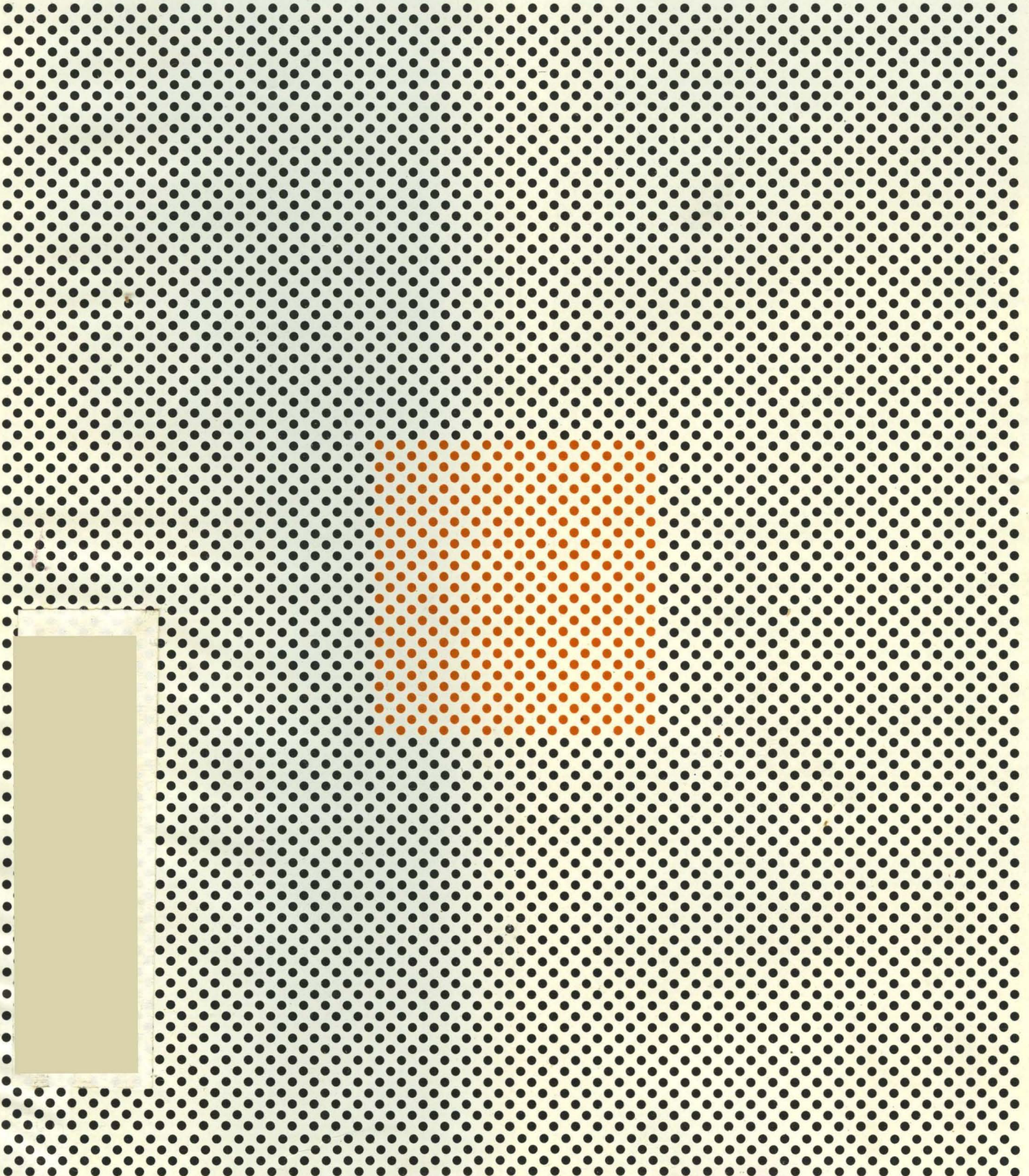


DATA MATION®

October 15



data management systems — a user's view





Last Spring, you met our thoroughly modern mini.

Hey, look at her now!

Take another look at our gal on the go. Now our 2100's moved up to a minisystem. The new HP 2120. With big system power at a pocketbook price: \$32,950.

This buys a high-speed paper tape reader, teleprinter, our new 5 megabyte, fast access 7900 disc drive — plus our thoroughly modern mini. And when we say modern, we mean a processor with value features like control read only memory (ROM), direct memory access, hardware multiply-divide and the latest in MSI/LSI technology. For special applications, our mini also offers convenient options like floating point hardware. Pulling it all together is the 2120's unique disc operating system. It puts you into the big performance league with program chaining, extended file management, and a job processor that mixes FORTRAN IV, ALGOL, and assembly language programs.

Our new 2120 Minisystem's flexible, too. Its modular design lets you easily expand both capacity and capability. As you need it. For instance, when you want more disc memory, move up in easy

and convenient steps and go all the way to 47 megabytes.

When you need a tape drive, line printer, card reader, or other peripheral, add it. Our minisystem is designed to handle them all. Plus as many as 47 HP instruments. And everything plugs right in.

As your needs change, we have software that keeps pace. Library programs, statistical routines, application packages and more. All are fully compatible with our over three thousand computer installations in industry, science, and education.

Now combine all this with a sales and service organization of 141 offices throughout the free world. They're an important part of our minisystem story. Big support, big performance, reasonable cost. That's our gal on the go.

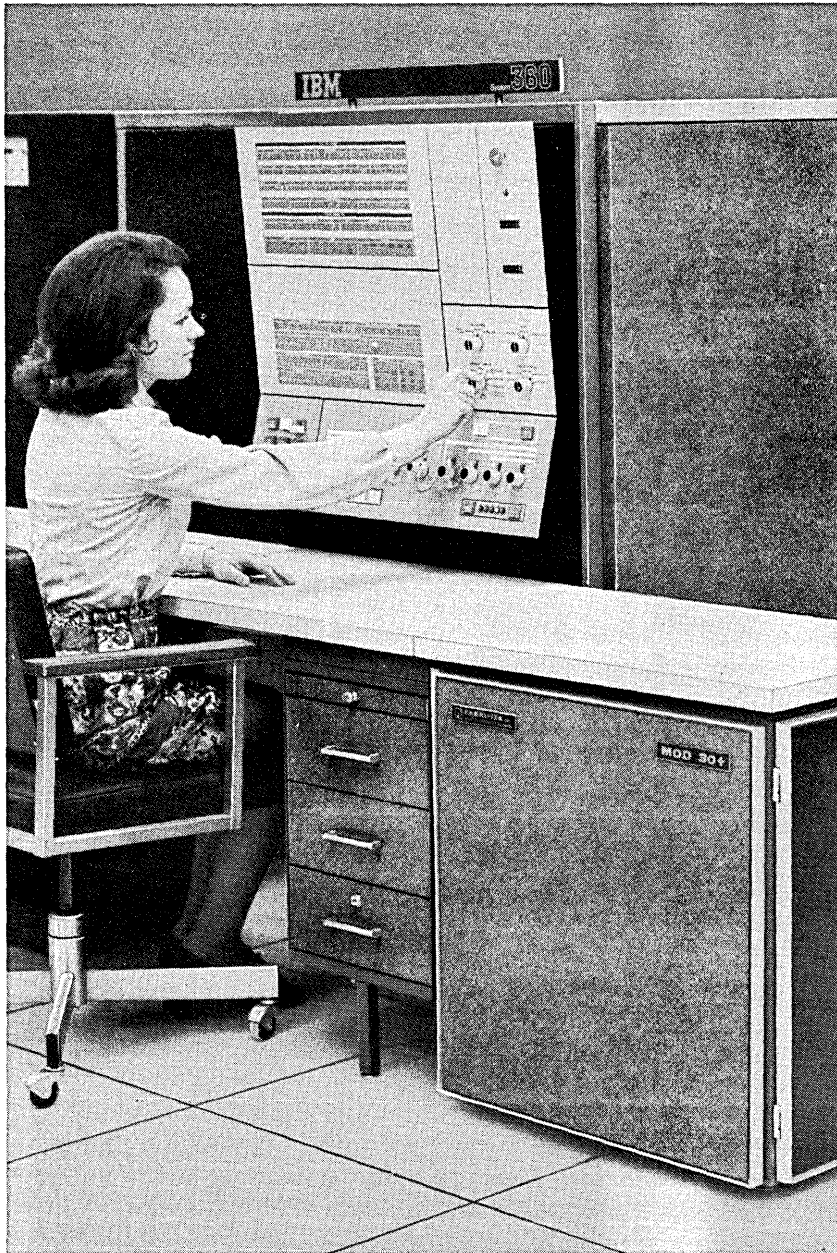
So why not take a look at her now. Just call your HP computer specialist. Or write for the system brochure. Hewlett-Packard, Palo Alto, California 94304; Europe: 1217 Meyrin-Geneva, Switzerland.

22128

HEWLETT  PACKARD
DIGITAL COMPUTERS

360 CORE YOU CAN TRUST

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



Who has Fabri-Tek produced core memories for over the past 15 years?

Hundreds of companies, including:

CDC	Canadian Westinghouse
XDS	RCA Ltd. (Canada)
RCA	Ferranti (Canada)
Honeywell	GE (Canada)
DEC	Northern Electric (Canada)
GE	DeHavilland (Canada)
Burroughs	Elliot (England)
Varian	Nixdorf (Germany)
NCR	Olivetti (Italy)
Collins	Marconi (Scotland)
H-P	ICL (England)
Bell Telephone	Honeywell-Bull (France)
IT & T	AEG-Telefunken (Germany)
Univac	English Electric (England)
Litton	Phillips (Holland)
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 • Inter-tek, 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.

Nationwide Service: Over 900 service representatives from Sorbus, Inc. provide you with 24-hour field maintenance in over 90 cities.

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:

MOD 30+ expands main memory of 360/30's to 128 K bytes.

MOD 40+ expands main memory of 360/40's to 512 K bytes.

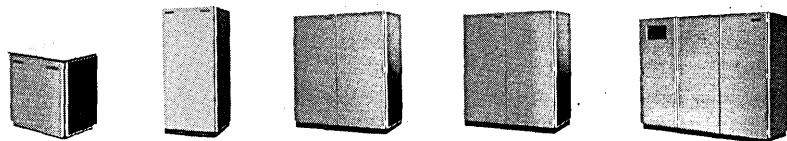
MOD 50+ expands main memory of 360/50's to 1024 K bytes.

Fabri-Tek also offers the LCM+ large peripheral core unit to expand memory capabilities of 360/50 and 360/65 processors.

Let us show you how a real leader can perform: Fabri-Tek, Inc., 5901 South County Road 18, Minneapolis, Minnesota 55436. Phone 612-935-8811. TWX 910-576-2913.

**From Fabri-Tek:
Leader in memory technology
for over a decade.**

FABRI-TEK INC.
MEMORY PRODUCTS DIVISION
Leader In Memory Technology For Over A Decade.



DATA MATION ⁷¹®

OCTOBER 15, 1971

volume 17 number 20

GENERAL

20 The Tribulations & Triumphs of GIS

ALAN KREGER and JANET NATHANSON. In real life, the implementation of a generalized information system is filled with pitfalls, as the Dept. of Health, Education and Welfare discovered. But the payoff — in thousands of dollars in man-hours saved — is just as real.

33 SID Symposium

SOL SHERR. Simply titled sid 71, this year's Society for Information Display symposium showed improvement in everything — except number of attendees.

TECHNICAL

26 Speed Tests, Costs, and Word Length

CHARLES E. COHN. The results of tests developed at the Argonne National Laboratory imply that the popular 12-, 16-, and 18-bit word lengths are less cost effective than the 24-bit length. The timing program used is included for the benefit of do-it-yourselfers.

MANAGEMENT

30 Sharing a Data Entry System

DAVID V. YOUNG. United Services Life Insurance Co. managed to please users, management, and even terminal operators when they implemented their plan for sharing their data entry system.

COMMENTARY

38 Perspective

Some 1500 universities and colleges are turning to a computer-based system to measure what taxpayers are getting for their education dollars. Some are skeptical of the outcome. But, at least, everyone is working together. And that's news.

80 The Forum: Six Generations of Overcommitment

FREDERIC G. WITHINGTON. Years of flamboyant flackery have left a trail of disillusionment. Is there anyone out there with sufficient modesty to understate the case for the computer?

About the Cover

Just how good are data processing systems? Our art director's design seems to be saying you can ask a simple question and get a simple answer because the system does all the work. The user, of course, hopes it does it well.

departments

<i>Look Ahead</i>	7
<i>Letters to the Editor</i>	13
<i>Perspective</i>	38
<i>News Scene</i>	41
<i>Hardware</i>	59
<i>Software</i>	63
<i>Literature</i>	69
<i>Washington Report</i>	73
<i>People</i>	77
<i>Index to Advertisers</i>	79
<i>The Forum</i>	80

HOW MANY MILLIONAIRES

ARE THERE IN THE UNITED STATES ?



JOHN SAUER, Pres.

... and how many NEW millionaires join the ranks every year? How did they acquire their wealth? The number and the reasons may astonish you! This amazing story is revealed in a valuable new booklet, "NEW ROADS TO OPPORTUNITY AND WEALTH."

Even more exciting are the factual details about a specific business opportunity that is nothing short of a gold mine. Why? Because, as an associate of the organization providing the opportunity, you help others to succeed.

For your free copy of "New Roads to Opportunity and Wealth," phone, wire, or write immediately to:



THIS VALUABLE 65-PAGE BOOK SENT **FREE!**

Yes, Rush me "New Roads to Wealth & Opportunity" Today!

NAME _____ PHONE _____
 ADDRESS _____
 CITY _____ STATE _____ ZIP _____

John Sauer, President
 D.A.T.K. Inc. - P.O. Box 22125, Denver, Colorado 80222
 (303) 757-5500

CIRCLE 27 ON READER CARD



A conventional typewriter with input/output—how about that?

Not bad, is it? Will fill a long-felt need and has all these advantages:

- Availability of all facilities of a conventional electric typewriter, e.g. red ribbon selector as well as upper and lower case
- Complete echo check of typewriter print-out
- Full code flexibility
- Ready access to the established, worldwide Facit service organization.

There is further interesting information on the new Facit 3851 in this publication.

Facit 3851 - the conventional typewriter with input/output



For further information, contact in US: Facit-Odhner Inc., 501 Winsor Drive, SECAUCUS, New Jersey outside US: Facit AB, Albygatan 102, 171 84 Solna, Sweden

CIRCLE 42 ON READER CARD

DATAMATION®

OCTOBER 15, 1971

volume 17 number 20

This issue 109,943 copies

EDITOR
ROBERT B. FOREST

EDITORIAL STAFF

Managing Editor
 Senior Associate Editors
 Associate Editors

Copy Editor
 Assistant Editors

Special Features Editor
 Eastern Editor
 New England Editor
 Washington Editor
 Midwestern Editor
 Southwestern Editor
 European Editor
 Australian Editor
 Contributing Editors

Editorial Adviser
 Technical Consultant

EDWARD K. YASAKI
 WILLIAM J. ROLPH, TOM McCUSKER
 RICHARD A. McLAUGHLIN,
 EDITH D. MYERS, JOHN T. WATERHOUSE
 JANET EYLER
 MICHAEL WILLIAM CASHMAN
 ALMA O'STEEN
 ANGELINE PANTAGES
 F. BARRY NELSON
 W. DAVID GARDNER
 PHIL HIRSCH
 LAWRENCE RAGAN
 ROBERT F. ALEXANDER
 PEARCE WRIGHT
 FREDERICK A. BLAND
 HOWARD BROMBERG, ROBERT V. HEAD,
 PHILIP H. DORN, LOUIS B. MARIENTHAL,
 MILTON M. STONE, F. G. WITTINGTON,
 PAUL ARMER,
 ROBERT L. PATRICK
 LOWELL AMDAHL

EDITORIAL OFFICES

HEADQUARTERS: 94 S. Los Robles Ave., Pasadena, Calif. 91101, Phone: (213) 681-8486; EASTERN: 35 Mason St., Greenwich, Conn. 06830, (203) 661-5400; 19 Marlborough St., Boston, Mass. 02116. (617) 267-9414; 9805 Singleton Dr., Bethesda, Md. 20034, (301) 530-7271; MIDWESTERN: 407 S. Dearborn St., Chicago, Ill. 60605, (312) 922-8245; SOUTHWESTERN: 2711 Cedar Springs, Dallas, Texas 75201, (214) 744-0161. FOREIGN: 65, Hill Road, Chelmsford, Essex, England; 322, Park Regis, Park St., Sydney, NSW 2000, Australia.

GRAPHIC DESIGN AND PRODUCTION

Art & Production Director
 Production Manager
 Production Assistant

CLEVE MARIE BOUTELL
 MARILEE PITMAN
 GLORIA J. FASANA

CIRCULATION

35 Mason Street
 Greenwich, Conn. 06830
 Circulation Director
 Circulation Manager
 Marketing Research Director

SUZANNE A. RYAN
 MAE VAN RENNES
 DOUGLAS DeCARLO

PUBLISHER

GARDNER F. LANDON
 ASSOCIATE PUBLISHER
 JAMES M. MORRIS

Circulation audited by Business Publications Audit



Member, American Business Press, Inc.



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

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

Printed by Beslow Associates, Inc.

DATAMATION



Kodak announces a new era in automated information handling: the Miracode® II system.

Now from the pioneers in automated microfilm retrieval comes a dramatic step forward—the Miracode II system.

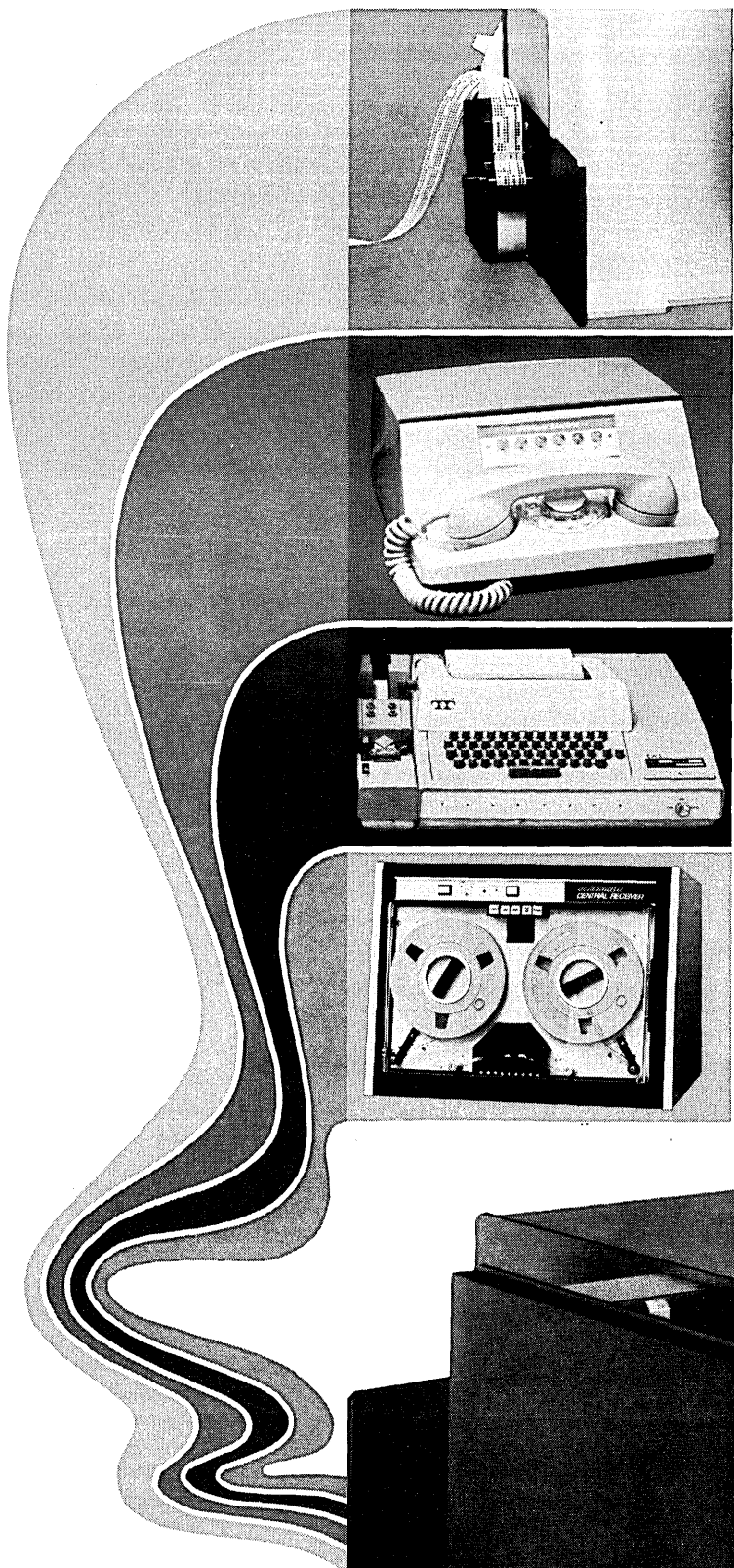
A new generation of equipment, the Miracode II system features reliable solid state circuitry, smart modern styling, and document input twice as fast as with the original Miracode system, already proven by almost a decade of successful use.

It lets you scan your entire microfilm file automatically at the rate of 350 documents per second, with push-button ease. It also lets you update, purge, add, and revise data in minutes. And the entire system can be tailored to your needs with a wide range of optional input and output equipment.

For complete details, write for our new full-color booklet, "The MIRACODE II System," to Eastman Kodak Company, Business Systems Markets Division, Dept. DP-576, Rochester, N.Y. 14650.

Miracode® is a trademark for equipment used in a coded input, retention, access, and retrieval system designed and produced by Eastman Kodak Company.

Kodak Microfilm Systems



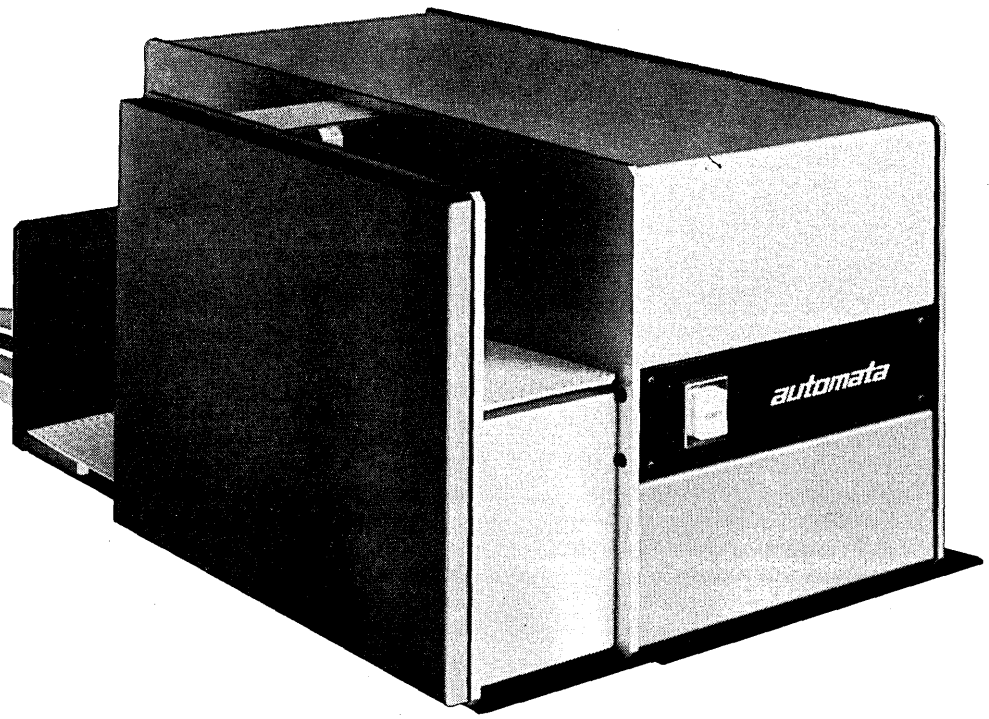
THE COMPATIBLE COLLECTOR

For a fast, simple, low-cost way to collect source data, you're unlikely to find a more agreeable collector than the AUTOMATA 3600 Optical Mark Reader. This collector gets along with punched, printed and pencil-marked cards. Even if they're bent, folded or crumpled. Even if they come mixed up in different sizes. And when it has collected, the AUTOMATA 3600 knows all the ways of talking to a computer — TTY, RS-232C, magnetic tape or perforated tape. If you'd like more information, give us a call or drop a line. We're compatible, too.



2952 George Washington Way
Richland, Washington 99352, (509) 946-4143

See us at the FJCC, Booths 113-115



LOOK



READ

IN BREACH OF
10,000 PROMISES

Those who would be kind look for some form of hidden strategy behind the crude way RCA Corp. handled the announcement it would abandon the general-purpose computer business. After almost two years of increasingly passionate commitment, RCA's sudden guillotine move was characterized as "unbusinesslike ... lacking in responsibility ... and in the style of a true amateur." A week after the announcement, all was in limbo and no one knew anything, although some announcements were due to trickle out late in September.

The big rumor was that L. E. Donegan, the ex-IBMer who had dreams of making RCA Number 2 by using a force of ex-IBMers, has been given 90 days to find a buyer. One possibility was said to be Xerox Corp. which had earlier denied rumors of discussions of a merger or the formation of a third company with RCA. Others are Westinghouse and Memorex. The latter had been slated to become a second supplier of 3330-like disc drives to RCA. Licensee Siemens reportedly refused flatly to buy the operation, but we hear it did order 30 more model 6 and 7s after the announcement of September 17.

PLEASE DON'T PANIC!

RCA customers had no advance warning and no specific details on the support RCA would provide in the future, especially for software. Richard Rau, president of the RCA Users Association and acting director of Pennsylvania's Bureau of Management Information Systems (17 RCA systems), cautioned users not to panic. With "valid, enforceable contracts" and systems and software that "will be usable for the next seven years," the user can definitely "plan for gradual replacement." The RCA users meeting is in San Francisco late this month, where it is grimly joked RCA managers will send their least favored underlings.

RCA Computer Systems employees were numb, caught unaware on every level--and some with a house in Marlboro and an unsold house in Cherry Hill. Layoffs planned before the move continued as scheduled while the rest of the 10,000-plus force continued to work--under tight security (mail was opened, briefcases searched, production workers frisked). Some software people were told in September they had at least 30 more days, but RCA denies any official policy. And just a few days after Black Friday evening, the mayor of Marlboro, Mass., still hadn't been able to find out what would become of the "industrial renaissance" it once was said RCA would help bring to his community.

ROUGH GOING FOR
THE COMPETITION

In Washington there was more than just concern over difficulties the feds will face in getting software support for the 180 RCA systems installed there. The company's withdrawal gives IBM partisans within the federal establishment a tremendous psychological lift and will make it more difficult for non-IBMers to compete against the Mother of Us All. The disappearance within a short time of both RCA and GE

makes the risk of long-term commitments with any of IBM's remaining customers much greater.

General Services Administration (GSA) recently began shopping for third-party maintenance services in Washington and St. Louis. We were told that RCA must win at least one of these contracts; otherwise its ability to continue marketing specialized dp systems and services will be "extremely suspect."

RCA spent \$2 million preparing their bid for the big Air Force Advanced Logistics System (ALS) and then flunked the benchmark. An outsider with good contacts inside RCA says this precipitated its decision. "If RCA had passed, the front office would have waited."

IBM & HILTON --
TOGETHER AGAIN

It wasn't surprising that when Hilton Hotels teamed with new Transamerica Corp. subsidiary, Compass Computer Services, Inc., to develop a hotel automation system last spring they selected RCA equipment. Hilton's first attempt at automation back in 1963, a costly joint effort with IBM, failed badly. But now it's back to IBM for the Hilton system. Compass had just begun testing on its first RCA on September 17. President Pat Morrison said there's no question about switching the system to 370 gear; the only question is "do we convert later or bite the bullet now." He estimates the conversion will add from 90 to 120 days to their schedule. The system was slated to begin operations at the end of the first quarter of 1972.

THREE IN ONE
IN A CADILLAC

Wither computer memories -- bipolar, MOS, or core? "All three" is how Digital Equipment Corp. might answer that one. The Maynard, Mass., company is putting the finishing touches on a 16-bit mini called the PDP-11/45 that will mix all three memories in a single machine. The specs call for 8K of bipolar, 32K of MOS, and 84K of core, giving the machine a total memory capacity of 124K. The machine has a system level access time of 295 nanoseconds. It will be the Cadillac of the DEC mini line but cost less than \$20,000 in a simple configuration. It will be shown at the Fall Joint Computer Conference in Las Vegas and delivered next year.

GOOD NEWS FROM
INTRANET?

Intranet Computing Corp., Los Angeles, which filed Chapter XI bankruptcy proceedings in November of 1970, should be out of the courts by November of this year. The company was prepared to go into court on September 23 with one of two versions of funding supporting a plan of arrangement it was sure would get it out of Chapter XI by October 23.

RUMORS AND
RAW RANDOM DATA

Italy's Olivetti is planning to make its own minicomputer that would be used in Olivetti's broad line of terminals, but no date is given for its introduction ... Although Univac introduced its long-heralded 1110 eleven months ago, it has received orders for less than 10 of them ... In contrast, a Honeywell customer who ordered a 6000 series machine was told the backlog is so big he must wait until '73 for delivery.

10 years ago Leasco pioneered
the leasing of computers...
and has saved its customers
over \$100,000,000.

Now Leasco continues its leadership by bringing you the new IBM System/370s.

The world's foremost computer leasing company now offers you IBM System/370s. On attractive medium-term plans, custom-designed to meet your specific needs and objectives.

Leasco proved the economic advantages of leasing with the IBM System/360. Now, in today's economy, it makes even more sense to lease from Leasco.

We can conserve your cash and offer you important savings right now, when you need it.

Let us show you, without obligation, the many advantages you get with leasing. Call collect: 516-466-9500.
Or mail this coupon.

Leasco
THE LEADER IN LEASING

To: Michael Morrell, President
Leasco Computer, Inc.
One Linden Place, Great Neck, New York 11021

Tell me how Leasco can improve my cash position and flexibility. I understand there will be no obligation on my part.

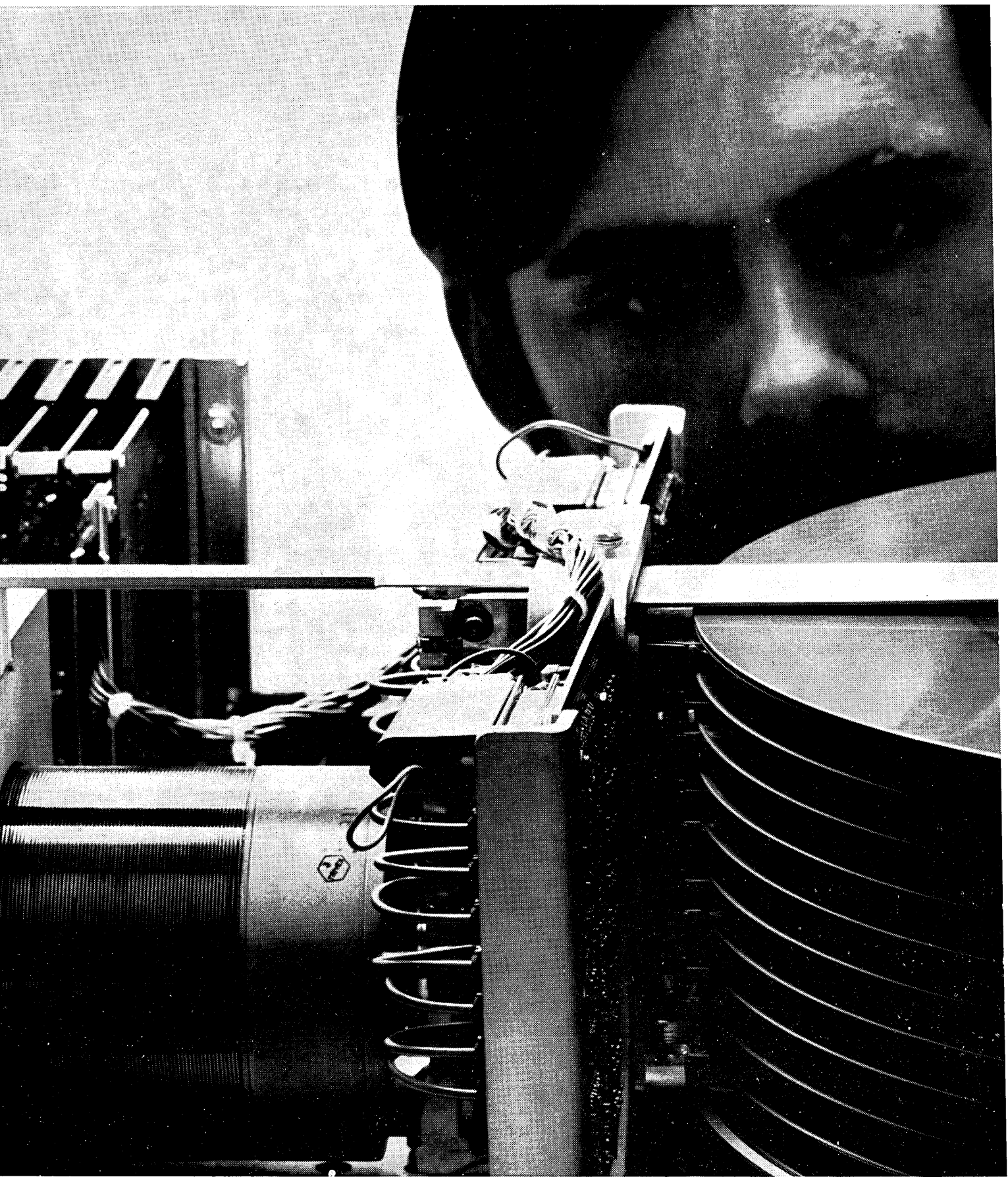
Name _____ Title _____

Company _____

Address _____

City & State _____ Zip _____

LCI-4



TAKE A GOOD LOOK AT OUR DISC DRIVE.

Look at a CalComp disk drive. It's faster than IBM's.

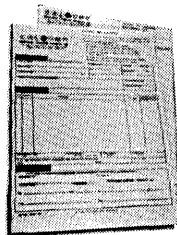
Now look at the leases.

A CalComp lease assumes that CalComp is going to be improving their equipment all the time.

An IBM lease assumes the same thing. Except, they won't write you a 3 or 4-year lease.

We will.

If you want to add equipment we'll do it without lengthening your lease.



Or as your performance requirements grow, we'll re-write the lease with no penalty.

IBM won't.

And the nice thing is, we actually make a wider range of disk drive equipment than IBM.

And CalComp is faster than IBM. The start and stop time is faster. And the access time is faster. So you'd get more for your money, even if CalComp equipment cost as much as IBM.

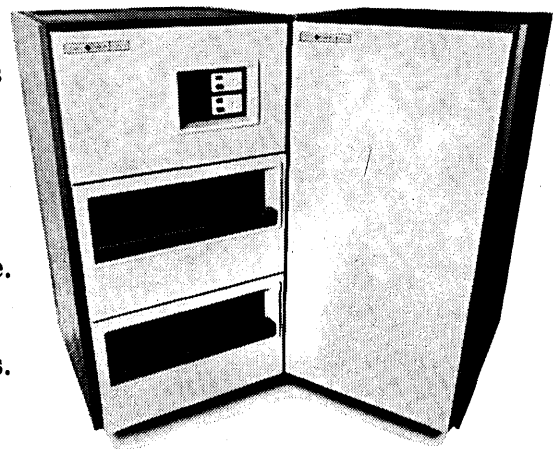
Except, it doesn't.

CalComp is less to lease. And less to own.

So look at a CalComp disk drive, then look at IBM's. Then compare leases.

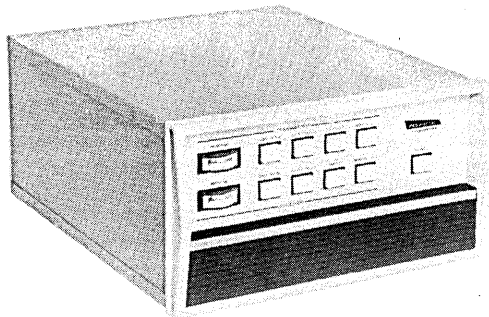
Then write us at

California Computer Products,
Dept. DM-10-71 2411 West
La Palma Avenue, Anaheim,
California 92801. Or call
(714) 821-2011.



CALCOMP

**Only one
dial-up modem can**
Double
your
2780*
throughput



The Paradyne BISYNC

- **Cut line costs in half**
- **Eliminate transmission errors**
- **Reduce 270X port requirements**
- **Maximum 360/370 system efficiency.**

Nationwide service available from 75 locations. For information regarding demonstrations, write or call: BISYNC Product Manager.

* IBM 2780 or any other remote system operating with dial up modems under IBM Binary Synchronous Communications (BSC) protocol.

paradyne

2040 Calumet Street • Clearwater, Florida 33515 • 813/442-5216



LETTERS

C'est la visa

Sir:

Mr. Bosomworth's suggestion (Aug. 1, p. 35) that job hunters requesting visas "lie a little, or assume a posture of blue-eyed innocence when you are found out" is appalling. It is incredible that a respected journal would publish an article that proposed such unprofessional behavior.

J. CHRISTOPHER REID
Columbia, Missouri

On-line exchange

Sir:

I read with interest your recent article concerning our newly offered SIGNET 80 service (Aug. 1, p. 50). The article was comprehensive and correct in all respects except:

1. The communications and line control handling in the new service will be accomplished with the use of a CCI-7000 (communications processing system) which is manufactured by Computer Communications, Inc., in Culver City, Calif. This new system provides a message throughput capability and cost-performance ratio second to none in the industry.

2. In the article you indicate that the service "... is not intended to serve very large firms ..."; in fact, we will run the service on a shared basis for small and medium-sized users, but feel the service has broad applications for very large firms on a dedicated basis.

The service is entering pilot operational status now, and we have already received commitments to use the service from over 10 brokerage firms.

R. THOMAS REHWALD
Midwest Stock Exchange
Service Corporation
Chicago, Illinois

New word announded

Sir:

The Aug. 1 issue contained an interesting new word. The first paragraph of Look Ahead (p. 19) announced an invitation to bid on "unannounded" machines. My copy of Webster's does not list the word, but I'm taking it for my own list of buzz words.

Suggested definition might be: UNANNOUNDED. To declare not-so-publicly with the intent of informing publicly without so doing. Very useful word when you think upon it. Might be used not only to annound computers but sstrs, Supreme Court Justice nominees, non-biodegradable detergents, peace talks.

Keep up the good work. What this country needs are some new noncontroversial words.

ROBERT S. YOUNG
Portland, Oregon

Dislocated rumor

Sir:

Rumors have never been known for their accuracy, but in your "Rumors and Raw Random Data" paragraph in the Aug. 15 issue (p. 18), you mention that "... Westinghouse has sold 140 of its \$700 DOS relocator packages." Everything is accurate in that sentence except the word "relocator." The product which you should have referenced is "disc utility," or "Dump/Restore/Copy." Thank you for the Westinghouse name in ink, but we have been receiving phone inquiries for a relocator package which we don't sell. Incidentally, as of today (Aug. 16) we have sold 185 of our disc utilities for IBM DOS systems.

WILLIAM E. BENDER
Westinghouse Tele-Computer
Systems Corporation
Pittsburgh, Pennsylvania

Legal preference

Sir:

I was most pleased at the appearance of Mr. Chris Larson's article on "The Efficient Use of FORTRAN" in the Aug. 1 issue (p. 24). It contained the practical type of material that rarely appears in such concise form in either reference manuals published by manufacturers or in textbooks.

I would like to make an addition to Mr. Larson's list. There is one case of a "mixed-mode" expression that is legal with all computers, and that involves the raising of a real quantity to an integer power. Most manuals and books state that the form

A**3

may be used in place of
A**3.

Few of them mention that the former is always preferable to the latter for reasons of execution time, accuracy, and capability.

The latter expression always involves both the taking of a logarithm and the calculation of an exponential. As a result of this, it 1) requires an excessive amount of machine time during execution, 2) introduces additional inaccuracy as a result of truncation or round-off (depending upon the nature of the hardware) in the calculation of logarithms and exponentials, and 3) fails to produce any result at all in the event that A should be less than zero.

This seems like a fairly trivial point, but I find that many of my students miss it.

JULIUS A. ARCHIBALD, JR.
Plattsburgh, New York

Friend indeed

Sir:

Your June 15 article (p. 48), "The Hidden Speed of ISAM," was well named because the speed of ISAM, if it exists, is indeed well hidden. Although the alternate access method is not mentioned by name, Mr. Coyle is obviously referring to AMIGOS, the ISAM replacement being marketed by COMRESS...

Mr. Coyle points out that adding records in reverse sequence drastically reduces the time required for string adds, but he fails to mention that *retrieval time* for records in a long chain would still be very high. In an AMIGOS file, all overflow is blocked and chains are limited to one-half cylinder in length. This is the extreme worst case. When the overflow area on a given cylinder becomes full, the entire cylinder is automatically reorganized and becomes two chain-free cylinders.

Mr. Coyle indicates that searching the cylinder index in core caused the job to run increasingly slower as the sorted input tape was processed. If this is so, the cylinder index must have been very large, perhaps 15K to 20K bytes, to cause this much degradation on a fast cpu. Using a binary search routine and modifying ISAM does not solve the core problem.

With regard to Mr. Coyle's finding, I can only surmise that he did not have the opportunity to objectively evaluate AMIGOS. To the three points that conclude his article, I respond as follows:

Letters...

1. AMIGOS would process approximately 41,000 transactions per hour in this situation vs. ISAM's 33,000. Also, less core would be used by AMIGOS.

2. Sequential processing is significantly faster with AMIGOS, not slower.

3. Many AMIGOS users have already tried some of the techniques suggested by Mr. Coyle and have given up. Even when ISAM is fully optimized, AMIGOS still outperforms it.

The 20% to 70% figures given are not performance improvements but, rather, percentages of run time reduction. Thus, a 75% reduction in run time is the same as a 400% improvement in performance. In several cases, AMIGOS has reduced run time by 97%. In Mr. Coyle's terms, that is a 3,000% improvement in performance.

JAMES LIOLIOS
Data Art Corporation
Santa Clara, California

The programmer's analyst

Sir:

Prof. Teichroew and Mr. Sayani ("Automation of System Building," Aug. 15, p. 25) are so right when they observe that there has been, is (and, for some time, will probably continue to be) a disproportionate emphasis on the programming part of the "problem-solving process." Even when they accomplish the very worthwhile purposes of their project, I fear, we shall have to count in decades the passage of time before the impact of their work would be widely seen or felt (so long will it take us to get programmers and the programming-is-everything mentality out of the driver's seat).

In the meantime, therefore, I also encourage them—and others who share the same concerns and interests—to believe that there is another aspect of this same business that merits more serious attention than we have yet devoted to it, largely for reasons similar to those explicit or implicit in Teichroew's and Sayani's article. We need to be able to answer the question: Has anybody already solved the problem now posed?

As more and more knowledge gets put in directly usable form—i.e., as computer programs—our need for a "universal" facility to catalog and disseminate answers to such questions becomes ever more urgent. And when we discover that nobody has solved *precisely* the problem in

which we are interested, we need to be prepared to reject *our* statement of the problem in favor of the statement for which the solution already exists. Another tool we probably could use, therefore, is a "metric" for measuring the difference between pairs of problem statements.

ROBERT M. GORDON
Chairman, ACM SICMETRICS
Irvine, California

Retail brainware

Sir:

I wish to congratulate DATAMATION on a pair of thoughtful retail articles by Messrs. Power and French (July 15). Each article was informative and sophisticated.

The retail industry has bordered on the threshold of automation for several reasons, not the least of which is the point well made by Power and French regarding the incredibly complex inventory problem. Finally, progress is being made in hardware technology for point-of-sale devices. Such hardware did not exist three and five years ago. However, the most pressing problem, in my view, that faces the retail industry is the need for inventory classification standards. With hundreds of thousands of stock-keeping units and vendors, this complex problem can only be solved by universal standards and coding procedures. The retail food industry faces similar problems.

The proposed utopian solution has been a universal coding system for all vendors and their products. These would be produced at the time the product is packed and would serve as universal identification. This coding would be machine readable by a standardized point-of-sale device reading procedure. Because of these types of problems, the most emphatic point to be made is that of Mr. French regarding the need for brainware, not hardware or software, in this industry.

PHILIP P. CARVILLE
Oakland, California

Cashless society

Sir:

Thanks for the irreverent bit of nostalgia on the DCA and its now perennial horseplay (Sept. 1, p. 30). I remember the first dinner at the Santa Ynez Inn and was never sure whether it launched DCA or SHARE or both. One of the apparently for-

gotten issues of the day was the PACT compiler which antedated FORTRAN. Had it won out, today we would perhaps think in vertical tabular formats instead of horizontal algebraic (?) ones. Sometimes I think it a pity it lost.

I was the second secretary-treasurer of DCA and still have the original membership cards. Also the original cash box (long since used as a tool box) which was planted on a table between the bar and dining room to be filled before dinner and mostly emptied after dinner to pay the tab. Just why these items were not needed by my successor, I don't recall. I think the membership list was put on IBM cards and maybe the box was too big for the amount of cash.

WILLIAM ORCHARD-HAYS
Rockville, Maryland

Remote botch

Sir:

In reading your Sept. 1 issue (p. 23), I came across several discrepancies in Table 1 of the article "Trends in Remote-Batch Terminals." We specified our CP-4B transmission rate to be capable of operating from 2000 to 240 kc bps (baud). Your article limits us to 9600 baud. Actually, the high limit is 100kc baud in our new model CP-4B. I realize that few commercial modems operate beyond 9600 bps, but you show several of our competitors operating at speeds up to 100kc and many of them up to 50kc.

Also, you show our lease to be \$900, *not including maintenance*. All of our lease prices *include* maintenance. Admittedly, there was no specific section in your survey to break this segment out, but we assumed that most companies included maintenance as part of their lease price. Should one of our customers desire to do their own maintenance, and we deem that they are technically qualified, then we will deduct \$100 per month from our monthly lease prices. Hence, our lease price on a one-year contract for a system comprising a 300 cpm reader, 300 lpm, 132 column printer and CP-4B communications processor without maintenance should show as \$800 per month.

The 10 cps teleprinter you show as standard for our system is not correct. It is an option at \$36 per month.

JACK F. MACDONALD
Data Computer Systems, Inc.
Santa Ana, California

Fresh from Remex.

A tape punch/reader combo for the price of a tape punch alone.

Remex breaks through the shell this year with another industry first. A combination tape punch and reader. Even more incredible is the price. It costs about the same as a tape punch alone. Like getting a tape reader free.

And the reader you get for nothing is really something. It offers photoelectric accuracy at 300 characters/second with a hybridized read station. Illumination is by an extra long life pre-stressed filament lamp. The unit's integrated circuits are TTL, DTL and RTL compatible. Plus, it's quiet. You'll never hear a peep out of it.

It shares space and power supply with a Remex 1075 tape perforator, so they work as well together as they do independently. Available in both roll or fanfold type configurations.

The 1075 tape punch features ultra-reliable punching of 5, 6, 7, or 8 track paper or Mylar® tapes. All at a quick 75 characters/second. Back space for easy program or operator correction is standard.

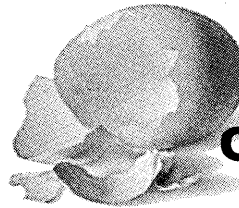
You'll never end up with egg on your interface, either. TTL compatible electronics are highly modular and mounted on highest quality circuit cards. It's

rack mounted with integral power supply and is packaged within 10½ inches of panel space.

Nesting these two high performance machines into one flexible, compact, low-cost unit is just another way Remex is breaking out of its shell this year.

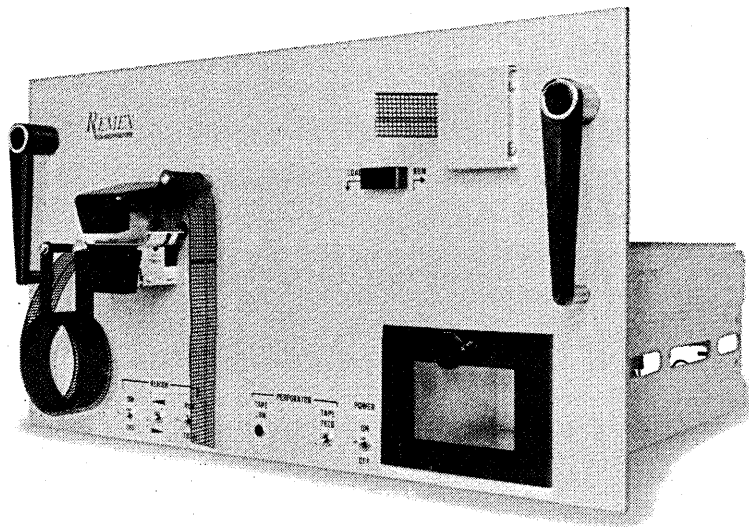
So stop brooding about costs. Write Remex. 1733 Alton St., Santa Ana, Calif. 92705. In Europe and U.K., contact S.p.A., Microtecnica, Torino, Italy.

Remember—Software compatible interfaces are now available for most popular minicomputers. Contact us for price and availability for your mini peripheral needs.



REMEX

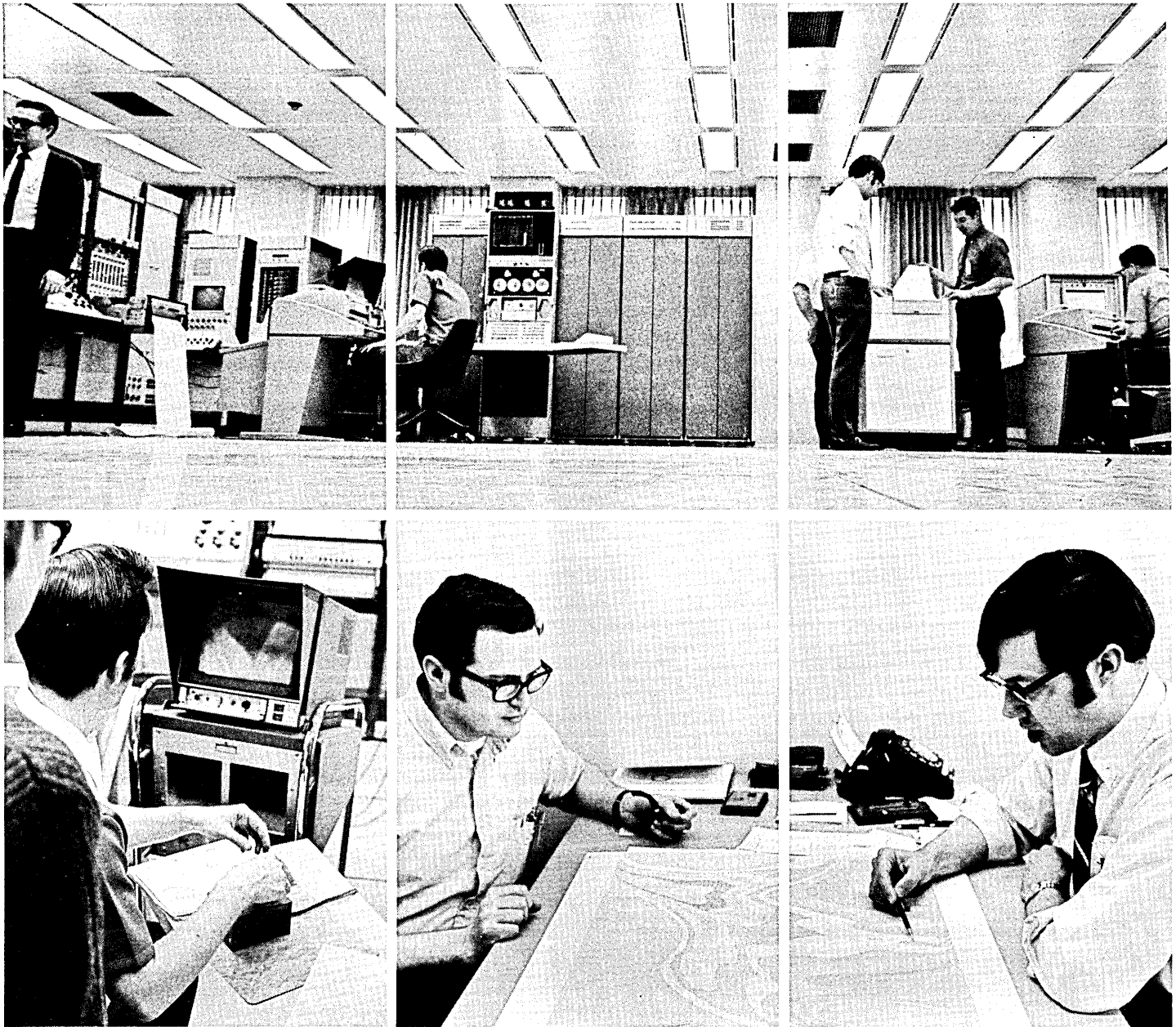
IS COMING OUT OF ITS SHELL.



A UNIT OF



EX-CELL-O CORPORATION



The Gould 4800 helps Battelle-Northwest analyze thermal discharges.

The Gould 4800 high-speed printer is playing a big part in the thermal pollution research being conducted at Battelle-Northwest.

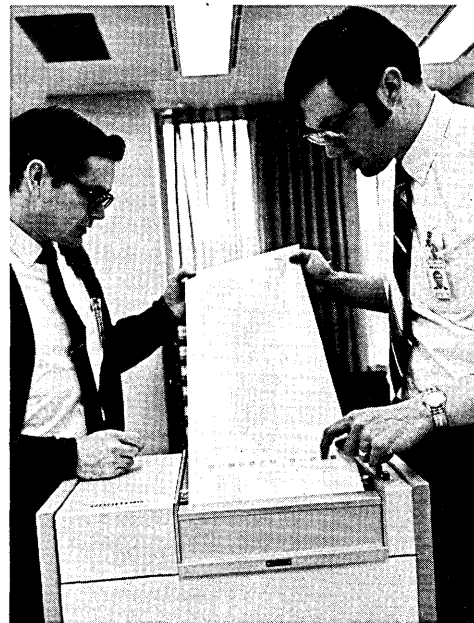
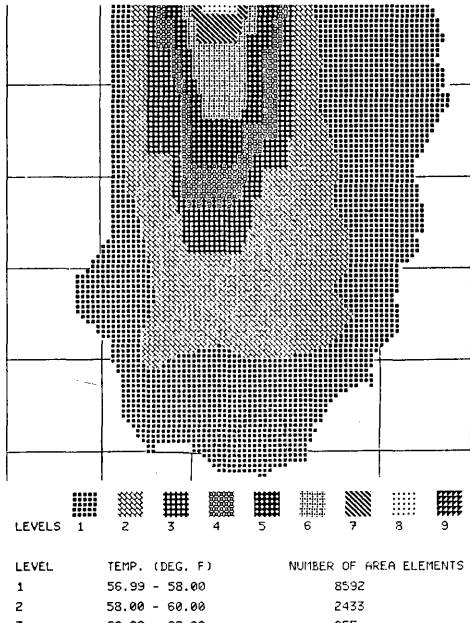
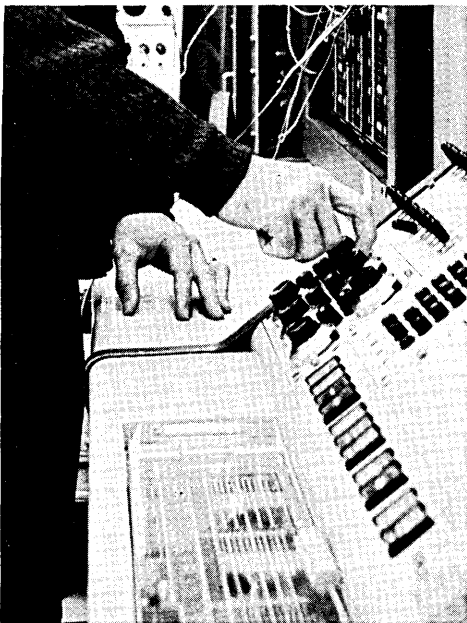
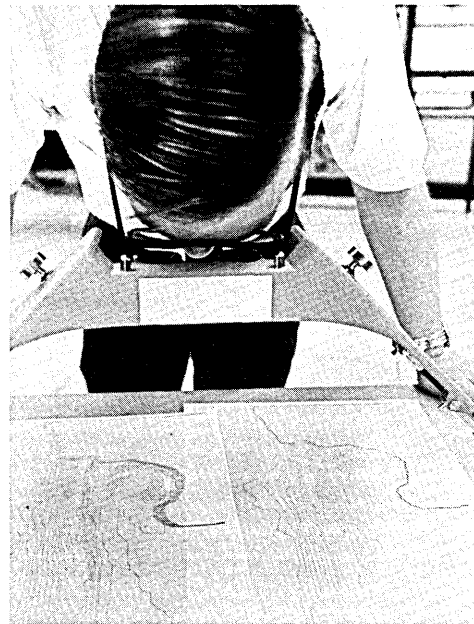
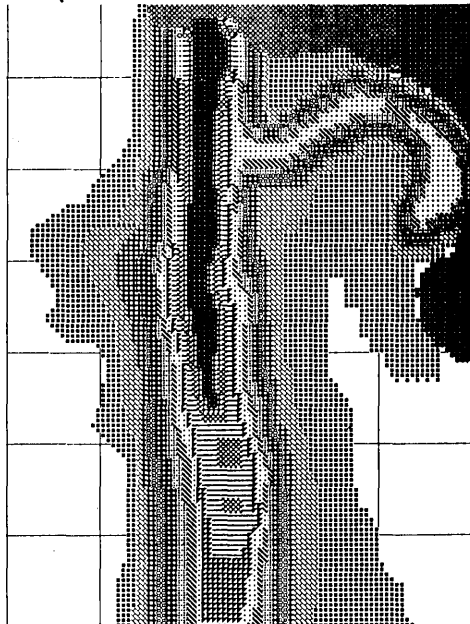
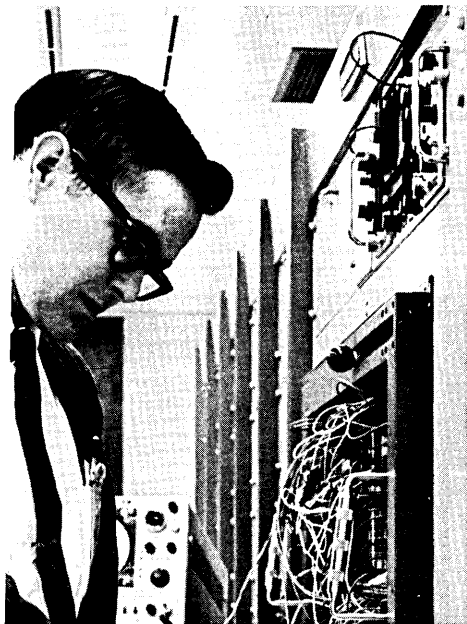
Battelle Memorial Institute, established over 40 years ago, is a not-for-profit research corporation with four major labs and offices around the world. Battelle handles many projects on a contract basis, with heavy emphasis on applied research.

Projects currently underway at Battelle-Northwest in Richland, Washington, include studies that determine patterns of wastewater discharges from industrial and muni-

cipal operations and to evaluate their effects on surrounding waters. The research technique, developed by Battelle, consists of collecting aerial infrared and tracer dye imagery of surface water discharges.

Data recorded from the infrared imager is processed by Battelle's computer system, a unique hybrid facility. A Beckman EASE 2133 analog computer is coupled to a DEC PDP 7 digital computer.

The Gould 4800 then prints out isothermal plots, density plots, and contour plots. The contour plots provide two different views.



COMPUTER PRODUCTS



Used with a stereoscope, these two views provide simulated three-dimensional temperature contours.

Researchers depend heavily on the Gould 4800's graphics capabilities for output of the simulation and modeling projects. And even with their small computer, they get high speed alphanumeric and graphics.

The Gould 4800 operates with the hybrid system in many other projects at Battelle, ranging from physics to social sciences. In addition, by means of a time sharing system, the 4800 operates simultaneously with an

SEL 840 computer for basic math and science calculations.

Battelle's initial investment in the Gould 4800 was less than the cost of impact printer and plotter equipment, and they developed their own interfaces and software for it. Since the 4800 has few moving parts, as well as solid-state electronics, there is also a minimum of maintenance and servicing.

The Gould 4800 high-speed printer. Put it to work for you. Write Computer Products, Brush Division, Gould Inc., 3631 Perkins Ave., Cleveland, Ohio 44114.

Sycor 340 data communications system . . . now with

Software and 12K bytes of memory at your command.



4K bytes of MOS/LSI read/write memory. Each of the hundreds of Sycor 340 terminals we're now shipping can be optionally equipped with fast random access memory. Now powerful programs can be more closely tailored to your specific applications and changed as your system requirements grow. And to get you started immediately, we've developed a Program Library, ready to be loaded from cassette and executed at the push of a button: Range Checking ■ Table Look-Up ■ Multiplication / Division ■ Value Comparison ■ Code Conversion ■ LRC or CRC checking for communications ■ Card Reader and Card Punch drivers ■ Check Digit generation / verification ■ Conversational Mode . . . And more to come.

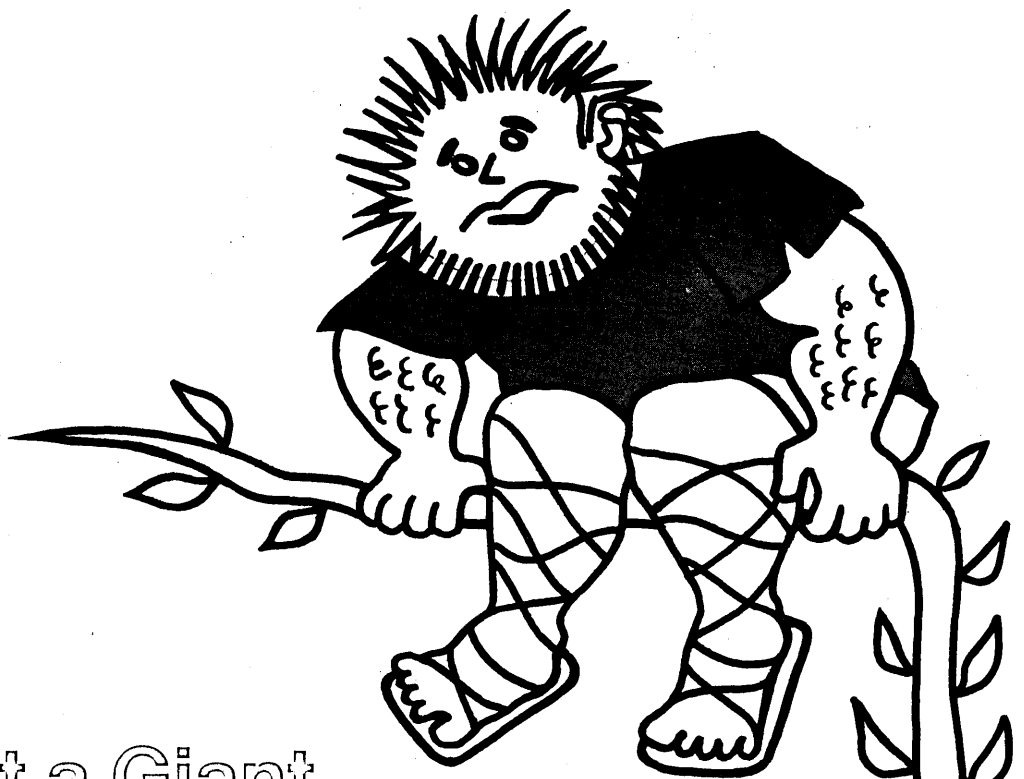
Our 8K byte ROM has been packed with "goodies" all along. Omission Detection™, Capacity Control™, 2400 BAUD BSC Communications and Data Compression. Drivers for 30 cps and 50

LPM printers. All that combined with a control program that doesn't waste time. Input / output operations are double buffered and fully overlapped. And most of our peripherals run on DMA Channels to increase system throughput and allow more application processing time. So far, we've spent over 27 man-years of machine language programming in optimizing your applications in field-proven, general purpose firmware. We didn't think you'd want to absorb the expense, and risk your schedules in doing that!

Even greater capability for 340 users. Once you've tried our Program Library, you may also want to write special programs of your own. Soon we'll be announcing this further capability. Keep watching, and . . . keep talking to Sycor.

100 Phoenix Drive, Ann Arbor, Michigan 48104

S
SYCOR INC



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.

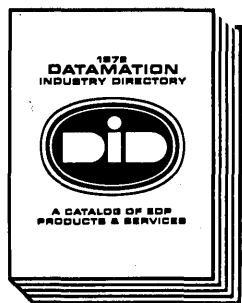
Take trade advertising, for example. Some of the Giants seem to feel it's a waste of time. So, they only take a page now and then for the sake of appearances. But this type of tokenism truly is a waste of money as any smart advertiser (big or small) knows.

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



Health, Education and Welfare discovered the implementation of a generalized information system was far from easy . . . but there is a payoff

The Tribulations and

G The past few years have seen a tremendous growth in the number of generalized data management systems available on the market. They are often sold to management as a data processing panacea, with the capabilities of storing, maintaining, and retrieving data with

After six weeks of floundering, it was realized that this was the first attempt, in either government or industry, to use all the features of the GIS package . . .

relative ease. This is not always valid.

The following case study describes the initial attempt of applying such a system in the Department of Health, Education and Welfare (DHEW). Although the application discussed is specific, the experiences encountered will be of general interest. It is hoped that this report will allow users to avoid some of the pitfalls of generalized data management systems without sacrificing their powerful potential.

In 1969 the DHEW administered over 400 public advisory committees containing more than 5,000 professional and lay members. The scope of the program and its sensitivity to public relations required con-

stant attention. Because of its continued growth it became increasingly difficult to manage the committees and to be responsive to the information needs of the Congress, the White House, and the public.

A task force of interagency personnel was established to consider the feasibility of automating the program. The group conducted a complete analysis of the committee management functions of all the DHEW agencies and the Office of the Secretary. The feasibility of an automated centralized system was ascertained. A systems requirements report was submitted to the Secretary. The goals of the proposed system were stated as:

1. To support the information requirements of the Secretary of DHEW, Department Committee Management Office and the agencies (Social Security Administration, Health Services and Mental Health Administration, National Institutes of Health, Food and Drug Administration, Office of Education, and Social and Rehabilitation Service) in: a) selecting potential members; b) notifying the Secretary of current and future vacant positions on public advisory committees; c) the tracking of nominations in process; d) producing required recurring reports.

2. To establish a centralized data bank that would provide rapid response to inquiries from the White House, Congress, the Secretary of DHEW, special interest groups and DHEW agencies.

The report included a description of suggested inputs and outputs of the system and an evaluation of some of the computer software alternatives that might be utilized for implementation. The recommendation was for IBM's Generalized Information System (GIS).

This article was written by Janet Nathanson and Alan Kreger in their private capacity. No official support or endorsement by the Department of Health, Education and Welfare is intended or should be inferred.

Triumphs of GIS

by Alan Kreger and Janet Nathanson

GIS was selected to take advantage of the theory that a generalized data management system would facilitate rapid implementation of the system. Since the application was to be centralized and automated at the same time with all costs absorbed by the agencies, it was felt that acceptance of the system would be greatest if these costs were kept at a minimum. Therefore, the software to implement the system had to be available on one of DHEW computers. Most important a generalized data management system with a powerful retrieval language would allow the users to have easy access to their data files.

GIS is a set of integrated computer programs for the IBM System/360 that is designed to perform data file creation, maintenance, retrieval and presentation operations that are common to many data processing applications. It operates in a multiprogramming environment using the MVT option of OS/360. It may be operated in a job sequential mode or a teleprocessing mode (currently QTAM) with remote terminals. Some of its capabilities and limitations are presented as follows:

Data description language. This provides the ability to name files and entries within files, and describe the format and editing to be performed upon data.

a. Simple one level or complex hierarchical file structures can be described.

b. Validation criteria for each field can be specified—such as alphanumeric designation of each character, range, table look-up, etc. In addition, linkage to an external user routine that provides additional field verification is possible.

c. Encoding or decoding can be incorporated into

the field description statement.

d. Free-form coding structure with either skeleton or very detailed field descriptions simplifies preparation of data description and reduces errors.

e. It is not necessary to revise procedures when a field description is changed.

f. Any file that conforms to OS/360 specifications can be processed by GIS. Files created or updated by GIS can be processed by any other OS language or utility, allowing maximum interchangeability.

Three months after the scheduled completion date the master files were still not established.

g. The appropriate JCL is created and stored with the description of file.

Query language.

a. The free-form procedural language conforms closely to written English. It is simple for a nonprogrammer to understand and use, yet powerful enough to produce elaborate reports.

b. Complex Boolean retrievals using a complete range of operations (equal, not equal, greater than, scan, etc.) are possible.

c. A sophisticated search strategy is built into the language, relieving the user of programming complex file-matching statements, thus simplifying multifile queries.

Tribulations and Triumphs . . .

d. A maximum of 16 files can be queried in one run.

e. A maximum of six work files can be created, and then sorted and queried in subsequent procedures.

f. A maximum of two reports can be generated by a single query.

g. Queries cannot be batched.

Data display.

a. The system can automatically format reports using field names or user-supplied headers.

b. A formal report with title page, headers, detail lines, summary information, and trailers can be coded.

c. All decoding specified in the data description language is automatically performed.

File maintenance.

a. A wide variety of update options are available which can add, change, or delete records or parts of records.

b. The entire range of procedural statements can be used including arithmetic and Boolean operations.

c. Field validations as specified in the data description section are automatically performed.

d. Fields can be qualified.

Operating environment.

a. GIS procedures are first compiled. If no errors are encountered load modules are produced. Diagnostic messages are incorporated into the body of the procedure if there are errors.

b. JCL statements are automatically produced for each executable module, which is then processed in turn. Load modules can be saved and executed at a later date, eliminating the compilation step.

c. Source statements can be saved in a library and corrected if required.

d. The language processor and the file processor are treated as two completely separate jobs. After execution of the language processor, the module to be executed by the file processor is put at the end of the job queue.

Discussions with other government agencies, who were using the system, indicated that the lack of GIS experience would have a great impact on the schedule. Therefore, it was decided to secure the services of a consultant who would provide the expertise and support needed. The IBM Corp. examined a rough draft of the systems requirements report and submitted a proposal to design and program the entire application, as well as implement the pilot agency. In addition, they agreed to provide 80 hours of support from the IBM GIS Program Development Group. A contract was signed with estimated completion date of three and one-half months.

The DHEW computer center was also interested in a trial GIS application. They detailed a systems programmer to the task force, who was to act as an interface with the computer system and learn the application language. Back-up staff as necessary was to be provided. If the system performed as specified and if it interfaced well with current operations, the computer center was prepared to provide it to all users.

The task force attended the five-day class in GIS so that they could monitor and evaluate the contract performance as well as plan and design possible applications within their own agencies. However, the course provided only an overview to the system. Its

content proved much too limited for these purposes.

The normal procedure in implementing a computer system is to evaluate the systems requirements in terms of an efficient and effective design. The master files are laid out, the computer flow is indicated, the processing steps to be followed in each program are described, etc.

According to the GIS Program Development Group this step was not necessary. They felt that the committee management systems requirements report provided sufficient documentation to proceed directly to the coding of GIS file descriptions and procedures. But it soon became apparent that the scope of the applica-

Top management should know about the most critical features of data

In order to implement a data processing system, it is necessary to write programs which (1) load a data base, (2) retrieve specified records from the data base, (3) process retrieved records, and (4) prepare reports. In most computer installations, customized programs are written to perform these rather general functions for each application. However, the use of customized programs has resulted in high implementation and maintenance costs. These costs are high primarily because of the difficulties of making minor changes to the system; if the data base is changed slightly, many of the programs which access the data base must also be changed.

Management has become more and more concerned with this situation and has been looking for a generalized solution for the problem. With the continuing decrease in processing costs, they have been willing to accept processing inefficiencies in return for reduction of implementation and maintenance costs.

An Idealized System

A data management system should consist of the following:

1. A data definition language used to describe the logical structure of a data base and the way it is to be physically organized.
2. A retrieval language so that individual records or subsets of the data base may be accessed.
3. A language to prepare output reports.
4. A checkpoint and restart capability.
5. A data security function.
6. An on-line as well as batch processing mode.

The first three of the above features merit further discussion. The most critical is the data definition language. The data definition language is used to describe the data base and is used in each application program to describe the portion of the data base which is needed by the application program. With this technique, it is possible to make logical changes and/or additions to the data base and still

tion was far broader than was anticipated because of the complex file maintenance specifications. After six weeks of floundering, it was also realized that this was the first attempt, in either government or industry, to use all the features of the GIS package in the areas of file design, creation, maintenance, validation, and generation of recurring reports.

File maintenance problems.

1. The transaction register problem. Since all the DHEW agencies were supplying input to the system a user-oriented transaction report was deemed necessary. While this seemed simple in concept, it proved to be a serious obstacle. As a normal part of its update

procedure GIS produces a report called "recording output" which shows the actions taken as the result of a transaction/master file interaction. IBM's original plan had been to consider this "recording output" the "Transaction Register." However, it was completely unsuitable to the needs of the Committee Management Office because of its format. Therefore, it became necessary to expand the contract so that a customized transaction register could be generated. This involved the following steps:

a. The data description tables (DDT's) defining the master files had to be modified to include an assembly language module that would annotate errors.

management systems . . .

not have to change application programs, thus providing program data base independence.

Next in importance is the data retrieval language. This language may be programmer or user oriented. If it is programmer oriented, its purpose is to make it significantly easier for programmers to access portions of the data base. If it is user oriented, its purpose is to make it easy for nonprogrammers to access and display portions of the data base in a language familiar to them.

Finally, a data base management system should have adequate report writing capabilities. It should be possible to use the data retrieval language to identify subsets of the data base and then, using a report writing language, easily prepare various output reports.

Diversity of Available Systems

Many people have attempted to build data management systems. There are probably well over 75 software packages on the market that are called data management systems by their designers or proponents. These systems vary a great deal in their capabilities. Some systems are simply collections of subroutines that can be used to access and maintain complex data bases. More sophisticated systems allow a nonprogrammer user to select records from a file and prepare simple kinds of formatted reports. More elaborate systems allow several nonprogrammer users to simultaneously make extremely complex inquiries into a data base. That is, users have available a language that allows them to express complicated requests for data from the file.

A very crude but useful way to classify the available software packages is to consider three attributes of the systems:

1. The complexity of the data base which can be handled.
2. The availability of a nonprogrammer-oriented inquiry report formatting language.
3. The response time and throughput capabilities.

Some systems have emphasized the ability to handle complex data bases, paying little or no attention to the response times and/or throughput requirements. On the other hand, some systems have been carefully designed to maximize throughput and response time but do not contain a user-oriented inquiry language and are not capable of handling logically complex structured files. For example, IBM supplies three products, all of which are called by some people data management systems, each with a special emphasis. One system, CICS, has as its primary objective fast response to structured inquiries to fairly simply structured files. The second, IMS, has as its primary objective on-line access to complex data structures. Less emphasis has been placed on maximizing response times and throughput capability. The third, GIS, allows unstructured inquiry with a nonprogrammer-user oriented language to complex data bases, but response times and throughput capabilities have received less emphasis than have inquiry language capabilities.

Thus, none of these IBM packages really has all of the capabilities desired of a generalized data management system. Instead, each has focused on handling a few aspects of the generalized data management processing problem. This is typical of the many packages currently available. Still, a great deal of activity is continuing in this area of software technology and the progress that is being made on individual aspects of data management systems can one day be expected to lead to the development of packages that successfully combine all aspects.

—George O. Gardner

Dr. Gardner is with the management consulting firm of Arthur D. Little, Inc. His primary professional activities have been in the areas of real-time system design, analysis of operating systems and data base design. He holds a PhD in applied mathematics from Brown Univ. and a BS in engineering from Princeton.

Tribulations and Triumphs . . .

b. *GIS* does not give the programmer direct access to transactions that fail the data description table specifications in the file maintenance module. Therefore, a pre-update query of the transaction file was coded. This procedure printed rejected transactions in a more suitable format.

c. An attempt was then made to update the master file with transactions that met the data description table specifications. An intermediate file was created containing the key fields of the transaction and a message indicating whether the transaction was accepted or rejected.

d. The intermediate file and the master file were then read and the updated master record or rejected transaction was printed.

This procedure took 200 bytes of core storage and doubled the number of passes made through the master file.

Due to the unanticipated additional costs, computer time used, and programmer time wasted, it was decided that a detailed systems design in terms of *GIS* procedures was vitally necessary. This systems design revealed the following further inflexibilities in the file maintenance module of *GIS*.

2. The update problem. The application had rigid requirements for adding records to the master file, making it a complex file maintenance problem in any language. Conforming to these requirements under the *GIS* restrictions was an horrendous task. Three successive update procedures were necessary to assure file integrity and to produce a meaningful transaction register.

This inefficient method of performing file maintenance resulted in many additional updates of the master files as well as creating, reading and modifying temporary files. The amount of CPU time was greatly increased, making cost estimates for the project far underestimated.

Many problems similar to the ones above caused the schedule to slip considerably. IBM replaced the original programmer with one who had a better grasp of the scope of the problem. To compensate for lost time and meet the estimated target date, a second IBM programmer was assigned to the project on a temporary basis. In addition, the *GIS* Program Development Group was given the task of coding the more difficult reports.

Systems interface problems. During this period, *GIS* was successfully installed on the computer and testing activities were attempted. Systems problems were immediately encountered and continued to hamper the progress of the project.

First, *GIS* was not able to interface with the *HASP* portion of the operating system. A modification, not warranted by IBM, had to be installed. During the six weeks required to accomplish this, testing was done with basic, rather than full, *GIS*.

Secondly, proper implementation of *GIS* requires systems programmers to have a high degree of knowledge and expertise in both *GIS* and the OS environment. Each systems problem encountered required considerable time and research until it was solved. Progress was further slowed by the uncovering of five *GIS* bugs. IBM was very responsive and provided the appropriate fix rapidly. But, each bug held up testing for more than a week. Turnaround time was another problem causing serious delays. Under normal cir-

cumstances, *GIS* procedures are executed in two steps. Step 1 is the language processor or compilation. This step produces executable modules with their associated *JCL*. Step 2 is the file processor, in which these modules are run against the test data. Initially, the executable module could not be run immediately after compilation as it is in *COBOL* or *FORTRAN*. It was treated as a new job and went to the end of the queue. This increased turnaround time from two-and-one-half hours to five hours, effectively allowing only one test shot per day. The computer center remedied this by making a temporary modification which provided for immediate execution.

Three months after the scheduled completion date the master files were still not established. An extension to the contract was granted. New problems arose in areas such as the reallocation of space on work files, restart procedures, etc. IBM was forced to assign a full-time *GIS* systems programmer familiar with the operating system to overcome the difficulties. The *GIS* libraries and operating options were tailored to interface more effectively with the operating environment at the computer center as well as the application specs.

The project . . . was complicated by the fact that neither the task force, nor the DHEW computer center, nor IBM was fully aware of the implications of using a data management system for an application of this scope.

As a result of continuous efforts made by IBM, the system became operational before the end of 1970.

Post-implementation operational problems. The following operational problems have been encountered since implementation. Some of these were remedied, while others continue due to the nature of *GIS*.

1. Each subprocedure in a procedure is treated as a separate job in terms of core allocation. For example, if a procedure consists of three subprocedures, the first requiring 50K, the second 200K, and the third 100K, each subprocedure will be executed separately in partitions of 200K. Therefore, when this procedure is in the queue, it must wait three times until a 200K partition is available. Elapsed time increases dramatically, and run time is charged on the basis of 200K with the attendant penalties. This also has a great impact on other 360 users. At present, no solution is available for this problem.

2. *GIS* handles requests for special forms paper in a similar manner to the core allocation requests. Each subprocedure in a procedure makes a separate request for multipart paper. But, *GIS* produces three different types of printer output. Therefore, each subprocedure makes three different requests for multipart paper. One procedure, consisting of 12 subprocedures, caused systems lockout until this was realized. This problem was solved by using standard one-part paper, and producing multiple reduced copies

on the Xerox.

3. The large amounts of core used, the large blocks of cpu time required, and the long elapsed time that a procedure is in the computer system have had a negative impact on all other users. In addition, the likelihood of computer malfunction or job cancellation due to system lockout occurring during execution of a procedure is greatly increased. Resubmitting procedures two and three times is not uncommon.

4. One of the original reasons for selecting *cis* was that a non-data processing oriented user could interface with his data files with a minimum amount of support from the DHEW computer center. However, the need to resubmit jobs that come to unsuccessful termination has required the user to learn the mechanics of scratching and uncataloguing partial master-file updates. This solution, although workable, is unsatisfactory because it demands a level of understanding of the operating system far greater than was anticipated. This problem would exist regardless of language or system selected. However, if it were a rare instead of frequent occurrence, the computer center staff instead of the user would be expected to respond.

5. Because of the possibility of computer malfunctions or systems lockout, the user has found it most efficient and least expensive to assure that the first part of a file maintenance procedure was successfully completed before submitting the second. Since these files require iterative updates, the entire processing cycle takes two to three days instead of one, depending upon computer workload. No solution is currently available for this problem.

6. One multifile query was taking in excess of 60 cpu minutes because of the search strategy used by *cis*. In order to reduce costs and ease the burden on the computer center operations, the query was segmented by creating four subfiles each consisting of one-quarter of each master file. The report was produced in four sections. Although the total cpu time was reduced, the user has the added burden of handling the output four times.

The purpose of this narrative was to illustrate the difficulties that can and will arise if adequate support is not available. The project to automate committee management activities was complicated by the fact that neither the task force, nor the DHEW computer center, nor IBM was fully aware of the implications of using a data management system for an application of this scope.

The purported *cis* capabilities do exist. However, the ability to apply many of them requires detailed experience in the use of the system. This learning process was greatly understated in the preproject presentations of *cis*. This is often the case when software packages are sold to management.

Potential users of *cis* or any other data management system must consider that the system is only a tool. Management must realize that a data management system requires a sizable commitment of resources for training and systems support. Application programmers must understand the capabilities and limitations in terms of file design, file maintenance, and query language. Systems programmers must receive intensive training in the interface problems so that the data management system does not impact too heavily on the operating environment. The computer

center must realize that the nature of a data management system makes it a heavy user of computer resources and must be committed to guarantee strong support to all users.

The preceding discussion may have convinced the reader that *cis* was a poor choice for implementation. This is not so. The Committee Management Office in only five months has gained considerable systems payoff. Many requests for information have been received from Congress, the Secretary and the Controller. Response to these requests has been quick and thousands of dollars in man-hours have been saved.

After a brief introduction to the *cis* query language, the Committee Management Office staff has begun to prepare, debug, and run their own queries. As they gain more experience, they are handling increasingly more complex requests for information. In addition, the committee management officer has been able to extract the necessary analytical information to enable him to formulate new policy for the effective administration of the DHEW Public Advisory Committees.

The requirements of the committee management system were not unique. The need for easy, rapid access to automated files is a problem in many applications. The ability to provide rapid response and produce well-designed, readable reports with a minimum investment of high level programmer time is a requirement that all computer centers have experienced. A data management system such as *cis* is a means to accomplish this. ■



Mr. Kreger is chief of the Management Information Systems Branch of the Welfare Reform Planning Staff, DHEW. He also teaches business statistics at the Univ. of Maryland. Previously, he was employed by the Division of Computer Research and Technology at the National Institutes of Health and the Philco-Ford Corp. He holds a BS and an MBA from Temple Univ.



Mrs. Nathanson is a consultant and project director for the Office of the Assistant Secretary for Administration and Management, DHEW. Formerly, she was chief of the Division of Systems Analysis and Programming at the Dept. of Labor. She has ten years' experience in the computer field. Her BA is from Brooklyn College and she has done graduate work at American Univ., Washington, D.C.

**Want to improve throughput
per unit cost? Switch to
a 24-bit word length**

Speed Tests, Costs,

T For the purposes of planning computer applications and selecting equipment, it is helpful to know the time required for certain elementary operations on various computers. This indicates how much real-time computational load may be carried by a given machine.

Some such information has been obtained from

**. . . the shorter-word machines
offer no savings in
memory cost for a given job . . .**

speed tests on a limited but representative selection of small-to-medium computers of the class commonly used for process control and data acquisition applications. Tests were run on a total of nine machines including two with 24-bit word length, one with 18-bit, five with 16-bit and one with 12-bit. Although some of the machines tested were not the newest, their performance relative to their cycle speed may be considered typical of newer machines of the same word length. Some comments will be made regarding the relative merits of these different word lengths.

The tests were run with a FORTRAN program that was specially written to test the speed of various single precision floating-point arithmetic operations and functions. The use of FORTRAN was the only means by which it was practical to test a wide range of computers with a reasonable expenditure of effort. However, the applicability of the results is not restricted just to FORTRAN programs. A floating-point

arithmetic or function subroutine can be considered just a particular type of data manipulation in which the bit patterns that we call the "floating-point operands" are operated upon in a prescribed way to yield another bit pattern that we call the "floating-point result." Therefore, the outcome of these tests is a good indication of the relative performance of the tested computers on other data processing tasks. Moreover, the results do not merely reflect some peculiarity of compiler generated code, because most of the time for each operation is spent executing hand-coded library subroutines.

Table I shows the computers that were tested. The two 24-bit machines were the Honeywell DDP-24 and the Systems Engineering Laboratories SEL-840MP. The SEL was tested both with and without its Extended Arithmetic Unit (EAU) which provides hardware floating-point capabilities. The other machines all used subroutines to perform floating-point arithmetic. All machines had hard-wired fixed-point multiplication and division. The 18-bit machine was the Digital Equipment Corp. PDP-9; the five 16-bit machines were the Varian Data Machines 620¹, the Systems SEL-810A, the Control Data Corp. CDC-1700, the IBM-1130, and the Honeywell DDP-516; and the 12-bit machine was the CDC-160A.

This table also shows the amount of memory occupied by the timing program and the library subroutines that it uses. Practically all of the space is occupied by instructions; only about two or three dozen words are used for data. For the 12-, 16- and 18-bit

1. Actually, the optional 18-bit version, designated DATA-622, was tested, but its instruction structure and running times are equivalent to the 16-bit version and were tested as such.

and Word Length

by Charles E. Cohn

machines the number of words required is enough greater than for the 24-bit machines that the total number of bits occupied is comparable. Now, the cost of a core memory is mainly proportional to the number of bits it contains and is not particularly dependent on how these bits are subdivided into words. This indicates that the shorter-word machines offer no savings in memory cost for a given job, even though a memory containing a given number of words might be cheaper than with 24 bits.

In the timing program the speed of each operation was tested by including it in a DO loop which repeated it a large number of times, 500 to 200,000 with different operands. The loop was preceded and followed by a PAUSE. The total running time of each loop was measured in different ways on the different computers. On the PDP-9, CDC-1700, IBM-1130 and CDC-160A the timing was done manually with a stopwatch, the elapsed times ranging from 2 to 9 seconds for the first three, much more for the later. Each loop was measured two or three times and repeatability was within $\frac{1}{10}$ of a second. On all of the other

machines except the SEL-840MP and DDP-516, a strip chart recorder was connected to the halt light on the console. The recorder was run at a speed of 3 ips. To eliminate errors due to recorder response time the record was measured from the beginning of the start transition to the beginning of the stop transition. Message typeouts on PAUSE were eliminated by altering instructions in core.

On the SEL-840MP, the timing was done with a binary counter connected to it. The counter received pulses from a time-mark generator. A special halt routine was written to read and reset the counter before and after each loop. The count read in at the end of the loop thus gave the loop duration. The time mark generator was run at a thousand pulses per second for the non-EAU tests and at a million pulses per second for the EAU tests. On the DDP-516, the timing was done with a 50 Hz real-time clock.

For each loop the gross time per operation was obtained by dividing the total elapsed time by the total number of cycles. To obtain the net time, the time required for a DO cycle was subtracted. In addi-

COMPUTER	DDP-24	SEL-840MP	PDP-9	DATA-620	SEL-810A	CDC-1700	IBM-1130	DDP-516	CDC-160A	
BITS PER WORD	24	24	18	16	16	16	16	16	12	
MEMORY CYCLE TIME, μ sec	5.0	1.75	1.0	1.8	1.75	1.1	3.2	0.96	6.4	
MEMORY OCCUPIED BY TIMING PROGRAM AND LIBRARY SUBROUTINES		Non- EAU	With EAU							
WORDS:	953	1129	881	1615	1907	1622	1845	2078	1636	3838
BITS:	22872	29496	21144	29070	30512	25952	29520	33248	26176	46056

Table I. Computer parameters.

Speed Tests . . .

tion, the sine, square root, natural logarithm, and exponential operations required subtraction of the time for the add operation used in forming the argument.

Table II shows the time in microseconds required for each of the operations on the various computers. Factors such as software efficiency or instruction repertoire might be adduced to explain the observed disparities in speed. For example, the unusually long times on some of the machines for the sine, square root, logarithm, and exponential functions result from the approximation algorithms for these functions being executed in floating-point. Better performance can be had where the approximation algorithms are executed in fixed point with the result being floated upon completion. Furthermore, the SEL-840MP is handicapped in speed relative to the other machines by carrying eleven significant figures in its single-precision floating-point arithmetic while the other machines carry just six or seven significant figures. Also, the unusually long time for a DO cycle on the DATA-620 results from the use of a subroutine to increment and test the loop index.

Nevertheless, these disparities in performance would appear to arise primarily from differences in word length. That can be seen from Table III. This shows the same information as before in terms of memory cycles per operation, which allows compari-

son of how efficiently each computer makes use of its basic speed capability. For the most part, the 12-, 16-, and 18-bit machines suffer from an evident disadvantage with respect to the 24-bit machines—well over a factor of two.

(All of the tested machines have comparably extensive instruction repertoires. In fact, some of the 16-bit machines have a much more extensive list of register-to-register instructions than do the 24-bit machines. Also, with the exception noted above, all of the software systems are of about the same degree of sophistication. The short-word machines have working-register complements comparable to those of the 24-bit machines.)

The inefficiency of the short word arises from the inconveniences in memory addressing that it imposes. A single word of 18 bits or less is not large enough to carry both an instruction code and the address of any location in a memory of reasonable size. It is often necessary to circumvent this limitation by the use of indirect addresses or double-word instructions, both of which consume extra time and space. In addition, multiple precision data handling is more frequently required.

In the light of all this let us reexamine the supposed advantages of the short word, primarily regarded to be cost savings. We have already seen that savings in memory costs are questionable because the

COMPUTER	DDP-24 ^a	SEL-840MP Non- EAU	SEL-840MP With EAU ^b	PDP-9	DATA-620 ^c	SEL-810A ^d	CDC-1700	IBM-1130 ^e	DDP-516 ^f	CDC-160A ^g
ADD	440	308	19	500	518	553	540	850	245	3445
DIVIDE	413	383	37	580	790	2622	720	1130	270	3805
MULTIPLY	369	282	26	500	732	611	550	960	250	3625
SINE	584	4970	365	5235	3396	9862	4540	3600	2375	37460
SQUARE ROOT	377	824	267	4085	806	13459	8440	5070	535	20710
EXPONENTIAL	1188	3009	470	6385	1916	N.A.	3340	2833	2105	30960
LOG	548	5887	373	4785	4576	11262	5940	5500	2725	32960
IF	28	11	11	90	24	85	190	200	36	1723
FIX	130	79	33	160	260	162	330	370	224	3065
FLOAT	105	50	8	160	356	615	760	540	312	2785
STORE SUBSCRIBED VARIABLE										
1-DIMENSION	196	77	28	240	53	192	370	640	89	2475
2-DIMENSION	221	88	39	300	242	213	380	750	124	2465
DO (1 CYCLE)	43	18	18	15	266	18	16	52	10	1295

^aResults also apply to DDP-124 if operation times are multiplied by 0.34 and 40 μ sec are added for ADD, DIVIDE, MULTIPLY, SINE, LOG and EXPONENTIAL. Increase memory requirements by 20 words.

^bEAU = Extended Arithmetic Unit (hardware floating-point).

^cResults also apply to DATA-620/i.

^dResults also apply to SEL-810B if operation times are multiplied by 0.45.

^eResults also apply to IBM-1800 if operation times are multiplied by 0.625 for the 2- μ sec memory or 1.25 for the 4- μ sec memory. Reentrant software may run slower.

^fResults also apply to DDP-116 and H-316 if times are multiplied by 1.82.

^gWith 168 arithmetic unit.

Table II. Operation times (in μ sec).

COMPUTER	DDP-24	SEL-840MP Non- EAU	SEL-840MP With EAU	PDP-9	DATA-620	SEL-810A	CDC-1700	IBM-1130	DDP-516	CDC-160A
ADD	88	176	11	500	288	316	491	266	255	538
DIVIDE	83	219	21	580	439	1498	655	353	281	595
MULTIPLY	74	161	15	500	407	349	500	300	260	566
SINE	117	2840	208	5235	1887	5635	4127	1125	2474	5853
SQUARE ROOT	75	471	152	4085	448	7691	7673	1584	557	3236
EXPONENTIAL	238	3009	269	6385	1064	N.A.	3036	885	2192	4838
LOG	110	3364	213	4785	2542	6435	5400	1719	2838	5150
IF	6	6	6	90	13	49	173	63	38	269
FIX	26	45	33	160	144	93	300	116	233	479
FLOAT	21	29	8	160	198	351	691	169	325	435
STORE SUBSCRIBED VARIABLE										
1-DIMENSION	39	44	16	240	29	110	336	200	93	387
2-DIMENSION	44	50	22	300	134	122	345	234	129	385
DO (1 CYCLE)	9	10	10	15	148	10	15	16	10	202

Table III. Memory cycles per operation.

lower cost of a memory having a given number of words is offset by the larger number of words required to accommodate a given job. To examine the processor cost situation we may divide the components of a processor into two classes. Class 1 is made up of those components of which there is one for each bit in the word, such as accumulator stages and adder circuits, while Class 2 is made up of those components of which there are a given number per computer regardless of the word length, such as timing and control circuits. Now, a 24-bit computer would contain 50% more Class 1 components than a 16-bit computer of similar architecture but the same number of Class 2 components, so the 24-bit computer should cost no more than 50% over the 16-bit machine. Furthermore, nonmanufacturing costs should be independent of word length since it should cost no more to design, program, and market a 24-bit machine than a 16-bit machine. Therefore, this 50% should be a very extreme upper limit. The results shown here imply that one gains several times 50% in speed by going from 16 to 24 bits, so that the 24-bit word would seem to be much more cost-effective.

Several 16-bit machines are available at present with basic mainframe prices around \$10,000. By the reasoning just stated it should be possible to market a 24-bit processor for well under \$15,000. However, the 24-bit word has not been employed in computers selling for less than \$50,000. One wonders about the reason for this. Is it fashion, following the leader? Or is it unawareness of the factors that have been discussed here?

Certainly, the question "what is the most cost-effective word length" still awaits a definitive answer. All that has been seen here is that 24 bits appears to be closer to the optimum than 18 or less. Perhaps 32- or 36-bit machines, which were not tested, would have looked even better. It is the author's belief that the optimum would not be as short as one might think for the smaller computers.

Finally, it is the author's belief that there is need for a "consumers' union" in the computer field to act as a spur on the manufacturers and to assist users in making sound equipment choices. This paper is an attempted first move in that direction.

Acknowledgments

Acknowledgments are due to Mr. W. R. Riihimaki, Argonne National Laboratory, for his assistance in running some of the tests. The SEL-810A and IBM-1130 were made available through the courtesy of Messrs. T. W. Hardek and N. F. Morehouse respectively, Argonne National Laboratory, while the PDP-9 and CDC-1700 were made available through the courtesy of Messrs. C. E. Burgart and J. B. Bullock of Oak Ridge National Laboratory. The DDP-516 results were obtained by Dr. J. B. Dragt of Reactor Centrum Nederland, Petten, The Netherlands. Work performed under the auspices of the U.S. Atomic Energy Commission.

APPENDIX

The Timing Program

A listing of the timing program is included for the benefit of readers who might wish to try these tests on other machines. The program is compatible with all

variants of FORTRAN. It is adapted from a timing program written many years ago by Dr. John P. Schiffer, Argonne National Laboratory. An overflow problem in the exponential test was corrected through a suggestion of Dr. J. B. Dragt. (Due to this problem, the exponential timing for the SEL-810A could not be

```

C      FORTRAN TIMING TEST
C      DIMENSION C(3,3),D(3)
77  PAUSE
C      10,000 ADD
A=1.0
D010I=1,100
D011I=1,100
11  A=A*0.5739283
10  CONTINUE
PAUSE 1
C      2500 DIVIDE
A=1.0
D012I=1,2500
12  A=A/1.000007
PAUSE 2
C      5000 MULTIPLY
A=1.0
D013I=1,5000
13  A=A*1.000007
PAUSE 3
C      1000 SINE
A=1.0
D014I=1,1000
14  A= SIN(A*1.0)
PAUSE 4
C      1000 SQUARE ROOT
A=1.0
D015I=1,1000
15  A= SQRT(A*1.0)
PAUSE 5
C      500 EXPONENTIAL
A=1.0
D016I=1,500
16  A=EXP(A*0.999999)
PAUSE 6
C      500 NATURAL LOGARITHM
D017I=1,500
17  A=ALOG(A*1.0)
PAUSE 7
C      25,000 IF
A=1.0
D018I=1,5
D019I=1,5000
IF(A)33,33,19
19  CONTINUE
33  CONTINUE
PAUSE 10
C      50,000 GO TO
D034J=1,10
D021I=1,5000
GOTO21
21  CONTINUE
34  CONTINUE
PAUSE 11
C      5000 FIX
A=573.9283
D023I=1,5000
23  L=A
PAUSE 12
C      5000 FLOAT
D024I=1,5000
24  A=I
PAUSE 13
C      10,000 STORE VARIABLE (1-DIM)
JJ=2
D0135J=1,10
D0125I=1,1000
125  D(JJ)=A
135  CONTINUE
PAUSE 14
C      10,000 STORE VARIABLE (2-DIM)
KK=3
D035J=1,10
D025I=1,1000
25  C(JJ,KK)=A
35  CONTINUE
PAUSE 15
C      200,000 CONTINUE
D027J=1,40
D026I=1,5000
27  CONTINUE
26  CONTINUE
PAUSE 16
GO TO 77
END

```

included.) The double loops for some of the operations are used to stay within the restricted integer range on some computers.

Two features of this code could well stand to be modified. First, the loop counts could be considerably increased to facilitate manual timing on the faster machines. Second, the GO TO test does not yield much information about performance because it is normally implemented just with a jump instruction. Hence, the GO TO results were not included here, and the test could well be dropped. Unfortunately, the desirability of these changes was not evident until well into the series of tests, so they were forgone for the sake of consistency. ■



Dr. Cohn is currently an associate physicist in the Applied Physics Division, Argonne National Laboratory, with which he has been affiliated since 1956. He has done work on noise analysis in nuclear reactors and on the application of computers to nuclear-reactor experiments. He holds AB, MS, and PhD degrees in physics from the Univ. of Chicago, where he is a member of Phi Beta Kappa and Sigma Xi.

How a medium-sized life insurance company has pleased nearly everyone

Sharing a Data Entry System

by David V. Young

M During the summer of 1970 United Services Life Insurance Co. began to consider acquiring a data entry system. The idea of individual key-to-tape stations was discarded immediately, because we owned our old equipment and the benefits gained from making such a change were far less than the cost. Key-disc-tape systems with minicomputers were the only type that offered sufficient benefits to interest us, but the cost seemed very high. We only had six punch units and a minicomputer cost of \$1,500 a month or more could not be covered by increased efficiency on so few terminals.

The logical way to decrease the per-terminal cost of the system is to increase the number of terminals. We contacted several other companies in our building and found that they also had considered data entry equipment but had not become serious about it because of the cost. We suggested acquiring a system jointly and a committee was formed for the purpose of considering such a possibility. Several vendors were contacted and their equipment and system approach evaluated from the standpoint of our needs. We unanimously agreed that the AU-100, produced by Applications Unlimited of Fairfax, Va., offered the most technically and would be the easiest to share.

The system hardware consists of a minicomputer, a large fixed-head disc, two tape drives, a KSR Teletype, and up to 32 entry stations. We started with 11 stations in December 1970, presently have 13 and contemplate expansion to between 16 and 20 within a year or so. The stations are physically located in four locations on three floors in the same building. The software approach includes very tight supervisor control and is oriented toward recording of the entered data on a "journal tape." The disc is dynamically allocated as an intermediate storage device. The second tape is normally used to format the completed data files, but may also be used to enter data from another source into the system where it can then be verified and/or corrected. Every day or two an end-of-day procedure is performed. This copies the journal tape, deleting batches which the supervisor specifies as no longer needed. The old journal tape can be saved as long as necessary; we keep ours about two weeks. We feel this capability is important and is costly in systems that use discs only. We have saved many hours of keying by being able to go back a week or more and reformat a tape that had been released prematurely. Statistics on job and operator performance can be obtained at any time on the KSR, and

are also summarized on the disc and dumped to a second tape as part of the end-of-day procedure. We run this tape into our Spectra 70 at month-end and produce some very comprehensive summaries.

All jobs to be performed are identified with a four-digit number. We have allocated ranges of numbers to each system user in order to avoid conflicts and each user has a job number permanently assigned to each job in their shop. Within each job number the data is entered in batches, which are also identified by four-digit numbers. We have found it convenient to have a relationship between batch number and date although this isn't required. Hence Job 0060 Batch 0205 is readily identified as name and address changes entered on February 5. Each operator is identified by a two-digit number. As with job numbers, each system user was allocated a range of operator numbers to avoid conflicts.

When a new format is needed, an analyst prepares a data input description (DID) and a data output description (DOD). Each of these is identified with a six character alphanumeric tag. In order to avoid conflicts each user has been assigned certain letters to be used as the first character of their DIDs and DODs.

A DID is used to specify and control the format of the data to be keyed at the work stations. In addition to the obvious function of shifting the dual-function keys on the keyboard, the DID enables us to specify such things as:

1. A field *must* be *all* numeric
2. Check digit control
3. Batch balancing
4. Crossfooting
5. Leading zeros
6. Verification or not

A DOD is used to specify and control the format of the data at the time it is formatted. Complete editing, rearrangement, selection, and substitution capabilities are present. Of particular importance to us is the ability to translate the code structure to produce tapes which will be read not only in native 360 and Spectra 70, but in RCA 301 variable emulator format as well.

At the beginning of the day, and whenever necessary thereafter, the system supervisor initiates jobs through the KSR by relating a job number and a DID. When a tape is to be formatted the supervisor relates a job number and a DOD.

As an example of the usefulness of these capabilities, we changed our chart of accounts from three-digit numbers to four. The source documents were delivered to data entry with the new numbers. The

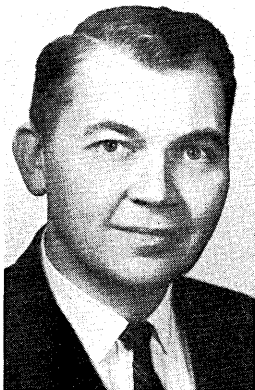
computer programs were set up to accept the old numbers and print the account name. Without the data entry system we would have had to change the programs or require the data entry operator to make a mental translation. With the system the operators were able to enter the new account numbers, the formatting operation replaced them with the old, and the old computer program was used without modification.

Another advantage of the separate DID-DOD approach is the ability to enter data once and format it several times, each with a different DOD. This is particularly useful when making major system changes because the terminal operators only have to enter records once while the system formats them for acceptance by both the old and the new programs.

The cost of our system is \$78 per terminal plus \$1,632 a month for the minicomputer, disc, tapes, and ksr. We are dividing this by taking the total system cost of \$2,590, adding \$200 for supervisor services, and dividing by the number of terminals (11) to get a per-terminal cost which is what we bill to the other users. This works out to \$254 but will drop to \$239 for 12 terminals, \$227 for 13, or \$216 for 14.

The principal cost-saving characteristic that is touted is more keystrokes per hour. While this is true, we have found that even greater savings come from a reduction of errors at the source. Under the old system, despite verification, we had about 5.0% reject rate because of invalid check digits, incorrect item or record length, alphabetic zip codes, etc. This always resulted in delays while source copy was located and corrections punched. This error rate is now down to 0.2% and corrections usually can be held over to the next update. The reduction in errors at source has saved us close to six hours a month of computer time per terminal.

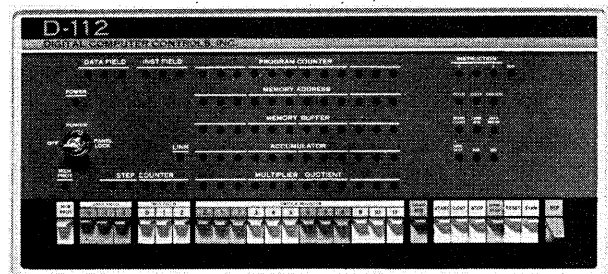
We were prepared to share the system efficiently: forms had been printed and procedures written for all operators. As a result there have been no serious conflicts between users. Management is pleased with the saving in computer time and the increased accuracy. The terminal operators seem to enjoy working with modern equipment. Sharing a data entry system offers an excellent opportunity to upgrade many small- to medium-size installations. ■



Mr. Young, currently vice-president, Methods and Systems, of United Services Life Insurance Co. of Washington, D.C., which specializes in protection for active or former military officers and their families, has worked in the computer field since 1953 with John Hancock Life, U.S. Air Force, RCA, COMRESS, and the Auerbach Corp. He is a graduate of Northeastern Univ. with a BS in mathematics.

Our minicomputers have proven their compatibility and performance in the field.

(Now only their prices are hard to believe.)



Over 100 of our D-112's are now being used in systems that *could've* used "8" series machines but didn't.

And it's easy to understand why. The D-112 is a 12-BIT MSI minicomputer with a 1.2 microsecond cycle time. It's completely compatible with "8" machines, yet costs only \$3990.

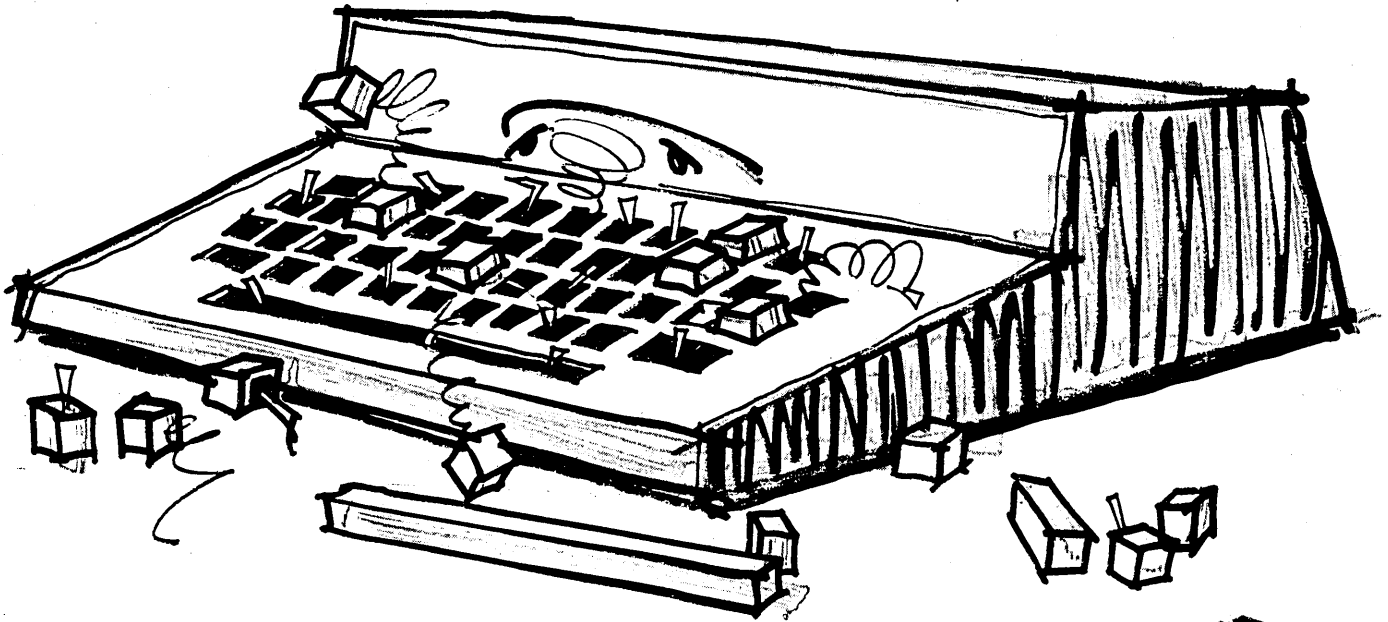
And that means you can drop in one of our machines for one of their machines. Without one single adjustment. Except in your purse string.

Write for our literature. We make "11" and "1200" compatible machines too. Digital Computer Controls, Incorporated, 12 Industrial Road, Fairfield, New Jersey, 07006. Phone (201) 227-4861.



**DIGITAL
COMPUTER
CONTROLS
INC**

the NON-KEY to success



Courtesy of Scan-Data OCR Systems.

The systems that do what you've been hoping OCR equipment would do someday—eliminate the need for re-creation of source documents.

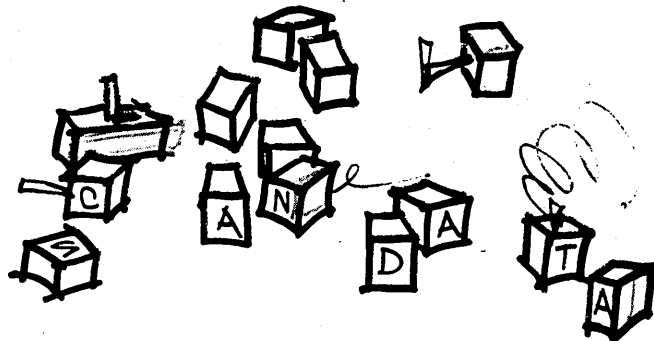
Which means no more of the costly and time-consuming re-keying that has made OCR equipment nothing more than a promise unfulfilled.

Until we introduced SWAMI, Software-Aided Multifont Input. The world's first, and only self-teaching OCR system. That reads virtually any consistent font, even degraded characters—directly from source documents. Combined with our superior handprint capabilities, SWAMI makes document re-creation a thing of the past.

And makes the economies of OCR a thing of the present.

Add SWAMI to our ability to take direct input from pages or documents from 3" x 5" through 11" x 14", no matter the weight or grade of paper, and you have an unbeatable combination.

We call it our one, two non-punch.



SCAN-DATA
CORPORATION

800 EAST MAIN STREET □ NORRISTOWN, PENNSYLVANIA 19401
215/277-0500 □ TELEX: 846485

SID Symposium

G With cavalier disregard for the acronymic propensities of previous symposia (IDEA, MEDIA, etc.) this year's symposium of the Society for Information Display presented itself simply and succinctly as SID 71. Although attendance was somewhat below last year (to be expected in these difficult times), the technical content of the program continued the steady improvement shown last year and was commendable throughout. Papers were presented on subjects as varied as new cathode ray tube technology, plasma displays, liquid crystal display technology, new display techniques, display applications and display systems. The international character of the meeting was attested to by the varied countries of origin of the speakers and the audience, ranging from Europe to the Far East.

Of particular relevance (especially in view of our social needs and the reductions in military programs) was the keynote address given by L. A. Goldmuntz, executive secretary of the Federal Council for Science and Technology and assistant to the science advisor to the President. He discussed such well-known areas of application as air-traffic control, education and health, and emphasized the growing use of interactive displays in each area. Government funding is expected to increase to help meet these pressing needs.

An extremely interesting invited address on "Some Curiosities of Human Vision" was given by L. D. Harmon of Bell Labs during the first luncheon. He presented a number of optical illusions which illustrated the influence of mind on the perceptual process. One superficially startling

statistic is that the brain loses 500,000 neurons a day or about 10% by age 70. Fortunately, this gradual deterioration is compensated for by the extremely large number (10^{11}) of neurons with which one begins. The various geometrical and color-dependent illusions described and illustrated in this talk included several



familiar length and some less common brightness judgments.

The main talk at the second luncheon was given by Peter Williams of Computer Optics, Inc., substituting for the listed speaker, T. D. Kegelman, also of Computer Optics, Inc., who was taken ill at the last moment. Mr. Williams intrepidly chartered an airplane and flew down in time to give this talk. The talk itself, entitled "Experiences with CRT Displays During Election TV Coverage," was somewhat less exciting than the tale of devotion and determination which prefaced it. These experiences were descriptions of the use by one network of a display system provided by Computer Optics to monitor and obtain information for analysts and commentators. The system exhibited surprisingly good performance (3,000 characters), in view of the standard TV monitors used, and may

establish a trend for election coverage.

At the sessions, one was struck by the shortage of papers on holography, laser systems, and light-emitting diodes (LEDs). These have been popular topics in previous symposia of SID. Of the two papers mentioning lasers, the one given by W. J. Carlsen on "Variable-Color Holograms for Projection Display" had nothing to do with 3D, the usual display justification for holography. It did describe an interesting application of holography which permits the recording and projection of full-color images from monochrome film. The second laser paper, "Unified Laser Color-TV Display System," by S. M. Stone, J. D. Schlafer and V. J. Fowler, is a continuation of the indefatigable efforts by GTE Labs to arrive at a feasible laser display system. The system improves each year and it may lead to practical results before too long. Of LED papers there were none, although the evening panel session on matrix displays indicated continued interest and activity in their development and use. One can only conclude that other techniques and concepts are coming to the fore, such as plasma panels and liquid crystals, while LEDs are consolidating their position prior to the next great leap forward.

A large number of papers were presented on matrix displays embodying plasma and liquid crystal technologies. Of the seven papers on plasma displays and the seven on liquid crystals one might arbitrarily mention "A ¼ Million Element AC Plasma Display with Memory," by W. E. Johnson and L. J. Schmersal, as representing the fulfillment of the promises made some years ago by the inventors of this type of display—Bitzer, Slottow and Willson. One of these three, H. G. Slottow, was chairman of the plasma session and a member of the panel on "Matrix Displays—Plasmas Vs. Light-Emitting Diodes." In comments during these sessions and privately with this writer he reiterated his contention that the technology is maturing, the future will bring color, gray scale, and larger panels, and plasma panels will become competitive with the CRT.

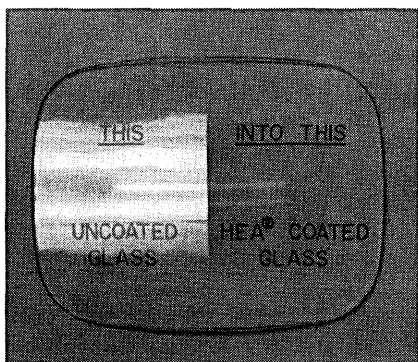
Liquid-crystal technology may not have come of age as yet but it is a fascinating subject. As one speaker noted, liquid crystals are extremely photogenic, as evidenced by the number of films presented by the various speakers. Indeed the live pic-

Are Ghost Images Confusing Your Customers' View?

Blurring the signals on oscilloscopes? Dimming the images on TV monitors or radar displays? Obscuring the data on computer terminal displays? Do your customers have to look twice at any of your cathode ray tube display devices to get the proper information?

Let OCLI Help You Clear Things Up!

HEA®—a high efficiency multilayer antireflection coating—reduces reflections over the visible range of the spectrum by a factor of 10 over uncoated glass. Deposited directly on the curved surface of a CRT or its faceplate, HEA will transform



(unretouched photograph)

The coating can be deposited on either acrylic or glass, is extremely durable and can be cleaned and handled with a minimum of care.

HEA for Display Devices is only one of OCLI's large family of HEA coatings designed to improve the view through nearly every type of visual optical system. Find out more about how OCLI can brighten images. Write to our Marketing Department, Technical Products Division.

OCLI

**OPTICAL COATING
LABORATORY, INC.**

Technical Products Division

P. O. Box 1599, Santa Rosa, California 95403.
Teletype 510-744-2083, Telephone 707-545-6440.

Manufacturing facilities also at Dunfermline, Fife, Scotland. Represented in Japan by Hakuto Co., Ltd., Tokyo; France, Belgium, Netherlands and Luxembourg by Techmaton; and in Germany, Austria and Switzerland by Betzelt GMBH.

tures of state changes in liquid crystals were quite exciting visually and esthetically and should, perhaps, be explored by artists as well as scientists. Space limitations restrict us to the invited paper—"The Physics and Chemistry of Liquid Solids," by R. A. Soref—which was a clear and concise exposition of basic principles, and "Nematic Liquid Crystals—Cinematography of Electrodynamical Instabilities," by R. A. Kaslow, which offered some striking films. There is still more experimentation than development being reported on and we must wait before we can fully assess the potential of this technology.

Of the other sessions, several papers remain with this writer, probably due more to his own interests than their intrinsic value as opposed to other papers not mentioned. These are "A Cathodochromic Storage Display," by D. R. Bosomworth, which brought back memories of the late lamented Dark Trace Tube it greatly resembles and whose fate it may also experience; "A 5 MHz Graphics Display Unit," by J. Riggen, which is significant for the new electrostatic crt it embodies, with high-deflection sensitivity and speed; "Mass Character Generator with a Small Rotating Image Disc and Vidicon Buffer," by J. Yamato et al., which is impressive in the number of Chinese characters achieved (3,000), although the technique is not novel; "Conducting Glass Touch-Writing System," by R. K. Marson, which describes an interesting finger-activated input overlay which has seen military service and may be applicable to commercial systems; and finally the ubiquitous Ovshinsky paper, "Reversible High-Speed High-Resolution Imaging in Amorphous Semiconductors," by S. R. Ovshinsky and R. H. Klose, which describes still another use for this component of apparently unlimited versatility.

There were six panel sessions on two evenings as opposed to six on one evening at last year's symposium. This permitted better attendance at more sessions, and judging by the many people and lively discussions at the several this writer was able to attend, the discussion sessions were a complete success. The sessions on cable tv, matrix displays and color were particularly provocative, with many opinions and even a few facts offered. At the matrix display session, the question of plasma vs. light-emitting diodes was expanded by the inclusion of a liquid-crystal expert

among the panelists. It was further expanded by an enthusiast in the audience, Mr. Aron Vecht of England, expounding on the virtues of dc electroluminescence and demonstrating a small hand-held alphanumeric device. Further conversation by this writer with Mr. Vecht elicited the information that he and his colleagues were investigating the use of zinc sulfide in powder form. His contention is that there has been virtually no work in the U.S. on dc electroluminescence and he believes it has great potential.

Although there were fewer exhibits than last year, the quality was by no means diminished. Among the products shown were the 0.6 mil spot, 4 μ s display and absolute raster generator of Celco; the high-output 5-inch projection crt and postdeflection magnification crt of Thomas Electronics; the high-voltage, 15- μ sec switching unit of Computer Power Systems for penetration color crts; the track-ball and joystick controls of Measurement Systems; the miniature image storage tube and the short-length, high-sensitivity crt of Thompson csr; the precision crt system and high-resolution flying spot scanner components of Syntronics; the various monitors and the multibeam tube of CRT Sylvania; the Data Disc digital-display system; the color-display generators and graphics system of Monitor Systems; various special crts by General Atronics; and the new color systems for measuring rate of change of gray scale announced by Spatial Data Systems.

As a final note, a few words of commendation for Bernie Lechner (who incidentally also was the first recipient of the Francis R. Darne Award) and his whole symposium committee are in order. The technical sessions exhibited the improvement referred to, attendance was good, especially considering economic conditions, and several new ideas such as two evenings of panel sessions and individual author discussions were quite successful. In addition, two notable scientists, Harold B. Law and Ben Kazan, were made Fellows of the SID. Next year, the SID 1972 International Symposium will be held in San Francisco. A digest of papers given at the 1971 SID Symposium is available and may be obtained by writing to SID Digest, Society for Information Display, 654 N. Sepulveda Blvd., Los Angeles, Calif. 90049.

—Sol Sherr

A System 3 Fortran more accurate than Fortran IV?



It's called PIFORT.

Binary is a beautiful thing except for the fact that it tends to give "more or less" kinds of answers. But PIFORT for System 3 is written in decimal. You add 0.1 and 1.9 and you get 2. Not 1.9999999 etc., which is close but not accurate. Of course, that's not the only thing about PIFORT. For openers, it's the only FORTRAN available for System 3 on immediate delivery (IBM's will not be available until August of 1972). It doesn't require a disk which IBM's will. It's compact, allowing for the solution of large problems in a small space.

OK. Who needs a FORTRAN on a System 3? Well, if you have engineers or technicians who are buying time from service bureaus or running up bills on a timesharing terminal, then the \$100 a month that PIFORT costs actually becomes a saving. Try it for thirty-days absolutely free.

And remember. Close only counts in horseshoes. For your thirty-day free trial or for more detailed

information, just drop us a line. We can turn your System 3 into a scientific computer almost immediately.

```
C TRY THIS TEST WITH YOUR FORTRAN
C
  INT(X)=X
  WRITE (3,200)
200 FORMAT (39H1 DOES YOUR FORTRAN GIVE THESE ANSWERS?)
  I=INT (0.4 + 0.6)
  J=INT (0.1 + 1.9)
  K=INT (0.2 + 1.8)
  L=INT (0.3 + 1.7)
  M=INT (0.4 + 1.6)
  N=INT (0.5 + 1.5)
  WRITE (3,300) I,J,K,L,M,N
  STOP
300 FORMAT (15H0 0.4 + 0.6 =,I2,/15H 0.1 + 1.9 =,I2,
1/15H 0.2 + 1.8 =,I2,/15H 0.3 + 1.7 =,I2,
2/15H 0.4 + 1.6 =,I2,/15H 0.5 + 1.5 =,I2)
  END
```



PROGRAMMATIC

a subsidiary of Applied Data Research

11661 San Vicente Blvd., Los Angeles,
Calif. 90049 (213) 826-6503



I'm sorry IBM, but what could I do?

You know I've always been a loyal user—been buying your equipment for 15 years . . . and when you unbundled and all those other guys were screaming . . . wasn't I right with you!

But this time it was **too** tempting.

You know my V.P. of Finance cut my budget—and even so, I tried to get through the order for a larger computer . . . Lord knows I needed it.

Then along came COMRESS with this AMIGOS program—you know, the “plug-to-plug compatible” replacement for ISAM?

They guaranteed AMIGOS would save me 30% running time for all my ISAM work . . . plus 20% less core . . . plus less disc space . . . you know what that would mean—I could get more work done on my present computer and I wouldn't need a larger one!

So I took the gamble . . . and guess what—I reduced my run time 50% . . . core 25 . . . and disc space 20 . . .

Now my boss loves me . . . and your efficient-running computer . . . I'm sure I'll have no trouble getting a larger computer next time.

But . . . don't call me, I'll call you!

COMRESS HEADQUARTERS

TWO RESEARCH COURT, ROCKVILLE, MARYLAND 20850. PHONE: (301) 948-8000

AMIGOS—Developed by DATA ART—Subsidiary of COMRESS

PERSPECTIVE

an interpretive review of significant developments

Computer Technology Brought to Bear on Colleges' Dollar Squeeze

Higher education is being called to account.

Today there are some 7 million students in 2,500 institutions of higher education in the U.S. About 60% of the nation's high school graduates go on for at least two years of school after high school, and this percentage is expected to increase. Of those in colleges and universities, some 85-90% are in publicly supported institutions; and it is the public and its duly elected representatives that are calling for the accounting. It is computers that ultimately will provide the means.

The increasing costs of education are obvious. So are campus riots. What the taxpayers are getting for their education dollars is not.

In Boulder, Colo., 38 people are bringing computer technology to bear on the problem . . . to come up with ways of measuring the processes and benefits of education. They're the full-time staff of the National Center for Higher Education Management Systems (NCHEMS) at Wiche (Western Interstate Commission for Higher Education). They work on behalf of some 1,500 participating higher education campuses. These participants are taking part on four different levels, with the greatest number in what NCHEMS has designated Level 1, for interested observers or, as they have been described by many, "Wiche Watchers." As the numbers get higher, participation becomes greater. Level 2 participants are considered "potential users of, but not contributors to, the products of the program," while those participating at Levels 3 and 4 are expected to both use and contribute.

Campus MIS

Primary purpose of the NCHEMS program is to "encourage the development of management information systems within higher education institutions which will, at the same time, be sufficiently individualized to serve the unique needs of the respective institutions and sufficiently compatible to al-

low valid interinstitutional data comparisons AND to promote efficient reporting to state and federal governments."

It's the last part that has caused concern among some of the Wiche Watchers, particularly among those from the private institutions which fear a potential information bias in favor of publicly supported schools. Some seem to feel there may be a tendency to overdo the quantitative approach — to promote the notion that the school with the largest student throughput at the lowest per unit cost is doing the best job, that more is better. And those administrators who feel it is inevitable that the federal government will have to provide some kind of financial support for all financially pressed institutions of higher education, private as well as public, fear aid will be based on the more-is-better notion.

But even those who are concerned welcome the center's existence. They agree with avid supporters of the program that the big thing it's done is to bring people in the field together for the first time to communicate and to share ideas. Lack of communication has long been a hindrance to development of effective management information systems for higher education. Says John Hoskins, director of instructional research for Yale Univ.: "It's always been every tub on its own bottom in this business."

Mike Roberts, director of administrative computation at Stanford Univ., a Level 4 participant, called the program "a valuable catalyst." "Three years ago," he said, "people were saying it (the work of NCHEMS) won't be done. It can't be done. The fact is, it is working." He said some private school people feel the project will tend to homogenize higher education, "and this would drive Stanford up the wall," but "actually there is very little of this."

Dr. George Weathersby of the Office of Analytical Studies, Univ. of California at Berkeley, said the pro-

gram's "results have been spotty so far as far as production" but "it's great in that it has gotten people together that just couldn't get together before. It's a breath of fresh air . . . a quantum leap."

Widening Wiche

Wiche has been around since 1951 when it was created to administer the Western Regional Education Compact adopted by the legislatures of the 13 western states. The NCHEMS program got started in the late 60s when a group of western higher education institutions involved with Wiche discovered they were working individually to develop and implement management information systems on their campuses and were duplicating one another in many of these efforts. Representatives of these institutions met to discuss the possibility of uniting under one cooperative effort to develop standard planning and management systems which would be applicable to all of their needs. As a result, the Wiche Planning and Management Systems Program was created and ultimately funded through the U.S. Office of Education, Bureau of Research, Div. of Higher Education Research.

To bring more representation to the program, its design committee, early in the life of the project, suggested including the Univ. of Illinois and the State Univ. of New York. The two schools were invited to participate and both agreed. As the program progressed, increasing numbers of requests for participation were received by Wiche headquarters from institutions outside the participating states. At the same time, administrators began demanding early solutions to immediate problems which didn't fit in with the long developmental process planned for the program. In December of 1969 it was decided to make the program national and to step up the pace of systems development. In April of this year, the program got its new name and a guaranteed \$1 million per year funding from the Office of Education. In addition, the program has received a half million dollars in funding from the Ford Foundation for

research. A prime research project is to develop a way to measure the output of higher education. The current status of this work was described by Dr. Weathersby as "development of a long laundry list of possible kinds of outcomes." He said the first step will have to be getting agreement as to basic definitions of the vocabulary of higher education. "Even the word 'student' has different meanings for different schools."

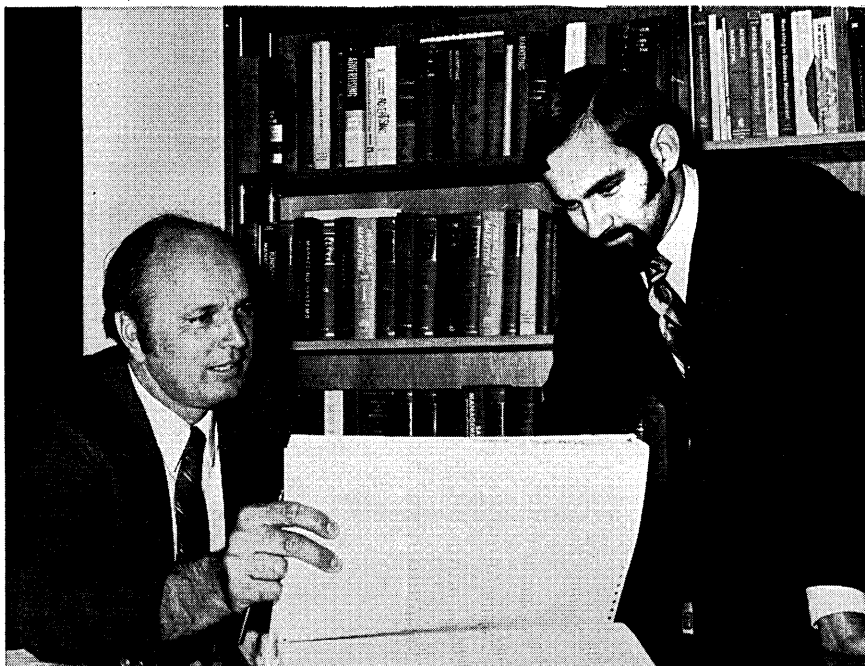
Models for Management

But he believes the program will develop a way to "take a snapshot of the input and the output of colleges and universities" and thus to quantify the "value added" by the institutions so it could be added as data to a management information system which "will be a powerful tool to aid higher education decision makers." One tool already available is the program's standard data element dictionary which sells for \$5 a set with sections, at \$1 each, covering: student, staff, facilities, course, and finance.

Another is a Cost Effectiveness Model (CEM) which is being distributed "on a limited basis" for distribution costs and with the understanding that it is not fully refined or finished. This is a mathematical model of cost elements involved in running an institution of higher education which will, when translated into a series of computer routines, show where costs are the heaviest and where expenditures are the most effective and indicate what could happen if expenditures were shifted. San Fernando Valley State College, Northridge, Calif., using the model on an experimental basis, found it could save money and still meet existing needs by reducing the size of its physical education department.

A somewhat similar model, the Resource Requirements Prediction Model, will be made generally available this month for distribution costs only. This model currently is in pilot-program use on eight different campuses: New Mexico Junior College; Portland State College; California's Humboldt State College; Stanford Univ.; State Univ. of New York; UCLA; Univ. of Utah; and Washington State Univ.

RRPM is described by its developers as a model which basically takes



STUDENTS ARE INVOLVED: Gary Montgomery (right), vice president of the Associated Student Body of California's Humboldt State College, studies an RRPM output with director of institutional research, Donald F. Lawson. A state college spokesman said the students are fearful of what they consider dehumanizing aspects of computer-based planning but are interested and willing to be shown.

student enrollment projections for a period of time 3 to 10 years in the future and converts them to the resources necessary to support them (i.e. faculty, staff, operating expenses, and space) for each of those years. Once the relationships between student enrollments and resources are understood, they explain, it is possible for the administrator or analyst to test certain changes in the institutional system and thus simulate the resulting effects on the required resources.

With some 1,000 students, New Mexico Junior College in Hobbs is one of the smallest schools using the model. Dr. K. M. Hussain, of New Mexico State Univ. 250 miles away in Las Cruces, is directing the project, which makes use, remotely, of the university's IBM 360/50. Dr. Hussain said the model has not yet been used in budget making because it was validated after the school's last decision-making cycle had started, but it is anticipated it will be used both for short-term budget making and long-range resource allocation. It currently is being used to answer what-if questions and to experiment with planning variables.

Dr. Hussain listed as unexpected by-products of the use of RRPM that it revealed institutional characteristics

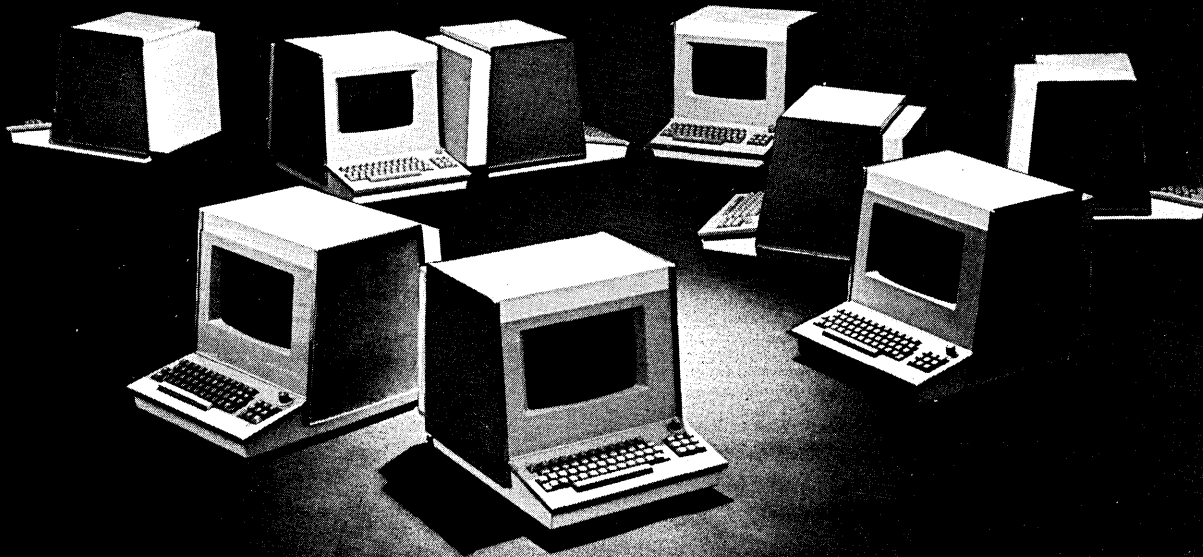
of which management was unaware; it provided a data base useful for institutional studies not otherwise possible; it "involved" management in formal long-range planning and introduced concepts and approaches formerly unknown to them; it made management want a comprehensive management information system; it forced management to analyze and define its institution in a formal way; and its simulation aspect forced management, especially middle management, to consider trade-offs and appreciate interrelationships.

Legislators on several levels are among the Wiche Watchers. Two states, California and Oregon, are considering legislation which would require public institutions to use NCHEMS products when submitting their budgets. A federal bill before the House Committee on Education and Labor originally would have imposed a similar requirement on institutions which received federal funds in any form (which covers a lot of ground), but the requirement was deleted in committee.

But it was considered, and the inevitable accounting appears to be beginning to take place.

—Edith Myers

The Economist



Does More, Costs Less than Stand Alones or 2260s

A 16-terminal Wyle CRT cluster costs between \$30,000 and \$40,000. An equivalent IBM 2260/2848 system checks in at from \$80,000 to \$100,000.

That's a savings of \$50,000. Give or take a few thousand.

Which is a real break for end-users who are looking for a plug-and-play and software compatible replacement for IBM systems. One that offers many more features for many less dollars.

It's also a great product for the independent peripheral supplier who can now provide a CRT cluster system without the time and expense of in-house development.

And it can be a boon to main-frame manufacturers who need a CRT system as part of their peripheral package, because our controller can be modified to interface with any computer.

And check these features. 960 or 480 character screen capacity, up to 9600 bps data rate, non-destructive cursor, colon-seeking tab, many special editing keys and general or specific terminal polling.

Plus columnar tab, character address, format protect, upper and lower case alphabet, hard copy printer and built-in data set options.

When it comes to dollars and sense, the Wyle 8000 beats the 2260/2848 hands down.

Our cluster also offers economic advantages over stand-alone CRT systems since the controller electronics is shared by up to 16 terminals. Also means fewer data interfaces, modems and communications lines. The end result is a lower cost CRT system with faster, more sophisticated polling capability.

First we introduced The Bookie, NYC's Off-Track-Betting terminal. Now The Economist, the do-more, cost-less cluster system. Our parent company, Wyle Laboratories, with \$90 million annual sales and assets in excess of \$60 million, gives us the financial muscle to tackle the big jobs. Send for our full color brochure.

WYLE COMPUTER PRODUCTS, INC.

A Subsidiary of Wyle Laboratories
128 Maryland St., El Segundo, Ca. 90245 (213) 678-4251

CIRCLE 12 ON READER CARD

Plan to Certify Foreign Attachments Unveiled

Ever since the Federal Communications Commission handed down its famed Carterfone decision in 1968, independent makers of terminals and many users have been battling with the telephone company on how they gain access to the switched telephone network with their foreign attachments.

In the celebrated Carterfone case, the FCC said it was permissible to attach terminals to the telephone system, but not if they could harm the network. It was on this ground that the carriers refused to allow universal interconnection.

And those independently made modems that were allowed to be used had to be connected through a "connecting arrangement" — a device sold exclusively by the telephone company and rented at rates users claimed were excessively high. This, some users said, allowed the telephone carriers to retain their monopoly over the modem and terminal market.

At issue was an effective way to determine whether equipment connected to the switched network was safe or not. Some headway may have been made last month when an FCC advisory group, which includes representatives of all sides to the issue, approved unanimously a plan to certify independently made private branch telephone exchange (PBX) equipment, which is one kind of foreign attachment. Once certified, this equipment could be connected directly to the telephone network.

The advisory committee says the PBX equipment should be tested by a nongovernment organization, such as Underwriters Laboratories, whose activities would be supervised by an "interconnect board" consisting of representatives of the affected parties. Applicants whose products were turned down could complain to the board, as could users who had complaints about their local telephone company. After the products were tested, the board would issue a certificate to the manufacturer which would allow that model or class of terminal

equipment to be linked to the switched telephone network without a connecting arrangement supplied by the carrier. Cost of testing and certification would be paid for by the equipment maker.

The committee's plan also provides for the telephone company. Users wanting to install an approved, independently made PBX would have to notify the telephone company and then pay to have its facilities removed or modified. It has also defined what parts of a PBX system threaten the network and has reached some agreement on the voltage and other parameters within which equipment must operate in order to be approved. Some test procedures have been developed. But many unresolved questions remain.

For example, should standards be developed for all the components in a PBX system, or just for an interface between the PBX and the telephone company network? The interface would be similar to the connecting arrangement now provided by the phone company, except that it could be manufactured by independent suppliers and the user wouldn't have to pay a separate charge for it. Certifying interface rather than PBX terminal configurations would simplify the job and cost the manufacturer far less. Ultimately, some will be approved this way. Key question is what kinds.

While it has a tentative plan, the committee still must resolve some knotty certification issues before it can deliver a workable program. How much will the manufacturer be charged for certification? What should the user pay the phone company for re-engineering needed to have independent systems installed? There is also the problem of inspecting a certified installation after it has been in service a while to make sure no network hazards have developed. One answer is to monitor the terminals automatically from telephone company central offices. But this gives the carriers more discretion than some users and manufacturers are willing to accept. On-site inspections by employees of the certifying agency represent another alternative; but that

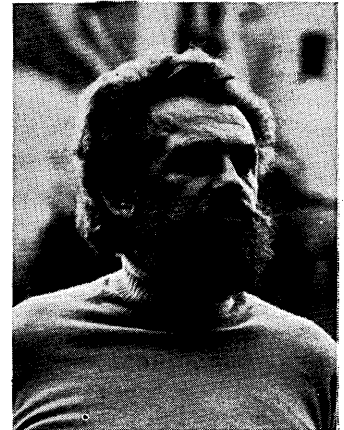
probably means additional costs for the user.

Whatever the outcome, the certification procedures embodied in the plan could be applied to most terminal devices. So it is generally agreed that once a scheme for approving foreign PBXs has been finally adopted, direct interconnection of the other kinds of foreign attachments will become possible soon afterward.

General Computer: Trouble in Dallas, Help in France

During the spring and summer of 1970 an unusually large number of new computer companies found themselves in the same unhappy boat — a boat sinking fast for lack of money. With the softness in the U.S. economy and the plunge in the stock markets, the traditional sources of capital in New York, California, and Texas had dried up.

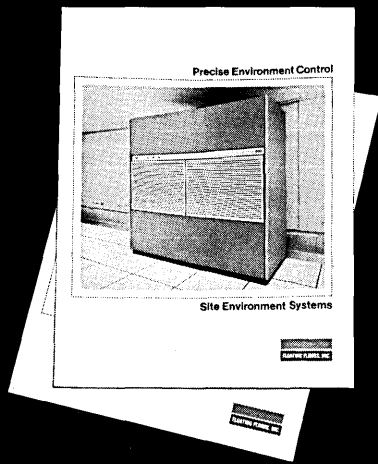
A passenger in that sinking boat was a Dallas data entry firm called General Computer Systems, which, like many other new computer companies, was sending out distress signals for financial aid. Its signal was



BERNARD S. BENSON: Restores an old castle in France and a new company in Dallas.

picked up by a man living in a 12th century castle in the southeast of France; and thus was set in motion one of the most unorthodox rescues in the history of the computer industry.

The man in the castle was Bernard S. Benson, founder of the Benson Lehner Corp. of Los Angeles. While still in his late 30s, Benson retired to France in 1962 after selling Benson



Get this brochure before you buy or specify an environmental control system.

Expensive, sensitive computers demand the ultimate in environmental control protection. This brochure describes it . . . The Site Environment System (SES®).

Reliability—Engineered and built to operate continuously. Dual circuits and dual condensers give fail-safe protection.

Precise Environment Control—Automatic controls maintain temperature within $\pm 2^\circ$ and humidity within $\pm 5\%$ constantly. Ideal for critical environmental cooling with top discharge air plenums.

Adaptability—Completely self-contained units in a complete range of colors and sizes — 3, 5, 7½, 10, 15 and 20 tons for use singly or in combination.

Flexibility—Available in water or glycol-cooled, air-cooled, or chilled water models. Easily altered to duct air up or down through ductwork or plenum.

Economy—Quality engineering and components reduce the need for maintenance. Easy access from front cuts service time.

Write for this authoritative technical brochure: Floating Floors, Inc., Subsidiary of N L Industries, Inc., 5400 North Detroit Ave., Toledo, O. 43612. (419) 479-0721.

NL
INDUSTRIES

**FLOATING
FLOORS, INC.**

N L Industries, Inc. is the new name of National Lead Company

CIRCLE 50 ON READER CARD

Lehner and its foreign affiliates as well as his interest in other firms, including Documentation, Inc., Washington, D.C. His nest egg was feathered further by the profits he realized from his early involvement as a founding investor in Scientific Data Systems (now Xerox Data Systems) — an investment that made him close to \$3 million. Benson remembers that when SDS was in its embryonic stage, he saw “great potential” in the SDS founder Max Palevsky and lent him an office, a secretary, and “a few transistors.” SDS, of course, became one of the great success stories of the computer industry. Benson sold his SDS stock in the mid 1960s.

“As far as I was concerned, I thought I had closed the book on electronics,” Benson recalls. “Everyone was always bringing me all kinds of deals — there were about 150 of them in all, I think — but I didn’t invest in any of them until General Computer came along.” Benson had been an early investor in GCS — through an \$80,000 convertible debenture — but he remained aloof from any active involvement in the firm until GCS ran into trouble.

In April 1970, after an absence of several years, Benson made his first trip to the U.S. — to Dallas — and visited the company. (“I didn’t know whether I was going to a funeral, a wedding, or a birth.”) GCS was in the process of perfecting the prototype of a key-to-tape-to-disc system configured around a mini-computer. Feeling that the product and concept held enormous potential, Benson wrote the firm a check on the spot (“artificial respiration”), and over the next few months he wrote additional personal checks to tide GCS over its financial crisis.

“You must remember that these were the days when no one was investing,” recalls Benson. “The Dow was going straight down. Normally, it would have taken a few phone calls, but investors weren’t interested in even thinking about thinking about investing. So I went back to Europe.”

Benson began a manic period of dashing between Dallas and New York and the European monetary centers — London, Paris, and Switzerland. In all, he sank more than half a million dollars of his own money into General Computer Systems. After

five months of negotiations, in October of 1970, Benson brought in three “well-heeled” private investors and two large financial institutions, Kleinwort-Benson Ltd. of London and the Paris-based Suez American Bank. They were just in time. When the deal was consummated, GCS had a total of \$27.45 left in its bank account.

When Benson made his financial commitment to GCS, the company began closing orders. Prior to this, potential customers were reluctant to order until they had assurances that GCS was financially sound. A new management team was formed with Benson serving as chairman of the board and Albert H. Bieser, former vice president of engineering and a former director of market research and development at Recognition Equipment Corp., becoming president. Today Bieser directs the operations of the company while Benson, shuttling between the U.S. and his castle in France, concerns himself with long-range strategy and with the financing of the company. The days when GCS was teetering on the brink of financial disaster are now far in the past. Sales for fiscal 1971, which ended June 30, were \$2.1 million, and the firm is already committed to ship \$3.4 million during the first six months of fiscal 1972. GCS turned in a slim profit in the third quarter of fiscal 1971 — \$42,487 on sales of \$1,017,854 — and should show a slight profit for the last six months of fiscal 1971. Losses during the first two quarters, however, will more than offset the profits, and GCS is expected to report a loss on the entire year.

In more recent financial developments, Benson was instrumental in negotiating a \$600,000 private placement, this one with the American affiliate of the Schroder Banking Corp. of England.

As for Benson, his life has changed drastically since the days when he was president of Benson Lehner. He spends his time continuing the restoration of the huge 34-room castle on which he has been working 10 years. Also, he is restoring nine old stone farmhouses — one for each of his children — on the 1,000-acre wildlife sanctuary where he lives.

And what of the future? Will Benson get involved in the computer business again? “Absolutely not,” he says

firmly. Then he pauses and adds with a smile: "Unless, of course, I change my mind."

From Child to Parent in Less Than a Year

What to do when you're starting a business and need resources? Sometimes you join forces with a larger firm — you get yourself a rich parent.

Often times this works well. It's especially nice when the child eventually becomes, in effect, the parent. This was the case with Proprietary Computer Services, a small company formed in Van Nuys, Calif., in late '69 to develop proprietary computer systems. Principal founder was Bill Barancik, who had been with Computing and Software, Inc., as vice-president, Western Computer Div. The fledgling company spent its first four months developing a land investment accounting system for subdividers, buying outside computer time as it went along. Then came the time when it needed some of the things that only money can buy — like a computer — since they wanted to offer their systems on a total service basis.

So Proprietary Computer Services joined forces with Marquardt/CCI, and a new corporation, Proprietary Computer Systems, Inc., was formed with Marquardt/CCI as 90% owner. This was in May of 1970. Marquardt/CCI was the first company to offer APL time-sharing on a commercial basis, and while there had been some skepticism when this was started in October 1968, the service did well with a firm base of some \$60,000 per month in business from then-big Marquardt Corp. When Service Bureau Corp. decided to drop its Datatext business, Marquardt/CCI picked up the ball with its successor, Administrative Terminal System (ATS), and did well with this too.

But things went badly during 1970 for Marquardt Corp., the original parent of Marquardt/CCI, and the \$60,000 monthly volume of business to the time-sharing operation dropped to \$5,000. By the end of 1970, Proprietary Computer Systems was in some trouble. And so, a renegotiation. Barancik and a group of employees who had been with what had been Proprietary Computer Services

bought out some of CCI's ownership in Proprietary Computer Systems, cutting the CCI interest to 30%. And so the child became the parent.

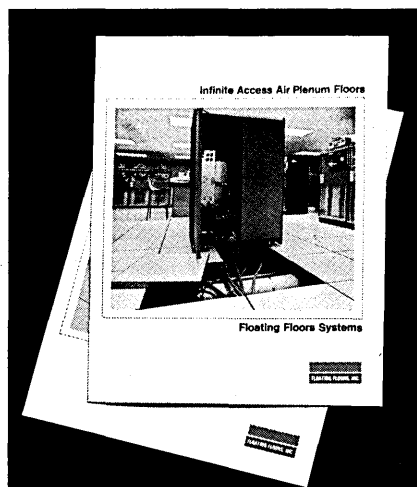
In its new state, Proprietary Computer Systems retains some of what once was Marquardt/CCI — about 20 employees, a 360/50, and the APL and ATS time-sharing services. It also offers the proprietary business systems developed by the old Proprietary Computer Services. In addition, some raw machine time is sold where Proprietary does the total job except program writing. The firm also does some keypunching and consulting. It's currently developing large, custom on-line systems using crt's, primarily for order entry and inventory control.

Recession Drives IBM to Early Retirement

IBM is offering a bonus of two years' annual salary to employees in the U.S. who elect to retire early. It's an effort "to correct a temporary imbalance" in personnel. The plan, announced to employees last month, was the first officially acknowledged personnel reduction at IBM, which has avoided any lay-offs, in contrast to most other mainframe makers during the recession. IBM has been accused of pressuring resignations in some cases, however, and has allegedly fired marginal personnel who once would have been retained in the best paternal tradition of the firm.

It wasn't revealed how many personnel might avail themselves of the early retirement bonus, but it can't be too many, as the offer applies only to those with 25 years' service and it expires at the end of the calendar year. The special payment would be spread over a 45-month period and would be in addition to whatever regular retirement benefits the individual was entitled to under existing early retirement and vested interest provisions.

Xerox Corp., an IBM rival in the computer, office copier, and good works fields, was not to be outdone. It announced last month it will allow employees to take a year off with full pay, provided they devote the year to some form of social work that meets with the approval of Xerox management.



Get this brochure before you buy or specify a raised floor system.

Data processing installations deserve the best in unlimited access floors for the support of expensive equipment and for maximum flexibility. The answer . . . The Floating Floors® System.

Choice of Panels—Aluminum for highest quality, steel for economy.

Choice of Surfaces—Hard surfaces or carpeting permit any combination of appearance and function.

Precision-Fit—Made to virtually perfect squareness for complete interchangeability.

Strength—Strong panels and proper pedestal design give needed strength without stringers. Support 1000 lb. per square inch with less than .085" deflection.

Rigidity—Positive interlock between aluminum panels and pedestal makes a stable floor approved for seismic conditions.

Total Access—Panels lift out to allow complete underfloor access.

Flexible Air Distribution—The cavity beneath the Floating Floors system can serve as a plenum.

A complete line of accessories is available. Write for this authoritative brochure: Floating Floors, Inc., Subsidiary of N L Industries, Inc., 5400 North Detroit Ave., Toledo, O. 43612. (419) 479-0721.

N L INDUSTRIES
FLOATING FLOORS, INC.

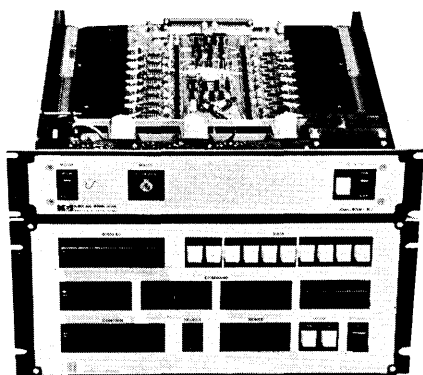
N L Industries, Inc. is the new name of National Lead Company

CIRCLE 51 ON READER CARD

Microprogram without fear!

**the OmniROM™ is
a nonvolatile
writable
control store
with
plug compatible
models for
Microsystems
Milacron, Interdata
Data General
Intercomputer
DEC, MAC
minicomputers
& yours.**

- load as I/O device
- run as ROM at full speed
- OmniROM diagnostic software included
- 30 day delivery
- OEM discounts



* See OmniROM at the FJCC

Memory Systems, Inc.

3341 W. El Segundo Boulevard
Hawthorne, Calif. (213) 772-4220
CIRCLE 11 ON READER CARD

NEWS SCENE



INVESTMENT TOOL: Bunker Ramo's John J. Haberstroh, marketing vp, and Anthony A. Barnett, division manager, with data terminal that is part of firm's system for monitoring market prices, trading patterns, research reports, and hot news. It also can be used to make trades.

BR Stirs: New Service, Ultronic Dispute

In two unrelated moves last month, Bunker Ramo Corp. made news by announcing a new nationwide stock market data service and by partially cutting off NASDAQ stock quotation service to its competitor, Ultronic System Corp.

Ultronic was charged by BR with providing NASDAQ Level 1 data to unauthorized users in violation of contractual terms, and BR stopped supplying such data to Ultronic. Ultronic denied the charge, however, and the next day a joint announcement said that service would be resumed and that the firms had agreed "to meet under the auspices of the NASD to discuss amicable resolution of their differences." At press time, no more plugs had been pulled.

The new BR service, called Market Decision System 7, uses a new crt/keyboard terminal for displaying securities and commodities information and for performing certain trading computations required by brokerage personnel. It permits access to stock ticker and newswire information, quotations, indices, averages, earnings, and review of a stock's history during the last four years. The screen can monitor up to 72 stocks for current

price and up or down tick, and a transaction watch feature shows the last five trades on any six issues.

It's the firm's most elaborate stock service to date, and will be available in the second quarter of next year. The company was unable to provide quotation of the price of the service, however.

Circuitry Firms Promise Cheaper, Better Minis

"Truly unprecedented" are the price/performance improvements in small computers, says D. E. W. Archdale, the product planning director for Interdata, the Oceanport, N.J., maker of small computers.

"The price decline in LSI (large-scale integrated circuitry) is having a dramatic impact on control logic and gives great flexibility to the computer designer, while giving the user the promise of unparalleled system capability," Archdale adds. Control logic, he says, is becoming more flexible through the use of fixed and dynamic control stores that use fixed read-only memories, as well as "once writable" programmable ROMs and high-speed read/write LSI.

Archdale's comments were made at a three-hour seminar last month on

Our new teleprinter runs so quiet we had to fake a little noise.

Operators couldn't get used to the eerie quiet of the keyboard on our new TermiNet *300 teleprinter.

So we added a little noise to give them some "feel." Even then it's quieter than an office typewriter.

And when it's running as a high-speed printer from tape or computer it's quieter still.

A front-panel switch lets you select a speed of 10 characters per second. That makes it compatible with the leading communications terminal. Or a speed of 15 characters per second. That makes it compatible with the leading computer terminal.

Or its unique speed of 30 CPS. Which makes it compatible with your special requirements of data handling, and saves you money.

But quietness and speed aren't all. We've built a whole raft of versatile features into the TermiNet 300 printer. That way it'll take care of your needs for years to come.

Things like horizontal or vertical tab. Long-print lines—up to 118 characters. Pin feed. A transparent mode. Remote 20-character answerback. Parity check. Full/half duplex operation. And many more.

Most of these options are supplied as simple modular plug-ins.

Which brings us to the reliability of modular construction. It's very reliable. And that's backed up by General Electric's nation-wide service. A point worth considering. And considering again.

Whatever your needs—time sharing, information systems, computer-outputted editing and formatting, even just repetitive printing—the TermiNet 300 teleprinter is what you should specify in your present system. Or in your next. General Electric Company, Communication and Control Devices Department, P.O. Box 4197, Lynchburg, Virginia 24502.

GENERAL  ELECTRIC



Terminet 300 DATA COMMUNICATION PRINTER
*Trademark General Electric Company, U.S.A.

CIRCLE 29 ON READER CARD

The 100 Series



A beautiful new way to wrap up your print-out storage problems.

Now there's a Control-Rack series that's as beautiful to look at as it is simple to use.

National's new 100 Series—the first referral and retention system with the look and feel of fine grained walnut. Rich. Warm. Beautiful.

But also beautifully practical. Combined with National Slide-A-Ref™ and Hang-A-Ref™ data binders, the 100 Series provides the most sophisticated approach currently available to print-out storage problems.

The new 100 Series is made up of desk-top, and floor storage units. Including organizers, mobile floor units, wall or divider units, bi-level data consoles, expandable storage units, data reference tables and a special data cube with removable top and free-wheeling mobile stand.

All are modular in design to provide maximum flexibility in establishing and main-

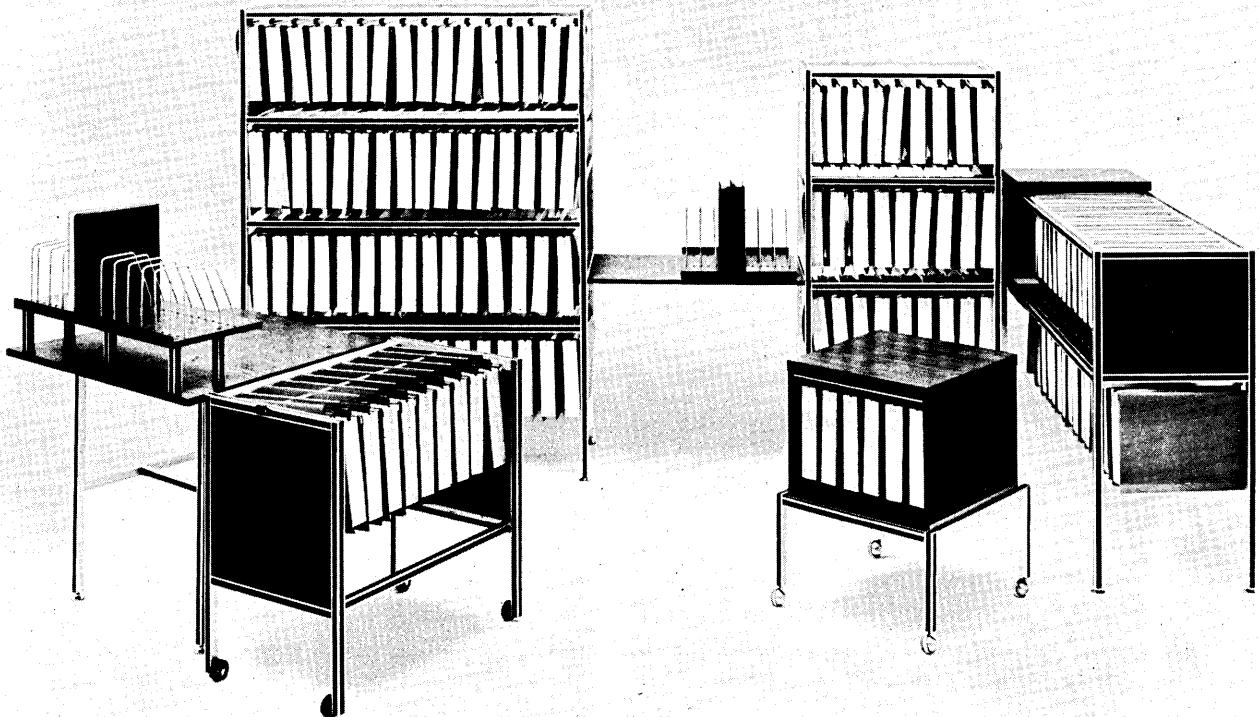
taining an efficient and well-organized data reference control system.

All in all, a new series that is easy to work with, beautiful to live with. See your National representative for complete details. Or send for free color catalog.

National Blank Book Company, Inc.
Department D
Holyoke, Massachusetts 01040

Please send me my free copy of National's new 100 Series color catalog.

Name _____
Title _____
Company _____
Street _____
City _____
State _____ Zip _____



NATIONAL BLANK BOOK COMPANY, INC.

A Subsidiary of Dennison Manufacturing Company

CIRCLE 17 ON READER CARD



\$30,000 quality in a low cost line printer.

Digitronics Model 200 sets a new standard in low cost line printers. With print quality for each of six copies better than that of printers selling for more than four times its price. And no printer at any price operates so simply. Virtually no training is required. The 200 has a swinging yoke for easy front loading, flexible font belt, and a universal multi-font buffer for automatic speed adjustment.

Our 200 lpm* printer is styled with incomparable beauty to enhance any mini-computer or terminal associated with it. Visit us at Booth 1618 at the FJCC or call (516) 484-1000.

*200 lines/minute with 64 character font; 132 columns; sharp, crisp type on all copies; 8-channel vertical format; low power dissipation (less than 300 watts); compact - just slightly larger than a typewriter.

 **DIGITRONICS CORPORATION**

One Albertson Avenue, Albertson, L. I. N. Y. 11507

new technology and small computers. It was sponsored by Interdata for the press and security analysts, but the firm was careful to avoid self-promotion. It even overlooked any official presentation of the new line of mini-computers (Sept. 15, p. 42); they were hardly even mentioned. Speakers were from Texas Instruments, Advanced Memory Systems, Intersil — the semiconductor houses — and from Monmouth College. Some 70 persons attended from as far as Canada and California.

Gerald Larkin of Advanced Memory Systems said his firm is now shipping 128K MOS memories as add-ons or replacements for users of IBM 360 computers, thus giving the firm field experience before original equipment manufacturers commit themselves. This is similar to Interdata's recent switch away from end-user toward oem marketing.

Mel Snyder, director of bipolar marketing at Intersil, said the core memory market, excluding IBM, was \$210 million last year and will peak at \$360 million in 1975, then decrease to \$340 million in 1976 under the impact of semiconductor memories. Plated wire will be harder hit: It will grow from \$10 million in 1970 to \$20 million in 1973, then decline to \$16 million by 1975.

The really big growth, of course, will be in semiconductor memories. Snyder's projections are a RAM/ROM market (again excluding IBM) rising from \$21 million last year to \$410 million in 1975, an average annual increase of 85%. No comment was made on whether the semiconductor industry will stabilize or become profitable.

Dan Sinnott, Interdata president, said prices of small computer systems will decline about 28% through 1975; but the average system size will increase, pushing the cost of software up "dramatically." Therefore, the average cost of a small computer configuration will remain about the same.

ADAPSO Launches Software Section

The Association of Data Processing Service Organizations has launched a Software Section, in competition with the Association of Independent Software Companies which ADAPSO had

previously wooed to become a semiautonomous software division. Jack Little of Planning Research Corp., president of AISC, commented that his organization has balked at joining ADAPSO primarily on the grounds that they prefer the freedom of immediate action afforded by independents, but also because they might be "at cross purposes" with some varieties of companies in a group as broadly based as ADAPSO. The AISC has only nine members, but Little said other software houses often assist, and there are several more prospective members.

The new ADAPSO section will operate similarly to its Time-Sharing Services Section and will initially comprise the group's 15 software house members. New members are being sought, however, and software firms have been invited to attend a special two-day conference Oct. 21-22 at the Brown Palace in Denver, concurrent with the regular ADAPSO Management Conference. The software program will be chaired by Larry Welke, president of International Computer Programs, and will cover such topics as unifying the software industry, and include an interchange of ideas and self-education in finance and marketing. The registration fees may be applied to ADAPSO membership. At press time, 28 nonmember software houses had registered.





Also announced was the Fifth Annual DP Services Industry Study, this year prepared by International Data Corp. in conjunction with ADAPSO. It indicates the industry isn't in as bad a condition as many believe. According to the study, sales passed the \$2 billion mark last year, with batch processing accounting for more than half that total. Remaining slices included software, \$540 million; time-sharing, \$300 million; other sectors, over \$60 million. There was a cumulative loss of 8.3% as a whole, but over half the firms showed a profit.

At the same time, ADAPSO concluded from the survey that the industry is now operating profitably, and sales should equal about \$2.5 billion this year, excluding bank data processing, which they hope to include in the future. Copies of the 50-page study are available at \$95 from ADAPSO, 551 Fifth Ave., New York, N.Y. 10017. (Continued on page 53)


Want to know the key to sound file security for your tape library?



atlas
AUTOMATED TAPE LIBRARY ACCOUNTING SYSTEM

-  **IMPROVES YOUR FILE SECURITY** by providing all necessary information on data set movement, remote storage and inventory control.
-  **REDUCES YOUR OPERATING COSTS** through lower rerun levels and economy in tape purchasing.
-  **INCREASES YOUR RECORD-KEEPING EFFICIENCY** by faster, more accurate posting of activity.
-  **INCREASES YOUR AUDIT CONTROL CAPABILITIES** by providing the current status, location, and physical information history on all tapes maintained by the library.

Written in COBOL for IBM 360/25 and up. Both OS (MFT, MVT, PCP), and DOS available. Send for free general information brochure.



atlas
GIS DATA SERVICES
P. O. Box 1548
Tampa, Florida 33601

Please send ATLAS brochure:

NAME _____

TITLE _____

FIRM _____

ADDRESS _____

CITY _____

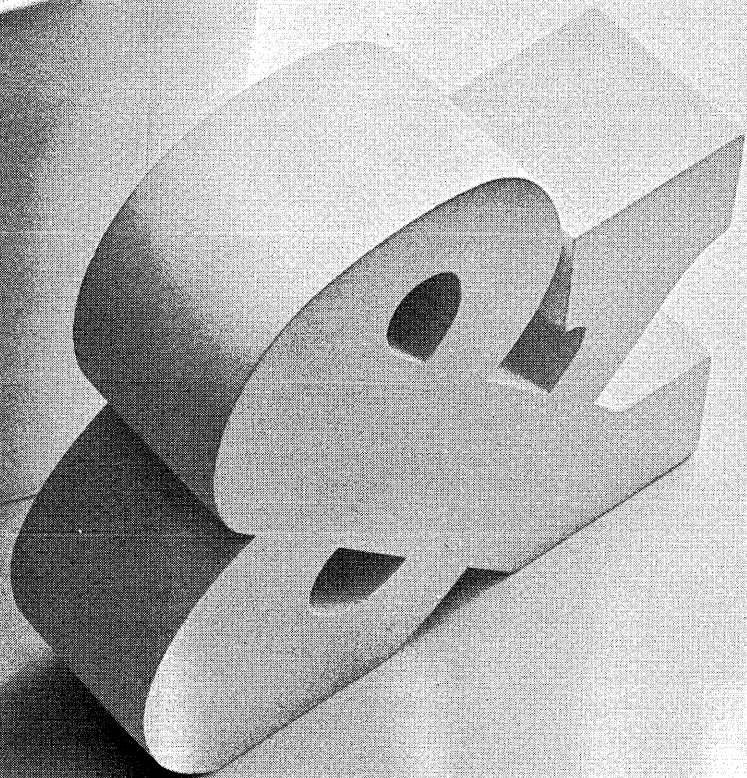
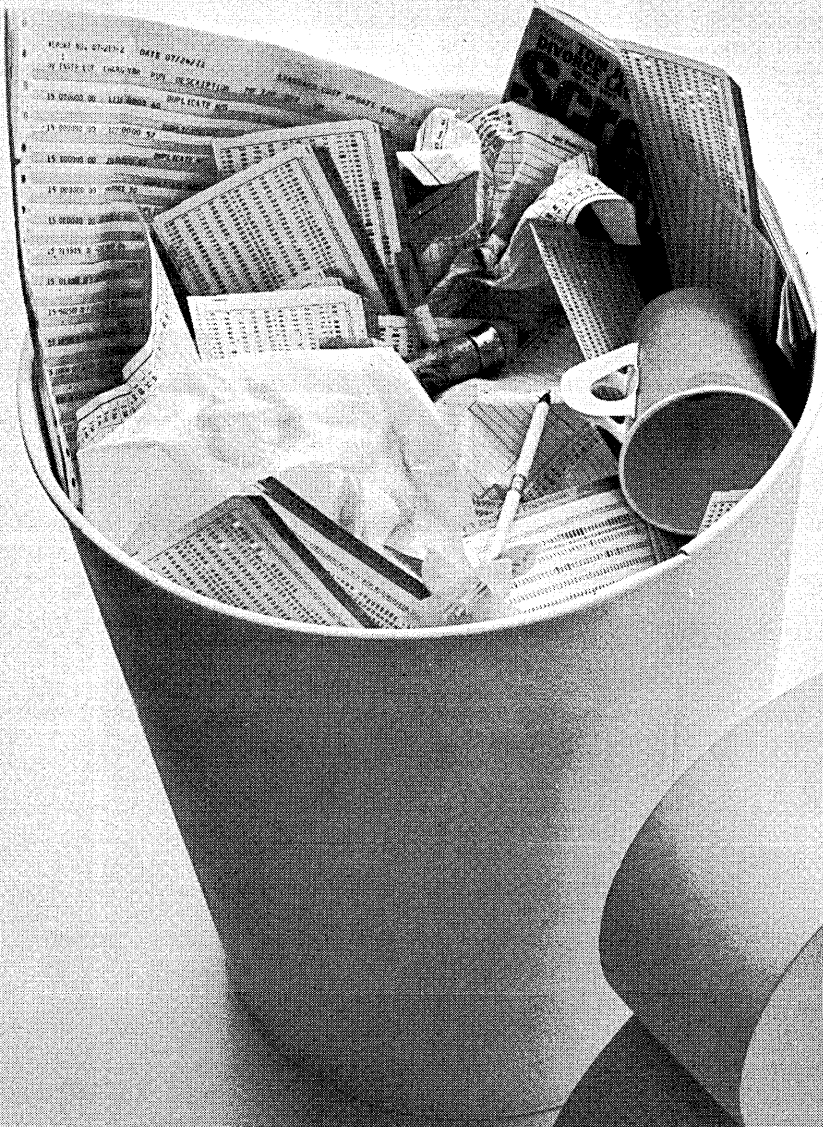
STATE _____ ZIP _____

OUR TAPE LIBRARY HAS _____ TAPES

OS _____ DOS _____

CIRCLE 32 ON READER CARD

Bell & Howell &



Kiss the Girls Good-bye

Sorry. But cute as they are, key punch girls are a thing of the past. You don't need them anymore. Thanks (or no, depending on how you look at it) to MDR. The Mark Document Reader.

It's a remarkable machine. We bought it lock, stock and the best people, from Motorola.

What it does, as we said, is knock out the need for key punching. It reads simple pencil marks. Nothing fancy, and anybody can make it work. (Incidentally, it also reads pre-print and key punch. But the nice thing about it is it's set up to be simple).

Reads tab cards (standard, long or short), snap sets or page formats.

Has over 200 combinations of character speeds, bit rates and languages.

With several interfaces. It's compatible with incremental recorders, modems, etc.

That's the hardware. But there's more. We've got a nationwide installation and service group. And a forms expert that designs the most efficient form for the job. So a customer gets on stream right away. No fussing around with expensive trial and error. All part of the package.

Sorry girls, but this is also a remarkable machine. MDR. Only from Bell & Howell. Electronics & Instruments Group, 360 Sierra Madre Villa, Pasadena, California 91109.

ELECTRONICS & INSTRUMENTS GROUP



Our R-250 three-speed data recorder you see below has more than enough going for it so it's a standout in any crowd.

As a solo performer, it's a rugged individualist.

But since made to IRIG standards, its character is congenial enough to work compatibly with other components in your system.

(One of the virtues born of its being a member of the large, world-renowned family of TEAC instrumentation products, where synergy is the watchword.)

When put to work by itself or

with other units, in the lab or the field, it provides precise FM recording and reproducing of analog signals from DC to 5kHz at 15 ips.

Its seven-inch reels carry half-inch tape that gives you seven independent record/reproduce data channels.

The eighth channel is an edge-track that takes voiced comments.

While one of the biggest (and best) in our family line, it still weighs in at an easy-to-get-along-with 67 pounds.

Front to back, the R-250 Series is a mere 12", 18" high, 20" wide—

a handsome addition to anyone's measuring instruments system.

Or as a starter of it.

It's not really particular how it's put to use. Or who it works with.

Only *how* it works.

To find out more about how it can work for you, just write or call Ken Williamson, Director of Marketing, Technical Products, TEAC Corporation of America, 7733 Telegraph Road, Montebello, CA 90604. Telephone (213) 726-0303.

He'll give you all the particulars on why there's a good reason to go TEAC.

The particular data recorder that's not particular who it works with.



(Remote control unit is optional)

Feds Limiting Sole-Source DP Contracts

Federal agencies have been told to use sole-sourcing only as a last resort when they need more data processing capacity. The order was issued recently by the Office of Management and Budget (OMB) after a prolonged gestation (see June 15, '71, p. 55).

The new regulation directs an agency to consider several alternatives before soliciting bids from manufacturers for new dp equipment. The alternatives are: revalidation of the agency's workload and dp requirements to determine if either can be reduced; programming changes; "selective" acquisition of new software or peripherals to improve the existing system; use of equipment supplied by third-party lessors or by GSA from its surplus equipment inventory; purchase of already-installed equipment that is presently being leased.

If an agency can show that none of these alternatives is feasible, it's free to put a bid solicitation on the street.

But the procurement must be competitive unless the agency needs additional capacity in a hurry and can justify sole-sourcing on that basis.

Until now, federal agencies wanting to upgrade or replace existing systems via sole-source contracts have been able to do so without much trouble.

If the agency could show that its existing system was inadequate and that the manufacturer had an improved, more cost-effective system, its request was usually granted (assuming funds were available). Often, the whole scenario was written by the supplier, who submitted it as an unsolicited proposal.

Presumably, the new regulation will end this practice. Presumably also, the federal dp market will become more attractive for independent peripheral makers and software suppliers as well as non-IBM system manufacturers.

Last March, DOD issued a similar directive, applying only to the military services. But it hasn't been in force

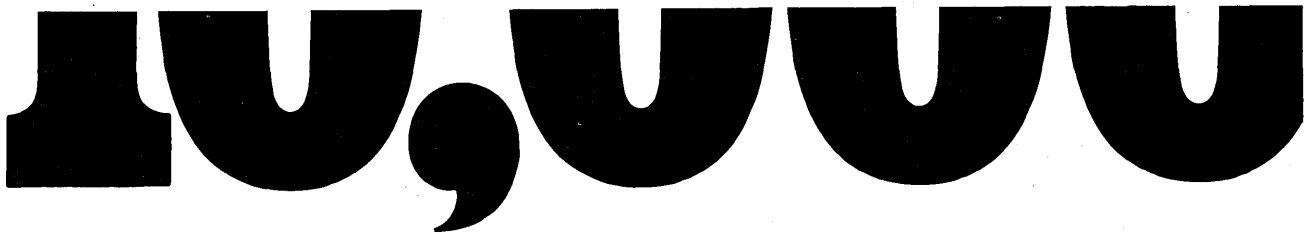
long enough to measure the effects, reports a spokesman.

"GAO Impatient," Army Says of Basops Blast

Basops, the Army's Base Operating Information System, is so full of bugs that the whole project should be stopped immediately and reevaluated. So says the General Accounting Office (GAO) in a recent report to the Secretary of Defense.

Managers of the project are apparently satisfied, however. Interviewed recently, they admitted that some software problems have developed, but quickly added that these will be corrected by the end of the year. They say GAO is "too impatient."

Last May, Brig. Gen. R. L. Fair, the Army's chief dp systems coordinator, was equally optimistic when he testified before a House Appropriations Subcommittee. "Didn't the Army have some problems with (Basops)?" asked Congressman John Rhodes of

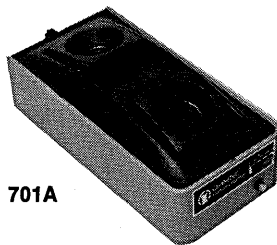


Omnitec reliability begins with 10,000 customer proven installations

Over 10,000 Omnitec acoustic couplers in use today add up to an impressive testimonial for Omnitec reliability. And, this outstanding performance record didn't just happen by chance. Omnitec acoustic couplers are the product of intensive engineering development that has brought about the quality, flexibility and operational features called for in today's demanding data coupler requirements.

**Model 701A
The industry standard**

No other coupler on the market has proven more economical and reliable for a broad range of data terminal applications than the model 701A. Offering data rates in excess of 300 Baud, (30 cps ASC11) acoustic or hard-wire (DAA) line

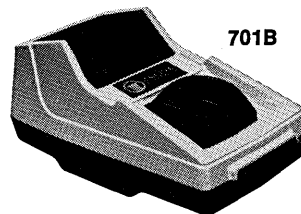


701A

coupling, high sensitivity—greater than — 40 dBm in acoustic mode, simultaneous TTY and EIA (RS23S) output, and half-duplex and full-duplex operation, the Omnitec model 701A provides the degree of systems interchangeability necessary for standardization.

Model 701B Compatible for high speed conversion terminals

This is a fourth generation coupler designed for terminals



701B

operating at extreme high data rates. The model 701B combines a high speed capability, in excess of 450 Baud (40 cps ASCII), with ultra-high sensitivity: 50 dbm in acoustic mode, acoustic or hard-wire (DAA) coupling, simultaneous TTY and EIA (RS232) output and half-duplex and full-duplex operation to provide maximum flexibility and interchangeability in a single unit.

For complete technical information on Omnitec 701A and 701B acoustic couplers use this publication's reader service card or phone or write directly to Omnitec, Phoenix, Arizona.

See the entire Omnitec product line in booth #2726 at the Fall Joint Computer Conference



OMNITEC

A NYTRONICS CORPORATION
903 North Second Street
Phoenix, Arizona 85004
Telephone (602) 258-8246



First disk packs with Crashguard protective coating.

First computer tape resistant to handling damage.

First in-process-tested computer tape.

First computer tape resistant to rub-off.

First computer tape.

First research and development of magnetic recording tape and coated disks.

3M. We've got a habit of getting there first.

What does this mean to you?

It means you can put an extra measure of confidence in "Scotch" Brand computer supplies. All of them. Computer tape. Disk packs. Digital cassettes. Disk cartridges. And related accessories.

You know these products are developed by the most experienced team of chemists, engineers and technicians in the field of magnetic media. The team that brought the electronic data processing industry its first computer tape.

You know that these products are unsurpassed in quality and performance. Products that have brought you, time after time, the latest technological improvements.

And you know where more new product improvements are most likely to come from.

Magnetic Products Division **3M**
COMPANY
3M CENTER • SAINT PAUL, MINNESOTA 55101

"SCOTCH" IS A REGISTERED TRADEMARK OF 3M CO.

CIRCLE 8 ON READER CARD

Arizona. "Of course, anytime you are trying to put a software package together, you will have some problems," answered Fair. "It is operational now. At present we have three applications on the machine: the management of personnel, financial management, and supply."

According to the GAO report, "the deficiencies in the financial management subsystem are seriously affecting accuracy and reliability of accounting records . . . (Basops users) are unable to adequately manage and budget their resources (and) have had to establish and maintain expensive annual records."

The report, which hasn't been made public, adds that deficiencies in the Basops supply management subsystem "are causing duplicate issues, distortion of demand history and stockage levels . . . and Basops installations have had to adopt numerous manual procedures" to help overcome these shortcomings.

About \$16.5 million has been invested in the system, so far, and the total projected cost through FY'76 is

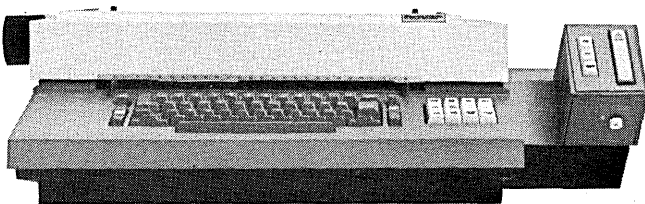
\$87.4 million. Ever since 1969, Basops development has been the responsibility of the Army Computer Systems Command (ACSC), which was set up that year to develop systems used by more than one Army command. Congress had been complaining for a long time prior to 1969 that the Army's failure to centralize multicommand systems development was wasting money and producing systems that didn't work.

The recent GAO report on Basops suggests that this reorganization hasn't produced much improvement. "... (I)n some instances program changes not only failed to correct problems but also created new ones. A computer systems command official stated that the financial programming had been altered so many times that it is difficult now to make further corrections because computer systems command resources are not sufficient . . ."

Basops had been under development since 1965. Originally it was called Cocoas (for Continental Army Class I Automated System). In 1966,

IBM won a contract to lease 36 360/30s, plus peripherals, to Cocoas users. But it wasn't until October 1970 that the secretary of the Army approved the prototype installations and allowed deployment to operational sites. During this period, the system was drastically redesigned and was renamed Basops. GAO says the secretary's approval of the prototype supply management subsystem was "contingent upon the correction of some 34 deficiencies . . . the subsystem was extended, however, before 20 of these deficiencies were resolved. Most were still unresolved as of July 1, 1971."

Meanwhile, the system has undergone further changes. Memory capacity of the computers has been increased. Systems have been installed at 22 sites out of the projected 35, and the army is insisting that the personnel system is operational at 17 sites, and the supply and finance system at 10. They promise they'll be operating at all 35 sites by the end of June '72. Army dp system managers at the Pentagon now are talking about



This terminal can be equipped with Unattended Operation capability, enabling it to transmit data to and receive data back from the computer—with no operator present. Take advantage of low nighttime phone rates—or use your WATS line. Ask about the Model 5-50.

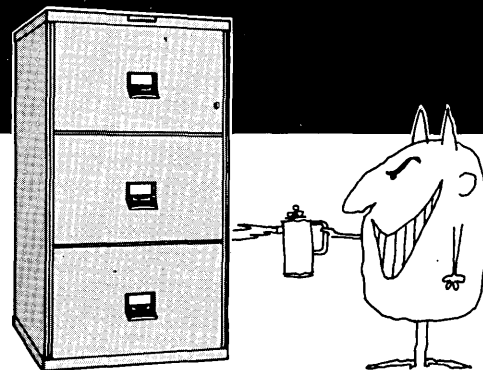
NOVAR

Novar Corporation • 2370 Charleston Road
Mountain View, Calif. 94040 • (415) 964-3900
Offices In Principal Cities

GTE INFORMATION SYSTEMS INCORPORATED

CIRCLE 14 ON READER CARD

**THIS POINT-OF-USE
TAPE FILE
WENT THROUGH HELL
FOR YOU.**



Victor Super LX Tape File passed every devilish test Underwriter's Laboratories handed it . . . and won its UL 150-1 hour label!

It's the *only* point-of-use tape file that gives you complete assurance of safety against heat, humidity, impact and explosion.

Five different drawer configurations for tapes, discs, microfilm, microfiche and IBM System 3 cards.

Colors to match your computer equipment. Write for name of your Victor dealer.

VICTOR[®]
SYSTEMS & EQUIPMENT
P O BOX 171, MARIETTA, OHIO 45750

CIRCLE 25 ON READER CARD

extending Basops to installations overseas. They think 10 or more additional systems are needed.

Computers Can't Look Flashy; Just Expensive

Computers are called many different things by many different people, but we know of no one who ever accused them of being beautiful.

Industrial designers, of course, try to make them beautiful for esthetic reasons, but, for business reasons, they also must make them look expensive. "One of the idiosyncracies of the computer industry," says Gregory Fossella, a Boston industrial designer, "is that manufacturers want their products to look expensive. Computers can't look flashy, for instance."

As president of Gregory Fossella Associates, Fossella has designed scores of computer and computer-related products for such firms as Cincinnati Milacron Inc., Computer Displays Inc., Delta Data Systems Corp., Entrex Inc., Logitron, and Sanders As-

sociates.

"The computer," says Fossella, "is an expensive piece of equipment and manufacturers want its outside design to reflect the cost of the equipment. As a result, I think that some of the best design work in the country is being done in the computer field."

As an example, Fossella Associates cites the case of the computer manufacturer who came to the design firm with a sophisticated piece of interface equipment that would sell for more than \$10,000. "There would be a credibility gap if there was simply a black box that didn't reflect the level of sophistication and electronics in the box," explains Gary L. Benton, executive vice president of the firm. Fossella Associates put a casing around the black box, colored its front gold, and even convinced the manufacturer to put a light on the front panel.

Just because the computer industry is so volatile, the industrial design end of the industry is equally volatile. Because, for instance, the proliferation of solid state componentry has

spurred miniaturization of computers, it is getting more difficult for designers because some computers and modules are simply too small to do much with. Another virtually universal problem in designing computers is that they must be easily accessible for field servicing.

NEWS BRIEF

U.S. Buys 65—Used!

The U.S. government has finally made its first "significant" used computer purchase, according to Summit Computer Corp., which sold the Dept. of Labor a million-byte System/360 Model 65 system for only \$1,600,000 — over three-quarters of a million off list for the same hardware new. But, laments Summit, the deal was handled outside the normal negotiating channels of the GSA, since GSA has not found it possible to purchase used computers as "[GSA] specifications are oriented to original equipment



The only display terminal that eliminates glaring mistakes.

Lear Siegler introduces the LSI 7700 Interactive Display Terminal. It's the only one with a glare-free screen to help avoid operator errors. The 12-inch screen, along with the large, easy-to-read characters, eliminates mistakes attributed to misreading a glaring screen of small characters.

The 7700 is available in 1,000 or 2,000 character versions. Both are self-contained — equipped with keyboard, control and editing logic, character generator, refresh memory, interface and split screen.

In standard configuration, the versatile 7700 is completely compatible with EIA Standard RS232; or with a parallel transfer rate of 15,750 characters per second. An optional configuration permits serial transmission up to 120,000 bps.

Write today for more of our output. And avoid terminal mistakes.

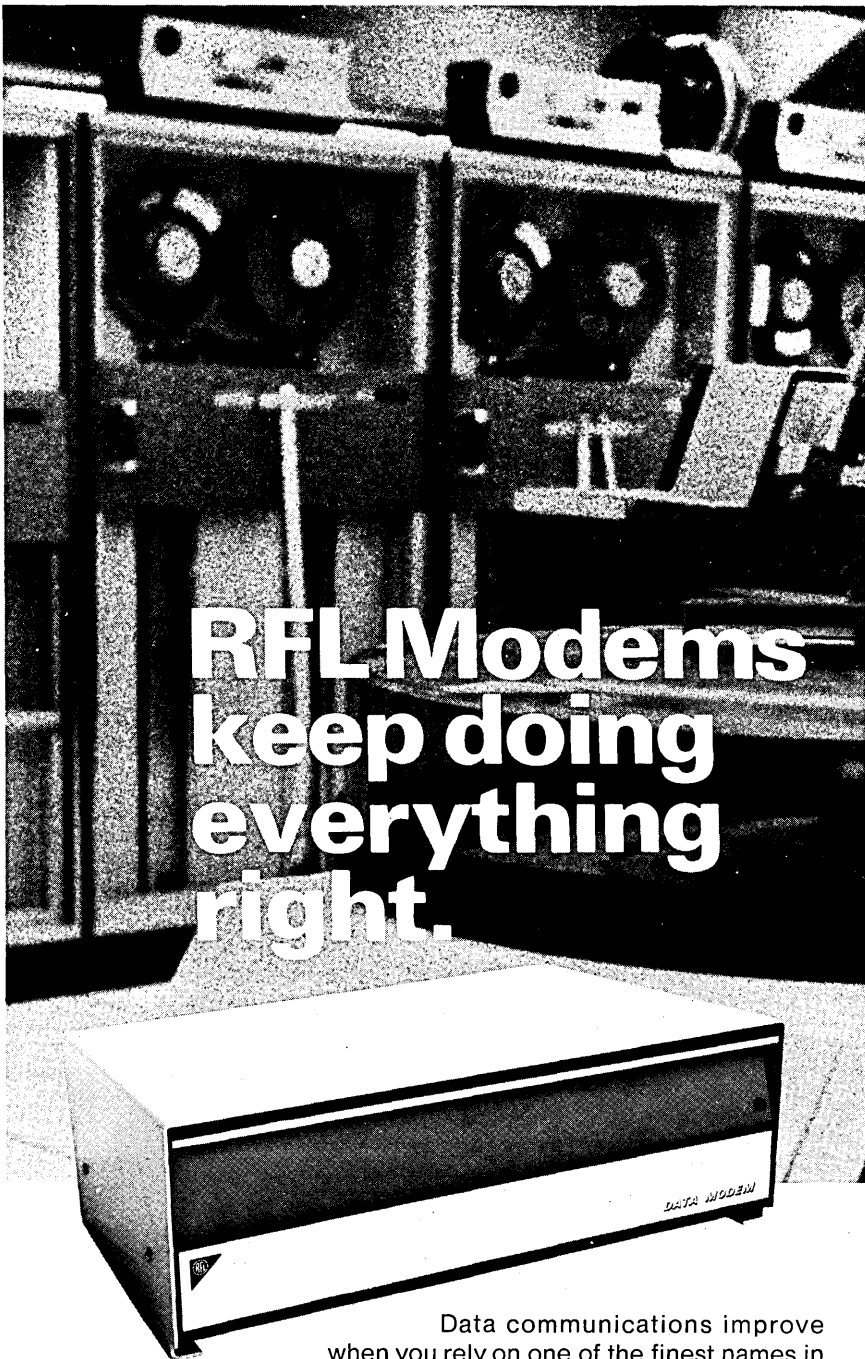
LEAR SIEGLER, INC.
714 No. Brookhurst Street
Anaheim, Calif. 92803



manufacturers and their contractual terms."

SHORTLINES

Courier Terminal Systems, Inc., Phoenix, has gone into the total systems business with formation of a Systems Development Div. which will offer complete systems including equipment acquired from other manufacturers . . . Bucode, Inc., Hauppauge, N.Y., received a \$1.5 million order from Digital Equipment Corp. for automatic loading magnetic tape systems for the DECsystem-10 computers . . . Recognition Equipment Inc. plans to cut its ownership in Corporation S, Dallas-based computer services firm, from 49% to less than 20% . . . Computer Management, Inc., Cleveland, acquired the COM division of Superior Microfilm, Inc., Pittsburgh. The business will be operated by CMI's COM division, Micro-Cor Inc. . . . International Reservations Corp. has come up with a promotion scheme to send U.S. reservationists to Britain and vice versa. The program, conducted with International Reservations Ltd. of Great Britain, began with a contest to select the "best all-round sales agent" at IR centers in the two countries. The winner in each country will change jobs with his or her overseas counterpart for three weeks. Runners-up will receive 5 shares of Planning Research Corp. stock. PRC is IR's parent company . . . Emery Air Freight added terminals in London, England, and Sydney, Australia, to EMCON, its computer-based air freight shipping system which provides a complete trace on shipments within minutes of inquiry and acts as an alerting agent to consignees that shipments are enroute . . . The Washington state Dept. of Highways purchased a \$225,000 million-byte extended core memory from Ampex Corp. for its 360/65 . . . Scan-Data Corp., Norristown, Pa., producer of OCR equipment, expanded its domestic marketing organization with the opening of a new Boston sales office and the move of its Los Angeles and Chicago sales offices to larger quarters . . . The Cyphernetics Corp., time-sharing firm headquartered in Ann Arbor, Mich., opened an East Coast regional office in Springfield, N.J. ■



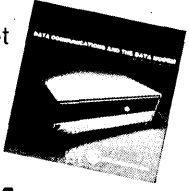
**RFL Modems
keep doing
everything
right.**

Data communications improve when you rely on one of the finest names in the industry. Reliability and service improve, too. RFL's high standards of engineering and manufacture are followed-up by a large international network of carefully selected sales/service professionals.

With RFL, you save money by selecting the *right* modem for your applications — from the widest selection in the industry.

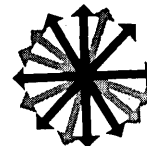
And the RFL multiplexer permits use of up to 22 channels over a single circuit. New RFL delay and amplitude equalizers improve line condition for higher speed transmission.

Use outright purchase or rental plans and get prompt delivery. Write or phone for our new booklet on the full RFL modem line, specs and prices today.



RFL RFL Industries, Inc.
Communications Division, Boonton, N.J. 07005

TEL. 201-334-3100/TWX: 710-987-8352/CABLE RADAIRCO, N. J.
CIRCLE 44 ON READER CARD



Graphics / Alpha Terminal

It's hard not to get enthused about the model 4010 alphanumeric and graphics display terminal, for the product seems to offer so many nice features at a reasonable price. For example, the software support available to buyers of the 4010 must be one of the more comprehensive offerings in the industry as it includes routines developed for the manufac-

PRODUCT SPOTLIGHT

turer's other graphic terminals, plus a number of specialized subroutines developed for the Corning 904 graphics terminal (now defunct). There is also software support (and hardware interfacing) for a large number of computers, including most of the DEC PDP line, the Data General

offerings, the Hewlett-Packard minis, the Varian 620 series, Honeywell's



H316 and DDP 516, the Interdata 3 and 4, several of the Raytheon series, and 360/370 gear, too.

For hardware, the 4010 uses the bistable storage tube used in previous graphics terminals from this manufacturer, and the tube has the advantage of not requiring refreshing. Images are stored for up to one hour on the 11-inch diagonal screen in the form of 1K x 780 points (1K x 1K addressable points) or 35 lines of 72 characters/line, drawn from a 63-character ASCII set. Graphic input is by a dual thumbwheel arrangement above the model 33 tty-style keyboard. The vector drawing time is 2.6 msec, independent of direction or length, and communication rates range from 150 to 9600 baud.

Prices start at \$3950, or a three-year lease calls for \$200/month rental, including maintenance. Deliveries start next month, depending on quantity. TEKTRONIX, INC., Beaverton, Ore. For information:

CIRCLE 527 ON READER CARD

Nonimpact Printer

A 1200 lpm, 132-column print station called the X/3 features electrostatic printing on any paper, a 96-character ASCII set, output suitable for OCR in fonts interchangeable in three minutes, and options of faster speeds and overlay forms generation. It is designed to operate with the vendor's 20/20 optical character reader (Apr. '70, p. 260), but it can also be used as an off-line print station with an IBM compatible tape drive. Prices start at \$20K, or the X-3 rents for \$600 per month including maintenance. Deliveries should begin early next year. SCAN-OPTICS, INC., East Hartford, Conn. For information:

CIRCLE 517 ON READER CARD

Fast Disc Storage

FAST seems to be the perfect name for this fixed-head disc unit considering that its 6000 rpm speed provides an average latency time of 5 msec and a transfer rate of 6 MHz simultaneously from up to 16 tracks. Two models provide capacities of 6 and 12 megabytes. If the specs look a lot like the IBM 2305 unit, then you know the market the manufacturer is going after for oem's. End users can contract for the controller needed for their particular computer, but the disc unit itself is priced at approximately \$100-150K. Deliveries begin after the middle of next year. DIGITAL DEVELOPMENT CORP., San Diego, Calif. For information:

CIRCLE 522 ON READER CARD

360/20/30 Add-On Core

First product offering of a firm that previously confined its activities primarily to reconditioning and reconfiguring cpu's, mostly for leasing companies, is a 360/20/30 core extension. Called the model 3768 storage unit, it is plug compatible with cpu's having either 1.5- or 2.0-usec cycle times. It can extend memory to a maximum of 64K, and memories for 96K and 128K will be available soon. A unit to upgrade an 8K model 30 to 32K sells for \$26,500; to upgrade the same cpu to 64K, \$45,200. Rental is available; delivery, immediate. COMPUTER HARDWARE CONSULTANTS & SERVICES, INC., Warrington, Pa. For information:

CIRCLE 526 ON READER CARD

Disc Storage

Other manufacturers have solved the challenge of building a double-density 2314-type disc storage system by doubling the number of storage tracks and leaving everything else pretty much alone. But the designers of the 3665 system felt it might be safer to leave the distance between the tracks constant, double the recording density, and cut the rotational speed in half to arrive at the same 312 KB transfer rate as the 2314. From one to eight drives (plus a spare) can be attached to the 3665, and the drives have an average access time of 35 msec. No software



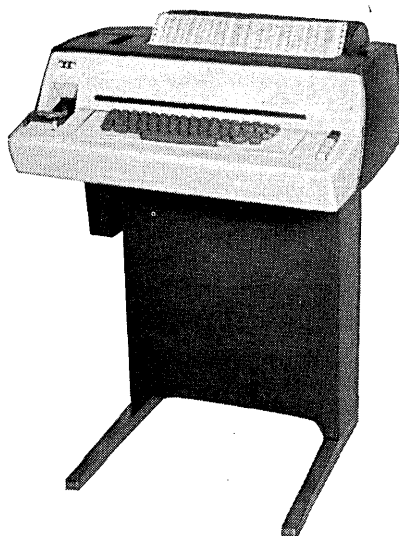
changes are said to be required to take advantage of the 3665's attributes. If our arithmetic is right, the 3665 system offers a 100% increase in storage at about a 20% increase in price compared to this same manufacturer's 2314-type storage system. The 661 controller rents for \$970/month, the 665 double-density adapter goes for \$430/month, and each spindle runs \$400/month, with these prices based on a 12-23 month contract including maintenance. MEMOREX CORP., Santa Clara, Calif. For information:

CIRCLE 521 ON READER CARD

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

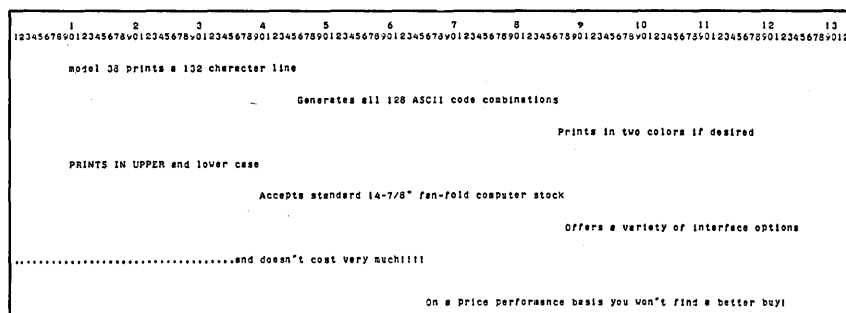


It's the Teletype® model 38. And its capabilities go far beyond the wide format aspect of operation.



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

... the important differences



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

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

If you would like to input computer data in red and receive output data

in black, or vice versa, the Teletype 38 terminal has this capability, too.

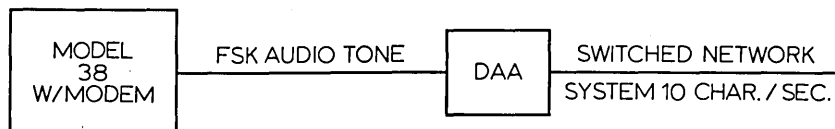
As you can see, the 38's format flexibility makes it easier to get your data in and out of the computer. And it broadens your on-line capabilities as well.

... the line is complete

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

... plug to plug compatibility

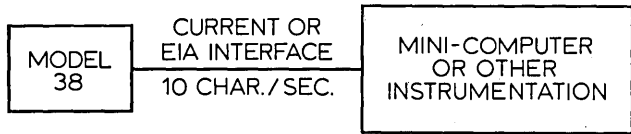
The model 38 is available with several interface options, operating at 10 characters per second (110 baud).



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

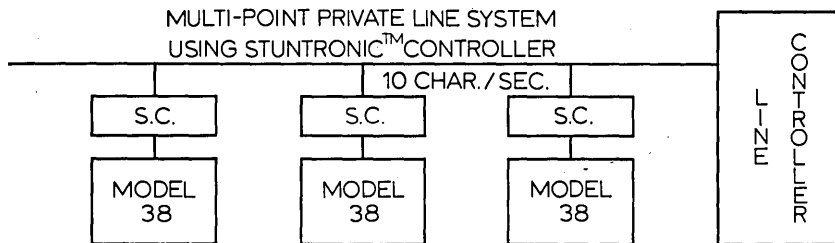
DATA COMMUNICATIONS

equipment for on-line, real-time processing



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

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

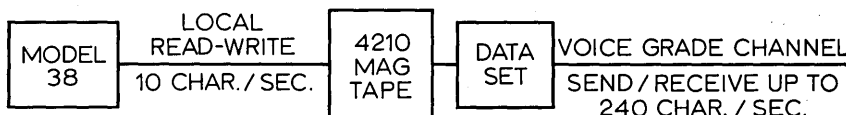


You can even use the model 38 in multi-point "selective calling" systems by adding a Teletype Stuntronic™ station controller.



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

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



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



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

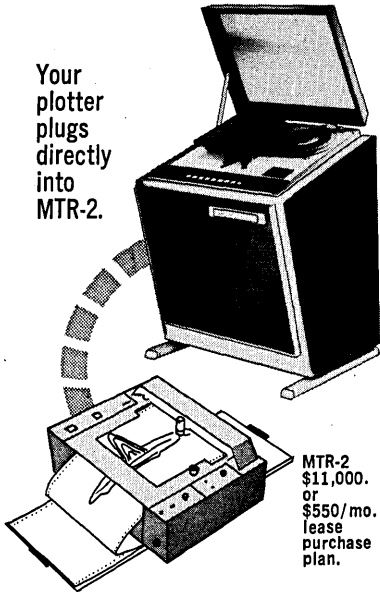
We would like to be of service.

TELETYPE
machines that make data move

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

Offline Plotting NOW FOR THE FIRST TIME AUTO BLOCK ADVANCE AT LOW COST

Your
plotter
plugs
directly
into
MTR-2.



MTR-2
\$11,000.
or
\$550/mo.
lease
purchase
plan.

The MTR-2 is a magnetic tape reader which accepts IBM compatible 800 BPI, 9 track 1/2" tape on 10 1/2" or smaller reels.

The software, provided free of charge, utilizes a single code group which means one character will step the plotter one increment. Particularly useful with medium and large computers, the MTR-2 is a convenient means of plotting without using costly CPU time for other than writing the tape. Extra copies of the plot are obtained by simply replaying the tape — not using any CPU time.

- 800 BPI, 9 track 1/2" tape on a 10 1/2" reel (or smaller)
- Block advance
- Free housekeeping software supplied with purchase of MTR-2
- Tape speed is 1.5 IPS for 300 increment/sec. plotter or 6.0 IPS for 1200 increment/sec. plotter.
- Rewind speed is 100 IPS
- Push button switches: POWER, LOAD FWD/LOAD POINT, PLOT, BLOCK ADV/READY, STOP, REWIND, SINGLE/CONT.
- The MTR-2 costs only \$11,000. or \$550/month on lease-purchase plan.
- OEM Discounts available.



houston instrument DIVISION OF BAUSCH & LOMB
4950 Terminal Avenue, Bellaire, Texas
77401 (713) 667-7403

houston instrument European Office
Johanneskirchner Strasse 17, 8043 Unterföhring
München, W. Germany (0811) 97-1673

CIRCLE 34 ON READER CARD

... HARDWARE

Hard Copy Terminal

The CD 3000 operates at 10, 15, and 30 cps with full alphanumeric i/o, 132 character lines, and up to 6-part printout is accommodated. It's acoustically coupled and operates in asynchronous or synchronous mode. It prints out a full ASCII 64 subset, and transmits all 128 ASCII characters. Features include full- and half-duplex, switch-selectable; parity check; carrier detector; and a solid-state keyboard. It can optionally be interfaced to card handling equipment, crt's, and magnetic tape recorders. The price is \$3490 each for quantities up to 10, or rental is as low as \$127/month including service. COMPUTA DATA CORP., INC., Providence, R.I. For information:

CIRCLE 520 ON READER CARD

Data Entry Terminal

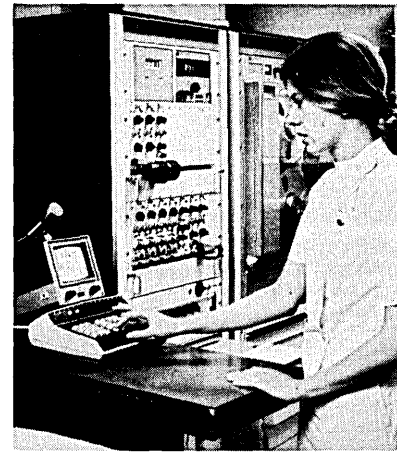
For applications not requiring the hard copy records of this manufacturer's System 2100 key-to-tape system (Aug. '69, p. 157), a crt terminal is offered as an alternative to the strip printer models, or to complement them in the same system. The crt displays up to 16 lines of 32 characters choosing from a set of 64 ASCII characters, and refreshes the display at 60 Hz. Monthly rental on a 20-station system, including the controller, disc unit, tape unit, and supporting software packages, is approximately \$2800, with the crt terminal renting for about \$75/month. GENERAL COMPUTER SYSTEMS, INC., Dallas, Texas. For information:

CIRCLE 525 ON READER CARD

Hospital System

A dedicated system, based on an HP 2100 minicomputer, automates cardiac catheterization laboratories in hospitals. Developed jointly by Stanford Univ. and the vendor's Medical Electronics Div., the system centralizes the processing of patient information obtained during catheterization and provides the cardiologist with on-line calculations. A one-bed system is priced at \$68,500. It includes 8K memory and FORTRAN software. HEWLETT-PACKARD, Waltham, Mass. For information:

CIRCLE 519 ON READER CARD



Drum Storage

An eight-product series of drum memories is the first offering from a group of designers who were building such oem-oriented units for another manufacturer until recently. The DR6E line ranges in capability from the DR6E-12C, with 12 tracks storing 240,000 bits, and having a transfer rate of 500 KHZ, to the DR6E-36A which stores more than two megabits and has a transfer rate of

1.8 MHz. All models rotate at 3600 rpm and have access times of 8.6 msec. Ruggedized versions are available, as is limited electronics capability. Availability of models in the DR6E line ranges from off the shelf to 45 days ARO, and prices start at approximately \$800 each for an order of 50 DR6E-12s. CALIFORNIA ELECTRO MECHANISMS, Torrance, Calif. For information:

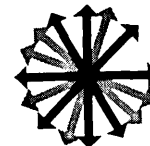
CIRCLE 524 ON READER CARD

Punch Card TP

The Telecommunications Punch makes it possible to transmit punched card information over dial-up lines; no data set is required. The acoustically-coupled unit attaches to an IBM 029 keypunch for both input and output, allowing remote keypunching without physical transport

of cards. The price is \$1675, or rental is \$68.75 per month. You'll need at least two. The vendor is a firm mostly owned by Western Union and Western Union Computer Utilities. INTERNATIONAL DATA TERMINALS, INC., Ft. Lauderdale, Fla. For information:

CIRCLE 518 ON READER CARD



Business Language

A superior replacement for COBOL? As a four-man, 19-month-old firm, the vendor is understandably hesitant to make such a claim, but it's clearly the goal of the T-7 compiler. It's a non-procedural language, in contrast to COBOL, and the pitch is that this enables the user to specify what is to be accomplished rather than how to accomplish it. There is no way to convert programs from COBOL to T-7 except by reprogramming, but T-7 will operate on exist-

ing files used in the context of other languages, so complete conversion is not necessary.

The capabilities claimed include: A software virtual memory up to 16 million bytes is used by all system programs and object programs, and enables adaptation to partition sizes as small as 24K through core swaps; self-relocating and read-only compiler and object programs; unlimited number of sequential and random files for input and output; and coding completely free form with no special forms required. T-7 has been the

primary effort of the vendor and was the reason the company was formed. It is said to be an original language, not a subset of any other, though its external appearance is somewhat like PL/I.

T-7 is not likely to be implemented casually: It's priced at \$23K or \$850 per month for a minimum one-year lease. It runs on any IBM mainframe with OS or DOS and requires at least 32K core. THOMAN SOFTWARE CORP., Cincinnati, Ohio. For information:

CIRCLE 513 ON READER CARD

Disc File Maintenance

CRAMMIT (CBIS Relocatable Access Modules for Maintenance, ISAM Technique) accurately describes what it does for 2311- or 2314-type disc storage devices. It deletes all records flagged in the ISAM file and reorganizes the entries into the prime data area. Any character in any record position may be used as the deletion flag. CRAMMIT can also create an ISAM file from any fixed-record-length SAM file and prepare back-up SAM files for any ISAM file, as well as keep such statistics on the file as record counts, deleted record counts, and a description of the file allocation. CRAMMIT is written in BAL, requires approximately 4K bytes, and runs under DOS. Including a one-year warranty, the purchase price is only \$250. CBIS INFORMATION SYSTEMS, Woodland Hills, Calif. For information:

CIRCLE 507 ON READER CARD

Multisystem Catalog

Some users should be able to reduce core requirements for their supervisors with Multi-DOS, a BAL program that allows the DOS user to have up to nine different DOS supervisors catalogued in the core image library simultaneously. The desired supervisor is selected at IPL time. The Multi-DOS program itself is only 200 bytes (which are overlaid so it requires no additional core), and it runs on any system supporting DOS. Uses of Multi-DOS include the testing of new supervisors without the risk of having to rebuild a system pack if one cancels. Just select an alternate monitor and continue. Other applications include situations where supervisors with special features are infrequently used. The program is priced at \$50. GENERAL ELECTRONICS, Lyons, Ill. For information:

CIRCLE 512 ON READER CARD

X-Y Plotting

PI-PLOT is a four-module FORTRAN program for generating x-y plots that operates after the user program that develops the inputs terminates. Approximately 44K bytes are required to perform functions such as log-log and semilog scaling, vertical and oblique labeling, axis generation, curve annotation, dashed lines, histograms, multiple-valued function plots, plots of long strings of text, and placing several curves on a single frame. PI-PLOT supplies substitute values if errors are encountered, makes a "best guess" plot, and identifies the plot with an error diagnostic. Plotter and machine independent, PI-PLOT is priced at \$2K including the source program, a user's manual, a test exercise, and installation instructions. PHYSICS INTERNATIONAL CO., San Leandro, Calif. For information:

CIRCLE 510 ON READER CARD

Tape, Disc to Print

Extended Tape to Print (E-T-P) and Extended Disc to Print (E-D-P) are utility packages available by mail order. Each simulates an off-line printer with an additional option of driving two printers from one partition. They will print, from tape or disc, items which have been prepared in a main chain or edit run with data completely edited and a control character in the first byte to control spacing. The packages are written in BAL for use under DOS/360 and require a 10K partition for driving one printer, and 18K for two printers. Prices are \$500 for the one-printer packages and \$250 additional for the second printer. FRANKLIN DATA SERVICES CORP., Springfield, Ill. For information:

CIRCLE 502 ON READER CARD

Pre-Assembler

The Certified Program Generator is a BAL pre-assembler which translates special macros in the vendor's own language into BAL source code, resulting in programming time reductions of 80-90%, according to the firm, with somewhat less spectacular results for COBOL and RPG users. CPG has language capabilities to update and create files, and it is designed to exploit the machine efficiencies of BAL while reducing the time spent coding. It can be used on any System/360 Model 22 and up, or Univac 9400, with a minimum of 32K bytes of memory required. The price is \$8500, or it rents for \$306/month on a three-year contract. CERTIFIED SOFTWARE PRODUCTS, Minneapolis, Minn. For information:

CIRCLE 515 ON READER CARD

I/O Buffering

Any CDC 6000 user running under the SCOPE 3.2 or 3.3 operating system and doing much I/O at all might take a look at the Bufpack software module. It is written in COMPASS and requires 63 decimal words of storage to effect a three-to-one increase in speed compared to the native buffering routines in the SCOPE system, it is claimed. Bufpack has multiple entry points enabling the user to initiate any data transfer or file positioning request with one call and with from one to three arguments. The \$950 price for the package includes the source deck and listing, and user instructions for its implementation and operation. ENGINEERING NUMERICS CORP., Dallas, Texas. For information:

CIRCLE 508 ON READER CARD

PERT for Minicomputers

Nearly every application program eventually finds its way onto a mini-computer it seems, and now PERT has made it, too. The more memory on the mini the better, of course, but this one can get inside an 8K 16-bit

machine, depending on how much room the monitor takes up. Figure about 15 words per activity, and there is no fixed limit to the number of activities the package can accommodate. The user can even specify a list of non-work days within reporting periods, and other features in-

clude provisions for constructing, modifying, analyzing, and reporting the PERT network. A FORTRAN source deck, or paper tape, and a user's guide are included in the \$550 price. MODERN DATA SYSTEMS, INC., Santa Ana, Calif. For information:

CIRCLE 511 ON READER CARD

Retrieval, Reporting

The Data Analyzer, a System/360 retrieval/reporting program, uses a simple language for the generation of management reports by non-technical personnel, according to the vendor. It will access any data base which can be processed by a 32K

Model 30 or above, and runs under both DOS and OS. It is said to be especially powerful in data presentation, with an ability to create bar graphs, histograms, cross tabulations, and other graphic forms. Free form statements entered on a one-page report request form are used. The price is \$15K. The vendor is a firm com-

prised of former Information Science Inc. marketing personnel who are now selling that company's software packages. PROGRAM PRODUCTS INC., New City, N.Y. For information:

CIRCLE 514 ON READER CARD

Cross-assembler

Versions of this cross-assembler are available for assembling DAS source programs for the Varian 620 and 622 minicomputer families on OS and DOS 360s, most of the large XDS Sigma models, CDC 6000 gear, the GE 600 line (probably including HUS 6000

stuff, too, since TRANSEMBLER runs under GECOS III), Univac 1108s, and even venerable IBM 7090 equipment. Input from either 026 or 029 key-punch models is accepted by the 128K FORTRAN program. Other features include diagnostic messages, batched assembly, cross-reference listings, and a symbol table size of

1,200 entries which may be expanded. The price of TRANSEMBLER for individual computers in the Varian series is \$1250, or a version that handles all of them goes for \$1600. CODE, INC., Los Angeles, Calif. For information:

CIRCLE 528 ON READER CARD



H. Levin, MBA, Personnel Management, Member of ACM and DPMA



**EMPLOYMENT
AGENCY**

**for PROGRAMMERS & ANALYSTS
N.Y./N.J./PENNA.**

RSVP will provide employment counseling, develop and circulate your resume, at no cost to you. Call or send resume or rough notes of objective, salary, location restrictions, education and experience to either of our offices:

- **CHARLIE COOKE, Manager**
RSVP Services, Dept. M
Suite 104, Towle Bldg.
1777 Walton Road
Blue Bell, Penna. 19422
(215) 643-5550
- **HOWARD LEVIN, Director**
RSVP Services, Dept. M
Suite 714
One Cherry Hill Mall
Cherry Hill, N.J. 08034
(609) 667-4488

RSVP SERVICES

employment agency
for computer professionals

CIRCLE 306 ON READER CARD

COMPUTER DESIGN !

- **Hardware and Software Development!**
- **Systems Application Engineering!**
- **Systems Marketing!**

Goodyear has new engineering openings in its commercial computer activity on the team that produced the world's first associative array processor.

- If you have been fighting the losing battle against CPU speed limitations and overhead time chewed up by complex "transparent" operating systems in large-scale data management systems . . .

- If you have been party to frustrating "reduce-the-requirement-to-fit-the-machine" tradeoffs in command, control, or sensor systems that affect national security or safety of flight . . .

- If you want an opportunity to make a *major personal impact* on civil or military programs of national importance . . .

GOODYEAR WANTS TO HEAR FROM YOU!

We are the world leader in the new, rapidly growing area of associative array processing. Join us—do your part to end the "tyranny of ADDRESS"—join Goodyear, and GO!

Please write: Mr. J. G. Evans Coordinator
of Technical and Scientific Personnel

GOODYEAR AEROSPACE CORPORATION
Akron, Ohio 44315

An Equal Opportunity Employer

Laboratories in Akron, Ohio; Jackson, Ohio; and Litchfield Park, Arizona

CIRCLE 301 ON READER CARD

DATAMATION

... SOFTWARE

Business Software

APRIL (Accounts Payable/Receivable/Inventory Library) is an integrated cash management and inventory system available to service bureaus or end users in FORTRAN IV, extended BASIC, and RPG II versions. The program is designed to manage finished goods inventories of up to 33,000 items, receivable files of a like number of customers, and purchasing and accounts payable record keeping for all active vendors. Full reporting capability is claimed for APRIL, and other features include production of invoices, customer statements, and voucher checks on demand. Inquiry to customer and item files is permitted, and APRIL maintains audit trails of the transactions. A FORTRAN version of the package is currently running on a PDP-10, with about 10K of memory required. Other versions are available for the Burroughs B5500 and the Control Data 6600. End users may purchase APRIL for approximately \$10K, with other arrangements available to service bureaus. WESTERN DATA SCIENCES, Phoenix, Ariz. For information:

CIRCLE 523 ON READER CARD

Information Management

The System 2000 data base management system originally announced last year for CDC users (July 15, 1970, p. 149) has now been coded for use on IBM 360 and 370 machines, and Univac 1100 series equipment, too. Modules in the system allow definition, loading, retrieval, and updating of elements in the data base, and there are routines for complete data base redefinition, maintenance, re-optimization. Procedural language interfaces for COBOL and FORTRAN are offered, and an English-like command language permits users to selectively or completely invert files, establish hierarchical relationships, name and describe fields, etc. The pricing is as modular as the package, with typical applications costing about \$60K. Minimum systems go for as low as \$25K, and a system with every conceivable option runs more than \$100K. Prices include installation, one week of training, and one year of support. MRI SYSTEMS CORP., Austin, Texas. For information:

CIRCLE 509 ON READER CARD

DESIGN, SYSTEM, DIAGNOSTIC and SYSTEM EVALUATION ENGINEERS DIAGNOSTIC AND SOFTWARE SPECIALISTS

CHALLENGING AND REWARDING POSITIONS IN A STABLE, GROWING COMPANY.

Whether you are a development specialist, system designer, programmer, field engineer or technical aid from a telephone, computer or electronic systems organization, GTE AUTOMATIC ELECTRIC LABORATORIES, INC. has positions available that will utilize your present capabilities and offer broader responsibilities encompassing individualized and group technical challenges.

In addition to equating your background with the positions described below, consider the following factors regarding our company. Automatic Electric is a company that continues to grow with stability, even during downturns in our economy. We are constantly researching designing and building new electronic equipment that will service the general public, industry, commerce and government—not just a specialized few. Our systems—past, present and future—will function *decades* after they are sold. These are reliable systems that we service with pride in our product and our work.

In this age of modern communication, new and ever-increasing demands and problems are arising that require immediate action—challenging technological confrontations in meeting the needs of man and his environment. If these needs and goals are to be met and these problems solved we need capable individuals to fill positions as described below:

STAFF DESIGN ENGINEERS . . . Originate, plan and design circuits for new systems or modification of existing systems.

REQUIREMENTS: BSEE or equivalent with two to five years design responsibility for either electronic telephone equipment or computer type logic circuitry, preferably at the systems level.

DIAGNOSTIC DESIGN ENGINEERS . . . Responsible for specification and design of maintenance plan and software for Computer Controlled Electronic Switching Systems. Will help lead the design and implementation of fault recovery and diagnostic programs, including interface with hardware design groups.

REQUIREMENTS: BS/MSEE, Math or Computer Science with approximately three to six years experience in software design of real-time systems and/or diagnostic program design.

DIAGNOSTIC SPECIALISTS . . . Responsible for specification and coordination of maintenance development for a Stored Program Electronic Switching System. Duties include specifying design goals and approaches, coordinating design efforts, etc.

REQUIREMENTS: BS/MSEE, Math or Computer Science with seven or more years experience in design of Computer Controlled Electronic Switching Systems. Must have an applicable background in both hardware and maintenance software design.

SOFTWARE SPECIALISTS . . . Plan, specify and develop real-time Call Processing Programs for a Stored Program Electronic Switching System.

REQUIREMENTS: BS/MSEE, Computer Science or equivalent with seven years or more experience in the design of Software Architecture for computer controlled electronic switching system or similar systems. Must have hardware as well as software experience.

SYSTEM EVALUATION ENGINEERS . . . Responsible for specification and coordination of System Functional Tests for prototype Computer Controlled Electronic Switching Systems. Other engineering positions include responsibility for the development and execution of software and system function test plans for these and similar type systems.

REQUIREMENTS: BS/MSEE, Math or Computer Science with approximately three to twelve years experience (different levels of positions and responsibilities available) in test and evaluation of Computer Controlled Switching Systems.

SALARY OPEN! Salary will be commensurate with experience and qualification. Applicants should submit a detailed resume outlining applicable experience, education, salary history and goals. Resumes will be held in strict confidence. Send to:

Robert Diana, Professional Employment

**GTE AUTOMATIC ELECTRIC
LABORATORIES**
INCORPORATED

A Part of General Telephone & Electronics

400 North Wolf Road

Northlake, Illinois 60164

An Equal Opportunity Employer

CIRCLE 303 ON READER CARD

Now it's easier to teach (or

Howard W. Sams brings you the new ITT Educational Services series of Data Processing texts for students and trainees. • They make a highly technical subject clear and easy to understand. • They cover every facet of data processing in logical step-by-step progression. • They simplify the complex. • They explain, demonstrate and all but look over the student's shoulder as he practices. • They are, by all odds, the most helpful classroom and study aids ever designed for the Data Processing field. • And they are ready now for your next classes. • Use the coupon and see for yourself how ready they are.

COMPUTER CONCEPTS

Two volumes. These prerequisite texts for any programming language contain all of the computer theory any student needs. Clearly and concisely, they cover all basic computer concepts in logical, easy to follow sequence. Student exercises are strategically positioned throughout the texts.

Computer Concepts, Vol. I: Fundamentals of the computer and computer system, computer numbering systems, symbolic logic, computer hardware, central processing unit, input/output devices, auxiliary memory devices. 334 pgs., 8½" x 11", softbound.

No. 26021—Textbook\$13.50
No. 26022—Teacher's Manual\$ 5.00

Computer Concepts, Vol. II: Basic concepts of programming and programming applications, introduction to RPG COBOL and BAL, details of the IBM System/360. 383 pgs., 8½" x 11", softbound.

No. 26023—Textbook\$13.50
No. 26024—Teacher's Manual\$ 5.00

COMPUTER PROGRAMMING—RPG

An introduction to the Report Program Generator programming language. This text teaches RPG for the IBM/360, Univac 9200 and RCA Spectra 70. It includes ten complete programming problems for practical application from which transparencies can be made. Computer Programming—RPG, in presenting Card RPG, Disc RPG and Tape RPG, is a must for every student. 535 pgs., 8½" x 11", softbound.

No. 26025—Textbook\$13.50
No. 26026—Teacher's Manual\$ 5.00

COMPUTER PROGRAMMING—Assembler Language

The clearest presentation yet made of the highly complex Assembler Language. Computer Programming—Assembler Language is an IBM/360 Assembler Language programming text that presents the many details

of Assembler Language coding through ten programming problems and examples. 666 pgs., 8" x 11", softbound.

No. 26100—Textbook\$16.00
No. 26101—Teacher's Manual\$ 5.00

DIRECT ACCESS PROGRAMMING

An advanced programming text on Assembler Language. RPG and COBOL language specifications for magnetic disc programming. Provides indepth study of the IBM 2311 and IBM 2314 disc packs and RPG II language specifications for IBM systems.

No. 26031—Textbook\$12.50
No. 26032—Teacher's Manual\$ 5.00

KEY PUNCH

Full, thorough explanation of the program card and the functions of the IBM 026 and the IBM 029.

The 264 pg., 8" x 10", softbound Text-Workbook contains 21 real-life job exercises including accounts receivable, accounts payable, payroll problems, time-cards, sales analysis and computer source problems; plus six numeric drills for accuracy and speed. Using this Text-Workbook, a student can learn through practical application at his own pace and the instructor is free to provide individual instructions to other students.

KEY PUNCH KIT

... includes the Text-Workbook and a kit of 1500 cards in a handsome heavy-duty box. Using the Text-Workbook and kit, a student can learn through practical application at his own pace and the instructor is free to provide individual instructions to other students.

12 drill tapes, 3¾ ips, are also available to facilitate learning.

No. 26027—Key Punch Text-Workbook\$ 6.75
No. 26028—Teacher's Manual\$ 5.00
No. 26029—Text-Workbook and Kit\$13.50
No. 26030—Drill tapes, 12—3¾" ips\$96.00

Howard W. Sams & Co., Inc. Dept. DA 101
4300 West 62nd Street, Indianapolis, Indiana 46268


Please send ITT Educational Services books checked at right. \$_____ enclosed.

Teachers: Educational discount applies to texts and workbooks. Write for examination copies on school letterhead.

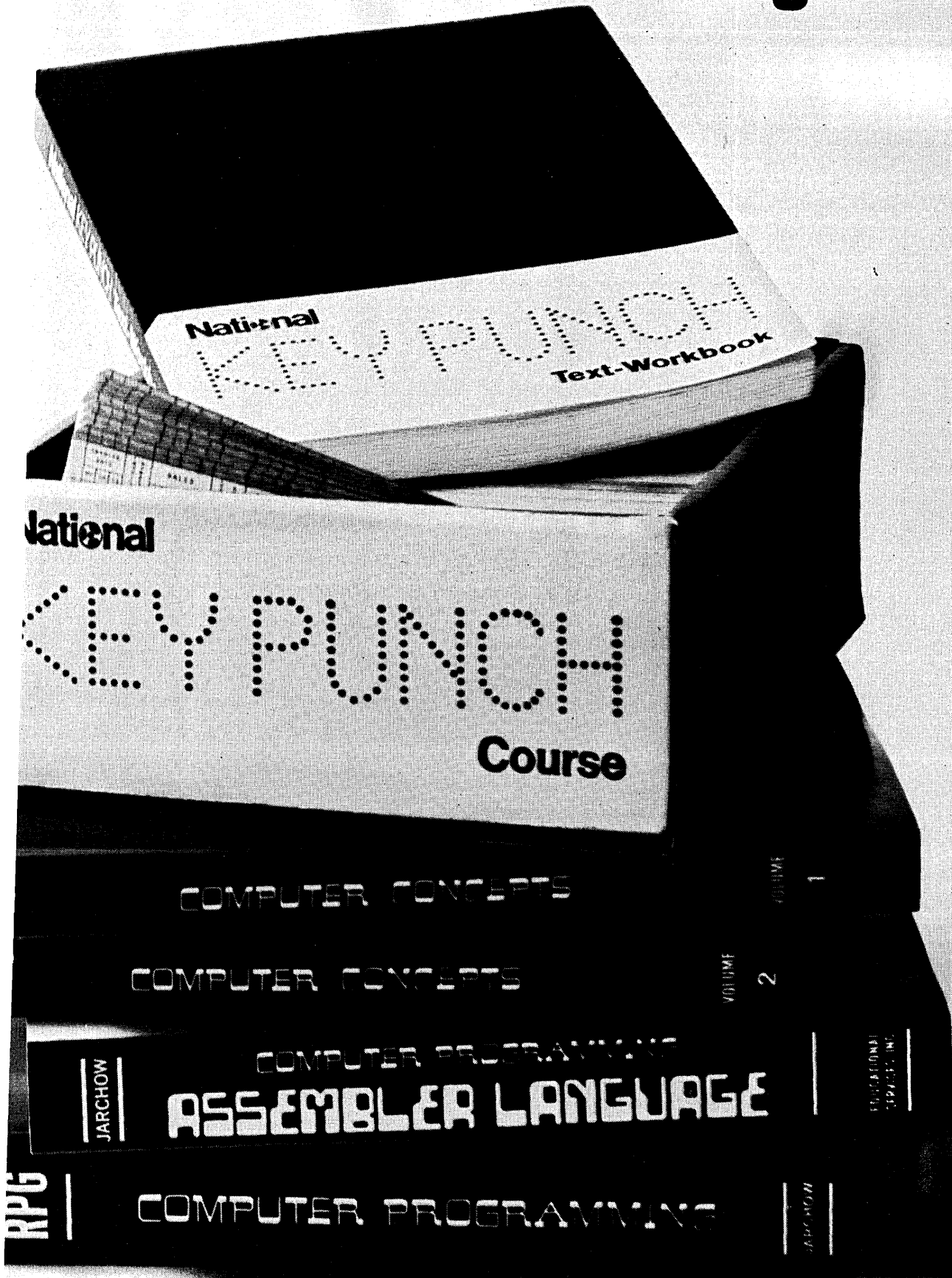
Send FREE 1972 Sams Book Catalog.

26021 26026 26027
 26022 26100 26028
 26023 26101 26029
 26024 26031 26030
 26025 26032

Name _____
Position _____
School or Company _____
Address _____
City _____ State _____ Zip _____

 HOWARD W. SAMS & CO., INC.
4300 West 62nd St. • Indianapolis, Ind. 46268

learn) Data Processing.



ASI-ST AND ITS OFFSPRING ENABLE IBM 360/370 AND RCA SPECTRA 70 USERS TO MAXIMIZE THEIR EDP DOLLAR



If you are interested in ...

- Increasing programmer productivity
- Decreasing programming costs
- Bypassing the conventional programming bottleneck
- Decreasing maintenance costs
- Obtaining automatically generated documentation
- Achieving standardization in problem solution
- Caring less about programmer turnover
- Increasing computer processing efficiency

... you need one of our general purpose software products!

ASI-ST is a general purpose data management system composed of the following characteristics: Employs an easy to use language Separates data definitions from references Performs both transaction driven and event driven file maintenance Has extensive data retrieval and manipulation facilities Provides flexible report generation Affords unlimited user defined calculations Processes multiple independent or coordinated files in parallel Accommodates fixed, variable and repeating record formats Processes job streams composed of recurring and one-time requests Interfaces with IMS and TOTAL Provides unparalleled efficiency Runs under OS, DOS, TDOS Price — \$33,000.

COMPACT ASI-ST is the retrieval/report generator subsystem of ASI-ST Price — \$20,000.

REPORTER is the report generator subsystem of ASI-ST Price — \$10,000 + training.

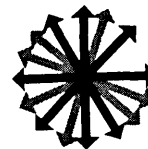
SMF/RPG is applicable to IBM 360/370 OS users only It is a special purpose report generator for processing the SMF data set Produces standard reports on job and machine statistics Users can obtain customized reports easily Price — \$3,500 + training.

This portfolio of software products is totally upward compatible through the full ASI-ST system. Designed and implemented by Applications Software, Inc., ASI-ST and its offspring have been operational in IBM 360 and RCA Spectra 70 installations since 1969. ASI-ST generality is reflected in the variety of user environments in which it is found. ASI-ST users include: Corning Glass Works, Singer, Universal City Studios, American Airlines, American Republic Insurance, City of Los Angeles, Combustion Engineering, Scandinavian Airlines System, Signetics, Hueblein, Northwestern Mutual Life Insurance, Inland Steel, A. O. Smith, Northrop, Bankers Trust, Nationwide Insurance and State of Iowa.

These users have found in ASI-ST, a general purpose package where machine efficiency has not been sacrificed for ease in problem solution. On the contrary, such users have marveled at the performance superiority of a product that has the unique distinction of having won every competitive benchmark test in which it has been a participant. Should you wish to maximize your EDP productivity and minimize your costs, we invite your inquiry.



Applications Software Incorporated. 21515 Hawthorne Blvd. Torrance, California 90503 (213) 542-4381



More Acronyms

Latest dictionary of data processing acronyms, "An Up-to-the-Minute Guide to the EDP Acronym Jungle," contains more than 4,000 standard, special, and esoteric edp acronyms. Prices are \$3 for soft cover and \$5.50 for hard cover, 1-4 copies; \$2.75 soft and \$5 hard, 5-24 copies; \$2.50 and \$4.50, 25-99 copies; \$2.25 and \$4, 100-299 copies; and \$2 and \$3.50 for 300 or more. PISCES PRESS, Box 661 Teaneck, N.J. 07666.

Softwear System

An irreverent description of the Mark iv file management system, "the general purpose softwear line," offers a prospect such goodies as steak knives and vacuum cleaners with Mark iv purchases and describes the system as easy to use even when the user is intoxicated because "it's written for users who have the mentality of a marble." SOFTWARE PRODUCTS CO., Canoga Park, Calif. For a chuckle and copy:

CIRCLE 501 ON READER CARD

Spring Joint Proceedings

Proceedings of the 1971 Spring Joint Computer Conference contains 67 papers covering such diverse topics as "Computers in the Electoral Process," "Computer Assisted Instruction," and "Simulation of Computer Systems." The fully indexed, 631-page volume is available for \$26 or \$13 for prepaid orders from members of AFIPS constituent societies. AFIPS PRESS, 210 Summit Ave., Montvale, N.J. 07645.

Engineering Programs

Pocket-sized brochure describes vendor's electrical engineering library of computer programs, called ELI. Programs include: linear circuit analysis; rf and filters; logic minimization; a microwave circuit analysis; and non-linear circuit analysis. ON-LINE SYSTEMS, INC., Pittsburgh, Pa. For copy:

CIRCLE 505 ON READER CARD

Large Disc Store

Four-page brochure describes vendor's System/7000 large disc store for Univac computers. The store is compatible with Univac 1108, 490, and 418 computers. It replaces the Fastrand II memory and is reported to be twice as fast with twice the capacity at lower cost and occupying less floor space. DATA PRODUCTS, Woodland Hills, Calif. For copy:

CIRCLE 506 ON READER CARD

Compatible Memories

A report on a study of the 360 compatible memory market, appropriately titled, "The Compatible Memory Report," covers memory units manufactured by 11 independent manufacturers and describes them as "the hottest computer products" for 1971. Copies are available for \$85. COMPUTER INTELLIGENCE CORP., 525 B St., San Diego, Calif. 92101.

Course for Programmers

A basic systems course for programmers, a 25-week extension course designed to broaden the programmer's skills to include a working knowledge of systems analysis, is described in a four-page brochure which outlines in detail 125 study units which cover survey and analysis, records, reports, procedures, management process, clear writing, systems design and installation, and edp as a management tool. SYSTEMATION, INC., Colorado Springs, Colo. For copy:

CIRCLE 503 ON READER CARD

Autoflow Handbook

"Autoflow Handbook for EDP Managers" is a 24-page book which covers ways in which a new enhanced Autoflow system can be used to simplify and improve overall computer programming operations. Autoflow is described in the book as "an automated documentation, debugging and analysis tool which currently is the nation's leading proprietary software package." APPLIED DATA RESEARCH, INC., Princeton, N.J. For copy:

CIRCLE 504 ON READER CARD

DIGITAL SYSTEMS APPLICATIONS SPECIALIST

This is a new position, reporting to our Manager of Educational Services. The recent introduction of Foxboro's large system for plant-level process control has created the need to educate our customers and employees in utilizing sophisticated software tools to design and implement critical plant level applications. Of particular interest are areas such as raw material control, product handling, laboratory automation, plant evaluation and scheduling.

A B. S. degree in one of the physical sciences is required, together with five to eight years' experience in the central computer group of a process control-oriented industry. This should include senior experience in the planning, justification, selection and proposing of Real Time Computer Systems. Ideally, you will have the ability or potential to operate as an in-house digital consultant to the process industries.

Mail your resume or a detailed letter, including salary requirements, to Mr. Mark Campbell, The Foxboro Company, Cocasset Building, Dept. D10, Foxboro, Mass. 02035. Foxboro is an equal opportunity employer.



CIRCLE 307 ON READER CARD

MONOLITHIC MAIN MEMO

ITEL Corporation
is one of the most
progressive and largest
companies in the data
processing industry. The
Company's Computer
Leasing Division owns and
leases approximately
\$200 million of IBM 360
computers.

ITEL
CORPORATION
COMPUTER PRODUCTS DIVISION

SALES OFFICES:

Del Amo Financial Center/21535 Hawthorne Blvd./Torrance, Calif. 90503/(213) 542-4591
1120 Avenue of the Americas/New York, N.Y. 10036/(212) 687-7630
300 West Washington Street/Chicago, Illinois 60606/(312) 372-5713
2900 Turtle Creek Plaza/Dallas, Texas 75219/(214) 528-4980
18877 West Ten Mile Rd. / Southfield, Michigan 48075 / (313) 355-5151
770 Welch Rd. / Palo Alto, California 94304 / (415) 327-5801

introduced by **ITEL**

RY SYSTEMS*

Now...the Monolithic Main Memory that extends the life of the IBM system/360 model 30, 40, 50 & 65 by expanding the memory capacity.



ITEL introduces MONOLITHIC MAIN MEMORY. The price/performance standard of the industry.

Here's why:

MONOLITHIC MAIN MEMORY offers not only increased memory capacity but also greater reliability and maintainability features that every 360 user urgently needs.

MONOLITHIC MAIN MEMORY provide Error Checking and Correction circuits (ECC), (exactly as you'll find in the new IBM 370), corrects errors automatically without any loss of performance.

MONOLITHIC MAIN MEMORY is plug compatible, upward and downward, with your present or future system.

MONOLITHIC MAIN MEMORY offers significant advantages over core which include smaller size, greater speed and over all system design simplicity.

MONOLITHIC MAIN MEMORY allows 360 users to meet immediate expanded memory requirements without investing huge sums of money in an outright purchase. MONOLITHIC MAIN MEMORY, with the same technology used in the IBM 370, can be easily leased or purchased from ITEL at a price less than core.

MONOLITHIC MAIN MEMORY provides IBM rental customers significant dollar savings. For example, if you presently have a 360/40 with 128K and you wanted to increase capacity to 256K, the ITEL rental would be 60%-80% of the cost of IBM rental. Plus, there is no extra shift charge on our memory.

MONOLITHIC MAIN MEMORY is available in an entire range of upgrades to 2 million bytes.

Comma Corporation is the service agency for MONOLITHIC MAIN MEMORY. ITEL, through its experience with Comma, has found significant advantage in using this company over all others.

There's no charge for a consultation and analysis of your system and situation. Fill out and mail the coupon.

* AMS MONOLITHIC MAIN MEMORY is manufactured by Advanced Memory Systems, Inc. Sunnyvale, California

ITEL.
We're putting problems out of business.

ITEL Corporation
COMPUTER PRODUCTS DIVISION
One Embarcadero Center / San Francisco, California 94111

F-1

Gentlemen:
I am interested in learning more about the ITEL Monolithic Main Memory.

- Please send me your full-color specification brochure.
 Please have an ITEL representative call me.

Name _____ Position _____

Company _____

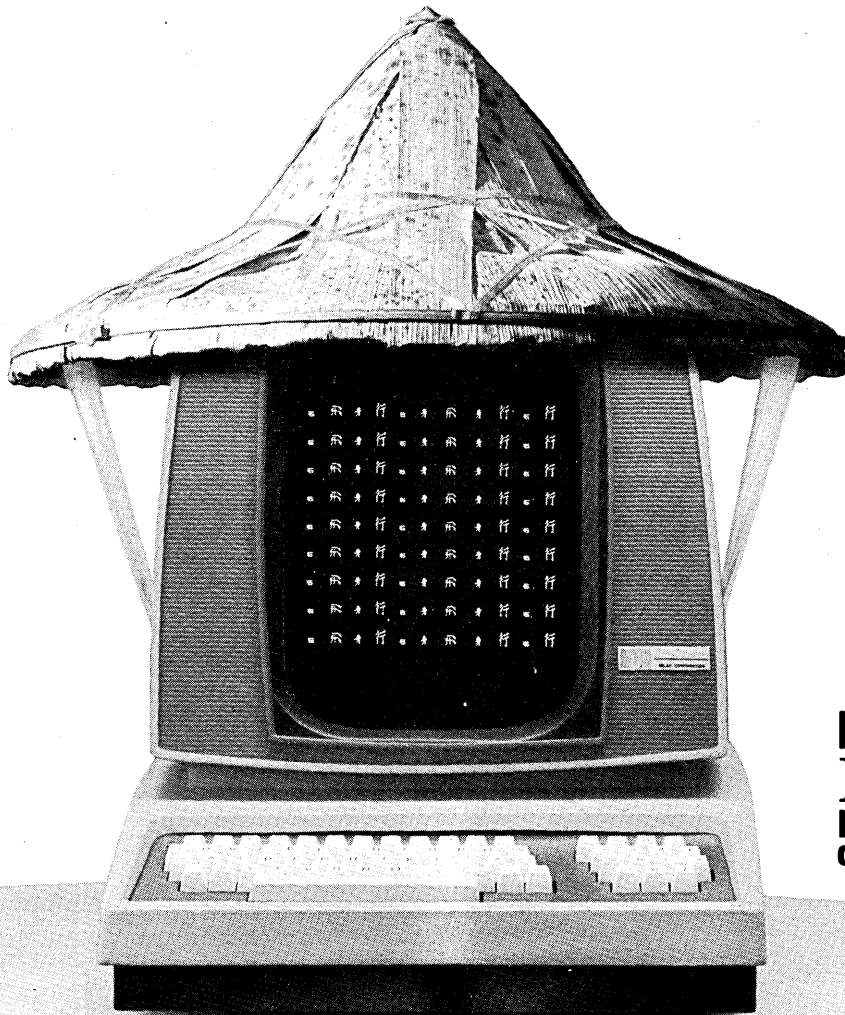
City _____ State _____ Zip _____

Telephone Number _____ Type of Business _____

IMLACは萬能選手です。 (wears many hats)

Take off your hat to IMLAC: the terminal display computer with creative capability. If your language is beyond alpha- numerics, you can design your own characters from the keyboard — without programming. You can send, receive, animate, edit and store symbols. Language is just one of IMLAC's research and design applications. Its graphic ability qualifies it for unlimited academic and industrial potential.

For around \$10,000 our lexicographer performs most functions of systems costing four times as much. So if you have a spare fez or turban, and need some help with your language — hang your hat on IMLAC. Soon it will speak your language better than you.



**IMLAC
PDS-1
DISPLAY
COMPUTER**

Write for information.

IMLAC CORPORATION 296 NEWTON STREET, WALTHAM, MASSACHUSETTS 02154 TEL. 617/891-1600

360'S TO BE REPLACED

Two upcoming Army procurements will give independent suppliers a chance to take customers away from IBM. One buy involves replacement of "selected" 360s, now being leased from Armonk, with identical configurations. The other procurement involves acquisition of extended core memories for 360/50s and 65s used by the Army's Management Systems Support Agency and by the Corps of Engineers.

The first buy could lead to replacement of up to 50 systems, ranging from 360/20s to 50s. An rfp is due before the end of next month. More than one contract may be awarded. The bid solicitation will list the bundled and unbundled features included in each configuration, and the vendor who supplies the replacement will have to provide these same features on the same basis. An rfp for the core memory procurement was due for release late last month.

The Army's Computer Systems Support and Evaluation Command, Washington, D.C. 20315, emphasizes no contract will be awarded in either case unless bidders can deliver significant cost savings.

AGENCIES WILL ABSTAIN ON ANSI IDENTIFIER VOTE

A "Standard Individual Identifier" using the social security number is supposed to be voted on by ANSI's X3L8 technical committee this month. Approval of the standard probably will increase business and government use of individual identifiers. Federal members of X3L8 will abstain from voting because the standard lacks privacy safeguards, and this could prove embarrassing. HEW plans to convene a blue-ribbon panel to recommend guidelines for the SII's use and to protect privacy. The Senate Constitutional Rights subcommittee is studying use of identifiers.

JAPAN MAY LIBERALIZE PERIPHERALS IMPORTS

Japanese officials told the U.S. during recent cabinet-level meetings they were studying the possibility of removing import quotas on computer peripheral equipment during the first half of '72. They were also considering opening up foreign investment in computer hardware to some extent by August '74. Meanwhile, Compress, Inc., Rockville, Md., licensed the Japan Management Association to market its SCERT package in Japan.

CAPITOL BRIEFS

FCC told Ma Bell and Western Union last month to eliminate the discrimination in the present Telpak tariff by whatever means they choose. Earlier, the commission had ordered the carriers to allow unlimited sharing, but this solution was overturned in court... Bunker Ramo's complaint against Western Union was dismissed recently by FCC examiner Ernest Nash when BR insisted on further discovery proceedings. Nash had previously ruled these proceedings were unnecessary. The complaint alleged that WU favors its SICOM customers and discriminates against users of BR's competing Telequote services.

**THE BELL SYSTEM HAS
13,000,000 MILES OF DIGITAL
COMMUNICATIONS CHANNELS,
AND IS ADDING TO THEM
AT THE RATE
OF 8,000 MILES EVERY DAY.**

If this is welcome news to you in the data field, good. But our purpose is broader. Our purpose is better service for all Bell System customers.

You see, we have one fully integrated network. It has both "analog" and "digital" channels...and has had for many years. Signals travel as waves on one and as pulses on the other. Regardless of the original source or form of the signal, whether human voice or computer, we readily transform it to travel over either channel.

This flexibility makes virtually all of our network available for data transmission. It keeps charges low. And it gives us alternate routes should trouble arise.

Then why are we going heavily digital? Because with modern electronics, especially solid-state circuitry pio-

neered at Bell Labs, digital transmission is better not only for data but for many other services as well.

Digital transmission is better because it eliminates many kinds of noise, thereby getting more information over the same size cable with greater accuracy.

Digital is clearly technology's best answer to many of America's future communications needs. It will benefit everybody, not just our data customers.

We have 13 million channel miles of digital now, and we have definite plans for the near future.

- For 1972, a new digital system that will operate at 6.3 megabits per second, four times the speed of our present all-digital lines.
- By the mid-'70's, initiation of private line service on an end-to-end, fully digital basis which will ultimately serve every major city in the country.
- By the late '70's, waveguide systems capable of thousands of megabits per second.
- By 1980, the Bell System's network will be four times its present size. A large proportion of it will be digital—enough to provide ample capacity to meet America's data-handling needs.

The American Telephone and Telegraph Company and your local Bell Company are continually working to improve service to business.

This time by increasing digital services to benefit all our customers.



The best portable, battery operated, off-line or on-line, remote batch, alphanumeric recording, transmitting and receiving terminal that \$1435 can buy!*



Call or write for a demonstration in your office.

MSI
DATA CORPORATION

Costa Mesa, Cal. 92627
1381 Fischer Ave.
714-540-6600

St. Louis, Mo. 63101
1002 Chestnut St.
314-231-5430

Des Plaines, Ill. 60018
2474 Dempster
312-297-6232

Parlin, N. J. 08859
1145 Bordentown
201-721-5900

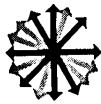
Smyrna, Ga. 30080
5 Perimeter Place
404-432-7736

Oakland, Cal. 94610
168A Santa Clara Ave.
415-658-0137

London W1R-9TB, England
24 Conduit Street
01-629-8662

Brecksville, Ohio 44141
11026 Fitzwater Road
216-526-5499

*OPTIONAL FEATURE



PEOPLE

Computer industry pioneer, **Dr. Wallace J. Eckert**, died Aug. 24 in Englewood, N.J., at the age of 69. Dr. Eckert had retired as an IBM Fellow in 1966 and as Professor of Celestial Mechanics at Columbia Univ. in 1970. He had been on the Columbia faculty since 1926 and was director of the IBM Watson Laboratory for many years beginning in 1945 . . . **Lee Johnson** was elected president and board chairman of Computer Network Corp. (COMNET). He was one of the company's founders . . . Computing and Software, Inc., elevated **Roger Lee**, vice president since 1966, to senior vice president and named to new corporate vice presidents, **Richard Finnegan**, formerly assistant to the president, and **Klaus Ruege**, formerly general manager of Douglas Dunhill, Inc., a Chicago based c&s subsidiary . . . And **Mits Tamura**, who helped put Computing and Software's credit reporting operations on-line, has left c&s to become vice president, systems and programming, for Proprietary Computer Systems, Inc., Van Nuys, Calif. . . . **John A. Postley** was named president of a new Informatics Inc. operating unit, Software Products Co. . . . Solidifying positions they have held on an interim basis since August of last year at Management Assistance Inc., New York, were chief executive officer, **Jorge M. Gonzalez**, and chief operating officer, **Raymond P. Durshan** . . . Moving to MAI subsidiary, Sorbus, Inc., from MAI Equipment Corp., were **Raymond A. Castelhana**, vp and assistant to the president; **Richard D. Katzenmoyer**, vp and treasurer; and **Thomas O. Harbison**, vp, marketing. The fourth new officer at Sorbus is **Bruce W. Buckwalter**, vp and controller, who most recently was with Computer Response Corp. . . . **Henry A. Samulon** will head up a new electronic group at trw. He had been general manager of the Electronic Systems Div. of trw Systems and continues as a corporate vp. The new group will expand into the commercial electronic equipment market, which will include some computer peripherals, environmental and process controls, communications and telephone-related equipment, and security and medical instrumentation . . . At International Reservations Corp., **L. Ronald Kister**, most recent-

ly with the Official Airline Guide, is new director of airline marketing and **Lawrence L. Pelegrin**, formerly with Atar Computer Systems, is new director of reservation operations . . . **Harvey J. Brudner**, a director of Westinghouse Learning Corp., New York, was elected president of the company . . . **Richard C. Lemons**, president of Informatics Tisco, Inc., is now also president of Informatics Systems and Services Co., recently formed within the parent company to consolidate operations in the D.C. area. Informatics Tisco is now a division of the new group which does nearly all its business with the federal government . . . **Robert J. Smallcombe**, former president of Milgo/IDAB Corp., is the new president of Tal-Star Computer Systems, Inc., Hightstown, N.J., a systems house dedicated to the automation requirements of newspapers and related industries, formed in 1969 by the Washington (D.C.) Star and Talcott National Corp. . . . **James W. McNabb**



was appointed vp of MCI Communications Corp. where he will be responsible for corporate planning. He is the former director of engineering of Philco-Ford's Communications and Technical Div. . . . **J. C. R. Licklider**, professor of electrical engineering at MIT, was named chairman of AFIPS' Data Communications Advisory Group . . . Systems Engineering Laboratories, Inc., Fort Lauderdale, Fla., named two new vice presidents: **Richard C. Baker**, vp, manufacturing and systems engineering, and **Bruce L. Chancellor**, vp, development . . . **Thomas F. Hitchcock** was elected a vice president of Data Tech Corp., a new Denver-based software company. He formerly was with Hamilton Management Co. . . . **John T. O'Kane** was appointed director, management information systems, for Otis Elevator Co. . . . **David Smith**, consultant in the Computer Sciences Dept. at Esso Mathematics & Systems, Inc., Florham Park, N.J., was elected president of SHARE. ■

Shhhhhhh

CONFIDENTIALLY SEEKING?

The best way to keep a secret is not to tell anyone. But, if you're looking to hire . . . or you're looking to change jobs . . . you'll never make a move unless you tell someone you can trust.

The Robert Half Organization is the largest, oldest and most respected placement service specializing exclusively in the Financial and Data Processing fields.

Your specific requirements are serviced with speed, competency and confidence.

ROBERT HALF PERSONNEL AGENCIES
FINANCIAL & EDP POSITIONS ONLY

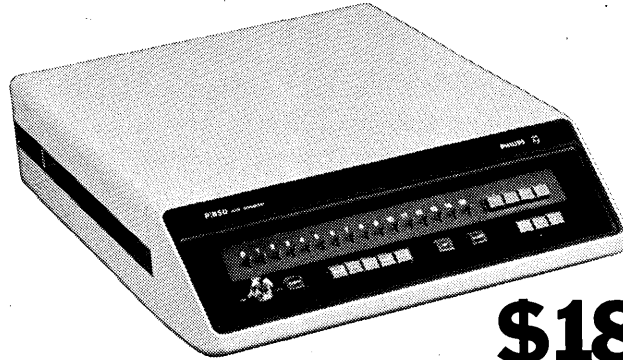


Atlanta: 235 Peachtree St., N.E.	(404) 688-2300
Baltimore: The Quadrangle-Cross Keys	(301) 323-7770
Boston: 140 Federal St.	(617) 423-6440
Charlotte: 907 Baugh Bldg.	(704) 333-5173
Chicago: 333 N. Michigan Ave.	(312) 782-6930
Cincinnati: 606 Terrace Hilton	(513) 621-7711
Cleveland: 1367 E. 6th St.	(216) 621-0670
Dallas: 1170 Hartford Bldg.	(214) 742-9171
Denver: 1612 Court Place	(303) 244-2925
Detroit: 140 Honeywell Center, Southfield	(313) 354-1535
Hartford: 111 Pearl St.	(203) 278-7170
Houston: 1200 Central Nat'l. Bank Bldg.	(713) 228-0056
Indianapolis: 9 N. Illinois St.	(317) 636-5441
Kansas City, Mo.: 127 W. 10th St.	(816) 474-4583
Long Island: 585 Stewart Ave., Garden City	(516) 248-1234
Los Angeles: 3600 Wilshire Blvd.	(213) 381-7974
Memphis: 12 S. Main St.	(901) 527-7324
Miami: 1190 N.E. 163 St., North Miami Beach	(305) 947-0684
Milwaukee: The Clark Bldg.	(414) 271-9380
Minneapolis: 822 Marquette Ave.	(612) 336-8636
Newark: 1180 Raymond Blvd.	(201) 623-3661
New York: 330 Madison Ave.	(212) 986-1300
Orange, Cal.: 500 South Main	(714) 835-4103
Philadelphia: 2 Penn Center Plaza	(215) 568-4580
Pittsburgh: Gateway Towers	(602) 279-1688
Portland, Ore.: 810 S.W. Alder St.	(503) 222-6778
Providence: 400 Turks Head Bldg.	(401) 274-8700
St. Louis: 1015 Locust St.	(314) 231-0114
San Francisco: 111 Pine St.	(415) 434-1900
San Jose: 675 North First St.	(408) 293-9040
Stamford, Conn.: 111 Prospect St.	(203) 325-4158
Washington, D.C.: 7316 Wisconsin Ave. N.W.	(301) 654-1850

CIRCLE 304 ON READER CARD



data systems



\$1800
gives an OEM
a 16 bit mini computer

...plus a company
called Philips.

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

The P850, our smallest mini, has a 16-bit word, 3.2 microsecond cycle time 512 word memory (expandable). Punched tape I/O, teleprinter, card reader, display unit and magnetic cassette tape units are all available. Transfer rates are up to 50,000 words per second.

Special options include interrupts, power failure/automatic re-start and a real time clock.

Software includes a mathematical library, relocatable loader and restricted assembler — impressive for such a small machine.

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

Europe:
N.V. Philips-Electrologica
P.O.Box 553, Apeldoorn,
Netherlands

North America:
North American Philips Corp.
Dept. 007
100 East 42nd Street,
New York NY 10017

Far East:
Philips Industrial Development
and Consultant Co. Ltd.
Kokusai Building, (7th floor)
1-1 Marunouchi 3-chome,
Chiyoda-Ku, Tokyo 100, Japan

Philips - Sales and Service worldwide

Arthur L. Rice, Jr., President
 Gardner F. Landon, Exec. Vice President, and President, Thompson Division
 James B. Tafel, Exec. Vice President, and President, Technical Division
 Calverd F. Jacobson, Financial Vice President
 Edwin C. Prouty, Jr., Secretary and Director of Data Processing

ADVERTISING OFFICES

Sales Manager **JOHN BRENNAN**
 & Vice President 35 Mason Street, Greenwich, Conn. 06830
 (203) 661-5400

Eastern District Managers **JAMES M. MORRIS**
WARREN A. TIBBETTS
IRWIN L. WERFEL
 35 Mason Street, Greenwich, Conn. 06830
 (203) 661-5400

New England District Manager **WARREN A. TIBBETTS**
 & Vice President 112 West Haven Rd., Manchester, N.H., 03104
 (603) 625-9498

Midwest District Manager **JOHN M. GLEASON**
 205 West Wacker Drive, Chicago, Ill. 60606
 (312) 346-1026

Western Manager **HAMILTON S. STYRON**
 & Senior Vice President 94 So. Los Robles Ave., Pasadena, Cal. 91101
 (213) 681-8486

Western District Manager **JAMES E. FILIATRAULT**
 61 Renato Court, Redwood City, Cal. 94061
 (415) 364-3171

England and Western Europe **WALLACE K. PONDER**
WALLACE K. PONDER CO.
 31 Lyncroft Avenue
 Pinner, Middlesex HA 5 1JU, England
 (01) 868-9289

Houston Instrument, Division of
 Bausch & Lomb 62

IMLAC Corporation 72

Itel Corporation 70, 71

Lear Siegler Inc. 57

Leasco Computer, Inc. 9

Memory Systems, Inc. 44

MOS Technology, Inc. Cover 3

MSI Data Corporation 76

National Blank Book Company, Inc. 46, 47

North Electric Company 80

Novar Corporation 56

Omnitec, A Nytronics Corporation 53

Optical Coating Laboratory, Inc.,
 Technical Products Division 34

Paradyne Corporation 12

Philips Electronica 78

Programmatics, a Subsidiary of Applied Data Research. . 35

Redcor Cover 4

Remex, A Unit of Ex-Cell-O Corporation 15

RFL Industries, Inc. 58

RSVP Services 64

Howard W. Sams & Co., Inc. 66, 67

Scan-Data Corporation 32

Sycor Inc. 18

TEAC Corporation of America 52

Teletype Corporation 60, 61

3M Company, Magnetic Products Division 54, 55

Victor Systems and Equipment 56

Wyle Computer Products, Inc. 40

ADVERTISERS' INDEX 

American Telephone and Telegraph Company 74, 75

Applications Software Incorporated 68

Automata Corporation 6

Bell and Howell,
 Electronic and Instruments Group 50, 51

Cadillac Associates, Inc. 79

California Computer Products 10, 11

Comress 36, 37

Datamation Industry Directory 19, 81, 84

D.A.T.K. Inc. 4

Digital Computer Controls, Incorporated 31

Digitronics Corporation 48

Eastman Kodak Company,
 Business Systems Markets Division 5

Fabri-Tek Inc., Memory Products Division 2

Facit-Odhner Inc. 4

Foxboro Company 69

Floating Floors, Inc., Subsidiary of
 N L Industries, Inc. 42, 43

General Electric Company,
 Communication and Control Devices Department 45

Goodyear Aerospace Corporation 64

Gould Inc., Brush Division 16, 17

GTE Automatic Electric
 Laboratories Incorporated 65

GTE Data Services 49

Robert Half Personnel Agencies 77

Hewlett-Packard Cover 2, 1

IMMEDIATE OPENINGS

PROFESSIONAL & CONFIDENTIAL placement assistance to people like yourself has been our business for 40+ years. Our staff of SYSTEMS & EDP SPECIALISTS will represent you to those at "decision-making" levels in the nation's finest firms. Give us the opportunity of discussing your interests and objectives and explaining how we can help you satisfy them. Remember: Our service is nationwide and without cost to you. Client companies pay all fees & expenses.

MGR.—SYSTEMS & PROGRAMMING . . . To \$22,500
 Manage 15 Systems Analyst/Programmers for large financial corp. Strong mgmt. & tech'l background with MIS experience.

SOFTWARE PROGRAMMER To \$16,000
 Thorough knowledge of ALC and OS/JCL with exper. in development of On-Line Information Systems or Operating System generation and maintenance.

PROJECT LEADER To \$18,000
 Lead project team of Systems Analysts in evaluation, design & development of computer applications. EDP center of rapidly expanding corp. with two S/360's using full Operating System.

OPERATIONS RESEARCH ANALYST . . . To \$15,000
 Manufacturing & distribution. Three yrs. exper. in production, distribution & inventory control with knowledge of computer based manufacturing systems.

O/S SYSTEMS PROGRAMMER To \$17,000
 Complete responsibility for design, installation & maintenance of IBM's O/S MFT on an S/370. Should have O/S software exper. or strong background in DOS.

CALL OR WRITE TODAY!



E. W. Moore
 Executive Vice President
CADILLAC ASSOCIATES, INC.*
 32 W. Randolph, Chicago, Ill. 60601
 (312) 346-9400

On the West Coast, contact: **LON BARTON ASSOCIATES**
 3325 Wilshire Boulevard, Los Angeles, Calif. 90010
 *Where More Executives Find Their Positions Than
 Anywhere Else In The World

Six Generations of Overcommitment

C I think we are in the sixth generation of overcommitment by spokesmen for the computing profession. I

count:

1. Giant Brains. In the early days the experts opined that machines thinking faster and better than man would obsolete him and stuff. This got a tremendous play in the popular press, but hasn't shown up much for 15 years.

2. Automation. Then it appeared that computer-controlled machines would replace factory workers, and there was a ferment of arm waving about discontent, the uses of leisure,

the Protestant Ethic and so on. This has quieted but has not died as completely as giant brains: in specific instances it is true, and yellow journalists seeking sensationalism still write occasional "automation" articles (viz., "Shaky" in *Life* last year).

3. Command and Control. During the halcyon days of computing in the military-industrial establishment it was an article of faith that the optimal algorithm in a fast enough computer could fight the perfect battle. This idea survived despite the blow dealt by the Korean War; it took the Viet Nam War to signal its final demise (though some say the idea still lives in

pernicious form in the ABM system—who can tell for sure?).

4. Time-Sharing. Experience showed that we couldn't program most things, but somehow time-sharing (implemented on the computer utility) was supposed to avoid this: housewives were going to learn how to raise their children perfectly by writing conversational BASIC programs and so forth. The popular press showed less inclination to believe this, but the flackery of some vendors and academics took up the slack.

5. Management Information Systems. Having given up on writing perfect programs, our spokesmen discovered the integrated data base. Managers, interacting in some unspecified free-form way with a comprehensive data base (contents likewise incompletely specified), were to become able to manage organizations with perfect rationality. This got a big play in the business press which is generally wiser now. Most computer people also scale down their definition of MIS now, but a few remain who support the myth.

6. Solutions to Social Problems. The hot button today is models of social systems that will enable us to "determine the effect of new programs in advance," to "manage the urban system," to "optimize ecological balances." The needed models never seem to exist, but investments ranging from "a few million dollars" to "massive" are confidently expected to spawn them. These assertions are piously accepted and never questioned (though the press doesn't seem inclined to give them much play). Is this because we simply want it to be so, or because there is some evidence I'm unaware of that it's true?

So what's to be done about it? We must remember the First Amendment, which protects any shrill jackass no matter how self-seeking. We can also find comfort in Mr. Lincoln's remark about all the people all the time. But sometimes we have opportunities for modest counteraction—writing project proposals, addressing local chapter meetings, teaching, at cocktail parties. Maybe a little humility intentionally practiced by 100,000 *Datamation* readers would outweigh our oversellers' posturings.

—Frederic G. Withington

Real Time Systems Software Development

Programmers for continuing development of new, computer controlled commercial telephone systems. Current development of a new electronic tandem switching system, ETS-4, requires individuals with 2-4 years experience in real time, assembly language, software development in the following areas:

MAINTENANCE PROGRAMS

On-line functions of automatic fault-detection, recovery and re-configuration for a multi-processor control system. Extensive hardware/software interface experience necessary.

DIAGNOSTIC PROGRAMS

Diagnostics for all control hardware which includes processors, memories and interfaces. Computer hardware experience required for this software development.

In addition, possible openings exist for individuals with experience in telephone switching systems or I/O applications of mini-computers. Location near Columbus, Ohio in a new research and development center. Send resumes including salary history in confidence to R. Lonchar, Manager ETS-4, Control Software Development.

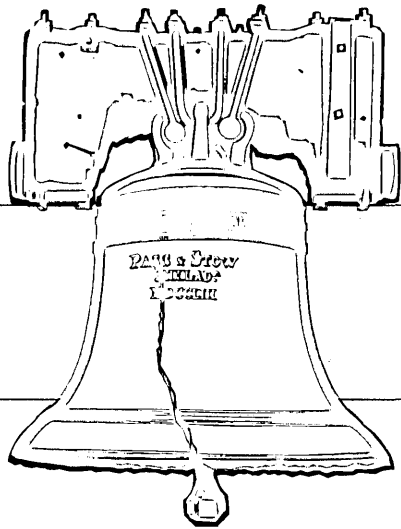
NORTH
ELECTRIC COMPANY

Telecommunications Division

Paul H. Henson Research Center

P.O. Box 20345, Columbus, Ohio 43220 • (614) 548-1414

A Subsidiary of United Utilities, Incorporated
An Equal Opportunity Employer



we cracked an
American institution,
supplanted it with new
flexible organizations.

MOS TECHNOLOGY'S NEW MCS-20 SERIES OF ROMS

Now from MOS TECHNOLOGY—a variety of organizations that permit the flexibility you need in selection of total memory capacity, number of data outputs, and number of address bit required!

THE FEATURES:

Interface capability with TTL, DTL, MOS, High speed operation (800ns for TTL loads), Static operation (no clocks required), Lower power (350 mw maximum), 24 lead dual-in-line hermetic packaging, AND A PRICE OF \$15.40 PER ON 100 PIECES!

THE ELECTRICAL CHARACTERISTICS:

(Absolute Maximum Ratings)

GATE VOLTAGE (V_{GG})* +0.5 to -25 volts

INPUTS (V_{IN})* +0.5 to -25 volts

OPERATING TEMPERATURE -25°C to +85°C

STORAGE TEMPERATURE -65°C to +150°C

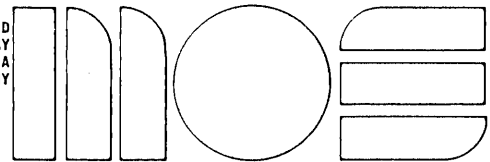
THE MCS-20 SERIES OF ROMS . . . FROM MOS TECHNOLOGY . . . IN VALLEY FORGE . . . the home of successful revolutions.

*Referenced to V_{SS}

THE MCS-20 SERIES, READY NOW!

No. Outputs	No. Address Dits	Configuration	Part No.
1	12	2560 x 1	MCS 2003
1	11	2048 x 1	MCS 2009
2	11	1200 x 2	MCS 2006
2	10	1024 x 2	MCS 2010
3	10	768 x 3	MCS 2014
4	10	640 x 4	MCS 2011
4	9	512 x 4	MCS 2011
5	9	512 x 5	MCS 2004
5	9	448 x 5 (64x7x5)	MCS 2000
6	9	384 x 6	MCS 2015
7	9	320 x 7 (64x5x7)	MCS 2001
8	9	320 x 8	MCS 2003
8	8	256 x 8	MCS 2012
9	8	256 x 9	MCS 2007
10	8	256 x 10	MCS 2002

WE'VE TURNED
A TECHNOLOGY
INTO A
COMPANY



MOS TECHNOLOGY, INC.

VALLEY FORGE INDUSTRIAL PARK, VALLEY FORGE, PENNA. 19431 • 215-666-7950

A Proud Affiliate of Allen-Bradley Co.

EASTERN REGIONAL OFFICE—REGIONAL SALES DIRECTOR—Mr. William Whitehead, MOS TECHNOLOGY, INCORPORATED, 88 Sunnyside Blvd., Suite 307, Plainview, New York 11803 • Phone: (516) 822-4240 • **ALABAMA, FLORIDA, GEORGIA, N. CAROLINA, S. CAROLINA, TENNESSEE, MISSISSIPPI—**Currie Aerospace Associates, P.O. Box 1424, Huntsville, Alabama 35807 • Phone: (205) 536-5650 • 2907 McCoy Road, P.O. Box 13229, Orlando, Florida 32809 • Phone: (305) 855-0843 • P.O. Box 5588, Greensboro, North Carolina 27403 • Phone: (919) 273-3040 • **NEW ENGLAND STATES—**Victor Associates, 179 Union Ave., Framingham, Massachusetts 01701 • Phone: (617) 879-5710 • **NORTHERN NEW JERSEY, NEW YORK (WESTCHESTER COUNTY, LONG ISLAND)—**Falk Baker Associates, 383 Franklin Avenue, Nutley, New Jersey 07110 • Phone: (201) 661-2430 • **E. PENNSYLVANIA, SOUTHERN NEW JERSEY—**Rivco, P.O. Box 338, King of Prussia, Pennsylvania 19406 • Phone: (215) 265-5211 • **DELAWARE, MARYLAND, WASHINGTON, D.C., VIRGINIA, W. VIRGINIA—**Bernard White & Company, Inc., 7 Church Lane, Baltimore, Maryland 21208 • Phone: (301) 484-5400.

CENTRAL REGIONAL OFFICE—REGIONAL SALES DIRECTOR—Mr. Alan Mattal, MOS TECHNOLOGY, INCORPORATED, 10400 W. Higgins Rd., Suite 631, Rosemont, Illinois 60018 • Phone: (312) 298-2035 • **ILLINOIS, INDIANA, WISCONSIN—**Coombs Associates, Inc., 1001 E. Touhy, Des Plaines, Illinois 60018 • Phone: (312) 298-4830 • **OHIO, KENTUCKY, W. PENNSYLVANIA—**McShane, Inc., P.O. Box 523, 123 W. Washington, Medina, Ohio 44256 • Phone: (216) 725-4568 • **MICHIGAN—**R. C. Merchant & Co., 18411 W. McNichols Road, Detroit, Michigan 48219 • Phone: (313) 535-6000 • **MINNESOTA, N. DAKOTA, S. DAKOTA—**Mel Foster Company, Inc., 7389 Bush Lake Road, Edina, Minnesota 55435 • Phone: (612) 941-7600 • **MISSOURI, KANSAS, NEBRASKA, IOWA—**Harlan J. Weisler & Assoc. Inc., 2050 Woodson Road, St. Louis, Missouri 63114 • Phone: (314) 428-3934 • **TEXAS, OKLAHOMA, ARKANSAS, LOUISIANA—**Norvell Associates, 10210 Monroe Drive, Dallas, Texas 75220 • Phone: (214) 357-6415.

WESTERN REGIONAL OFFICE—REGIONAL SALES DIRECTOR—Mr. Jack Turk, MOS TECHNOLOGY, INCORPORATED, 2172 Dupont Drive, Patio Bldg., Suite 221, Newport Beach, California 92660 • Phone: (714) 833-1600 • **ARIZONA, NEW MEXICO—**Toward Engineering Assoc., P.O. Box 15268, Arcadia Station, Phoenix, Arizona 85018 • Phone: (602) 955-3193 • **CALIFORNIA, NEVADA—**Bertrand & Zoolalian, Inc., 7340 Florence Avenue, Suite 205, Downey, California 90241 • Phone: (213) 927-4406 • **Hunter Associates, 1208 Fox Plaza, San Francisco, California 94102 • Phone: (415) 626-8576 • COLORADO, UTAH, WYOMING—**R. G. Enterprises, 1107 South Pearl Street, Denver, Colorado 80210 • Phone: (303) 744-2464 • **WASHINGTON, OREGON, IDAHO, MONTANA—**J. A. Tudor & Assoc. Inc., 2605 Western Avenue, Seattle, Washington 98114 • Phone: (206) 682-7444.

INTERNATIONAL SALES REPRESENTATIVES—ARGENTINA—T. R. C. Electronica, S.A.C.I.e.l., Cangallo 4450, Buenos Aires, Argentina • Phone: 88-4044/5/6, Mr. M. Lissin • **ENGLAND, WALES, SCOTLAND, IRELAND—**Impectron Limited, Impectron House, 21-31 King Street, London W3 9LH, England • Phone: 01-992-5388 • **FRANCE—**Bureau de Liaison, 113 Rue de L'Universite, Paris Vile, France • Phone: 551.9920 • **GERMANY, NETHERLANDS—**International Micro Electronics, Inc., Arbellahaas 1838, Arabellastr. 5, 8000 Munich 81, Germany • Phone: 92-321 • **INDIA—**Electronic Enterprises, 46 Karani Building, New Charni Road, Bombay 4, India • Phone: 375375 • **ISRAEL—**Eastronics, Ltd., 75 Haifa Road, P.O. Box 21029, Tel-Aviv, Israel • Phone: 38352 • **ITALY—**Special-Ind. Corporation, Piazza Spotorno, 20159 Milano, Italy • Phone: 632-435 • **JAPAN, HONG KONG, KOREA, TAIWAN—**Takachiho Koheki Company Ltd., 1-7, Chome Kohjimachi, Chiyoda-Ku, Tokyo 102, Japan • Phone: 263-3211 • **SWEDEN, DENMARK, FINLAND, NORWAY—**Thru F. Forsberg, Forsshagan 58, P.O. Box 79, Farsta 1, Sweden • Phone: 647040 • **SWITZERLAND—**Ernst M. Egl, Ingenieur—Bureau Ag, Witikonstrasse 295, Zurich (CH 8053), Switzerland • Phone: 53.38.11.

STOP SOARING DATA ENTRY COSTS... FEATHER YOUR NEST WITH REDCOR'S KEYLOGIC

Get a data entry checkup today. Those card killing pains aren't going to go away. Timewise. Costwise.

Logic dictates you consult with the two top specialists in the data entry field.

REDCOR and Honeywell. Competition is keen. That's good.

But when Honeywell entices you with a lick and a promise. Remember KeyLogic. This bird has been around.

When Honeywell tells you how great it's going to be. Don't yield. Get the facts.

KeyLogic users can tell you how great it's been. And is.

When Honeywell whispers, "software is on its way." Be wary. Now it's time to fact-zap that pie in the sky.

REDCOR'S KeyLogic (key-to-disc) systems are here. Including complete software packages.

KeyLogic is the now system. Working, tested, refined, and proven for over a year. Saving users thousands of dollars.

In countrywide installations. Always with local service.

We're doers, not talkers. Be stouthearted. Get a complete data entry cure. Order a KeyLogic system.

Put a feather in your controller's cap at the same time. Call REDCOR: (213) 348-5892.

REDCOR The Other Data Entry Company

