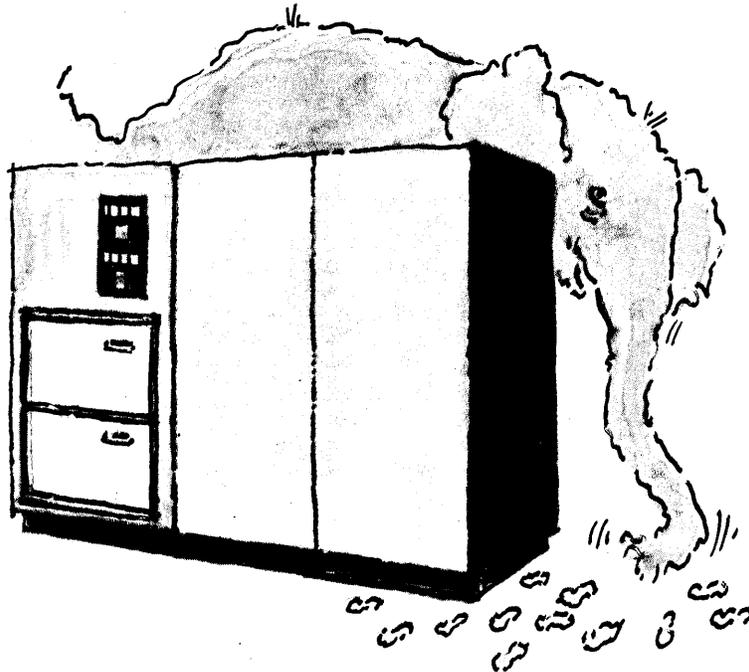
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tion and do not participate at the same time. Although much more work needs to be done, such techniques make it possible for government to involve a wide variety of the public in discussing policy issues and increases the capability of policymakers to anticipate the future, and not merely react to situations which have already degenerated.

Social experimentation. To anticipate the impact of major social policy before it becomes established requires experimentation prior to its implementation. This can be costly; so experiments have been limited. Now the computer is being used in the simulation mode to test the parameters of national policy projected from base-line data generated by experiments. This activity could be called "interface research." It represents not only a major new activity for the computer specialist, but also for the social science researcher.

—Gilmore S. Wheeler

T-S Industry Could Spend More Time on Cobol

The time-sharing industry has overlooked the benefits of time-sharing for business (COBOL) programmers. Large amounts of data are generally associated with business applications; and time-sharing is often not an effective price-performer. Some small business applications do exist, however, and can be run on-line effectively. Fast response required for certain business applications can easily justify the more expensive time-sharing operation. The testing and debugging phase of any business program also can utilize an interactive system.

A study we have made of on-line systems supporting COBOL shows that some type of on-line COBOL processing is available with several interactive systems supplied by vendors. Our study also included FORTRAN and BASIC programs since these are frequently more appropriate for certain applications.

The systems tested and their equipment include:

Time-Sharing MCP (using a Burroughs 5500); KRONOS VI (CDC 6400); Time-sharing Monitor (DEC PDP-10); GECOS III (HIS 635); CP/67 (IBM 360/67); TSOS (RCA Spectra 70/46); EXEC 8 (Univac 1108) and BTM (XDS Sigma 7).

By running on-line programs written specifically for this test, we examined the language interfaces, file systems, command languages and text editors. The study did not attempt to measure computing power, throughput, price/performance or response time. These largely are dependent on system loading over which we had no control during our tests.

From our study of the individual systems, we can conclude that the time-sharing industry has apparently not fully addressed the potential for on-line service to the business programming environment. With most systems, the suppliers knew very little about running COBOL from an on-line terminal. In some cases, the COBOL diagnostics would not fit on a Teletype line, resulting in overprinting the last position. No COBOL convention has been established and accepted by the suppliers for accessing a time-sharing terminal. Some systems could not easily list a COBOL data file.

The usability of on-line systems for commercial

processing, we concluded, is basically inadequate to attract the majority of COBOL programmers. COBOL generally has not been adapted satisfactorily to time-sharing as has FORTRAN. We expect that in the next



Gilmore S. Wheeler is director of information services with the Office of Economic Opportunity. He has been involved in social science research and development and information systems for ten years. His BS and MS in mathematics are from George Washington Univ., and his PhD is from the Catholic Univ. of America. His SJCC session is "Responsive Government."

E. Hubbs Grimm III and Paul R. Borman are with Ford Motor Co. Grimm has been a computer systems analyst since 1969 at the corporate systems office. He previously was a systems programmer at Univ. of Pittsburgh Computer Center. His BS in math is from the Univ. of Pittsburgh. Borman is developing communications front-ends for two major on-line information systems. He joined Ford in 1968 from General Electric Co., Philadelphia. His MS in computer science is from the Univ. of Pittsburgh. They will report on a study of eight vendors in a session titled "Competitive Evaluation of Interactive Systems."

Thomas E. Osborne, technical advisor to Hewlett-Packard Co.'s Data Products Group, received his BSEE from the Univ. of Wyoming and MSEE from UC Berkeley. He has been active in the design of small computing systems for the past ten years. His SJCC session is "Distributed Processing."

several years the interface between COBOL and the programmer will be refined through time-sharing. Meanwhile, if the user is willing to use awkward procedures or to devise his own procedures and select his applications carefully, programs can be run effectively on existing on-line systems.

—E. Hubbs Grimm III and Paul R. Borman

(Continued on page 49)

If you're underwhelmed

...with outside computer time-sharing, consider the convenience of an in-house TDS-1255. It's the time-sharing system that lets you write, debug and run big-system programs. 256K words big. Then run them, if you wish, on big computers.

For example, with its enhanced FORTRAN IV, the TDS-1255 has processed programs written for the 1108 and the larger 360 systems with no changes.

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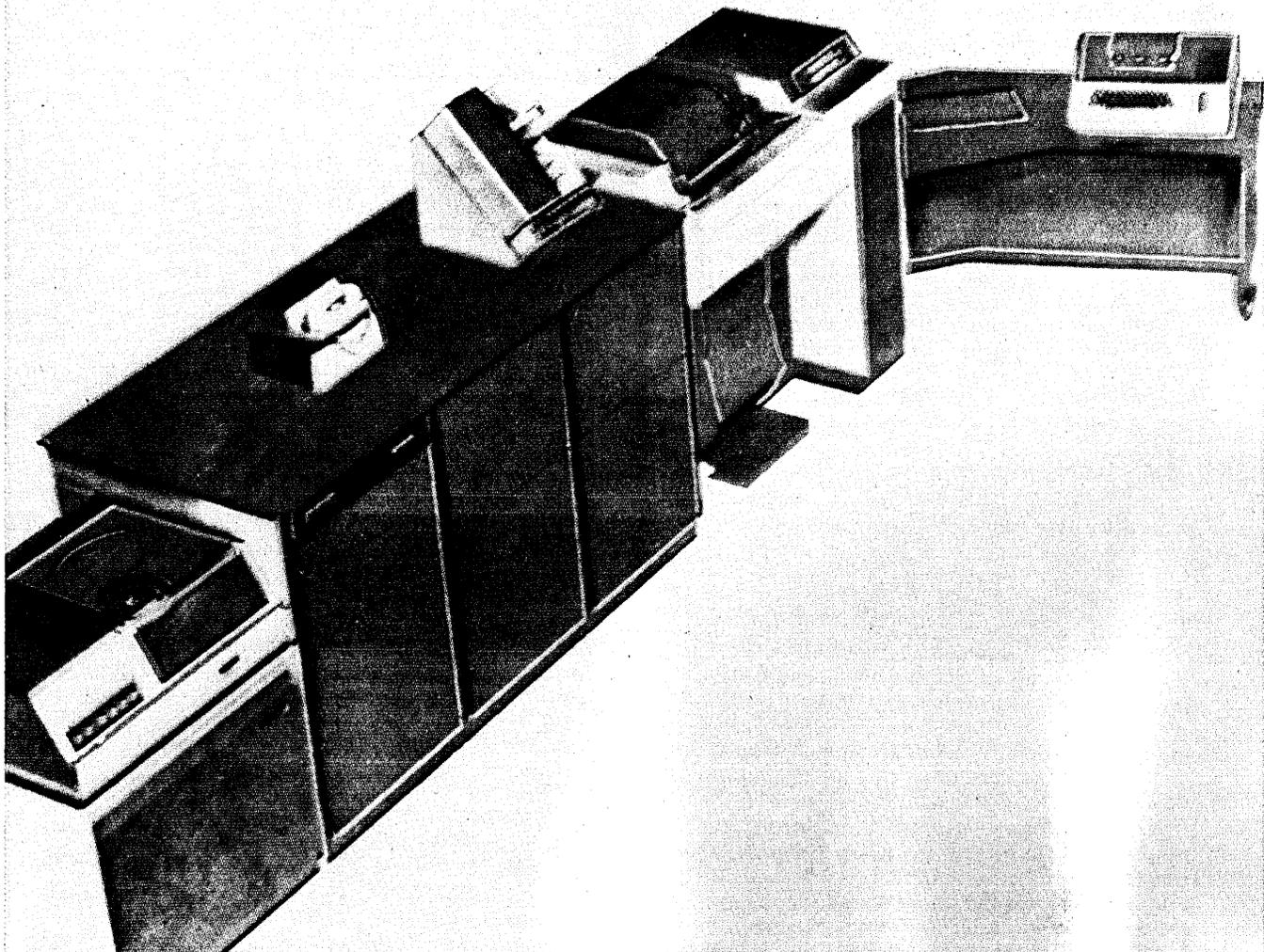
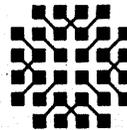
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EDP Trends Toward Smaller, Simpler Systems

We should question whether our current philosophy of processing information is anywhere near optimum. More than likely, future generations will marvel that we could accomplish anything with the constraints that have governed our development during the first two-and-a-half decades of electronic computer history.

We operate in an environment in which the participants have no absolute measure of performance. We measure our achievements relative to those of our peers. The laws which will provide us with absolute measure of information are yet to be discovered. We will welcome those who present us with laws of conservation, with laws of equivalence, with concepts analogous to entropy and friction because they will show us if we are living in an aura of ignorant bliss with regard to the rearranging of information.

Most of the impressive strides of the past decade are correlated to improved technology, not to better techniques of rearranging information. We have been hard pressed to implement one technology before it is obsoleted by a newer one. Although this trend will continue, several factors point to a vulnerability in traditional processing techniques.

—LSI memories are significantly different from anything we have experienced previously. Primarily, they offer a low-cost per bit even in small sizes. We can, if we desire, economically distribute memory throughout a computing system. They also differ from most other read/write memories in that they do not require a write cycle following a read operation.

—Arithmetic sections are becoming one of the least expensive parts of a computing system. If speed is not paramount, an arithmetic unit can be extraordinarily inexpensive.

—A significant amount of overhead occurs in sharing one cpu among many tasks. In some instances the overhead has become more of a problem than the original problems to be solved. As a result, a substantial amount of hardware is directed toward reducing overhead.

Although there are many other important factors that contribute to the vulnerability of the traditional processor, the three cited are sufficient to demonstrate that it is becoming more difficult to build large centrally based information processing systems whereas the very small systems are becoming easier to construct.

We must find out if we can distribute many small processors throughout a system, especially in the peripheral units, and see if we arrive at a more optimum solution than we currently enjoy. We may surprise ourselves by finding that many of the tasks we currently define as "necessary operations" will totally disappear. For instance, when we wish to update a file is it really necessary to transport the entire file from a disc into a main memory and return it, with very few changes, onto a disc? Would the only consequence of a disc with its own processor for updating files be (1) a more expensive disc, (2) an infrequently used data bus, (3) a cpu drumming its thumbs in a wait loop, and (4) a vacant mass of main memory?

—Thomas E. Osborne

World EDP Market Hurries to Catch Up

The world market for electronic data processing, including hardware and software, is expanding at a greater rate than that in the United States. Most foreign governments have singled out computers and telecommunications as the most important industries



Dr. Carl Hammer, staff scientist with Univac in Washington, D.C., was born in Chicago and received his PhD in 1938 from the University of Munich where he previously had won a diploma in mathematical statistics. He is an adjunct professor at American Univ. and a visiting professor at the Industrial College of the Armed Forces. His SJCC session is "An International View."

Herbert Halbrecht, of Halbrecht Associates, Inc., Greenwich, specializes in personnel counselling and executive recruitment. He has organized a session at the SJCC to discuss the job market for computer professionals, in view of the increased sophistication of employers. The title is "The Computer Professional and the Changing Job Market."

Robert F. Rosin is with the computer sciences department at State Univ. of New York at Buffalo. He is a frequent lecturer on microprogramming and has organized a session at the SJCC on "Microprogramming and Emulation."

capable of contributing to their technological progress and some are beginning to challenge the U.S. in these areas with broad support for programs designed to accelerate their technological independence.

The market in Western Europe is approximately one-third that of the U.S. with some \$7 billion of equipment installed against \$21 billion and it is growing at the rate of 20% a year. U.S. controlled companies dominate the market with 81% of the installed equipment of which IBM has 60%. Univac is second with 8%.

It has been estimated that Eastern Europe has some \$1 billion of equipment currently installed but only the Kremlin knows for sure. About 15% of this equipment is believed to come from our side of the Iron Curtain. The U.S.S.R. certainly is making a big push in the computer field and is believed to be spending some \$1 billion per year in this activity. Computers also are being built in East Germany and Czechoslovakia.

(Continued on page 50)

Take
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and
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solve
your
input
problem.



Arthur D. Little did.

The famed Cambridge research company needed a system that could reliably and economically convert volumes of data from graphs and charts into computer processable information. So they bought a \$3,000 Graf/Pen for an interactive graphics system. The pen traced the data, and immediately digitized it for storage on ADL's IBM 1130.

Graf/Pen is a ballpoint with a difference. It uses a tiny spark that sends sound signals to strip microphones that record x and y coordinates. Because sound is used, data input is very simple.

If you have an input problem involving written, drawn, formatted or graphic information, chances are that Graf/Pen can help solve it. Simply.

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Japan is by far the largest foreign computer market. It may reach the \$1 billion mark this year and should top \$2 billion by 1974. In terms of machines installed it ranks fourth after Germany, the United Kingdom, and France. Many expect Japan to overtake its three rivals in the near future because the value of installed equipment there is growing at better than \$300 million each year. IBM's share of the Japanese market is a scant 35% due principally to government restrictions and the nation's determination to build a national computer competence.

All foreign governments want to prevent U.S. domination of their computer activities. Electronic systems are *the* key item in national defense; for modernization of business and government systems; for handling large masses of data; and for providing better information. Thus it is painful for a government to lack its own nationally controlled competence in this high-level area.

Experience indicates foreign governments want us to do three things: (1) conduct real R&D in their country; (2) permit import of their products into the U.S.; and (3) provide for a growing number of jobs in their country and opportunities for study at U.S. universities.

Wherever U.S. controlled companies do these things they become "acceptable" and get orders, import licenses and visas. Where they don't they find out in hundreds of little ways that it becomes harder and harder to do business in these countries.

—Dr. Carl Hammer

No Room at the Top for Pure Computer Scientists

Computer users are becoming more sophisticated and, in today's economic climate, more keenly aware of a need for cost-effective use of their expensive tools. And so, top management is looking for managerial and executive capability first, and technical virtuosity second in edp and MIS managers.

Obviously, where possible, a company seeks both, but more and more employers are willing to trade off some technical brilliance to get top managerial talent. There is an increasing awareness that the technically outstanding computer scientist is not necessarily capable of or interested in handling budgets, time constraints, employee development, and corporate problems in general. Our firm recently placed two vice presidents of systems and data processing and, in both cases, the man selected was not technically best.

Top management's attitude toward the computer or management information activity itself is changing. The notion that a computer is merely an instrument of operational control is being discarded. Users are becoming aware and appreciative of the ways in which management information systems can be utilized to assist in top management decision making including strategic planning as well as in operational control. And so they are becoming aware it takes a broader based and less parochial executive than the typical computer scientist to participate and make valid contributions at these levels.

IBM, and possibly other computer manufacturers,

has reoriented its marketing strategy to large customers emphasizing how these customers could improve substantially the economic benefit derived from computer use by development and implementation of far-reaching management information systems.

And many large user firms are increasing top executive participation in decisions concerning computers and MIS. In many companies where a computer systems manager previously had pretty much run his own show, today there is a great involvement of presidents, vice presidents and other noncomputer executives.

There is a tired cliché to the effect that war is too important to leave to generals. I believe the world of the computer user is becoming wisely aware that the computer and ways in which it can be used have become too important to leave to computer professionals.

—Herbert Halbrecht

Moving the Software Into the Hardware

Microprogramming offers a point of view which places it in the forefront of computer system development.

The advent of writable control stores, often called "dynamic microprogramming," encourages the system implementor to exploit the well known methodology of the software system specialist to come up with a given "virtual" machine. This "product" is often called an emulator.

The methodology implies hierarchical routines, systematic parameter passing, and the intermixed use of interpretation (simulation) and translation. It requires the availability of general facilities in the hardware level "host" machine to support more specific facilities in the virtual machine. For example, a set of uniformly accessible fast registers of identical size is far more useful than a set of registers, some of which have specialized bus access and are of differing widths.

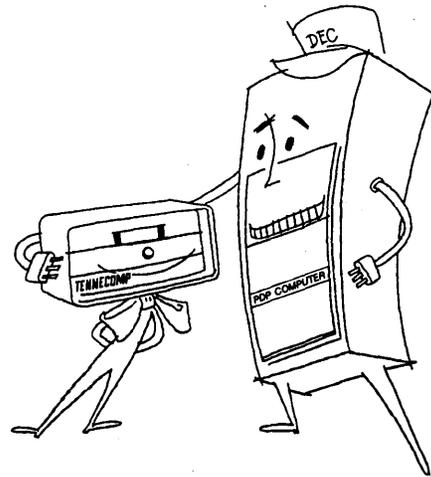
Use of microprogramming also places new burdens on the system implementor. He's the one who must ascertain the meaning and development of primitive hardware components. He may decide that dynamic paging is a useful feature in some system—but he must then participate in the considerations as to the level and nature of the implementation, given the cost/performance requirements he sees. Dynamic address translation can be achieved through use of a microcode written for a somewhat conventional host machine, or by using a combination of special purpose hardware (e.g., an associative store) used in a more traditional microprogramming scheme.

Availability of such a store then leads one to consider other uses to which it might be applied in coming up with alternative systems on a uniform hardware base. The implementor must be aware of the timing, cost, and performance characteristics of a wide variety of such possible system components.

Microprogramming and emulation, used throughout the IBM 370 product line and in almost every minicomputer, is having a marked effect on everyone in our field.

—Robert F. Rosin

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PERSPECTIVE

an interpretive review of significant developments

Fred Adler--Happy Venture Capitalist in a Down Economy

Can a former trial lawyer find joy and happiness as a venture capitalist in the computer industry?

The logical answer, of course, is that no one can find joy and happiness as a venture capitalist in the computer and computer-related industries after what happened to the economy and the stock market last year. That, at any rate, is the logical answer. However, Frederick R. Adler, who fits our description of a trial lawyer turned venture manager, is an exception.

In these unhappy days of red ink, Adler is either an anachronism or a prophet: All his technology companies are profitable. Furthermore, two of Adler's companies — each less than three years old — must be considered leaders in their respective industries.

The Data General Corp. of Southboro, Mass., is Adler's flagship company in the computer industry. Less than three years ago, Data General, a minicomputer company, consisted of a handful of ex-Digital Equipment Corp. and Fairchild Semiconductor employees working out of an old beauty parlor. Today, the firm operates from a modern 220,000-square-foot plant in Southboro and, most important as far as Adler is concerned, is the fact that Data General has been profitable during its last five quarters with the rate of both sales and earnings increasing in each successive quarter. During fiscal 1970, the firm earned \$536,000 while sales jumped from \$1 million to \$7 million over the previous year. "Data General's philosophy is to grow and to make money at the same time," says Adler, who is secretary and one of the largest stockholders of the firm.

In addition, Adler is the venture manager of one of the hottest new semiconductor companies, Intersil Inc. of Sunnyvale, Calif. Intersil is not a public company, so Adler would say only that the firm doubled its sales during the past year and has already turned the profit corner. Adler is a director of Intersil and chairman of Intersil Memory, a subsidiary.

Why, Adler was asked, would any-

one want to enter two industries — minicomputer and semiconductor — in which the list of unprofitable companies is longer than the list of profitable ones.

Look for rapid growth

"Above all, a venture manager must pick areas of rapid growth," says Adler. "If you miss that, then you're in trouble. I'd rather have competition and growth than little competition and little growth. If you make money, then you will get competition anyway."

Adler also is the venture manager for two computer-based firms still in their embryonic stages. Rockland



Systems of Blauvelt, N. Y., makes a voice response system for computers, while Vertek Inc. of Burlington, Vt., produces special-purpose computers for diagnosis and monitoring of lung and respiratory functions. Both firms are already profitable, says Adler.

Adler seems to thrive on competition, and while he is not outwardly aggressive, he approaches his work in an aggressive way. For instance, many venture capitalists wait for "deals" to come their way, but three years ago Adler staked out three industries — minicomputer, semicon-

ductor, and medical electronics — and then began searching for new companies in those areas.

"I must have looked at 20 minicomputer companies before Data General," he recalls. Several other venture managers had turned down participation in Data General before Adler came along. According to the officers of Data General, Adler not only was able to raise more money for them than they had at first thought they needed, but he also got them a bigger "piece of the action" of the company than they had asked for.

What to expect

Now that Adler has arranged several computer and computer-related deals, it is possible to prepare something of a composite of what he looks for and expects from a company.

"If you talk to me about one product or two products, I'll listen," says Adler. "But when you start talking about a bunch of products, I won't listen. If you use a shotgun in this business, you're going to spend a mint and lose a lot of money." Adler, of course, doesn't attempt to dictate management styles to the companies he represents, but they all tend to be lean operations — austere buildings, no landscaping, and inexpensive and functional furniture.

At the firms where Adler serves as a venture manager, there tends to be a lack of pompous hierarchy. There are, for instance, no reserved parking places at the firms. "If you want a good space you better get in early," he says.

Another common device Adler uses is the setting aside of substantial amounts of founders' stock or substantial stock options in the companies he represents, so any gaps in the management structure can be filled out by attracting key men with the stock. One can probably safely assume that attractive stock options figured somewhere into the picture which attracted James Riley from Signetics to Intersil.

As for Adler himself, technically, he is a practicing attorney; but it is clear that the bulk of his attention is spent on the development of his com-

puter and computer-related companies. He is a partner at Reavis & McGrath, a New York law firm. Adler gives the impression of being a man who thoroughly enjoys his work, as might be expected of someone who watches his capital and the capital of his associates grow in what at times must seem to be geometric progression. (No company in which Adler has been the chief venture manager has been a losing investment, although he

claims no infallibility and says he has participated in unsuccessful ventures as an investor.)

As for the future, Adler's days as a trial lawyer are over. "I was a trial lawyer for at least a dozen years. Being a trial lawyer is like being a hired gun in the West: the target is your client. But I don't really miss it. It's too much fun being a venture capitalist."

—David Gardner

Hotels Beginning to Look Hospitably at EDP

The lodging industry has been called the most virgin territory for data processing and the most resistant to it.

"Hotel men today are operating much as they were 200 years ago, and they don't want to change," said one observer. "Suggest change, particularly involving edp," he said, "and they'll tell you to remember IBM and the New York Hilton and laugh."

And while many do remember and smile about an unsuccessful joint effort of IBM and the Hilton Hotels Corp. to automate the New York Hilton back in 1963, the resistance is beginning to crumble for those data processing people who are taking the trouble to really learn the hotel business.

And one of the first large hotel chains to achieve complete automation may very well be the Hilton. Compass Computer Services, Inc., formed last month as a wholly owned subsidiary of Transamerica Corp. (April 15, p. 19), is implementing the first phase of a project which is the result of a joint study effort with Hilton. This will provide an automated inventory-type on-line internal reservations service for all Hilton Hotels and Inns. Phase two will see the system taking over back office accounting, and phase three, guest ledger accounting. The completed system will take the guest from point of reservation through check-in to final billing.

And presumably any benefits to be derived from past mistakes will be reaped by Compass, for the new company's vice president is George Alvey, Hilton's representative in the 1963 New York fiasco.

Alvey feels the time just wasn't right ... "It wasn't technically feasible." He emphasizes that the system did what it was supposed to do, but it cost them many times what it would have to do the job manually.

"The hotel was scheduled to open in May 1963, and we had to have the system ready to go on opening day, as guest check-in was part of its job. Computers were being installed and programs being debugged at the same time the plumbing was going in."

The system was based on a 1401 with a 1405 for back up. At one point during installation a sprinkler went awry and doused the 1405. "We were lucky it wasn't over the 1401," says Alvey.

"The equipment just wasn't sophisticated enough, especially the terminals. The computer was right behind the front desk, near the door, constantly exposed to dirt and temperature changes." The system was pulled out after a costly year and one-half.

The new Transamerica-Hilton system will be RCA 2-based. Initially it will use two 2s in Dallas where a pilot operation will be started in October. Compass hopes to have the complete system operational for phase one by the end of the first quarter of 1972.

Terminals will be provided by Terminal Communications, Inc. Applications software is being developed by Unicorn Systems Co., Los Angeles.

Other companies have and are tackling the problems of hotel auto-

mation. One was now-defunct General Analytics Corp., whose An-Tec division had developed a time-sharing system to provide reservations services, guest ledger accounting, and complete back office accounting for hotels. The system is now in the hands of a receiver as part of Chapter XI proceedings. Critics say it wouldn't have worked anyway; that its use of IBM terminals and its communication needs made it too expensive; and that it wasn't sufficiently flexible to accommodate the varying needs of different types of hotels.

A more successful attempt is that of Electronic Engineering Co. of California (EECO) whose Nova-based EECO Hotel Computer System currently is operational in Del Webb's Newporter Inn, Newport Beach, Calif., and Rockresorts' Dorado Beach Hotel in Puerto Rico and is due to go into Sheraton's new Honolulu hotel in May and Los Angeles' Century Plaza in the near future. EECO leases its systems and two separate packages, a room management package and a guest ledger system. Total cost for both runs from \$6-9K per month. The system uses TEC crt's and IBM teleprinters and line printers.

The lodging industry itself is becoming interested in edp. The American Hotel & Motel Association has outlined some of the things the industry feels could be accomplished in a publication called "Operational Breakthrough" and is sponsoring an American National Standards Institute project for development of an international standard travel-reservation format.

And the big names are in there, too. Honeywell is working with Holiday Inns in St. Petersburg, Fla., on a system for use in Holiday's larger properties. NCR, which has been cooperating since 1967 with Cornell Univ. School of Hotel Administration on studies of edp use in the lodging field, has a contract to provide terminals and software by November for the Hyatt hotel in Burlingame, Calif.

The lesser lights are there as well. One company called Captain International Industries, which up till now has concentrated on blinking lights and dispensing gadgetry for hotels, is developing a system for the Marriott Corp.

It's the inn-thing to do.

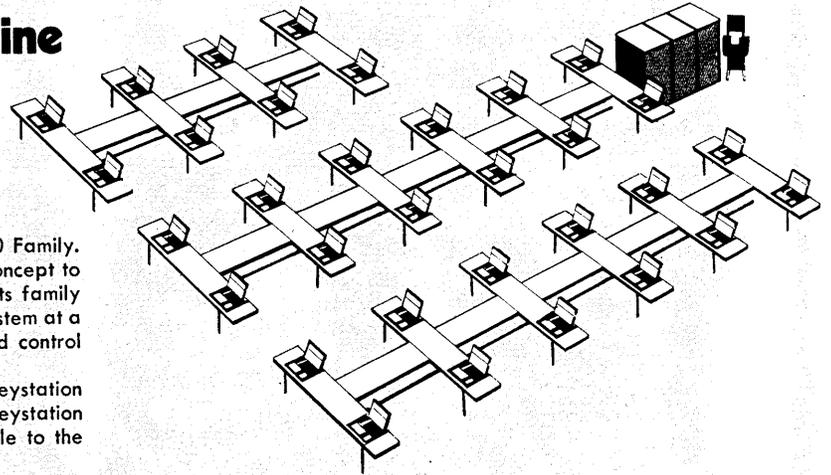
— Edith Myers

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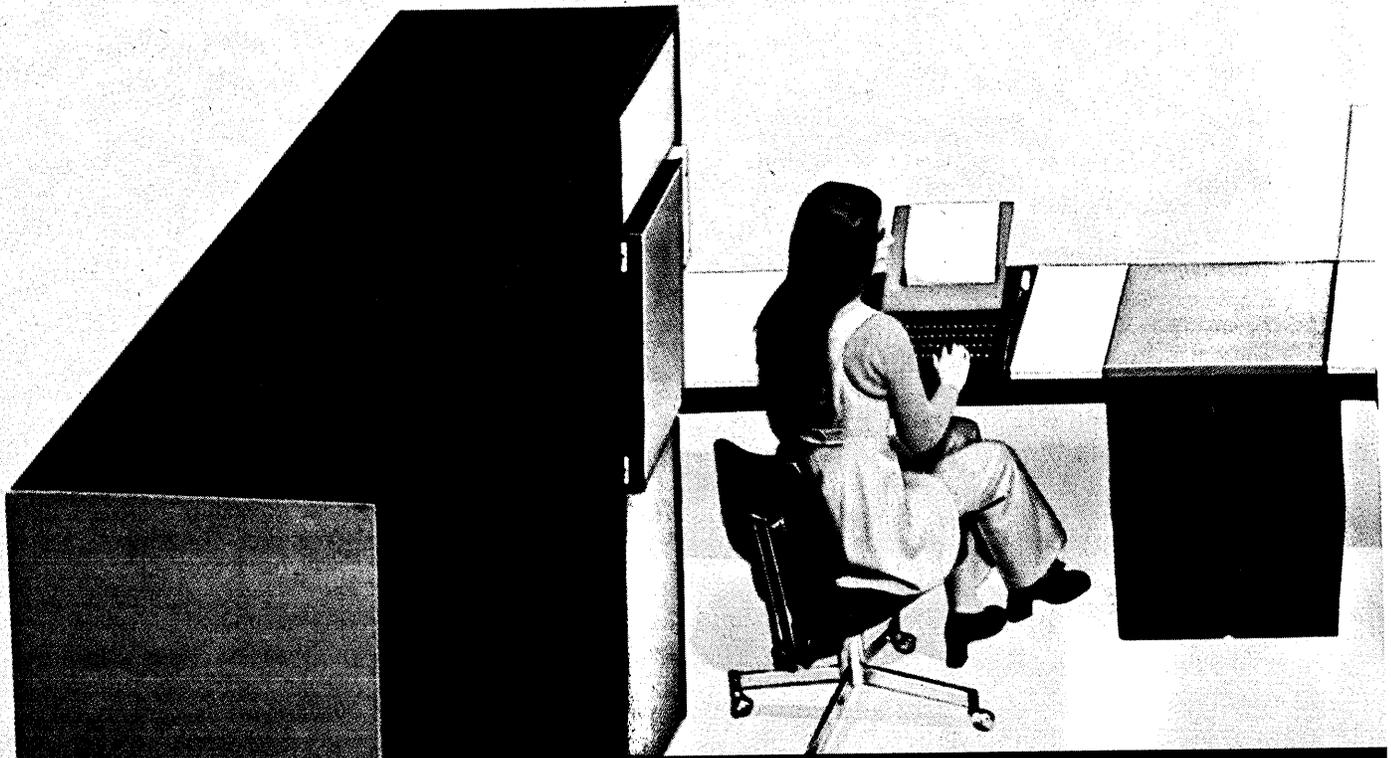
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With the KEY-EDIT 100/85 your total monthly cost-per-keystation can be as low as \$100 per month. This is the lowest cost-per-keystation of any keypunch or key-to-tape replacement system available to the high-volume input user today.

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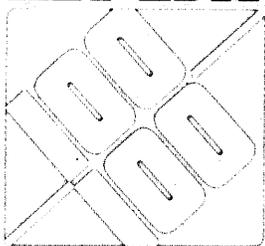
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This communications-oriented addition to the KEY-EDIT™ family, with powerful control and editing features as standard, can be tailored to a variety of user processing needs.

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Larger companies can use the 100/145 as an economical terminal processor, linking remote branches with head-quarters location.

With a powerful editing and control processing capability, the 100/145 becomes a high-performance introductory system to large users for evaluation and specification development.

Users can select from a variety of data capturing devices, card readers, paper-tape readers, and other peripheral equipment to make a powerful integrated data input system.



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CONSOLIDATED
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INC.

World Leader In Data Input Equipment

CIRCLE 19 ON READER CARD

Conrac Knows the Score At Auto Race Events

Computer applications in and around the playing fields of U.S. sport continue to diversify as people are measured for the pro football draft, strategy is determined from past performance data, and immediate updating of statistical information for the delectation of baseball buffs is displayed on electronic scoreboards. One of the more effective and useful applications now being implemented is the timing and placing system at Ontario Motor Raceway in Southern California where the Datex Division of the Conrac Corp. has installed the first elements of what will be the largest electronic scoreboard in the world.

Recently awarded a \$1.5 million contract for the construction of electronic scoreboards for the 20th Olympiad in Munich, Germany, Datex is attempting to reduce the traditional confusion at auto races (cars scream by and it's difficult to tell which is in the lead and which is fighting to stay out of last place). At Ontario, a coaxial antenna runs beneath the start-finish line and the pit entrance and exit, and each car in a race is fitted with a small (1½ lbs.) battery operated transmitter whose signal the antenna picks up as the car passes over. The frequencies of the transmitters are separated by 5KC and the system is designed to handle up to 50 cars.

The computer configuration consists of a Computer Automation 216 and an IBM 1130. The 216 receives the antenna input, logs and posts it,

then sends it to the 1130, which computes speed and compares speed and time for all cars on that lap, stores it on disc for future reference, and sends it back to the 216 for posting on the three-sided 65-foot scoreboard pylons that dot the course. The pylons list the lap number and the identifying numbers of the first nine cars in order of placement at the time. Thus, the crowd is able to tell just who is chasing whom.

When the main scoreboard is installed, possibly late this year, it will be 265 ft. long, 65 ft. high, and will rest 75 ft. off the ground. It will use 40,000 light bulbs (just like in your reading lamp), all addressable, and be programmed for animation, display of stored information on past events, current data, and probably cheerleading, just as on the Conrac scoreboard at the Oakland Coliseum for the Oakland A's baseball team. Zoom!

GE Makes People, Service Changes

General Electric's time-sharing Information Services Business Div. has made some service and organizational changes that reflect continuing adjustments being made during the build-up of its large-scale nationwide network. It also reflects time-sharing's continuing search for the right pricing schemes.

Establishment of its communications grid has afforded more level loading of each of its centers and elimination of extra charges because

of long-distance communications costs. For the network customer who uses the service for file updating from nationally distributed offices, this means his rates now equal those of the more local problem-solving Mark II customer. In other words, rather than an I/O data charge of \$.40/month per 1,000 characters, it is now \$.25; rather than \$1.20/month for 1,280 characters of program storage, it is \$1.10.

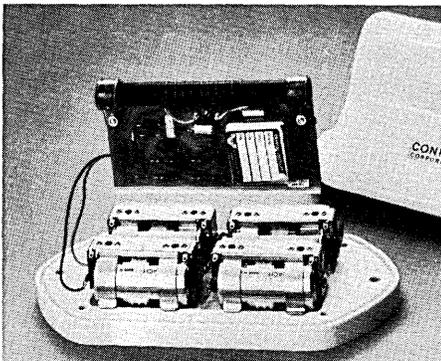
GE also has new offerings for Mark II customers with high-volume data-transfer tasks. Normally among the charges are \$7/hour for connect time and \$.25/month for 1,000 I/O characters. Now a user with high volume and a low-speed terminal can opt for \$10/hour connect time and \$.10/month for I/O data. With a high-speed terminal (30 cps), he is offered \$13.50/month connect time and no I/O charge. Finally, with the big 600 series systems taking over many tasks from the GE-265s, GE is looking for more small users. BASIC I, a subset of Mark I, gives the customer use of 42 BASIC programs for \$5.75/hour connect time, \$.03/month per computer resource unit (variation of cpu time), and \$1.75 for 1,536 characters of storage. Minimum is \$25/month, and Mark I's minimum has been reduced from \$100 to \$25.

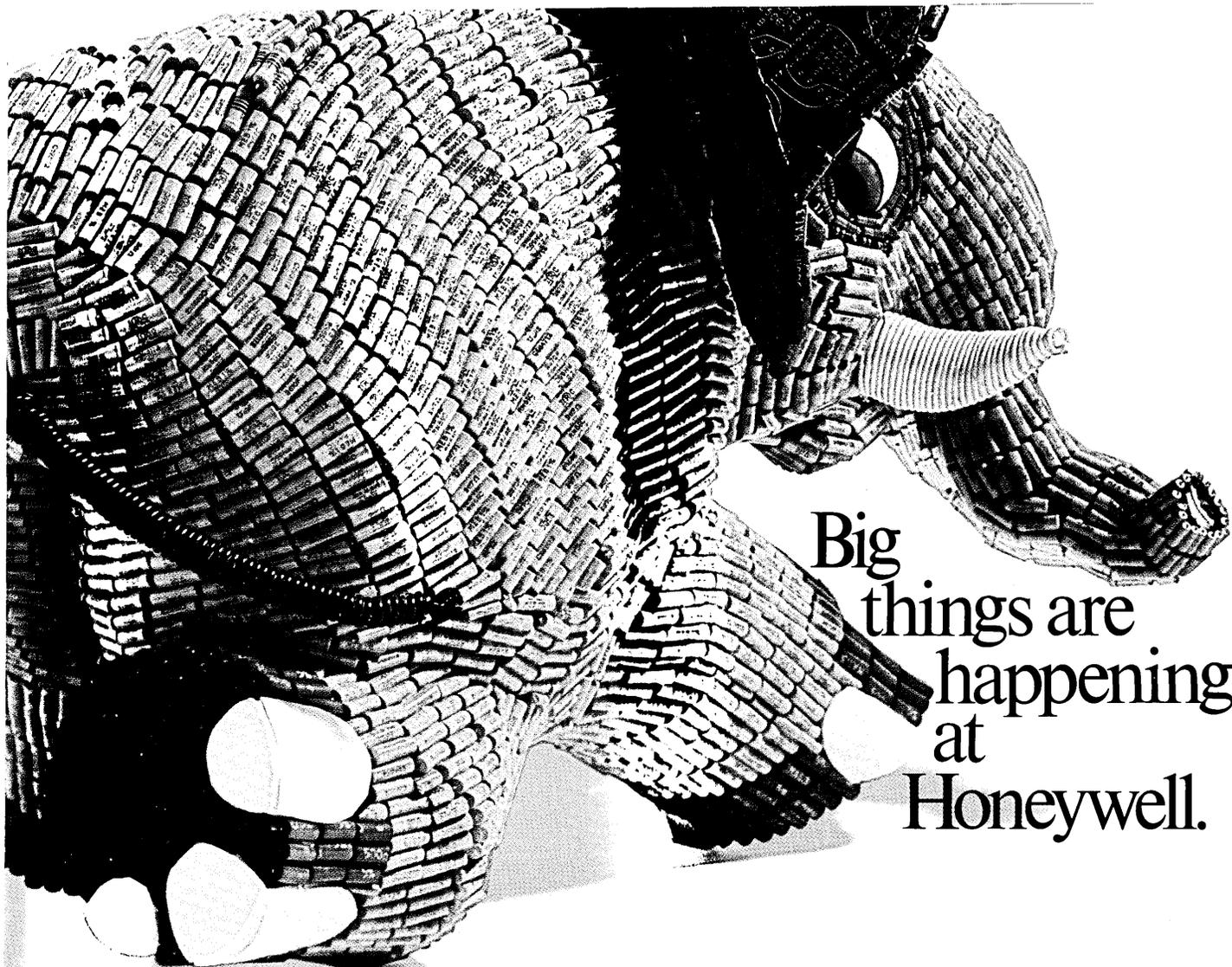
Within GE, a new Information Services Planning operation has been established for short- and long-range planning. One of the GE executive quadrumvirate, Paul R. Leadley, has been moved out of the marketing department top post to head this. Deputy division manager Paul Sage will head up the marketing effort, and William C. Thorne has been promoted from eastern sales manager to marketing manager. From outside the GE family, Ralph Pearson, formerly with Remote Computing Corp., has been enlisted as national accounts manager.

Text Editing Pioneer Closes in Washington

VIP Systems, a pioneer developer of computerized text editing, closed its service center recently, just before
(Continued on page 65)

Small transmitter fitted onto racing car transmits its position to computers which then post that information on a scoreboard.



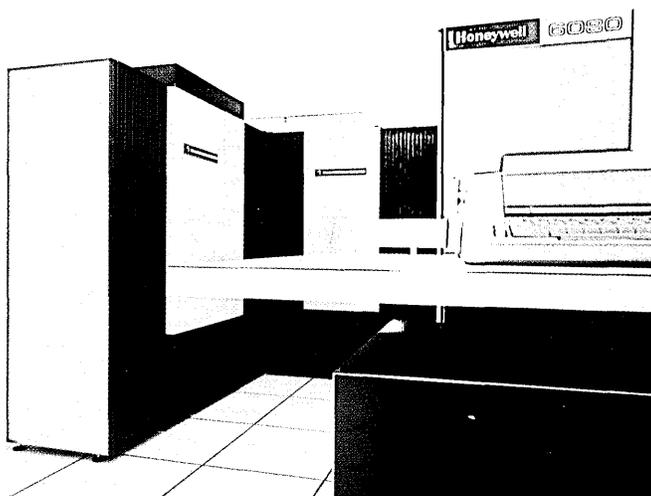


Big things are happening at Honeywell.

Series 6000 Giants are off and running.

The Other Computer Company introduces a full line of large-scale systems: Series 6000. A family of big computers featuring multiprocessing and multiprogramming, extensive data communications, data base management, time-sharing, built-in testing and maintenance, and plenty of growth potential. It's all there; see for yourself.

There are six state-of-the-art models to choose from: Models 6030, 6050, and 6070 handle mixed scientific/engineering and business workloads. Models 6040, 6060, and



6080—with more than 100 powerful new business-oriented instructions—are specifically designed for heavy COBOL users.

The heart of the series is the GECOS operating system. It's been working for years; and it's

Continued on page 2.

What's big...

- Series 6000 Giants announced.
- Large-scale benefits from GECOS.
- Vast new offerings in small-to-medium systems.
- EDINET education services.
- Data communications in DOD.
- More time-sharing with new 1640 Series.
- Far-reaching data communications systems.
- Keyplex moves mountains of data.

been steadily refined to meet taxing workloads. It's ready now for your present multidimensional processing needs.

Ten giant steps for the Series 6000.

1. Multidimensional Processing. Series 6000 supports local and remote batch processing, remote access and transaction processing, and time-sharing — all at the same time. All processing modes can access a common data base. Priorities can be assigned dynamically to any processing dimension; for example, you can reassign job queue priorities for specific job types, remote job entry, time-sharing, transactions, etc.

2. Multiprocessing/Multiprogramming. For expanded processing or back-up, Series 6000 systems can add multiple processors. In fact, users can tailor their systems to specific needs by adding processors, memory, Input/Output Multi-

plexors (IOM), communications processors, or peripherals. For multiprogramming, dynamic memory petitioning offers multiple job activity with low memory overhead. The result is modularity and flexibility for increased throughput and efficiency.

3. Business/Scientific Processing. Hardware and programming language features prepare Series 6000 systems for all manner of mixed business and scientific processing chores. Series 6000 machines are word-oriented with fast internal speeds, floating point hardware, and an advanced Fortran compiler for all types of business/scientific applications. Models 6040, 6060, and 6080 offer an additional instruction set for the business use of a new full-ANSI COBOL compiler.

Here are 12 other management tools for Series 6000:

Generalized Inventory Management System

Generalized Parts Explosion System

Automatic Programmed Tools (APT)

Linear Programming

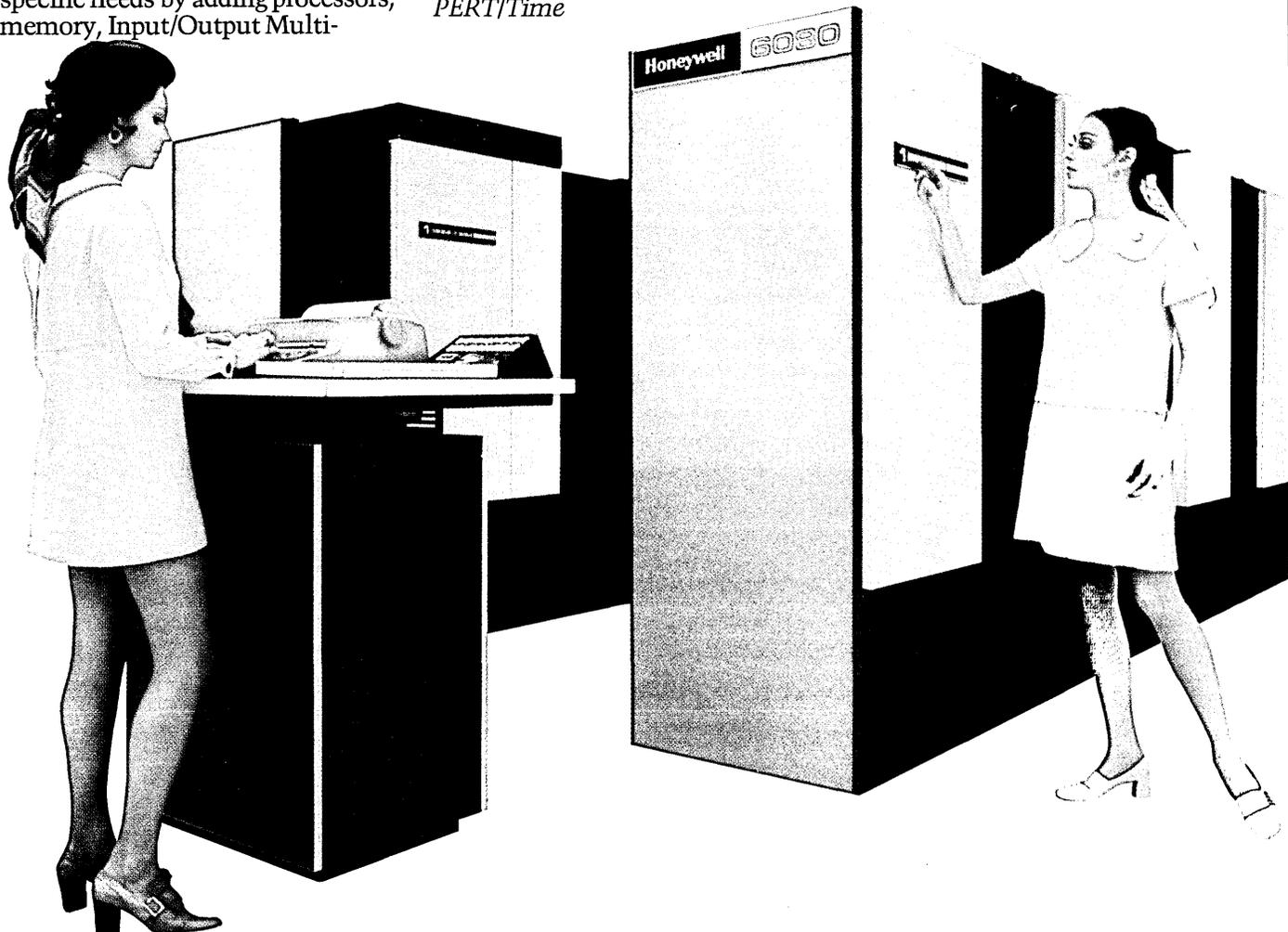
PERT/Time

PERT/Cost
SIMSCRIPT

Time Series Forecasting
MATHPAC Subroutine Library
Civil Engineering Package
Electrical Utility Package
Biomedical Statistical Package

4. GECOS (General Comprehensive Operating Supervisor). The most advanced, thoroughly proven operating system available. It operates on all Series 6000 models, and its multidimensional capabilities work in all configurations. GECOS provides optimum use of total system resources. It handles automatic scheduling and dynamic resource allocation to ensure the highest possible throughput — in terms of jobs completed per day. And GECOS operates with low overhead. Memory management techniques provide for easy program swapping and complete flexibility in memory allocation. And GECOS has been working for years.

5. Data Base Management. The GECOS Common File System for data base operations includes multilevel tree-structured catalogs,



	6030/6040	6050/6060 (K = 1,024)	6070/6080
Max. Memory Size in words (36-bit word)	128K	256K	256K
Cycle Time (micro seconds per 2 words)	1.2	1.2	.5
No. of Data Channels	16	24	24
Max. Transfer Rate Per IOM (char/sec)	1.3M	3.7M	6.4M
Peripheral Capacity (subsystems)	16	24	24
I/O Compute Simultaneity	16	24	24
Programmable Registers	27	27	27
Floating Point	Yes	Yes	Yes
Memory Protect	Yes	Yes	Yes
Hardware Radix Conversion	Yes	Yes	Yes
Interleaving	No	2-way	2 + 4-way
Instruction Overlapping	No	Yes	Yes
Instructions per second	340,000	550,000	1,400,000
Rental (typical complete system)	\$24,100/ \$26,000	\$44,850/ \$46,350	\$65,500/ \$67,300

Series 6000 offers powerful and modular hardware, complete and demonstrable software, and the right pricing.

password protection, access permissions, and file sharing. So you can access a data base for remote inquiry/response or transaction processing, time-sharing, and remote or local batch processing—all at the same time. The system includes Integrated Data Store (I-D-S), a powerful data base structuring capability using disk storage files. Programs can be processed in sequential, indexed-sequential, or random mode.

6. Front-End Communications Processors. The DATANET communications processors used with Series 6000 are stored-program computers that perform all line control functions and relieve the central system of all communications overhead. Transmission speeds can reach 50,000 characters per second. Teletypewriters, CRT's, and terminals for remote batch entry can be connected. In conjunction with DATANET 355, the Mass-Store-Link feature of GECOS lets the communications processor access mass storage subsystems directly and store all batch input and output, without the attention of the central system.

7. Peripheral Strength. High-speed Input/Output Multiplexors (IOM) can connect a virtually unlimited number of devices while providing high throughput rates and simultaneous operation of all channels. From eight to 24 channels are avail-

able per IOM to transfer at peak rates in excess of one million characters per channel. There are new disk pack drive subsystems offering on-line storage up to 2.13 billion characters with average seek times as low as 30 milliseconds. New magnetic tape drives offer speeds up to 266 thousand characters per second at 1600 bits per inch density.

8. High-Up-Time Systems. Series 6000 systems are built from the ground up for a minimum of downtime. With the latest in integrated circuit technology, improved packaging results in more compact and easily maintained hardware. Circuit testers and maintenance panels expedite system diagnosis and help to isolate malfunctions quickly. And, the on-line testing and diagnostic routines in GECOS allow temporary deallocation of central system modules, peripherals, or communication subsystems for automatic checkout while normal processing continues in other system elements.

9. Compatibility. Series 6000 grows on you. Add multiple processors, memory, or data communications, and do it without reprogramming or changing operating systems. Hardware modules work together the same way in any Series 6000 configuration. Your programming investment is safe as you work up through Series 6000. Because GECOS is what you start with and

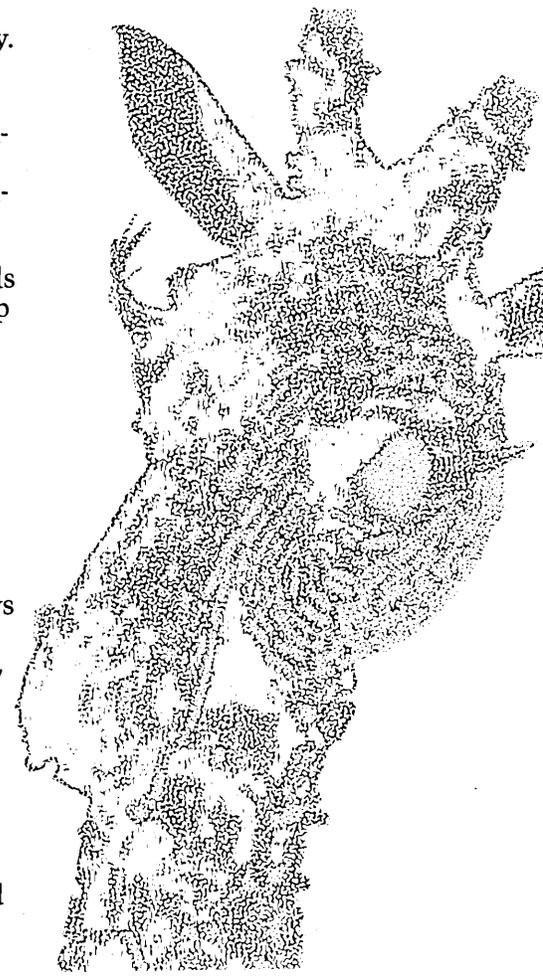
what you stay with.

10. Price/Performance. A lot was put into these systems but in a way that lets us price them right. For example, Honeywell feels these six models offer better performance than just about any other comparable systems, and at less money. And Series 6000 comes bundled, so basic support services, education, software, and application packages are included in the basic system price.

Series 6000 systems are a convenient way to upgrade Honeywell Models 400 and 600. But they're just as beneficial an upgrade path for other users. Sure, conversion costs must be weighed, but weigh these benefits, too:

- A sophisticated operating system that is really easy to use.
- Simplified but comprehensive data base management.
- Time-sharing.
- Remote access for MIS or transaction processing.
- Local or remote batch processing.
- Bundled pricing.
- Price/performance.

Check 210 on reader service card.



The large-scale benefits of GECOS.

GECOS maintains the status of all system resources (peripherals, memory, and processors) and all the jobs in a Series 6000 System. And, there is much more to GECOS than basic job scheduling and resource allocation.

Common File System

GECOS has a centralized file system using hierarchical, tree-structured design, accessible by local and remote processing techniques. Catalogs and files are secured by passwords, and file access is controlled by GECOS. Several programs may read a file concurrently, but only one program at a time may update a file. A unique feature of the file system allows maintenance (repacking) routines to clean a portion of the file system while other jobs are accessing other portions.

Batch Processing

Local and remote batch entry can be handled concurrently with remote access and time-sharing. This multidimensional aspect of GECOS means more job throughput, less job turnaround, and better use of system resources. Any batch program that can be entered locally can be entered remotely. Various options are provided to process and route job output.

Remote Access

Data base inquiry, remote data base management, data collection, and other remote access applications round out processing needs. Remote access provides direct terminal access to a program in execution. The program written in any batch language (Fortran, COBOL, etc.) may be submitted via local, remote, or time-sharing batch entry. For remote application, the terminal acts as an input/output peripheral.

Transaction Processing

Everyday business transactions can now be processed in any desired priority with the GECOS Transaction Processing Subsystem. Transactions are entered from a terminal, and the transaction processing executive interprets the transaction code in the message, calls the pertinent application programs, and processes the message. The required output or acknowl-

edgement is returned to the sending station.

Time-Sharing

The GECOS time-sharing executive provides installations with concurrent time-sharing featuring Fortran, BASIC, and a powerful text editing package. A time-sharing batch facility lets users create and initiate batch programs and scan or receive output—all from a time-sharing terminal. The common file system provides catalog structuring, file protection, file sharing, access control, and source/object file storage.

Total On-Line Testing (TOLTS)

The Total On-Line Testing System for GECOS is made up of POLTS, for peripherals; COLTS for communications; MOLTS, for main frame; ROLTS, for remote access processing. These elements are integrated into a system for total maintenance and recovery. Up to eight diagnostic programs may be operating concurrently with user programs under GECOS.

System Resource Monitor

A system resource monitor provides quantitative measurements of system balance and performance. It monitors job flow through the system, status and requirements of all jobs in the job queue, and status of resource allocation tables. Gross imbalances, such as consistently unused memory resulting from a peripheral-bound situation, can be found quickly. Operational inefficiencies and programming bottlenecks can also be identified. Cost/performance advantages of alternatives to existing configurations can also be found from the output.

Data Base Subsystem

GECOS combines its common file system and the Integrated-Data-Store (I-D-S) programming aid to achieve simplified but comprehensive data base management. The design of the common file system ensures that files are accessible in all dimensions, so that files normally maintained on a daily basis may be accessed at any

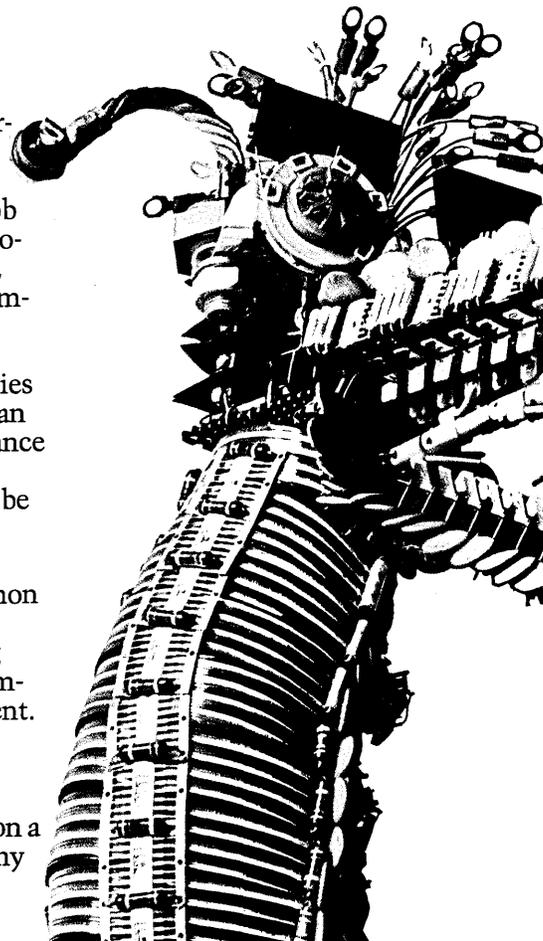
time by a transaction processing program. To complement the centralized file processing concept, I-D-S provides an easy-to-use language and data management technique to integrate differently organized files on disk. The I-D-S language is an extension of COBOL with specific operators for file structuring, storage, and retrieval. Sequential, indexed sequential, or random files can be processed and maintained efficiently.

Communication Mass-Store-Link

To increase the efficiency and availability of remote batch proc-

Vast new offerings in small-to-

Key Specifications:	58	115	115/2	1015	2015
Cycle Time (μ s)	1.2	2.75	2.25	1.6	1.33/two char
Max. Memory (K = 1,024)	10,000	32K	64K	128K	256K
Data Structure	8-bit byte	6-bit char.	6-bit char.	6-bit char.	6-bit char.
I/O Channels	6	2, one opt.	3, one opt.	12, var. speed	12, var. speed
I/O Transfer Rate	350,000 bytes/sec	500,000 cps.	500,000 cps.	667,000 cps.	1,000,000 cps.
Avg. Disk Seek Time (ms)	75	50	50	30	30
Max. Disk Storage (per control)	4.6M bytes	36.8M char.	147.2M char.	280M char.	1B char.
Magnetic Tape (max. KC)	—	149	149	224	224
Printer (max. lpm)	200	1100	1100	1100	1100
Card Reader (max. lpm)	200	1050	1050	1050	1050
Card Punch (max. lpm)	30	400	400	400	400
Additional Periph.	—	All series 200 operating below 500,000 cps			All series 200 types.
Rental Range	1,000-3,000	2,100-6,200	3,800-8,500	8,000-18,000	13,000-30,000



essing, GECOS uses the mass-store-link concept with a DATA-NET 355 and a Series 6000 disk subsystem. Communication data arriving at the 355 does not have to pass through the central system. This frees the central processor for work on active user programs. The link eliminates redundant functions, that is, the DATANET 355 can write/read remote input/output directly to/from disk without requiring central system reading or writing. Such a capability increases remote batch throughput significantly while reducing total memory load.

Check 210 on reader service card.



medium systems.

Early this year, Honeywell Information Systems announced a broad range of computer systems, peripherals, software, and applications packages. These products offer growth potential to new customers, as well as current Series 200 computer users.

A first computer or satellite — Model 58.

Small, fast, versatile, and simple to program, the Model 58 introduces great flexibility for smaller data processing systems. It uses MiniCOBOL, an abbreviated version of the USASI standard.

Model 58 comes equipped to tackle general accounting, payroll, order processing and billing, inventory reporting, and similar functions for manufacturers, distributors, business services, and many others. It fits in the office and needs no special flooring, cabling, or air conditioning. And it communicates with other 58's in standard ASCII code at up to 2400 baud.

Model 58's unique console with digital display provides complete operator control for direct transaction entry and processing. The added dimension of batch processing is supported with high-speed peripherals. It even has its own keypunch and card sorter.

A fast entry to Series 200 — Model 115.

Model 115 is a fast disk-oriented system offering low-cost computer power. Either the Disk COBOL Programming System or Mod 1 Operating System offers comprehensive control, programming languages, and utility routines. Disk application packages handle accounting and inventory control and offer things such as a dedicated communications system for bankers, and Mini-APT for numerical control. New peripherals for the 115 include a new low-cost disk drive (4.6 million characters) and a new tape drive (33.4KC).

An expanded 115 — Model 115/2.

Model 115/2 offers faster cycle time, increased memory, additional channel capacity and more disk storage. The Mod 1 (Mass Storage Resident) Operating System offers Disk COBOL and Fortran languages, and many utilities. The increased capability of the 115/2 can handle advanced

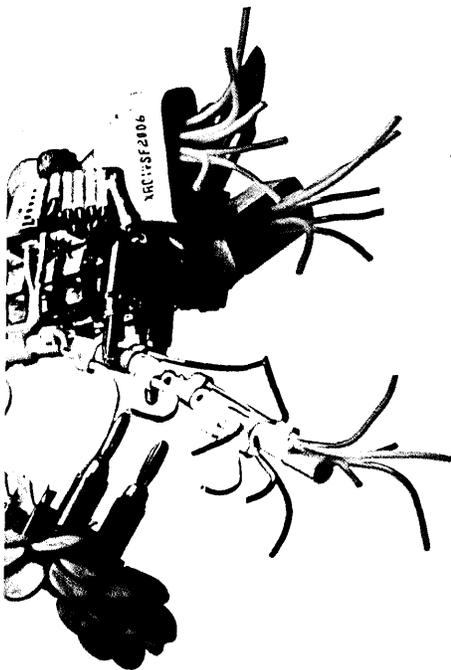
applications packages for manufacturing, banking, and distribution. Standard hardware features for the 115 are also provided with the 115/2: automatic interrupt, advanced programming instructions, financial editing instructions, and integrated controls for disk, printer, and card equipment.

Entry System for Multiprogramming — Model 1015.

For small-to-medium users who want to stretch their data processing dollar: Model 1015 is a low-cost way to expand into foreground/background multiprogramming and real-time communications. There's speed, capacity, and simultaneous peripheral operation, plus interrupt capability and storage protection in the hardware. The expandable OS/200 Operating System allocates control and resources and provides the base for continued growth to more advanced data processing applications.

A Medium Systems Leader — Model 2015.

Extremely powerful and sophisticated, the Model 2015, with operating systems such as OS/200 and Mod 4, provides total flexibility. From single to multiple-job stream processing, plus communications and as many as five data transcription routines—operating at the same time. These systems offer the file centralization and protection necessary for data base management and data communications. And, like all Series 200 systems, Model 2015 comes bundled with basic support services, software, and application packages included in the system price.



Check 212 on reader service card.

EDINET time-sharing educates in big way.

Honeywell recently expanded its Educational Instruction/Information Network (EDINET) by opening a Minnesota EDINET Center. The Center is dedicated to serving about 100 schools statewide, with a time-shared Honeywell 1648 computer. During the current school year, as many as 100,000 students are expected to benefit from this system, making it one of the world's largest.

Subscribers may join EDINET for as little as \$300 a month; one terminal connects the user to the total resource offering.

Computer-Based Instruction/Learning services offer both teacher and student highly individualized educational techniques. The EDINET terminal at the school can be used for many functions: from generating tests to monitoring the instruction/learning process of students.

Administrative and Clerical Information services can be used for diagnosis, testing and analysis of student progress . . . for prescribing individual assignments . . . and for maintaining files on students, personnel, financial and other business administration information. A special file can help in selecting an advanced educational institution anywhere in the U.S.

Consulting Services and a Users Group provide the necessary backup and access to up-to-date information and techniques on a national scale. Other EDINET Centers are now located in the San Francisco Bay area and in Washington, D.C. The latter Center will eventually service a region extending from Virginia to Philadelphia.

Honeywell will conduct a program for school assemblies to introduce both teachers and students to the EDINET concept and the use of the computer as an educational tool.

Check 213 on reader service card.

Get Your Best-Seller List.

A folder outlines our "Top 40" EDP educational publications. Education allowances are available on item quantities over 50 or 100 copies. Find out about:

- Study Guides
- Program Instruction Texts
- Lesson Plans
- Audio/visuals
- Videotapes
- Documentation supplies

Check 218 on reader service card.

Data Communications in the DOD.

Two major computer communications networks were developed by Honeywell for the Department of Defense. One system represents the largest time-sharing network installed in the Department. Dual Model 615s, with 262K words of memory, provide time-sharing service throughout the U.S. for Air Force (AF) Communications Service, AF Logistics Command, and the AF Institute of Technology.

The 615's installed at Wright Patterson Air Base interface terminals located at the following bases: Griffiss in New York, Newark Station in Ohio, Warner Robins in Georgia, Richards-Gebaur in Missouri, Tinker in Oklahoma, Kelly in Texas, Hill in Utah, McClellan in California, and Davis-Monthan in Arizona. Presently, four G-115 computers, two graphic terminals, and 39 teletypes interface with the 615's. System expansion is planned to reach 94 terminals within the year.

Another major network of 11 Model CCT-07 computer systems was set up for the Defense Supply Agency. These systems will help control and administer contracts with DOD suppliers. Communications capability will ensure up-to-date status reporting and provide for the timely payment of contracts.

Check 214 on reader service card.

More time-sharing with the new Series 1640.

Series 1640 Time-Sharing Systems were announced at the Fall Joint Computer Conference and the response has been terrific ever since.

An easy way to grow.

They offer low start-up cost at \$2,995 for a Model 1642 with 32K 16-bit words of memory, 7.5 million bytes of disk storage, and the capability of handling up to 32 users simultaneously. Or Model 1644, 1646, or 1648A may provide a better entry point. At any case, all models are fully upward compatible.

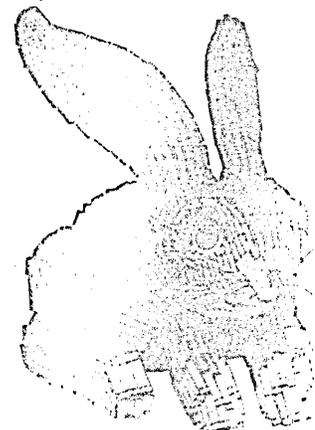
Easy to use.

Even if you do not understand computing concepts, compiler languages, or syntax, you can solve problems with Series 1640 systems in only a few minutes. Only a few commands are needed to compose, test, and execute solutions. Languages are available for both

New Data Communications Systems.

Honeywell Information Systems has introduced two remote message concentration systems and two modem by-passes for data communications functions.

The concentration systems, called the Models 1621 and 1622, use both hardware and software to convert up to 128 low-speed lines (45-300 baud) into one to four medium-speed lines (1200 to 9600 bps). Each system features auto



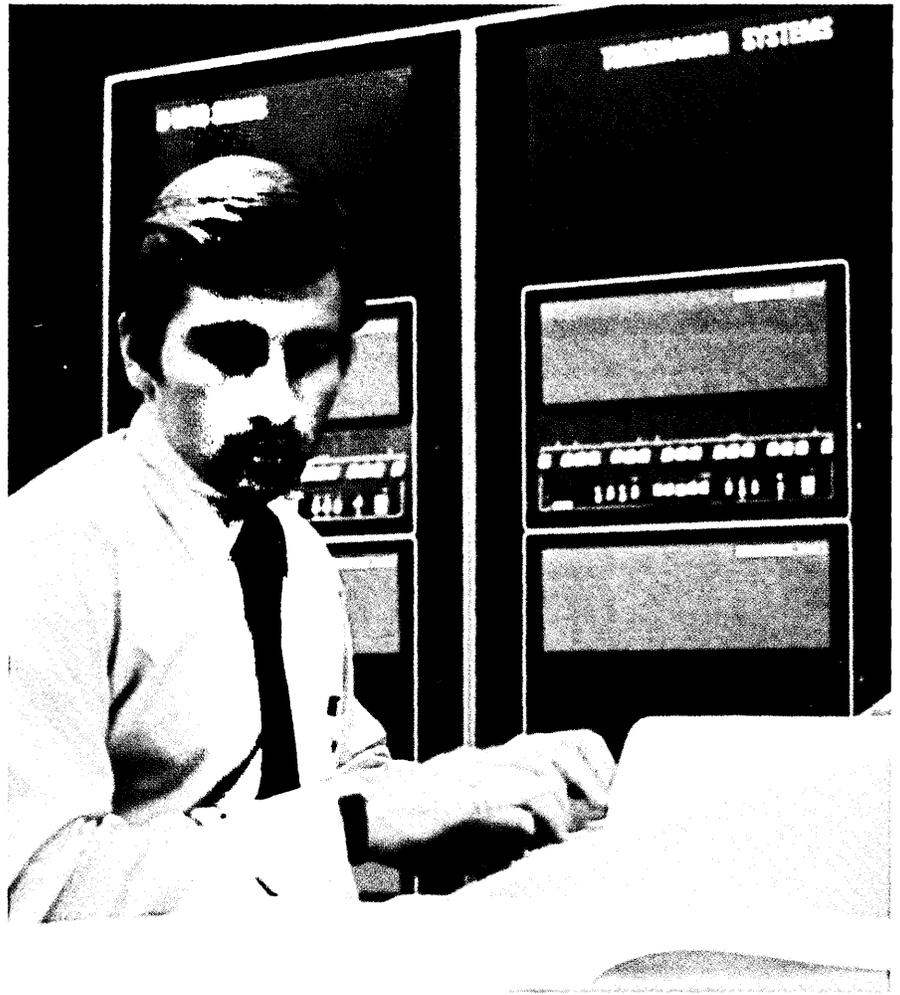
business and scientific applications, and many precoded programs and subroutines are on call.

Many languages available.

There are many languages available to solve problems: BASIC and Extended BASIC—fundamental compiler languages resembling Fortran but easier to use; COBOL (Model 1644 and up); Full USASI Fortran; TEACH—an interpretive language to aid in education; EDIT—an interactive context editor; SOLVE—convenient language for conversational use; and DAP-16—a symbolic assembly program. These languages are available on all 1640 systems. Also, block sizes and linkages of file systems are identical for source and data files on all systems.

Multiprocessing for low system overhead.

The unique multiprocessor configurations of Series 1640 systems vastly improve performance over comparable time-sharing systems, and the result is low overhead. Instead of multiprogramming a single computer to make it a time-sharer, the tasks are divided among various computers, allowing each to function with a simple monitor program. Check 215 on reader service card.



restart, power failure interrupt, and timer to permit the system to operate unattended. The basic Model 1621 system leases at under \$1000 per month and the Model 1622 rents from \$1600 per month. Both can be delivered within 90 days.

An automatic recovery option can allow programs to be loaded from the host computer, while other options include a cyclic redundancy check to permit medium-speed lines to operate with System 360 and binary synchronous communications line procedures. Both ASCII and EBCDIC codes are also fully supported.

The two modem by-passes can transmit and receive data up to 2500 feet and are considered by Honeywell to be inexpensive plug-in replacements for EIA RS 232C modems. Each operates at up to 10,800 bits per second and has a feature for use in repeater and multi-point configurations. Priced at \$395, the by-pass devices can be delivered in 60 days.

Check 216 on reader service card.

New ruggedized, certified minicomputers.

Honeywell's ruggedized Model 316 minicomputer has just been certified by an independent laboratory to meet certain military specifications. The computer passed a battery of tests for shock, vibration, inclination, temperature, humidity, electrical capabilities, and altitude.

- Shock—Operating and Non-operating: 15g. (Mil-Std-810B)
- Vibration—Operating: (Mil-Std-167B)
 1. Exploratory vibration—
5-33Hz @ .020" ± .004" D.A.
34-55Hz @ .006" ± .002" D.A.
 2. Variable Frequency—
5-15Hz @ .060" ± .012" D.A.
16-25Hz @ .040" ± .008" D.A.
26-33Hz @ .020" ± .004" D.A.
34-40Hz @ .010" ± .002" D.A.
41-55Hz @ .006" ± .001" D.A.
 3. Endurance—Resonant dwell for two hours/axis @ 50Hz.
- Inclination—Operating and Non-operating: (Mil-E-16400F) 45° on either side of the computer vertical axis at a rate of 5 to 7 cycles per minute in the horizontal and horizontal transverse axes.
- Temperature—Operating: 0° to 55°C. (Mil-Std-810B) Non-operating: -62° to 85°C.
- Temperature/Altitude—Operating: 0° to 55°C, altitude 20,000'.
- Non-operating: -62° to 85°C, altitude 50,000'.
- Temperature/Humidity—Operating: 95% RH, 30° to 55°C, five days. Non-operating: 95% RH, 30° to 71°C, five days.
- Electrical—Operating: supply line voltage, transient voltage, and transient frequency per Mil-E-16400F.
- Electromagnetic Interference: (Mil-Std-461A, 462, 463).
 - Conducted Interference—20KHz to 50MHz, power leads.
 - Conducted Susceptibility—30Hz to 50KHz, power leads. 50KHz to 400MHz, power leads. Spike, power leads.
 - Radiated Emission—30Hz to 30KHz, magnetic field. 14KHz to 1.0GHz, electric field.
 - Radiated Susceptibility—30Hz to 30KHz, magnetic field. 14KHz to 1.0GHz, electric field. Magnetic Inductance field.

Check 211 on reader service card.

Keyplex moves mountains of data.

Both the earth mover and Honeywell's new Keyplex system pictured below have the power to handle big jobs efficiently. A Model 5500 Keyplex system can move the mountains of data that are burying many key-punch operations. And save money besides.

It's processor-controlled. Simultaneous input from multiple keystations is merged by the system's computer and temporarily stored on disk for subsequent batch output to ½-inch magnetic tape, 7- or 9-channel. Card-to-tape translation is eliminated for a savings in main computer time.

It offers record flexibility. The system accepts record sizes of from eight to 400 characters, with record sizes variable from job to job. A variety of jobs with different record sizes can be entered simultaneously. And as many fields can be used as the application warrants.

It provides nearly unrestricted source document formatting. Up to 999 program formats may be stored in the system library at one time, and all are easily accessible to the operator.

It helps to purify source data. System features help operators identify and eliminate most source errors before the data goes on tape for computer use.

It makes error correction sim-

ple. When an operator hits the wrong key, she simply backspaces and rekeys. Experience shows key-to-disk operators typically correct 80% of their errors as they enter data, without loss of speed.

It simplifies verification procedures. Verification may be performed at the entering station after a batch is complete, or any other keystation may begin verifying as soon as the first record is complete.

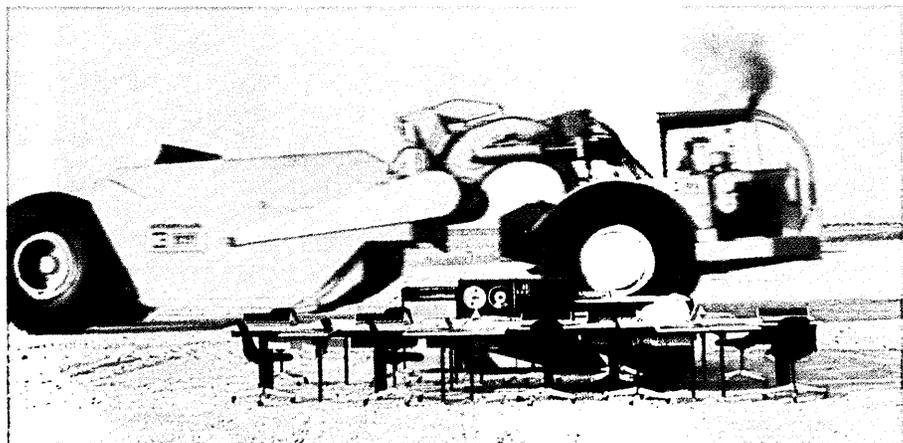
It reduces your personnel requirements. About 25% fewer operators are required than were needed with keypunch equipment. And the operators are happier with Keyplex, because they're operating more efficiently, more effectively, and in more pleasant surroundings.

It includes a full line of related attachments, such as communication devices and printers.

It's priced right. A Model 5500 with a maximum of 64 keystations per control, 7.2 million bytes of disk storage, and tape drive rents for \$1,400 plus \$85 per station per month.

It's backed by Honeywell's extensive operator training program, a 3,000-man field engineering force, computer systems expertise, and more than three years experience in key-to-tape/disk data entry.

Check 217 on reader service card.



Many proven application packages.

Honeywell has valuable packages for just about every industry and commercial business. Here are a few examples.

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Many others. Packages are also available for retailing, insurance, media systems, research and development, and engineering design.

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For more information about a specific product or service, check the appropriate numbers on readers service card or just drop a note to Honeywell Information Systems (MS 061), 200 Smith Street, Waltham, Massachusetts 02154.

The Other Computer Company:

Honeywell

IBM repossessed the company's 360/40 for nonpayment of back rental charges. Ironically, VIP had been operating profitably or close to it since the beginning of this year after sustaining losses for much of 1970.

VIP customers were offered the option of switching to Bowne Time-Sharing, Inc., New York, which sells a similar text editing service, or of finding their own suppliers. VIP said it will receive from Bowne "certain future amounts, based on their future sales to former VIP customers and on certain new business."

When the end came, VIP reported it owed IBM more than \$200K. The debt grew out of a protracted legal battle which began in the fall of 1969 when VIP became unhappy with IBM's maintenance service and refused to pay equipment rental charges for several months. Early last year IBM tried to repossess the 360/40, but a D.C. District Court judge deferred action after extracting a promise from VIP that it would pay all future rental charges on time. Last fall the company missed at least one more payment. IBM returned to court and won a repossession order. VIP President Joan Van Horn, queried at press time, said the company's future hasn't been decided. The antitrust suit apparently remained alive.

COM to Be Strong at Microfilm Meet

Computer-output microfilm is being re-evaluated by the microfilm industry, but it's still growing at a rapid pace and will be a dominant theme of this month's National Microfilm Association convention. The meeting, to be held in Washington's Sheraton Park Hotel May 25-28, is officially dubbed "Infographics Updated" (last year it was just plain "Infographics") and is expected to be the largest ever.

The microfilm industry has looked to COM as a technology to change its image from one of stodgy, archival records to becoming a part of the "information" industry. (The '69 NMA meeting was called "Instant Information.") Although past predictions of COM growth didn't come true, COM has still grown very rapidly. Speaking at the end of last year, NMA president George H. Harmon noted that the pre-

dition of 150% growth in COM units during 1970 was off the mark: actual growth was probably "only" about 70%.

The NMA is providing its own predictions for the convention, with general chairman John R. Robertson anticipating attendance of from 14,000-16,000 (up from nearly 5,000 last year), with more than 100 exhibits (There were 96 last year). The influence of COM is shown by a look at the convention seminar topics, with COM the theme of five and the subtheme of at least four or five more of the 26 seminars. And if the trend of recent years' continues, the COM seminars will be the most heavily attended.

Cambridge Has a Memory of its Own

While Bell Laboratories continues to struggle with the development of its highly publicized bubble memory, a relatively new company — Cambridge Memories Inc. of Newton, Mass. — is quietly threatening to steal the thunder with its own traveling magnetic memory device.

Cambridge Memories' memory is called Domain Tip Technology (DOT), and the firm will exhibit a half-million-bit block-oriented random access DOT memory at the Spring Joint Computer Conference. At this writing, Cambridge Memories scientists were hoping to have the prototype fully propagated for the SJCC.

"We haven't quite crystalized our thoughts on what our first DOT product will be," says Richard J. Egan, CMI's marketing vice president. "We're working on it now and we hope to have the first commercial product ready in six months or so."

Egan suggested that DOT memories would probably replace some fixed head discs initially and then, if all goes well, replace additional memories.

Egan and CMI's president, Joseph F. Kruey, believe that the DOT memory may be easier to produce than bubble memories, as well as more reliable, largely because DOT memories use common ferro-magnetic materials like nickle and iron in their preparation, while bubble memories use rare earth materials.

CMI acquired the patents on the

DOT technology when it bought the assets of the Laboratory for Electronics' magnetics operation. Two of the inventors, Dr. Robert J. Spain and Harvey Jauvtis, joined CMI where they have been continuing their work on the traveling magnetic memory.

Although CMI is just slightly more than two years old, it claims it has been profitable since last May, and Kruey expects that his privately held company will ring up \$4 million in sales during the current calendar year. "We didn't have any trouble raising money during the financial pinch," he says. "Our sales have been running at the rate of \$1.5 to \$2 million a year and, of course, the fact that we're profitable didn't hurt." Kruey declines to disclose earning figures however.

CMI has delivered more than 1,000 units of its ExpandaCore memory, an expansion memory that is used chiefly with minicomputers. The firm is currently preparing to mount a new product thrust at Giant IBM, aiming to produce a plug-compatible add on main memory for the 360 series

One interesting wrinkle to CMI's approach to the memory market is its effort to design memories that are easy to repair.

"We think that second order effects will decide the race among memory suppliers," says Kruey. "That's why we have a modular approach to maintenance."

Kruey sees the add-on memory to the 360 as an evolutionary step between its eom-oriented ExpandaCore minicomputer memories and the DOT memory market, which, like the 360 market, is an end user business.

GSA Names Three Firms to Replace IBM Drives

Ampex Computer Products, Texas Instruments, Inc. and Tracor Data Systems have won a \$5.7 million federal contract to replace IBM peripherals with their plug-compatible equipment. Altogether, 532 tape and disc drives will be rented from the three companies, for approximately 40% less than the IBM rates.

The rental period is expected to be 18 months, said a spokesman for the General Services Administration (GSA), which acted as procurement agent. *(Continued on page 66)*

The agency also said its next step is to put out bids for Independently-made printers, keyboard terminals and core memory extensions. This should come within the next six months. GSA's latest contract, which a spokesman said not only impacts IBM but other mainframe suppliers as well, is distributed as follows:

Ampex will supply 210 TM 1629 tape drives, at an 18-month rental price of \$1.771 million, to replace an equal number of IBM 729s now being leased by the feds. TI is supplying 274 of its series 924 tape drives with an 18-month rental value of \$1.785 million. They will replace IBM 2401s. Tracor, which bid its TDS series, will replace 48 IBM 2311s and receive \$2.146 million in rentals.

One bidder offered purchase options "somewhat better" than IBM terms, another made an "equivalent offer" while the third was "a little less favorable." The agency refused to specify which bidder made which offer. The most favorable terms will allow the government a 36-month accrual period, during which it can earn

a 60% purchase equity. IBM's terms on 2000 series equipment, by comparison allow only a two-year accrual, up to a maximum equity of 45-55% depending on model number.

Ampex, TI and Tracor will each maintain their own equipment. GSA doesn't expect difficulties with IBM because all three companies use Armonk's diagnostic software. An agency spokesman added that downtime on independently made peripherals acquired earlier by the Navy and the Veteran's Administration is averaging 5% or less.

Identi-Logic Spreads Security Blanket

As the question of computer security becomes more severe and the friendly glass-walled displays disappear into hidden interiors, access and accountability have assumed an increasingly critical importance. One company whose sole product is

security is Identi-Logic, Anaheim, Calif., a division of Eaton, Yale & Towne, Inc., one of the world's largest manufacturers of locks and keys. I-L's devices also involve locks and keys, but the key in the Identi-Lock 1001 system is shaped like a book of matches and the lock is a keyway that looks like a large coin slot.

The key is binary coded (over a million possible combinations), and when inserted in the keyway, is read by a solid-state reprogrammable logic control panel, and the door either opens or an alarm sounds if the key isn't kosher. The control panel produces a hard copy record of the key number (and thus the identity of the user), date and time of entrance and exit, area entered and exited, and other data that puts people in their places. A pushbutton coded entry device is available (pushing the correct four buttons in sequence out of ten — the odds against lucking out are somewhat large).

In the initial phase of establishing a security system, I-L works with the client company in determining the "fin-

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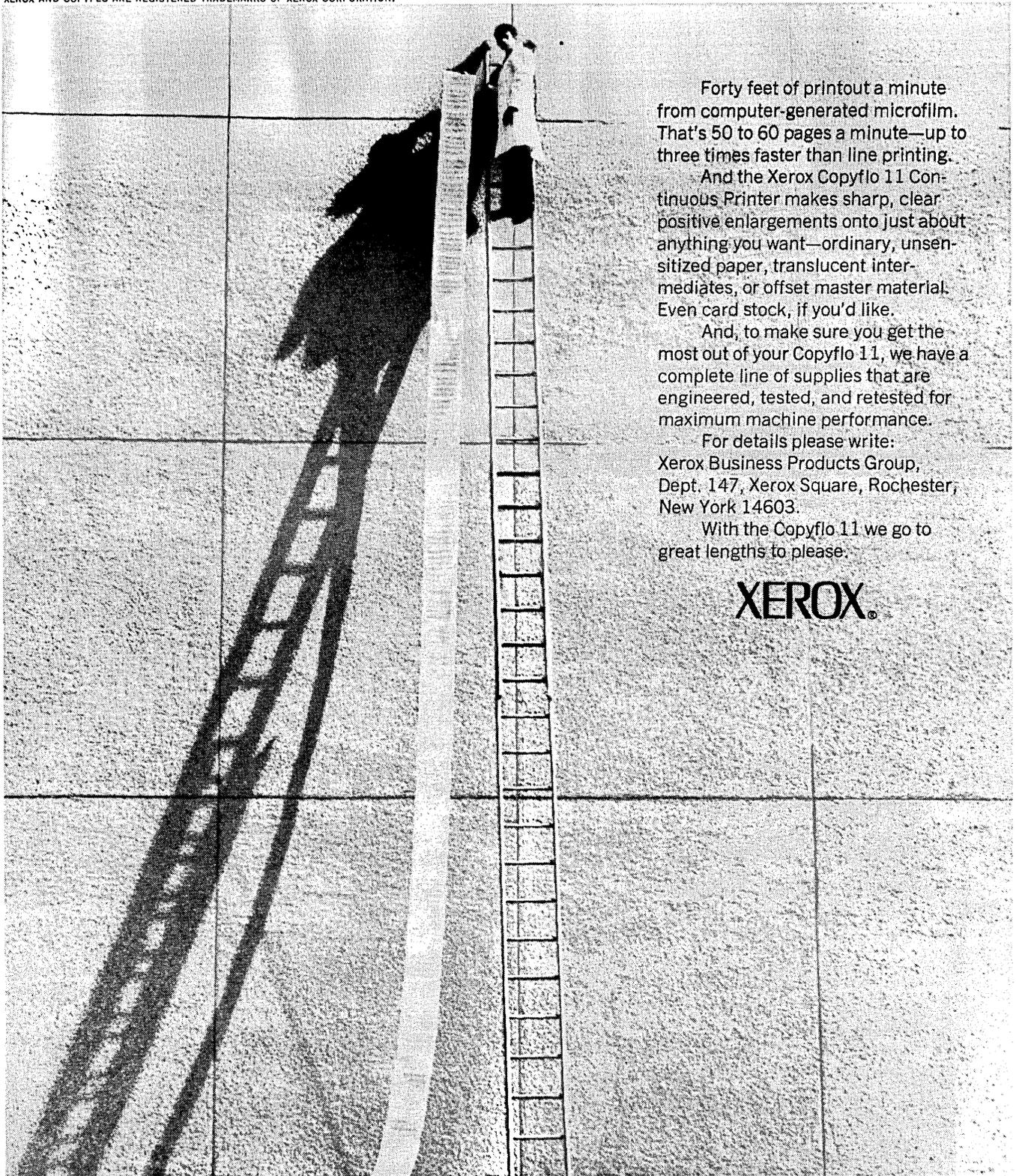
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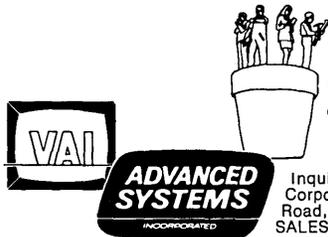
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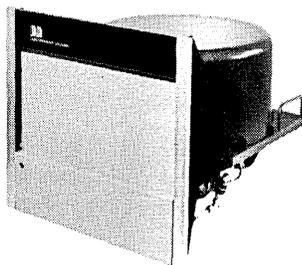
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CIRCLE 44 ON READER CARD

NEWS SCENE

gerprint" of the company, that general norm of operation that indicates who should be where, when. Once known, any deviation from the norm can be quickly ascertained from the hard copy reports on key usage and the right kinds of questions can be asked: What was an accountant doing in the computer room? What was an engineer doing in accounting? How did a programmer get into the executive washroom? This is known as "management by exception" — only those activities that fall outside the norm are noted.

One problem Identi-Logic faces is persuading employees of client companies that they are not being spied on, but the demand for personal accountability is essential to security, and, says I-L general manager Bob Phinzy, "It can be made inoffensive." However, he noted that the scientific community is the most sensitive to security measures, and this in a profession where more than usual precautions are necessary for protection against mischief and vandalism.

It is said that the federal government has conceded that any security measure can be breached by an adversary with motivation and knowhow and asks only that it be aware that such an attempt has been made. To this end, Identi-Logic has designed a bit-coded key that must be destroyed to be duplicated. Thus, if an employee returns from lunch one day with a handful of crushed key and the excuse that he ran over it, the key can immediately be programmed out of the system. And probably the employee, too.

Counter Conference Called Off

The Counter Conference has been called off. The Aug. 3-5 meeting in Boulder, Colo. scheduled by a group of ACM members to protest holding of ACM '71 in Chicago, "an established symbol of the repressive side of current American life" died a natural death for natural reasons, lack of papers and an inability to put up money needed for conference facilities.

Dr. Robert R. Feinichel said there will be no attempt to resurrect the protest conference. He feels its planning

has had one effect, the prodding of ACM toward greater social awareness.

NEWS BRIEFS

Cartridges Win Hands On

What is thought to be the largest order ever (\$2.5 million) for tape systems in the minicomputer business has been placed by Lockheed Electronics, a subsidiary of Lockheed Aircraft Corp., with Tri-Data Corp. of Mountain View, Calif. Tri-Data will supply 100 each of its models 1124 and 4196 (Jan. 1, p. 69) CartriFile storage systems which store 3 and 12 million bits, respectively, on a quarter-inch continuous loop tape contained in a cartridge. One model of each CartriFile will be interfaced to Lockheed's MAC-16 16-bit minicomputer in systems being built for an unnamed retailing firm requiring the equipment be used by non-edp-oriented personnel.

Why tape cartridge storage instead of cassette or even disc storage? Lockheed engineers said the cartridges would fare better in unsophisticated user hands than cassettes. And numerous cassette drives would be required to supply the same storage capacity that the two CartriFiles can, while disc storage is still too expensive. Lockheed commented, however, that if the prices of discs keep falling and the unnamed customer's capacity increases very much, they may eventually opt for disc storage.

System/3 Prices Adjusted

IBM lowered the purchase prices of the 16- and 32K-character versions of the System/3 Model 10 — a reduction which IBM says affects "very few" users. In effect, it was the price of that second 16K of memory that was brought into line. Previously, the card model jumped from \$22,575 for 16K to \$48,275 for 32K, more than double; the disc version was \$28,700 and \$54,400. This big price jump was odd because the addition of memory to a system requires only the core and some minor processor modifications. Now the 32K prices have dropped

about 21% to \$37,700 (Card) and \$43,825 (Disc). Seven Percent was slid off the 16K models, now \$20,800 and \$26,925.

IBM also increased maintenance by \$11-13 on the 8, 12, and 16K models and \$26 on the 24 and 32K versions. Some think that this indicates a "piecemeal" IBM effort to raise maintenance on all non-370 systems, but so far nothing similar has happened in the System/360 line.

Communications Group Meets

CSMA (Communications Systems Management Assn.), the year-old group of computer and data communication people, is holding its first national meeting May 21 at the Statler Hilton in NYC. The meeting for members and nonmembers will present a discussion of specialized common carrier services by representatives of AT&T, Datran, and MCI. Representatives of three computer and communication equipment manufacturers will discuss the line interconnection situation. CSMA directors will present plans for certification of communication professionals and talk of the association's programs and goals. Registration for the conference is being handled by Thomas Malatesta, Technical Management Promotions, 1102 West St., Wilmington, Del.

ACM Votes For Ethics

Two amendments to its constitution were recently approved by the Association For Computing Machinery. The first creates a Publications Board that will have "clear responsibility and authority over all ACM publications," not just for editorial content, as before, but for the production and cost of such publications as well. The second amendment, the "so-called ethics amendment," calls for the establishment of standards "to maintain the integrity and competence of individuals engaged in the practices, sciences and arts of information processing." The second amendment, long a project of Donn Parker of Stanford Research Institute (April 1, p. 40), was passed with a vote of 5,160 for, 2,124 against. Five to two for ethics isn't a bad margin.

(Continued on page 72)

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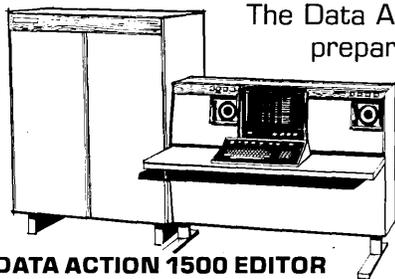
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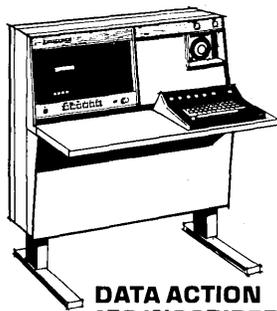
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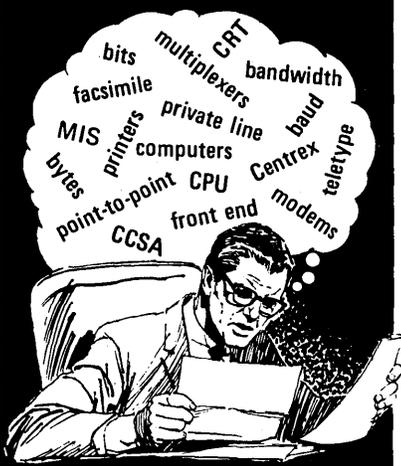
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CIRCLE 39 ON READER CARD

NEWS SCENE

Koory Forms Calculare

Calculare, Inc., an information handling services firm, has been formed in Los Angeles by a group headed by Jerry Koory, former manager of PRC Computer Center, Inc., and prior to that director of data processing with Butler Data Systems and technical director at Programmatic. Its first endeavor is a computerized horoscope analysis service now being market tested in California.

MDS Buys Terminal Supplier

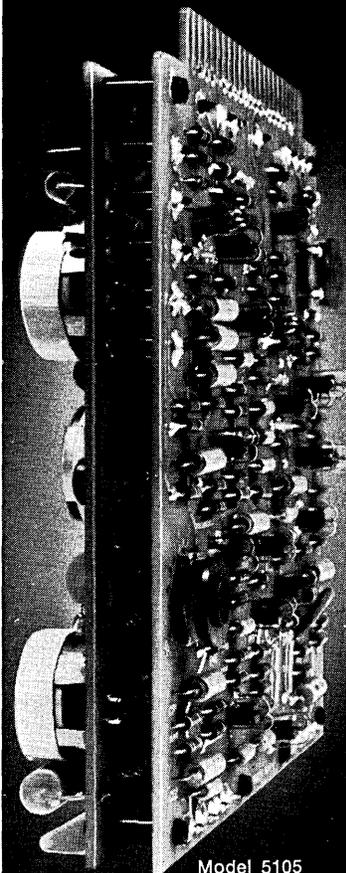
Mohawk Data Sciences Corp. is acquiring for 81,500 shares its long-time supplier of source data acquisitions terminals, Colorado Instruments, Inc. Colorado's deal to supply the terminal equipment for the MDS source data collection system accounted for 35% of its revenues for the first half of FY 1971. Colorado also markets terminal components and its own data collection systems. Its revenues for the six months ended Nov. 30, 1970, were \$594,410, and a net loss of \$393,837 was reported. This is the second merger by MDS with a supplier. Earlier this year Atron Corp., Minneapolis minicomputer maker, was acquired. MDS had been buying more than 80% of Atron's production and plans to use its computers in the MDS 2400 series of peripherals processing systems.

SHORTLINES

Three SS-100 analog/hybrid computers produced by the Hybrid Systems Div. of Digital Resources Corp., Houston, will be helping to develop better "bugs" by mid-1971 when they are installed in the Wolfsburg, West Germany, facilities of Volkswagenwerk AG . . . And in Greece next spring, students will begin training in computer programming and usage on a Control Data 3200 ordered by V. Vranas and Co., Athens educational organization . . . Unitrode Corp., Watertown, Mass., has established a European sales office to serve Europe and Israel . . . EIE, Japanese electronic marketing representative firms, formed a new company, NACO, specifically to sell Cambridge Memories" memory products in Japan . . . And the first NCR

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CIRCLE 46 ON READER CARD

DATAMATION

Century 200 has been installed in Singapore. It is used by Gammon South East Asia Berhad, an engineering and construction company, as nucleus of a management information system designed to assist in the planning and supervision of large and complex building projects through Southeast Asia . . . The Univ. of Cape Town, South Africa, took delivery last month on a \$1 million Univac 1106 . . . Consolidated Computer Ltd., Toronto, opened two European offices, its first two, in Frankfurt and Munich, Germany . . . Informatics has licensed Mitsubishi Electric Corp., Tokyo, to market its ICS-500 Communications system in portions of Southeast Asia The National Cash Register Co. said it will expand its data center operations internationally to the tune of \$3 million with the opening of centers in Hightstown, N.J., San Antonio, Texas, and Sapporo and Hiroshima in Japan . . . Western Union Data Services Co. was ready last month when AT&T stopped installing additional teleprinter terminals under 300 baud for Data-Phone. Z. V. Zakarian, president, said his firm has been providing low-speed teleprinters since it was formed last July and in the early months of this year "was gearing up to fill the gap." . . . Tracor, Inc., Austin, Texas, is developing a \$1.3 million system for the Army to be used within Ft. Hood test areas to locate men, moving vehicles, trucks and tanks, personnel carriers and aircraft, both helicopters and fixed wing . . . Morgan Information System, Inc., Palo Alto-based manufacturer of microfilm storage and retrieval systems, said it has completed a major financing agreement with Northrop Technology Development, Inc., venture capital subsidiary of Northrop Corp. . . . The Transitel Computer Support Systems Div. of the Sangamo Electric Co. reduced one-year lease rates for its KeyTran data entry systems by 30% . . . Comma Corp. established regional marketing territories on both coasts following its announcement of maintenance agreements with four major third-party leasing companies which it says will open an additional market exceeding \$15 million annually. ■

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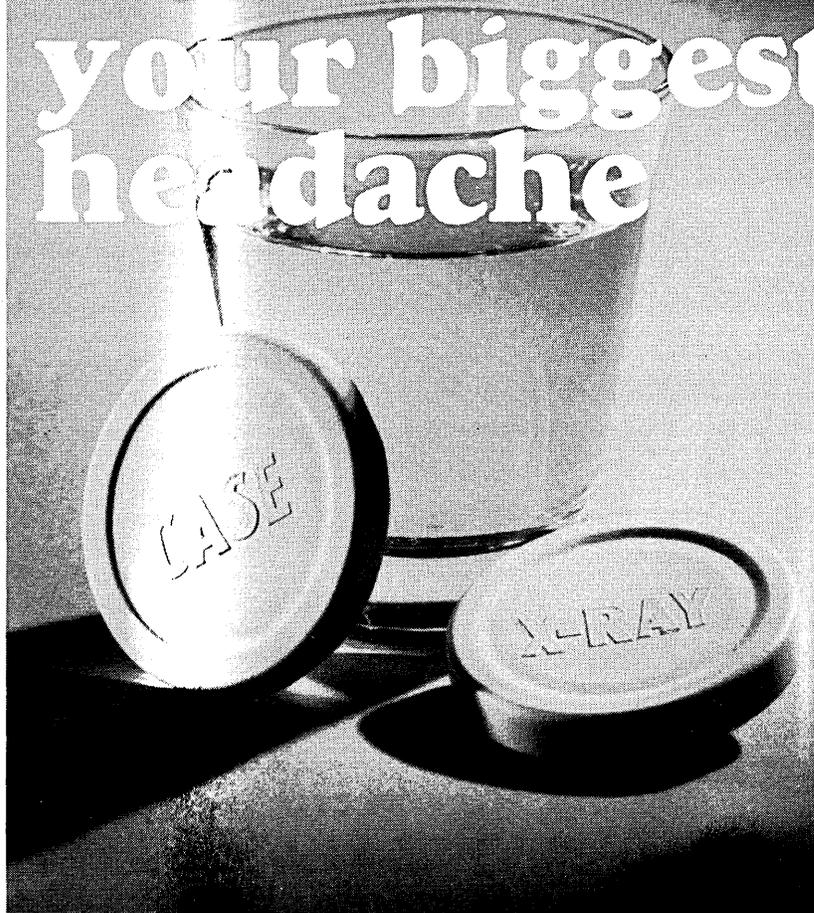
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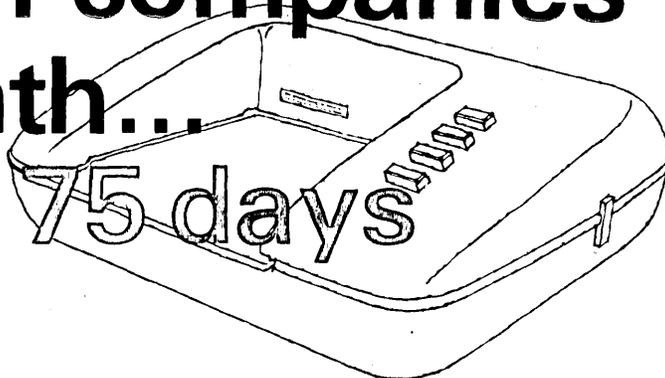
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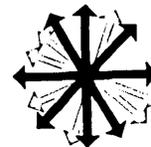
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HARDWARE

Small-scale 370

Now that current 360 model 40 through 65 users have had their future computing growth provided for in past 370 announcements, IBM apparently feels it is time to point directions for the estimated 13,000+ 360/30 and /25 users throughout the world before they start eying competitive equipment. Odds are that the 370/135 is the last model in this series we will see for awhile—at least at the small end of the scale.

As was expected the machine looks like a small /145 in many ways, including the Integrated File Adapter (IFA) and the all-monolithic cpu and memory, but becomes the first 370 to offer an optional Integrated Communications Adapter (ICA), an idea borrowed from the 360/25 to provide the first eight lines of low- and medium-speed communications capability. If eight lines cannot satisfy the 370/135 user, he graduates back to 2701/2/3 equipment to support his needs.

Four memory sizes are available ranging from 96-240K made up of combinations of 48K chunks above

PRODUCT SPOTLIGHT

the 96K. That's roughly four times the maximum number of bytes allotted 360/30 users hitherto. And all those bytes cycle quite a bit faster than /30 bytes do (1.5 usec) at 770 nsec for reading and 935 nsec for writing two bytes. What this does for throughput isn't known yet, but IBM claims internal speed comparisons that look like this: Four and one-half times faster than a /30 and six and one-half times faster than a /25 in commercial mixes, and 7:1 and 16:1 ratios respectively for scientific job streams. We'll speculate that current 40 users whose machines are not saturated in capacity might do well to explore the possibility of switching sideways to a 370/135 and maybe save some money. A four-byte inter-register fixed-point add takes only "2.558" usec.

The microcode many would like to get their hands on is shown being inserted into the reloadable control storage feature. It can be expanded from the basic 24K bytes up to 48K if needed, for accommodating options such as extended precision arithmetic or emulation of 1400 series equip-



ment.

The integrated file adapter controls the same one-to-three-pack 2319 configuration offered with the /145. A total of 87 megabytes can be stored on the 2314-like packs. Beyond this, the 2.4 aggregate megabyte channel speed of the 370/135 will easily accommodate two additional 2319 three-pack units, or the 3330 disc unit, as well as other fast peripherals like 200 ips tape drives, the 3211 printer, etc.

For those who have huge program libraries oriented toward the dos/360 operating system, dos programs are supported on the 135 without reprogramming, but the 135 is set up for os to provide greater data base and multiprogramming capability.

Two peripherals also were announced with the 370/135 and are available to other 370 users as well. The 3505 card reader is available in either an 800 or 1200 cpm version for reading standard 80-column cards or optionally up to 40 columns of hand-penciled (standard No. 2 pencil) or preprinted vertical marks. Including maintenance, the

3505 will rent for \$565 for 800 cpm speeds, and \$670 per month for 1200 cpm. The 3525 card punch has an option of up to 25 lines of 64 characters/line. Also, an optional reading feature allows the 3525 to operate as a backup reader to the 3505 . . . they both operate out of the same control unit. Three models are available: \$400/month for 100 cpm, 200 cpm speed costs an additional \$105/month, and for 300 cpm capability the monthly rental is \$610. These prices include maintenance. Delivery is scheduled during the second quarter of next year.

A 370/135 configuration with a 15 cps console printer, 96K of memory, a three-pack 2319 disc storage unit, a 1403 printer, and one each of the fastest versions of the new card reader and card punch, would rent for \$9870/month. First customer shipments of the 370/135 are scheduled for May of next year. IBM CORP., White Plains, New York. For information:

CIRCLE 511 ON READER CARD

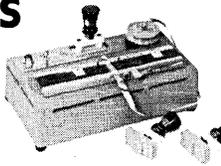
(Continued on page 76)



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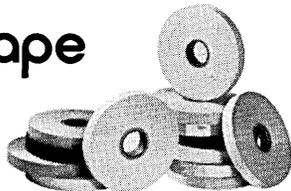
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CIRCLE 63 ON READER CARD

Graphics Display

The System 32 is a sophisticated graphics display unit for use in such problems as designing printed circuits, LSI circuit masks, etc. It features a 20-inch diameter crt, with a flat surface for minimal geometric distortion. It is also fast: vectors can be drawn at up to 1 inch per usec, and characters can be generated in 5 to 8 usec. The standard character generator provides 96 characters, with 192 optional, for jobs where lower case is desired. Codes accepted are ASCII or EBCDIC, and interfacing is provided for all digital computers. Prices start at \$60,000 for a display, interface, and software consisting of FORTRAN-callable assembly language subroutines. Delivery requires three to six months ARO.

Options include alphanumeric or function keyboards, light pen, track-

ball, or tablet. Circle, ellipse, and rectangle generators, expanded character and symbol displays, three-dimensional rotation, and projections are also available. An 8K or 16K re-



fresh memory may also be included. LUNDY COMPUTER GRAPHICS, Paramus, N.J. For information:

CIRCLE 518 ON READER CARD

Optical Scanners

Lower cost optical scanners are available from this vendor at the expense of lower throughput. The models 12 and 17 are table-top units, the former intended for use with a minicomputer, and the latter for use as a remote or stand alone unit. Documents ranging in size from 2x4 inches to 8½x11 inches are accommodated, with throughput about 300 documents per hour.

The units scan conventional optical mark reading (OMR) marking with a number 2 pencil and handwritten block printed numerics. Also available is a printing line compat-

ibility feature enabling the scanning of information marked on computer printed forms or turnaround documents. The model 12 is transparent to tty software, so it can use the tty channel of a minicomputer. The 17 can transmit through a type 103 modem or interface with cassettes or paper tape equipment for off-line operation. Deliveries begin in June with prices approximately \$3500 for the model 12, and \$5K for the model 17; rental is about \$125 and \$195 per month, respectively. OPTICAL SCANNING CORP., Newtown, Pa. For information:

CIRCLE 523 ON READER CARD

Oem Minicomputers

For sale: 8-bit byte-oriented minicomputer, including hardware multiply/divide, direct memory access, automatic memory scan, block load and dump, vectored hardware priority interrupt scheme, and 4K of 2.6 usec memory. Price: \$1700. Also, 16-bit minis for \$2400. Those prices are for firm orders of at least 200 units, and the NAKED-MINI contains no power supply, console, or metal chassis. All of the software developed for the 108/208 and 116/216 computers runs on the two models of the NAKED-MINI, and all the options and peripherals offered in the past will hook up, too. COMPUTER AUTOMATION, INC., Newport Beach, Calif. For information:

CIRCLE 521 ON READER CARD

PDP Digitizer

A writing tablet for digitizing data provides input for the PDP-8, -12, and -15 computers. Designated the vw01, it's the first device of this type available for DEC computers, and will digitize any kind of graphic material. The tablet is activated with a stylus or ball point pen with a spark gap. The paper on the surface of the tablet serves as a hard copy of what was drawn or written. The tablet is horizontal, measuring 11 x 11 inches. A single tablet, including controller, is \$4500. Additional tablets, less the controller (which handles up to four tablets), are \$3500 each. Delivery requires 90 days ARO. DIGITAL EQUIPMENT CORP., Maynard, Mass. For information:

CIRCLE 525 ON READER CARD

... HARDWARE

System/3 Peripherals

Probably no manufacturer during the last year has been as busy announcing new products in virtually every category as has this one. This time the System/3 model 10 has come in for some careful attention, including new language capabilities (COBOL and FORTRAN), additional core storage, a new disc drive, faster printer configurations, and other catalog additions.

The new disc drive is called the model 5445. One or two 2316-type disc packs are utilized, each limited to 20.48 megabytes. The access time is the same as on the 2314 at 60 msec. At least one model 5444 disc storage device must be attached to the Sys/3 before the 5445 can be attached. Monthly rental starts at \$885 for a single drive unit, and \$1235 for dual-pack configurations. Initial shipments are scheduled for the second quarter of next year.

Model 10 cpu's can now have up to 48K bytes of storage. This cpu would rent for \$1285 on a card system, and \$1410 per month on disc systems. First deliveries are scheduled for December.

The venerable 1403 printer can now be attached to the System/3 using the 5421 control unit. An 1,100 lpm model 1403 including the controller will rent for \$1407/month, with 600 lpm models listed at \$1130/month. Deliveries are scheduled for early next year on these products. IBM CORP., White Plains, New York. For information:

CIRCLE 522 ON READER CARD

Minicomputer

From the people who brought you a cheaper (and faster) PDP-8 replacement, the D-112 (May '70, p. 207), comes the D-216, a ringer for the PDP-11. It's aimed at oems that use PDP-11s in their systems, and sells for about 12% less than DEC prices. A plain cpu, without memory, is \$2600 in single quantity. Oem quantities of 100 yield a 26% discount, resulting in a price tag of about \$3950 each for 4K systems. The vendor claims the performance specifications of the PDP-11 are exactly duplicated, not exceeded, this time. Deliveries begin this summer. DIGITAL COMPUTER CONTROLS, INC., Fairfield, N.J. For information:

CIRCLE 517 ON READER CARD

(Continued on page 78)

May 1, 1971

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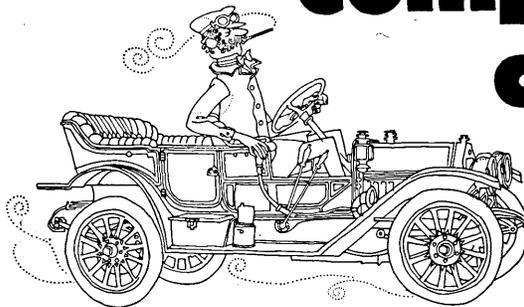
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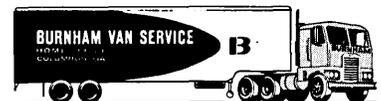
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CIRCLE 67 ON READER CARD

Scientific Computer

In considering the position of the Sigma 8 in this manufacturer's product line-up, think of it as comparing to the Sigma 5 in much the same ratio as the recently announced Sigma 9 compares to the Sigma 7 . . . approximately twice as powerful, with a complement of new wrinkles to effect improved price/performance figures. Fully compatible with other 32-bit members of the Sigma series (Sigma 5, 6, 7, and 9), the 8 is biased toward scientific and engineering applications. The lack of hardware decimal capability does not prevent it from performing business computations (the 8 has COBOL), however. Decimal arithmetic support is handled exclusively with software.

From 16-128K of 32-bit 900 nsec memory is possible, with memory increments supplied in 16K blocks. The cpu is word-oriented, but is also addressable in 8-bit bytes, halfwords, and doublewords. The Sigma 8's instruction set includes the set of 93 Sigma 5 instructions, plus some for single and double precision floating point, logical shift, byte string, and compare operations. Overlapping of four instructions should also enhance performance, as should 2- or 4-way memory interleaving.

Two types of i/o processors can be attached to any or all of the 11 memory ports—just like the Sigma 9—to provide asynchronous transfer

rates of either 900 KB (for slow and medium speed devices), or 3 megabytes for the faster stuff. Each iop accommodates up to 32 devices. Rounding out the Sigma 8 specifications are 16 general-purpose registers expandable to 64, up to 224 hardware priority interrupts, two real-time clocks, with two more optional, master and slave mode memory protection, snapshot diagnostics, voltage and clock margining, and others. A full line of peripherals is offered for the latest Sigma.

Sigma 5 programs can be run without alteration on the Sigma 8 under any of the three basic system monitors, including a real-time batch monitor, batch/time-sharing monitor, and a batch processing monitor. There are FLAG, extended FORTRAN IV and IV-H, BASIC, and ANSI COBOL compilers, and assemblers for SYMBOL, MACRO-SYMBOL, and META-SYMBOL, as well as a library of specialized applications programs.

A typical Sigma 8 system, including 64K of core, 56 megabytes of disc storage, a line printer, card reader, card punch, two tape drives, and an i/o typewriter is priced at approximately \$800K, and will rent for \$19K/month on a four-year contract. Deliveries are scheduled for the third quarter. XEROX DATA SYSTEMS, INC., El Segundo, Calif. For information:

CIRCLE 520 ON READER CARD

CRT Terminal

The Elite 2000 crt/keyboard terminal is a plug-compatible replacement for the Teletype. It features an MOS memory expandable from 960 to 1,920 characters in 480-character increments. The display is 80 characters per line on a nine-inch screen; a 12-inch crt is optionally available. Three operator-controlled modes are available: page mode, roll mode, and transmit line mode. The operator may also select half- or full-duplex operation. Maximum transmission speed is 1800 baud. Automatic answer-back is available. The price is under \$2000 in quantities of 25, with further reductions in larger oem quantities. It's the first product of a ten-man firm. Delivery requires about 60 days ARO. DATAMEDIA CORP., Blackwood, N.J. For information:

CIRCLE 516 ON READER CARD

Display Multiplexor

Attaching the 4701 multiplexor to this manufacturer's model 601 or 611 storage display unit, the nonstorage 602 display, or the model 4501 scan converter allows up to eight separate analog inputs from biophysical, biochemical, educational, hospital, or process control applications to be displayed on the same screen. The 4701 is plug-to-plug compatible with the above devices, and can also be used with most other xyz storage or nonstorage crts, it is claimed. Repetitive or single time base sweeps are possible in 21 calibrated steps ranging in time from 10 usec to 50 seconds. Any information channel can be selected as a source to initiate the sweep. Available currently, the 4701 eight channel multiplexor is priced at \$1500. TEKTRONIX, INC., Beaverton, Ore. For information:

CIRCLE 519 ON READER CARD

...HARDWARE

Terminals

Everyone thinks of IBM as the one putting the price crunch on the "transplant" builders, but now this major manufacturer could possibly shake things up for many of the remote terminal builders. The 700 series of terminal products includes the model 711 single station crt, the 712 terminal printer, and the model 713 time-sharing terminal.

The model 711 displays 8 lines of 80 ASCII characters, expandable to 16 lines, on a 15-inch diagonal screen. The rs232-c interface is designed for half-duplex synchronous data transmission up to 4800 baud. A full range of cursor controls are featured, as are roll and page format, non-destructive blinking cursor, 60Hz refresh rate, and the provision for a magnetic tape cassette and hard copy unit. The 711 will rent for \$90/month on a one-year contract, and the maintenance is \$20/month.

The model 713 looks very similar to the 711, but the innards are set up to allow 96 ASCII alphanumeric and symbols plus 32 control codes to go through rs 232-c interfaces at asynchronous transmission rates of 75, 110, 150, or 300 baud. Switch selections permit full- or half-duplex



transmission modes, as well as roll page format. The 713 rents for \$60/month on a one-year lease, and the maintenance charge is \$15/month. The unit sells for \$1995.

The model 712 printer has 132 columns, a print speed of 30 cps, and a 64-character ASCII set, plus a 10-key numeric cluster, and controls. The 712 sells for \$4950, or leases for \$150/month on a one-year schedule. The maintenance charge is \$40/month. CONTROL DATA CORP., St. Paul, Minn. For information:

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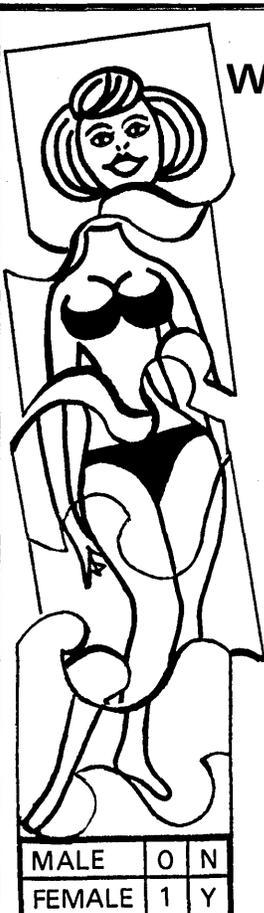


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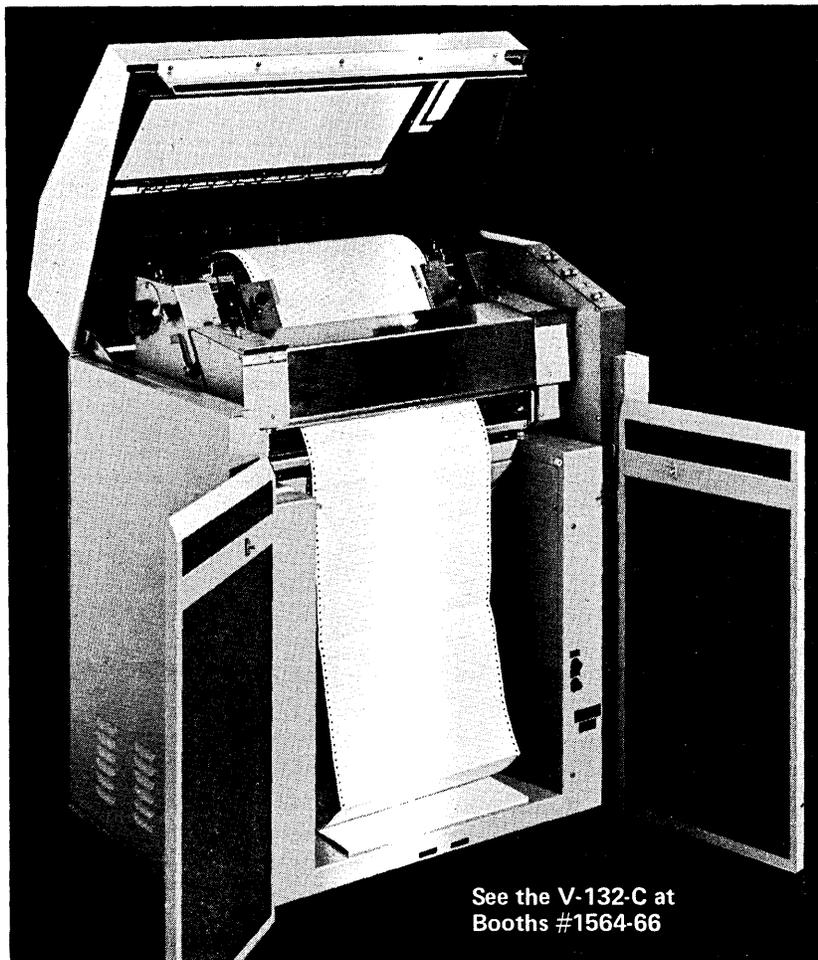
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CIRCLE 26 ON READER CARD

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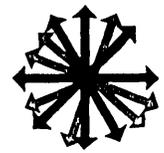


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Compiler Compiler

cwic is a compiler for writing and implementing compilers, interpreters, report generators, data base generators, and editors. It consists of three languages and their associated compilers. The first language is a syntax language for transforming the strings of characters of a source language into a tree-structure representation. Its task is to simplify such aspects of compiler construction as character string scanning, parsing, dictionary or symbol table construction, and others.

cwic's second component is a generator language that transforms the tree developed by the first language (or by other generator routines) into an object language. It features opti-

mization of code sequences by delineation of special cases, evaluation of constant expressions at compile time, elimination of duplicate and undefined labels, and many others.

The final language is a machine-oriented language, being a replacement for BAL. It has a compiler's grammar and an assembler's vocabulary, but the ALGOL-like MOL allows the user direct control of the machine's memory and registers.

Some of the potential applications of cwic include implementation of conventional programming languages such as FORTRAN, JOVIAL, and LISP; production of special-purpose programming languages customized to a particular application; and probably most important, it allows the development of machine-oriented

languages for use by system programmers on given machines to fill the void between assembly language and high-level languages like PL/I.

Requisite minimum hardware for utilizing cwic is any 256K 360 running os/360, and either 2311 or 2314 disc storage. The price ranges from \$48K for just a binary tape, through a typical installation price of \$400-600K (which includes documentation, and one week of training for four people), up to a maximum of \$1.2 megabucks for considerable hand-holding, installation, training, documentation, etc. SYSTEM DEVELOPMENT CORP., Santa Monica, Calif. For information:

CIRCLE 510 ON READER CARD

Time-Sharing System

Two t-s operating systems have recently been contributed to the H-P program library making it possible for interested installations (primarily educational ones) to merely purchase a few of their favorite terminals, install the system, and put a small-scale t-s capability on the air. The first system requires about 6K of core on any of the H-P minis. Four users can be supported with 8K of 16-bit

words, and 12K will support eight users writing in BASIC. Punched tapes and documentation for this system, developed by Pacific Union College at Angwin, Calif., are supplied for \$10, or the documentation alone is priced at \$2.

The other time-sharing system was developed at Montana State Univ. and is somewhat more powerful, since the 8K word system performs matrix operations and does system accounting to keep track of the time

each user spends running BASIC programs. Minimum hardware required includes 16K of core, a time-base generator, paper tape reader, and a teleprinter. This system package is priced at \$80 including documentation, or the documentation can be obtained for \$5. Updating and error correction functions are the responsibilities of the respective contributors. HEWLETT-PACKARD, Palo Alto, Calif. For information:

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Statistical Analyses

A set of nine FORTRAN IV programs designed by a social scientist for other social scientists encompasses most statistical analyses, including column frequencies, percentages, means and standard deviations, cross-tabulation, correlation, multiple-regression, partial correlation, scatter-

plot, curve-fitting, analysis of variance, and cluster analysis. The programs operate under os/360 and are presently used on a time-sharing service using a 256K 360/67, but they may be modified for smaller mainframes through use of disc storage. Comprehensive documentation is available, especially written for social scientists who may be minimally

knowledgeable about computers. The price of the complete package is \$6000, but modules may be purchased separately; rental is also available. FUNKHOUSER ASSOCIATES, State College, Pa. For information:

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Payroll

This little firm's first program offering is a payroll package that can be adapted for running the payroll for many small firms, or for larger firms that have many departments. All the typical reports, including the payroll register, journal, checks, and deduction register, are generated by the 64K byte COBOL F package, which can run under DOS or os/360. The package is mailed out with supporting documentation for \$500 and is also marketed as a service. COMPUTER PAYROLL CO., Garden Grove, Calif. For information:

CIRCLE 504 ON READER CARD

Fortran Cross Reference

For \$750, this package provides cross reference on FORTRAN IV programs. Operating on System/360 under DOS, it cross references all named common, subroutine calls, and variable name usages. A system consisting of 40,000 FORTRAN statements is said to have been completely cross referenced in one hour on a 64K 360/30. It is also available as a service at 2¢ per input card. ANALYSIS AND PROGRAMMING CORP., Greenwich, Conn. For information:

CIRCLE 506 ON READER CARD

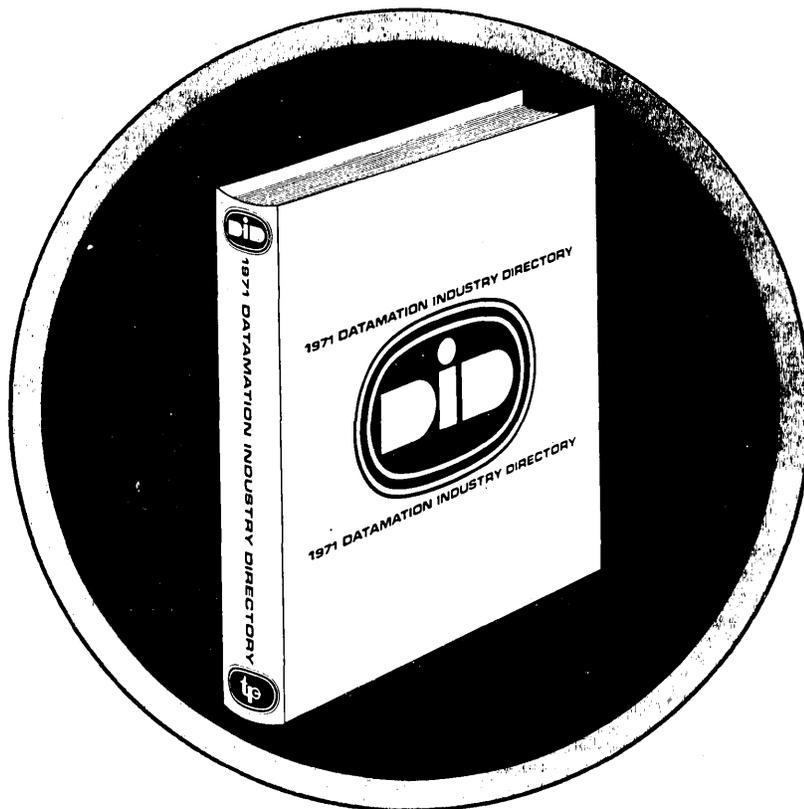
Plotting Software

A general-purpose program for drawing any figure on any Calcomp plotter is the description for SPLAT (Specialized Plots of Logograms And Trademarks). The FORTRAN package requires typically 4K bytes and is supplied as a commented source deck with listings for \$400. No on-site support or debugging can be provided by the small firm, but the program is said to be guaranteed. LOGOGRAPHICS, Wilmington, Del. For information:

CIRCLE 503 ON READER CARD

(Continued on page 83)

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System/3 Software

The addition of ANS COBOL and FORTRAN IV to the System/3 model 10 makes it a true general-purpose small-scale computer. Additionally, the maximum core storage capacity has been bumped from the previous 32K byte limit up to 48K (for now?), faster and greater disc storage capacity is offered, as is the ability to attach 1403 printer models. These changes and additions probably look a lot like 370/125 blueprints—if they ever existed—with the significant exception of no tape drive provisions. One can speculate that IBM is thinking about tape capability for the model 10 somewhere in the future, however.

The ANS COBOL subset requires at least 16K bytes on the model 10. It is scheduled to be available in the second quarter of next year, and will rent for \$75/month. The FORTRAN compiler requires at least 12K of memory, will debut somewhat after the COBOL module, and will rent for \$100/month. IBM CORP., White Plains, New York. For information:

CIRCLE 509 ON READER CARD

Matrix Inversion

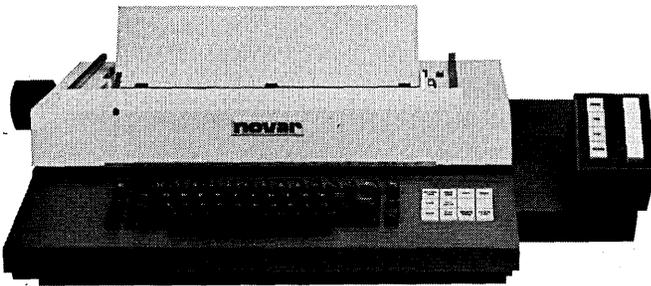
Large core savings can be effected by Sparse, a set of subroutines for inverting matrices by not saving zero elements in the matrix. In many engineering problems, savings can be dramatic: the vendor claims some million-word problems can be shrunk to 30K words of core. The package runs on any mainframe supporting standard FORTRAN IV, and the subroutines themselves require less than 1K core. Sparse works like this: It takes in a description of the matrix list form. Each element value and its row and column position in the matrix is contained in the list. By suitable type declarations, Sparse can handle real, complex, or double precision matrices. The package uses a modified Gauss-Jordan elimination scheme and will work on nonsymmetric matrices. The price of \$2000 includes source deck, program listing, and a manual. ENVIRONMENTAL COMPUTING, INC., Lowell, Mass. For information:

CIRCLE 507 ON READER CARD

Cobol Program Writer

To ease the flurry of program writing here is SNOFLAKE, a program writing system which produces programs in any of the IBM-defined COBOL dialects. SNOFLAKE is modular and currently consists of report writing, label printing, and file rebuilding and reformatting functions. Its features include multiple input files, sequential or indexed-sequential; file subset selection capabilities; and an unrestricted number of subtotal levels. Input to the system is done by keyword and function name similar to COBOL macro calls. According to the producer this permits use by nonprogrammers. Output is a COBOL source deck. SNOFLAKE operates under OS/360 and a full feature system requires a maximum of 200K of core. It is sold by function module—report, \$4000; label \$2000; rebuild and reformat, \$2000. There are discounts on multiple function and multiple system purchases. SOFTWARE ENGINEERING, INC., Norton, Mass. For information:

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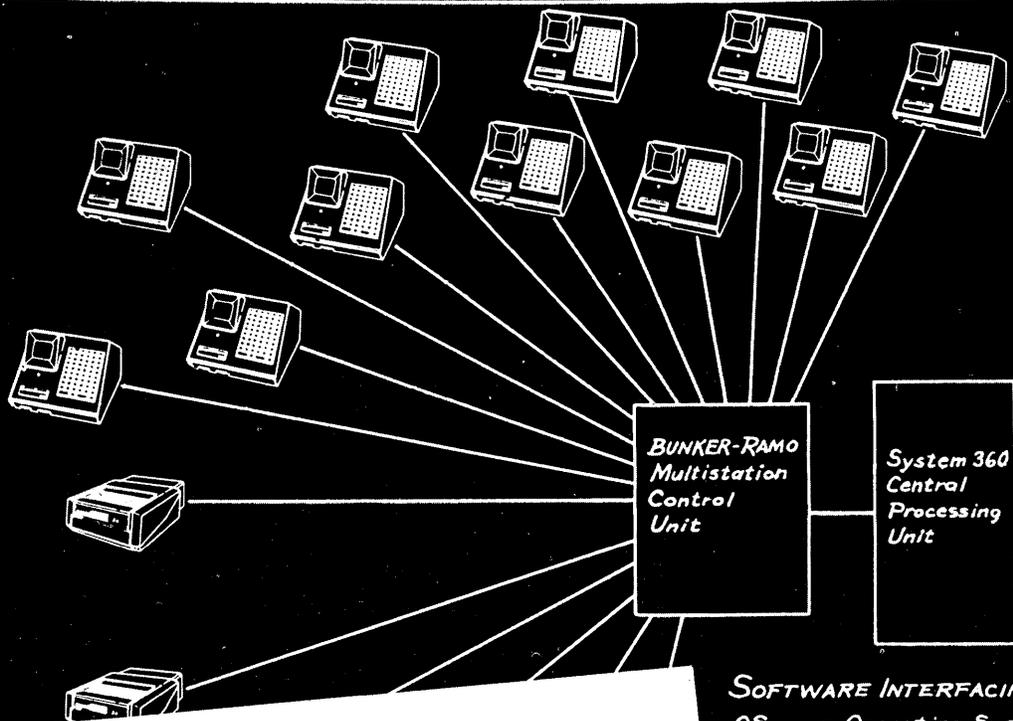
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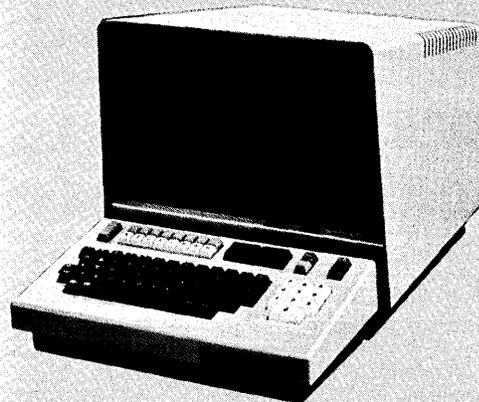
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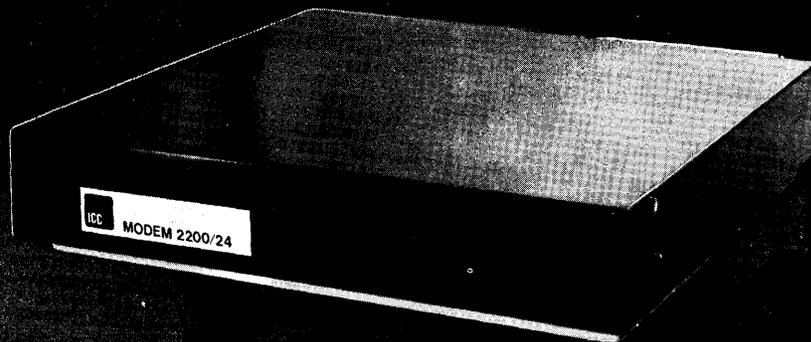
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AMERICAN EXPRESS BUYS INTO HOSKYN'S

An 11% stake in the Hoskyn's Group of management consultants, software, and computer services companies has been bought by American Express for over \$750,000. This is seen as one of the brightest spots in the computer services industry in the U.K. in several months, following the difficult economic climate that still prevails. Staff cutbacks and complete closures have been more in view than signs of expansion. American Express is also providing a 10-year convertible loan, which when converted will increase its total holding to over 20%. Hoskyn's is one of the few European computer companies which has taken its services across the Atlantic with any success. The agreement with American Express gives the British company a valuation of over \$7 million and will help with expansion programmes both in Europe and the States.

UNIVAC TO MANUFACTURE

Univac is also making expansion plans that include manufacturing in the U.K. Although the computer division of Sperry Rand was probably the first of the international giants to start making machines in Europe with a plant in Germany over 10 years ago, its success in Europe has been subject to big fluctuations. But the group has slowly built a network of effective software development groups as well as manufacturing over the past three to four years.

U.K. DISCRIMINATES IN FAVOUR OF ICL

The major British firm ICL has had some encouragement from the U.K. in that the new administration appears more favourably disposed to it than had been expected. Under the old administration of a Labour Government the company had marked preferential treatment when it came to procurement of machines for central government departments and government agencies. This advantage was expected to be whittled down on the return to power of the Conservatives. However, it has been made clear that a policy of favouring ICL machines will continue for the sake at least of achieving some degree of compatibility. The Ministry of Defence is discussing terms for seven large systems to update existing installations for the Navy and Air Force. This has not been open to competitive bidding and can only be taken to confirm earlier remarks from makers such as IBM that there was discrimination against the international groups. But this has not discouraged a steady rise in the U.K.'s computer import bill.

Nevertheless, ICL was in need of a fillip. Its difficulties against competition are reflected to some extent in the decline of the value of its stock, which dropped in past months from \$7.60 a share to \$3.60 a share. There was also encouragement in the fact that prime minister Edward Heath was prepared to personally intercede on ICL's behalf with President Nixon over the matter of sales of U.K. machines to Russia. ICL expects to add to promising eastern bloc sales with a big computer system for Serpukhov.

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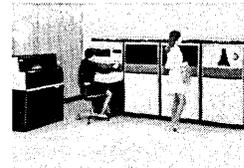
Data-Printer Configuration



Data-Converter Configuration

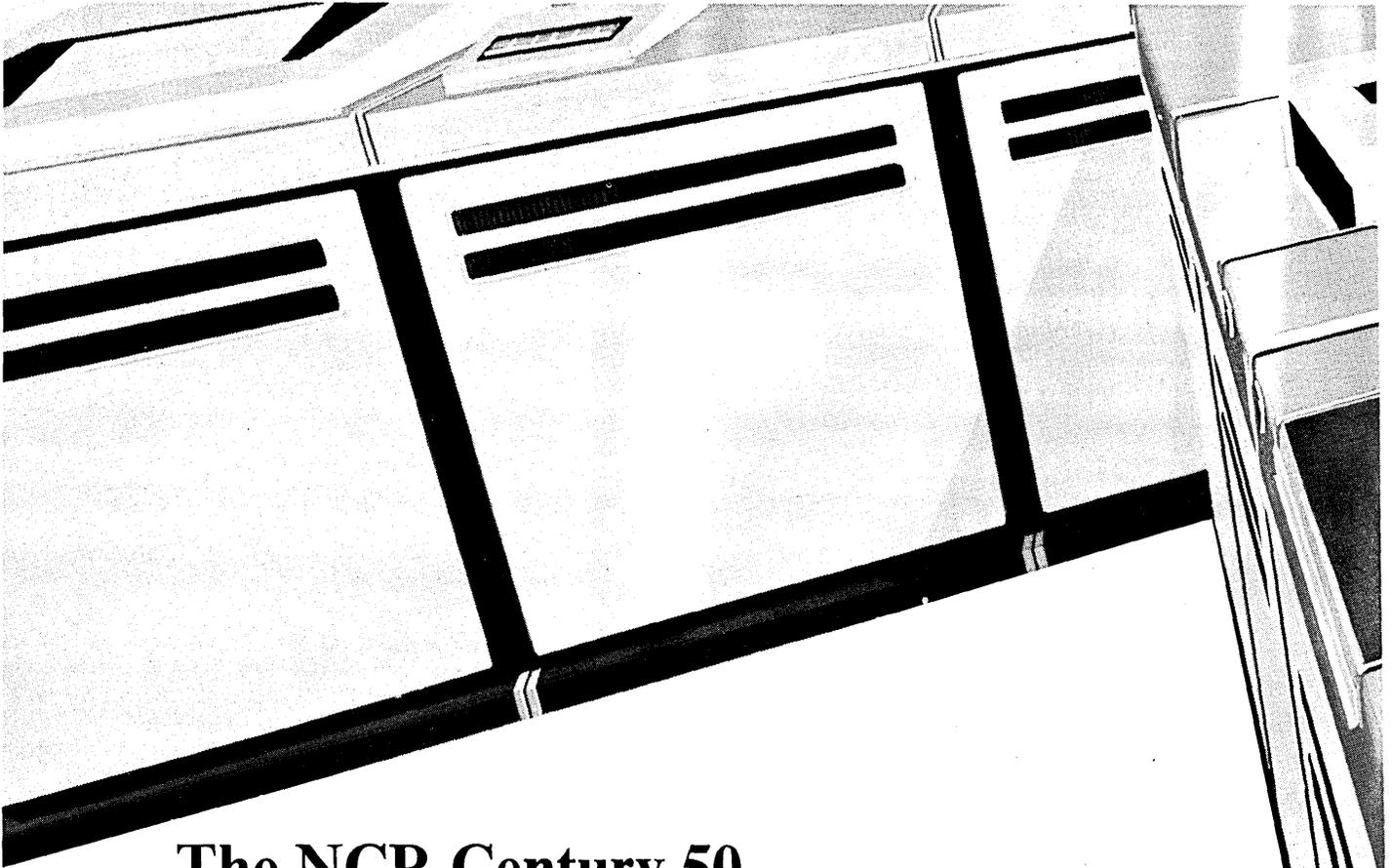


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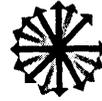
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PEOPLE

The former president of Computer Sciences Corp.'s Infonet Division in Los Angeles has moved to Texas to become executive vice president of the Computer Terminal Corp., which makes crt terminals. Marvin J. Franklin left IBM's Poughkeepsie laboratories in 1968, where he was manager of systems planning, to join Computer Sciences as vice president of marketing. He became president of the company's Information Network Division early in 1969, but resigned two years later for reasons that weren't disclosed publicly. Computer Terminal makes the Datapoint line of terminals.

At csc, meanwhile, James R. Grimm was named director of international finance and planning, a new post at the company. Grimm left Fairchild Semiconductor Division at Mountain View where he was director of international finance . . . Roy S. Mushrush, 52, is the new president of Electronic Associates, Inc., of West Long Branch, N.J. He succeeds Arthur L. Adamson who resigned last fall. Mushrush, who also becomes chief executive officer and a director, left Sylvania Electronic Systems where he was a vice president and general manager of the eastern division . . . Irwin E. Kaplan was named vice president of Programming Methods, Inc. where he will head the firm's Information Services Division . . . Paul Nortman is the president of

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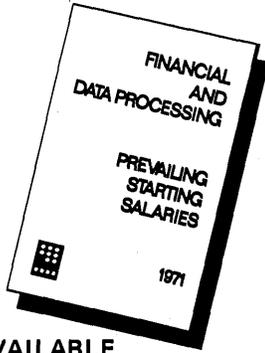
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Dataware Marketing, Inc., a subsidiary of Boothe Computer Corp. which sells peripherals and used computers. Nortman formerly was with Dataware's New York office . . . Victor A. Diels, 40, has been named vice president and a director of Proprietary Computer Systems, Inc., Los

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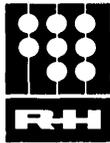
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CIRCLE 303 ON READER CARD

May 1, 1971

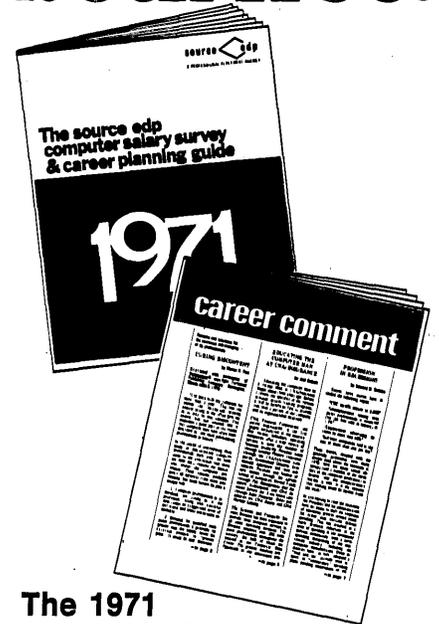
Angeles service center. He has been with the company since it was started recently and before that was manager of the Marquardt Corp. data center . . . Jack Busch has left Honeywell Information Systems to become director of service with Telex Computer Products, Inc., Tulsa. He was with Honeywell 14 years, most recently as director of field engineering .

Swiss Industrialist Walter Haefner was named a director of University Computing Co. Haefner founded Automation Centers International, a network of 10 computer service centers in Western Europe acquired by ucc in 1969 . . . A. Peter Polus, a director and general manager of Advanced Digital Systems, Inc., Mohawk, N.Y. since it was founded in July 1969, was elected president . . . Norbert E. Andres, Jr., left Cogar Corp. to become ADS director of marketing . . . Kelly P. Ohka was named to the newly created position of Director of Engineering for the Technical Products Division of TEAC Corp. of America, Santa Monica, Calif. subsidiary of the TEAC Corp., Tokyo, Japan . . . Colorado Instruments, Inc., Broomfield, Colo. manufacturer of source data collection systems, reorganized its marketing staff. Corles M. Perkins, executive vice president and general manager, assumed responsibility for marketing activities. The position of marketing vice-president was eliminated. Erle Hodges, former Mid-Atlantic regional manager, was named national sales manager . . . John S. McGeachie is the new director of Dartmouth College's Data Processing Center, at Hanover, N.H. . . .

The abrupt resignation of SEL president and chief executive spot by Sheldon P. Eglash was countered with equally swift appointment of C. E. Griffin to the post. Eglash's resignation came immediately upon his return from a European trip and although official communique said the reasons were personal it is thought to have been a result of SEL's poor half year performance. Profits for the first half are 2 cents a share compared to 27 cents for the same period last year.

Griffin, for the past 18 months vice president of manufacturing, has been with SEL since its founding. He also held the post of president of corporate services and chief of the company's system engineering operation. Griffin is a Georgia Tech alumnus and worked for Radiation Inc. before joining SEL.

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Beginning with the 1971 SJCC, you can save \$10.00 on the conference registration fee. The "bonus saving" is offered to both "member" and "non-member" registrants providing their registration is received by APRIL 30th.

3 are the days of the conference

These three days—from May 18 to 20—will be packed with activity, all of which will center around the Conference Theme—Responsibility. Every effort has been made to ensure that your visit to Atlantic City will be professionally and personally rewarding. (If you're counting, that's 13)

2 for the doubled convention hall

This year represents the first conference in the newly expanded Convention Hall. In addition to increased exhibit facilities, the new accommodations permit all conference activities to be conducted on the same floor with additional meeting rooms for the Technical Program. (That's 15)

37 deal with the technical program

In addition to the Keynote Address by Sir John Wall (Chairman of the Board of International Computers, Limited), the Technical Program will consist of 36 sessions. Representative sessions include: *Image of the*

Industry, an exploration of public attitudes by a panel of journalists; *Responsive Government*, relating the role of computers in Local, State, and Federal Government; *Competitive Evaluation of Interactive Systems*, Ford's evaluation of eight vendor supplied systems; and *Computers in the Electoral Process*. (Now we're up to 52)

9 are planned special activities

One highlight of the Special Activities for the SJCC will be an evening Ecology Forum—*Computation, Decision Making and the Environment*. Other activities range from the Computer Art Show and Forum, the Conference Reception and Luncheon, to a planned Post Conference Night on the Town in New York. (That's 61)

24 are the other guys waiting in each line to register

By pre-registering you will by-pass long registration lines at the conference and be able to pick up your credentials at specially provided desks. (We're at 85)

MAY 18-20 • CONVENTION HALL • ATLANTIC CITY, NEW JERSEY

71 SJCC ADVANCE REGISTRATION		OCCUPATION (Check One Only)	FEES
NAME _____ <small>Last First Initial</small>		1 <input type="checkbox"/> Management/ Administration	Member: \$20.00 (Check all applicable)
COMPANY _____		2 <input type="checkbox"/> Engineering	1 <input type="checkbox"/> ACM 7 <input type="checkbox"/> ASA
ADDRESS _____		3 <input type="checkbox"/> R & D	2 <input type="checkbox"/> IEEE 8 <input type="checkbox"/> ASIS
CITY-STATE _____ ZIP _____		4 <input type="checkbox"/> Consulting	3 <input type="checkbox"/> SCI 9 <input type="checkbox"/> ISA
<input type="checkbox"/> WIFE WILL ALSO ATTEND <input type="checkbox"/> YES <input type="checkbox"/> NO		5 <input type="checkbox"/> Teaching	4 <input type="checkbox"/> ACL 10 <input type="checkbox"/> SIAM
<input type="checkbox"/> Send Information on "A Night on the Town in N.Y." (p. 16).		6 <input type="checkbox"/> Sales/Application Engineering	5 <input type="checkbox"/> AIAA 11 <input type="checkbox"/> SID
		7 <input type="checkbox"/> Systems & Procedures	6 <input type="checkbox"/> AICPA 12 <input type="checkbox"/> SLA
		8 <input type="checkbox"/> Programming Application	<input type="checkbox"/> Non-Member: \$50.00
		9 <input type="checkbox"/> Full Time Student	<input type="checkbox"/> Full-Time Student: \$ 5.00
			<input type="checkbox"/> Military: \$ 5.00
			<input type="checkbox"/> Conference Reception: \$ 8.00
			<input type="checkbox"/> Luncheon: \$ 7.00
			TOTAL: _____

Mail To: 71 SJCC Registration | 210 Summit Avenue
c/o AFIPS Headquarters | Montvale, New Jersey 07645

(Please enclose check payable to 71 SJCC)

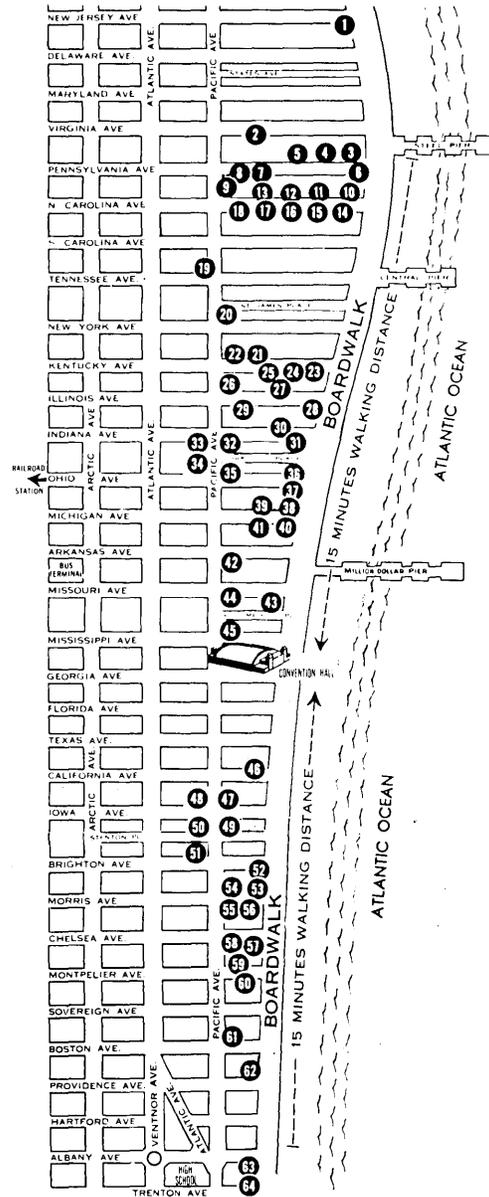
The last 64 reasons are the Atlantic City Hotels, who handle reservations on a first come basis.

Select your choice from the list below and mail your request early to ensure the accommodation of your choice. (And that makes 149)

MAP NO.	TOTAL ROOMS	HOTEL NAME	ROOMS WITH BATH		PARLOR SUITES	
			Single	Twin/Double	1 Bedroom	2 Bedrooms
BOARDWALK HOTELS						
6	83	Abbey (5)	10-12	14-16		
10	1000	Chalfonte-Haddon Hall (1, 2, 3)	13-35	19-37		
31	400	Claridge (1, 2)	13-31	16-34	64-130	94-165
38	425	Claridge (1, 2, 3, 4)	15-27	18-28	50-70	67-100
43	400	Holiday (1, 4, 5)	16-28	14-36	72	84-138
57	166	LaConcha (1, 2, 3, 4, 5)	14-24	14-26	35-52	66-78
37	410	Marlborough-Blenheim (1, 2, 3, 4)	14-18	18-30	44-60	
1	93	St. Charles (1, 2, 3, 4, 5)	10-16	16-20		
40	325	Shelburne Empress (1, 2, 3, 4)	15-27	18-36	47-72	67-100
52	119	Sheraton-Deauville (1, 2, 3, 4, 5)	14-30	16-32	50-100	80-135
3	160	Sheraton-Seaside (1, 2, 3, 4, 5)	18-22	22-30	65	95
28	600	Traymore (1, 2, 3, 4)	12-26	16-30	35-85	65-135
OFF-BOARDWALK HOTELS						
16	75	Carolina Crest (5)	10-16	14-18		
8	195	Colton Manor (1, 2, 4, 5)	16-26	18-27		
34	100	Eastbourne (4, 5)	12-14	16-18		
25	168	Jefferson (1, 2, 5)	12-14	16-18		
21	100	Richfield-Boscobel (1, 5)	10-16	14-20		
24	60	Sterling (5)	12	14		
MOTELS						
22	54	Acapulco (4, 5)	14	16-20		
54	102	Algiers (1, 2, 3, 4, 5)	14-18	16-22	50	
59	64	Aloha (4, 5)	16-18	18-22		
47	73	Ascot (4, 5)	16-20	16-20	32	
29	108	Bala (1, 2, 3, 4, 5)	10-18	14-24		
15	100	Barbizon (4, 5)	14-20	20-32		
12	73	Barclay (3, 4, 5)	16-26	18-28	55-65	
32	110	Best Western Crillon (3, 5)	16-24	18-30	60-70	80-90
18	88	Burgundy (4, 5)	14-16	16-24		
46	84	Californian (2, 4, 5)	14-18	18-22		
58	60	Caribe (4, 5)	16-18	18-24		
17	26	Carolina Crest (5)	12	16-22		
55	38	Castle Roc (4, 5)	12	14-20		
14	56	Catalina (4, 5)	16-20	20-28		
30	275	Colony (1, 2, 3, 4, 5)	14-24	16-28	45-65	75-90
27	50	Colton Manor (1, 2, 4, 5)	22-30	24-32		
7	64	Continental (4, 5)	10-18	14-24		100
9	34	Crown (5)	14-16	16-20		
39	96	Dennis (1, 2, 3, 4, 5)	14-16	18-36		
49	61	Diplomat (4, 5)	14-16	16-22	42-46	
51	35	Dunes (4, 5)	14-18	16-22		
33	57	Eastbourne (4, 5)	16-18	20-22		
48	25	Eldorado (5)	16	16-20		
20	45	Envoy (5)	18	20-22		
19	72	Fiesta (1, 4, 5)	20	22	50	
44	115	Four Seasons (3, 4, 5)	16-20	18-28		
50	64	Galaxie (4, 5)	12-16	14-18		
42	333	Howard Johnson's (1, 2, 3, 4, 5)	18-22	22-38	52-76	114
13	225	LaFayette (1, 2, 3, 4, 5)	12-22	14-30	40-85	90-120
64	38	Lincoln Roosevelt Beach (4, 5)	18	22-24		
23	247	Lombardy (1, 3, 4, 5)	12-24	15-33		
60	72	Malibu (4, 5)	9-21	12-24		
56	27	Mardi Gras (4, 5)	14	16-20	30	
36	88	Marlborough-Blenheim (1, 2, 3, 4)	27-29	56		
45	120	Pageant (1, 2, 3, 4, 5)	14-24	16-28		
63	137	President (1, 2, 3, 4, 5)	14-24	18-36		
35	152	Quality Motel-Mt. Royal (1, 3, 4, 5)	12-24	15-33		
11	250	Ramada (1, 2, 4, 5)	14-28	16-38	85-125	150
2	44	St. Moritz (5)	18-20			
41	266	Shelburne Empress (1, 2, 3, 4, 5)	15-27	18-36	47-72	67-100
53	241	Sheraton-Deauville & Sheraton Deauville West (1, 2, 3, 4, 5)	16-32	18-34	100	135
4	140	Sheraton-Seaside (1, 2, 3, 4, 5)	20-24	22-30	65	95
26	78	Sorrento (4, 5)	12-14	12-18		
5	150	Terrace (1, 2, 3, 4, 5)	20-24	22-30	65	
61	54	Tropicana (4, 5)		18-22		

1 - Restaurant and/or Coffee Shop on premises
2 - Cocktail Lounge and Bar on premises
3 - All Year Pool on premises
4 - Outdoor Pool on premises
5 - Rates include parking
Kitchenette facilities - rates on request

NOTE: The above rates are subject to 5% Municipal Tax



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1971 Spring Joint Computer Conference
16 Central Pier
Atlantic City, New Jersey 08401**

Please make reservations listed below. I understand that reservations for bedrooms or multi-room suites must be accompanied by deposits of \$20 per room. A check made payable to AFIPS HOUSING BUREAU is enclosed.

Hotel/Motel Preference:

1st _____
2nd _____
3rd _____
4th _____
5th _____
6th _____

Names of all occupants:

1. _____
2. _____
3. _____
4. _____
5. _____

Type of Accomodation:

Single occupancy, rate to range from \$ _____ to \$ _____ per day
 *Double bed, double occupancy, rate to range from \$ _____ to \$ _____ per day
 *Twin beds, double occupancy, rate to range from \$ _____ to \$ _____ per day
 Suite (with parlor) of _____ bedrooms, rate to range from \$ _____ to \$ _____ per day

*2 names must be listed below

Arrival date:

May _____, 1971
at _____ a.m./p.m.

Departure date:

May _____, 1971
at _____ a.m./p.m.

Confirm reservations to:

(please print or type)

Name _____
Company _____
Address _____
City _____ Tel. no. _____
State _____ Zip _____

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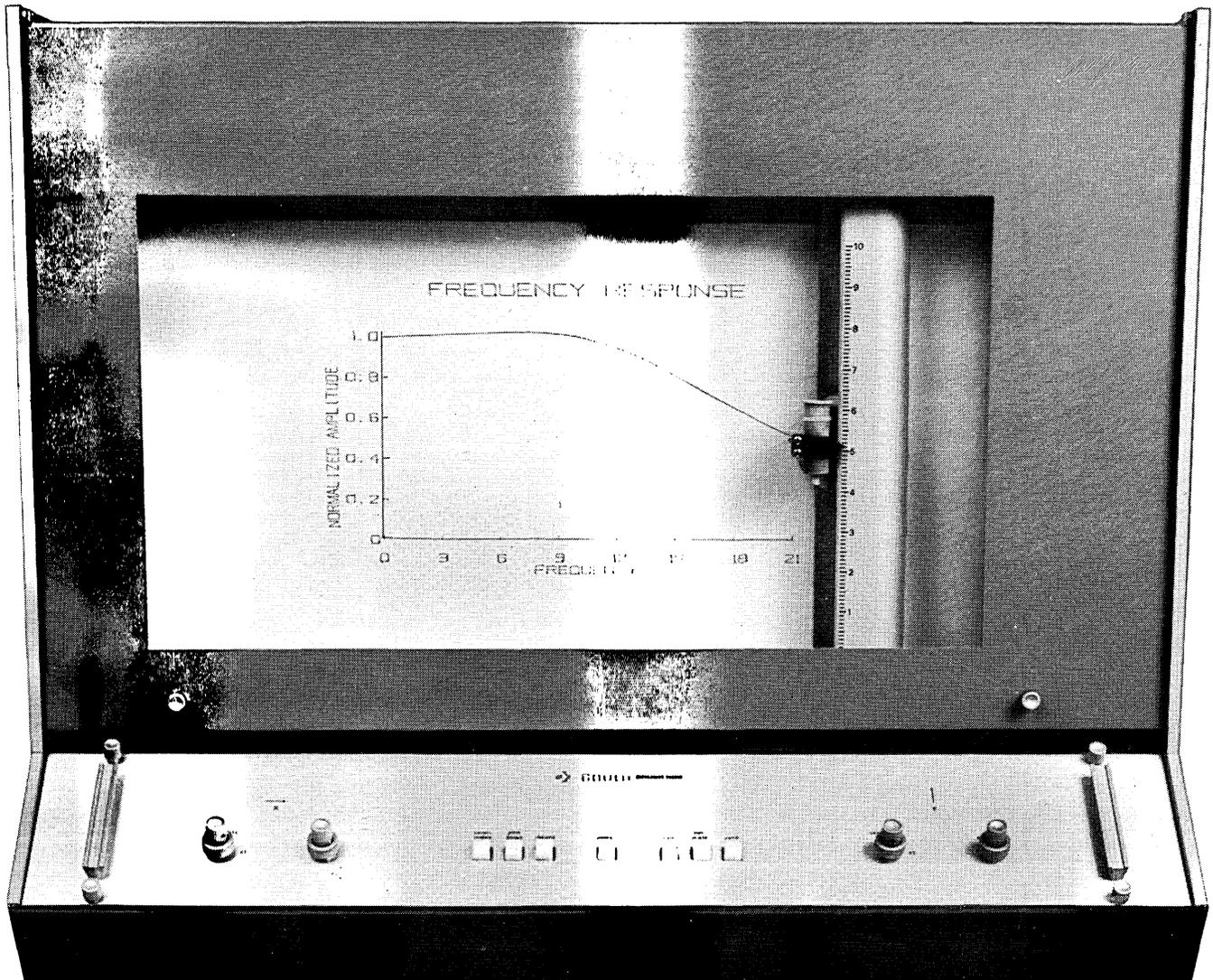
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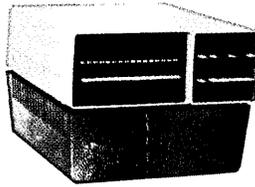
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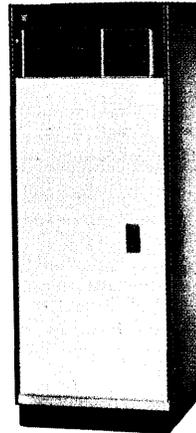
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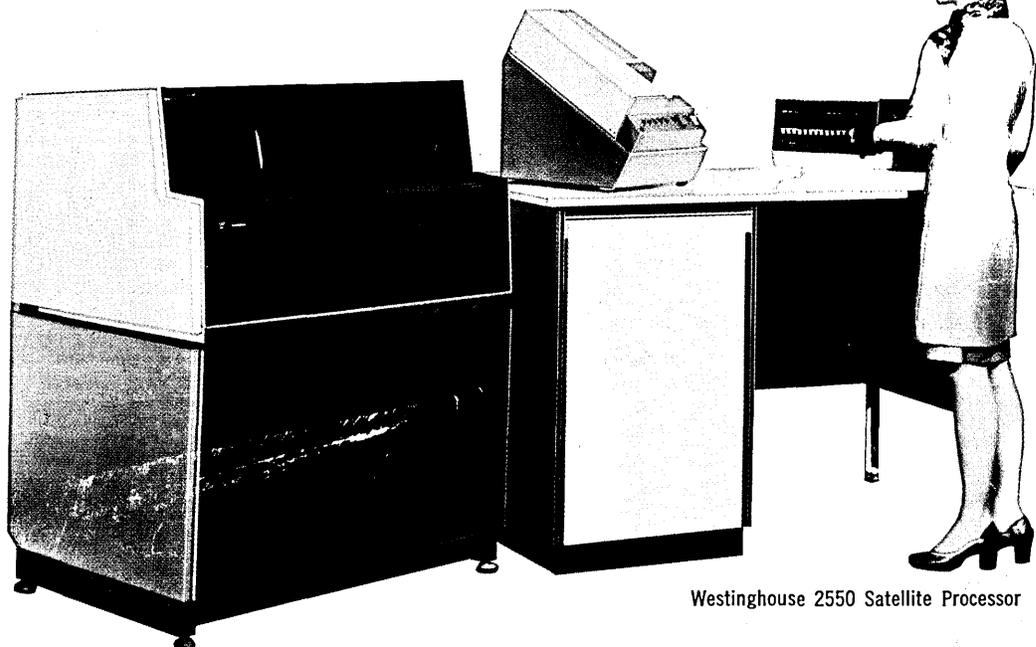


Westinghouse 2500 Table Model

Westinghouse 2500 Rack-Mounted Model



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