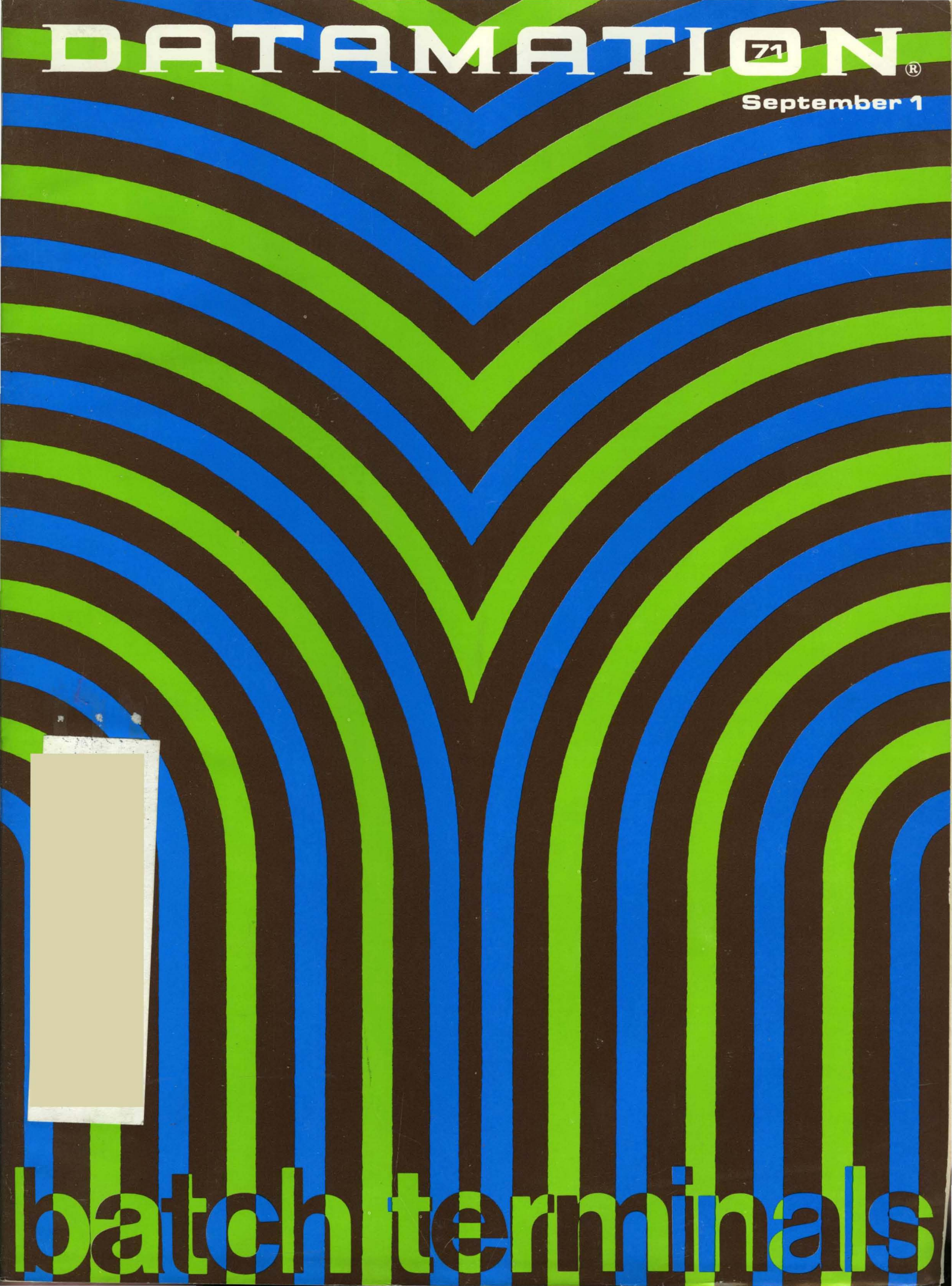
DATAMATION®

71

September 1



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The 620/L is 100% I/O-and software-compatible with the 620/i, and new peripherals and software have been, added. All peripherals, software, and application packages (developed for earlier 620 models), as well as the 620/L itself, are off-the-shelf.

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varian data machines

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CIRCLE 1 ON READER CARD

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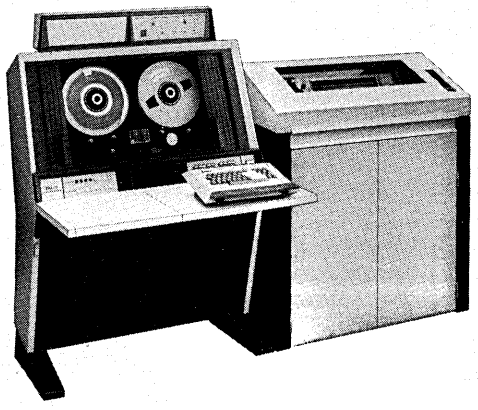

Typical Printer—Datascribe configuration

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CIRCLE 4 ON READER CARD

more than "equivalent to"

the CDS•214 dual disk drive

"200 tracks/surface, 20 surfaces/pack, 2.5-megabit transfer rate, 2400-rpm rotational speed . . ." Those are the specifications an independent must meet to be pack interchangeable with the IBM 2314. Meeting them wasn't difficult; several companies did. But only Century Data took the basic function and improved the technology across the board. For example:

The CDS-214 is a two-high unit that stores 466 megabits in half the floor space. It has a unique electromagnetic head-positioning system — without mechanical pawls, detents, or gears — that gives faster access time (65 msec compared to a competitor's 80 msec). All common logic is packaged on a common board, so the end result is one-third as many boards — and MTTR is reduced to a 1-hour maximum (compared to a competitor's 1.5 hours). And, an off-line checkout exerciser quickly isolates problems without tying up the controller.

Other features also make the CDS-214 "more than just equivalent to": a cylinder difference calculator that simplifies OEM controller design, a variety of index and sector generation electronics for variable or fixed formatting, and interface options for virtually any industry standard logic. So that your system can be more than "just equivalent to," we'll be happy to send you full details.

Looking for an "incomparable"? The CDS-215 is a 400-track, two-high disk drive capable of storing up to 116 million 8-bit bytes, twice the capacity of the CDS-214. There's nothing like it . . . anywhere.

Century Data SYSTEMS, INC.

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DATAMATION 71®

SEPTEMBER 1, 1971

volume 17 number 17

departments

GENERAL

TECHNICAL

COMMENTARY

About the Cover

All the comings and goings through the batch terminal may alter its image, but the cost goes down, the data goes round and round and comes out right where the user wants it. Our art director's design follows this well-controlled maze and colors it efficient.

DATAMATION®

SEPTEMBER 1, 1971

volume 17 number 17

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IMLAC wears many hats.

Studious IMLAC, the terminal display computer with a bent for graphics. What makes IMLAC so smart? It's the software. Including Fortran graphic sub-routines for the host machine, and programs for text and graphics editing on the terminal's own internal computer.

IMLAC performs most functions of systems four times its quiet price range of $10,000. And, as an option, delivers the best text and graphics hard copy output available. Unlimited potential for academic and industrial users in MIS, interactive control or monitoring, computer aided design applications and more. Interested in flexible intellect? Consider IMLAC, the scholarly mind with the expressive face.

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COMPUTER

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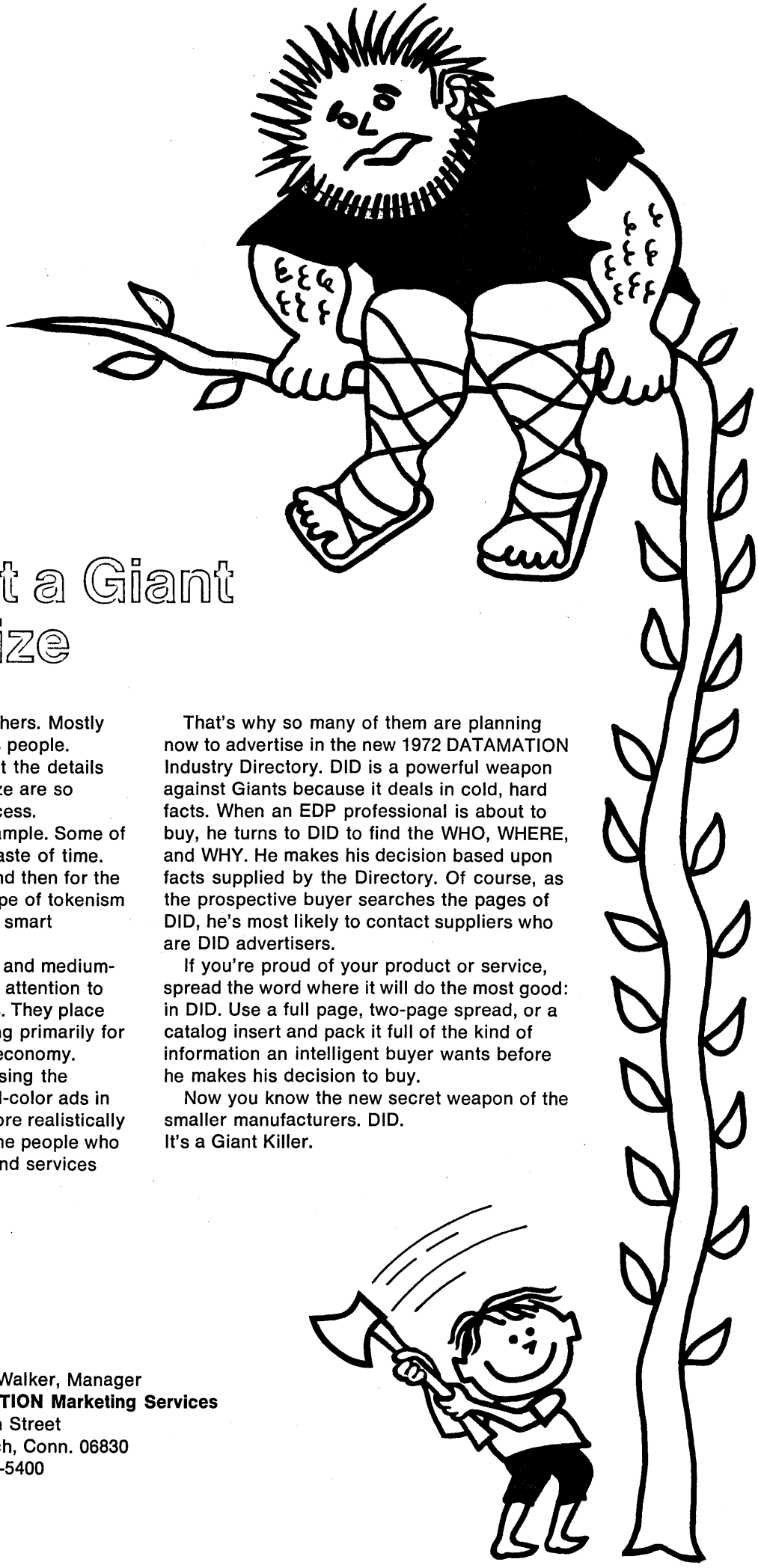


How to cut a Giant down to size

Computer Giants are like any others. Mostly they rely on their size to impress people. Consequently, they often neglect the details that smaller manufacturers realize are so important to their products' success.

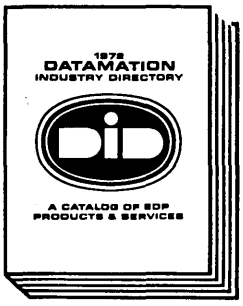
Take trade advertising, for example. Some of the Giants seem to feel it's a waste of time. So, they only take a page now and then for the sake of appearances. But this type of tokenism truly is a waste of money as any smart advertiser (big or small) knows.

On the other hand, most small and medium-sized manufacturers pay a lot of attention to marketing and production details. They place their advertising carefully, looking primarily for results . . . and secondarily for economy. They're not interested in impressing the man-on-the-street with costly full-color ads in consumer magazines. They're more realistically concerned that their ads reach the people who buy and specify their products and services and do an effective selling job.

That's why so many of them are planning now to advertise in the new 1972 DATAMATION Industry Directory. DID is a powerful weapon against Giants because it deals in cold, hard facts. When an EDP professional is about to buy, he turns to DID to find the WHO, WHERE, and WHY. He makes his decision based upon facts supplied by the Directory. Of course, as the prospective buyer searches the pages of DID, he's most likely to contact suppliers who are DID advertisers.

If you're proud of your product or service, spread the word where it will do the most good: in DID. Use a full page, two-page spread, or a catalog insert and pack it full of the kind of information an intelligent buyer wants before he makes his decision to buy.

Now you know the new secret weapon of the smaller manufacturers. DID.
It's a Giant Killer.



A. Treat Walker, Manager
DATAMATION Marketing Services
35 Mason Street
Greenwich, Conn. 06830
(203) 661-5400

Conversation piece for computers

Construction site reporting . . . Client data for computer-programmed insurance plans . . . Field salesmen's orders for the warehouse . . . Damage reports for emergency repair or insurance claims . . . Inventory taking . . . Cash receipts reporting . . . MSI Data Corporation's Source 2000 talks about them all. Then, via ordinary telephone lines, the 2000 reports directly to your edp center, where the data is fed into the computer for processing.

Like more dialogue on how MSI Source 2000 extends the effectiveness of your computer to remote locations? Or a demonstration in your office? Write now. Or tell us your data collection problem, and we'll have your local MSIman contact you. He'll bring more than just conversation.

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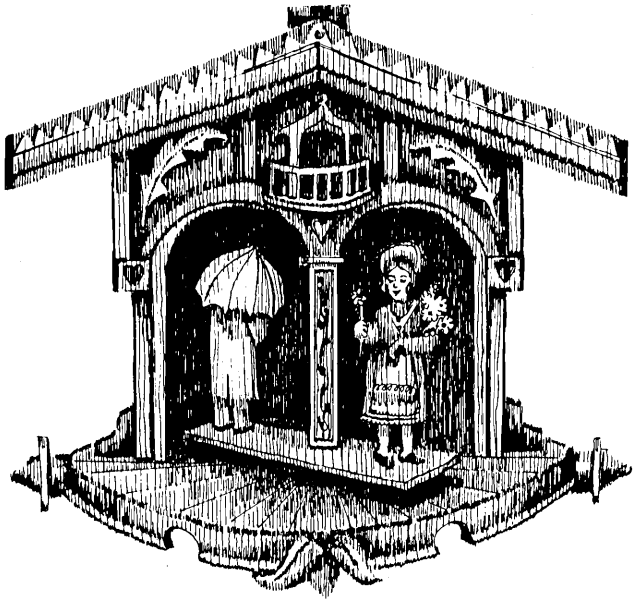
CIRCLE 48 ON READER CARD

a change is coming in computer systems



At Collins, it's already here. And it means a brighter forecast for expansion costs.

The brighter forecast is the result of Collins C-System, a communications-based computer system. It's no longer necessary to start over with a new system every time you reach maximum capacity. With the C-System, you *keep* the system you have—including other manufacturers' computers—and add equipment and programs on a modular basis as needs expand. And that means keeping money—lots of it when you consider equipment change-out costs.

The C-System's connectability and associated communications software make the difference. They let you connect dozens of processors and peripherals in a single network. All processors in a center work together as a single machine on the center's work load. Any computer can communicate with any connected mass storage element. Data centers hundreds or thousands of miles apart can operate from a common data base.

Airline, manufacturing, and government customers already are benefiting from this change in system design. The change can reduce *your* expansion costs. Contact Collins Radio Company, Dept. 300, Dallas, Texas 75207. Phone: (214) 235-9511.

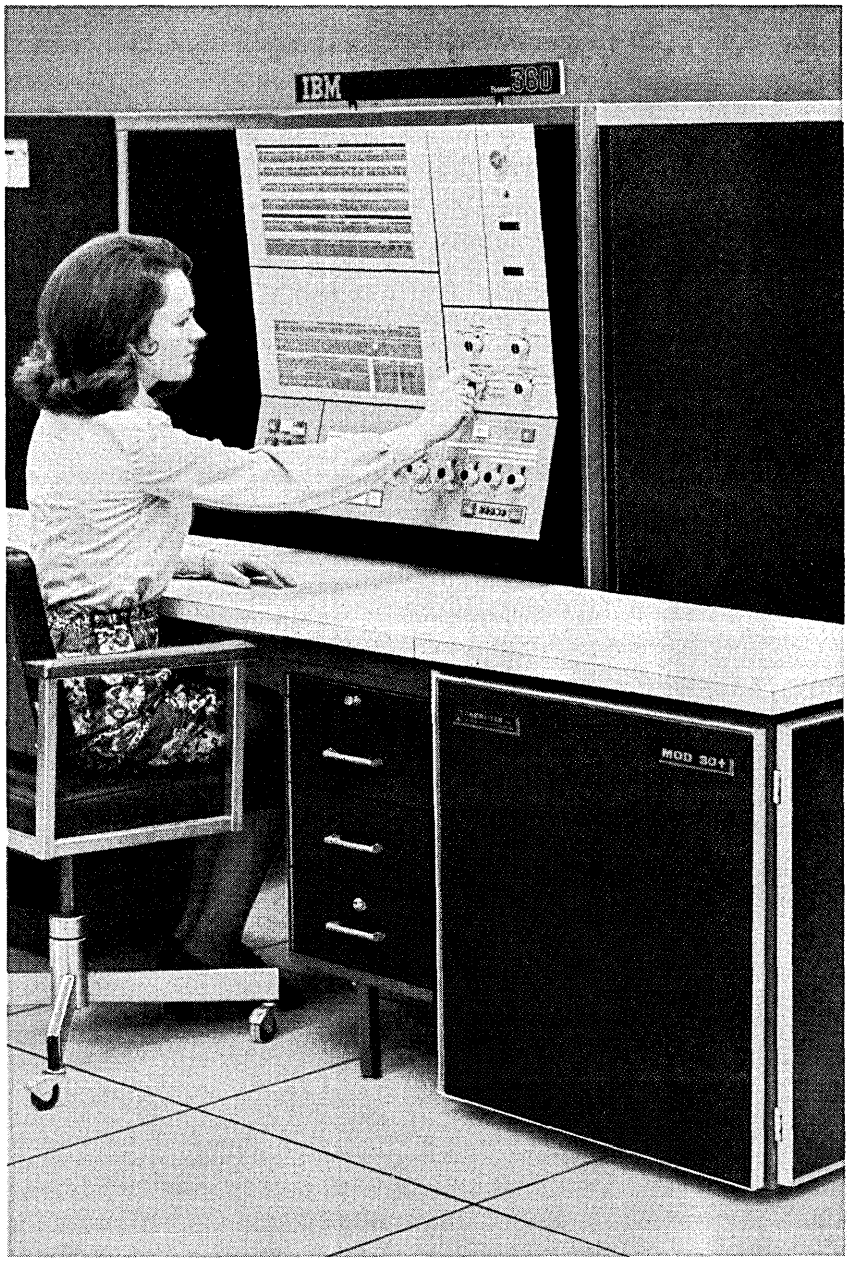
COLLINS

CALENDAR

DATE	EVENT/SPONSOR	LOCATION	CONTACT	COST
Sept. 22-24	IEEE Computer Society Conference	Boston	1971 IEEE Computer Conf. Gen. Del., Kendall Sq. PO Cambridge, MA 02142	$35, members $45, others $2, students
Sept. 29- Oct. 1	9th Annual Tele-Communications Assn. Conference & Exposition	San Diego	Charles H. Buxton 6311 Yucca St. Los Angeles, CA 90028	$25, members $50, others
Oct. 14	22nd Annual Western Systems Conference of the ASM	Los Angeles	Richard G. Harry Western Systems Conf. P.O. Box 2655 Sepulveda, CA 91343	$35
Oct. 17-21	NRMA Annual Information Systems and Telecommunications Conference	Dallas	NRMA 100 W. 31st St. New York, NY 10001	$125, members $175, others
Oct. 25-29	BEMA 1971 Business Equipment Exposition	New York City	Prestige Expositions Inc. 60 E. 42nd St. New York, NY 10007	$2.50
Nov. 7-11	American Society for Information Science 34th Annual Meeting	Denver	ASIS 1140 Conn. Ave. NW, 804 Washington, DC 20036	$45, members $60, others $3, students
Nov. 16-18	Fall Joint Computer Conference	Las Vegas	AFIPS 210 Summit Ave. Montvale, NJ 07645	$20, members $50, others $5, students

360 CORE YOU CAN TRUST

MODELS 30+, 40+, 50+, 65+



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Hundreds of companies, including:

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Varian	Nixdorf (Germany)
NCR	Olivetti (Italy)
Collins	Marconi (Scotland)
H-P	ICL (England)
Bell Telephone	Honeywell-Bull (France)
IT & T	AEG-Telefunken (Germany)
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CFTH (France)	CII (France)

And yes — even IBM!

Now you can capitalize on this expertise, as this growing list of 360 customers and users are doing:

Boothe Computer Corp. • Dearborn Computer Leasing • Levin-Townsend Computer Corp. • National Computer Rentals • Intertek, Inc. • Electronic Data Systems Corporation • Professional Automation Group • Gant Shirtmakers • Chicago, Milwaukee, St. Paul and Pacific R.R. • Eagle Discount Supermarkets • Medtronic, Inc. • Spring Mills Inc. • Accounting Corp. of America • Rome Research, Inc. • Weldon, Inc. • Certified Grocers Co-op • MAI Equipment Corporation • Lowes Companies, Inc. • Union National Bank • Kentucky Farm Bureau Mutual Insurance Co. • Maryland Hospital Service, Inc. • Graco, Inc. • Onan • U.T.L. Computers Inc. • Educational Testing Services • E.B.S. Data Processing Inc. • Day's, Inc. • Rockland State Hospital • Trans Union Systems Corp. • Univ. of R.I.

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We back our products, and you can be sure we're going to be here to service your 360 memories — and provide spare parts — for as long as you need. And furnish your next generation memories as well.

Reliability and dependability:

Our 360 Core Extension Memory systems have been on-line and fully operational since the summer of 1970, with an exceptional up-time record.

Find out for yourself! We would be pleased to supply customer reference lists.

Our complete, high-performance line:

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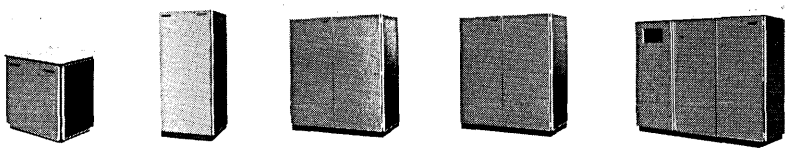

LETTERS

Thoroughly frightening

Sir:

D. Van Tassel's compendium of computer catastrophes (July 1, p. 30) is as thorough as it is frightening. Especially thoughtful is the author's recommended check of back-up site capability to successfully process programs during your computer down time.

But behold! Shouldn't the security precautions in force at your back-up site also be investigated as completely as are your own? (Yes, they should.) What could be more vulnerable than exposing your proprietary programs and data bases, so carefully hoarded through riot and cyclone, to the whimsies of computer managers less careful than yourself, or Mr. D. Van Tassel?

CURTIS C. MORGAN
Ft. Belvoir, Virginia

To catch a thief

Sir:

The articles on Criminal Justice Information Systems and Law Enforcement Assistance Administration (June 15) were very informative. The article on Project SEARCH added a dimension, and editor Pantages summed them all up nicely in Editor's Readout.

The Institute for Court Management is one of the more progressive actions taken by anyone involved with the courts in the past 50 years. Unfortunately, it is just wasted if limited to court personnel. Record clerks of all bodies involved with statistical records of any law breaker must receive some type of synchronous training so that their information is interchangeable.

Connecticut, motivated in part by financial reasons, utilized the services of the one group of people who were the most experienced in jail, court, and prison matters—inmates of the Connecticut Correctional Institution. A two-day cram course in FASTER equipped a mixed class of prison inmates and state data center employees with the basics to write the programs needed. Utilizing the knowledge of the professionals from the state center and the "inside" knowhow of the inmate programmers resulted in a far better concept of what was actually involved in court records and sentencing procedures.

Although the prison had only a 360/20, the inmates had become proficient in higher-level programming and languages by writing for other town and state agencies, utilizing the larger configuration at the state data center. The very fact that these inmates had had personal experience in passing through these jails and courts, and being sentenced to prison gave them some additional insight into the many problems of record keeping which might not otherwise have been so readily observable.

A further step in the utilization of this inmate knowledge came when the terminals were installed in the various institutions, and inmates from prison were assigned to operate them.

It is indeed a step forward to recognize the need that court personnel have for training other than just the rudiments of law, but real progress is when a state constructively utilizes the services of its inmate population while offering a road to their rehabilitation. Unfortunately, this is only a very small breakthrough in the antiquated penal systems of this country. Many federal and state institutions have courses in data processing but refuse to employ these same inmates when they are released.

Data processing is only one area in which the experience of inmates could be utilized. Where could any agency possibly find people more aware, and able, to function as social workers (and aides in parole and probation work) than the men and women who have traveled down that road?

W. C. WILLIAMSON, *#21249*
Connecticut Correctional Institution
Somers, Connecticut

Why, indeed?

Sir:

Frank Coyle's article, "The Hidden Speed of ISAM" (June 15, p. 48), was very interesting and showed initiative which has obviously paid off. ISAM, of course, refers not to the concept of a sequential file that can be accessed randomly using indices, but to a specific implementation of this concept. It would seem that Mr. Coyle's efforts have proved that the concept is valid. It also seems to point out the inefficiency of the standard ISAM approach to this concept.

An even better approach might be to locate all track indices on one cylinder of a second device. While moving the access arm of the "data device" toward the correct cylinder, the track index could be read from the "index device" and searched. Normally, of course, this cannot be done until the "data device" access arm arrives at the correct cylinder. But it costs a device and drifts us further away from the ISAM implementation of the indexed sequential concept. Each little "drift" trades off extra effort and ingenuity for efficiency.

In 1968 I authored a paper proposing a number of alternatives to ISAM. These offered speed and flexibility in exchange for a little thought and effort. The best, I believe, is the QSAM-BDAM approach. The file is created and processed sequentially with QSAM. Indices are also created which are designed to fit the application. The index handling routines can be almost as transparent to the applications programmer as they are in ISAM. When random processing is appropriate, the same file is accessed through the indices using BDAM in the relative record mode. Some variations of this approach don't even need indices. With a little effort, blocked and/or variable length records can be used.

The benefits of this concept are:

1. QSAM outperforms QISAM.
2. BDAM outperforms BISAM.
3. The file and indices are designed to fit the application.
4. The file and index searches are designed to fit the application.

The costs:

1. Design of the file indices, and
2. Creation of index maintenance routines.

If the extra effort is not worth it, Mr. Coyle's approach is a fine alternative. Perhaps, with a little of the same kind of effort, the compatible software, which his approach outperforms, could be improved as much as he improved on ISAM. However, we haven't really answered the most interesting question: Why was the speed of ISAM hidden in the first place?

PAUL P. CLEMENT, JR.
Chicago, Illinois

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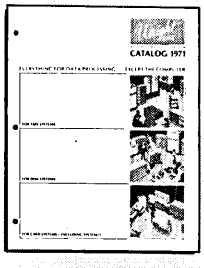

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1. Select from the catalog and mail or phone your orders directly to your local Wright Line branch office or main plant in Worcester. Wright Line's more than 60 offices are listed in the yellow pages.

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


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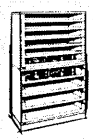
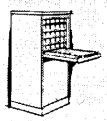

DISK STORAGE


CARD FILES


TAPE STORAGE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CIRCLE 8 ON READER CARD

Inefficient ISAM

Sir:
The technique described in Mr. Coyle's article is entirely equivalent to finding the record in the applications program and calling BDAM. Using ISAM in his situation merely adds overhead, since ISAM is no longer doing anything useful. As his story shows, when ISAM *is* forced to do anything, it remains inefficient, probably because of IBM's unfortunate habit of using trainees fresh out of school to write their systems code.
BARNET A. WOLFF
Queens, New York

Fight bravely, falcons . . .

Sir:
Not only has "the ultimate in statistical reporting . . ." been experienced by the Atlanta Braves ("Sports and EDP . . . It's a New Ballgame," June 1, p. 24), but by our Falcon football team as well.

During the 1970 fall football season, the Atlanta Falcons successfully produced half-time and final game "stat sheets" using programs developed by the Atlanta Honeywell systems staff. Similar to baseball, information is typed into a teletypewriter using short codes designed for ease of input; for example, a pass attempt by Bob Berry would be coded PA, 17. At the end of a half, game statistics for both teams are printed in the accepted league format in an average time of three minutes.

It must be emphasized that this entire operation remains under the direction of the team's official scorer; at no time is a judgment on the game made by either the operator or the computer.

Since the system has proven itself to be an accurate and highly efficient statistical tool, Honeywell plans to offer it to other teams in the NFL for use during the 1971 football season.
SUSAN A. GERALD
Honeywell Information Systems Inc.
Atlanta, Georgia

Magic mushroom

Sir:
While it is not surprising that Zayre's Robert Bozeman (News Scene, June 15, p. 56) doesn't know that Burroughs has been building and installing virtual memory computers since 1963 (its 5500 is the most widely used virtual memory machine in the world), it is unfortunate that your reporters and staff let this misinformation slip into print.

For the record: Burroughs has announced virtual memory followons to its 500-5500 series in the 5700, 6500-6700, and 7700 series of machines. It has also installed 5700, 6500, and 6700 systems; 7700 deliveries are scheduled for about a year from now.

Unfortunately, Burroughs' technical excellence is exceeded only by the ineptitude of its sales and PR departments. This leaves spreading the gospel to us users who have eaten the magic mushroom.
JOHN AHLSTROM
Lexington, Massachusetts

Mr. Ahlstrom has correctly stated Burroughs' accomplishments with respect to virtual memory machines. But their sales effort hasn't been that bad, either. In 1965 International Data Corp. ranked Burroughs seventh in the industry; for 1970, the same source ranked them fourth on a worldwide basis. Meanwhile, Arthur D. Little sees Burroughs as having reached third worldwide and second domestically in 1970.

Stock options

Sir:
Two sophomore students in our group were just completing a program to provide real-time score keeping for college rodeos when I received "Sports and EDP . . . It's a New Ballgame," by J. Gerry Purdy, in your June 1 issue (pp. 24-33).

College rodeo scoring is quite complicated. Both teams and individuals may compete in six events for men and three for women. The programs provided continuous updates on event leaders and team standings. At the end of each go around (every contestant entered in the event has had his or her turn), points are assigned to the top four scores and totals are updated. Team and individual rodeo and national standings are provided. There are three go arounds. In addition, the computer is used for randomizing the draw for stock and the order in which a contestant competes.

The system was operated in a Hewlett-Packard 2116B (16K) using a removable disc operating system (DOS-M). Input and output was via Teletype, with one output unit for the press stand and another in parallel for the announcer and rodeo secretary.

The programs were successfully used during the National Intercollegiate Rodeo Finals held in Bozeman, June 22-26. Fifty-six schools and 210 contestants from 24 states were entered.
NICK SHRAUGER
Montana State University
Bozeman, Montana

Moving experiences

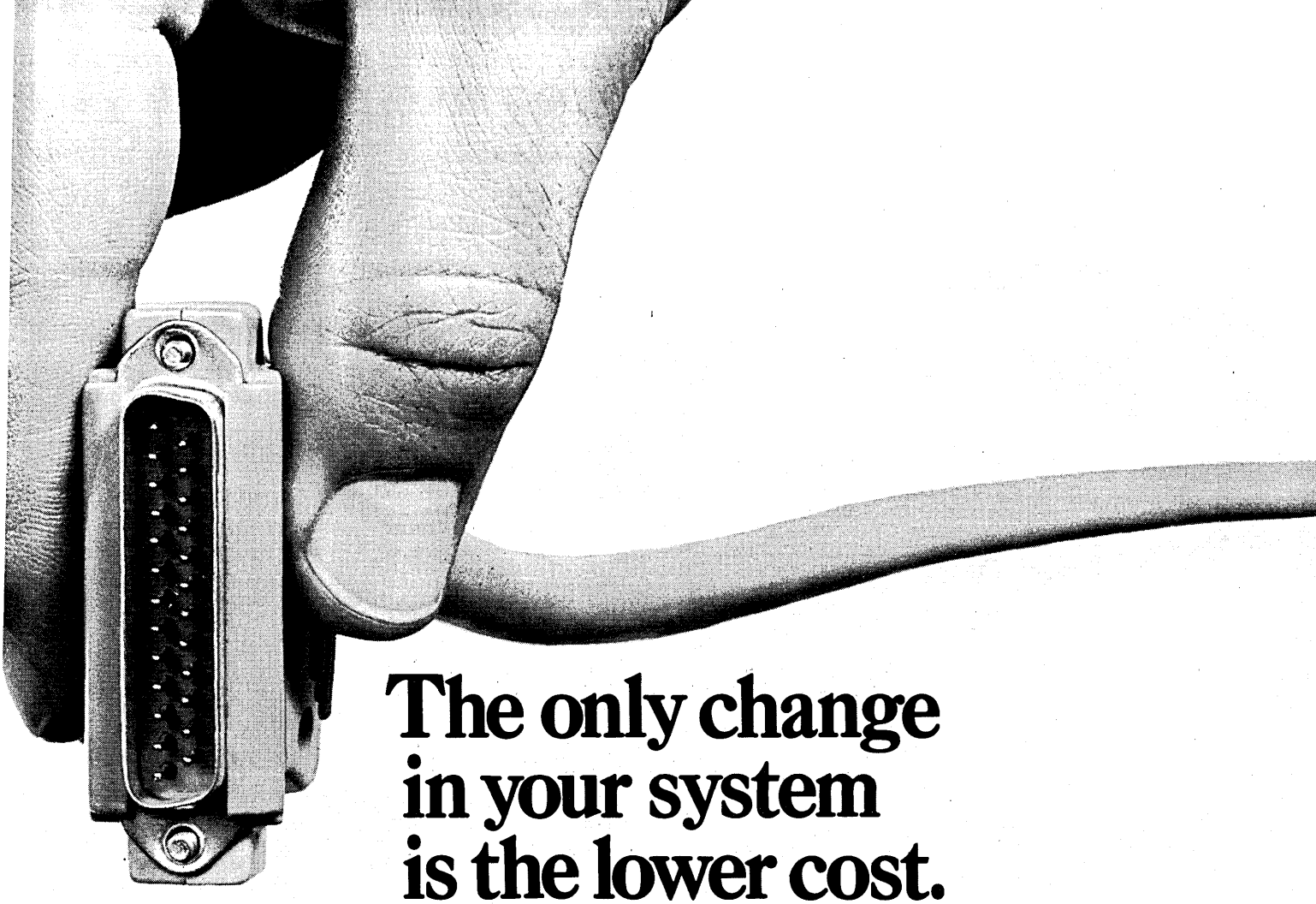
Sir:
I would like to add my recycling experiences to those of Sam Gordon (May 15, Letters) and Mary Fowler (July 15, Letters). We sold used computer paper and tab cards to a scrap company to fund our beer and pizza parties. One day I had nine boxes of scrap paper in my station wagon when I visited the neighborhood where I do volunteer tutoring. The preschoolers begged for some of that paper. I hesitated to give it out, afraid mothers would blame me for cluttering up living rooms and yards. Finally I tried to pick out sheets that had little or no printing for the children. But one four-year-old said, "Gimme some with words on it." . . . Words? "IF (IP.EQ.1) GOTO 1." Some of these kids will be turned off by words in a few years—maybe next year when they start school. Now they are so eager.

After that experience, we also gave computer paper to two day-care centers in Washington, D.C. Maybe public schools would be interested too. Unfortunately, it's not easy to get the computer programmers and the administration interested in this kind of community action. You have to be neat in saving it. Neither the scrap company nor the children should get carbon paper. You need a place to accumulate it. You need to transport it. We live too fast and too high to be bothered.

Also, when you move, use it to pack your dishes. It's cleaner than newspaper.
MARILYN BELSON
Veterans Administration Hospital
Washington, D.C.

Another use, not evident from the printing of this letter here . . . it was typed on printer paper, folded and stapled, with the blank side used as the envelope. ■


SOLID STATE
SHIFT
ULTRONIC® Videomaster 7000



The only change in your system is the lower cost.

Compatibility.

True plug-for-plug compatibility with your IBM Systems 360 and 370. No software change. No need to replace any other part of your system.

Ultronic Videomaster® compatibility doesn't stop there. All Videomaster equipment transmits USASCII code. The serial I/O interface conforms to EIA Standard RS-232C. Which means compatibility with just about any computer system out there.

The Videomaster comes as a stand-alone terminal, or as a cluster display system with as many as 24 terminals connected to one master control unit. Display format varies from 240 to 1920 alphanumeric characters on a sharp, clear 12-inch screen. Transmission ranges from 1200 to 9600 baud (depending on your system's capacity and the type Videomaster you need) over telephone lines in a start/stop half-duplex mode. There's even a hard copy printer available that works at 30 characters per second to give you permanent copies directly from the video terminal or computer.

So you can plug a single Videomaster terminal, or even a whole cluster, with optional printers, into your system and no one will even notice the change.

Until bill time rolls around. And then you'll discover that you've saved from 20 to 50% of the cost of comparable equipment. Without losing any of that big-name dependability or security. Because we have our own nationwide service organization. With trained technicians in 56 cities. So we never have to run very far if you run into trouble.

Compatibility, performance, service and cost. Those are pretty strong reasons for changing to an Ultronic Videomaster. Especially when you remember that we can supply most of your data communication needs. Time division multiplexers, frequency division multiplexers, data sets, video and hard copy terminals, communication processors. Just about anything you need.

Ultronic is the kind of change your system could use.

Call Lee Shrout at 609-235-7300. Or write Ultronic Systems Corp., Box 315, Moorestown, New Jersey 08057

Ultronic Video Terminals

GTE INFORMATION SYSTEMS

CIRCLE 28 ON READER CARD

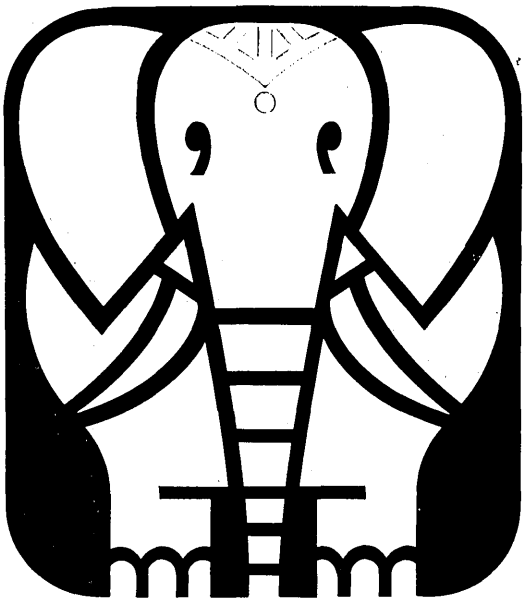
WHY PAY MORE FOR VIRTUAL MEMORY?

You don't need to. Not when Burroughs offers you a whole series of moderately priced systems (the B 2500, B 3500 and B 4500) with built-in virtual memory performance.

These systems use Burroughs unique simplified program segmentation technique, dynamic memory management, and a comprehensive Master Control Program. In this way they deliver full virtual memory performance without costly "extras"—like extra programing, extra-complex hardware, extra operating considerations.

Virtual memory performance means, of course, that your Burroughs computer doesn't have to have a very large main memory for the sake of a few very large programs. Rather, you save money by getting the work done at less cost with a more efficiently used machine.

Burroughs introduced virtual memory performance to users of medium size systems back in 1966. Isn't it time you found out more about it? Ask your Burroughs representative for information. Or, write to us in Detroit, 48232.



Burroughs

HONEYWELL'S DISC DEAL WITH CDC IS TEMPORARY

Control Data Corp., which has produced disc drives for Honeywell before, has been selected by Honeywell to build its 3330-equivalent. The deal, we hear, is just temporary with Honeywell planning to gradually take over production of the disc drive. Meanwhile, the status of IBM's 3330 remains in a somewhat paradoxical situation. Although customer shipments may have already begun (ahead of schedule), we hear that all benchmarks still aren't up to specs yet.

SHAME ON WHO?

"It is a shame for any man, if he is in good health, to put in 12 months in a territory in our business and not come through with 100% of quota." That was what Thomas Watson Sr. told a gathering of IBM's Hundred Percent Club in 1927. Today, the difficulty in joining the ranks of the 100 Percent Club is at its most intense stage in the history of IBM. In the most glaring recent effort to join the club, a Boston area salesman put in an order for a 370/155 before the customer had actually placed it. As a result, the salesman made the club last year, but IBM thought the improprieties of the situation were serious enough to warrant sacking the salesman and other marketing people, including top executives in the Boston area. Thus far this year, things look grim for that office as far as the Hundred Percent Club is concerned. We hear only one salesman has qualified as of this writing. An estimated 70% made the club last year from that office.

Elsewhere in IBM, we understand that the exodus of former marketing men and systems engineers from White Plains to branch offices is continuing and will continue. In all, several hundred persons could be involved in the measure, which IBM says is designed to beef up its field marketing force. IBM doesn't say so, but most are going reluctantly. The main hope for IBM now--and for the rest of the industry--is for the economy to move out of the doldrums. In addition, many knowledgeable outsiders--and presumably many within IBM--are looking for a high percentage of 370 sales in the fourth quarter to hypo the computer colossus' earnings. Many customers appear to be purchasing the 370 machines outright and deliveries are accelerating sharply.

DATA ENTRY DEVICES DO WHAT COMPUTERS DID

Typically, shared processor data entry systems displace keypunches, but one vendor, General Computer Systems, Inc., of Dallas, has been knocking out mainframes too. GCS systems have already displaced one mod 30 and one mod 20 and, we understand, the removal of another mod 20 is imminent. The 30 had been used for printing reports, balancing accounts, and editing; the mod 20s solely for editing. All functions performed by the mainframes are being picked up by the GCS systems at what the data entry firm says are substantial savings. GCS' agreement with Interscan Ltd. of London has spawned a contract calling for delivery of 10 systems by the end of the year. Another four are going to

Datanamics in Australia. The Dallas firm operates at the high and often lonely end of the data entry market--expensive but high performance via sophisticated and flexible software.

MAINFRAMER MAY SIGN FOR REDCOR KEY/DISCS

Redcor Corp., the Los Angeles data entry firm which recently plucked a $1.5 million insurance company order in Boston from under the noses of local competitors Honeywell, Inforex and Entrex, may soon sign up to supply a major mainframe company with its Keylogic key/disc system in the U.S. and overseas. The company won't confirm the report, but admits it's approached "a number" of mainframers with the idea. The company's order from Employers Commercial Union for 10 systems was the largest in its history.

FIRST MICROPROGRAMMED COMPUTER FROM NANODATA

User interest (and confusion) in the writable control store is peaking because of its increasing use in commercially available systems like the IBM 370, and its potential impact on microprogramming and emulation. Of course users' desire to get their hands on microcode in the 370, at least, is thwarted by IBM's policy of not supporting user alterations. But one place they can look to for major research into these still nebulous techniques is the Univ. of Buffalo. After examining several off-shelf and experimental systems for this, Dr. Robert Rosin and team have recently selected a new system designed by Nanodata Corp., Buffalo, N.Y. QM-1 is described as a "programmer-defined, medium-scale microprogrammed computer with extreme flexibility that lends itself to the research and real-time processing environment." In addition to several software and firmware projects, involving emulation, diagnostics, simulation and higher level languages, the team hopes to determine more specifically the architecture of computers required for dynamic microprogramming.

Nanodata, a 10-man firm, formed last April, will deliver its QM-1 to the university before year-end and will by then announce the general availability of the $100-150K system.

RUMORS AND RAW RANDOM DATA

CG-100 where are you? A lot of people were asking this question in mid-August when Laser Computer Corp., which had promised to show the first models of its 10 trillion bit laser computer in mid-July, still hadn't come through...We hear IBM is developing a new mag tape system that uses a 100-inch length of tape almost three inches wide, but with the same storage capacity as a 2400-foot reel. Code name for the hush-hush project reportedly has been changed from Comanche to Oak... Something unique for a manufacturer: Honeywell is first designing its software for its next line, and then will tailor its hardware to meet the software specs... Although Friden won't give out figures, we hear it has more than 20,000 orders for its programmable point of sale terminal, the MDTS; a large chunk is going to Sears. Sources also say "several hundred" System Tens are on order and perhaps 50 have been installed, rather than six estimated this summer. (see Aug. 1, p. 44).

The combination of lower cost peripherals, communications equipment, and minis has led to cost-effective terminals that are beginning to offer an inviting alternative to in-house data processing

Trends in Remote-

The use of data terminals of all kinds is increasing rapidly. Contributing factors are more useful end-user application programs, standardized terminal equipment, and the development of specialized user-oriented terminal equipment (e.g., off-track betting terminals in New York). The remote terminal market is expected to increase to over $1.5 billion per year by 1975, from under $500 million in 1970. One quarter of this will be represented by remote-batch terminals.

Remote terminals can be considered in the following major categories:

1. Keyboard/printer terminals (e.g., Teletypes)
2. Alphanumeric crt terminals
3. Smart terminals (also referred to as intelligent terminals)
4. Data collection and transaction terminals
5. Remote-batch terminals
6. Other types of terminals

With the advent of lower cost and greater availability of computer/communications utilities, the use of remote-batch terminals becomes attractive to more and more small users who cannot justify their own data processing systems. Remote-batch terminals can be used in any type of application in which computers are needed for conventional scientific computing and business data processing. In such applications remote-batch terminals offer the user convenience by providing input/output equipment in his facility, while still permitting him to share the capability of a large central computer, thus providing very fast response and eliminating the need for taking data back and forth between the user's facility and a service bureau or central facility.

Basically, remote-batch terminals are assemblies of input/output and peripheral equipment at the remote user's facility, connected via communication lines to a central computer at another location. In most systems of this type all computation and data processing is performed by the central computer with data read from input devices, such as those using punched cards or magnetic tape, at the remote-batch terminal and the resulting output provided at the remote terminal by output devices, such as card punches or line printers. To the user, the remote-batch terminal appears as a complete batch-processing computer facility with input/output, data processing, and storage capability. In fact, however, the data processing and a major portion of the storage is provided by the central computer while the I/O functions are provided by the remote-batch terminal.

Remote-batch terminals extend the facilities and capabilities of service bureaus by permitting their customers to input and output data in their own facility, while using part of the capability of a large, remotely located computer. This type of operation is frequently referred to as remote job entry. Remote-batch terminals are also applicable within a large company to permit serving different plants or divisions from a centrally located computer, which is larger and more cost-effective than any of the plants or divisions would be able to provide in their own facility.

Specific applications for remote-batch terminals include the following:

Scientific and Engineering: Engineering computation; scientific computation; statistical research; data reduction; simulation; operations research; and automatic program control (APT).

Business Data Processing: Payroll and labor cost distribution; inventory control; production control; market and sales analysis; ordering and invoicing; resources scheduling; and information retrieval.

Remote-batch terminals do not offer any signifi-

Batch Terminals

by D. J. Theis and L. C. Hobbs

cantly new type of computing capability as crt terminals and smart terminals do. Rather, remote-batch terminals offer convenience for the user in providing input/output equipment in his facility while still permitting him to share a capability more than he could justify in a local on-site computer. For example, the user of a remote-batch terminal may have in his terminal only a card reader, a card punch, and a medium speed line printer, yet he can have at his disposal for short periods of time the full use of a large computer with 128,000 words or more of core storage, large disc files, magnetic tape units, and other expensive peripheral equipment.

Survey guidelines

The term remote-batch terminals conceivably could be applied to equipment such as the $750 Teletype (which has a 10-character-per-second keyboard printer) and to a multi-million-dollar computer system linked remotely to another computer system, if these are used in an on-line batch mode. For our purposes, the term is restricted to terminals designed to provide *typical* on-line batch processing input/output at a remote site connected to a central host computer, usually over communications lines. The typical input/output equipment is a card reader and line printer. Several other types of peripheral equipment may be included, such as magnetic tape units, crt displays, card punches, paper tape reader/punch, plotters, discs, and cassette/cartridge tapes. The major portion of the cost of remote-batch terminals is in the peripheral equipment. The minimal requirements used to select remote-batch terminals for inclusion in this survey for a standard remote-batch terminal are as follows:

1. Input device: card reader—100 cpm
2. Output device: printer—120 lpm, 120 cols
3. Data set interface compatibility (EIA 232 specifications) to operate both input and output devices concurrently.
4. Remote-batch terminal to operate "off-the-shelf" with at least one computer/operating system configuration.
5. Optional capability for some other devices, such as card punches, magnetic tape units, crt displays, etc.

With the above guidelines a survey of remote-batch terminals is presented in Table 1 (which follows on pp. 22-24) with the basic equipment features grouped as follows:

1. Input device(s)
2. Output device(s)
3. Communications interface
4. Controller configuration
5. Optional features

Excluded from this survey are stand-alone computer systems that may be implemented as terminal systems (e.g., IBM 360/20, Univac 9300, GE 430).

The purchase and rental prices shown, which have been supplied by the manufacturers, are intended to include all the equipment necessary on the remote end of the communications link (except the modem) to make the remote-batch terminal fully operational.

Types of remote-batch terminals

The major approaches to remote-batch terminals are:

Simple terminals with hard-wired control and I/O equipment, and

Terminals including a minicomputer for stored-program control and preprocessing, with I/O equipment plus other peripherals such as a disc

Manufacturer/Model No.	Atron Mohawk Data Sciences 501-74/501-76	Atron Mohawk Data Sciences 501-78	Atron Mohawk Data Sciences 501-80/501-90	Atron Mohawk Data Sciences 501-84/501-88	Atron Mohawk Data Sciences 501-96/501-98	Badger Meter (Noller) DTS-100	Burroughs 1102/1103	Burroughs 1202/1203	Burroughs 1101/1201	California Computer Products 900 RJE	COMPACE Corp. 2400	Compat Corp. 88-23
Input Devices												
Card Reader, cpm (80 cols)	300/1000	300	300	300	300/1000	400	200	200	—	300	300	300
Keyboard Printer (char/sec)	—	—	—	ASR-33	ASR-33	ASR-33	Teleprinter (15)	Teleprinter (15)	Teleprinter (15)	Teleprinter (1030)	Teleprinter (30)	Selectric (15)
Optional Paper Tape Reader (char/sec)	—	—	—	—	—	—	—	—	500 or 1000	300	—	300
Output Devices												
Line Printer, lpm (cols)	300/1250 (136,160)	300 (136)	300 (136)	300 (136)	300/1250 (136, 160)	300 (132)	300 (120)	300 (120)	300 (120)	242-1110 (136)	250 (136)	600 (132)
Optional Card Punch, cpm (80 cols)	—	—	—	—	—	100	200	100	—	—	100	—
Optional Paper Tape Punch (char/sec)	—	—	—	—	—	—	—	—	100	—	—	—
Other Optional Input/Output Devices Available												
Magnetic Tape—7 or 9 tracks	✓	✓	✓	✓	✓	✓				✓	✓	✓
CRT-Keyboard						✓		✓	✓	✓	✓	
Disc	✓	✓	✓	✓	✓					✓		
Plotter										✓		
Application Orientation (Business, Scientific, both)	B	B	B	B	B	both	B	B	B	S	both	B
Communications Characteristics												
Transmission rates (bps)	up to 4800	up to 50K	up to 100K	up to 4800	up to 50K	up to 9600	up to 4800	75 to 4800	75 to 4800	up to 2400	up to 9600	up to 2400
Code Compatible												
ASCII		✓	✓	✓		✓	✓	✓	✓	✓	✓	✓
EBCDIC		✓	✓		✓	✓	✓	✓	✓	✓	✓	✓
XS-3	✓	✓				✓	✓	✓	✓	✓		
SBT		✓						✓		✓		✓
6 BIT TRANSCODE		✓	✓					✓		✓		
Controller Type												
Programmable, Hardwired	Programmable	Programmable	Programmable	Programmable	Programmable	Programmable	Programmable	Programmable	Programmable	Programmable	—	Programmable
Memory/Buffer Size (chars)	8K	8K	4K	8K	8K	4K	8K	8K	8K	—	—	4K
Monthly Lease, 1 year, not incl. maintenance	$995/$1,655	$1,155	$765/$995	$1,145/$1,055	$1,115/$1,715	$1,290	$1,163/ $1,343	$1,726/ $1,906	$1,023/ $1,586	UR	$880 (3 yr lease)	$740 (3 yr lease)
Sale Price* (including card reader, line printer, and controller)	$35,450/ $64,780	$40,150	$34,130/ $35,450	$41,470/ $38,950	$28,950/ $66,790	$49,529	$53,760/ $62,160	$78,240/ $85,680	$46,800/ $71,560	UR	$30,000	$29,600
Special Features/Options	Univac 1004 replacement; message compression and retransmission	Multi-function communications channel option	2780/2780-I replacement. IBM 2701 and 2703 compatible	Compatible CDC 200 Users Terminal	Compatible 360/20 work station (use BSC mode to 360 HASP)	Compatible with 1004, 2780 or User 200 terminals via applications software	Automatic dial out, single line control, 1103 price includes CP	Price includes 16 line multiplexor and 16 Synch/ asynch adapters. 1203 price includes CP	Model 1101 price includes single line control. Model 1201 includes 16 line multiplexor and 16 adapters	Graphics CRT Terminal. Scientific applications	—	Price includes Com file Memory System, Storage 64KB, random access 0.5 seconds

*Modem equipment optional

UR—upon request

Table 1

Manufacturer/Model No.	Computer Communications Inc. CC-36	Control Data Corp. 200 User Terminal	Control Data Corp. 733	Data 100 Corp. Model 70-1	Data 100 Corp. Model 78	Data Computer Systems, Inc. CP-4B	Eldorado Electrodata Corp. 125S	HETRA T-Series	Honeywell 2441/2442	Honeywell (Gen. Elect.) 105 RTS	IBM 2770	IBM 2780
Input Devices												
Card Reader, cpm (80 cols)	300	333	1200	300	300	300	400	400	400	300	300	400
Keyboard Printer (char/sec)	CRT-keyboard	CRT-keyboard	CRT-keyboard	—	Teleprinter (10)	Teleprinter (10)	Selectric (15)	Selectric (15)	—	—	Selectric (15)	—
Optional Paper Tape Reader (char/sec)	—	—	—	300	300	600	—	—	—	—	120	—
Output Devices												
Line Printer, lpm (cols)	300 (132)	300 (136)	1200 (136)	300 (132)	300 (132)	300 (132)	135	600	300 (120)	250 (120)	300	300
Optional Card Punch, cpm (80 cols)	—	—	—	200	200	100	75	60	100	100	60	—
Optional Paper Tape Punch (char/sec)	—	—	—	75	75	240	—	—	—	—	120	—
Other Optional Input/Output Devices Available												
Magnetic Tape—7 or 9 tracks					✓	✓	✓	✓				
CRT-keyboard	Standard	Standard	Standard		✓	✓	✓	✓		✓	✓	
Disc						✓	✓	✓				
Plotter		✓				✓						
Application Orientation (Business, Scientific, both)	both	both	both	both	both	both	both	B	both	both	both	both
Communications Characteristics												
Transmission rates (bps)	up to 50K	2000 to 4800	50K	2000 to 9600	2000 to 9600	2000 to 9600	up to 9600	up to 9600	2000 to 4800	2000 to 4800	up to 4800	up to 4800
Code Compatible												
ASCII	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
EBCDIC				✓	✓	✓	✓	✓			✓	✓
XS-3												
SBT				✓	✓							
6 BIT TRANSCODE												✓
Controller Type												
Programmable, Hardwired	Hardwired	Hardwired	Programmable	Programmable	Programmable	Hardwired	Programmable	Programmable	Hardwired	Programmable	Hardwired	Hardwired
Memory/Buffer Size (chars)	—	—	4K	1000	—	800	4K	8K	400	4K	—	—
Monthly Lease, 1 year, not incl. maintenance	$1,175	$750	$2,345	$810	$1,149	$900	$700	$875 (3 yr lease)	$1,080/ $1,185	$1,145	$600	$875
Sale Price* (including card reader, line printer, and controller)	$39,900	$25,000	$97,400	$29,000	$43,890	$36,000	$17,050	$30,000	$43,890/ $48,090	$45,600	$26,000	$38,410
Special Features/Options	Price includes TV display and controller. Same terminal with nonimpact printer 300 cps, 80 char/line is $23,900. Light pen option.	Price includes CRT display and controller. Partial transmit capability std. PT Reader/ Punch, plotter options.	4KB memory expansion in programmable terminal. Up to 4 line printers capability in terminal.	Compression techniques and dual modem switch available. 400 or 600 lpm printers available.	Dual data set option. Compatible CDC 200, IBM 2780, & Univac DCT 2000.	Full transparency. Automatic answering, data compression Mark sense card reader option	Stand-alone configuration available.	Price includes modem interface adaptor. Data compression, auto answer and turnaround, and multiple record transmission.	2780 compatible Model 2442 price includes CP.	Message compression	Automatic answer, security identification, 1255 MIC reader, Model 50 magnetic data inscriber options	Multiple record transmission, automatic answer

*Modem equipment optional

Table 1-a

Manufacturer/Model No.	M & M Computer Industries Inc. 515/560	M & M Computer Industries Inc. 565/580	RCA 8740-8741	Remcom-Tracor Data Systems 2780	Scientific Control Data Corp. DCT-132	Unitech Inc. UT-1	Univac DCT-2000	University Computing Co. COPE 30/ COPE 32	University Computing Co. COPE 34/ COPE 36	University Computing Co. COPE 38/ COPE 41	University Computing Co. COPE 45/ COPE 1225	Xerox Data Systems 7670
Input Devices												
Card Reader, cpm (80 cols)	300/800	300	300	600	300	400	200	200	300	600	1500/300	200
Keyboard Printer (char/sec)	Teleprinter (10)	Teleprinter (10)	—	—	ASR-33	ASR-33	—	ASR-33	ASR-33	ASR-33	ASR-33	—
Optional Paper Tape Reader (char/sec)	625	625	—	—	—	300	300	500	500	500	500/NA	75
Output Devices												
Line Printer, lpm (cols)	135/1800 (132)	245 to 1100 (132)	300 (132)	400 (132)	300 (132)	600 (136)	250 (80)	360 (132, 136)	360/480 (132, 136)	480/1250 (132,136)	1250/300 (132,136)	250 (128)
Optional Card Punch, cpm (80 cols)	275	275	—	—	100	60	75-200	40-200	90-200/300	90-200	90-200	—
Optional Paper Tape Punch (char/sec)	110	110	—	—	—	150	110	150	150	150	150/NA	—
Other Optional Input/Output Devices Available												
Magnetic Tape—7 or 9 tracks	✓	✓				✓		✓	✓	✓	✓	
CRT-keyboard	✓	✓	✓		✓	✓						
Disc	✓	✓				✓						
Plotter	✓	✓				✓		✓	✓	✓	✓	
Application Orientation (Business, Scientific, both)	both	both	B	both	both	both	B	both	both	both	both	both
Communications Characteristics												
Transmission rates (bps)	up to 50K	up to 9600	up to 9600	1200 to 9600	up to 4800	up to 9600	up to 4800	up to 50K	up to 50K	up to 50K	up to 50K	up to 2400
Code Compatible												
ASCII	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
EBCDIC	✓	✓		✓	✓	✓		✓	✓	✓	✓	✓
XS-3	✓				✓		✓	✓	✓	✓	✓	
SBT	✓	✓						✓	✓	✓	✓	
6 BIT TRANSCODE								✓	✓	✓	✓	
Controller Type												
Programmable, Hardwired	Programmable	Programmable	Hardwired	Hardwired	Programmable	Programmable	Hardwired	Programmable	Programmable	Programmable	Programmable	Hardwired
Memory/Buffer Size (chars)	4K	4K	—	400	4K	8K	—	4K	4K	4K	4K	—
Monthly Lease, 1 year, not incl. maintenance	$615/ $1,923	$1,160/ $890	$929	$950	$992	$1,380	$565	$1,130/ $1,245	$1,300/ $1,405	$1,510/ $2,035	$2,700/ $770	$900
Sale Price* (including card reader, line printer, and controller)	$18,880/ $56,190	$39,880/ $35,590	$49,610	$23,000	$27,950	$34,500	$15,290	$45,200/ $49,800	$52,000/ $56,200	$60,400/ $81,400	$108,000/ $30,800	$36,000
Special Features/Options	Cassette 200K chars. 2400 bps optional. No teleprinter on Model 515	Stand-alone capability. Message compression.	Mark sense card reader. Automatic retransmission.	Message compression. Stand alone printer terminal available.	Compatibility for Univac DCT 2000, 1004, and IBM 2780.	Compatibility for CDC 200, Univac 1004, IBM 2780.	Unattended answering, off-line listing error detection & retransmit. CP included in price.	Expandable memory to 8K, compatible with 1004, 2780, or User 200 terminals. Full transparency.	Expandable memory to 12K. Compatible with 1004, 2780 or User 200 terminals. Full transparency.	Expandable memory to 12K. Compatible with 1004, 2780 or User 200 terminals. Full transparency.	Expandable memory to 12K. Compatible with 1004, 2780, or User 200 terminals. Full transparency.	Off-line list. Unattended answer.

NA—not available.

Table 1-b

file.

In the simple terminals with hard-wired control, data is read from the input devices in the remote-batch terminal, transmitted to the computer over a communication line, and processed at the central computer. The results are then transmitted over the communication line back to the remote-batch terminal where the output devices produce the output records. At the remote site, the control of the individual items of input/output equipment and the communication line is handled by special logic and buffers designed specifically for this purpose. For relatively simple remote-batch terminals, this hard-wired control may be less expensive, but it is also significantly less flexible.

In more sophisticated remote-batch terminals, a small computer is included to store programs, to control the input/output equipment, and to do some preprocessing functions (e.g., code conversion and editing) and output functions (e.g., formatting). In such terminals the use of a minicomputer reduces the amount of data transmitted to and from the larger central computer, provides flexible control, and provides editing and formatting for the input/output equipment.

Advantages and disadvantages

The advantage of remote-batch terminals lies in permitting the distribution of people and equipment away from one central location. Inherent disadvantages of remote-batch terminals include data security, local personnel, maintenance, downtime due to communication equipment problems, and high communication cost compared to messenger service.

Other limitations in using remote-batch terminals have centered about three kinds of problems:

1. Central computer hardware and operating system software to support remote terminals has been minimal.
2. The high expense and complications associated with using data communications equipment and services forestalled a normal growth in using remote-batch terminals.
3. The proper cost-effective operating procedures and techniques were not developed primarily because of (1) and (2).

These problem areas are being addressed directly and it seems obvious that remote-batch terminals have just begun to impact the data processing world.

Small business operations that have had either no data processing or a service bureau to support them, and larger businesses which now require more than a central computer facility, now have several alternative approaches to consider.

One obvious approach is the small stand-alone data processing system. Over 10,000 IBM System 360/20s have been sold and the new IBM System/3 is expected to sell in excess of 20,000 units in the next few years. The significant decrease in cost of small computers (typically 20% a year) has had a major impact in providing data processing capabilities for the small user. However, a large portion of the system's price is in the peripheral equipment. The central processor, with its internal storage, will represent an even smaller percentage of the total system cost in the future because the cost of logic and semiconductor memories continues to decrease.

One must consider the specific user's requirements in order to evaluate the remote-batch terminal vs. small stand-alone computers. However, there is a trend toward making terminals of these small stand-alone computers, as evidenced by the System/3, which was originally announced as only a stand-alone system but which now has communications options. A prime advantage in the terminal approach is the ability to access a large data base. However, the data base file management costs, implementation techniques, user methodology, and flexibility are significant problems in terminal systems that must be faced in the 1970 decade.

Communication networks facilitate three basic remote-batch-terminal modes of operation:

1. Point-to-point with the central computer facility.
2. Point-to-point with another remote-batch terminal.
3. Multipoint configuration to some combination of other terminals and computers.

The two parameters most commonly associated with the communications interface are the character code (e.g., ASCII or EBCDIC) and the transmission rate. In general, a remote-batch terminal can usefully support at least a 300 lpm printer and a 400 cpm card reader, provided the communications interface/controller is capable of data rates in the order of 4,800 bps or higher. The communications interface usually resides in the controller portion of the terminal where its function is to convert the bits used in the computer and terminal into the appropriate modulated, or analog, signals which can be handled over the telephone line.

Remote-batch terminals require a control unit (i.e., controller) which maintains synchronization between the transmitting and receiving equipment, controls the flow of data, provides buffer storage for input and output data, and initiates the proper control functions in the terminal itself. The controllers are either hard-wired or use a small computer to control the terminal functions. The small computer used as a controller has a well-defined control program to execute the required functions, but alternate programs may be used for different equipment configurations and different transmission modes. These programs are normally supplied by the manufacturer.

Options and features

Many different control features and options are available for remote-batch terminals. The survey presented in Table 1 includes the optional features and equipment that can be included to meet the user's particular needs. Typical optional devices include magnetic tape units, card punches, crt displays, and other peripherals. Some of the special features available on remote-batch terminals included in this survey are:

Message compression
Error detection and retransmission
Switch-selectable character/block transmission modes
Off-line card to print
Attended/unattended operation

Partial transmit capability
Automatic answer and turnaround
Multiline control operation
Horizontal format control on printer
Terminal ID

Certain significant trends are becoming evident which will accelerate the use and economic benefits of remote-batch terminals. Four key trends are:

1. Lower-cost peripherals will be available.
2. Communication equipment (modems and interfaces) costs will continue to decrease and units will be more readily available.
3. More central computer service facilities will be available to support user remote-batch terminals.
4. Remote-batch terminals with higher degrees of stand-alone capability will be available.

Advances in remote-batch terminals are tied almost directly to advances in input/output equipment, such as punched card readers and punches, printers, magnetic tape equipment, etc. The dominant factor in the cost of remote-batch terminals at present is the electromechanical input/output and other peripheral equipment in the terminal. The digital logic, storage, and small computer constitute a minor portion of the total cost of the terminal.

The trend toward lower cost peripherals is due primarily to the growing minicomputer industry where the ever-decreasing computer costs force lower-cost peripherals. Drum-type line printers typically cost $15,000 or more with controller. Now, lower-cost techniques (belt, matrix, and nonimpact methods) are employed to offer line printer units for less than $10,000 with controller. Some of the newer types of input devices include magnetic tape cartridge or cassettes where the emphasis is on lower cost, yet achieving reasonable input rates.

With the increasing availability of lower-cost modems and multiplexors from independent manufacturers, the trade-off of using a high-speed modem and/or transmission lines with a multiplexor to time-share the line becomes more attractive. A major portion of the time-share service centers now offer, or will shortly be offering, complete remote-batch terminal support with the necessary equipment, systems and application software that were not readily available in the past.

More alternatives

The two alternatives to remote-batch processing are the use of computers with conventional peripheral equipment for local batch processing and the use of time-sharing approaches to computation and data processing. However, the trend seems to be toward remote-batch processing instead of local-batch processing and interactive time-sharing cannot compete on a cost basis in applications which can be handled on a batch basis. The major effect of time-sharing will be to drain away from remote-batch processing those applications in which there is an advantage in user interaction and fast response.

More and more emphasis is being placed on performing as many functions as possible in the terminal to alleviate the associated overhead in the central computer system. A major impetus for this is the effect of semiconductor technology in making cpus and memories very low cost and thus very attractive for inclusion in the terminal—i.e., terminal processors. Many of the remote-batch terminal manufacturers incorporate a minicomputer to perform control and transmission functions required in the terminal. The flexibility of a low-cost stored program minicomputer offers many advantages. It is cheaper to do some preliminary data processing tasks (e.g., sorting, data testing, data compression) in the terminal processor. Also, the terminal can be used in an off-line mode of operation for card-to-print, card-to-tape, and other operations without utilizing the communications link and central computer system.

Future design objectives

Design objectives for future systems employing remote-batch terminals should include the following:

1. Simplify and reduce the routines in the host computer required to interface with the terminal.
2. Standardize the software in the terminal processor to as great an extent as possible.
3. Minimize changes in the central or host computer software, especially operating system changes.

These trends will continue even further with terminal processors doing more of the work (e.g., report generation) while access to the central computer system will be required primarily for large data base operations and for larger programs exceeding the capabilities of the terminal processor. ■

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The DCA: Its birth, life, and continuing demise

Of Corks and Jibes

The year was 1952 and few, if any, of the toilers in the computer fields, workers then (still?) harriedly trying to define their jobs, had formed the conceit that in less than 20 years their industry would rank among the top 10 in dollar volume in the U.S., or that the consequences of their labors would ultimately touch the lives of everyone, everywhere. Certainly, none of them had an inkling that some of them would become legends of one sort or another in their own times. In Southern California, IBM 601s, 602s, and 604s were operating in many installations, and the 701 was on the way. (The first Remington-Rand computer in the area was a 409 installed in 1952 at Douglas Aircraft.) Activity was constant, feverish, uninformed, and typified by a desire to know.

It was in this climate that a good fellowship and technical group was formed to meet once a month called the Digital Computer Association which now meets only once a year for the exchange of insults and downing of the grape, but which, in its heyday during the fifties, was considered the most stimulating and sophisticated of all the organizations then beginning to take shape.

The beginning of the DCA was auspicious—a dinner gathering at the Santa Ynez Inn, a lovely, rambling hotel located at the foot of the Santa Monica Mountains, a quarter-mile from the ocean. The dinner was hosted, almost inadvertently, by an IBM sales representative, R. Blair Smith, some of whose customers had ordered 701s and needed to share "information and know-how." In an article entitled "A Short History of Digital Computing in Southern California" (in the late, lamented *Computing News*, March 15, 1959), Fred Gruenberger, who has become one of those legends, quotes a letter from Smith:

"In your letter, you honor me as a founder of DCA. I am proud of the part I played, but I am sure you must realize that my customers gave me the idea and provided the nucleus of strong support that made the DCA successful. For instance, I remember discussing with Paul Armer of RAND the need for better communication between 701 customers. While I cannot remember the details of that discussion, I would venture to say that, based on my knowledge of Paul, it was he who suggested that such a group be organized. He probably also suggested that IBM pick up the tab for the first dinner."

> **. . . a time of whizzing sugar cubes, corks, ice cubes, and balled napkins.**

According to Frank Wagner, the idea of hosting a big informal dinner for users and actually serving them drinks was such a novel one that Smith had to turn in his expense account to IBM three times before he got his money back.

A good time apparently was had by all at the dinner, and it was decided that a monthly meeting should be held. According to Gruenberger, "DCA, then, stresses first of all good fellowship among computing people, and sponsors incidentally a talk at each dinner meeting on some phase of the art."

The first scheduled meeting of the group was held on Feb. 13, 1953, at Carl's Restaurant in central Los Angeles ("Informal Bar—Dinner $2.50"), and the topic for discussion was "fixed vs. floating decimal C.P.C. boards." The panelists were Jack Strong of North American Aviation (at the time), Rex Rice of

Northrop Aircraft, Dr. Everett Yowell of the Institute of Numerical Analysis, and Bob Bosak of North American Aviation.

From the first, it seems, irreverence was the order of the night. While the monthly topics were meaningful and pertinent for the time, for some reason the audience considered it compulsory to badger, harass, insult, and otherwise humiliate not only the speakers but other members of the audience. As a result, the issue of floating vs. fixed point was not settled that night at Carl's and was not to be considered again until 19 years later, when Jack Strong was again scheduled to speak on the matter at this year's DCA meet, which was held in March. More on that.

As time went on, the cocktail hour prior to the dinner assumed a larger importance and people began arriving earlier and earlier. This assured the proper atmosphere for the dinner and technical discussion that followed, a time of whizzing sugar cubes, corks, ice cubes, and balled napkins. Research has failed to turn up any incident involving a table knife, although the feeling might have been there from time to time.

There was the guest speaker from IBM who had not been apprised of the true nature of the gatherings, and as he stood confidently, although a little mizzled, at the blackboard, chalk poised, to explain the glories of his latest software development, his look of calm slowly changed to befuddlement as the corks flew through the air; he was asked questions that had nothing whatever to do with the subject at hand, his qualifications were loudly doubted, and his character was loudly assassinated. Befuddlement turned to despair, he made a slight gesture, and fell over on his back, unable to continue.

It brought the house down.

Toward the end of the fifties, the Association for Computing Machinery had the largest chapter in the U.S. in Los Angeles, and a San Fernando Valley chapter was started, both of which seemed to get along quite well with formal, orderly procedures (the cocktail hour was kept to an hour) and a steady reckoning of technical advancement and still provide a lively intercourse of personalities and ideas. The DCA began to face and finally became what it is today—a once a year meeting commemorating the traditional conviviality of the early days and reminding the attendees that legends are human.

The 1971 meeting of the DCA was held in March at Little Joe's restaurant in downtown L.A. Little Joe's is a large, popular cafe with many rooms and caters to Kiwanians, conferences, and kaffee klatsches. The DCA room was staffed by a bevy of efficient, matronly waitresses whose ingenuity and tact were shortly to be put to the test. Eighty-five or so computer types attended, including Paul Armer (who traveled the farthest to make it, from Harvard, somewhere in the East), Jack Strong, Bob Patrick, Gene Jacobs, Frank Wagner, Bob Berman, Chris Shaw, Bob Beach, Al Deutsch, Jerry Koory, Mort Bernstein, Bob Forest (nonlegend), Joe Smith (whose name tag read "Brigham Young"), many other living legends and one whose name tag said "For Sale."

Each year a chairman, whose duties are to organize and run the meeting the next year, and who always is chosen without his or her consent, is designated. This year the chairwoman was Mrs. Toni Schuman, a diminutive, pretty lady who seemed somewhat out of place with the crusty veterans in attendance but never ill at ease. She ran things with as firm a hand as possible.

and Floating Points

by Aubrey Dahl

During the preliminaries, the waitresses and the bar downstairs were well patronized, and when the assemblage sat down to the tables where carafes of red wine awaited them, the atmosphere was right on. Plates of corks had been thoughtfully provided, and the barrage began almost immediately, to continue fitfully throughout the evening. Naturally, the aim was mostly bad. "It went in my wine, goddamnit," said Armer. Jerry Koory managed to hit Strong on the head (bald) and was kissed on the ear as a prize for his effort by Deutsch.

The entree was cork-flavored veal parmesan.

The technical discussion was a little difficult to call to order. When Mme. Chairman attempted it, she was told to "siddown" and Armer was heard to remark "Is Women's Lib going to take over this meeting?" When she finally gained some kind of order, she asked how many were attending their first DCA meeting and was accorded a loud "Yea." When she asked how many were attending their last DCA meeting, she was given an even louder "Yea."

At this moment, Armer was in a corner in the rear of the room, coat on backward, a handkerchief on his head, Forest feeding him wine as from a *bota*. He missed.

Mort Bernstein was to introduce Jack Strong, who was to discuss once again "an early and still unresolved problem"—fixed vs. floating point. Bernstein referred to Strong, cruelly and appropriately, as "Early Curly." When Bernstein invited comments from the floor, he was greeted with such mots as "Paul Armer is the industry's earliest and still unresolved problem," and "It's fixed point at home, floating point on the road," and other imprecations not for publication in a family trade magazine.

When Strong finally took the rostrum, he was hailed with thunderous boos and hisses whilst he

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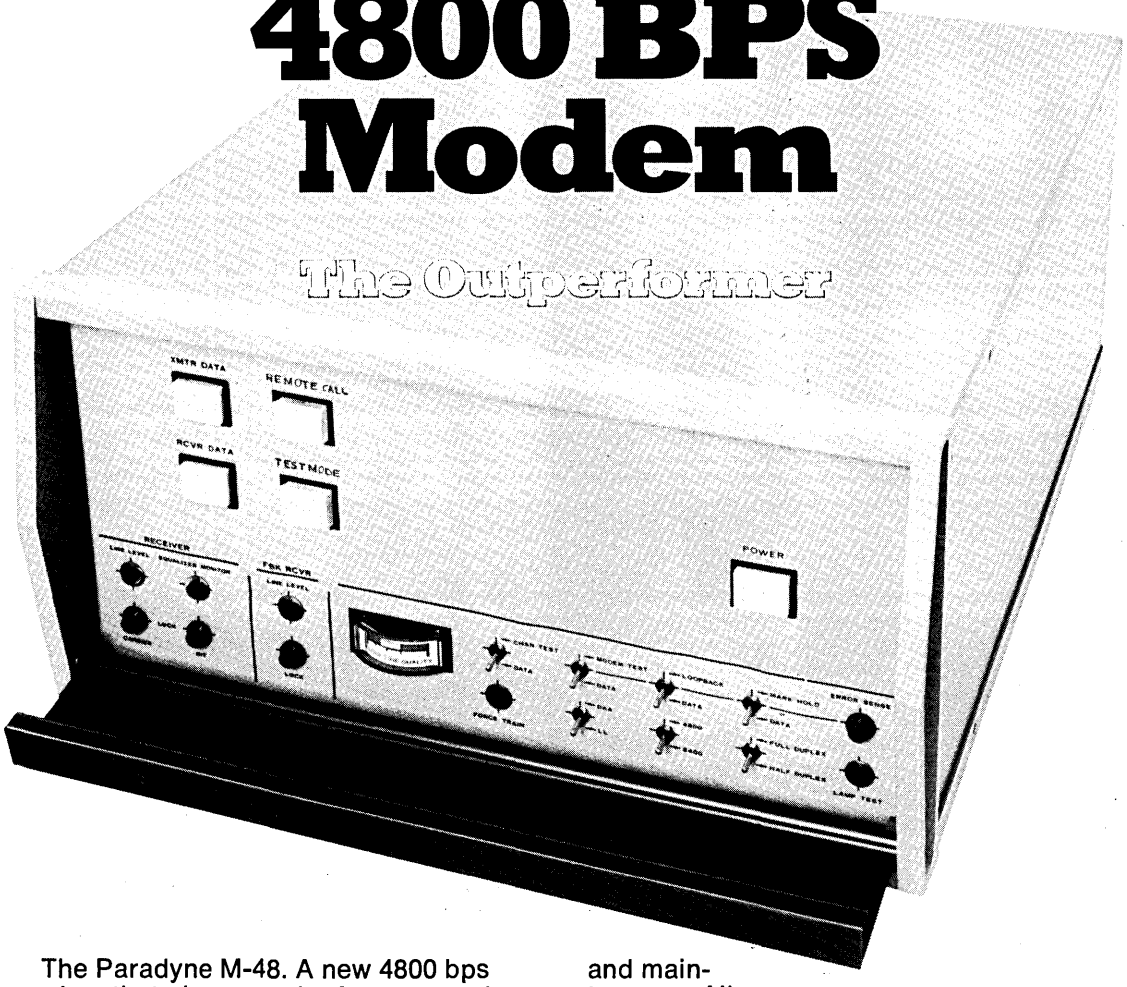

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smiled warmly and w·· ·ed his arms in acceptance of the acclaim. Even the microphone hissed and whistled and at the inappropriate moment, of course, it went limp on its stand. "It's getting feedback from your eyelashes," someone said. With a couple of million dollars worth of technical talent in the room, a waitress fixed it at last, accompanying her efforts with such comments as: "You're supposed to stand back from the mike," and "They don't like your speech." This before Strong had managed a word.

When he began, Bob Patrick rose to leave the room, which prompted Strong to say "Please check my kid. I think I left her on the john."

"Get on with it, Jack. Let's hear the good stuff."

Strong attempted to get on with it. "Why, you ask, a discussion of fixed vs. floating point? Well, in those days we had to have a whole room full of refrigerator-sized machines to work, and they could only add and subtract."

From the floor: "Be fertile and multiply."

"It's obvious," Strong replied, "not many people in this room understand the problem."

Shouts and imprecations from the floor. Loud, rude remarks, a few of them funny, rang through the smoke-hazed air while waitresses scurried about removing the clutter from dinner. Strong waved and sat down, fixed vs. floating point to remain unresolved for perhaps another 19 years.

An interview, patterned after the Carl Reiner-Mel Brooks two megayear old man routines, was conducted by Mrs. Schuman, with Morris Needleman (who wrote it) playing the oldest programmer in the world. He asked for a little respect from the audience. "I'm going to die soon."

"How about right now?"

Some of Needleman's responses to questions contained such information as the fact that the initials IBM really come from Izzie's Bar Mitzvah, when the invitations were chewed up by a bunch of lions, and Hollerith made a fortune training lions to chew punched holes in cards. Asked what he thought was the most important invention in two million years of computing, Needleman answered without hesitation: "The blinking light." He ended his interview (the audience, for the most part, remained silent, except to laugh) by offering a final word of advice to today's programmers: "No matter how great the pressure, how dire the threat, how shaky the job, don't ever document anything!"

Bob Patrick then rose to announce the chairman for next year's meeting, which will be held, he said, in March, which is traditional, or November, which is traditional, or any other traditional month. He said they had gone over the membership list and had found no one qualified for the job, but they had found one patsy. And he named the unsuspecting Bob Berman, who also happens to be the current president of the L.A. chapter of the ACM. A nonplussed Berman accepted the giant spitball, traditional symbol of office, lurched to his feet, and promised to make a botch of the job.

Door prizes were awarded. They included a collection of new product news releases rejected by DATAMATION, the world's first core memory, donated by Burroughs, a large disc and some crashed heads, and a vacuum tube panel ("It could be anything") from a Univac II. A final door prize was to have been Mary Ann Chappelear for the man who had traveled farthest to get there, but when Armer reached for her, she implored the audience, "Save me from this fiend."

The meeting was adjourned.

It happens once a year. Sometimes it's funny, sometimes it's childish, always it's fun. And always it jibes at itself. What began as an attempt at insight into the uses and development and responsibilities of the computer and the people who make it go has become an annual cathartic, a nose thumb at those responsibilities, which were then, in 1952, and are now, so awesome.

At one point during the evening, someone rose and said he'd like to recite a poem that had been rejected by DATAMATION. It is by Howard Rose and it goes, "A program is like a nose/Sometimes it runs, sometimes it blows."

Editor Forest allowed as how "Sometimes a magazine blows."

So now it is published. ■

Mr. Dahl, formerly an associate editor at Datamation, is now editor, marketing communications, Computer Machinery Corp.

Has this elegantly simple beginner's language suffered irreparable damage?

The Case Against...

The BASIC language was developed at Dartmouth College in the early 1960s, and has suffered mightily since. That the fate of divergent development should befall such an elegantly simple language is a crime. It is, of course, a product of the simple fact that we know too little about what should be incorporated into a language, and which syntax is most useful to people.

It is the position of this paper, however, that just as an experienced professional can determine the differences between a good program and a bad program, even though they accomplish the same purpose, the difference between good language improvements and bad language extensions can be identified. Table 1 is a short summary of the original BASIC language.

The BASIC language (Beginner's All-purpose Symbolic Instruction Code) was not designed for the audience which now makes most use of it. It was developed for undergraduates at the college algebra level, and was obviously designed on the premise that something had to be easier to teach than FORTRAN.

The objective was met. The distinction between integer and real values was discarded by treating all values as reals. The FORTRAN FORMAT statement (really a cryptic language-within-a-language) was ignored, and I/O facilities were simplified to the point of triviality. Even references to data files were removed, and data from outside the program was available only from the user at a time-sharing terminal.

To be sure, there are problems in BASIC. The lack of data files, the single data type (real numeric), the restricted symbol set, and the lack of a subroutine capability with local and formal declarations have all been widely acknowledged. But, the language *does* meet its objective of being a simple language for beginners.

Let me reiterate that last phrase: *for beginners.* There's the rub. And since many system programmers have had experience with FORTRAN, they have attempted to make BASIC look more and more like FORTRAN. It is unreasonable. Extensions to the BASIC language which maintain its simplicity yet widen the scope of applicability are possible. I feel that some of the extensions have been absurd. It is a safe statement that only a small percentage of all BASIC compiler writers have ever *used* the language.

Some BASIC problems

One of the most severe constraints in the BASIC language is the smallish set of symbols. The restricted symbol set, consisting of symbols composed of one letter, or a letter followed by a single digit, is incurred because some statements have embedded

. . . obviously designed on the premise that something had to be easier to teach than FORTRAN.

words. For example, BASIC loop control is handled by the FOR statement. A typical FOR statement looks like this:

```
FOR I = 1 TO J
```

Notice that the symbols used, I and J, consist of but a single letter.

Since blanks are ignored in the language, the following case could arise if multiletter symbols were allowed:

```
FOR I = JTOTOK
```

which would admit to two interpretations:

```
FOR I = J TO TOK
```

BASIC

by Jerry L. Ogdin

or

FOR I = J TO TO K

If both J and JTO were used as symbols in the program, then the FOR statement couldn't be uniquely interpreted by the compiler. Other statements in the language exhibit the same idiosyncrasy. To prevent this ambiguity, the architects of the language decided to restrict the symbol set to the 286 possibilities formed of one letter followed by an optional digit.

The subroutine facility of BASIC is primitive and most closely resembles COBOL in style. Subroutines are identified by usage, not by any kind of special statement in the subroutine itself. This leads to the possibility of a subroutine also being used in-line. The distinction is made upon entry to the routine, and some conditional statement must be used to avoid the RETURN statement when the subroutine is used as an in-line routine. This can confuse the novice, and for this reason is seldom mentioned in texts on BASIC.

The most unfortunate part of the subroutine conventions in BASIC is that no local variables may be declared or implied, and there is no parameter-passing mechanism. All symbols are globally known throughout the program. This is analogous to the simple PERFORM verb of COBOL. This means that any temporary or intermediate results computed are not private, and may destroy important contents saved under the same name elsewhere in the program.

Another idiosyncrasy has crept into the original language: The same symbolic name may be used in the same program for both a scalar and an array name. This is possible because an array name is always followed by a left parenthesis (for the subscript) in statements where a scalar might also be used. In the conventional LET assignment statement, for example, the following might validly occur:

LET P = B(B)

which is both novel and confusing.

Example	Description	Form
100 DIM A(20,3), B(20)	Dimension	DIM <id> (<integer> , . . .) , . . .
110 DEF FNL(X) = LOG(X)/LOG(10)	Function Definition	DEF FN <letter> (<id>) = <expression>
120 MAT A = ZER(20,3)	Matrix Arithmetic	MAT <id> = <matrix-expression>
130 INPUT N	Terminal Input	INPUT <id> , . . .
140 IF N = 20 THEN 160	Conditional Branch	IF <expression> <relation> <expression> THEN <line-nr>
150 STOP	Stop	STOP
160 FOR I = 1 TO N	Loop Control	FOR <id> = <expression> TO <expression> [STEP <expression>]
170 READ B(I)	Read (from DATA)	READ <id> , . . .
180 LET A(I,1) = FNL(B(I)+5)	Assignment	LET <id> = <expression>
190 GOSUB 500	Subroutine Call	GOSUB <line-nr>
200 NEXT I	Loop End	NEXT <id>
210 PRINT "RESULTS FOR SIZE"; N	Print (Output)	PRINT [<expression> | <quoted-text>] , . . .
220 MAT PRINT A	Matrix Print	MAT PRINT <id> , . . .
230 RESTORE	Restore all Data	RESTORE
240 GOTO 120	Branch	GOTO <line-nr>
250 REM A SUBROUTINE FOLLOWS	Remark	REM <anything>
500 LET A(I,2) = B(I) * B(I)	Assignment	LET <id> = <expression>
510 LET A(I,3) = SQR(A(I,1))	Assignment	LET <id> = <expression>
520 RETURN	Subroutine Return	RETURN
800 DATA 500.3, 74, 89.3E2, 44532, 4.4	Data (for READ)	DATA <constant> , . . .
810 DATA 900E-2, −1E4, 67.5, 99.36, 8, 9		
820 DATA 34, 86.3E2, 99.99, 1000, 1E3, 17		
830 DATA 1, 2, 3		
999 END	End of Program	END

Table 1. A brief and incomplete summary of the BASIC language.

In BASIC, matrices are handled by a unique set of statements. For example, to invert a matrix Q and store the result in a matrix named L, the following statement can be used:

MAT L = INV(Q)

and nothing could be simpler. As one unnecessary restriction in the first version of BASIC, only single letters could be used as names for matrices. One of the immediately obvious and most common exten sions of successor BASIC compilers has been the removal of this arbitrary special case, but not all have done so.

Interestingly, where an array is used in BASIC without appearing in any dimension-defining declaration, the array is assumed to contain 11 elements if it is a vector, and 121 if it is a matrix. Subscripts range, in the original BASIC, from zero through ten in the implied array, and from zero to the given upper limit in an explicitly declared array. In any event, the dimensions of a matrix used in the MAT statements are dynamically defined during execution.

BASIC was the first general-purpose language to be designed specifically for use from a time-sharing terminal. Recognizing the need to differentiate between commands to be interpreted immediately and data to be placed in a file, the designers decided to pivot on the first character of the typed line. If the first character is a digit, the line is assumed to be data, and the digit is a line number. Otherwise the line is interpreted (if possible) as a command. Since all lines entered have numbers, what would be more natural than to use the line numbers as statement numbers? In practice, the GO TO and similar statements refer to the line number as the statement label.

BASIC probably more closely resembles ALGOL than FORTRAN. It is apparent in the generality of arithmetic expression usage. The arithmetic expression may appear anywhere that one might expect to be able to use it. The PRINT and FOR (loop control) statements, in particular, permit expressions where FORTRAN prohibits them.

Some obvious extensions

The array-declaring statement in BASIC is the DIM. In the original version of the language, only one or two dimensions could be declared. An obvious extension is to permit several dimensions, and a commonly chosen value is seven (for purely historical and FORTRAN-related reasons). One compiler has a maximum limit of 13 dimensions, based on a physical fact of space allocation. In that system, only 16,384 words are available to the user, and each real value occupies two words. A subscript must have a minimum range of two to be useful, and 13 dimensions, each of range two, occupy 16,384 words.

Another extension is in the LET statement, where the word "LET" is made optional. In BASIC, every statement is preceded by a short type word. This simplifies the compiler organization, and has mnemonic significance for the user. However, many FORTRAN programmers who try the language remember the older convention that if a statement can't be otherwise classified, an interpretation is attempted as an assignment statement. This doesn't affect the novice, since the "LET" may be used, and this is the only default statement classification in the language.

Arithmetic statements in the first BASIC compiler incurred one glaring error in the order of evaluation of mathematical operations. Some compilers have subsequently removed this inconsistency, while others have perpetuated it. The problem is the unary minus operator. In the earliest BASIC compiler, the unary minus was treated as the highest priority operator.

Arithmetic statements in the first BASIC compiler incurred one glaring error . . .

and the negation of the operand was performed before all other operations. This leads to the following problem:

$-10 \uparrow 2$

($\uparrow$ is the exponentiation operator) is treated as equivalent to:

$(-10)\uparrow 2$ (result of which is + 100)

rather than:

$-(10 \uparrow 2)$ (result of which is −100)

which is the conventional treatment.

Furthermore, the BASIC language was designed to be used from teletypewriter terminals connected to a time-sharing system. The Teletype models 33 and 35 are based on a subset of the ASCII code. The $\uparrow$ operator appeared in the ASCII code until 1967 when it was replaced by the symbol $\wedge$. This should present no problem, except that a few BASIC compilers have admitted the FORTRAN convention of "**", which is the only two-character arithmetic operator in either language. At least so far no compiler has *required* the use of "**". Be grateful for small blessings!

There have always been additions to the set of allowable arithmetic functions in different compilers for most languages. Each FORTRAN seems to be different. Now, each BASIC seems to be different. In BASIC, all functions have a three-character name, followed by the argument in parentheses. In all cases, a single argument is permitted and required. One of the missing functions in early BASIC compilers was the common logarithm. The natural logarithm was supplied, called LOG. Most compilers have subsequently included a new function, CLG, for the common logarithm. But in at least one case the unique function name LOG10 has been used.

BASIC permits the definition of simple arithmetic functions through the DEF statement, in the vein of FORTRAN's one-line function definition (which is seldom used). In the original BASIC, a function is named FN*x*, where *x* may be any single letter. One scalar argument is required, and no more may be used. The argument is a "dummy," and in the function definition:

DEF FNL (X) = LOG (X)/LOG (10)

the symbol X is local to the statement, and use of this function does not destroy the contents of some symbol named X elsewhere in the program—at least in most compilers. In one early successor to the Dartmouth BASIC, the parameter was *not* local in scope and did modify the contents of the named variable. This seems a simple matter to correct, but that problem lives on in the particular compiler.

Later BASIC compilers have seemed to be in agreement to permit zero or more parameters, but there is an obvious limit since the function definition must fit onto one line. In a later extension, multiple-line function definitions have been added and are keyed to the presence or absence of the equal sign in the DEF statement. If the equal sign is missing, the next line is the first line of the function definition, and successive lines are part of the definition until an FNEND statement is executed. The FNEND statement is a return statement.

Now that the conditions may be tested for in a function definition, the function may be directly or indirectly recursive. This was prevented in the original BASIC because recursion could never have been ended by the single arithmetic expression. In at least two BASIC compilers recursion is allowed, and all parameters (still only scalars) are saved in a push-down stack only when recursion is actually used. Therefore, the overhead associated with the push-down stack is avoided for the most common nonrecursive cases. In one particular compiler which handles recursion in DEF statements, only the values in the argument list are pushed into the stack. In another, every value referred to in the function is placed in the stack—even large arrays!

The PRINT statement has, in some compilers, been extended by the addition of a TAB function, which may only appear in the PRINT statement. The TAB function has a single arithmetic expression as an argument. The integer part of this expression specifies the location where the next character is to be printed. The left margin is adjacent to the position numbered one. The TAB statement permits a limited kind of format control, which is useful since tables of numbers printed with the unadorned PRINT statement come out left-adjusted rather than with decimal points aligned. A simple example is the alignment of decimal points in column 22 for a limited range of numbers:

```
PRINT TAB (23 - CLG(X)), X
```

which will position the output so as to align the decimals. However, if the value of X is very large or very small, the exponential form (E-format) is used. Of course, since some BASIC compilers print a blank position for a positive sign and some place the first nonblank character in the first print position, this example of the TAB function will not work, even if the common logarithm of the absolute value of X is computed.

The FOR-NEXT statement pair has often been extended in recent BASIC compilers. A typical use of the FOR and NEXT statements is:

```
FOR I = 1 TO 10
  FOR J = I TO 10
      •
      •
      •
  NEXT J
NEXT I
```

and one of the obvious extensions is to permit multiple-loop terminations on a single line. This is done by allowing the NEXT statement to contain several symbols:

```
NEXT I, J
```

which terminates both loops. Now, since both loops are being terminated, is it important to have the symbols in reverse order of the associated FOR statements? One compiler seems to think so! The compiler can obviously deduce the proper order, and should reasonably do so. Yet this same compiler permits several endings of the same loop, as in:

```
FOR I = 1 TO 10
  IF some condition THEN xyz
      •
      •
      •
NEXT I
      •
      •
      •
xyz:
  NEXT I
```

where the particular NEXT statement used is dependent upon the outcome of the conditional transfer in the IF statement. This extension prevents the pairing of FOR and NEXT statements, which is one of the most common mistakes made by novice programmers. So here is a language extension which, by default, can get a novice user into trouble. If an extraneous NEXT statement is used, the results will probably be obviously false, but the compiler will not detect the error if proper nesting has been observed.

So here is a language extension which, by default, can get a novice user into trouble.

The FOR statement has been extended slightly in some cases to permit the initiation of two or more nested loops in a single statement, as in:

```
FOR I = 1 TO 10, J = 1 TO 10
```

where J is the parameter of the innermost loop. Another modification has permitted the use of the commas in place of the words "TO" and "STEP", *à la* FORTRAN. These two statements are then equivalent:

```
FOR I = 1 TO 10 STEP J
FOR I = 1, 10, J
```

which, while not incompatible with the previous extension, does make the readability something less than perfect.

Symbols in BASIC, as described earlier, may consist of a letter followed by an optional digit. One obvious improvement is to permit the symbols to consist of a letter followed by (optionally) several digits. In practice, this extension is usually defined to limit the number of trailing digits to three or four.

About the only statements which have escaped unscathed have been the READ, GO TO, GOSUB, STOP, and END.

Divergent designs

Several extensions have been variously made to BASIC in which the compiler writer has attempted to appliqué over the top of the language the characteristics of some different language. In each case, because of no central source for control of extensions, each compiler writer has gone a different way from

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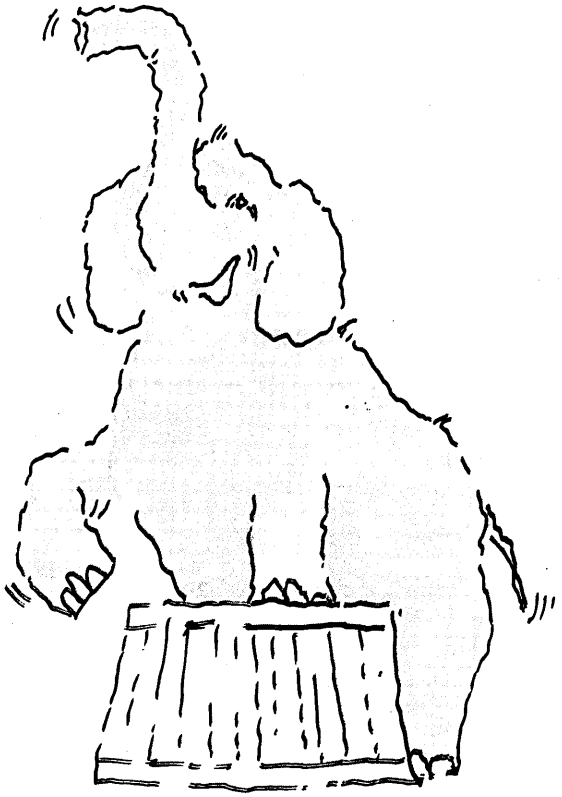

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his predecessors. This may be due to the fact that many of the earliest compiler writers extending BASIC were hopelessly naive about what people really use a computer language for: solving problems. Some of the extensions have basic ambiguities in them, and others are the product of system programmers with no real appreciation for application uses. One is reminded of the FREQUENCY statement in the first FORTRAN, which simply wasn't used.

One of these kinds of extensions is the multiple assignment option in a LET statement. For example:

```
LET A = B(I) = I = 5
```

which may be interpreted from the left or the right. Some compilers treat this statement as the triplet:

```
LET A = 5
LET B(I) = 5
LET I = 5
```

while others interpret from right to left, with the results:

```
LET I = 5
LET B(I) = 5
LET A = 5
```

with a different result if the variable I contains a value other than 5 before the execution of this statement. This is a classic case, and is of little or no help to the user. He can write one line at a time and avoid the problem. However, if the multiple assignment is used, the program's portability is degraded, since at least three different treatments exist in different compilers (left-right, right-left, and no multiple assignment). This is an ambiguity in that the compiler knows which convention is being used, but there is no single clear convention for the user to follow.

In another example, the computed transfer vector has been implemented. It is my contention that, while the statement

```
GO TO (200, 300, 400), X-5
```

is a useful extension to BASIC, the statement

```
ON X-5 GO TO 200, 300, 400
```

is definitely more in the style of the BASIC language.

Interestingly, if the BASIC compiler includes the SGN function (value is −1, 0, +1 as the argument is negative, zero, or positive), the FORTRAN-like arithmetic IF that is so useful can be programmed:

```
ON SGN(X) + 2 GO TO 200, 300, 400
```

but many compilers do not have this function. This appears to be an oversight, and tells us something about the experience the compiler writers had before they went about extending the language. The SGN function exists in the original BASIC compiler. However, it was inadvertantly left out of the first manual published by Dartmouth. Most users were aware of its existence, and many commercial time-sharing services published addenda to the manual. However, several compilers on the market today do not have this useful function.

BASIC admits to only one type of data—real numbers. However, this presents little difficulty to users, since the INTEGER type is seldom required, and COMPLEX arithmetic type is used even less often. However, there are always special interest groups. So at least one compiler has introduced INTEGER, REAL, and COMPLEX-type statements. The REAL-type statement is required, since this compiler will change the type during execution. Not only is this extension not appropriate to the language, but if it were really deemed necessary, why couldn't the more meaningful APL conventions be adopted and do away with declarations altogether?

One type of data that has become popular and useful is alphanumeric. To avoid naming conflicts, and to augment the already austere symbol set, the first compiler to permit text strings used the explicit declaration of a dollar sign ($) in the symbolic name. This also avoids the problem of defining the meaning of a symbol within the program. Not perfect, but adequate.

However, this compiler set a fixed size limit of 15 characters on the size of a string. Strings were available only from a READ or INPUT statement, and the individual characters could neither be individually accessed nor modified. This limits usage.

Even Dartmouth is at fault here. In their successor compiler, for the GE-635, they included an alphanumeric type and incorporated a new statement (CHANGE) for changing a string of characters into a vector of numbers. The individual numeric values can be manipulated, and the numeric array can be rechanged into an alphanumeric string. Couldn't there be a better way?

A string of characters can be considered to be a vector. A group of strings is a collection of vectors, or a matrix. BASIC has standard ways of addressing and dealing with the elements of vectors and matrices. In the MAT statements, the name of an array refers to the entire content. So there are several precedents which can be used to specify a syntax for string manipulation.

One method is to admit strings into vectors, and keep the tradition of the right-most subscript varying most rapidly. The right-most subscript will index characters in a vector. This means, that by permitting one special case (referring to an array with n or n-1 subscripts) both the string and its characters may be accessed. The only difference between this kind of usage and the arithmetic usage of data is the dollar sign in the symbolic name. For example, these would be acceptable statements:

```
LET B$ = "ABCDE"
LET C$ = B$(5)
LET D$ = B$
LET D$(6) = B$(3)
PRINT D$
```

and the result printed would be

```
ABCDEC
```

in six contiguous locations.

Note that the dollar sign may appear anywhere in the symbol. Although a few compilers demand a particular location within the symbol (usually the last character), it is unnecessary. Furthermore, a string vector has dynamic length, which is in keeping with the tradition of BASIC numeric arrays. The length is adjusted as required to contain the strings and characters placed in the area, and trailing blanks are elided. The maximum length is defined in a DIM statement, but the assumption is made that the lowest value of the subscript is *one*, not zero. If a string vector is used without declaration in a DIM statement, the maximum string length is 10, just as in the case of numeric arrays.

In yet another BASIC compiler, the PL/I convention of using the SUBSTR function is provided to manipulate strings. This function causes enough grief to

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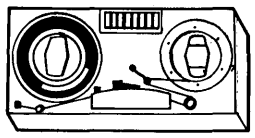

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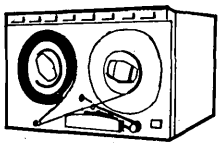

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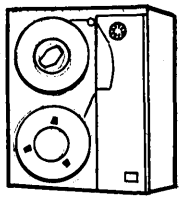

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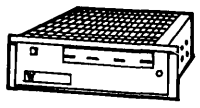

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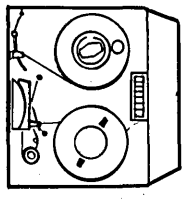

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PL/I programmers—now it is impressed upon novice programmers that everything has to be tough in useful languages!

Another area of divergent opinion on the part of BASIC compiler writers has been in the treatment of data files from programs. It seems that no two compilers use the same conventions. For writing to a file, some compilers introduce the WRITE statement, while others use the PRINT statement with modifications to include a file name. The former seems more logical. For input from a data file, some compilers use the INPUT statement (intended for keyboard input from the terminal device), while others use the READ statement.

At least one compiler has OPEN and CLOSE statements that are used to equate internal file numbers to external file names. This permits changing file references dynamically in the program. The file names are also string constants or symbols, which permits file names to be supplied at execution time. Other compilers force the file name to be explicitly used in each and every file reference statement. The latter kind of design prevents the programming of certain kinds of processes, such as elementary sorts and merges. At least one compiler requires the user to declare the names of one input and one output file when invoking the use of the program, and only one of each type may be used during execution.

Conclusion

The recitation of extensions and limitations could go on and on. There doesn't seem to be an end to the flow of new and different changes to the BASIC language. This paper could include references to the CALL/SUB subroutine definition pair, the facilities for declaring precision of output data, the various schemes for randomizing the random number generating function, and the (ugh!) format statements. But it is futile.

The BASIC compiler writers, by and large, have not been experienced in the use of BASIC. In the blind objective of making BASIC suit all uses and all users, unnecessary and unreasonable changes have been perpetrated on the flimsy premise that all potential programs should be able to be programmed in BASIC. This has been the difficulty so well recognized in PL/I; namely, that the default options required to hide the extra facilities from the novice user usually get the novice in trouble, and the intermediate programmer just doesn't know where to turn. That is a price we decided to pay for PL/I—but BASIC was supposed to be a novice's language. I feel that BASIC has effectively been killed as an industry-wide language because no two compilers have even a semblance of compatibility.

A proposal

It is about time that the individual members of this industry begin to claim some responsibility for what is provided to the user-programmer community. The originator could take several steps:

First, document the language adequately—not just the syntax and semantics, but the reasons why the various choices were made in the design process. Few languages have had this done; notable exceptions are ALGOL and APL.

Second, the language originator should create a small cadre of the professionals involved in the development, who will act as a clearinghouse for changes and modifications to the language, and will advise prospective implementers of successor compilers of the potential structural conflicts, and recommend alternative methods for implementation. Although there is no binding reason for participants to abide by these decisions, there are obvious advantages in doing so.

Third, the original authors should publicize their names and addresses. This can probably be best accomplished through the ACM's Special Interest Group on Programming Languages SIGPLAN Notices.

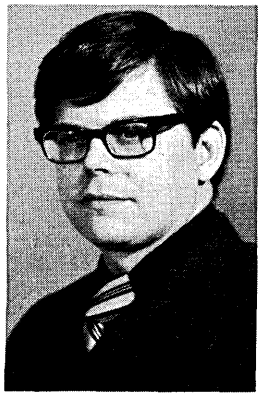
BASIC has effectively been killed as an industry-wide language . . .

Fourth, recognize that compiler writers are but another breed of specialists. This brand of experience qualifies them in no way to make language decisions. Just as most organizations separate analysis and programming functions, language design and compiler implementation should be separated. Just as there are exceptions in the case of competent programmer/analysts, there may be a few compiler writers competent to make language changes.

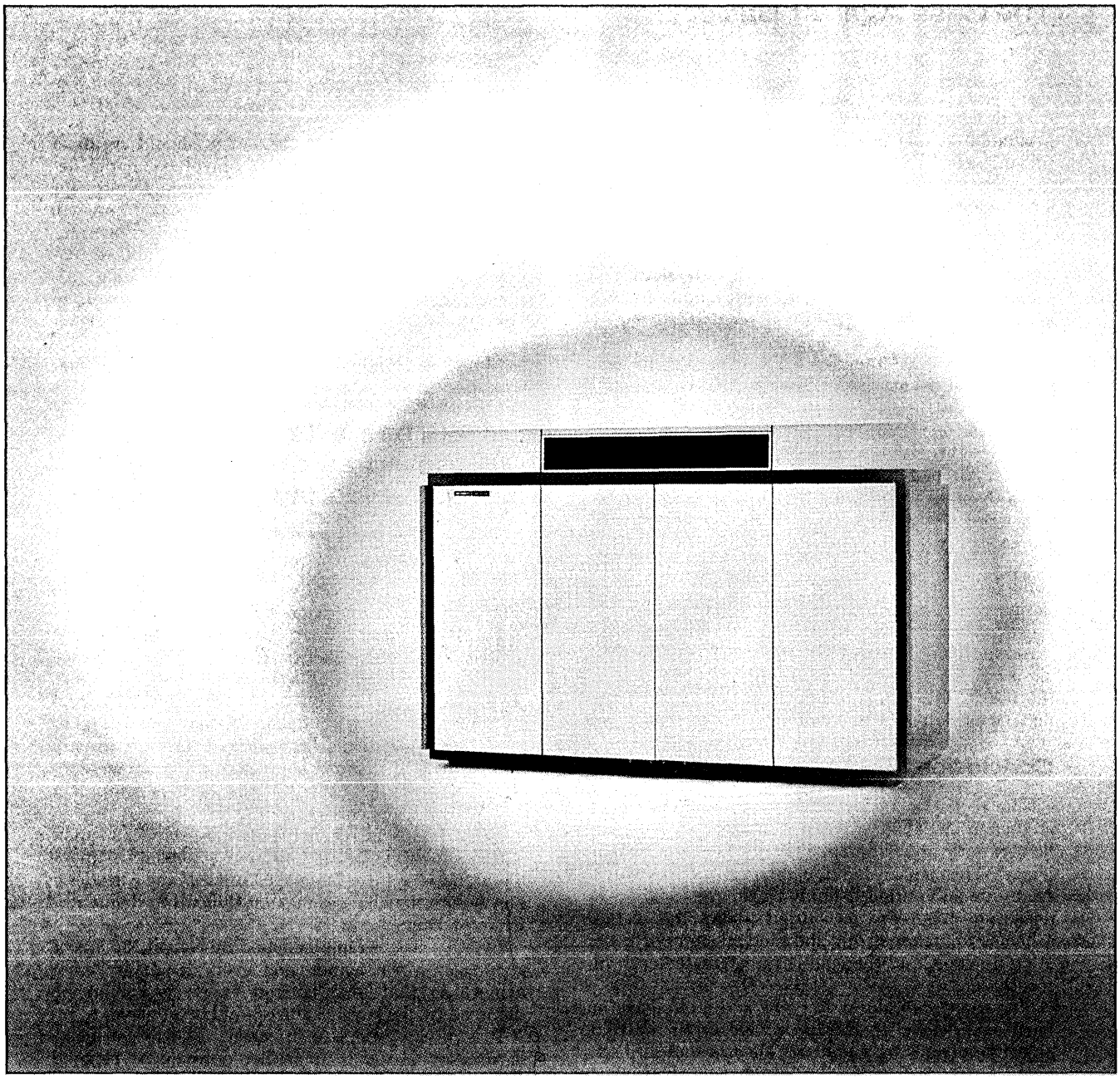
Fifth, let us all urge the various standardization entities to drop the rhetoric and procedural squabbling and recognize languages suitable for consideration *before* the changes make it difficult to define just what the language is.

Finally, the idea implemented by Calvin Mooers of copyrighting the name (and every language has a name!) so that unauthorized abortions cannot be dignified by the family name should be pursued.

It is already too late for BASIC. The formal standardization channels are either dormant or clogged with rhetoric with no objective. But, it may be time to protect some other languages, most notably PL/I (touch-and-go at the moment) and APL. ■



Mr. Ogdin is an independent consultant based in Washington, D.C. In fourteen years he has accumulated a diverse background in systems programming and delevopment, and has experience with real-time, time-sharing, and communications-oriented systems, as well as with computer language processors. Mr. Ogdin conducts a public seminar on "Compiler Writing Techniques" each month for the Institute for Advanced Technology of Control Data Corp.



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The EDUCOM Spring Conference

Computing in Higher Education

Most academic administrators with responsibility, direct or indirect, for computing have one top priority thought in common: where is the money going to come from? EDUCOM (the Interuniversity Communications Council) captured this interest (and more than 300 attendees) in a one-day conference on financing and organizing computing in higher education. The conference was held in Philadelphia with the cooperation of the University City Science Center on April 29.

Martin Greenberger of Johns Hopkins Univ., the chairman of the conference, stated the theme of the meeting in his opening talk. He reviewed the phenomenal growth of computer use in colleges and universities and the way in which this was encouraged and assisted by generous manufacturer discounts and liberal government grants. The discounts and the grants are gone; the market for computing among students, faculty, research, and administrative personnel continues to grow. Greenberger suggested that computing in higher education must undergo a radical change to face this new environment; the possible forms the transformation might take was left to the day's activities to disclose.

Some suggestions came from the other speakers in the morning session, the general title of which was "The Problem and Some Possible Solutions." Robert Mautz, chancellor of the state university system of Florida, presented the Florida plan for replacing campus-centered computers with a single integrated system for all nine of the state institutions of higher education. The plan is to replace all of the computers (except a few small special-purpose machines) with one or two large centers (with machines on the order of the 370/165) for research and instruction, and four regional data centers (370/145) for administrative purposes. This plan, Mautz suggested, will result in greater capacity for all users, a saving of $1.8 million in hardware costs, and a similar saving in personnel and ancillary costs. The only question is "whether pride and possessiveness will prevail over logic and economics."

John Hrones, provost of Case-Western Reserve Univ., presented another radical departure from the on-campus computer. Case-Western decided in 1968 to purchase all its computing from an off-campus commercial organization—and proceeded to set up the commercial corporation (the Chi Corp.) which would satisfy its requirements. With the university as its first and major customer, Chi was able to finance a substantial operation (built around an 1108). It now has several additional academic customers and about 150 nonacademic customers. Hrones allowed that the management problems of the first few years were considerable and greater than had been anticipated. But the corporation now appears viable and the idea looks like a valuable alternative to the university with more appetite for computing than budget.

The afternoon sessions consisted of a dozen parallel meetings which allowed the attendees more freedom to ask questions and discuss the issues. The topics of these sessions covered a broad spectrum of interests but most of the meetings were faithful to the theme: how can we save enough money to pay for what we need? And the answer, so far as there is an answer, seemed to be in terms of what was once a dirty word in academic circles: management. Better management of existing resources, innovative management techniques, management at a higher level.

Besides the radical departures of the Florida and Case-Western systems, attendees were invited to consider the possibilities of regional centers for academic users, the idea of national networks, and campus centers with off-campus customers.

Better management of existing resources was the theme of discussion sessions on Campus Centralization, Administrative Systems, Management Control, and Central Computing. The plight of the large university computer center was considered at length: hardware was acquired for expected future growth; costs are fixed or rising; income from research users has decreased markedly; the squeeze is on general university funds from all directions. No easy answers were proposed to this problem: further consolidation and centralization and better service to users, so as to route the maximum number of dollars into the deficit-burdened center. And better management techniques of pricing, accounting, amortization, planning.

After discussing the problem in smaller groups, the participants met in a final general session at which "The Role of Federal Government" was discussed by representatives of three key government agencies: Raymond Bisplinghoff of NSF, William Niskanen of the Office of Management and Budget, and John Mays of the Office of Science and Technology.

The university's computer problem, Niskanen said, is one of "overinvestment and undermanagement." Computing, all three speakers agreed, is no longer a "special case" when it comes to government funding. It will get funds if it is needed to support specific educational and research objectives; there will be no funds any longer for computing as a thing apart. The government will support projects directed toward important and meaningful goals. Computing is just one recourse among many which can be applied to these goals.

The message of the government session was interpreted by one disheartened administrator, as he pulled on his coat, to be, "Yes, we pushed you overboard, but we didn't shove you under. Why aren't you grateful?" Most of the attendees left the meeting convinced that a change is certainly taking place; and that the best thing to do is to go back home and learn how to swim.

—Charles J. Mosmann

A Churl's Garden of Verse

A sly old coder of Stimper
On his deathbed said with a simper,
"I shall relinquish life's station
With graceful degradation
And not with a bang or a whimper."

Wailed a CE down in Eau Claire,
"This Kludge I can never repair.
Its mean time to fail
Is of little avail
Since it's less than its time to repair."

A digital gourmet of the Ritz
Said, "My new menu will give them all fits—
Card Jam and Tape Punch,
Time Slices to munch,
Gibson Mix and Binary Bits."

Said a data compressor whose job
With the Library of Congress played hob,
"I've reduced all of it
Down to one bit
Which I carry around on my fob."

Said an X3 stalwart of Nancy,
"They'd garner more folk than they fancy
If they'd play their own game
And stick with one name,
Be it ASA, USASI, or ANSI."

Mused a linguist of wide reputation
After moments of rapt contemplation
Of naughty graffiti
On the walks of his city,
"One might call it Polish Notation."

A programmer down in Moline
Said, "I'm the match for any machine.
My secret's aversion
To loops and recursion—
Just acres of in-line routine."

—William J. Wilson

"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 PROGNAME
NO RECORDS
NO UPDATE
NOT IN JOBFILE
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:

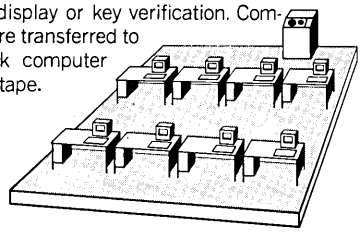
Our 125-character display screen does a lot more than provide a visual check on the operator's work. If she makes an error in procedure it tells her exactly what is wrong. Gives her the status of the job at any time. Issues instructions. Lets her resume work quickly and accurately after an interruption.

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, Birsigstrasse 4, 4000 Basel. Switzerland.

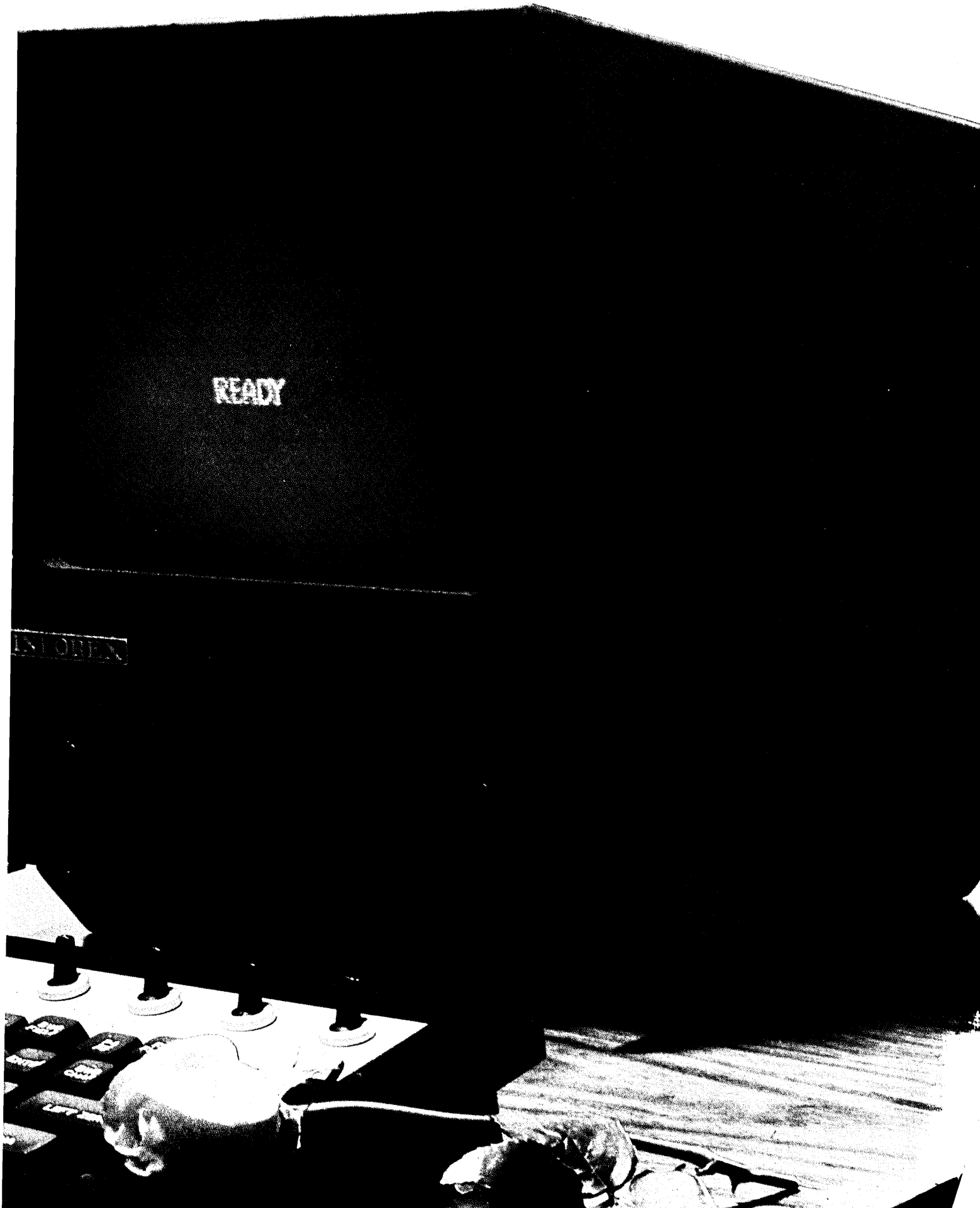
EIGHT KEYSTATION SYSTEM FOR $120 A MONTH PER STATION

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

PERSPECTIVE

an interpretive review of significant developments

A row of 370/145 systems is shown undergoing final checkout at the manufacturing facility in Endicott, N.Y.

It Takes One to Build One: IBM Has Great Success Using Its Own Systems

If there is one overriding impression left with a visitor to IBM's largest manufacturing facility in Endicott, N.Y., it is the magnificent ways these people have found to use the very machines they build. Perhaps no one knows better how to use tools than the tools' maker. Nearly every manufacturing step necessary to build the 370/145; the 360 models 22, 25, and 30; the 1403 and 3211 printers; banking systems (MICR sorters among other gear); numerous models of serial printers, including the 2222, 2213, 3215, and 5213; and all circuit packaging of SLT (Solid Logic Technology, like that used in the 360 line) and MST (Monolithic Systems Technology for the 370 equipment) is under the watchful eye of 1130s, 360/30s, or a large 360/50.

The 512K model 50 is kept busy (85% cpu utilization, according to IBM) collecting production information from an extensive 2790 data communications network located throughout the production areas, while simultaneously monitoring process variables such as oven temperatures in the epoxy lamination stage of circuit board production, scheduling and tracking orders and other production control functions, establishing priorities and identifying orders requiring special attention, supplying test data and analyzing test results on various pieces of gear, scheduling rework operations, etc.

Saving Paper

Additionally, the 50 finds enough time to supply 500 million bytes of n/c data to 48 machine tools every 24 hours. It would take a paper tape stretching from Endicott to San Francisco to accommodate that much information. Needless to say, the 50 is so vital to Endicott operations that there is another 50 right beside it to take up the load if the on-line system goes down — which it hasn't yet, IBM says. The off-line system is used to thoroughly check out program changes or additions to insure that the on-line system won't go down.

Ever Onward

"We're always finding new things to do with the system — it's no more finished than New York is," says Bill Jones, superintendent of processing systems at Endicott. He might have chosen better words to describe the impressive system credited with getting the 370/145 and 360/22 out the door ahead of schedule. The system also is credited with reducing the number of production expediters by some 30% since the location of assemblies and status of parts is always available by inquiring at one of the numerous terminals in the plant.

Adds Frank Paul, general manager of the Endicott installation: "Salesmen who have seen the system would love to get their hands on it, but we're not about to let them have it." Salesmen seem to be running Armonk more and more lately, however, and there is the possibility that Endicott's on-line, real-time production system might find itself in some other large manufacturer's production facility some time in the future.

— M. W. Cashman

Dollars Lend Muscle as ITEL Presses "Hot Buttons"

ITEL Corp. is pushing hard on the "hot buttons" of the industry: IBM-compatible (or interfaceable) peripherals, and computer leasing. In June the San Francisco firm completed a convertible debenture issue and raised $20 million. Most of this will go to support its rental base as it enters the end-user market with disc drives, including the 3100 drive announced in June and the IBM 3330-compatible system which it expects to deliver at the end of 1972.

The firm also has a $50-75 million line of credit, and with the debenture funds, says ITEL president Peter Redfield, it is adequately financed to produce $200-250 million worth of equipment.

ITEL is a disc drive manufacturer by virtue of its 1971 purchase of Information Storage Systems, Inc., a 1,000-man firm that has been Telex Corp.'s oem supplier. And it is in a position not enjoyed by most of its independent competitors. Started by

Fund American Companies as a leasing company called SSI Computer Corp. in 1967, ITEL now has the revenues and the customer base accruing from $200 million of 360 systems on lease — plus the established lines of credit that came with the leasing development.

American Express, which bought Fund American, now owns 42% of ITEL; the bank that holds more than $100 million in ITEL notes is the giant Bank of America. It does not appear ITEL will flounder for lack of backing.

Certainly, IBM's recent big price cuts across its peripheral line have impacted the independent manufacturers, and, to a lesser degree the leasing firms. And ITEL's new entry into the end-user peripheral market, with all the overhead that it entails, and the very possible end to the relationship with Telex, which has accounted for more than $35 million in ISS sales, means a period of decreased revenues during the cutover.

At writing, the Telex-ISS relationship had not been resolved. Telex has exclusive marketing rights on the IBM 2314-type drives made by ISS until the end of 1972 as long as it buys agreed-on quantities. But the question is whether Telex will use ITEL products to fill all its remaining backlog, try to arrange some future marketing agreement, or sever ties with its new competitor.

In an interview, Redfield, formerly with Transamerica's leasing operation and McKinsey & Co., expressed great confidence in the passel of ex-IBMers that make up its marketing force.

"Leasing is a target IBM has much difficulty shooting at," says Redfield. "No two contracts are alike, but are tailored to meet the needs of the user."

And that is how ITEL plans to sell peripherals — the special package deals that many financial analysts claim will be necessary to combat IBM. For example, ITEL plans to battle the lag time between IBM's 3330 disc drive deliveries and ITEL's with this offer: If the 3330 customer will sign a letter of intent with ITEL and take a monthly rental on the IBM unit, ITEL will pay the difference between rental and the IBM long-term lease until it can deliver.

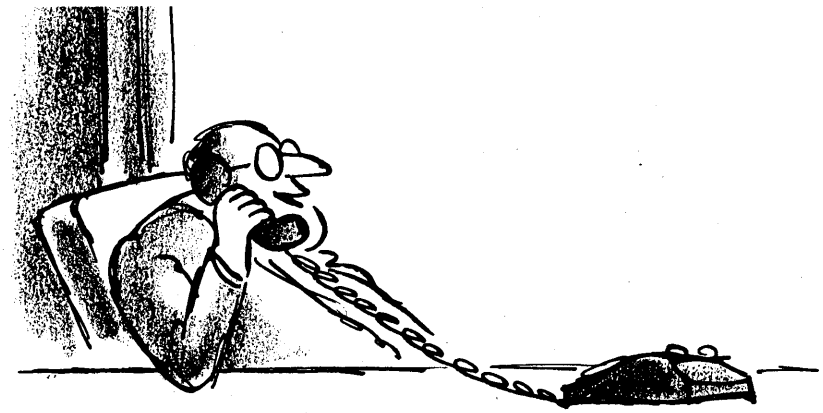
Redfield also said the firm won't try to be plug compatible in all its products, noting that the interfaceable 3100 can be installed on a 360 within eight hours. "We can't wait for IBM to make the moves."

ITEL says the IBM price cuts have not impacted its leasing contracts, since their total systems are still cheaper than IBM's. Currently, the firm claims, it is having no difficulty re-leasing its 360s to new customers. The rates are "better than forecast," 10% less than the rate on the first leases (most lessors ran 10-20% less than IBM on their first leases). So far, $30 million worth has been relocated, much of it winning out over IBM 370s. Redfield noted ITEL has not had more than $500,000 worth off lease at any one time.

ITEL is interested in buying 370s for full-payout leases, but leasing will be of declining company emphasis. Gross revenues will decline from the firm's $42 million in 1970 as rates come down, although interest payments also will go down. Redfield noted that currently the 360/65s are the subject of a price war because of "some outfit in Texas" which had several 65s headed for the warehouse. By contrast, earlier this year ITEL leased a 65 cpu to Merrill Lynch for 93% of original rental. He expects rates on 40s and 50s will start to dip as the 370/145s are delivered in larger quantities. While ITEL does not plan to "alter the guts" of the 360s to make them technically more competitive with the 370, it is already offering product alternatives and enhancements: cheaper add-on memory from Advanced Memory Systems, bulk core from other suppliers, and its own disc drives. The way the industry is "leapfrogging," said Redfield, ITEL could some day manufacture main memories itself, but it has no plans to make computers.

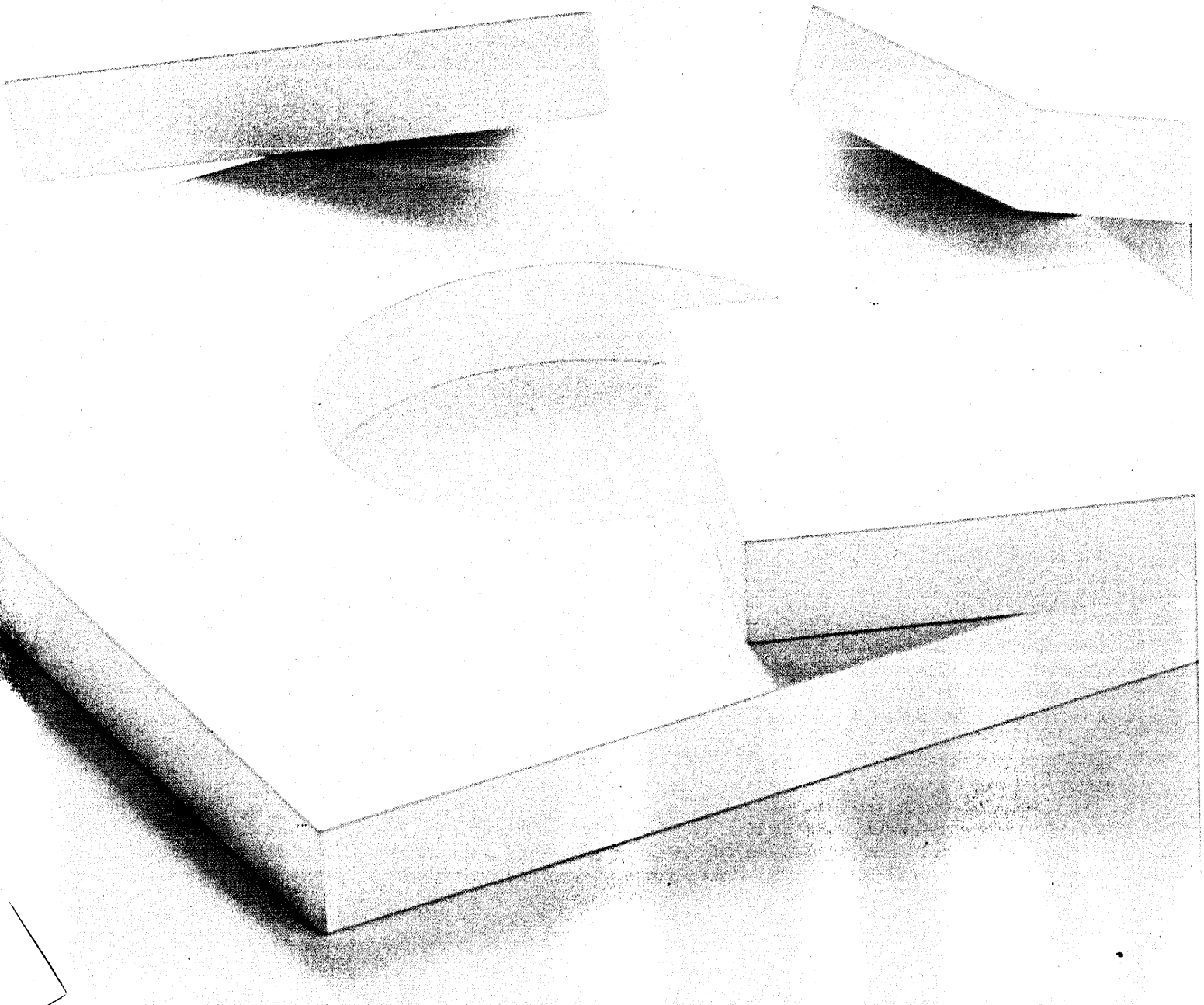
ITEL is a 2,400-man firm, and leasing and disc drive production are not its only activities. Leasing accounted for 46% and disc drives for 26% of the $91.6 million (combined revenues) in 1970. But ITEL's data handling and terminal products inherited through the 1970 acquisition of Intercontinental Systems, Inc., (the old Dura line) accounted for $11 million. More than $8 million was grossed by its transportation leasing division which has three subsidiaries leasing or providing financial services for lease of trucks, containers, airplanes, box cars, etc.; and $4 million was grossed by the Data Services Div. which developed when Service Center Statistics for Management Data Processing Corp. merged with SSI Computer to form ITEL. This group, with more than 200 employees, provides accounting services via two 360/40s, and it has recently purchased a small time-sharing company, World Wide Time-Sharing, Inc., Chicago, which specializes in small business services — a harbinger of things to come. It also has an interest and option in Diablo, Inc., which makes disc drives for minicomputers.

— Angeline Pantages



"Oh, yes, our president is quite pleased with the contract and the board has approved it. The lawyers have gone over it and right now it's at our astrologer's."

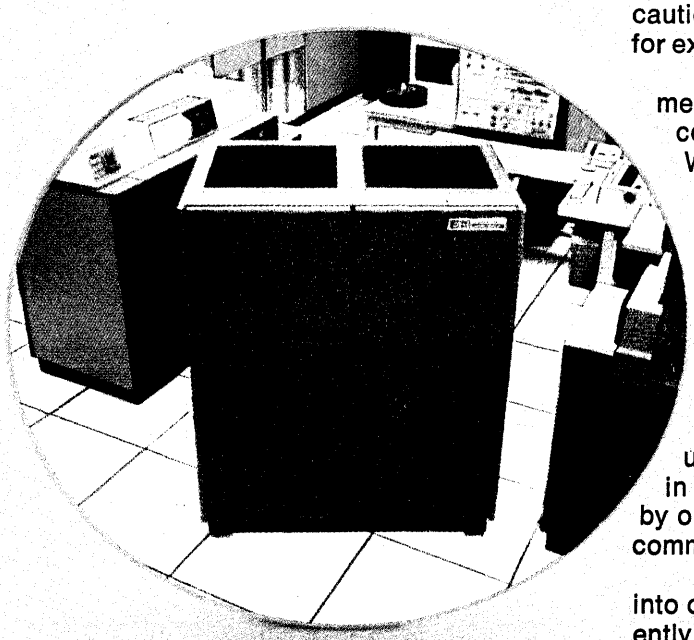
Compatible.



We took the word just a little more seriously.

For years you've heard and read about plug-to-plug IBM-compatible core storage memories. You've been told to buy or lease more core storage instead of going to a new system. You've been told that all it takes is a big box full of core with a connector that you plug into your central processing unit. You double or triple your memory capacity. Your system keeps humming along without interruption. And there are no painful conversion problems or costs.

If it were really that simple,



you'd have done it by now.

But expansion storage memories aren't the solution to every system throughput problem. If it appears that they *will* solve your problem, then you still face two complex decisions:

Evaluating the best design. And selecting the best resource.

So what makes Electronic Memories a preferred resource for IBM-compatible memories?

The reasons we're a preferred resource are the same reasons it took us so long to bring out a full line of compatible memories.

We have more to lose than the others.

Electronic Memories & Magnetics Corporation does a sales volume of approximately $100 million annually; most of it in the computer industry. With this product line, we risk that entire reputation. And we don't do that lightly.

We're one of the largest independent manufacturers of cores. And core arrays. And core stacks. And core systems. Our customers include virtually all of the high speed main frame computer manufacturers. We process core products in our own facilities around the world. And as a disk pack manufacturer, we've established sales and service to over 2,000 data processing centers.

All that experience makes us very cautious. About a word like "compatible" for example.

What makes our compatible memories different from all the other compatible memories?

We've designed a unique "buffer box" that protects your central processing unit by isolating its circuitry from our memory in every way — except for data transfer. In no way do we violate existing hardware.

To us, that's true "compatibility."

We're equally cautious about the word "reliable."

So our compatible memories use our own Nanomemory 4850...proven in years of telecommunications work by one of the world's largest communications firms.

And we built a self-testing capability into our memories which operates independently of the central processing unit. System performance interruptions are minimized.

All these features are worth considering. But...

Perhaps the most important reason for considering us is the fact that an Electronic Memories memory is completely designed and built by Electronic Memories. We make the core. We build the stacks. We assemble and test the complete system. We sell. We lease. And we take full responsibility for installation and for continuing service.

Let's hear from you. We think you'll find it refreshing to discuss compatible memories with the people who took a little longer — because we took the word a little more seriously.

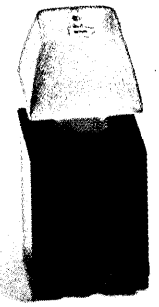
Compatible Core Storage Memories built by Electronic Memories.

EMM

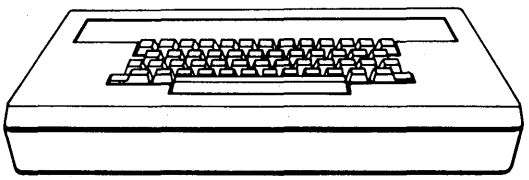
COMPUTER PRODUCTS DIVISION of Electronic Memories & Magnetics Corp. • 3435 Wilshire Blvd. • Los Angeles, CA 90005 • (213) 380-1111

CIRCLE 50 ON READER CARD

We've formed a small movement to eliminate keyboard downtime.



The only moving mechanical parts of our keyboard are the plungers. And they barely travel 3/16 of an inch.



Everything else is all solid state. So there's no need for mechanical linkages, electromechanical parts, contacts or any of the moving parts that normally wear out and result in expensive downtime.

The reliability of our all solid state keyboards will play an important role in helping you beat the economics of downtime. Especially during critical operating periods.

But if you ever do need application assistance, experienced MICRO SWITCH field engineers are standing by to provide the back-up help you'll need to solve your individual problems.

MICRO SWITCH can supply all standard and custom key arrays. Each with the same touch and spacing as a regular keyboard.

Let's get together and discuss keyboard reliability or any other part of the business you consider important. Dollars. Technology. Compatibility. Delivery. They're all important to us. Call or write us and see.

MICRO SWITCH
FREEPORT, ILLINOIS 61032
A DIVISION OF HONEYWELL

NEWS SCENE

Potter Asks NY Court for Another IBM Price Boost

July 28, IBM snatched back about half the systems savings users thought they would receive as a result of the May 27 changes in peripheral lease plans and prices. In the name of inflation, the firm announced it was raising the central processor prices for all the System/370 line, and most of the 360s; it said this would result in an average 3% increase in system costs.

Coming on the heels of the peripherals cuts, and the flattening of IBM earnings in the second quarter, the user accepted the idea, even if he didn't like it. And the computer manufacturers and leasing companies breathed a little easier. They had regained some of their pricing edge over IBM, and some could even think about raising their own prices. The peripheral makers had regained nothing, however.

July 29, one peripheral maker, Potter Instrument Co., did make a move to force IBM to withdraw almost all the cost savings on peripherals. In the Supreme Court of the State of New York, Nassau County, it sued IBM for antitrust violations under New York's Donnelly Act. According to Potter, the action "seeks to declare that IBM's new fixed-term one- and two-year leases applicable to certain types of peripheral equipment are against public policy, illegal, and void ... " and asks for "injunctive relief permanently and during the pendency of the action."

While the action was drawn up before the IBM price increases on cpu's, Potter does feel that the reason IBM gave for that move — rising costs — adds fuel to its contention: the giant could only have changed peripheral policies to "restrain growing competition" and is "anticompetitive and monopolistic."

Consultants contacted about the price change did note that IBM "could afford to hike the processor costs since the unit is not as vulnerable to competition." And certainly one effect of the various IBM moves recently is to change the peripheral-cpu price ratios.

Specifically, IBM is raising rental by 4% for the cpu's of the 360/30, 40, 50, 65, 67, and 75. Maintenance on the cpu's (purchased) goes up 20%. For the 370 line, both the rental and purchase of the 155 and 165, not including memory, go up 8%. Each of the four models of the 135 and 145 that have internal memory will increase 5-8%. IBM also: hiked the rental and purchase of the 12 submodels of System/3, model 10, by 6%; increased rental of four-card I/O models; increased maintenance of five-card I/O units and four typewriter terminals by 10-25%; and decreased maintenance by 10-20% on the 2365 core system, the 2301 and 2303 drums, and the 2830 drum control unit. Increases in lease and maintenance prices take effect Nov. 1. Purchase price increases were effective immediately.

The increase in processor prices are by no means IBM's first. About five years ago, it hiked many 360 charges by 5% because of rising costs, and much of the competition followed suit. In 1968 it tried to increase maintenance across the line, but because it applied only to purchased equipment, lessors and owners protested and IBM rescinded the move. In 1969, for unbundling its services, IBM cut 360 prices by 3% — strangely similar to the average increase of its latest move. No one can recall anything similar to the current juggling of price increases and decreases — rapidly becoming known as IBM's "Jekyll-Hyde strategy" — only some say because there's never been such competition, such an economy, and such a legal entanglement.

Honeywell Head Hails Honey of a Honeymoon

"The worst is over," said Honeywell's C. W. Spangle one recent hot summer day in the middle of discussing the merger of General Electric's and Honeywell's computer operations.

At the worst, however, "the worst" wasn't bad. In fact, it was pretty good. In spite of a U.S. economy that sagged

C. W. SPANGLE: The worst was pretty good.

during late 1970, revenue of Honeywell's computer subsidiary, Honeywell Information Systems, was 13% higher than the combined 1969 revenues of the two separate units. Further, Honeywell officials have indicated that revenues continued to gain during the first six months of 1971 and that the outlook for the last six months of the year is even brighter. No one at HIS is willing to go out on a limb and predict that the computer company will crack the $1 billion annual revenue mark this year, but HIS will surely be pushing that figure, if it doesn't actually surpass it. Combined revenues in 1970 were $859 million.

As executive vice president and the chief operating officer of HIS, "Clancy" Spangle is the first to admit that the past 15 months or so — since May of 1970 when the merger was announced — have not been easy.

"Our sales force was hit with a lot," said Spangle. "But now the marketing force is clicking along like it used to before the merger." HIS' marketing force faced a two-fold challenge as a result of the merger: Not only did the marketing people from two separate companies have to be integrated into one unit, but Honeywell decided to consolidate all its separate computer functions in one unit. This led to some inevitable problems.

Data entry salesmen and minicomputer marketeers, for instance, found that there was more emphasis on large mainframe systems. Spangle concedes there were some initial dif-

ficulties along this line, but he says that the various marketing offices have retained some specialization by accounts and, also, by products. "One thing we found out is that a good salesman of small and medium systems can sell big systems, too," he said.

On the subject of big systems, Spangle said that the sales of HIS' new large-scale computer series — the 6000 line — "have exceeded our most optimistic projections." HIS has been adding to the labor force at Phoenix — where the 6000 line is manufactured — to accommodate 6000 orders, and customer interest in the new series has been high enough to warrant Honeywell acquiring a new plane to fly prospective customers to Phoenix.

At first glance, the HIS product line as marketed in the U.S. — from the small Mod 58 to the large-scale 6000 series — would appear to be a crazy-quilt pattern of incompatible machines. Not so, says Spangle.

"It's not necessarily a nice tidy line," he says. "The important thing, though, is that we have a solution for practically everyone, and as our users have come to realize this, the problem goes away for them." Spangle observed that more than a dozen users of Honeywell's 200 line have found ways to convert to 6000 machines.

Spangle uses the example of the users moving from the 200 series to the 6000 series to illustrate "the synergism" of the merger. ("These were accounts that GE wouldn't have landed on its own, and these were accounts that Honeywell would have lost.")

Smooth conversions from line to line have been achieved often through COBOL. The 58, for instance, is offered with a mini COBOL program, and the 200 users who are moving to 6000 machines are converting via COBOL. Other conversion systems exist for moving users from the 400 line to the 600 line and from the Gamma 10 to the Gamma 100. HIS is also offering common peripherals — tape drives, displays, disc drives, etc. — for all its lines, and this measure, says Spangle, helps to standardize and smooth off the overall product line.

Spangle said about 80% of HIS business is coming from existing accounts, while 20% is coming from new accounts, with most of the latter being picked up by new applications offered by the firm.

Prior to the merger, Spangle had been optimistic about the two computer companies complementing one another and, after 15 months of living with the merger, he is even more bullish about this. As examples, he noted that GE's work with read-only memories was far advanced over Honeywell's, while Honeywell's expertise in low-cost mass production methods was superior to GE's. And, as had been widely noted at the time of the merger, the two companies' lines tended to mesh nicely, with Honeywell's strength lying in medium systems and GE's best markets being in small and large systems.

At the time of the merger, there were some 50,000 persons employed in the Honeywell and GE computer units. The figure is now at about 47,000. The drop includes "redundancies" directly traceable to the merger of two companies and layoffs brought about by the economic recession in the U.S., as well as normal attrition (resignations, retirements, etc.).

Spangle also expressed enthusiasm for the performance of Honeywell-Bull, HIS' European-based computer operation. "Many people felt we were buying a big headache with Bull," said Spangle. "Yet Bull has been more profitable than the rest of our computer business."

A few months ago, Bull reported a 35% jump in its pre-tax revenue. French accounting methods differ greatly from those in the U.S. so it was not possible to obtain an accurate comparison, but the figures do represent at least a ballpark indication of Bull's performance. In addition, Bull's Mod 58 is being marketed in the U.S. and, although it is off to a slow start, Spangle expects sales of the 58 to pick up sharply as the small machine's special support center network swings into full operation.

Though in DEC's Shadow, Old CCC Is Still Alive

"The reports of my death are greatly exaggerated." Mark Twain, of course, said that, but the statement is also applicable to Honeywell's former Computer Control Div., which, among other things, has been responsible for Honeywell's minicomputer design and production.

In a recent interview, C.W.Spangle, HIS chief executive officer, left no doubt that the Computer Control unit — now meshed into HIS via the Systems Components operation — is not only alive but that Honeywell remains deeply committed to the minicomputer business. "Our minicomputer business is still good," he says. "We're still the second largest supplier of minis."

The largest supplier is Digital Equipment Corp., and therein lies this tale. Before Honeywell acquired the Computer Control Corp. (CCC) of Framingham, Mass., in 1966, CCC had a higher annual sales volume than DEC. Yet DEC moved ahead to capture an estimated 60% of the mini market while the Computer Control unit dropped back with an estimated 10%.

The operation remained more or less autonomous with former CCC executives running the minicomputer unit. One early head of CCC, Ben Kessell, was said to have been one of Honeywell's largest stockholders, perhaps even the largest. In recent months, rumors — prompted in part by a series of developments — began to circulate that the unit might be phased out by Honeywell.

First, Neil N. D. Morrison, the crack production man at Honeywell, was brought back from Europe to get the unit's production lines humming and then resigned as vice president of operations. He was followed by the unit's chief operating officer, T. Paul Bothwell and Bothwell's resignation, in turn, was followed by the resignation of the top marketing man, Timothy C. Cronin. The rumblings were intensified when the unit closed plants in Marlboro, Mass., and Peterboro, N.H. The Marlboro plant was a machine shop, while the Peterboro facility manufactured modules and memories.

Honeywell does not break out profit-and-loss statements on its vari-

ous individual units, so it was not possible to obtain precise financial figures on the operation. Spangle indicated, however, that the profitability of the operation "hasn't been very good," although he said Honeywell has not been dissatisfied with the volume there.

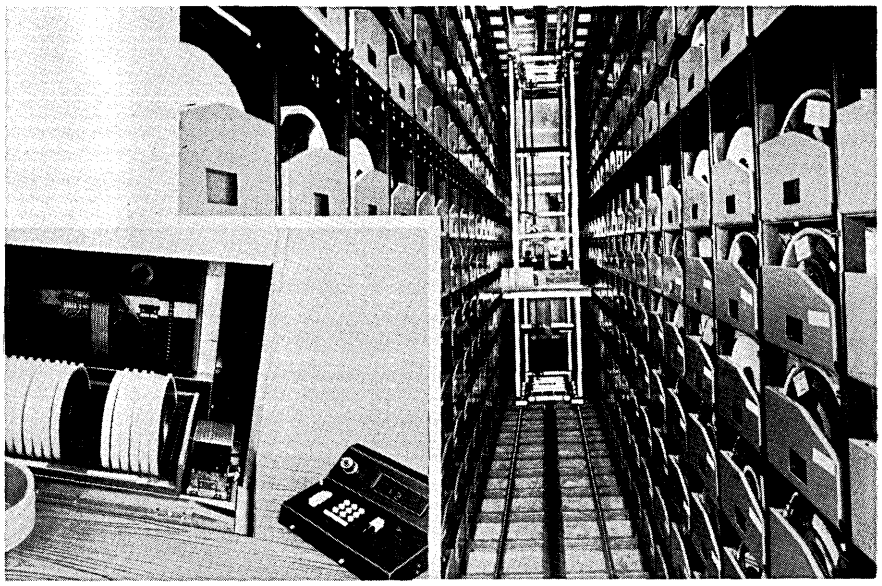
"We're continuing to put development funds into it," said Spangle. "We'll be doing more systems work there and less oem business. And we are going after blue chip customers." Honeywell supplies many minicomputers to its own in-house automation, process control, and computer operations.

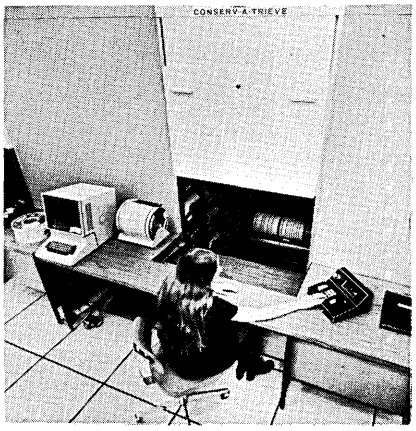
As for products, a Honeywell spokesman says that the minicomputer unit is working on new products, but he declines to release any specifics. Although some development projects have been dropped in recent months, it was learned that Honeywell has high hopes for a product now called the X-13. It is understood to be a 16-bit minicomputer, and although it would probably impact some of the 16-bit machines Honeywell currently is marketing, it is designed to strengthen the firm's position in the mini market.

Trans-A-File Gets First Order—for Lovely $600K

Trans-A-File Systems Co., one-and-a-half-year-old infant of giant parents Transamerica Corp. and The Singer Co., has landed its first order for the all-digital Trans-A-File storage and retrieval system.

Announced early last year (*Datamation,* Feb., 1970, p. 203), the system found a home with Colonial Penn Group Data Corp., the data processing subsidiary of Colonial Penn's insurance operations, Philadelphia. The customer is a newcomer among insurance outfits, started in 1966, and has a novel approach to the business. Instead of playing the averages and tossing out the older people who have the nerve to file a claim, Colonial Penn takes the opposite tack and only insures those over 55. This approach was good for $86.5 million in sales last year, up 25% from the year before. They started out with health and accident insurance to supplement





Medicare, added auto coverage for the oldsters, and have now cagily gone into the package tour business. Their customers have the time.

Maybe this attitude of being willing to try new things helps account for their being a Trans-A-File pioneer. It's a novel system, controlled by a PDP-15, and able to store document images in digital form — retrieving them in a variety of media depending on the customers' needs. The Colonial Penn version, at $600,000, has eight photodiode scanners, three high-density tape drives, and two Gould electrostatic printers. The drives, made by International Video Corp., are helical-scan units with one-megabit-per-square-inch packing density and a transfer rate of 10 megabits per second.

The sale should bolster the faith of the parent companies as the offspring gets deeper into the fray with Ampex's Videofile, a better-established product fitting the same kinds of applications.

Automated Library Handles 58K Reels

It cost AT&T $130,000 to do it, but they've made space for 58,500 tape reels in a room that formerly held only 30,000, and retrieval has been automated as well, at a large New Jersey computer center whose location was not disclosed. Whereas clerks once walked and climbed among 214 racks of 7 tiers each, they now sit at work stations and push buttons, causing reels to be mechanically fetched and conveyed to an aperture at each work station. Reels are similarly replaced on the appropriate rack when not needed. The system is called Conserv-a-Thrieve and is built by Supreme Equipment & Systems Corp., Brooklyn. Prices start at $25,000.

EDP in California: A Wart on the Wrinkle

A three-year wrangle over who controls California's $80 million-per-year edp operations took a new turn last month as weary state legislators, winding up what probably will be the longest legislative session in the state's history, appeared to be about to pass the newest in a long succession of edp-related bills put before them.

Protagonists in the wrangle have been the Administration and the Legislature, and this bill looks like it might satisfy both. It hands the problem over to a new California Informa-

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tion Systems Implementation Committee made up of three representatives each from both sides. The bill charges the committee with responsibility for developing a plan for the state's edp operations by Feb. 1, 1972, when the legislature will convene for its next session. The committee would have to "develop an organization structure within state government which will (a) provide for the implementation of the accepted policies, existing plans, and recommendations of the committee and (b) encourage, accommodate, and accomplish the utilization of appropriate electronic data processing technology in meeting the state's information requirements." This has been interpreted by many as opening the door to creation of a separate department of data processing in the state which would own all state edp equipment, as has been advocated by the state's legislative analyst and in a now-dormant Senate bill.

Such a department would replace the now-defunct Office of Management Services (Aug. 15, p. 39). In the meantime, responsibility for the control and service of the state's edp operations is in the hands of the Dept. of Finance. At this writing the state's Personnel Board had just created a new civil service position within this department — Chairman, EDP Control — open to applicants in and out of state government. It was generally assumed the post would be filled from "the private sector," as requirements were for a person with management experience in a large, multicomputer complex in a decentralized environment. It also was assumed whoever gets the job will carry on in whatever body is created through the proposed committee's recommendations and subsequent legislative action.

Put in Your Quarter; Enter Your Program

Two bits may not buy a shave and a haircut any more, but it can buy two and one-half minutes of computing time.

You can get it in Monterey, Calif., from 9 a.m. to 9 p.m. Monday through Friday, from 9 a.m. to 6 p.m. on Saturday, and from 1 p.m. to 5 p.m. on Sunday. What has been billed as "the nation's first self-service, coin-operated computer" has been installed in the Monterey City Public Library.

Actually, the machine, an HP-9100A, is listed by its manufacturer, Hewlett-Packard, as a calculator. But J. B. Flippin who, as one-man Computer Rental Service, installed it says its internal memory and stored program capability make it a desk-top computer, and even the experts are saying of late that the distinction between programmable calculators and minicomputers is narrowing. The library unit's programmable memory can hold up to 196 instructions. Output is via crt which displays three registers. It was designed for scientific and engineering work and is capable of computing the full range of trigonometric functions.

Operation and programming are simple, says Flippin, as there is no programming language to learn. A user enters his program through either the keyboard, magnetic card reader, or an attached HP-9160 marked card reader.

He says typical users would be professional engineers, surveyors, and students. Himself a free-lance electronic engineer, Flippin got the idea for coin-operated unit when he was given an opportunity to work some problems on a 9100A and began to wish he had one. He talked to others who felt the same, he said. He declined to say in mid-summer how many quarters he'd gleaned from the machine since its installation on June 16 but did note that use had been "slow." He felt it would pick up with the start of school, as the library is right across the street from Monterey High School.

A user who knows how long his problem will take can pump the necessary number of quarters in at the outset. For those who don't, a red light appears when less than 60 seconds remain, allowing time for insertion of an additional coin.

Flippin said purchase and installation of the machine cost him $5,000, which means it will have to be used 50,000 minutes, or 813 hours, before it begins to pay off. He said the library installation is in a "consumer test period" which will last through December. His big problem initially: "Nobody believes it."

IBM Phases Out Work on Showcase TSS Effort

IBM has virtually given up on its showcase effort in time-sharing — TSS/360. This fall it will cease to implement new product functions for the program.

The multimillion dollar effort, first announced in 1965, never attracted more than a few customers, and has to rank along with IBM's STRETCH program as one of the computer colossus' least successful programs.

IBM declined to give a cost for development of TSS, saying it is a policy of the company not to discuss such matters. However, several persons close to the program said that a $100 million development cost would not be an unreasonable figure.

At one time, IBM had more than 400 persons committed to writing software for TSS, and one man close to the project estimated that IBM spent more than 2,000 man-years developing software for TSS. The large-scale time-sharing program was designed for use with the model 67, a machine that employs virtual memory.

"The basic conception of TSS was all wrong," said one man who worked with TSS. "It tried to be all things to all computer people, but it ended up being too little to too few."

As for IBM, a company spokesman said that the firm continues to offer and maintain TSS and he noted that TSS release 8.1 will be available in the fall. When asked about the statement that TSS had attracted "just a few" customers, the IBM spokesman said the statement seemed to be about right.

Although TSS had barely more than a handful of customers, the model 67 sold fairly well. IBM declined to give the number of 67s that have found their way to customers, but reliable industry sources placed the figure at around 60. Originally, the 67 was to have been supported by just TSS, and many within IBM thought the firm would be lucky to deliver 40 67s.

However, the machine was largely saved by a program called CP-67 (for Control Program). Developed at IBM's Cambridge (Mass.) Scientific Center, CP-67 employed the virtual machine concept too. Most of the 67

users are thought to be using CP-67 or variations of the program.

Originally announced in August 1965, Release 1 for the TSS program was delivered on schedule in October 1967. At first designed to receive widespread use as a commercial program, this concept was all but eliminated when TSS' COBOL capability was dropped. FORTRAN became the main TSS language.

Besides virtual memory, IBM played up what it called "the slice of time" concept in TSS.

"TSS was easily IBM's biggest time-sharing development program," said one man who worked with TSS.

Pointing out that IBM offers additional time-sharing programs, he mentioned TSO, CALL/OS, Interactive Terminal Facility, and APL 370. He observed that these four programs bring time-sharing to a broad base of IBM customers.

TSS was, of course, not a total failure. Indirectly, TSS was responsible for the Mod 67, and that hardware is highly respected in the industry. Other TSS features — like its checkout system and its file structure — were considered to have functioned well.

More important, perhaps, is the fact that TSS gave IBM valuable experience with time-sharing and with virtual memory.

IBM's most widely publicized failure was the STRETCH machine, the firm's supercomputer, which was estimated to have cost IBM more than $20 million. TSS certainly cost more than $20 million, and its future appears limited to a few machines at best.

NEWS BRIEFS

ACPA Exam Takes Shape

The one-year-old Association of Computer Programmers and Analysts, which has been critical of professional certification efforts of ACM, DPMA and AFIPS, has given top priority to its own certification program which it expects to complete by the first quarter of next year. Its Professional Standards and Certification Committee formed in January, was, at this writing, reviewing sample problems submitted by six task groups. Next step will be completion of six exam segments, then integration of these into a single examination which can be completed in a reasonable time limit. ACPA hopes its test will "provide a sound standard of measure for programmers entering the profession" — a measure it says is needed because of "a woeful lack of consistency in curricula being offered today by both private edp schools and universities."

NYSE Expands BAS

The New York Stock Exchange has added American Stock Exchange issues to its Block Automation System and has instituted a teleprinting confirmation program that provides institutional subscribers with an overnight statement confirming details of their block trades executed during the day. BAS, with 206 institutional and member firm subscribers, matches buy and sell interests for blocks of 1,000 shares or more and for bonds valued at $250,000 and up, by computer. Execution takes place on the floor of the exchange in the normal manner, and execution data is transmitted within 15 hours of the close of a trading session to printers located at each subscribing institution.

Kanji I/O System

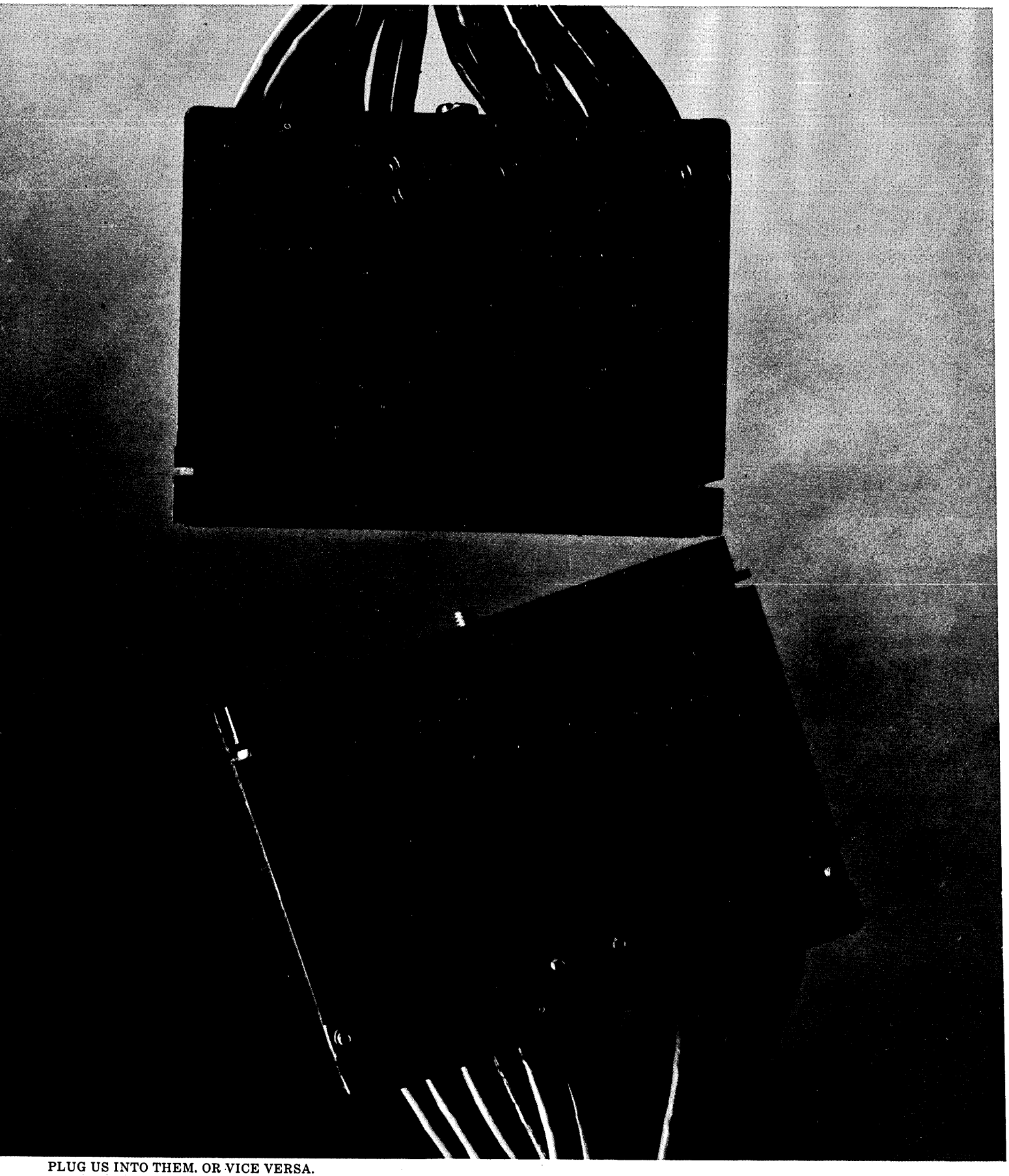
A system which can input and output Kanji has been developed by IBM Japan, Ltd., for use with 360 Models 30, 40, 50, and 65 and 370 Models 135, 145, 155, and 165. It consists of an impact printer, a Kanji keyboard attachment to the IBM 029 card punch, and a matrix character generation program package. Kanji characters are ideographs widely used in all forms of written communication in Japan and in the Chinese speaking areas of Asia. The Kanji keyboard contains 3,600 selected characters or symbols, and an additional 7,000 can be printed by use of 100 reference codes and character references. In addition to Kanji, the system can print letters in the Japanese Hiragana and Katakana alphabets, the Roman alphabet, numerals, and other symbols.

Any Offers?

Frontier Airlines last month was still trying to unload two 360/65s (June 15, p. 17) and was willing to take a loss. The company has used up two years and some months of an eight-year lease and is looking for either a sale or a lease take-over, but "based on what we see in the market" we know we are going to lose, said a company spokesman.

SHORTLINES

Price reduction is the name of the game, and IBM's not the only one playing. Peripheral Equipment Corp., Chatsworth, Calif., announced a 25% across-the-board price cut on incremental wire tape transports. Video Systems Corp., Philadelphia, reduced prices on its VST-1200 data terminals. In quantities from one to four, terminals are now priced at $1,795 compared to $2,670 ... Sycor Inc., Ann Arbor, Mich., has received new financing. North American Corp., a New York City leasing firm, agreed to purchase a minimum $12 million of Sycor terminals over the next three years. Sycor also signed an agreement with the Central National Bank of Cleveland for a $1 million line of credit ... A bank data processing cooperative, Financial Independents, has been formed by The Weiland Computer Group, Inc., of Chicago and seven banks from southern Cook County, Ill.... University Software Inc. was formed in Pittsburgh, Pa., primarily to act as broker for software written by members of the university community ... The optical character reading systems and equipment of Farrington Electronics, Inc., have been acquired by Lundy Electronics & Systems, Inc., Glen Head, N.Y.... Under a new name, Nicolet Instrument Corp., the former Fabri-Tek Instruments, Inc., of Madison, Wis., a subsidiary of Fabri-Tek Inc. of Minneapolis, has filed a registration statement with the SEC for its first public stock offering ... TRW, Inc., became the international arm of Computer Terminal Corp., San Antonio, Texas, under an agreement signed in early summer, and probably will manufacture CTC intelligent terminals and peripherals outside the U.S. under license ... Engineered Structures Corp., developer of time-sharing systems, signed an oem agreement with Xerox Data Systems for $5 million worth of XDS computers over a three-year period. ■



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How does CalComp match up with IBM?

This way.

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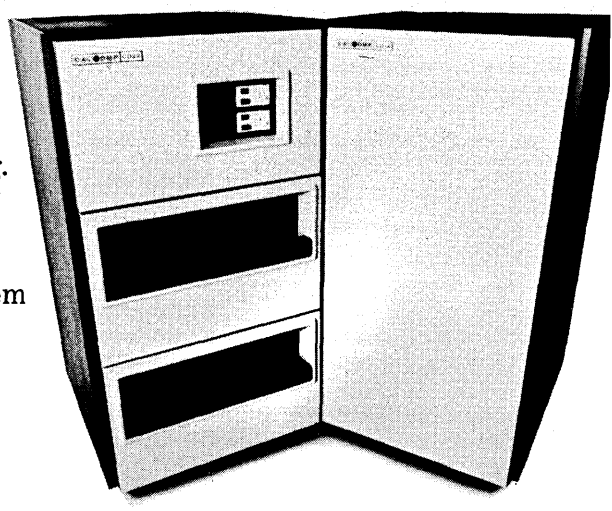
It stores up to 233 million bits of information per disk pack. And while these disk packs spin at 2400 rpm (a lot faster than your phonograph records) the pack can be stopped to be removed in only 12 seconds, (faster than your phonograph records).

And this bears repeating. All the CalComp disk memory systems are engineered to be totally interchangeable with IBM's equipment. You plug them in. And turn them on.

And they're faster than IBM's. And they cost less to lease.

IBM and CalComp. They match up just fine.

Write us at California Computer Products, Inc., Dept. DM-M9-71, 2411 West La Palma Avenue, Anaheim, California 92801. Or call (714) 821-2011.



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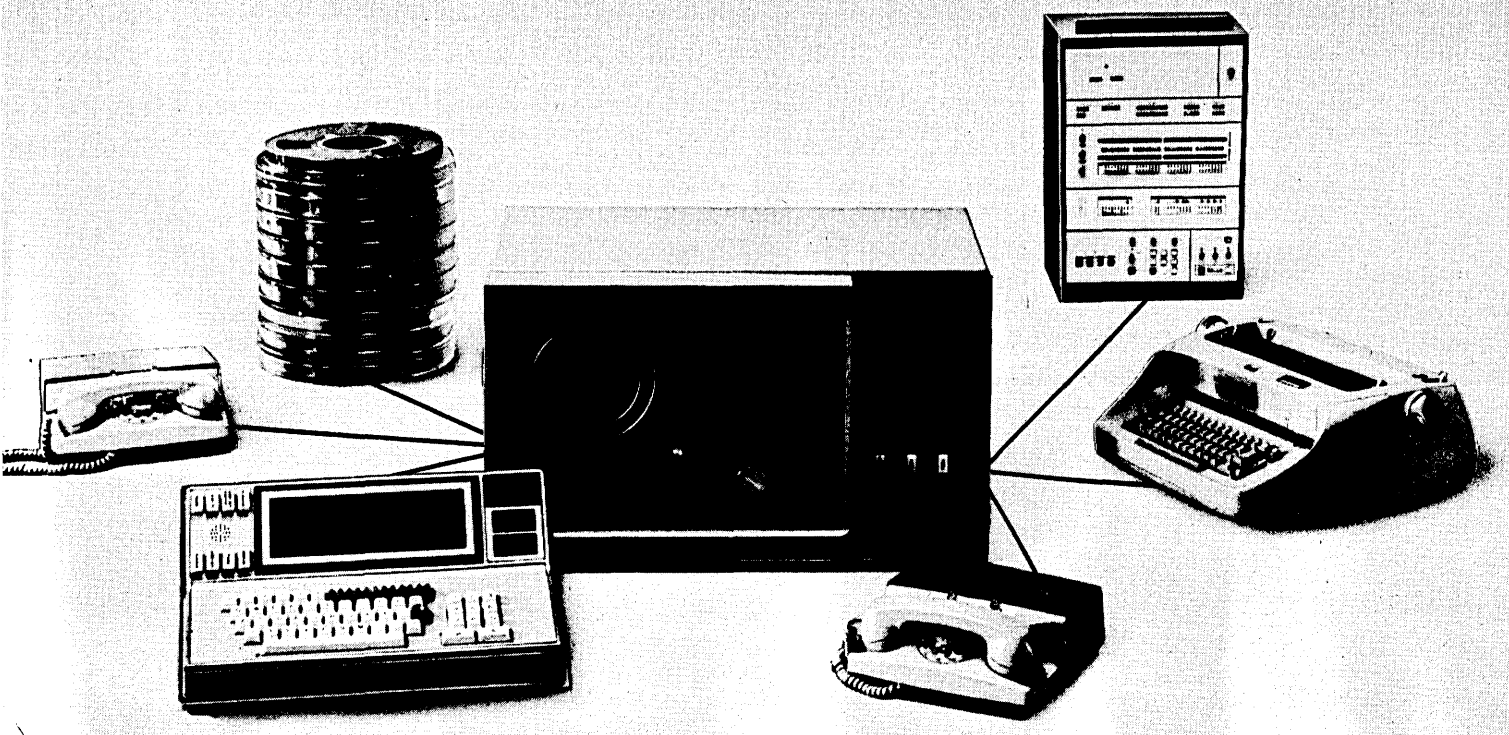


INPUT *OUTPUT*

CIRCLE 18 ON READER CARD

Small-scale System

Birth control has been a big flop for the HIS 200 Series—the first of the so-called third generation of computers—as another child, called the model 105, has been added to the family. It falls between the model 58 and the model 115 in price and performance. The new machine is not wholly compatible with the small French model 58, but there is substantial compatibility achieved through programming languages via COBOL.

The model 105, though, is wholly compatible with the other members of the 200 Series. The vendor's idea is to hook a customer on the model 58—which is in the System/3 class—and then move him into the 200 Series. The model 105 is aimed primarily at replacing some 360/20s, picking up some first-time customers, and replacing unit record equipment.

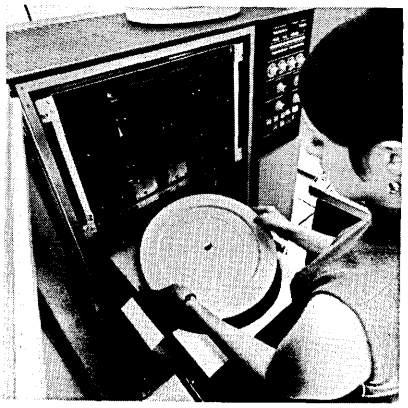
The entry-level model 105 system, which typically consists of the cpu with 16K of 3.5 usec main memory, a printer, a card reader, and 9.2 million characters of disc storage, can be leased for $1641/month or purchased for slightly more than $95,000. The machine can be operated as a local or remote batch processing terminal. It is being offered in the U.S. only, since the G-100, already marketed in Europe, fits roughly in the same category. Deliveries are scheduled for the fourth quarter. HONEYWELL INFORMATION SYSTEMS, Wellesley Hills, Mass. For information:

CIRCLE 502 ON READER CARD

System/7 Add-ons

A number of standard and RPQ features, probably the most significant of which is disc storage capability, have been announced for IBM's smallest computer, the System/7. One fixed disc or a fixed disc with a removable disc cartridge, each storing 1.23 million 16-bit words, is offered with access times of either 126 or 269 msec. The data transfer rate is 99,500 words/second. Monthly rental for the 5022 disc storage module ranges between $300 and $455, depending on speed and capacity desired. The 5022 will be available next May.

An RPQ is offered for a custom console that permits users to display



the status of a process using a user-provided black-and-white or color tv monitor. Software could enable the color screen to flash in any one of the three primary colors, depending on what condition has been met. The custom console can also be made up of a special function keyboard labeled in a particular application jargon, a typewriter keyboard for data entry, and a serial printer for hard copy of display messages.

Also on the RPQ list are a teleprocessing multiplexor, bisynchronous communication capability with any bisynchronous device, and the ability for several System/7s to share the same 5028 operator station. IBM CORP., White Plains, N.Y. For information:

CIRCLE 501 ON READER CARD

Communications System

The Multi-Comm terminal model 7208 is a card-oriented communications system, configured similarly to the vendor's system 2400 (March 15, p. 73) which is tape-oriented. It is built around an Atron minicomputer and can operate with or in place of such units as the IBM 2780 BSC, CDC 200, and Univac 1004 or DCT 2000. Standard peripherals include a 400-cpm card reader, 300-lpm 132-column printer, and dial network transmission at 1200 to 3600 bps. Price is $34,400 purchase or $860/month on a one-year lease. MOHAWK DATA SCIENCES CORP., Herkimer, N.Y. For information:

CIRCLE 511 ON READER CARD

TTY Stepper

The editing of paper tape on Teletypes is facilitated by a single-step tape advance accessory which provides skip and read functions through two buttons. Thus, the tape may be stepped and printed, a single character at a time, through correct parts of the tape, and stepped without printing through errors in the tape. The device can be installed with a screwdriver in only 20 minutes, according to the vendor. It's available for either 5-level Model 32 or 8-level Model 33 tty's. Single units are $78. CONTROL SCIENCES CO., Chicago, Ill. For information:

CIRCLE 512 ON READER CARD

Terminal

The CT-50 Superterminal is a programmable terminal of modular construction that can serve as a remote batch terminal, a conversational terminal, automatic send/receive terminal, or a key-to-tape system and can perform as a multiprogrammable minicomputer for business applications. The basic CT-50 configuration, priced at $15,500, includes a 4K (8-bit) byte-oriented processor, expandable to 64K, and a Selectric plus a 10-key calculator keyboard and a pair of cassette decks mounted on a desk. Delivery requires 30 days ARO. SCI-TEK, INC., Wilmington, Del. For information:

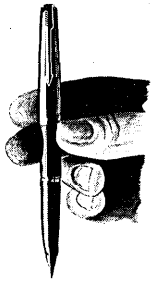
CIRCLE 513 ON READER CARD

Oem Cassette Drive

The 2500 series cassette tape drive is based on a servo-controlled direct-drive capstan, with individual motors at each reel to control tape tension. Data can be recorded synchronously by record at rates up to 9600 baud or incrementally by character at up to 30 cps. Philips-type cassettes are recorded by a one-track head (two-track head is offered optionally) at 800 or 1600 bpi. Synchronous drive speeds of 2 and 6 ips are standard, 12 ips optional. The bidirectional 2500 has a search speed of 90 ips, and is unit-priced at $400 in quantities of 1,000, including transport electronics and interface. Delivery is 45 days ARO. INTERDYNE, Los Angeles, Calif. For information:

CIRCLE 506 ON READER CARD

Does IBM's price cut add up?



You figure it.

IBM's newly announced cuts in monthly charges for some data processing products might look pretty good.

If you take a fast look.

But can you afford a fast look? Here's how it all adds up.

An IBM 1403N1 on-line high speed printer will lease for 24 months—with the necessary controller and 3615 feature—for $1302 per month.

You can rent a comparable Mohawk Data 3160 for $1050 per month. As the chart shows, our prices are significantly lower across the board. That goes for our other products, too—even in the face of price cuts.

Don't stop adding. There's more. The IBM machine prints 1100 lines per minute, with a 132 character print line. Mohawk's 3160 prints 1250 lpm, with a 160 character print line.

You can vary format more, print more, on fewer forms. It all adds up to more for less.

Now, don't get us wrong.

We think it's pretty nice that the big guys in the industry figure you ought to be paying less for data processing equipment.

We only wonder why they didn't think of it sooner.

Fixed-term lease and maintenance	IBM 1403NI High Speed Printer* 1100 lpm	MDS 3160 High Speed Printer 1250 lpm	Savings with MDS Printer
12-Month	$1,426/Mo.	$1,150/Mo.	$276/Mo. 19+%
24-Month	$1,302/Mo.	$1,050/Mo.	$252/Mo. 19+%

*Price includes required 2821.002 controller and 3615 feature.

Mohawk Data. Where it all adds up.

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Mohawk Data Sciences Corp.
Herkimer, New York

CIRCLE 49 ON READER CARD

7070/7074 Emulation

IBM won't say how many installations are still using 7070 or 7074 equipment, so we'll just have to figure that there are enough left in the field to justify the development of a 7070/7074 emulation package for the 370/155 running OS. The hardware portion is a field-installable feature that rents for $900/month or can be purchased for $43,200.

The software support for the emulation comes from a no-charge program, OS 7070/7074 Integrated Emulator, which may reside with the 1400/7010 emulator, the DOS/OS emulator, or both. The software also includes tape formatting programs for converting 7070/7074 tape files to standard OS format. A minimum partition or region of 188K bytes is required by the emulator, simulated 7070/7074 storage, and minimum I/O buffers. The emulation capability is scheduled to become available during the first half of next year. IBM CORP., White Plains, N.Y. For information:

CIRCLE 505 ON READER CARD

Portable Terminal

A portable terminal is the first product of an offshoot of a military supplier of amplifiers and other communications components. The unit is acoustically coupled and has a solid state, magnet actuated keyboard that generates 128 ASCII characters in transmit mode and 64 characters in print mode. The 28-pound terminal can produce up to six carbon copies at 10 characters a second in 80 character lines. Standard features include an automatic carriage return, line feed, parity check of transmission errors, and both half and full duplex communication. The terminal measures 18.5 inches by 17.5 inches by 7.5 inches. It sells for $1999 in quantities of one to ten and is available on a three-year lease for $69 a month with coupler. Delivery is 60 days ARO. COMPUDATA CORP., INC., Providence, R.I. For information:

CIRCLE 508 ON READER CARD

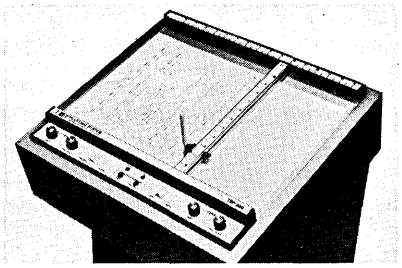
Phototypesetting

All 26 models in the Pacesetter series of phototypesetters are driven by 6-, 7-, or 8-level paper tape and offer a type size range of 5 to 72 points. Operating speed is rated at 50 newspaper lpm, and each Pacesetter model has up to 16 point sizes on the machine in a choice of either 4 or 8 types faces. Total character capacity for the 4-face models is 448, while the 8-face models have a total character capacity of 896. Price range for the series is $13,500 to $22,700. PHOTON, INC., Wilmington, Mass. For information:

CIRCLE 504 ON READER CARD

30 CPS Fast Plotter

The TSP-300 time-sharing plotter can plot an 18-inch line in under one second, while utilizing 30-cps transmission in conjunction with most ASCII-coded terminals. An 11 x 17-inch x-y recorder with 10 x 15-inch maximum plot size is driven at 450-600 pen movements per minute.



Price is $3700. A companion model, the TSP-310, can operate at 30 cps or be switched to 10-cps mode. It's $3900. Software includes routines for driving, alphanumerics, symbols, and curve smoothing. TIME SHARE PERIPHERALS CORP., Danbury, Conn. For information:

CIRCLE 520 ON READER CARD

Disc and Controller

A controller designed specifically for interfacing this manufacturer's head-per-track disc units to the popular PDP-8 minicomputer has been announced. Called the DMC-600/8E, it handles up to four such discs, which may be set up for any sector length, depending on user requirements. The price is approximately $2700, and delivery is 60 days ARO.

One of the discs that can be attached to the above controller is the model 640, which with its 5-megabit capacity complements four other family members ranging in capacity from 256 kilobits to 10 megabits. The average access time is 17 msec, and the transfer rate is 2.34 MHZ. Prices start at $5200, with delivery 60 days ARO. WABASH COMPUTER CORP., Phoenix, Ariz. For information:

CIRCLE 526 ON READER CARD

Disc Controller

Minicomputers such as the Nova and PDP-8 and -11 can handle IBM or compatible 2311 and 2314 disc drives such as the Century Data 111 and 114 through use of the Diva disc controller. It features automatic header confirmation, variable length sectors, and hardware and software write protect. Prices start at $6500 with oem discounts available. Delivery requires 30 days ARO. DIVA ASSOCIATES INC., Red Bank, N.J. For information:

CIRCLE 514 ON READER CARD

360 Memories

From the maker of the model 70 add-on memories for the 360/65 and 67 (March 15, p. 75) come models for the 30, 40, and 50. Called the 7030, 7040, and 7050, the new units are totally monolithic and plug-compatible. Typical memories are a 32K-byte 7030 at $980/month on a two-year lease, a 64K 7040 at $1620, and a 128K 7050 at $3040. Maximum capacities of the memories are 128K, 256K, and 1 megabyte. Deliveries begin in December. COGAR CORP., Schuyler, N.Y. For information:

CIRCLE 509 ON READER CARD

OCR System

Latest low-priced ocr unit is the System/70 at $33,600. It includes an automatic-feed desk-top scanner, a display console and keyboard, and a cpu. Standard software includes recognition of intermixed hand-printed numeric and machine-printed characters, as well as alphanumeric OCR-A. It reads documents from 4 x 3¼ to 8½ x 14 inches, as well as journal tape, fanfold, and paper rolls. Unrecognizable characters are displayed for operator correction on the keyboard. Delivery requires 12 weeks. COGNITRONICS CORP., New York, N.Y. For information:

CIRCLE 507 ON READER CARD

Portable Terminal

Two models of the 25-pound COMPROPORT portable terminal differ only in the transmission rate—10, 15, or 20 cps for the model 1020 and up to 30 cps for the model 1030. Both models print a standard 96-character ASCII set across 80-character lines and include an integral modem for acoustic or hard-wire communication. Optionally available are a cassette storage unit and a bidirectional paper drive that allows the terminal to act as a plotter. The basic price for the 1020 is $2200, and the 1030 goes for $2950. COMPRO CORP., Santa Ana, Calif. For information:

CIRCLE 527 ON READER CARD

Tape Drive

Several months ago this firm's first IBM-compatible tape drive appeared (April 1, p. 55), and now there are 25-ips versions in a series called the 7/9 F. Densities from 200-1600 bpi, single- and dual-gap heads, and a rewind speed of 175 ips are principal features of the single-capstan, buffer-arm drives. Oem accounts ordering 50 or more of the 7/9 F units qualify for a four-year extended repair service whereby any defective pc board will be replaced for $8. Prices start at $1940 each in orders of 100 units, and availability is 60 days. WILLARD LABORATORIES, INC., Los Angeles, Calif. For information:

CIRCLE 521 ON READER CARD

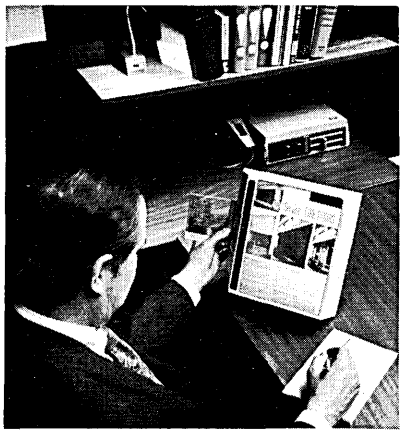
Graphic COM Unit

The model 451 graphic display/microfilm recorder is designed and software supported for precision graphic and phototypesetting applications. It allows precision plotting in a "quick look" mode or production mode. The 451 is compatible with the earlier model 401 COM recorder—which means it can handle ASCII or EBCDIC coding, among other things. The basic system includes a disc file, two mtu's, a display monitor, I/O console, camera, hardware and software character generators, and forms overlay with programmable spot size and variable intensity levels. The basic application software includes simulators for IGS language and CalComp plotters. The price is $160K. SEACO COMPUTER-DISPLAY, INC., Garland, Texas. For information:

CIRCLE 528 ON READER CARD

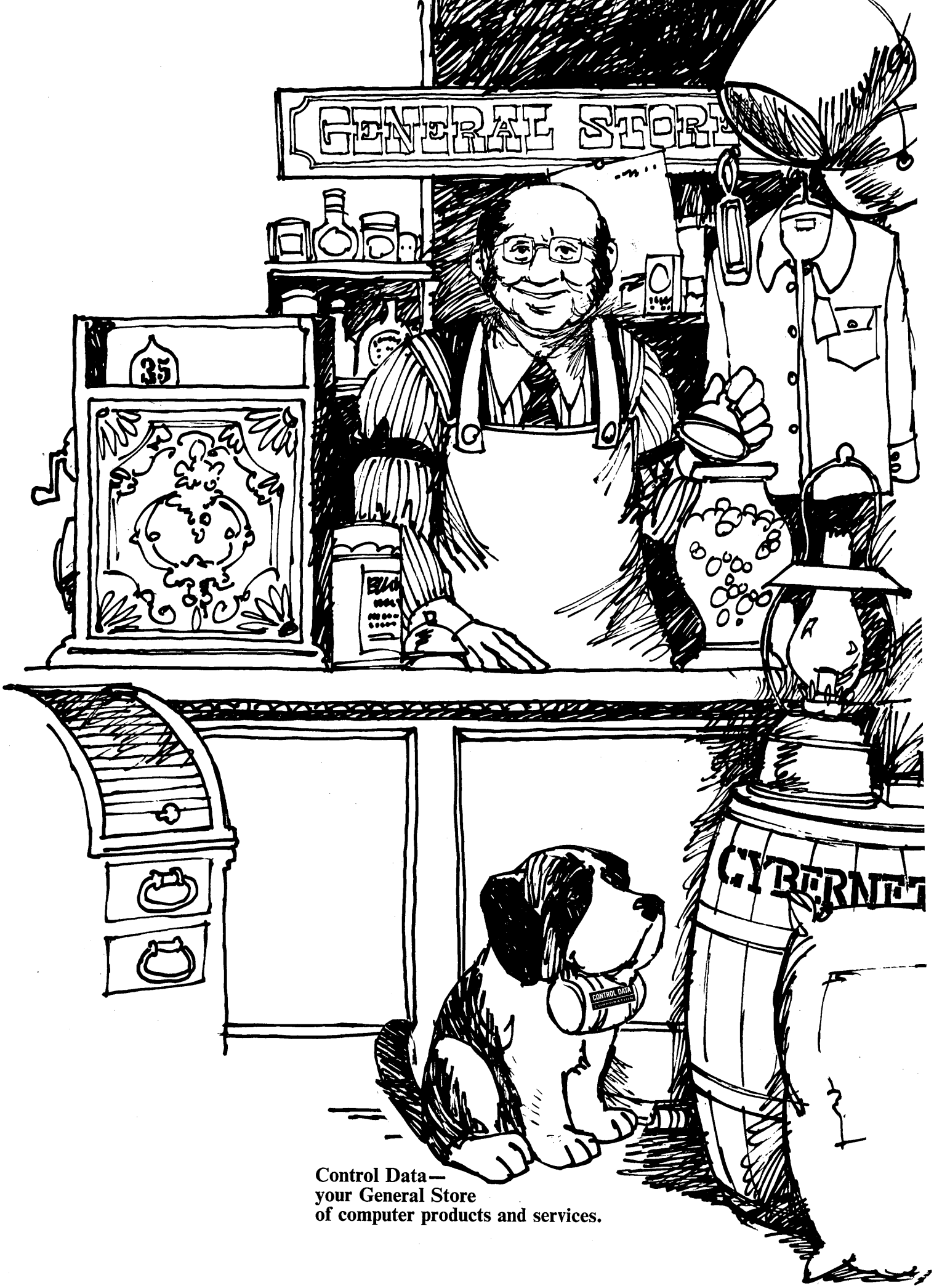
Desk-top Microfiche

Billed as a "lap/desk-top" microfiche reader, the model K-K-100 handles 4 x 6-inch COSATI and NMA standard microfiche, measures just over 10 x 11 inches, and weighs under 5 lbs. At



press time, pricing was not definitely established but was planned for $139-149. MICRO-SCAN SYSTEMS, INC., Pearl River, N.Y. For information:

CIRCLE 510 ON READER CARD ■



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Language Conversion

PASSPORT is a good name for this language conversion service—though LIFESAVER wouldn't be a bad nickname. The program is a macro processor that is pattern driven rather than syntax oriented or format directed. A recursive minicompiler with routines for character scanning, pattern recognition, and processing, and the ability to dynamically expand files permits translation of several different manufacturers' FORTRAN programs to COBOL. Additionally, PASSPORT can convert FORTRAN programs to BAL, COBOL to FORTRAN, BAL to FORTRAN, IBM COBOL to NCR COBOL, and Honeywell COBOL to NCR COBOL. The cost of converting languages ranges between 20¢ and $2 per line of source code, dependent on program complexity. Patterns for other language conversion projects can be supplied, and there are plans to lease the program in the near future. CREATIVE COMPUTING TECHNIQUES, Buena Park, Calif. For information:

CIRCLE 524 ON READER CARD

Data Set Management

Tape Management Software (TMS) is a set of nine routines for gathering and maintaining tape volume and data set status as it occurs. TMS interfaces with the OPEN and END OF VOLUME modules in 360 or 370 OS, requiring 2K resident and about 2K transient storage for data set protection without using external labels or operator options (unless nonlabeled or nonstandard label tapes are used). Additionally, TMS allows retention dates to be modified without touching the tape volume and provides lists of available scratch tapes, tape drive performance information, and information regarding the users of a given tape volume or data set for accounting or security reasons.

A set of external programs lists protected data sets, entries by volume serial number, volume location, volume expiration dates as defined by users, etc. The purchase price for the BAL program is $10K for a single cpu, and $3333 for each related cpu sharing library access. UNIVERSITY COMPUTING CO., Dallas, Texas. For information:

CIRCLE 517 ON READER CARD

Cobol Standards

Standard practices in the writing of COBOL programs can be enforced through MECCA, Monitoring and Enforcing Conformance to COBOL Administrative package. It supplements the IBM compiler diagnostic messages. Over 200 standards are available in MECCA. Through the use of a severity code, each standard is given a degree of importance that is reflected on the program output. A monthly report is prepared, summarizing errors by programmer, by program ID, by date, and by error type. MECCA runs under DOS and requires a 64K minimum machine. The price is $1800. An OS version will be available next month. ARKAY COMPUTER APPLICATIONS, Lowell, Mass. For information:

CIRCLE 503 ON READER CARD

Brokerage Program

Brokerage Back Office System One is designed for firms that process 3,000 or less stock transactions in a day. It consists of three major subsystems: purchase and sale, which creates and maintains name and address and security master files; stock record, which creates and updates a stock record master file that is used to produce daily summaries and weekly stock record listings and generates an option report file; and bookkeeping, which prepares a bookkeeping journal and a balance file. The system is written in COBOL, requires 64K, and runs on any RCA mainframe with either DOS or TDOS. It's bundled. RCA, Marlborough, Mass. For information:

CIRCLE 522 ON READER CARD

Order Processing

ORDER-MATIC is an on-line order processing system that controls every function from order capture through inventory allocation, warehouse scheduling, inventory fulfillment (including development of picking and packing lists), credit checking, invoicing and billing, and inventory optimization. The 256K BAL program runs on 360 and 370 models supporting OS and is terminal independent, accommodating tty, crt, or intelligent crt. ORDER-MATIC can be supplied in program form only for approximately $70K, or on a complete turnkey basis, with the vendor supplying the necessary terminals, installation, etc. INFORMATICS INC., River Edge, N.J. For information:

CIRCLE 525 ON READER CARD

Payroll

Probably the most striking thing about SUPER/PAY is its price of $960. It runs under OS/360, using a 3700-byte employee master record and requiring 80K of storage, or it can fit into 64K DOS environments if the file sizes are reduced. The payroll can serve large corporations having multiple divisions and also features the ability to handle 36 separate types of earnings, 32 types of voluntary deductions, 5 state-and-local and 2 federal tax segments, and tax routing for over 30 states and Canada. The source program tape, documentation, and a 30-day money-back guarantee are all included in the price. CALIFORNIA DATALEASE SYSTEMS & FINANCIAL, INC., Los Angeles, Calif. For information:

CIRCLE 515 ON READER CARD

DOS Spooler

If there are any IBM DOS 360 users left who haven't converted to one of the competing spooling packages offered by many firms, perhaps they will be interested in this one. It operates in less than 4K of storage, permitting printers to be driven from the foreground partition while it spools the backlogging output onto a disc. The output is automatically moved to the printer as it becomes free. A 15-40% throughput increase is claimed, depending on job mix. Priority printing, lookahead printing, and restart printing are also features of the spooler. The price of the package is $3500, or it can be rented for $195/month. A 30-day free trial is offered. BOOTHE RESOURCES INTERNATIONAL, INC., Los Angeles, Calif. For information:

CIRCLE 523 ON READER CARD

Product Planning

This unusual program is a model of a single-product manufacturing start-up venture that provides year-by-year market sales estimates, manufacturing and labor costs, and even a pro forma profit-and-loss statement. The FORTRAN IV program uses customer-supplied input describing market areas, past annual growth rates, year of intended market penetration, etc. Both long- and short-term debt is represented in the program, and together with start-up monies permit the exploration of optional financing strategies by either the business leaders themselves or prospective venture capitalists. The price of $1600 includes the coding in card or tape form, documentation, a test deck, and a print-out sample. FILEPLEX, Palo Alto, Calif. For information:

CIRCLE 516 ON READER CARD

Project Management

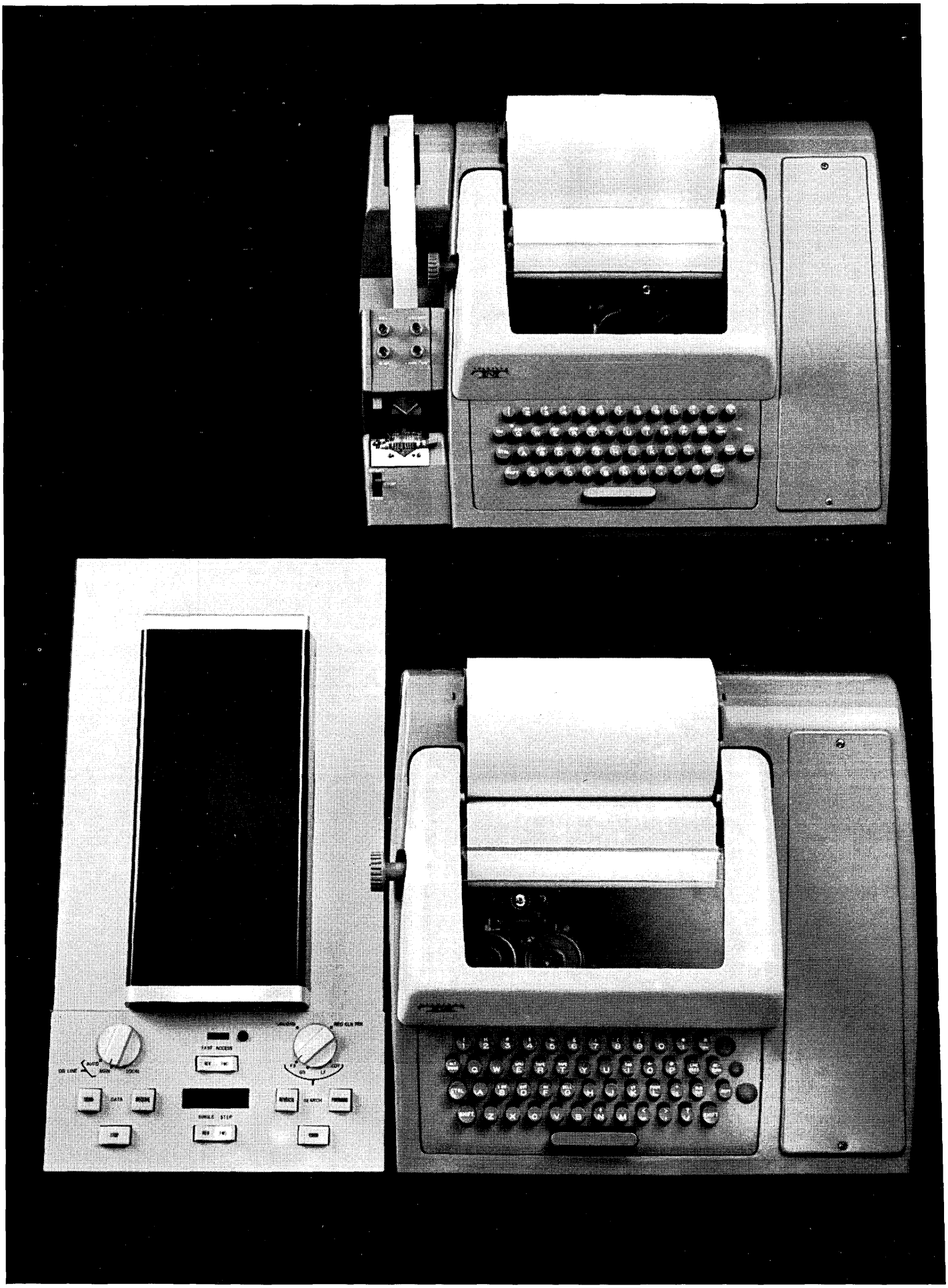
Project Simulation is a set of FORTRAN IV programs that provides management with information to plan and control the schedule and resources for any number of engineering projects. The collection of programs is similar to PERT but also provides for resource allocation. Typically, 160K bytes of storage or equivalent is required on IBM 360, Univac 1108s, CDC 6600s, or large Burroughs' gear, but the program could be put on most any large machine supporting FORTRAN. The many different modules are priced separately, or can be purchased together for $20K, including installation, documentation, and guarantee. J. TOELLNER & ASSOC., Los Angeles, Calif. For information:

CIRCLE 519 ON READER CARD

System/3 Accounting

These five accounting programs for the System/3 include modules handling inventory control, accounts payable, accounts receivable, payroll, and general ledger-financial reporting. They are written in RPG II and run on models from 8K card through disc systems. Prices are $1-3K per module, depending on options, with leases available on purchases over $2K. Instruction manuals and forms are provided so that the system may be used by non-data processing personnel, according to the vendor. CERTIFIED SOFTWARE PRODUCTS, Minneapolis, Minn. For information:

CIRCLE 518 ON READER CARD ■



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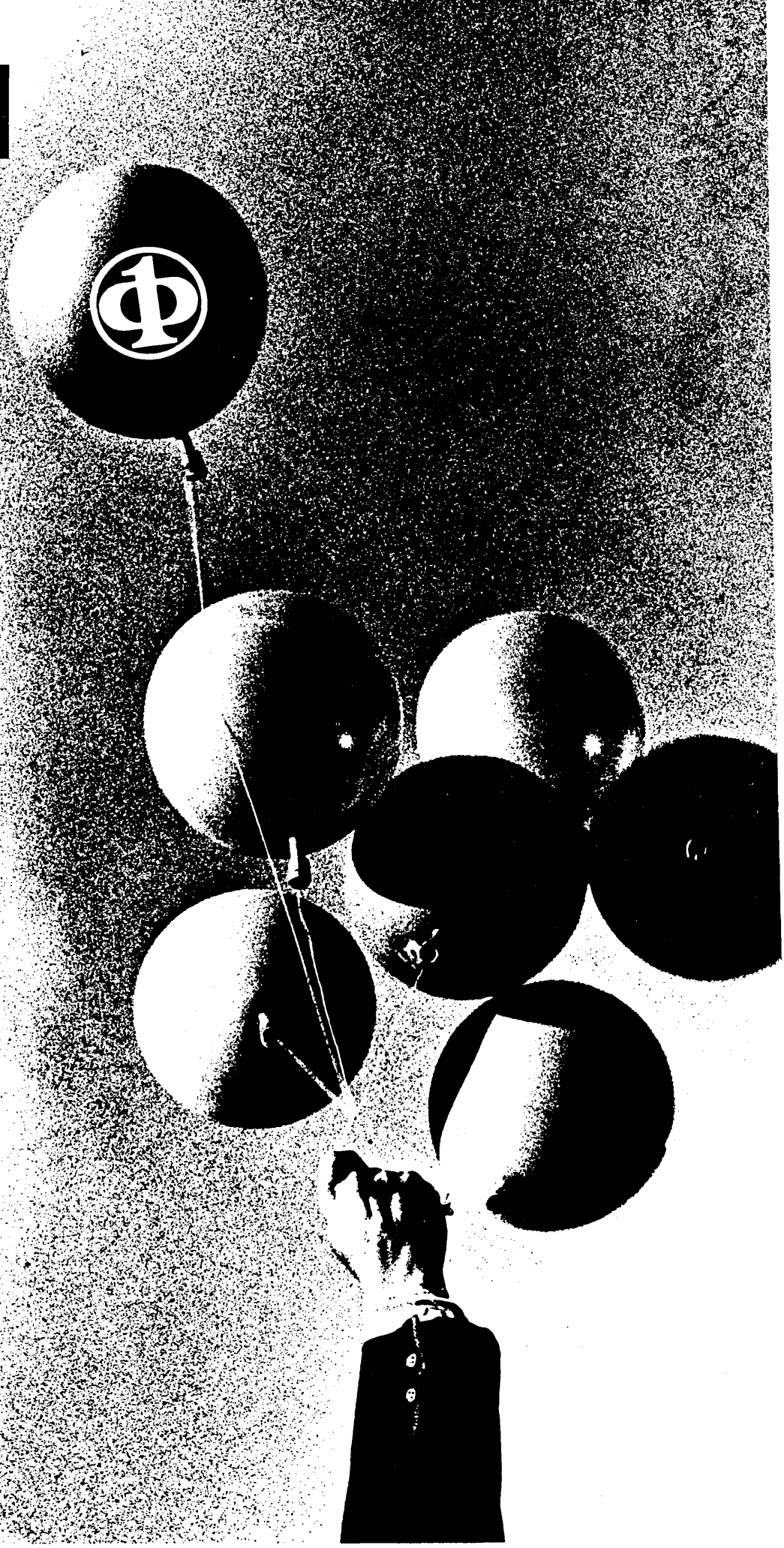
ADVERTISERS' INDEX

PEOPLE

Dr. Charles P. Smith, who headed up the state of California's Office of Management Services until OMS wound up with a zero budget in July (see Aug. 15, p. 39), has joined the nonprofit American Justice Institute to direct its Project STAR (Systems Training Analysis Requirements), a three and one-half year, $2.7 million effort funded by the Law Enforcement Assistance Administration (LEAA) and aimed at developing models for determining the roles and training requirements for all persons involved in criminal justice systems . . . **Robert E. Benn** resigned as manager of advanced development for KDI Adtrol, Broomall, Pa., and established "a facility which will specialize in the development of advanced computer peripherals." Mr. Benn, a pioneer in the field of nonimpact printing, says that recently he has been active in the development of printers using electro-sensitive paper, which might be a clue to what he's up to at the new facility . . . DPMA has elected **Edward O. Lineback,** a 24-year Boeing veteran who is now managing its Division Computing Services 747 Program, as international president of the association . . . At the International Business Forms Industries annual meeting, **R. J. O'Connell,** vp and gm of Southam Business Forms of Montreal, was elected president . . . **Gordon R. Williamson** is now a vp of IBM World Trade Corp. in addition to his duties as general manager of IBM Europe . . . **Albert E. Cookson** and **Lynn W. Ellis** were named chairman and president, respectively, of ITT's new subsidiary, Interplan Inc., which will provide consulting services to large telecommunications equipment users . . . Agency Records Control, Houston supplier of dp services for insurance agencies, has elected **Geary W. Eppley** as president. He has been with the company since it was formed in 1963 . . . **William R. Hewlett,** president and chief executive officer of Hewlett-Packard, received the 1971 WEMA Medal of Achievement at the association's annual meeting last month . . . **Mel Day,** head of the NSF Office of Science Information Service, has been named chairman of the Committee on Scientific and Technical Information (COSATI) . . . Indenticon Corp., two-year-old Waltham, Mass., manufacturer of scanning devices and coded labels for manufacturing and distribution lines, has elected **Harvey White** as president and board chairman . . . **Pierre H. Delva** has been named president of Computer Sciences International to succeed **Dr. M. I. Montana,** who, as reported earlier, has returned to Los Angeles to head the company's International Div. . . . **J. L. Krauser,** most recently manager of memory development and system packaging for Weismantel Associates, has joined Fabri-Tek as manager of the End-User Engineering Dept., as the firm continues to push its new line of 360 memory replacement/expansion units . . . **Nyal McMullin,** former vp of marketing for Peripheral Equipment Corp., Chatsworth, Calif., has been appointed to the board of Xebec Systems, Inc., Palo Alto peripheral manufacturer . . . **Russell K. Hileman** has been appointed manager of software development at Data Disc, Sunnyvale, Calif., with responsibility for development of system software for the company's computer display products, especially the end-user systems that interface with IBM 360 and 370 systems. Appropriately, Hileman comes from IBM, where for the past 12 years he has been engaged in disc software development, most recently as a developmental programmer in advanced technology working on prototype software for systems not yet introduced by IBM . . . New systems vp at Scan-Data Corp., Norristown, Pa., ocr equipment manufacturer, is **W. J. Luther,** former gm of operations at CDC's Data Services Div., where he directed all software development, implementation, and operation of the firm's real-time data center network . . . Coming from Western Union Telegraph Co. to WU Data Services Co., Mahwah, N.J., are **Harry J. Cowin,** now vp and manager-operations, and **Arthur Kirscht,** vp and manager of engineering . . . The new Publishing Div. of Image Systems, Inc., Culver City, Calif., will be headed by **Werner J. Christmann.** Division headquarters are in Washington, D.C. . . . At Peripheral Equipment Corp., **Norm Gruczelak,** formerly of Ampex, Houston Fearless, Texas Instruments, and most recently Control Data, was appointed director of engineering. ■

We'll give you a lift



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WORLD ROUNDUP

IBM EXTENDS PRICE CUTS INTERNATIONALLY

IBM's fixed-term plans and price reductions for most of its peripherals have been introduced in 18 European countries, plus Canada, Australia, Japan, Mexico, Venezuela, and Colombia. Rumors abound on how well the new plans are doing in the U.S. One source says 50% of on-rent peripherals already have been converted to one of the plans; another says it'll be 50% by year-end. Another source claims 40% of those that have been converted are purchases. If the latter is true, it could be a shot in the arm for IBM's next earnings report.

RAILROAD PLANS GIANT REAL-TIME SYSTEM

France's railroad system, SNCF, will turn its data processing system into what it thinks will be the largest real-time system for commercial operations in Europe. And the railroad's advances likely will be adopted by the other state-owned railroads on the European continent.

When completed, the new system will integrate jobs ranging from fully automatic handling of freight cars to passenger seat reservations. A freight car control system is already working with 500 Olivetti TE 318 terminals feeding to twin Univac 1108s. In the next stage, another 1,000 Olivetti terminals are expected to be added to the system. This will involve the use of minicomputers to act as concentrators for messages transmitted over a long-established private teleprinter network. Honeywell's H316 mini is considered to have the edge in a competition to replace some 40 concentrators, but something of a battle is raging. CII, the French computer maker, would be the supplier if that nation's politicians have their way. And IBM's French subsidiary just happens to be IBM's specialized unit for communications processor development; so IBM thinks it should be considered.

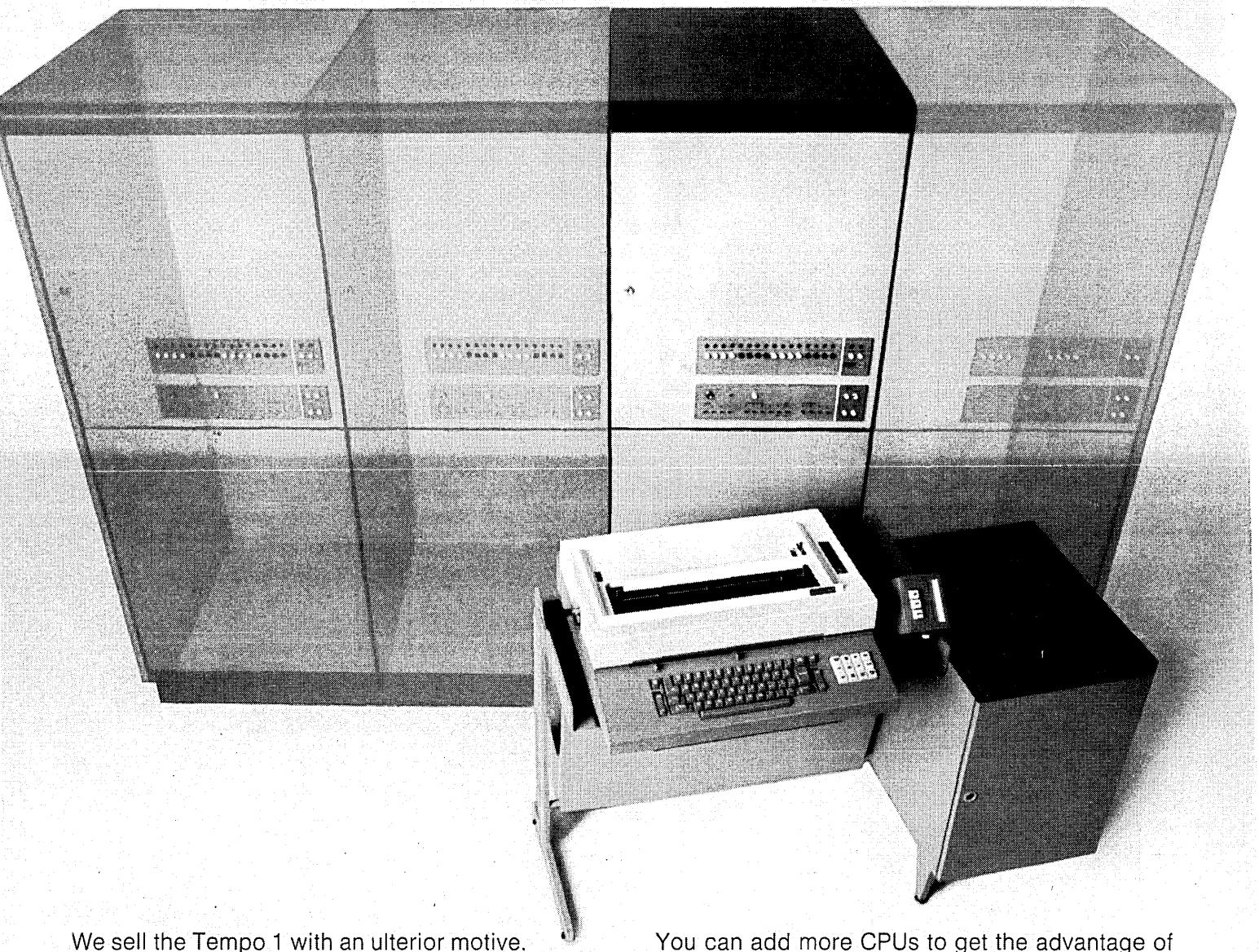
SYSTEM WOULD LINK 87 JAPANESE BANKS

A system to link 87 banks across Japan within the next three years has been proposed by the country's Federation of Bankers Association. The idea has been under study since 1968. Japanese banks already are highly automated--with three Univac 418s at the Taiyo and twin 1108s with Fuji. Members of the National Federation of Local Banks have an operational network in existence based on Fujitsu's Facom 230-50 processor covering 62 locations. Just under 7,000 branches are expected to be interconnected by 1973 over the Nippon Telegraph and Telephone System.

STRANGE THAT IT WOULD HAPPEN ON THE SAME DAY

The events weren't connected, but the day RCA announced plans to step up its U.K. computer activities International Computers, Ltd. (ICL), said it was laying off 1,800 people. ICL makes some computers based on RCA designs. RCA said it has a 30-man operation in London to sell the firm's Model 2, 3, 6, and 7 to U.K. users, units introduced last year shortly after IBM's 370 line was announced. The ICL layoff, affecting six plants, was described as an economy move.

If your needs can grow as fast as this computer, you've got it made.



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Tempo Computers

GTE INFORMATION SYSTEMS

CIRCLE 25 ON READER CARD

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

THE FORUM

On the ABM

Four axes of polarity have emerged among technicians with respect to the ABM system: government vs. nongovernment scientists, for or against, will work or will not work, knowledgeable and not-knowledgeable. Of the many possible points of view that could be expressed in this controversy, only two have come forth; the government scientist who is presumed to be knowledgeable, is for the ABM and is convinced that it will work, and the unknowledgeable, nongovernment scientist who is against the ABM and says that it will not work. Neither of these postures is appropriate to an examination of the technical feasibility, or the possible political desirability of the ABM.

It is my intention to examine three questions concerning the ABM:

1. What does it mean to say the ABM will "work"?
2. Can it technically be made to work in this sense?
3. Is the workability of an ABM a technical or political question?

1. *What does it mean to say that the ABM will "work"?* An ABM "works" if the effect of an attack is such that the gross national product is reduced less than it would have been without the ABM, taking into account the wasted portion of the GNP that went into the construction of the system, and the probability and cost of an inadvertent firing or misfire.

"Working," then, does not mean a perfect defense, an impenetrable shield, or that the defense will not itself inflict damage. Part of the controversy surrounding the technical feasibility of the ABM is due to the prevalent misunderstanding about what "working" means.

2. *Can the ABM be made to "work" in this sense?* Every system can and will fail. Every system can be overwhelmed. Given a sufficiently intense attack, interceptors will eventually be exhausted, at which point the defense will be penetrated. One cannot simply state that the system "works" but that it will or will not "work" against a specific postulated threat model. The model includes the technical characteristics of the attacking missiles and warheads, the number of such missiles, their spacing, and the trajectories along which they are expected to travel.

There are two basically different kinds of attacks, termed "sophisticated" and "unsophisticated." The unsophisticated attack is a single missile traveling along a predictable trajectory. Detection and interception are relatively simple. The epitome of the sophisticated attack is a missile with independently targeted, maneuverable, multiple warheads, decoys, chaff, fragments of the booster, and electronic countermeasures. Finally, some of the warheads may be detonated prematurely to produce radiation that will "blind" the radars.

The strategy of the sophisticated attack is to overwhelm the detection and data processing capabilities of the ABM system and cause it to dissipate its interceptors against decoys. The central technical problem of the ballistic missile defense system is its ability to discriminate between junk and the real thing. It has been argued that discrimination is not possible. This argument is inherently illogical. If a decoy differs in any manner, such as size, weight, aerodynamics, radar reflection, etc., from the real warhead, there is a property and therefore a measurable physical phenomenon that can be used for discrimination. While a decoy can mask one or more properties, it cannot mask them all unless it is identical in every respect to a warhead. If it is identical, the economics of boosters forces the assailant to use a real warhead rather than a perfect decoy. A knowledge of the techniques used for discrimination might enable the attacker to counter them. For this reason, discrimination techniques are generally kept secret.

Since the components of the ABM are coordinated and abetted by the data processing and since data processing is no small part of discrimination, the feasibility of the ABM hinges on the feasibility of the controlling computer complex. The publicly voiced controversy has focused most often on whether we can or cannot build a complex of computers as large as that required by the ABM system and keep that complex working despite the failure of individual computers and operators.

A comparison with the earlier SAGE system is instructive. The computer industry was then in its infancy. There were only a few hundred computers and a few thousand programmers. The SAGE computer requirements presented totally new problems. It was the first system in which a form of automatic self-repair was employed. It was the first computer system design effort in which a programming task measured in thousands of man-years was attempted. Computers, far more complex than any that had been built before, were put into serial production. Testing techniques were developed that allowed the rational integration of the many different programs developed for SAGE. Massive automatic communications between computers and electronic devices were first tried on SAGE. With much effort and many mistakes, a viable SAGE system evolved.

Today, there are over 50,000 computers in operation in the United States alone, while there are hundreds of thousands of programmers. Universities offer undergraduate degress specializing in computer science and engineering. Over all, the ABM system, while far more complex than the earlier SAGE system, represents a lesser technical advance. The differences are no longer qualitative but quantitative. The speed required of the ABM computers is several thousand times that of SAGE; but computers are several thousand times faster today. The viability requirements are similarly greater; but the

present computers have failure free operation of thousands of hours compared to SAGE's 24 hours. Fully automatic self-repair was only a theoretical possibility then; today there are many computer complexes (such as Overseas AUTODIN) that have operated for three or more years without catastrophic failure. Power and cooling was a major problem; present computers require comparatively minuscule power, can be cooled by commercial air conditioning and can draw emergency power from batteries. Automatic diagnosis of computer malfunctions was generally considered impossible; it is now used in every computer installation. In fact, unlike the SAGE computer which was a special design, the Defense Department is seriously considering commercially available computers for the ABM system.

Technical opponents of the ABM have pointed out numerous instances of failures in commercial computer installations or in specialized systems such as those that are used for election night predictions. The cost and effort for military systems programming is about ten times that used for commercial systems. Commercial systems do not employ automatic self-repair. The amount of testing done for military systems would be prohibitive for a commercial application. One might as well compare the family sedan to a tank or a speedboat to a submarine. If analogies are to be drawn, they should be between military systems and not between military and commercial systems.

The defense does not consist of a single site but of a number of overlapping sectors. Each sector can continue operation despite considerable damage. Furthermore, each sector can cover the adjacent sectors. The defense is not a single line but multiple lines consisting of the initial defense with SPARTAN missiles and terminal defense based on the SPRINT missile.

The possibility and danger of a misfire should not be ignored. Misfires or "broken arrow" incidents have occurred and can occur. The probability of a misfire, however, is greater for offensive systems than defensive. Since we have learned to live with these possibilities, albeit uncomfortably, with respect to our offensive weaponry, misfires do not appear to be germane to the ABM question. What is important is not an absolute measure of the workability of the system, but a sufficiently high probability of working to be credible.

3. *Is the technical question really technical or is it political?* As a strategy, it is not intended that the ABM ever be used. What is required is that the "enemy" be convinced that it can work as advertised, *whether in fact it does or does not work.* If the enemy can be convinced that the system will work, it will have the effect intended for it. On the other hand, if he is convinced that the system does not work (whether or not it does) it will be useless. Therefore, the technical opponents and proponents are inadvertently participating in global political strategy by eroding or supporting the credibility of the system. In the light of this, the technician can no longer claim that he is considering a purely technical question in which political considerations and his private point of view for or against the ABM are not germane. The two questions are inseparable. The technician does not have the luxury of retreating to an ivory tower, of divorcing politics from science, or of claiming that the politics is not his domain. By offering technical arguments that affect the credibility of the system he has entered the political arena. This should not be done unknowingly, or without serious, mature consideration of the political aspects of the ABM.

Let our technical colleagues who oppose the ABM on political and social grounds (and for that matter, those who support it as well) not take refuge in or falsely claim special authority in front of the public from their technical expertise. If they make technical pronouncements pro or con, let it be with the honest realization that they are making political utterances that affect the ABM's credibility —a fact which they should make clear to their audience. Let them put their political foot where their technical mouth is and debate the ABM issues on grounds of global politics and national priorities (undistorted by specious technical arguments), in any of a number of social and political forums.

—Boris Beizer

For a company with more employees than the population of Scranton, Pa.,

BASF is awfully picky about small details

"Think Big" would seem an appropriate motto for a company with more than 100,000 employees, 120 manufacturing plants and an annual gross approaching $3 billion.

But when you're manufacturing disk packs and computer tape, where tolerances of a few millionths of an inch are critical, you have to think mighty small and you have to do it well.

The exceptional performance and reliability of BASF disk packs result from the constant, unrelenting attention to precision and minute detail that is routine throughout the huge, antiseptically clean BASF plants where computer tapes and disk packs are produced.

And because BASF is extra fussy about details, their customers are extra satisfied with the long, trouble-free service that results. Why not join them? Call today, or write to BASF Systems Inc, Crosby Drive, Bedford, Massachusetts 01730. Tel. (617) 271-4000.

BASF SYSTEMS INC BASF

BASF Systems Inc is a wholly-owned American member of the BASF Group. Regional offices in Chicago, Ill., Los Angeles, Cal., Washington, D.C., Clifton, N.J. Branch offices in most major cities.

CIRCLE 2 ON READER CARD

The Westinghouse 2550 Satellite Processor

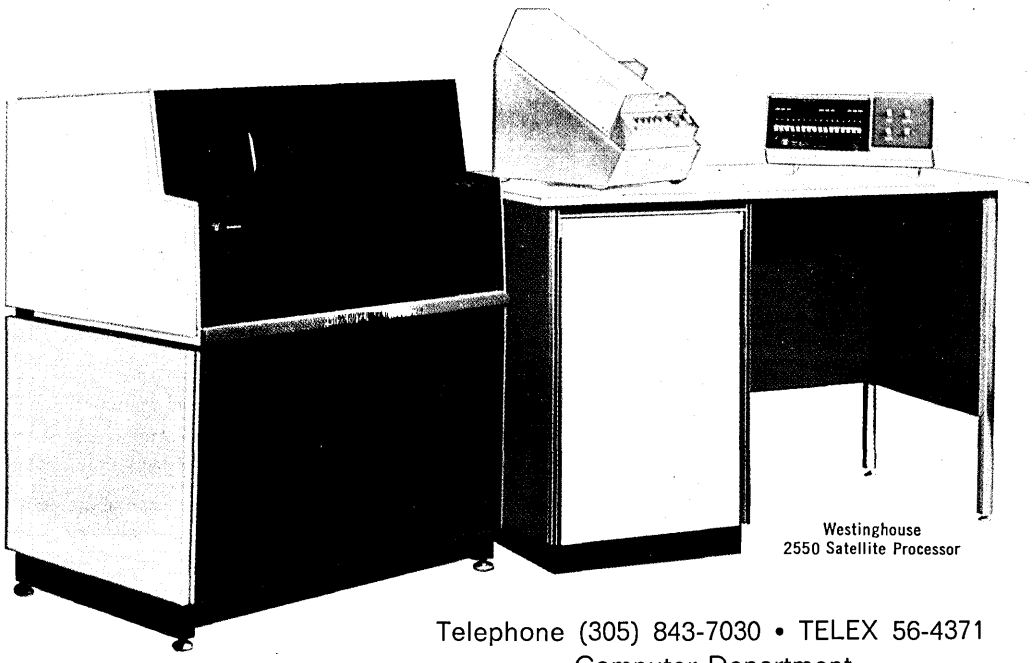
In announcing the Westinghouse 2550 Satellite Processor, the Westinghouse Computer Department introduced the industry's outstanding programmable terminal designed for remote and off-line data processing.

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

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

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

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



Westinghouse
2550 Satellite Processor

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CIRCLE 3 ON READER CARD