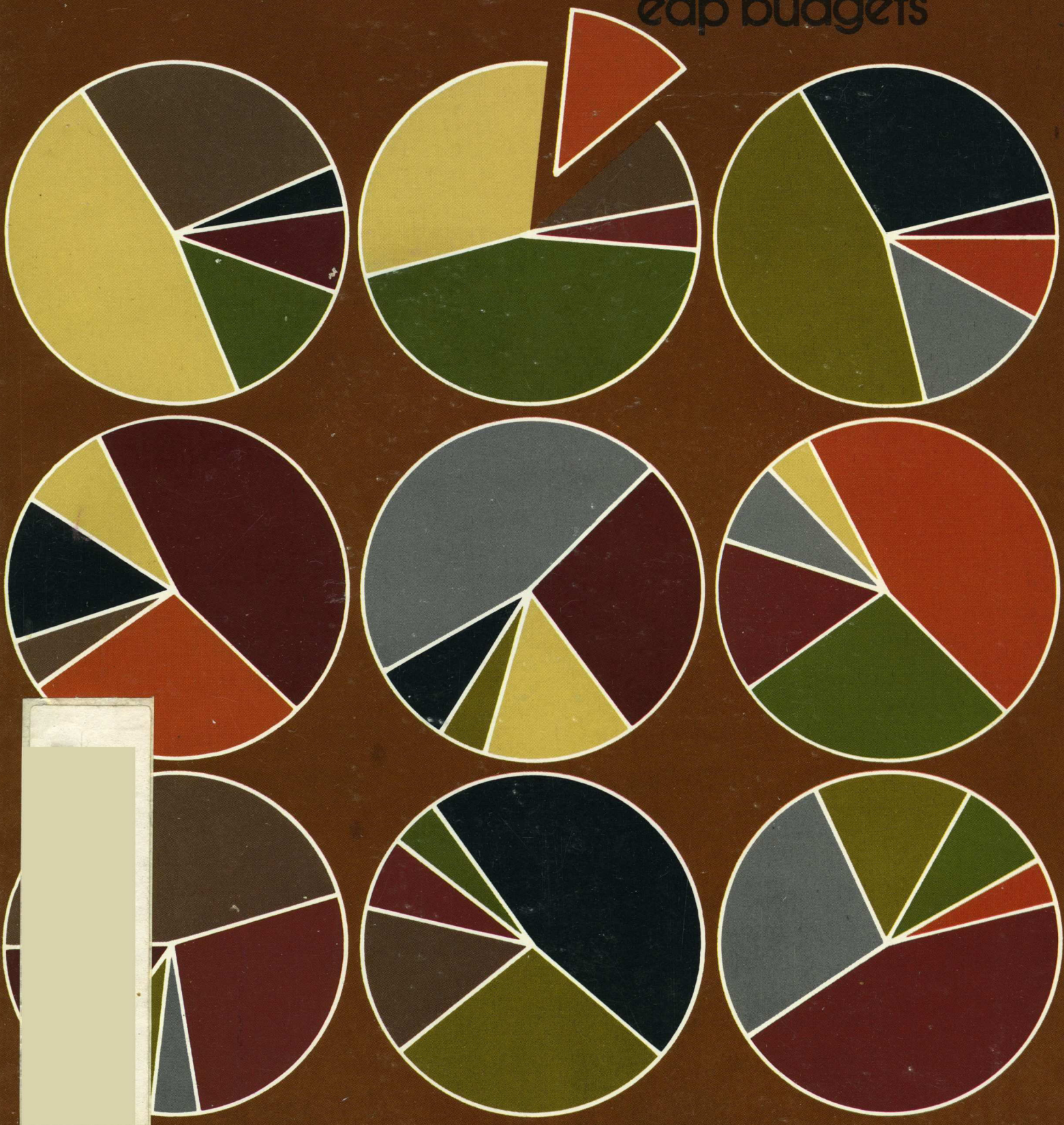
DATAMATION®

74

February

edp budgets



also...pricing computer usage, leases and taxes, and *why* women are predictable...

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Simple is beautiful.

What is it? Model 331 is the latest addition to the finest line of cartridge recorders available. Designed with the OEM in mind, and utilizing the 3M quarter inch cartridge, Model 331 is very low in cost, versatile, compact and has a simple interface.

What will it do? With Model 331, anything is possible. It's ideal for terminals, data communications applications, as a program loader or for any application requiring low cost data storage.

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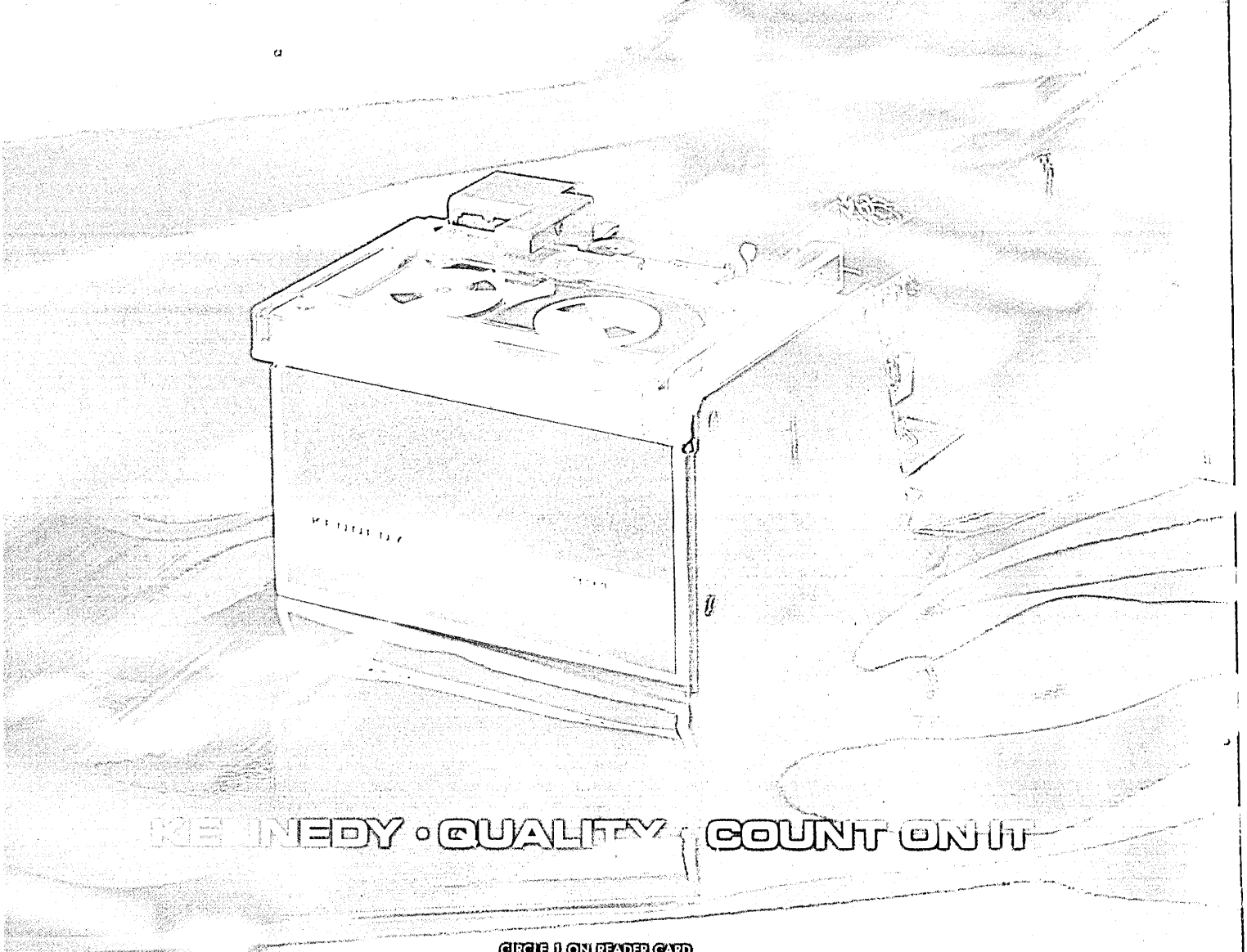

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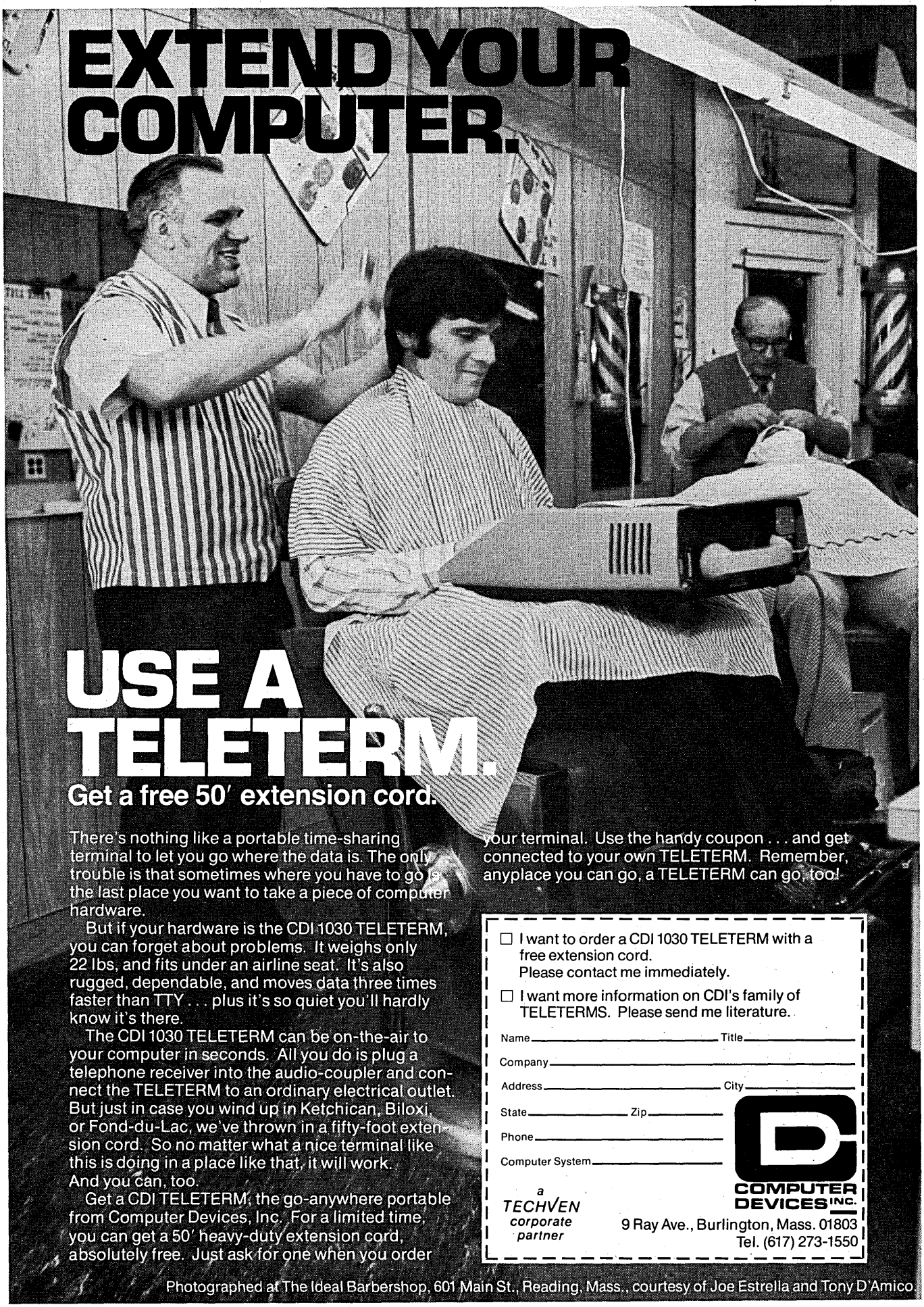
CIRCLE 1 ON READER CARD



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Get a free 50′ extension cord.

There's nothing like a portable time-sharing terminal to let you go where the data is. The only trouble is that sometimes where you have to go is the last place you want to take a piece of computer hardware.

But if your hardware is the CDI 1030 TELETERM, you can forget about problems. It weighs only 22 lbs, and fits under an airline seat. It's also rugged, dependable, and moves data three times faster than TTY . . . plus it's so quiet you'll hardly know it's there.

The CDI 1030 TELETERM can be on-the-air to your computer in seconds. All you do is plug a telephone receiver into the audio-coupler and connect the TELETERM to an ordinary electrical outlet. But just in case you wind up in Ketchican, Biloxi, or Fond-du-Lac, we've thrown in a fifty-foot extension cord. So no matter what a nice terminal like this is doing in a place like that, it will work. And you can, too.

Get a CDI TELETERM, the go-anywhere portable from Computer Devices, Inc. For a limited time, you can get a 50′ heavy-duty extension cord, absolutely free. Just ask for one when you order your terminal. Use the handy coupon . . . and get connected to your own TELETERM. Remember, anyplace you can go, a TELETERM can go, too!

☐ I want to order a CDI 1030 TELETERM with a free extension cord.
Please contact me immediately.

☐ I want more information on CDI's family of TELETERMS. Please send me literature.

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DIVA'S COMPUTROLLER, PDP 11, AND 3330 TYPE DISC DRIVE UNITE.

AN INCREDIBLE MARRIAGE.

An Episode in the True Chronicle of the DIVAS, Proudest Peripheral Family in the Computerworld.

The computerworld stares in awe at the incredible wedding scene which has unfolded before them. The bride is minicomputer PDP 11, offspring of the illustrious maxi-computer clan, begat of Abacus. The bridegroom is DIVA COMPUTROLLER, scion of this proud, most respected peripheral family. Officiating at the ceremony is Duke DIVA Disc Drive, direct descendant of IBM compatible 3330 type disc drives.

Realizing the great impact this interfacing will have on the computerworld, our happy guests monitor the wedding with joyous solemnity.

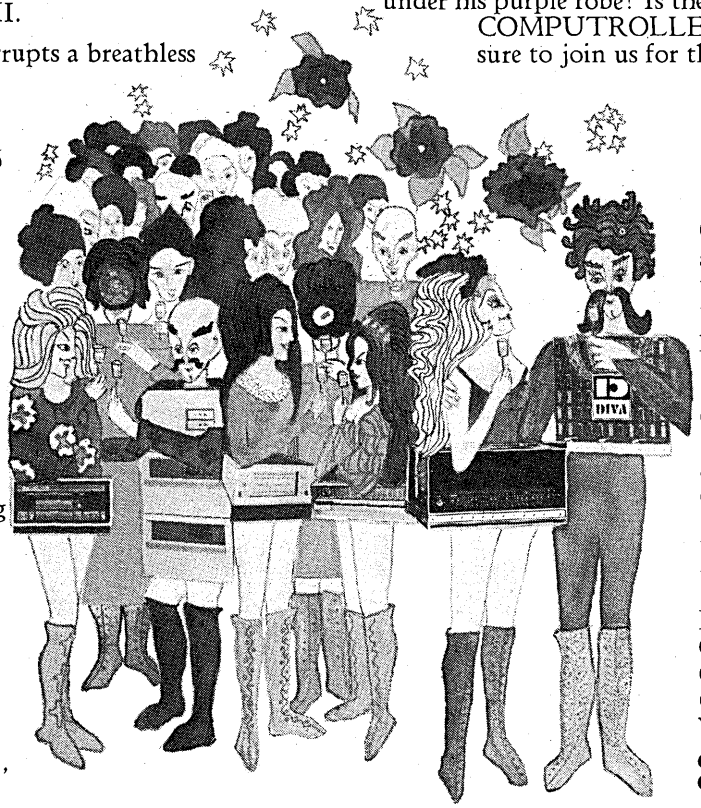
"Mated," Interdata 70 whirrs, "PDP 11 will have access to 100 million bytes of data on a single spindle or 200 million bytes on a dual spindle disc drive unit within an average access time of 32 msecs."

"And with COMPUTROLLER providing a buffering sector, data will be transferable at the rate of 645,000 bytes/sec," marvels Nova II.

"And keep in mind," interrupts a breathless TI 980A, "that with COMPUTROLLER controlling eight drives, mini will have access to 1.6 billion 8-bit bytes of data!!"

But, hush! Listen to Duke DIVA repeating those always-inspiring words: "With the data stored in me, and with provided interconnecting cables and distribution panel, I now pronounce you linked in holy matrimony."

Resounding cheers befitting the occasion arise from the crowd. "A toast! A toast! A toast!" they roar. As is the custom, the proud parents, mini processor and DIVA controller, propose the toast to the dazzling couple: "To the most splendid and significant union in all our memories."



"*Vive*, DIVA! *Vive*, DIVA! *Vive*, DIVA!" Everyone unwinds.

But even as we listen to the clink of ceremonial glasses and the exuberant laughter, we sense an underlying sadness. Those unchosen minis — do they count for nothing now? Will they not be able to enter the world of high speed data storage/access and low cost/bit performance? And why — throughout this entire festivity — has COMPUTROLLER remained hidden under his purple robe? Is there more to COMPUTROLLER than meets the eye? Be sure to join us for the next episode in the True Chronicle of the DIVAS when we will hear the horrendous accusation: "Bigamy! BIGAMIST!"

In the meantime, learn COMPUTROLLER'S inside story. Find out about the free implementation and training courses, the software packages, and warranties that go with each disc system. All you PDP 11 users call George Roessler at 201-544-9000 for cost and delivery information. Or write: DIVA, Inc. 607 Industrial Way West Eatontown, N.J. 07724 TWX 710-722-6645.

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CIRCLE 81 ON READER CARD

DATAMATION 74®

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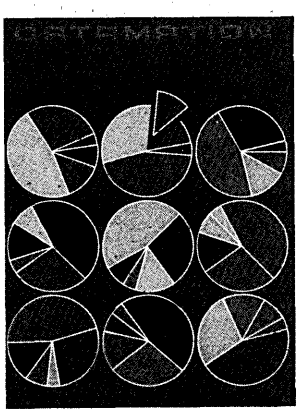
volume 20 number 2
This issue 117,600 copies

departments



about the cover

Dividing up the dollar resources pie is an important part of dp planning. In this period of economic watchfulness, prudence leads us to paint the picture in muted hues. Design is by our art director.

DATAMATION®

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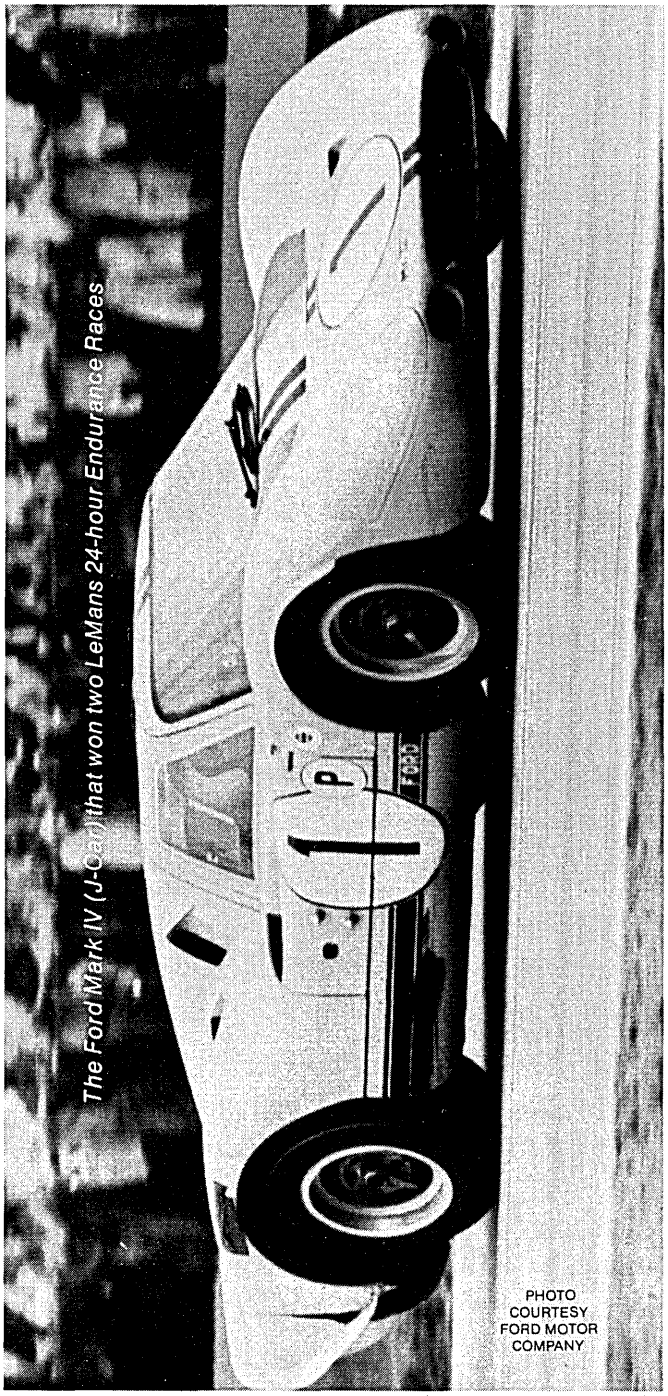
Theirs: High Performance Hardware



The Ford Mark IV (J-Car) that won two LeMans 24-hour Endurance Races

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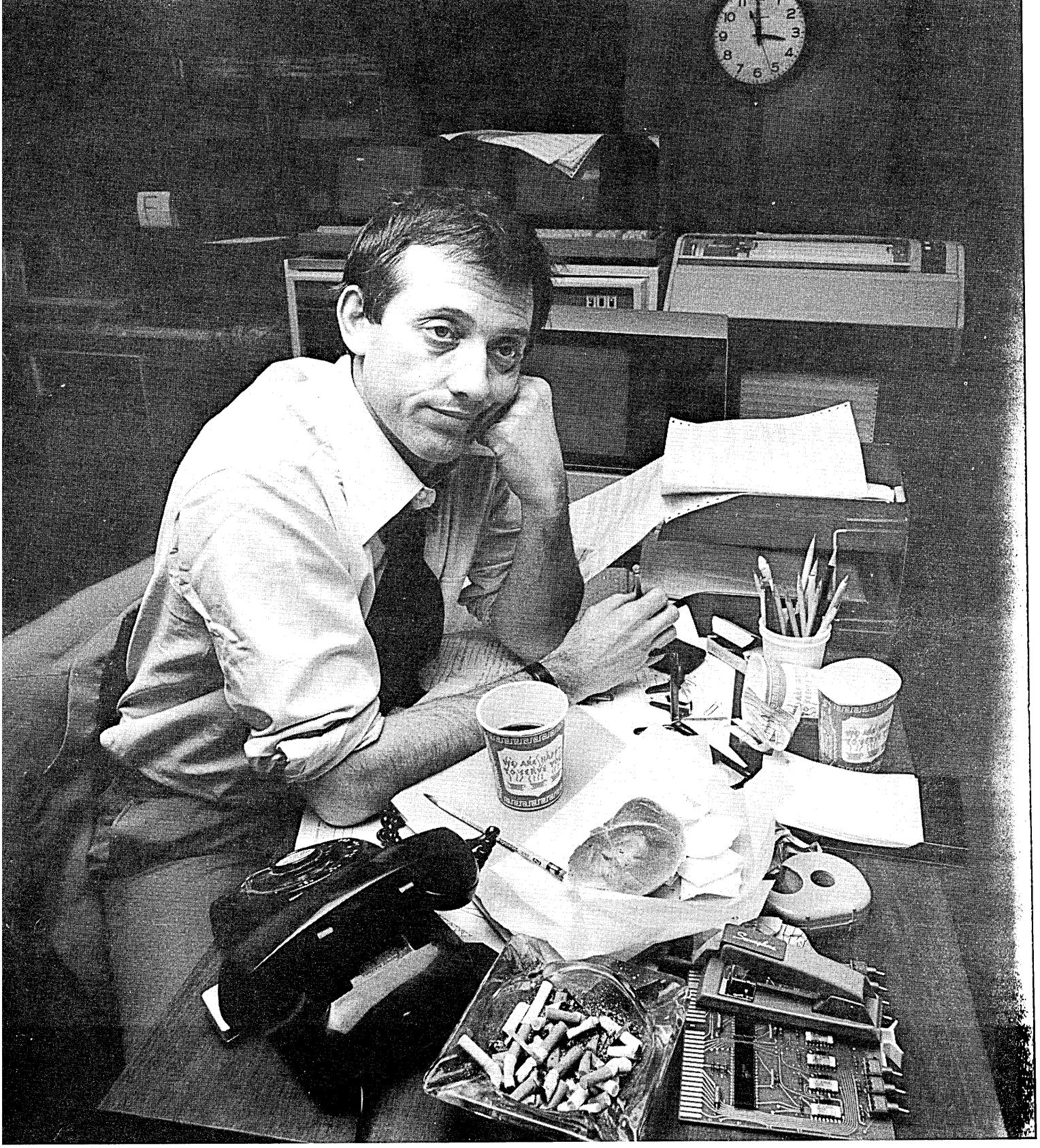

It's hard to love the hardware when the software is keeping you up all night.

INTRODUCING THE LATEST ROCKWELL MOS/LSI ADVANCE... AND NEW VERSATILITY IN MACHINE DESIGN: NEW PPS.

What it does
Our new Parallel Processing System (PPS) has the potential of cutting the cost of many machines—professional and programmable calculators, business machine terminals and system controllers. Even for small volume applications, PPS circuit costs will be in the range of volume-produced circuits. That's because the entire PPS system—except for one circuit—is predesigned to work in *all* these machines. Only one circuit is unique to *your* machine—and, once you've mastered microprogramming, you can design it yourself, with no Rockwell design involvement. Even if you're already using MOS/LSI, you should evaluate our new PPS. The "Characteristics" chart at right shows you its design advantages. And here's another advantage: Rockwell has ready for you a complete package of design aids: a time-tested program for Microprogramming through Tymshare . . . special equipment for microprogram assembly and ROM emulation . . . evaluation board for prototype testing . . . programmer's reference manual, and all required documentation.

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The PPS performs the arithmetic and logic functions of a four-bit parallel microprocessor. It's based on a powerful one-chip CPU controlled by ROM microprogramming and possessing its own discrete I/O capabilities. The other building blocks are predesigned compatible ROM/RAM, ROM, RAM and I/O circuits plus a crystal-controlled clock generator circuit. The smallest PPS is a 2-chip set capable of executing 704 eight-bit program instructions and storing 76 four-bit words. It can be expanded into a 30-circuit system without need for additional buffering or drive circuitry. As a digital processor, the PPS can readily be interfaced with a variety of sensors—card readers, keyboards, displays, etc.

What you should do about it
Just drop us a line on your company letterhead and we'll send additional information so you can make your own microprocessor comparison. Marketing Services, Microelectronic Device Division, Rockwell International, P.O. Box 3669, Anaheim, Ca. 92803, U.S.A.

ROCKWELL PPS CHARACTERISTICS	
Instructions.....	50
Instructions Cycle Time—μS.....	5
Addition of Two 8-Digits—μS.....	240
Nesting of Subroutines—Levels.....	Unlimited
ROM Chip Size.....	1024 x 8 (16K Words Max.)
RAM Chip Size.....	256 x 4 (8192 Words Max.)
I/O Capability.....	24/CKT +12 CPU

Write us today for an appointment for a PPS demonstration at IEEE in New York.

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the centronics 306 measures up as a 80-column printer for $1295 and 30 day delivery!

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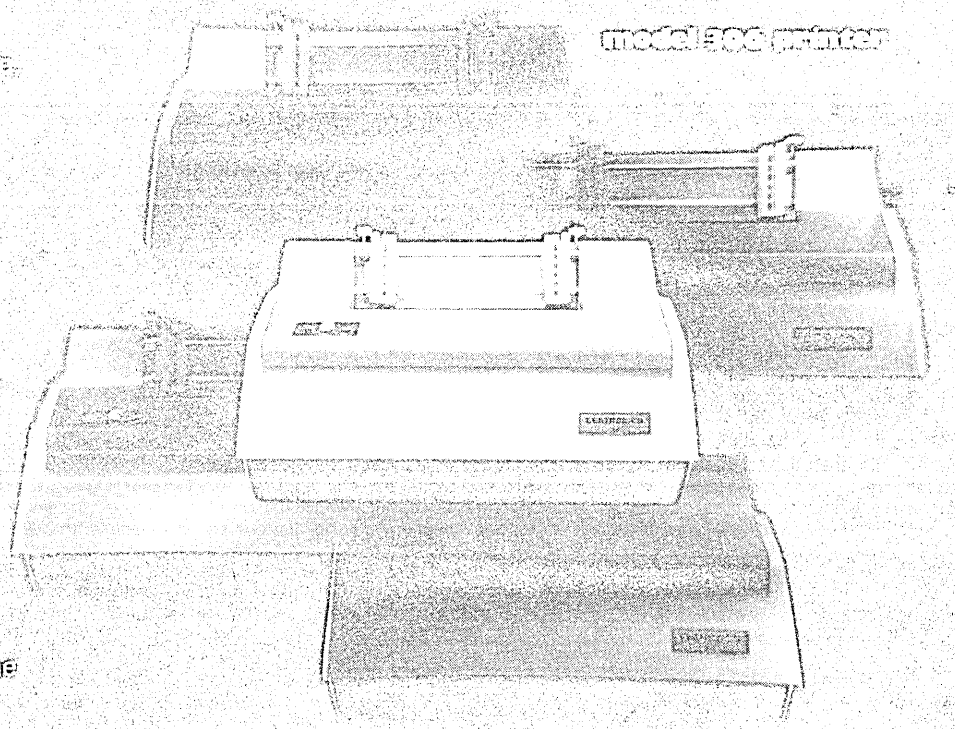

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Calendar

FEBRUARY

Second Annual Midwest Data Equipment Exhibit, Feb. 20-21, Minneapolis. With an expected attendance of 500 users and manufacturers, this is an exhibit of interactive terminals, data communications equipment, and peripherals. Sponsors are seven manufacturer's representatives with offices in the Twin Cities. Contact: Clarence K. Peterson, Deerland Distributors, Inc., Hennepin Square Bldg., Minneapolis, MN 55413.

Fifth Southeastern Conference on Combinatorics, Graph Theory, and Computing, Feb. 25-March 1, Boca Raton, Fla. This conference is directed toward the applied mathematician or mathematical scientist whose work is concerned with mathematics having applications in business, industry, government, and the social sciences. The purpose of the conference is to promote a better understanding of modern applied mathematics, combinatorics, and computer science, and to acquaint the participants with the various techniques and algorithms available. Fee: $95, participants from business, industry, and government; $50, participants from universities. Contact: Dean of Continuing Education, School Service Center, Florida Atlantic Univ., Boca Raton, FL 33432.

Course on Basic Systems and Procedures, Feb. 25-March 1 (New York), **April 15-19** (San Francisco), **April 22-26** (Atlanta), **May 13-17** (Houston), **June 24-28** (Toronto). This American Management Assns. course is for newly assigned business systems personnel or analysts, newly assigned business systems managers needing a thorough review, and department heads or supervisors who want to revise their own internal system or who want to become more conversant with systems techniques. Topics include: fact-gathering techniques, methods for fact recording, fact analysis techniques and documentation, work measurement tools, forms design and control, basic PERT techniques, and preparation and presentation of systems project reports. Fee: $465, members; $535, nonmembers; reduced rates for teams from companies. Contact: AMA, 135 W. 50 St., New York, NY 10020.

MARCH

First Annual International Computer Film Festival, March 7-9, Olympia, Wash. The purposes of this festival, sponsored by Evergreen State College's Dept. of Computer Services and the Washington State Arts Commission, are: 1) to provide the first comprehensive forum for many of the computer films made in the last decade; 2) to assemble some of the major figures in the field, show their work, and suggest future directions; and 3) to bring this technological/creative interface to the public's awareness. Seminars will be offered during the daytime, with films shown at night (on the first night, educational films; on the second, artistic; on the third, technical and scientific). No fee. Contact: Richard Speer, Dept. of Computer Services, Evergreen State College, Olympia, WA 98505.

Annual Data Processing Symposium, March 27-29, Los Angeles. The Continuing Education in Engineering and Mathematics program of the UCLA Univ. Extension, in cooperation with Informatics, Inc., is presenting this symposium on the theme "Information Systems and Networks: The New World of Information Retrieval." Topics include: the evolution of interactive information systems, data bases, on-line information retrieval systems, cost-effectiveness of information retrieval systems and networks, and information networks in the 1980s. Fee: $50. Contact: Tom Mincer, Continuing Education in Engineering and Mathematics, Univ. Extension, UCLA, P.O. Box 24902, Los Angeles, CA 90024.

MAY

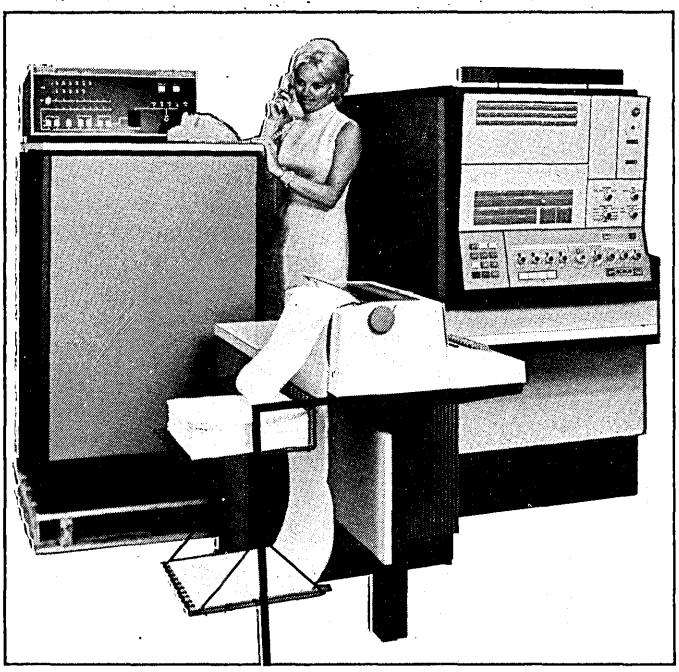
1974 National Computer Conference & Exposition, May 6-10, Chicago. This annual event of AFIPS is expected to attract over 35,000 participants and about 300 exhibitors in more than 800 booths. Over 100 sessions, emphasizing computer productivity as it relates to the user, will be organized around 10 major industry applications (communications, health care and biotechnology, education, manufacturing, distribution, retail, government, finance, industrial process control, and transportation) and five broad science and technology areas (computer architecture and hardware, software systems, computer networking, information management, and management acceptance). Fee: $50, full conference advance registration, including Proceedings; $15, exhibits only (May 6-9); $20, any one-day program and exhibits. Contact: AFIPS Headquarters, 210 Summit Ave., Montvale, NJ 07645.

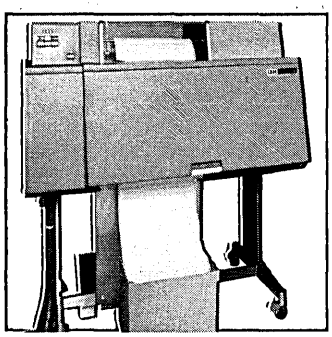
Eurocomp—European Computing Congress, May 13-17, Uxbridge, England. Eurocomp is the first in a series of annual computing congresses for users, suppliers, and designers of computer systems, organized by Online Computer Systems Ltd. and the Business Equipment Trade Assn. (BETA) in cooperation with the British Computer Society. Aiming to be the European equivalent of the NCC, it will have an integrated program of conference sessions, industry presentations, and exhibits. The theme will alternate each year between business/commercial and scientific/engineering applications; this year's theme will be commercial computing. Fee: £68; after March 30, add £10. Contact: Sylvia Wall, Online, Brunel Univ., Uxbridge, Middlesex, England.

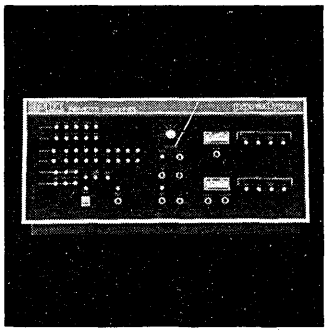
Sixth Australian Computer Conference, May 20-24, Sydney, Australia. Papers will be presented on major aspects of computing activity, with emphasis on computing applications. Keynote speakers will examine such topics as: the impact of computers on the quality of life, management systems, trends in large-scale software developments, satellites and computer networks, computers and the law, computers in medicine, growth prospects for an Australian computer industry, and projections of Australian manpower needs for the computer industry. There will also be panel discussions, seminars, workshops, and an exhibition of computers and allied equipment. Fee, including Proceedings: $55; after Feb. 28, add $10. Contact: Australian Computer Society, Inc., Box N 250 Grosvenor St. Post Office, Sydney, N.S.W. 2000, Australia.

JULY

APL Summer Institute, July 8-26, Binghamton, N.Y. The State Univ. of New York at Binghamton Computer Center offers this national summer institute on various aspects of APL. The first week's session is on Elementary APL. Fee: $300. The second week, on APL packages, reviews necessary theory, and on different days treats the use of APL in computer-assisted instruction, statistics, management, numerical analysis, graphics, and plotting. Fee: $250; separate fees for individual sessions. The third week, Advanced APL, discusses topics such as teaching APL, producing complete program packages, style, debugging, and facilities like files and shared variables. Fee: $300; separate fees for individual sessions. Contact: Anne Kellerman, Computer Center, SUNY-Binghamton, Binghamton, NY 13901.







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CIRCLE 75 ON READER CARD

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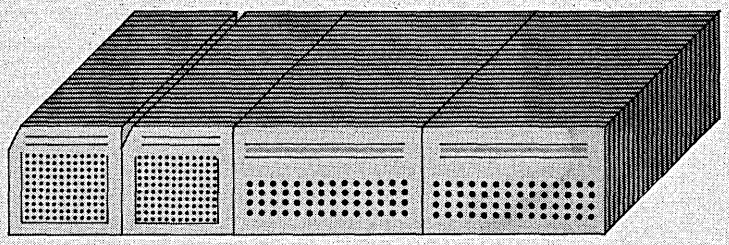
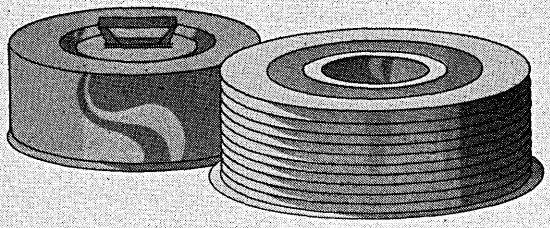


one for disks,



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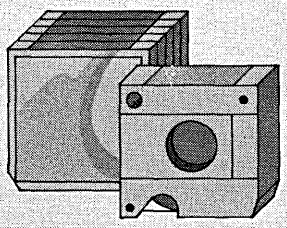
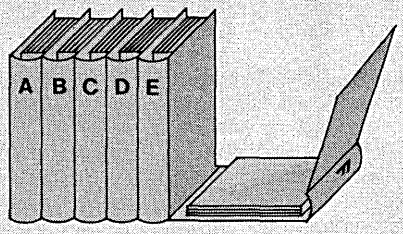


one for binders,



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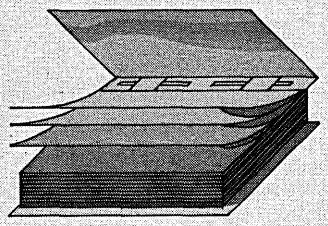
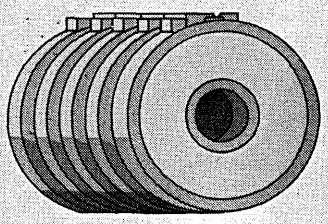
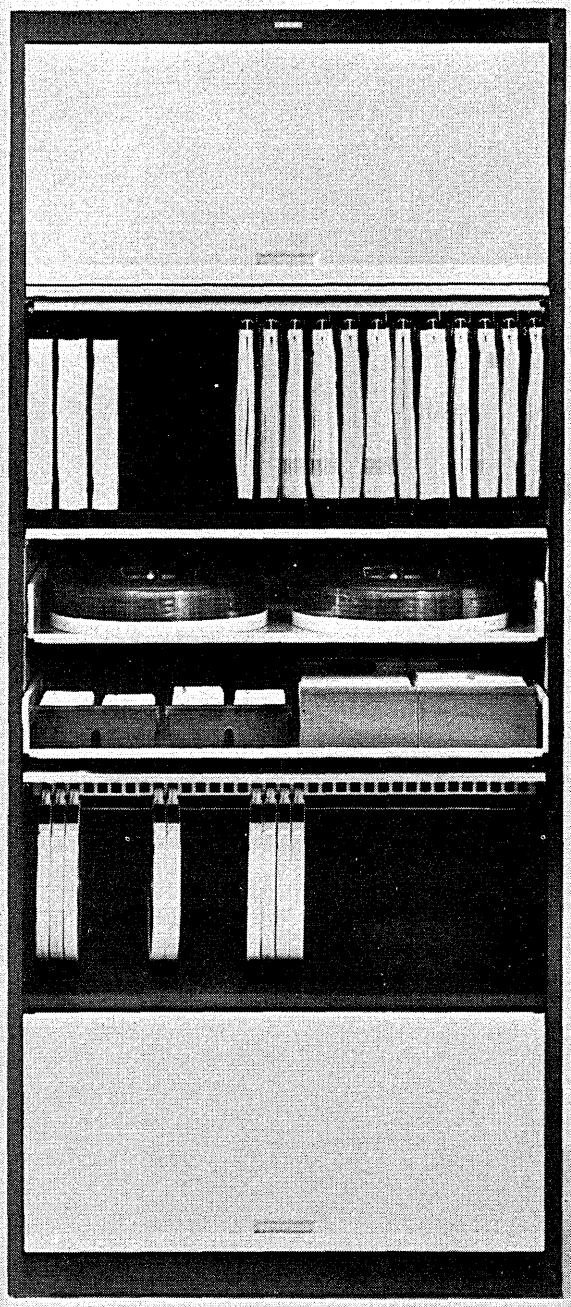


and one for tapes.





This one.

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CIRCLE 49 ON READER CARD

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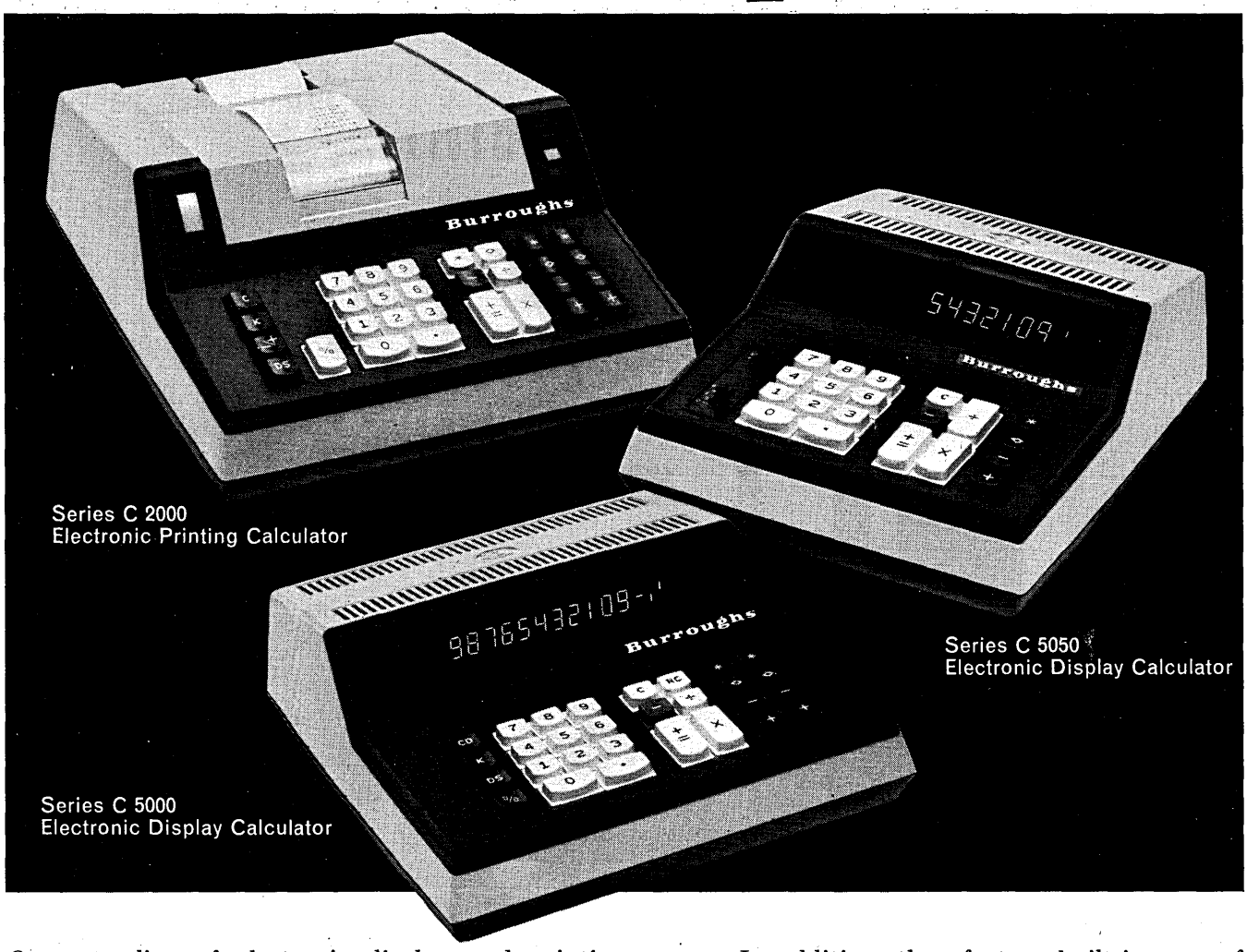

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LOOK AHEAD

NETWORK SINKING UNDER BUREAUCRATIC WAVES

That big Agriculture Dept./GSA information network (November 1973, p. 120) looks like it's sinking beneath the bureaucratic waves. Last March, the Ag had 50 systems designers and related specialists working on the project. Last month, only one was left -- Bob Head, assistant director of the agency's office of information services -- and we hear that he will be looking for a job shortly. The troops out in the field allegedly don't want the system implemented because it would centralize responsibilities that are now dispersed.

An rfp, due to be released the first of this month, probably won't be. A GSA source believes the delay will amount to "only a few days," but another fully knowledgeable observer is willing to bet there will be substantial slippage. If Agriculture pulls out, "the specs will have to be rewritten completely, and that's going to take weeks."

The system encompasses five to nine large-scale processors dedicated to dp, and a sophisticated nationwide packet-switched communications network that would service several thousand terminals through 16 regional concentrators, eight switching concentrators, and a network control center.

USERS STILL RELUCTANT TO LOCK ONTO LEASES

IBM rental customers aren't switching in droves to fixed- and extended-term leases, even though the company has suspended penalties for breaking them. A recent poll by this magazine of 119 IBM customers found only 22 planned this year to convert from rental to take advantage of free overtime use and other discounts offered with the longer-term leases. Another 22 already were on the longer-term plans, and seven were thinking about changing. But the remaining 68 weren't contemplating any change this year, possibly out of fear that IBM might succeed in overturning Judge Christensen's ruling against the penalties last September in the Telex judgment.

IBM NOTWITHSTANDING, NRMA STILL LIKES OPTICAL

A move on the part of the National Retail Merchants' Assn. toward adoption of optical technology as the standard product marking means for retail point-of-sale systems came in for criticism at the NRMA convention in New York last month. But the NRMA doesn't seem to have been diverted from its course. "We still tend to favor OCR," said Hans Rubner of Montgomery Ward, chairman of NRMA's Merchandise Identification Task Force. "The next question is what font." The NRMA committee has turned over its review of various marking technologies and its reasons for recommending optic to a Manufacturers' Liaison Committee of the Computer and Business Equipment Manufacturers' Assn. (CBEMA), composed of representatives of firms who make the equipment used in point-of-sale systems. This committee has been asked to consider possible fonts, and the next step, says Rubner, will be "interplay" between them and us. Some criticism of the optical direction at the New York convention was based on the fact that IBM has not adopted this technology in its POS line. Said Rubner, "we knew that before we decided optical was the way to go."

WHERE ANGELS FEAR TO TREAD?

Ross Perot might not want to try it but tiny Infonational, Inc. of San Diego was willing. It's facilities management for Equity Funding. The San Diego firm isn't taking over operation of one of the most widely publicized data processing services in the world without some

special concerns, but these concerns evidently are outweighed by favorable expectations. "We're walking in and taking over and immediately we're behind in terms of control," said Infonational's president, Gary McMullen. "New management (Equity is operating under Chapter X proceedingswith court appointed officers) has been very understanding. Problems have been identified but not corrected and control is not 100% my responsibility."

Infonational had a 256K 360/40 in its Los Angeles data center, and Equity had the same in its center in Century City. "One machine can do all the work," said McMullen, so one will go back and the combined work of Equity and the Infonational center will be handled from Century City. Infonational has employed some 30 former Equity dp employees, mostly in keypunch and operations.

INSTANT BILLING BY THE METER MAN

One of these days the meter man, carrying a 10-pound computer-based device, will read your water, gas, or electric light meter, punch in the data, and print out the bill, leaving it under your door. Utility executives, worried about rising postage rates, were understood to be excited over the "Port-a-Biller," shown to them at a gathering in New Orleans by Bell & Howell's Electronics and Instruments Group, which hopes to field test the device before midyear.

With a 3K Intel microprocessor and touchtone pad, the battery-powered device holds 50 blank bills, calculates the amount due after the meter reading is punched into it, and then prints it out in OCR-A font. Bell & Howell next month will introduce an OCR reader and MICR printing system to process customer remittances under the Port-a-Biller system.

ENTREPRENEUR'S DREAM COME TRUE

Some technologically-advanced and cheaply manufacturable products can be anticipated. A 20-man R&D outfit in Riverton, Wyo., LRC, Inc., has sold its first product, an impact type matrix printer that has a "substantially higher performance than any other serial printer on the market." Like an entrepreneur's dream come true, the company stands to get up to $4.7 million for the printer. It's already received $1 million from Texas Instruments which acquired exclusive rights to it. LRC, started by Ray Larsen when UCC moved its Datel Communications terminal manufacturing operation from Riverton to Dallas, has a second product near completion that "is going to make more money for us than the first one."

Larsen, a wild, red-headed inventor who looks every inch the part, also has a memory device in the pipeline. But it's the recent addition to the staff of Nick Kondur that made the matrix printer a marketable product. Kondur was research director for Victor Comptometer, and was able to apply his expertise in manufacturing and packaging. In case you're wondering, LRC stands for Longitudinal Redundancy Check, an aviation term.

SHUGART DEVELOPING A $3K PRINTER

Shugart Associates, the Sunnyvale, Calif., manufacturer staffed by many former Memorex people, is about to announce a product other than a floppy disc system. It's a 100 to 300-lpm printer that will compete with similar offerings from Centronics, Data Products, Data Printer, and others. The Shugart printer design team, headed by ex-IBMer Albert Chou, is reportedly planning to offer a device with a greatly reduced number of moving parts, priced at roughly $3K in unit

(Continued on page 133)

Charge!

And join the thundering herd to Inforex's new key-to-disc System 1303.

Like you, most computer users have stacks and stacks of data to process. So they need a data preparation system that's big in throughput, big in editing, and big in communications.

That's why so many companies are changing to the new Inforex 1303.

Now, Inforex System 1303 offers improved key-to-disc data entry. With capabilities like: advanced applications oriented editing and cross footing. Eight levels of program control with up to 1000 bytes of blocking. Bi-synchronous communications from 300 to 9600 baud for local and remote installations. Line and serial printers. And a 2400-foot, 45 inches per second, tape drive, in standard densities, for direct computer processing.

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CIRCLE 41 ON READER CARD

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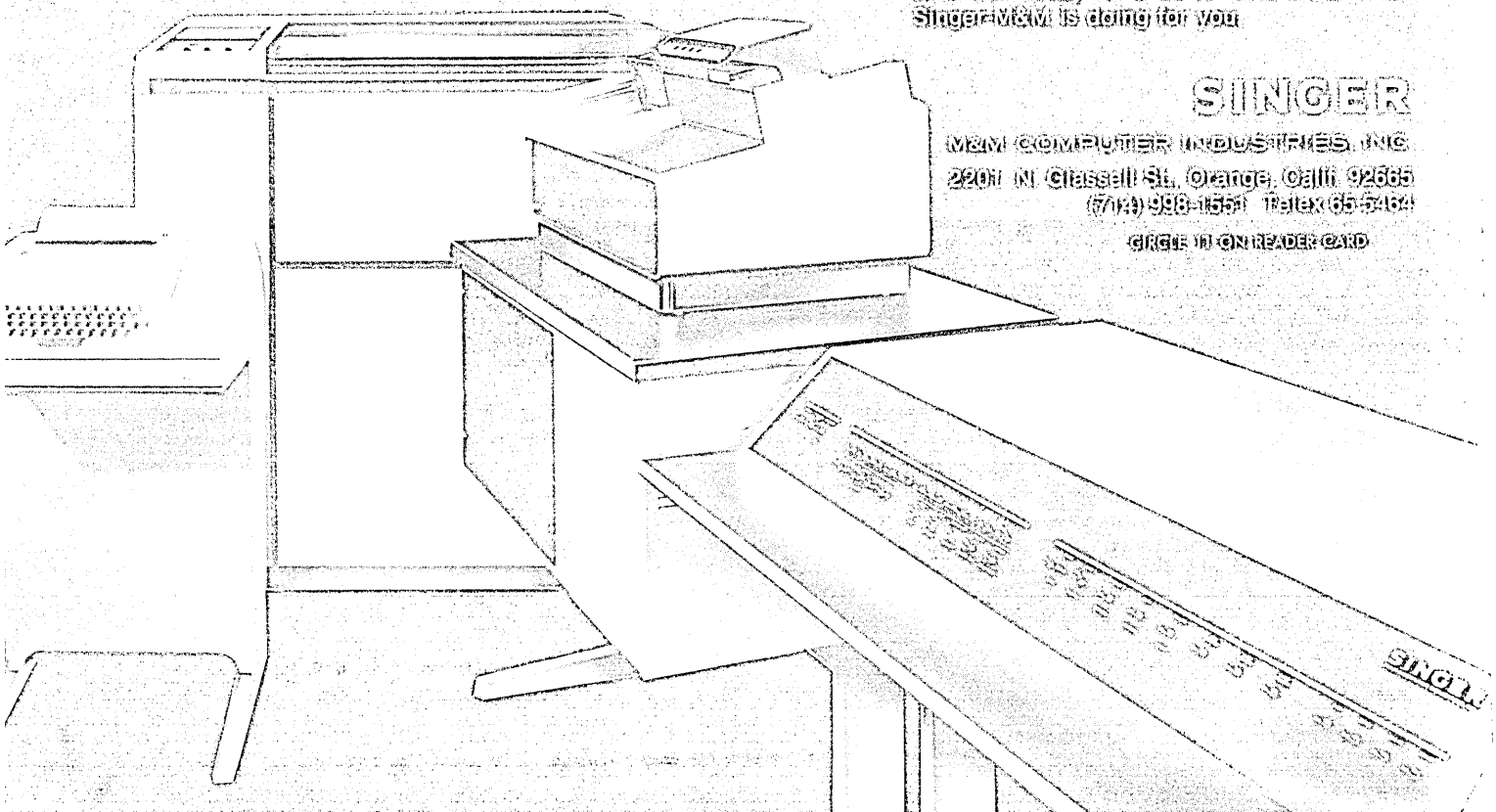
Singer-M&M Intelligent Remote Batch Terminal Systems are communicating worldwide with all the major mainframes at speeds up to 50 Kbps., processing jobs limited only by your imagination. IBM, CDC, UNIVAC, Burroughs, Honeywell . . . they're all transparent to us.

When you consider price/performance, the chart below quickly shows that basic Singer-M&M Remote Batch Terminal Systems deliver more for the money than any other equipment now on the market.

BASIC SYSTEMS	520*	530*	555*	560*
Card Reader				
300 cpm	X	X	X	
600 cpm				X
Line Printer				
200 lpm	X			
400 lpm		X	X	
600 lpm				X
Communications				
2 to 4.8 Kbps	X			
4 to 7.2 Kbps		X	X	
4 to 50 Kbps				X
Keyboard/Console	Opt	Opt	Std	Std
Multileaving HASP Work Station	N/A	N/A	Std	Std
Monthly Rental including Maintenance	$675	$940	$1060	$1645

*Optional Peripherals available

Add to all this the name SINGER with worldwide sales and service and you now have the versatility, price/performance, reliability and intelligence to specify a remote batch system. Call today for a demonstration of what Singer-M&M is doing for you.



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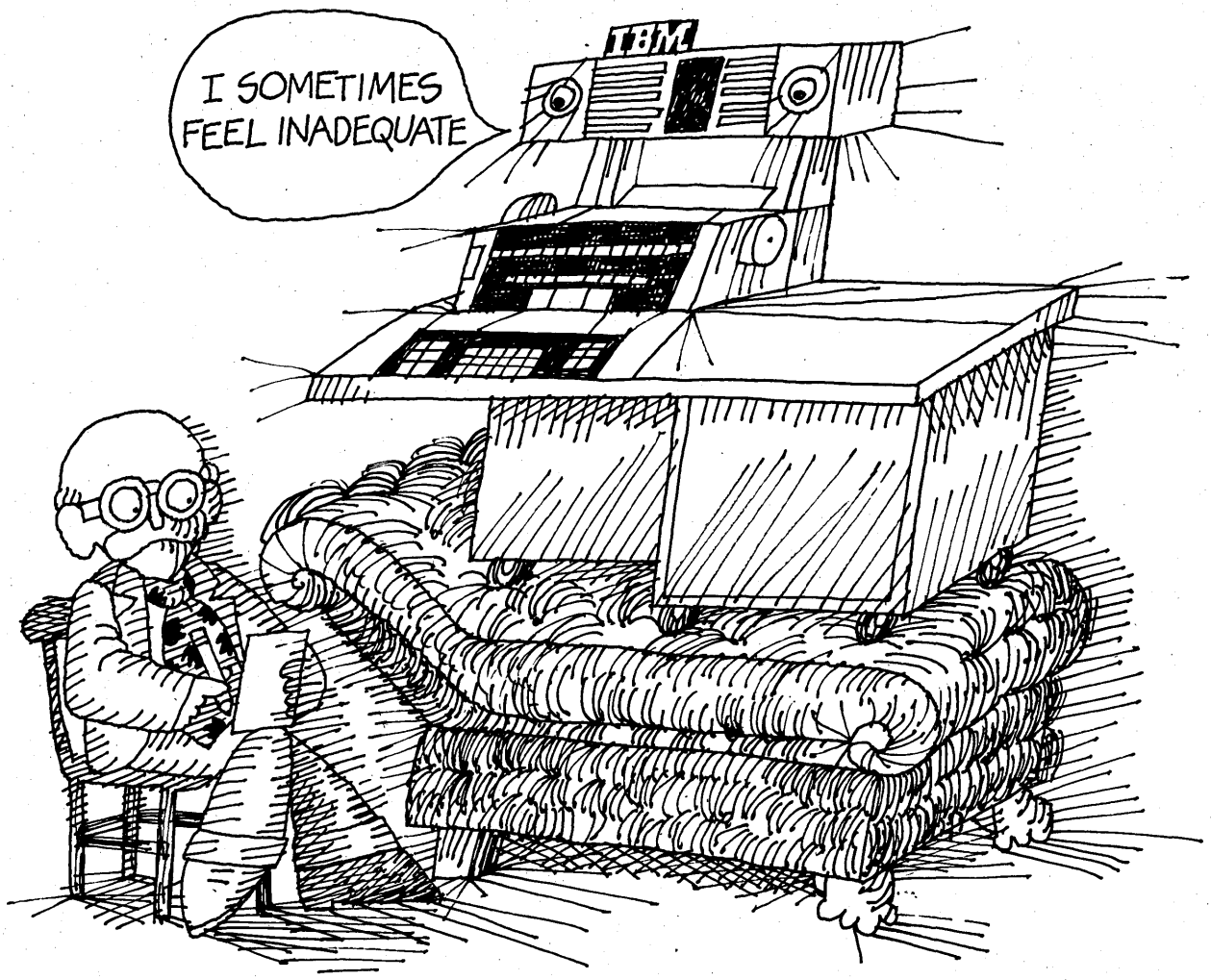
CIRCLE 11 ON READER CARD



Computer Hardware Inc. has a painless cure for overworked 1130 systems

Add a disc storage system with 20 times the capacity and more than 12 times the speed of the integral disc drive in your 1130. Our CHI-1114 disc storage system has a capacity of 10.24M words and can be expanded to 20.48M words by adding a second disc drive. No software modifications are required to install a Computer Hardware Inc. disc storage system.

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Add core at half of IBM's cost. Add a big chunk of core. As much as 65K, by plugging right into the CPU with the option of accelerating your machine to 2.2 μsec. And when you add CHI core, your 1130 DM2 programs need no modification.

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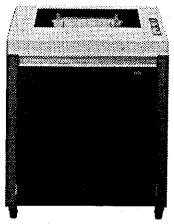
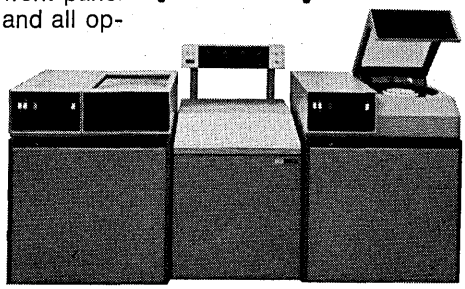
Don't wait . . . cure your overworked 1130 system with peripherals from Computer Hardware Inc.





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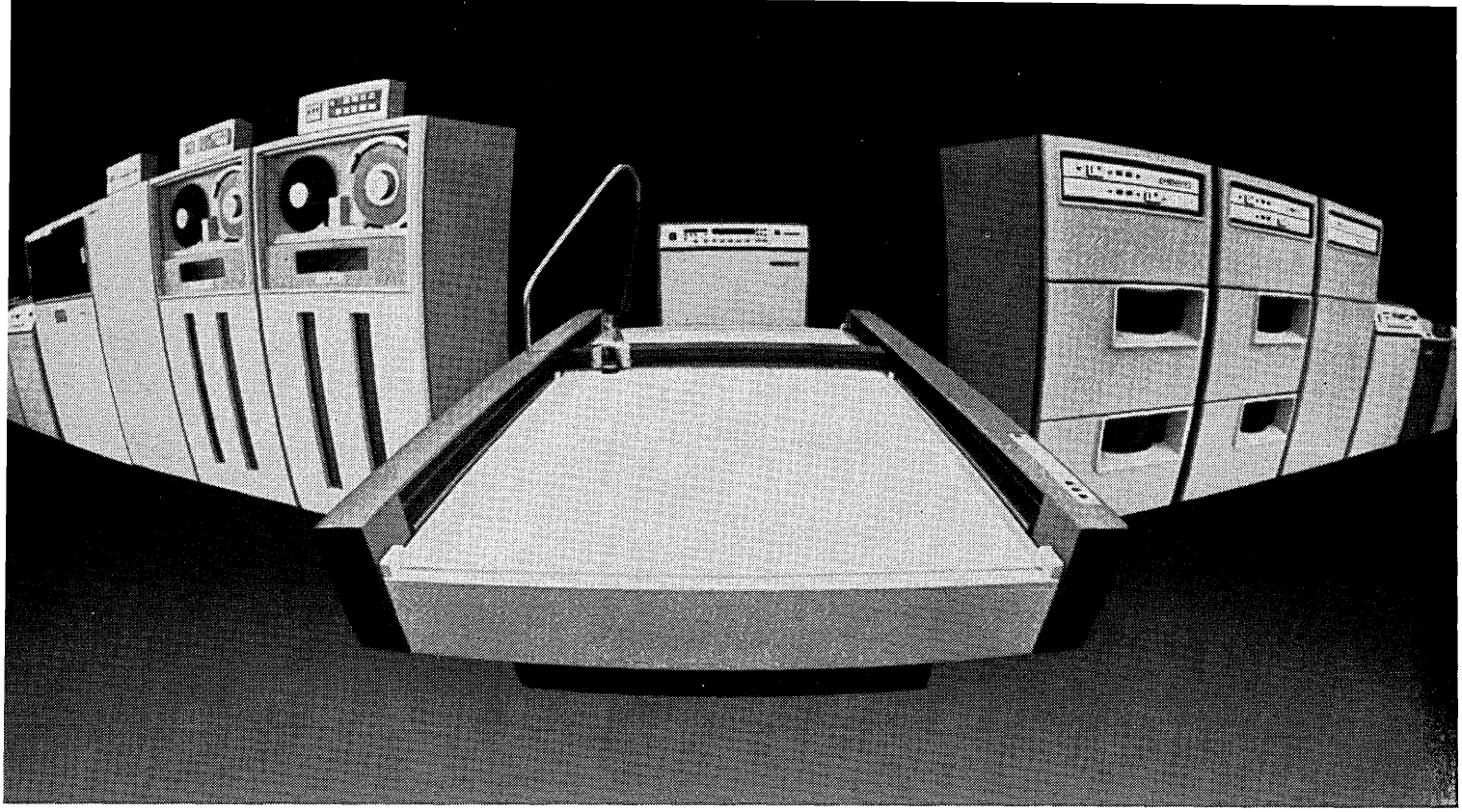

Peripheral vision.

From the beginning, we have preferred concentration to diversification. We don't supply everything that attaches to your computer. But the things we do supply are the best.

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Drum plotters. We're the world's leading supplier of both hardware and software.

Flatbed plotters. Several years ago, we saw a need and an opportunity to expand the plotter's uses. The flatbed plotter allows a variety of materials to be substituted for paper, and it has expanded the market for computer graphics, as well.

Microfilm plotters. Here, we got bigger by getting smaller. With microfilm. Our 1675 COM plotter/printer and our 2100 COM printer deliver the best price/performance in the industry.

Disk memory equipment. This was our second area of concentration. In a remarkably short time, we have become the leading independent supplier.

Tape systems. We've recently begun to concentrate on tape. The result is that our new 1040 Tape Drive combines the features of others with our own experience. We intend to be a leader in this field.

The point is we have not grown by accident. Thirteen years after our beginning, we have become a leader in computer peripherals.

For information on peripheral products, call your local CalComp office, or contact California Computer Products, Inc., DM-M2-74, 2411 West La Palma Avenue, Anaheim, California 92801 (714) 821-2011

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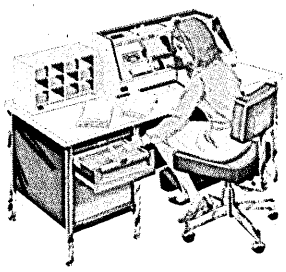
Keypunch Work Station includes Keypunch Desk, Cousti-Cover sound dampening enclosure, card rack, posture chair and footrest.



Microform Work Station uses Optimedia Reference Stand, Posture Chair, Footrest and Card Tray. Optimedia Reference Stands are available in a variety of colors with woodgrain or off-white plastic-laminate tops.

data entry and terminal work stations

You can improve the productivity of your data entry and terminal operators. Wright Line's specialized equipment used with operating devices creates highly efficient operator work stations. These planned work environments combine adequate work surface, proper viewing and keyboard heights, storage space, non-fatigue posture seating, and enclosures with cable access for machine accessories such as data phones and modems.

Complete information including typical work station environments for all types of data entry devices, CRT terminals, printer terminals and microform readers are shown in our new color brochure. For a copy circle the readers' service number or write direct to Wright Line, Division of Barry Wright Corporation, 160 Gold Star Boulevard, Worcester, Massachusetts 01606.

Printer Terminal Work Station with Optimedia Printer Stands and Posture Chair. Optimedia Printer Stand has bin and cut-out top for feeding continuous forms and basket for collection of forms.

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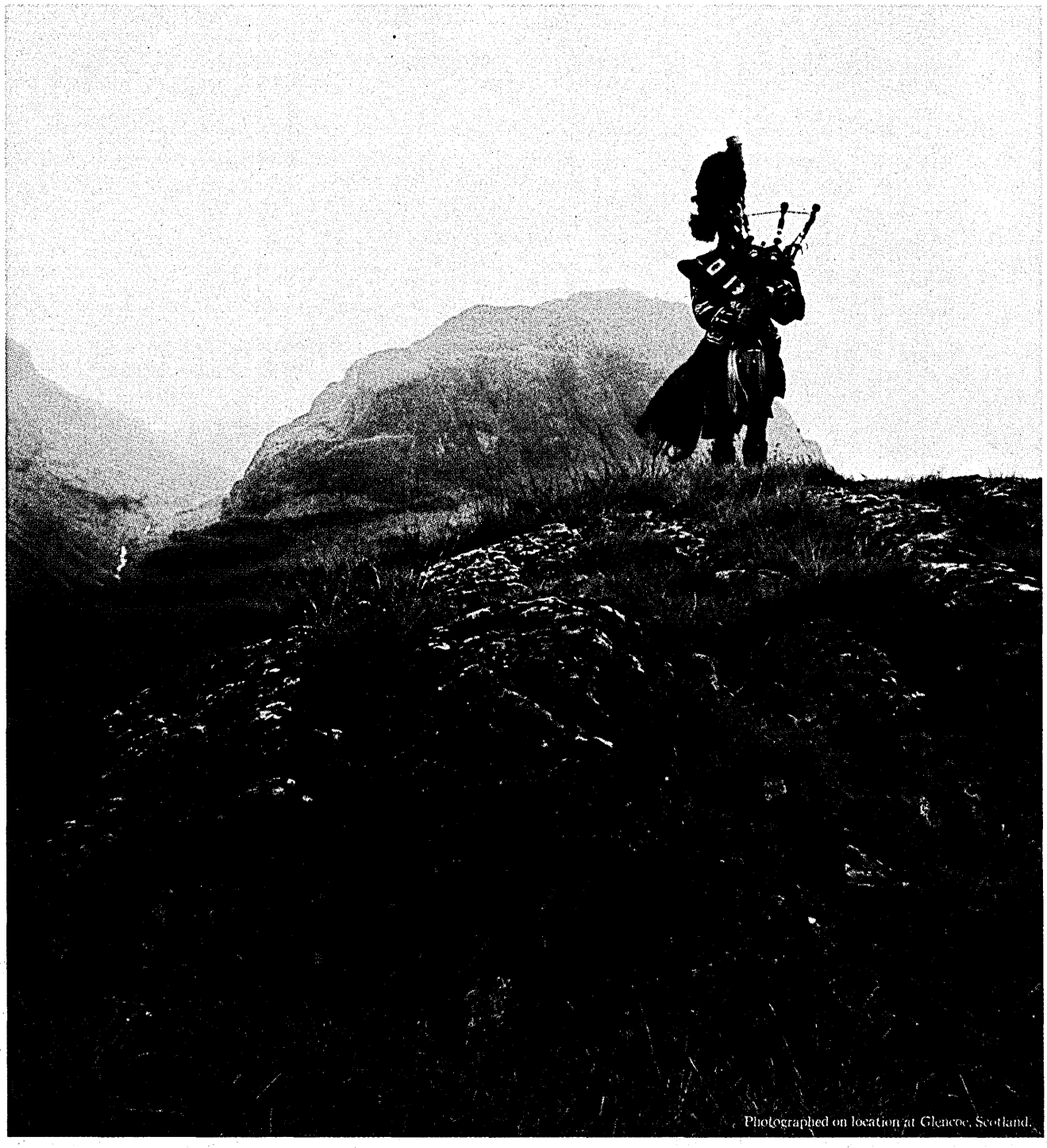
Typical CRT Terminal Work Station uses Optimedia Reference Stand with two drawer pedestal, Wright Line Posture Chair, Footrest and Reference Manual Stand. Optimedia Reference Stands are available in several sizes and heights with or without drawer pedestals.



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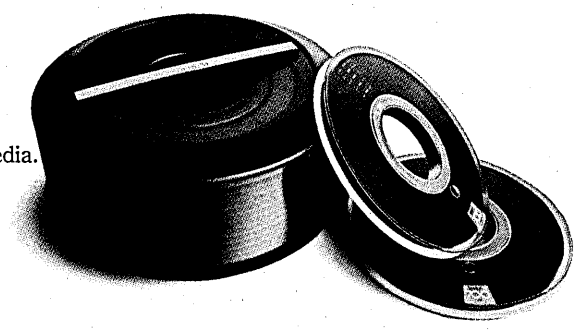


"Scotch" is a registered trademark of 3M Company.

3M COMPANY

Letters

Uninvolved

I was entertained and enlightened by Phil Hirsch's article about the old inventor, Vernon M. Bugg, and his prolonged tribulations with IBM, in the December issue (p. 100). And while the account of, and reasons for, Bugg's $120 million antitrust suit against that company and AT&T are all quite fascinating, there appeared in the piece an interpretive comment that was not accurate.

Referring to Mr. Bugg's suit to recover damages for the alleged confiscation of his teletype inventions, the writer says: " . . . Rodgers, author of the widely-praised history of IBM called *Think,* has seen the rest of the documentation and is helping Bugg prosecute his case."

I have no involvement at all in the prosecution of this bizarre but, in my judgment, thoroughly justified damage suit. The Washington law firm engaged by Mr. Bugg is taking care of that. I never met Vernon Bugg until after the publication of my book about Thomas J. Watson and his life and times at IBM. If I had, I would surely have devoted a chapter to his close and historic association with Watson in the critical years of the company's phenomenal development. Bugg is a resource for a writer and is one of those overlooked personages who ought not to be lost to industrial history. I have some plans to write about him but none to "help" prosecute his case. That's quite out of my league and beyond the range of professional interest. Nevertheless, I hope he wins his case in the courts. Between IBM and AT&T, according to strong evidence I have seen, the giants suppressed his inventions and kept competition from entering the teletype field for 40 years. For this, Bugg deserves full redress from them, late as it is.

WILLIAM RODGERS
Centreville, Maryland

Ludicrous linguistics

In his stimulating discussion of the COME FROM statement, Mr. Clark overlooked the question of what would happen if two or more COME FROM statements tried to transfer control from the same statement. The obvious answer is that the system would enter multitasking mode and generate a new task for each extra COME FROM. This would be a painless way of introducing multitasking into FORTRAN.

Suppose, for example, that a programmer was using a system with multiple cpu's and wished to execute two subroutines, A and B, in parallel. The following program would do so:

```
10 CONTINUE
   COME FROM 10
   CALL A
   STOP
   COME FROM 10
   CALL B
   STOP
```

I hope Mr. Clark further contributes to programming linguistics by exploring the inherent potential of the GO AWAY and GET LOST statements.

JOHN F. SOWA
IBM
Yorktown Heights, New York

Mr. Clark's article is a beautiful spoof. His factoral algorithm, in particular, really captures the imagination. If we proceed in this fashion, someday we may write some no-programs which will require no effort at all to document and read.

ANTHONY AMORT
Senior Programmer Analyst
Eaton Corp.
Kenosha, Wisconsin

Can it be possible that author R. Lawrence Clark is unable to squarely face his readers after writing, "A Linguistic Contribution to GOTO-less Programming," (Dec., p. 62), hence a side view of his face?

Where I "come from," we call it a "put on."

ALICE FENYES
Bankers Trust Co.
New York, New York

How not to manage

Professor Beer's efforts at economic cybernetics in Chile under the Allende government provide a classic example of how *not* to manage a mechanization conversion (Dec., p. 125). By neglecting factors outside the scope of the system (in the "world system") and by ignoring opposition from within (in the "distribution subsystem"), Beer and his erstwhile employer insured their own failure.

These are items that every analyst must know and recognize before he can manage a conversion. One simply cannot ignore the "real world" (in this case, literally) in which a system must function, but sometimes the size and scope of our systems and our infatuation with the ultimate goals cause even the best of us to lose this perspective. A ruined national economy and a violent revolution are the price that was paid in this case. Textbook writers should not allow future analysts to forget this tragic example.

ERIC R. ZIEMER
Systems Analyst
Illinois Bell Telephone Co.

Frequent phalluses

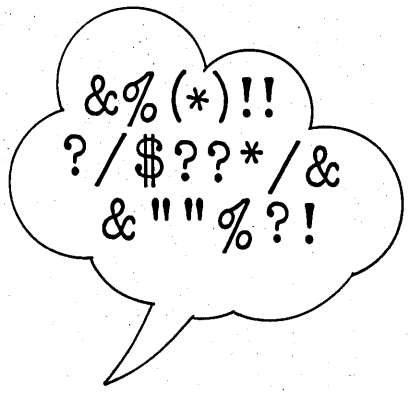
Mr. Callahan, ("Who Is Qualified," Dec., p. 170), has been infected by one of the most frequent (though less publicized) fallacies of this and other industries—that the professional applicant is and should be a male. The article contains 12 references to the professional "man," as well as a generous sprinkling of the masculine pronouns. As the author himself says: "This unfortunate situation (the artificial shortage of personnel) is not going to change until managers begin to challenge, examine, and correct these false assumptions in their hiring practices."

PAM MCPHERSON
Systems Analyst
Southeastern Massachusetts Univ.
North Dartmouth, Massachusetts

Structured programming

So now it's structured programming and chief programmer teams that will clear up all the troubles and make master programmers of all us clods. Pardon me while I yawn; I've been here so many times.

What do we have that's new? Write in small modules, with one entry and one exit point. That's the way good closed subroutines have been written ever since Maurice Wilkes taught us how to use them 20 years ago. Indent the various levels of logic; that has been around a long time. Avoid GOTO's; in well-written code, few are



needed. Just about everything I see in this new amazing concept was advocated some 15 years ago by Charles L. Baker at Rand.

I object to the implications in the articles. Already I have been asked "Do you teach structured programming at your university?" Well, no; we're trying to teach *computing,* which is a very broad subject, and programming is its smallest part. The writing of computer instructions, in whatever language, is a necessary thing, but far removed from the main problem, which is to get the desired solution organized in a logical and testable form. There is a strong implication

letters

that Utopia has arrived; that, by following some simple mechanical rules, all our computing problems will go away. Sorry, fellows, but I can't buy it. Every single advance in software (assemblers, compilers, subrouting, modular programming, flowcharting) has been introduced with exactly the same claims. Each such advance (and the totality of structured programming may well be one) adds to our bag of tricks. And none of them contributes very much to the real underlying problem, which is clear thinking in the area of problem solving.

FRED GRUENBERGER
California State Univ.
Northridge, California

It is with some irony, no doubt, that your headline in the December issue speaks of "revolution in programming." Evidently, putting a sophisticated tag on a simplistic idea is supposed to cause a shock. Why "structured" programming? Who can possibly support the contrary: programming without structure?

It is interesting to note that the concept really refers only to procedural coding. Nothing at all is mentioned either about data references or interrupt handling. If "structured" programming is a manner of "organizing and coding programs that makes the programs easily understood and modified" then it is not much more than a platitude, like urging "good and useful" documentation.

DAVID SCHECHTER
Arthur Young & Co.
New York, New York

Congratulations on the excellent articles on the coming revolution in programming by Dan McCracken, et al. At the U.S. Bureau of the Census, we have studied and experimented with structured programming for several months and began teaching it to our programmers on Nov. 5, 1973. In a recent survey of over 300 programmers this course was requested more than any other.

Anyone for founding a new industry-wide Special Interest Group for the Generation and Advancement of Structured Programming (SIG/GASP)?

PAUL D. OYER
U.S. Bureau of the Census
Washington, D.C.

Clean and tidy

This letter is being written in response to Dan McCracken's invitation at the end of his overview of structured programming. While I cannot clarify the history of structured programming, I have a suggestion on how to provide structuring facilities in languages (notably FORTRAN) which are not inherently capable of such techniques.

Consider an analogy between machine language and higher level languages. Most machines still require branch or jump-type instructions to implement control flow. Higher level languages mask these nasty features by providing constructs (such as CASE, IF-THEN-ELSE, etc.) which the programmer can use instead. The compilers still generate the machine-code branches, but they are removed from the realm of the programmer.

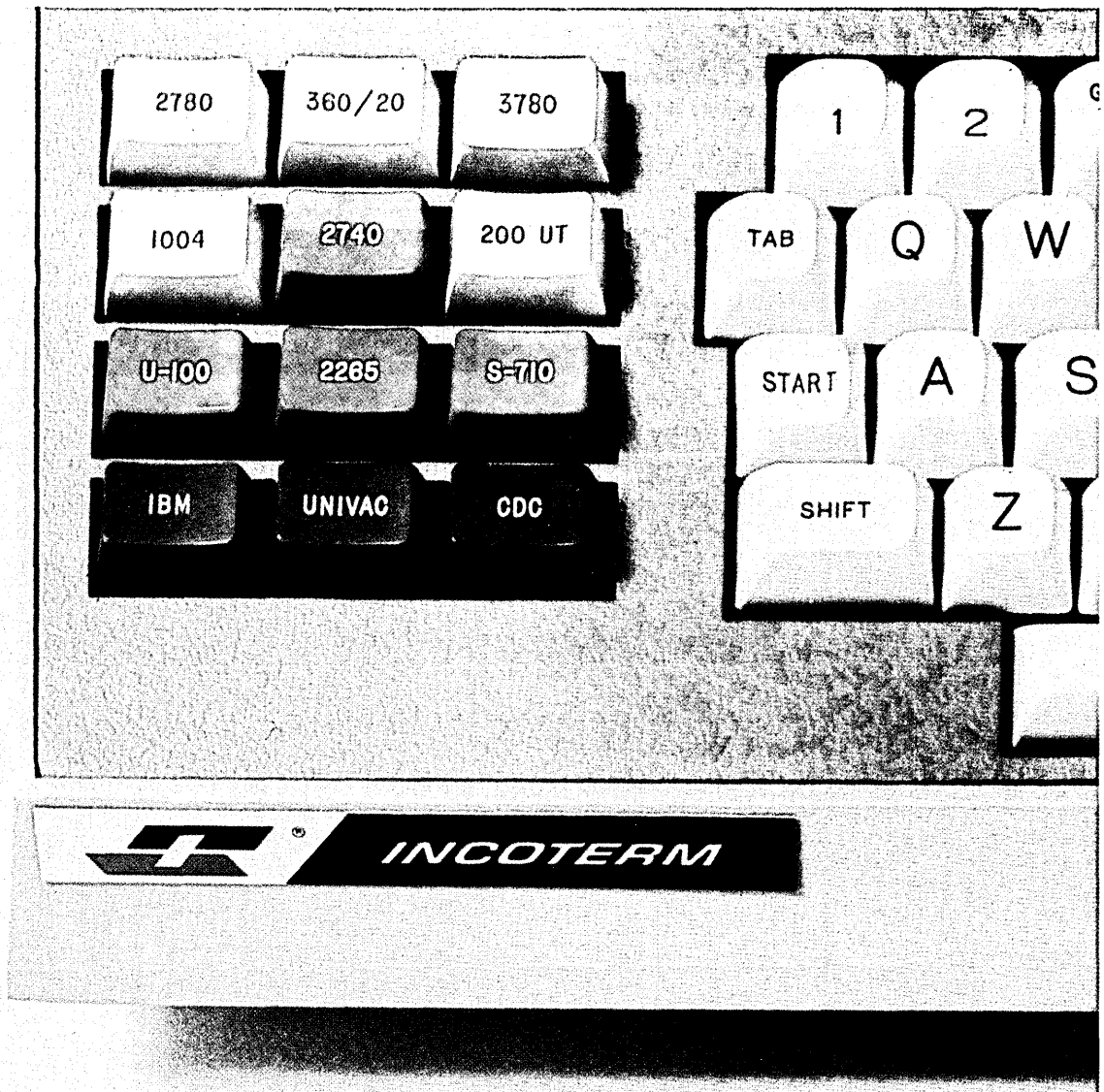
Now look at FORTRAN as an intermediate language: one which has good facilities for assignments, input/output, etc., but one which reverts to the lower level branching operations, specified explicitly by the programmer. Since it is virtually impossible to extend FORTRAN at this late date, what I am suggesting is to provide a program (pre-compiler, if you will) which would generate FORTRAN GOTO statements where required, much as other compilers generate machine-code jumps.

Most FORTRAN shops already have a FORTRAN pre-processing program (known variously as TIDY, CLEAN or some other such name). This program was written to clean up FORTRAN source programs. It primarily renumbers statements to make the programs easier to read. Many versions can also translate manufacturers' extensions to standard ANSI and indent DO-loops (as suggested by McCracken and hosts of others). My suggestion is to add a few "macro" facilities to these programs.

Suppose that we introduce some ALGOL-68 type control statements into the TIDY-acceptable source programs. To simplify recognition by both TIDY and programmers, use some special character to flag these keywords (i.e.,#).

Now, as TIDY is performing its passes over the source, let *it* generate any and all GOTO (and CONTINUE) statements necessary to reflect the desired structure in terms of valid ANSI FORTRAN constructs. As it does so, it would make comments out of the original structuring statements. The resulting programs would be standard ANSI FORTRAN (and thus would not require any extensions of any existing FORTRAN compiler). It should be noted that these techniques are fairly simple and almost any shop with TIDY should be able to add the required code.

RONALD HOCHSPRUNG
Northwestern Univ. Medical School
Chicago, Illinois □



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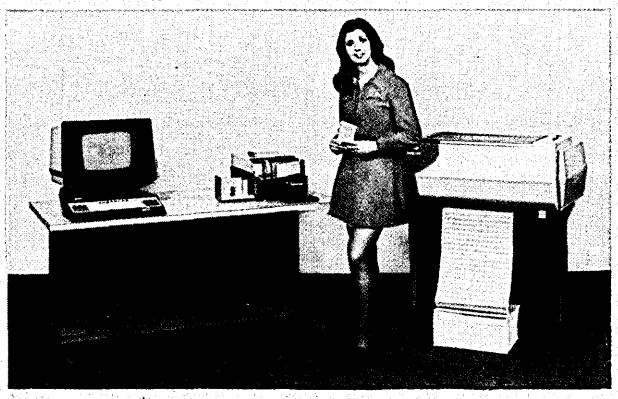

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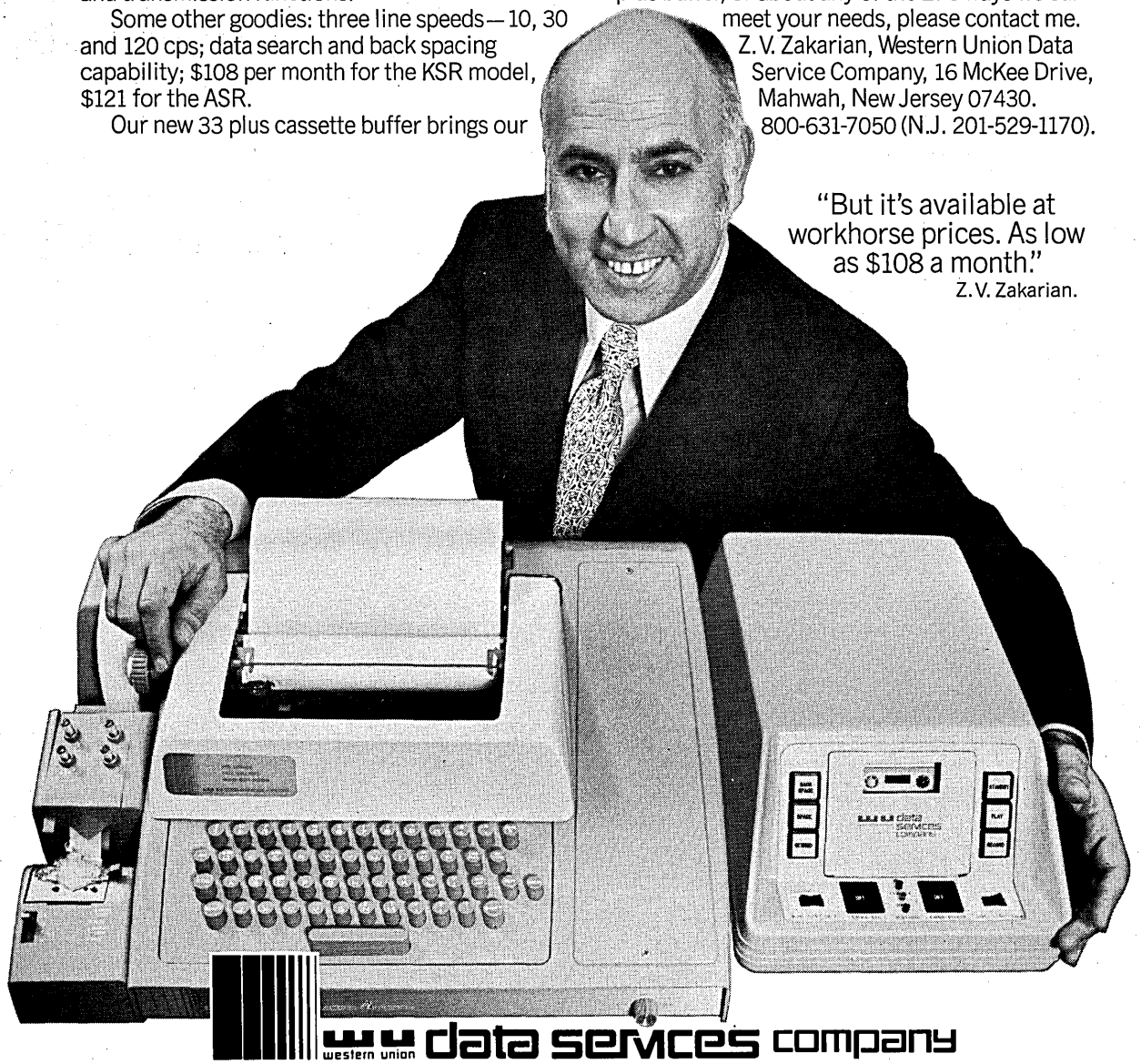

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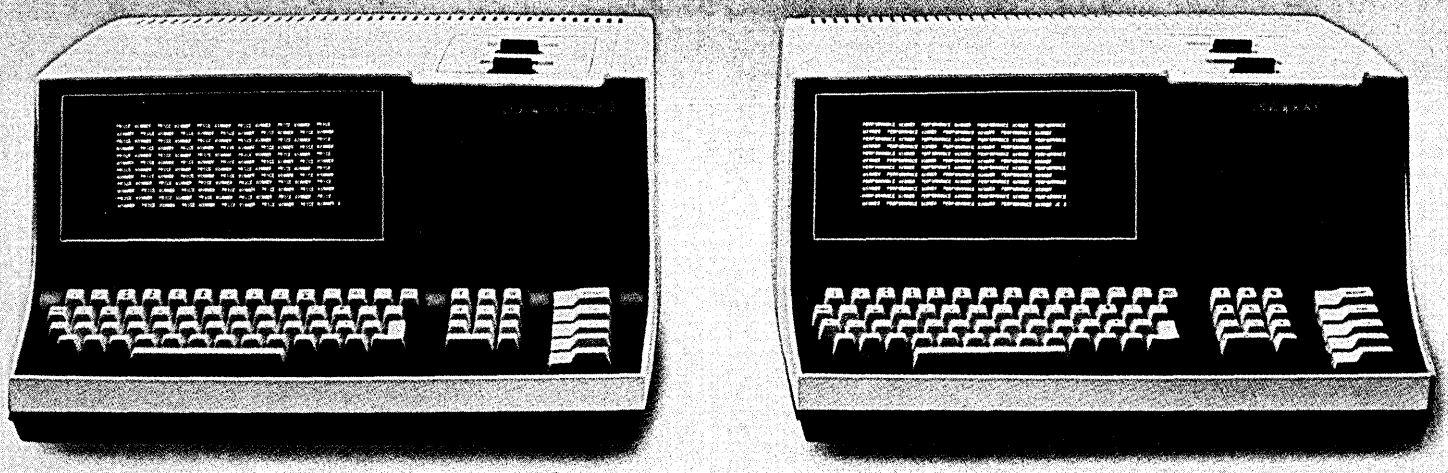
The Datapoint 1100 intelligent terminal



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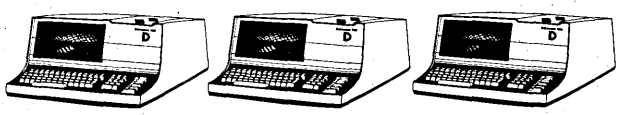

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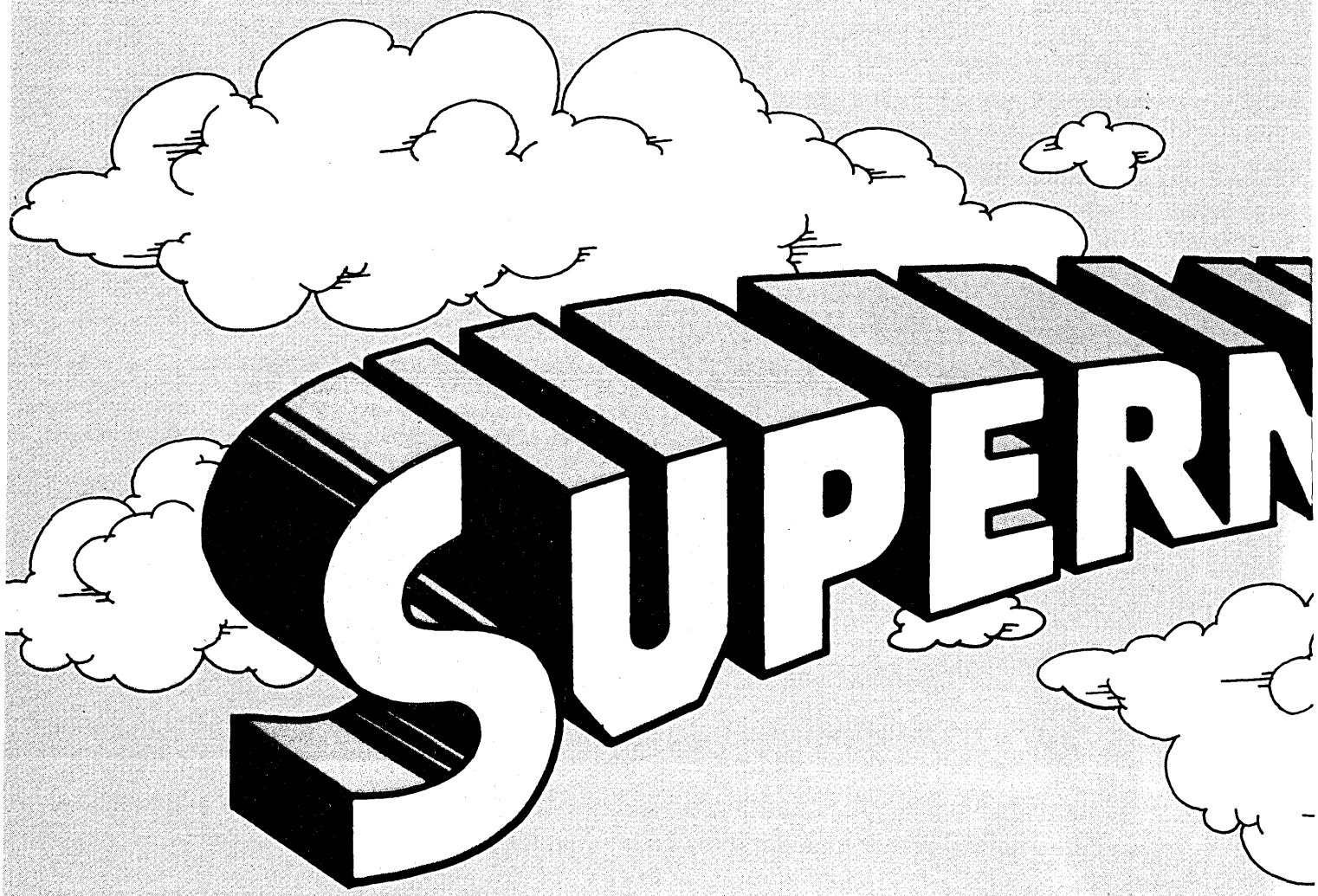

Our new RDS-500 minicomputer... a real hero for half the cost of a mere mortal.

Any minicomputer will cost you. Including our new Supermin.

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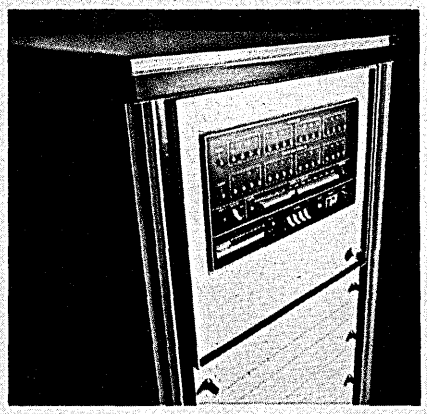

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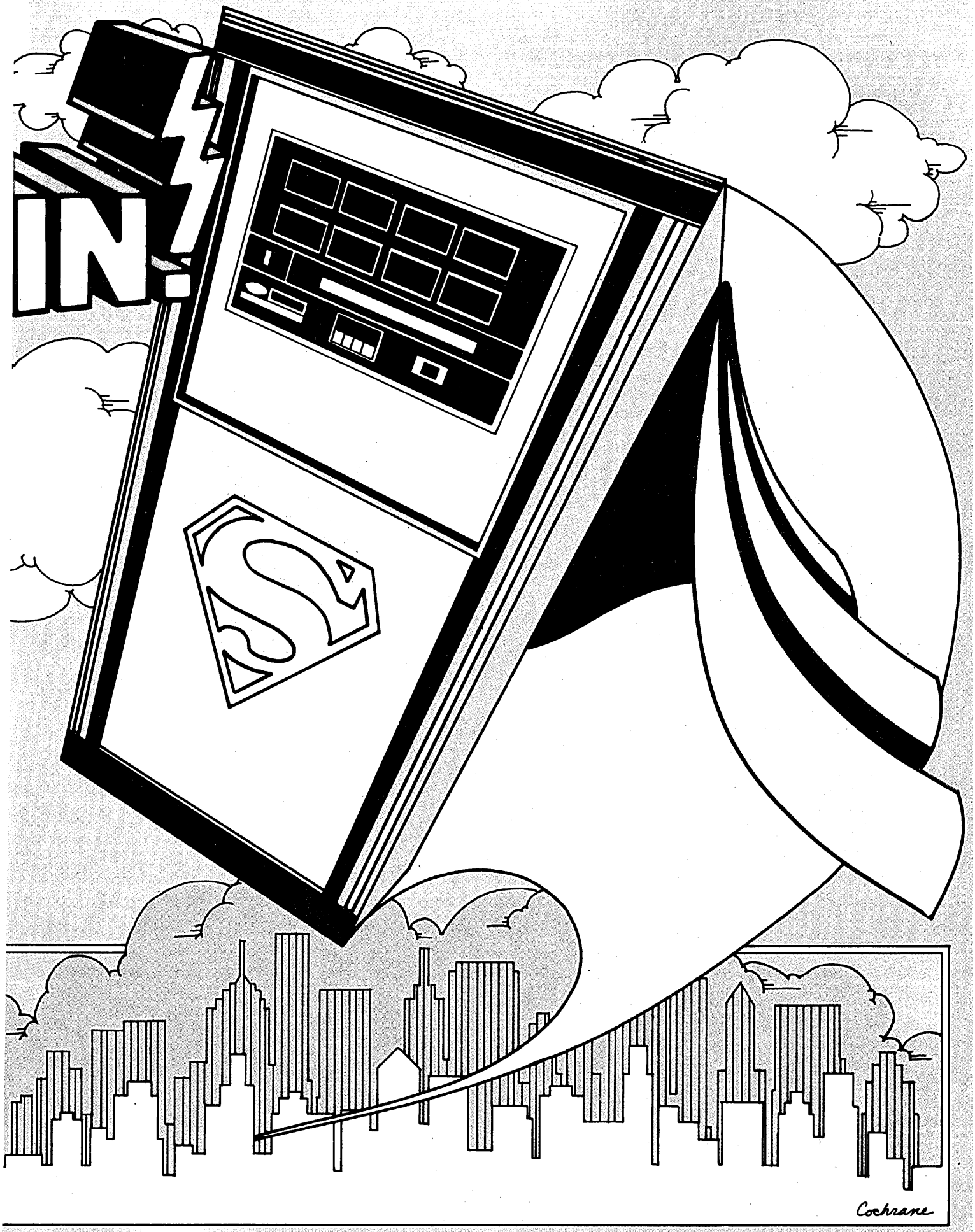

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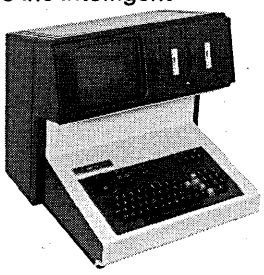

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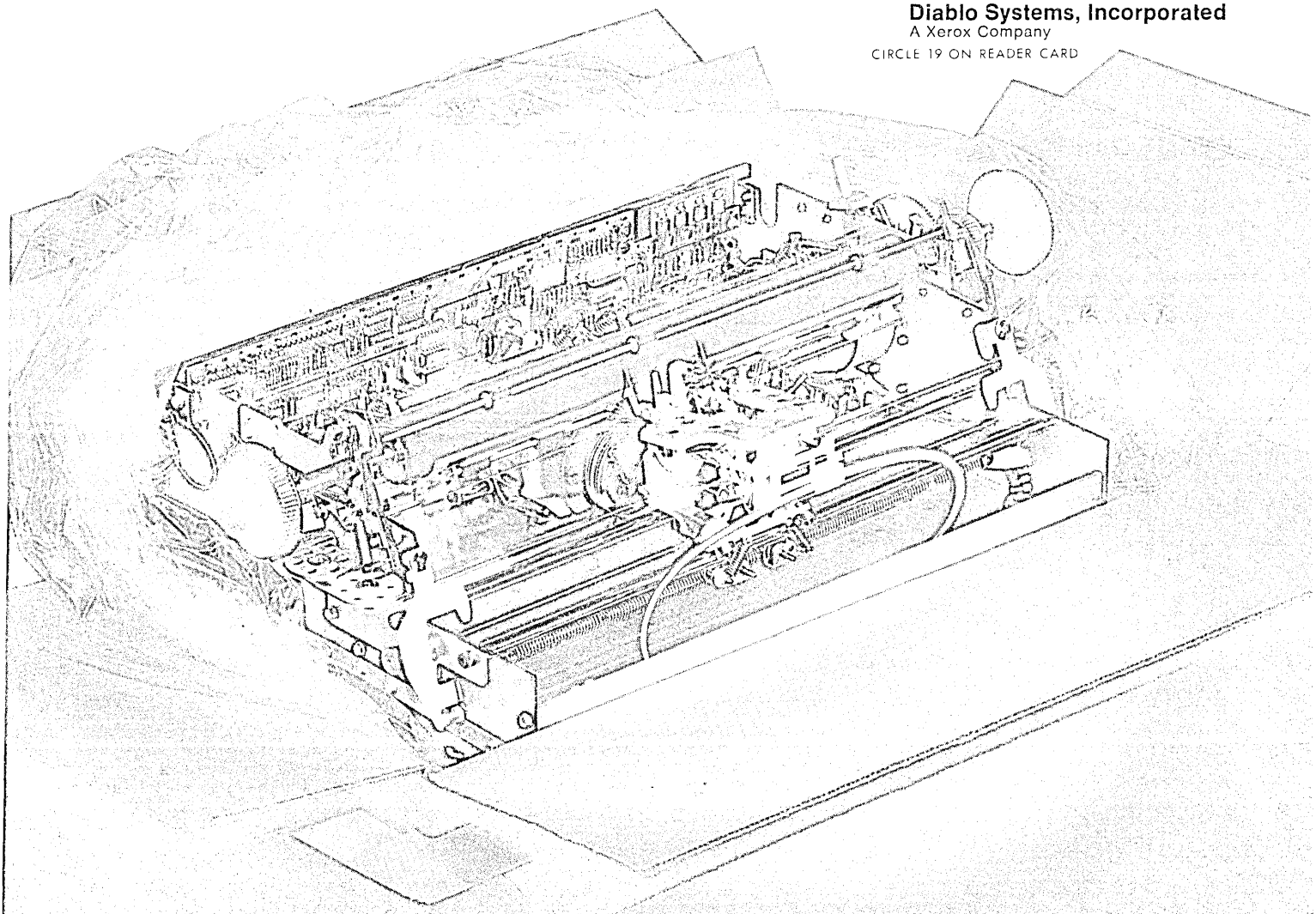

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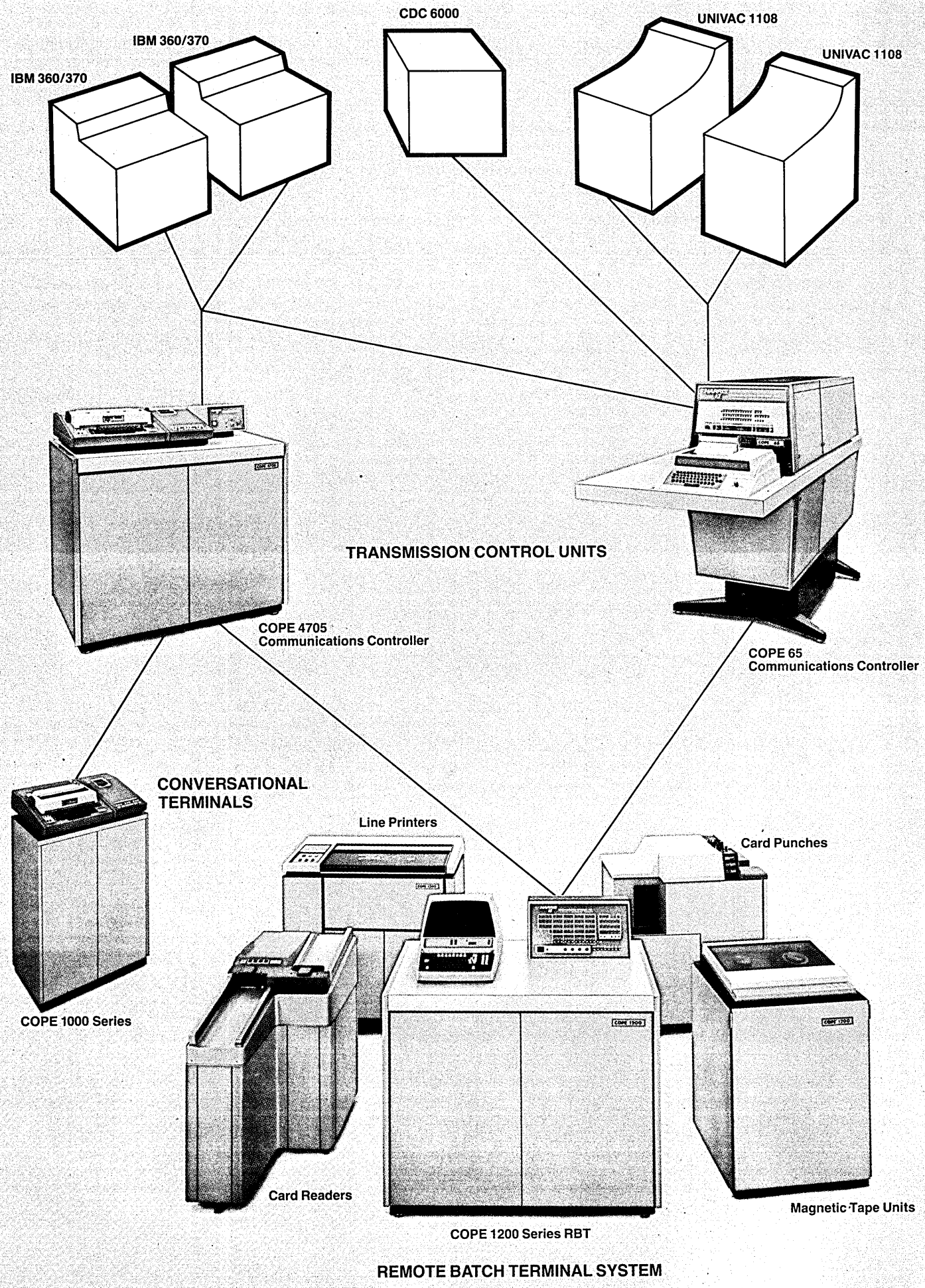

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The Gould 5100 has been specifically designed for scientific and engineering work where speed is essential, and where the ability to print out such materials as seismographic charts and A to D size drawings is required.

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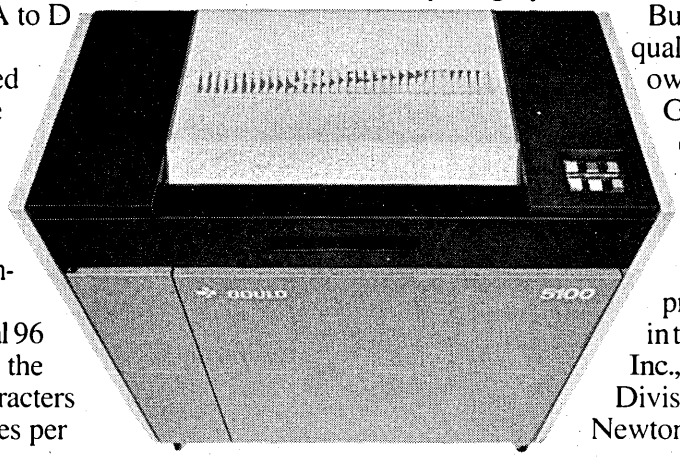
And Gould software is the most efficient and flexible available anywhere. In addition to the basic software package that emulates the widely accepted Calcomp graphics package, specialized engineering, drafting, scientific and business graphic software enables your computer to efficiently handle the most sophisticated computer graphics.



Built with traditional Gould quality, and backed by Gould's own reliable service, the Gould 5100 will greatly expand the efficiency and throughput of your production of computer-generated graphics. Let our Pete Highberg or Bill Koepf prove it to your satisfaction. Get in touch with them now at Gould Inc., Dept. D2, Data Systems Division, 20 Ossipee Road, Newton, Massachusetts 02164.

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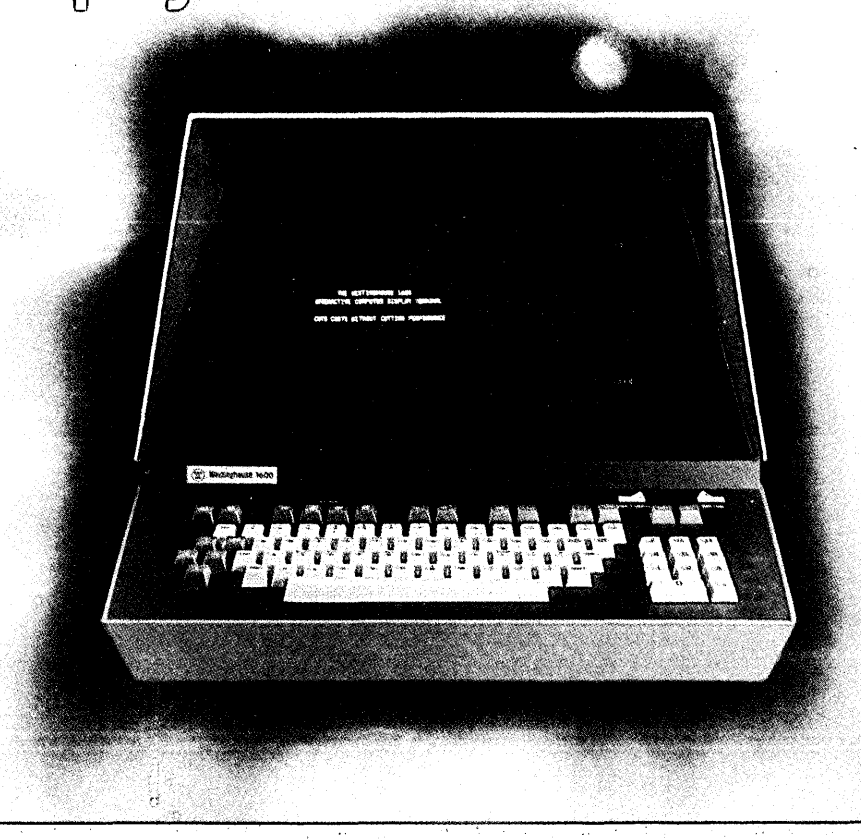

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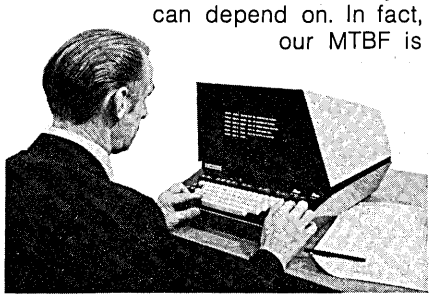

Besides reliability, the Westinghouse 1600 provides the user with exceptional flexibility thanks to an extensive range of features offered as standard in the base price. These include both synchronous and asynchronous operating modes, eleven switch-selectable data rates plus format mode and a full selection of edit functions. In addition, a low-cost option—station address for polling by computer—can yield significant cost reductions by line sharing.

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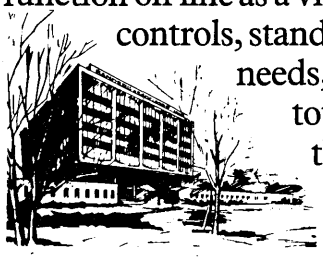

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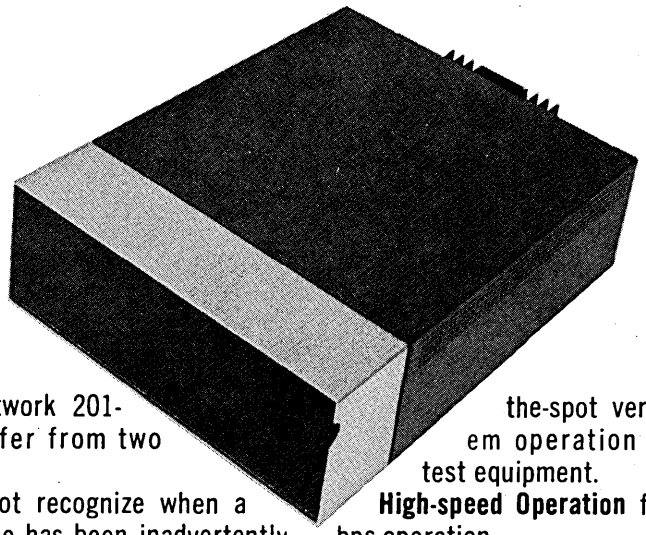
When your computer is talking to San Francisco and nobody's listening. . . it's expensive.

General DataComm's 201-5 Modem won't let it happen.



Most switched network 201-type modems suffer from two shortcomings.

First, they cannot recognize when a communications line has been inadvertently disconnected; unless an EOT (end-of-text) signal is received, they go merrily on with their transmission, even into a dead line. That's costly in telephone line charges and even more costly in wasted computer time.

Second, they have difficulty in slipping back and forth between data and voice modes with the result that they "forget" whether they should be transmitting or receiving or that they sometimes disconnect when they really mean to change modes.

General DataComm's 201-5 LSI synchronous modem has a circuit design that eliminates those two data transmission bugaboos. It also has a lot of other superior features like: **Built-in Diagnostics** which permit on-the-spot verification of modem operation without special test equipment.

High-speed Operation for 2000 or 2400 bps operation.

CBS or CBT Compatibility.

Interchangeable with Western Electric 201A modems.

Other General DataComm 201 modems are available with features to meet your special requirements — the 201-9 private line modem, for example, has addressable remote diagnostics so that you can test an entire nationwide network from one central point, and 201A-B/C modems are enhanced replacements for the corresponding WECO units.

Why not contact our applications manager, Jack O'Neil, for the full story. You can call him at (203) 762-0711 or write him at:

General DataComm Industries, Inc.

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NEW! Computer printout form with "Eye Track"* color guides for easier, clearer line-by-line reading of reports

Data is full size, not reduced to cause eye strain. Across-line reading is easier, faster.

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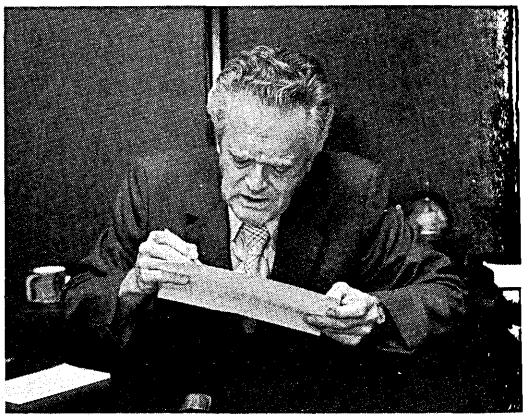
Now—line-by-line reading of your data reports can be easier, faster—without distraction from other data lines above or below. "Eye Track" color bars in the new Speediread computer printout form provide an ocular track to make across-line reading of data clearer, faster.

Specifically formulated color guides make each data line distinctive, independent of other data units, permitting undistracted, comfortable reading across the report. You read faster, with less eye fatigue, as data characters are full size, affording maximum readability.

The size of Speediread is also better for handling and binding. Its convenient 8½-inch depth offers 68 lines of data—its 14.3-inch width provides printout space for 132 characters per line. You literally pack more data into less paper.

Ask for test or working samples from your local Moore representative. Call the nearby Moore office or write to us at: Niagara Falls, N.Y., Oakland, Calif., Denton, Texas, Glenview, Ill.



Reduced-size data can cause eye strain, poor legibility, with blurred data lines hard to read.

SPEEDIREAD packs more data in less paper

Packs in data

More data per report—68 lines per form—full 132 printer characters across the sheet. And—every line can be read perfectly.

More readable

Eye guides of special warm and cool colors aid in across-form reading. Eliminates eye fatigue from reduced, blurred data lines.

Easier handling

Convenient 8½-inch depth for ease in reading reports. Bound easily, using marginal-punch holes. No additional prepunching or special holders required.

Saves trees

Less page depth than normal 11-inch depth—a saving of more than 25% in paper pulp. Less paper saves trees—a real aid in conservation, ecology.

Sequence

Multiple forms come from printer in exact sequence with no sorting needed. Eliminates need for resystematizing process flow.

Faster thru-put

8½-inch depth means faster computer skips over unused lines. Instant multiple copies eliminate need for extra data processing and equipment.

Highlights data

Speediread packs masses of data onto reports in blocks and lines. "Eye Track" color guides isolate each line.

Cuts storage space

Speediread is made with paper of lower caliper to ease bulky storage problems and reduce needed file capacity. Smaller cartons, too, cut storage space, reduce shipping costs, and are easier for operators to handle.

Full-size data

Full-size alpha and numeric characters—no reduction to cause illegible lines or data. All data on copies sharp and clear.

*Trademarks of Moore Business Forms, Inc.

CIRCLE 59 ON READER CARD

WAREHOUSE SHIPMENTS BY PRODUCT LI

WAREHOUSE	PLUMBING SUPP.	BLDG. HDWR.	IND. HDWR.	FINSH. M
ABERDEEN	202688.97		155473.19	104501.
AKRON		99634.31		74837
ALBANY				
ATLANTA				87835
BRENT	42688.57	183318.15		
BRYANT	117895.37		122674.72	5548
CHARLESTON	141444.46			
DALLAS				
DENVER		80985.29	86433.25	
EVANSVILLE				
FLINT	51669.50	267413.57		
FRESNO			326008.83	
INDEPENDENCE			194083.44	1207
JACKSONVILLE				
LIMA	171393.27	151333.41		949
LINCOLN				
MOBILE				
OLEAN				
PALMER				
PERRY				
PORTLAND			159623.18	591
PROVIDENCE		88466.33		
RHODES				
SALEM	52345.69	871151.06	1044296.61	5974
TULSA				
TOTALS	780125.83			

INCOMING SALES BY PRODUCT

DIVISION	PLUMBING SUPP.	BLDG. HDWR.	IND. HDWR.	FINS
ATLANTA	67748.30	81260.60	87773.50	7
BALTIMORE	91355.40	103176.60	120066.90	4
BOISE	44672.50	54293.80	79823.80	6
BOSTON	85563.60	52055.10	103990.20	8
CHICAGO	73913.90	99639.80	165997.70	
DALLAS	73189.50	65219.90	90415.30	
DENVER	90054.20	90337.60	56229.50	
INDIANAPOLIS	66681.70	24479.40	62422.40	
KANSAS CITY	82158.80	145423.40	63273.80	
LOS ANGELES	136515.50	115307.80	142831.90	
NEW YORK	118891.40	138424.90	158627.40	
TOTALS	930744.80	969618.90		

Patent Pending

SPEEDIREAD "EYE TRACK" COLORS BY WORLD'S LEADING COLORIST

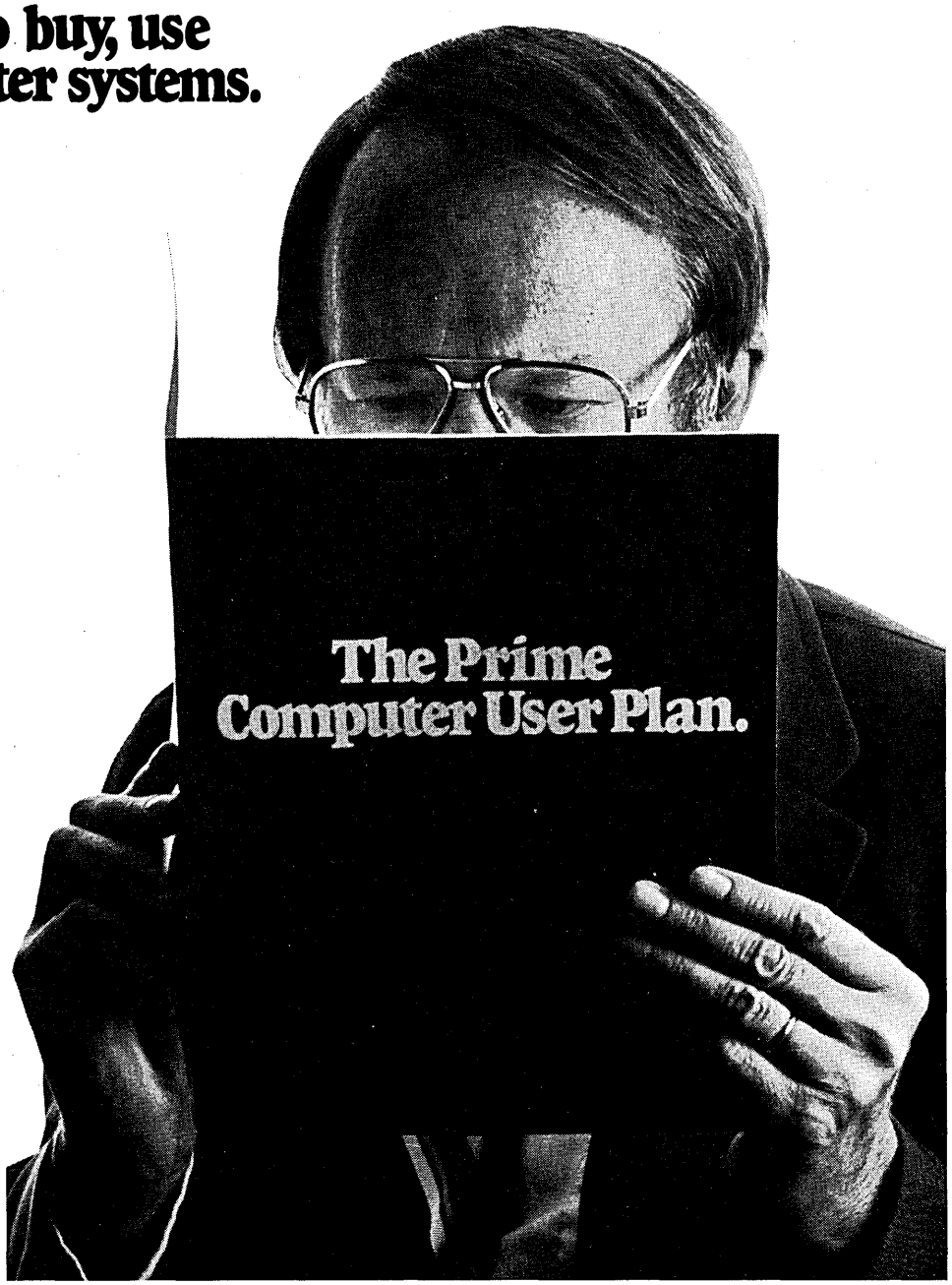
Colors used in Speediread were selected and specified by world-famous color perceptionist Domenico Mortellita, chairman of the DuPont Color Council.

MOORE

MOORE BUSINESS FORMS, INC.

The Prime Computer

A totally new way to buy, use and upgrade computer systems.



The Plan introduces the first two-year guaranteed trade-in schedule. This program fully protects your computer investment when it's time to expand. Grow as much and as fast as you wish. The Plan will back you all the way.

The Plan protects your budget by eliminating arbitrary system packaging. You only buy what you need. With 3 discount schedules, you need pay as little as possible.

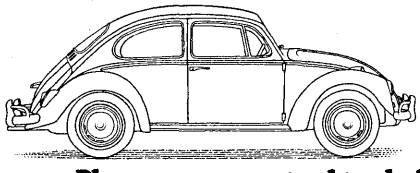
The Plan also protects your software investment. Only Prime offers upward *and* downward system compatibility. Without modification.

The Plan offers a whole new maintenance procedure, too. Built-in integrity checks can isolate a fault to a circuit board and maintenance is as simple as replacing the board.

There's even a program called Air Spare. It's fast delivery of a backup board and low-cost repair of the defective one.

Everything we offer at Prime, hardware, software and support, works together as a logical system, be it large or small. You can put together a powerful, reliable, easy-to-use computer system at a better total system price than ever before possible. The Plan shows you how.

Read on.



Plan on a guaranteed trade-in

You can start your system with any Prime Computer. If, for any reason it isn't the best one to handle expanding applications, trade it in. Trade all of it or parts of it. Trade whatever is standing between you and better performance.

For instance, to upgrade from a Prime 200 to a 300 processor, simply trade in the original processor board. You can then plug in a fully equipped* Prime 300 for $5000 (less a 50% trade-in credit for certain optional features on the original processor).

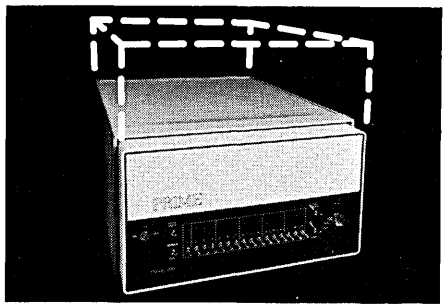
You can also elect to keep the original processor as a spare. The cost is only $1000. Keep your original power supply, memory and chassis, too. Or selectively upgrade any of them under similar trade-in arrangements.

Of course, all the software written on the original system

*Standard features include: virtual memory, restricted execution mode, memory protection, byte parity, extended direct addressing, integer multiply/divide, direct memory access system, automatic program loaders and microverification.

User Plan.

will run on the new one without modification. Only Prime makes this possible. Only the Prime Plan guarantees it.



Plan on unheard of compatibility

You can write real-time and time-independent programs on any Prime processor, in any language, under Disk Operating System control, or as stand alone programs, using a common set of support packages. You can then execute the developed programs on the same or any other Prime processor under Disk or Real Time Operating System control, or as stand alone programs—without modification. Furthermore, the Prime 300 supports a multi-user, virtual memory version of the Disk Operating System (DOS VM) and a foreground/background version of the Real Time Operating System (RTOS VM).

Choose Any Processor	Choose Any Development System	Choose From Support Packages
100 200 300	DOS Stand-Alone	File Systems Libraries Utilities IOCS Drivers

Choose Any Language	Choose Any Operating System
Macro Assembler FORTRAN BASIC	DOS RTOS Stand-Alone

Plan it right, right off

The right combination of computer resources are all here and they're yours to select.

Pick a processor. Enhance it with options if you wish. Select memory size and speed. Add peripherals and controller.

		PROCESSOR					
		100		200		300	
Memory	First Increment	4K	8K	4K	8K	8K	8K
	Cycle Time	1 μsec	1 μsec	750 nsec	750 nsec	750 nsec	600 nsec
	Parity	no	no	yes	yes	yes	yes
Chassis	5 Slot	x	x	x	x		
	10 Slot	x	x	x	x	x	x
	17 Slot	x	x	x	x	x	x
Features	Battery Backup	x		x		x	
	Automatic Prog. Load	x		x		x	
	Direct Mem. Access	x		x		x	
	Integer MUL/DIV	x		x		x	
	Extended Direct Addressing			x		x	
	Microverification			x		x	
	Single Precision Floating Point Arith.			x		x	
	Double Precision Floating Point Arith.			x		x	
	Writeable Control Store					x	
	Virtual Memory					x	

Then package the electronics in the right size chassis and you're done. We'll provide the right power supply to handle whatever you put together.

There are no arbitrary restrictions. No surprises, either. With the chart above you could start planning now.

Plan on running full time

Prime service is every bit as sound as its technology. It's just as inventive, too. For instance, you can pick a full service contract or choose to use our services only when required. In either case we maintain a nationwide network of service and customer service representatives. They're ready to help.

We even have a way to hold maintenance costs to an absolute minimum. We call our idea Air Spare. For $200 we'll loan you a spare (processor, memory or controller). We'll then repair the faulty unit while you keep on running. And better than running, the whole replacement is handled by air express.

Read more about it in the Plan.

One more thing to plan on

The Prime Computer User Plan is a unique and remarkably logical document. You've just been treated to a sampling here. For the first time you'll know everything to expect in a computer system. Read the Plan. Send for it today.

To: Prime Computer Inc.
23 Strathmore Rd.
Natick, Ma. 01760

☐ Send the Plan
☐ Send Planner
(He'll call for an appointment.)

Name

Title

Company

Address

City State Zip

PRIME

Editor's Readout

EFTS: THE FED MEANS BUSINESS

The Federal Reserve Board is about to take us one step closer to the "checkless/cashless" society. Alarmed by the rapidly growing use of checks (they estimate a doubling of the present 25 billion items a year over the next decade if the trend continues), the Fed has issued proposed regulatory changes* governing the use of their interregional electronic funds transfer network, the underpinning of the nation's payment mechanism.

The proposal is "intended to delineate the legal rights and responsibilities of the parties to electronic transfer of funds using the Federal Reserve facilities." It expands "Regulation J," which governs the current system's check collection procedures, by establishing rules under which Reserve banks could accept and deliver both credit and debit transfers by wire over the Fed's national communications network. The Board not only asks for comments on the proposed regulation, it is also seeking opinions on what it considers the big picture. Specifically, who should own and operate the electronic payments system; who has access to the system and on what terms; and how should costs be allocated. Deadline for submissions is March 8, a longer than normal period (the proposal was issued on November 19, 1973), reflecting the Board's desire for feedback on the broad issues as they see them.

The proposed regulation is at best sketchy; if an electronic funds transfer system (EFTS) were grown from this rocky soil, it would evolve like a Los Angeles suburb—sprawling and unwieldy, difficult to administer, and in constant need of repair. However, the Fed's offering seems to be in the nature of a trial balloon, and, if our conversations with concerned individuals in and out of the financial industry are any indication, the Fed can anticipate a massive response. A good deal of that response will be concerned with what's left out of the proposal rather than what's in it.

For example, there's no mention of line security and error checking even though there's been a good deal of press lately about the "new criminal," the electronically adept crook who makes the computer his accomplice. Feeling the need for a new car or perhaps a trip to a country with no extradition laws, he may decide to tap into the EFTS, electronically transfer funds from a well-stocked, pre-selected account into his own, cash in, and leave.

Comparison of a signature card against the signature on the back of a check is a currently valid security technique; when the piece of paper is replaced by an electronic impulse, how will the counterfeit be detected?

It might also be possible for an enterprising business or individual to snarl the finances of an enemy or a particularly troublesome competitor. Using a legitimate company, the perpetrator may be able to initiate debits against his enemy's accounts from insurance companies, stores, and utilities, leaving him with a mess that may take months to unravel. There is no precise indication in the proposed regulation as to how the individual or business will be appraised of debits to his account. Will there be a daily statement? Will the account holder have to watch his account constantly in order to identify unauthorized withdrawals and initiate action to have them corrected? Plans for such measures as encryption, passwords, call-back to verify, or other security and error-checking techniques must be incorporated into any proposed system.

Another glaring omission from the Fed proposal is a safeguard to individual privacy. At the present time the sheer volume of separate checks makes data correlation difficult and builds in a measure of protection. But, if data on individual and business transactions are centralized, correlation becomes feasible and information on an individual's financial life becomes much easier to access.

The first question is who owns the data? And how will the owner, whether it be the Fed, or a combination of the Fed and the participating users of the system, allocate access to the data? To what extent, for example, will the Internal Revenue Service be allowed to tap the data base?

As the commercial banks and the Fed continue their push toward a national system, the attractiveness of the new and inexpensive financial services —such as automatic depositing of payroll checks, and pre-authorized payments of fixed monthly bills—will eventually lead to widespread customer acceptance of EFTS. We'll probably never reach the stage where checks or cash become totally abolished, but it may become increasingly difficult to purchase goods and services as the retail sector reacts to public acceptance and such advantages as instant credit checking and security (less cash on hand for would-be robbers).

It all sounds wonderful but what happens to the individual who either chooses not to become a part of this highly automated system, or, because he does not fit a pre-established norm, is refused access to the system? Unless, like Euell Gibbons, he can wander the woods and fields eating pine trees and dandelions, he's in trouble.

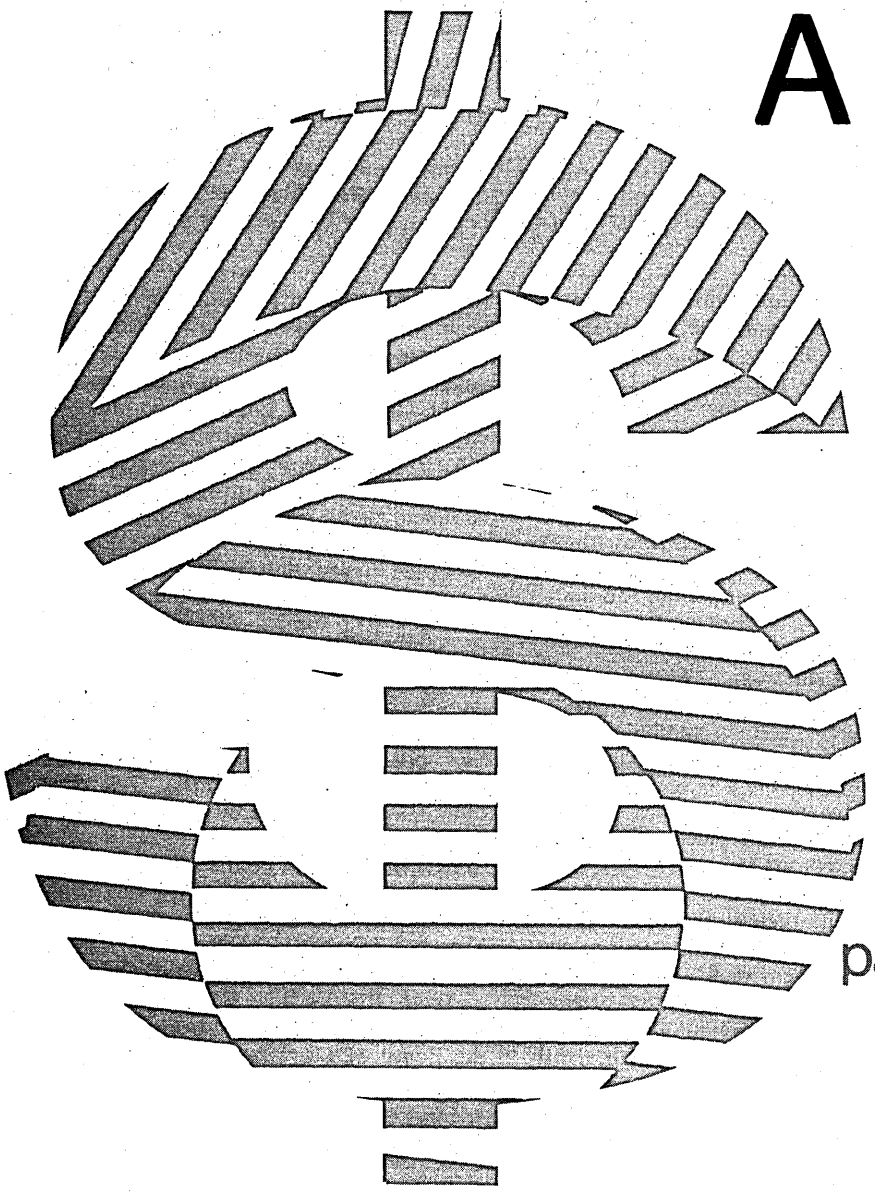
And then we have what Bob Long at the Bank Administration Institute calls "system shelters," the loophole in any system that is doggedly sought for and exploited by its users. In the case of banking, it's that great American game called "float." Individuals play it, corporations play it. When EFTS starts and the float sinks, which members of the Fed system will be gainers and which losers? And although the more virtuous among us may state that float is immoral and good riddance, we've all been doing it for years. How we make the transition to a floatless society ought to be on the Fed's mind. (They might contact their European counterparts who have been thinking about EFTS for years.)

Although the Fed proposal is incomplete, its issuance does serve notice that EFTS, long considered a technological pipe-dream that might come to pass sometime in the indeterminate future, is just around the corner. There seems to be a tacit assumption on the part of the Fed and the financial community that such a system is inevitable and desirable. This may well be the case, but, before proceeding any further, the Federal Reserve Board should, in a definitive study, show justification for implementing EFTS. The study, which would be the cornerstone for substantial public debate, should address sociological as well as financial considerations. Alternatives to EFTS should also be a part of the package.

Again, the deadline for comment is March 8. The address is: Secretary of the Board of Governors, Federal Reserve System, Washington, DC 20551.

—John L. Kirkley

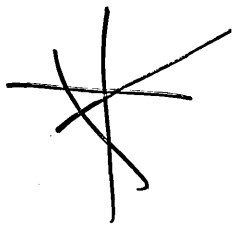
*Federal Reserve System (12 CFR Part 210) *Transfer of Funds Through Federal Reserve Banks.*



A SURVEY

by Richard A. McLaughlin, Articles Editor

Budgets for 1974 have that lean and hungry look. Expenditures will be up, but not by the big percentages we are used to. Hardware is up 9.2%, people costs up 7.3%, and other items up 6.3% overall. Outside services are being cut back. Data communications money is up again, but the big sleeper is in packaged software. Here is where the money is being spent, and by whom.



OF 1974 dp BUDGETS

The year 1974 opened to mixed reviews. 1973 had taken its best shot and left us feeling the pinch of uncontrolled inflation, coupled with shortages in energy and materials. Many strings of lights were left packed in the rafters in hopes that next Christmas would bring enough electrical power to run them. And data processing managers were worrying about supplies they had long taken for granted—in things like continuous forms and card stock.

All of the things that were happening in the "outside world" were having their impact on dp planning. To find out how much, DATAMATION conducted an in-depth survey of several hundred dp installations. We found guarded optimism, some shuffling of dollar resources, and a "steady as she goes" attitude. In general, we found the installations were reacting to outside forces, not anticipating, not innovating. For instance, though we found managers who were willing to stockpile as many forms as they could, we didn't find many that were allocating funds for standby power supplies.

Data processing is still big business, but if our picture of it is representative, the rate of growth of the industry has slowed from a canter to a crawl. As far as we can determine, dp expenditures ran about $26 billion last year, and may go to $28 billion in 1974. The dollar amounts are impressive, but inflation alone could account for much of the difference between the two figures. There isn't much space for expansion.

Where dp installations planned budget increases averaging about 11% last year (and generally spent just a *little* over their budgets), the plans now allow for an increase of only 8% this year. And half of that will go towards increased personnel expenses. Dp sites are still upgrading hardware and taking on new applications, but perhaps at a slower rate than they once did.

That doesn't mean that the workload is being proportionately held in check. In fact, things are up about 20% measured in jobs per month or in total transactions. What it boils down to is that the dp manager is being pressured to produce more output for very little more money. Sounds like home, doesn't it?

How will they do it? Partly by switching over to extended term leases (especially now that IBM may not be able to enforce its early cancellation penalty clauses), partly by cutting down on outside services, and partly by shaving a little here and there on small items like the phone bill (on the lines that don't carry data). Some reasonable-sounding alternatives are *not* being considered. In particular, we could find no indication that users planned to switch to independently manufactured peripherals, or to third-party leases. Those that have independent peripherals or outside leases will keep them; other folks will mostly keep what they have, too.

The big picture is that people costs are budgeted for a 7.3% increase, hardware gets 9.2%, and everything else heaped together gets 6.3% more this year. But the gross figures don't mean much unless you know where the money is going. A System/3 installation isn't likely to be too concerned about how General Motors spends its dp money, either. Therefore, instead of running one big survey, we actually ran seven small ones in parallel. We split up our sample based on hardware dollars, and separated those from Canada for special consideration. We ran the same analyses against each group, and found a surprising amount of agreement.

In setting up the six basic U.S. groups, we included sites that spent a certain number of dollars per year on hardware regardless of whether that hardware was rented, purchased, or leased. The only major hitches were that we had to learn how many dollars are being *amortized* each year for the purchased equipment, and had to make certain that all the numbers include maintenance. Both of these things were done, so that the members of each group are as alike as we could realistically make them.

SURVEY
1974 BUDGETS

One thing we found to be true of nearly all sizes of computer sites was that more money is being budgeted for acquiring software in 1974. Part of this increase may be the delayed effects of IBM's unbundling, but there's more to it than that. Software funds to be paid to the mainframe vendors are up something like 50%, but the increase in funds for software from independent sources is up well over 100% in most cases. Although it is true that a larger percentage of users pay for software from their computer vendors, the smaller group that buys outside packages actually spends more.

Another thing we saw is that despite all the flap about computer abuses and unauthorized access to data, very little is being budgeted for security. Funds earmarked for security may actually fall into other categories, like space rental and overhead. But if this is true, it suggests that no special kinds of precautions are being taken for dp security.

Another even stranger lapse comes in the area of training. Ours is a people-intensive industry. Dp shops spend far more on people than on machines. Yet in our whole survey we found only five or six people with titles like "trainer," and the budget percentage set aside for training is miniscule.

Finally, the use of outside services of all kinds, service bureaus, contract programmers, and consultants, seems to be down across the board. There is still hope for the consultants though, it turns out that Canada wants them.

Please keep a couple of things in mind when reading the following summaries and charts. Every manager breaks down his budget differently. In order to have any kind of consistency in our data, we had to request that the managers translate their budgets to our way of doing things. This took a couple of hours in most cases, and sometimes they succumbed to the temptation to lump things together. We suspect this happened in hardware, for instance, where the money for peripherals was sometimes lumped into the cpu/memory category.

Also, the figures we present in the charts are averages. A small number may mean that people spend very little on that particular item, or that very few sites budget for it, or both. This kind of thing happens with Computer Output Microfilmers (COM), for instance.

We think the overall drift, the relative differences in the sizes of the numbers, tells more than the actual figures.

Less than $25K/year

Spending $25,000 per year will do a lot for you in terms of cars, refrigerators, and penthouse apartments if your tastes aren't too extravagant. In data processing hardware, this amount limits you to an IBM System/3 Model 6, a 1401 if you still have one, or an NCR Century 50. Some high-class accounting machines fall into this category, too. It was the smallest group we surveyed, but making the survey sample larger probably wouldn't have changed our findings much. In computing, you can't do much on a $2,000-a-month budget, and you must be truly inventive to make that budget very complicated.

As in most data processing situations, people are the biggest expense items for the small shops, running over half of the total yearly expenditure. This was the only category of users that actually budgeted an overall *decrease* in money for supplies and accessories and other non-hardware items. These are often entry-level shops, though, and we think the decreases reflect the fact that the second or third year's running costs less than startup. One factor that seems to reinforce this impression is that 1973's spending included money for consultants' fees, and in 1974 the shops all plan to go it on their own.

$25K to $100K/year

A shop spending up to $100K/year ($8,333/month) on hardware may have a System/3 Model 10, a Burroughs 1700, NCR Century 100 or 200, a Honeywell 105 (sometimes even an HIS 2030), or a Univac 9300. In most cases, these are batch-oriented shops,

PERCENT OF BUDGET DEVOTED TO HARDWARE BY INSTALLATION SIZE

	to $25K/year	$25K to $100K	$100K to $250K	$250K to $500K	$500K to $1M	Over $1M
CENTRAL SITE HARDWARE						
Data Entry Equipment	7.28%	2.81%	3.05%	4.51%	3.20%	0.90%
Computers/Memory	16.62%	24.93%	18.91%	15.93%	18.76%	18.28%
Peripherals	0.00%	5.39%	7.54%	12.75%	8.61%	13.34%
Computer Output Microfilm	0.00%	0.00%	0.36%	0.18%	0.29%	0.66%
Film Readers, Printers, etc.	0.88%	0.18%	0.12%	0.12%	0.12%	0.07%
Auxiliary Equipment	1.35%	0.69%	0.49%	0.59%	0.74%	0.46%
Communications Gear	0.00%	0.32%	0.98%	1.95%	1.36%	1.20%
Other	0.00%	0.91%	0.57%	0.12%	0.16%	0.92%
Central Site Total	26.13%	35.23%	32.02%	36.15%	33.24%	35.83%
REMOTE SITE HARDWARE						
Computers/Memory	0.00%	0.05%	0.92%	0.59%	1.63%	6.47%
Terminals	0.00%	0.81%	0.96%	2.41%	1.28%	2.99%
Communications Gear	0.00%	0.15%	0.23%	0.23%	0.06%	0.82%
Other	0.00%	0.07%	0.39%	0.10%	0.00%	0.23%
Remote Site Total	0.00%	1.08%	2.50%	3.33%	2.97%	10.51%
TOTAL HARDWARE BUDGET %	26.13%	36.31%	34.52%	39.48%	36.21%	46.34%

PERCENT OF BUDGET DEVOTED TO OTHER EXPENDITURES BY INSTALLATION SIZE

	to $25K/year	$25K to $100K	$100K to $250K	$250K to $500K	$500K to $1M	Over $1M
ITEM						
Communications Lines						
Data Lines	0.00%	0.14%	0.44%	1.58%	0.38%	1.57%
Voice Lines	0.00%	0.03%	0.12%	0.19%	0.46%	1.28%
Total Line Charges	0.00%	0.17%	0.56%	1.77%	0.84%	2.85%
Software	0.00%	0.46%	0.79%	0.94%	0.81%	1.05%
Media and Supplies	22.05%	6.99%	5.45%	6.85%	7.03%	3.88%
Security	0.00%	0.24%	0.17%	0.10%	0.54%	0.25%
Outside Services						
Time-Sharing	0.00%	0.35%	0.21%	0.29%	0.01%	0.35%
Batch Processing	0.00%	0.12%	0.19%	0.05%	0.02%	0.55%
Remote Batch	0.00%	0.45%	0.40%	0.00%	0.00%	0.00%
Film Processing	0.00%	0.08%	0.23%	0.07%	0.16%	0.04%
Total Outside Services	0.00%	1.00%	1.03%	0.44%	0.19%	0.94%
Outside Personnel						
Consultants	0.00%	0.23%	0.45%	0.17%	0.95%	3.08%
Contract Programmers	0.00%	0.92%	0.19%	0.02%	0.00%	0.86%
Temporary Help	0.00%	0.23%	0.55%	0.25%	0.33%	0.62%
Total Outside Personnel	0.00%	1.38%	1.19%	0.44%	1.28%	4.56%
Miscellaneous	0.00%	0.66%	0.45%	0.41%	0.00%	0.70%
TOTAL OTHER BUDGET %	22.05%	10.90%	9.64%	10.92%	10.69%	14.23%

but an increasing number of those at the higher end are moving into teleprocessing.

As mentioned above, one "truth" we discovered about nearly all of the shops of all sizes is that software expenditures are going up. In this group, nearly a third of the shops giving us a detailed breakdown of their budgets had set aside something for software from their mainframe manufacturer, and they had set aside 25% more cash than last year. Half that many set aside funds for software from independent vendors, but they spend more, and they have budgeted *an increase of over 300% (a total of four times last year's sales)*.

Only about 20% of the shops spend money on telecommunications, but there are twice as many of those people as there were last year, and they are earmarking more than twice as much as they did in 1973 for remote site communications hardware, terminals, and data lines. Remote site expenditures, on the whole, are up over 40%.

Other big increases this year are for contract programmers. Again, only one shop in five hires outside programmers, but they are planning to spend nearly three times as much this year as was spent by this class of shop in '73. Money for consultants is up too, but only about 10% of the shops are involved.

These sites are being impacted more than any others with the increase in the cost of supplies. The supplies budget is up over 19% compared to the average rise of 13%. We'd guess that they are most often running high-pressure schedules of nearly 100% production work. They're probably flogging their machines for all they are worth, and are especially vulnerable to the rise in the cost of paper.

They get an extra point for being concerned with security too; the money for this is up over 50%.

$100K to $250K/year

This category (up to $21,000/month) includes shops with IBM 360/30s and 40s, 370/125s and 135s, NCR Century 300s, HIS 2200s, or RCA/Univac Spectra 70/35s. About a third of them are into teleprocessing. As a percentage of the "average" budget, data lines are up 66%, central site communications hardware is up nearly 25%, and remote site communications hardware (not terminals) is up over 40%.

Software dollars are growing as a percent of the budget, and 50% more sites are buying software from their mainframe manufacturers (presumably they are learning about unbundling). Again, fewer of them are spending more dollars on outside software, but for some reason we cannot explain fewer people are buying from independents this year in this size shop.

Like the next smaller-size shop, these installations are paying more for security. (Equity Funding's computer operation is about this size, by the way.) Still, very few of the shops in this category are greatly excited about the security problem, at least as far as their dp budgets go.

Outside people services, contract programming, consultants, and temporary help are down. So are outside batch processing and remote batch services. Meanwhile, the cost of salaries and fringe benefits is up, so maybe these shops are doing more in-house.

There's an increase in interest in computer output microfilm, too. Although it still affects only 10% of the group, that's five times as many people and more than five times as many dollars as last year.

$250K to $500K/year

We usually consider computer departments of this class "middle size," although nearly 90% of all U.S. computer departments are smaller. These are the people running a 360/50 or even a 370/145, or a Univac 1106, a CDC 3500, HIS 2070, or multiple cpu's that add up to $42,000/month. The machines are supporting remote sites half the time, and the budget allotted to central site communications hardware leads us to believe they often obtain a front-end processor to support the terminal load. They spend a lot on terminals, more than twice what the next smaller shop does. They're planning to

PERCENT OF BUDGET DEVOTED TO PERSONNEL BY INSTALLATION SIZE

ITEM	to $25K/year	$25K to $100K	$100K to $250K	$250K to $500K	$500K to $1M	Over $1M
Salaries and Fringe Benefits	50.92%	52.13%	54.91%	48.73%	52.03%	38.87%
Training	0.23%	0.28%	0.37%	0.40%	0.49%	0.25%
Conferences	0.10%	0.30%	0.39%	0.28%	0.24%	0.19%
Other (travel, etc.)	1.57%	0.08%	0.17%	0.19%	0.34%	0.12%
TOTAL PERSONNEL BUDGET %	51.82%	52.79%	55.84%	49.60%	53.10%	39.43%

PROCESSING THE SURVEY DATA

The dp managers who cooperated in our survey are from DATAMATION's Computer Executive Panel. The panel comprises over 1,000 dp executives from large and small companies scattered across the U.S. and Canada. Its members were chosen to statistically represent industries, hardware brand and size, and even parent company size ranges.

Nearly 300 of these people supplied their confidential budget information. We selected the responses that were the most detailed, setting aside those that were ambiguous or that had other problems. Some installations we learned about seemed to be going through a change of life: their 1974 budgets were either three or four times as large as their 1973 expenditures (or were one-third to one-fourth as large as 1973 expenditures). These, too, were set aside.

The result of this mechanical "smoothing" operation was a sample consisting of 181 "stable" U.S. installations of various sizes, and 13 Canadian installations.

Broken down by hardware expenditure, the 181 U.S. sites fall into these categories:

Hardware expenditures of:	
Less than $25K/year	7
$25K to $100K	67
$100K to $250K	51
$250K to $500K	24
$500K to $1M	15
Over $1M	10

The data collection medium was a four-page, 200-item questionnaire. After screening and editing, these were keypunched at Dylakor's Los Angeles service bureau. A full questionnaire required a 33-card set, but very few installations required that much data to describe their budgets.

One of Dylakor's own proprietary software packages, DYL260, was used to build files and create reports for each of the six minisurveys. (DYL250, the $1 a month utility, is the better-known of the Dylakor products. The 260 version is an update that makes report generation *almost* easy enough for an editor who hasn't coded anything in five years.)

Line printer output led directly to the charts included in this article. □

spend more, too. The allotment for central site communications gear is up nearly 20%, terminals are up over 60%, and remote site communications gear is up over 40%.

They love outside software, apparently. Half of them spend money on it, and the average expenditure is over $15,000 per year, compared to an average of about $6,000 per year they spend on software from IBM or whoever built their mainframes.

With the exception of the communications-related stuff, budgets for these shops look more stable than most, perhaps because running this size installation is well within the state-of-the-art.

$500K to $1M/year

The shops that spend up to $84,000 per month to get a 370/158, Univac 1110, or their equivalents, are sophisticated and generally self-sufficient. They seem self-sufficient in that they spend nearly zero on outside computer time (they most often have more than one cpu), on outside programming (since they may have two dozen full-time programmers on the staff), or on consultants (our sample was biased by one shop which is spending $140,000 this year on consultants).

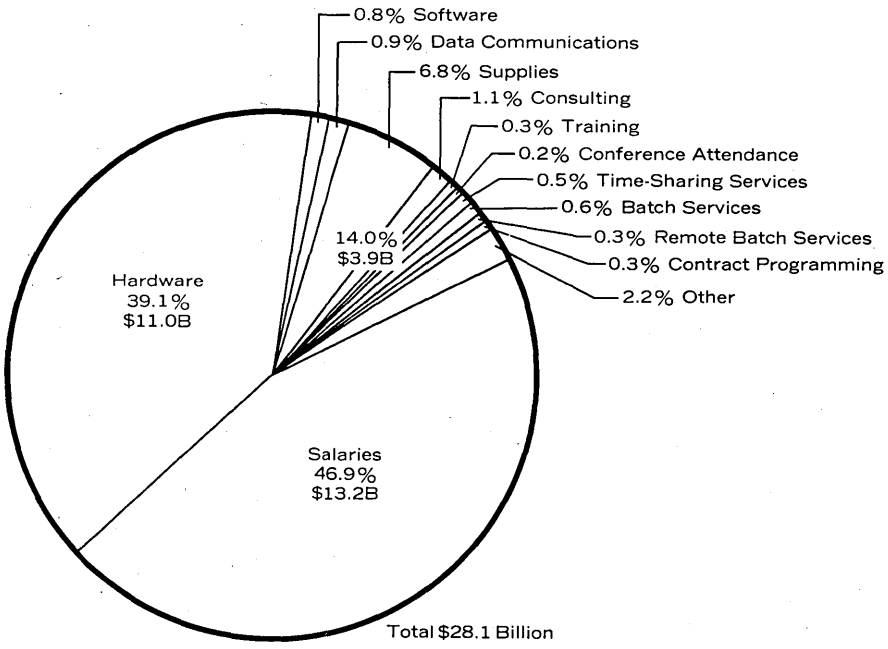
Their budgets are stable except for increases in software and terminals. They are spending more than they used to on software from independents (100% more, in fact), but on the average, they spend less per installation than 360/50 shops do. Still, their software budgets are up 50% overall. They spend a lot of money on ordinary vanilla-flavored terminals (three and a half percent of their total hardware budget), and they have set aside even more (four and a half percent) for remote site cpu's or intelligent terminals. In addition, they've budgeted for a 40% increase in the use of data lines.

Over $1M/year

This is the big league. Aerospace firms, large insurance companies, and General Motors are some of the firms that would spend over $1 million per year (over $84K per month) on hardware. Most sites have multiple computers, many of which may be large. The firms are unusual in another respect, too. Their people expenditures are less, as a percentage of their total dp budget, than any other class of computer sites. Since they spend far more than other sites on remote computers (14% of their hardware budget) and terminals (about six and a half percent), this probably means they are the central sites in set-ups where applications programmers and others are attached to the large remote sites. This would also explain the low percentage of budget allocated to data entry.

Apparently, these huge centers are going to play things closer to the chest in 1974. Although their total expenditures will be up slightly, they are turning off the tap on outside service money, especially outside batch processing (down 25%) and contract programming (down more than 70%).

The hefty increases in budget items go to software again. There will be 85% more funds for acquiring software from their computer vendors, and a staggering 230% increase in funds for proprietary software from independents. As in some of the other classes of shops, fewer members actually get software from independents than from the mainframe manufacturer (*all* of them will be paying mainframers while about two-thirds will buy from independents), but 75% more real dollars will go to the independents.



Projecting the Survey Data

There is always the temptation, once survey results are in, to attempt to put a size label on our industry. We have tried it. The pie chart, that shows expected total 1974 dp expenditures in the U.S., was constructed by applying a multiplier to our total sample. The multiplier, in turn, was arrived at by using our best guess at the number of dp shops like those we surveyed that live in the U.S., about 34,500.

Since we have not surveyed either shops with dedicated-purpose machines, like process control sites, or users who do not have their own computers, the numbers cannot be expected to represent the whole industry. They represent instead that part of the industry made up of stable shops with general-purpose computers installed. We would expect the numbers to be very low for outside services of all kinds, since they blatantly disregard service bureau users, among others.

Canadian dp shops

If U.S. installations are setting aside lots of money to compensate for increased costs of paper and other supplies, the Canadians must be expecting a blockade. An average budget increase for supplies south of the border (our northern border) is about 13%. North of the border they are budgeting for almost 29%. They are unlike us also in that they are budgeting increases for contract programming and especially for consultants. They don't use many contract programmers, but more than half of our sample used consultants. Dollars for consultants are up too, by over 40%. That should give all those U.S. consultants that were left out of our budgets a place to go for the summer.

Unlike U.S. shops, the Canadians are not budgeting big increases for software, they already had big budgets for it. About half the shops buy outside software and about half buy it from their mainframer; like U.S. shops, the expenditures for independent software are bigger than for mainframer packages.

They seem to be lagging in the use of teleprocessing, as few have allocated money for data lines. On the other hand, maybe their new Dataroute digital net is having effect; the budget for data lines is up over 150% in the third of the population that uses them. □

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CIRCLE 42 ON READER CARD

Taxation influences must be incorporated into cost models for a more realistic appraisal

TAXATION IN THE LEASE-PURCHASE DECISION

by Donald D. Martin

The unique decision concerning the lease-purchase of computers has received recent attention in DATAMATION. Erdei presented a breakeven graph (Aug., 1972); Brandon included a breakeven method in his article (Sept., 1972); Hekman constructed an improved lease-purchase model around discounted cash flow (Dec., 1972); then Jones questioned the presented techniques in the August 1973 issue. All of these ideas have contributed to the lease-purchase decision. But I have noticed the absence of a significant factor throughout all of these articles. None of the presented models include *taxation* as a model parameter.

Realistic model building requires that relevant factors be included in the model and that the decision-making environment be closely simulated. Neglecting taxation as a parameter means that a very real influence is not considered.

The model constructed in Fig. 1 will overcome this deficiency. This after-tax model considers the influence of federal corporation income tax, state corporation income tax, and local property taxes using the following assumptions: The federal rate is assumed a constant at 48%; S is used to represent the state rate; Q is used to represent the local property tax rate.

Other symbols used are t, representing leasing duration; G, representing computer useful-life; r, being the organization's internal rate of return; F, the monthly lease cost; i, which is t + ½ rounded up to give tax benefits only at year end; and P(t), the purchase cost at time t. With these assumptions the model equation is shown in Fig. 2. It should be noted that a cost model does not justify utilization of a computer but does allow the least costly computer to be selected, given that the decision to acquire has occurred.

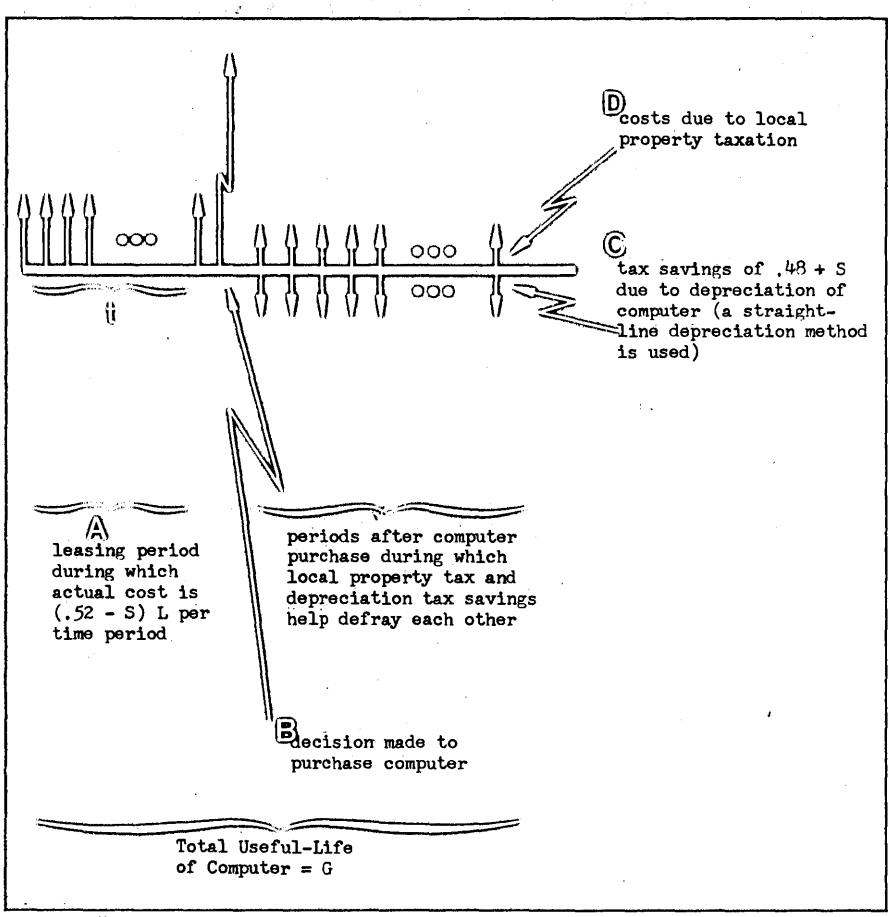


Fig. 1. After-tax model of lease-purchase cost flows

The after-tax model was used on Hekman's example of the IBM commercial contract. The relevant parameters are S = 4%, r = 10%, F = $10,905, P(t) = 55% accrual of lease amount for a maximum of 12 months, Q = 2%, original purchase price = $583,440, and G = 8 years. Fig. 3 shows the results of this example in the after-tax model. The figure illustrates that the optimum time to purchase is never reached. Including the taxation influence changes the optimum purchasing time from near one year to perpetual leasing.

Repeated simulations of the model over wide ranges of parameters lead me to some interesting conclusions. The true after-tax cost is always lower than a before-tax model. Taxation influences also significantly delay the optimum time to purchase. It was also found that only with an internal rate of return between .05 and .10 and lower is it better to purchase. This can be interpreted to mean that an organization with a higher internal rate of return should lease perpetually and invest capital elsewhere. It was also found that a rising property tax increases total cost, but a rising state income tax lowers overall cost—a result explained by the fact that state

$$\text{cost}(t) = \left(\frac{1}{(1+r)^{t}}\right)(12)(F)(.52-S)(t) + P(t)\frac{1}{(1+r)^{(t+1/12)}} - \sum_{i=t}^{G}\left((1+r)^{-1}\frac{P(t)}{G-i}(.48+S)\right) + \sum_{i=t}^{G}\left(P(t)(1+r)^{-1}Q\right)\left((.52-S)\right)$$

Fig. 2. After-tax model equation

taxes are functions of expenses while local property taxes are based on value. More significantly, neither tax affects the optimum point of conversion. (More complete graphical results of this complete simulation are available by forwarding a self-addressed, stamped envelope to Dr. Donald Martin, Rockhurst College, Kansas City, MO 64110.)

To give an idea of how the taxation influence affects lease-purchase deci-

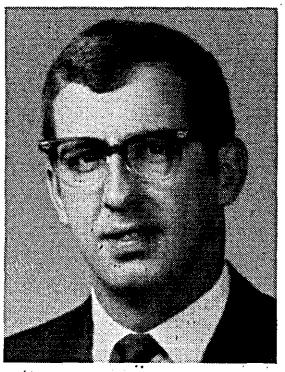
sions, Hekman's case study is used as a basis for comparison. His example shows the optimum purchase time of an IBM 370/145 cpu to be eight months at an internal rate of return of 10%, with a total cost to be between $975,808 and $1,001,512. The after-tax model predicts that optimum t is never reached when the internal rate of return is 10%. If a customer converts from lease to purchase at eight months instead of doing perpetual leasing, at least a 14% increase in cost is incurred [i.e. ($350,182 − $301,403)/$350,182]. Ignoring taxation therefore adds approximately 14% to total cost.

As Jones states, model building with discounted cash flow techniques does improve the model but even a DCF model is only as good as the factors included. Taxation influences need to be placed into cost models. As the example illustrates, cost minimization in the lease-purchase model cannot optimally occur until taxes are included.

Time to Conversion = t	Cost (t)
.05	$375,547
.25	367,968
.50	358,870
.75	350,182
1.00	341,891
1.25	345,675
1.50	347,040
1.75	348,051
2.00	348,726
2.25	349,746
2.50	349,793
2.75	349,547
3.00	349,023
3.50	345,592
4.00	342,798
4.50	333,210
5.00	328,767
5.50	307,174
6.00	301,403
minimum cost	

Fig. 3. Example of after-tax model IBM commercial contract for Q = .02, S = .04, and R = .10

All models are, by definition, simplified replicas of reality and never contain each and every influence. But to ignore taxation in any cost model is only to invite cost overruns and ultimate disaster. □



Dr. Martin is chairman of the accounting dept. at Rockhurst College in Kansas City, Mo. He has previously held systems analyst positions and has a PhD from the Univ. of Missouri.

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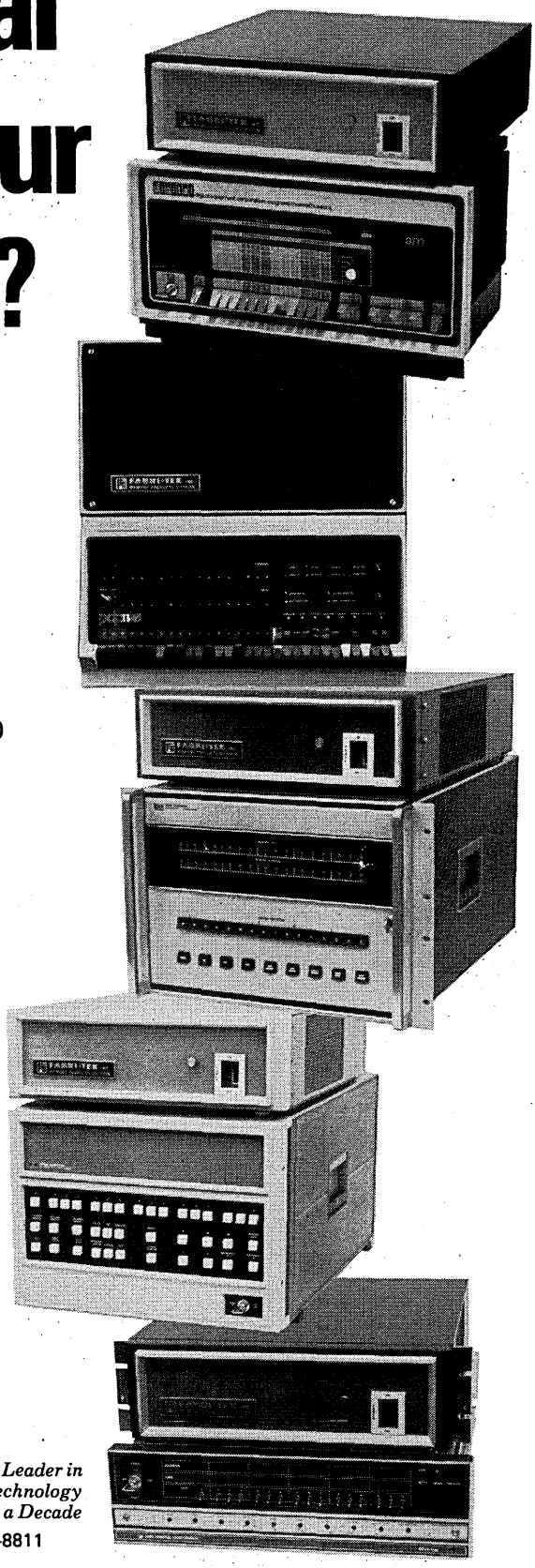

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Provided that dp customers understand the algorithm for computer charges, prices should be set high enough to recover costs, not high enough to make a profit

PRICING COMPUTER USAGE

by J. J. Sobczak

Most data processing installations are faced with the problem of allocating costs among their users. At a session dealing with this subject at a recent SHARE conference, Mr. Gottfried Ludderer remarked that it is very difficult to discuss data processing accounting systems, since accounting objectives vary from installation to installation. The ensuing discussion period later in the session proved his assessment to be quite correct. Differences of opinion could most often be attributed to differences in accounting philosophy. There are, apparently, many who consider the accounting routine just another tool the dp manager has in his arsenal for manipulating users. Is this a valid point of view? If not, why not? Is it even really necessary to charge internal customers for computer work? What is it that is supposed to be accomplished?

From a financial control point of view, the primary function of the data processing accounting process is to maximize the benefit the firm receives from its dp resources by providing the user with the information required to make prudent business decisions. Though such a goal may be generally accepted, it is not entirely clear how it is achieved. The objectives of this article are: to demonstrate that in order to maximize dp benefits, the accounting procedure must above all other considerations be cost reflective and, therefore, the major design objective in developing an accounting algorithm is to establish prices that reflect as closely as practical, actual costs to the organization; and to show that there are many popular accounting practices and techniques in use today that produce results that are decidedly not cost reflective.

Importance of cost reflective pricing

Classical microeconomic theory can be used to establish that a cost reflective accounting system does, in fact, maximize the benefit produced by the computer dollar or, stated in other terms—if a computer center attempts to make a profit or sell computer services below cost, forces have been created that encourage suboptimum conditions. In *The Economics of Computers,*[1] E. F. Sharpe argues that the computer center should be established as a cost center rather than as a profit center. His analysis can be used as well to show that the "price" set for computer services must be a reflection of cost in order to maximize profit.

In Fig. 1, the Total Cost (TC) curve represents the cost to the computer center, and therefore to the firm, of providing capacity for a specific quantity of computer work (Q is used to represent units of computer work). In other words, a cost of TC_1 dollars is required to install computer systems capable of producing Q_1 work units.

The Total Value (TV) curve represents the value to the user, and therefore to the firm, of that work. Its shape (increasing at a decreasing rate) results from the well-known law of diminishing returns. The more you have of something, the less valuable an additional unit of that something is to you.

Fig. 2 represents the marginal cost and value curves that correspond to the total curves in Fig. 1. These curves represent the cost and value of an additional unit of capacity. The optimum operating point for the firm is where the marginal value of an additional unit of work is equal to the marginal cost, which is shown at Q_1 units in Fig. 2. Producing any more is akin to spending $10 to receive $8 in value, clearly not an astute economic decision. Referring again to Fig. 1, it can be seen that the total profit to the company is equal to TV_1-TC_1 dollars. This is the profit maximization point; producing any other quantity of work will result in decreased profits.

However, consider now the case when the computer center is attempting to maximize its own internal profit. Previously, the revenue to the computer center corresponded to the TC curve. To examine the computer center as a profit center, a revenue curve must be added above the cost curve. This is

1. E. F. Sharpe, *The Economics of Computers,* Columbia Univ. Press, New York, 1969.

represented by the TR curve in Fig. 3.

The TV curve in Fig. 1 represented the total value to the buying division and therefore the firm. However, since the objectives are now to maximize computer center profit, the value curve to the computer center is the TR curve. The TR curve is also the cost curve for the buying division. This curve is, by necessity, below the TV curve since revenue is simply price times quantity and a buying division will not pay a price that is higher than the value received in return. The profit maximization point for the computer center is where the marginal revenue equals the marginal cost. From Fig. 4 it can be seen this is at a capacity of Q_2 work units. The price the buying division will pay for Q_2 work units is not more than the value he would receive, or P_2.

In this case, the total profit to the firm is equal to TV_2-TC_2. This profit is divided between the computer center and the buying division, with the computer center receiving a total profit equal to TR_1-TC_2, and the buying division, a profit equal to TV_2-TR_1. The total profit however, TV_2-TC_2, is less than the original TV_1-TC_1 profit when the computer center operated as a cost recovery center. Hence, establishing the computer center as a profit center could work to the detriment of the firm.

The profit center concept, in this case, encourages exploitation of one division over another. This problem could be reduced by allowing the buyer to purchase outside services which could theoretically force the computer center to sell at a price lower than P_2. In any event, the theoretical maximum profit to the firm cannot be greater than the profit realized when the computer center operates as a cost recovery center. A similar analysis can be used to show that setting computer center prices below cost also produces a suboptimum condition.

The analysis demonstrates that if a computing center sets its prices at cost, and if buying divisions respond to these prices in a prudent fashion, value to the firm will be maximized. The computing center's obligation appears to be to establish prices that properly reflect costs, and this seems to be a reasonable limit to their responsibility. It does not seem proper to expect them to police the buying division's actions nor to bestow on them the power to manipulate these actions.

Establishing the internal transfer price at cost differs from the concept of price as viewed by the economist or businessman. The economist believes that price should exceed cost by only what is required to yield a competitive rate of return on invested capital. Often, he views a fair or normal profit as an element of cost. The businessman, on the other hand, considers cost as only one of the factors determining price and feels that factors such as product demand and the value to the consumer must also be considered. The term "cost" is also apt to be used in different senses. Usually the differences center around various methods of treating fixed costs as opposed to variable costs. Since the majority of costs in most computer centers are usually of a variable or semivariable nature, this problem is not of the magnitude of those found in other areas. Still, care must be taken in deciding which costs should be used in developing billing rates.

It is important to note that sensible user reaction to the prices established is implicit in this entire discussion. If users do not respond in a cost sensitive manner—in other words, the prices set on dp services are not a factor in their decision-making process—the dp accounting system has not provided any benefit. In fact, the firm will probably incur a loss since there is usually substantial overhead associated with establishing and maintaining an internal transfer payment system. The point is that distributing costs among the users is not "good in itself," and the user must react in order for benefit to be derived.

Perhaps for a much more simplified version of the microeconomic analysis, one should imagine a computer center that sets a price of $150 on computer services that actually cost the firm $100. If the potential buyer perceives the value of the computer services at $125, he will make a decision not to avail himself of the computer, and the firm will suffer an "opportunity loss" of $25. Similarly, if the computer center establishes a price of $100 on computer services that actually cost $150, the buyer who values the services at $125 would decide to computerize resulting in a $25 reduction in the firm's profit.

Common non-cost reflective accounting practices

The intent of the preceding discussion is to prove the assertion that a cost reflective accounting system is required if a firm is to maximize the benefit produced from its data processing expenditures. A discussion of prevalent violations of this principle follows.

With large multiprogramming systems, the accounting algorithm must allocate costs on the basis of system resources (cpu, processor storage, channels, etc.) utilized to be cost reflective. Installations accounting on an elapsed time basis, simulated stand-

Fig. 1

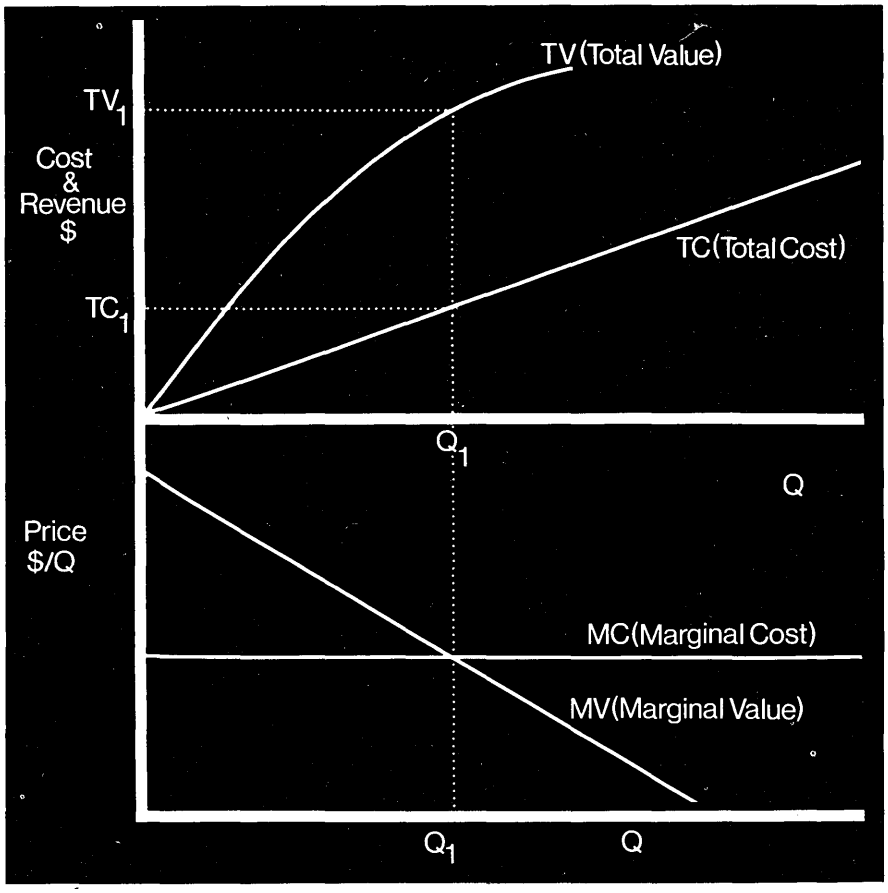


Fig. 2

alone elapsed time, or simply on the basis of cpu use, do not properly account for resource usage. Such techniques are decidedly not cost reflective and it is not difficult to develop realistic examples where actions that reduce running time in a standalone system, or result in decreased central processor usage, could actually be more costly in a multiprogramming environment.

Many accounting routines charge improperly for programs that use a disproportionately large amount of a single resource. It is not absolutely correct to say a job should be charged in proportion to system resources used, since disproportionately high usage of a single resource can inhibit the use of the other system resources. For example, if a job uses most of the processor storage that is available, central processor usage and other resource usage can usually be expected to be lower than average for the duration of the job, resulting in decreased revenue.

The situation is somewhat analogous to a uniprogramming system where a one-hour program may have been using the cpu only 10% of the time but, since no other program could use the remaining processing cycles, it was proper to charge the program the full cost of the entire processor. Some multiprogramming accounting algorithms neglect this factor altogether. In others, there seems to be an attitude that a user should be penalized for such usage, over and above the loss of revenue incurred, and an unreasonable surcharge is invoked.

As the microeconomic analysis illustrates, charging a job two or three times above cost is no better than charging two or three times below cost. Another problem often encountered is that such a complicated solution is developed in attempting to properly account for such usage that it is doubtful the user could react sensibly because of the algorithm complexity.

Accounting algorithms

Many installations have recognized the desirability of establishing a measure of computer work. Upper management, while observing a steady growth in dp budgets, has been told that the cost of computing is decreasing. What is required is a measure of total work performed so that it can be divided into the computing expenditures to show that the unit cost of computing is decreasing. Many have developed such a measure and are also using it as an element in their accounting algorithm.

Work conceptually consists of the execution of instructions and the transfer of data. With virtual storage systems, the work performed in executing a program is also a function of the program's locality of reference. A satisfactory measure of work, by its nature, must remain constant and independent of the computer system used. In fact, its desirability is based on a need to compare and evaluate computer systems. This requisite, however, is contrary to the aims of a cost reflective billing philosophy that requires execution costs to change along with changes in the relative costs of the various resources that comprise the system.

For example, if a cpu is replaced by another that, for the same cost, can execute instructions two or three times as fast, the cost of executing programs that tend to be cpu-bound falls dramatically, relative to the cost of a tape copy, for example, which remains basically unaffected. If the accounting algorithm does not recognize this change in relative cost, it is not cost reflective. Similarly, the units of work should not change, since the theoretical amount of work performed has not changed. Therefore, using the unit of work as an element in the accounting algorithm can cause difficulties in satisfying both requirements.

Many claim that an accounting algorithm should discourage the use of expensive resources. This objective is often implemented by placing an unreasonable surcharge upon the "expensive resource," employing a charging philosophy whose intent is apparently to penalize usage of these resources. If the resource in question is, in fact, expensive, a cost sensitive algorithm will reflect this. The microeconomic analysis demonstrates there is no substantiation for charging any more than actual cost.

Another twist along the same lines is the structuring of rates so as to discourage inefficient resource usage. Again, this is often accomplished using an overcharging penalty philosophy as, for example, placing extremely high charges on programs using hardware emulation features in order to encourage conversion. Ironically, the microeconomic analysis demonstrates that overcharging itself encourages inefficient allocation of resources.

The cost reflective criteria can be carried to an extreme when developing an accounting algorithm. Two requirements have been presented that enable a firm to efficiently use computer resources. The actual costs of performing computer work must be available, and the customer or user must react to these costs in an economic fashion. As mentioned earlier, merely allocating costs equitably is not good in itself and both factors must be present in order to have an effective system.

However, for the customer to react, he must be able to understand the algorithm in use. For this to occur in most installations, the algorithm must be relatively simple. Consequently, the perfect accounting routine does not exist; perfection would require exact cost reflection while being so eminently simple, even novice programmers could fully understand it. A proper balance must therefore be established. If the simplicity requirement is not recognized, an extremely complex algorithm may result. Some installa-

Fig. 3

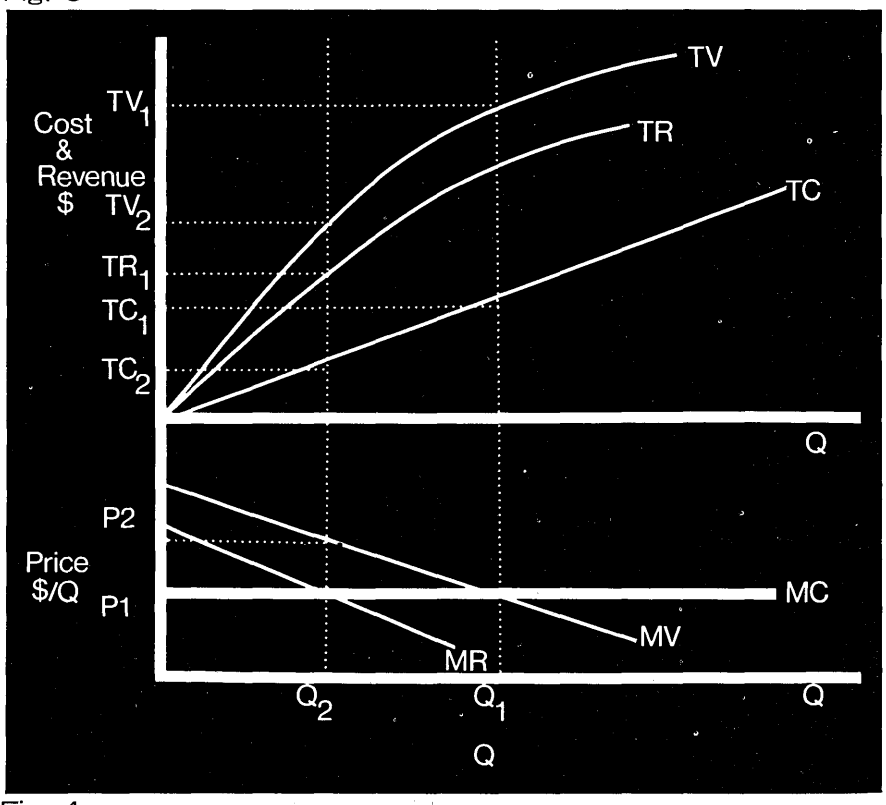


Fig. 4

tions have developed such elaborate accounting systems that an experienced system programmer would have difficulty deciphering the various elements contained in the algorithm.

A special case exists for resources that experience low utilization. Cost reflective rates for such resources are extremely high, since a relatively small number of users must recover the entire cost of the resource. If the low utilization condition results because the resource in question is obsolete, or is so specialized that there are a small number of users, the high rates are proper. The case of an obsolete resource is a good example of one of the advantages of cost reflective accounting, since it is an excellent means of identifying the savings potential associated with a conversion.

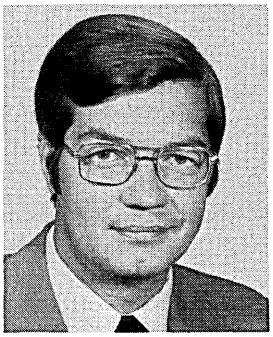
However, there is also the case where low utilization exists because the resource is new and usage has not had a chance to develop. An installation manager would be quick to point out that establishing full cost recovery rates at the outset for such resources would discourage use. The proper accounting for this situation would seem to be to develop rates that assume final expected utilization, and identify the losses incurred during the period that use is below the expected level as a launch cost associated with installation of the resource.

An argument often presented against the type of analysis offered in this article is that dp users don't really respond to charging for dp services, and the accounting process is merely a game played to satisfy the firm's financial community. Rather than a refutation of cost reflective pricing, these are actually arguments in opposition to the entire process of charging internal users for dp services.

Perhaps an installation manager should first ask the following questions: Does the charging process really have an effect on data processing usage in the company? Do my users receive "rubber stamp" approval for the data processing portions of their budget? Do programmers or their managers really care how much their programs cost to run? If those costs were available, would they make efforts to reduce the costs through more efficient programming techniques?

If honest answers to those questions are in the negative, and this may be the case in no small number of installations, then a dp accounting system constitutes an unnecessary expense and efforts should probably be directed toward reevaluating the financial control philosophy of the organization.

On the other hand, if the user community is responsive to the prices set on dp services, it is difficult to support an accounting system design that does not produce cost reflective results. A successful cost reflective accounting system will provide the user with the information required to maximize the benefit the installation receives from its computing systems. □



Mr. Sobczak is presently an internal management consultant in the Management Services Dept. of Ford Motor Co.'s Finance Staff. He has worked in a variety of dp capacities with emphasis on hardware/software planning and system performance evaluaton. He has an MBA from Univ. of Detroit.

An interview with an insurance company dp exec focuses on a two-year upgrading project

UPGRADING—ONE COMPANY'S EXPERIENCE

by W. David Gardner, New England Bureau Manager

During the winter of 1969-1970, William L. Harrison, assistant vp of the Hartford Insurance Co.'s dp services dept., had an uncomfortable feeling that everything at the job wasn't going precisely the way he wanted it to go. It wasn't so much that he didn't like what was happening at the installation, as it was that he wasn't sure what was going to happen in the future.

"We knew we didn't want to keep going the way we had been going," recalls Harrison. "We just didn't like the idea that we were reacting to the environment."

The "environment" at Hartford was IBM, just as it is at most other big computer installations. So in April 1970 the Hartford, under the direction of Harrison and Edward J. Becan, another executive in the dp dept., set up a special planning unit to help pave the way for upgrading. The job was a formidable one; not only were the Hartford's sales ($1.8 billion this year) growing about 15% a year, but the dp workload was growing more than 25% a year. Moreover, the Hartford had an almost unwieldly installation of nine large mainframes—two 65s, three 50s, and four 30s. "It was a motley combination, all right," Harrison remembers.

> We just kept going and going, and the machines kept coming in.

One of the first, most important activities of the planning group was to examine any potential alternative mainframe manufacturers. The Hartford gave some cursory consideration to RCA, because of its time-sharing capabilities and its relative compatibility with IBM programs. But, in the last analysis, the Hartford found it was already locked in with IBM and couldn't give any other mainframe manufacturers serious consideration. Moreover, Harrison decided that the route to go was to "integrate" the nine cpu's into a slower—but more powerful—number of machines.

"We knew that we really couldn't integrate unless we got locked in to IBM even further," says Harrison. "And, with tighter cpu integration, it becomes harder for other vendors to crack in, although we can, and do, bust out of our chief vendor here and there in the peripherals and front-end areas."

At any rate, the Hartford's planning activities were in full swing when IBM announced its 370 line in mid-1970. "We found that the key thing was to have a basic document, or plan, of where we wanted to go with our dp. We then fit IBM's announcements around our plans, and tried to make the IBM products complement our plan. Without our own basic documents, we would have been reacting chiefly to IBM's."

Harrison worked with a basic two-year hardware plan in which virtually all possible parameters are evaluated—everything from software and manpower needs to forecasting of the workload growth. The plan was updated every six months.

But how do you set up a game plan for replacing nine old mainframes and scores of old tape and disc drives with newer equipment—particularly in a pathologically secretive industry in which users often have little inkling of what future product offerings will be?

The game plan, as Harrison learned, was fraught with danger. Harrison was tagged by IBM in that cat-and-mouse game unique to the dp industry in which IBM (or another mainframe maker) obsoletes a machine with a new one more quickly than the user had anticipated; with the result that the value of the old machine depreciates more quickly than the users had anticipated. Harrison was one of those unlucky chaps who purchased a 165 without knowing that IBM's virtual memory 168 would be coming out relatively soon. Nevertheless, the Hartford, which leases the remainder of its equipment, obtained one of the first 165s, so Harrison feels the move was still a sound one. Others who purchased 165s later in the delivery cycle, of course, were left holding the bag.

In addition to hardware requirements, the plan covered those of software. "One of the biggest problems we had was that every proposed operational change required many different people with different skills to look at the change," Harrison said. "This problem was created by becoming integrated, but it had big payoffs."

> . . . I think that things improve overall when you have a multiple vendor environment . . .

The dp facilities were traditionally batch-oriented and, in addition, the Hartford cut over to corporate teleprocessing in 1969 to service its 50 regional offices. Most of the mainframes were already operating on OS—a blessing—but one model 50 was operating on DOS. Harrison recalls that the DOS program was operating so smoothly that it simply wasn't recognized as a potential problem at first.

The decision was made to convert the DOS to OS in early 1972, and this was accomplished with the assistance of a $50,000 modification program the insurance firm purchased from an independent software house.

The insurance company had another built-in assist in its upgrading endeavor

—the Hartford had already written its own COBOL subsets as a matter of course. Thus, the various equipment had a common language with standard interface. However, the company had inadvertently deviated from its standard plan with 3330 disc files, and Harrison says his people had to put great effort into preparing standard interfaces for the 3330s.

Additional software used for the upgrading project was HASP which, since it more or less sits on top of OS, was useful for the extensive spooling required in the new multiprogramming environment. Other software was of an expected nature, and involved installing 1401 emulators and simulators, and installing MCS and ASP.

The entire conversion period took 18 months and ended in mid-1972. The first machine to go was a 30—most of the work on that machine was then being run on one of the 65s. Then the first 155 was brought in, replacing the two 50s. Then another 30 was taken out along with the first of the 65s. At this point, the 165 was installed and, later, another 155. Finally, in order of removal, the last 65, 50, and 30 were taken away. Later, as the workload grew, another 155 was installed, but this was not really associated with the upgrading endeavor.

It was virtually a never-ending job for those involved in the upgrading. "We never thought we'd stop," said Edward Becan, recalling the time. "We just kept going and going, and the machines just kept coming in. It never really did come to an end. One day things just seemed to quiet down. I think if we had switched over everything at one time, instead of stretching it over 18 months, we'd have died."

The Hartford did a near-perfect job of meeting deadlines, and Harrison explained "that was not just because they were well-organized, but because the old equipment, which was on lease, had been committed to other customers by the leasing company." They were faced with the unhappy spectre of their old equipment being rolled out by the leasing company on the day it was due to leave.

What was the biggest problem? There was no equivocation in Harrison's voice when he answered that question—his operational staff. Harrison has nothing but the highest praise for his staff in the transitional period, but he says no one quite foresaw the "people problems" of upgrading from a conglomeration of scattered installations to one big multiprocessing installation.

In a nutshell, the problem was that the operational staff had been accustomed to working almost "hands on" with a single configuration. The change to an environment in which the staff had to work remotely with the equipment caused the problem.

"It was our biggest surprise, besides being our biggest problem," Harrison says. "We had about 75 in all on our operational staff, and we had to add an additional 12 or 13 people. And the problem with the operational staff never stabilized during the changeover, either, because we were constantly changing. Things didn't stabilize until May of 1972, when the upgrading was behind us."

The situation took care of itself to a large extent, Harrison says. The more experienced people have moved up into positions of higher responsibility, so they don't tend to miss working with their "own" personal computer. On the other hand, the new personnel have never worked anywhere but at a multiprocessing installation where the operational staff tends to be centrally located and offsite.

Things got so difficult in this regard originally, that after the integration began, attempts were made to create the illusion for operators that they were still at small, separate installations. For instance, portable screens were put up to block off banks of printers from operators, and a minisystem was even installed so operational staff members would not feel so separate from the equipment.

There were other problems. Because of the massive physical changes, the company had to renovate its central installation in Hartford. Because of the newer, more powerful equipment that required more and heavier cables, the 8-inch floor space was inadequate and the floor had to be raised to accommodate the new equipment. Also, additional air conditioning was installed and the entire air-conditioning system was rebalanced.

> If I had to lay out any single thing, it would be dollars.

Throughout the upgrading endeavor, the Hartford relied almost exclusively on its own staff for the major moves and the major decisions. However, they drew on help here and there from consultants and a service bureau. The service bureau, National CSS, Inc., saw its interactive COBOL program preparation used often. Harrison says that the program was used when he had to check out a program quickly. "We used it when time was of the essence," Harrison said, "we could check out a program in 15 minutes."

One reason it didn't make sense for the Hartford to use outside services was the sheer size of the mammoth insurance company and its rapidly growing workload. For instance, the dp dept. did some 245,000 runs in 1971 and more than 500,000 in 1974.

"We are just too big for facilities management," says Harrison. "And time-sharing doesn't make sense for us. The movement of paper and dp services is just too crucial in the insurance business for us to go outside for services."

Harrison noted that the company does use some small outside supportive services now and then.

Although Harrison found that the Hartford is more locked in to IBM than ever, there are still pockets of vigorous competition among vendors in certain sectors on the installation. "And I think that things improve overall when you have a multiple vendor environment," Harrison says. "We're big enough to be able to generate our own facts and not rely exclusively on the vendors for them. For instance, we have 36 Storage Technology tape drives and 32 IBM tape drives. It's an apples comparison for us. I think that the competition on the site has made both vendors perform better. It keeps them on their toes."

All in all, though, the Hartford installation is heavily committed to IBM. The only other equipment in sufficient quantity is Mohawk key-to-tape equipment, Sanders terminals, and Memorex control units.

Would Harrison do it all over again? Of course he would, and the reason he gives is purely monetary. "If I had to lay out any single thing, it would be dollars. It's an economic thing—the equipment was proliferating.

"In the past, as the workload went up, the equipment went up at the same rate. But we've put a stop to that now. From 1971 to 1974 our workload will be going up 100%, but our budget will go up only 55%—from just under $4 million in 1971 to about $6 million in 1974."

Moreover, additional economic advantages are becoming apparent as the Hartford gains more experience with its new installation. For one thing, Harrison has been able to get a tighter grip on the budget, and in spite of the rapid growth in workload and the challenge presented by operating a new installation, the dp budget is currently running 6% below its targeted budget figure.

Not only does Harrison have the feeling that he has the proliferation of hardware under control—it's not increasing as fast as the workload—but the operational staff isn't growing so rapidly anymore either. Small wonder, then, that Harrison is emphatic in saying he damn well would do it all over again. □

Women, to a greater extent
than men, put forth their best effort
in test situations and
in day to day performance

WOMEN ARE MORE PREDICTABLE THAN MEN

by Jack M. Wolfe

In 1962 the *Journal of Counseling Psychology* published an article by Harold G. Seashore of the Test Div. of the Psychological Corp. entitled: "Women Are More Predictable Than Men." The results of Dr. Seashore's and other studies show that aptitude test scores and college course grades in general correlate more highly for women than for men students.

In the research of the author of this article, with regard to testing for programming aptitude, it became apparent that correlations between the aptitude test scores and teachers' grades in a programming course were significantly higher for the women students than for the men. This does not mean that the women were superior to the men. It means that the quality of the performance of the women students on the aptitude test was closer to the quality of their subsequent performance in the programming course than was the case for the men students. These results in the field of computer programming corroborate the results of Seashore and others with reference to college performance in general.

The principal role of aptitude tests in a school situation is for guidance purposes. In industry their principal use is as one of the factors in a selection procedure.

Aptitude tests may be useful in a school situation where it is desirable to form separate classes for superior, average, and below average students. They may also be administratively helpful where limited facilities may preclude the enrollment of all the students who wish to pursue a course of study in computer science or computer technology. In many cases the student who does poorly on the aptitude test as compared with his classmates will voluntarily withdraw from further pursuit of that course of study. Thus the aptitude test will have served a guidance function. However, strong motivation and good work habits often enable a student to perform significantly better than was indicated by the aptitude test.

If selection is to be made by the aptitude test rating because time and personnel are not available for individual interviews with students, it would be desirable to include additional channels for qualifying for admission to the computer course of study. This would open the door to students whose previous school work was below average. The inclusion of the aptitude test is desirable because the overall work in the programming course is so very different from the work in courses taken previously.

A reasonable procedure would be to admit approximately one-third of the student enrollment in the computer curriculum on the basis of previous record in related courses as defined by the computer faculty. Approximately one-third would be allocated on the basis of complete previous record. All other applicants could be given the aptitude test as the final path for the remaining places in the course. Term by term, or annually, the percentages allocated to these three routes should be modified in accordance with the relative performance of the corresponding groups in their course work. Eventually, for example, a school may find that it is allocating 40% of its places on the basis of grades on previous related courses, 25% on previous overall record, and 35% on the basis of the aptitude test.

Programming aptitude tests in general do show a positive correlation with success in programming courses. If the students are motivated to take the test because of possible personal benefit, the test can provide valuable information that can be particularly useful in borderline cases or in cases where inadequate pertinent information is available. It must be recognized, however, that some students do poorly in a test situation but do well in their total course performance. In the present study there was a significant difference between the course performance of the men and women students who scored below average on the programming aptitude test. Twenty-four percent of those men were rated average and 28% above average in their course work, thus making a total of 52% of those men doing average or better in their course work. For the women students, however, 30% of those scoring below average on the aptitude test were evaluated as average in their course work. None of the women scoring below average on the aptitude test actually rated above average in their course work. Thus 70% of the women scoring below average on the aptitude test were so rated by their instructors, as compared with 48% for the men's group.

No aptitude test measures all the facets of a person's capabilities and work habits. Nevertheless the results of an aptitude test do contribute an additional and worthwhile evaluation to be taken into consideration as one additional item of pertinent information. The less reliable and less standardized the other relevant information may be, the greater may be the weight allocated to the aptitude test. An aptitude test is particularly useful when it is necessary to make a selection without adequate

or standardized information. Decisions made with the aptitude test score as one of the known factors are likely to be superior to decisions made without such information.

The present study used the author's experimental Form A programming aptitude test, school edition, administered to 295 students in seven colleges. Tables 1 and 2 show the correspondence between the programming aptitude test classifications and the classifications by the programming instructors for the 192 men and the 103 women tested. In these tables the ratings of A and B were grouped as above average, and the D and F ratings as below average.

In Table 1 it is seen that 55% of the 192 men were identified in the same classification by both the aptitude test at the beginning of the course and the instructor at the end of the course. That is, 33% of the men were rated above average by both the aptitude test and the instructor, 8% were rated as average by both, and 14% were rated as below average by both. Relatively serious discrepancies occurred for 4% of the men, who were rated above average on the aptitude test and below average by the instructors. Serious discrepancies in the opposite direction occurred for 8% of the men, that is, with aptitude test ratings of below average and instructors' evaluations of above average. Of this total group of 12% of the men, twice as many did significantly better in their course work than the reverse.

In Table 2 it is seen that 68% of the 103 women students were identified in the same classification by both the aptitude test and the instructor. That is, 41% were above average in both ratings, 13% average in both ratings, and 14% below average in both ratings. There was only a 3% occurrence of serious discrepancies with the women students. None of the women who were rated below average on the test scored above average in their course work. In all, 51% of the women were rated above average on the test. Six percent of this group, 3% of all the women tested, performed significantly worse in their programming course. This discrepancy does not necessarily imply that the test was inaccurate in these cases. The test, taken in one sitting, is like a snapshot of the person at one moment. The course grade on the other hand is an evaluation based on many facets of the person's performance over a period of five months. There are many occurrences of a personal nature or reflecting a change of interest that can cause a student to perform less well in the course than was indicated by the aptitude test at the beginning of the course. The frequency of occurrence of above average aptitude test ratings and below average course performance was almost the same for both men and women students, namely, 4% of the men and 3% of the women.

It is significant that none of the women scoring below average on the aptitude test were actually rated above average by their instructors. Of the 20% of the women who were rated below average on the test, 6%, or 30% of that 20%, were rated average by their instructors. This is an occurrence that could well be expected. By perseverance, conscientious effort, and strong motivation a student who appears to have below average potential can perform sufficiently well to earn an average grade. It is not very likely, however, that such performance will be rated above average by the instructor.

The occurrence of 8% of the men's group scoring below average on the aptitude test and above average in their

Classification by Wolfe P.A.T. and programming grade for 192 men students

Test Evaluation	Instructors' Evaluation Below Average	Average	Above Average
Above Average	4%	11%	33%
Average	7%	8%	9%
Below Average	14%	7%	8%

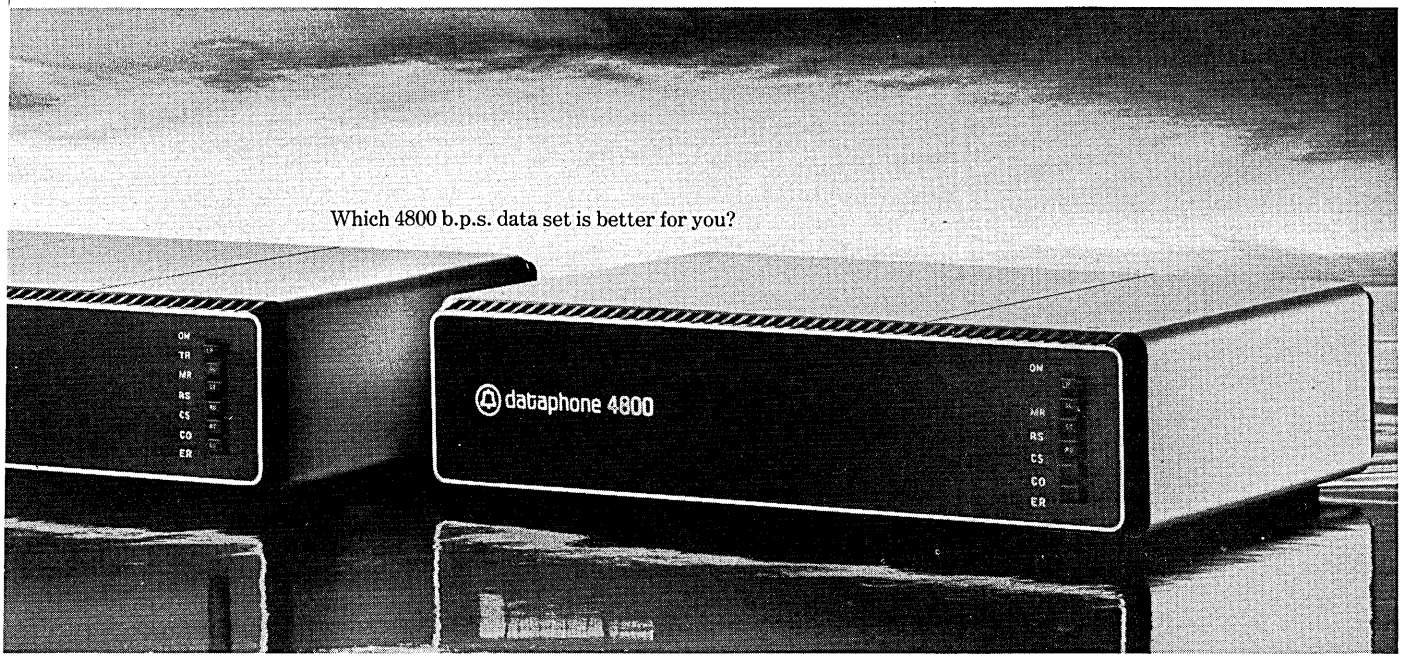
Table 1

Classification by Wolfe P.A.T. and programming grade for 103 women students

Test Evaluation	Instructors' Evaluation Below Average	Average	Above Average
Above Average	3%	8%	41%
Average	10%	13%	7%
Below Average	14%	6%	0%

Table 2

switched telephone network lines, depend on Bell System Dataphone® 4800 service.



The Bell System's Dataphone 4800 service is designed to transmit data at 4800 b.p.s.—economically. It is now available for data customers who use the switched telephone network, as well as for those with private-line facilities.

Dataphone 4800 service features automatic adaptive equalization. Turnaround times of 50 milliseconds for private lines and 50 or 150 milliseconds for the switched network, as you choose. And low monthly charges.

Provisions for local and remote loop-back testing are built right into the 4800 data sets. Signal lights indicate the status of the sets at all times.

And solid-state technology from Bell Laboratories fits all these features into a compact housing 16 by 11 by 4½ inches.

In addition to our local maintenance forces, the Bell System's Data Technical Support Team stands behind all our Dataphone service. The Team's collective expertise analyzes and corrects malfunctions quickly, and so minimizes your cost of downtime.

At AT&T and your Bell Company, we know good data service at moderate cost is vital to your business. Whether you use the switched network or private lines.

We hear you.

course work may be due in part to less than their full effort on the aptitude test together with extensive effort in the course because of strong motivation toward programming as a career for economic reasons. This factor is likely to be of greater significance for men students than for women. In cases where the course performance is significantly superior to the aptitude test rating, the course performance is likely to be the better indicator than an aptitude test. An aptitude test is useful where it is necessary to make an evaluation of the person's potential in a certain field before he has actually established a record of performance in that field.

A measure of the greater predictability of the women students can be seen by comparing hits to misses. The aptitude test and instructors agreed for 23 of the women students for every one student for whom there was a significant discrepancy. For the men there was an agreement on 5 students for each miss. This ratio of hits to misses for the women is almost five times that of the men.

The greater predictability of women may be due to the greater degree of cooperation of women in putting forth their best effort in both the test situation and their subsequent day by day performance in their course work. Men, to a greater extent than women, may be inclined to be less than sincerely cooperative in putting forth the concentrated effort required to do well on a difficult test when they know that the results will not affect them personally. If women students agree to take a test, however, or undertake a responsibility such as a test or a course, even if they are instructed to do so and have not chosen to do so voluntarily, they are more likely to be conscientious about trying their best in good faith even when they know that a high test score will not be of personal benefit to them.

The author has found in contact with his own students that it is not very unusual for men students, possibly between 5% and 10% of them, to have a rather nonchalant attitude about their performance on tests even when the test results will affect their grades. Such an attitude among women students is far less common. The author suggests that in all studies, and particularly where the testing is done for research purposes and the persons tested know that they will not be affected personally by their test ratings, more information will be obtained if the statistics are maintained for men and women as separate groups rather than as one composite group.

Some psychologists believe that the greater conformity of girls, along with their indoctrination from a very young age to follow the instructions of established authorities, may be a key factor in the greater predictability of their test results. If this is so, there may well be a lessening in the predictability of women as women's liberation concepts take greater hold among young women students and, subsequently, in the upbringing of their daughters from early childhood. If freed from the adherence to following instructions, increasing numbers of girls and young women may eventually take an approach of non-concern and less than full cooperation if they are asked or told to take a difficult test, particularly if the results will not affect them personally. When the pattern of "doing as they are told" is broken or eroded, the greater predictability of women may become somewhat diffused as well.

The data in the author's study of the comparison of the degree of correlation of men's and women's test scores with instructors' grades in programming are shown in Table 3. Each college was requested to evaluate the students' performance in a grading system of five grades. The test rankings were made early in the programming course. The instructors' evaluations, of course, were made at the end of the term.

In order to adjust to the different grading standards in the various colleges, the rankings by the aptitude test were converted into the grade evaluations on a school by school basis as follows: If a particular college had 10% A grades, 20% B's, 50% C's, 15% D's, and 5% F's; then the top 10% on the aptitude test were classified as A, the next highest 20% on the aptitude test were classified as B, etc. Although the system of converting the aptitude test rankings to grades in the A to F scale was the same for all seven colleges, the percentages varied somewhat from college to college, as should be expected.

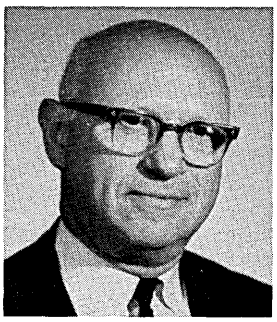
The Pearson coefficients of correlation ranged from .14 to .69 for the men and from .54 to .95 for the women. For all men combined as a single group the correlation was .45 and for all women combined as a single group it was .70. From the data in this study the greater predictability of the women's group is established as statistically significant. The likelihood that the difference of predictability in favor of the women's group was due merely to the random chances of sampling is less than one chance in a thousand.* □

Correlation coefficients of men and women students in Wolfe P.A.T. ratings and instructors' grades in programming (7 colleges, 295 students)

Participating School	Men No.	Men Pearson r	Women No.	Women Pearson r
Brooklyn College Brooklyn, N.Y.	20	.33	8	.81
Cambrian College Sault Ste. Marie, Ontario, Canada	35	.16	19	.72
Eastern Iowa Community College Davenport, Iowa	42	.42	30	.54
University of Iowa Iowa City, Iowa	21	.46	14	.56
Nassau Community College Garden City, N.Y.	16	.14	11	.74
Northeast Wisconsin Technical Institute Green Bay, Wis.	13	.69	8	.95
University of South Florida and Hillsborough Community College Tampa, Fla.	45	.48	13	.69
TOTAL	192	.45	103	.70

It is of special significance that in **every** instance the correlation between aptitude test ratings and instructors' grades was higher for the women than for the men.

Table 3



Dr. Wolfe is a professor of computer and information science at Brooklyn College, CUNY. He has served on a special committee of the education dept. of ACM for the formulation of problems for a standardized college placement test in dp and programming, and is the author of the Aptitude Assessment Battery: Programming test currently published in England, Australia, and the U.S.

*Further data for persons interested in research on this topic, and information and copies of the test for school personnel interested in participating in a validation study of an experimental, self-scoring form of the school edition test, may be obtained by writing to the author.

Do Not Return

1974

Memory segmentation boxes, indirect addressing, and base address registers were all considered and discarded as methods for giving a minicomputer a million-byte memory

THE MEGA-MINI SUCCEEDS THE MODEL T

by John Michels

Imagine Henry Ford's first Model T with 250 robust "horses" under the hood. Ridiculous, isn't it? Nobody was ready for any such breakthrough in those dawning years of the 20th century.

Imagine a "minicomputer" with a million bytes of directly addressable main memory. Preposterous. Even more preposterous to imagine such a beast before 1963 when the DEC people startled the world with the first PDP-8.

Yet a rapid but evolutionary growth has occurred, and today, the minicomputer shops are experimenting with different schemes to hang a megabyte (or more) of main memory on their favorite in-house processor.

What follows is an attempt to set down the Interdata solution to the challenge of combining a minicomputer with a megabyte of main memory, the end result being a product called a "Mega-Mini." But first, it is necessary to examine briefly what the other mini houses have been doing in the same area.

First came Digital Equipment Corp. with its Memory Segmentation Unit. Following them were Data General Corp., Varian, and MODCOMP. The DEC method of mixing large memories with minicomputers is representative of the others. And, because of the majesty of the corporation and the availability of descriptive literature, the DEC method deserves more than just a passing reference.

Memory segmentation unit

The DEC method for extending memory beyond the natural limitations imposed by 16-bit addressing makes a distinction between program space, or "virtual" space as it's called, and real space, or physical memory.

For purposes of relocation and segmentation, both program space and physical memory are conceptually divided into 64-byte blocks. Through the magic of the Memory Segmentation Unit, 16-bit virtual addresses are transformed into 18-bit physical addresses. This extends the maximum addressing space from 64KB to 256KB.

The Memory Segmentation Unit for the PDP-11/45 contains three sets of segmentation registers: one for user mode, one for supervisor mode, and one for kernel mode. Two bits in the current Processor Status Word (PSW) control model selection. Each set of segmentation registers includes eight registers for instruction references and eight registers for data references. The Memory Segmentation Unit does not require the separation of instructions and data space. However, DEC software requires this at this time. With this arrangement, programs can consist of as much as 64KB of pure procedure and 64KB of data. Segmentation registers are 32 bits wide and contain six fields, as shown in Fig. 1.

With physical memory conceptually divided into 4,096 blocks each 64 bytes long, 12 bits are sufficient to address any individual block. The Segment Address Field of the segmentation register holds such a 12-bit address. By definition, this address is the starting location of the first block controlled by the segmentation register. The Segment Limit Field indicates the number of contiguous 64-byte blocks controlled by the register. It is interesting to note here that segments can extend upward, with increasing physical addresses, or downward, with decreasing physical addresses. If the segment ex-

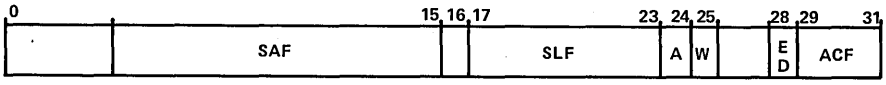


Fig. 1. DEC segmentation register.

tends upward, the value placed in the Segment Limit Field is one less than the number of blocks in the segment. If the segment extends downward, the value in this field is 128 minus the number of blocks in the segment. Address and limit values together describe the size of the segment, which may range from 64 bytes to 8KB in 64-byte increments.

Having this information, plus information concerning the type of operation—instruction read, data read, data write—available to a unit external to both the processor and memory provides an appealing (inexpensive) way of achieving sophisticated memory access control. DEC uses the Access Control Field to identify six types of control. They are:

1. Not present—interrupt on all accesses.
2. Interrupt after completion of a read or write.
3. Interrupt after completion of a write.
4. Free access—no interrupts.
5. Abort writes and interrupt, interrupt on read.
6. Abort writes and interrupt.

The E bit identifies the segment as extending upward or downward. The A and W bits are used in conjunction with the Access Control Field for memory management purposes.

The Memory Segmentation Unit divides the 16-bit virtual address into three fields as shown in Fig. 2. (This process is completely transparent to the application programmer.)

The first field is a pointer to one of the eight possible segmentation registers. The second field is the address of a 64-byte block within program space.

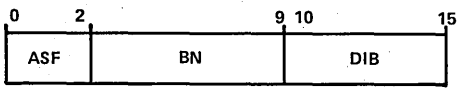


Fig. 2. Virtual address.

The third field is the byte displacement within that block. Construction of an 18-bit physical address from a 16-bit virtual address requires the following steps:

1. Processor Status Word bits select the appropriate set of segmentation registers — User, Supervisor, or Kernel.
2. The operation—instruction reference or data reference—determines which block of eight segmentation registers within the set is to be used.
3. The ASR field of the virtual address selects one of the eight registers.
4. The BN field of the virtual address is added to the Segment Address Field of the register.
5. The Displacement Field of the virtual address is concatenated with the result of the previous addition.

Since the unit can do most of its error checking in parallel with the addition, the entire operation on the PDP-11/45 takes no more time than a very reasonable 90 nsec. Among the advantages of the DEC approach are:

- It allows true hardware relocation. Programs can be loaded anywhere in memory as absolute code.
- Contiguous segments can be scattered throughout memory. This allows efficient use of memory and permits overlap of shared code and shared data.
- Segments do not even have to be in memory. A virtual memory system is possible.

Other manufacturers (Data General, Varian, MODCOMP) have introduced units similar to the DEC Memory Segmentation Unit. Some are more elegant, such as MODCOMP's, with its profligate use of LSI chips. Others are less elegant, but still serviceable. All are reminiscent of the dynamic relocation techniques used by IBM in the 360/67.

Memory management unit

We have known for quite some time that it was necessary to provide minicomputer systems with memories larger than 64KB. The big question was how to do it.

There were many theories, most of them some variation on the IBM relocation box. One of these, the one that looked the most promising, was very similar to the DEC Memory Segmentation Unit. It had separate sets of segmentation registers for user mode and supervisor mode. Each set had eight registers for instructions and eight for data. This immediately gave us a maximum program size of 128KB, provided we wrote a new compiler and new assembler to separate instructions from data. This seemed reasonable. But the first serious objection was quick to arise:

It's fine to say that in a 512KB system all programs are limited to 128KB. However, lurking in the shadow, there is always one program greater than 128KB. That one is the operating system, which is actually 512KB. The data base for any operating system is all of memory.

The answer to this objection was that since the operating system is mapped through a set of segmentation registers, it remaps itself whenever it needs to access locations outside the immediate area.

This is probably an acceptable overhead to bear for the privilege of having 128KB user programs. The next objection involved user programs. We assumed, and rightly, that most large programs would be written in FORTRAN. The objection:

How many FORTRAN programs consist of exactly 64KB of pure procedure and exactly 64KB of data? Not many. How many FORTRAN programs consist of less than 64KB of pure procedure and more than 64KB of data? A lot!

To make matters even worse, we realized we would be writing an operating system and a compiler inexorably tied to an external device. Think of a compiler that can accept input only from paper tape. If you want to change the input device, you have to rewrite the compiler completely. Such a situation cannot be good. Why should our adaptation of an idea that works so well for IBM fail so miserably for us? The answer is: We were trying to make it do more than it was ever intended to do. IBM uses this technique for relocation and control. We were using it for this, but in addition, we were using it to enlarge the address field. It could not do this. If the maximum program address is contained in a 16-bit field, then no amount of hardware can make this into 18, 20, or 24.

Must minicomputers and large main memories be essentially incompatible? Of course not. There is no natural law that forbids minicomputers to generate addresses greater than 65,535. Sure, put 256KB, 512KB, or even more main memory on the system. But let the program address *all* of memory. This is, in essence, the concept of the Mega-Mini.

Now, having freed the program from the 64KB address restraint—at least in theory—we were faced with two very interesting questions: How much memory do we allow the program to address, and how does the program address more than 64KB? We answered the second question first and, in so doing, came up with an intrinsic limit that answered the first question.

Once again, our engineers, scientists, technicians, and programmers produced almost as many methods as there were human beings involved. Gradually, the number of possible methods narrowed as one scheme after another was rejected as impractical. New alliances formed and reformed around the remaining methods. For a while, an indirect addressing approach had widespread support.

Indirect addressing, as a programming technique, has its advantages. Reentrant coding, subroutine linkage, and table lookup, among many other things, really become very simple with indirect addressing. However, as a method of addressing more than 64KB, it is too slow. It is very cumbersome, what with references to page zero and to the current page. To be

really effective, indirect addressing requires multilevel indirect references which slow the system even more. Ease in programming requires extremely complex assemblers and loaders. Finally, it is a foreign concept to programmers accustomed to direct addressing on all previous Interdata processors. And so, indirect addressing was discarded. After this, only two choices remained.

One of the two remaining approaches was to go all the way with IBM. This meant enlarging the general registers to 32 bits and substituting a base-displacement field for the old A2 field. The new memory reference format would then be as seen in Fig. 3.

There was a certain aura of Linus-blanket security about this approach. If the Olympians of Armonk endorsed this method, could the mortals of Oceanport presume to disagree?

Fortunately, the Interdata staff includes a lot of hard-nosed pragmatists, some of whom are also excellent IBM programmers. They were quick to point out that base-displacement programming is not all beer and skittles. Reserving general registers for use as base registers puts a severe restriction on the use of general registers as temporary storage locations, accumulators, and index registers. Loads and stores proliferate in direct proportion to the size of the program. External subroutine linkage becomes a software simulation of indirect addressing.

Supplying a separate set of registers for use as base registers does not help; it would probably be even worse. The overhead in context switching becomes much greater. What is even more serious is the need then for a complete set of instructions to allow operations between base registers, between base registers and general registers, and between base registers and memory.

The method

By now we had eliminated all the alternative addressing methods except one, and this one was really our original method. We chose the method of direct addressing not in 1973, but in 1967, for the company's first for-sale minicomputer, the venerable Model 3. For that processor, we created an architecture that superficially resembled the 360, while eschewing the use of base registers in favor of direct addressing.

In the design of the Mega-Mini, we looked hard at indirect addressing (base-displacement addressing is really indirect addressing with the address word contained in a register rather than in memory) to reassure ourselves

that direct addressing would be the fastest, and from a programming point of view, the easiest way to access memory. Once again, in the design of the Mega-Mini, as in the design of the Interdata Model 3, direct addressing won out.

The simple brute force approach of enlarging the address field of memory reference instructions to 32 bits was not at all satisfactory. We realized, as did IBM, that it is not wise to penalize the small configuration with a long instruction format required only by the large configuration. Therefore, we increased the general register size to 32 bits and devised three new memory reference instruction formats. Any one

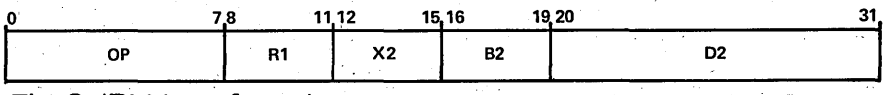


Fig. 3. IBM type format.

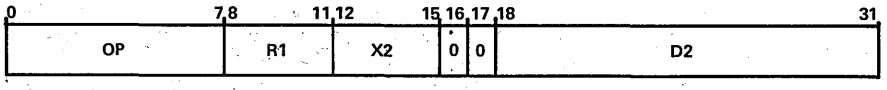


Fig. 4. RX1 format.

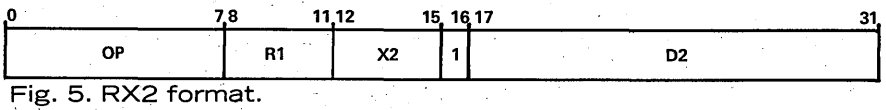


Fig. 5. RX2 format.

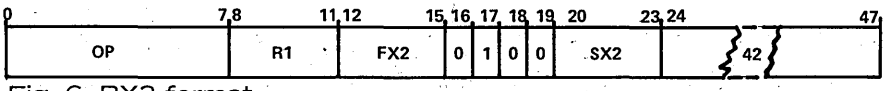


Fig. 6. RX3 format.

of the three formats can access any location in memory. Only one of the formats requires more than 32 bits for the complete instruction. (In the three formats described below, the first operand is the contents of the general register specified by R1.)

The first memory reference format, RX1, is shown in Fig. 4. In this type of instruction the address of the second operand is formed by adding the contents of the index register, specified by X2, to the contents of the D2 field. The D2 field contains a 15-bit displacement that can directly address up to 32,768 bytes.

The second memory reference format, RX2, is shown in Fig. 5. In this type of instruction the address of the second operand is formed by adding the current location counter to the contents of the index register, specified by X2, to the contents of the D2 field. The D2 field contains a 15-bit, two's complement number with a range from minus 16,384 to plus 16,383.

The third memory reference format, RX3, is shown in Fig. 6. In this type of instruction, the address of the second operand is formed by adding the contents of the first index register, specified by FX2, to the contents of the second index register, specified by SX2, to the contents of the A2 field. The A2 field contains a 24-bit unsigned direct address with a range from zero to 16,777,215.

It is in the definition of the RX3 format that we found the answer to that earlier question: How much memory? Twenty-four bits in the address field allow for 16 million bytes of memory, which is a lot of memory. We believe it is enough memory even for long-range planning. Although the cost of memory (both core and semi-conductor) is coming down, the cost of putting together large memory systems —with power supplies and dependable, fast bussing—has not decreased significantly. (For this very reason, the initial implementation of the Mega-Mini is limited to one million bytes of memory.)

The three formats described above met our needs very well. Small programs, less than 32KB in length, need never use a 48-bit memory reference instruction. With the relative addressing capability of the RX2 format, even large programs can very often avoid the use of 48-bit instructions. It is only when the user wants to take advantage of the double indexing feature (invaluable in array processing), or when the memory reference exceeds the range of the RX1 or RX2 format, that a 48-bit instruction is required.

One more advantage is that most of the time the programmer does not have to worry about formats. Unless he specifically asks for double indexing, even a simple-minded assembler can determine the proper format.

Back to the MMU

Many problems, both major and minor, arose before the Mega-Mini became a complete product. One of these was somewhat embarrassing. We had done a beautiful hatchet job on the Memory Management Unit concept in order to get direct addressing. Now, even with direct addressing, we needed hardware relocation and protection. So the MMU went back, this time in a very different form. The "Memory Access and Protect Controller" (a face-saving name change?) is no longer a 16-bit address juggler with segmentation and protection frills. It is a simple, straightforward adaptation of the old IBM idea. It relocates program addresses without trying to do anything spectacular. At the same time it provides for segmentation and memory access control.

Ford Motor Company has advertised its Pinto as the direct descendent of the "rugged, dependable Model T." Similarly, the Mega-Mini descends from a line of minicomputers, the compatible family of Interdata processors. What distinguishes the Mega-Mini from its ancestors is analogous to the differences between the Pinto and the Model T. Outward appearances aside, what really separates the two cars? Two things: horsepower, and the advances in automotive technology that have made increased horsepower a practical and economic reality, perhaps even a necessity.

Back in 1922, Henry Ford could have built a high-horsepower Model T. But he judged correctly that the buying public was neither ready psychologically, nor willing financially, to accept such a motor car. It has taken nearly 50 years for the Pinto to evolve.

Events move more quickly in the electronics industry. Only two years ago, the Mega-Mini would have been as impractical as the 250 horsepower Model T. (If God had intended minicomputers to address more than 64KB, He would have created them that way.) Today, with the ratio of memory cost to cpu cost so reduced, increased horsepower in a minicomputer is psychologically and financially acceptable. It is also highly desirable. □

Mr. Michels is manager of the advanced planning and development group at Interdata, Inc. Prior to joining Interdata in 1969, he was a systems software analyst for Pratt & Whitney Aircraft Co. He is a graduate of Spring Hill College.

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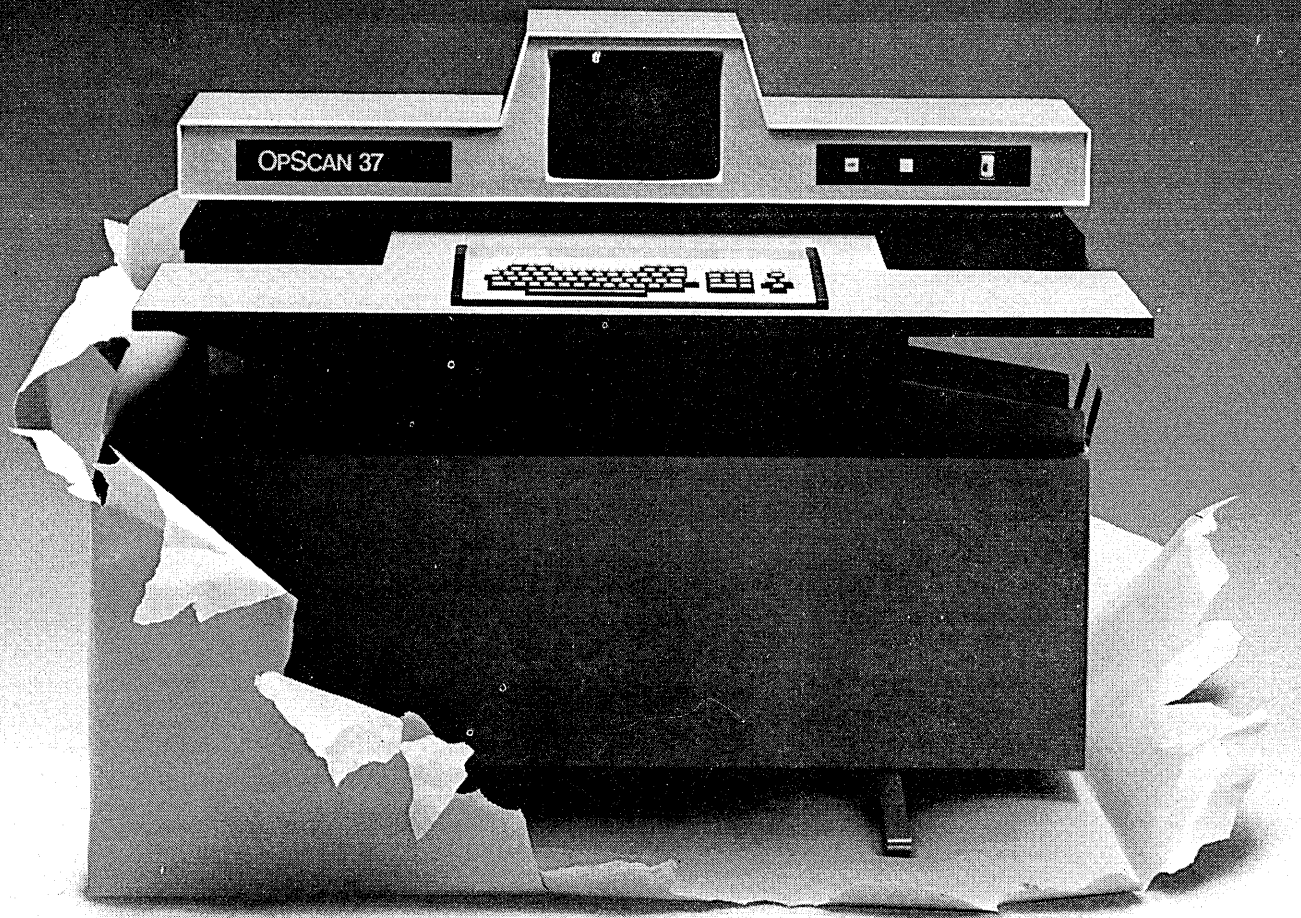

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GENERAL AUTOMATION

NEWS IN PERSPECTIVE

The banks and the thrift organizations debate the issue of who participates and who pays for electronic funds transfer systems. The Federal Reserve Board asks for comments. The public, with some odd exceptions, could care less. It is the public, however, that ultimately will decide when the concept of paperless transactions catches on. Where it all stands is reported on this page . . .

Whatever happened to the estimated 50 Memorex computers, recently abandoned by the financially-troubled company? There are bargains, and some software support is emerging, page 82 . . .

A federal judge in Minnesota seems to have defrocked Eckert and Mauchly as the high priests of electronic digital computer invention, page 84. Meanwhile, the man to whom the judge gave the credit in a fascinating decision last year says he and Mauchly are "pretty good friends." . . .

How do you penetrate a remote access computer? It's easy, says Bob Abbott of the Lawrence Livermore Laboratory, page 90. He does it with uncanny regularity and with government funds . . .

Ma Bell gets a setback in court in the phone company's effort to knock out the specialized communications carriers, page 92. The decision, if it stands up, takes the heat off fledgling MCI Communications Corp. . .

There'll always be a computer industry in England, despite the energy shortage, as workers merely wear heavier woolens, page 98.

Banking

Electronic Funds Transfer Systems: Broad Issues and a Sepia-Colored Stage Coach

Some lofty battle lines are being drawn this month on the broad implications of electronic funds transfer systems (EFTS). On another level, critical problems are being solved with things as simple as a sepia stage coach.

The first level is the concern of parties interested in EFTS who are preparing responses to a request by the Federal Reserve Board for comment before March 8 on such issues as the appropriate roles in ownership and operation of various segments of a nationwide EFTS, extent and conditions of access, and how costs should be allocated.

The biggest line of demarcation is expected to be between commercial banks and thrift organizations (mutual savings banks, savings and loans, and credit unions), with the latter calling for equal participation in and access to a national system. The commercial banks, jealous of what they consider their innovative efforts in developing the necessary software and legal framework and because they have assumed liability for transmission errors and failures in existing local systems, are seeking assurance that participation by thrift institutions will not create problems for themselves and their customers.

The Justice Dept. is expected to bring up the potential of antitrust issues *if* joint ownership of switching portions of the systems by participating banks is suggested. And there undoubtedly will be some hue and cry on safeguards for data privacy.

Even as these broad and somewhat esoteric issues are being debated, and positions on them being formulated, those involved in the day to day implementation of EFTS are making a plodding kind of progress, with selling the concept to potential users their biggest area of concern. EFTS is moving, albeit in a piecemeal way.

The Fed evidently thinks that EFTS' time has come, which is why it has asked for comments on what essentially is an extension of its "Regulation J," governing the collection of checks through the reserve system, to cover the acceptance and delivery of both credit and debit transfers of funds by wire over its national communications network.

The Fed has said its efforts toward this end are "based on estimates that check volume is increasing at a rate that will double the total check volume during the next decade from a current estimate of 26 billion items yearly."

Selling the customer

Those most concerned with selling the potential user are concerned with this projection, too. "We've got to undo some of our own work," said a banker attending an American Bankers Assn. automation and operations workshop in Seattle last November. "For years we've trained the customer to think of his canceled check as his receipt. He wants to see that check in front of him." Under an EFTS, a statement entry would replace a check as proof of payment.

A representative of California's Wells Fargo Bank said at the same meeting that he had met resistance from within—from a bank executive concerned because he felt colorful checks had become Wells Fargo's trademark. The bank is getting around this by decorating its statements, starting with a sepia stage coach.

Wells Fargo is one of 111 California banks participating in an electronic funds transfer system (see Nov. 1972, p. 155) sponsored by the California Automated Clearinghouse Assn. (CACHA), which began operations with great fanfare in October 1972; processed its first 29 live entries on Nov. 30, 1972; broke the 100 mark in entries processed by year-end 1972; and by the end of 1973 was processing an average of some 4,000 entries a month. Hardly impressive when compared to check clearances. "It's been slow," organizers are quick to admit. Selling, they say, has been the big stumbling block.

Jesse H. Moya of City National Bank of Beverly Hills, a participant in the California system, said selling has been awkward because of a general lack of understanding. He said his bank received "many calls" when the system first was announced in the papers, "like from one guy who wanted to know if we were participating and when he found out we were, said he wanted to have his phone bill paid by EFTS." It had to be explained to the caller that a pre-authorized payment can be accepted only if the billing customer is participating.

One of the arguments used in selling companies on use of pre-authorized payments through the system is the postage that can be saved in eliminating billing. For California utilities this wouldn't apply because they are required by law to inform customers of the bases for charges.

California's system was brought to implementation stage by the state's SCOPE (Special Committee on Paperless Entries). A subsequent and somewhat more ambitious project, linking 178 banks in Georgia, was placed in operation last May by the Georgia Automated Clearinghouse Assn. Since then, similar operations have been started in Boston and the Twin Cities. All four are operating in the batch mode and use FRB facilities as Automated Clearing Houses (ACH). Additionally, SCOPE groups have been organized in more than 20 other areas across the country and many plan to implement ACH facilities in '74.

Ambitious Atlanta

The extra added attraction in the Atlanta system is the bill-check in which a bill for goods or services essentially becomes a check in payment for same. A customer signs and returns a portion of his bill to the person from whom the goods or services have been received. This person transmits the payment information on tape to his bank, retaining the bill-check for authentication if needed. The entries then are processed through the ACH and are distributed to the appropriate bank for posting to the customer's account. Initial public acceptance is reported to be favorable. Plans for the future in Atlanta include use of a card at point-of-sale where a customer can choose either to have his account debited or to use an established line of credit.

While customer acceptance of ACH systems has come slowly so far, Barbara Johnson, vp at Bank of America, San Francisco, and project coordinator for California's SCOPE effort, feels public confidence was given a boost by a successful pilot test conducted by the Air Force last fall. It involved electronic Air Force payroll entries using SCOPE banks in California and Georgia. Among other things, she said, it proved the effectiveness of use of SCOPE technology on an interregional basis.

The ABA is working to foster and facilitate interregional paperless exchanges through an ad hoc task force appointed last March. In December this committee completed a list of recommendations for standards and legal arrangements for interregional exchanges which, upon formal acceptance by the ABA board of directors, will be promulgated as standards by the association as new interregional and local ACH associations are formed.

While ACH systems are primarily pointed to operational efficiencies, many payment system trends, which ultimately could be hooked to them and are at varying stages of advancement, can be viewed as offering to banks more consumer marketing opportunities. One is the increase of on-line credit authorization for bank charge cards.

Another is the automated teller. Currently, according to the ABA, more than 1,500 full service type auto-tellers are installed but only a few are on-line. High volume machines achieve about 2,700 transactions per month (75% after banking hours). Average use is closer to 1,000 per month (about 80% cash withdrawals). Equipment reliability, once a severe problem, has improved to 98.5% up-time, the ABA says.

Then there's the in-touch pioneering service offered for a time by Seattle First National Bank (see Sept., p. 128, and related story this issue). One reason given when the service was abandoned was the lack of sufficient in-touch telephones in the Seattle area. But such a service could be something for the long-term. Some 23% of the nation's telephone installations are touch-tone now but 85% has been projected for 1981.

On-Line Phones off the Hook

A unique service that placed home phones on-line, enabling subscribers to pay their bills to local merchants with one phone call, has suspended operations.

The In-Touch service went on the air last summer in Seattle, Wash., with some 30 local retail establishments and utilities signed up, without many more paying subscribers. The number of subscribers reached 400, far short of the 6,000 they were looking for, and more than 50 merchants were brought into the fold, according to Joseph W. Gelzer Jr., president of Telephone Computing Service, Inc., the subsidiary of Seattle-First National Bank that developed the system.

Gelzer said the service might have survived if they could have signed up another dozen key merchants. He explained that the bill-paying feature, among the six major applications made available to subscribers, was the most popular, but In-Touch lacked the few additional establishments that together generate the bulk of local bill-paying. For $6.50 a month, subscribers also used the calculator mode heavily, Gelzer said, but more for its novelty than out of any need. A number of records-keeping applications were also available, but subscribers who initially input their data from push-button phones reportedly lost interest in them. "We had no mechanical problems," he concluded. "It's a marketing problem." But the company has not given up on the idea of resurrecting the service in some other city, or even again in Seattle, Gelzer said. □

"Just to be on the safe side, I think we had better have a quiet, after-hours audit of Axton's books."

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The thrift position

The thrift institutions have been every bit as busy as commercial banks in implementing automated payment system advances. Indeed, the mutual savings banks, as an industry, lay claim to being more than 90% computerized and on-line as opposed to less than 20% for commercial banks and 40% for savings and loans. They are, therefore, in a position to be in the forefront of EFTS.

The mutual banks' biggest thrust toward EFTS participation will be through MINTS (Mutual Institutions National Transfer System, Inc.) announced in February 1973 as an independent affiliate of the National Assn. of Mutual Savings Banks "to provide a central facility in aid of savings institutions in planning and implementing transfers of funds services." MINTS has

developed the MINTS money transfer card via which depositors, in banks participating in MINTS through support and funding, can go to any MINTS member bank and deposit or withdraw money, make a payment on a mortgage, or do any other banking business they might do in their own bank. MINTS' avowed hope is eventually to tie this service into a national network "hopefully managed by the Federal Reserve."

At this writing, Roger Hotte of the MINTS staff said about half of the NAMSB member banks (some 230-235 out of 482) were supporting and funding the MINTS program. Hotte said MINTS was preparing a comment in answer to the Fed's request and would have a statement ready by the March 8 deadline. "We're looking forward to responding but I'm not at liberty to disclose our position."

The Savings and Loan League is looking to get into EFTS with a subsidiary which franchises the "Transamatic" system, which provides for prearranged transfers from checking accounts at banks to pay mortgages at savings and loans, and which includes a cash card called "Prestige" for use with POS terminals and automatic tellers.

And then there's Money Transfer Systems, Inc., formed late last year as a joint venture of Wilmington Saving Funds Society, Wilmington, Del., and Payment Systems, Inc., New York City. Payment Systems' president is Dale Reistad, a long-time EFTS disciple. The fledgling corporation will offer financial institutions what it calls "a total consumer-oriented financial service to their customers."

This will include all the bells and whistles, such as a cash/charge card system, consolidated statement system, pre-authorized payment processing, and merchant marketing programs, once MTSI gets its computer and tests out its software—which it hopes will be before mid-1974.

George W. Mitchell, member of the Board of Governors of the Federal Reserve System, testifying before the Subcommittee on Bank Supervision and Insurance of the House Committee on Banking and Currency, estimated there are 4,300 savings and loans, 390 mutual savings banks (under Hotte's estimate) and 23,000 credit unions in the nation. He used these figures to justify advocating what he calls the "payable through" clearing method for thrift institutions in Automated Clearing Houses. This method would mean a thrift institution wanting to receive a payroll deposit would have to associate with a commercial bank. A clearing-house computer would be able to associate deposits bound for the thrift house in the clearing and settlement process. It would credit the payroll deposit to the associated commercial bank which would credit it to the savings bank. This, said Mitchell, could be accomplished in the same time span as applicable to customer deposits in a commercial bank. And it would decrease the number of "end points" to which the ACH's would have to make daily sorts and delivery by 24,690.

It's not too likely that thrift institutions will see it this way.

For financial institutions, the advent of EFTS is just a new chapter in an age-old fight over who can do what and for how much. Data processing service organizations are concerned with its potential for erosion of its service business, particularly in payroll, accounts payable, and accounts receivable. For computer industry vendors, EFTS opens up a big new market. For practitioners, it's a new, exciting and very visible application area—one perhaps particularly vulnerable to the blame-the-computer syndrome. But for all, EFTS heralds a need to change long-standing money habits . . . to learn to live with less float. It's happening slowly, but it's happening!

—Edith Myers

Mainframers

Memorex: Bargains For the MRX Bunch

Around the country there are clubs for owners of Corvairs and Edsels and other automobiles no longer being made. In existence now is an even more elite bunch: Memorex computer users. Some who had Memorex mainframes on lease prior to the company's announced withdrawal from the business last summer have chosen to return the hardware. But a number of them have purchased those mainframes, now out of production, at handsome discounts. The discontinuation of software support, they say, is "one of the disadvantages we have to take in stride."

But, it is learned, some members of the original software group have left Memorex and formed their own company, Programming Research Associates, Minneapolis. They will continue maintenance of the operating system. "Memorex is setting them up and is giving them so much business in order to keep working on the operating system," John Gray, president of Computer Utilities of Seattle, says he was told. His company purchased a 64K MRX/50 with four disc drives and two printers "for considerably less than half the original purchase price"—less than one year's rental on the system, he says.

Another service bureau, Quality Data Processing, Baltimore, Md., had a 48K MRX/40 on lease at the time of Memorex's announcement. The firm upgraded to a 64K mod 50, added some peripherals, and purchased the entire system at "a bargain," according to Barry Ries, president. Ries admits he had no alternative: he either bought the hardware or lost it entirely. Or, he says, he could pay a half to two-thirds as much again for a different system. "Rental was somewhere on the order of four grand a month," he explains. "To get anywhere close to it from IBM, we would have had to go to their upgraded System/3 at just under $6,000, and it wouldn't be available to us until next June."

For the ill-fated mainframe venture, which saw 100 computers manufactured and only about 50 installed, the company took a $40 million write-off. In the first nine months of '73, Memorex had a loss of more than $105 million, which included write-offs, asset revaluations, and acceleration of depreciation on equipment-for-lease to the tune of more than $94.6 million. The computer systems activity was terminated in July, followed by the layoff of 1,200 employees. About that time, it looked like Memorex would be bailed out of its plight by an outside organization. Formal talks had been held with Singer Corp. and with Control Data, but to no avail.

At that point, the company said it would seek an arrangement with the holders of its debt, estimated at more than $300 million, to go it alone. A basic agreement was reached, allowing for the budgeting of $8 million for R&D expenses and $35 million for the manufacture of new equipment and, most important, relieving the company of the payments of principal and interest on its debt for the remainder of '73. Late last year, the company signed agreements with the Bank of America and creditors of ILC Peripherals Leasing Corp., providing for the extensions of credit through 1979.

Still, the company has chosen to burden itself with the legal expenses involved in a $3 billion antitrust suit against old foe IBM. Before tripling as required by antitrust law, the suit asks damages of $750 million for Memorex, $100 million for ILC Peripherals Leasing, and $200 million for foreign subsidiaries. Hang onto your ticket. The ride isn't over yet.

—E. K. Y.

(Continued on page 84)

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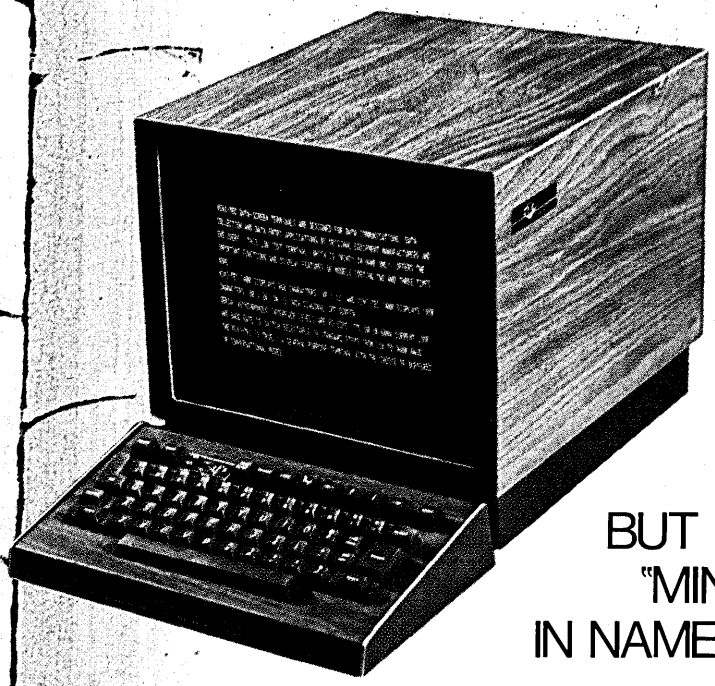

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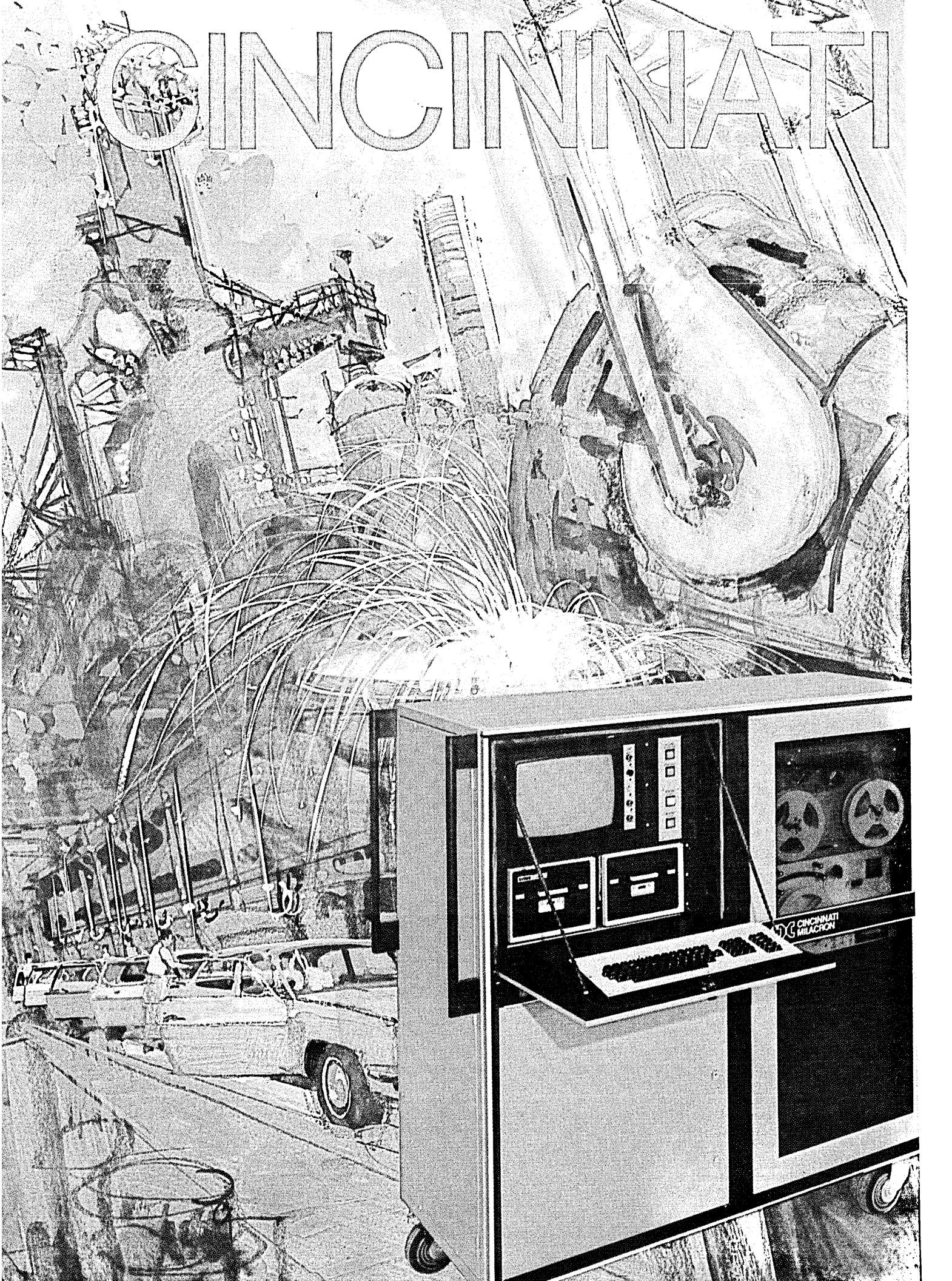
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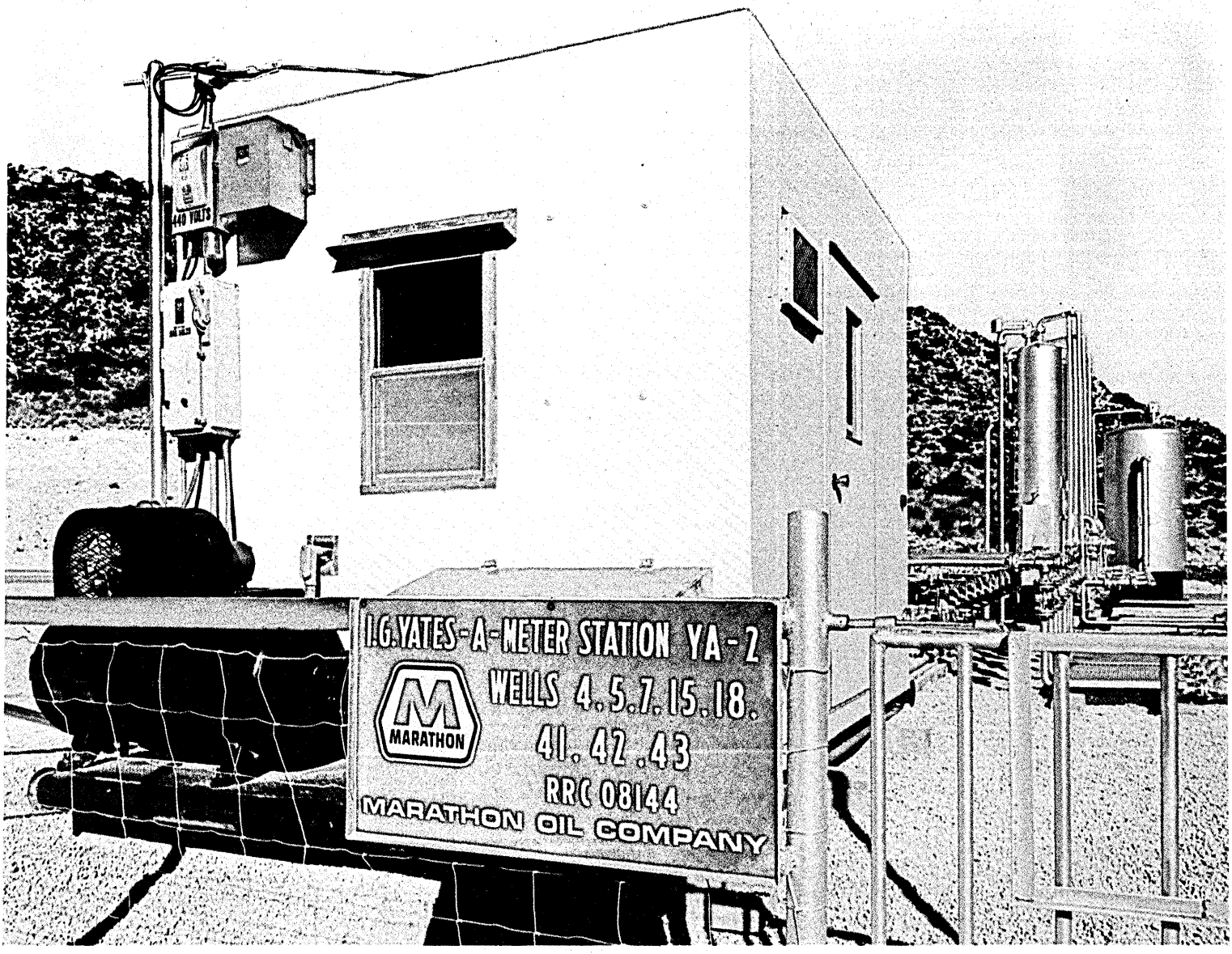


Marathon improves oil production techniques with Texas Instruments minicomputers

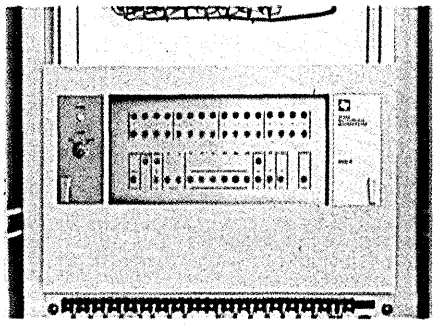
More efficient oil field and gas plant operations are among benefits Marathon Oil Company expects from a computer control system in the Yates Field of West Texas.

Texas Instruments is supplying 960A minicomputers and peripherals. Systems Application Engineering (SAE) provided systems design and software implementation.

960A minicomputers were selected, both for low cost and because the Communications Register Unit (CRU) simplifies system design and operation.

Reliability is designed into the system. Full-time, real-time communication is provided between office computer and remote computers. However, all computers can continue to operate even when communications are interrupted.

Also, system operation continues with 24-volt battery power even in case of external power failure.



Seven months after the system was ordered—and after only three weeks of installation and startup—the wells were under automatic control.

At present, the system includes 960A computers in the field office and five remote units. Marathon plans to operate virtually all of its 219 Yates wells with computers.

This is one of hundreds of control applications that use 960A minicomputers. For information on how 960A's can help solve your problems, call (512) 258-5121, or write Texas Instruments Incorporated, P.O. Box 2909, Austin, Texas 78767.

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money, we can offer these services this year, and also extend our network to Atlanta, Boston, and the Ohio Valley cities. If not, we'll have to wait until 1975. But the Philadelphia decision improves our prospects tremendously because it eliminates most of the risks for investors."

Besides finances, MCI faces another problem—one that could turn out to be less tractable. Sources inside the company report tremendous dissension there, including charges of excessive spending on fancy offices and expense accounts. Also, senior vp Carl Vorder Bruegge, who was trained by IBM, allegedly is fighting with other executives over marketing strategy. He has given most of the salesmen industry rather than geographic territories, say these critics who claim this has forced MCI to hire more salesmen than it needs. Vorder Bruegge also has been criticized for hiring computer people instead of communications specialists. "The computer systems guy talks a different language and tends to be better educated than the typical customer's communications manager," says one source. "This makes the manager suspicious, particularly when an MCI salesman bypasses him, as frequently happens, and goes to the president or financial vp."

McGowan, who is "proud of our marketing effort to date," replies that "virtually all of our salesmen are now working geographical territories, although last year they were assigned on an industry basis . . . If you look at what we've spent on our offices, you'll find that in both Washington and New York City, we're paying below average rental. Our office furnishings are considerably less expensive than those of other communications carriers and, as a matter of fact, the layouts are so cost-effective that the General Services Administration is copying them."

The issues in court

The Philadelphia decision addressed three basic questions AT&T and MCI have been fighting about for some time.

1. Did the FCC, in its 1971 Specialized Common Carrier Decision, want to foster limited or total competition among suppliers of private line services?

MCI complained it couldn't provide a fully-competitive interstate private line service because Bell operating companies had imposed four kinds of interconnect restrictions. They were refusing to interconnect the MCI network with Bell customers using common controlled switching arrangements. They declined to provide local loops between MCI and users in suburban areas. They wouldn't supply links between MCI towers and those of NCCC, another specialized carrier which plans to merge with MCI. And they wouldn't allow MCI to interconnect its foreign exchange (F-X) lines to Bell facilities so MCI could compete with AT&T Long Lines F-X service.

Judge Newcomer ruled that all four restrictions violated the 1971 decision because the commission in that decision "considered the full range of private line services, and it contemplated competition by the newly authorized carriers in the provision of all these services."

2. Is AT&T's Long Lines division an interconnecting carrier, in fact, if not in name?

MCI said it was being refused interconnect privileges routinely provided by Bell operating companies to the Long Lines division. AT&T insisted the operating companies and Long Lines provide the disputed services in partnership and thus there is no "interconnection" of facilities. Judge Newcomer found that "AT&T Long Lines provides no services completely on its own (and) is a functional competitor of MCI . . . There should be a functional equivalence between the services the local companies provide Long Lines and those they provide MCI."

3. Are local loops a state or federal regulatory responsibility?

Bell has argued repeatedly, with support from state public utility commissions, that local loops and other communications channels located wholly within a state are state responsibilities. The phone company insisted in court it couldn't provide the local loops that had been requested until they were tariffed by each of the states involved. Judge Newcomer, however, came to a different conclusion:

The FCC, and only the FCC, "has jurisdiction over the interconnection arrangements between common carriers for the provision of such interstate private line services as F-X, CCSA, or inter-exchange. (Bell) may not delay compliance with orders of the FCC on account of filings with state regulatory commissions, since these bodies lack authority over communications facilities . . . used to terminate interstate service."

The latter part of that conclusion is particularly important because the jurisdictional question underlies interconnection hassles in North Carolina, Minnesota, Nebraska, California, and Hawaii. The North Carolina proceeding is possibly the most significant. There, the state utility commission has announced a plan to bar the connection of independently-made telephone sets and modems to the intrastate telephone network. In Washington, the FCC has a hearing underway aimed at determining whether such a regulation would be beyond state authority. Previous pronouncements indicate the feds believe the answer is "yes." Judge Newcomer, by deciding he shares that opinion, puts the FCC in a significantly stronger position to impose its will.

Although origins of the MCI-AT&T court battle can be traced back to FCC's 1968 Carterfone decision, the immediate antecedents began with a 6-0 decision by the commission last Oct. 4, "requesting" the phone company to honor several long-standing MCI orders for local loops. That same day, Bell asked the FCC to review its 1971 Specialized Common Carrier Decision, but the FCC rejected the request on grounds that it's "premature"—the new carriers haven't been in business long enough to provide a basis for evaluating their performance and effects.

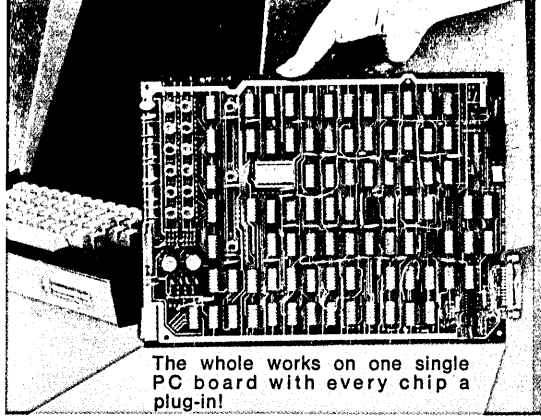
Meanwhile, Western Union, MCI, and several domestic satellite carriers have complained to the Commission that AT&T wants too much money for local loops under the interstate tariffs filed in response to last October's FCC order. These tariffs—there are more than 20—cover local loop service to domsat carriers and Western Union, as well as MCI and other specialized carriers.

Wyly Corp.'s Datran division has contended that non-Bell carriers are being charged more than AT&T Long Lines for these facilities, which it feels is discrimination. Western Union was particularly upset; its existing local loop contracts with Bell, signed in 1970, require a five-year termination. But these contracts are based on intrastate tariffs which, ordinarily, would be superseded by AT&T's new interstate local loop tariffs. Last December, WU told the commission that the new rates proposed by the phone company "are significantly higher than those in the 1970 contract."

Last month, the commission agreed that "substantial" questions had been raised. It decided they would be addressed in the upcoming hearings set in motion by the show-cause order. In the meantime, AT&T's tariff package was allowed to become effective but Western Union will continue, temporarily, to obtain local loops at previous rates. As for the other carriers, the commission held out the possibility that their local loop rates will be adjusted later, if the evidence warrants.

—Phil Hirsch

(Continued on page 98)



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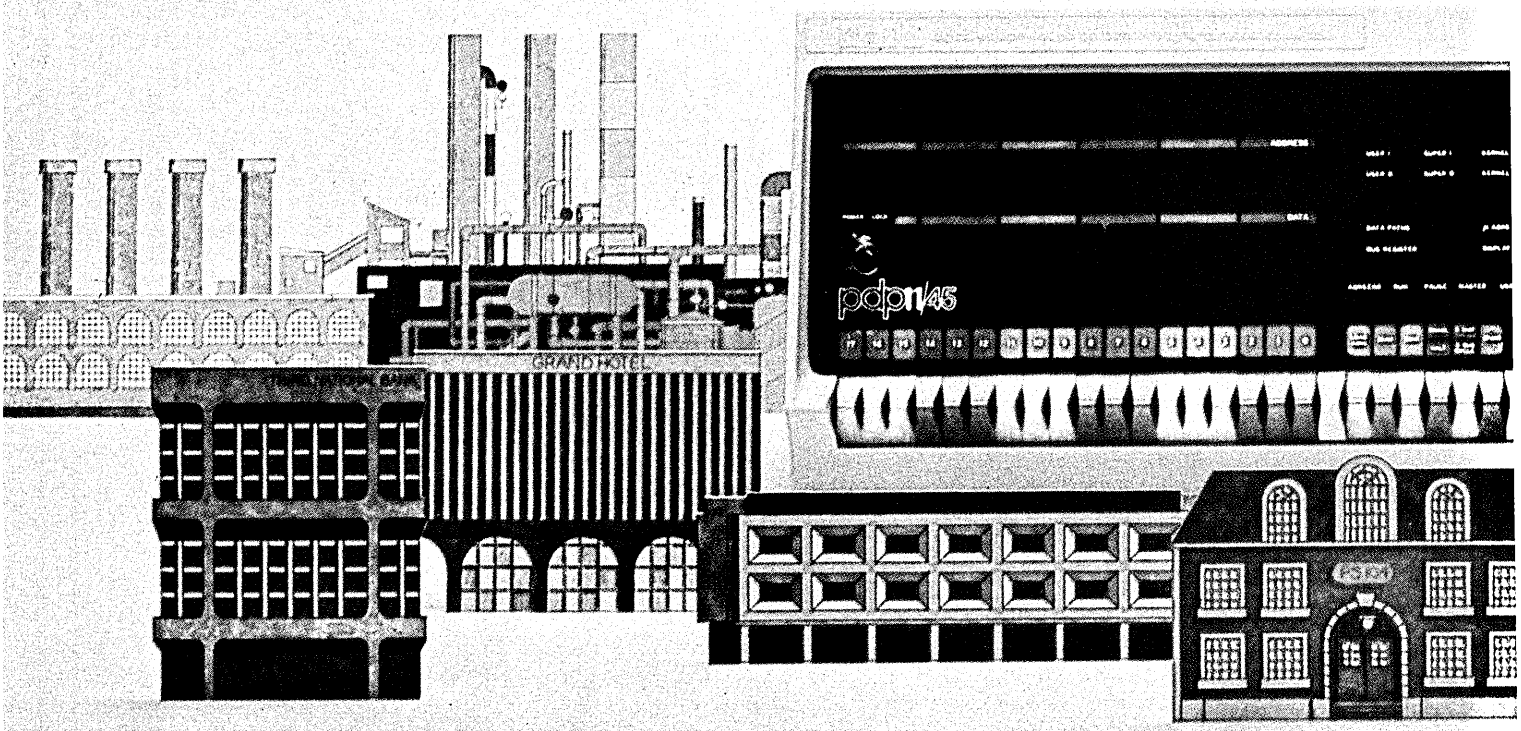

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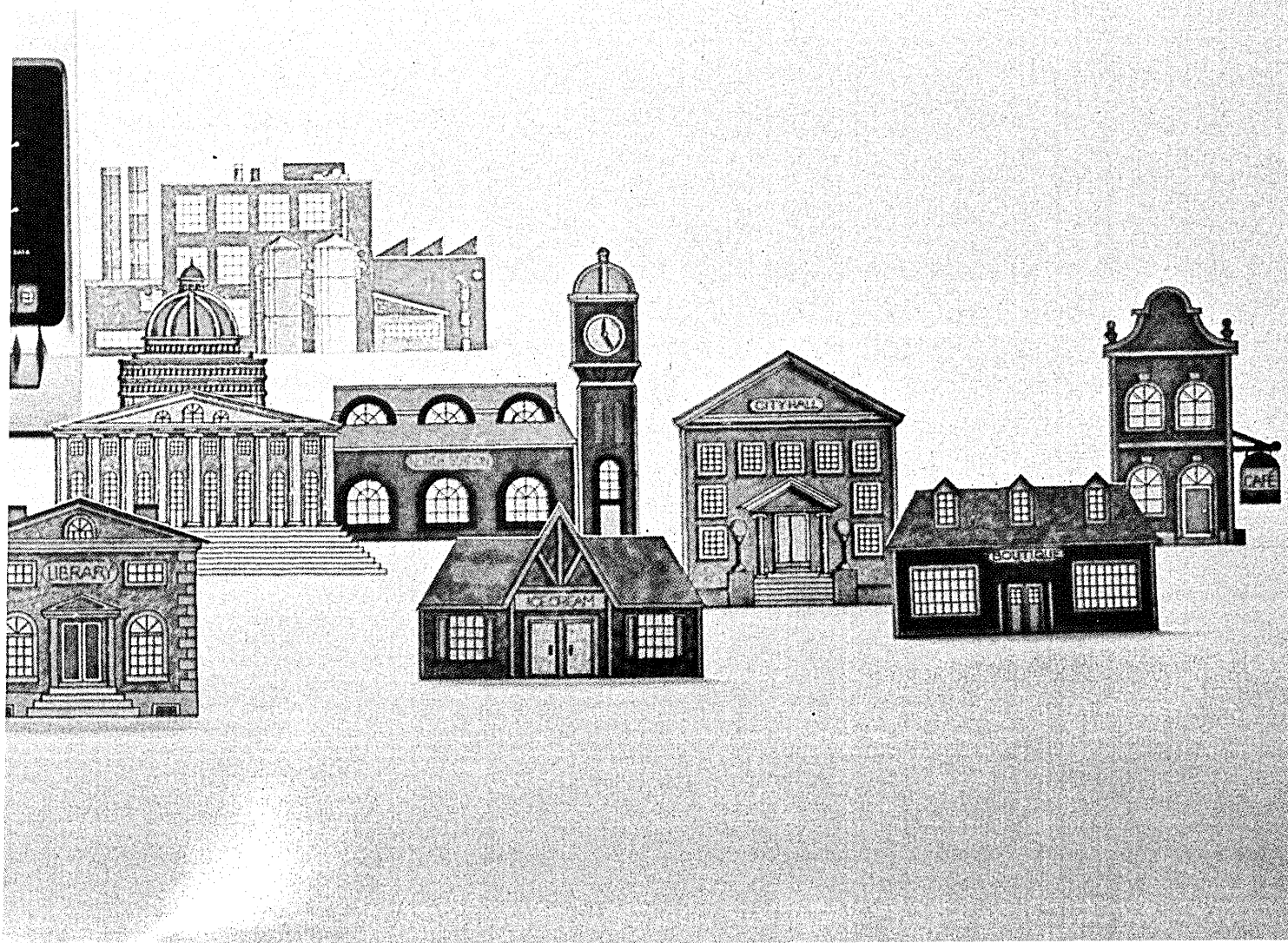

news in perspective

International

U.K. Workers Don the Woolens and Dig In

There is one mitigating factor in the U.K.'s energy famine: Britain has probably the most sophisticated computer-controlled electricity distribution system in the world. But even that isn't helping anyone to assess the likely effect on business of the energy shortage created by the Arab oil cutback.

Unhappily, an insight into the vulnerability of the computer industry can be had in Britain, where the government has imposed special emergency regulations with a so-called "three-day week." It simply means that factories, commercial premises, offices, and shops are not allowed electricity from the public utility supply for lighting, heating, or power for three days each week. The particular three-day blocks —Monday, Tuesday, Wednesday, or Thursday, Friday, Saturday—have been allocated to different regions.

The electricity industry has been hit because Arab oil embargoes coincided with an industrial dispute in the coal mines. As part of wage negotiations, the mining unions have stopped members from doing overtime work. About one third of the coal is produced during extra time. The bulk of electricity is generated by coal. Only about 25% comes from oil, gas and nuclear power.

Electricity production is controlled by a state-owned Central Electricity Generating Board and near-autonomous regional generating organizations, called Area Boards.

However, the central board operates a national monitoring and computer scheme of the national supply grid. Normally, regional boards can buy and sell surplus electricity to them, at the most favorable price, via this network. But it involves dynamic modelling of very complicated operations. This is made possible because of the monitoring and control center's work. In the emergency, this method allows power to be distributed through the country according to the three-day week demands. Without the flexibility of computer control, the situation in the U.K. would be far worse.

Computers are exempt

There are exemptions to the three-day rule. Food and process industries are excluded and so is the operation of computers and essential business machines. On their non-electric days, office staffs work only through daylight. The executive of one insurance company said even this would have been impossible if the computer was switched off.

The biggest U.K. computer firm, ICL, has not only installed power generators, but has bought its own tanker truck to move fuel between factories. Assembly workers wear extra woolens for warmth. ICL said it has not encountered any materials supply problems that did not exist before the crisis, when there already was a delay in shipments of semiconductor components.

IBM saw no immediate effects on production, but felt the circumstances might differ between their factories. One producing large cpu's had longer schedules. Another, engaged on a wider range of sub-assemblies and units for different peripherals and processors, relied more on supplies through subcontractors, themselves facing possible delays from cutbacks in materials deliveries, particularly in steel. IBM thought the way work was dispersed among a number of suppliers would ensure production. However, the whole situation was under constant review.

A more serious blow to the industry is from a spending cut in the public sector brought in with an emergency budget that accompanied the other energy measures. Over the next year, spending on the computer and communications sector by government agencies will be slashed by $20 million. This comes at a moment when most manufacturers' order books were up 20-30% following a recovery from the last economic downturn.

—Pearce Wright

Benchmarks

No Contempt Says Judge: Telex' first try at enforcing injunctive provisions of the revised Telex-IBM antitrust suit failed last month when Judge A. Sherman Christensen dismissed a Telex request to find IBM in contempt of court for violating the provisions. Telex had contended IBM had "willfully violated the court's amended judgment" by failing to provide interface information it requested according to the decision's requirement that IBM "make available on request, at the time of first customer shipment of an IBM cpu or its channel, information describing the design of the electronic interface for such product . . ." In denying Telex' request for a contempt citation, Judge Christensen upheld IBM's claim that the information requested by Telex concerned computer design, rather than interfaces.

No Uncertainty Here: The industry's two biggest profit makers, IBM and Burroughs, don't foresee any slackening in edp activity as a result of energy shortages. Both reported record revenues in 1973. IBM's revenue rose 15% to $10.9 billion from $9.5 billion in 1972 and its profits soared 23% to $1.5 billion, compared with $1.2 billion a year earlier. Burroughs reported a 22% increase in revenues—from $1 billion in 1972 to $1.2 billion in 1973 and its profits reached a record $115.8 million, 32% above the 1972 profit of $87.5 million.

Some analysts noted that an increase in outright purchases of dp equipment by customers contributed significantly to IBM's record fourth quarter rise in income of 38%, although the company nevertheless recorded a 15% increase in revenue from rented equipment. IBM also said it had a strong backlog of orders at the year-end, higher than at the end of 1972. Burroughs said its backlog at the year-end soared 30% over what it had on its order books at the end of 1972. This is a record increase. Its chairman, Ray MacDonald, said the company had experienced no significant effect from energy problems. He said capital spending plans continue to be strong and this should have a favorable impact on the edp industry. Even the traditionally unprofitable Xerox Corp. computer operations won't lose as much money this year. The company expected to lose $25 million in 1973, but a "very encouraging" order rate leads it to expect a "substantially reduced loss in 1974" from computer operations.

Fast Fax: Graphnet Systems, Inc. will use packet switching technology in a nationwide facsimile communications network it plans to build. The company, a subsidiary of Graphic Scanning Corp., Englewood, N.J., received approval to operate the network from the Federal Communications Commission Jan. 5. It said its network would enable transmission of documents at prices as low as $1.50 for a typical 8½" x 11" document. It is the second value added carrier to receive FCC authorization to use computer hardware and software to transmit data at very high speeds over ordinary telephone lines and microwave circuits leased from the telephone company. The first was Packet Communications, Inc. An application also has been filed by Telenet, a subsidiary of Bolt Beranek and Newman Inc., which developed the processors in a similar system for the Defense Dept.'s ARPA network. □

There is a better way to meet the paper crisis.

Paper costs are on the rise. Pending paper shortages are making matters worse. Postal rates are up adding to the crisis. The paper explosion occurring in American business is causing inflationary havoc with company operating budgets. There's no end in sight.

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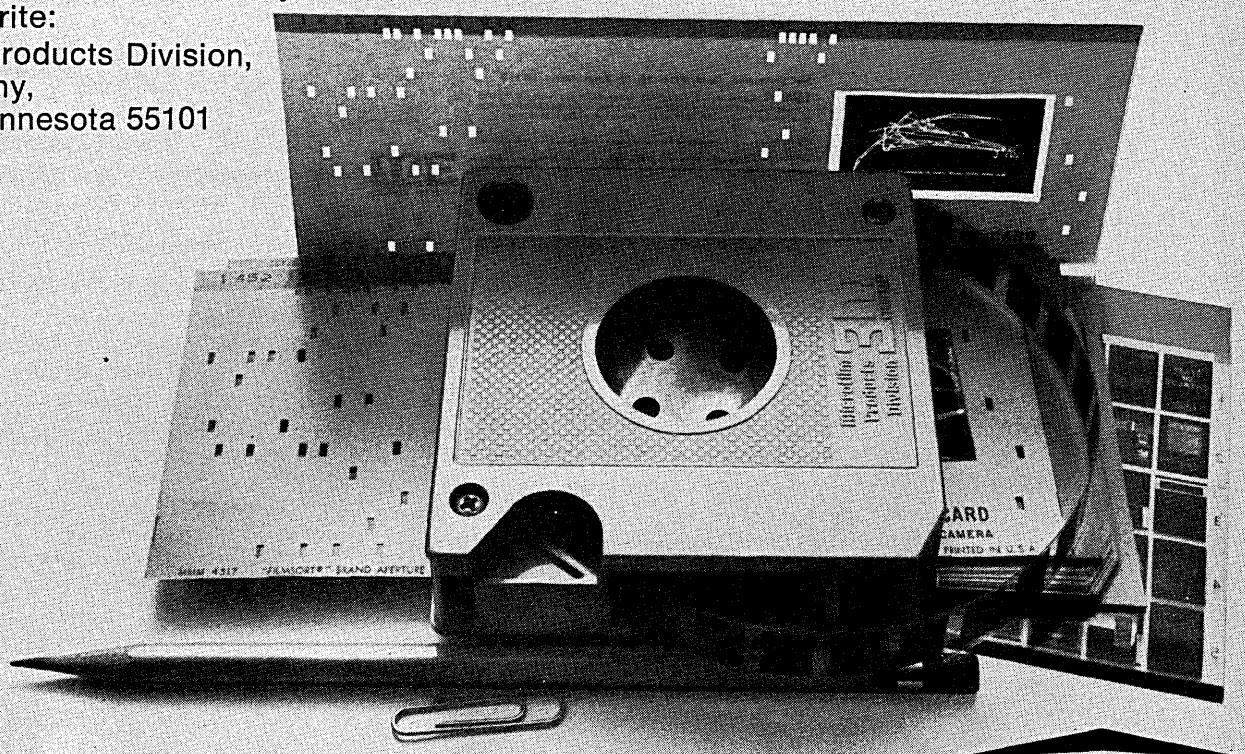

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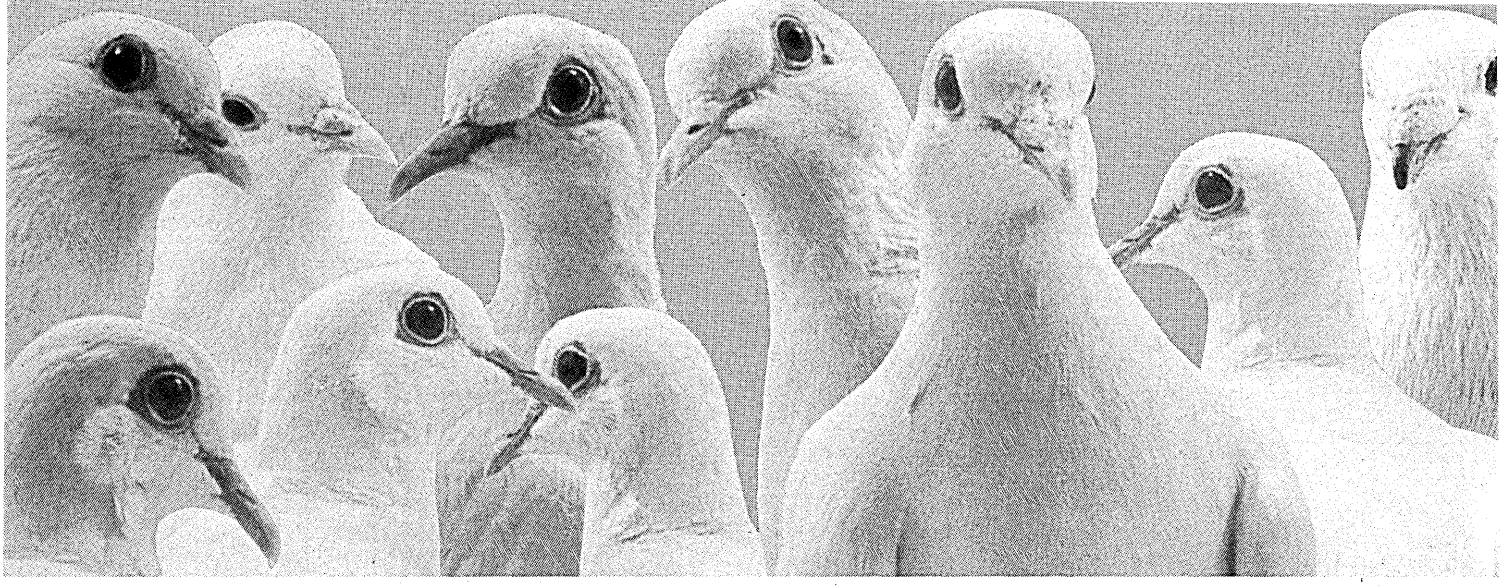

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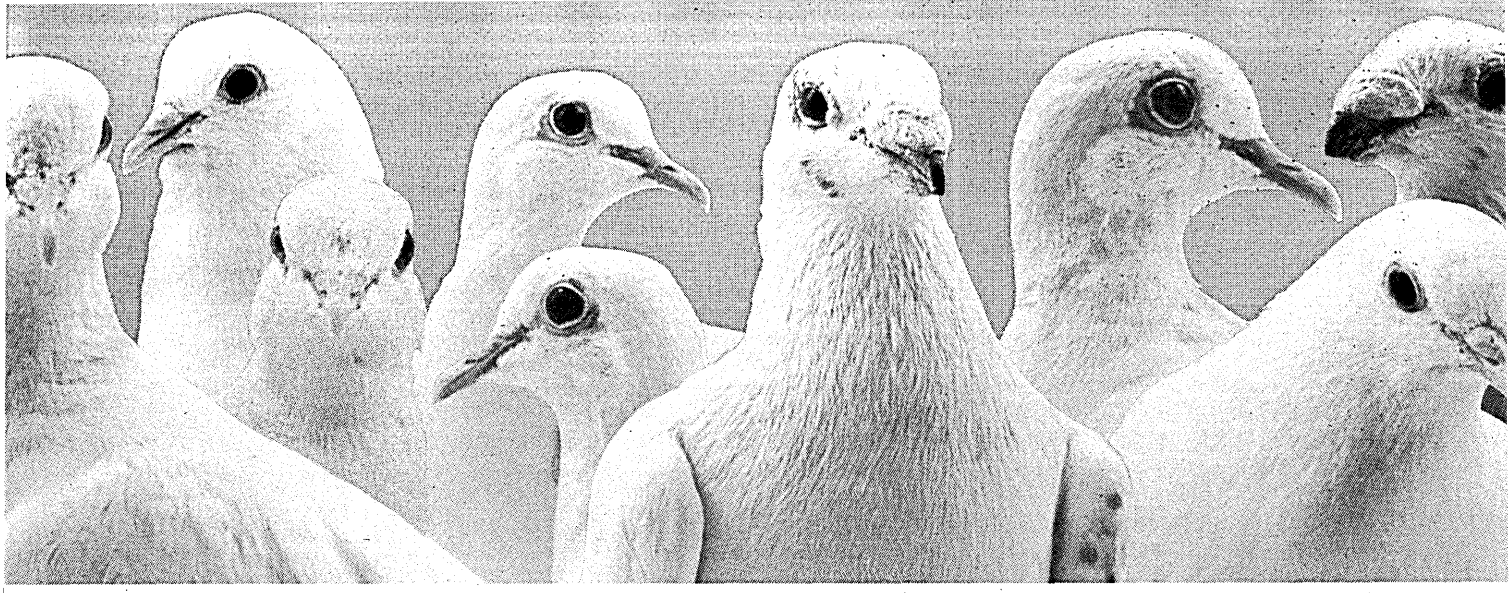

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CIRCLE 48 ON READER CARD

Hardware

Off-line

Contrary to initial reactions, the energy crisis might be good for the information processing industry, both in terms of increased sales and improved public image. One of Xerox Computer Systems' steady customers is F&M Systems, a Dallas, Texas company that specializes in supervisory control and data acquisition systems for most forms of energy distribution. Recently the firm automated a gas pipeline that carries 10 million cubic feet of gas daily between Texas and Canada. Before automation, the pipeline required from 30-40% of the gas just to drive the pumps that move the gas. After the Xerox Sigma computers took over, a 5-8% reduction--500,000 to 800,000 cubic feet per day savings--was realized. Even more impressive, F&M claims that computers can improve oil field recovery by as much as 15% through better pump control.

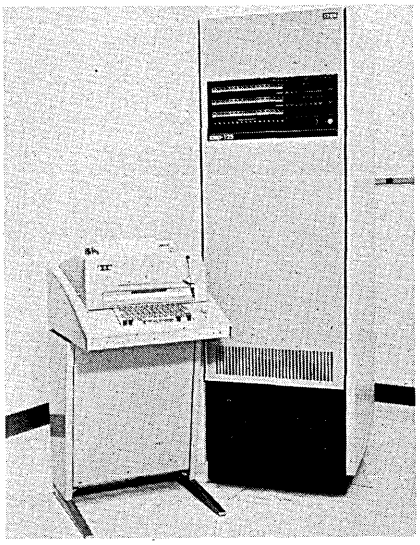
Nearly 8,000 small business computers went to U.S. users during 1973, a 52% increase over 1972 shipments, according to International Data Corp. in a recently completed market study. By 1977, Newtonville, Mass.-based IDC thinks small business computers will compose fully half the total number of general-purpose computers installed, or roughly 60,000. Another finding of the study: 25% of all U.S. businesses with 100-249 employees now perform in-house processing.

Another traditional bastion of number crunching mainframes--the insurance company--has fallen to minicomputer forces under the command of Data General. When the Monarch Life Insurance Co. of Springfield, Mass., saw that it was spending upwards of $15K/year in time-sharing costs for calculating actuarial listings, it checked into the possibility of getting the same job done on a 24K Nova mini system. Although it couldn't find another insurance company using a minicomputer to construct its risk analysis tables, Monarch is very pleased with the purchase of the $40K system. Not only have operating costs decreased, throughput has gone up, and having the system in-house contributes toward better data security.

Midicomputer

The CSP-125 is a very high-performance 16-bit computer manufactured by a firm familiar with such applications as signal processing and spectra analysis. Accordingly, the software available for the machine is biased toward those applications and others such as Fourier transforms, linear prediction, ⅓ octave filtering, recursive digital filtering, histograms, modeling, etc.

What allows the 125 to tackle such formidable applications, where massive amounts of data typically have to be processed in very short times, is an impressive list of hardware characteristics. The machine can have up to 32K words of 125 nsec IC memory, and up to 128K of secondary core storage.



There are 256 mnemonic instructions including simultaneous fetch and store to core commands that allow foreground processing rates to carry on undisturbed by background-based operation. There are eight levels of hardware priority interrupts standard, expandable to 57, hardware multiply/divide, 32 general-purpose registers, 14 of which can be used as index registers, etc. A good measure of the 125's performance is the claim that a full 16-bit by 16-bit multiply can be completed in 1.25 usec. Systems software includes FORTRAN IV, an editor, loader, debugging package, and peripheral drivers. The manufacturer installs the 125 on a turnkey basis, with prices starting at approximately $50K for a 4K system. CSP INC., Burlington, Mass.

FOR DATA CIRCLE 281 ON READER CARD

Disc Storage

The 3673 is perhaps the first alternative disc storage device available to users of the IBM 370/125. The disc pack storage systems are plug-compatible with IBM's 3330 models I and II, with a choice of either 100 or 200 megabyte-per-pack storage densities. The 3670 also hooks to the 370/135 through a controller, but since the 370/125 doesn't have a channel upon which to append a controller, Memorex has figured out a way to attach the system directly to the 125's Direct Disc Attachment (DDA) integrated control unit. Up to eight drives of either density can be controlled by the 3673 controller, and string switch features similar to IBM's permit additional drives to be attached. Now if they can only find a way to hook up to the 370/115 so users aren't forced to use the Winchester disc file or go without. Pricing on a two-year lease is $265 for the 3673 controller and $600 for each disc drive. MEMOREX CORP., Santa Clara, Calif.

FOR DATA CIRCLE 282 ON READER CARD

General-purpose System

The developers of this system, which is based on the Datapoint intelligent terminal, have decided to call it Omnishare, which seems like a good name considering all its capabilities. For example, when talking to a host computer in a network configuration, Omnishare can run emulators to make it look like an IBM 2780 or 360/20 terminal, a CDC User 200, or a Univac 1004 or DCT-2000 terminal. While processing as a standalone unit, the Omnishare knows routines that can make it act as a key-to-disc system or a letter generation system, and it can also do text processing, file maintenance, and a considerable amount of processing by itself in RPG II and BASIC (with COBOL scheduled for later this year). Up to eight remote crt terminals can use the system concurrently. A typical system with 16K bytes of memory, a 5-megabyte disc, line printer, card reader, tape drive, an eight-port terminal multiplexor, and all software rents for approximately $2,500/month. OMNIWARE SYSTEMS INC., Rosslyn, Va.

FOR DATA CIRCLE 283 ON READER CARD

COM-to-crt Device

Get ready for what may turn out to be the birth of a common generic product type within a few years. It's called Computer Output Video (COV) and what it does is take digital page records —typically destined for an off-line COM device—and convert them into high density video images which may

then be routed directly to a display monitor with associated video buffer, or even to a videotape unit for storage and later retrieval. The cov page converter would allow industries, e.g., the airlines, to display information on 1,280 tv line crt's to make it easier to read the small lettering. The cov converts two full 3,888-character pages per second from an 800-bpi density tape. The price of the cov unit is approximately $40K which includes the tape drive required. AMPEX CORP., Redwood City, Calif.

FOR DATA CIRCLE 284 ON READER CARD

Operations Aid

Here is another source for a product that seems like a good idea—a volume serial number display for helping operators keep track of mount messages on tape drives, disc drives, and printers in IBM system environments. Mount messages are intercepted from the cpu-to-console data line and transmitted to individual displays atop the devices.

This particular system does not require any modifications to existing software since its operation is totally hardwired. A malfunction in the VSN system in no way affects computer operation. A typical system rents for $450/month on a three-year lease and includes a controller and 10 displays. GENESIS ONE COMPUTER CORP., New York, N.Y.

FOR DATA CIRCLE 285 ON READER CARD

Tape Drives

The three members of the 2700 series tape drives contain some features significantly different in design and philosophy from many of their competitors' —which should at least be considered by oem's. For example, while two of the drives are vacuum column units, they share 80% of the parts with the third member of the series, a tension arm unit. The commonality should greatly reduce systems designers' problems in stocking spare parts. Additionally, the manufacturer of the 2700 series is convinced that automatic load will never become a popular option for lower-speed units (75 ips and below) and has therefore designed the tape path so that it is very easy to load manually.

All models use 10½-inch reels and

can be equipped with seven- or nine-track NRZI and/or phase-encoding heads. Actually, all models have the same recording heads, with their particular recording mode determined by a single pc board swap that can be made in the field. The 2730 tension arm model is available in 12.5 to 45 ips speeds; the 2740 features a three-inch wide vacuum column to reduce sound levels for office environment operation at 12.5 to 45 ips, and the 2750 has dual vacuum columns for operation at up to 75 ips. Prices for the three models are $2,800, $3,200, and $3,500, respectively, based on orders of 100 units. Units come with 13-month warranties. BRIGHT INDUSTRIES, INC., Sunnyvale, Calif.

FOR DATA CIRCLE 286 ON READER CARD

Magnetic Tape

Before starting development of its fourth generation of magnetic tape during its 12-year history, Memorex surveyed 1,000 computer sites trying to find the principal reasons why old tape has to be scrapped. We're told that the answers were nearly unanimous: edge damage. That is the problem principally addressed by a product code named "Super tape" which will be dubbed something perhaps more modest by the time you read this. Pricing has yet to be established, but officials state that the tape will probably be somewhat more expensive than their current top-of-the-line models (roughly $30-40 depending on quantity), but should wear much longer due to its being structurally stronger than previous tapes of its make by a factor of two. MEMOREX CORP., Santa Clara, Calif.

FOR DATA CIRCLE 287 ON READER CARD

More IBM Data Entry

It's no secret that IBM's 3740 hasn't met with unqualified success, but the addition of the models 3 and 4 may change that considerably. The units are user programmable and contain instructions for performing arithmetic operations, I/O control, logical tests, branching, and operator guidance. All of this is done in a new language called ACL (application control language). Application programs can be designed, coded, and tested at the 3741 without the need for using the host computer for object code creation. A translator is offered for generating new programs or modifying existing ones. The models differ in that the model 3 is a stand-alone model, and the model 4 is equipped with a binary synchronous communications adapter, enabling it to talk to other computers or data entry devices when it's not operating under ACL's control. Other than the addition of ACL, the models 3 and 4 function exactly like the original diskette data entry devices. Standard monthly rental for the units ranges from $253 to $288, with the ACL translator renting for $35/month. IBM CORP., White Plains, N.Y.

FOR DATA CIRCLE 288 ON READER CARD

Portable Data Entry

The Source 1100 is a portable keyboard-operated terminal that stores up to 8K 10-digit ASCII numbers typically representing inventory items for subsequent transmission to a computer for processing. The all solid-state device is battery powered and has control buttons and indicators for showing erroneous entries, low battery level, etc. Transmission of the memory contents is at 40 cps through a standard telephone receiver. Prices start at approximately $900. MSI DATA CORP., Costa Mesa, Calif.

FOR DATA CIRCLE 289 ON READER CARD

Crt for Nova Systems

The Lexiscope 2000A is this manufacturer's entry into the dp field, although it has built instrumentation products for some time. The crt can be supplied in various forms ranging from the pc-board controller alone (so that users can attach the crt of their choice to Data General minis), on up to a complete, ready-to-run system using either

product spotlight

Communications System

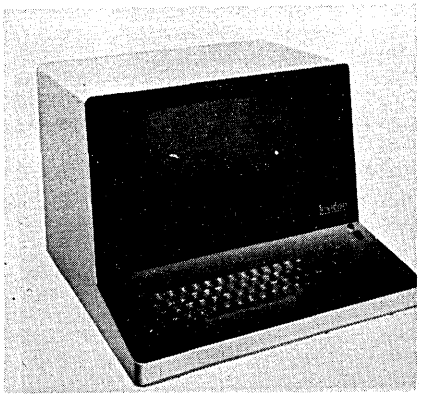
Characteristically, IBM has announced a product that in some degree will affect our thinking about the place of a number of products in the coming years, specifically intelligent terminals, data entry/inquiry, and, to some extent, data preparation devices. It would seem that the industry giant has done a complete about-face from its traditional stance of completely endorsing centralized processing (begun with the 3705 programmable communications controller) and is willing to let more processing be done at remote sites on a network with the 3790 communications system, though programming for it still must be supplied from some remote 3704 or 3705 controller through NCP/VS. Only time will tell whether all of the 3790's features will be exactly what any specific industry wants, but it would seem to be just what the insurance industry would have designed to do its particular kind of distributed processing.

The 3790 consists of the 3791 controller, one or two 120-lpm line printers, and up to 16 terminals, which can be 3793 keyboard printers (in reality these are modified Selectric II typewriters with operator guidance controls) and/or 3277 display stations. The 3791 is expandable from 4.8 to 27.5 megabytes of disc capacity for storing application programs and local data files. This storage might typically represent a branch office's daily transactions, against which operators can apply various local programs. The 3791 also can record data on diskettes for batch transmission to the host cpu during non-peak activity times. Each terminal operator can be dealing with a separate application routine such as data entry and validation, range checking, etc.

A typical configuration of the 3790 might include the 3791 and its integral line printer, 27 megabytes of disc storage, four 3277 crt displays (each with 1,920 character capacity), and two of the modified Selectric II terminals. This version would sell for $103,330 or rent for $2,817. Deliveries are slated for about this time next year. IBM CORP., White Plains, N.Y.

FOR DATA CIRCLE 280 ON READER CARD

a 12-inch or 15-inch crt. Options include an expanded ASCII character set with upper and lower case capability, blink and underline attribute features, etc. Software support allows such operations as scrolling, tabbing, field pro-



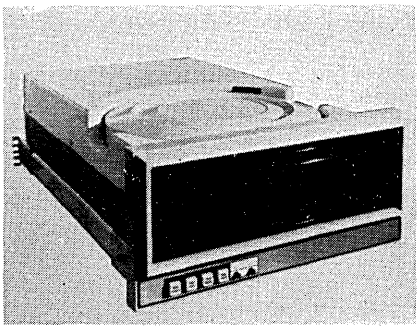
tection, and other editing functions.

The basic system is set up to show 25 lines of 80 characters, and can transmit them back and forth between the cpu and crt at rates approaching 200K cps. System designers can obtain the controlling circuitry alone for $1,495, or users can get a complete 12-inch crt system for $2,095. LEXICON, INC., Waltham, Mass.

FOR DATA CIRCLE 290 ON READER CARD

Disc Storage

A complete disc and controller system has been developed for the Computer Automation Alpha 16 minicomputer, consisting of one fixed and one removable 5440- or 2315-type disc cartridge. More than 2.5 megawords of storage are thus available, with access times of 35 msec and a 1.56 megabit/second transfer rate. The controller provides the word buffering and signal timing for core-to-disc transmission, using the block I/O and auto I/O data transfer



mode of the computer, thus not requiring the direct-memory-access channel. The model 1101A is also compatible with Computer Automation's 116 and 216 mainframes, and also with the recently introduced LSI Naked-Mini machines. Single unit price for the disc subsystem is $7,500 and includes the drive, controller, and supporting software. DIGIMETRIX, INC., Hayward, Calif.

FOR DATA CIRCLE 291 ON READER CARD

Envoy.

The Paperless Portable vs. Portable Paper.

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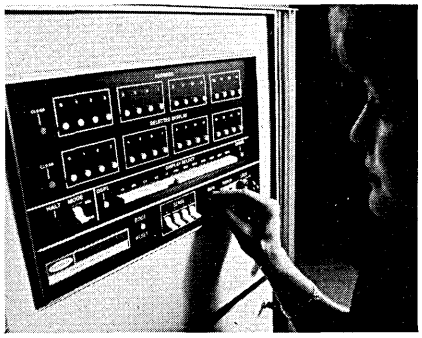
CIRCLE 7 ON READER CARD

Minicomputer

There were a lot of users who thought this manufacturer's 704 minicomputer was the best on the market, primarily due to its extensive instruction repertoire and well-checked-out software. They probably won't be disappointed with the extension of the 704 philosophy, the RDS-500—which has been dubbed SUPERMINI. Available to both oem's and end users, the internal speed of the 500 has been increased by a factor of two over the 704, running from up to 64K of directly-addressable 800- or 900-nsec core memory. The cpu speed is 100 nsec. Also inside the RDS-500 are 98 instructions, with an additional 24 commands standing by should the user want floating-point op-



eration. Standard in the 500 are 16 vectored priority interrupts, printer controller, automatic bootstraps for four devices, and an operator's console. A 32K version with these features is priced at approximately $14K and is also available on leasing contracts.

Options include single- and double-precision floating-point hardware, power fail/restart, an eight-device memory multiplexor for each of two bi-directional bus structures, multiprogramming memory protection, and memory parity. Software includes FORTRAN IV, SYM III, a two-pass macro assembler, COBOL, RPG, and all earlier 700 series software libraries. RAYTHEON DATA SYSTEMS, Lexington, Mass.

FOR DATA CIRCLE 292 ON READER CARD

370/145 Memory

MULTIMEMORY 7370/145 is the name for this line of semiconductor add-on memory products offered for IBM's 370/145 models one and two. The plug-compatible increments are 256K for the 3145-2 processor, and both 256K and 128K for the 3145-1. With the price of nearly everything in a state of flux currently, the vendor doesn't want to quote an exact dollar figure for the units, but will say that rental will be approximately 90% of whatever IBM is currently quoting for the popular I to IH conversion (512 to 768K increase), based on a two-year lease.

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Tape interchangeability with IBM tape drives is ensured, and the Mod 1200 operates with all standard WANGCO interfaces, as well as most low-cost tape system controllers.

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FOR DATA CIRCLE 293 ON READER CARD

Line Printer Controller

A line printer controller has been developed that enables users of the Digital Equipment PDP-11 minicomputer to attach nearly any line printer to the system. Buffered or unbuffered printers, such as the Centronics, Data Printer, Data Products, Pertec, and Printec are interfaced via printed-circuit boards inserted into the mini. Operation and programming remains the same as described in the PDP-11 operational manuals, including operation codes, commands, and diagnostics. Prices, including cables, start at $450. MDB SYSTEMS, INC., Orange, Calif.
FOR DATA CIRCLE 294 ON READER CARD

Key-to-disc System

The model 1200 is a compatible member of Mohawk's key-to-disc data entry systems that is optimized for shops requiring from 4-12 keying stations. More than just a packaged configuration of the larger 2400 system, the 1200 marks the debut of a design that puts a 32-64K word processor, 8K byte (Diablo) disc drive, and tape drive in a common cabinet to help keep the cost-per-keyboard—and floor space requirements—at a minimum.

One of the 125-character crt stations can be designated as the supervisor's station for initiating operations such as dumps, transfers, startups, closedowns, batch searches, and status checks. Two I/O channels are the limit for the 1200, one for 2780-mode half-duplex communications at up to 9600 baud, and the other reserved for a choice of four hard copy printers ranging from a 100-cps serial printer to a 760-lpm line printer. Pricing on the 1200 starts at $625/month for the control unit/tape/disc combination, plus $50/month for each keyboard. First systems won't go to the field until August. MOHAWK DATA SCIENCES CORP., Utica, N.Y.
FOR DATA CIRCLE 295 ON READER CARD

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City	Date	Site
Washington, D.C.	Feb. 20-22	Shoreham Hotel
Cincinnati	Feb. 26-28	Cincinnati Convention Center
Houston	Mar. 5-7	Albert Thomas Convention Center
Anaheim	Mar. 19-21	Anaheim Convention Center—South Hall/ Sheraton Anaheim Hotel
San Francisco	Mar. 26-28	Civic Auditorium
St. Louis	Apr. 3-5	Chase Park Plaza Hotel
Chicago	Apr. 9-11	Hyatt Regency O'Hare
Boston (Woburn)	Apr. 15-17	Northeast Trade Center (Rte. 128, Exit 39 or 40)
Charlotte	Apr. 23-25	Charlotte Convention Center
New York	Apr. 30-May 2	Americana of New York

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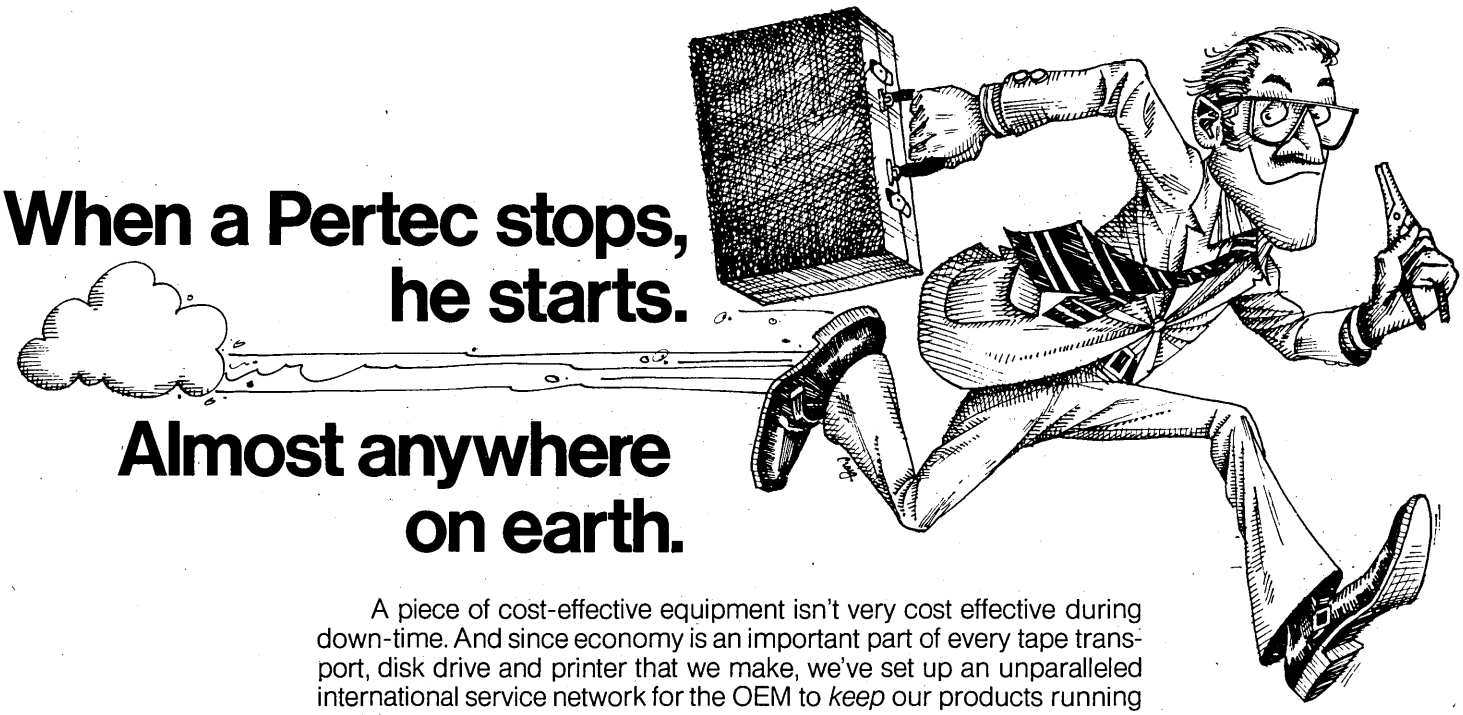

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CIRCLE 83 ON READER CARD

Software & Services

Updates

A technique has been found for analyzing the content of unstructured English language narrative data. Developed by Analytics Inc., Jenkintown, Pa., under a contract with the Office of Naval Research, the technique was initially used to grade the performance of officers during a naval exercise by analyzing records of the verbal information on which they based command decisions. Analytics' methodology searches strings of information--which may be entire sentences or clauses--and establishes what is being talked about by building up hierarchical relationships and creating a thesaurus. Particular attention is paid to keywords and operators (verbs). While not presently offered as a product, it would seem that the analysis technique could be used in other disciplines, particularly psychology.

Today's army has automated the recruitment function, using a program called "Request" that runs on Computer Sciences Corp.'s INFONET time-sharing network. It's claimed that the days of sending physicists to cooking school (and cooks to physicist school) have ceased, and the recruiter can find out in real-time whether particular training or stations can be promised. The new system is credited with helping the army meet its recruiting goals for the first time since the draft ended.

ACM has announced that it is willing to turn over the tapes... tapes of its highly successful ACM '73 conference held in Atlanta last August. Guaranteed not to contain any mysterious blank spots of critical conversations regarding data bases, computer research, and virtual memory management, a selected portfolio of 10 tapes is priced at $85 for ACM members; $100 for non-members. They are available from Information Cassettes, Inc., 866 N. Wabash, Chicago, Illinois.

The National Bureau of Standards is now distributing a metric conversion software package (FORTRAN IV), documentation, and test cases for approximately $500. Developed by the Caterpillar Tractor Co., the double-precision program has a maximum difference of .0005-inch between millimeter and inch values.

System Security

A major improvement to the data protection capabilities of IBM operating systems is said to be provided with the Data Access Security System (DAS). Some minor modifications to the monitor are required for its implementation, but these can be accomplished over a weekend, states the vendor. The alterations are said to result in slightly increased system overhead.

Job control statements or TSO procedures are used by DAS to determine authorized access to data sets. Unauthorized accesses result in ABEND's, and all accesses are logged in the SMF audit facility. Included in the DAS package is historical, analytical, and exception reporting modules. DAS operates on all versions of OS, release 21 or later, including HASP, TSO, MVT and MFT. Support for multiprocessor 360/65s is also available for releases 19 and 20. The product is delivered complete with source and load libraries, technical description, program logic manual, and a recipe type procedures guide for installation and use of the system. Yearly license is $2,400 for the first year, $1,200 for each additional year, or $4,400 for a perpetual license. Virtual memory versions will be ready in the near future. INTERNATIONAL COMPUTER TRADING CORP., San Francisco, Calif.

FOR DATA CIRCLE 261 ON READER CARD

Carpool Scheduling

It would seem that with the prospect of gasoline rationing, organized car pools would be the only way many of us could survive on the allotments currently being mentioned. Here's a computerized service that may be of interest to governments, universities, and larger business entities for generating lists of car pools. Subscribers to the service are provided input forms for employees to fill out with information such as destination point, origin point, telephone number, address, and whether the employee is merely a rider or can also drive. These forms, together with a map of the area in which the employees reside, is furnished to the vendor of the service. A directory is then given the customer, coded by geographic points and by time of departure for individuals leaving and arriving in the same areas. The pricing varies by number of records to be processed, but a run on 5,000 records would cost $4,500, with each additional 1,000 records costing $190 extra. The pricing seems high, considering that employees move around, change jobs, etc., and it may be that the vendor could be talked into selling the software outright for some nominal fee. AUTOPOOL, INC., Seabrook, Md.

FOR DATA CIRCLE 262 ON READER CARD

370 Simulation

The S/370 Simulator consists of routines for performing in software the seven instructions that make a 370 different from a 360. In addition to the mnemonics CLCL, CLM, ICM, MVCL, SRP, STCM, and STCK instructions, the byte alignment feature is also simu-

software spotlight

Teleprocessing Aid

The intent of the Telecommunications Translator (TLT) submonitor is to reduce the entire process of developing message processing routines for teleprocessing monitors to a one-step operation the user may perform at a crt. Usable with such telecommunications monitors as CICS, Task/Master, and Minicomm, TLT requires only a free-form list of the words, phrases, and data a message may contain. TLT analyzes the message, using the specification as a guide, and identifies its information content for the user's on-line system. The translator then tells the user what information the message contains and what is missing. Data satisfying the user's specifications is copied out of the message, edited, and made available to the user's system for further processing. TLT also detects inappropriate or erroneous data and pinpoints it, so that it may be returned to the operator for correction.

The assembler language module requires approximately 4K bytes, and is compatible with any of IBM's 360 and 370 operating systems. The package is available under a license agreement for $95/month, with the user receiving a paid-up, irrevocable license after 48 months. A 30-day trial period is offered. SOFTWARE CREATORS INC., Port Washington, N.Y.

FOR DATA CIRCLE 260 ON READER CARD

REPLACEMENT MEMORY PUTS

EMM IN THE LINE-UP

AT THE NFL PLAYER DRAFT

The annual draft analysis for three NFL football teams is only one of the many uses to which Optimum Systems, Inc. puts their two 360/65 systems, each with a total of 2 megabytes of EMM memory. Others include such applications as the development of stress factors for multi-story office buildings and record control for six neighboring municipal departments.

Why have so many Systems 360 and 370 users like Optimum Systems chosen EMM compatible memory?

With some, **reliability** was the key. They know that EMM has more **experience** with semiconductor, core and disk memory **technology** than any other memory company. They know that EMM controls every step of its manufacturing processes from basic storage component through finished system.

Others had a budget problem. They discovered that EMM is willing and able to tailor its **terms** to meet their specific needs.

With still others it was essential that their memory supplier be around to stand behind their products. And they knew that EMM has the **stability** of a major NYSE company committed to the memory market.

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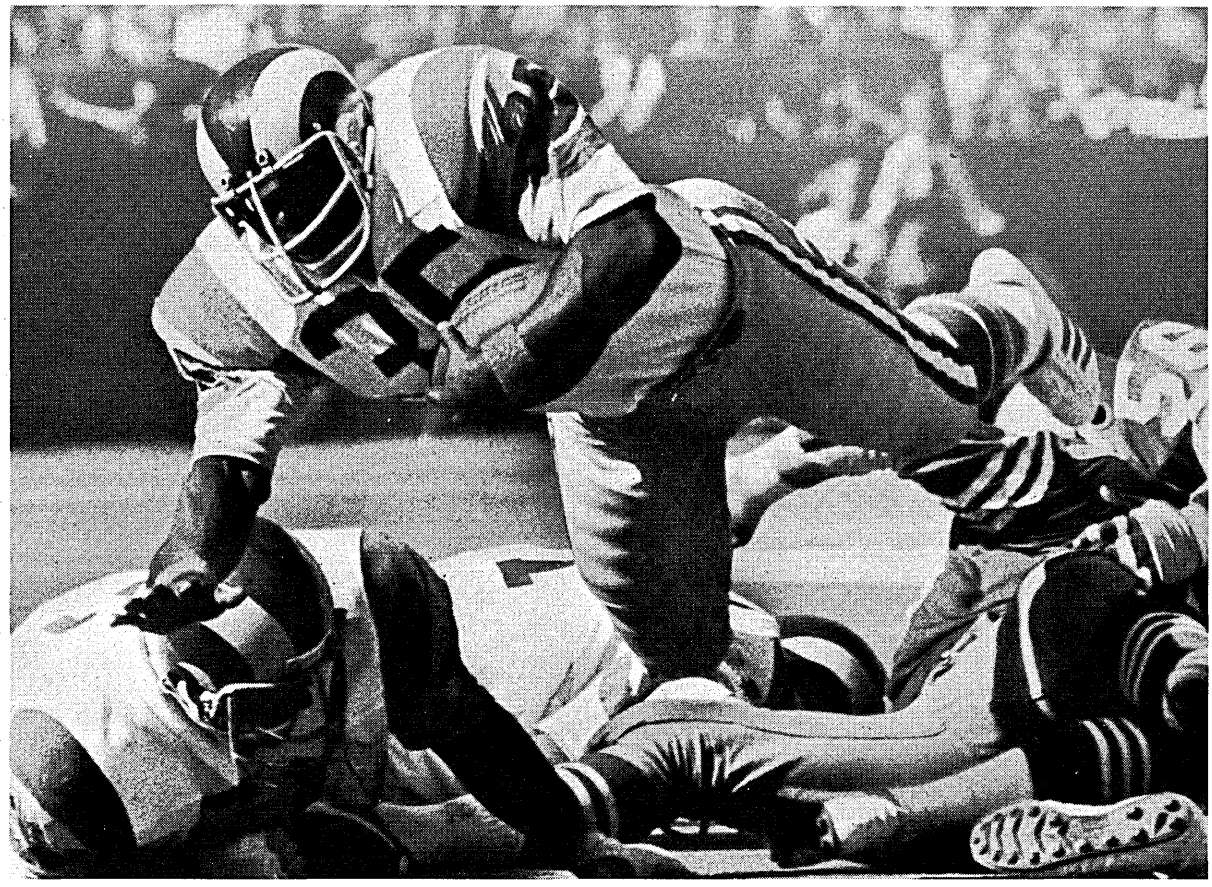

lated. The module receives control from the hardware on program interruptions by a program status word switch. Operation and specification exceptions are interrogated to determine if they are caused by S/370 instructions or byte alignment. If that is the case, the requested instruction is performed and control returned.

The Simulator package is priced at $750 for a one-time, non-exclusive, nontransferable license, and might be a very handy way for service bureaus or other large users to back up operation of 370 equipment with the greatly lower-cost 360 systems. MHT SERVICES, Jersey City, N.J.

FOR DATA CIRCLE 263 ON READER CARD

Virtual APL

A program interface has been developed that allows the APL language to run under IBM's VM/370 operating system. Considering how compact the APL language is, it's hard to conceive of a user requiring a workspace of 800K; but with virtual APL, it's there if needed. Other attributes of the new product include file compatibility with other high-level languages such as FORTRAN and COBOL, extensive peripheral device support, and all the capabilities of APL 360/DOS and APL/CMS. Including installation assistance, the package is priced at $2,500. AMERICAN INFORMATION SERVICES, Greenwich, Conn.

FOR DATA CIRCLE 264 ON READER CARD

Performance Measurement

SLACMON is a hardware and software performance monitoring package, written at Stanford Univ., for monitoring IBM OS/MVT and MFT operating systems with subtasking. It monitors various system events, such as I/O interrupts, and samples many others, such as alterations to control blocks, to provide a statistical profile of system performance. Input to SLACMON is twofold: the parameter field on the EXECUTE card, coupled with the corresponding operand in the operator's START command, allows various functions to be performed or omitted; five data sets (optionally) provide names of queues, I/O devices, or modules that SLACMON is specifically to track.

Output from the assembler language routines consists of up to 12 reports detailing the performance of the system, together with a single page that summarizes the 12 reports. SLACMON is priced at $600, with documentation an additional $12.50. COSMIC, Athens, Ga.

FOR DATA CIRCLE 265 ON READER CARD

Volume Utilization

A software package is now available that produces reports on direct access storage device volume utilization under IBM OS and VS monitors. DISCLOSE supplies users with volume-table-of-contents information in alphabetical order by data set name, and an accounting of physical track use sequentially by absolute track address. Additionally, a map of the free space on a volume, and a detailed report of all VTOC data are generated. The package is priced at $370, for which the purchaser receives the assembler language source programs on tape and associated documentation. The package is also available on a 30-day trial basis, in which case object decks are temporarily provided. DISCLOSE requires approximately 100K bytes of memory for operation. PROGRAMMART CORP., Cambridge, Mass.

FOR DATA CIRCLE 266 ON READER CARD

Sort/Merge

Seven man-years are said to have gone into this sort/merge package by its developers, who also claim that it is being well-accepted in Europe, where it was developed. It is "plug-to-plug" compatible with the IBM 483 DOS sort, but has additional capabilities such as sorting in less than 22K bytes (with 2314 drives), 32 sort keys, merging of up to nine files, and minimum elapsed time improvements on the order of 20-25%. All common IBM disc models are supported, including the 2311, 2314, 2319, and 3330 peripherals. CA-SORT/II is priced at $6,700 and is supplied in object code form on tape or cards. COMPUTER ASSOCIATES INTERNATIONAL LTD., Geneva, Switzerland.

FOR DATA CIRCLE 267 ON READER CARD

Real-time Submonitor

When added to Digital Equipment Corp.'s RSTS time-sharing monitor, LABX enables the PDP-11 minicomputer to do double duty as a time-sharing and as a real-time system. The only restriction is that the user must be able to tolerate real-time response delays on a par with those that time-sharing users are accustomed to. The LABX module is coded in BASIC+, and since the source code is supplied for the package, users may modify it to suit their particular applications. As supplied in standard form, LABX would typically allow up to 16 independent RSTS jobs to be sharing an A/D converter, with each job owning one multiplexor channel. With the minimum recommended buffer size, LABX requires approximately 1,250 words of the PDP-11's memory. The price for the real-time module is $1K, with support provided in the form of revised versions mailed to customer

sites. EVANS GRIFFITHS & HART, INC., Lexington, Mass.
FOR DATA CIRCLE 268 ON READER CARD

PL/1 File Utility Package

TRNSFR is offered as an alternative for IBM's IEBGENER, IEBTPCH, and IEBISAM PL/1 utility subroutines for all 360 and 370 installations having PL/1 libraries. The program can transfer any sequential or indexed sequential file from memory to any output medium, such as disc, tape, card, or hard copy. Additionally, the package can convert sequential files to indexed sequential format and vice versa, with control provided through the parameter entries in JCL cards. The TRNSFR routine can require as much as 110K bytes of memory for operation. It's priced at $99 and is supplied in object deck form with documentation and examples. PAUL-ANDRE DESJARDINS, Quebec, Canada.
FOR DATA CIRCLE 269 ON READER CARD

Installation Security

A nationwide computer-based service is now available for registering office machines such as typewriters, calculators, dictating machines, and even small computers for protection against theft. Subscribers to the Identifax program are provided exclusive code numbers to engrave on the equipment. These numbers are available to police departments across the country via a toll-free 24-hour number. The electric engraving tool is also furnished, as are warning labels to be posted stating that property has been marked for instant identification. It is known that potential burglars — and employees — generally avoid taking property that has been marked for identification by police. The monthly charge for cataloging up to 2,000 items is $10. LISTFAX CORP., New York, N.Y.
FOR DATA CIRCLE 270 ON READER CARD

APT Home Study Course

UNIAPT, United Computing Corp.'s popular version of the original Automatic Programmed Tools numerical control software, is now offered as a home study course (number 436x) from Brigham Young Univ. The coding exercises are submitted either on specially marked cards available from the university, or on traditional keypunch cards if you have access to a keypunch. The course costs $98 plus texts, approximately $12-14. BRIGHAM YOUNG UNIV., Provo, Utah.
FOR DATA CIRCLE 271 ON READER CARD □

DECISION-MAKING

Nay, lad! *Deciding's* not your ploy,
For that's a risky game.
It's *making a decision*
That's your surest road to fame.

Decide means *to take action,*
And that might rock the boat,
And you act and don't succeed,
Small chance you'll stay afloat.

But . . . *making a decision.*
Ah! *That's* the way to swing.
It keeps the masses happy
And doesn't change a thing.

So get yourself a task force
Well-skilled in all the arts
And call them all together
And watch them flip their charts.

For Jack says no and Jim says yes
And Billy says perhaps
And Chester asks good questions
. . . When he isn't taking naps.

And Bertram, chomping his cigar,
Is chock full of statistics,
While Waldemar, who smokes a pipe,
Is famed for his heuristics.

"The figures prove. . . ," "The model says . . ."
"The forecast bears me out."
"The complex simplex program
Shows I'm right without a doubt."

Let's tiptoe out and close the door
And let them stew a while.
No fear that they'll do something rash,
For *doing's* not their style.

Reality's an untamed beast
That's difficult to master,
But models are quite docile
And give you answers faster.

So build yourself a model
To glorify your name.
Then get yourself a task force
And learn to play the game.

—J. C. L. Guest

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Twenty years ago some farsighted businessmen had an idea. To establish an organization to combat littering. They called it Keep America Beautiful, Inc.

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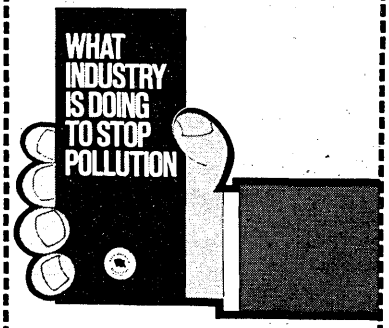

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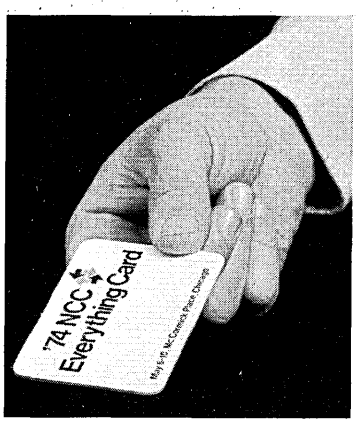

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Books

Academic Computers in Service
by C. Mosmann
Jossey-Bass, Inc., 615 Montgomery St., San Francisco, Ca., 1973
186 pp. $8.50

Mosmann has made an important contribution with a book that ought to be known more widely than it is likely to be. He writes in the preface that his book "is a practical handbook for administrators and for students and faculty performing administrative functions," i.e., for everybody concerned with computing in academic environments. In my opinion, however, he has written a practical handbook for *anyone* associated with computing, be he a provider or consumer of computing services or just the guy who pays the bill.

Let me give a brief indication of the scope of this book by enumerating (partly paraphrased to suggest the generality) some of the chapter headings: Computing as a Service, Determining Needs of Users, Alternative Sources of Computing Services, Computing Services Networks, Setting Policy, Financing a Computing Services System, Acquiring Systems (Hardware and Software), Computers for Innovation and Service. In addition, there is a list of organizations which can serve readers of the book, an annotated bibliography and a very helpful index.

On page 80 Mosmann presents the reader with a collection of questions aimed at formulating a policy to guide an academic computing services centre. Among them:

"1. What is the function of the computing establishment in terms of the ideals or goals of the college as a whole?

2. Whom does it serve? In cases of conflict, whom does it serve first?

3. Who determines the policy of the establishment? In cases of differences of opinion, who has the last word: the administration, the computing centre management, the users, or some other body?

4. What level of service and what style of operation will best satisfy the objectives? Should the centre be run in a formal or informal fashion? Will the user receive lots of guidance or will he be expected to learn by making his own mistakes?

5. How will planning be done? What is the relationship of the computing plan to the long-range institutional plan, if one exists?

6. How important is good computing to the college? What is it worth in terms of money and in terms of the attention and time of the busiest and most talented members of both the faculty and the administration?

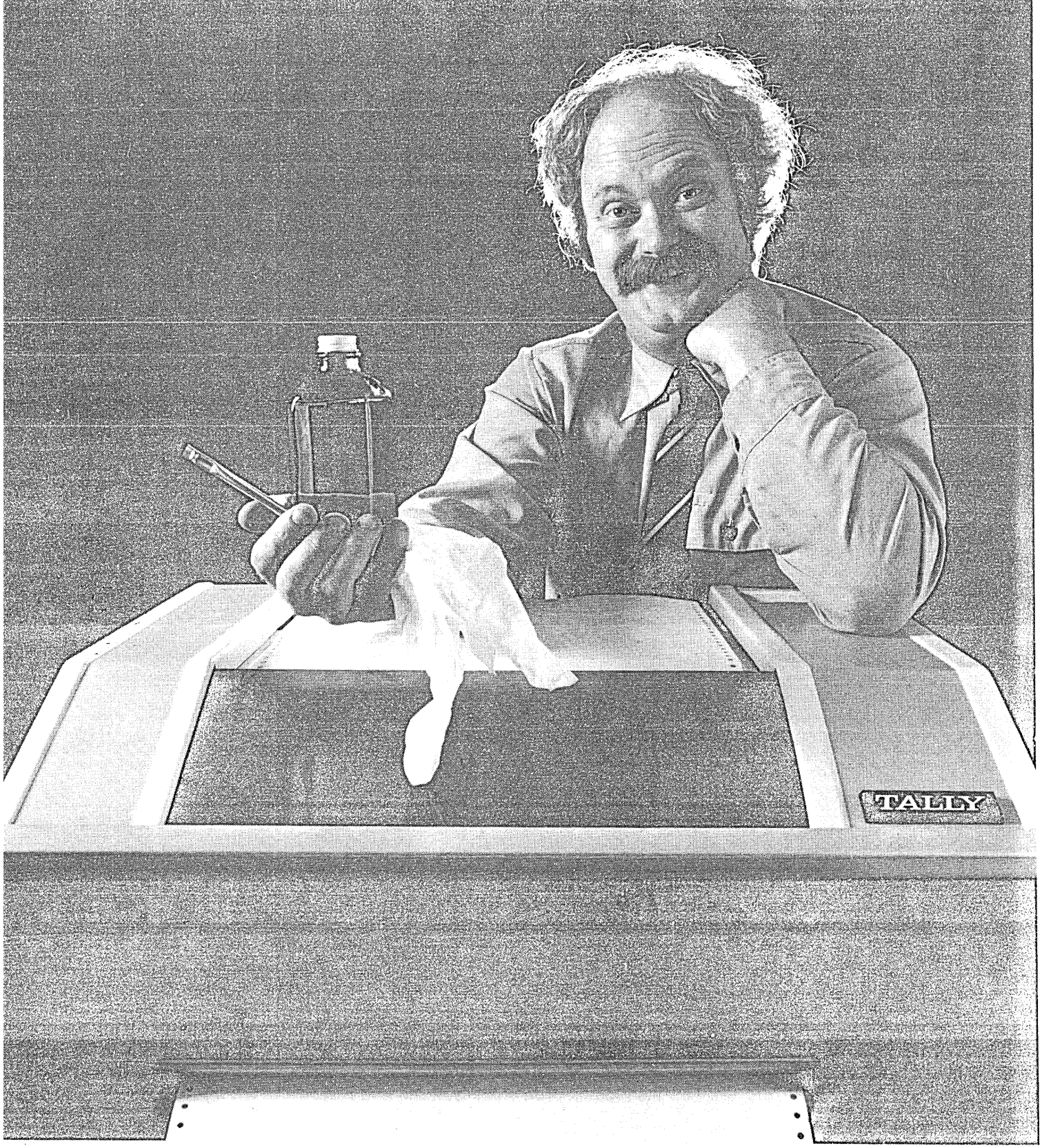
7. Who will decide how much money is going to be spent on computing: the users, the computing director, the chief budget officer of the college?

8. Is the computing centre a business run by the college for its own convenience or is it an unofficial, not-for-credit academic department, where research and education are carried out?"

To this list ought to be appended six that appear on page 59 in another context, management and control:

"How can we evaluate the computing situation on our campus? How can I tell if we are getting our money's worth? Have we got a good director of computing or a bad one? How can we tell if we are doing the right thing? Are my people telling me the truth? How much should we be spending for computing?"

I believe two important aspects of academic computers in service have been neglected by Mosmann. The more important of the two has to do with what I have come to believe is the most important attribute of a computer: storing knowledge in directly-usable form. Computers *know* how to



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CIRCLE 5 ON READER CARD

solve differential equations; they *know* how to draw animated figures; they *know* how to determine economic order quantities. *If computers know, what shall man learn?* We do not have to look far to find computers (machines that know) coupled to machines that do. *If computers know and do, what will man do with himself?* The search for answers to these two questions will very likely radicalize educational institutions everywhere, from kindergarten through graduate school.

The second neglected subject is that of the use of software purchased or rented from others. Mosmann notes there is very little such use, little evidence that the situation will change. The whole business of using software created by others has been relegated to a secondary role, for the most part. Who among you can identify a textbook or manual on programming, or computer science, in which there is more than passing mention of the subject? One would guess that it is not socially acceptable to buy programs! The point, I believe, is that the audience for Mosmann's book deserves to be made aware of the issue and to be provided with suggestions for dealing with it.

Despite these omissions, this book ought to be read by everybody in our business. I must say, however, that I missed the wonderful drawings of Robert Osborn which added just the right note of levity to the seriousness of the predecessor to ACS, *Computers on Campus.*

—**Robert M. Gordon**

Development of Information Systems for Education
by Khateeb M. Hussain
Prentice Hall, Inc., 1973
419 pp. $10.95

This book reflects the usual attitudes of university administrators toward the role of the computer in support of administration and management. There is something in it for just about everyone concerned in any way with administrative data processing in higher education in the traditional sense of those words. However, there is nothing in the text addressing the really exciting prospect of use of computer-based informational technology to manage the instructional process itself, permitting use of highly modularized instructional units, self-paced learning, and with the potential of tailoring the academic program to each student's needs and desires.

The preface states that the book is addressed primarily to the administrator and would-be administrator in educational administration. The computer technology content (mostly input, output and data format) is very elementary. With increasing sophistication of the lay public in basic computer concepts (20% of our public high schools currently offer computer technology instruction), it seems hardly necessary to state: "The transformation of written data into machine-readable data by punching prescribed holes on a card is achieved by using equipment called *key punches.*" Indeed, use of the book could be strengthened by eliminating chapters two and three on tools of analysis, as the subsequent use of the notation developed there is probably obvious when used in context.

There are five parts, two appendices, and a glossary. There are 18 chapters distributed among the five parts, and each chapter is essentially self-contained with an introduction, several sections dealing with the subject of the chapter, a summary and conclusions section, a key terms and review questions section, and a selected annotated bibliography.

Part One distinguishes between ad-

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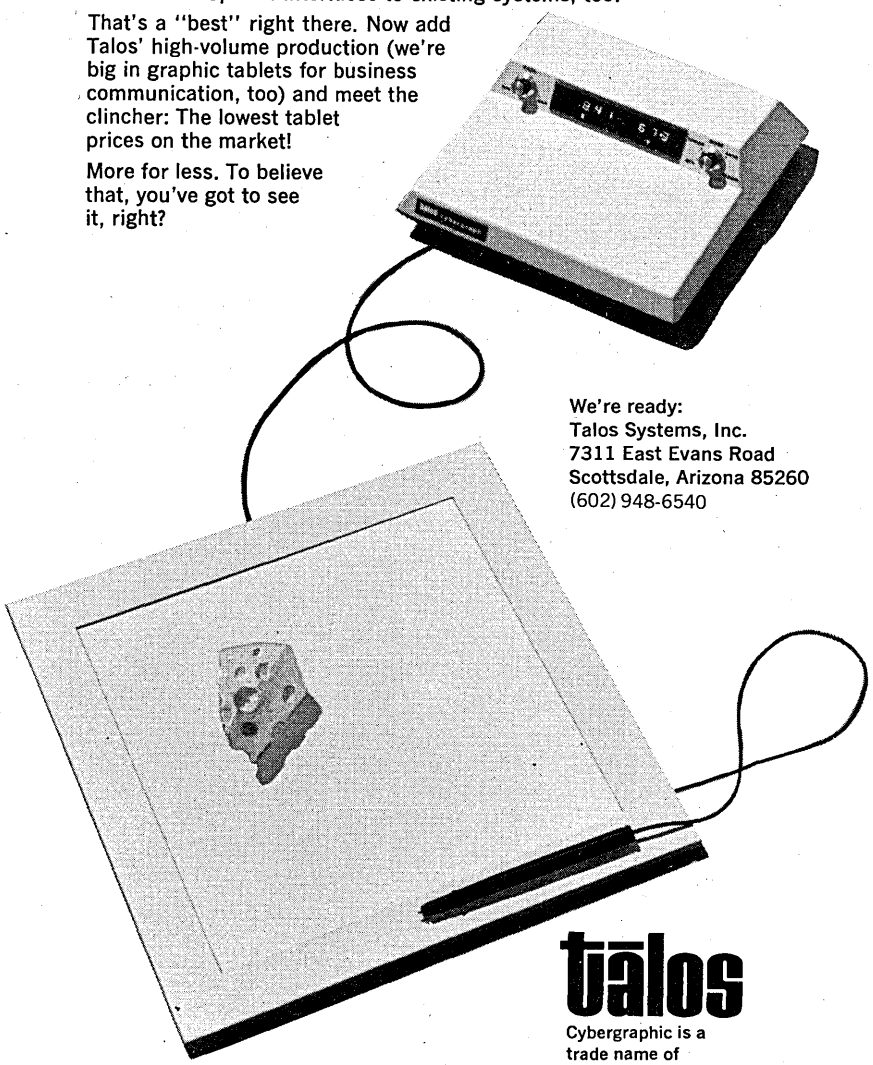

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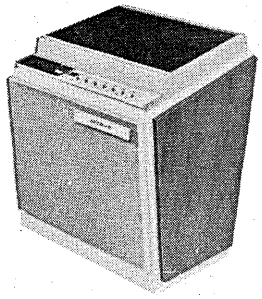

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CIRCLE 94 ON READER CARD

ministration and management, gives the scope of the book, and talks about analysis tools including decision tables.

Part Two deals with the concepts of systems, information and information systems.

The concepts of data and its organization are covered in Part Three.

Part Four is the meat of the book. Beginning with a glossary in prose it goes on for about half the text of the book, developing through eight chapters the various states of evolution of an information system, including explicit consideration of the users' needs and training needs of the personnel intended to drive the system.

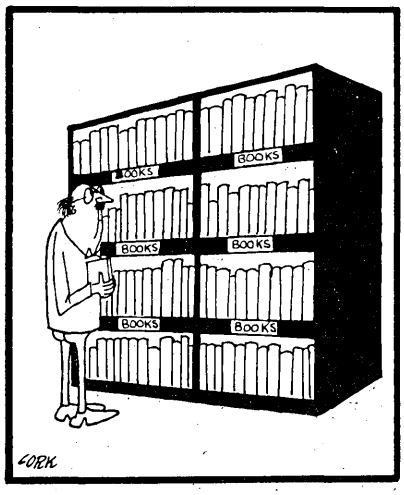
The fifth and last part deals with uses of an information system and is primarily "blue sky" stuff.

Appendix A is a supplement to Part One and includes eight pages of Decision Tables technology.

Appendix B is a seven-page annotated list of input and output equipment. For example, item 14 (of 15) is headed "Plotter" and reads: "Some information is best described graphically as a curve. This can be done by a plotter."

The glossary, selected from the American National Standard Vocabulary for Information Processing, X3.12—1970, contains about 350 terms and their definitions.

The author states he has excluded much technical material dealing with informational technology and systems



theory. Administrators in higher education are under increasing pressure toward computer networking on the one hand, and use of minicomputers on the other, within the framework of administrative data processing. Additionally, administration in higher education requires decisions to be made about use of computer-based technology in the instructional process and in academic research.

Explicit recognition of these problems and opportunities would have added significantly to the impact of the book. These developments have undergone great change in the past four years.

The author's style is fairly lively. His occasional examples generally add to understanding as well as serving to concretize the concepts being developed. The annotated bibliographies are impressive in their scope (even Bess Sondel is mentioned!) and the annotations are interesting reading all by themselves. But the references are all four years old or older, so many important works are not mentioned!

Mastery of the ideas and terminology-in-context in this book should enable administrators in education, government, and the private sector to communicate more effectively with their systems analysts, while the bibliographies point the way to hunting grounds where more comprehensive treatment may be found. More importantly, the book gives administrators a feeling for what they can expect from informational technology as a support tool in traditional administration, both in the way of problems and opportunities.

—Peter Lykos

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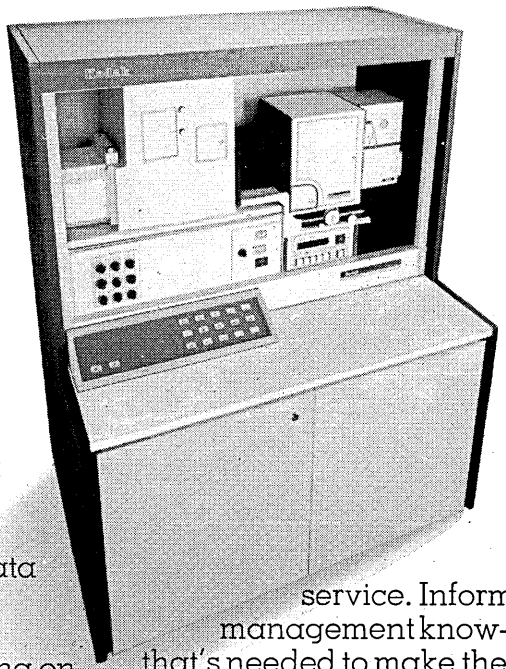

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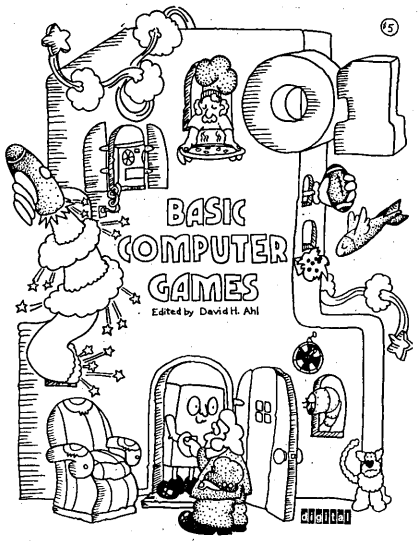
Literature

Whether You Win or Lose

Make friends with your computer and challenge it to a game of poker—or bingo, or checkers, or craps, or baseball, or basketball, or monopoly, or hangman. Or, if you're feeling romantic, let it write you some poetry in four-part harmony. Then again, if you've been wondering where the four Mugwumps are hiding on the 10x10 grid,



this is the time to find out. This book of *101 BASIC computer games,* collected and edited by the editor of Digital's *EDU* newsletter, is the perfect companion for those long weekends without gasoline. The cost is $5, plus 50¢ for postage and handling. DIGITAL EQUIPMENT CORP., Software Distribution Center, Bldg. 1-2, 146 Main St., Maynard, MA 01754.

Private Line Rates

A $30 research report entitled *A New Private Line Rate Structure* analyzes AT&T's new Hi-Lo private line rates, which went into effect Jan. 15. The report, which includes a set of work sheets for pricing private line services under the new rate structure, examines the cost impact for large and small users, explores network design complexities, and reviews the problems and opportunities inherent in the Hi-Lo plan. Also available are various excerpts from AT&T's tariff filings; the cost for the research report and the complete set of excerpts together is $75. CENTER FOR COMMUNICATIONS MANAGEMENT, INC., P.O. Box 324, Ramsey, NY 07446.

Communications and COM

Three recently updated Datapro research reports, reprinted from supplements to *DATAPRO 70* (a loose-leaf information service) are available for $10 each. *All About Modems,* 36 pages long, includes comparison charts on more than 225 modems from 48 suppliers, as well as general information on modems. *All About Multiplexors and Concentrators,* 18 pages long, explains communications multiplexing techniques and surveys 49 products of 28 manufacturers. And the 27-page *All About Computer Output Microfilm (COM),* with comparison charts on 37 commercially available COM recorders from 16 suppliers, describes the characteristics, applications, advantages, and disadvantages of COM. DATAPRO RESEARCH CORP., 1805 Underwood Blvd., Delran, NJ 08075.

Records Management

Records Management is a 64-page collection of essays by 12 authors on aspects of reports management, systems documentation, data collection, data base management, forms control, and microfilm usage. In the words of one of the authors, "a records management program, effectively initiated and maintained, is the most meaningful, practical, and comprehensive administrative technique to profitably identify and administratively control paperwork, records, and data." The cost of the booklet is $4.50. ASSN. FOR SYSTEMS MANAGEMENT, 24587 Bagley Rd., Cleveland, OH 44138.

Telecommunications Market

A detailed table of contents and a descriptive letter give information on a $445 160-page report (#229) on the computerized telecommunications services market in the U.S. The report analyzes major trends and forecasts that the market—already more than $600 million—will be almost $3 billion by 1983. Frost & Sullivan, publishers of the report, does market research on many industries including data processing, communications, instrumentation, pollution, oceanography, medicine, aerospace, optics, education, power, and transportation. FROST & SULLIVAN, New York, N.Y.

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Conversion Tables

Eighteen pages of tables give over 1,100 conversions for metric, electrical, electronic, and physics measurements. In addition, this booklet includes a one-page listing of metric measurements and charts of useful physical constants, prefixes used in the metric system, and the Greek alphabet. The cost for a single copy is $1.50; 10 copies are $1.20 each, postpaid. HENRY LAVIN ASSOC., INC., 12 Promontory Dr., Cheshire, CT 06410.

Careers in Dp

AFIPS and the Council of Better Business Bureaus have prepared a 16-page brochure for people considering careers in data processing. The brochure gives basic information on edp, as well as descriptions of job functions, average salaries, and advice regarding training. For a free copy, please send a stamped, self-addressed #10 envelope to COUNCIL OF BETTER BUSINESS BUREAUS, INC., 1150 17th St., N.W., Washington, DC 20036.

Edp for Management

A series of three booklets—*Edp Planning for Management, Edp Feasibility for Management,* and *Edp Audit for Management*—gives advice on planning and preparing for installation of an edp system. The first is intended to help new edp users understand the effort behind every successful computer installation; the second describes the main steps in evaluation of dp needs; and the third examines the computer as a tool or resource in the framework of a business. The series, or individual booklets, may be ordered free of charge through local NCR branch offices. NATIONAL CASH REGISTER CO., Dayton, Ohio.

Texas Directory

Texas A&M Univ. has published a 234-page directory of 1,036 computers operated by 763 organizations in Texas. Facilities are listed three times—alphabetically, geographically, and by manufacturer and model. Included is the following information: type of computer, memory size, peripheral equipment, operating system used, whether rental use or programming assistance is available, application areas, and programming language. The cost is $10. TEXAS A&M UNIV., Industrial Economics Research Div., College Station, TX 77843.

Standards Catalog

More than 350 standards publications are listed by subject as well as by numerical sequence in this 32-page *IEEE Standards 1974 Catalog.* The many ANSI standards published by IEEE are included. Standards developed within IEEE cover communications, computers, integrated electronics, information theory, logic diagrams, and definitions. IEEE STANDARDS DEPT., New York, N.Y.

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PEOPLE

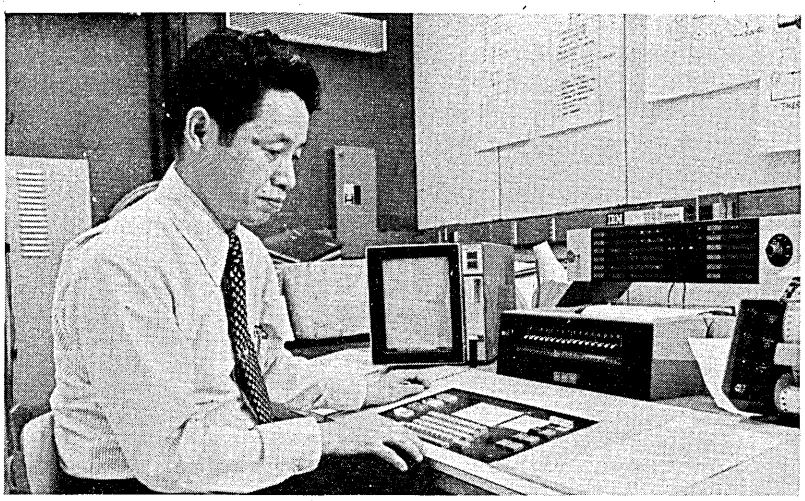
THAT'S WHAT PHYSICISTS ARE FOR

Meet Leo Esaki, an IBM research scientist who shares one-half of this year's Nobel Prize in Physics with Dr. Ivar Giaever of General Electric, with the remaining half going to Britain's Dr. Brian Josephson. If it is ever possible for us to "think of the computer as a *lot less* energy"—to bend IBM's latest pr pitch, it may be in no small part due to Dr. Esaki's curiosity about a physical phenomenon called "tunneling," the mysteries of which he laid bare in his doctoral thesis *Tunneling Phenomena in Semiconductors* for the Univ. of Tokyo in 1959.

Tunneling describes a phenomenon that occurs in very low electrical current levels where the classical laws of physics break down and allow extremely low energy electrons to "tunnel" through stronger—though still extremely small—resistance levels. "Physicists had known about these effects for years but no one ever took the time to investigate what was really happening," says Dr. Esaki. "I thought it would perhaps be something that would be useful to the academic community, and to my employer at that time, a little company called Sony. Believe it or not, Sony *was* small in those days, with perhaps 400 people." Esaki was right. The first device developed with the newly-understood tunneling theory was the tunnel diode now used in communications, for which he and Sony were granted the original patent.

The key to the importance of Esaki's studies was that the tunneling phenomena occurred extremely fast, in trillionths of a second. The high speed with which the signal could be detected, together with the low energy levels that made it possible, made tunneling devices a promising technology for future computer memories. Since 1960 Dr. Esaki has been involved in related studies for IBM at its Yorktown Heights, N.Y., research center.

"It's fair to say that tunneling devices are a possible future circuitry technique. Some aspects are very promising, especially the speed and low power consumption. But there are problems, too, that keep the technology in the research laboratory. For example, for such a memory to work it must be kept in a refrigerated chamber only a few degrees above absolute zero: minus 273 degrees. This raises questions such as: how do we maintain such a device in the field, and what are the effects on a computing installation of a memory that is so cold, in terms of ambient temperatures and personnel?"



Leo Esaki

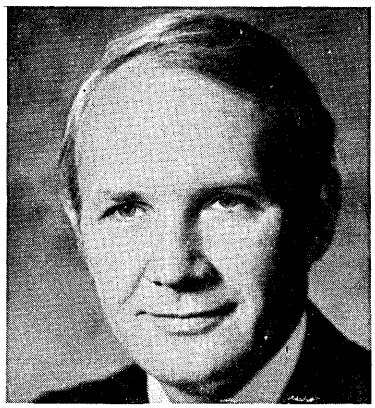
Where was Dr. Esaki when he heard he had won the prize? "I was in bed. A New York City radio announcer called me. I thought it was a joke and told him that it was six o'clock in the morning. He said, 'yes, but it's two o'clock in the afternoon in Stockholm!' For the rest of the morning my wife and three children kept bringing me telegrams pouring in from all over the world. But nothing official. I searched all the radio stations and heard them say the prize had been awarded to two Americans and a Briton, so I thought, well, I'm almost an American citizen now, so maybe it *is* me. Finally, around noon, came the official telegram." And the good Doctor's reaction after he realized it was indeed true? "I think it's more than I deserved for just trying to understand something. That's what physicists are for."

FROM CENTRAL CASTING

The scenario of successful computer companies usually starts with a group of go-go entrepreneurs starting up the firm, getting it off the ground, and then gradually turning it over to a professional management. But what usually happens is that the go-go entrepreneurs like the empire they have created so much that they won't give up the reins.

Entrex, Inc. is following the classical scenario, however, and if central casting were called upon to produce a professional manager,

(Continued on page 130)



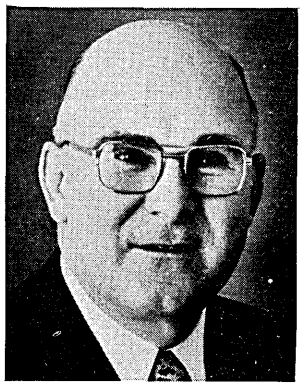
Donald W. Fedderson

he would likely be Donald W. Fedderson, the Massachusetts data entry firm's new president. Fedderson had had a more extensive background in the fields of transportation and finance than in the computer industry. But when he took over as general manager of Gould, Inc.'s Data Systems Div. in 1972, he welded together four small companies with combined sales of under $3 million annually, and within 12 months increased sales to a $10 million-plus rate. Naturally, he's hoping to continue that record at Entrex.

The company is something of a sleeper in the data entry field. Entrex is No. 3 behind Inforex and Computer Machinery Corp. and Fedderson takes a page from the Avis merchandising routine by saying, "When you're No. 3 you try harder." Fedderson has high hopes for Entrex's marketing deal with Redifon in England, Marubeni Electronics in Japan, and Nixdorf in Germany.

Another particularly interesting arrangement—something of a wild card—is with Recognition Equipment, Inc. of Dallas; it calls for mating key-to-disc and OCR technologies.

HIS ROOMATE'S FATHER



Allen J. Burris

When Allen Burris was going to college his aim for the future was to get into "general management." He had no specific interest in banking or dp. Today he is vice president of the Systems and Planning Dept. of the Northern Trust Co. of Chicago, and the new president of GUIDE International, one of the largest and most influential of IBM computer user groups, composed of users of large-scale IBM computers.

Burris, who has been with the Northern Trust Co. for 26 years, credits his college roommate's father with getting him interested in banking. "I was living at school and he (the roommate) was living at home. I used to freeload at his house on weekends." The roommate's father was with Northern Trust Co. at the time.

How did he get into data processing? Easy. "Top management said: get into it." That was seven years ago and he has been active in GUIDE ever since. His aim as GUIDE president: to represent the wishes and issues of concern of 1,600 institutional members and to see to it that these are communicated to IBM.

Burris received his M.B.A. from the Univ. of Chicago in 1948.

●

GORDON N. THAYER, executive vp of Bell Laboratories in charge of the Business Information Systems Programs Area, retired after 43 years with the Bell system . . . DR. EBERHARDT RECHTIN, former Assistant Secretary of Defense for Telecommunications, joined Hewlett-Packard Co. as manager of telecommunications . . . WILLIAM A. O'BRIEN, formerly a principal with Cresap, McCormack & Paget, Inc., joined the Stamford, Conn., firm of Mathews & Co. as a vice president . . . BERTRAM H. WITHAM was elected treasurer of IBM, effective Feb. 1. □

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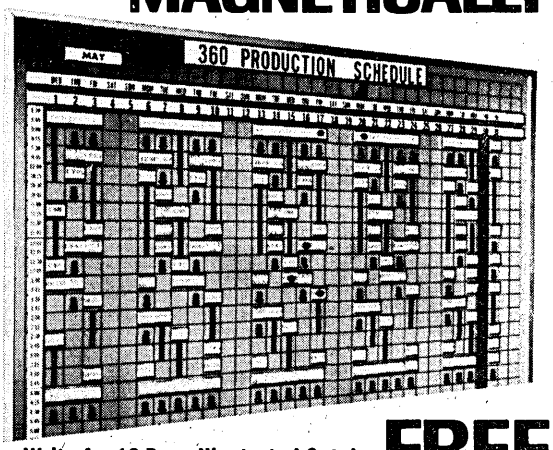

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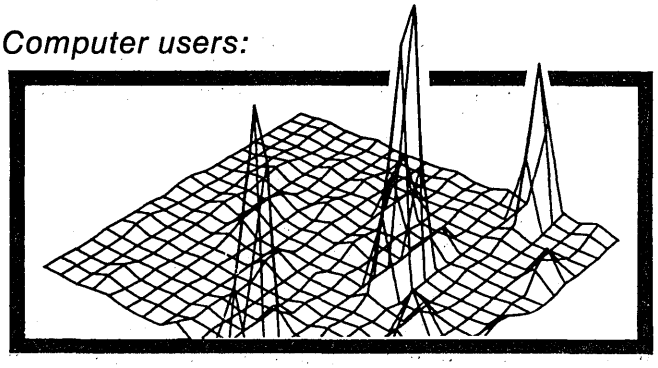

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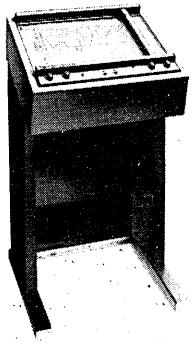

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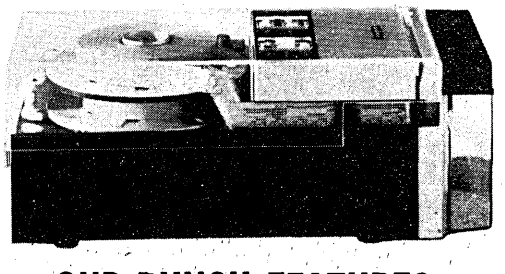

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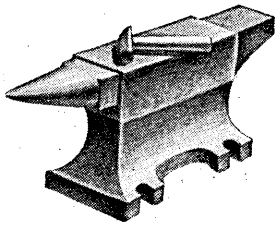

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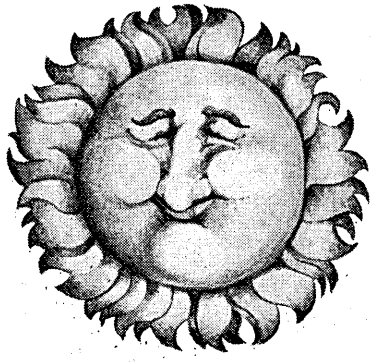

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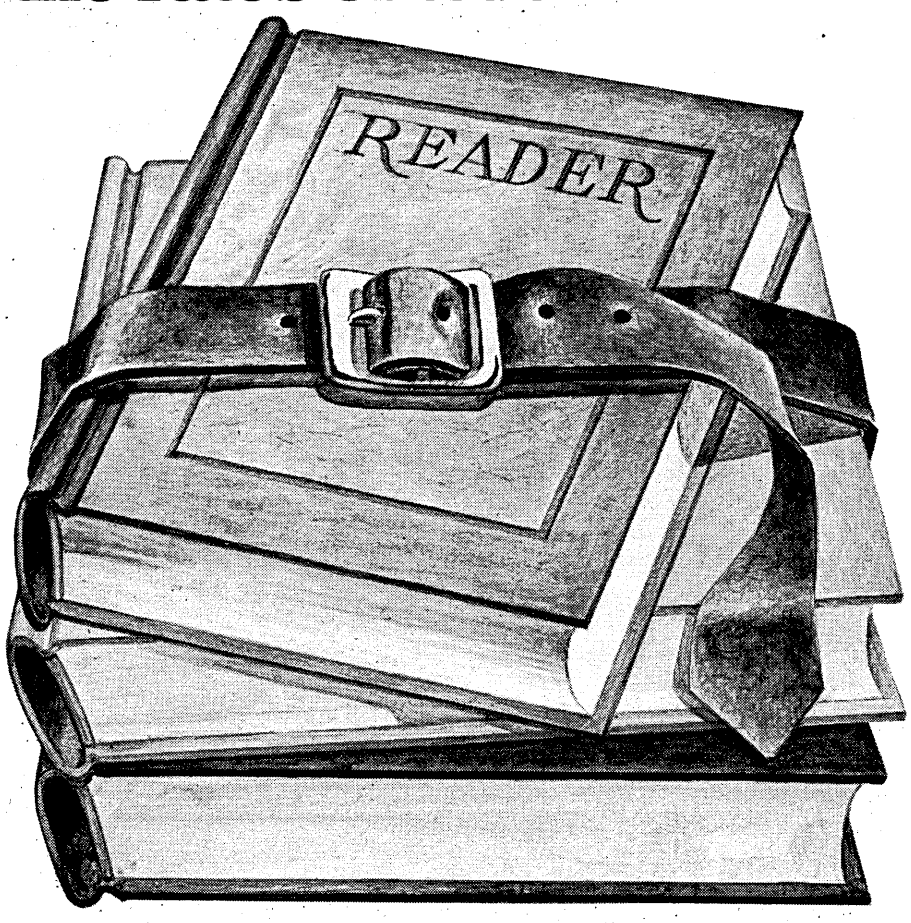

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LOOK AHEAD

(Continued from page 18)

quantities. Evaluation models may be out as early as April.

ALL SPEEDED UP, AND NOWHERE TO GO

It'll be another month or two before the fate of ElectroPrint's fast non-impact printer can be determined. The Cupertino, Calif., company that announced an 8,000-lpm printer a year ago last October, claims to have improved print quality at 10,000 lpm and has built a few prototypes, but lacks the cash to carry the project much further. It also continues the search for a company with cash at the front end which could undertake the manufacturing and marketing functions. Nor has its Japanese licensee made any further progress. "We're both behind in our development schedules," says EPI's Jim Sutherland.

WHAT'S IN A NAME?

During hearings conducted by an H.E.W. Advisory Committee, which led to the report "Records, Computers, and the Rights of Citizens" (Sept. 1973, p. 112), committee members listened to assurances from law enforcement agencies that their data bases were regulated tightly on a need-to-know basis. One committee member, a young law student, excused himself and put in a phone call to the Philadelphia police department. He identified himself as a potential employer, gave the names of two other committee members, and asked if the department had any record of them. The clerk came back soon saying there was no record on either of the names he had given, but there was one for a name which closely resembled one of them, and then read a long record!

RUMORS AND RAW RANDOM DATA

Nixdorf Computer, long rumored to be thinking about a low-end 370-like computer, has a five-man development group hard at work and planning to expand in Costa Mesa, Calif. But it won't say what's being developed...National BankAmericard, Inc. is offering member banks a $1 million software package that doesn't discriminate against sexes. The system, to issue separate accounts within families, replaces all references to "his" and "her" with the word "person"... When the Tacoma Times Herald had time to spare on its PDP-11 based time-sharing system running under DEC's RTSS, it offered services outside. The first customer: a service bureau, Boeing Computer Services, which is awaiting delivery of a PDP-11...It's been 21 years since the Digital Computer Assn. (DCA) was formed in Los Angeles. It's a loosely knit group of some of the computer profession's earliest practitioners that holds one meeting a year, on the Friday nearest to St. Patrick's day, this year on March 15 at the Airport Marina hotel in Los Angeles...Although the company won't confirm it, Cordura Corp. (formerly Computing & Software) suffered big losses conforming to such recent legislation as the Fair Credit Reporting Act, and this was the factor in its decision to sell off its credit reporting business to Chicago's Trans Union Systems Corp. TRW Credit Data's Edward J. Brennan Jr., meanwhile, says all credit reporting agencies have had "significant added costs" from the new laws and from demands by customers for more positive data...Group Insurance to pay legal bills is catching on, says Donald Caldwell, a Sacramento consultant who has formed Unimark/Caldwell to offer a computerized service for administering such policies. Labor unions, with increasing frequency, are asking employers to provide group policies that pay for workers' attorney fees.

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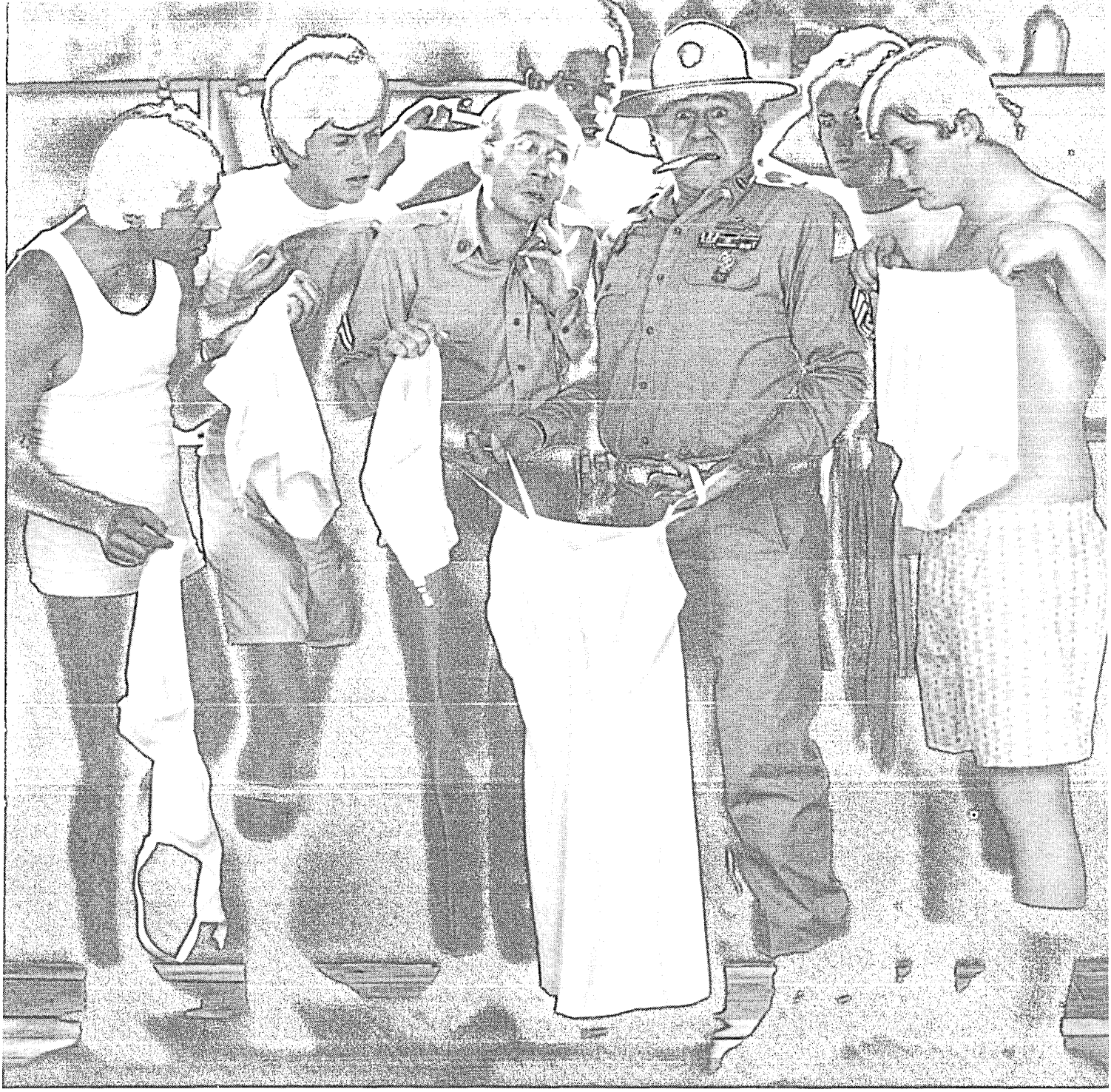

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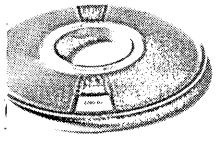
One more point. Our tapes don't cost any more than the competition's. You're already paying for BASF quality . . . you might as well have it. Write today for the complete story of how BASF tapes stack up against the competition. Remember, nobody makes better tape than the people who invented it. BASF Systems, Crosby Drive, Bedford, Mass. 01730.

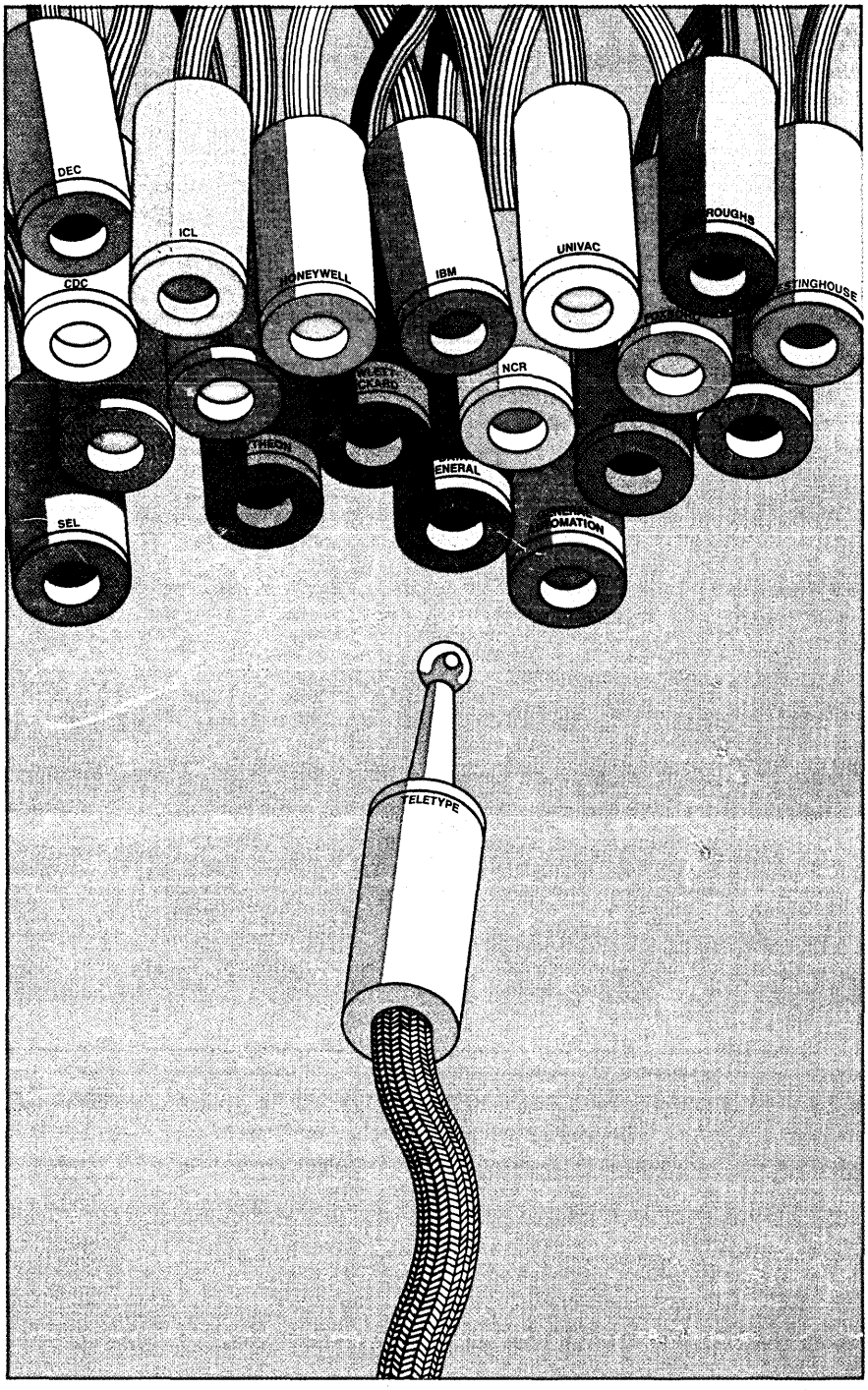
BASF



When it's BASF...you know it's not the tape that goofed.

CIRCLE 2 ON READER CARD

For years, people thought Teletype® machines only talked to themselves.



Fact is, Teletype machines have been carrying on intelligent conversations for years with some of the fastest information movers in the world. Computers.

We've earned a good, solid name for ourselves in computer communications because our equipment is compatible with practically any computer-based system.

Our product line proves the point.

The number one standard-duty data terminal in the industry is our model 33 series. And our new wide-platen model 38 offers big system features at economy system prices.

Heavy-duty operation with minimum maintenance? Check out our model 35. And our model 37 series delivers the utmost in flexibility and vocabulary for complex data systems.

We also build equipment for paper tape systems, as well as a magnetic tape terminal for greater on-line savings. As you can see, our reputation in point-to-point communications has served us well in computer terminals. No one comes close to us in reliability, flexibility and economy.

It takes more than manufacturing facilities to build the machines Teletype Corporation offers. It also takes commitment. From people who think service is as important as sales. In terminals for computers and point-to-point communications.

That's why we invented a new name for who we are and what we make. The computer-cations people.

TELETYPE®

Teletype is a trademark registered in the United States Patent Office.

CIRCLE 3 ON READER CARD

For more information about any Teletype product, write or call TERMINAL CENTRAL: Teletype Corporation, Dept. 81F, 5555 Touhy Avenue, Skokie, Illinois 60076. Phone 312/982-2500.