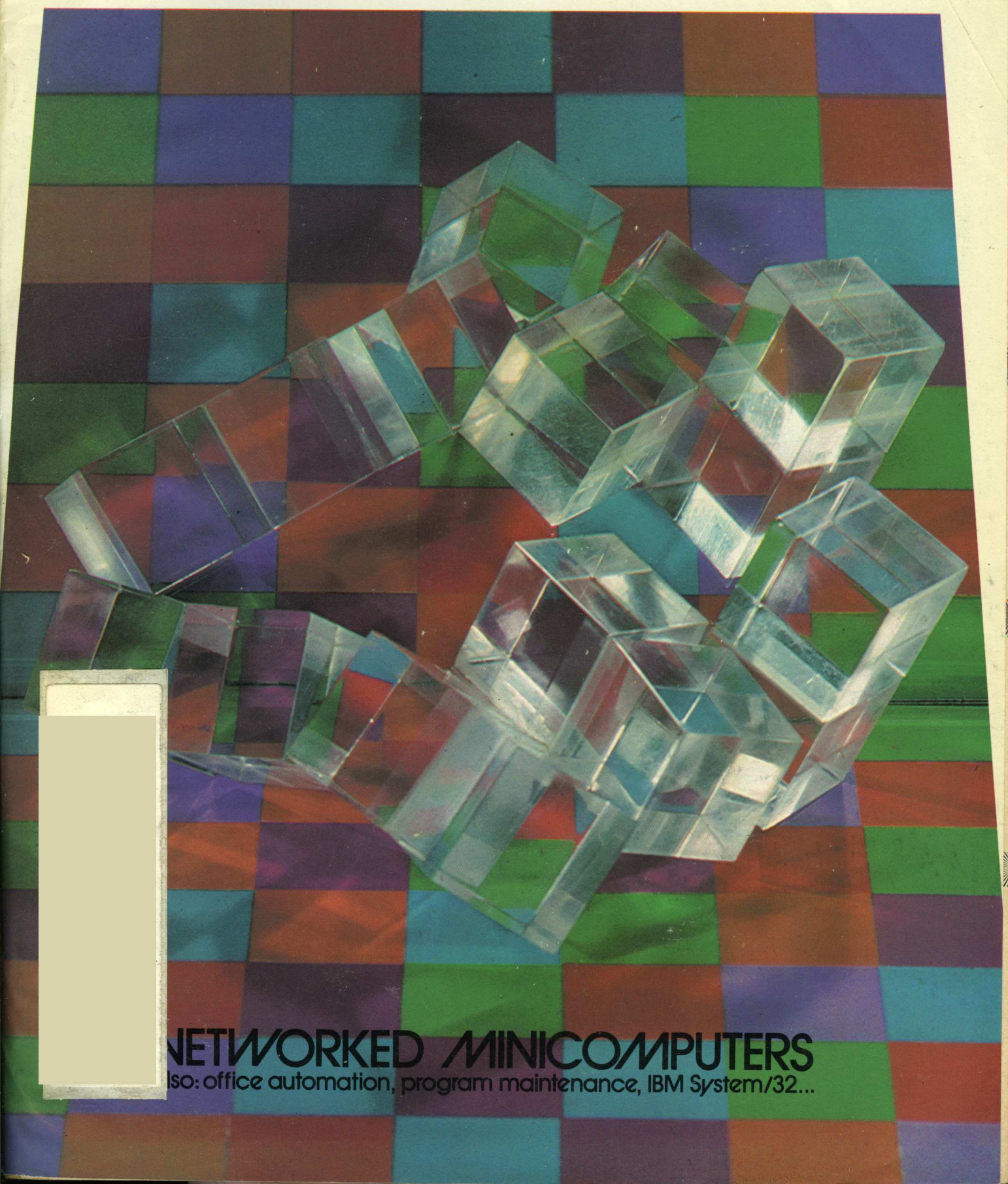
DATAMATION®

75
February



NETWORKED MINICOMPUTERS

Also: office automation, program maintenance, IBM System/32...

Series 9000
Hotter than ever for '75.

Sometimes when you're way ahead, there's a tendency to relax. The Kennedy OEM Series 9000 is the ultimate in tape transports, but we're not about to relax.
So for '75, we've made Series 9000 an even better buy. For instance:

1. We've added a position arm anticipatory sensing system. It's a linear, non-contact position sensor, requiring no lamp source and assuring performance for the life of the machine.
2. All Series 9000 transports (including our new 75 ipper) have interchangeable electronics, reducing stocking costs and down time.
3. For options, we offer our own ferrite heads which expands performance life by a factor of 5.
4. For simplicity of customer electronics, we offer 7 and 9 track NRZI and PE formatter and popular mini-computer controllers.

We've kept the features that makes Series 9000 the best. Features such as 7 and 9 track, 800 NRZI, 1600 PE or 800/1600 NRZI/PE. We still have our front-accessible off-line test panel, our marginal skew check, threshold scanning to automatically compensate for drop-outs or drop-ins, our Read-After-Write shortened skew gage, simplified tape path and quick-release hubs.

Naturally, the performance is improved, too. Data transfer rates of 72 KHz, tape speeds from 10 to 75 ips, and much more.

Being first is a responsibility we don't take lightly. Series 9000 for '75 is still the finest O.E.M. digital tape systems you can buy, as shown by the decisions of major mini and large scale computer manufacturers.

With system 9000, you can relax—because we don't.

KENNEDY CO.
540 W. WOODBURY RD., ALTADENA, CALIF. 91001
(213) 798-0953

Xerox thinks computers shouldn't be too busy to talk to you.

So we've developed ways for you to really talk to your computer. And have it talk back intelligently.

Distributed Multi-use computer systems. From Xerox.

It's a new approach to hardware and software design that combines a unique hardware interrupt structure with independent processors and multi-port memory.

And we tie it all together with what we think is the most advanced operating system in the business: CP-V. It gives you simultaneous access in five modes:

Real Time.
Time-sharing.
Multi-programmed Batch.
Remote Batch.
Transaction Processing.

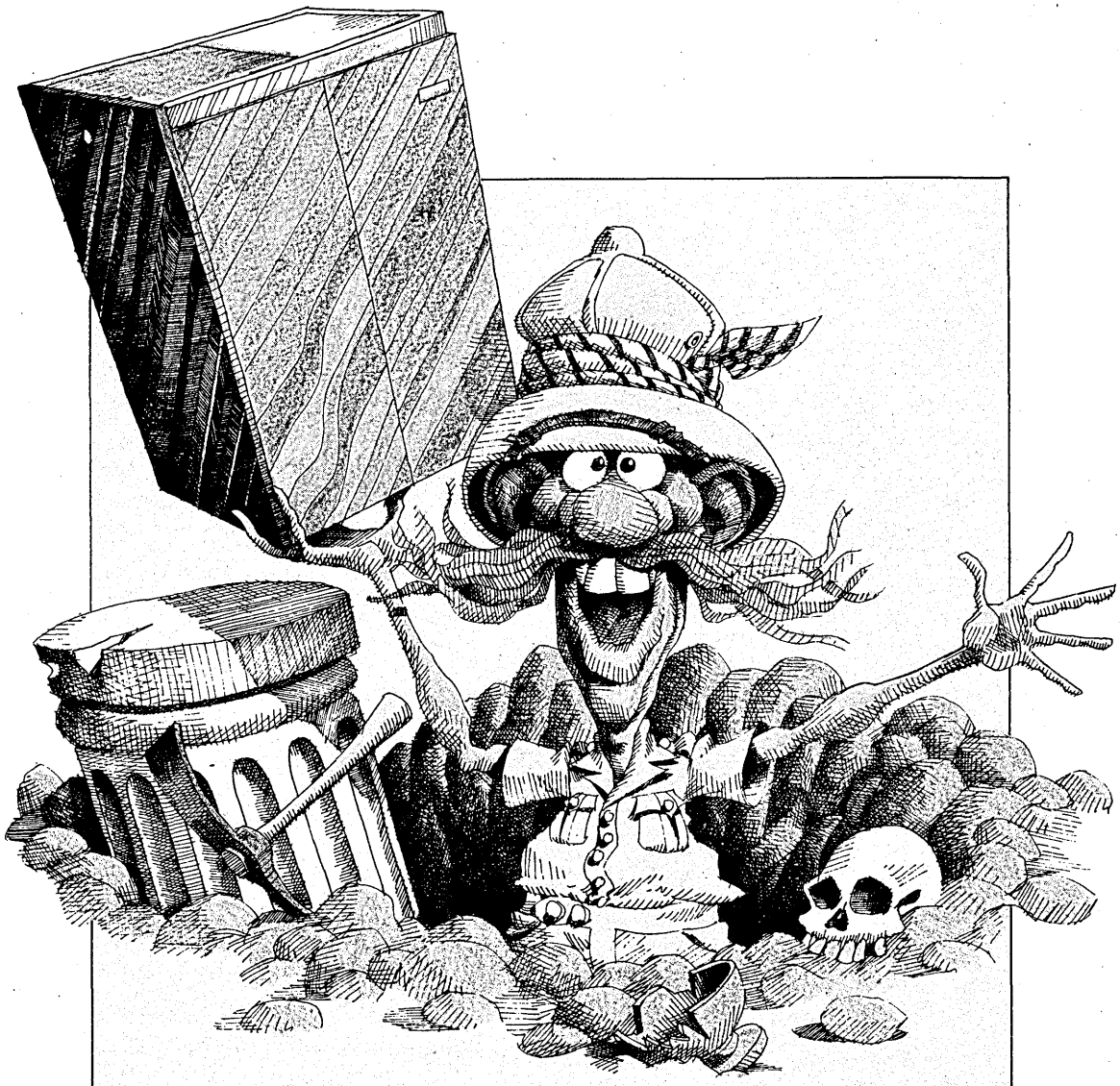
Or any combination you'd like. All available now.

We can give you more computer accessibility for everyone in your company. Which means better, faster, less expensive decisions.

Which is really something to talk about!

Talk to us. Call (800) 421-6882. In California, (213) 679-4511, ext. 950. Or write Xerox Corporation, Dept. I 5-08, 701 S. Aviation Blvd., El Segundo, California 90245.

XEROX



ITEL has found the missing link!

Hierarchical Main Memory.

A new concept in data storage technology for IBM 370 systems. An innovation that bridges the gap between monolithic memory and the various forms of auxiliary storage. An ITEL exclusive.

By combining the high speed of monolithic memory with the low cost of auxiliary storage, ITEL Hierarchical Main Memory meets large capacity main memory requirements at a substantially reduced price per bit.

By greatly increasing the amount of real memory available, ITEL Hierarchical Main Memory can eliminate the paging overhead associated with virtual hardware and virtual operating systems.

At ITEL, we couldn't have acquired over half a billion dollars in IBM computer leasing experience without digging up something new.

Your financial alternative.

ITEL
CORPORATION
DATA PRODUCTS GROUP

One Embarcadero Center, San Francisco, California 94111, Phone (415) 983-0000

DATAMATION 75®

VOLUME 21 NUMBER 2 | This issue 120,230 copies | FEBRUARY 1975

FEATURES

Networked Minicomputers
Complexes of small processors offer less expensive, more reliable, and more flexible alternatives to larger single cpus. Long in the experimental stage, these configurations are now proving themselves by running real work.

NEWS IN PERSPECTIVE

DEPARTMENTS

ABOUT THE COVER
Moving from two dimensions to three; from concept to realization, our modular construction symbolizes the open-ended flexibility available in the minicomputer networks explored in this issue. Photographer Andy Cominos and designer Barbara Benson put it all together.

DATAMATION.

EDITORIAL STAFF

Editor	John L. Kirkley
Articles Editor	Richard A. McLaughlin
International Editor	Angeline Pantages
European Editor	Nancy Foy
Communications Editor	Phil Hirsch
Industry Editor	W. David Gardner
Products Editor	Michael Cashman
Source Data Editor	Daniel P. Schlosky
Calendar Editor	Gloria Tidstrand
News Editor	Tom McCusker
Bureau Managers	
San Francisco	Edward K. Yasaki
Los Angeles	Edith D. Myers
Washington, D.C.	Phil Hirsch
New York	Angeline Pantages
New England	W. David Gardner
Correspondents	
Minneapolis	James K. Johnson
Southwest	Robert F. Alexander
Australia	Frederick A. Bland
Editorial Advisor	Robert L. Patrick
Technical Advisor	Lowell Amdahl
Contributing Editors	Paul Armer, Howard Bromberg, Philip H. Dorn, Louis B. Marienthal, Ray W. Sanders, Milton R. Wessel, F. G. Withington

EDITORIAL OFFICES

Headquarters: 1801 S. La Cienega Blvd., Los Angeles, CA 90035. Phone (213) 559-5111. **Eastern:** 35 Mason St., Greenwich, CT 06830, (203) 661-5400. Lakeside Office Park, 599 North Avenue, Wakefield, Mass. 01880, (617) 246-2121, 9805 Singleton Dr., Bethesda, MD 20034, (301) 530-7271. **Southwestern:** 2711 Cedar Springs, Dallas, TX 75201, (214) 744-0161. **Western:** 2680 Bayshore Frontage Rd., Suite 401, Mountain View, CA 94043, (415) 965-8222. **Foreign:** 14 Ashburn Place, London, S.W.7; 373-3745; 64/90 Blues Point Rd., McMahons Point, NSW 2060, Australia.

GRAPHIC DESIGN & PRODUCTION

Art & Production Director	Cleve Marie Boutell
Advertising Production Manager	Marilee Pitman
Production Assistant	Alberta R. Martin

CIRCULATION

35 Mason Street, Greenwich, CT 06830

Circulation Manager	Suzanne A. Ryan
Marketing Research Manager	Deborah Dwelley
Publisher	James M. Morris
Assistant Publisher	F. Douglas De Carlo

Circulation audited by Business Publications Audit

BPA

Member ☆ABP American Business Press, Inc.

tp

DATAMATION is published monthly on or about the first day of every month by Technical Publishing Company, 1301 South Grove Ave., Barrington, Illinois 60010; Arthur L. Rice, Jr., Chairman of the Board; James B. Tafel, President; Gardner F. Landon, Executive Vice President. Executive, Circulation and Advertising offices, 35 Mason Street, Greenwich, CT 06830, (203) 661-5400. Editorial offices, 1801 S. La Cienega Blvd., Los Angeles, CA 90035. 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 $24; $40 Air Mail annually in the U.S. and Canada. Reduced rate for qualified students, $14.00. Foreign subscriptions are available for £16.80 or for the equivalent of $40 U.S. in most West European currencies. Sole agent for all subscriptions outside the U.S.A. and Canada is J. B. Tratsart, Ltd. 154 A Greenford Road, Harrow, Middlesex HA13QT, England. No subscription agency is authorized by us to solicit or take orders for subscriptions. Controlled circulations paid at Columbus, OH and Form 3579 to be sent to Technical Publishing Company, P.O. Box 2000. Greenwich, CT 06830.

Microfilm copies of DATAMATION may be obtained from University Microfilms, A Xerox Company, 300 No. Zeeb Road, Ann Arbor, Michigan 48106. Printed by Beslow Associates, Inc.

Varian Blitzes DEC

Typical FORTRAN execution times (microseconds)

	V-74½	PDP-11/45
A=B+C	7	33
(double) A=B+C	10	82
A=B	4	14
Do Loop	4	22
A(I,J)=B	22	63
A=Sin(B)	100	251

Move over DEC.

Varian just beat the PDP 11/45 with the V-74½.

Really beat. As these new benchmark tests show (all run recently, on the latest operating systems and compilers, and the same FORTRAN benchmark programs run in every case).

It's the V-74½'s synergistic combination of hardware, software and firmware enhancements that did it. Specifically, the FORTRAN Accelerator, the new Floating Point Processor, and the VORTEX operating system with all the software built around it.

And if you need to double your processing speed, the V-74½ gives you the flexibility of mixing core and semiconductor memory (330 ns) without changing a single operation.

Then there's a big plus that doesn't show up in the numbers. In the I/O area, the 11/45 unibus is a troublesome bottleneck. With the V-74½'s dual port memory, the only bottleneck is your imagination.

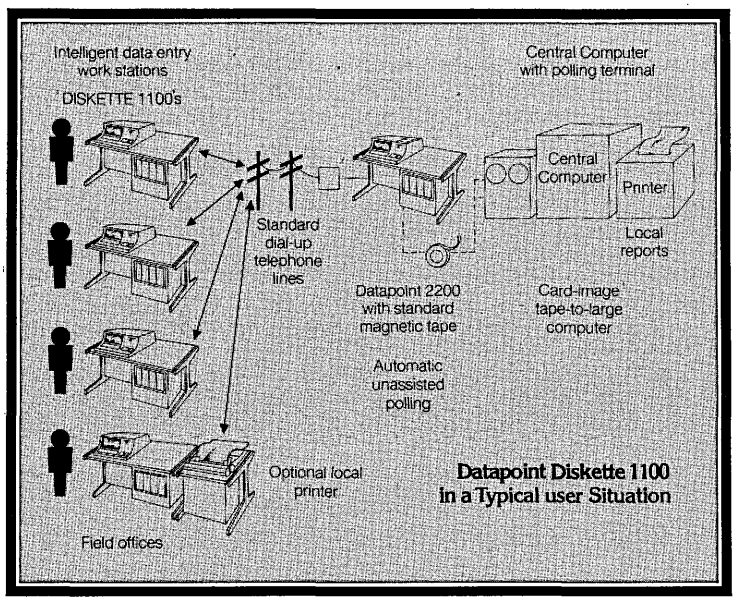
DEC's PDP 11/45 no longer figures. Especially when you consider the price. The V-74½ is delivered at up to twenty percent less.

For your copy of the complete report, call your nearest Varian Data Machines' office. Offices in major U.S. and European cities. Or write Varian Data Machines, 2722 Michelson Drive, Irvine, CA 92664, (714) 833-2400.

varian data machines

The Datapoint Diskette 1100–

The Next Step Forward in Dispersed Data Processing.



Datapoint leadership in Dispersed Data Processing is further enhanced with the introduction of the Diskette 1100 System, a combination of computing power and data storage designed to meet critical requirements for cost-effective data entry and processing applications.

The Diskette 1100 combines a powerful business-oriented computer with 16,000 characters of fast memory and a rapid yet inexpensive flexible diskette data and program storage facility. And, since it's a Datapoint, it has the same operator-oriented styling and features including a wide, clear video display and typewriter and numeric keyboards that have made Datapoint dispersed processors "workhorse" data entry and processing terminals in thousands of organizations.

The system's integrated Diskette unit offers on-line storage for over one million characters through the use of up to four diskette drives. Each diskette can hold up to 256,000 characters of data or programs with an average access time of approximately 80 milliseconds.

This capability puts bottom-line performance where it counts — at the disposal of the people who really need computer power. Here are some of its operational advantages:

1. FAST FORMS RETRIEVAL — Almost instantaneous form display for data entry tasks — through form retrieval off a Diskette and then a high-speed display on the screen. You simply select your form, hit a button and zap — it's there. Result: Higher operator productivity, less waste.

2. FLEXIBLE LOCAL FILE CAPABILITY — Now a local office can create, access and maintain files on locally entered data plus other useful files such as duplicate home office master files. All files can be sorted, edited and locally printed out. Result: Local personnel stay in closer touch with relevant business situations.

3. LOCAL DATA PROCESSING — The computer's power permits data to be processed by use of a number of high-level languages; DATABUS, RPG II or BASIC, saving home office computer time and providing timely local reports. Remember that data files on the diskette are compatible with all Datapoint programming languages — no need for complex conversions.

4. EASY COMMUNICATIONS — No need for expensive communication programming development. Our DATAPOLL package offers simple to use yet powerful communications between a Diskette 1100 and home office Datapoint system. Dialing and answering are automatic over standard telephone lines. If communications with a large computer are needed then a suitable emulator can be selected from among those available for most standard main frames.

5. A TRUE DISK OPERATING SYSTEM — Many processor-based terminals offer only the minimal programming tools and file support software. Not so here. All programs run under a true Disk Operating System that provides easy operation and sophisticated file support. It can also be upgraded to larger systems such as DATASHARE without modification.

6. PRICE — And finally the price is right. Just $254 per month with one diskette drive on a two year lease including maintenance. Check that against what the competition is asking. For more information on this next step forward in dispersed data processing, contact your local sales office or write or call Datapoint Corporation, 9725 Datapoint Drive, San Antonio, Texas 78284, (512) 690-7173.

DATAPOINT CORPORATION

The leader in dispersed data processing

Home Office: 9725 Datapoint Drive, San Antonio, Texas 78284 (512) 690-7151 • **Sales Offices:** Atlanta/(404) 458-6423 • Austin/(512) 452-9424 • Baton Rouge/(504) 926-3700 • Boston/(617) 890-0440 • Chicago/(312) 298-1240 • Cincinnati/(513) 421-6122 • Cleveland/(216) 831-0550 • Dallas/(214) 661-5536 • Denver/(303) 770-3921 • Des Moines/(515) 225-9070 • Detroit/(313) 478-6070 • Greensboro/(919) 299-8401 • Hartford/(203) 677-4551 • Honolulu/(808) 524-3719 • Houston/(713) 688-5791 • Los Angeles/(213) 645-5400 • Milwaukee/(414) 453-1425 • Minneapolis/(612) 854-4054 • Nashville/(615) 385-3014 • Newark/(201) 376-1311 • New York/(212) 759-4656 • Orlando/(305) 896-1940 • Philadelphia/(215) 667-9477 • Phoenix/(602) 265-3909 • Pittsburgh/(412) 391-7213 • Portland/(503) 761-2250 • Puerto Rico/(809) 783-5320 • Salt Lake City/(801) 272-6441 • San Diego/(714) 460-2020 • San Francisco/(415) 968-7020 • Seattle/(206) 455-2044 • Stamford/(203) 359-4175 • St. Louis/(314) 291-1430 • Tulsa/(918) 664-2295 • Washington, D.C./(703) 790-0555 • **International:** TRW/Datacom—International/Los Angeles, California, TELEX 691286 (213) 475-6777 • Sydney, Australia/922-3100 • Vienna, Austria/022Z/36 2141 • Brussels/76 20 30 • Rio de Janeiro, Brazil/246 7661 • Toronto/(416) 438-9800 • Copenhagen/(01) 965-366 • Guayaquil, Ecuador/394844 • London/903-6261 • Helsinki/90-661 991 • Paris/581 12 70 • Hanover, Germany/(0511) 634-011 • Rotterdam/(010) 216244 • Tel Aviv, Israel/(03) 410565 • Milan/316 333 • Tokyo/264 6131 • Kuala Lumpur, Malaysia/21416 • Oslo/15 34 90 • Makati Rizal, The Philippines/877 294 • Singapore 10/378165 • Johannesburg/724 9301 • Stockholm/(08) 188295 • Lyss/Byrne/(032) 844240

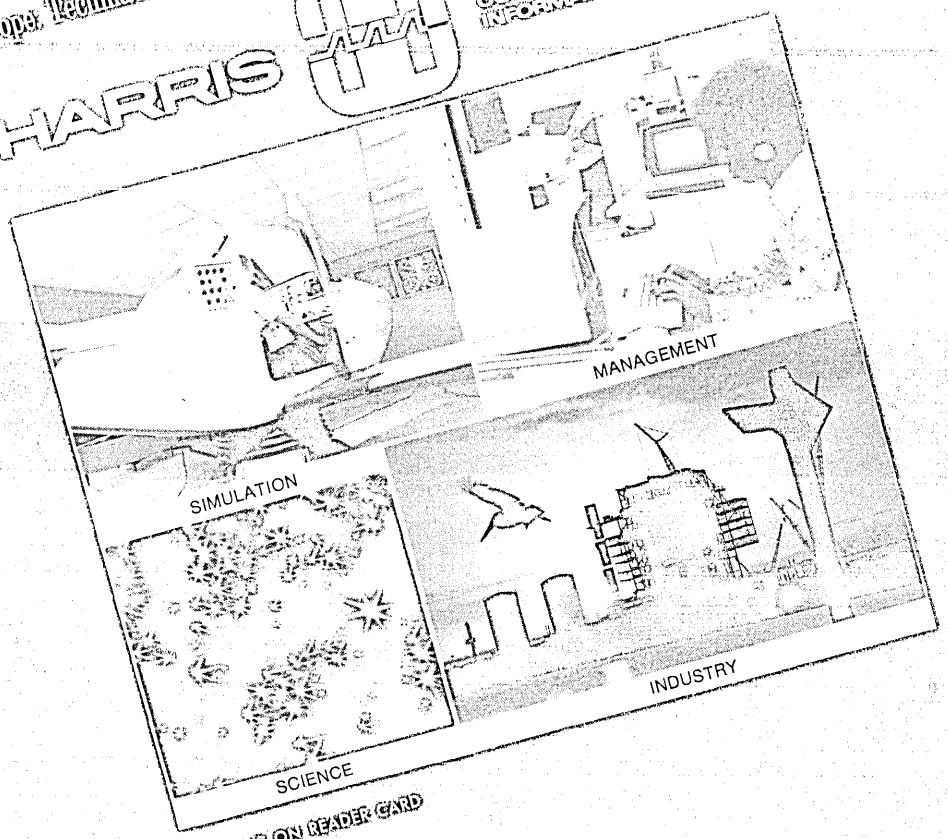
CIRCLE 17 ON READER CARD

HARRIS COMPUTERS TEACH, SIMULATE, MANAGE & CONTROL

They're the Useable Systems.
Proved in installations around the world, in sophisticated applications. Millions of dollars worth of Harris Useable Systems.
For example, the Useable SLASH 4/VMS. Its powerful VULCAN software simplifies programming. And, its facility to handle huge computations of data, combined with fast throughput, delivers performance economies.
Useable Systems from Harris. For data base management, complex simulation, or distributed systems. Write Harris Computer Systems, 1200 Gateway Drive, Ft. Lauderdale, FL 33309. Europe: Technimation N.V., Gebouw 105/106 Schiphol-Oost, Netherlands.

HARRIS

COMMUNICATIONS AND INFORMATION HANDLING



CIRCLE 42 ON READER CARD

letters

Tracking IBM's backtracking

The News In Perspective summary by David Gardner in the December issue (p. 107) was fascinating reading to some of us addicted IBM-watchers who have been unable to keep up with the documents that are relevant to the government's antitrust case. It is beginning to look like the reflections and lapses into truth on the part of IBM management people over the years may produce an antitrust equivalent of

Richard Nixon's tapes, although the drama and denouement may suffer by the probable failure of Gerald Ford to pardon people running a big company the way he could give sanctuary to someone destroying the country. Nevertheless, it ought to be interesting to watch these men trying to persuade the court that previously uttered truths don't count and that readjusted testimony is more valid. One is reminded again of the cornered Mr. Nixon, trapped by evidence of his own making, trying to persuade us that what he meant was not what he said.

I do not myself mean to suggest odious comparisons here for I believe the IBM men who must defend themselves against antitrust charges are superior to the last pair we elected to the two highest offices of the land. Nevertheless, as Mr. Gardner so deliciously pointed out, when you argue at one point that you are not a monopoly because you only have 70% of the business, you cannot very well expect to preserve your reputation for veracity when you come along later and tell us you have recomputed the figures and now discover you are not a monopoly because you have only 38% of the business. We get the feeling your figures are not to be trusted.

Having taken some flak now and then from IBM men complaining that my assessment of that company's power was exaggerated, I take some comfort in the knowledge, based on IBM's own records, that I was fairly on target most of the time—and that the highest management of the company knew very well what they were doing all the time they were doing it and then denying it had been done. In that respect, at least, they do resemble the pack that roamed the Nixon domain, although for some reason I cannot quite grasp, I do not feel it quite so reprehensible of corporations to be greedy and deceptive as I do those who are chosen in elections to run our government. Maybe none of us should tolerate these double standards.

. . . it is a great joy to see the walls of secrecy breached and to see, after so many years, the truth about industry—and the truth about our corrupt government—coming to light. I thank DATAMATION for its contribution to this process.

WILLIAM RODGERS
Centreville, Maryland

Mr. Rodgers is the author of "Think: A Biography of the Watsons and IBM."

Backup computer

Regarding Lars Persson's statement that "real-time" is a weak argument for having a backup computer (*Designing for Minimum Downtime,* November, p. 51), I have to make a four letter comment. . . . BULL!

I wonder what happens to Scandinavian Airlines' reservations system and how the company's revenue is affected when the tubes go blank?

What about process control computers? What about banks, warehouses, stock markets, brokers, communications, to name only a few. They don't require redundancy to preserve human life, but the loss of a computer system could cost them great loss of money and, in some cases, could put them out of business.

Of course if Mr. Persson is referring to a batch accounting job he can get away with outages. But he can't make the generalized statements he does and then base his article on them.

Why, even the statement that "the fact your competitor has a backup system is no reason for you to have one" is not generally true. If my time-sharing vendor's system "bombed" and I found they had no backup, I'd sure as hell go out and find another vendor who *had* backup. If my bank's system failed a few times when I was on-line and I couldn't get out of there quickly with an updated passbook, I'd find another bank to do business with. So competition *is* of importance.

The need for a backup system must be equated against the impact on a company of system failure vs. the cost of recovering from that failure. It may take only a few minutes to recover from the blip-of-the-light type of failure but if your system was receiving random input over which you have no control, you don't know if you've lost data, what was lost, or what to ask for if the source could repeat it. And if you have people all over the world scheduling their production or otherwise depending on your computer to deliver some information, you had better be able to deliver it. They won't be very happy with a message to the effect that the system was down and that it will start up again after the engineers arrive . . . and if they can fix it promptly or have to send out for some part.

JERRY FRAENKEL
Data Processing Manager
The Associated Press
Rockefeller Plaza
New York, New York

Mr. Persson replies: Your comments "smash an already open door."

My statement that the only reason to duplicate anything is to save money by doing so, goes very well with your comment that "the need for a backup system must be equated against the impact on a company of system failure versus the cost of recovering from that failure." The only difference I can see is that I have substituted "impact on a company" with "cost for a company." This, however, is a very important substitution as it makes it possible to use calculations instead of rules of thumb.

Let me say it in another way. Here we have two theories, one saying that real-time computers need a backup, the other saying that one has to compare outage cost to backup cost. Everyone knows that in most real-time cases these theories give the same answer. But the first one does not tell you whether you need a hot standby or a cold one. And it does not help you pinpoint the very rare and very interesting situations when a real-time computer does not require a computer backup, just a manual fallback procedure. There are such animals.

Further it looks as if you believe that a single level of backup should be enough for all real-time installations. How do you judge whether a second installation is needed as a backup for your backup, maybe even in another city? By the feelings of your fingertips? Or by calculations? It is up to you in your case. I prefer the calculations.

Mnotes on mnemonics

I agree with Mr. Wander (Letters, Dec. 1974, p. 161) that the higher-level languages should replace awkward mnemonics like .EQ., .LE., etc. by =, <, etc. for improved intelligibility and other reasons. But any improvement in machine efficiency is incidental; if

(Continued on page 116)

4000 deliveries later, Nashua's ready to call its Mod/11 disc pack an instant success.

At last there's a dependable, trouble-free disc pack for your 3330 Mod/11 drive. It's called our Model 4436DD (for Double Density). And it's available today from Nashua.

As the leading independent disc pack manufacturer, Nashua was the logical company to come up with a reliable Mod/11 pack. But if you know us at all, you know that we wouldn't want to talk about it until we were really ready.

Well, now we are. With over 4000 Nashua packs spinning on Mod/11 drives worldwide, we've geared up our manufacturing effort to be able to provide volume shipments of the 4436DD to meet your delivery needs.

If you're a Mod/11 disc user, you can appreciate the advantages of having a reliable, technologically topnotch alternative to IBM's own disc packs. And if you've already been looking for a supplier, you can stop now.

The 4436DD is the latest brainchild of Nashua's 125-year history of leadership in particle technology, joining a growing line of disc packs, cartridges and tapes that combine competitive pricing with an unmatched 3-year parts and labor warranty.

With factory formatting to insure absolute system compatibility, and Nashua's unique weighting system to maintain perfect balance in the drive, the 4436DD has already received wide user acceptance as the best long-term answer to everybody's Mod/11 needs.

Nashua offers a whole line of disc packs, cartridges and diskettes, with a major Winchester announcement coming up soon. But if all you care about is Mod/11, why wait? Get the good news today from your Nashua representative. OEM and system house special discounts are available. Call us collect at (603) 880-2885.

Nashua Corporation, Nashua, New Hampshire 03060.

David Wright, Marketing Manager
Computer Products Division
Nashua Corporation, Nashua, NH 03060
I need:
☐ planning information now.
☐ a salesman now.

Name _____ Title _____

Company Name _____ Phone No. _____

Address _____ D

NASHUA
That's Disc-manship

CIRCLE 60 ON READER CARD

people

AFTER THREE STORMY YEARS

Looking back on three stormy years as chief of edp control and development for the state of California, Kent H. Gould has some harsh words for vendors and some advice for state legislators.

Gould, 37, left the state job last July to become Manager, Management Information Systems for National Semiconductor's NS Electronics (H. K.) Ltd. in Hong Kong. A key figure in California's controversial procurement of computer equipment for the Stephen P. Teale consolidated data center (March 1974, p. 122), Gould says he made the decision in January '74 to leave the state on or about July 1. "I felt that by that time, I would have achieved all that was possible to achieve and that perhaps my effectiveness might, by that time, be crippled by the vicious in-fighting that was going on."

In the middle of the Teale fight, in mid-1973, Gould was affected by said in-fighting when it was leaked to the press and to legislators (no one ever said by whom or why) that he had a small amount of stock in Boole and Baggage (where he once worked), a software firm which was a subcontractor to IBM whose bid for the Teale Center Gould favored.

His words for vendors: "In the use of computers in government today, what is even more inexcusable than cost is the unnecessary proliferation of hardware, and I don't really care what the vendors say and I mean all of them. They only have one interest . . . to sell. Some, in some cases, are more careful, and some do truly care about their customers at various points in time but when it comes down to the end, when they are losing their sale . . . There are no good losers and all of them will be protesting when it comes time for them to lose revenue."

For state legislators who are considering central edp control and looking for the man to honcho the project, the blunt-talking Gould had this advice: "When you pick your key guy, do not fire him if he gets in trouble 'cause plan on it, he will get in trouble. If he isn't in trouble, it is because he isn't doing anything."

"It is not possible to do a Central EDP Control job in any state," says Gould, "without getting into trouble, without getting everybody mad at you because what you are effectively doing

KENT H. GOULD
Hong Kong is a ball

is tearing down empires and demanding more performance, more productivity, more cost effectiveness."

Gould strongly believes that consolidation in state edp is an important issue. "Today's processing capability in every machine line allows the user to do more and save money. I think the real key issue facing government and the use of computers in the coming three or four years is going to be productivity. That is not necessarily the issue which is going to get the most press and the most attention. By productivity, I do not mean efficiency, I mean the true productivity of the computer pushing capacity to its limit and getting what we in the semiconductor business call true yield, getting the most product."

Gould considers his tour in Sacramento to have been "fulfilling but not easy." Despite shortcomings that appear today, he says, "we did reduce the amount of money being spent and we did, in fact, reduce the number of installations."

He likes Hong Kong . . . "it's a ball" . . . and he likes his new job. He is responsible for installing information systems in Hong Kong which will be used to monitor and assist in the management of the corporation's Hong Kong operation. The Hong Kong facility, says Gould, "is the only National facility able to do product testing and final product identification on an off shore basis."

The operation will be installing information systems for: order control, backlog reporting, customer service, sales support, fixed asset accounting, payroll, inventory valuation, and customer shipment support.

"All of these major application systems are already operational in one form or another at the National corporate headquarters in Santa Clara, Calif.," said Gould. "Others are being developed using corporate guidelines at our facilities in Germany, Scotland, Hong Kong, and Singapore."

Gould became known to the senior management of National Semiconductor while still with Boole and Babbage which did a job for NS, helping it organize a basic approach to data processing. He was approached on the Hong Kong assignment in May 1974. "I decided yes, this would be for me the best choice."

Gould holds a BA in international relations and economics from the Univ. of Southern California and has done post graduate work at the Univ. of California, Berkeley and UCLA. He holds a Certificate in Data Processing and is a member of the Data Processing Management Assn. (DPMA), the American Production Control & Inventory Society, the Assn. for Computing Machinery (ACM), the Assn. For Systems Management (ASM), and the Federal Task Force for the establishment of edp accounting standards under sponsorship of the U.S. General Accounting Office.

In addition to his position as western regional technical manager for Boole & Babbage, Inc., his jobs prior to joining the state of California in-

IN NEW POSTS . . .

DANIEL O. ANDERSON was promoted to vice president of finance and administration for Honeywell's North American Computer Operations . . . DR. JACK R. HARRIS was named vice president, scientific systems, of Pinkerton Computer Consultants, Warminster, Pa. . . . Copperweld Corp. named ALEXANDER FERENCE to the newly created post of Manager of Information Systems . . . PETER A. CUNNINGHAM left Quantum Science Corp. to become president of Input, Palo Alto, Calif. market research and business consulting firm . . . RICHARD COBB, senior vice president of Mathematica, Inc., was named to head the company's newly formed RAMIS Div., which supports a data management, information, retrieval and supporting system . . . MICHAEL P. LA VIGNA was promoted to corporate vice president, marketing, at On-Line Systems Inc. . . . CARL G. HOKANSON was appointed president of Lear Siegler International, Inc.

cluded: corporate director, Management Information Services for the Larwin Group, Inc.; manager, Services & Systems, McDonnell-Douglas Corp.; staff to Corporate Director of Equipment Operations, Northrop Corp.; senior systems analyst, North American Aviation, Inc.; and programmer, Bank of California.

Gould refers to the California consolidation implementation as "the first successful effort in that state's move toward utilization of today's technology while reducing costs." Prior to the consolidation efforts, he says, "the growth in computing power was without cohesive thread and could be likened to what has so often happened in a multi-division corporate entity."

"The approach (in California) required a complete assessment of current capabilities and needs. These had to be structured in such a fashion as to establish a set of correlation points for future use. An assessment of emerging data base and data communications technology had to similarly be developed so that current capabilities, known requirements, and future capabilities could be correlated."

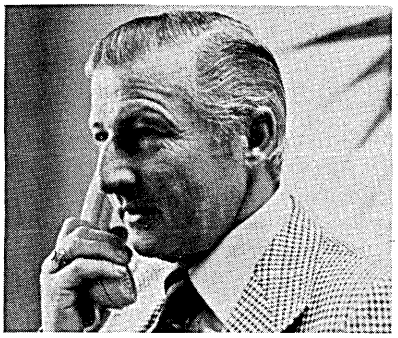
One of the most consistent weaknesses of this type of effort, says Gould, is that "current capabilities are underestimated and future requirements never have sufficient elasticity. This inevitably results in a long range plan which is out of date when implementation begins. This can be avoided by using planning factors that force recognition of the changes in the business environment.

Gould firmly believes that "data processing has become essential to the effective operation of government" but he feels "the demands placed on a member of the professional community in government today are inconsistent with the public understanding of what it takes to operate government. People so frequently talk about the opportunity to serve your country and the 'benefits'. In reality, benefits are worse than industry . . . job security is fiction because, at the wish of any legislator, positions may be and are eliminated."

INTERNATIONAL SURPRISE

A resignation that evoked considerable surprise and speculation in both Europe and the U.S. was that last month of Henry F. Sherwood as director of the Diebold Research Program in Europe.

Sherwood was founder of the program and had been director since its inception in 1965. He resigned effective January 1. He also resigned as a vice president of the Diebold Group, Inc., N. Y., parent company of Diebold Europe, Frankfurt, which administers the European Research Program. Sherwood's operation was one of the few remaining profitable ventures of the Diebold Group.



HENRY F. SHERWOOD
Where to now?

David Butler, director of operations for Diebold Europe, London, since 1972, was appointed to succeed Sherwood who was noted for running a highly personalized organization.

During Sherwood's 10 year directorship, the Diebold Research Program, Europe, grew from an initial six sponsors to 100 governmental, industrial, and commercial organizations and computer industry participants. In the same time frame, Sherwood is credited with having built up a highly successful professional computer consulting activity with clients from Capetown to Helsinki and including Eastern as well as Western Europe.

A magna cum laude graduate from the Univ. of Detroit in business administration, he began his data processing career with Univac in 1956. Subsequently he became manager of the Management Sciences Div. of an American-based international accounting firm, and in 1962 he joined Burroughs Corp., where his responsibilities included product development strategy.

In between times he became adroit at being photographed with luminaries, including the Pope. He also achieved the distinction of becoming an Admiral in the Texas Navy.

He also found time to author numerous articles and to lecture extensively throughout Europe and the U.S. on management problems associated with edp. He is a lecturer at the Technical Univ. of Berlin and, in 1970, was appointed a Fellow of the Hudson Institute for Policy Research.

Sherwood had not announced future plans at this writing but speculation was that he would start a firm of his own in Europe.

His successor, Butler, started in data processing in 1962 as a programmer and later dp manager for a hospital board. He joined Urwick Diebold in 1965 and worked on a range of consultancy assignments for the Diebold Research program. He is a member of the British Computer Society and a Fellow of the Institute of Directors. □

Our 132-character printer will dazzle you with its printing speed, not its footwork.

Our Execuport 1200 is an asynchronous wire matrix impact printer. It's very fast (up to 120 cps), quiet and stable. (It'll print like a demon all day and not move a millimeter.)

What it lacks in footwork, it makes up in other features. The 1200 can send and receive data at 10, 15, 30, 60 and 120 cps. It will print an original and five copies. And it will print them 132 characters wide. It even has a new print position indicator that tells you where you are at any time.

The 1200 has a self-contained keyboard which uses a complete 128 USASCII character set. Its printer provides 96 characters, with full upper and lower case. Its special print mechanism and mobius strip ribbon reduce wear and replacement.

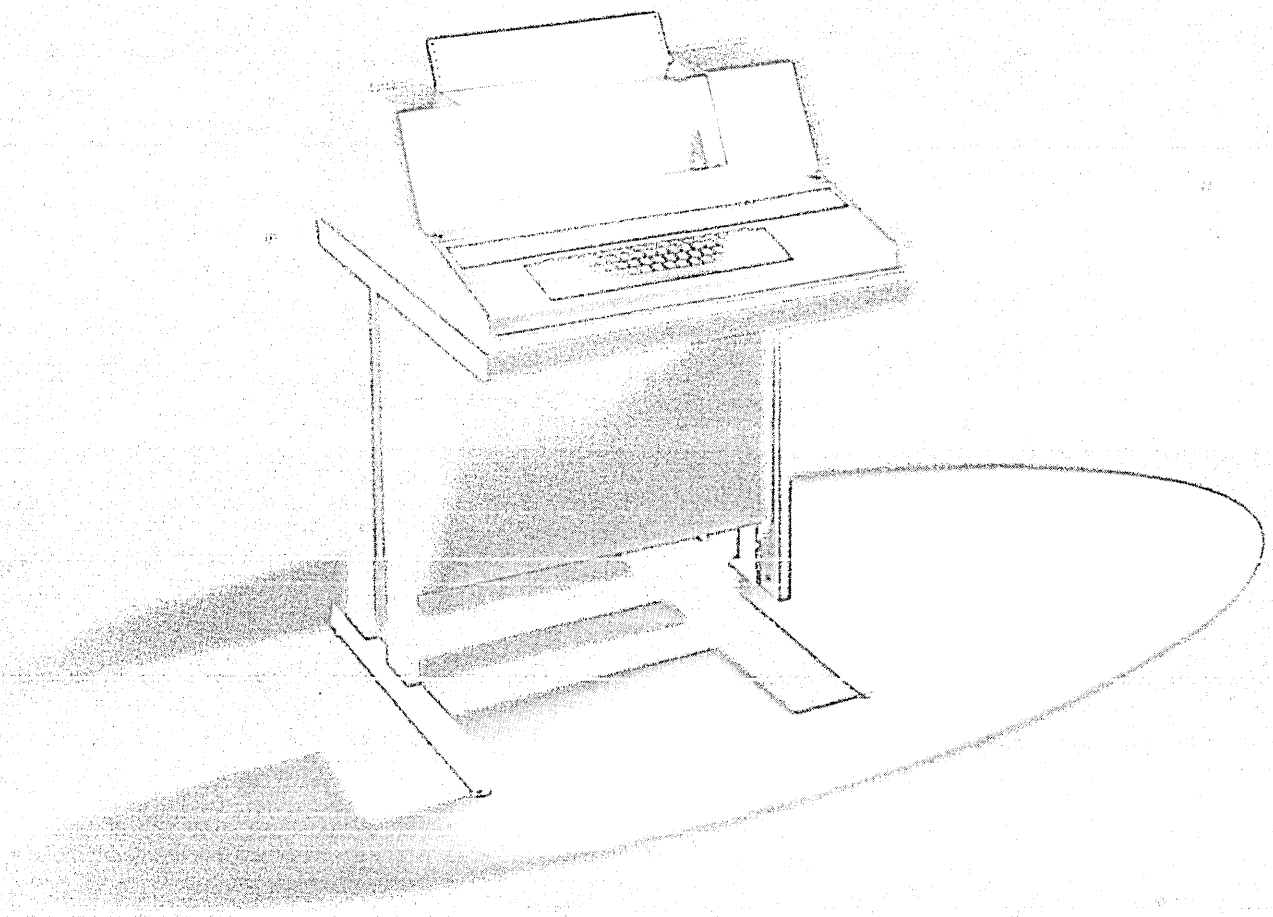
You can adjust the 1200's paper tractor from 3½" to 14⅞", load it from back or bottom, and interface it with all kinds of peripherals.

Get all the facts on our 1200. Call Charles Kaplan or Shirley Newman at (201) 261-6800.

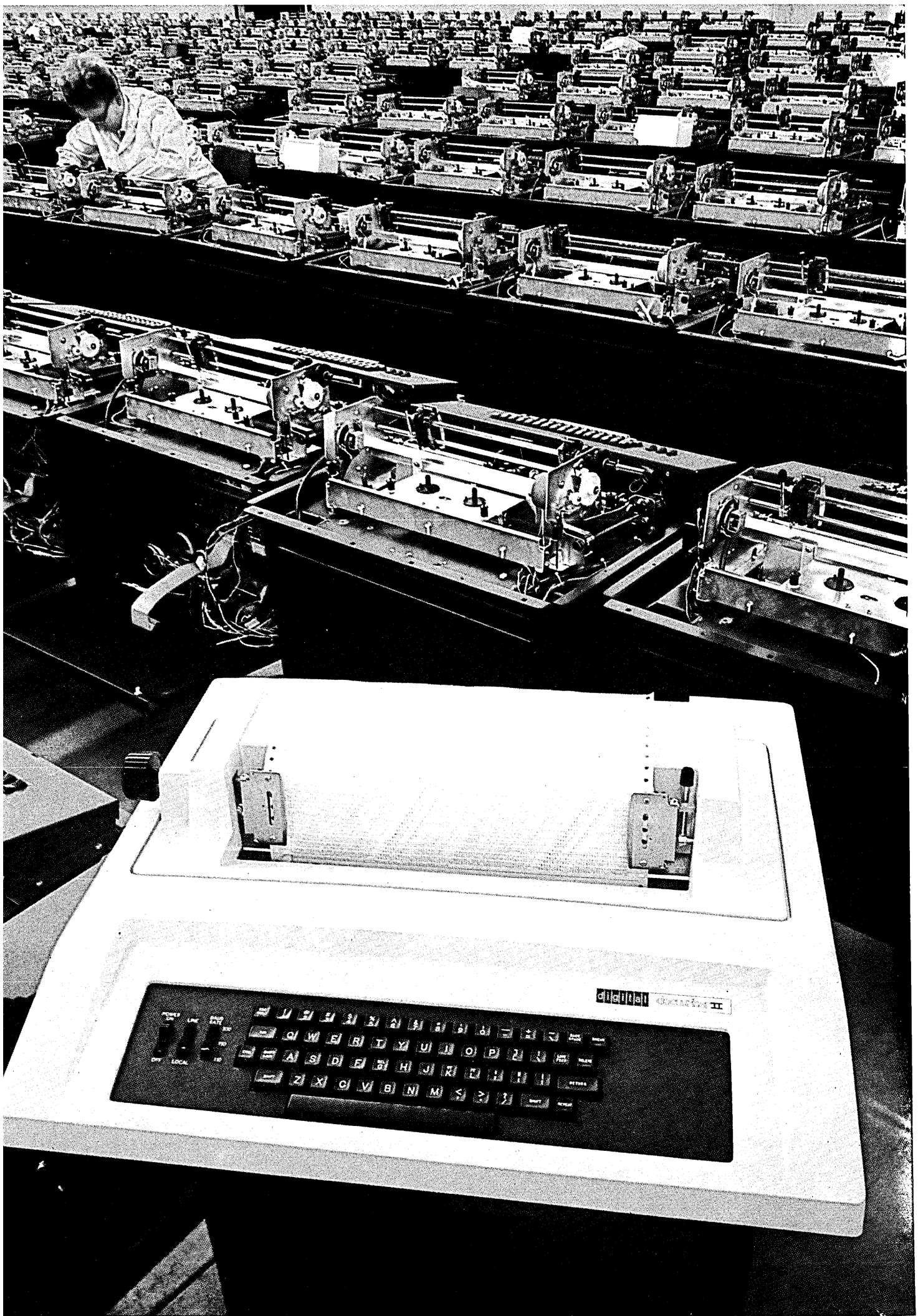
Computer Transceiver Systems Inc.
East 65 Midland Ave.
Paramus, N.J. 07652

CTSI

Execuport 1200 printing terminal.



CIRCLE 93 ON READER CARD

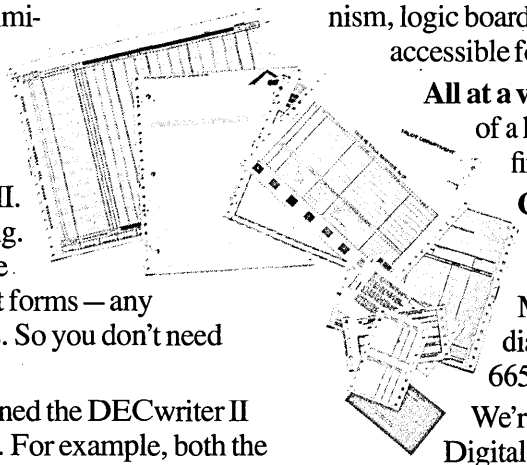

digital
POWER ON
LINE
STATE
OFF
LOCAL
ON

We designed the new DECwriter II for speed and reliability.

And we priced it to sell. $1250 in quantities of a hundred.

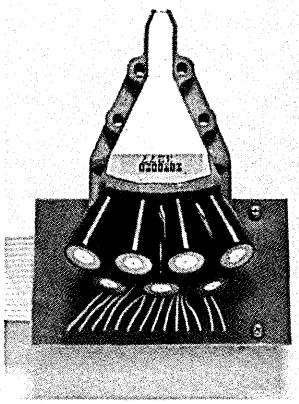
The DECwriter II gives you performance no one can touch at the price.

It's fast. A true 30 characters per second, including carriage return and line feed. This makes full use of standard phone lines and eliminates the need for software-generated fill characters.



It's versatile. You can use your standard line-printer forms with the DECwriter II. You get 132-column printing. And the reliable tractor-type paper feed takes up to 6-part forms — any width from 3 to 14⅞ inches. So you don't need special forms.

And it's reliable. We designed the DECwriter II using proven concepts only. For example, both the printhead and keyboard — the two most critical elements — are field-proven designs, already in use at Digital customer installations. We build the DECwriter II to last; it'll give years of service with minimum maintenance.



You get highly legible printout. A full 96 printable characters, upper and lower case. Each character is printed on a 7 x 7 dot matrix. Legibility, as well as reliability, is ensured by a servo-system to control carriage motion and by a stepper-motor-controlled paper feed to produce accurate line spacing.

And easy interfacing. A 20mA Teletype interface is standard, EIA is also available.

And trouble-free maintenance. The LA36 is modularly designed. Printhead, keyboard, mechanism, logic board, and power board are all readily accessible for easy replacement.

All at a very low price. $1250 in quantities of a hundred. Can you afford not to find out more?

Call us. Dial 800-225-9480. Toll-free from 8:30 AM to 5:30 PM Eastern time. (US only. Massachusetts residents, please dial (617) 481-7400, extension 6653.)

We're the Components Group of Digital Equipment Corporation, One Iron Way, Marlborough, Massachusetts 01752.

In Canada: Digital Equipment of Canada Limited, P.O. Box 11500, Ottawa, Ontario, K2H8K8. (613) 592-5111, extension 127.

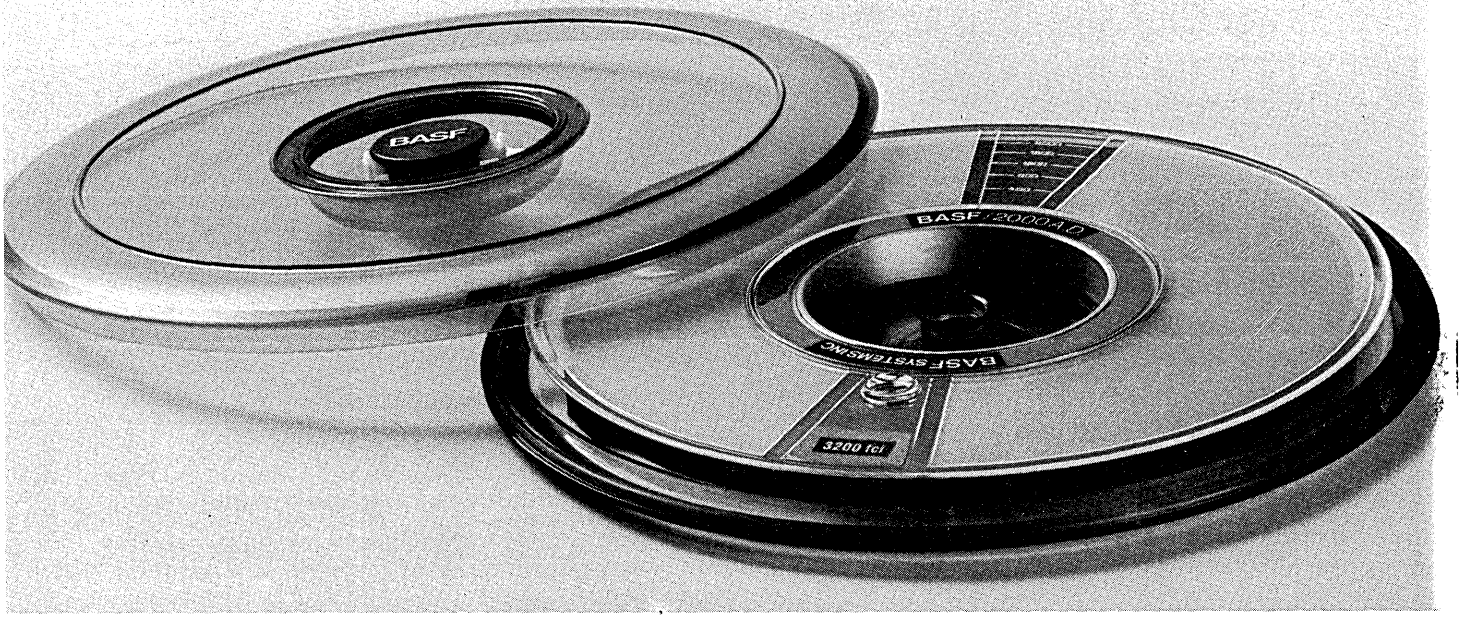
In Europe: 81 Route de l'Aire, 1211 Geneva 26, Telephone: 42 79 50.

digital
COMPONENTS GROUP

Unbundling the world's most popular minicomputer systems.

CIRCLE 50 ON READER CARD

If you think all premium computer tapes are alike, take a closer look at BASF 2000/A.D.



Because all premium computer tapes re 100% certified and meet industry tandards, you might think they're all qual. They aren't. The important differnce is the margin by which a manuacturer's standards *exceed* industry tandards. It's this extra margin that allows o margin for errors. Let's look at a few uperior points of BASF 2000/A.D. omputer tape:

Debris-free edges

Rough edges and debris on tapes re the result of inferior slitting, which auses the coating to overhang the base. he projecting edges become detached y tape guides and drive rollers. The esult: loss of head-to-tape contact . . . nd errors. BASF has eliminated these roblems with an exclusive double-cut itting technique that keeps our tape dges perfectly debris-free.

Straight edges

Another hassle, even with premium tapes, is edge waviness. This causes intermittent reading and writing errors. Dynamic conditions during tape transport can occasionally compensate for the waviness, so it's a tough job to track down. Again, our double-cut slitting technique keeps 2000/A.D. edges absolutely straight and symmetrical.

Uniform width

Uniform tape width is essential, in order to avoid dynamic skew errors. According to industry standards, a width tolerance of ±.002″ is acceptable. We peg our 2000/A.D. standard at ±.001″. It's a small detail, but it could eliminate a few 3:00 a.m. debugging sessions.

Superior coating

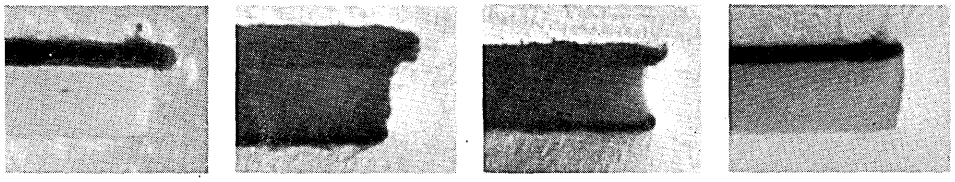
We've developed a new "hotter oxide" coating . . . a higher energy oxide that produces an output consistently higher than that of the National Bureau of Standards reference tape. Then we apply this oxide with a unique coating technique that provides a more even dispersion of oxide particles in the binder. For any bit density, including 6250 B.P.I., 2000/A.D. gives you more reliable writing and reading . . . better bit-to-bit uniformity . . . fewer drop-ins and drop-outs. And virtually no permanent errors.

Hard surface

Head wear is inevitable, but it shouldn't be excessive. That's why we developed a finishing operation that gives 2000/A.D. a harder, smoother surface than anyone else's. It's a lot kinder to your tape head, and keeps your maintenance time to a minimum.

And in conclusion

2000/A.D. costs no more than other premium tapes. You're already paying for BASF quality . . . you might as well have it. For the whole story of how 2000/A.D. stacks up against the competition, write to BASF Systems, Crosby Drive, Bedford, Mass. 01730.



BRAND A BRAND B BRAND C BASF

CIRCLE 12 ON READER CARD

BASF

You're already paying for BASF quality, you might as well have it.

LOOK AHEAD

DECISION IN DENVER: WHAT NOW?

If the U.S. Supreme Court accepts Telex's request for a review of the U.S. Court of Appeals' decision that reversed the IBM-Telex case in favor of IBM, the computer colossus won't have to face a particularly hostile court. The court has traditionally tended to rule against companies accused of violating antitrust regulations, but that's changed in recent years, particularly since Richard Nixon's appointees have joined the court. Moreover, a few years ago at least three Supreme Court Justices were reported to be IBM stockholders (any IBM stockholders currently on the court would presumably disqualify themselves from hearing the IBM-Telex appeal).

While the decision in Denver was a resounding victory for IBM and restored the firm to its pedestal of invincibility, the decision could have unhappy long-term effects for the remainder of the weakening computer industry. In effect, the decision permits IBM to systematically stake out and bear down on smaller competing companies. The decision also strengthens IBM's hand in its case with the Justice Dept., if not significantly from a legal point, then from a psychological point. IBM would certainly have to give up less in a Consent Decree now. Some speculate that IBM might be encouraged to let the case drag on for years in the belief that it would win the government case too.

MEANWHILE, BACK AT ARMONK

Before the Telex decision, IBM was moving ahead with a plan to break its Data Processing Div. in two -- the 115 through the 145 to be in one unit, the 155 on up in the other. In at least some IBM sales areas, the plan called for various IBM industry marketing operations to be used for field facilities for one of the new groups, while industry marketing would presumably be reestablished in each of the new groups. The reason for the new reorganization? Some speculate that it's planned to make the computer colossus easier to manage, while others believe the move had antitrust overtones (e.g. IBM is restructuring itself along lines it would find acceptable in a Consent Decree).

On the subject, G. A. Saxton & Co., a Wall Street firm with a sterling reputation for expertise in the computer industry, and one that has long enjoyed good relations and communications with IBM, is telling its clients that IBM management is apparently willing to talk about a fundamental restructuring. If that's so, IBM could be willing to accept some form of breakup in a Consent Decree. Without a Consent Decree, the Saxton firm feels the IBM-Justice Dept. litigation could stretch out beyond 1980 -- a date that could be intolerable to the remainder of the struggling, capital-strapped industry.

Another plus for a Consent Decree could be embodied in President Ford's choice for attorney general, Edward H. Levi, the president of the University of Chicago. As a former head of Justice's Antitrust Div. and former chief counsel to the House Subcommittee on Monopoly Power, Levi would have a more-than-usual interest in the largest antitrust case in history and would presumably be able to avoid time-consuming briefings to understand the case, which is scheduled to go to trial in New York City this month.

NCR IN FACILITIES MANAGEMENT

NCR Corp.'s infinitesimal share of the computer market had been unprofitable until last year, although it dominates in the point-of-sale market that IBM now pursues hungrily. The Dayton, Ohio company, where IBM's Thomas Watson, Sr. first entered the business machines market, has turned its computer business around with a massive cost trimming and marketing reorganization program. Its latest move has been to enter a field that IBM seems determined to shun -- facilities management. (IBM chairman Frank T. Cary says FM is too hard for users "to justify to the board of directors"; see Nov. 1, 1971.)

NCR's first contract is with Ohio's Montgomery County, where Dayton is located. The $503,000 contract calls for NCR people to take over operation of the county's Century 251 and 201-based data processing center and to make a study for the county's future computer buys over the next three years. The contract is understood to be the pilot for an aggressive facilities management

effort by NCR in the lucrative government market and, eventually, in the financial systems market where NCR has long held its own against IBM in systems know-how, if not in volume of hardware installed.

BELL AFFILIATE CHARGED WITH BRIBES, SHREDDING AND DELAYS

The Justice Dept.'s case against AT&T may be aided by revelations from another antitrust case against the company. A former top official of AT&T affiliate Southwestern Bell, James Ashley, has talked of payment of bribes to city councilmen, shredding of embarrassing internal documents, and intentional delays in supplying circuits to users of independently-made terminal equipment. His testimony was made recently in a deposition in an antitrust case filed two years ago by the now bankrupt San Antonio Telephone Co. and other manufacturers of equipment that connect with the Bell system. Bell has denied all the charges.

SHADES OF THE SIXTIES

A rare bird, hitherto thought to be extinct, has been sighted in the Boston area. It's a computer hardware company startup venture -- something that hasn't been seen through the tangle of bankruptcies and forced mergers for years. The company, in Lexington, Mass., is called Lexidata, and has designed a soon-to-be announced, inexpensive graphics terminal that would sell for $1,200 in large oem orders. The company claims its equipment outperforms similar hardware on the market that typically sells for $15,000 in oem quantities.

ONE FOOT IN CUBA

The West German smuggling ring that trafficked in shipping IBM materials into the Soviet Union may have had some American members. While German authorities announced the arrest of nine Germans in the ring, some American individuals are said to be under investigation in the case...Meanwhile, another communist country -- Cuba -- is interested in purchasing as many as 7,000 typewriters from IBM-Canada. The deal is still in the negotiating stages, but IBM-Canada does admit that the Cubans have expressed an interest in the typewriters. If IBM can pull the deal off, it could represent an important foot in the door for IBM, just at a time when U.S.-Cuban relations are improving.

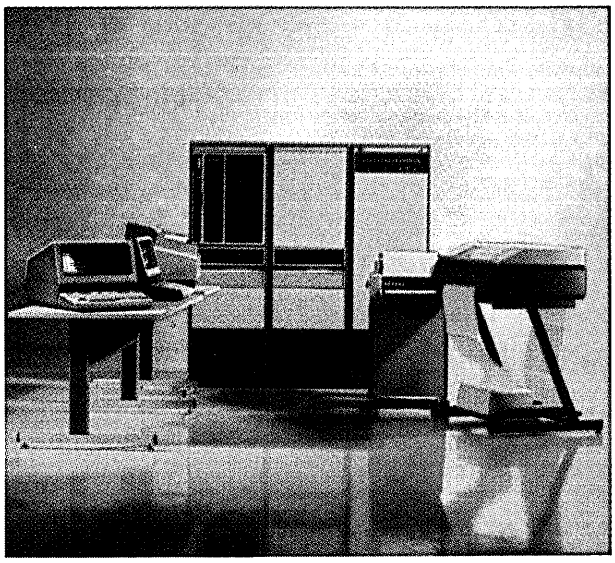
FIRE AT KERONIX: WHOSE ALLEGATIONS ARE RIGHT?

On the eve of his birthday, Jan. 3, 1973, executive vp George Foldvary of Keronix, Inc., of Santa Monica, Calif., received an 8 p.m. telephone call from Laszlo Keresztury, president of the 60-employee core memory company. He was ordered to come right down. The plant was on fire. Foldvary arrived at the flaming plant in a dinner jacket, thinking the call had been a ploy to get him to a surprise birthday party.

Last Christmas Eve Keronix filed a civil suit in Santa Monica superior court alleging that the fire was set by agents of minicomputer maker Data General Corp. It asked for $55 million in actual and punitive damages. It's a bizarre case involving FBI and local and county investigations into Data General's alleged hiring of a detective agency that tried without success to wiretap the Keronix phones, successfully got telephone records to intimidate Keronix customers, and finally set the company's plant afire at 7:15 p.m. on Foldvary's birthday eve.

Keronix, which sells add-on memories for Data General and six other minicomputer lines and now manufactures a minicomputer of its own, has set the business press and the fiercely competitive minicomputer industry buzzing with questions about the suit. Half of last month's one-hour Data General annual meeting was devoted to it. Data General's president Edson deCastro said the charges are "preposterous" and Frederick R. Adler, a founder and director, called the suit a "bloody pain in the neck" that will cost the company $250,000 a year in legal fees to fight. deCastro and Adler are named in the suit. Three Data General officers, including deCastro, were called before a grand jury for questioning about the Keronix case. Data General has

Continued on page 98



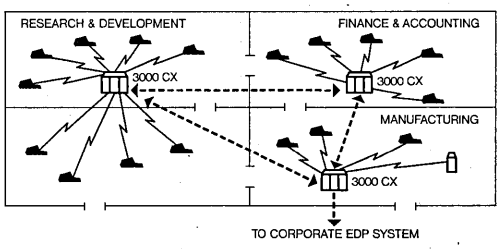
HP 3000CX Mini DataCenters

Think of them as branch offices. Computers for the many data handling "customers" within a company. The 3000CX is a series of small, terminal-oriented systems that work as an adjunct to the corporate EDP center.

Not just minicomputers. Mini DataCenters. They're the only minis with a single, fully multiprogrammed, multiuse, operating system. You get spooling, virtual memory, and a communications subsystem to link Mini DataCenters to each other. And to the big number crunchers as well.

You can run programs in five languages (any combination), in all three modes — time-share, real-time, and batch.

Full service "branches." A Mini DataCenter will support an entire department or division with interactive terminals and options to handle tasks in business, science, and industry.



So, while the folks in R&D are using a Mini DataCenter for real-time data acquisition, shipping is using it to call up orders, and marketing is generating a quarterly sales report. As the volume increases, add another 3000CX (or two).

More for your money. Call HP and see one in action. Then you decide. Four 3000CX models cost from $99,500 to $203,500 in the USA. Low enough to let you branch out now.

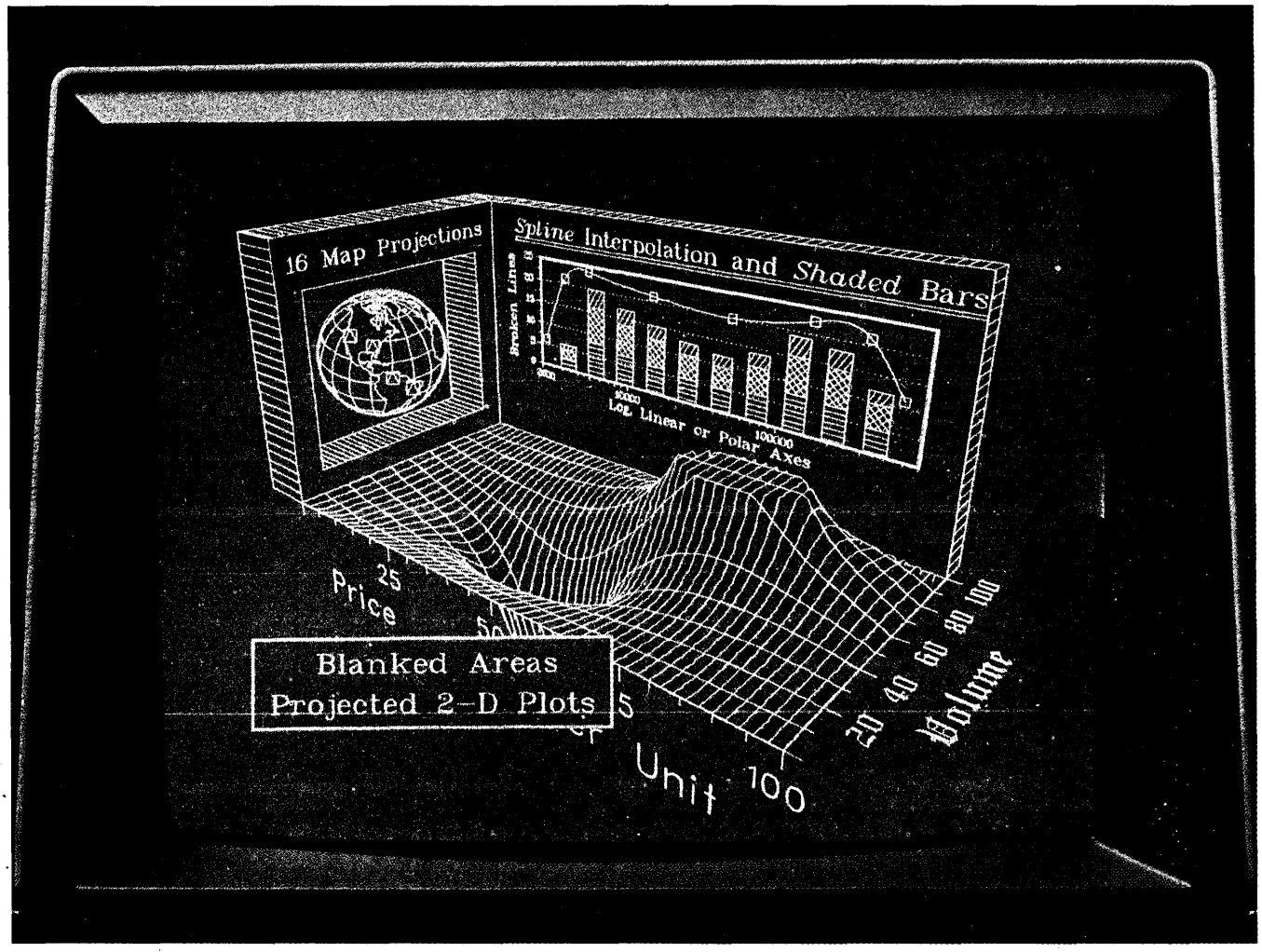
HP minicomputers. They work for a living.

HEWLETT hp PACKARD

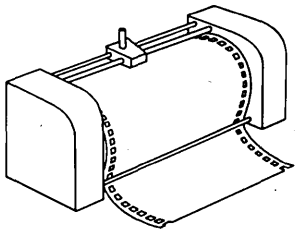
Sales and service from 172 offices in 65 countries.
1501 Page Mill Road, Palo Alto, California 94304

22507 A

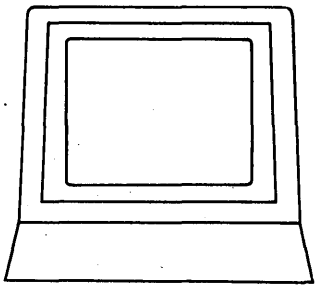
CIRCLE 18 ON READER CARD



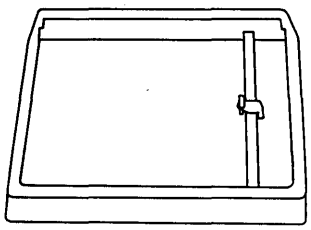
Our Independent Graphics Software System Leaves You To Your Own Devices.



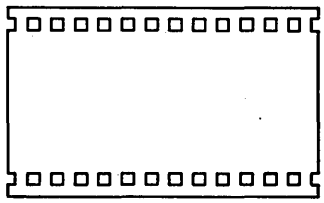
Drum Plotters
Interfaced to:
Calcomp (563, 565, 763, 765, 936, 1036, 1136); H.I.; Zeta



CRT's
Interfaced to:
Tektronix (all); Computek; H.I.; Vector General; Adage; IBM 2250

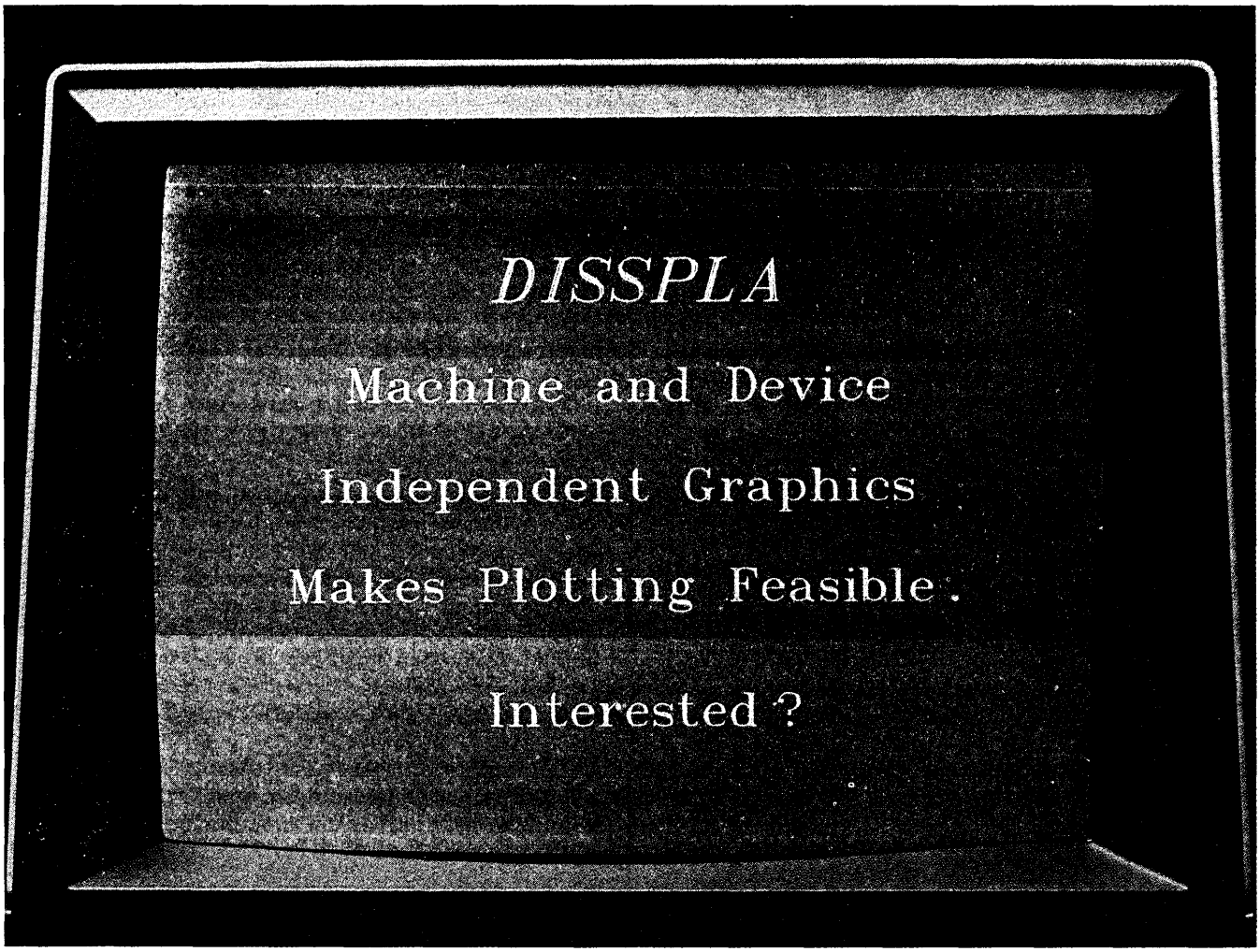


Flatbed Plotters
Interfaced to:
CIL; Xyenetics; EAI; Tektronix; Hewlett Packard; Gerber Artwork Generator; Gerber



Microfilm Devices
Interfaced to:
Calcomp (835, 865, 890); FR 80; COMP 80; SC 4020; SC 4060

All we ask is the ability to draw a straight line.



Our users are able to construct a sophisticated plot on a CRT terminal in *about an hour.* Check it for accuracy on a drum plotter. Then use microfilm for the production run. And all with the same program.

Almost every computer application can make good use of graphics. Bar charts, pie graphs, performance comparisons, route maps, even computer usage graphs are plotted from computer printouts. Graphics, generally, haven't been plotted *directly* by the computer. Hardware is available. But limited and incompatible software has been the obstacle. DISSPLA *now* makes plotting feasible.

DISSPLA is machine and device independent. And it is rapidly increasing graphics use. One user installed this package and one week later ordered *30 terminals.* Another user averages five thousand plots daily. Graphics are now practical for *more* programmers than just the specialized.

1. **MACHINES** DISSPLA turnkey versions are readily available for IBM 360/40 through 370/195 (OS, DOS, VS, and TSO); CDC Cyber 70, 6000 Series, 7600 (SCOPE and KRONOS); UNIVAC 1106/1108/1110 (Exec 8); Special military (Q20B, UNIVAC 1230). In fact, each principal version took less than *four* weeks to prepare and checkout.
2. **EASY TO USE** DISSPLA is a system of FORTRAN subroutines. And heavily used from COBOL, ALGOL and PL/I. Beginner, intermediate and advanced manuals are provided with many examples. You'll receive the instructions to produce the two plots in this ad with the DISSPLA information package.
3. **PUBLICATION-QUALITY PLOTS** DISSPLA has business and scientific features, maps, 3-D hidden line surfaces, 51 publication-quality character sets, shading and numerous other features.
4. **ALREADY IN WIDE USE** DISSPLA has been in use more than six years. And now in more than 50 installations in the U.S. and Europe. Here is a partial list of our users:

   The First National Bank of Chicago; Bell Laboratories (Murray Hill, Whippany, Merrimack Valley, Columbus, Naperville); AEC (Argonne, Hanford, Savannah River); AVCO Computer Services; EXXON; General Dynamics (Convair); CDC Cybernet (Worldwide); FMSAEG; Lockheed Missiles and Space Company, Inc. (Sunnyvale); Naval Electronics Lab Center; Naval Undersea Center; Naval Weapons Center (China Lake); Dutch Post Office (PTT); Shell Petroleum (Worldwide); SIA (London); Standard Oil Company (Indiana); TRW Systems.

DISSPLA

Display Integrated Software System and Plotting LAnguage
A proprietary software product of ISSCO

For more information call Sunny Harris (714) 565-8098 or (714) 272-5606.
Or write

ISSCO

Integrated Software Systems Corporation
P.O. Box 9906, San Diego, California 92109

In Europe contact: Repko b.v. van Blankenburgstraat 58
The Hague, Holland
Telephone 070-608425

calendar

FEBRUARY

Midwest Digital Equipment Exhibit, Feb. 18-19, Minneapolis. More than 50 manufacturers of computer terminals, data communication equipment, peripherals, data acquisition and digital test instruments will exhibit their products for an expected attendance of 500 users and manufacturers. Contact: Clarence K. Peterson, Deerland Distributors, Inc., Hennepin Square Bldg., Minneapolis, Minn. 55413, (612) 331-6433.

3rd Annual SWAP Symposium, Feb. 17-20, Lake Buena Vista, Fla. The 2,000 members of Wang Laboratories users society are invited to attend this meeting to discuss problem-solving, and new applications and programs. Reports from committees and special interest groups will be presented. Fees: $35. Contact: Jason Taylor, 836 North St., Tewksbury, Mass. 01876, (617) 851-4111.

MARCH

7th Annual Southeastern Symposium on System Theory, March 20-21, Auburn, Alabama. Sponsored by the engineering schools of Auburn Univ. and Tuskegee Institute, with IEEE participation, the symposium will feature theoretical and applications-oriented papers on system theory concepts and methodology. Topics include micro and minicomputers, environmental systems, communication systems, biomedical systems, and instrumentation systems. Fees: $35, members; $45, nonmembers. Contact: Fred O'Brien, Jr., Auburn Univ., Auburn, Ala. 36830, (205) 826-4370.

APRIL

5th Conference on Computer Audit, Control and Security, April 14-16, New York. This meeting will feature papers and panel discussions covering developments of the past 16 months in edp audit, control and security of information systems. About 500 auditors will exchange ideas and experience, as well as information on advanced systems. The conference is sponsored by the Institute of Internal Auditors and Automation Training Center. Fees: $300. Contact: IIA, 5500 Diplomat Circle, Orlando, Fla. 32810, (305) 647-4700.

International Conference on Reliable Software, April 21-23, Los Angeles. Conference objective is to bring together "theoreticians, tool-developers and practitioners to exchange results, concepts, experience and ideas contributing to the achievement of reliable software." Daytime meetings, evening panel sessions and ad-hoc discussions will center on the theory, construction aids, testing and estimation, and practical aspects of the conference subject. Fees: $45, ACM or IEEE members; $50, nonmembers; (add $10 after April 1); $10, students. Contact: Dr. Barry W. Boehm, program chairman, TRW Systems Group, One Space Park, E1/5017, Redondo Beach, Calif. 90278.

Interface 75, Data Communications Conference & Exposition, April 21-23, New Orleans. This third annual conference, billed as "the only national forum exclusively for data communications users and vendors," is expected to attract 2,000 representatives from business, industry and government. Sessions will include advice on the purchase of data communications hardware, software and services, and applications programs on "how-to" plan and implement datacom systems in several specific areas. The DataComm school will be geared to newcomers in the field with discussions of systems planning and administration, data terminals, data transmission services and modems, and data processors and software. More than 100 vendors will exhibit their products and equipment. Fees: one day, $50; three days, $95; team fees (three or more), $25 and $50, respectively. Contact: Ken A. Puleo, 160 Speen St., Framingham, Mass. 01701, (617) 879-4502 (collect).

16th International SID Symposium, April 22-24, Washington, D.C. "Original papers and state of the art tutorials, describing significant developments, will be presented on display hardware and software techniques, devices, systems, applications and effectiveness," at this annual forum. Approximately 35 exhibits will display operational equipment, systems and components. A supplemental two-day seminar program on displays, cosponsored by the Society for Information Display and the Univ. of Maryland, will be held April 21 and 25. Symposium fees: $45, members; $55, nonmembers; $10 less for advance registration; seminar fees: $70, one day, $110, two days. Contact: Lewis Winner, 152 West 42nd St., New York, N.Y. 10036, (212) 270-3125.

6th Annual Pittsburgh Modeling and Simulation Conference, April 24-25, Pittsburgh. In addition to traditional areas of the subject topic, this year's meeting will emphasize social, economic, educational, urban and global modeling and simulation. Sponsors are the Univ. of Pittsburgh's school of engineering, in cooperation with the IEEE and the ISA. A varied audience of engineers, social scientists and economists is expected. Fees: $35, members; $40, nonmembers. Contact: William G. Vogt, 231 Benedum Engrg. Hall, Univ. of Pittsburgh, Pittsburgh, Pa. 15213.

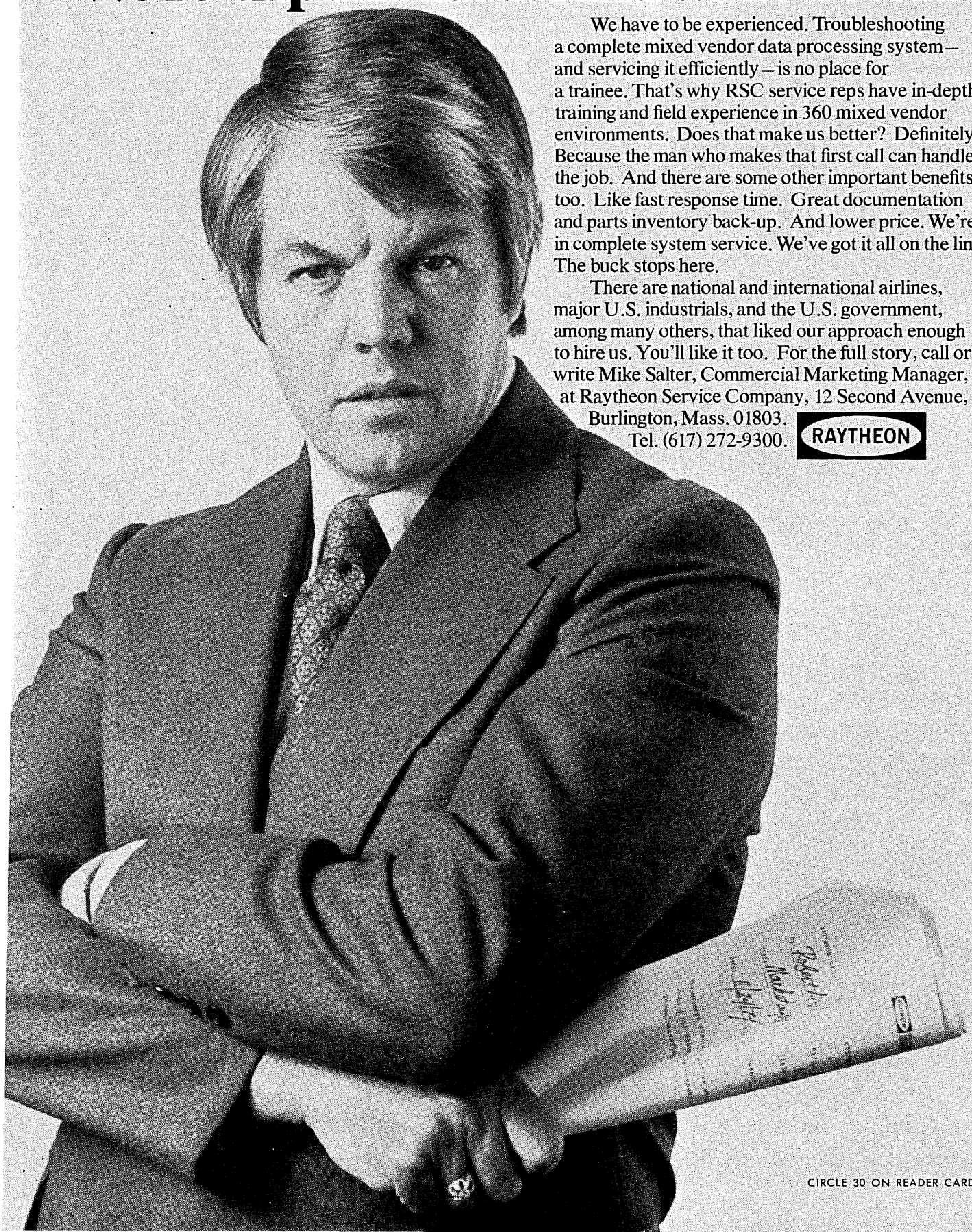
Computing Careers for Deaf People, April 28-29, Washington, D.C. Sponsored by the ACM Special Interest Group on Computers and the Physically Handicapped (SIGCAPH), this conference will "emphasize the challenges and opportunities for deaf people in the computing field" by acquainting educators, vocational counselors, industry, and government with recent developments in training of the deaf for dp careers. Interpreters will be available. For registration and fee information contact: Dr. Steven L. Jamison, 1501 California Ave., Palo Alto, Calif. 94304, (415) 493-3000, ext. 3107.

MAY

4th Man-Computer Communications Conference, May 26-27, Ottawa, Canada. The radio and electrical engineering division of the National Research Council of Canada is sponsoring this conference to "provide a forum for the presentation and critical discussion of recent and current work in interactive computer graphics applications and techniques." Technical sessions will be geared to the interests of industry, government and universities. Contact: M. K. Ward, National Research Council, Ottawa, Canada K1A OR6.

Conferences are generally listed only once. Please check recent issues of DATAMATION for additional meetings scheduled during these months.

When you service mixed vendor systems you'd better be experienced. We're experienced. And we're better.



We have to be experienced. Troubleshooting a complete mixed vendor data processing system—and servicing it efficiently—is no place for a trainee. That's why RSC service reps have in-depth training and field experience in 360 mixed vendor environments. Does that make us better? Definitely. Because the man who makes that first call can handle the job. And there are some other important benefits too. Like fast response time. Great documentation and parts inventory back-up. And lower price. We're in complete system service. We've got it all on the line. The buck stops here.

There are national and international airlines, major U.S. industrials, and the U.S. government, among many others, that liked our approach enough to hire us. You'll like it too. For the full story, call or write Mike Salter, Commercial Marketing Manager, at Raytheon Service Company, 12 Second Avenue, Burlington, Mass. 01803. Tel. (617) 272-9300.

RAYTHEON

CIRCLE 30 ON READER CARD

Today's broadest choice of medium-speed

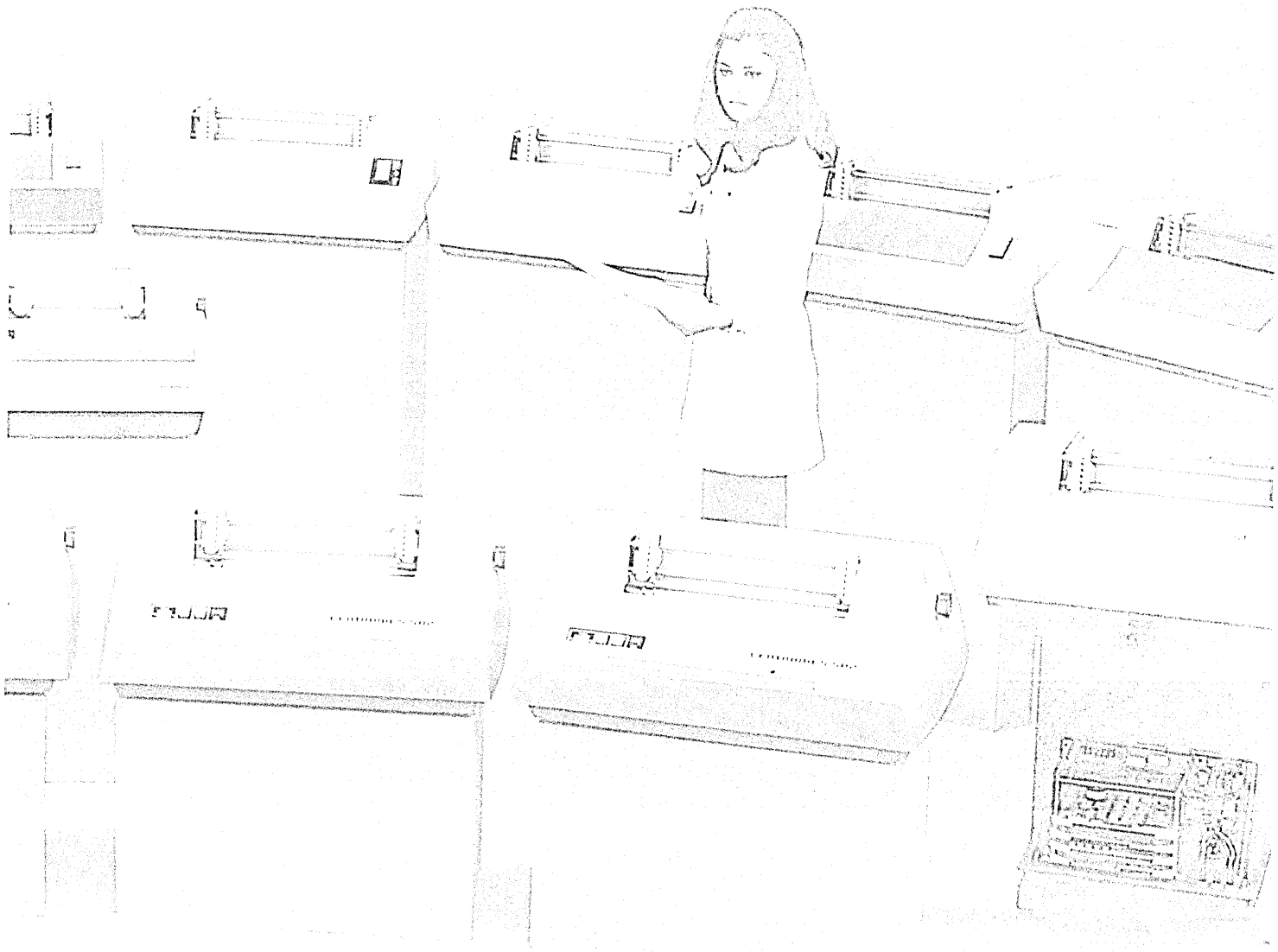
Centronics offers more models, features and options than anyone else.

Anywhere you need hard-copy output—in communications systems, data entry, minicomputer systems, small business systems, computerized industrial control—you'll find there's a low-cost, high-reliability Centronics® impact printer to do the job.

It's industry's broadest and fastest-growing line of printers and teleprinters. Which means you have more to choose from. Including three different series of printers with speeds from 100 to 1000 char/sec. (40 to 300 lines/minute). And column widths from 80 to 132. And data communications in receive-only or keyboard send/receive. And multicopy printing with bold face characters on command. And our new, unique condensed type. Plus a choice of over 20 foreign language character sets for multilingual printing. Plus a broad range of other capabilities that puts Centronics printers in a class by themselves for optimum price/performance value.

And that's not all.

Centronics has more optional features than any other printer manufacturer. Options like RS-232, current loop, and CRT interfaces. And computer interfaces. Communications to 1200 baud. With Centronics printers—the most advanced, most widely used, and most thoroughly proven printers of their kind—you get:



printers. And the family keeps growing.

State-of-the-art design—Advances like LSI electronics, and fast, twin-head bi-directional printing (no carriage return to slow down output).

High reliability—Proven in tens of thousands of installations. All Centronics printers pass stringent computerized tests, and incorporate the same basic, field-proven modular components.

Expert field service—Available through over 50 field service offices in the United States, plus offices in Canada and Europe. With Nationwide Central Dispatch Service through a single, toll-free number for faster service turnaround and centralized customer service records.

Supply dependability—Through volume production of printers, Centronics keeps your costs low, and assures prompt deliveries—two of the very best reasons for making Centronics *your* source for printers. Centronics Data Computer Corporation: Hudson, New Hampshire 03051 (603) 883-0111.

Eastern Region: Burlington, Mass., (617) 272-8545
Central Region: Kettering, Ohio, (513) 294-0070
Western Region: Santa Ana, Calif., (714) 979-6650
Centronics Data Computer (Canada) Ltd.: Mississauga, Ont., (416) 625-0070
Centronics International Corp.: Brussels, Belgium, 02-762-3572/3

CIRCLE 75 ON READER CARD

The fastest-growing family of medium-speed printers CENTRONICS

Our Graphics.

Now they lend an even bigger hand.

Present graphic and alphanumeric information the fastest way possible.

Our 4010 Graphic Display Terminal gives you the power. With 11 inches of pure screen readability. Team it with our 4610 Hard Copy Unit and copy your ideas as quickly as you get them. Change them, and then work with them some more.

A graphic presentation gives you your ideas in pictures, designs, graphs, and procedures. All in sharp high-resolution display. Flicker-free. Instantaneously. Just the way you think. Analyzing is faster. Decision making, more profitable.

Add our Flexible Disc Memory. That's convenient, user-controlled storage for off-line or auxiliary use. With dual disc capacity of 524K bytes. Our Graphic Tablet for fast, freehand digitizing and menu picking. Whatever you need in a big way, our graphics give you. At a price that's just as realistic. Graphic terminals from $4195, to the big 19-inch terminal for $9995.
Graphic Tablet, $4995.
And Dual Disc Memory, $5995.

Ready for a big hand? Give your local Tektronix Applications Engineer a call. And for a bigger picture of the graphics story, write for our new publication, The Computer Graphics Handbook. It's free and it's information you can use, from:

Tektronix, Inc.
Information Display Division
P.O. Box 500
Beaverton, Oregon 97077.

TEKTRONIX®

CIRCLE 61 ON READER CARD

source data

SOURCE DATA provides information on books, courses, references, reports, periodicals, and vendor publications.

books

SECURITY OR INSECURITY

Security Systems Review Manual
by R. L. Patrick
American Federation of Information Processing Societies
AFIPS Press, 1974
109 pp. $10.00

Guidelines for Automatic Data Processing Physical Security and Risk Management
by R. V. Jacobson, Dr. W. F. Brown and P. E. Browne
Federal Information Processing Standards Pub. 31, 1974
92 pp. $1.35

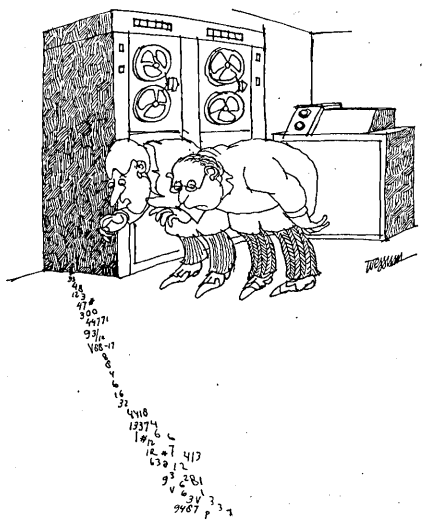
These two latest computer security manuals are opposite extremes in approach to the subject.

The AFIPS Security Manual might have been better named the "Insecurity Manual." It is largely a collection of questions, 800+ in number, calculated to spur the imagination and concern of its audience. No reasonably dedicated computer center manager could read the AFIPS manual and feel secure about his installation. The manual states that in order to do an adequate threat analysis, one must be suspicious and "think like a thief." This reviewer was suspicious to begin with and now may be slightly paranoid.

The most unsettling thing about the AFIPS manual is there are no solutions to some of the problems portrayed. Particularly those in the systems section. After all, how many of us can afford to rewrite his operating system?

Still, there is a great deal to be said for AFIPS' approach. Many data center managers today have convinced themselves they have a "reasonable" level of security. Some have paid a very high price to counter obvious security threats. After reading the AFIPS manual, they may discover very subtle but dangerous flaws in their security plan. For instance, one may install a diesel generator to supply emergency power, but put the fuel supply in a place where it is easily polluted. The AFIPS manual causes one to think about most possible security breaches. Many can be discarded without too much thought, but at least they were considered and rejected.

AFIPS includes many "general principles" which are minimum recommended reading for "busy" managers. Most are basic, some are subtle and a few are thought-provoking. The goals of the manual are, first, to allow each computer center manager to assess his needs for security, and, second, to make him aware of steps taken by others faced with similar problems. It may well be an excellent self-assessment tool. Since the manual was computer composed and therefore should be easily updated, I can only assume the second objective will be satisfied in future publications. The manual recommends itself to data center managers, dp auditors and systems designers. Of this audience, the auditors will find it most useful.



© DATAMATION ®

"Patrick's manual didn't say anything about **this** kind of a security leak."

If after reading the AFIPS manual, you are feeling insecure about your computer center, let me recommend the *Federal Guidelines for ADP Physical Security and Risk Management.*

It begins with an 11-point action summary. The summary starts with how to organize your security program, and covers risk analysis, natural disaster probabilities, utilities, com-

(Books continued on page 112)

reports & references

Data Base Systems

How do users rate the leading data base management systems? A 28-page report, *A Buyer's Guide to Data Base Management Systems,* a November supplement to *Datapro 70,* finds a higher degree of overall satisfaction among users of the four leading independent systems—TOTAL, IDMS, SYSTEM 2000, and ADABAS—than with IBM's IMS or DL/1 DOS/VS. Each DBMS was evaluated by the users surveyed for performance in five categories: overall satisfaction, throughput/efficiency, ease of installation documentation, and vendor support. In addition to detailed analyses and comparisons of these systems, the report presents guidelines for selecting and implementing a DBMS. Price: $10. DATAPRO RESEARCH CORP., 1805 Underwood Blvd., Delran, N.J. 08075.

Computer Output Microfilm

The results and analysis of a survey of current and potential computer output microfilm (COM) users is documented in the 47-page book, *Industry Survey: Computer Output Microfilm.* Covered are such subjects as COM recorders, processors, duplicators, preferred microforms, polarity, reduction, film type, etc., plus additional figures on user organizations. Price to members: $40; to nonmembers: $65. Publication Sales, NATIONAL MICROFILM ASSN., 8728 Colesville Rd., Silver Spring, Md. 20910.

Time-sharing Market

Revenues in 1974 for computer time-sharing services exceeded $1 billion for the first time, and are projected to double within five years. The median monthly expenditure was about $5,000, and General Electric, Control Data, Tymshare, and National CSS were the most heavily used vendors. Of the 250,000 terminals installed for time-sharing purposes, a growing proportion is composed of CRT/keyboard display devices and special purpose terminals. Further details of an in-depth market survey of a cross section of dp managers of major industrial firms and financial institutions are found in the 190-page *Timesharing Markets.* A 10-year market projection, a detailed analysis of the market, and future tele-

source data

communications requirements for time-sharing are featured. Price: $595. INTERNATIONAL RESOURCE DEVELOPMENT, INC., 46 Main St., New Canaan, Conn. 06840.

Computer Networks

All aspects of computer networks including hardware, software, data transmission, time-sharing, and theory applicable to network design are covered in a 169-page *Computer Networks: A Bibliography with Abstracts* (COM-74-11572/6WC). Using the NTIS online search system, NTIsearch, 153 abstracts of research reports were selected. Price: $20. NATIONAL TECHNICAL INFORMATION SERVICE, U.S. Dept. of Commerce, 5285 Port Royal Road, Springfield, Va. 22161.

COBOL Standard

The 1974 revision of *American National Standard Programming Language COBOL* (X3.23-1974) is now available. Forms for and interpretations of COBOL programs are specified, and a high degree of machine independence is intended. Price: $12. AMERICAN NATIONAL STANDARDS INSTITUTE, INC., 1430 Broadway, New York, N.Y. 10018.

Communication Facilities

Privately built communications facilities are rated higher by data communications users than Bell System facilities, which itself scores slightly higher than Western Union, other telephone companies, and the specialized common carriers. Such are the findings of an extensive user survey reported in *All About Data Communications Facilities,* a 27-page reprint from the December supplement to *DATAPRO 70.* Designed to help users in selecting facilities, the report features charts and tables that summarize current rate structures for the public networks, leased lines, WATS, TWX, Telex, and other services. Price: $10. DATAPRO RESEARCH CORP., 1805 Underwood Blvd., Delran, N.J. 08075.

Remote Computing Services

Network Information Services (NIS), the remote computing services industry, will grow from $766 million in 1973 to $2.9 billion in 1979, according to the 125-page report, *The Remote Computing Industry.* Analyses of 20 successful remote computing companies are included. Competition from banks, dp spin-offs of large companies, and in-house expansion of computer power due to decreasing costs of hardware and data communications, are covered. Price: $495. QUANTUM SCIENCE CORP., 245 Park Ave., New York, N.Y. 10017.

DATAMATION Subject Index

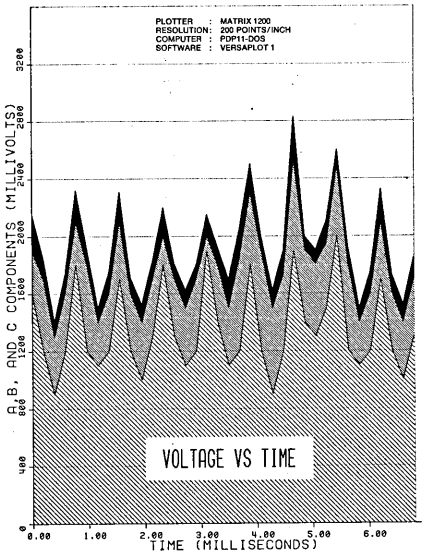
There are still some copies of the subject index of 1974 DATAMATION, Vol. 20, Nos. 1-12, which includes references to feature articles, conference reports, book reviews, News in Perspective, Editor's Readout, and the Forum. DATAMATION, Los Angeles, Calif.

FOR COPY CIRCLE 200 ON READER CARD

vendor literature

Printing & Plotting

Why, Where, and How to Use Matrix Electrostatic Printers, Plotters, Printer/Plotters, and Proofers, a 16-page booklet describes advantages and applications of electrostatic outputing. Impact and nonimpact printers are compared,



and this vendor's electrostatic machines are discussed in detail. Applications from general dp use to medicine, production control, and printing and publishing are mentioned, and a four-page folio presents sample output.

Two basic software packages for electrostatic plotting are described in a 12-page brochure, *Versaplot Software.* Illustrations of plot samples and other pertinent information are included. VERSATEC, Cupertino, Calif.

FOR COPY CIRCLE 201 ON READER CARD

Paper Eater

Getting rid of files, folders, etc. in a hurry is made convenient by this vendor's Model 10 Shredder. Up to 300 pounds of unwanted papers, including paper clips and staples, are shredded into ¼-inch strips "to ensure that confidential matters stay confidential." Described as "blending with any office decor, the equipment can be kept close at hand" to provide, one supposes, instant ability to make paper evidence vanish. The equipment is also described as quiet and clean in operation. CUMMINS-ALLISON CORP., Glenview, Ill.

FOR COPY CIRCLE 202 ON READER CARD

Print/plot System

Systems which include a Statos 31 or 33 electrostatic printer/plotter and matching read-only magnetic tape unit, designed for use with large computers such as the IBM 360/370 in an off-line configuration, are described in a six-page brochure. Hardcopy applications are featured; and the electrostatic writing technique is discussed, as well as the software which supports the system. VARIAN, Palo Alto, Calif.

FOR COPY CIRCLE 203 ON READER CARD

Private Phones

Interconnect telephone systems for businesses and institutions are described in literature available from this vendor. The INTERCONNEX systems are reportedly for firms requiring from 12 to several thousand extensions. LEAR SIEGLER, INC., Santa Monica, Calif.

FOR COPY CIRCLE 204 ON READER CARD

Disc Products

Three technical product bulletins describe new disc products. The Memorex 3673 disc controller is an electronic interface unit that permits direct attachment to large 370s, and in addition, provides 2-, 3-, and 4-string switching. The 3672 disc storage control unit interfaces to 360 model 195, 370 models 135 and up, and also contains the optional string switching capability. The 3675 double density disc is a large capacity, high performance, direct access device consisting of two independent drives; in conjunction with the 3673, the 3675 provides more than 400 million bytes of on-line storage.

These bulletins contain photographs and descriptions, lists of standard and optional features, operation characteristics, specifications, and other pertinent information. MEMOREX CORP., Santa Clara, Calif.

FOR COPY CIRCLE 206 ON READER CARD

(Continued on page 33)

DP DIALOG

Notes and observations from IBM which may prove of interest to data processing professionals.

At a 3650 point-of-sale terminal, a sales clerk "wands" a magnetically-encoded merchandise ticket at a Dillard's Department Store.

IBM Industry Systems Meet the Public

Supermarket checkout clerks, bank tellers, department store salespeople—all face a steady stream of customers who seem to have one thing in common. They're in a hurry. They'd like to be taken care of so they can get on to something else.

Now three new IBM systems are at work aiding people who serve the public. The systems are making possible faster, more accurate customer service and they're providing management with swifter, more comprehensive information. Much of this information is gathered when transactions actually take place, at the point of sale or at the teller's window. The result should be a marked increase in overall operating efficiencies.

The three new systems are the IBM 3600 Finance Communication System, the 3650 Retail Store System and the 3660 Supermarket System. In recent months, each of the systems has been installed at a number of locations. Experience with them, although brief to date, already throws light on the kind of benefits these systems help make possible.

Dillard Department Stores, with headquarters in Little Rock, Arkansas, operates 30 full-line department stores in six states. New stores are being added at an average of three a year and sales have grown rapidly to a projected $185 million in 1974.

Dillard's is using the 3650 Retail Store System in two stores, one in Little Rock and the other in Lubbock, Texas. Three more stores will be converted to the 3650 this year. Components of the system now operational at Dillard's include point-of-sale terminals, ticketing units and store controllers, the latter interfacing with the terminals on one hand and with Dillard's IBM System/370 Model 145 on the other.

"Results with the 3650 so far have been very good," says Archie Crittenden, vice president of corporate systems and data processing. "We expect the system will provide us with both flexibility and centralized control."

Chemical Bank, New York, was one of the first commercial banks to install the 3600 Finance Communication System. With 158 offices in metropolitan New York, plus comprehensive domestic and international banking services, Chemical's ultimate objective with the system is the establishment of a single data processing network for the entire bank.

(Continued on next page)

Advertisement

Helping Computers Operate At Top Efficiency

Two years ago, Bernie Patton, computer operations manager for Deere & Company of Moline, Illinois, faced a difficult challenge. Deere's progressive data processing plan required a major equipment and programming conversion in a comparatively short time (from a System/360 Model 65 multiprocessor system and two System/370 Model 155s under OS/MVT HASP to dual System/370 Model 168s running OS/VS2 and ASP).

Introducing change into a production system can increase the possibility of error, and Deere's plans called for numerous major changes. At the same time, the testing of system programming changes demanded an hour and a half of dedicated machine time every weekday. This required taking 47 RJE terminals linked to Deere plants, sales offices and parts depots off-line.

"Production pressures resulted in insufficiently tested software," says Patton, "and that caused us too many outages. The productivity of our data processing professionals was being hampered by a lack of test time. It was costing us time and money, and our users were unhappy."

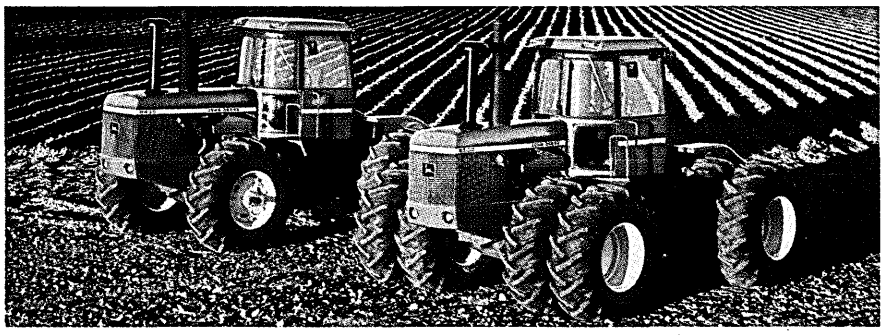
Patton and his staff mapped out a step-by-step conversion plan. They were determined to maintain maximum availability on the new Model 168s and it was essential that all new programming work smoothly. As a result, a System/370 Model 145 with virtual storage capability was used to meet the testing requirements.

Bernie Patton and Dick Townsend (right) review results of a programming test on the Model 145 with Karen Ziegler, systems programmer.

Dick Townsend, Deere's manager of computer centers, says: "The Model 145 meant far greater reliability of our programming. We also were able to make changes faster, while encountering fewer problems. Programmer turnaround time was substantially reduced. We were not only able to maintain extremely heavy production schedules but were also able to meet commitments to our user departments." Patton adds: "There is no doubt that the System/370 Model 145 has made a contribution toward increasing the overall productivity of our data processing department."

Soon, Deere will be opening a second computer center, five miles away, with a Model 158 and a Model 168. During lulls in testing, the Model 145 will run as a production machine. At other times, however, it will run under VM/370 for testing. Says Patton: "Every job we can run on the Model 145 under VM/370 will mean one less problem when we put the Model 158 and Model 168 systems on the air."

IBM



More efficient computing power has helped business boom at Deere & Co.—home of Deere tractors.

Industry Systems...

(Continued from first page)

"We now have numerous networks with various types of terminals linked to our IBM System/370 computers," points out Donald R. Moore, vice president. "The 3600 is a major step toward integrating all these terminals into one compatible system. And with its extensive on-line capabilities the 3600 will put us on the road to real-time control of operations."

And James F. Welch, vice president, information systems, points out that the 3600 should make possible substantial savings in time and costs. "For instance, the system will be able to produce up-to-the-minute account balances and place holds for all checks cashed," he says. "This could eliminate time-consuming check-cashing approvals."

Ralphs of Los Angeles is a major supermarket chain on the West Coast, with 80 stores in California. The company sees the 3660 Supermarket System as making possible a major advance in customer service. In October a Ralphs store in Lakewood, California was completely converted to 3660 operation, with the company's IBM System/370 Model 145 serving as the host computer.

"The transition was smooth and our Lakewood customers are responding favorably to the system," reports John Robertson, vice president of information systems. "Before converting, we set up a demonstration booth in the store to familiarize our customers with the procedures involved. They particularly like the register receipt tape, with each item identified and priced.

"Accuracy will be another benefit," he continues. "When the price of an item is retrieved from the 3660, the shopper doesn't miss any sale or promotional price and is always charged the correct amount of sales tax on the correct taxable item."

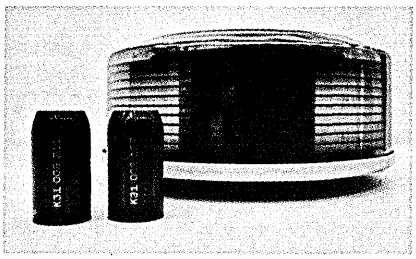
IBM

New IBM System Reduces Cost of Storing Data

The increase, both in multiprogramming and complex applications, has pointed up the need for more on-line data storage capability. As scheduling becomes more difficult, the handling and storage of tape reels and disk packs takes up more space and ties up many skilled people.

Now there's a new way to store and access information. It's called the IBM 3850 Mass Storage System and it extends the virtual storage concept to direct-access storage devices. Combining the economy of tape processing with the flexibility of disk, the 3850 can expand a user's on-line data storage capacity to as much as 472-billion characters of information.

Use of the system can end practically all manual handling of tape reels and disk packs. At the same time, the 3850 can dramatically reduce the actual monthly cost for storing a megabyte of data down into the 20-to-50-cent range. This can make new complex



applications economically feasible.

Key to the new system is the IBM data cartridge, only two inches across and four inches long, which can hold up to 50 million bytes. Two cartridges have a storage capacity equal to that of one IBM 3336 Model 1 Disk Pack (shown above).

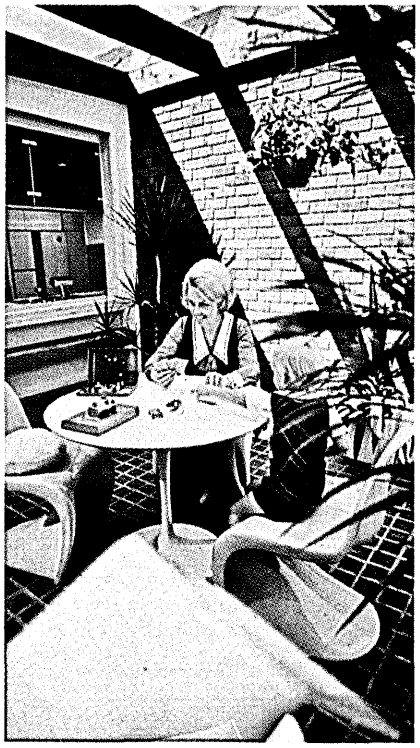
Cartridges like these are stored in a "honeycomb" of cells. When data is needed for processing, a cartridge is removed from its cell by an automatic mechanism and the data is read onto an IBM 3330 Disk Storage for computer use. **IBM**

A Test for the Solar Home

A computer in the garage and solar panels on the roof were two features of this home in Columbus, Ohio. The home was built by the Homewood Corporation of Columbus in an effort to make a real contribution to solving the nation's energy problems through low-cost residential energy.

Ohio State University, using the home as a field test laboratory, installed an IBM System/7 to demonstrate the technical and economic practicality of solar heating and cooling in single-family homes.

The computer took readings every 15 minutes. As it monitored the home, it checked temperatures in various spots around the house, recording the opening and closing of doors and checked such energy-related factors as thermo-



An experimental solar home heated and cooled by the sun.

stat setting, air and water flow and use of appliances and lighting. Outside, the computer kept track of the temperature, precipitation, wind direction and velocity.

Engineers at Ohio State are evaluating this information. Results of their analysis will give developers like Homewood the data needed to build the most efficient solar home.

Says Homewood vice president William Goldman, "We want people to see that solar energy for the home is not a dream. It's a real possibility." **IBM**

Researching Energy Alternatives

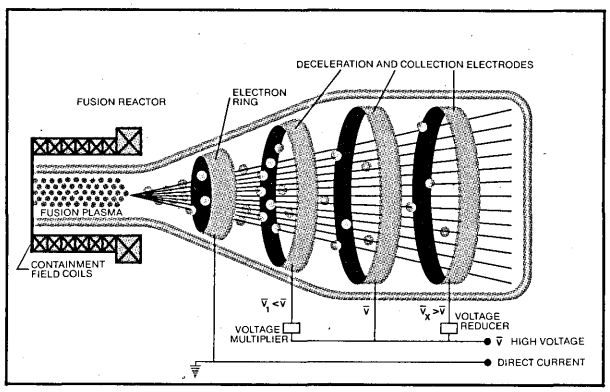
Energy development has become a critical national priority, involving both government and private business. To help meet this challenge IBM has recently increased its energy research efforts as exemplified by the work at its Scientific Center in Palo Alto, California, headed by Dr. Horace Flatt.

"Here we have combined some of the best talents within IBM to work on one problem—to help find solutions to the nation's energy problems through the use of the computer," says Dr. Flatt. "Our scientists are now involved in a variety of projects, including studies of pollution and optimizing electrical power distribution, as well as thermonuclear fusion."

Dr. Baxter Armstrong, manager of the fusion project, describes nuclear fusion as "the far-out technological hope of the energy crisis over the long term. Here at IBM we have worked since 1969 to assess the contribution which the computer can make toward the goal of controlled nuclear fusion."

Fusion reactors, he explains, offer several advantages over today's nuclear fission reactors, including an almost limitless supply of fuel.

"In the Fifties the outlook for achieving this goal of a practical fusion reactor was disappointing. But with the advent of new plasma confinement machines and large, high-speed computers, there is new promise for a solution to this most critical problem. Toward that end we are working here to formulate large-scale computational methods which will permit the realistic simulation of laboratory experiments or eventually, even of proposed fusion confinement machines." **IBM**



Working with a fusion reactor model like this, engineers hope to produce electricity by direct conversion, complementing primary power indirectly generated through a conventional steam cycle. (Schematic courtesy of Dr. R. F. Post of Lawrence Livermore Laboratory.)

Advertisement

The Changing Role of the DP Manager

Time was when the data processing manager ran a computer department which sometimes amounted to an extension of the accounting department. Payroll checks, financial statements and general ledger work were the order of the day.

But times have changed. Businessmen no longer look at the computer as a super-adding machine, spewing out just basic financial data. They look to it as an information tool for the entire company, providing tighter control over their assets.

This situation has thrust the data processing manager into a position with much broader and heavier responsibilities. Besides managing a team of programmers and technicians, he must now be able to work with and coordinate information with executives at all levels. He answers the needs of various departments with workable, usable information. In short, he has become an executive making decisions which can affect the entire company.

Responding to these changes, IBM is offering a five-day Data Processing Executive seminar at its Data Processing Division Education Centers in San Jose, California and Poughkeepsie, New York.

Ted Garvey, an instructor in the program, explains: "We stress the need for management involvement in the creation of an information system plan, which is also an integral part of the business plan."

To do this, the seminar focuses on having each student evaluate an organization from the viewpoint of the chief executive. In this way, the DP director can develop an understanding of the problems of the entire organization on every level.

One DP manager who attended the IBM seminar was Dick Eaton, data processing manager of the Charles Machine Works of Perry, Oklahoma, a manufacturer of a broad line of service line trenchers. The trenchers, marketed under the tradename Ditch Witch, are the invention of Ed Malzahn and his father Charles.

Ted Garvey drives home a point at the San Jose Education Center.

Ed Malzahn (right) and Dick Eaton in the Ditch Witch plant in Perry, Oklahoma, created an information system used as an integral part of the business plan.

As Eaton recalls: "I was brought in to organize the company's data processing department in 1971." "Our idea," adds Ed Malzahn, president, "was to computerize our business because we couldn't keep pace with the way we were growing."

The Charles Machine Works, which has its origins back in 1893 when Ed Malzahn's grandfather opened his blacksmith shop for the homesteaders, now has an IBM System/370 Model 135 operating under DOS/VS using CICS and DBOMP. In the plant, which covers some nine acres, and in the offices, 20 terminals are on line to the computer.

"At first," Eaton says, "I tried to develop an information system for the entire company, from our plant operations right down to the accounting department. The trouble was I didn't zero in on the needs of the other departments and because of this, I ran into some problems.

"The idea of working with the user was something I became more aware of while at the seminar in San Jose," says Eaton, "and after I returned to Ditch Witch, the first thing I did was to get together with Ed Malzahn. We then organized a steering committee which consisted of a task force for each division, from manufacturing to sales. In this way the problems of each department were discussed openly and freely and then, after working with our group of systems programmers, we were able to help work out their problems.

"Just recently, we met with the engineering task force to discuss a comprehensive project control system. This system will enable them to keep track of the costs of 21 different steps during development of a project. They want to be able to find out, via terminals, the exact status of each project as it is developed. From our discussions, the DP department will be able to write programs to fit their requirements. We follow the same procedure throughout the company.

"In the end I guess you could say spending more time with each department and having everyone involved in developing the system has made possible a more well-managed company, as well as a better organized DP department.

"We've really taken a new look at ourselves. We now have a long-range, seven-year business plan, which ties together our business objectives with our data processing requirements. We're into the third year of that plan now and we're right on target."

DP Dialog appears regularly in these pages. As its name suggests, we hope DP Dialog will be a two-way medium for DP professionals. We'd like to hear from you. Just write: Editor, DP Dialog, IBM Data Processing Division, White Plains, N.Y. 10604.

75-1

IBM®
Data Processing Division

source data

Decibel Reducers
Quietizers, acoustic enclosures which stop noise, are described in a catalog as available for dp terminals, word processing terminals, and office machines. They are claimed to be rugged and durable, yet are easy to install and allow easy operator access to the machine. VAN SAN CORP., City of Industry, Calif.
FOR COPY CIRCLE 207 ON READER CARD

Microelectronics
Microelectronics Technology at Raytheon/Quincy, a 12-page brochure describes high reliability, hybrid microelectronic circuits available from this company. Technical discussion on the

design and packaging of thick film circuits, and descriptions with pictures of production and quality control facilities are included. RAYTHEON CO., Quincy, Mass.
FOR COPY CIRCLE 205 ON READER CARD

Office Furniture
A 20-page brochure describes nine ways to plan "next generation" offices and workstations. Arrangements of workstations for programmers, crt operators, and word processors are provided, as well as those of executive and managerial offices. Photographs, scale layouts, and drawings detail the components of each assembly. STEELCASE, INC., Grand Rapids, Mich.
FOR COPY CIRCLE 209 ON READER CARD

Printer Links
Units which link the IBM 1403-series printers to non-IBM computers are described in an illustrated four-page brochure. This vendor's line of printer controllers and programmable off-line printing systems are featured. SPUR PRODUCTS CORP., Santa Monica, Calif.
FOR COPY CIRCLE 210 ON READER CARD

Computer Leasing
A portfolio on computer leasing provided by this vendor, a subsidiary of First National Bank of Boston, presents descriptions of services and equipment (computers and peripherals) available. Answers to questions such as "Why should a company look into computer leasing?" and "How is the bottom line affected by computer leasing vs. outright ownership?" are given. Over 240 cities across the country are serviced by this vendor. IBM 360s, 370s, tape drives, disc storage, printers, and other peripherals comprise the equipment inventory available. Installation practices and procedures are described. RANDOLPH COMPUTER CO., Greenwich, Conn.
FOR COPY CIRCLE 208 ON READER CARD

courses

Dp Seminars
A number of three-day seminars on various topics of interest to dp managers, system analysts, programmers, controllers, financial analysts, user managers, etc. are scheduled from February through April. The topics include data base systems; micro, mini, and midicomputer systems; edp financial analysis and reporting; effective system analysis and design; structured programming and other tools; and data communication systems. These courses will be held in selected cities (San Francisco, Dallas, New York, Washington, D.C., St. Louis, Detroit, Chicago, and Boston). Fee: $425 for each course (10% discount for AIIE members; team fees, half price). AMERICAN INSTITUTE OF INDUSTRIAL ENGINEERS, P.O. Box 25116, Los Angeles, Calif. 90025.

Individual IMS Training
CDC's Individualized Education Services Div. has come up with a complete IMS training program designed for an individual or group learning situation. With audio, visual, and written text materials, the curriculum includes IMS data base programming; IMS data base concepts; IMS data communications, concepts, and programming; and IMS advanced data based programming. IMS. P.O. Box 0, CONTROL DATA CORP., Minneapolis, Minn. 55440.

Management by Objectives
A self-study course on goal orientation in management is offered by AMA. Designed for all management levels, the course is not a theoretical one, but rather will stress "a nuts-and-bolts approach," giving guidelines, do's and don't's, and procedures. Other AMA self-study courses include "Communications for Results," "Human behavior in the Organization," "Training and Developing Today's Work Force," and "What Managers Do." Price: $55 each course ($50 for AMA members); 20% discount for all five courses. AMERICAN MANAGEMENT ASSOCIATIONS EXTENSION INSTITUTE, 135 W. 50th St., New York, N.Y. 10020.

periodicals

Creative Computing
A bimonthly, *Creative Computing*, is a nonprofit magazine for students and teachers using computers in colleges, secondary schools, and lower grades. Articles, news, and reviews of computer related subjects are included, and games, problems, exercises, etc., are featured. Articles in the first issue (November-December) include "The Guinness Book of Computer Records" and "Computer Experiments in Cognitive Psychology." Subscription: $8/yr. ($6 for students). CREATIVE COMPUTING, P.O. Box 789-M, Morristown, N.J. 07960.
FOR COPY CIRCLE 211 ON READER CARD

Information Systems
An international bimonthly journal, *Information Systems*, concerned with design, construction, maintenance, and use of computer-based information systems, begins publication in early 1975. Seeking to serve as a forum for researchers, developers, and practitioners in the field, the journal will have a unique feature in allowing readers to subscribe just to specific articles available as printouts or on magnetic tape. The editor-in-chief is Dr. Hans-Jochen Schneider, Institut fur Informatik, Univ. of Stuttgart. One year subscription (6 issues): $60. PERGAMON PRESS, Fairview Pk., Elmsford, N.Y. 10523.

Model 204

Database Management Software System

If you are considering a database management system, you should know about Model 204.

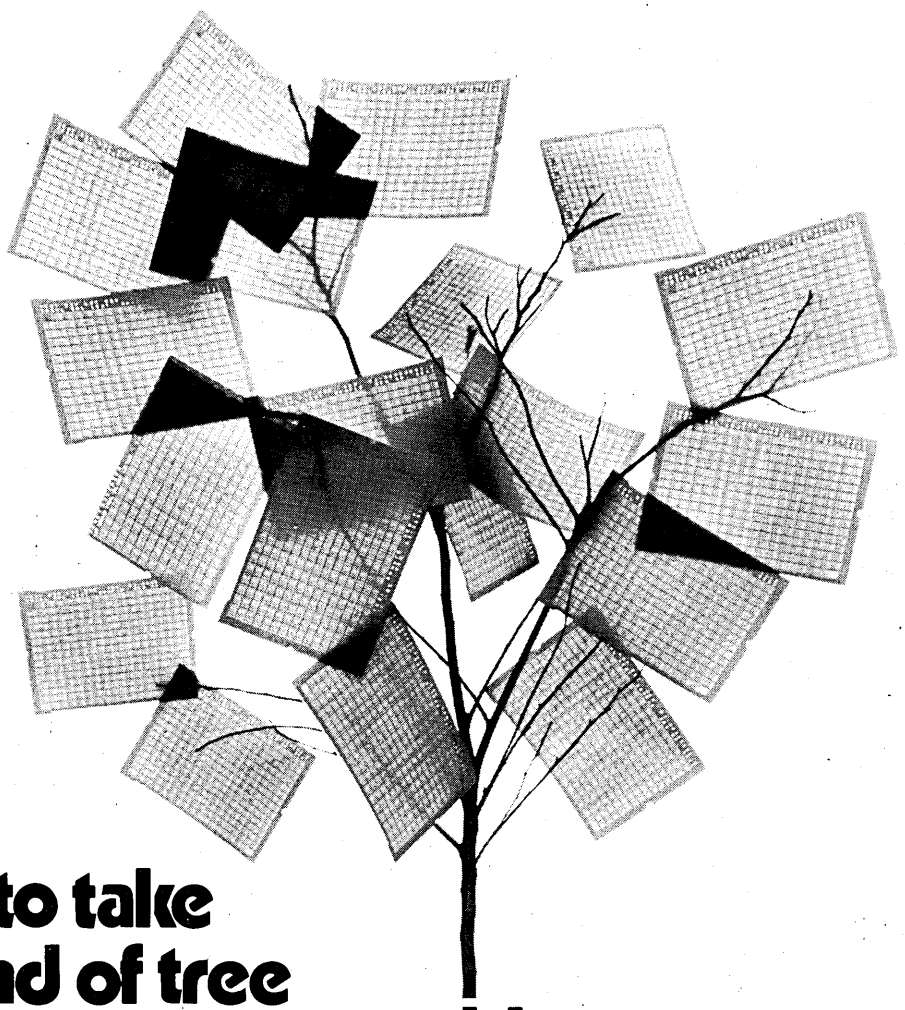
Model 204 is a proven database management software system offering multi-key access with rapid response, flexibility in data organization and safeguards for the privacy and integrity of data. A full complement of options is available, including on-line and batch update, a simple yet powerful user language, an interface to programming languages and a utility for file conversion.

Model 204 provides a practical solution to the problems of managing large databases. You will find Model 204 a superior product.

Computer Corporation of America specializes in the design, development and implementation of advanced information retrieval and database management systems.

Computer Corporation of America
575 Technology Square
Cambridge, Massachusetts 02139
(617) 491-3670

CIRCLE 49 ON READER CARD



It's going to take a new kind of tree to solve your paper problems.

Why use miles of forest . . . when all you may need are inches of microfiche? One of our modular DatagraphiX System 4500 COM recorders can help you beat computer-crippling paper problems in several ways.

Take the short supply of paper, for instance. No need to worry with DatagraphiX System 4500 on the job. Your viewer replaces paper—unless you want an occasional printout.

Or consider paper costs—which have recently risen as much as 75%. Also, some computer stock is now being discontinued by suppliers, forcing you to upgrade to more costly paper.

And don't forget the storage situation. To keep ahead, you must buy in unnecessary volume—then find floor space for the paper until it's needed. We've got your record storage problems under control, too. Just compare inches of fiche with mountains of paper.

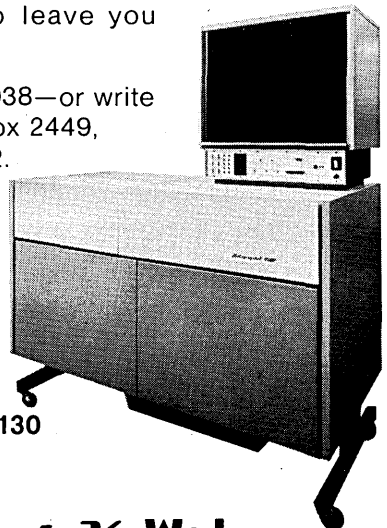
The System 4500 is designed in modular units to fit your exact needs now. But you can always add on as requirements grow.

The versatile off-line Model 130 COM recorder (shown) accepts magnetic tapes from a wide variety of computers. Incorporate a high-speed minicomputer and solid-state electronic data terminal—you have our Model 150, eliminating host computer handling and reformatting. Or consider the online Model 120 which interfaces directly with existing computer equipment. And there's still much more to come in the modular System 4500.

So, if you're not looking good on paper, look at our new technology in computer information handling.

We're not about to leave you out on a limb.

Call us—(714) 283-1038—or write DatagraphiX, P. O. Box 2449, San Diego, CA 92112.



System 4500 Model 130

DatagraphiX

Stromberg DatagraphiX Inc ◻ a General Dynamics subsidiary

We have the answers.

Hello, IBM.

ADDS introduces the first truly low cost CRT terminal for the IBM user.

We've been waiting a long time to say this:

Hello, IBM!

There, we finally said it.

You see, IBM (we almost feel like we should call you "sir") Applied Digital Data Systems (that's us) now has a terminal for IBM users. Wait'll you see it.

It's called the 980A. And, it's packed with the features that helped ADDS carve a reputation in the Teletype® compatible market. Sharp, readable screen with upper and lower case character display. Line as well as character insert/delete. Not to mention blinking, formatting, and patented graphics.

Compatibility?

The 980A looks just like a 3270 to the telecommunications access method (BTAM, TCAM, etc.) and to such real time monitors as CICS. It can even operate on the same phone line as 3270's.

However, since your 3270's don't have blinking, lower case, graphics (or most other special 980A features, we might add), applications software developed to support the 3270 won't support our 980A. So we don't think we'll be replacing many of your 3270's.

But, the IBM user can develop new applications around the 980A. And the reason we think he should (here's where you get

nervous again) is quite simple. The 980A offers unmatched features at an extremely low cost. Namely, $3200.00 to purchase, $90.00* a month to lease.

And all of our units are serviced by NCR.

That's pretty much why we think if our shoe fits, the IBM user's going to wear it.

Because even though you're very, very good, IBM, there's always room for a little improvement.

Sir.

Hello, ADDS.

I may have a new application for your 980A.
Please send additional information.

Name _____

Company _____

Address _____

_____ Zip _____

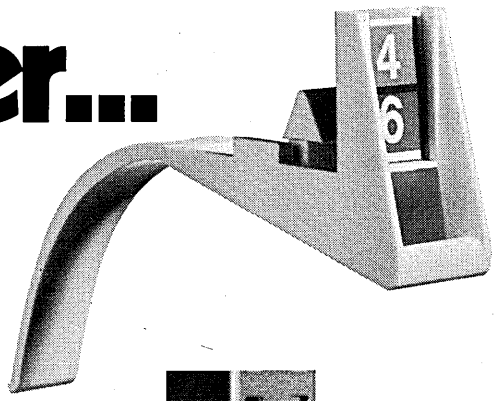
Applied Digital Data Systems Inc.
100 Marcus Boulevard, Hauppauge, N.Y. 11787

ADDS

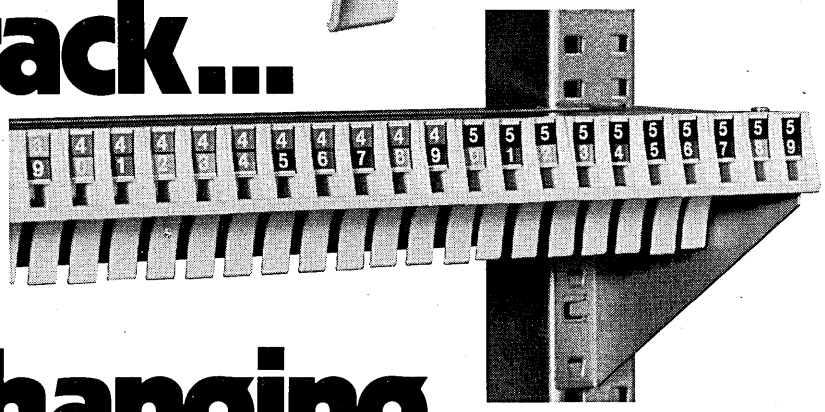
*3 year lease-purchase not incl. maint.

CIRCLE 11 ON READER CARD

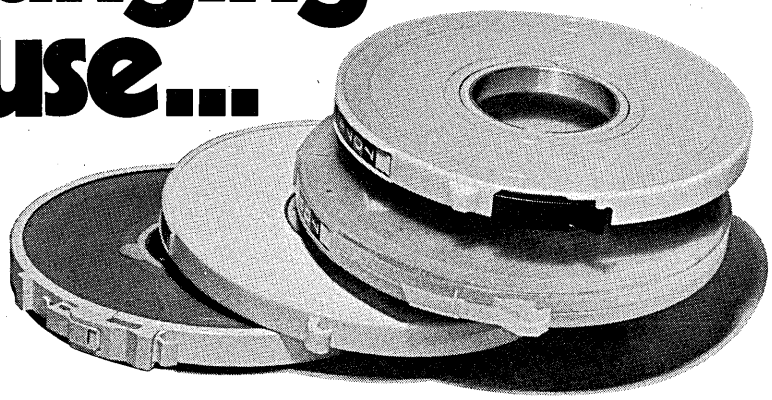
With this hanger...



and this rack...



and any hanging tape you use...



Tab presents the most versatile tape storage yet devised!

We call it Tab Hang II.™ That's because this compact, new concept in hanging tape storage accommodates any type seal or cartridge with a hook in use today—and, for that matter, probably any in store for the future!

Spring loaded, plastic-against-plastic.

Basically, the system consists of a rack with polypropylene hangers that can be used in open, mass library storage, or in our Data Media Cabinets. The plastic hangers exert a spring-loaded effect on the tapes—a tap of the finger swings a tape out so it is easy to grasp. The system allows side-to-side movement of the hangers, accommodating the varying widths of hanging tapes.

The plastic hook on your tape mates with the plastic hanger, eliminating metal-to-plastic abrasion. Tab's new Hang II, a hanging tape storage system for all reasons!

Call your local Tab Products representative or write for information. Tab Products Company, 2690 Hanover Street, Palo Alto, California 94304.

TAB
PRODUCTS CO

Editor's Readout

John L. Kirkley, Editor

Breaking Up IBM

Now that the consent decree rumors of December have died down, even money has it that the Justice Department antitrust suit against IBM will finally go to trial.*

Whether the final outcome is a judgment or a consent decree, we urge that the concept of "maximum separation" be considered.

Maximum separation is one of those things that only lawyers *really* understand. All we laymen can do is appreciate the grand design and wisely sidestep the specifics. Reveal more than a passing interest to your friendly antitrust lawyer, and he will promptly bury you under a flurry of verbal footnotes. But, given that caveat, here's roughly what it's all about.

Maximum separation is often triggered by a competitive situation called "incremental marketing." A good example is the sale of excess computer time by a vendor whose primary product is not computers—like the banks. If this interferes with or suppresses previously existing freedom of trade, the courts cry foul. And, in three major computer industry cases, maximum separation has been the remedy.

The concept was introduced into our industry almost 20 years ago. Among other things, the 1956 IBM Consent Decree required the corporation to operate its computer service business as a separate entity. And so the Service Bureau Corporation was spawned. But even more important was the birth of the independent computer services industry. Maximum separation worked.

In SBC's case, the concept meant a separate corporation, separate books, a new name, and no breaks on the purchase of IBM equipment which would give them an unfair edge in competition with other service bureaus. There's more, but the general idea was to be sure that SBC was to compete on its own, not under the Gray Giant's wing. The fact that SBC wound up as a poker chip in a high stakes game with CDC is another story.

In 1971 the Federal Communications Commission expanded the concept. At the time the communications common carriers were freely marketing excess computer time—that old devil incremental marketing again. The service bureaus complained. The FCC decided that the carriers could compete, but only under the tightest of restrictions. They would have to form separate subsidiaries with different names, separate books, separate personnel and separate locations. And the subsidiary couldn't sell services to its parent, not even at market prices. (Later an appeal softened the decision somewhat.)

In the same year the Federal Reserve Board ruled on complaints by the service bureaus that bank holding companies were unfairly marketing their excess computer capacity. The FRB considered maximum separation and rejected it, imposing only the barest of restrictions on the banks. ADAPSO is still fighting that one.

Well, what about the present IBM antitrust case? If you happen to browse through the 1956 consent decree you'll come across a familiar name on the last page of the judgment: Judge David N. Edelstein, the man who has been presiding over the current suit since its inception in January 1969.

And so, when the final moments come, it may well be that the judge will rummage through his bag of remedies and pull out maximum separation. There's good precedent, and the precedent is his.

But the rub is, apply maximum separation to what? And to what extent? IBM, when challenged, is not a company to sit idly by, thumbs twiddling, as the Telex documents so vividly demonstrate. Reorganizations have occurred, capabilities have been dispersed across several divisions; the giant has not been sleeping.

Back in 1972, for instance, communications, terminals and displays were imbedded deep within the newly created System Development Division. SDD's primary charter is design and architecture; extracting terminals from this melange would be difficult at best. And a new remote terminal, the small business computer System/32, is a product of the General Systems Division.

To break out components, the judge would have to reach into the System Products Division, the unit that is charged with the development and manufacture of cpus. Faced with all this, the path of least resistance would be to cut along the dotted line that IBM has already so obligingly drawn around several of its divisions. But, as one IBM-watcher remarked, "It's like the punched card business. IBM will only get rid of what it doesn't need."

Compared to breaking up the corporation into four or five voracious mini-IBMs, or imposing artificial constraints, such as restricting their market share to less than 50%, the application of the maximum separation concept is preferable. But the decision as to what gets separated from what must be a judicious one indeed. □

A Serious Game

Strong opinions are expressed in many quarters about breaking up IBM. Here's one recipe:

Separate manufacturing and development from marketing. (This is "The Motion Picture Remedy"; it's the solution that the courts applied to Loews, who at the time not only owned theatres but motion picture studios as well.) In IBM's case you might combine the Office Products Division with the organization responsible for small systems, the General Systems Division. This new entity would become a separate company. Then separate mainframe development and manufacturing from marketing, creating two more companies. And finally, components could also be spun off. You also might impose certain constraints: interface specifications must be released at the earliest practical date; and IBM must service all equipment connected to their gear.

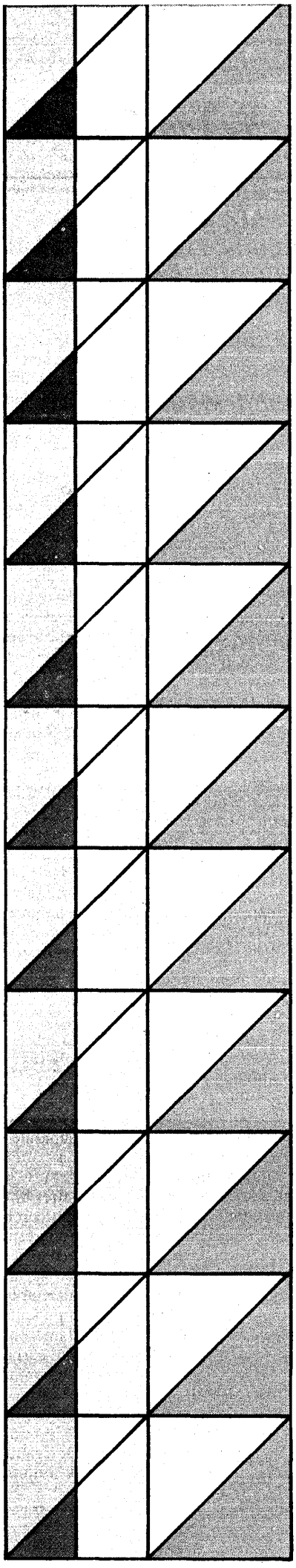
What do you think? We'd be interested in receiving your opinions about restructuring IBM.

With enough ideas we may have the makings of another new parlor game for antitrust buffs. Maybe Parker Brothers will pick it up. After all, Monopoly has been a hit for years. □

*At the time of this writing the February 18 date was still firm. But, with a six year history of slipped schedules, that date could hardly be considered a sure bet. And, of course, a consent decree could be reached at any time.

In this kind of network, the lowest level minis can act as if they have extensive sets of peripherals and very sophisticated operating systems. They actually have access to larger machines or other networks.

by R. L. Ashenhurst and R. H. Vonderohe



A HIERA

Since the introduction of computer systems, there has been a conflict between localized and centralized provision of computing services. The earlier trend, facilitated by increased versatility in computer system configurations and the organization of computing or information processing centers, was toward centralization. The introduction of the interactive terminal and the corresponding system support, making for convenient remote access to centralized facilities, was the logical conclusion of this trend. More recently however, the availability of low-cost minicomputers, and the possibility of distributed computing through networks, have paved the way for a countertrend toward localizing computing at user sites.

Applications where the computer is an intrinsic part of an industrial process or a laboratory experiment require at least part of the computing facility to be at the application site, and under control of its operations staff. The minicomputer seems perfectly suited to such applications. There is also another set of relevant applications where no physical process is involved with strict real-time constraints, but rather routine clerical or other human-monitored processes that require continual interaction with the computer on a daily basis. Although centralized facilities with remote terminal access are supposedly well suited to this purpose technically, there is an increasing tendency to recommend a more decentralized solution on grounds of departmental scope and control. Here again this solution is made attractive by the availability of the low-cost minicomputer system with appropriate I/O and mass storage.

Three-level hierarchy

The needs arising from on-line applications, particularly those of the experimental laboratory where continual reprogramming of new modes of use is required on a cycle measured in months, have been addressed in a project of the Institute for Computer Research at the Univ. of Chicago. Supported by the National Science Foundation in its developmental stage, a minicomputer network has been implemented, called the Minicomputer Interfacing Support System (MISS). (Preliminary installations of

RCHICAL NETWORK

MISS in various laboratories of the university are now being facilitated by a grant from the Louis Block Fund for support of physical and biological scientific work, and MISS is also being applied to on-line clinical applications in the university hospitals under a grant from the Dept. of Health, Education, and Welfare.)

The MISS project embodies *hierarchical networking*. This is to be contrasted with projects based on an interconnection of minicomputer configurations of approximately the same level of capability into a network for purposes of data interchange or distributed computing. In a hierarchical network, minicomputers running applications are interfaced remotely to centralized facilities which provide operational and developmental support as needed, on a shared (hence cost-effective) basis. There is a particular emphasis in the MISS project on the formulation of such a system in a general way, for use in a wide range of on-line applications.

MISS, as shown in Fig. 1, is based on a tri-level hierarchical concept. At the lowest level, level 0, are minicomputers of a variety of types, under control of their users and/or owners at a diversity of local sites (in this case, all on the campus of the Univ. of Chicago). At the intermediate level, level 1, is a computer configuration dedicated to the support of the level 0 minicomputers, to which they are interfaced by medium-speed (9600 baud) communication lines. The word "dedicated" is important—not only is the hardware/software configuration of level 1 dedicated to the minicomputer support application in the usual technical sense, but with it is associated a staff group knowledgeable about and competent in on-line applications. The intermediate level configuration (located physically in the Institute for Computer Research) is then interfaced by a high-speed line (50 kilobaud) to a general purpose service facility (in this case the campus Computation Center), which provides batch and interactive services at the highest level, level 2.

Note that: (1) the level 2 configuration could be not just one facility but a geographically distributed network such as ARPANET, permitting access to the kind of discipline-oriented computing capability which is increasingly being proposed (such as the existing National Center for Atmospheric Research); (2) the level 1 configuration could be replicated, on the same campus site or elsewhere, to give additional local access capability to the same level 2 network; and (3) the level 0 minicomputer systems, notwithstanding what might strike one from the configuration diagram, should not be thought of as "front-ends" for the higher-level facilities, but rather as "standalones" which are connected into a supporting network. This latter distinction may seem a bit precious, but it is real—an important attribute of the hierarchical approach is that applications may be geared to a mix of localized-centralized services, depending on particular needs. Thus the user is not faced with an initial decision to "go centralized" (try to work the application into the general services supplied by a computing center) or "go localized" (procure a minicomputer system and hope for some assistance from other users experienced in getting the application up and running on the same configuration).

There is another concept which is useful here, that of the "remote operating system." One way of looking at the function of the intermediate level of the hierarchical support system is that it provides an enhanced operating system, for each of the minicomputer configurations, of a size and capability that would not be cost-effective if supplied in each minicomputer system separately. Although the notion of remote (cross-) assemblers and compilers has become a common one, it seems at first glance that the operating system of a computer would have to execute *on* that computer. Further consideration shows, however, that many operating system functions are not logically required to be so executed at all.

An analysis of operating system functions yields the following three areas of classification: (a) execution services; (b) operation services; and (c) data and program handling services. Included in execution services are such things as interrupt, trapping, debugging and logging mechanisms as well as peripheral handling and interpretive pseudoinstruction execution. Of these functions only interrupt and trapping mechanisms cannot logically be supplied at a different level. Even in these cases, however, the bulk of the action burdens may be borne remotely. Among operation services are such things as program loading, starting, stopping, and overlaying, as well as resource allocation and scheduling, operator instructions, console displays and accounting functions. All of these operation services may be adequately supplied remotely. The last group of functions, data and program handling services, includes file access and transfer, data sorting, and program functions such as assembling, compiling and editing. Here again all of these functions may be logically and even desirably furnished remotely.

Other advantages of the intermediate level are provision of versatile access from level 0 to the extended computing facilities of level 2, by an interactive package functioning at level 1, and provision of extended user capabilities at level 0 (e.g. I/O and graphics), by interactive packages functioning at level 1. As the details of MISS capabilities are discussed below, it can be seen how these possibilities are achieved.

MISS hardware

At the lowest level of the hierarchy are the minicomputers, of a variety of types and dedicated to laboratory and other on-line functions. Because it is assumed that they are to be used a good deal of time in "standalone" fashion, the additional hardware/software required to interface to MISS is designed to be minimal (one circuit board and a resident software package occupying 1K or so of memory, standardized but specifically tailored to each variety of minicomputer supported).

The intermediate level of MISS is a dedicated system. This level provides, on a shared basis for all minicomputer users: (1) extended I/O services (card, printer, etc.); (2) mass storage services (mainly disc, but also magnetic tape); (3) access to the highest level of the system, where are maintained a set of specialized support services; and (4) a connection to central computing facilities. The intermediate level system is implemented on a DEC PDP-11/45, and the highest level is at present the IBM 370/168 system run by the University Computation Center. In the broader concept of MISS, as mentioned earlier, the third level is a network of major computer systems. (This allows a much

broader class of backup services to be provided, and permits replication of MISS at any desired node of the network by simply duplicating the PDP-11/45 configuration.)

The level 1 facilities, shared among MISS users only, are designated MOM, for Minicomputer Operation Monitor. Some of the MOM peripherals, in particular magnetic tape units, paper tape reader/punch, card reader and line printer, may be thought of as extended I/O units for the minicomputers. The console terminal and the disc units function more as system resources for MOM itself, although users can obtain limited disc space allocations as part of MOM services and manipulate data at this level through the use of software packages running on MOM.

Note that no user programs execute at the intermediate level, although this capability could in principle be included in "background" mode. The reason for this is that the general-purpose facility is available for such execution through MOM, and the problems of load balancing at the intermediate level are materially simplified by having only standard commands and packages executed.

The level 2 facilities are general purpose and shared with others not part of MISS. The services supplied at this level, however, are distinguished as those particularly developed and maintained for MISS users, and those others available to any user of the general purpose facility. The former are designated DAD services, the acronym standing for Data & Algorithm Distributor. Similar considerations would apply to a more general network at level 2.

Software

The software architecture of MOM can be described as a tripartite assemblage, as shown in Fig. 2. Each part of the tripartite assemblage has as its objective a different facet of the implementation.

The leftmost portion of Fig. 2 is concerned with the functions of the Basic Operating System which provides the support environment for the two other parts. The middle portion is dedicated to the direct support of the lines connecting user machines to the intermediate level of MISS. It includes software for both the minicomputers and MOM. The rightmost portion of the figure depicts the interactive support provided to the minicomputers and their respective users. More packages may be added to this portion in the future.

User capabilities

In describing the user capabilities of MISS, it is enlightening to discuss the various states in which a minicomputer may be placed either by a user or by the user's program.

The most fundamental state in which the user minicomputer may function is the *internal* state. In this state the minicomputer can be acting solely as a standalone computer. At such times there is no communication with MOM, save the possibility of monitoring timing pulses which MOM places on the lines. (These timing pulses are available whenever MOM is running, and in a limited sense could replace some local clock functions.)

If explicit support from MOM is desired, the user may log on, either by initiating a MOM bootstrap (causing communication and terminal packages to be loaded from MOM into the minicomputer core and a minicomputer executive to be created), or by loading the packages locally (as from disc) and transmitting a special "attention" character to MOM.

It is possible to use the minicomputer in internal state, but with MOM supplying *operational support* for certain minicomputer functions. Included among these are data storage and program overlay, and assembler support, all using the MOM disc file system as auxiliary storage. Another such feature yet to be implemented is external timing support (such as a wake-up call) using the MOM clocking system.

Alternatively, the minicomputer can function in *external* state, essentially as an intelligent terminal for gaining access to intermediate- and higher-level interactive services. Transition into and out of external state is accomplished with ease, and it is also quite feasible to set up most minicomputers so that external and in-

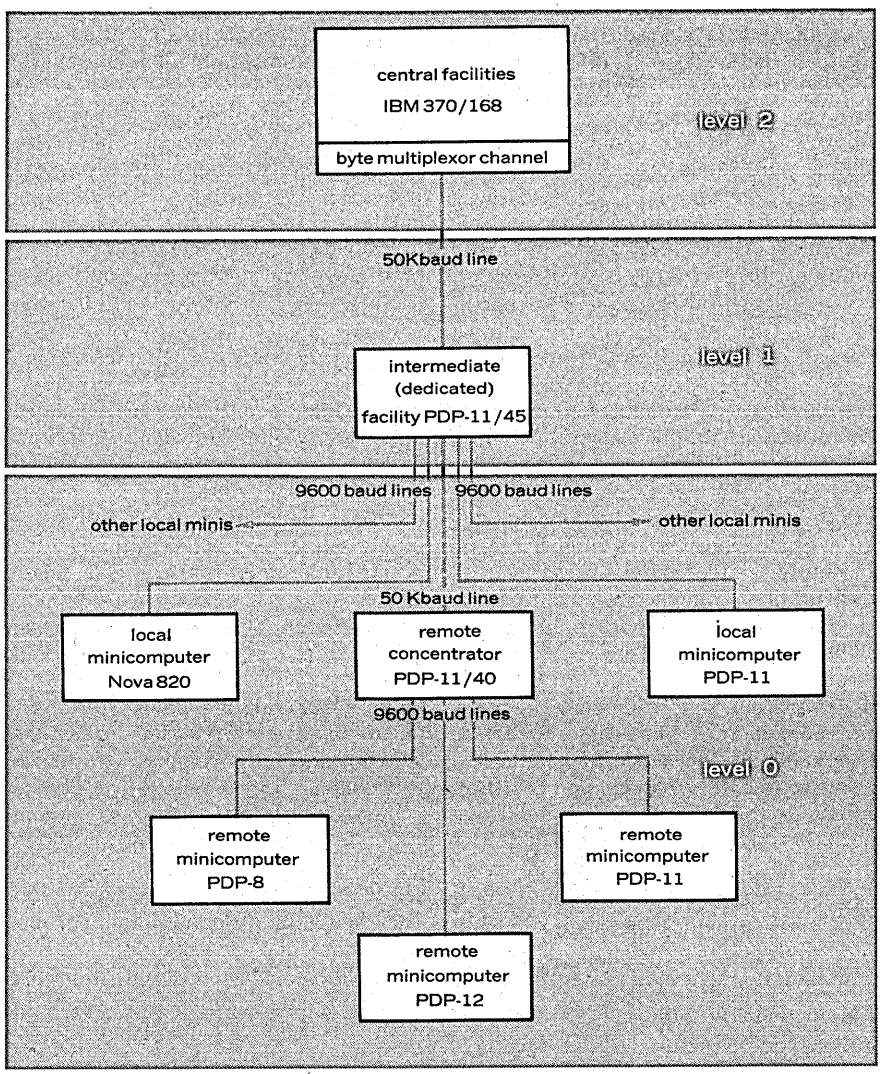


Fig. 1. The network being implemented at the Univ. of Chicago has three levels. Computers at level 0 are standalones, often committed to a lab experiment. These can share peripherals and operating system components available at the intermediate level, or access the central facilities.

ternal states may exist together, as "foreground" and "background," respectively.

In the *direct command* mode of external state, individual commands are issued to MOM and are then executed without requiring additional user interaction. These essentially comprise the utility functions of Fig. 2. These commands (as is true for all MISS commands) may be issued either by a person or by a user program. Included in this mode are commands to request the time and date, send messages to the MOM operator, log off, obtain status information on MOM peripherals, etc. Also included are certain specific file manipulation commands such as deletion, renaming, copying, appending, or listing files which reside on MOM disc files. In addition there are the operational support commands to load programs into the minicomputer core from MOM disc files, or to create a disc file from the contents of the minicomputer core. All commands in this mode are handled by either the minicomputer executive or the terminal executive in MOM.

In the *interactive package* mode, which is entered through the direct command mode, a dialogue takes place between the minicomputer user and a package executing on MOM. The distinction here is that the dialogue is directly with the package and not with one of the executives. Included in this mode are the text and general editors, the processing service, and the directory service. In each case the interactive package requires the manipulation of MOM files in a content-oriented manner.

Both of the modes just described have a counterpart in DAD services. Paradoxically, the counterpart of the direct command mode is the *indirect command* mode. In this mode the commands are forwarded by MOM to the appropriate DAD service. An example of this mode is the remote initiation of job execution on the Computation Center facility. Similarly, the *remote interactive package* mode permits a dialogue not with a package on MOM, but with a package on the Computation Center facility. This mode, for example, would permit the use from the minicomputer keyboard terminal, of such systems as WYLBUR for interactive program development on the 370/168.

Current status

MISS is currently in transition from a development system to an operational system. During the purely development phase, considerable assistance was derived from several users who were willing to suffer some inconvenience in return for being able to use the system and critique it.

Since MISS development was originally aimed toward support of minimal configuration minicomputers (8K core memory with only keyboard printer), the first facility needed was a bootstrap function. Each user minicomputer connected to MISS is supplied a chassis into which a second keyboard printer control (9600 baud) is connected. This interface contains the drivers and receivers for long line communications and a bootstrap request switch. To bootstrap, the user first ensures the existence of a nine word bootstrap routine in his minicomputer core memory or diode memory. Raising the bootstrap request switch begins execution of the routine. In approximately three seconds, a secondary bootstrap routine, followed by the communication package and terminal package, are loaded into memory from MOM disc files. This procedure is completed by a keyboard printer message requesting a command. As mentioned, the loaded packages require approximately 1K of core memory.

For other than minimal configurations, especially those having their own disc storage, it will not be necessary to raise the bootstrap switch. These systems will be able to load the necessary routines from their own disc files and effect the equivalent of a "connect" by transmitting to MOM several coded characters. This technique will also permit the periodic transmission of accumulated data to MOM disc files.

User feedback from minimal configuration machines has been directly responsible for the assembly support offered by MOM. To achieve this support, the standard vendor supplied assembler was modified so that input and output were conducted through the line to MOM. The end result is a command which greatly facilitates assemblies. In the command the user specifies the source file, names the object file, and indicates whether or not a listing is desired. When the carriage return key is depressed executing the command, the assembler is transferred from MOM to the minicomputer core memory. The assembly then begins with the source arriving from MOM files and the object being sent to a MOM file. The listing takes place concurrently. In this manner assemblies execute at approximately communication speeds of 1,000 cps. This capability, in conjunction with the capability of remotely editing MOM files, has drastically modified former debugging and program modification methods to the user's benefit.

Another capability users found extremely useful is that of program loading or file creation. With this capability, users cause arbitrary file to be loaded from MOM disc into their

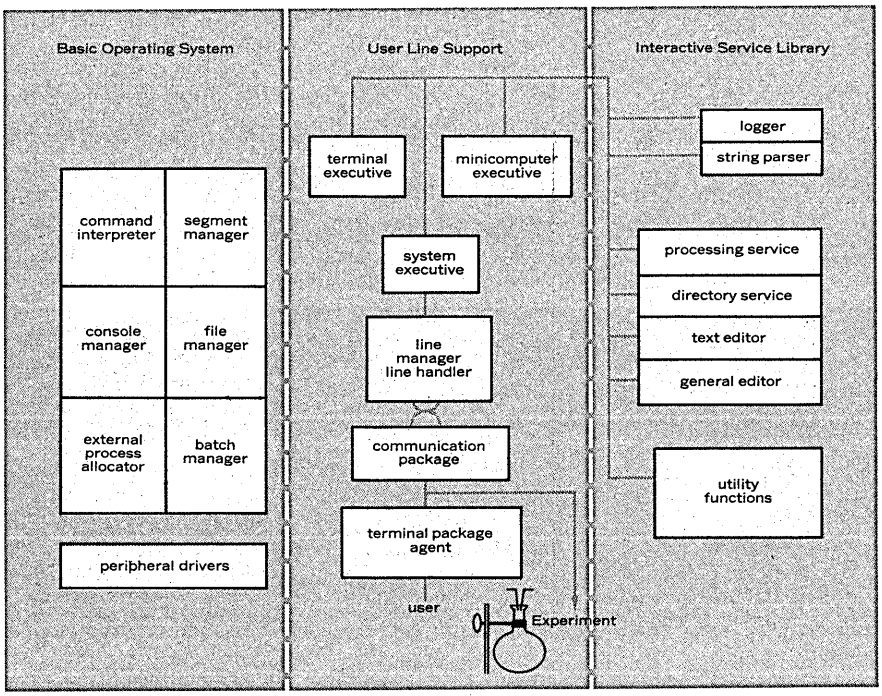


Fig. 2. This MOM software, executing at the intermediate level of the hierarchy, performs services for the minis; some of it, like the text editor, may be used conversationally through the minicomputers' terminals. But no user programs operate at this level.

core memory, or create a MOM disc file from the contents of their core. In addition to the normal loading of programs, the former aspect permits the overlaying of appropriately segmented routines. The latter aspect greatly aids program debugging by permitting easily restored starting points.

Of general use to connected users are a variety of file manipulation and file modification capabilities. The most useful of these capabilities have proven to be the source and general purpose file editors and the ability to list any file on the MOM line printer. In the case of listing files, the user may disconnect immediately after initiating the command. The actual listing proceeds independently.

One capability which has been provided to users but which has been scarcely used is the ability to automatically store accumulated data. This fact was originally attributed to the lack of user confidence in having MOM be the sole repository for data. However, it was learned that the necessary user program interface was sufficiently complicated and painstaking that most users preferred not to use the capability. This design shortcoming is being corrected in conjunction with the general problem of interfacing MISS to user operating systems.

Present users

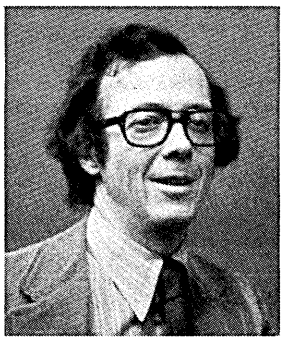
Of the nine minicomputers currently connected to MISS, the most frequent uses have been in the areas of program development, file access, and peripheral sharing. The benefactors of these services have been functioning in the disciplines of chemistry and physics on such experiments as molecular spectroscopy and electron microscopy. In the majority of cases, the minicomputers are used for data acquisition from the experiments. In several, the minicomputer also performs some control functions.

Facilitated by a campus cable network currently being installed, 12 additional minicomputers will be connected in the next several months. These machines are centered primarily in the biological and medical sciences departments, and are used for such purposes as film scanning, image analysis, clinical laboratory test analysis, cardiac catheterization, and radiation therapy. Many of these configurations are more extensive than the original ones connected to MISS. The benefits to be derived by these systems are information exchange capabilities inherent to networks, and access to higher level support for analysis and large data base storage.

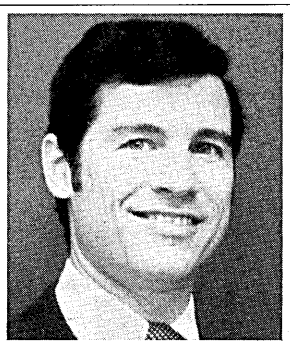
Results

In the implementation of the MISS system, a major emphasis has been placed on the intermediate level of the tri-level hierarchy. It is at this level that the maximum facility for certain kinds of standard services can be provided to the minicomputer user at the lowest cost. For users with minimal configurations, the MISS facilities have the major impact on methods of operation. For minicomputer users with substantial configurations that normally function with their own operating systems, MISS provides at least the capability of a communications network permitting the transfer of information freely between numerous sites, and access to higher-level support programs.

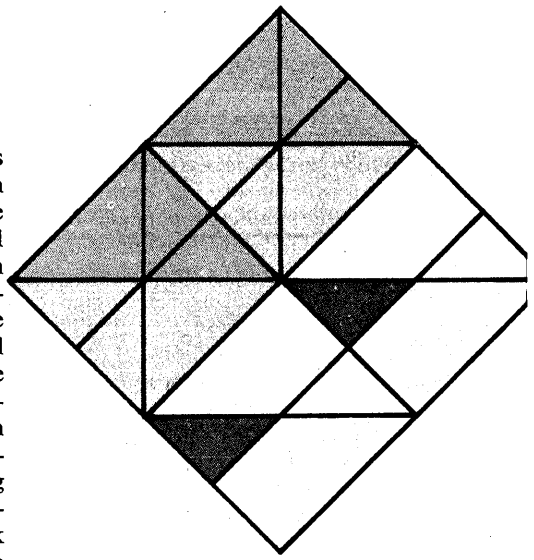
For both types of configurations the needs of the user have been kept foremost when making design decisions. This has resulted in a facility to support a wide variety of applications at the greatest convenience to as many users as possible. The net result is that while the MISS system is not all things to all people, the majority of users are benefited. □



Dr. Ashenhurst is Professor and Director of the Institute for Computer Research at the Univ. of Chicago. He has worked in various computer-related fields, including switching theory and computer architecture, and is currently the Editor in Chief of Communications of the ACM.



Mr. Vonderohe is a Project Manager in the Institute, and has been active in computer interfacing, configuration design, and computer networks for many years.



A RING

The Distributed Computing System (DCS) is an information utility developed at the Univ. of California, Irvine, under National Science Foundation Support. The goal of DCS is to develop a model for an integrated hardware and software system which provides reliable, fail-soft service at low cost.

Reliability is obtained through distribution—distribution of hardware, distribution of software, and distribution of control. Gross hardware components, such as small processors and peripherals, are geographically distributed; a failure in one component does not necessarily make another component unavailable.

The basic system software is modular, and several processors are capable of hosting the various modules. Thus the failure of one or more processors or peripherals does not prevent the software from functioning with the remaining hardware. Finally, distribution of control eliminates the need for a central allocation mechanism. No processor which can support the basic software is subordinate to another. Thus there is no central resource which must function in order for the DCS to function.

The distribution of functions vital to the success of the DCS is made possible by the way interactions between elements of the system are structured. Architecturally, the DCS is a network (see Fig. 1), a collection of minicomputers connected by a ring-like digital communication system. All communication is done over this ring through messages between processes, rather than processors, and is not tied to physical addresses. (A "process" can be thought of as a module or even as just a clump of code which talks to other clumps by sending messages like "open file," "read record," or "shut

More flexible than a hierarchical network, the ring does not depend on the operation of any one component

NETWORK

by David J. Farber

down." Examples of processes are the decoder which interprets user commands, and the loader.) Thus a process can migrate among processors capable of supporting that process, and this migration is transparent to other processes.

Low cost is achieved in several ways. Each of the component computers of the network can be relatively small and inexpensive, although larger computers are not excluded. The communication ring is also inexpensive. The system software is a modest programming effort. Existing applications software, interpreters, compilers, and application packages can be readily integrated. Lastly, expansion of this network can be easily achieved. Connection of a new processor is through a standardized interface to the communication ring, which now costs $600 but will shortly be available in LSI form for about $100. Basic software necessary for the new processor is minimal since most of the processes required can be performed for this processor by other processors.

Goals

We were interested in examining what happens when one creates a system by connecting together a number of small (mini) processors and then views the result as a distributed machine rather than as a set of independent processors.

We were motivated in our development by our perceived need in the real world for systems capable of modular growth, system reliability, low overall vulnerability, incremental modernization, and dynamic restructuring of resources. We were responding also to a set of real world facts and needs. These include: changes in cost for computers (minis are cheap); low cost/bit large stores; refinements in digital communications; and application needs (in particular the need for high reliability systems capable of supporting distributed data bases).

The prototype

The DCS minicomputers are connected to the digital communication ring by devices called ring interfaces. This communication ring serves as a unidirectional information path operating at 2.3 megabits, with the ring interfaces assisting in information routing. The control of the ring is distributed among the ring interfaces.

The DCS software is process oriented. Thus, all activities are carried out by processes, interacting via the sending and receiving of messages. These messages are addressed to processes by name, rather than by physical hardware address. A message from one process addressed to another process is first placed onto the ring. As the message arrives at each ring interface, the interface compares the destination process name with a list of all processes active in the attached computer. If the indicated destination process name is present, the interface attempts to copy the message into the component memory. Whether the addressed process is present or not, the interface allows the message to travel on to the next interface on the ring.

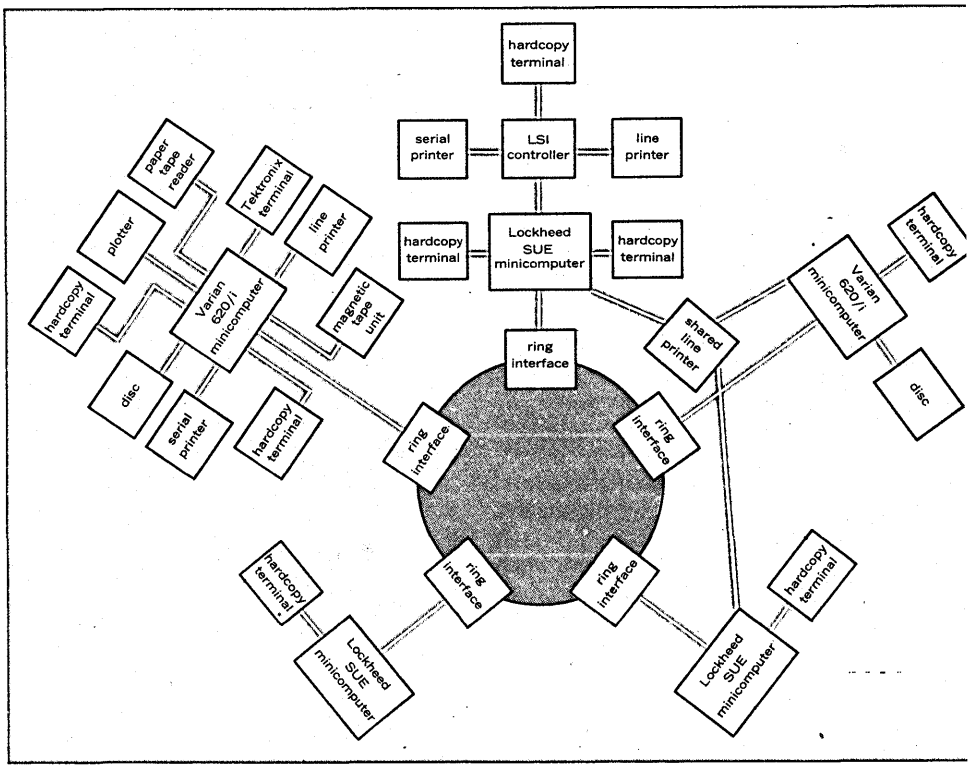


Fig. 1. There is no central or master processor in UCI's ring network. When one node issues a service request, other systems "bid" on providing the service.

The message continues around the ring until it arrives at the interface for the processor where the message originated. This interface then removes the message from the ring.

Each processor on the ring has a resident software system called the nucleus. The nucleus provides facilities for the scheduling of processes and for transmitting and receiving messages. Other system functions, such as resource allocation, device I/O, and file system services are provided by processes executing in the DCS. Because the nucleus is the only software absolutely bound to a particular processor, all other system services may be executed by any machine in the ring and can be accessed from any user processes through the message system. A process requesting service addresses requests by name, it does not need to know where in the system the needed service process resides. A request for a service, issued at job initiation or whenever a new resource is needed, are recognized by all the processors in the system. Those processors with available resources in effect "bid" to supply the service.

Failure detection and recovery

Failures are detected when a communications problem arises, when an interrupt indicating an error occurs, or when a regular observable process action fails to occur. A ring failure, a failure of a ring interface, or a failure in a component connected to a ring interface will cause a communication error. Error detection facilities included in the communications hardware and protocols are the primary means for detecting hardware failures such as intermittent transmission errors, failure of a ring interface, or complete interruption of a transmission.

Most failures in a hardware or software component can be classified as either nucleus or software process failures. The failure of a nucleus is equivalent to a processor failure, since without the nucleus software, a processor cannot function in the DCS. The failure of either a system or user process is less serious than a nucleus failure, since its effect is likely to be smaller and more localized.

A *nucleus* failure is detected when a processor fails to accept a message. This failure is recognized when a message is sent and one of two failure indicators in the message is returned as the status of the transmission attempt. Special processes, called status checkers, distinguish the various failure possibilities and initiate recovery actions when necessary. If a nucleus has failed, a remote restart process causes a bootstrap sequence to be executed in the failed processor. After the appropriate reinitialization of the processor, a new copy of the nucleus is transmitted and processes communicating with those executing in the failed processor are notified. If a nucleus fails repeatedly, a processor failure is assumed and that processor is removed from the system.

A failure of a *process* is detected when a machine interrupt indicating an error occurs, or when a regular expected action fails to occur. After such a failure is recognized, the nucleus of the processor where the failing process resides starts a message interchange with some status checker. The status checker takes some action depending on the type of process which has failed. These actions include the saving of the process environment, initiating a test process, initiating a new copy of the failed processor, or taking no explicit action until told to do so by an external source, and finally possibly terminating the process.

Although the overall design of the DCS is intended to minimize the possibilities of failure, failures will occur. The distribution of hardware, software, and system control makes it possible to detect and recover from such errors. In addition, the design assures that the effects of such failures are minimized.

Current status

DCS is an operating distributed system running on a five-minicomputer configuration. The equipment attached to the system includes:

1. 3 Lockheed SUE machines (similar to PDP-11s)
2. 2 Varian 620/i machines operating as file managers
3. 2 2314-class discs (one attached to each Varian)
4. 1 magnetic tape unit
5. 6 hardcopy terminals
6. 1 Imlac graphic terminal
7. 1 Diablo serial printer
8. 1 upper/lower case printer
9. 1 data ring operating at 2.3 megabits with ring interfaces, each having a 16 name associative store and supporting distributed communication control and variable length messages.

The support software, which we call DCOS, is completely distributed and includes components such as: (1) nucleus code which handles communications and processes starting in each machine, (2) peripheral control, (3) command and log-in processes, (4) system status modules, and (5) peripheral interchange processes.

The user level software running under DCOS on the prototype system includes: (1) assemblers, (2) MOL (system programming language) compiler, (3) link editors, (4) a document preparation system, (5) a text editor, (6) a distributed debugger, (7) utilities, (8) a distributed file management system, and (9) measurement tools.

At present DCS is being used primarily for software development and for document production. A course in software for minis is running this academic quarter also, in which students learn to program for DCS. We also expect in the near future to connect DCS to the ARPANET as an experiment in secure local distribution of resources.

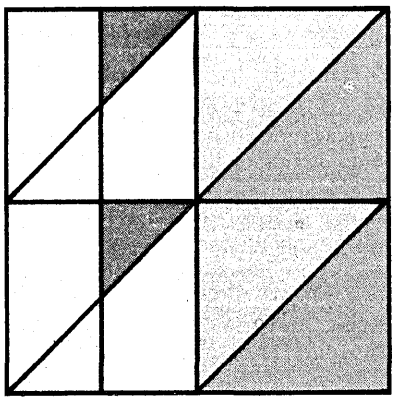
Conclusions

We would expect to see the ideas and hardware organization of DCS to be used in fields such as:

1. banking
2. airline reservations
3. real-time command and control
4. process control
5. office automation
6. corporate and military logistics

We feel that the most important impact of distributed processing is in distributed data management. That is, in an environment where data is geographically distributed yet can be viewed by a user as one data base. Increasing interest among the governmental and business sectors in distributed data management has presented an opportunity which the computer profession is just beginning to explore. We intend to use the DCS as a vehicle for such exploration. □

Prof. Farber is with the Information and Computer Sciences Dept. of the Univ. of California at Irvine. His past positions include being supervisor of computer research at Bell Labs, and being a member of the technical staff at both Xerox Data Systems and Rand. He has also held offices in IEEE, ACM, and SHARE, and has been selected to be a member of the National Science Foundation Computer Science Advisory Board.



by William Wulf and Roy Levin

A LOCAL NETWORK

in most ways it looks like a geographically distributed network. No processor is the master, but the kernel of an operating system resides somewhere.

The history of data processing has been characterized by a constant pressure for both more, and more cost-effective computing power. At any given time, hardware technology imposes limits on both the maximum power available from a single computer and on the lowest cost of obtaining a given amount of computational power. Any attempt to circumvent these technological limits must be done by architectural techniques; one such is the use of parallelism.

Because our appetite for computational power has grown even faster than the amazing advances in electronics, many styles of parallelism are being explored. Machines such as the CDC 7600 and IBM 370/195, for example, utilize parallelism to speed the execution of rather conventional programs. The CDC STAR and ILLIAC IV, on the other hand, obtain even greater performance by providing the user with instructions which operate on entire vectors or matrices in parallel.

These large machines are very expensive. Moreover, it seems that they can realize their full potential on only a small set of specific problems, most of which are scientific in nature. An alternative to these very large machines is being explored at a number of universities and within some of the major manufacturers—namely the interconnection of enough minicomputers to supply the desired power, as was done for the Carnegie-Mellon Multi-Mini Processor, the C.mmp.

C.mmp hardware

The basic C.mmp hardware configuration is shown in Fig. 1. The central component of the system is the "switch" which connects 16 processors and 16 memory boxes. This switch allows any of the processors to access any of the memory boxes on each memory reference. The processors are not permanently attached to a memory box; rather, each time a processor wishes to access a particular memory, a temporary connection is established through the switch for that access. Sixteen separate processor-memory connections are possible simultaneously. Thus, unless two processors are attempting to access the same memory, 16 separate and simultaneous communication paths exist between processors and memory.

The processors in the current system are modified versions of the Digital Equipment Corp. PDP-11. In principle, any of the several models of the PDP-11 may be used in the system, although so far we have only used PDP-11/20s and /40s. The modifications made to the processors to interface the system are relatively minor and involve about one day of an engineer's time (to change two chips and 70 wires).

As can be seen from Fig. 1, peripheral devices are connected to I/O buses associated with each processor, and gain access to the shared memory through these buses; there are no independent I/O channels. Thus a processor can only communicate directly with the peripherals attached to its I/O bus. In addition, however, each processor can interrupt each of the other processors at several priority levels and can start and stop other processors. This facility permits one processor to direct another to perform an I/O operation for a user program running on the first processor. Thus user programs are not constrained to

execute on any particular processor.

The figure also shows that each I/O bus (and thus a processor and its associated peripherals) is connected to the central switch through specially designed relocation hardware (Dmap boxes). This hardware implements a virtual memory mechanism which both provides protection between programs and increases the system's ability to efficiently utilize the hardware resources.

Other hardware to be added in the near future includes: (1) another PDP-11/40, (2) a connection to the ARPA network, (3) a high-speed intelligent graphics terminal, and (4) a special purpose hardware performance monitor.

C.mmp is not a monolithic machine; it can be subdivided into independent, smaller systems. Each of the possible processor-memory interconnections at the central switch can be manually locked out. This permits the hardware to be partitioned into two, three, or even 16 totally separate configurations. Thus, for example, a single processor and memory box combination can be isolated and turned over to the hardware engineer for maintenance, leaving a 15x15 configuration for the users. A similar partitioning can allow the programming group to check out a new version of the operating system. In either case the basic system degrades gracefully, with the software adapting to the smaller configuration (see next section). In particular, a processor malfunction does not require taking the entire machine down for maintenance. The offending processor is simply "partitioned out," and execution continued.

Benefits

There are several attractive aspects to such multiple minicomputer systems:

Reliability: By having multiple processing units, an interconnection of minis has the property that the failure of any one of them need not preclude continued operation. In the case of C.mmp it seems unlikely that the user will notice the loss of one or two processors out of 16.

Cost: Minicomputers are produced in large numbers, and the cost for a collection of minis should be much lower than for a single large processor of equivalent power. It is extremely difficult to predict how great these cost advantages will be, in part because our own experience with C.mmp includes the one-time development costs, and in part because the manufacturers' pricing policies are difficult to fathom. However, including the one-time costs, C.mmp cost less than one half of what we would expect to pay for a single machine of similar power. Commercial versions might cost more or less than this; in principle they should be considerably less.

Incremental expansion: With a single large processor, a user must replace that processor with another in order to expand his computing power. Interconnected minis allow the user to start with only the number he initially needs, and expand by adding processors as necessary. Further, as new and faster models of the minicomputer processor become available, the user may "trade-up" some or all of his processors to enjoy the benefits. Incremental costs here are small. By using both of these techniques, we can configure C.mmp to supply computing power ranging approximately from that of an IBM System/3 to that of an IBM 370/168. Of course, comparisons based upon raw computing measures (million instructions/sec and maximum memory bandwidth) can only be used as rough indications of power. Relative *functional* power (number-crunching or character-pushing) will be mentioned later.

Variety of use patterns: Perhaps one of the strongest arguments in favor of interconnected minis is the variety of ways in which they might be used. At one extreme, all the processors may be cooperating to solve a single problem. At the other extreme each might be solving a problem for a different user. Even when working together on a single problem, the processors may be utilized in several ways; they might all be working together on a single subproblem, or they might be working on separable subproblems.

Both approaches are used in current applications of C.mmp for example, the HEARSAY II speech understanding system utilizes a number of distinct tasks operating truly in parallel, but all contributing to the recognition of a verbal utterance. Here, several processors execute on behalf of a single program (user). At the same time, however, other tasks may be using other subsets of the processors, such as a chess-playing program exploiting the available parallelism to speed up its tree search. Thus the component processes of these independent activities all proceed in parallel, eliminating to a large extent the scheduling overhead associated with multiplexing them on a single processor.

Conservative technology: At any given time, hardware technology imposes limits on the speed of the basic circuits used to construct a processor. Attempts to get more speed in a sin-

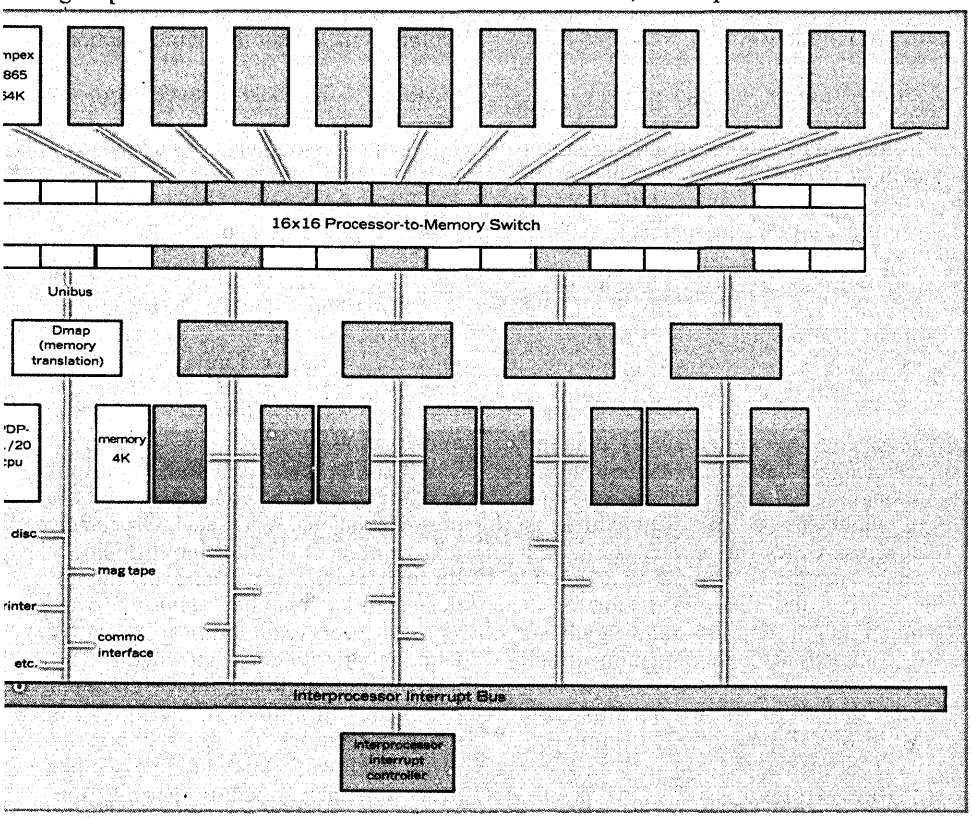


Fig. 1. The Carnegie-Mellon Multi-Mini Processor is not a geographically distributed network. All of its five processors are in the same room. The cpus connect to shared main memory through a switch box, and can interrupt other processors through an interrupt bus.

gle processor require pushing that technology—which is both expensive and risky since hardware fabricated with state of the art components is frequently less reliable and more prone to subtle design errors. The multiple-mini approach permits the use of conservative, less expensive, and more reliable technology to achieve greater total computing power.

Real-time response: A multiprocessor with, say, 16 processors, can provide better real-time responses than a single processor which is 16 times as fast. Even though it clearly takes longer to service each individual real-time event, service for an event can usually begin immediately in a multiprocessor system, since more than one processor is available to respond to the (high priority) request for real-time service. In a uniprocessor system, the cpu will be masked for interrupts at least part of the time; in a multiprocessor it may be possible to guarantee at least one cpu is interruptible.

Applications

By now the data processing community has become sophisticated enough to understand that there are no panaceas. Thus, although there are many advantages to multiple minicomputer systems, such systems are not ideal for all applications and they pose new problems which must be solved if these new architectures are to realize their full potential.

Perhaps the most obvious applications for which the multi-minis are ill-suited are the large "number crunching" ones, involving a great deal of floating-point arithmetic. Minis, multi or not, frequently do not have floating-point hardware, and even those that do are constrained by their small word size to implement such operations as slow, multiple memory reference instructions. They therefore fall short of large scientific processors both in basic cpu speed (by a factor of 2-5) and memory bandwidth (by a factor of 2-8), and these factors may go much higher for specific machines (like CDC STAR's pipelined floating-point processor or the IBM 360/85 with its cache memory). However, commercial data processing applications fall well within the minis range of practical utility, since it is intended to perform byte manipulation and I/O with considerable efficiency. The C.mmp architecture can support burst I/O rates of 8×10^6 bytes/sec from conventional secondary storage units, and the theoretical maximum is eight times that figure.

Obviously, bit rates do not tell the whole story. In exchange for the speed inherent in parallel processing, the user receives the problem of task-decomposition—that is, the subdivision of an application program into pieces which can be executed in parallel and thereby fully use the power available in the system. Fortunately for the user, he is not required to solve this problem at the outset; he can choose to build his program initially in the traditional, sequential way and rework it later. Obviously, his initial program will not run faster, but the system can still execute 16 such "temporarily sequential" programs in parallel, with no real loss in throughput over a multiprogrammed uniprocessor or batch system. Eventually, as the user designs an effective parallel decomposition, he can rebuild his program to reap the benefits of the architecture.

Many of the current applications of C.mmp involve research into this problem of effective task decomposition, and span a wide range. The speech understanding and parallel tree-search problems have already been mentioned. Other current applications include data base management, integer-programming, and benchworking programs. We are also investigating the design of compilers which make efficient use of parallelism, and the usefulness of multiple processors for other standard support software.

The C.mmp operating system

Hydra, the operating system for C.mmp, like all operating systems, has two goals: to provide a set of facilities which make it convenient for the programmer to use the underlying hardware, and to make sure that the hardware is efficiently utilized.

The central core of Hydra is a 'kernel' set of operating system facilities which provide both basic protection, and management of the hardware resources. These facilities are not those with which the average programmer is likely to be concerned; rather, they are those useful for the construction of user-visible operating system facilities. Thus, for example, the kernel does not provide either a file system or a job control language. It does, on the other hand, provide facilities which grant protected access to memory, to the I/O devices, and other resources.

Almost all operating systems contain a portion which provides facilities which, although they differ in particulars, have goals similar to those of the Hydra kernel. The big difference is that in Hydra everything outside the kernel is treated as though it were a "user" program. In fact, the Hydra kernel has no way of knowing which programs are applications and which are providing operating system facilities such as file management.

This approach has two important implications: First, an error in one of the (non-kernel) operating system programs like the file system can, at most, affect the application programs currently using it. It cannot cause the entire system to crash. In fact, the usual case is that only one application program will be affected by such an error. (An error in the kernel, of course, usually has a more catastrophic impact. However, because the kernel is reasonably small and has reasonably clear, well-understood functions, errors are relatively rare.) Second, the user may, if he wishes, define his own operating system facilities. Since the kernel does not (cannot) distinguish between "applications" and "operating system" programs, the user may write an ordinary program which defines what is usually thought of as an operating system function—a job control language system, for example. The user may do this either to provide himself with a facility not provided by the existing programs, or to replace an existing facility by one more closely attuned to his specific needs.

The second of these issues is one we consider to be especially important. It is closely related to another objective of the Hydra design, namely, to make a careful separation between policies and the mechanisms used to implement those policies. This objective has many manifestations in Hydra, but we will illustrate with two examples: scheduling and disc management.

Scheduling is one of those facilities which the kernel does *not* provide; scheduling is provided by one or more "user" programs. However, the kernel *does* provide a mechanism which permits one such program to determine the scheduling policy for other user programs, and thus implement a normally privileged operating system function.

This implies that the operations manager of a computing facility can, if he chooses, easily define a scheduler tuned to the special requirements of his installation. It also implies that if there are two or more separate classes of jobs to be run on the same system (such as time-sharing, real-time, or batch) separate schedulers may be written to handle the various classes. Finally, it implies that a new scheduler, because it is just another user program, can be written, debugged, and tested in a "real" environment during the normal operation of the system.

Often the management of peripheral devices such as discs is crucial to both individual program and overall system performance. This may be true of the space allocation strategy, the I/O request service policy, or both. A policy which works well on the average may be intolerable for a particular application. Thus, once again, the Hydra kernel provides mechanisms which allow user programs to define these policies, and a manager may define them to suit the unique problems of an installation or application.

We must emphasize the difference between what *can* be done versus what *must* be done. Hydra has user level programs which provide scheduling, device management, job control, and so on. The standard policies and facilities implemented by these programs are at least as reasonable as those found in other "general purpose" systems. The user is not *required* to define these, but he does have the option of doing so, and thereby increasing the utility of the system for his needs. Specifically he might either increase the set of facilities or contract them, in the later case reducing the overhead related to "unnecessary generality."

To provide the flexibility implied in the previous discussion, the Hydra kernel provides a protection mechanism which guarantees not only that users are protected from one another, but also from the "operating system" programs. Flexibility and protection are closely related issues in a system structure. Flexibility in a multi-user environment means the ability to use the facilities of the (virtual) machine in a manner that the user himself deems most appropriate to his needs. Protection, although it has a restrictive connotation, should not be considered the inverse of flexibility. It has much the same goal as flexibility, namely to allow users to "do their own thing" without interference.

We feel that protection must be built in a uniform manner throughout the operating system, and not just applied to specific entities, such as files. A uniform data structure in Hydra provides such protection for all entities, including files, processes, I/O devices, and all other resources, physical and virtual. This protection involves not only the traditional read, write, execute capabilities, but also arbitrary protection conditions where the meaning is determined by higher-level software.

Some earlier multiprocessor operating systems have operated in a "master-slave" mode, that is, the operating system executed on only one processor, the "master." Only user programs could execute on the other, slave processors. A master-slave system has two serious drawbacks related to reliability and performance. First, any non-replicated component like a master processor reduces the overall reliability of the system. Second, as the number of processors increases, the master processor quickly becomes a bottleneck. For both these reasons Hydra does not have the concept of a master processor. The kernel can execute on any of the processors and, in fact, on any number of them simultaneously. While it might at first blush appear that this increases the complexity of the system, in fact it doesn't.

For much the same reasons as listed above, the user programs are run in a distributed manner. That is, a particular program is allowed to execute on any available processor. At one instant a program may be executing on processor number 1, a few moments later it may be running on processor number 13, later on number 5, etc. This flexibility assures both maximal use of the processor resources and also that the loss of a processor need not impact individual programs. It also implies, as suggested earlier, that the system degrades gracefully when a processor is removed.

Current status

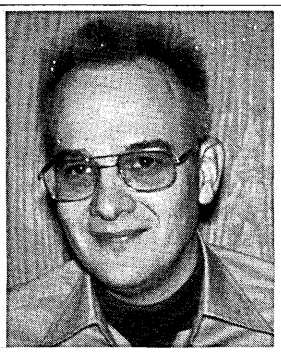
C.mmp and Hydra are still research vehicles and both have been used by "real" users for only a few months. At this writing there are five processors and 1.5 million bytes of shared memory on the system. The number of processors is scheduled to be expanded to nine by summer. There is a modest collection of discs, tapes, a line printer, terminals, etc. in the current configuration.

The Hydra kernel is complete, as are initial versions of most of the user-level operating system programs. The active application areas are deeply involved in task decomposition and have begun debugging support facilities. All of the software to date is essentially experimental and will undoubtedly be revised as both the designers and users gain more experience.

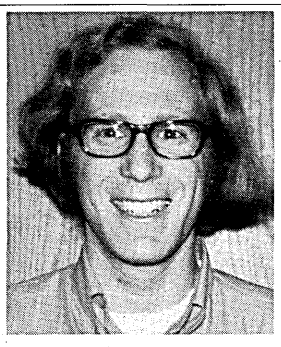
Our experience in implementing the Hydra system may be of interest. The entire implementation was done in a higher-level language, BLISS, and utilized a structured design and programming methodology. The roughly 90,000 instructions in the current system were produced by about six people at an average rate of more than 40 instructions per man-day. We think this is nearly 10 times larger than the industry average for similar projects. The use of a highly optimizing compiler for BLISS has proven to produce code comparable to, and often better than, that written in assembly language. Only about 30 software errors have been found to date.

Conclusions

Although our operating experience is still quite limited, the prospects seem very bright. All of the evidence indicates that the cost, performance, and reliability goals will be met or exceeded. Thus, it appears that within the next few years the data processing manager can look forward to substantially less expensive, higher performance, more reliable, expandable systems implemented as a complex of smaller processors. Moreover, although it may require some adaptation of existing programs to maximally utilize these machines, most of these benefits can be realized with no changes required. □



Dr. Wulf is an associate professor of computer science at Carnegie-Mellon Univ. in Pittsburgh. He is also chairman of IFIP committee WG2.4 on machine-oriented higher level language, a member of the SIGPLAN executive board, and of the IEEE technical committee on software engineering, and the editorial board of the IEEE Transactions on Software Engineering.

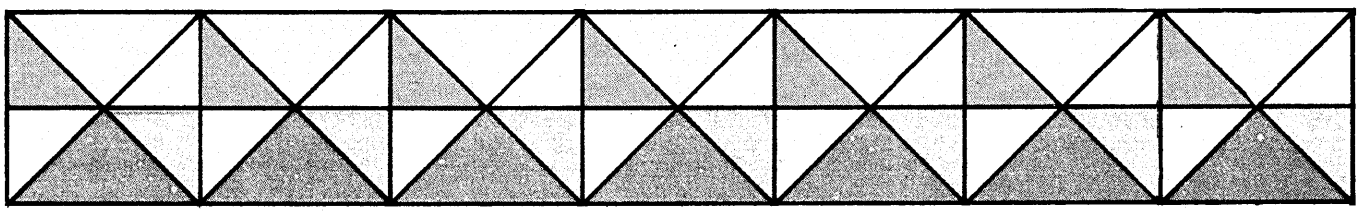


Roy Levin is a Ph.D. candidate in computer science at Carnegie-Mellon and a member of the ACM. At a previous position with the Perkin-Elmer Corp., he worked on the expansion of the IBM CP-67 operating system.

by A. G. Fraser

As in the University of California system, simple hardware interfaces take the place of sophisticated software; here the twist is in the conveyor belt channel.

A VIRTUAL CHANNEL NETWORK



A small switched data communications system is operating at Bell Laboratories' Murray Hill, N.J. location. Called "Spider" it links 11 computers of five different types. Each machine connects to Spider through a Terminal Interface Unit (TIU) which itself contains a microcomputer. Several TIUs share a common transmission loop to reach a switching center. Computers connected to the system have a switched data communications service with the following characteristics:

Speed Control—Any pair of computers can exchange data regardless of their respective working speeds. Input and output speeds are coordinated by the network.

Multichannel Interface—The TIU provides a computer with the equivalent of 64 independently switched full-duplex communication channels.

Error Control—Error detection and retransmission are carried out automatically by the TIUs.

High Performance—The network is capable of transmitting at data rates up to 125,000 bps (or at 500,000 bps if automatic retransmission on a per packet basis is not required).

By the late '60s minicomputers were being used extensively at Bell Laboratories. These machines were often located in research laboratories and were connected to laboratory equipment. They were sometimes individually connected to larger general purpose computers through datasets and voicegrade communications lines. In 1969, plans were made to build an experimental switched communications network that would serve this distributed computing capability at Bell Labs' Murray Hill location. Spider was to be an experimental research system that would provide insights into techniques and services which would interest computer users if high data rate-low delay communications were available. It would aid in understanding how to control such a network and how to structure it at reasonable cost.

After reviewing various multiplexing, switching, and control alternatives, it was decided that the service to an individual user should *appear* to be a direct channel linking him to his correspondent for the duration of a conversation. However, data would actually be transmitted in packets on demand-shared digital transmission loops. In this way, long holding times could be handled without dedicating transmission capacity to inactive users. Thus, the concept of a "virtual channel" was developed. When two machines ask for a virtual channel to be established between them, only a route for the data to follow is chosen: no assignment of physical equipment or bandwidth is made. Only when data is ready to be sent over the virtual channel does the network find bandwidth and switch capacity along the chosen route, and these resources are released immediately after the burst of transmission ends. The virtual channel concept allows the network to use a transmission technique suited to the type of traffic it has to carry, while the user sees a service that is independent of the communications technology used.

Spider interconnected its first two computer systems in 1972. Since then the population has grown steadily. As yet only computers are directly connected to the network (see Fig. 1), but the design includes the possibility of interconnecting keyboard terminals as well.

A general problem with some computer networks is that successful communication depends upon the correct working of software and hardware in each computer. Experience has shown that this software is not easy to write and test. The problem is reduced in the Spider network because each computer connects to the network through the intelligent Terminal Interface Unit. The TIU substitutes for the dataset of a more conventional network. A major difference between the TIU and a dataset, however, is that the TIU is capable

of handling 64 full-duplex data transmission channels at one time. This means that the PDP-11/45 shared file system, for example, can carry on simultaneous conversations with several other computers even though it has only one TIU. In addition, the TIU provides buffering for one packet of data on each of its input and output paths. This allows terminal I/O operations to proceed asynchronously at any speed up to the maximum the network can handle, and the TIU can retransmit the packet automatically when transmission error makes that necessary.

Considerable thought was given to general principles for designing an interface between a computer and a communications network. Here the functional characteristics of the interface were of greatest interest because, unlike the telephone voice network, there is no universally accepted definition of what data communications service should be. Nevertheless, a durable definition of the interface between data processing machinery and the communications system is required in order to make long-range planning and optimization of flexible computer communications networks practical. There are two criteria of particular importance:

1. Minimization of technological dependence between terminals and networks. The terminal interface should depend as little as possible on the internal workings of the network; otherwise, the terminal design would have to change when the network's internal operation changes.

2. Communication should be possible between any pair of terminals connected to the network. Communication between two terminals should not be ruled out simply because they operate at different speeds or because they have chosen to purchase different grades of communications service.

The terminal interface design chosen for Spider satisfies both of these criteria. In addition, the network provides error control, speed changing, flow control (i.e., regulating input and output speeds so that data do not flood the network, nor are terminals idle unnecessarily), multiplexing and switching. Data format conversion and code conversion are left to the terminals.

Physically, the interface has four main parts:

1. An asynchronous data output path carries data from a terminal to the network. A handshake technique is employed to allow for arbitrary response times from either the terminal or the network, and Spider puts no limit on the length of a message.

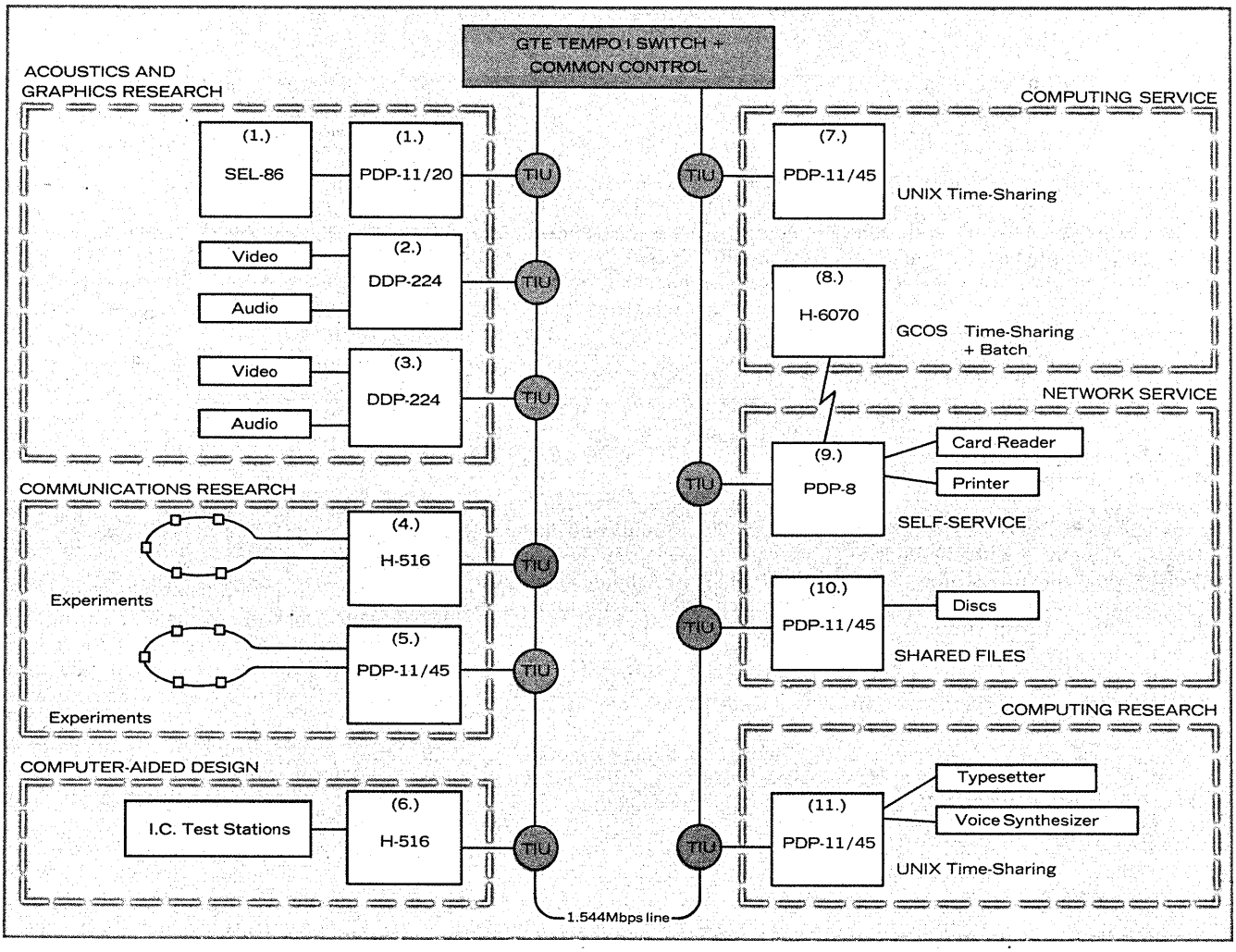
2. An aysnchronous data input path carries data from the network to a terminal.

3. A channel select path is used by a terminal to specify to which of the 64 channels subsequent data transfers relate.

4. A channel request path allows the network to tell a terminal when one of the channels requires attention.

In addition to the above, there are leads in the interface to allow the network and a terminal to indicate to each other when they are operational and when trouble forces a restart of communication.

The controlling component in a TIU is an experimental special-purpose microcomputer called 'Fly.' Fly operates at a rate of 5 million instructions per second. It has 8 operation codes, 256 16-bit words of program storage, 16 8-bit words of data space and two 256-bit I/O buffers. Its software allows it to be tested under remote control, and its continued proper operation is



monitored by hardware. Under the control of this microcomputer, a TIU assembles data, 32 bytes at a time, into packets. Sequence numbers and check characters are added to the packets before they are shipped to the destination TIU. At the destination, the packets are checked and acknowledged, and the data is delivered to the destination terminal. In case of error or loss, the central switching computer instructs the source TIU to retransmit the unacknowledged packets.

Terminal computers on Spider are connected to the central switching machine by 1.544 Mbps digital lines. Spider uses several loops to connect terminals to the switching machine. Each loop serves several terminals and operates like a conveyor belt for timeslots of fixed size. There are two packet types: large packets for terminal data each contain up to 32 data bytes, and small packets for internal network signals each contain 4 bytes. In addition, every packet is prefixed with an 8-bit TIU identification code. (That is the TIU's position on its local loop.) Each time slot can hold one packet of each type. Thus, a loop actually carries two independent information channels, one for terminal data and the other for network signaling.

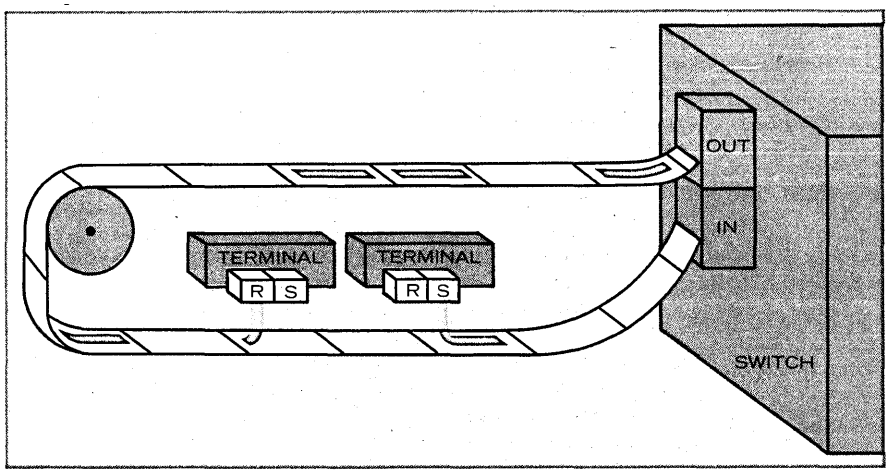


Fig. 2. Terminals transmit packets by adding an identification code to their data and putting the message into an open time slot on a conveyor belt-like channel. Receiving input works similarly.

A TIU transmits a packet by prefixing its own ID and depositing the packet in an empty time slot. When a TIU has no data to transmit it imposes no load at all on the transmission loop. At the switch, the sending TIUs ID is replaced by the ID of the destination TIU and the packet is placed on the destination TIUs loop. Each TIU looks at every arriving packet and takes it from the loop if the packet contains the appropriate ID. When a packet is removed, the timeslot which it occupied becomes empty.

One potential problem with loop transmission systems is that a failure in one terminal can put down the entire loop. To eliminate this problem in the Spider network, a simple Line Ac-

The machines currently connected to Spider are:

1. DEC PDP-11/20 and SEL 86—The PDP-11/20 is used as a peripheral controller for the Systems Engineering Lab's Model 86 mainframe. The 86 supports research into acoustic and visual phenomena, graphics, and man-machine interaction. It is being equipped with a variety of peripherals, including analog/digital converters, high-fidelity audio output, visual displays (color and black/white), and graphics input devices.

2. Honeywell DDP224—This machine serves the same user community as the SEL 86, and is equipped in a similar manner.

3. Honeywell DDP224—A duplicate of the above. The two machines are used interchangeably on a sign-up basis.

4. Honeywell 516—Supports research into communications techniques and systems. The machine has a serial loop I/O bus threaded through several labs at Murray Hill. Equipment under test is connected either directly to the bus or to a minicomputer which is then connected to the bus. Also available are graphics display terminals and a device that can write read-only memory chips.

5. DEC PDP-11/45—Will take over the equipment testing currently handled by the Honeywell 516 mentioned above when the latter is reassigned.

6. Honeywell 516—Connected to this machine are test stations which automatically measure and test integrated circuit chips.

7. DEC PDP-11/45—This machine, which runs under the UNIX time-sharing operating system, is operated by the computing service organization for the benefit of people developing software to support telephone services.

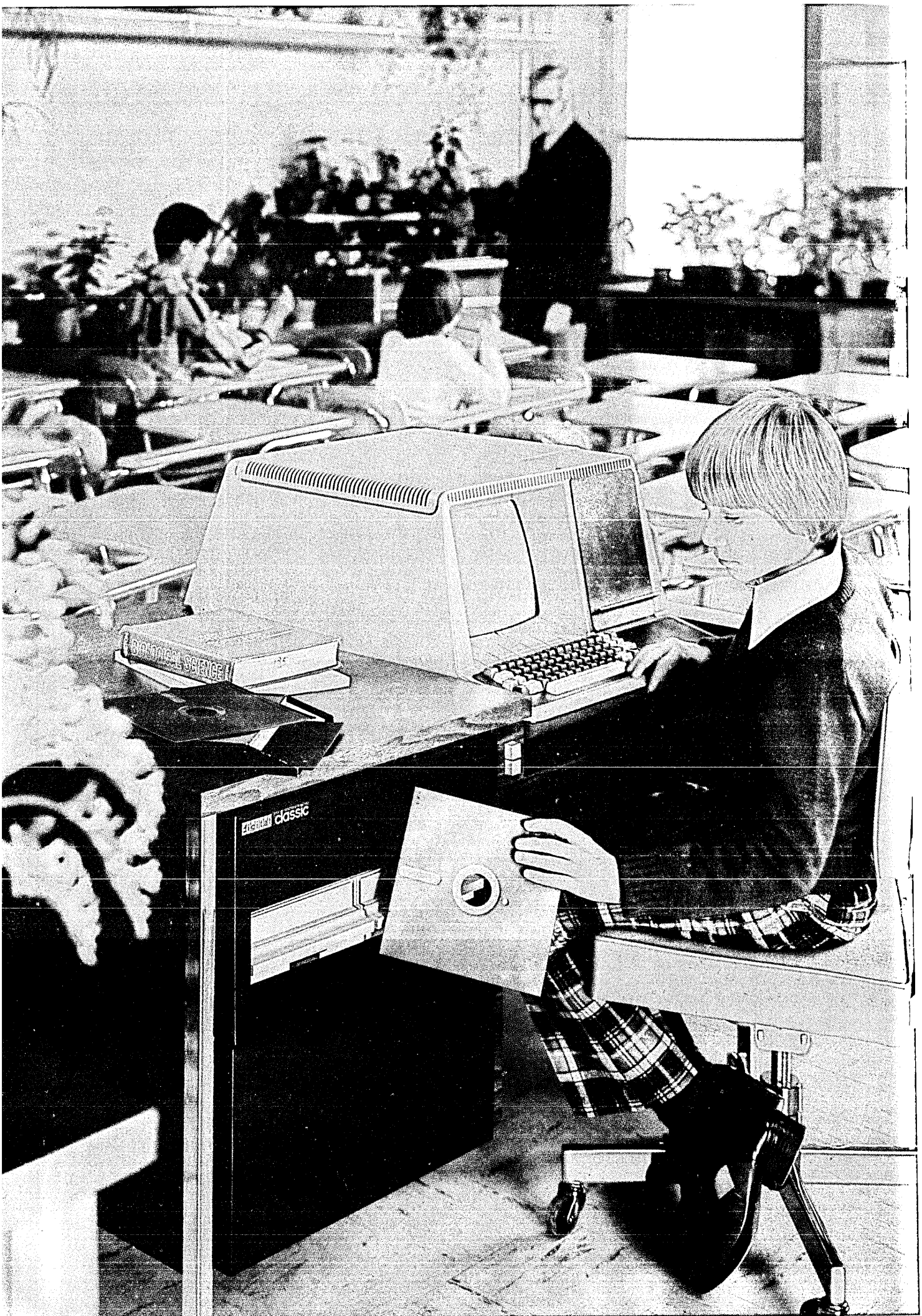
8. Honeywell 6070—This is the Murray Hill center's prime computer; it runs both batch and time-sharing work under the GCOS operating system.

9. DEC PDP-8—Provides a line printer for use by any computer connected to Spider, plus a 50Kbps data link to the H 6000.

10. DEC PDP-11/45—This machine, like the PDP-8, was obtained specifically to service the Spider user community. It is equipped with mag tapes and disc storage, and acts as a free-standing shared file system for use by the other machines in the network.

11. DEC PDP-11/45—Supports various computing science research projects, many of which have to do with text processing. (Webster's dictionary is kept on file.) The machine was the base for operating systems research that resulted in the time-sharing system, called UNIX, that now runs on it. In addition to disc, this machine has a phototypesetter, a graphics display, and a simple voice synthesizer attached to it. □

← Fig. 1. The Bell Labs experimental network, "Spider."


digital classic

Announcing the start of a new era in educational computing.

Introducing Digital's CLASSIC.™ A complete computer system for under $200 a month.

Now you can actually get a computer without a computer budget.

It's Digital's CLASSIC. A complete computer system, including processor, peripherals and operating software, for as little as $200 a month or $7,900 purchased.*

CLASSIC stands for CLASSroom Interactive Computer. But it's much more than that. It's a system you can use for everything from classroom physics projects to independent research — by programming it yourself in easy-to-use BASIC, or FORTRAN IV if desired.

Educational software is available for problem solving, computer-assisted instruction, or simulation — including a complete series of Huntington simulation routines for a variety of uses in physical and life science studies.

But the real strength of CLASSIC comes from what you can do with it on your own, right there in your own classroom, office or laboratory. CLASSIC is easy to install (any standard electrical outlet will do), easy to use (you'll be operating it yourself in minutes), easy to maintain (requires no air conditioning or other pampering), even easy to look at (its handsome, compact cabinet fits right in anywhere).

The basic CLASSIC system includes a fast minicomputer with 32,768 characters of memory, 512,000 characters of flexible disk storage, CRT display terminal, keyboard, printer, and complete system software.

And because the CLASSIC comes from Digital, it comes with the built-in reliability and support that have made Digital the acknowledged leader in educational computing. Support that includes comprehensive training aids, textbooks, and sample programs, plus the accumulated experience of over 5000 schools and colleges that are already using Digital computers.

All told, the mere existence of the CLASSIC is a major advance. If you've always wanted your own computer, but couldn't afford one, your time has come. Order your CLASSIC now, and start a new era.

*Price for educational institutions only

Send in the coupon below or call Education Products Group, Digital Equipment Corporation, 146 Main Street, Maynard, MA 01754. (617) 897-5111, Ext. 6707. European headquarters: 81 route de l'Aire, 1211 Geneva 26, 42 79 50. Digital Equipment of Canada Ltd., P.O. Box 11500, Ottawa, Ontario K2H 8K8. (613) 592-5111.

digital

Education Products Group D
Digital Equipment Corporation
146 Main St.
Maynard, MA 01754

I'm ready to start my new era in educational computing.

☐ Please send me more information on the CLASSIC.
☐ Please send a sales person immediately.
☐ Please send a CLASSIC.
PO #_____

Name_____
Title_____
Institution_____
Address_____
City_____ State_____ Zip_____
Telephone_____

cess Module was designed for the transmission line at each terminal. Failure in the region of the terminal causes that section of the loop to be automatically disconnected from the system. The switching computer can also disconnect a terminal by sending a signaling packet to the TIU.

The central switching machine is a minicomputer (a GTE TEMPO I with 24K 16-bit words of core). Packet switching is table-driven and is accomplished entirely within interrupt routines. The tables dictate how packets from each of the TIUs should be routed: the identity of the destination TIU and the loop on which the TIU is located. Thus the switch's tables must change whenever a terminal stops sending data on one of its channels and starts sending on another. This is effected by the TIU sending a signaling packet to 'mid-level control' software which runs autonomously within the switching machine. The mid-level process responds to the TIUs signaling packets and adjusts the switch's tables accordingly.

Mid-level is one of four principal processes that run autonomously within the switching machine. A second is the auditor process that is clock-driven and constantly monitors the state of the network. If the data flow between TIUs should halt, the auditor tries to break any deadlock that might have arisen as the result of transmission error. If a TIU fails to respond to signaling packets from mid-level, it is the auditor that causes these packets to be retransmitted. Finally, the auditor checks on the state of the data structures within the switching computer and forces a restart if they are corrupted.

A third autonomous process services the keyboard and display which are provided for manual operation of the network's diagnostic and maintenance programs. This system is like a "one-man" time-sharing machine. It has a small file system and command interpreter. Unlike most such systems, the user can spawn processes that can respond to machine interrupts or be driven from the clock. By this means one can perform engineering tests while the network continues to provide service. Such tests include remote operation of a TIU, and contol of specialized peripheral equipment used for maintenance of network components.

The fourth autonomous process is high-level control. In some respects it is like another terminal on the network. A terminal communicates with high-level control to set up and take down calls. It does so over certain dedicated channels. There are 64 of these "control channels," in one-to-one correspondence with the 64 data channels by which terminals normally communicate with one another. To a terminal, high-level control is a "machine" that responds to certain command messages like CONNECT and as a side effect alters the data structure which governs mid-level control's operation.

A barometer of user acceptance of the experimental network is the growth and style of use of the free-standing PDP-11/45 share file system. The first productive use of the network arose when one of the Honeywell 516s was equipped with a program that used a PDP-11/45 for long-term storage of its files. By invoking a single command, a file could be transferred from the 516 to the file store or vice versa. More recently, software for the DDP224 computers has been modified so that they can treat file store files in the same way that they treat files on their own smaller backing stores. Once a file is opened, I/O operations are performed on it without regard for its actual location. The most extreme example of dependence upon the file store occurred when a PDP-11/45 was delivered without its discs. Until the discs arrived, the machine was able to run the UNIX time-sharing system by using a file store disc for swapping as well as file storage.

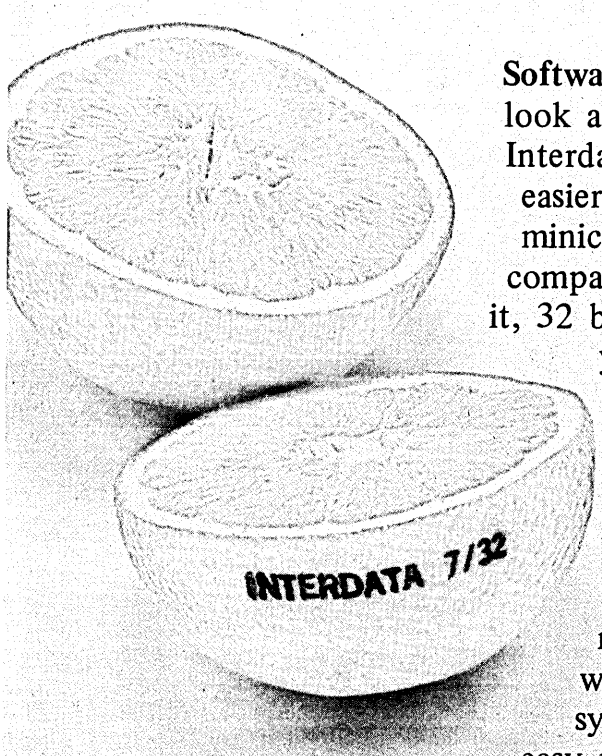
Apart from some initial exercises, growth in network usage has relied upon individual members of the technical staff seeing personal advantage in using the system. Usually the initial involvement requires some readjustment of working habits if not some program writing. As utility routines become more numerous and familiarity with network characteristics increases, growth pains are diminished. In the early days the driving force was the desire to share peripherals, such as disc storage and a line printer. More recently, however, the availability of certain capabilities on one machine has prompted users of another machine to use the network. For example, users of the DDP224 have only primitive editing facilities and can only use their machine on a sign-up basis. The UNIX time-sharing system, or the computation center's GCOS time-sharing service, on the other hand, operate around the clock and have excellent editing facilities. It is therefore more attractive to use a time-sharing system for program editing and to use the network to make these files available to the DDP224. In the long run it seems that human resource conservation will be quite as important a reason for using a network as is the desire to share hardware resources.

The areas of greatest difficulty have involved finding adequate protocols that can survive loss of coordination resulting from hardware or software malfunction, or from extraordinary actions taken by the user. Problems occur at low levels, between TIUs and the switching machine, and at high levels, between application programs. To handle these problems we have first to learn how to specify, develop and test programs that operate in asynchronous and physically separate machines. For example, there is no single ('halt') button that one can press, so that it is not usually possible to stop communicating programs in a coordinated way. Memory dumps made on the separate machines will frequently correspond to different states of the system. Finally, persistent protocol problems occur quite infrequently, are timing-dependent and difficult to reproduce.

An interesting symbiosis has been required to make experimental research on computer networking possible. Network users are primarily concerned with their own research, and look on Spider as a service which aids them in that goal. Therefore, users' acceptance depends heavily upon their perceptions of what advantages the network offers them, and upon their observations of the reliability and availability of the service provided. Since existing habits have to be changed and effort expended to make use of the network convenient, these are resonable concerns. To date Spider has succeeded in building user confidence on both of these fronts. The network is available 24 hours per day to serve the needs of research people who often work strange hours. Network services, such as file storage, printing, and access to the Murray Hill computation center are also run around the clock. □

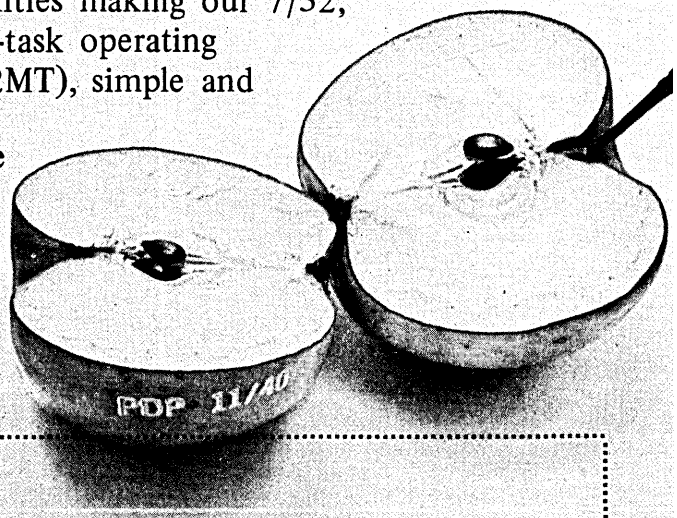
Dr. Fraser designed the specialized electronic parts and did the programming for Spider. He came to Bell Labs in 1969 from Ferranti Ltd., where he was responsible for compiler writing. Prior to that he was assistant director of research at Cambridge Univ., where he worked on the file system for the Atlas computer.

THE ONLY WAY TO COMPARE APPLES & ORANGES



Software makes it no comparison. Especially when you look at the Interdata 7/32 versus the PDP 11/40. Interdata believes that hardware exists to make programming easier. That's the reason we invented a 32-bit minicomputer. And that's the reason there can be no comparison with a 16-bit machine. When you think about it, 32 bits makes it happen. Which means, no matter how you slice it, you get: Unrestricted program size that gives you application programs which are not limited to 65K (16 bits) of memory; Instant disk-to-core loading, dynamic address relocation and task handled traps to assure you of rapid context switching; a Command Substitution System that gives your operator/programmers macro-capabilities making our 7/32, with its multi-task operating system (OS/32MT), simple and easy to use.

Software, that's plain and simply why we made the 7/32 happen – to make your software more efficient and cheaper. So don't try to compare apples (the PDP 11/40) and oranges. Especially when their apple only has 16 bits to help their software and our orange has 32.



This is the Interdata 7/32 minicomputer.

INTERDATA®

A subsidiary of The Perkin-Elmer Corporation
Oceanport, N.J. 07757. (201) 229-4040.
6486 Viscount Road, Mississauga, Ontario, Canada L4V 1H3. (416) 677-8990.
Arundel Road, Uxbridge, Middlesex, England. Uxbridge 52441.
8032 Grafelfing bei Munchen, Waldstrabe 31, West Germany. 854-20-34-38.
92 Chandos Street, St. Leonards, Sydney, Australia 2065. 439-8400.

Interdata, Inc.,.Oceanport, N.J. 07757. (201) 229-4040.

Gentlemen:

☐ Maybe there's no way to compare apples and oranges, but I've got to try. Send more information about the 7/32.

☐ Let's talk oranges. Have an Interdata representative contact me.

Name _____ Title _____

Company _____

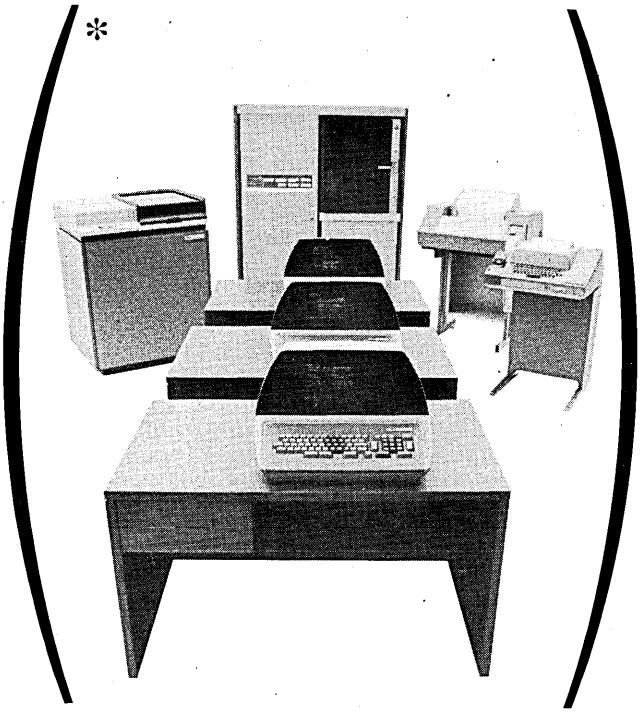
Address _____

City _____ State _____ Zip _____

Telephone _____

CIRCLE 53 ON READER CARD

GREAT COMPUTER SECRETS*



We've been so busy developing our powerful GCS 2100 system, we've never taken the time to tell enough people what a great system it is.

How efficient it is (average of 80% reduction in errors — 35% to 85% faster document handling). How reliable it is (less than 1% downtime). How simple it is (operator training time less than 8 hours). Or how economical it is (10% to 40% savings in data preparation costs).

And our competitors have loved us for keeping it such a secret!

The GCS 2100 is a complete data entry system: it lets you collect and edit data at the source (data is actually edited while it is being keyed); store the data on disc; then transfer the clean data to an output media like magnetic tape. (Data already on tape or cards can be re-submitted to the GCS 2100 for editing, reformatting, etc.)

The GCS 2100 can interface up to thirty-two Touch-Tone® telephones. Card readers. Medium and high speed line printers. Four-tape drives. Four fixed or moving head discs.

All on a single system.

The GCS 2100 provides extensive I/O functions so you can transfer data to and from disc storage and other I/O devices.

The GCS 2100 can accommodate up to 64 local or remote terminals: local terminals can be located up to 2500 ft. from the system's CPU. You get faster, more accurate data entry for functions like payroll, shipping, receiving and manufacturing, because the person most familiar with the data does the keying.

The GCS 2100 also offers data entry from remote terminals (it can handle up to five remote terminals over one dedicated telephone line).

A Programmable Extension Package (PEP) extends the power and the flexibility of the 2100 system: up to 255 PEP tables provide capabilities like automatic data insertions; range and value checks; table look-ups; logical tests; character expansion; and data dependent format switching.

These tables are not job assigned, so they can be used on several different jobs.

A library of over 100 special edits is also available. (If there isn't an edit for your needs, we can design one.)

The GCS 2100 also provides up to 99 format levels per job; up to 255 balance accumulators; variable length record and blocking factors; and up to 255 jobs stored in the system.

GCS 2100 Peripherals: GCS DataTone — data entry via Touch-Tone® telephones. GCS Data Tel — remote batch communications.

For more Great Computer Secrets, contact Agent 2100 at General Computer Systems, Inc., 16600 Dooley Road, Addison, Texas 75001. (800) 527-2568 toll free. In Texas (214) 233-5800.

GCS 2100
General Computer Systems Inc.

Current trends may culminate in the office of the future being an extension of the computer center, or vice versa.

TOWARD THE AUTOMATED OFFICE

by Edward K. Yasaki, Senior Associate Editor

While data processors are concentrating their efforts on maximizing throughput and minimizing run times and, all in all, running an efficient dp shop for their users, significant developments are beginning to surface in the office environments of some of those same users—developments in the classic office functions and processes that have nothing to do with computer-related data capture or the use, say, of terminals. These developments bring into play a variety of separate but related technologies that in the 1980s, observers say, will tie the front office very intimately to the corporate dp function. They will combine a wider availability of lower-cost communications facilities with technological developments in displays, microelectronics, and data base management.

None of the separate office functions introduces a new term. Word processing as an activity is rampant . . . facsimile transmission is gaining in acceptance . . . digital message store and forward systems are already being used by a number of companies . . . and document storage and retrieval using microfilm or fiche is old hat. What's meaningful is the increasing realization among equipment makers that these separate developments can be tied together to increase productivity in the office of the future.

First word processing

Take word processing, for example. It's being seen as the foot in the door, the opening wedge to the automated office. Clearly it's the closest the office has yet come to automating any function, and it's the center of most of what goes on there. Word processors, based on the typewriter, manipulate and adjust text in ways that cut costs. DATAMATION's contributing editor, F. G. Withington of A. D. Little, foresees enhanced capabilities and expanded markets for these systems with the advent of microprocessors and low-cost minis. The prices of these devices need not go up, he observes, while the price of labor constantly does.

Having greater ramification, Withington adds, is the logical follow-on. If you're typing text, you're also digitizing it for storage on a magnetic medium. You can then carry it to someone else's machine for transcription or transmit it over lines inexpensively —and have none of the bandwidth problems of facsimile transmission. With the mail service being what it is, it's even appealing to send memos, letters, and proposals over phone lines. And, of course, all this can become computer input.

Enhanced capabilities through such integrated functions is the byword in office automation. Office products that now are standalone devices will be integrated into systems, according to Quantum Sciences study. There already are text editing typewriters linked to a shared processor, providing economies of scale and such features as access to common data bases containing, say, customers' names and addresses and boilerplate paragraphs, as well as shared high-speed printers.

In the future, too, they say, copiers will be integrated with the facsimile transceiver, as well as with text editing output, and with microfilming. The text editing process will meld with storage/retrieval systems and, in other instances, with photocomposition for in-plant printing. And a dictation transcriber could become a part of the office typewriter. Not to be overlooked, in addition, is a computer-based, user-programmable PABX.

According to John Brennan of Quantum, the electronic switchboard will have modems shared by office terminals, allow incoming messages to be stored for later delivery, allow office dictation to be recorded on voice store-and-forward units for later transcription, and provide toll accounting and traffic analysis to allocate phone budgets and optimize line usage.

A $23 billion market

The recent Quantum study forecasts shipments of office automation products and systems over the next five years totalling $23 billion. Shipments in 1973 came to $3.4 billion, of which standalone products comprised 99%. But in 1978, when shipments will have grown to $5.8 billion, conventional products will account for 79%, integrated systems for 5%, and new products for the remaining 16%, Quantum says. In that same time frame, there will be a growing shortage of clerical labor. And secretarial salaries in the major cities that averaged $160 a week in 1973 will jump to $220 a week.

Still, one might question whether automation in the office environment, sometimes requiring a drastic change in the ways things are done, will be accepted. Prof. Edwin B. Parker of Stanford Univ.'s Dept. of Communications, has been studying and writing widely on information technologies. He thinks the economics of the automated office will provide sufficient impetus to bring about acceptance, despite the attitudes of office workers. There obviously will be transitional problems, he adds, and "it's hard to measure the economics. The thing is there are things you'll be able to do with an automated system that you can't with the manual. And how do you put a dollars-and-cents value on these?" An automated system for librarians was developed at Stanford, he explains, and there were fears and trepidations among the staff there—which have since disappeared. But the decision to implement the system was made at the management level, influenced strongly by its economics. And he sees the same occurring with the automated office.

Evelyn Berezin, president of Redactron Corp., Hauppauge, N.Y., also sees equipment being developed with a combination of functions. Her company's word processing equipment, which comprise a prominent share of the marketplace, has a communications capability. She foresees a text editor also being able to access a central data base and going out into the world over the Telex or TWX network.

In a sales office, she explains, you might be using word processing equipment for very ordinary letters or for proposal preparation. You could insert boilerplate information into letters, inquire into a data base to learn when something was scheduled for delivery or to learn what was in inventory, and also from that same terminal enter purchase order information for batch transmission to some central point.

"So you're talking about a very wide variety of applications for that word processing equipment," Berezin says. "It's available now. And what one would like to do is to consider that combination of capabilities extended into even more general operations: to reproduce textual information, if you needed it, or to transmit facsimile information, so that at any field office or maintenance facility you would be able to do whatever is also possible at the home office."

Achieving something like this, of course, is often outside the ken of a single company. San Francisco-based Fireman's Fund, for example, is the seventh largest insurance company in the U.S. It has 49 branch offices around the country and six regional

This publicity still from Redactron Corp. illustrates some of today's state of the art—separate transcription, text editing, and digital communications products.

DP Management and the Automated Office

Secretaries are said to favor the use of word processing systems in offices, for it opens a career path for them. Freed from the typewriter, or at least much of the typing duties she now has, the secretary can become more of an administrative assistant to her boss, it is being said.

The automated office, too, can mean a new career path for those in data processing. It will require, however, a far greater awareness by dp people of what's going on in the corporate office environment, where computer-based systems on a dedicated basis are beginning to appear. These are black-box controllers doing things unrelated to the classic dp shop, but in time these systems may be interfaced to the dp center.

Similarly, there's the company's automatic switchboard. "The dp manager and the data communications manager will have to become more directly involved in the acquisition of PABX systems for the office and for offices throughout the company," says John J. Brennan of Quantum Science Corp., New York, a firm that has completed a study of this market. Most PABXs are currently selected by, say, the office manager, and for the next five years or so that's the way it will continue. But with the approaching availability of a programmable PABX and the ramifications that that has, it becomes important that the dp manager become involved.

Depending on the nature of an organization's primary activity, the initial impetus to the automated office will be made by the word processing, the printing/reproduction, or the telecommunications function. In most instances it will be word processing. And that activity might be headed by an administrative vice president, who also oversees his company's voice communications functions, the printing/duplicating, and general office services. Whatever that person's title, he is not the data processing manager, who is responsible only for edp and data communications.

With the implementation of some of the concepts discussed here, however, Quantum Science foresees a change in the organizational makeup of a company. All of these activities, it is believed, will become the responsibility of one executive, perhaps a vp of information services. Reporting to that executive will be the managers of edp, communications (voice and data), graphics, word processing, records, and general office services.

George Schussel, who has held management positions in computing for many years, doesn't see this type of reorganization occurring soon. Perhaps over two decades, he says. Schussel, vp of Information Systems & Services Group, American Mutual Insurance, Wakefield, Mass., says, "What I see happening is the MIS or dp function coming under the Administration, rather than the Controller. There's sort of a trend in that direction. As that happens, and as the dp function continues to grow, all of a sudden what you're looking at is, say, a senior vice president of Administration who has a vice president of data processing reporting to him, but 80% of all the people reporting to him are in dp." □

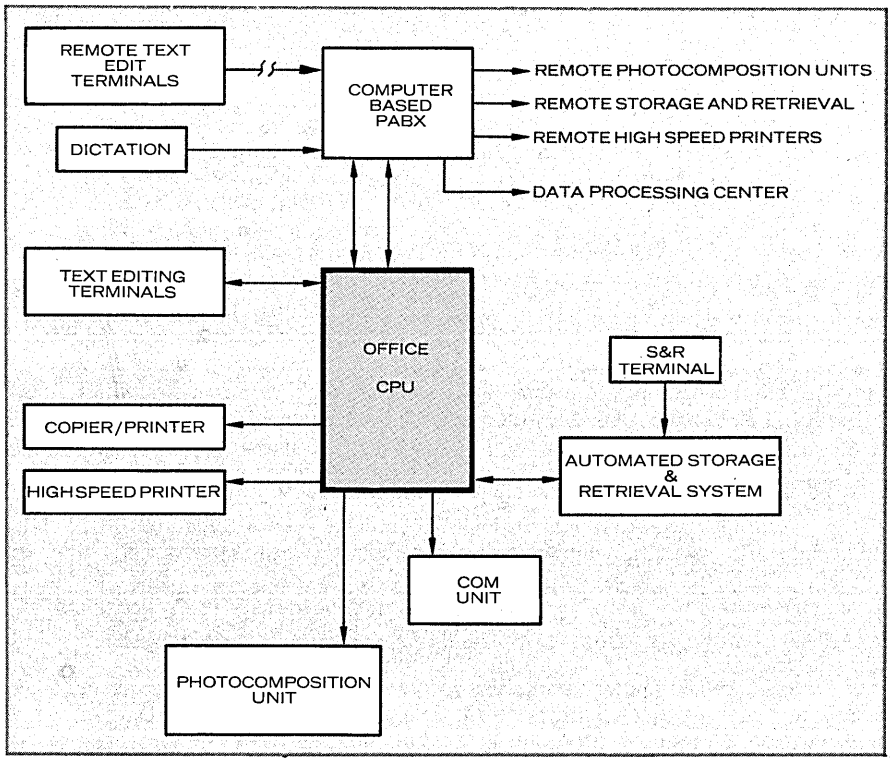
processing centers. This company is looking to automate its insurance policy preparation. A big expense at the branches is assembling anywhere from eight to 30 documents that comprise a policy and typing on each one. The problem is that an insurance company is regulated by each state in which it operates. "So you have forms requirements that are different in each state," laments Jack Coplen, who heads Fireman's branch office automation group. "You have maybe 200 forms for each state, multiplied by 50 states." He adds that a large effort is currently underway by the industry to standardize on forms, something that must be achieved "before you can really get the thing down to a scale where you can attack it with word processing."

Features along these lines are said to be incorporated in an experimental secretarial station developed at the Xerox research center in Palo Alto, Calif. The people there refuse interview requests, but it's been learned that some 100 units of a system dubbed Apollo were being manufactured by the company's computer operation in Los Angeles. Apollo reportedly is based on a Nova minicomputer from Data General, has a million bytes of semiconductor storage, and a crt with a resolution said to be 10 times greater than that of a conventional tv screen. It purportedly is being used initially as a secretarial desk for the maintenance of local files, but can be networked to make shared files.

But A. D. Little's Withington points out that all this talk about keying data once at the word processing station, then transmitting it or storing it for later retrieval, implies a digital technology. "Offices don't work digitally; they work with analog images on paper." It's a point also made by Tom Humphrey of Stanford Research Institute. People's reliance on the hardcopy, very difficult to overcome, won't be changed for a long time, he says. But there will be less reliance on the hardcopy.

Humphrey believes there are three routes to the automated office. One is word processing; a second is telecommunications; and a third is through the printing/publishing technologies. At SRI they produce about 1,000 master pages a day for such documents as reports, proposals, and brochures. That's nearly 250,000 master pages a year, not to be confused with printing impressions. Thus their interest in word processing and other aids to realizing economies. Critical of the typewriter, Humphrey sings praises for the electronic keyboard, which, with a display tube, reportedly can produce much greater throughput.

At Trans World Airlines, they use IBM word processing systems for the documentation of their computer software and for the maintenance and updating of 28 administrative manuals. The text for these loose-leaf manuals is stored on more than 4,000 reels of tape. The text preparation and editing devices from Redactron and others are designed to prepare text for typesetting for applications such as this.



Source: Quantum Science Corporation

Fig. 1. Text editing, document preparation, facsimile transmission, automated file systems, and programmable switchboards exist separately today. Integrated, they could make up the automated office of the future.

Who cares about PABX?

The third bridge to the automated office is through telecommunications. Brennan sees the programmable switchboard linking the various pieces of the automated office together. In the U.S., he says, word processing is leading the way to the automated office, while in Europe the programmable PABX may do this. The Europeans have more sophistication in this than in word processing, he explains, and the phone companies there are less restricted from providing computer-based PABX capabilities.

The computer-based switchboard, Brennan says, will link the various administrative functions within the office to each other and to other functions, such as security and control systems. It will also provide a link to systems outside the office—to the corporate edp center and to outside computer service vendors. These systems, integrating both voice and data communications through a single control point at the corporate office, will feature modems shared by office terminals and will perform store-and-forward functions with voice messages and digital facsimile signals. "You want to be able to dictate messages into the phone," he says, "and retain a message for your secretary. And you will want to dictate letters to the word processing center."

Brennan admits the initial appeal of the electronic switchboard will be its ability to improve cost controls by performing an analysis of phone usage and possibly monitoring and restricting calls. A company might subscribe to both a zone 3 and a zone 5 WATS service; if zone 3 is busy a caller may just go to the zone 5, which is more expensive. This can be controlled, restricting zone 5 only to those requiring that facility.

An important factor leading to the delay in the installation of such switchboards, Brennan says, is that the prime candidates for them, the large offices, have a strong preference for the Centrex switching services provided by the phone companies. It therefore will be up to independent suppliers to provide a system that can be interfaced to the Centrex and that has the features of a programmable PABX to perform the office system integration.

Centrex takes the switching gear out of the office and puts it in the telephone company plant. "And that practically eliminates the programmable PABX market from the offices that could best use it," says Brennan.

In Europe, IBM has been marketing an electronic PABX that is not available in the States. If IBM's attempt to get into the domestic satellite communications business is any indication of the problem it will have diversifying its business, it will be several years before its new switchboard will be available in the States. A few other independents, however, are developing systems for the U.S. market. Their arrival onto the marketplace could coincide with the wide availability of digital network services.

In certain industries—banks, insurance companies and utilities among them—there are specialized filing applications that require the storage and retrieval of microfilmed documents. In an insurance company, that might be applications for policies. In cases such as this, Brennan sees a continued demand for a hybrid storage-retrieval system, such as Kodak's Miracode II. It allows for the entry and inquiry of file index information from a terminal, display on a film reader, and the availability of a hard copy from a reader-printer.

While the implementation of computer-based storage-retrieval systems will not be widespread in the next five years, he says, the availability of a shared processor text editing system will make it feasible for the indexing and referencing of material prepared in the office to be done at the time of the original text entry. The shared processor can also be used for indexing and referencing material prepared externally that enters the office files, and will assist in the integration of all stored documents in centrally controlled files.

The automated office, then, has these types of characteristics and capabilities, promises benefits that are difficult to express in dollar figures, and apparently will bring about a reorganization of the traditional office structure. Logically, current suppliers of office and business equipment will attempt to establish a foothold in this large market.

The vendors ante up

Of the major computer manufacturers, IBM, Xerox, and Univac are in the word processing business to at least some extent. IBM popularized the term, taking it from the German *Textverarbeitung.* Xerox entered the field last October, announcing a standalone text editing system that many observers see as only the proverbial tip of the iceberg. And Sperry Remington, which had been selling the Redactron units under its own name, now has a licensing agreement to begin manufacturing them.

Those who follow such developments look for a restructuring at IBM that brings into even closer association the General Systems Div., which markets the System/3 small-scale computer, and the Office Products Div., which markets typewriters, copiers, dictating equipment, and text editing typewriters. Market researcher Robert F. Wickham, formerly associated with Creative Strategies, says 2741 terminals connected to a S/3 with the proper software could produce a shared processor text editing system that would run circles around anything now offered by the Office Products Div.

At Sperry Rand Corp., there's been a recent consolidation of its Sperry Remington office systems and machines operations into the Sperry Univac Div. "This will ensure our successful future participation in the rapidly growing information processing systems markets," commented Sperry's chairman and chief exec officer, J. Paul Lyet. Under this reorganization, Univac will be responsible for the development, manufacture, and marketing of all computer systems, peripherals and terminal products, office systems, office machines, and related products.

Others also are expected to make their moves. Burroughs recently took steps to acquire Graphic Sciences Inc., manufacturer of facsimile transceivers.

To date, within companies, data processing and word processing have been operating pretty much independently. But when one thinks about it, a lot of the information eventually massaged and stored by the dp department originates in the office. For this reason, executives at a number of companies have begun thinking about the eventual closing of this loop.

"In the long run I think these word processing machines and the data processing world are really going to move together," says Redactron's Evelyn Berezin. "I mean, that's really the future of the office, to tie it all together."

And she thinks it's "terribly important" that the dp manager become involved with word processing. "I think one of the problems has been that there's been no management connection between the data processing operation problem and the total office problem . . . The office of the future is going to come about only when there is a connection." □

People can be motivated to want to be part of a program maintenance staff.

ORGANIZED PROGRAM MAINTENANCE

by John W. Mooney

Planning, staffing, and organizing a completely new approach to program maintenance made 1973 a turnaround year in data processing for Spring Mills, Inc., a major Fort Mill, South Carolina based textile manufacturer. Now, two years later, we have collected enough information to know that the approach we adopted was the right one.

Spring's Computer Information Services (CIS), based at the company's Customer Service Center in Lancaster, S.C., was at that time operating 24 hours per day, 6 days per week, with an IBM MP/65 and over 3,000 productive programs written in COBOL, RPG, and BAL. Two 1401s and two 7070s were supported with an additional 800 productive programs each. In addition, thousands of frames of microfilm and microfiche were produced daily. And approximately 700 new programs were being placed into production each year. (No new programs were being written for the second generation equipment, and attrition was diminishing the number of old ones.)

The old way

No records were kept before 1972 to provide statistics relating to cost and effort, although deficiencies in new development were evident. New systems were implemented behind schedule and over budget. One or more programmers remained on the projects, often as long as six months, correcting and enhancing the systems to make them operational and acceptable to the users. This, then, affected manpower scheduling for systems waiting to be staffed and taxed the user's patience and confidence in data processing in general.

Records were compiled during 1972 showing where all efforts were expended, to determine what percentage of time was actually being devoted to new development and what was happening to the rest of the time. Efforts were categorized as: new development, maintenance, special projects, and administrative overhead.

Prior to 1973, CIS had no particular staff members assigned to maintenance. Instead, it was performed in conjunction with new development. No plans were made for servicing requests and no personnel were budgeted for performing this necessary and sometimes critical function. Therefore, in 1972, 30.1% of total programmer effort was spent in maintenance while only 45.2% went to new development. The remaining time went to special projects (10.5%) and administrative overhead (14.2%).

A few words of explanation are needed to clarify terminology. "Special projects," as defined by CIS, means: "one time" programs, conversions from one language to another, and special reporting necessitated by wage and price controls. Maintenance falls into one of three categories:

1. Repair—
   correcting program deficiencies
2. Revisions—
   business or government oriented changes such as payroll changes, and changes to improve job or program efficiency
3. Enhancements—
   different reporting from or additions to existing systems

Repairs and revisions are performed on an "as needed" basis without regard to cost justification. The user submits a written request for an enhancement cost estimate. When he receives the estimate, he evaluates the cost versus the payback and benefits he expects to receive. If his findings are favorable he then submits a request to have the task performed.

Administrative overhead is defined as non-project oriented activities such as supervision, education, vacations, holidays, sick leave and other time off.

The 45.2% effort applied to new development sounded great, but we knew it could stand a lot of improvement. Not only were new and needed systems going undone, the 45.2% being developed was full of errors due to constant interruptions created by maintenance, thus compounding the maintenance problems. Maintained programs often required re-maintaining because programmers, in their haste to be rid of the burden, would neglect to upgrade documentation or ensure that only the correct version of the program remained in the libraries. With a staff of 40 programmers servicing between 70 and 80 requests each month, any type of control using this method of handling maintenance was impossible. At one point the test libraries contained more modules than the production libraries.

The new way

At the beginning of 1973, we created a maintenance team made up of a selected group of senior and junior programmers. A project manager was assigned to organize the team and operate as follows:

1. Prepare a log and record all requests in and out, by date, for control.
2. Evaluate each request for its severity and assign priorities.
3. Assign tasks to the programmers in the group.
4. Ensure standards were met and documentation upgraded.
5. Ensure that maintained programs were thoroughly tested before being placed in production.
6. Get programs back into production as expeditiously as possible.

Since maintenance has traditionally been regarded as distasteful and unre-

warding, we braced ourselves for a mutiny or, at best, a slump in morale. To help ease the situation, certain promises were made to the personnel selected to serve in this area. They were assured that while serving on this team they would always receive the largest merit increase allowed by company policy. They were also assured that if they wished, they would be rotated out of maintenance after serving six months, without forfeiting the promised increase earned during their stay. It was also explained to them that this task was more important to the company than any other programming function. When the maintenance backlog permitted, members of the team were assigned one time special programs to write so they would be prepared to work on new development when they desired the change. (At this writing, I have received no request for rotation.)

Instead of the anticipated low morale problem, maintenance personnel accepted their new responsibilities as a challenge and a way of learning how *not* to write programs. Their morale has remained high; they offer suggestions of what not to do to new development personnel; and, they voluntarily arranged Saturday staffing among themselves, which was not then one of their required duties. The team developed into multilingual experts capable of handling any program change or any abend. They take pride in their work and are respected by others and praised by management. They have offered many suggestions causing standards and documentation changes affecting program maintenance.

In 1973, this team serviced nearly 1,000 requests for revisions, enhancements, repairs, etc., while reducing the total maintenance percentage to 20.1%, allowing new development to reach an all time Springs Mills high of 57.9%. This amounted to a 10% decrease in maintenance effort and a 12.7% increase in new development. (The additional 2.7% difference occurred in administrative overhead and special projects.)

The fact that new development personnel were concerned with only new development and the maintenance staff concerned only with maintenance seemed to have a positive affect on morale within the programming department. The newly developed systems went in on time, under budget, and operational. Programmer turnover for 1973 averaged 9.3%.

The second year's numbers

In 1973, we were staffed with 40 programmers, of which 10 were assigned to the maintenance team. New projects made it necessary to increase the staff to 44 early in 1974, but none were added to the maintenance group. The turnover rate for 1974 settled out at about 11.3%. Five programmers left the company; but none left from the team. So far, no one on the team has even asked to be reassigned.

In 1974, maintenance ran 20.2% of total effort, a marginal increase of 0.1% over 1973. There are now eight programmers in maintenance; two were placed on new development projects in July (and *objected* to the move).

The computer department is replacing its old configuration of hardware with two 370/158s. Springs Mills Management is pleased that more effort is now going into new development, and we are constantly looking for ways to improve what we already have. For example, a programmer implementing a program change rarely knows the affect the change could have in succeeding jobs or systems. Consequently, one systems analyst has been assigned to the team to research changes when dependencies are not known.

Now all new programs are implemented with the possibilities of future maintenance in mind. New systems undergo a rigid review prior to the detail design stage. Reviews, presented by the senior systems analyst, are attended by the CIS Director, a data processing auditor, the managers of Program Development, Systems Development, Technical Support, and Operations, and the senior programmer that will be assigned to the project. An attempt is made, by all persons involved, to pick holes in the system or discover loose ends or uncertainties. Once the system appears sound, the analyst reviews the system with the user. At that time the user accepts or rejects the system.

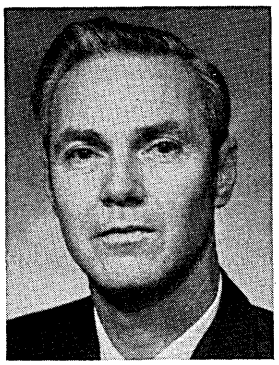
When a system design is accepted by the user, program estimating is done, schedules established and program specifications are begun. All program specifications are edited and reviewed by a senior analyst or project manager before being accepted by the programming staff. Edit program specifications are further reviewed by a programming project manager for completeness and clarity.

At implementation, all programs are thoroughly examined for adherence to standards before being approved for production. All programs must be modularly constructed with clear and meaningful notes explaining the purpose of each module. Program options, constants, tables, etc. must be external to a program to reduce future program changes. Programs, particularly edits, must produce a program control summary accounting for records in, records out, number and type of errors produced on error lists, money and/or quantity amounts.

If all programs meet standards the system is given a shakedown run by the development team and an operations analyst where operator instructions and other such considerations are reviewed. If the system passes these rigid examinations it is then classified as productive; however, all new programs must run productively and trouble free for a 90 day period before they become the responsibility of the maintenance team.

In addition to all previously mentioned checks and examinations systems and programs must pass, our data processing auditors periodically pull documentation folders from the library and audit either an individual program or an entire system. Their role is to ensure that the system complies with the user's accepted goals, that users get what they need, and that what they get is accurate. Often the auditors recommend certain changes that can further benefit the user or make maintenance easier.

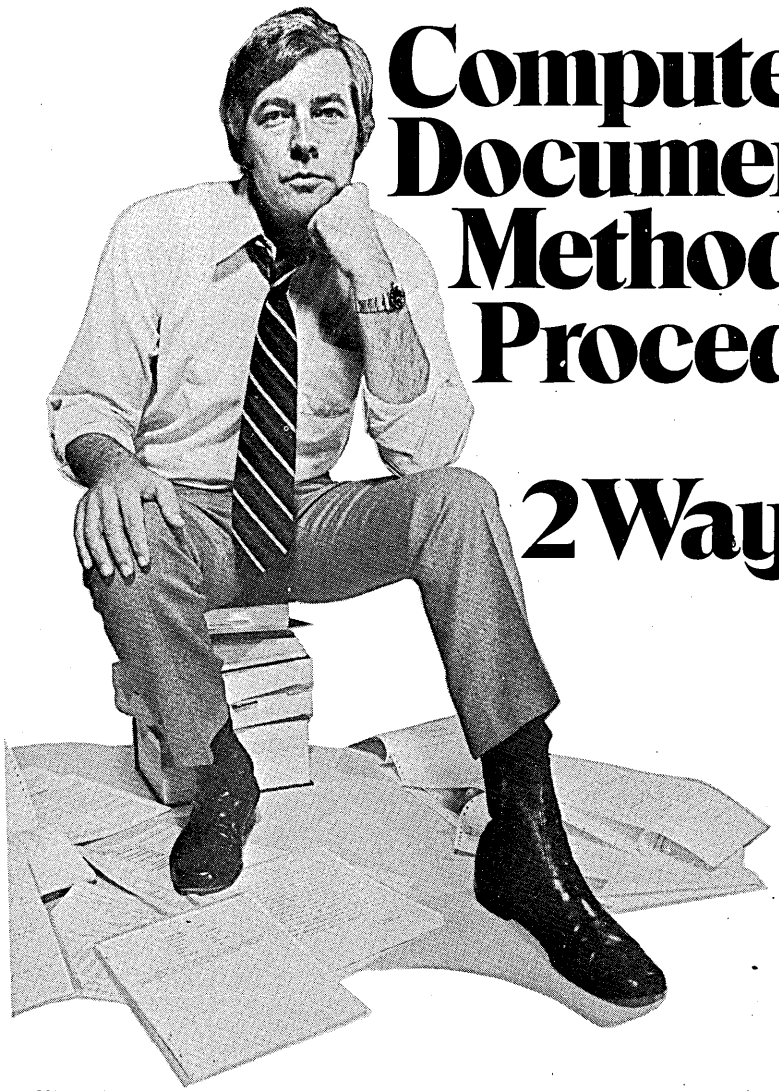
Springs places a lot of emphasis on reducing future maintenance. With the number of new producing programs being implemented yearly, surely the percentage of total effort spent on maintenance must grow accordingly. We realize of course that certain kinds of maintenance must always be performed —our objective is to minimize the effort. Consequently, it is evident that no matter what we do nor how sophisticated our systems or installations become, maintenance is a fact of everyday life, it is expensive, and it is here to stay. Therefore, it is something that must be planned, staffed, and above all "organized." □



Mr. Mooney is the manager of program development at Spring Mills' Customer Service Center. He has had 21 years of dp experience including positions with Colorado Interstate Gas Co., Delcos, Inc., and Texas Eastern Transmission Co.

Computer Documentation Methods & Procedures.

2 Ways to do it.



Hire a Documentation Specialist.
Efficiency is bound by the parameters of knowledge, experience and time.
Development Period : 2 to 5 years, possibly.
Guarantee : None.
Cost : Approximately $30,000+ per annum.

Invest in KEYSTONE. The Ultimate Source.
Provides thoroughly tested and proven knowledge necessary to develop skills vital to producing precise documentation.
Development Period : None. Available immediately.
Guarantee : 30-day trial at no cost. No risk. No fooling!
Cost : Exactly $9800

Chances are that you don't have adequate documentation right now. And, you need it!

Most EDP organizations lack the skill to produce effective computer documentation. That's unfortunate, because documentation is a real *'problem solver'*.

Sure, you can hire a 'specialist' to develop documentation standards. All it takes is time and money (as long as 5 man-years and as much as $150,000 or more). And, there's really no assurance that your investment will pay any viable dividends.

A Better Way.
KEYSTONE. The *new standard* in computer documentation methods and procedures solves the problem of implementing the 'problem solver' — your computer documentation.

Proven Success.
KEYSTONE was funded by 15 prestigious companies including : General Mills, Inc.; Coca-Cola USA; Bell & Howell; Chase Manhattan Bank, N.A.; and Allis-Chalmers Corp.

These companies were a source of individual in-depth research conducted right at their facilities. And, they provided in-put, feed-back, in-process reviewing . . . and considerable development capital.

KEYSTONE participating companies took all of the risks involved in creating a *new standard* for documentation. Now, you needn't take any risk. It's guaranteed!

Comprehensive and Complete.
KEYSTONE thoroughly covers 14 levels of design, system support, operations and user support documentation methods that may be required to support your system throughout its entire life cycle.

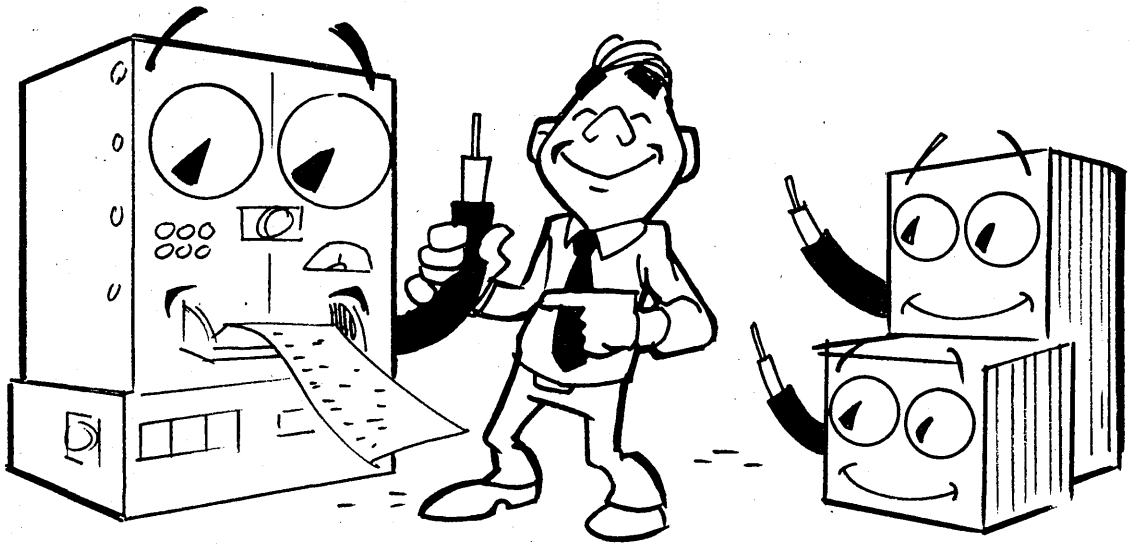
KEYSTONE'S modular format presents exact 'how to' examples. It includes the most effective and efficient techniques of documentation preparation, as well as writing, production and administration methods.

If your computer documentation methods and procedures aren't up to the new standard, why not *go right to the source.*

KEYSTONE. The Ultimate Source.

PPI ***Precision Publications Incorporated***
The Computer Documentation Service Company
9841 Airport Boulevard, Suite 528 • Los Angeles, California 90045 • (213) 670-2547

Is your system wiring a twisted bag of worms ?



THERE'S A SINGLE LINE SYSTEM THAT DOES MORE AND CAN COST YOU LESS !

Growing systems require extensive communications wiring with the increasing numbers of processors, sensors, controllers, keyboards and displays. Multiple twisted pairs merely compound the problem. And, each I/0 device you add just increases the growing bag of worms.

At ISI we have a single, wideband coaxial cable system that handles hundreds of data communications devices, plus voice communications and several channels of closed circuit TV. That's just a bit more than you'll get with a twisted pair. And, it costs less to install.

We offer — on a single cable — frequency division multiplexing, 1000 full duplex channels and time division multiplexing within channels. Maybe we can help you get the worms out of your system as well as the wiring.

Why not write or call for more information?

INTERACTIVE SYSTEMS

MAN-MACHINE SYSTEMS

3980 Varsity Drive, Ann Arbor, Michigan 48104 • (313) 973-1500

Since its rental price is about one-third that of a System/3 model 10, IBM can call on more customers with the System/32 than it could with all its other computer systems combined.

THE IBM SYSTEM/32

by Michael Cashman, Associate Editor

Complete with phrases such as "increased productivity to help fight inflation" and "immediate help for the small businessman, who typically gets hurt worst in a recession," IBM's General Systems Division almost made it sound as if its new product, the long awaited baby brother to the System/3, might alone bail out the economy. That seems like a tall order, but one thing seems fairly certain about the January 7 announcement: American business will never be quite the same again. By some estimates, IBM currently has approximately 70,000 computer systems installed worldwide. There are probably upwards of 100,000 businesses in the U.S. alone that could not only use the power of the new machine, but could make the monthly payments, starting around $770/month for the system, plus the charges for supporting programs. It seems then that a larger number of people are about to see an IBM salesman for the first time than have seen one within the last five years.

If IBM is worried about the implications those numbers might have to the U.S. Justice Dept., it didn't show at the Atlanta unveiling, where a phalanx of systems were shown visiting editors to underscore GSD's total commitment to five relatively large and isolatable industries: construction, hospitals, membership organizations, wholesale food, and the wholesale paper and office products industries. This emphasis is somewhat of a retrenchment from the customized support offered with System/3 software which undoubtedly forced IBM into trying to wear too many hats. It seems to be a wise decision: there's less chance of getting a large number of unhappy users—something no vendor wants. These marketing emphases are the initial ones; more will undoubtedly be added.

A good way to look at the product is to consider it a System/3 model 2, with the numbers combined for better identification. Resembling an accounting machine, the System/32 combines a microprocessor-based cpu, a choice of 16K, 24K, or 32K size Mosfet technology memories, a visual display screen, a floppy disc unit for accommodating input and small file output, and a large (5 or 9.1 megabyte) fixed disc unit. Initial IBM product announcements have a habit of growing into more exciting systems, however, and IBM "grudgingly" let it be known that there was certainly room for expansion of the system and that there is nothing implicit in the design of the cpu that would prevent it from handling a larger memory complement, though, as always, IBM doesn't like to speculate on future, unannounced products.

With 4,500 sales personnel in 67 branch offices across the U.S. and Canada (the only two countries where the system was announced), it probably doesn't matter that IBM is, again, coming to this market late. The Singers, Qantels, and Datapoints of the world have been making a good living in specific application areas. (See June 1973, p. 76.) Though for its power the System/32 might be the lowest priced system in history, other vendors won't have that much trouble coming in under IBM's price—but that isn't always enough. In support of the sales personnel are 2,700 to 3,000 specialists involved in system support.

Interestingly, IBM believes that System/32s will "stay put" longer than past products, and that the 600,000 lines of coding in the application packages won't be modified very much at the user level. The message seems to be that if more processing power is needed, get another system, or go up to the bigger System/3 models. Part of this reasoning may explain a new three-year lease plan, complete with an inflationary protection clause that promises prices won't rise more than 5% per year during the last two years of the lease. Signs of the times. The new plan, called the Term Availability Plan, knocks roughly 5% off the standard monthly rental charge.

Hospital applications are one of the five vertical industries IBM will heavily support with the new System/32. The operator is shown peering at output generated by the "high-speed" (50, 100, or 155 lpm) printer. Immediately to her left can be seen the display screen. The cabinet to her left holds the cpu/memory, floppy disc unit, and the large, (5 or 9.1 megabyte) non-removable disc storage unit.

Pricing

A minimum system with 16K of memory, 5 megabyte disc, and 40 cps

printer is $809/month on straight rental, $770/month on the new TAP, or $33,100 on purchase with a maintenance charge of $165/month. For each additional 8K of memory add $50/month; add $89/month for the 9.1 megabyte disc. A fully equipped system with the 155lpm printer, big disc, 32K of memory, bi-synchronous communications support, RPG II language and utilities would run $1,374, plus any industry application programs required. These numbers might mean that some System/3 model 6 equipment will come in off lease, and an IBM spokesman confirmed that was a possibility.

So, on the eve of the most important antitrust case it has ever been involved in, IBM seems to be as strong as ever. If the Justice Dept. does demand that the General Systems Division, with its arsenal of System/3 and System/7 gear be broken away from IBM, this division will probably turn out to be the largest member of the new company structure, in terms of numbers of systems installed. □

A Closer Look At The Specs

Hardware

Designed largely by the team responsible for the original System/3, the System/32's architecture allows upward compatibility to that system. The bipolar cpu features an 8K microprocessor to hold most of the operating system, with an additional 2K of user memory required. The 8K of Mosfet memory is a writable control store that is loaded from a flexible disc peripheral that is standard on all systems and which can be used for other purposes. The internal machine speed is approximately 1usec per instruction, but it's a lot slower than that at the system level, roughly 60usec per instruction. Data is represented in EBCDIC form, and the system's memory cycle time is 600 nsec. IBM will not be responsible for microcoding altered by users for their own applications, but this level of machine seems an unlikely candidate for such alterations anyway.

A variation of the Winchester project disc drive, but with a simplified access arm arrangement, is standard on the system, providing 5 megabytes of direct access storage as standard; 9.1 megabytes optional. Chances are good that the System/32 will never be found waiting on information from the disc: the transfer rate is the same as previous Winchesters at 889KB. Access times, excluding latency, range from 13msec minimum to 180msec maximum, depending on model, with an average access time of 70msec for the standard unit, and 14.2msec minimum to 167msec maximum for the 9.1 megabyte model.

The keyboard/console looks like a typewriter to help keep things as simple as possible for first time users. A 10-key numeric keyboard and function keys are clustered around the console. The function keys are dual-defined, providing 24 commands.

The visual display screen is similar to the one that appeared on the 3740 data entry system some time ago and displays up to six lines of 40 characters. With its 64-character set, the screen is used for operator prompting, file inquiry, or other output functions under program control.

The diskette i/o device is used in a number of ways, serving as a replacement for punched cards. It is used to initially define the system, and then can be used for input (coming from a 3740 data entry system), for output, for storage of information from the larger, nonremovable disc, etc. The unit can read up to 3,400 128-byte records per minute and write and verify at a rate of 1,800 128-byte records per minute.

The standard printer for the System/32 is a 40cps unit that uses a 7x7 wire matrix as the writing element. A second model doubles the speed to 80cps. Standard features include bidirectional printing with line optimization to save time, a 64-character set, and a 132 print position line length. These printers operate like typewriters with regard to printing on a single form or ledger cards.

A line printer is also available for the System/32 for printing at 50, 100, and 155lpm. This unit uses an engraved print belt containing either 48 or 64 character sets. Line and serial printer capability cannot both be had on the same System/32.

Software

The logic necessary to support disc storage operation, the display screen, the keyboard, and printer operation is included with the System/32. In addition, a new buffered data management technique is provided for the display and the keyboard is said to make programming interactive data entry easier. All disc data access methods available on the System/3 are offered on the new machine (consecutive, direct, and indexed). Off-line multivolume support of consecutive diskettes is provided.

Beyond this complement of software, the user can pick packages and utilities that support his intended functions. If the user expects to write his own programs, RPG II is available under a license for $25/month. The utilities program product includes facilities for creating and maintaining disc files, sorting, and creating and maintaining system operating procedures. It rents for $15/month. Applications programs tailored for the five specific industries supported by IBM are separately priced, as shown in the table.

Communications

By attaching an optional communications adapter ($95/month), the System/32 may be used to communicate with a larger System/360 or 370, a System/3, a System/7, another System/32, or a 3741 data entry device, model 2 or 4 by using the binary synchronous communications protocol. IBM's newest communications technique, synchronous data link control (SDLC) is also available for the System/32 ($116/month), enabling the system to function as a remote batch entry work station. This equips the new machine for use in distributed processing networks where it will probably become a very common item.

Industry	Front-end Charge	Monthly License
Construction	$470 to $2,330	$20 to $100
Hospital	$2,000	$868
Membership	$1,485	$62
Wholesale Food	$2,975	$140
Wholesale Paper	$2,500 to $2,975	$120 to $455

Support

This has been IBM's forte for many years and shows no signs of changing. Roughly 2,700 to 3,000 support personnel in 66 service centers from Maine to Hawaii will be offering everything from self-study courses to instructor/classroom techniques, plus pre installation test time at local offices, etc. □

Antitrust

IBM Says Government Hasn't A Case on Competition Issue

Cites U.S. and Foreign Competitors Not Mentioned in Justice Dept. Case

International Business Machines Corp. competes in the edp business against companies the Justice Dept. has never thought of, including "more than 200 European and Japanese companies," a number of which "are presently marketing their edp products in the United States."

In its defense against the Justice Dept.'s antitrust case, scheduled to go to trial this month in Federal District Court in New York, IBM will claim that the Justice Dept. failed to establish that the big computer company is a monopoly as defined by Section 2 of the Sherman antitrust act on which the case is based.

"In this case, perhaps for the first time in a monopoly case that has actually gone to trial, there is substantial direct evidence of competition," IBM contends in a pretrial brief filed Jan. 15 with the court. The 160,000-word brief also answers government allegations that the company tried to crush competition by price cutting, tie-in agreements and fighting machines—that is, machines introduced to crush the comparative products of other systems competitors.

Of its 360/90 that was cited by the government as a machine to knock off Control Data Corp.'s 6600 largescale series, IBM says, "we will deny that and will prove it not so." In its brief, it claims the model 90 was built at the request of federal agencies—or the "Plaintiff" as it refers to the government throughout the one-inch thick brief.

Throughout the document, IBM also cites "plaintiff requests" as the source for its development of other "innovative" machines, including the Model 360/67, also cited by the Justice Dept. as a "fighting machine." That model was built as the result of demands by many users "because of research on projects thought by agencies such as the Advanced Research Projects Agency of the Department of Defense, to be important to the national defense and welfare."

Bundling defended

In its defense of tie-in agreements, IBM claims that the practice of "bundling," as it became known, "was not only in existence at the time of the 1956 Final Judgment (Consent Decree) but was sanctioned and IBM (was) ordered to furnish all services which had been and were being supplied to rental customers without separate charge to all purchase customers." And it claims that bundling did not prevent "hundreds of firms" from entering the software services business during the 1950s and 1960s. The company began charging separately for some previously bundled services five years ago.

Of alleged price cutting, the company's brief refers to its accomplishments as an innovator whose competitors eventually are "forced to respond to the innovation through imitation, original innovation or price reduction." It continues: "As the innovator is brought to the level of its competitors, it feels the pressure for further innovation or reduced prices in order to achieve higher profits."

IBM's defense will emphasize growth through excellence and risk. As it "bet the company" on the 360 line, so is it now "betting the company" on the new Future System line. As a measure of its excellence it cites what might become a de facto standard for maintenance response. "In 1974 . . . IBM responded to a malfunctioning machine within one hour in 81.5 percent of emergency calls, and within two hours in 92.3 percent of such calls."

Its case in the pretrial brief also is that IBM is a natural resource, facing "strong and growing competition . . . from a number of European and Japanese companies . . . (who) with the active support of their governments are entering the United States market in increasing numbers and at an increasing rate and represent both actual and potential competition to all domestic edp competitors, including IBM."

IBM also claims that the Justice Dept., in "asking this court to limit its focus to certain small, artificial portions of the EDP industry," does not include in its definition of the computer market 18 companies which IBM says "manufacture and market complete edp systems." Among these, it names AT&T which it says had 1972 revenues in edp of $706 million, Litton Industries, with $219 million, Lockheed Aircraft with $156 million, and Mohawk Data with $76 million.

In an economic analysis of the industry filed with the court last Dec. 10, the Justice Dept. defines the main computer market as including nine companies: IBM, Burroughs, Control Data, Honeywell, NCR, Univac, Xerox, and Digital Equipment Corp. and Singer. IBM said this is a narrow definition and "another example of plaintiff's continued efforts to increase IBM's market share."

The company's defense concludes that it has earned its success through competition on the merits and that the Justice Dept.'s claims are "unprecedented, unwise and should be dismissed."

news in perspective

Transportation

Bus Service: Helping Hand from Computers

In the midst of renewed discussions of the oil shortage, of increased costs for fuel, and relaxation of what had been increasingly stringent pollution standards for auto makers, the computer technology has risen to lend a small helping hand. It is making possible a personalized bus service that offers door-to-door transportation to residents of California's expansive Santa Clara county, south of San Francisco. Similar bus services are running in more than 50 communities across the country, according to a spokesman for the U. S. Transportation Dept.'s Urban Mass Transit Administration. But never before had any of them attempted to service a population of more than a million residing within 240 square miles.

Using a computer-assisted scheduling and dispatching system, the county's transportation agency is offering to pick you up at your front door at one end of the county and take you to the other end for only 25¢. Ten cents will suffice for those below 18 and over 64, age groups that account for a significant share of the ridership.

Santa Clara's dial-a-ride system, also referred to in the trade as demand responsive transportation, uses 25-seat, propane-powered buses, smaller than the coaches that run along fixed arterial routes. But the appealing feature is that the bus will come to your front door and take you to a neighboring address; one phone call, sufficiently in advance of the pickup time, will do the trick.

For the commuters, who comprise the bulk of the ridership, arrangements also can be made to be picked up each day at the same time for transportation to the same place. The bus, on its way, will stop to pick up other passengers headed for the same or nearby destination, travelling down residential streets in the process, as in a carpool. Obviously, the reverse direction can be followed at the end of the working day.

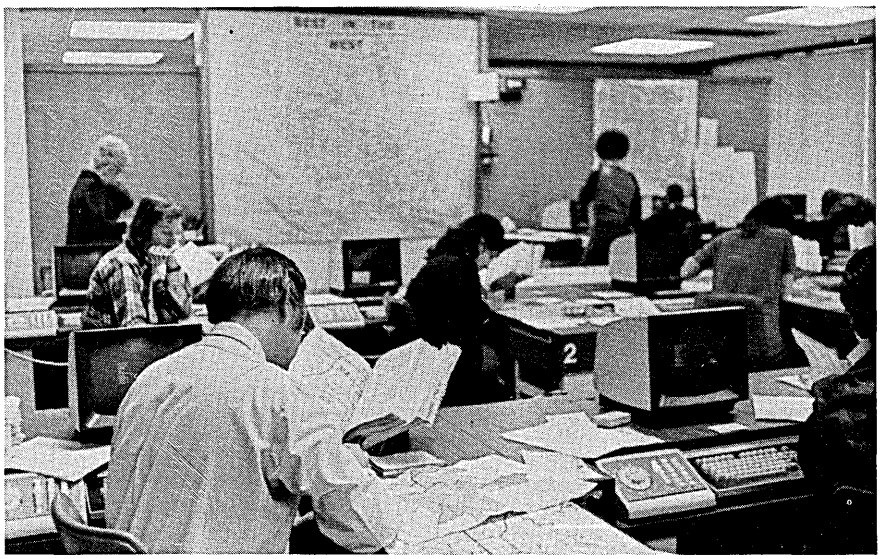
Door to door in Haddonfield

In smaller communities where this same experiment is also being conducted, such as around Haddonfield, N.J.—where the dial-a-ride system has been in operation since early 1972—the bus will take you door-to-door to just about anywhere locally. Not quite to Camden or Philadelphia, but then who wants to . . . well, anywhere locally. The area being served covers almost 11 square miles and a population of 40,000. Small enough not to require the use of a computer, the Haddonfield service earlier was reported to have carried some 1,200 passengers a day, now is down close to 700. What with none of the public transit systems paying its own say, the life of the Haddonfield operation is currently in jeopardy.

Last winter, at the height of the petroleum panic, computers also lent a hand in the organization of local carpools, some of which still exist. But the computer-assisted public transportation system in Santa Clara, serving an area where populations and service facilities are widely dispersed, is more than a proposed solution to the gas shortage or the air pollution problem. It is, perhaps more importantly, an attempt to provide low-cost and convenient transportation to that segment of the population that otherwise might have none. This includes schoolchildren, the retired, and the handicapped. On order are four buses equipped with hydraulic lifts that will be able to accommodate riders in wheelchairs—a service also planned in Ann Arbor, Mich. More than 5,000 passengers are being transported daily during weekdays in Santa Clara county, still a miniscule percentage of the total traffic, but it is growing.

When one adds ridership on the fixed-route arterial lines, however, the total approaches 30,000 a day. That's an improvement over the average 12,000 in 1972, before the county purchased the local, private bus lines, and 17,000 a day in '73.

In contrast to Haddonfield, Santa Clara county stretches over 13,000 square miles, most of that being in the mountains that run along three of its sides. The valley floor covers some 500 square miles, with the bulk (97%) of the population residing within 240 of them. This area is laced with 19 arterial routes where buses run on fixed schedules, the traditional public transit system. The fixed-route bus service purportedly provides a "transit opportunity" to a theoretical 60% of the population, which means that many people have a bus stop within a quarter-mile of their homes. "But our financing is from 100% of the population," says James T. Pott, director of the county's transportation agency.



TWO SECONDS: Reservationists in Santa Clara control room, sitting at split screen crts, book bus trip requests and automatically search the nearest vehicle for the customer. Search procedure requires about two seconds.

"Local exchange"

Therefore the dial-a-ride system was overlaid onto the same geographical area. To implement it, the 240 square miles have been divided into 18 local areas, each said to be equal to or larger in size than any other dial-a-ride operation in the country. By analogy, the fixed arterial routes might be compared with AT&T's long lines division, while each of the 18 dial-a-ride areas operates like the local exchange, feeding and being fed by the arterial routes but also handling local traffic.

The local bus will now pick you up and take you to any address within the same area. It will also take you to any transfer point on an arterial route or to

a transfer point for a dial-a-bus operating in an adjacent area. Transfers are free. According to the county's Jim Pott, the transit system now serves a theoretical 97% of the population.

One commuter tells of a dial-a-ride bus she was riding that reached a transfer point of an arterial bus just as the latter pulled away. The driver of the smaller bus chased the arterial vehicle, flagged it down, and transferred his passenger. It sounds like something that might occur in Derby, Conn., which also has tried the dial-a-ride service, rather than the less intimate Santa Clara county.

The 18 local areas are grouped into four control areas. And in three of these control areas are Four-Phase Systems IV/70 computers to assist in the scheduling and dispatching of the buses. (The fourth area lacks sufficient passengers to justify a computer.) The configuration in each control room is a 72K processor, adequate to support up to 60 buses, from 11-15 crt terminals, two 2.5-MB disc drives, and a 300-lpm printer.

In the control room, a reservationist sits at a crt terminal and keys in a caller's name, address, and destination. On the right-hand side of the split screen, a list of street names similar to the pickup address is generated automatically, showing which of the 18 local areas that address is in. The same also appears for the destination address. At the bottom of the screen appears a time constraint: If the customer must be delivered to a destination at a certain time, as for a doctor's appointment, the time of pickup will be automatically displayed. It takes into consideration the speed of buses in that local area (some ares are more congested than others) and the distance.

Two second cycle

Each request for a trip reservation receives a serial number, which is the time of day to the tenth of a second. That number follows the trip request until it is completed. When the reservationist has booked the reservation and approved it with the customer, an ACCEPT key is hit. That information then goes into the scheduling queue, and the system assigns to the trip request the vehicle in the best position to accept it. This, of course, is based on proximity, productivity, and other factors. It requires about two seconds. All this information is then immediately printed out to avoid the data being lost in case the system should go down.

It then goes to the dispatcher, who is in constant voice communication with vehicle drivers. The driver, on arriving at a destination assigned previously, calls in for the next address. The dispatcher, looking at the crt screen, assigns an address to a driver and codes that address with a T. It shows that the address has been transmitted, or assigned. The next time that driver calls in to indicate he (or she) has arrived at the address, it can be wiped off the screen. Throughout the process of booking a passenger and assigning a vehicle, there is a manual override capability.

In an upgrading of this system, now in the early stages, the voice communication is to be replaced by digital communication, backed up by the radio. In that mode, each vehicle will be equipped with a display that shows the driver his next two addresses; a third address will be in a queue. At that time, the dispatcher will merely hit the TRANSMIT key, see the T on the screen, and know the address has been assigned. Most significantly, too, the new system will have an automatic table look-up feature. Each address in the county will be stored for quick reference, and the local zone will be flashed for each pickup and destination address requested by a customer. It promises to speed up the reservation process, which currently is one of many administrative problems that has kept ridership down. In addition, it will uncover any fictitious addresses and perhaps reduce the number of no-shows—people including pranksters who don't show up when the bus does.

A recent addition to the software, all of which was designed and developed by Lex Systems Inc. of Menlo Park, Calif., is called a deferred demand module. It enables a reservationist to accept a request at, say, 9 a.m. for a pickup at 2 p.m. that day. That trip request goes into a deferred queue and gets a priority status.

The county's Jim Pott says he knows of no other dial-a-ride operation that uses a computer. He also acknowledges that no urban transit system can sustain itself only with farebox revenues. Therefore the public, which subsidizes these operations, might find the justification in the extent to which they remove private cars from the roads, with all that that means, or the social factor of providing mobility for employment and social purposes to those who lack private conveyance.

—Edward K. Yasaki

Privacy

First Pass at Privacy Laws Given an "A" for Adequate

The Privacy Act of 1974 has some weaknesses, ambiguities and unnecessarily restrictive features, but it generally is adequate as a first pass at legislation to protect the privacy of individuals on whom personal information is contained in government data banks.

This is the opinion of analysts who have reviewed the privacy bill which Congress passed just before Christmas and President Ford signed a short time later. But these analysts were emphasizing in January that their conclusions were only preliminary. Dr. Willis H. Ware, of the Rand Corp., who headed a government-sponsored study on the issue of personal privacy, said he will organize two workshops for persons experienced with the subject, to further study the implications of the legislation. The workshops, in February and April in San Diego, will be sponsored by the American Federation of Information Processing Societies (AFIPS). The federation last spring formed a Special Committee on the Right of Privacy, headed by Dr. Ware who was chairman of an advisory committee to the Dept. of Health, Education and Welfare on automated personal data systems (September 1973, p. 112).

The Privacy Act of 1974, also referred to in government announcements as S 3418, basically is the House privacy bill (HR 16373), but with some changes inspired by the Senate measure (S 3418).

The Senate's main accomplishment was to get a privacy commission included in the final legislation. Originally, the commission would have been authorized to make a two-year study of assorted privacy problems and have the power to delay the establishment or modification of any federally-supported personal information system which failed to meet specific privacy protection standards.

Notice to OMB

Under the compromise legislation, power to rule on personal information systems remains with the Office of Management and Budget (OMB) which now must be given advance notice of an agency's intention to establish or modify such systems.

The commission's study assignment, meanwhile, has been expanded slightly to include such questions as whether an organization maintaining a mailing list should remove an individual's name upon his request. This was mandatory

in the original bill.

The new law allows the commission to go into operation immediately. Other provisions take effect around Oct. 1.

Some exemptions

All personal information systems operated by federal agencies are covered by the new law with the exception of most law enforcement and intelligence files as well as some personnel records. Some systems operated by federal contractors and grantees also are covered—i.e. those operating under contracts signed after the effective date of the legislation. (But law enforcement systems covered by such contracts can be exempted).

The privacy law bars federal, state and local government systems from discriminating against any individual who refuses to disclose his social security number, but this provision applies only to systems which go into operation after Jan. 1, 1975. The Senate bill also included privately-operated personal information systems, but the House language ultimately prevailed.

Generally, an agency that discloses personal record information to an outsider must make sure it's accurate, relevant, timely and complete. It must obtain the subject's consent beforehand, and must record the nature and purpose of each disclosure, as well as the name of the individual receiving the information. There are several exceptions, however. The major one involves "routine use," which is defined to mean ". . . disclosure of a record . . . for a purpose . . . compatible with the purpose for which it was collected."

There also is a general ban on personal records reflecting how an individual exercises his First Amendment rights. However, such information can be collected and disseminated if it is authorized by statute or if "pertinent to a duly authorized law enforcement agency."

Information collected from confidential sources must be disclosed to the subject if he asks, but in most cases the source doesn't have to be identified.

Corrections procedure

If the subject of a federal dossier believes the information is incorrect, he can request a correction, and the agency holding the record must respond within 10 days after receiving his request. The actual correction must then be made promptly, or, if the agency believes the original information is correct, it must review the subject's complaint and tell him why it disagrees. The individual can then ask the agency to reconsider. It has 30 days to do this, or more if it can show "good cause." Finally, if the agency still refuses to change the record, the subject can take the case to court.

An agency covered by the new privacy law must allow the subject of each personal record to read its contents, except for "information compiled in reasonable anticipation of a civil action or

(*Continued on page 76*)

Californians Look to Future Privacy Laws

Even as they were assessing the Privacy Act of 1974, S 3418, signed into law during the holidays, an embryonic group in California, representing private industry, was more concerned with future privacy legislation.

A group of nine met Dec. 30 in Palo Alto to try to launch an inter-industry task force to gather information to present to Congress before it gets going on new privacy legislation.

One of the group, William R. Pascoe, an attorney for the California Bankers Assn., led a delegation which went to Washington last August and was given major credit for getting the private sector eliminated from then pending privacy legislation (September 1974, p. 130). "We felt at the time," said Pascoe, "that Congress was making concessions in the interest of getting some kind of bill through with Ervin's name attached to it (Sen. Sam Ervin, D., N. C. sponsored the original Senate version of the bill) before he retired. We anticipated early hearings on privacy legislation that will affect the private sector in the new Congress and we want to be in a better position to deal with legislation we know is coming up."

Others involved in the December meeting were Eben Tisdale of WEMA, an electronics industry trade organization; Bob Campbell, Sunkist Growers; Harold Arthur, Wells Fargo Bank; Shari Cole, TRW Inc.; Irwin Gubman, Bank of America; Jim Case, Dylakor Computer Systems, and Bill Fenwick, an attorney with Davis, Stafford, Kellman and Fenwick, Palo Alto.

Among the kinds of information the task force would want to get, said Pascoe, would be a reasonable estimate based on facts, specifics, of what it would cost private industry to change information systems so as not to involve use of social security numbers. "We would want to take a look at all information systems of private industry to come up with alternative provisions that would achieve the privacy objectives sought by Congress at minimum cost to private industry."

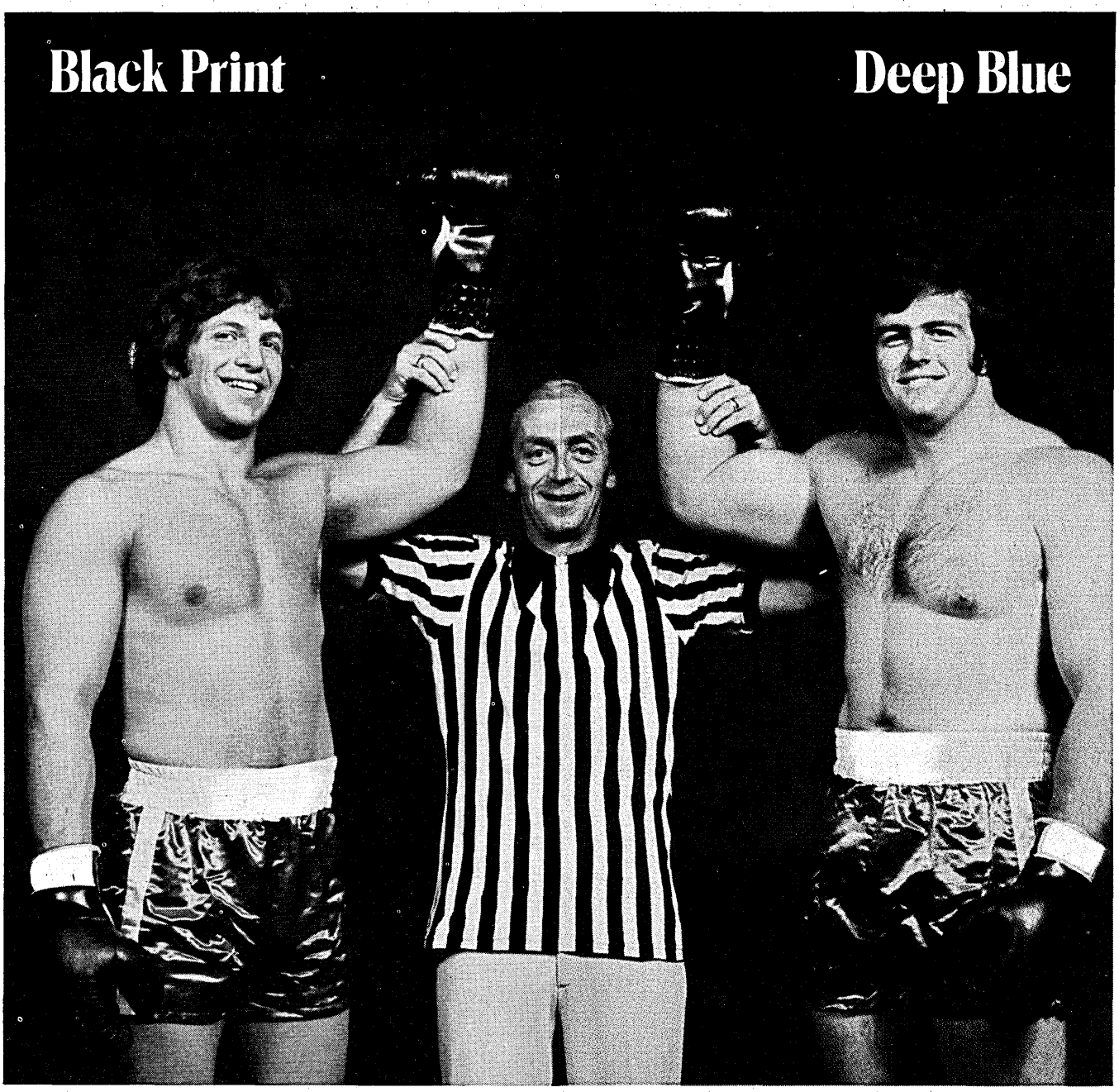
Participants in the initial meeting were charged with getting response within their own organizations, determining if their individual industries want to participate and what level of financial and other support they would be willing to lend, and seeking out other industries that would be affected and interested.

"We are looking for high level participation, like industry presidents, at least in the initial stages," Pascoe said. He said response within the CBA has been all for participation. A second meeting of the founding group was to be held Jan. 31.

Pascoe said the CBA currently is considering the wisdom of pushing for federal privacy legislation that would head off, preempt, state and other local bills that are popping up. He mentioned the Cullen bill currently before the California legislature, a descendent of and similar to the Bagley bill (December 1973, p. 108) which died in the last legislature, and a proposed ordinance by the city of Berkeley, Calif. which would require that city, before adopting any new information system, to develop a social impact statement including reference to the citizen's right to privacy and an evaluation of whether or not the system would invade it. "Then hearings on the system would be held bringing all sorts of people down to city hall."

Pascoe feels privacy bills have to be looked at "as a package, at all levels. Ultimately we (private industry) should get together and draft a bill that would achieve privacy safeguards at minimum cost to private industry."

But he emphasized that drafting legislation will not be the concern of the task force. "No one will be bound to support anything. We will merely be gathering a data base." □



Split Decision-NCR Paper Black Print and Deep Blue ...both winners.

Both fight the good fight in making clean, crisp copies of whatever you enter on your business form's original. Neither can smudge on a copy, on a typist's fingers, or on someone's clothes. NCR Paper, Black or Deep Blue, is easy to read – even for normally blue-blind copy machines. While both image systems do everything well, the important thing is that NCR Paper – and only NCR Paper – offers you a choice. We felt it was the gentlemanly thing to do.

Specify NCR Paper...all carbonless is not alike.

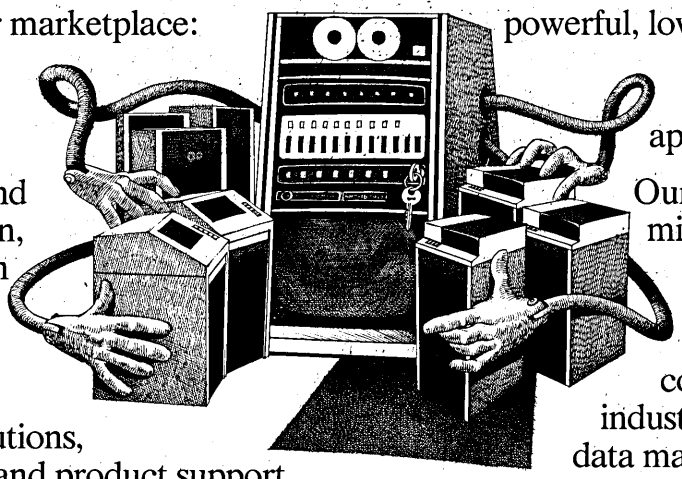
NCR APPLETON PAPERS DIVISION
GENERAL OFFICES, APPLETON, WISCONSIN 54911

NCR Paper®

THE GENERAL AUTOMATION CHALLENGE:

At the risk of sounding brash, we'd like to tell you exactly where we stand in the minicomputer marketplace:

In computers and systems for communications, data management and industrial automation, General Automation is number one.



In these three areas, we offer a better package of total solutions, performance, price and product support than any computer company in the world.

No other computer company has worked so hard or dug so deep to understand the requirements of these three corners of the marketplace.

Involvement has always been our long suit.

We've never favored the sell 'em and leave 'em end of the business. Which is why we're *not* number one in volume hardware sales. We think it's better to be the best specialist than the biggest generalist.

The most mini for the money.

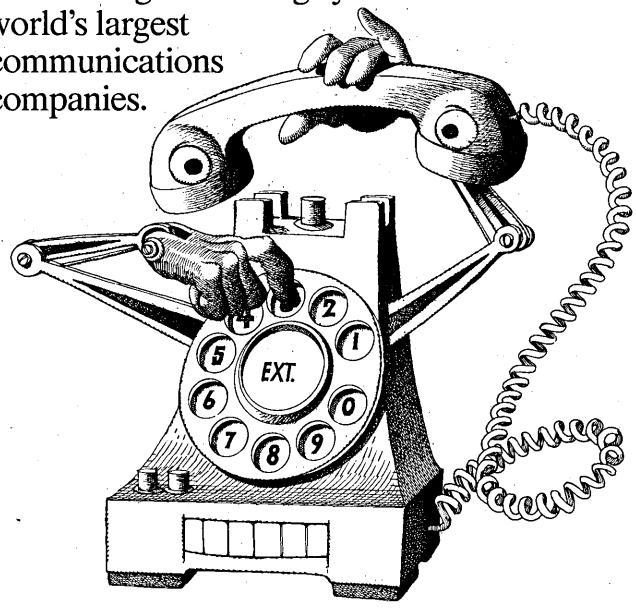
A good example is our family of SPC-16 computers. Quite simply, they are the world's most powerful minicomputers. They do more work in less time with less memory than any other mini you could buy. As a result, we offer the least expensive solutions instead of the least expensive minicomputers.

Our SPC-16 family has helped a lot of OEMs and end-users build a lot of powerful, low-cost systems for a lot of tough, tight-budget applications.

Our family of mighty minis is also one of the primary reasons we offer so much capability in communications, industrial automation and data management systems.

The best total communications systems.

General Automation is the major supplier of minicomputers for PABX control systems, front end processors, Telex message systems and message switching systems for the world's largest communications companies.

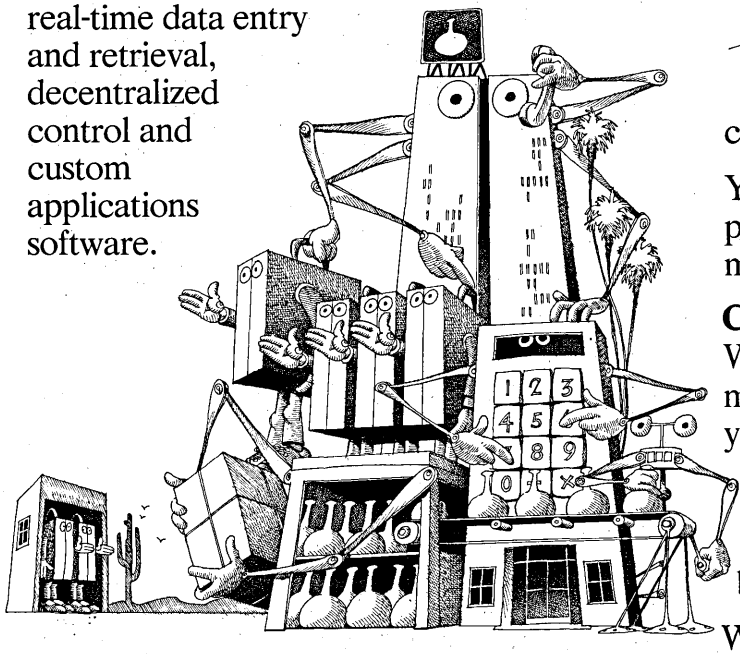


Our extensive experience has also made us the number one solver of tough problems for any company that needs a custom communications system.

If we can't solve your communications problem, nobody can.

The best total data management systems.
We can put you in better touch with your business by replacing a lot of time-consuming, non-productive status meetings, paperwork and guesswork with simple, automated systems that tell everyone who needs to know, everything they need to know, whenever they need to know it. No matter where they are or what they do or how they do it.

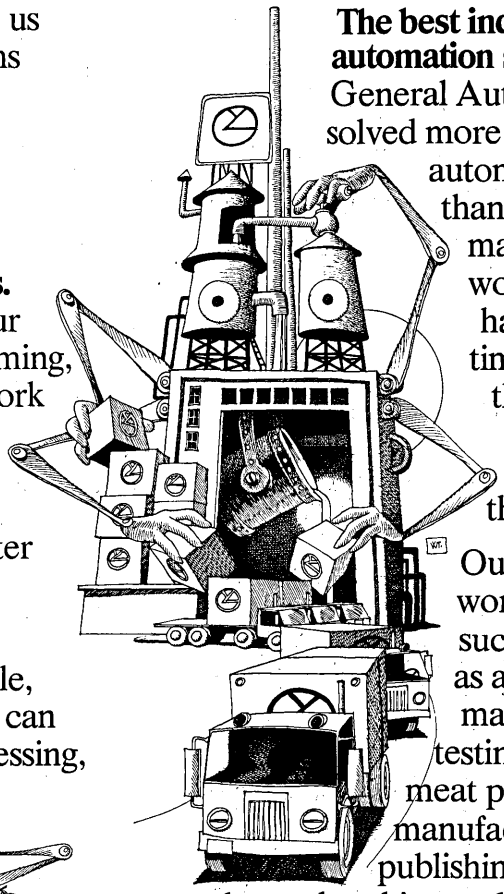
We can deliver a compatible, expandable, high-performance family of systems that can form a network offering batch data processing, real-time data entry and retrieval, decentralized control and custom applications software.



We have another family of on-line/batch systems that offers centralized control and a vast library of standard applications software.

In addition, we sell a low-cost, highly interactive turn-key system through distributors for companies that need economy more than system growth. And we manufacture the number one IBM 1130 replacement system.

Nobody can offer a better total solution in data management.



The best industrial automation systems.
General Automation has solved more industrial automation problems than any minicomputer manufacturer in the world. As a result, we have invested more time and understand this field better than any minicomputer manufacturer in the world.

Our systems are working in such applications as automotive manufacturing and testing, process control, meat packing, electronics manufacturing, newspaper publishing, warehouse control, metalworking and dozens of others.

You couldn't bring your industrial automation problem to a more experienced minicomputer company.

Challenge us.
We'd like the opportunity to prove we're more aggressive than arrogant. Let us show you that for a total package of technology, experience, involvement, price and product support, no minicomputer company offers you more or understands your business better than General Automation.

Write or call General Automation, 1055 South East Street, Anaheim, California 92803. Or call (714) 778-4800.
In Europe, write General Automation, S.A., 24 rue du Sergent Bauchat, 75012 Paris, France. Telephone (1) 346/7973.
In Canada, write G. A. Computer Ltd., 880 Lady Ellen Place, Ottawa K1Z5L9, Ontario. Telephone (613) 725-3626.

IF WE CAN'T DO IT, NOBODY CAN.
GENERAL AUTOMATION

proceeding."

Before a new records system, or a new application, goes into operation, Congress and OMB must be informed so they can evaluate "the probable or potential effect" on individual privacy. Also, the public must be given a chance to object. And the agency, each year, must publish a complete description of each personal information system in the Federal Register, including how the information is used.

The law includes several other administrative requirements–for example the agency has to establish "rules of conduct" for "persons involved in the design, development, operation, or maintenance" of any personal records system, together with an instruction program which will familiarize personnel with these rules.

The critics

Criticism of the law is directed mostly at what has been left out. For example, its exemption of the files of law enforcement agencies. This was to have been covered in separate legislation, but negotiations between Congress and the Justice Dept. were broken off last fall and the 93rd Congress adjourned without such legislation.

Dr. Ware thinks some of the language concerning other activity that is exempt from the law is ambiguous and that a requirement that agencies maintain records of accesses to personal data files going back five years is prohibitively expensive if it applies to routine as well as extraordinary accesses. OMB has estimated that the cost of total compliance with the legislation just for federal agencies will reach $300 million a year after a startup cost of $100 million.

William R. Pascoe, of the California Bankers Assn. (see accompanying story) said the bill is "not precisely as we would have drafted it," but that he's "generally happy," though hoping that Congress will allow the federal commission to conduct its two year study before it acts on legislation affecting privately-operated personal information data banks.

And, says Dr. Ware, it's adequate "as a first whack at the problem."

Financing

Computer Stocks: Did Financial Community Shun Everyone But IBM Out of Fear of IBM?

A new and potentially explosive issue has been raised in the Justice Dept.'s antitrust case against IBM: the relationship between the computer industry and that mysterious and amorphous institution that is generally referred to as Wall Street.

While the computer industry in general and IBM in particular are secretive enough to make the Central Intelligence Agency look like it operates in a fish bowl, Wall Street and financial community relationships with the computer industry have been secretive to the extent that it's not widely known that such a relationship even exists.

All that may change now. The government is seeking to subpoena data from major U.S. banks, insurance companies and Wall Street houses that deal with the computer industry, but particularly as to the relationship between the financial institutions and the computer leasing and peripherals sub-industries.

IBM is strongly resisting the government move on the grounds that it represents an injection of a new and delaying issue into the antitrust case.

Understanding the matter is becoming more important as IBM continues to consolidate its overpowering financial dominance over the remainder of the industry, which, in turn, has become subject to a growing financial blight. Bankruptcies, forced mergers, and a slowdown of growth due to shortage of capital are becoming commonplace in the industry.

While IBM's valuation has fallen with the dropping stock market–IBM's valuation has dropped from nearly $54 billion in 1973 to about $23 billion in mid-January of this year–other computer firms have generally taken an even worse stock market pounding with the result that IBM's relative financial strength over the remainder of the industry has grown over the period.

What are the mechanics of these stock investments?

There are indications that the government may be seeking the answer to that question. For instance, the Justice Dept. has asked for records of computer industry investments of some banks which share directors with IBM. Among the banks the Justice Dept. seeks information from are the Chase Manhattan, Morgan Guaranty and First National City Bank. Each of the last two named have two IBM directors on their boards.

The importance of the banks cannot be overestimated–the three largest New York city banks manage more money than all the nation's mutual funds combined. And the banks buy a great deal of IBM stock. At one point in 1974, for instance, the financial news paper, *Barrons,* reported that the Morgan Guaranty bank's trust department owned 4½% of IBM's stock. The valuation of Morgan Guaranty's IBM stock has often topped $2 billion.

Information is scarce, but in late 1969 the Securities and Exchange Commission studied 200 major financial institutions, including the 50 largest bank trust departments, and found that the institutions owned more than 43% of IBM's stock. Many believe that percentage has increased since then. IBM has long been the "glamor of the glamor stocks" and more funds and institutions hold more IBM than any other stock.

Why do people buy IBM? There are indications that Wall Street buys IBM for much the same reason that IBM customers buy IBM computers: because everybody else does. The purchaser is not criticized when he purchases IBM equipment or stock that doesn't perform well. A Wall Street analyst summed up the financial phenomenon best perhaps when he told *Business Week* last year that, "nobody lost their job for following Morgan Guaranty into IBM and Polaroid and staying with the ship while it went down. But if they bail out . . . and something good happens to the stock, they'll be keelhauled."

There have been, of course, good solid reasons to purchase IBM stock, not the least of which is the fact that the stock, like helium, always seemed to go up. The computer colossus has had excellent management, decent equipment, a fine earnings and revenue record, and continued dominance over the remainder of the computer industry.

While the nation's leading banks and financial institutions tend to purchase more IBM stock than any other firm, conversely they do not tend to purchase the stock of other computer firms.

Surviving on bank credit

One result is that the stock of nearly all of the remaining firms in the computer industry are selling at such depressed rates that the firms find it difficult, if not impossible, to raise needed funds through traditional money market equity channels. Many are surviving on bank credit lines, but company failures will surely rise as the financial squeeze continues.

And, while the smaller and younger companies have been hardest hit, the formation of startup firms has virtually

ceased in the past few years. Thus, the grim and worsening financial situation acts as not only a barrier to survival; it serves also as a barrier to entry to the industry.

Just as there have been good reasons to purchase IBM stock in the past, there have been good reasons to avoid purchasing the stock of IBM's competitors and not the least of these reasons is IBM itself: The firm is not only a formidable competitor; in some cases, it has been a fatal competitor.

IBM has apparently not been completely unaware of the importance of Wall Street support to its competitors. During 1967 when IBM was examining ways to stop the leasing company threat—which it then regarded as the most serious competitive threat to IBM—T. P. Papes, a top IBM executive, suggested using Wall Street in the battle against leasing firms. In a Papes' memo cited by the Justice Dept. the IBM executive suggested: "Send information to the investment banking community that would cast doubt upon the future of the leasing company industry."

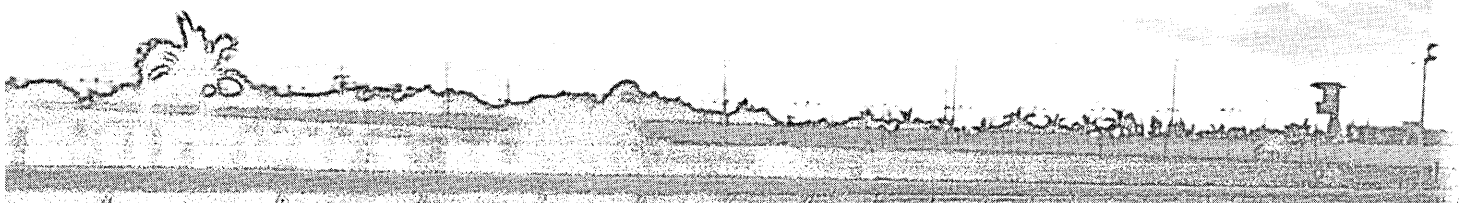
A year later, IBM was well into its war against the leasing companies and the firm's top officials, including Thomas J. Watson Jr. and T. Vincent Learson, took particular interest in a negative report on the leasing companies from the Morgan Guaranty bank. In part, the report stated:

". . . the computer leasing industry has had to cope with financial publicity which has voiced scepticism about these (leasing) companies. Many such articles have appeared over the past year or two, but the most critical was *The Wall Street Journal* article on October 31, 1968. It is rumored that some banks have decided not to lend additional money to computer lessors since October 31st . . ."

Peripheral firms hit

The leasing companies, of course, did indeed disappear as a serious threat to IBM, largely because they couldn't obtain the funding they needed from banks and other financial institutions. In addition, peripheral equipment competition to IBM also dropped off to a shadow of its old vigor when Wall Street ceased its heavy support of the peripheral firms.

One of the key elements the Justice Dept. undoubtedly will be looking for in its examination of bank and financial institutional reports on IBM and the computer industry is evidence that IBM has been viewed by the investing community as possessing the ingredients of monopoly power. If, for instance, the government can establish that the U.S. financial community concentrated its computer industry investing in IBM and



IT'S NOT ALWAYS

We know. Because we've been first so many times.

And every time we're first with something, the other guys all try to get in the running by touting their longshots. Only to lose out at the finish line. No matter how hard they try.

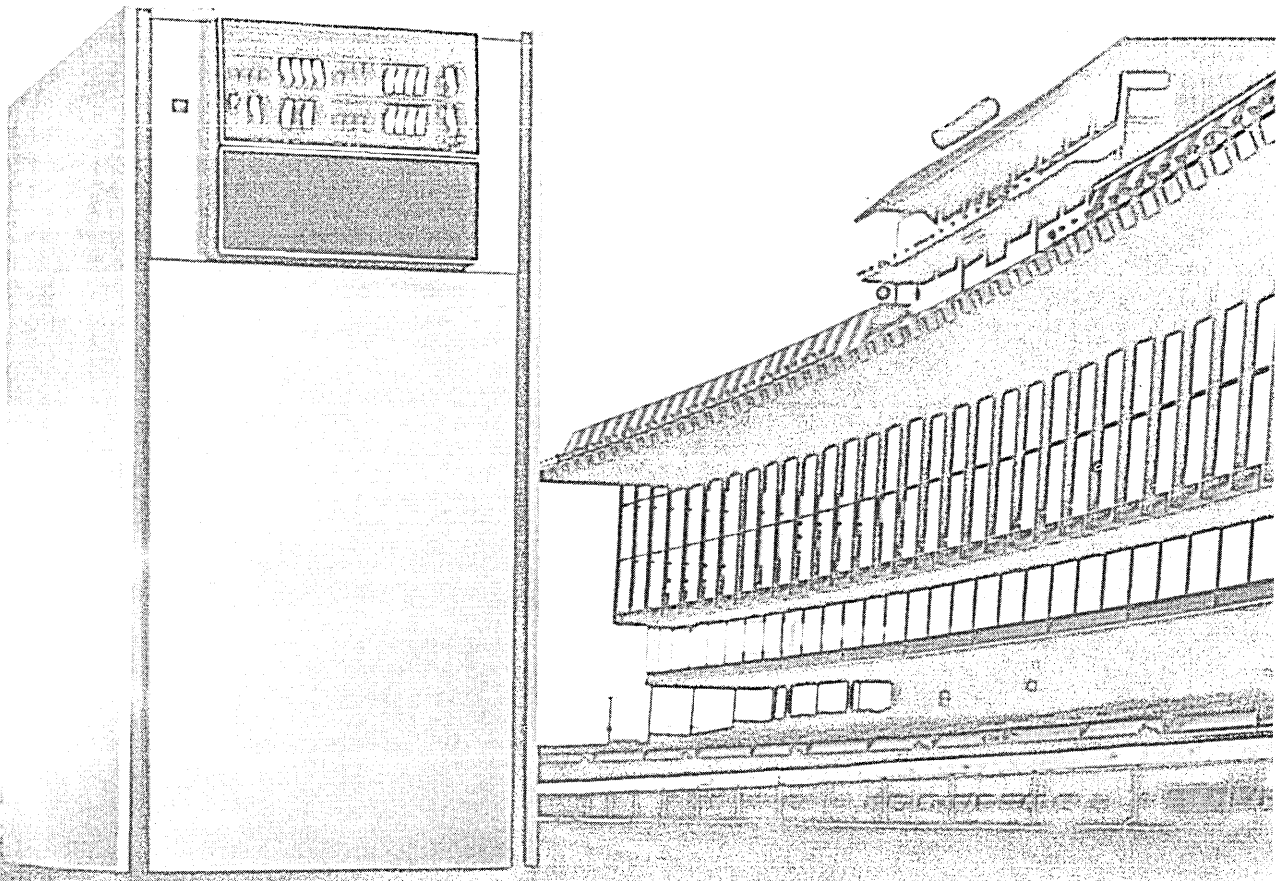
Consider MODCOMP IV.

First 32-bit computer to give you all the hardware and software system power of many big expensive mainframes. For the price of a whole lot of lesser 16-bit minis.

MODCOMP IV gives you full 32-bit processing. Sub-microsecond execution times. Big machine internal 64-bit floating point processor. Eliminating the need for time consuming I/O instructions to get operands in and out of the external processors typically used with minicomputers.

Up to a half million bytes of four-port memory. Broken down into 512-byte pages. With a memory management system that allows you to load multiple tasks into any available page locations, whether or not they are contiguous. Which means you eliminate memory fragmentation and get the most out of every last byte of memory.

Fastest context switching ever. Since each of as many as 16 programs can have its own set of



EASY. BEING FIRST.

fifteen general purpose registers, you can switch programs or tasks in as little as 3 microseconds. Compared with 150-200 microseconds in even the fastest minicomputers. Meaning that MODCOMP IV offers you a new low in system overhead.

And that's just for starters.

This MODCOMP IV hardware was designed to allow our MAX IV real-time operating system to do its job most efficiently. Assign system resources. And control the execution of multiple programs.

MAX IV also offers a great many user services. Including input and output spooling. Logical I/O. And full support of all MODCOMP IV peripherals.

As always when you buy ModComp, you also have full upward hardware/software compatibility with all other ModComp systems. Which can mean a lot in time saving and cost reduction.

MODCOMP IV. MAX IV. The winning ticket on any track. A ModComp "first" that's going to take anyone else a very long time to match.

Maybe forever.

Delivery? Order now, and your MODCOMP IV can be on your floor and running in 45 days.

For complete details and specifications, send for the new MODCOMP IV/MAX IV brochure.

The 32-bit MODCOMP® IV.

MODULAR COMPUTER SYSTEMS INC. 1650 West McNab Road / Ft. Lauderdale, Florida 33309
Telephone: (305) 974-1380. TWX 510-955-9820

European Marketing Headquarters: 103 Mytchett Road, Mytchett, Surrey, England
Telephone: Farnborough, Hants 514-251. Telex: 85631

news in perspective

largely avoided the remainder of the industry for fear of IBM's strength, then this would presumably help the government's antitrust case against IBM.

Also, the Justice Dept. will undoubtedly be looking for evidence that Wall Street turned negative on leasing firms and peripheral firms as IBM stepped up its campaigns against sub industries. The tip here is in the list of companies the Justice Dept. is interested in: Leasing firms like Greyhound Leasing and Data Processing Financial & General Corp. (DPFG) and peripherals firms like Memorex and Telex.

The government's subpoena list also indicates it will seek information on the modus operandi of Wall Street analysts. The government, for instance, has served notice that it wishes to subpoena information from a few leading Wall Street houses including Oppenheimer & Co., whose leading computer industry analyst, Gideon Gartner, has been a particularly outspoken booster of IBM stock. Gartner has also been generally negative about IBM competitors.

Gartner is a former manager of market information for IBM and is regarded by many as knowing more about the inner workings of IBM than any other Wall Street analyst. His knowledge, however, hasn't helped him much since IBM stock has usually dropped since he has been recommending it at Oppenheimer. Oppenheimer is somewhat representative of most of the Wall Street analyst houses in that the firm has consistently recommended the purchase of IBM stock and the avoidance of purchasing the stock of IBM competitors.

Dynamic, changing

The relationship between IBM and stock analysts is a dynamic one and, according to Wall Street sources, has been changing since Thomas Watson Jr. turned over the management reins of the firm to Vincent Learson. (One reason for the change may be that in recent years the calibre of Wall Street computer analysts has improved. For instance, most now have computer industry backgrounds and concentrate more intensely on few, rather than many, firms).

During Watson's long reign, IBM remained somewhat aloof from analysts, dribbling out bits of information and leaving the analysts to work with IBM's virtually unbroken string of quarters of record revenues and profit increases. Recently, however, the company has been more open with analysts. It should be noted however that IBM, like the other firms in the industry, remains extremely secretive. For example, computer firms that lease equipment—the overwhelming majority of firms in the industry do—don't disclose the value of equipment shipped each year and this is a glaring omission of information that could be used to better evaluate the progress of a company.

The foundation to IBM's dominance of the financial side of the industry is well established, however, and is predicated upon IBM's standard-setting practice of marketing equipment on a short term rental basis. Over decades, IBM has built up a rolling cash lease base dating back to the rental of its tabulating machines.

Once IBM reached a critical financial mass in the mid 1960s, the firm began to enjoy a true embarrassment of riches stemming from the huge base of equipment that continues to generate revenues even though much of the equipment is antiquated, as far as computer equipment is concerned. IBM has a staggering $3.5 billion-plus in liquid assets, which is enough to fund just about any project the firm could ever dream of. On the other hand, IBM's competitors are strapped for funding because of the unique nature of the computer rental business, which requires a manufacturer to pay for its equipment outright but receive payment from customers in installments over the years.

Victims of the crunch

For IBM's big competitors in the edp general systems market, the financial squeeze has become a real crunch recently. Both General Electric and RCA, firms with substantial financial resources, decided they could not muster the financial resources to effectively compete with IBM and each firm dropped out of the business. Other companies like Control Data and Xerox Computer Systems remain unprofitable. Only Univac, Burroughs, Honeywell and NCR remain profitable but at substantially lower levels than IBM's astronomical 27.1% pretax profit margin. Furthermore, all of those profitable firms were able to draw on the resources of non-computer activities to help them over the difficult financial hump.

At least one financial analyst, Eugene K. Collins, of Evans & Co., New York, believes the financial squeeze may well intensify. "The history of the general purpose computer systems manufacturers," said Collins at a hearing of the U.S. Senate's subcommittee on antitrust and monopoly, "indicates the extent to which

the capital barrier and the 'systems lock' have worked to minimize competition in the industry.

"Even the 'surviving' systems companies as a group look weak from a financial point of view, relative to IBM. Comparing IBM's financial strength to the other systems companies' ability to internally generate and to externally raise capital indicates that the industry could —and perhaps will—become even more highly concentrated in the future."

The non IBM sector of the computer industry had better, if delirious, days in the past. In the mid and late 1960s—the so-called "go-go years" on Wall Street—computer companies raised money easily. Often companies with no sales or profits and in some cases with no real product, raised millions. For instance, Scientific Data Systems which, if it had utilized conservative accounting practices, was not profitable. Yet, Xerox paid nearly $1 billion for SDS and that computer operation has remained in red ink ever since. Another company, called Foto-Mem, successfully executed three public offerings and saw its stock zoom to $60 a share while the firm had no real working product. People often joked about Wall Street's next soon-to-go-public company. It was called "papertronics."

But the bubble burst in 1970 and when it did some people were rich, but a great many more had lost their shirts "investing" in the next IBM. One problem of course, was that many firms utilized questionable accounting methods and when the government required them to use more traditional accounting practices, the firm encountered new problems. Also, the officers of many unprofitable computer firms had no complaints as long as they were getting rich personally on their soaring company stock. When the stock markets plunged, there was nothing left for many of them but to sue IBM.

Computer stocks now have a bad name on Wall Street similar to the reputation uranium stocks once had. And there was a quiet lesson for the computer industry on Wall Street last year. Leasco Data Processing, one of the hottest stock plays of the "go-go years," changed its name to Reliance after its insurance unit. There is now more glamor, it seems, in insurance than in computers. **—W. David Gardner**

Banking

First Nebraska; Now California

There are those in banking circles who are saying Hinky Dinky has spread to California.

It's not a disease. Hinky Dinky is a Nebraska supermarket chain which more than a year ago combined with First Federal Savings & Loan Assn. of Lincoln, Neb. in a pilot project which made certain banking services available to supermarket customers via terminals in the markets. There were lots of repercussions including three lawsuits, none of which has been completely resolved. But the Hinky Dinky project goes on.

And now it's happening in California. California Federal Savings & Loan Assn., one of the nation's largest S&LS, last month began a similar pilot project with Von's Grocery Co. and Hughes Markets, Inc.

The three Nebraska lawsuits, brought by the state's attorney general, by five commercial banks, and by 11 banks and savings and loan organizations, against Hinky Dinky, First Federal and the Federal Home Loan Bank Board which approved launching of the pilot, alleged illegal banking activities. Lower courts ruled in favor of the defendants in all three cases and an injunction which had stopped the program last July was lifted last September and the program was resumed and extended from two Hinky Dinky stores in Lincoln to five. John Dean, First Federal's executive vice president, expects to extend the program to Hinky Dinky stores in Omaha by mid-March.

Dean said the attorney general's lawsuit had been appealed to the state supreme court and he was anticipating a hearing before March 1. The other two suits, he said, "are sitting in limbo."

What is branch banking?

At issue is a question of just what constitutes branch banking. Dr. Barry Wessler of Telenet Communications, an Electronics Funds Transfer Systems (EFTS) watcher, is concerned that the Nebraska decisions to date imply that the place where a banking terminal resides need not be considered a branch office. He worries that this could lead to a New York bank, say, placing terminals in sites in other states "not authorized to do banking" and that "too much might happen all of a sudden."

No state lines have been crossed in this manner yet and Dr. Wessler feels there would be a lot of discussion and a lot of lobbying pressure before it could happen. Dean wants to do it. Hinky Dinky has stores in Iowa and Dean sees no reason why a First Federal customer who happened to be in Iowa for the day, shouldn't be able to access

Cut keystrokes by what happens to

SYCOR INC®

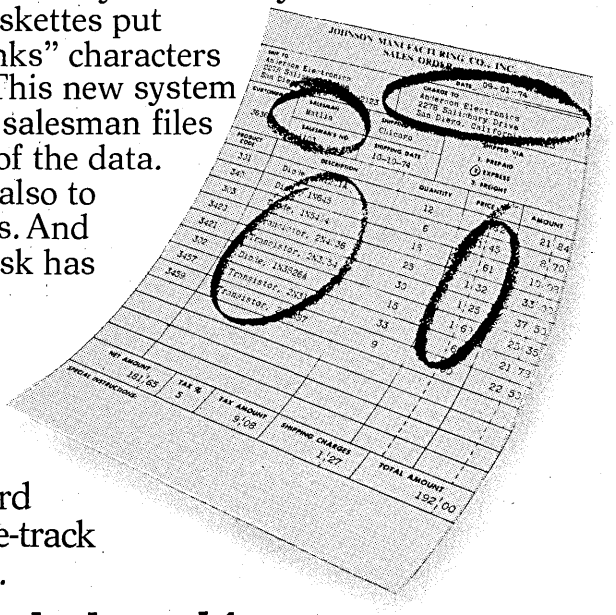
CORPORATE OFFICES: Ann Arbor, Michigan 48104 (313) 971-0900. DISTRICT SALES OFFICES: Atlanta (404) 457-1166 • Boston (617) 890-7290 • Chicago (312) 297-5200 • Cleveland (216) 831-8625 • Columbus (614) 888-8657 • Dallas (214) 521-6710 • Denver (303) 458-0794 • Detroit (313) 355-5770 • Greensboro, N.C. (919) 274-2964 • Hartford (203) 529-1100 • Houston (713) 688-5224 • Indianapolis (317) 784-6779 • Kansas City, Mo. (816) 842-7799 • Los Angeles (213) 640-0120 • Miami (305) 592-1533 • Milwaukee (414) 257-3780 • Minneapolis (612) 854-2309 • New York (212) 371-9050 • Philadelphia (609) 665-1170 • Pittsburgh (412) 922-3350 • Portland, Ore. (503) 227-5672 • San Francisco (415) 349-6626 • St. Louis (314) 878-0090 • Washington (703) 527-0200. SERVICE CENTERS IN 80 CITIES. CANADA: Sycor International Ltd., Toronto (416) 429-0883.

50% and guess data entry costs?

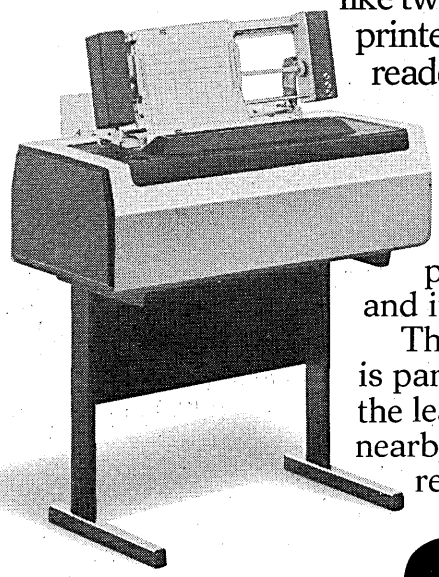
Costs are reduced and so are errors. Use of Sycor's 340 intelligent terminal with dual flexible disk in a typical order entry application can, in fact, reduce keystrokes by 50%.

And fewer keystrokes means greater throughput with fewer operators and a sharp reduction in error rates.

Our Model 340 with dual flexible disk may be used to automatically retrieve data from a file that an operator would normally have to key-in. These two IBM-compatible diskettes put 500,000 "fill-in-the-blanks" characters at your operator's fingertips. This new system allows you to store customer, product/price and salesman files right where you need them most—at the source of the data. And you can use it not only to retrieve data, but also to maintain and update files—even generate reports. And you can do it fast... because the Sycor flexible disk has the fastest access time in the business.



We'll surround you with peripherals. Another advantage of our Sycor 340 is its large supporting cast of peripheral equipment. Things like two speeds of matrix printers, a line printer, a card reader, and seven and nine-track magnetic tape drives.



From the people who brought you intelligence. This new concept of remote data base management wouldn't be possible without the intelligence of our Model 340 and its powerful TAL programming language.

The Sycor 340 and its wide variety of peripherals is part of the family of intelligent terminals that have made us the leader in the field. For more information, contact your nearby Sycor representative. He's got all the answers for reducing your data entry costs.

SYCOR

CIRCLE 74 ON READER CARD

his account there as easily as he can in Nebraska. "I don't feel state lines have any more effectiveness in this electronic world."

Another concern of Dr. Wessler's about bank's putting terminals in stores is that this could give one bank a lock on a store's business. He feels that any EFTS between stores and banks "should be oriented the way money is oriented with the retailer responsible for all financial transactions to the bank. We shouldn't have the bank standing at the cash register."

As Dean sees his system evolving this ultimately would be avoided. First Federal owns the IBM 2730 terminals in the five Lincoln markets. When the system is extended to Omaha, he hopes to use AT&T Transaction Telephone terminals which can use dial-up voice grade lines and have audio response. Initially First Federal would buy these terminals but, as the system spreads—he thinks it will, into department stores and other types of retail establishments as well as geographically—he sees the retailers taking over the terminals and leasing them directly from the telephone company. Then they could use them to access the computers of a number of financial institutions.

New accounts

Dean was unable to estimate the number of new accounts that have come to First Federal as a result of the Hinky Dinky experiment but said "we were picking up 100 a day for awhile." Federal law makes it illegal to open accounts at the markets but customers can pick up literature there and can open accounts by mail. Robert Weber, vice president for EFTS for California Federal, said he expects new accounts to be a definite by-product of his bank's program.

In the Nebraska program, services available via the terminals are limited to deposits and withdrawals into and from savings accounts. Dean says deposits have exceeded withdrawals by four to one in dollar value. The California system adds check cashing. "Any kind of check can be cashed," said Weber, "even a check made out to cash drawn on an account in a commercial bank." Both Dean and Weber contemplate adding additional services, such as bill paying, at a later date.

In the case of the California system this wouldn't happen until after mid-July when the pilot phase of the project is due for completion. At that time, Weber indicated, California Federal might also consider negotiations with other stores and extension throughout the Von's and Hughes chains. Only five markets are involved in the pilot. The first became operational Jan. 22.

California system

The California Federal system is using Amcat II terminals made by Addressograph-Multigraph, tied to a Univac 1106 computer at the bank's main office. A Data General Nova handles line control and message switching for the markets. Terminals, installation, and software for the system were provided by Jacquard Systems, Inc.

Like the Nebraska system, Cal Fed's uses a plastic identification card which it calls California Money. A depositor's account number and name are encoded on a strip of magnetic tape. When he wants to make a deposit or a withdrawal at a participating supermarket, he fills out a brief form similar to a credit card

charge slip which he hands, with his California Money card, to a supermarket representative who enters both into the terminal. The service is being offered throughout the day and into the evening, seven days a week.

Both Cal Fed and Nebraska's First Federal emphasize to potential users of the system the advantage of the combination of easy and efficient access to their accounts with the interest bearing nature of the accounts. This makes some commercial bankers nervous.

The prestigious American Bankers Assn. would prefer what one ABA spokesman termed "a well planned, orderly transition" to EFTS. He says that the S&LS are "jumping into what they think is a void in the marketplace without considering the impact on all consumers."

The ABA late last month began meeting with representatives of state banking associations to begin planning for the "orderly transition," one which would take into account rules and regulations of all states. ABA would like to involve S&LS and retailers. It is particularly concerned with retailers who, unlike the commercial banks and the S&LS, are not regulated.

And the Federal Home Loan Bank Board continues to consider applications from S&LS which would like to place terminals in non-banking sites. One is from San Diego First Federal Savings & Loan Assn. which would like to put terminals in at three airports. And other California S&LS have approached BART (the Bay Area Rapid Transit system) on putting cash dispensers in its stations.

"People say we're doing something new," says Dean of Nebraska's First Federal. "We're not. It's just a new way of doing what we've always done."

—Edith Myers

Technology

CCD Memory Comes in At 10 for a Penny

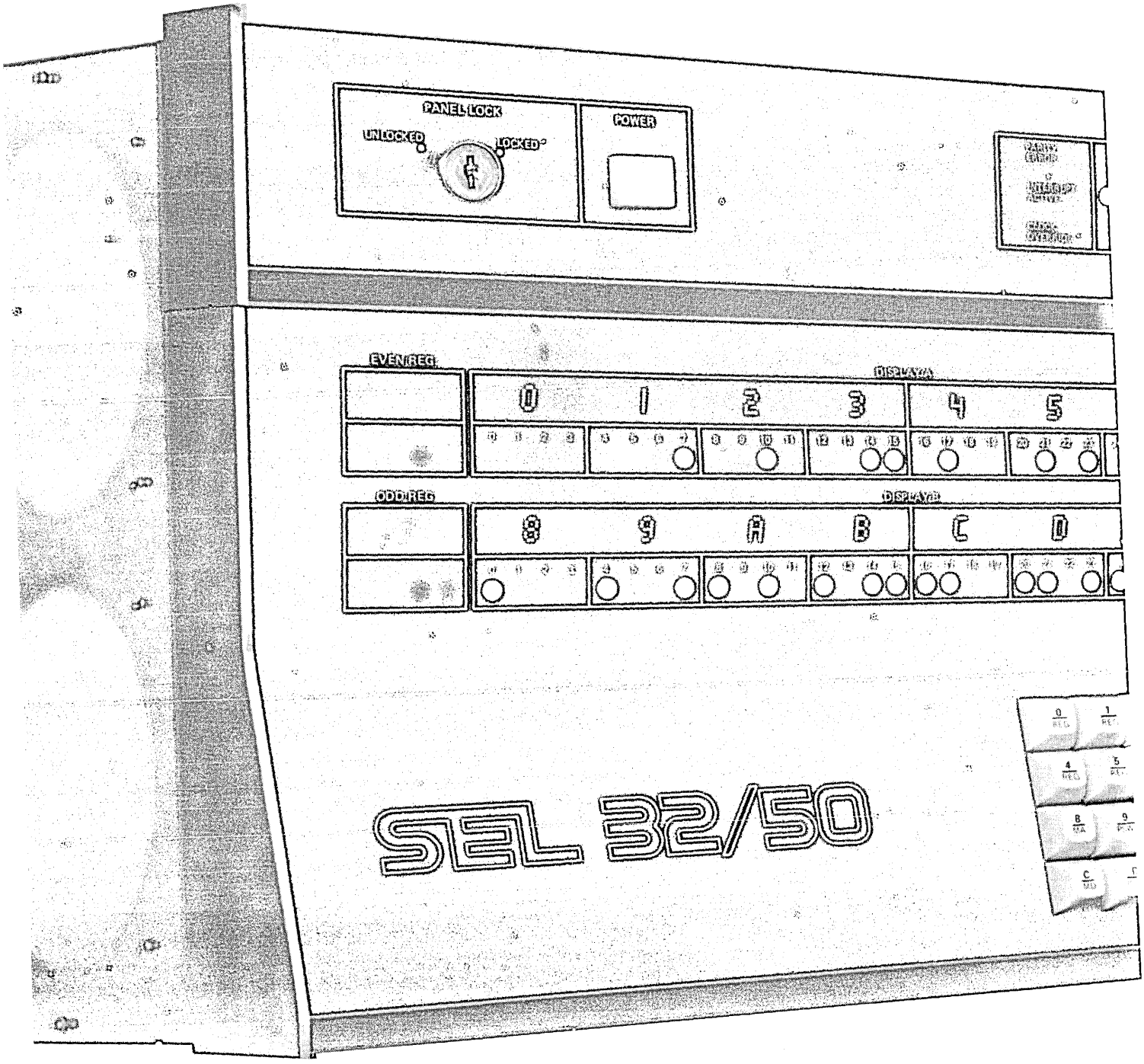
There exists a speed gap between the fast main memories of computers and the much slower rotating memories, discs and drums. Among the several technologies that people say are coming along to fill this gap, the CCD or charge-coupled device, as expected, has hit the marketplace first. Fairchild Camera & Instrument Corp. last month announced the commercial availability of memory components based on the CCD.

It is, of course, slower and cheaper than semiconductor and core memories but faster and more expensive than moving-head discs. The initial product, soon to be followed by more, stores 9,216 bits and has an average byte access time of 200 microseconds. It is aimed at applications in terminal buffers, to refresh displays, in smart terminals, as data storage in microprocessors, and for electronic switching in data communications networks.

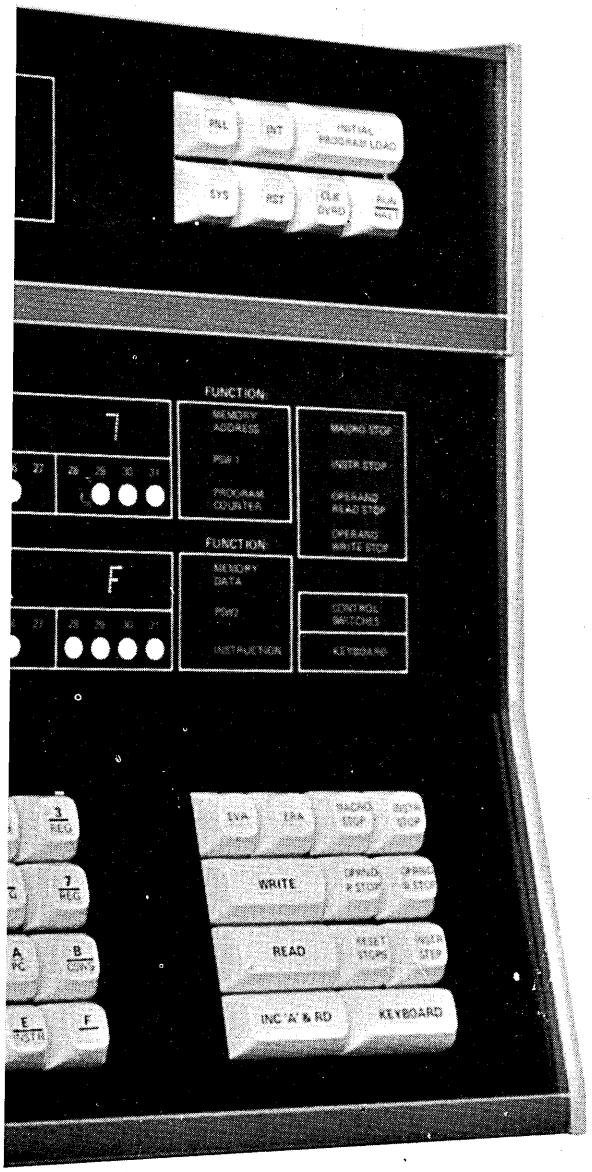
In the works, however, and due to be announced in a few months is a 16K CCD organized as a LARAM (line addressable random access memory). It reportedly will have a faster access time and a lower per-bit price, and "will find its greatest use in cache buffers, swapping stores, and mainframes." Its average access time reportedly will be, at worst, 25 microseconds.

The initial device, the CCD 450, is being shipped in evaluation quantities, priced at $90 each for any quantity up to 10, or $75 if you take 100. Fairchild says it'll be producing these devices in volume in the third quarter of this year, and foresees the price dropping to less than 0.1 cent/bit by year-end for volume purchasers. The device, which has a 3 MHZ data rate, replaces nine conven-

The first two of 32 bit virt



# of a hierarchy ual machines.



Virtual Machines... your insurance against obsolescence. Object machine firmware implemented on one PC board. Allows simple, inexpensive upgrades in coming years.

Newest Architecture... proprietary parsing logic, look ahead, 35 nanosecond bipolar register file, and 65 nanosecond local store. Assures longevity of the host structure.

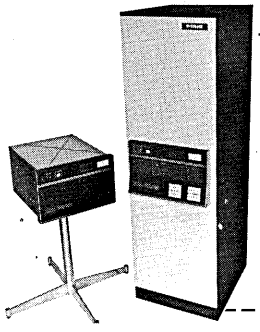
- Thruput: 26 million bytes/second continuous data rate
- Storage: 16 million bytes direct addressing design
- I/O: Discrete microprocessor controllers

SEL 32/50. If you're an OEM, you'll want to find out about the 64KB single chassis system for 19 inch EIA mounting. You can also meet your multiprocessor and distributive configuration needs.

SEL 32/55. End User? You'll be interested in key features like large computer capability, instant software maturity, 32 bit data paths, and two floating point processors.

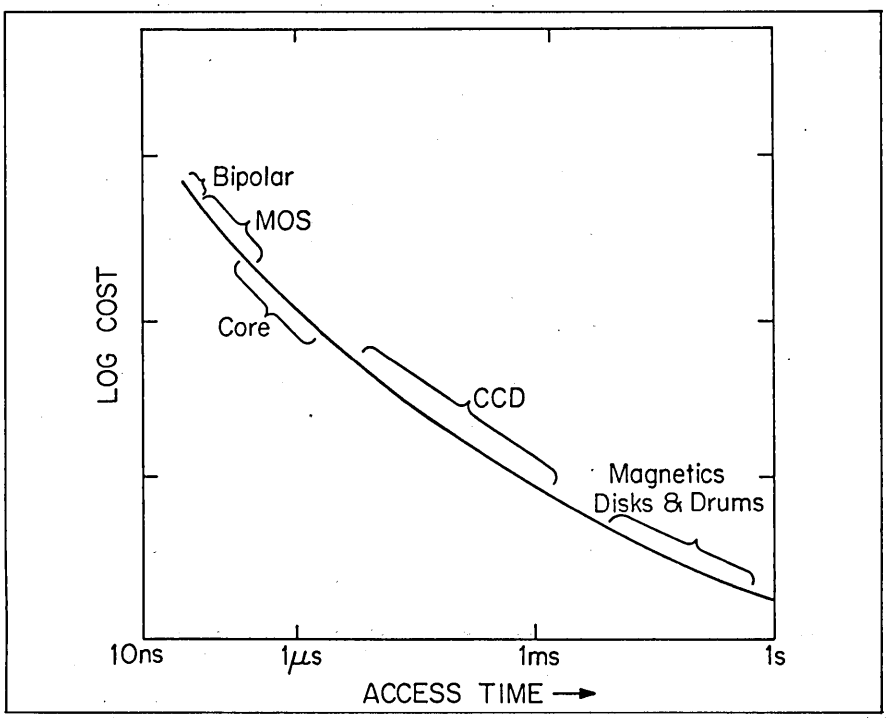
Priced to put a lot of money in your pocket (and a little in ours).

SYSTEMS
ENGINEERING LABORATORIES
6901 W. Sunrise Blvd., Ft. Lauderdale, 33313
European Inquiries:
85 bis Avenue Albert 1er 92 Rueil-Malmaison, FRANCE



☐ SEND ME MORE INFO A
☐ I HAVE PRESENT NEED FOR SYSTEM
NAME _____ TITLE _____
COMPANY _____
ADDRESS _____
CITY _____ STATE _____ ZIP _____
SYSTEMS Engineering Laboratories, 6901 W. Sunrise Blvd., Ft. Lauderdale, Fla. 33313

news in perspective



SPEED GAP: Fairchild Camera shows how CCD memory fills speed gap between fast semiconductor and core main memory and that of slower rotating units.

tional MOS dynamic shift registers in terminal-type applications.

At its current price, obviously, the CCD memory poses no threat to the mature disc and drum memories. Fairchild vp Tom Longo sees their CCB prices dropping to 0.01 cent/bit in a few years, but admits they have no idea when they could get it down to the more competitive 0.001-cent range. Meanwhile, Cambridge Memories champions the magnetic domain tip (DOT) memory while IBM continues its work on the bubble memory. That's what memories are made of nowadays.

International

Bulgaria: "Choice" People and Computers

Bulgaria, says one encyclopedia, "is wedged in between Greece and Turkey on the south, Rumania on the north, and Yugoslavia on the west. The eastern boundary is formed by the Black Sea."

It is a country of 42,800 sq. miles and 8½ million "choice people." The term "choice" was that of Bulgaria's Deputy Prime Minister, Ivan Popov, in the U.S.

'75 NCC PREVIEW

AN IMPERATIVE FOR COMPUTER PROFESSIONALS

Visitors to the 1975 National Computer Conference in Anaheim, Calif., May 19-22 will be able to choose from approximately 90 program sessions and over 900 exhibit booths. The '75 NCC is shaping up as the most varied and comprehensive computer conference ever held on the West Coast. All events will take place in the ultra-modern Anaheim Convention Center.

An estimated 400 speakers and session participants will explore key issues and answers in three vital areas . . . Data Processing Methods and Applications, Science and Technology, and Societal Issues. Under these broad headings, over 20 critical topics will be analyzed in depth. Many will be covered in "mini-programs" — one- or two-day updates on the most recent developments within each topic and held, where possible, at one specific location.

The '75 NCC exhibits are expected to fill 90,000 square feet, with some 300 exhibiting organizations anticipated. They will provide the visitor with a unique opportunity to examine the latest in data processing products, systems, software, and services.

THE INDUSTRY ON DISPLAY

The '75 NCC will include the largest computer exhibit ever held in a major West Coast city. Visitors will find a wide assortment of products and services — including minicomputers, mainframes, peripherals, terminals, package programs, communications systems, data processing services, technical publications, and much more. Many products will be displayed for the first time. There will also be live demonstrations, new product literature, and the opportunity for personal contacts with industry representatives.

Donal A. Meier
'75 NCC General Chairman

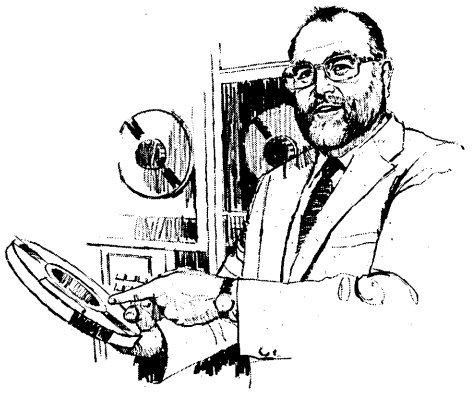
A PROGRAM VITAL FOR TODAY

The '75 NCC program has three primary objectives: to update the specialist on the latest in computer science and technology; to update users on methods and applications; and to promote interdisciplinary discourse leading to increasingly cost-effective systems and software.

Among key areas to be explored are training of user technical personnel, defining operational requirements and management objectives, privacy and confidentiality, and advanced system design techniques. Additional important areas will cover such subjects as government and legal issues, electronic funds transfer, medical/health care, computer architecture, interaction of hardware and software, memory technology, microprocessors, data base management, programming technology, interactive graphics, and communications and networking.

'75 NCC HIGHLIGHTS

- Approximately 90 program sessions.
- Over 400 leading speakers and program participants.
- Approximately 300 exhibiting organizations.
- Addresses by leading national authorities, high-interest special events, and a variety of social activities.



Stephen W. Miller
Program Chairman

MORE NCC DETAILS

Mail coupon for advance information on '75 NCC, or to preregister. With preregistration, you'll receive your NCC *Everything Card* covering the full conference and exhibits. Benefits include: a $15 saving over registration at Anaheim, conference luncheon discounts, advance housing arrangements, and the '75 *NCC Proceedings.*

DTM-275

'75 NCC, c/o AFIPS, 210 Summit Ave., Montvale, N. J. 07645

_____ Yes, send me my *Everything Card.* I've enclosed $60, covering the '75 NCC program and exhibits, plus preregistration benefits.

_____ Please continue to send me all the facts.

_____ My company is interested in exhibiting at '75 NCC.

Name _____ Title _____

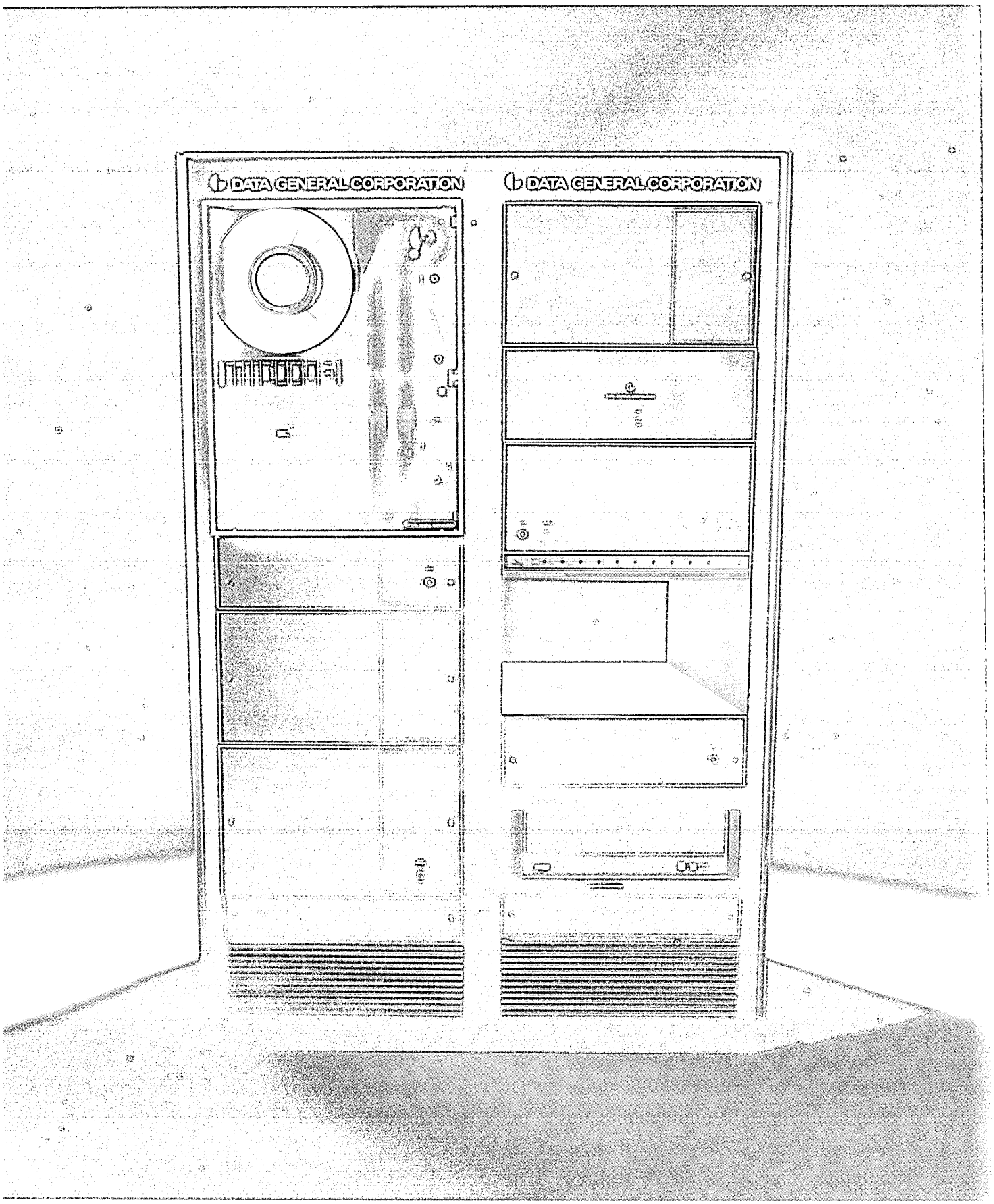
Company _____

Street _____

City _____ State _____ Zip _____

'75 NCC The Biggest Computer Show on Earth

c/o AFIPS, 210 Summit Avenue, Montvale, N. J. 07645
Telephone toll-free (outside of New Jersey): (800) 631-7070



The Nova 830.
A little less of a good thing.

It has come to our attention that there are people who don't need all the speed of our 840.

So we've come up with a computer that goes a little slower. And costs a lot less.

The Nova 830.

The 830 uses our low-cost 32K byte memory boards.

But aside from that, you can't tell an 830 from an 840.

The 830 comes with the 840's Memory Management and Protection Unit that lets you expand up to 256K bytes, all of which are fully supported.

And it has the 840's Mapped Real Time Disc Operating System that helps you develop programs as much as it helps run them. (MRDOS is one of Data General's family of compatible operating systems. So it can handle all our high level languages and all our peripherals.)

Like the 840, the 830 is a natural for dual operations: Timesharing and Batch, Remote Job Entry and Batch, Timesharing and Remote Job Entry, or if you're so inclined, Batch and Batch.

And like the 840, you can get an 830 in 45 days. Or less.

Unlike the 840, you can get an 830 with 128K bytes of memory for $23,150.

Data General

The computer company you can understand.

Data General Corporation, Southboro, Massachusetts 01772, (617)485-9100.
Datagen of Canada Ltd. /Data General Europe, Paris, France 504-23-44.

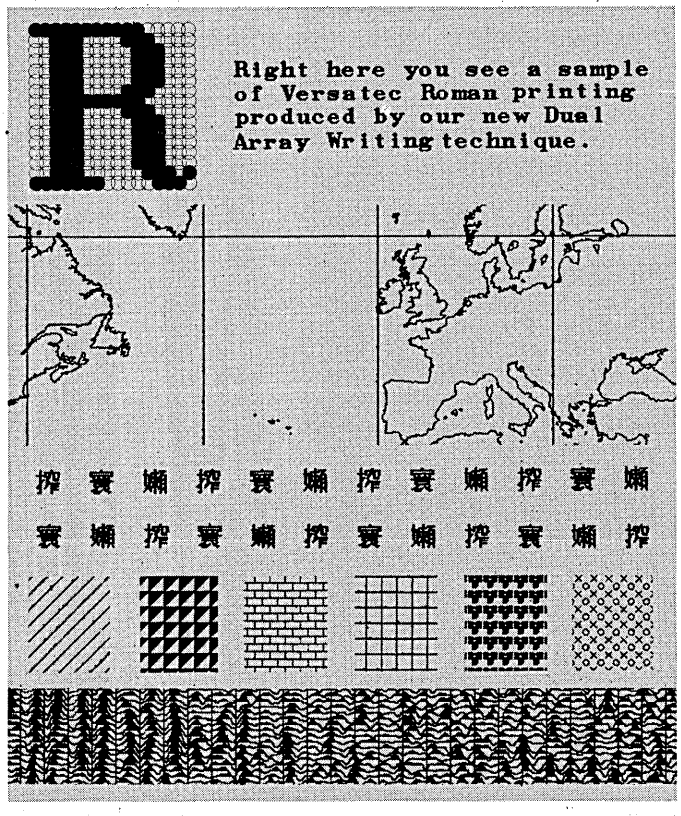
We've made electrostatic writing beautiful.

In 1971 Versatec introduced the first 500 LPM printer/plotter for under $8,000.

"Beautiful," said the computer programmer.

"Beautiful," said the OEM.

"Not so beautiful," said critics who didn't like the 7 x 9 dot matrix, 100 dots per inch printout that put "spots" before their eyes.



In 1973 Versatec turned a corner with high resolution printout: 160 dots per inch. And then—in 1974—we found a way to make the writing bolder, blacker, and even more beautiful at 200 dots per inch.

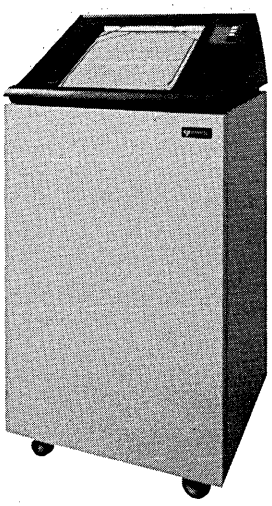
We call our new technique high resolution Dual Array Writing. It gets rid of the "dot look" by overlapping the dots. Samples are shown above.

600 LPM printers are now $4,500.

All this is part of a very handsome package. Our printer prices start at just $4,500, and printer/plotters at $5,900. Our Universal Versaplot Software is the most powerful ever designed for electrostatic plotting and starts at just $900.

We have controllers for over 30 computers.

Now add the fact that Versatec has the broadest product line in electrostatics, the highest resolutions (160 and 200 points per inch), and the largest installed base—more than 2,500 units operating world wide.



It's a beautiful story all around. For details concerning on-line or off-line operation on *your* computer system contact Versatec, Inc., 10100 Bubb Road, Cupertino, Calif. 95014.

Or phone (408) 257-9900. TWX 910-338-0243.

VERSATEC

The leader in electrostatic writing.

news in perspective

last fall heading a trade mission studying this country's electronics industry. His delegation was a sub-group of a larger trade mission of some 150 which, after visiting Washington D. C. for some general trade talks, split up and fanned out over the country studying a variety of U.S. industries.

Prof. Popov, an electrical engineer, has long held a strong interest in electronics and computers. His group was interested, among other things, in terminals, big computers, and minicomputers.

Bulgaria was, until the early '60s, primarily an agrarian country. More recently the government has been pushing industrial development and the computer industry has come in for a lion's share of the pushing. Prof. Popov seems as proud of his country's advancements in computers as he is of its people.

In Los Angeles in October to sign a "protocol" agreement (a kind of intent to do and guidelines for doing business) with Dataproducts Corp., he said there are "several hundred" computers installed in Bulgaria, noting proudly that most of these are Bulgarian made and designed. Of the remainder, he said, some are U.S. made, mostly IBM, some are Soviet, some are ICL and others are from the Danish GIER and Japanese Fujitsu. The Bulgarian computers, Prof. Popov said, are either minis or medium scale and are completely compatible with computers and peripherals produced by other Comecon (Council for Mutual Economic Cooperation—a body that coordinates production of computers and related equipment for most countries of the Eastern bloc) countries.

AGREEMENT: Prof. Ivan Popov (left), Deputy Prime Minister of Bulgaria, thanks Graham Tyson, president of Dataproducts Corp. (second from right) for a gift he received during a visit to Dataproducts to sign a "protocol" agreement. Watching are Bogomil Gerassimov (second from left), Bulgaria's Counsellor to the Council of Ministers, who acted as interpreter, and Angel Angelov, Deputy Director of Bulgaria's ISOT.

news in perspective

Like mid-360s

The most used Bulgarian computer, the ES 1020, was compared by Taddeus Ciundziewicki, Dataproducts' director of marketing, Eastern Europe, to the middle of the IBM 360 line. Prof. Popov said the largest U.S. made computer in Bulgaria is an IBM 370/145 with 500K of memory, used in shipbuilding. "But we have bigger," he said, "Soviet and Danish." He said most computers used in Bulgaria are hooked into a unified national system.

In addition to Dataproducts, companies visited by Prof. Popov's delegation included IBM, Control Data Corp., and General Electric. Bulgaria has protocol agreements with Control Data and GE similar to that with Dataproducts.

Dataproducts has been doing business with Bulgaria since 1972. In 1972-73, the firm received $300,000 in orders from Bulgaria for memories, line printers and punched card readers. In 1973, a core stack stringing contract was signed. An export license application for this contract, submitted to the U.S. government, is still pending. In December 1973, Dataproducts signed a $425,000 contract with Bulgaria for purchase of Model 8330 card equipment. In negotiation is a contract for Model 2230 line printer equipment with an estimated dollar value of 4-5 million. Ciundziewicki said this contract is similar to an already approved contract with Hungary and one pending with Roumania.

Who to deal with

Ciundziewicki explained that computer companies doing business with Bulgaria have to deal with both ISOT and Isotimpex. ISOT is the computer industry manufacturing and buying organization. Isotimpex is a sub-group of ISOT dealing with import/export. "We negotiate the technical details with ISOT," said Ciundziewicki, "and the commercial terms with Isotimpex."

Prof. Popov seemed quite happy with the results of his trip to the U.S. "The good understanding, the desire for cooperation, was more than we expected." He was particularly strong in his praise of Dataproducts. "We were particularly impressed by what we've seen here (Dataproducts' plant). The fineness of workmanship, testing and control, the whole operation impressed us tremendously." He noted they did not inspect facilities of all companies they visited. "At IBM," he said, "we know them from their European subsidiaries. Things are not very different here."

Of his overall impressions of this country, the genial Bulgarian grinned and said, "I have an optimistic impression. We've discovered America after Columbus."

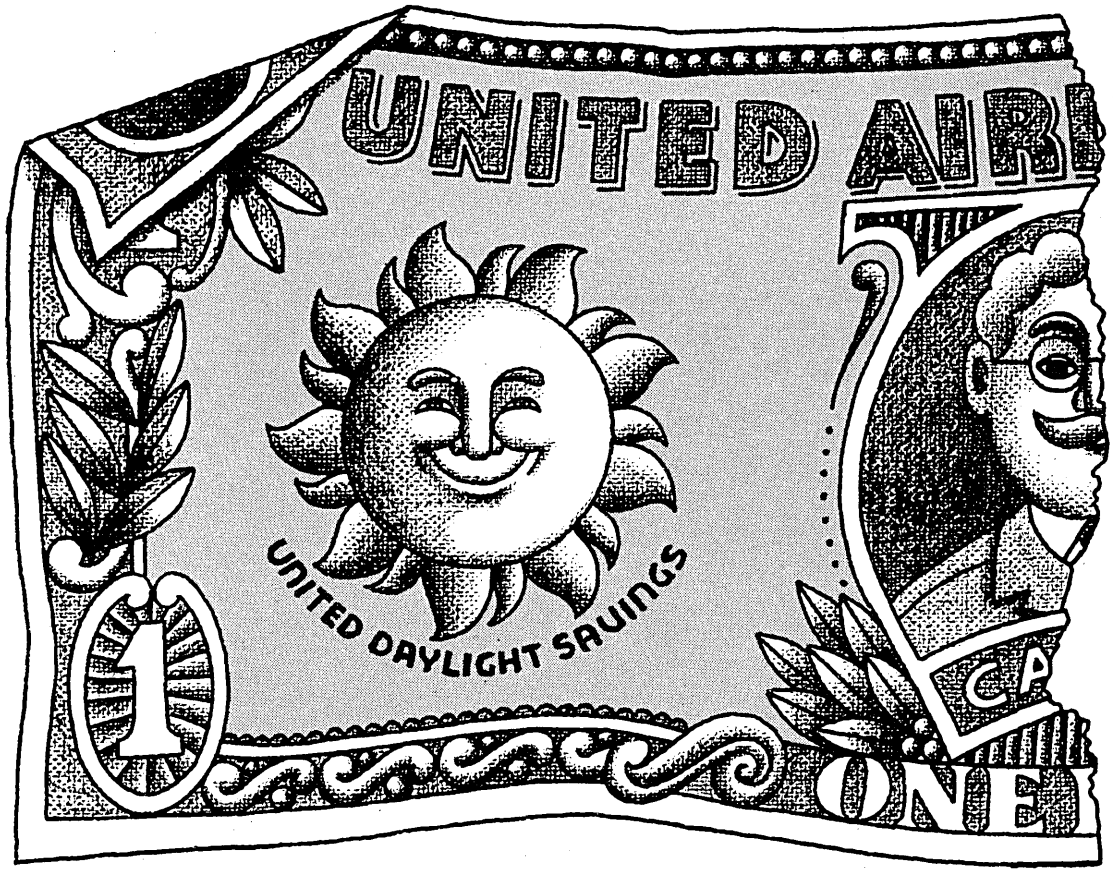
And while he wasn't generally evasive, when asked at the Dataproducts' plant, where he was going from there, his answer, after several moments' hesitation, was "to the hotel."

Prof. Popov seems to enjoy being interviewed, seeing himself in the role of teacher and the interviewer in the role of student. And he likes to turn the tables. After apologizing for perhaps not having been as serious a teacher as he should have been, he asked questions—questions like what are you going to write and what did you get out of the interview.

Since journalists are notoriously bad at answering questions, the answers he got were not even as good as "to the hotel."

—E.M.

CUT YOUR AIR FREIGHT COSTS IN HALF.



Ship 3,000 pounds for the cost of 1,500 pounds.

We call this United's "Daylight Savings." You can save 50% or more on high density shipments. We figure the rates point-to-point, per container. So the more weight you load in each container, the less you pay per hundredweight.

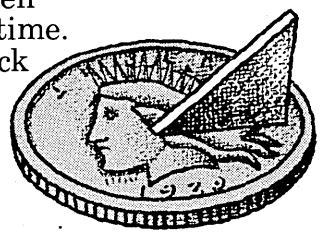
You save from 4 a.m. to 4 p.m.

To get our "Daylight Savings" rate, just get your shipment to us between 4 a.m. and 4 p.m.—our least busy time. All you do is load our big lower deck container and give it to us—we'll reward you with our big discount.

United's "Daylight Savings" from New York City, for example:

Weight of LD-3 contents (lbs.)		1500	2100	2700	3000	(Max.) 3160
Density (lbs. per cubic foot)		10	14	18	20	21
To:	flat charge*	Cost per 100 pounds				
Chicago	$112	$ 7.47	$ 5.33	$ 4.15	$ 3.73	$ 3.55
San Francisco	333	22.20	15.86	12.33	11.10	10.54
Los Angeles	318	21.20	15.14	11.78	10.60	10.06

*Based on airport-to-airport Time of Tender "Daylight Savings" rates. These rates were effective Jan. 1, 1975, and are subject to change.



No.1 in the U.S. sky

UNITED AIRLINES CARGO

News in Perspective

BENCHMARKS . . .

Recession Victim: A chain of recession related occurrences felled Memory Technology of Sudbury, Mass. The remnants of the add-on memory systems maker now belong to Cambridge Memories, Bedford, Mass. The chain was begun when Memory Technology's biggest oem customer, Control Data, apparently unable to find customers for the Massachusetts firm's products, cancelled a big contract retroactively, leaving Memory Technology with systems in storage and not enough money for payroll. The company was deeply in debt to the First National Bank of Boston. Cash was hard to come by and the bank finally seized the company's assets. Some of these, including capital equipment and machinery, designs, technology, and patents and product rights, were sold to Cambridge which indicated it would discontinue the Memory Technology add-on systems for IBM 370/155s and 165s but probably would continue the add-on for the 145.

Here to Stay: Honeywell Inc. has vigorously denied rumors that disappointment with 1974 operating results would lead it to abandon the computer business. "There aren't any such plans at all," said Edson W. Spencer, president. He said the firm's 1974 computer results were hurt by a number of factors including the recession which has induced many computer customers to change from outright purchases to equipment leasing which has meant deferred income for the company and increased borrowings at high interest rates to finance the leased equipment. Spencer said the company also failed to realize the full cost and time required to introduce a new product line like the Series 60. Since the introduction of the series last spring he said some $400 million in orders has been received with the series accounting for "a very significant part." The latest Series 60 order, for $25.6 million worth of 66/20s, came from Ford Motor Co. which will use them to replace Honeywell 2000 computers in the U.S. and Canada.

Not Burroughs: Ray W. Mac Donald, chairman of the board, Burroughs Corp., in reporting record revenue and earnings for 1974, said industry predictions that computer shipments may decline in 1975, primarily due to product cycles, "would not apply to Burroughs." He said product cycles have little influence on Burroughs because of planned overlapping of dates of introduction of different members of product families and the scheduled improvements of major products on a phased program. He said he expects Burroughs' computer shipments in 1975, measured at sales values, to grow at least 30% over the 1974 level. Burroughs' revenue for 1974 was $1,532,628,000, up 19% from 1973. Net earnings in 1974 were $142,937,000, a 23% increase over '73 results.

Together Again: Xerox Corp. has reconsolidated its computer development, manufacturing, and marketing operations into a new division, the Data Systems Division. John C. Lewis, formerly in charge of computer marketing, was named division president. He will supervise some 3,700 employees involved in planning, R&D, engineering, manufacturing, marketing, sales, and service. The new division is part of the Special Businesses Div. headed by general manager William R. Brown. other units in Brown's organization are Diablo Systems, Xerox Computer Services, and Xeroradiography of Pasadena. Three years ago, Xerox organized its U.S. operations by function, separating planning, development and manufacturing,

JOHN C. LEWIS

and marketing into three groups. Related computer activities became part of these groups. Lewis said a strong computer order position has created new demands on computer development and manufacturing and that the reconsolidation will help the company "improve responsiveness to customers' requirements." He noted that Xerox met an end-of-year delivery schedule announced with introduction of its 560 computer line last February by shipment Dec. 27 of the first two 560s to a Massachusetts vocational school and a New York-based consulting engineering firm.

A Test for DDS: AT&T has received a qualified go-ahead on its Dataphone Digital Service (DDS) from the Federal Communications Commission. The FCC authorized the phone company to begin DDS operations in five cities in which it already has facilities and to construct and operate facilities in 19 additional cities. but it questioned the rates AT&T wants to charge (below private line rates). The commission said Bell could charge the planned rates in the first five cities on an interim basis but would have to charge higher rates in the added 19, until a rate study is completed. The five favored cities are New York, Philadelphia, Chicago, Washington, and Boston. The other 19 are Atlanta, Baltimore, Cleveland, Dallas, Denver, Detroit, Hartford, Houston, Kansas city, Mo., Los Angeles, Miami, Milwaukee, Minneapolis, New Haven, Newark, Pittsburgh, Portland, Ore., St. Louis, and San Francisco.

No Great Rush: Although national banks have been authorized by the Comptroller of the Currency to install remote teller stations just about anywhere, there has been no great rush to do it. Bankers had sought the concession to enable them to counter competition from savings and loan associations which were given similar authority last summer by the Federal Home Loan Bank board. Now there is a deterrent in the form of legislation sought by Sen. William Proxmire ofnWisconsin, which would impose a moratorium on the installation of such facilities until Dec. 1, 1976. The Senator fears that the large banks and S&Ls will drive the smaller ones out of business if remote teller stations are allowed to proliferate before the implications of electronic funds transfer systems (EFTS) are explored. Congress has established a National Commission on Electronic Funds Transfer to make such a study. But some S&Ls are undeterred and are going ahead with remote teller installations (see p. 81).

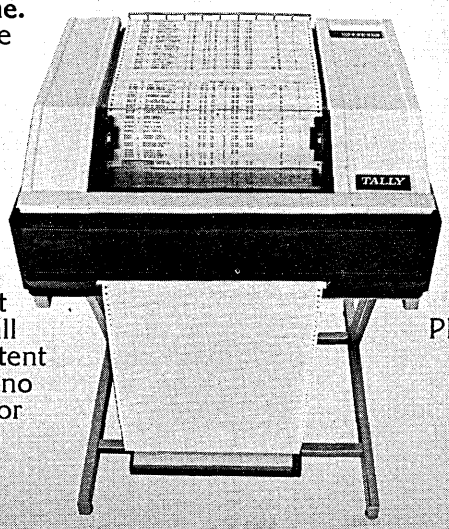
Commodity Futures System: Acquisition of a computerized system for reporting commodity futures transactions has been recommended by a sharply-divided study team composed of Agriculture Dept. officials and commodities traders. The traders opposed computerization. The study group majority recommended installing an on-line system, with a computer based in Washington, over a three year period; system proposals would be solicited the first year, and a contract awarded the second. The Commodity Futures Trading Commission will decide, finally, whether to implement the system. CFTC, authorized by the last Congress, officially goes into business next April. □

ANOTHER PAGE FROM TALLY'S RELIABILITY STORY

Consistent print quality line after line.

Steadfast reliability. A 200 line per minute printer you can drive as hard as you want without fear of failure. A line printer that assures you consistent, unwavering print quality and line registration.

Reliability made possible by the unique Tally comb matrix print technology. A technique that eliminates wear and tear while delivering "locked-in" precise print registration. You get straight lines all the time. You get clean and consistent print quality all the time. And with no preventative maintenance except for routine cleaning.



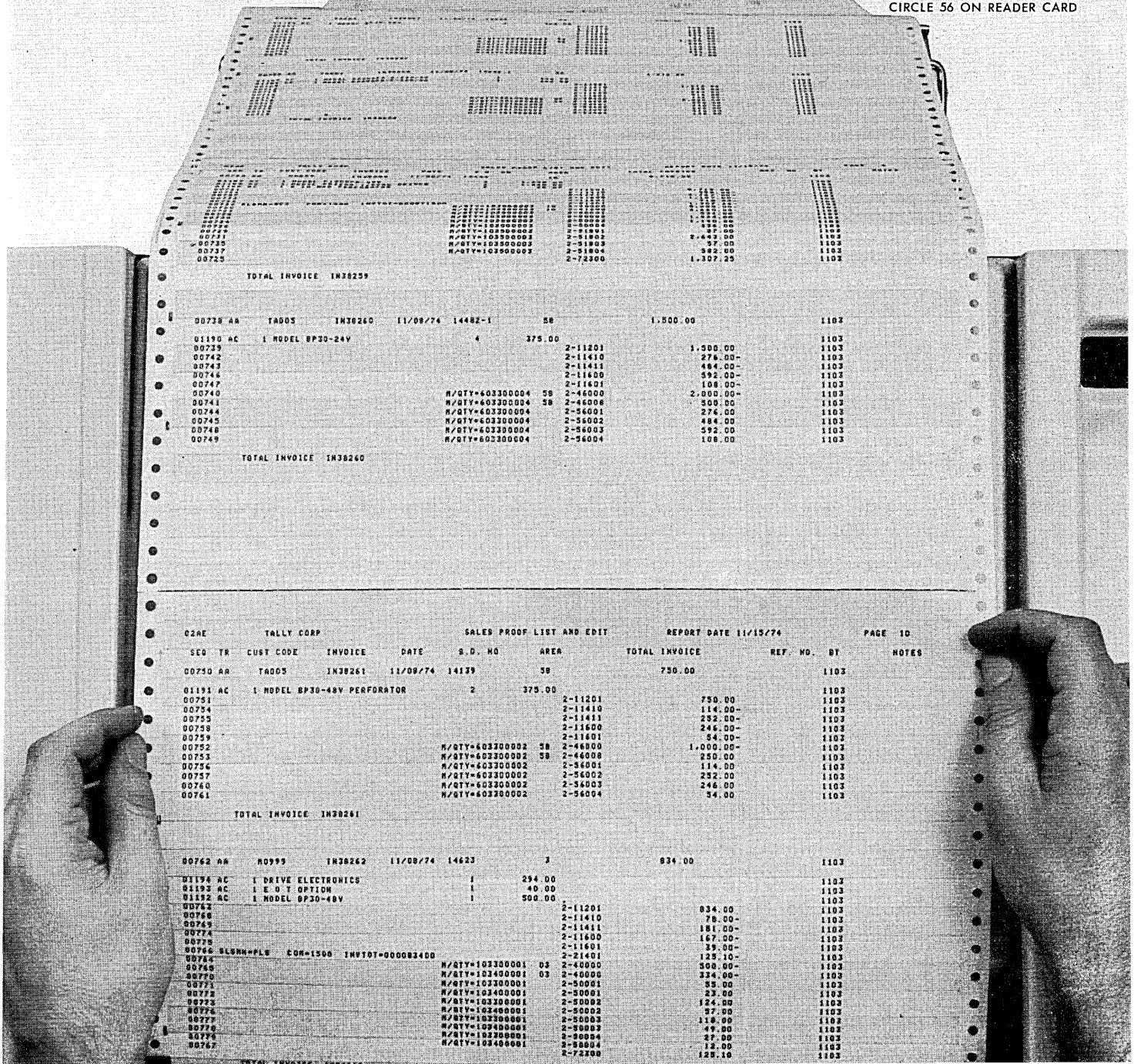
The Tally technique minimizes moving parts. The one-piece Tally print comb prints one horizontal dot row at a time. The paper advance assembly progressively steps the paper vertically one dot row to complete the matrix character. It's simple. It's reliable.

Join Tally's growing list of customers. Write for our brochure. Tally Corporation, 8301 S. 180th St., Kent, Washington 98031. Phone (206) 251-5643.

TALLY®

The line printer for the long run

CIRCLE 56 ON READER CARD



LOOK AHEAD

Continued from page 18

announced that a flock of countersuits would follow.

Keresztury and Foldvary, who told a reporter they once feared for their lives as a result of the incidents they charge, said the authorities were dragging their feet in the investigation. So, they said, they filed their allegations. "It's up to the court now to decide if our allegations are better than theirs," Keresztury says.

LOOKING AHEAD IN 1890?

Concern with technology's encroachment on personal privacy is not new. A successful petition to have the California Supreme Court rule that law enforcement officials may not seize or examine bank records of individuals without a court order, made this point: "Development of photocopying machines, electronic computers and other sophisticated instruments have accelerated the ability of government to intrude into areas which a person normally chooses to exclude from prying eyes and inquisitive minds. Consequently judicial interpretations of the reach of the constitutional protection of individual privacy must keep pace with the perils created by these new devices." A supporting footnote refers to an article, The Right to Privacy, which appeared in the Harvard Law Review in 1890, which stated: "Instantaneous photographs and newspaper enterprise have invaded the sacred precincts of private and domestic life; and numerous mechanical devices threaten to make good the prediction that 'what is whispered in the closet shall be proclaimed from the housetops.'"

HIGH-LEVEL LANGUAGE FOR TIME-SHARING

The people who developed the operating system for Computer Sciences Corp.'s time-sharing network, Infonet, now are working on a high level time-sharing language that would allow customers to use the service without going through programmers. Word of the development came out last month when CSC president Bill Hoover talked to securities analysts in Los Angeles about the high cost of programming. He said, "no major breakthrough in software technology is expected in the next few years," but noted that a "small but high level research program" is being conducted at CSC to help reduce programming costs.

Heading the program, it turns out, is CSC co-founder Roy Nutt who led the development of the company's CSTS time-sharing operating system five years ago. And within the company it's said the new language could very well be a "breakthrough" within the context of Hoover's talk to the analysts and that an announcement could be out before year end, not "in the next few years."

RUMORS AND RAW RANDOM DATA

The company that pioneered, and recently has prospered on the concept of shared processor data entry -- better known as key-to-disc -- actively seeks new financing and perhaps a new owner. Computer Machinery Corp. of Los Angeles last month assigned president Tom Ringer to go out and seek hard to come by lease financing, turned over his administrative functions to one of the company's founders, turned down an acquisition offer and was rumored still to be contemplating an acquisition proposal by Control Data...DEC's 11/70, the big midi machine, may be the last of the company's 16-bitters, but there are some who feel a 32-bit machine will one day be produced by DEC. The 11/70, which departs from the 11 family's Unibus concept, still has some traditional features -- e.g. most machines will use core in main memory...Storage Technology, which has been plagued in recent months by the loss of middle management, may be in for more top management defections. Resumes from some top STC managers are making the rounds...Varian-Canada this month will begin offering in the U.S. a Mark sense, transaction oriented terminal it has been selling in Europe and Canada for a couple of years. Called T-Scan and billed as the "anyone-can-use-it" terminal, it will sell in the U.S. for either $6,700 or $6,800 (F.O.B. Georgetown, Ontario, Canada).

hardware

Off-line

A small computer is the basis of an aircraft collision avoidance system patented early this year. The system, developed by George B. Litchford of the Lichstreet Company, Long Island, N.Y., uses signals from existing air traffic control equipment together with automatic responses made by transponders which are already on all commercial aviation craft. The computer provides data to a crt display to warn the pilot of any nearby aircraft or an obstruction such as a mountain peak, marked with a standard beacon.

Two Bell Laboratories scientists also received their patents early this year for developing the charge-coupled device (CCD) which is being considered for many practical applications as a replacement for transistors.

Digital Equipment Corp. continues its aggressive pricing strategies by slashing memory prices as much as 36% on selected PDP-11 configurations, and announcing new models with the lower priced memories. A 32K x 16-bit chunk for the PDP-11 now goes for $8K, down from $11,900. The 64K box was cut from $23,800 to $15K.

Recession and generosity don't exactly go hand in hand, which helps make California Computer Products, Inc.'s recent donation of $160K in computer equipment for minority training worthy of comment. Pepperdine Univ. and the Telco Institute of Urban Technology each received a complete drum plotting system and accessories which will be used by the two private schools in a HEW program to train minority students in computer technology.

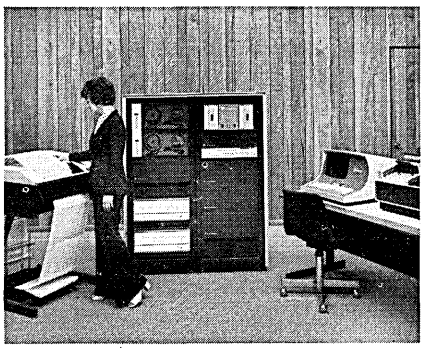
The Air Force Avionics Laboratory at Wright-Patterson AFB, Ohio, has contracted with the Goodyear Aerospace Corp. for an 11-month study on how microprocessors can be used to improve warfare signal processing systems. Some possible military uses for microprocessors being investigated under the contract include helping protect pilots in heavily defended hostile areas, and new, smaller, more economical electronic warfare systems with greatly increased capability. A pity.

World's Widest Mini Family

Whatever businesses Computer Automation was in before, it's in a few more now. In one fell swoop it has added to both the top and the bottom of its line, come up with new I/O and software, and carried distributed intelligence maybe one step too far—to the intelligent cable. CA's product line may be the only thing around that's expanding faster than the U.S.'s monetary inflation.

Taking it from the top, the newest biggest mini from CA is now the MegaByter, a machine that proves minis are small in outward appearance and price only. It obviously takes its name from having up to 1MB of main memory (oddly enough, still core). In addition it offers stack architecture, a 222-instruction repertoire, decimal arithmetic (a first for this builder) and compatibility with CA's smaller machines.

The compatibility turns out to be both a blessing and a curse. On the minus side, the compatibility is upward only, and holding the MegaByter's bus size down to be compatible with the smaller machines also



holds down the amount of directly addressable memory to 64K, a frustrating drawback in a megabyte machine. On the positive side, however, compatibility has forced the stack design to be implemented in software, and this means that multiple stacks can be going simultaneously.

All kinds of new instructions are available. In addition to the decimal arithmetic, there's a MOVE that works on up to 255 bytes, and a STRING COMPARE that compares string magnitudes and locates mismatched characters too. These and others suggest the machine may actually be a suitable component in an end-user business system.

CA touts the MegaByter as competition for Digital Equipment's PDP-11/45, Data General's Eclipse, and Interdata's 7/32. To prove it, the firm has offered its first version of an optimizing FORTRAN IV. Still no Accounts Receivable, though.

For peripherals interfacing, there's a multi-channel multiplexor called DIOS (Distributed I/O System). DIOS is compatible with every member of CA's family of processors. It can be used to interface terminals, datasets, card equipment, but not discs which presumably need faster lines. DIOS, in turn, relies on cables that have microprocessor chips imbedded in them. The cables pick up half of the interface workload. The "picoprocessors" bring the price of the cables up to $145 each, but offer another dimension in flexibility in exchange, by making the interfaces between cpu and peripheral that much less subject to change and that much easier to implement. (The DIOS I/O distributor runs as little as $380, partly as a consequence of the cables.)

Another new member of the line to which DIOS and its tentacles may attach, is the "millicomputer", so called because, in CA's eyes, it's midway between a minicomputer and a microcomputer. True to form, the company calls it the "Naked Milli," but it implements it in MSI rather than LSI. A full-scale 16-bit bipolar processor, it covers only a half a card, and is priced at less than $295 for one ($695 with 1KB of semiconductor memory). It is on this machine that the company bases its boast of the "broadest range of compatible products in the industry." All programs written for this machine will reportedly run on any larger member of the family. Further, programs written in the larger instruction sets (the milli has only 93 instructions) will run on this cpu through software macros.

So at least it is possible, if not practical, to pull out the $295 milli, put in a MegaByter and connect it to the same peripherals through smart cables. The jump in performance will cost about $10K if the MegaByter has only, say, 32K of 1.2-usec core memory (which isn't much money for that size of machine). To go to 192K still only costs $27K. A full-blown version with a real million bytes, costs $110K.

Hazeltine 2000 System

1. Start with the Video Display Terminal that's First In Sales The World Over

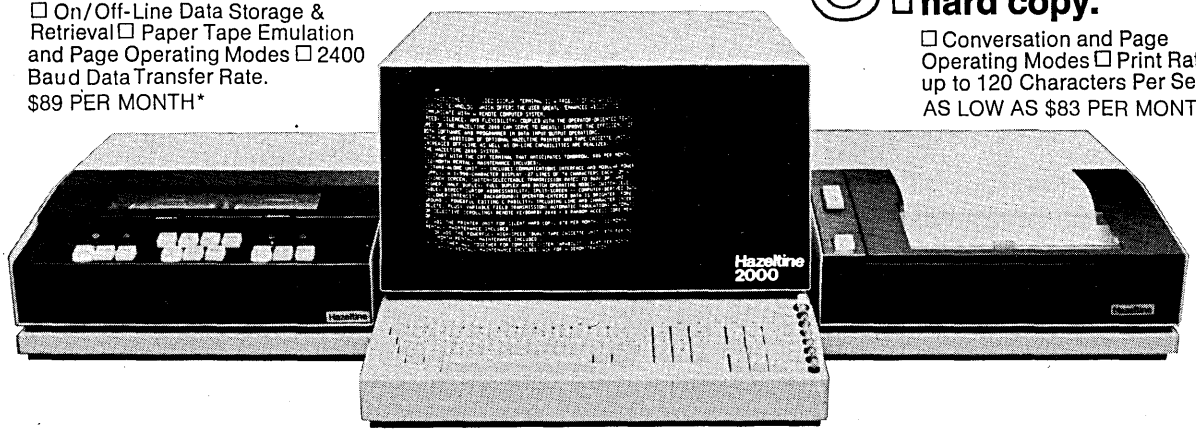
☐ 1998-Character Display ☐ Selectable Transmission Rates up to 9600 bps ☐ Full-Duplex, Half-Duplex and Batch Operating Modes ☐ Dual-Intensity Video ☐ Protected Format ☐ Editing Capability ☐ Options include: Lower Case and 80-Character Line.
$98 PER MONTH*

2. Add the powerful, high-speed "dual" Tape Cassette Unit.

☐ On/Off-Line Data Storage & Retrieval ☐ Paper Tape Emulation and Page Operating Modes ☐ 2400 Baud Data Transfer Rate.
$89 PER MONTH*

3. Add your choice of Printers for hard copy.

☐ Conversation and Page Operating Modes ☐ Print Rates up to 120 Characters Per Sec.
AS LOW AS $83 PER MONTH*



4. Put them all together for complete System capability.

$270 PER MONTH*

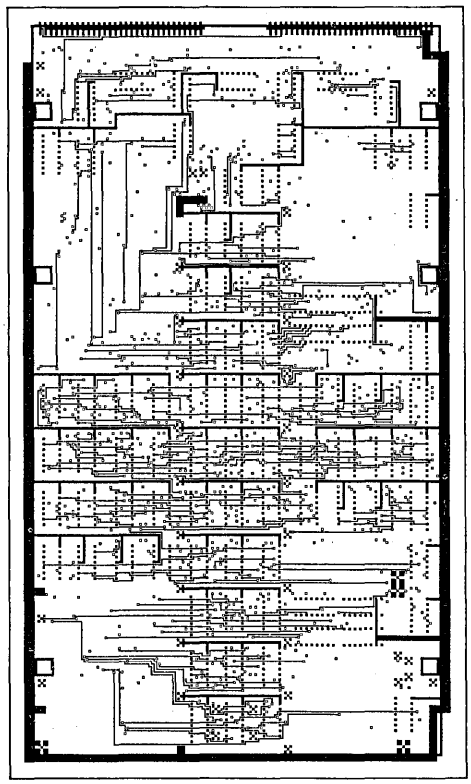
*12-MONTH RENTAL, MAINTENANCE INCLUDED. ASK FOR A DEMONSTRATION.

Hazeltine Corporation Computer Peripheral Equipment Greenlawn, N.Y. 11740 (516) 549-8800 Telex 96-1435

East: N. Y. (212) 586-1970 ☐ Boston (617) 261-5867 ☐ Phila. (215) 676-4348 ☐ Pittsburgh (412) 343-4449 ☐ Wash., D.C. (703) 979-5500 ☐ Rochester (716) 254-2479
Midwest: Chicago (312) 986-1414 ☐ Columbus (614) 864-4714 ☐ Detroit (313) 559-8223. *South:* Dallas (214) 233-7776 ☐ Atlanta (404) 393-1440
Houston (713) 783-1760 ☐ Orlando (305) 628-0132. *West:* San Mateo (S.F.) (415) 574-4800 ☐ L.A. (213) 553-1811 ☐ Denver (303) 770-6330 ☐ Seattle (206) 242-0505

FOR WORLDWIDE SALES INFORMATION, CALL (516) 549-8800 **Hazeltine and The Pursuit of Excellence**

By the time your drum plotter turns this out, a Gould printer/plotter can turn it out 400 times.



If what you're looking for is higher plotting speed and lower plotting cost, we've got something that can give you both. And something else besides.

A Gould electrostatic printer/plotter. The one that makes your old drum plotter remarkably underproductive. The one that gives you a useful printing capability in the bargain. A Gould plotter is so fast, it can turn out this plot in only 2 seconds – versus an average 13½ minutes for your old drum plotter.

And what gives that Gould plotter its blinding speed is its direct on-line operation to your computer. Whether it's the PDP-8/E, PDP-9, PDP-11, PDP-15, HP2100, Nova/Supernova, H316/516, Raytheon 704, UNIVAC 1108, IBM 360/370, CDC 3000/6000, Interdata 70 and more.

In addition to output speeds up to 400 times faster, a Gould printer/plotter gives you a lower unit cost, as well as lower paper cost. Better-looking output, since there's no ink to smudge, clog or run out of. Few moving parts for quiet operation, high reliability. Software that's upward compatible with the leading drum plotter. Without any sacrifice in mainframe CPU time.

And, in addition to everything else, it gives you an alphanumeric printing capability that also lets you compile management reports at speeds up to 3000 lines per minute.

Users will tell you that a Gould electrostatic printer/plotter makes their computer-aided design system truly interactive since output of modified data for verification can be quickly obtained. And by producing hardcopy output in a matter of seconds – instead of the many minutes it can take with older methods – time savings are maximized.

This all adds up to the best printing/plotting hardware and software available anywhere. And it's backed by Gould's own factory-trained service technicians.

To learn more about Gould electrostatic printer/plotters – get in touch with Gould Inc., Instrument Systems Division, 20 Ossipee Road, Newton, Mass. 02164 U.S.A., or Kouterveldstraat 13, B 1920, Diegem, Belgium.

GOULD

hardware

Deliveries have started; there's no paper tiger here. Shipments take about 60 days. COMPUTER AUTOMATION INC., Irvine, Calif.

FOR DATA CIRCLE 220 ON READER CARD

A 9600 Baud First

The vendor claims this 9600 baud modem is the first to be able to operate on unconditioned private lines (usually C2 or D1 level conditioning is required) and that it can also operate at that speed on most DDD (Digital Data Service) lines. That ought to make the device look particularly attractive to those intending to make use of Bell's newest, fastest transmission services. It uses type 3002 leased lines, thought to be the most common for both multipoint and point-to-point networks, and can fall back to 7200 or even 4800 baud when conditions demand.

Its error rate is claimed to be less than one bit in 100,000 in worst case simulations, and it operates in simplex, half- or full-duplex modes. It also has the ability to handle multiplexed transmissions in multipoint networks without necessitating hardware or software modifications to central site hardware. The unit is priced at $9,700 (figure it at a little over $1 a baud) and delivery takes 30 days. INTERTEL, Burlington, Mass.

FOR DATA CIRCLE 223 ON READER CARD

Bigger Tiny 370

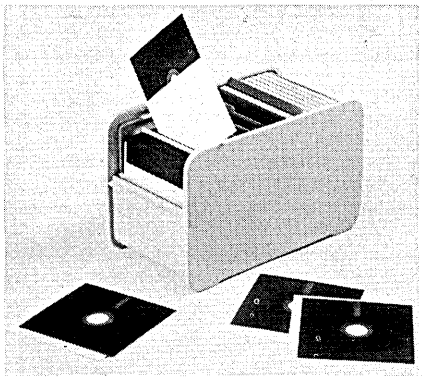
Perhaps to increase the distance between it and the System/3, the smallest IBM 370 has just gotten a little bigger. Previously available in four sizes ranging from 64KB to 156KB, the 370/115 has been allowed another memory expansion to 192K. The additional MOSFET expansion brings the price of the maximum 115 to $4,115 per month or $187,000. (The 156K machine runs $3,765/month or $172,000). Now IBM can turn its attention to thoughts of competition between the S/3 and *its* little brother. IBM, White Plains, New York.

FOR DATA CIRCLE 222 ON READER CARD

Floppy Storage

This company's claim to fame has been in building practical devices. The firm is named after its founder, James Morley, who invented the first automatic shoe button sewing machine back in 1890. How can you argue with that?

The present product, the File One,



is also practical. It stores up to 100 floppy discs and keeps them segregated with 10 movable dividers. Made of color impregnated high-impact plastic, it weighs about 10 pounds empty. Priced at $89, its only concession to history seems to be its roll top. MORLEY CO., Portsmouth, New Hamp.

FOR DATA CIRCLE 224 ON READER CARD

Communications Switch

Have 10 or more terminals that need to dial each other? Or three times as many terminals as computer ports? Maybe the Automatic Data Switch can help. The switch can interconnect up to 256 lines of speeds from 300 baud to 9600 baud. Not a multiplexor, it doles out available lines or ports on a contention basis.

One of its best selling points is expected to be its built-in diagnostics and audio and visual alarms. The vendor claims any "qualified" electrical technician can service it, and the qualifications may not be too tough since the diagnostics supposedly pin things down to the card level.

The basic unit, with 10 lines and 300 baud interface cards, starts at under $13,000. (Systems of 100 lines are less than $500/line, it is claimed.) Delivery takes four to six months. MULITIPLEX COMMUNICATIONS INC., Hauppauge, New York.

FOR DATA CIRCLE 230 ON READER CARD

Flip-side Mag Cards

IBM Selectrics used for word processing applications have a mag card feature for word storage, as do some other text development systems. Previously the magnetically recorded card stock had one side coated with a lu-

product spotlight

Microfiche Printer

Ten microfiche, equivalent to 980 letters, can be mailed across country (first class) for 10 cents. Upon their arrival, they can now be translated to 8½ x 11" form in about 20 minutes by the Model 970 printing system.

There is more to the 970 than a sophisticated way to beat the post office out of some stamps, of course. The system not only allows for the use of fiche as a paper distribution medium, but makes it easy to selectively print one or more frames from a fiche, to print several copies of these selected frames, and to collate up to 499 sets of those pages.

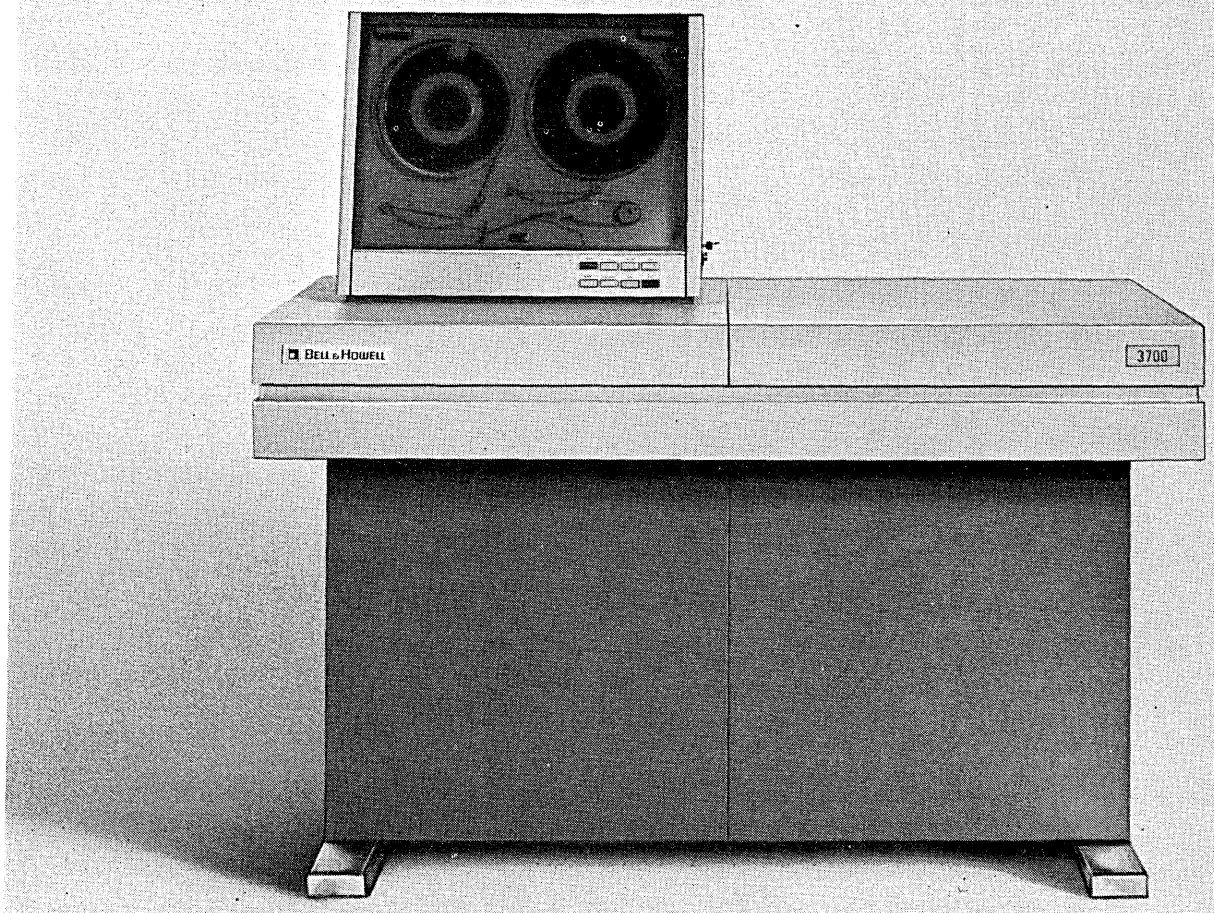
The many advantages of microfiche (a nickel or dime to duplicate 98 pages of information onto another fiche, computer output 10 times as fast as line printers, and 2% of the storage space of paper forms) might be accepted by more shops if users could quickly and easily get a sharp, inexpensive paper copy when they needed it. The 970 is built to do that. Like a copier, the machine is rented on a per page basis; 50,000 printsworth is included in the minimum monthly rental of $1,500 (which figures about 3¢ per page).

Models are available to print from 24X and 20X reductions, from horizontal layout on the fiche or vertical. All the models run between 3,300 and 3,500 pages per hour. XEROX CORP., Stamford, Conn.

FOR DATA CIRCLE 221 ON READER CARD □

WE WEREN'T THE FIRST WITH COM.

BUT NOW WE'RE ONE OF THE BEST.



At Bell & Howell, we just acquired a proven, well-known COM unit. We can now offer you a total microfilm package we consider second to none.

You get a recognized COM unit that interfaces with major mainframe computers.

You get the backing of Bell & Howell national sales and service.

And you can fill all your other microfilm needs from our range of imaginative software and reliable microfilm readers designed for COM.

COM plus Service plus Software plus Hardware—all from Bell & Howell.

Now's the time to write or call so we can prove our total capability in microfilm.

WE MAKE MICROFILM MEAN BUSINESS.

BUSINESS EQUIPMENT GROUP
6800 McCormick Road Chicago, Illinois 60645

BELL & HOWELL

CIRCLE 28 ON READER CARD

bricant like graphite and another coated with the magnetic oxide. This new stock, with both sides coated with both the lubricant and the oxide, doubles the amount of storage per card. Each side can contain about one typewritten page of text.

The cards come packaged 25 to a box—each with its own protective sleeve—for $37.50 per box in very small quantities, $33 per box for 10 or more boxes. GRAHAM MAGNETICS, Graham, Texas.

FOR DATA CIRCLE 231 ON READER CARD

Acoustic Coupler

Trying for the low end of the market, this unit is priced at $199.50 for prepaid orders. Compatible with the Bell 103A, it is called the Model 920 and can automatically switch between data and acoustic operations. It realizes its low price by being a send-only unit, so presumably will have to find a home in locations where no one wants any answers back. TYCOM CORP., Midland, New Jersey.

FOR DATA CIRCLE 232 ON READER CARD

Cassette Reader

Somehow this firm figured out how to record 16 channels of analog information on two tracks on about one-quarter inch of tape. Recording density is thus about 615 bpi, for a read rate of about 1700 bps at 2.75 ips. Reading between the ps's, this makes it a specialized small computer peripheral which will mostly see service in reading tapes produced on the firm's other products. Analog resolution is 12 bits, and interfaces for minis, larger mainframes, or RS232C terminals are available. Prices start at $2,095 with a parallel interface. DATEL SYSTEMS, INC., Canton, Mass.

FOR DATA CIRCLE 233 ON READER CARD

Synchronous Multiplexor

The TDM 1251 is another unit which anticipates the establishment of ultra-high-speed digital networks. As with most multiplexors, its buyer is offered a choice of interfaces (RS232, CCITT V24, CCITT V35, Bell 303), for a variety of input rates (600 bps to 64Kbps) and output rates (to 256Kbps). The final characteristics of the device are decided by the choices the customer ticks off on the menu. Only the serial synchronous I/O is fixed.

A standard unit accepts inputs to 19.2Kbps and outputs at up to 72Kbps. A standard box with space for 22 channels runs $3,700 plus about $250 each for the channels to put in the box. Larger boxes, with more little nests to stuff channels into, accommodate up to 62 inputs. GENERAL DATACOMM INDUSTRIES INC., Wilton, Conn.

FOR DATA CIRCLE 234 ON READER CARD

Intelligent Tape Drive

As microcomputers fall to about $10 or $12, watch for more and more items we once considered "peripherals" to get intelligence all their own. The PTT 8000 is a case in point. Built around an Intel 8008 microcpu, the device looks like a cartridge tape drive, but comes with up to 4K of memory and 12 switches and 20 lights that can be programmed to function "as you like it." (For users without the gear to actually program the PROM firmware, either this firm or Intel is willing to do the coding from customer specifications.)

The 8000 comes with an RS232 interface or can be run full-duplex, can switch between transmission speeds up

to 2400 baud, and can run in local or on-line modes. Its cartridge is the 3M unit.

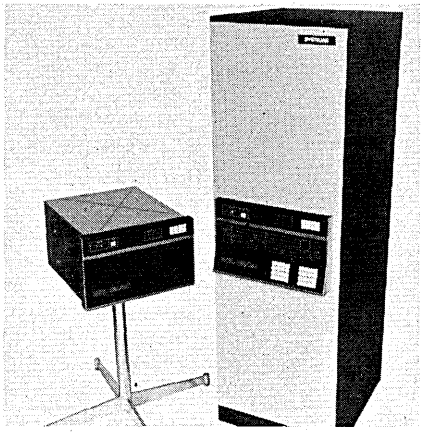
The price is $2,695. THREE PHOENIX co., Phoenix, Ariz.

FOR DATA CIRCLE 229 ON READER CARD

Midicomputer

If a minicomputer costs less than $10,000, what do you call a 32-bit machine that's just as small but runs about $20,000? Whatever the name, the 32/55 and 32/50 are that, and they represent the frontal edge of SEL's attack on the minicomputer market.

The 32-bit cpus are intended for real-time applications. They are virtual machines, unlike the rest of SEL's line, and the virtual firmware is collected on a single card so that the personality of the mainframes can be quickly changed. The midis are built around a single I/O bus architecture, now considered *de rigueur* by many



builders. But this bus is rated at up to 26.6 megabytes per second. Included in the mix are a file of 32x32 35nsec bipolar registers, a 256x32 65nsec scratchpad, and up to 1MB of 600nsec core.

Software includes a real-time operating system, an optimizing FORTRAN IV, macro assembler, and applications packages previously developed for SEL's existing line-up.

The difference between the machines is that the /50 is for oem buyers (it runs about $18,000 with 32KB, interrupts, etc.) and the /55 for end users (prices start at $25,000 with the same amount of memory, plus cabinetry, etc.). Optional hardware includes two floating-point processors and a shared memory connection for dual cpus. SYSTEMS ENGINEERING LABORATORIES, Ft. Lauderdale, Fla.

FOR DATA CIRCLE 226 ON READER CARD

Terminal Connector

There's an excellent analogy for the three-pronged plug and two-hole wall receptacle in data processing. Users with IBM mainframes and non-compatible terminals have been frustrated in trying to connect them; similarly, users wishing to buy impressive-looking terminals sometimes sighed and passed them by because of the hook-up problem. Here's one potential solution.

This microcontroller, which has been on the market about six months, has just been optioned with firmware to handle binary synchronous communications protocol. Also, when the IBM specifications are fully released, the vendor intends to add an option for SDLC protocol too.

Built to handle up to eight terminals, versions can be ordered to handle selective calling, automatic answering, data translation, clustering and multiplexing, on private or dial-up lines. Buffering to 16K bytes on lines to 4800 baud is also offered. A 4K bisynch version is priced at about $1,900. Primarily for oems, the vendor promises to configure tailored versions for end-users for about $300 to $500 more. APPLIED SYSTEMS CORP., St. Clair Shores, Mich.

FOR DATA CIRCLE 227 ON READER CARD □

software & services

Updates

Computers seldom get accused of helping to clear the air, but you would find that kind of attitude prevails at Michigan State Univ.'s observatory at East Lansing. Computers are credited with increasing the site's efficiency by 300%, giving the equivalent of 300 viewing nights instead of the 100 per year average without automation. The machines perform tasks such as data collection, recording, processing, analysis, down to such mundane chores as aiming the telescope, moving the protective dome, and adjusting the glass to keep pace with the stars as they move across the sky.

What is being billed as a full fledged data base management system for minicomputers has been developed by Express Software Systems, Inc., New York, N.Y. Implemented on the Wang 2200B mini, the Express File Manager (EFM) product handles hierarchical structures up to 16 levels. File description, maintenance, and inquiry are performed interactively via crt and involve no programming. The system can run in as little as 16K bytes.

Excerpta Medica On-Line is the name of a new service that allows researchers, physicians, and other health care personnel in North America access to a data base of worldwide medical literature from a desktop terminal. Developed jointly by the Excerpta Medica Foundation of Amsterdam, Holland, and Informatics Inc., Rockville, Md., the data base contains articles drawn from 3,500 journals consisting of 20,000 individual issues each year. Search tools for the information include a computerized medical thesaurus containing 180,000 preferred terms, and 360,000 synonyms.

Boston-based Cullinane Corp. has added "privacy clauses" to its IDMS data base management system. The clauses, implemented in the subschema processor, allow the data base administrator to restrict or limit program or command options. In essence, the new coding can be used to allow certain users to add, but not delete records; retrieve but not update a subschema area, and perform other intricate access controls.

Paging Analysis

A new enhancement for this firm's job accounting program, JASPER, provides paging statistics to IBM DOS/VS users to help pinpoint changes in page fault activity. Reports are generated to analyze the effects of increased paging and enable the user to spot degradation, optimize job mix, and probably improve throughput. One report, the page rate analysis report, shows the number of page faults per minute, rather than by program. The paging rate is calculated for each program and is plotted on a new report on a minute by minute basis. Rates are accumulated on a historic basis, allowing the user to compare current processing with past performance. The package also operates in a DOS environment, and can provide comparison data for installations making the move from non-virtual to virtual processing. JASPER is priced from $2,500 for a 360 DOS system to $4K for a 370/ DOS/VS. The new paging activity reports add $1K to the price. DATACHRON CORP., New York, N.Y.

FOR DATA CIRCLE 213 ON READER CARD

Graphic Terminal Support

A software package has been developed that makes it possible for PDP-11 DOS users with at least 24K of memory to use the Tektronix 4014 and 4015 model graphics terminals. The software is written in ANSI FORTRAN IV and PDP-11 assembler language, and includes subroutines that allow the user to select any of the four hardware character sizes available on the 4014. One routine permits the user to use any type of hardware dashed lines, focus, and defocus lines. Write-through mode is also supported, as is output buffering to speed execution time. A user manual and either source paper tape or source Dectape is priced at $575. TEKTRONIX, INC., Beaverton, Ore.

FOR DATA CIRCLE 214 ON READER CARD

PDP-11 Cross Assembler

Any machine that supports an ANSI FORTRAN compiler with 24-bit or larger integers can run this PDP-11 cross assembler, called X-11, it's claimed. X-11 is syntax compatible with Monitor Version v09 of the PDP-11 DOS Batch Assembler (MACRO). Input to the assembler, in the form of card images and a macro library, produces an output listing in Macro-11 format and a binary file suitable for input to Link-11, the DEC linkage editor. "Well annotated" source code and test programs, installation and user documentation, and a one year warranty are included in the one-time charge of $3,500. Delivery of X-11, in magnetic tape form, is two weeks after receipt of order. COMPATA, INC., Woodland Hills, Calif.

FOR DATA CIRCLE 235 ON READER CARD

Data Base Management

A data base management system developed at Wheaton College, Wheaton, Ill. has been taken under Digital Equipment Corp.'s wing, tested, refined, and is now offered to other

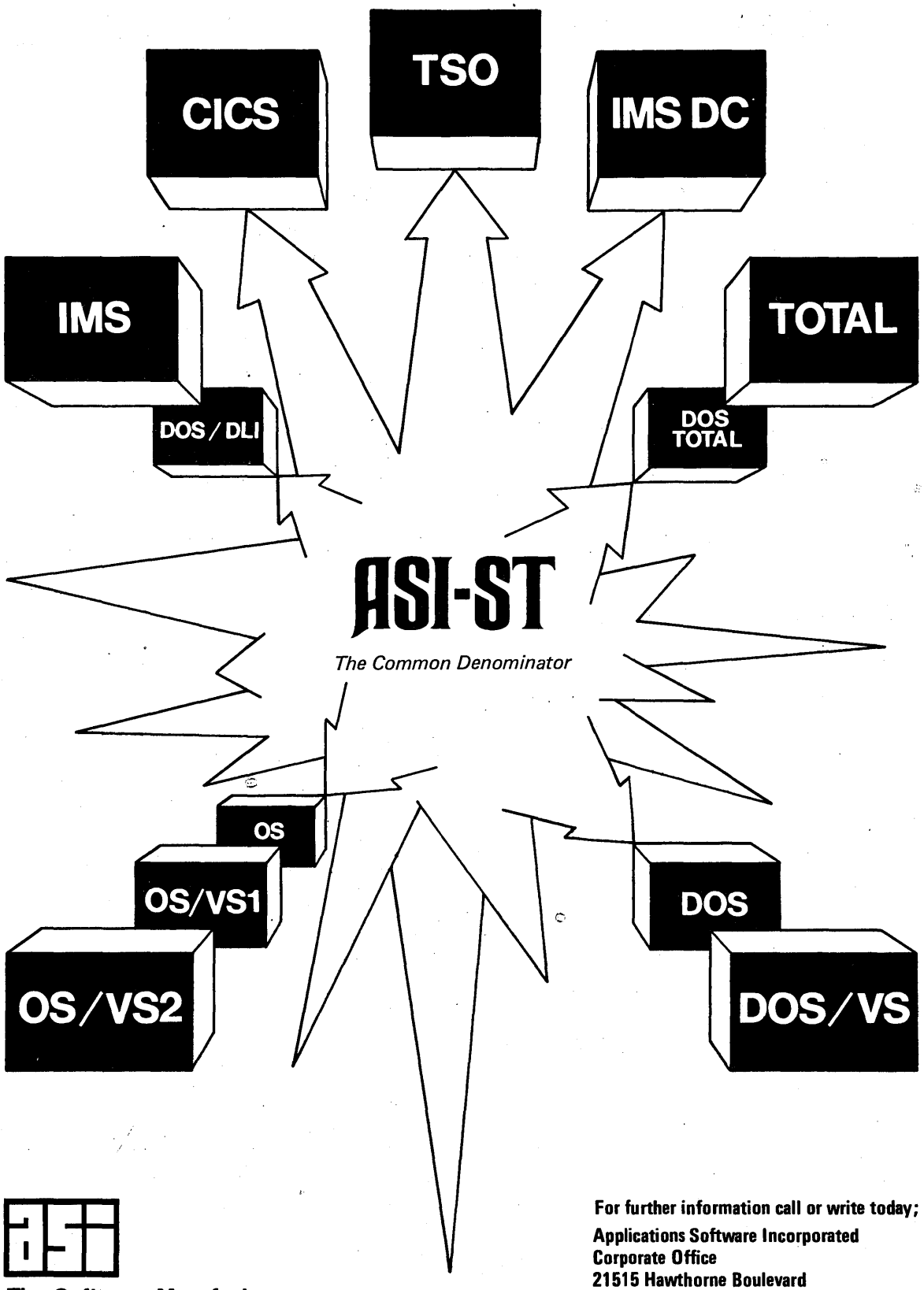
software spotlight

Fortran Analysis

RXVP automates the analysis and testing operations of FORTRAN software programs. The input, consisting of the source FORTRAN statements of the program to be analyzed, is first scanned, on a module by module basis. Tables are constructed showing the program's basic structure. This structure is then analyzed, with the output being suggested test data that could be fed the program to test all possible decision points. RXVP also informs the user which program paths have been tested, what occurred in those paths, and which program paths have been neither tested nor analyzed.

RXVP can handle various size FORTRAN programs, from as small as 50 statements to many thousands, but the basic lease price of $1-2K a month (depending on options) suggests that it is more suitable for use in the aerospace industry and by governmental agencies. RXVP is also offered on a service basis using remote batch transmission techniques. GENERAL RESEARCH CORP., PROGRAM VALIDATION PROJECT, Santa Barbara, Calif.

FOR DATA CIRCLE 212 ON READER CARD



The Software Manufacturer

For further information call or write today;

Applications Software Incorporated
Corporate Office
21515 Hawthorne Boulevard
Torrance, California 90503
(213) 542-4381

software & services

colleges and universities for (hopefully) reducing their dp costs. WISE, for Wheaton Information System for Education, provides many generalized data base management functions and a set of specific college/university application programs. Administrative computer applications include student records, alumni information, and admissions information. Typical programs include course registration, student grade reporting, grade transcripts, analysis of incoming students' characteristics, and analysis of alumni donation patterns. WISE runs under DEC's Resource Sharing Time Sharing/Extended monitor (RSTS/E), allowing simultaneous WISE processing.

WISE is touted as sharing many design similarities with generalized data base management systems, and imposing very few preconceptions on the nature or amount of data a school may wish to keep. Applications programs are separate from data base descriptions, making the system easy to expand.

For schools already having a PDP-11/40 or PDP-11/45 system with at least 48K words of memory, a magnetic bulk storage unit consisting of three disc cartridges, a line printer, and four video terminals, a WISE system, including support services, is priced at $10K. A complete hardware/software configuration is priced at approximately $115K for a typical system, with the bare minimum being $85K. Systems generally require four months for delivery. DIGITAL EQUIPMENT CORP., Maynard, Mass.

FOR DATA CIRCLE 216 ON READER CARD

Small Biz Fortran

Lockheed has developed an ANSI standard FORTRAN package for its SYSTEM III small business computer system. This makes it possible for the III to not only perform accounting related processing, but take on engineering and scientific tasks as well. The compiler executes in a minimum of 24K bytes. Files created by the RPG II and assembler languages on the system are said to be fully compatible with the new FORTRAN. Both the FORTRAN and RPG II compilers have the ability to exit to assembler language programming to take care of special application requirements. The complete FORTRAN package is priced at $2,200, including documentation and support manuals. LOCKHEED ELECTRONICS COMPANY, INC., Los Angeles, Calif.

FOR DATA CIRCLE 215 ON READER CARD

Manufacturing/Distribution

PICS 2000 "piggy backs" atop MRI System Corp.'s System 2000 data management system to provide an integrated production information and control system. Two subsystems are available: PICS 2000/DIST and PICS 2000/MFRG. PICS 2000/DIST provides for: order entry (including shipping), accounts receivable, inventory control, forecasting, inventory management, purchasing and receiving, and accounts payable. PICS 2000/MFRG provides for: forecasting, inventory management, product schedule planning, manufacturing activity planning, order release and plant monitoring and control. Other subsystems can be constructed to operate under the PICS 2000.

Subsystems are implemented in terms of System 2000 data item and record structure definitions and callable strings of System 2000 com-

mands for data input and report output. Numerous types of reports are generated. In addition, program language (COBOL, FORTRAN) interfacing programs are included to perform more complex data base work that might include BOMP, gross and net MRP (zero time phasing), fixed field/free field input utility routine, etc.

The basic prices for the PICS 2000 subsystems are $4,500 for the distribution function, and $7K for the manufacturing subsystem. The PICS 2000 nucleus is priced at $11K. The System 2000 data management system is available for IBM, Univac, and CDC computers from MRI Systems Corp., Austin, Texas. SCI-TEK INC., Wilmington, Del.

FOR DATA CIRCLE 219 ON READER CARD

SERVICES...

Network Optimization

The Hi-Lo Rate Center Listing is a data base that can be used to optimize private line usage under AT&T's Hi-Lo tariff. More than 29,700 records can be accessed by area code and telephone exchange number, eliminating the time consuming look-ups required in most similar systems, it's claimed. Each record includes the rate center (city and state) assigned for the local exchange, the vertical and horizontal coordinates of the rate center, and the time zone and daylight savings codes. Each telephone exchange designated "Low Density" under the Hi-Lo rate includes all assigned "homing points"—Hi Density rate centers through which private line services can be routed.

The Hi-Lo Rate Center Listing is supplied on a 9-track EBCDIC-coded tape in either 800 or 1600 bpi. The block length is 10 records of 160 characters each. The price for the initial file is $2,500, with updating service available semi-annually at $400/update. CENTER FOR COMMUNICATIONS MANAGEMENT, INC., Ramsey, N.J.

FOR DATA CIRCLE 218 ON READER CARD

On-Line Accounting

BARON (Business/Accounts Reporting Operating Network) is an on-line accounting system that runs on the vendor's remote computing time-sharing network. Though available nationwide, close local support is available only along the Eastern seaboard, in most major cities. Standard program modules are supplied, but the user has the ability to generate customized programs, or alter the standard packages. Programs exist for billing, inventory control, production/purchase orders, accounts payable/receivable, agings, daily registers, sales performance, statements, and more. English-like statements in a proprietary language called VICTOR are used to communicate with BARON. The language basically resembles COBOL and PL/1. All that is required in the way of hardware to get BARON working is one or more terminals to be leased from the vendor. Comprehensive checks are built into the BARON software to ensure that data in a given file cannot be modified by one user while another is generating output from the same file.

Pricing gets a bit difficult with services like this. For order entry applications, the cost is approximately $1 per order for processing through all associated modules, such as inventory control, etc. The same rate applies to billing applications. These rates are based on volumes ranging from 500 to 5,000 transactions per month. APPLIED DATA RESEARCH, INC., Princeton, N.J.

FOR DATA CIRCLE 217 ON READER CARD □

source data

Books

(Continued from page 27)

puter reliability, physical protection, procedures, contingency plan, employee awareness and audits.

It was written to cover most potential causes of computer center failure. This reviewer was pleased to note that while all areas of the operation were mentioned, the authors assumed the reader had basic management principles well in hand and only sought to enhance those skills as they applied to security.

Detailed suggestions on "how to" with graphic examples were plentiful. Guidelines for selecting remedial measures were excellent. The manual even went so far as to explain to the uninitiated, with diagrams and words, the features and benefits of motor generators, uninterruptible power supplies, and air conditioning systems. A small number of questions (compared to the 800+ in AFIPS) were included to assist the analyst in risk assessment. They seem totally relevant.

Unlike the AFIPS manual this publication avoided discussing those areas of security where there is no clear solution. It didn't address the writing of secure operating systems. It did address the three areas of dp security where substantial progress can be made, physical, personnel, and recovery planning.

Both AFIPS' book and the Federal guidelines accomplished their main objectives and both must be reviewed in that context. The AFIPS security manual was designed to stimulate the imagination of the broadest possible audience. The FIPS *Guidelines* was written to provide solutions to clearly definable problems. Security or insecurity, take your choice.

—T. G. Stephenson

As Manager of Computer Processing Services and Systems within Hughes Aircraft's Computing and Data Processing Dept., Mr. Stephenson is in charge of the operation of several very large computer installations. He previously spent 10 years with IBM in Field Engineering.

Understanding the IBM 360 and 370 Computers, With Machine Language Programming

by William T. Batten
Prentice-Hall, Inc., 1974
453 pp. $15.50

For the novice who wants his/her hand held on the way to understanding the System/360 instructions, Batten's text provides excellent material. To the dp sophisticate who knows other machine languages and can read reference manuals well enough, the presentation of material may seem tedious and poorly organized.

Following an introduction to dp and System/360, the machine instructions are described, most of them in great detail, along with related basic concepts such as number systems and hexadecimal arithmetic. The numerous illustrations and examples, and the continual preview and review of information, are invaluable aids to the beginner. Batten maintains a strict logical order of presentation, introducing new material only when relevant to what has been or is about to be discussed. This sometimes causes related items, such as fields of the Program Status Word, to be described in separate chapters, but the connection between them is always noted and reviewed.

On the other hand, some of us perhaps know too much to appreciate this presentation. Though some basic concepts are discussed in separate chapters or sections which can conveniently be ignored, most details and background information are an integral, inescapable part of the text. The more sophisticated reader must be humble and patient. The picture of the general scheme of things is presented gradually and never quite completely. Small pieces of it are linked together, but at the end there are "miscellaneous instructions" which never really fit anywhere—or do they? There is no overview of all the machine instructions, other than a few sentences in an early chapter and an appendix which lists them in operation code order. A thoughtfully composed overview would have done much toward providing an understanding of the computer, as promised, rather than of the individual instructions.

Clearly, then, even the novice could want more. There is little to be learned here about programming in machine language or about System/370. Batten's book is not for everyone, nor is it everything it tries to be. But for those who need it, it can provide an easy-going, friendly introduction to System/360 machine language, instruction-by-instruction.

—Caroline Rose

Ms. Rose is a senior systems programmer in the Data Management Systems Group of Tymshare, Inc. She has worked on implementation of a large interactive FORTRAN compiler, and is extensively experienced in applications programming and technical writing.

No terminal is an island.

"Because a terminal is only as good as the service that keeps it working, we give you Termicare®."
Z. V. Zakarian, president

This Termicare Center is the heart of our nationwide terminal support system. It consists of 5,000 square feet full of sophisticated communications and diagnostic equipment, service records and highly skilled people.

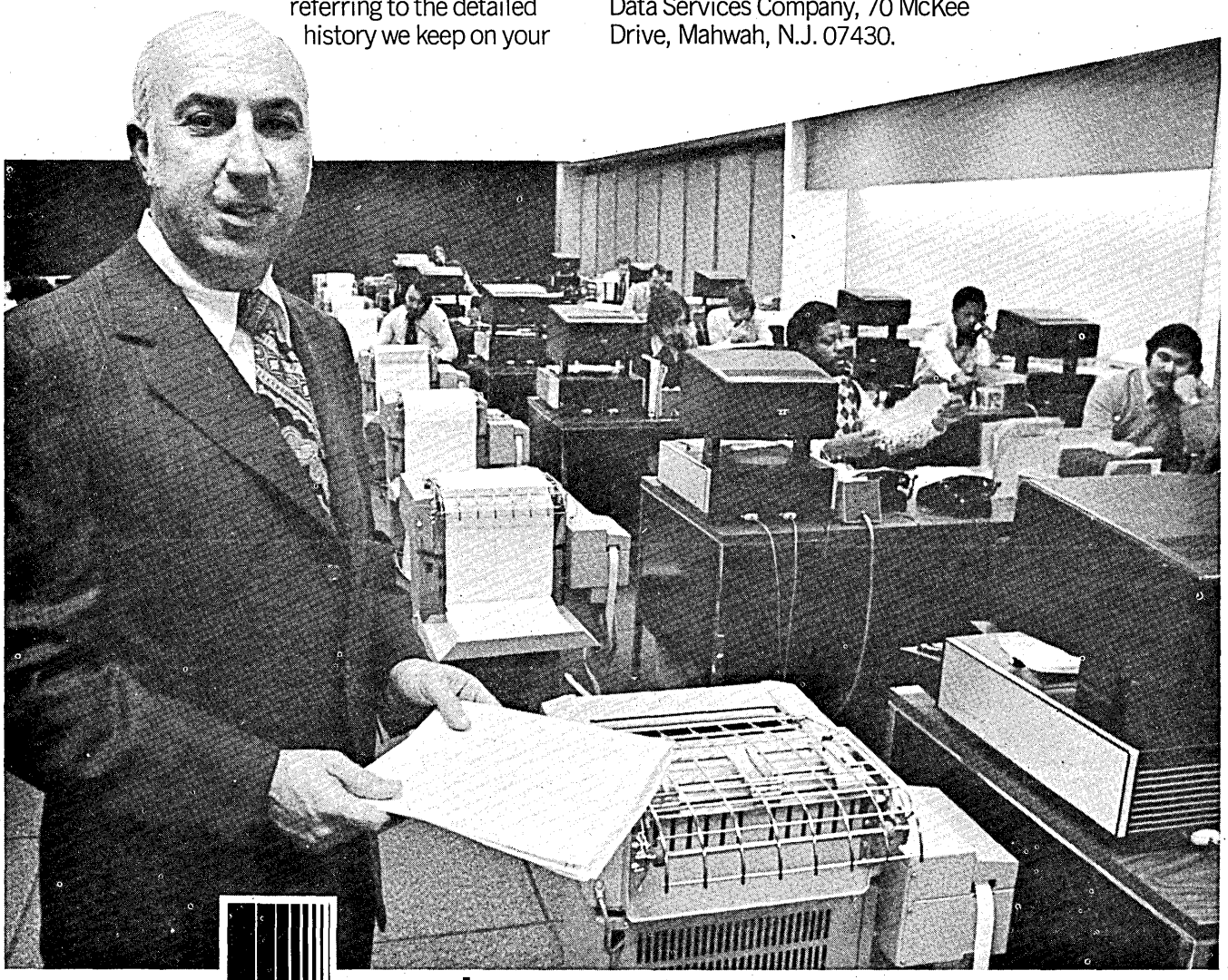
Because Termicare is centralized, we can focus all our resources on solving your problems. You don't have to rely on just one man in the field.

For example, if a terminal malfunctions, you call our Termicare Center toll-free. Within minutes, one of our analysts takes charge of your problem and sticks with it until it's solved. By monitoring your equipment and referring to the detailed history we keep on your terminals, he can quickly pinpoint the cause of most problems.

Almost 30% of all terminal malfunctions do not originate in the terminals themselves. So our analyst, with the help of a pool of experts, can frequently restore your terminals on the spot. If not, we will send a field man from one of 400 service locations. We'll alert him to the nature of your problem so he can bring the necessary equipment and parts.

Once the problem is resolved, it becomes part of your system's history. Future malfunctions will be avoided or solved more quickly.

Thinking about a terminal system? Let me prove what Termicare can do to keep it operating. For a free brochure on Termicare, without obligation of course, please call 800-631-7050 (in N.J. 201-529-1170). Or write Western Union Data Services Company, 70 McKee Drive, Mahwah, N.J. 07430.



western union data services company

The Bruning microfiche

Why we should be the business

If she can handle an 8-track player, she'll be a whiz on the Bruning 95.

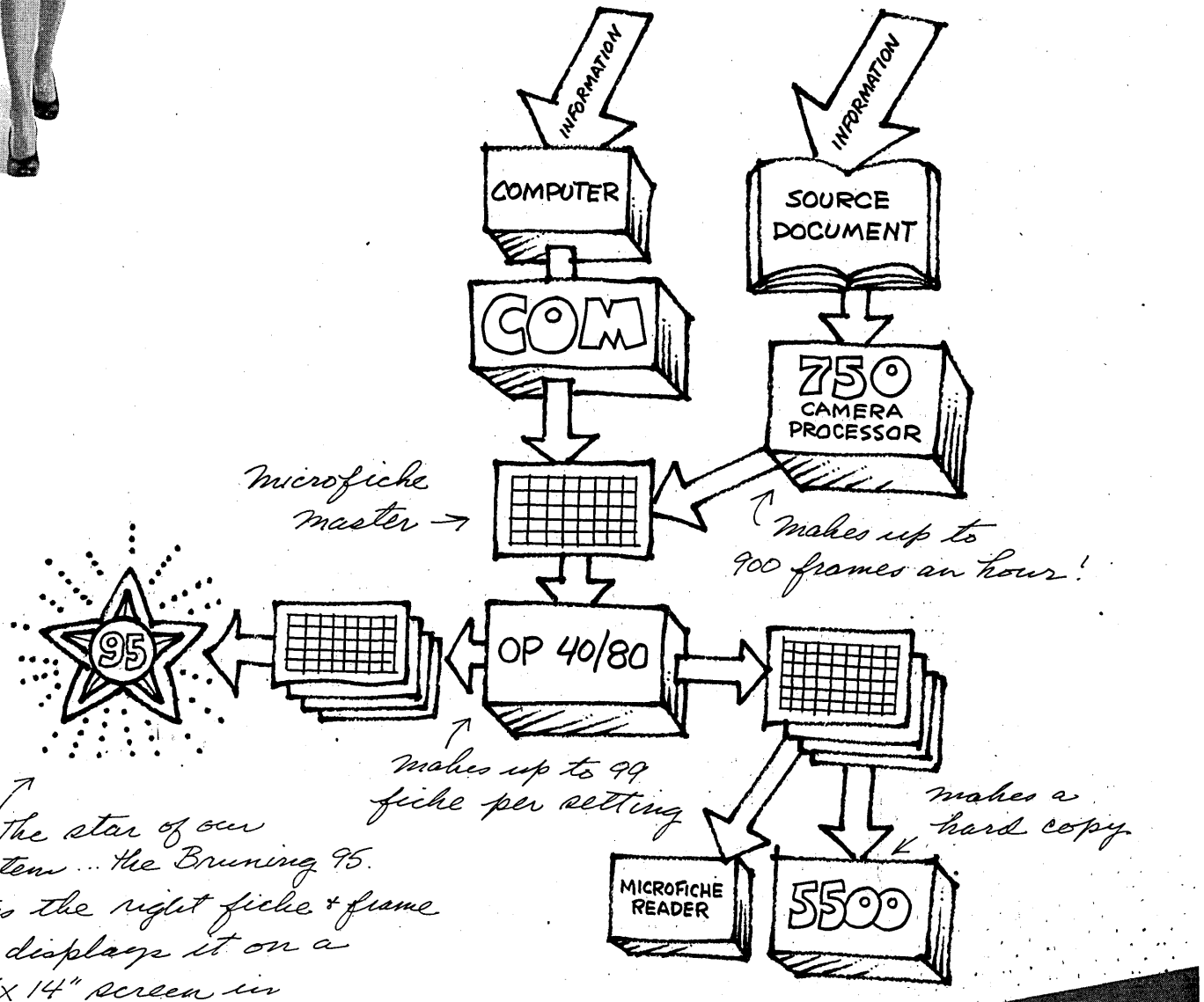
The model 95 Cartridge Retrieval Display is the secret to our system. With this unit at her fingertips, she can punch two buttons and get a display of any account in the house. In seconds.

It's as easy as A, B, C, D, E.

In today's complex world, the best systems are still remarkably simple. Here's how ours works: Put a master from your COM unit into the Bruning OP 40/80 Duplicator/Collator and make sets or copies at up to 750 an hour. Or convert source documents to fiche with the Bruning 750 Camera/Processor.

Send your fiche duplicates to the model 95 Cartridge Retrieval Display units that you've placed wherever you need them. Or use manual Bruning Microfiche Readers.

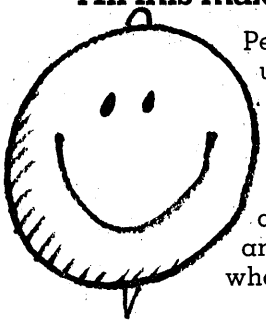
After all that micro-manipulation, sometimes you still need a hard copy. So add a Bruning 5500 Reader/Printer and have hard copies in a hurry, at very little cost.



retrieval approach.
end of your COM.

Suddenly, you've got a flexible system you can afford for every location you need to cover. One that your secretary can work. One that's programmed to use your COM data base. A total system that puts COM to work.

All this makes important people happy.



People in libraries, phone companies, utilities, hospitals. People in stores with lots of locations. Lawmen and lawyers, bankers, insurance men. Bruning's system cuts the gap between the question and the answer in countless applications, and makes cost accountants happy wherever it goes.

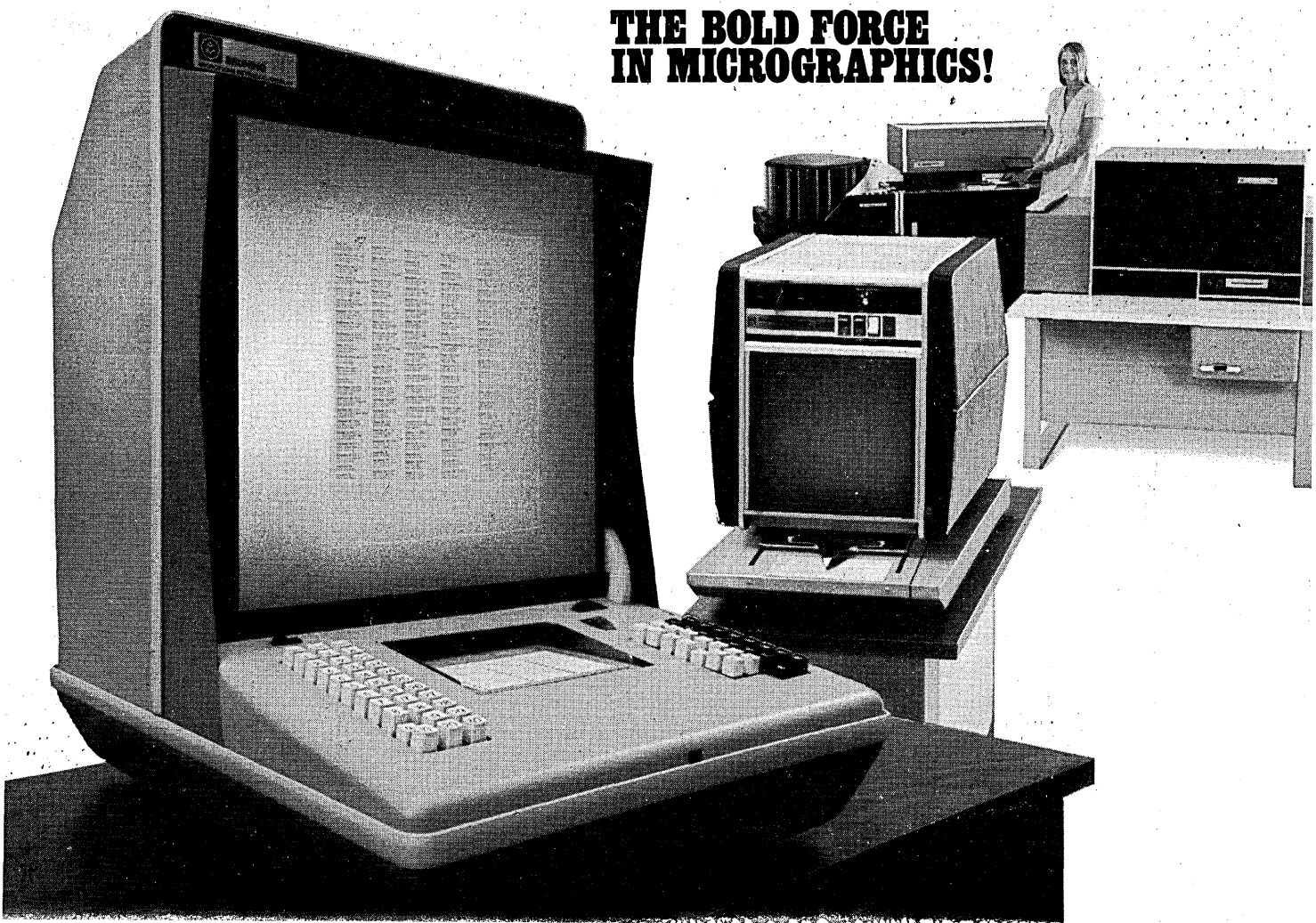
Call 800-447-4700 toll-free (in Illinois call 800-322-4400) for more information. When you're ready, talk to a Bruning System Analyst. He's a man with answers, not order blanks. Or write Bruning, 1834 Walden Office Square, Schaumburg, Ill. 60172.

ADDRESSOGRAPH MULTIGRAPH

BRUNING DIVISION

CIRCLE 27 ON READER CARI

THE BOLD FORCE IN MICROGRAPHICS!



letters

(Continued from page 9)

machine efficiency were the only consideration, we would all still be writing in machine or assembly language to save the machine the trouble of translating the higher-level language. (Come to think of it, too many of us still are.)

Programmer efficiency is much more important than machine efficiency. A programmer costs about $10/hour and averages about one line of fully-tested and debugged code per hour. A large scale computer might cost $500/hour and execute 10 million instructions per second. Assume that each line of code translates into 20 instructions. Then the cost of paying a programmer to write that one line is $10; the cost of executing that line one million times comes to 28¢. The cost of machine time is negligible compared to the cost of programming, and getting smaller every year.

Well, that's good, but what about the cost of repeatedly compiling and loading while debugging? Let's look at that. Suppose that each compilation of a line requires the execution of 100,000 machine instructions and that the program must be recompiled 1,000 times. Then the cost per line is $1.40.

Thus the cost of that line of code under these assumptions is $10 for the programmer's salary and $1.68 for machine time. Halving the machine cost reduces the total cost by only 7%. Eliminating it entirely cuts the total cost by only 14%.

What happens if we spend some of that machine time to provide more error checking, better diagnostics, interactive editing and debugging? Suppose machine time doubles while programming time drops by 33%. Total cost drops 14%. If tripling machine time can halve programming time, we decrease project cost by 14%, plus whatever benefits accrue from having it done in half the time.

These estimates are probably conservative. Very few programs will be recompiled 1,000 times. If the number of recompilations is as few as 100, we can afford to double machine time for as little as a 4% increase in programmer productivity.

In short, we should be working on improving programmer productivity rather than machine efficiency. The potential profits, both financial and psychological, are significant.

PAUL HUGHETT
Hewlett-Packard Laboratories
Palo Alto, California

. . . May I remind my respected friend Ken Wander that the goal of computer manufacturers is not "efficient programming" or indeed "efficient use" of their machines . . . the harder they are to use and the more difficult the solution, the more machine time, and the more valuable the machine time becomes both to users and especially to manufacturers.

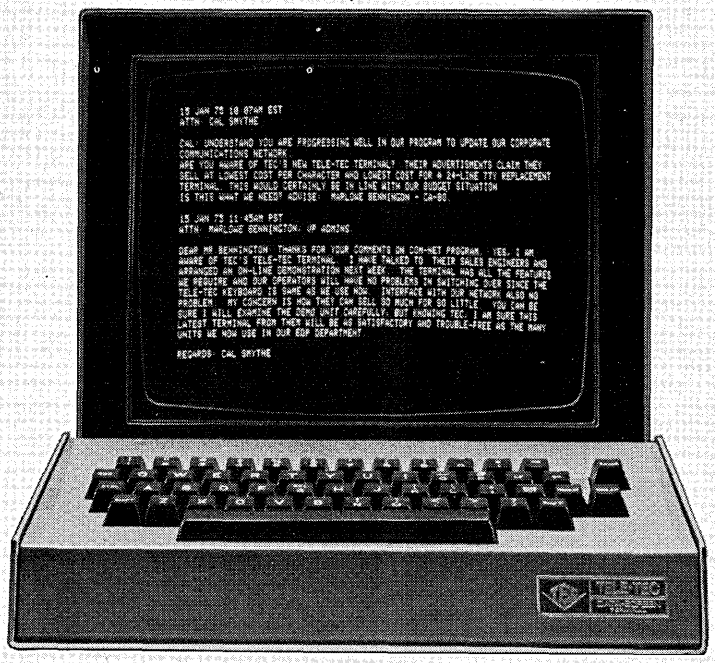
MICHAEL J. VIEHMAN
Tetra Tech, Inc.
San Diego, California

. . . Hasn't Kenneth Wander heard about APL? APL has been available since about 1967, and uses the symbols $< \leq \geq > \neq \div \times * \sim \lceil \lfloor \epsilon$ in approximately the normal mathematical usage and has many other symbols for ease of programming. PL/1 also uses the symbols $\sim < > |$ in addition to the symbols used by primitive languages such as FORTRAN.

MARK S. FINEMAN
Syracuse University
Syracuse, New York

ABSOLUTELY:

Lowest price per character, lowest priced 24-line terminal and next-to-lowest price of any terminal!



What else do you want to know about this new TELE-TEC™ terminal?

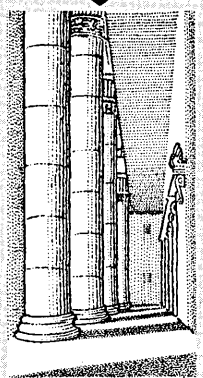
49.47 cents per character* . . . that's the cost of this simple, conversational mode teletypewriter replacement crt terminal! 80 character x 24 line format gives you full 1920 character display capability with 20 to 60 mA current loop and TTL interface or optional RS-232-C interface. Silent TELE–TEC DATA–SCREEN® terminals operate at switch selectable speeds from 110 to 9600 baud to meet any communications line requirement.

Separate keyboard utilizes TTY format for easy operator adaptation. TELE–TEC terminal's logic (proved by more than 8000 DATA–SCREEN® terminals in the field) generates sharp 5 x 7 dot matrix characters and bottom line entry duplicates hard copy roll-up.

We'll be glad to tell you even more if you call or write us.

*Based on 101 quantity terminal price of $950.

TEC®

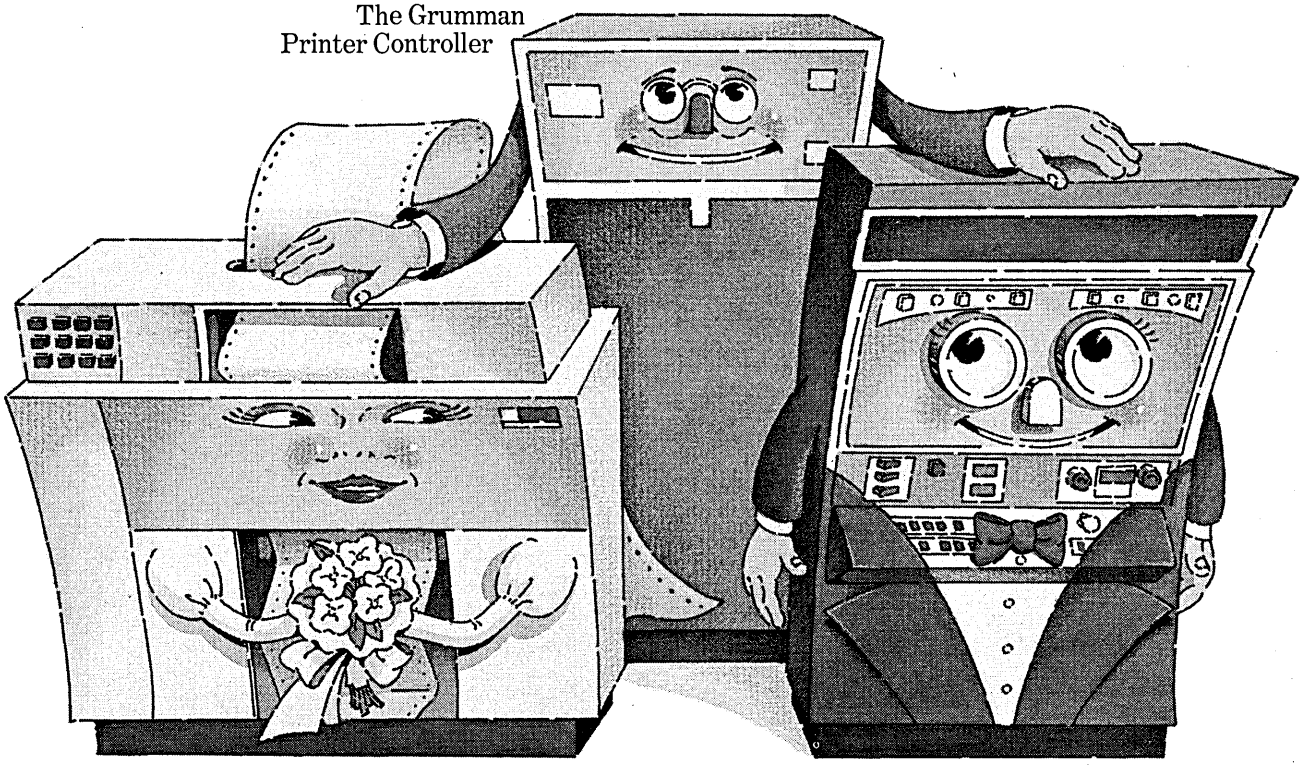


Stability Age Beauty

TEC, Incorporated • 9800 NORTH ORACLE ROAD • TUCSON, ARIZONA USA 85704 • (602) 297-1111

Now you can marry the best of IBM to other computers.

The Grumman Printer Controller



For years people have been trying to imitate the IBM 1403. Unsuccessfully. Now, with the Grumman Printer Controller you can connect your present computer to an IBM 1403 and give yourself the best printing in the business.

The IBM 1403 has built an extraordinary record. Highly reliable, high speed operation. Unusually consistent, clearly readable printouts. (No wavy lines so typical of drum printers.) Type fonts your operator can readily interchange. And, of course, it handles form changes easily.

With the Grumman Printer Controller you can improve your printing quality, speed, and reliability. All at an attractive, and perhaps, money-saving price. Speaking of price, you can buy our controller or rent it. We provide maintenance, of course.

With our printer controller you can connect the IBM 1403 to your present DEC, Xerox, GA, or CDC computer. We'd like to hear from Burroughs, Univac and the other computer users, too. For complete information please write or call Jon Ayers, Grumman Data Systems, Computer Products Division, 45 Crossways Park Drive, Woodbury, New York 11797. (516) 575-3034.

Grumman Data Systems

Products and services that lower the cost of computing.

You may not believe our salesman, but how could you not believe your own computer.

We know the image most sales people have. "They'll say anything to make a sale." And our sales people are pretty sensitive about that. So they would like you to ask a third party about our retrieval and reporting system.

That third party would be your own computer.

The only thing our sales people would do is supply facts about The Data Analyzer. And if your computer were fed all the facts about The Data Analyzer and all the facts about other retrieval systems, it would tell you that you really can believe what our salesmen say.

To get all the facts, send in this coupon and see what your computer would say about The Data Analyzer.

The Data Analyzer. The retrieval/reporting system computers would prefer.

A few facts you and your computer might find interesting about the 5 leading systems.

	Data Analyzer	Mark IV	Easy-trieve	Culprit	ASI-ST
Conventional columnar reports	✓	✓	✓	✓	✓
Basic language (learned in 2-3 hrs.)	✓		✓		
Cross-tabulations and matrix analysis	✓				
Graphs and Statistics	✓			✓	
Complete data analysis (subscripting etc.)	✓				
Executive command language	✓				
Exits to "own-coded" routines	✓	✓	✓	✓	✓
Entry of procedural language throughout	✓				
Macro processed functions	✓				
Interfaces with IMS and TOTAL	✓	✓		✓	✓
New pricing plans for today's economy	✓				

DM 275

Program Products Inc.
95 Chestnut Ridge Road
Montvale, New Jersey 07645
201-391-9800

I find these facts interesting. Please send more.

NAME _____

COMPUTER _____

COMPANY _____

STREET _____

CITY _____

STATE _____ ZIP _____

WHAT IS YOUR TRUE WORTH?

FREE JOB OPPORTUNITIES BULLETIN

Cadillac Associates represents the nation's largest and most respected professional placement service. Our close relationship with the nation's finest firms generates continuous career opportunity information and allows us to confidentially present your qualifications to those at "decision-making" levels.

Our bulletin, published quarterly, listing available opportunities in the Systems & Data Processing field is available free of charge and will be mailed to your home upon your request.

For your free bulletin, without any obligation, circle reader service card #115. Please USE HOME ADDRESS ONLY!

FREE CONFIDENTIAL PLACEMENT SERVICE

If you desire immediate assistance in locating an opportunity consistent with your objectives (professional/financial/geographic), *CALL OR WRITE TODAY.* A member of our staff of SYSTEMS & EDP SPECIALISTS will reach you by telephone to discuss your objectives and how we might help you satisfy them. A resume, or some details of background, will be appreciated.

Remember: Our client firms are located from coast to coast and assume all expenses (agency fee, interviewing & relocation).

E. W. MOORE
Executive Vice President
CADILLAC ASSOCIATES, INC.*
32 West Randolph St. Chicago, Ill. 60601
Financial 6-9400

*"Where More Executives Find Their Positions Than Anywhere Else in The World."

CIRCLE 115 ON READER CARD

FREE EMPLOYMENT SERVICE

FOR PROGRAMMERS AND ANALYSTS

Serving Northeast, Southeast and Midwest U.S.

RSVP®

RSVP will provide free employment counselling and develop and selectively distribute your resume.

Our openings include scientific and commercial applications, telecommunications, control systems, software development and systems programming utilizing most languages, computers and operating systems. We also serve engineering and marketing personnel in the computer field.

Call or send resume or rough notes of objectives, salary, location restrictions, education and experience (including computers, models, operating systems and languages) to either one of our offices. Or check the reader service card for a free sample resume and typical job descriptions. We will answer all correspondence from U.S. citizens and permanent residents and will guarantee our best efforts in a professional and ethical manner to all qualified applicants. Our client companies pay all of our fees.

- RSVP SERVICES, Dept. M., Suite 700, One Cherry Hill Mall, Cherry Hill, New Jersey 08034 (609) 667-4488
- RSVP SERVICES, Dept. M., Suite 104, Towle Bldg., 1777 Wolton Road, Blue Bell, Penna., 19422 (215) 629-0595

RSVP SERVICES

Employment Service for Computer Professionals

CIRCLE 111 ON READER CARD

Even Webster's Knows About QUEST

QUEST (kwest). v. 1. To make a search; to go on a quest.

QUEST SYSTEMS, INC. n. 1. A corporation founded in 1968. 2. The largest professional recruitment firm in the U.S. functioning solely in the computer sciences; its client companies pay all employment fees, interviewing and relocation expenses. Quest is known for its deep personal commitment to relate to each candidate as an individual with individual goals. 3. Its professional staff averages over 6 years of experience in EDP recruiting (additionally, staff members have direct hands-on experience in programming, systems, hardware sales, etc.) 4. Quest is presently searching for programmers and analysts (commercial, scientific, systems software) for over 3,500 client companies in the U.S. *Quest has openings in over 700 U.S. towns and cities.* 5. Methodology — see Questsystem.

QUESTSYSTEM (kwest sis'tem). n. 1. Discussing with an individual what he would like to be doing in light of what he has been doing. 2. Analyzing the realities of his objectives as they relate to the current job marketplace. 3. Contacting client companies and other Quest staff personnel to identify positions of possible interest. 4. Introducing the job candidate to his prospective employers by providing complete details to each about the other, ensuring the efficacious use of everyone's time. 5. Arranging interviews. 6. If employment offers are extended, Quest assists in evaluating the responsibilities, compensation and opportunities (and relates those to the initially stated objectives). The Questsystem has been working for thousands of professionals at no expense, whatsoever. Ask your friends of their past dealings with Quest. Then, put the Questsystem to work for you. For additional information on this subject, please inquire directly to Quest Systems, Inc. (All inquiries/resumes received will be responded to immediately and in confidence.)

Q

QUEST SYSTEMS INC®
6400 Goldsboro Road
Washington, D. C. 20034 (301) 229-4200
Baltimore: (301) 265-1177 • Philadelphia: (215) 667-3322

CIRCLE 110 ON READER CARD

EDP SEARCH

WHY IS FOX-MORRIS THE FIRST CHOICE OF EDP PROFESSIONALS?

A recognized staff of professional experts offering LOCAL, REGIONAL & NATIONAL COVERAGE through our direct branches as well as coast to coast coverage through our 75 member firms of National Personnel Consultants, Inc.

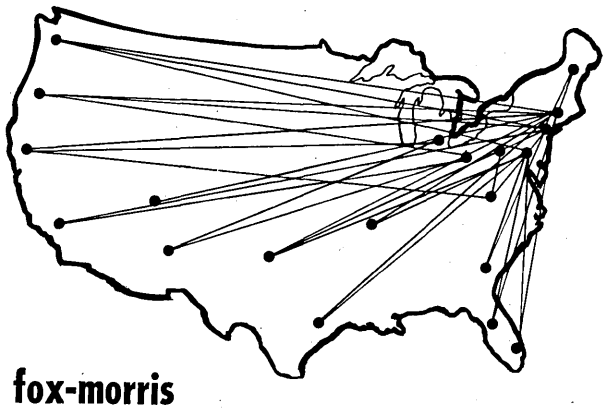
Completely confidential service geared to your career objectives.

Unparalleled contacts with industry based on years of successful results.

Professional resume evaluation and career guidance.

Client companies assume all employment costs—including interview expense, relocation (if necessary) and search fee.

SEND RESUME DIRECT, OR CIRCLE NUMBER BELOW ON READER CARD.



fox-morris
personnel consultants

New York: (212) 697-1820, 633 Third Ave., New York, N.Y. 10017
Philadelphia: (215) 561-6300, 1500 Chestnut St., Philadelphia. Pa. 19102
Pittsburgh: (412) 232-0410, 6 Gateway Center, Pittsburgh, Pa. 15222
Wilmington: (302) 654-4465, 2005 Concord Pike, P.O. Box 7017, Del. 19803
Princeton: (609) 452-8135, P.O. Box 2063, U.S. Rt. 1, Princeton, N.J. 08540
Baltimore: (301) 296-4500, 409 Washington Ave., Baltimore, Md. 21204
Charlotte: (704) 375-9151, 1415 East Blvd., Charlotte, N.C. 28203
Atlanta: (404) 321-3888, 2200 Century Pkwy., N.E., Atlanta, Ga. 30345

CIRCLE 114 ON READER CARD

Why twelve ads in Datamation are better than six ads in Datamation and six ads anywhere else.

It computes. In an uncomplicated way.

Think of your ads as sales calls. You'd never omit 70 of your most important 100 prospects. Neither does DATAMATION. It alone reaches all the buying influences. In fact, the next best EDP publication reaches only 30% of DATAMATION's audience.

Clearly, multiple ads anywhere else can't give you coverage of people they never reach. Anywhere else is really nowhere.

DATAMATION multiplies your advertising effectiveness like no one else can. Our advertisers recognize this. That's why we carry more advertising than any other publication in the field.

When you think about it, that's why we should be carrying more of your advertising. Six times or twelve times, it computes.

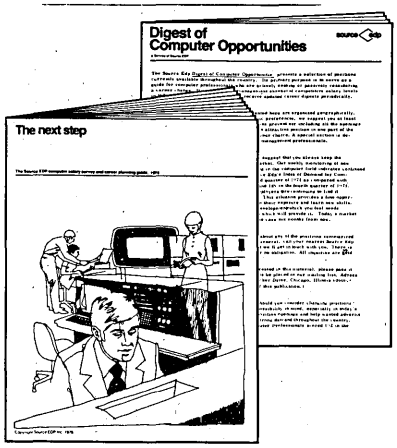
Technical Publishing Company

DATAMATION®

First in market coverage—worldwide.

1975 Computer Salary Survey-

Yours Free!



Do you know how much money your colleagues make for doing the work you do? Do you know which computing skills are most lucrative? Do you know how to get a better position?

Source Edp does. And we'll share what we know with you. Our ninth annual salary survey and career planning guide, "The Next Step," compiles salary data received from over 15,000 computer professionals. We add to that advice developed over our thirteen years of computer recruiting experience: danger signals that mean you should start looking for a new position, mistakes to avoid, strategy in career planning. You'll also receive the "Digest of Computer Opportunities," our periodic supplement listing positions available right now in every part of the country.

Source Edp is the largest nationwide recruiting firm devoted exclusively to computer professionals. We offer "The Next Step" as a service to people like you. Fill out the reader reply card and we'll send you one absolutely free. Or write:

Source Edp
Corporate Headquarters
100 South Wacker Drive
Chicago, Illinois 60606
312/782-0857

source edp

Regional offices:

Atlanta
Chicago
Cleveland
Dallas
Detroit
Houston
Irvine CA
Kansas City
Los Angeles
Minneapolis
New York
New Orleans
Northfield Il
Oak Brook Il
Palo Alto
Philadelphia
San Francisco
St. Louis
Union NJ

CIRCLE 109 ON READER CARD

advertisers' index

Technical Publishing Company

Arthur L. Rice, Jr., Chairman of the Board
James B. Tafel, President
Gardner F. Landon, Exec. Vice President
Calverd F. Jacobson, Financial Vice President and Treasurer
Thomas A. Reynolds, Jr., Secretary
M. Jay Turner, Jr., Director of Circulation
Paul C. Jarvis, Director of Information Services

Advertising Offices

Eastern District Managers
A. Treat Walker,
Warren A. Tibbetts: Greenwich, Ct. 06830
35 Mason St. (203) 661-5400

New England District Manager & Vice President
Warren A. Tibbetts: Manchester, N.H. 03104
112 W. Haven Rd.
(603) 625-9498

Midwest District Manager
John M. Gleason: Chicago, Ill. 60606
205 W. Wacker Drive
(312) 346-1026

Western Manager and Senior Vice President
Hamilton S. Styron: Los Angeles, Calif. 90035
1801 S. La Cienega Blvd.
(213) 559-5111

District Manager
Alan Balté, Jr.: Los Angeles, Calif. 90035
1801 S. La Cienega Blvd.
(213) 559-5111

Western District Manager
James E. Filiatrault: Mountain View, CA 94043
2680 Bayshore Frontage Rd.
Suite 101
(415) 965-8222

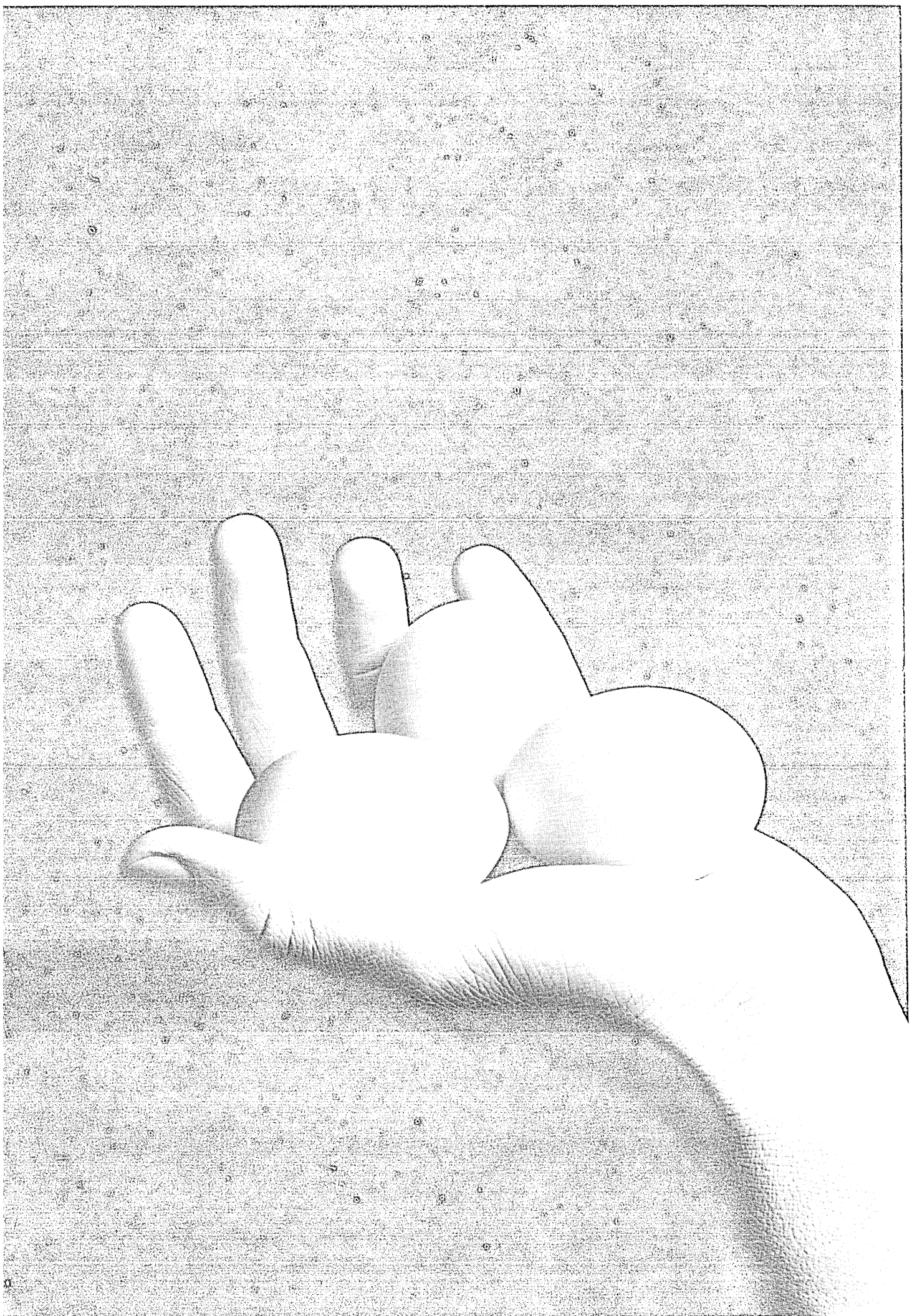
U.K., Scandinavia, Benelux, Germany
Intergroup Communications, Inc.
Wallace K. Ponder, European Director
Paul D. Dimmock, Regional Manager
31 Lyncroft Avenue
Pinner, Middx. HA5 1JU
England
Tel: (01) 868 9289
Cables: PACOM, Pinner

France, Switzerland, Italy, Spain
Gerard Lasfargues
32 rue Desbordes Valmores
75016 Paris
France
Tel: (1) 288 90 22

Japan
Shigeru Kobayashi
Japan Advertising Communications, Inc.
New Ginza Building
3-13 Ginza 7-chome
Chuo-ku, Tokyo 104, Japan
Tel. (03) 571-8748

Other tp Magazines

Plant Engineering — *Pollution Engineering*
Power Engineering — *Purchasing World*
Research/Development — *Consulting Engineer*



If your DBMS is laying eggs, get them all in one basket with UCC TEN.

Having a data base management system is one thing. Getting it under control is another.

What's needed is an automated, centralized source of all the data... about the data. Something that will let you put your finger on the information you need. Quickly and precisely. Without paperwork and the errors that come with it.

That something is the UCC TEN Data Dictionary/Manager. Without it, the benefits you expected and needed from a DBM system will probably go unrealized.

When used in conjunction with IMS, UCC TEN does more than centralize data information—it manages the data base environment. Because it controls data definitions, provides powerful cross reference features, automatically generates IMS control statements and facilitates new systems designs.

So, you can scramble for the information you need. Or, you can find it all in one neat package. UCC TEN.

- ☐ Please send me more information on:
- ☐ Have someone call me about:
- ☐ UCC ONE (Tape Management Software). A system that protects your data under OS operation. Provides real-time record of tapes, jobs.
- ☐ UCC TWO (DOS under OS). Lets you run DOS programs under OS control without reprogramming. Puts you in charge. Saves time, money. Prevents confusion.
- ☐ UCC SIX (PDS Space Management). Automatically inventories and controls OS disc space. Minimizes PDS compression requirements and disc investment. Saves programmer and machine time.
- ☐ UCC TEN (Data Dictionary/Manager)
- ☐ UCC FIFTEEN (Restart Management System). Saves hours on restarting OS jobs. Simple, sophisticated software automatically corrects OS catalog, GDG biases before you rerun or restart.

Name _____

Title _____

Company _____

Address _____

City/State/Zip _____

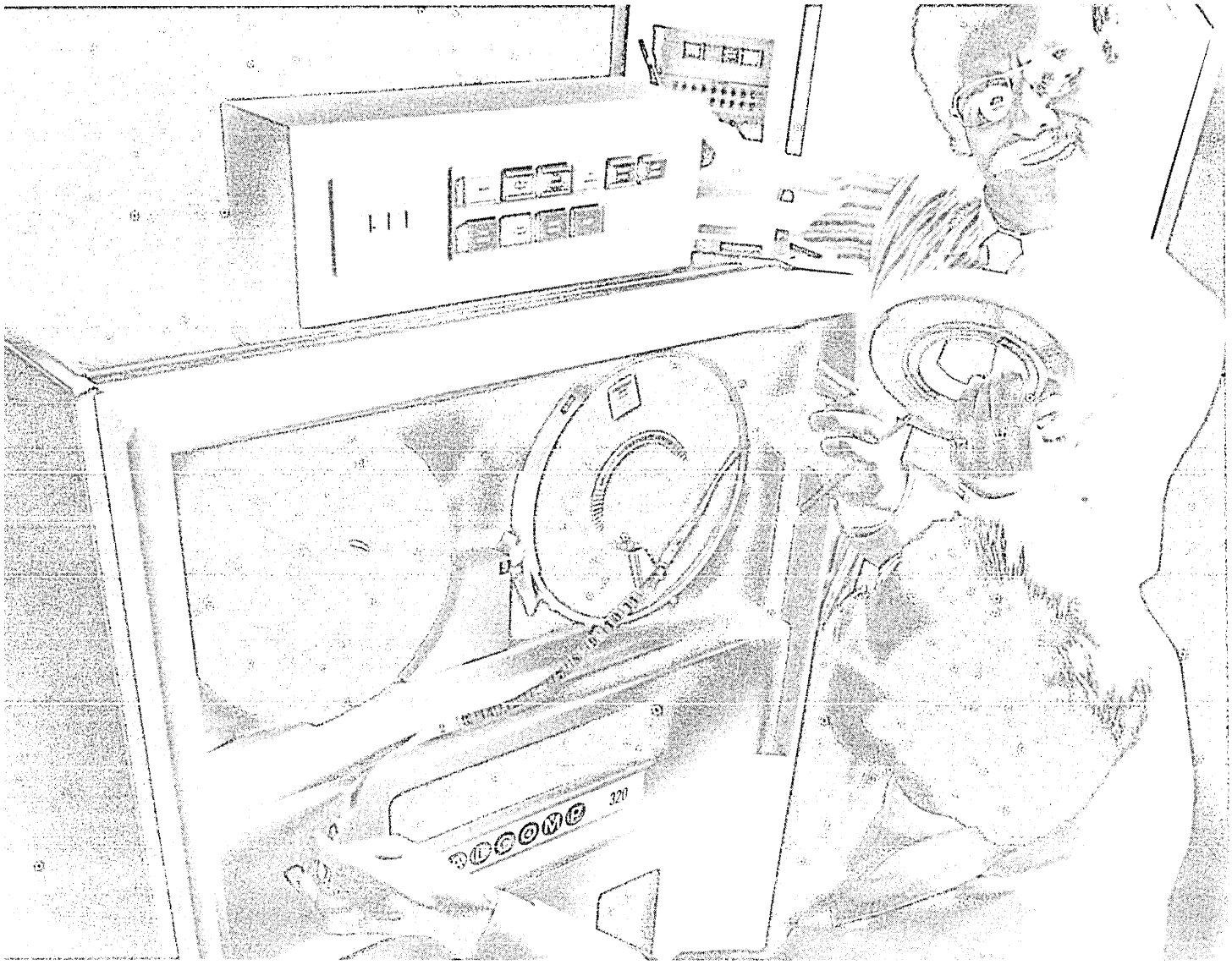
Telephone _____

Mail to UCC, Operating Software
P. O. Box 47911
Dallas, Texas 75247
Or call (214) 637-5010

DM0275

When you have the best people, you have the best product.

UCC
UNIVERSITY COMPUTING COMPANY
7200 Stemmons Freeway • P.O. Box 47911 • Dallas, Texas 75147
A Wyly Company



What makes a CalComp tape drive better?

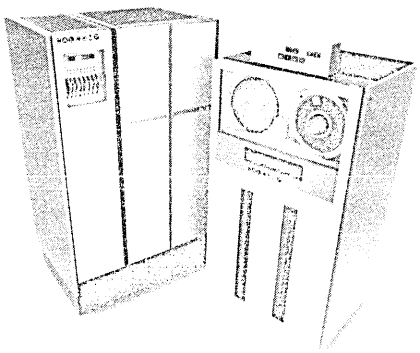
1. CalComp costs less.

2. CalComp has sales and service offices in over 30 countries around the world.

3. CalComp drives are compatible with IBM 360/30, 360/40, 360/50 computers and above. They're plug compatible with all IBM Systems 370 tape drives. And they're compatible with UNIVAC Series 9400 and 1100 computers.

4. All CalComp tape drives are self-loading and feature soft tape handling. (Only 5 rotating elements in the tape path.)

For a complete analysis of our ability to supply your tape drive needs, call your nearest CalComp office or contact: California Computer Products, Inc., DM-M2-75 2411 West La Palma Avenue, Anaheim, California 92801, Telephone (714) 821-2011.



CALCOMP

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

the forum

WHO NEEDS PROGRAMMERS?

As estimates, as many as 400 million programs may have been designed and manufactured for the more than 400 thousand computers humans have installed on this planet (at a cost almost certainly in excess of $400 billion). Perhaps 90% of the programs are functional duplicates. There are three main reasons for this state of affairs, and its continuance in the foreseeable future:

1. We train people who will be called programmers when they are employed; then we continue to reward them for doing what their name implies: writing programs. Why should we expect them to do otherwise?

2. Even if we changed their name and attempted to compensate them (at least in part) for finding and using program designs created by others, programmers would be faced with an insuperable task: there is no practical way to uncover useful information about more than a few thousand programs (remember: some 400 *million* may have been written).

3. Almost invariably—both in and out of school—we look at the problem-solving process as if it were a one-way street: here is a problem; find the solution. Perhaps that view is encouraged by the fact that there seems to be so little traffic going the other way: here is a solution, find the problem.

The augmented human intellect

For the moment, let me ask you to accept that computers ought to be freely used as intelligent technicians, not only by students, but by every other person who can benefit from them; the context is that called the augmented human intellect. I myself would prefer a mode in which I could say simply, "Here, George, take care of this." That is also the mode in which I would prefer to associate with my intelligent human technicians; but we—our social institutions and I—do not always program them well enough for that. It is more likely that we will attain "the Georgian end" with our machines before we achieve it with our people. In either case, however, the end is a long way off.

Is there anything we can do until the millenium arrives? I believe there is. For example, many of the characteristics of the intelligent technician can be put at our disposal if we can construct an environment in which we humans can function more effectively and more efficiently. If we are to do so, we shall have to:

1. Assure that the "system design" (or "system analysis," if you prefer) which is manifested by the code (program?) is available to those for whom the code itself is not the solution they are seeking.

2. Assure that more computer programs are manufactured in such a way that they can be used by persons other than their authors.

3. Provide means by which it is possible to determine that there already exists a program (or a system design) to do what is wanted. (The complementary set has great value too: learning that a sought-for program or system design does *not* exist.)

4. Incorporate the behavior implied by 1, 2 and 3 in the repertoire of our everyday skills and practices.

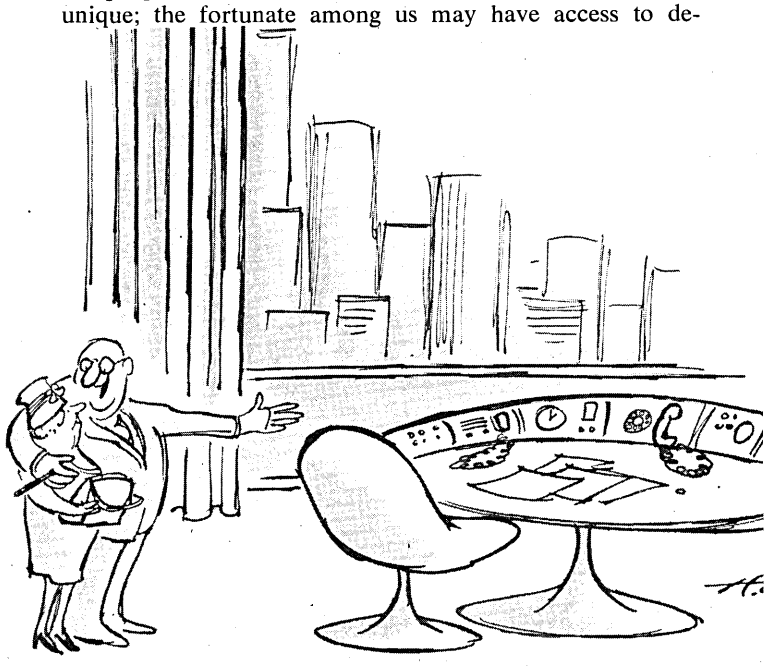
Some economic incentives

If all that precedes this sentence is insufficient incentive to seek the grail I have identified, let me add financial incentive, not necessarily as the keystone, but not to be ignored either. I do not pretend that the numbers I will use are accurate; I have made no carefully-constructed survey. But they are good enough, I suggest, to illuminate the starting-point of the path we ought to take.

In the slightly more than two decades during which we have been using computers, more than 400,000 of them have been installed. On the average, perhaps, between 100 and 1,000 programs have been designed and manufactured for each of them: a grand total of between 40 million and 400 million programs! On the average, again perhaps, the cost of developing those programs lay between $100 and $1,000 (those just have to be conservative estimates).

I will admit that there is a modest amount of duplication in this collection of all the world's programs. Suppose that 90% of the collection are functional duplicates of the remainder. Of the 4 million to 40 million not duplicates I will also admit that some are proprietary or, for some other reason, not of potential interest to users of computers: suppose they, too, number 90%. That leaves between 400,000 and 4 million programs that are of potential interest, 1% of the original lot.

I need hardly remind any of you reading this that *there is no practical way* for you to uncover any useful information about as many as two or three percent of those programs! It is also unlikely that many of you have a nodding acquaintance with so many programs that you cannot express their number with two decimal digits. That, I assert, is a pretty sad state of affairs: as few as 10% of the programs that have been written may be functionally unique; the fortunate among us may have access to de-



"Would you like to sit at my automated executive console for a few minutes, mom, and play 'Mr. Biggie'?"

the forum

scriptions of fewer than 0.2% of those—that is, of 2 out of every 10,000—of all the programs ever written!

Let me continue to belabor the obvious: if you insist that I have overestimated the number of programs that are duplications, I will grant that possibility. So let us suppose that only 70% are duplicates; and that, of those remaining, 70% are proprietary or for other reasons not of interest. In this second instance, then, there are between 12 and 120 million programs functionally unique; and between 3.6 and 36 million remain after eliminating the proprietary, etc. Of this number (nine times as many as I identified in the first instance), the fortunate among us may have access to descriptions of but two out of every 90,000 of the functionally-unique programs ever written. If the first instance was merely a sad state of affairs, the second is only a disaster!

Whichever case you prefer, let us consider its financial side. In the case of the first instance, all that unnecessary duplicated effort cost between $36 billion and $360 billion; in the case of the second instance, the cost has merely been between $28 and $280 billion. Whichever case you prefer—I, for one, am indifferent to your choice—we ought to regard as scandalous this squandering of the valuable resources that were involved: people, machines, money. And given the magnitude of this waste, it is all the more difficult to excuse the failure of computer users to devote a reasonable sum of money to the development and operation of a system that would help would-be-users answer that first question I put: Does there already exist a design for a program to do that which I wish to do?

Finally, from a consideration of matters like those above, I am often led to conjecture about the name of the game that computer users play. In 1969, McKinsey & Company (*Unlocking the Computer's Profit Potential,* McKinsey & Co., Inc., New York, 1969.) reminded its clients (and many fortunate others) that the name of the game is "make money":

> "From a profit standpoint, our findings indicate, computer efforts in all but a few exceptional companies are in real, if often unacknowledged, trouble. Faster, costlier, more sophisticated hardware; larger and increasingly costly computer staffs; increasingly complex and ingenious applications: these are in evidence everywhere. Less and less in evidence, as these new applications proliferate, are profitable results. This is the familiar phenomenon of diminishing returns. But there is one crucial difference: As yet, the real profit potential of the computer has barely begun to be tapped."

Conclusion

So far I have identified a variety of reasons why we ought to change our behavior. We ought to start changing at once. If we do not take the initiative ourselves, it will be taken by others, many of whom may not be qualified to make the required decisions (even if they have the power to do so). Besides, if we begin now, we just possibly might be able to do the right thing right.

—Robert M. Gordon

Bob is an ElectroData alumnus presently harbored in New Zealand as the director of the computer center at the Victoria Univ. of Wellington. He is engaged in a research project to determine the direction of rotation of rotating memory devices in the southern hemisphere, he says, and a pilot project to develop software sharing "down under."

In a year when it's important to cut corners, you should start by cutting this corner.

The 1975 Computer Caravan is coming to you with the information you need to increase efficiency and save money. Information is worth money in the computer industry. And The Computer Caravan is the national computer users' forum and exposition that brings you a unique combination of information sources. The User-to-User Forum lets you exchange experiences and share solutions with other users in a series of panels and workshops. And the Exposition gives you information direct from suppliers in an informal, business like atmosphere. You can look around and get the latest from many suppliers at the same time. And when you're finished, you'll be able to apply this information to your own organization. You'll increase efficiency and save money. That's the heart of it. Here are the details:

'75 Forum Topics

Forums run each day from 9:00 to 3:00. Admission fee is $35 per day, including lunch. Advance registration is recommended. Overall topics are:

Day One – Computer Systems Management
Day Two – Software
Day Three – Trends & Options in Data Communications

We also have special afternoon sessions that are open to all Caravan attendees. Topics for '75 include Professional Development; Virtual Vs. Real Storage and The Human Interface; External Opportunities and Dangers for Data Communications Users.

Exhibitors

We'll be keeping some excellent companies at our '75 Exposition. No advance registration is required, but we'll be happy to send you a free ticket if you send in the coupon. Here's a current list:

Modular Computer Systems • NCR Corp • Digital Equipment Corporation • Anderson-Jacobson, Inc. • Martin Marietta Data Systems • Memorex Corp. (Computer Media Products) • Varian Data Machines • Texas Instruments, Inc. • Sycor, Inc. • T-Bar, Inc. • Hazeltine Corporation • Incoterm Corp. • Lockheed Electronics Company • Hewlett Packard • Mini-Computer Systems • Omnitec Corporation • Scope-Data, Inc. • American Telephone & Telegraph Company • Cincom Systems • Datapoint Corporation • General Automation, Inc. • Interdata • Pansophic Corporation • Software International • Control Data Corporation • Cullinane Corporation • Grumman Data Systems • BASF Systems • International Communications Corporation, a Milgo Company • Datatype Corporation • Beehive Terminals • Software AG • Boeing Computer Services • Delta Data Systems • Computer Devices, Inc. • Prime Computer, Inc. • Cincinnati Milacron • Stromberg DatagraphiX • Consolidated Computer, Inc. • Cooke Engineering Company • Wabash

COMPUTER CARAVAN 75 sponsored by COMPUTERWORLD

The Schedule

The Computer Caravan is the computer conference that comes to a city near you. Here's our '75 schedule:

City	Date	Site
Atlanta	**Feb. 24 - 26**	**Atlanta Merchandise Mart**
Philadelphia	**Mar. 4 - 6**	**Philadelphia Civic Center** (Center Exhibition Hall)
Hartford	**Mar. 11 - 13**	**Hartford Civic Center**
New York	**Mar. 18 - 20**	**New York Coliseum** (4th Floor)
Cleveland	**Apr. 1 - 3**	**Cleveland Convention Center**
Chicago	**Apr. 8 - 10**	**McCormick Place**
St. Paul	**Apr. 15 - 17**	**St. Paul Civic Center**
Seattle	**Apr. 29 - May 1**	**Seattle Center**
San Francisco	**May 6 - 8**	**Hyatt Regency San Francisco** (5 Embarcadero Center)

Registration Office
The Computer Caravan/75
797 Washington Street Newton, Mass. 02160 (617) 965-5800

☐ Please send me further information and a registration form for The Computer Caravan Users' Forum. I understand that no advance registration is required for the Exposition.

☐ Please send me a free guest ticket for the Exposition only.

Name _____

Title _____

Company _____

Address _____

City _____ State _____ Zip _____

CIRCLE 44 ON READER CARD

Systems Analysts!

Your experience and education represent an important personal investment --what have you done with it so far?

"Got a job" isn't quite the full answer, is it? You're *you*. And there's more to life than just "a job"—or there should be!

What could you expect if you joined us? A quality of life that means the difference between "a job" and a way of living.

Something very exciting is happening at NCR. We've gone a long way beyond the manufacture of the world's best business equipment. We now design and manufacture complete electronic systems of many kinds. For business. For industry. For government. And the response has been massive.

As a result, we have an urgent need for experienced programmers and analysts of all kinds, up to and including the most advanced levels, for challenging assignments in finance, manufacturing control, marketing, and engineering systems.

Because we are a large company, we offer a total career growth-potential that is as big as we are. And because we are organized in relatively small product-oriented divisions, your abilities and contributions are highly visible from the time you join us, with prompt recognition of superior performance.

We have plants and offices all over the U.S. Whether you work for us in one of these, or at our corporate headquarters in Dayton, Ohio, you'll find yourself looking forward to coming to work in the morning.

Complete involvement . . . continuing career development . . . an environment of individual responsibility that encourages new ideas and rewards initiative—these are the dividends we offer on the personal investment you've already made on your education and career to date.

You owe it to yourself to check out the shape of this opportunity. Send your resume to:

Ms. Marjorie L. Jones
NCR Worldwide Headquarters, Dept. D-2-75
Corporate Executive &
Professional Recruitment
Dayton, Ohio 45479

NCR

An Equal Opportunity Employer M/F

If you're a small user with a small data center, or a big user with small satellite data centers, look at our new 4- to 12-keystation System 1200.

It has the muscle to take small operations thinking. Data purification and reformatting, plus complete range and error checking. And verification, accumulation and editing. Also you'll send clean and accurate data to your mainframe.

And you get your pick of up to 256 different formats. Even RJE communications, when you want to call home.

It's all wrapped up in a single economical package. Disk, processor and tape drive are imbedded in the compact control unit.

The keystations are the same ones proven for over two years now in our larger System 2400 key-to-disk.

The 1200 has a lot to offer your small data center. Avail it to your nearby MDS office, or to our headquarters at (315) 797-2424, will bring you the full story.

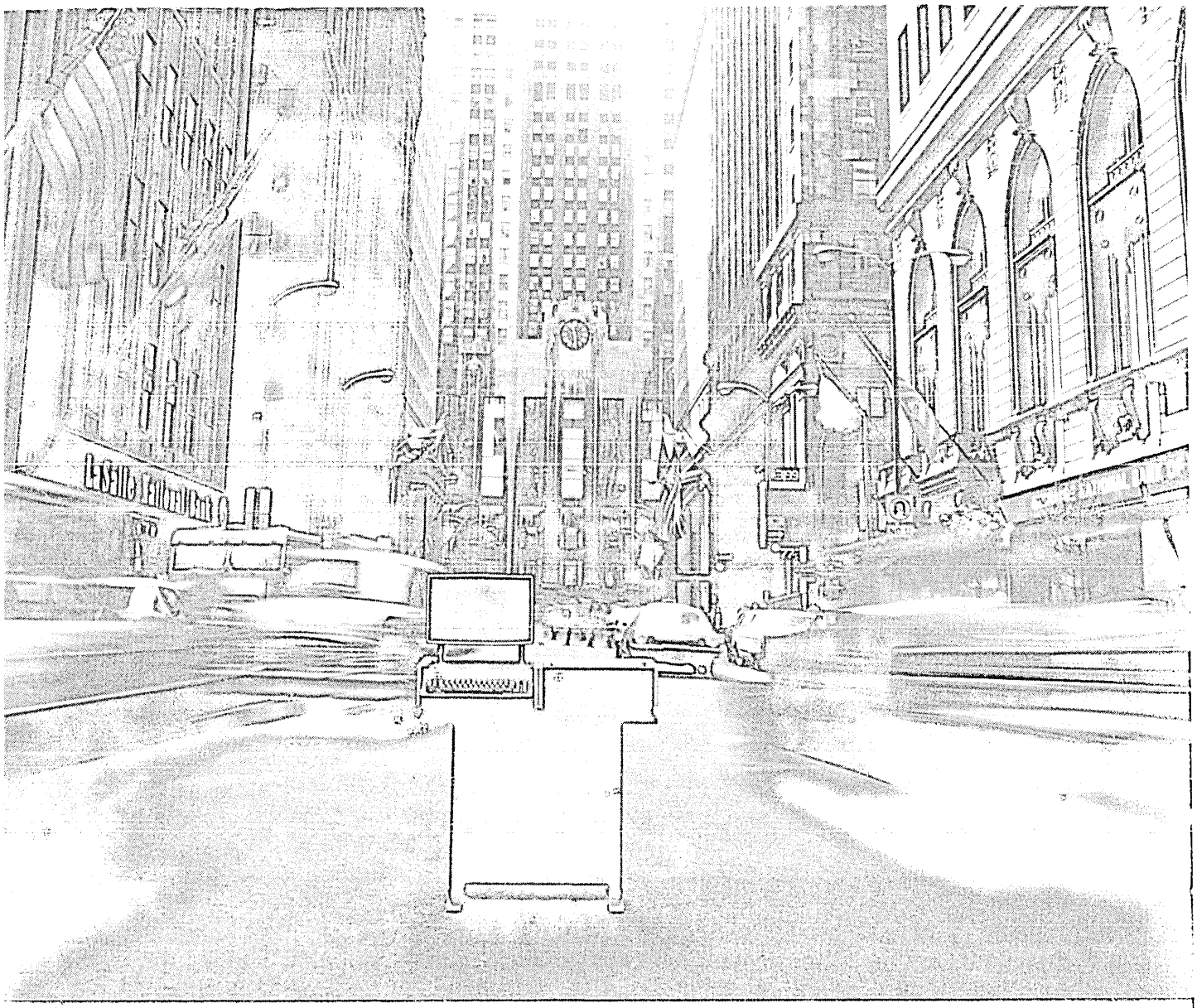
Find out for yourself why data entry products like our Data Recorders, our powerful system 2400's and our new compact System 1200 have made our user list the second largest in the industry. Mohawk Data Sciences Corp., Utica, N.Y. 13503.

MDS.

Mohawk Data Sciences

CIRCLE 49 ON READER CARD

Now Mohawk has a powerful key-to-disk everybody can afford.



We think the Teletype® model 40 system is so good nothing even comes close.

In fact, we believe our model 40 system is so good it'll change the way business looks at data.

It's a complete, versatile, reliable terminal system delivering maximum efficiency in a wide range of applications. From message communications to computer input/output on switched network or private-line systems. Right now, the model 40 system is being used by airlines, news services, brokerage firms, manufacturers, law enforcement agencies and time-sharing services.

Significant features of the model 40 are speed, ease of data preparation and editing, quiet operation and extremely low maintenance. And since the system is completely modular, you can forget about obsolescence. It's designed to grow as your needs grow.

If the model 40 sounds like something your business has been looking for, we'd like to tell you more about it.

The Teletype model 40 system. It's every bit as good as you've heard. And probably even better.

For complete technical data, please contact our Sales Headquarters at 5555 Touhy Avenue, Skokie, Illinois 60076. Or call TERMINAL CENTRAL at (312) 982-2000.

TELETYPE

Teletype is a trademark registered in the United States Patent Office

The Teletype model 40 system.

CIRCLE 3 ON READER CARD