1957
DATAMATION®
77
1977

April

WORD AND DATA PROCESSING CONVERGE

Also: April Foolishness and improving software performance...

Series 9000...

Still the hottest series around.

When you're hot, you're hot, and the thousands of Series 9000 Digital Tape Transports in use around the world prove we're doing something right. Part of the reason is the many unique features of Series 9000 — features such as:

- A position arm anticipatory sensing system. An exclusive Kennedy feature, the linear, non-contact (Mag Pot) position sensor requires no lamp source and assures performance for the life of the machine.
- Interchangeable electronics on all Series 9000 transports, reduce stocking costs and down time.
- Front-accessible off-line test panel, marginal skew check, threshold scanning which automatically compensates for drop-ins or drop-outs, Read-After-Write shortened skew gate, simplified tape path and quick-release hubs.
- All models are available with either 7 or 9 track, 800 NRZI, 1600 PE or 800/1600 NRZI/PE.
- 7 and 9 track NRZI and PE format/ control units to simplify custom electronics. Also, a variety of popular mini-computer mag tape controllers are available.

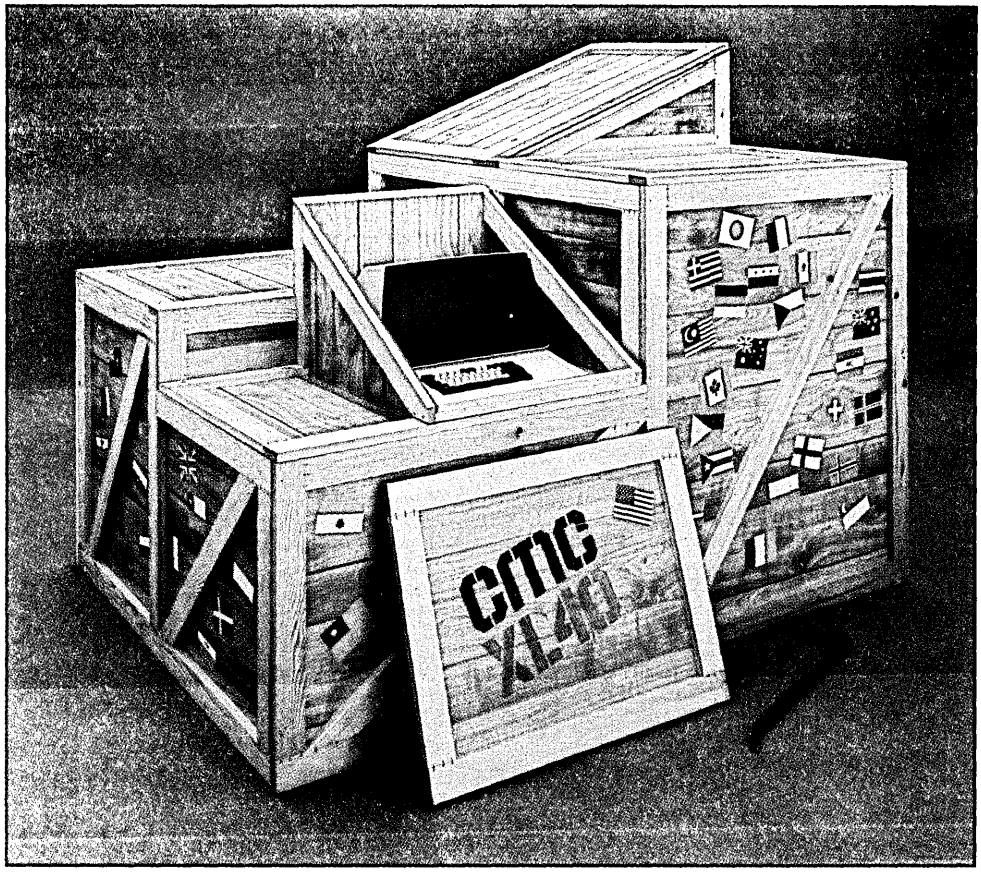
Series 9000 performance is as impressive as its features, with data transfer rates to 72KHz, and tape speeds from [illegible] ips.

Series 9000 is the most digital tape transport series around, and we plan to keep it that way, with constant improvements, rigid quality control and greater service capabilities. That should give you a warm feeling if you have a requirement for digital tape transports.

KENNEDY CO.

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

CIRCLE 1 ON READER CARD



You'd be surprised how much management control we deliver in a crate like this.

When you order CMC's XL40 Distributed KeyProcessing® System, that's precisely what's in it for you—management control.

Information gets to the people in your organization who need it, faster and more accurately. Because data is entered, validated and managed in source departments—by people who understand what products, quantities and prices the numbers represent—fewer errors are made.

While productivity goes up, your costs go down. Every mistake detected and corrected before it reaches your mainframe computer (or worse yet, a corporate officer) is money in the bank.

All the benefits of distributed processing are nailed down in the XL40. That's why we call it The DREAM Machine—for *D*ata *R*etrieval, *E*ntry *A*nd *M*anagement.

XL40 Data Retrieval ensures that your time-critical information is up to the minute—not last night's totals. XL40 Data Entry incorporates CMC's industry-standard-setting features, performing complex operations with a single keystroke. XL40 Data Management enables your departments to generate their own specialized management reports, specifying the information they need.

You get confidence and security too. CMC pioneered key-to-disk data entry, and we're the industry leader in number of systems and keystations installed worldwide. And we're backed up by the financial resources and respected service reputation of Pertec Computer Corporation.

Don't call us for our funny looking crate—call us for the management control inside. (213) 822-9914. TWX (910) 343-6451.

☐ Please mail full XL40 information.

Name_____

Title_____

Clip coupon to company letterhead; mail to CMC, P.O. Box 92300, Los Angeles, CA 90009.

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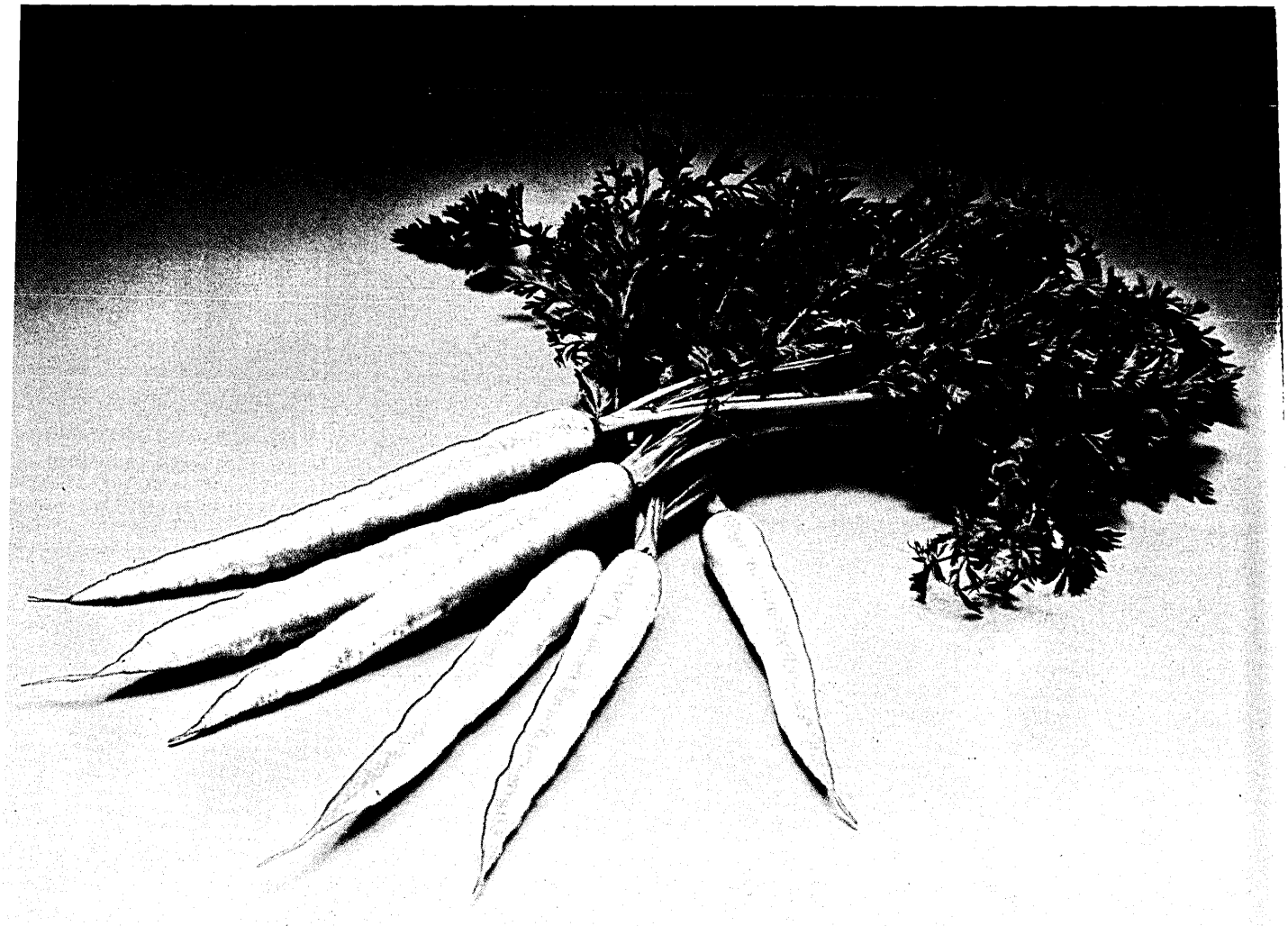
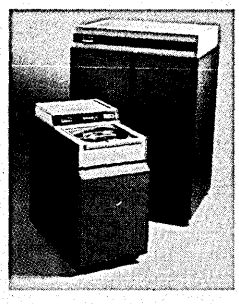


Itel Disk Drives.

Now you can pick one and get the whole bunch.

That's right. Our 7330-10, 7330-11 and 7330-12 disk drives are field upgradable from the smallest to the largest system. So when you have one, you really have them all. For example, when you upgrade our 7330-10 to a 7330-12, it's like going from an IBM 3330-1 to a 3350—without giving up media interchangeability. And there's no need to change control units when you upgrade, because all of our disk drive models can be attached to our 7835 controller. So, when you're ready to upgrade, all you need to do is call one of our field engineers. And Itel has the largest independent field engineering service in the country.



In addition, Itel now offers you another alternative in disk drives—our new 7350, which is compatible with IBM's 3350 and includes the Fixed Head feature. Of course, all our disk drives have the exclusive Dual-Port feature plus Itel's patented Advanced Function Capability. Add the fastest access time currently available, and you can increase throughput up to 25%.

Like all Itel data products, our disk drives and control units are plug-compatible, offering you superior performance at a lower cost. After all, reliable, economical alternatives are what Itel is all about. Not only in computer peripherals, but in field engineering, in financial packaging, in systems and software, in total computer capability.

Choose one of Itel's alternatives today—and later, you may want the whole bunch.

ITEL
CORPORATION
Data Products Group
One Embarcadero Center
San Francisco, California 94111
Telephone (415) 983-0000

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DATAMATION 77®

VOLUME 23 NUMBER 4 This issue 129,533 APRIL 1977

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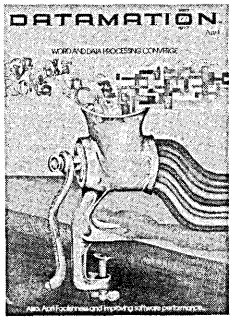

NEWS IN PERSPECTIVE

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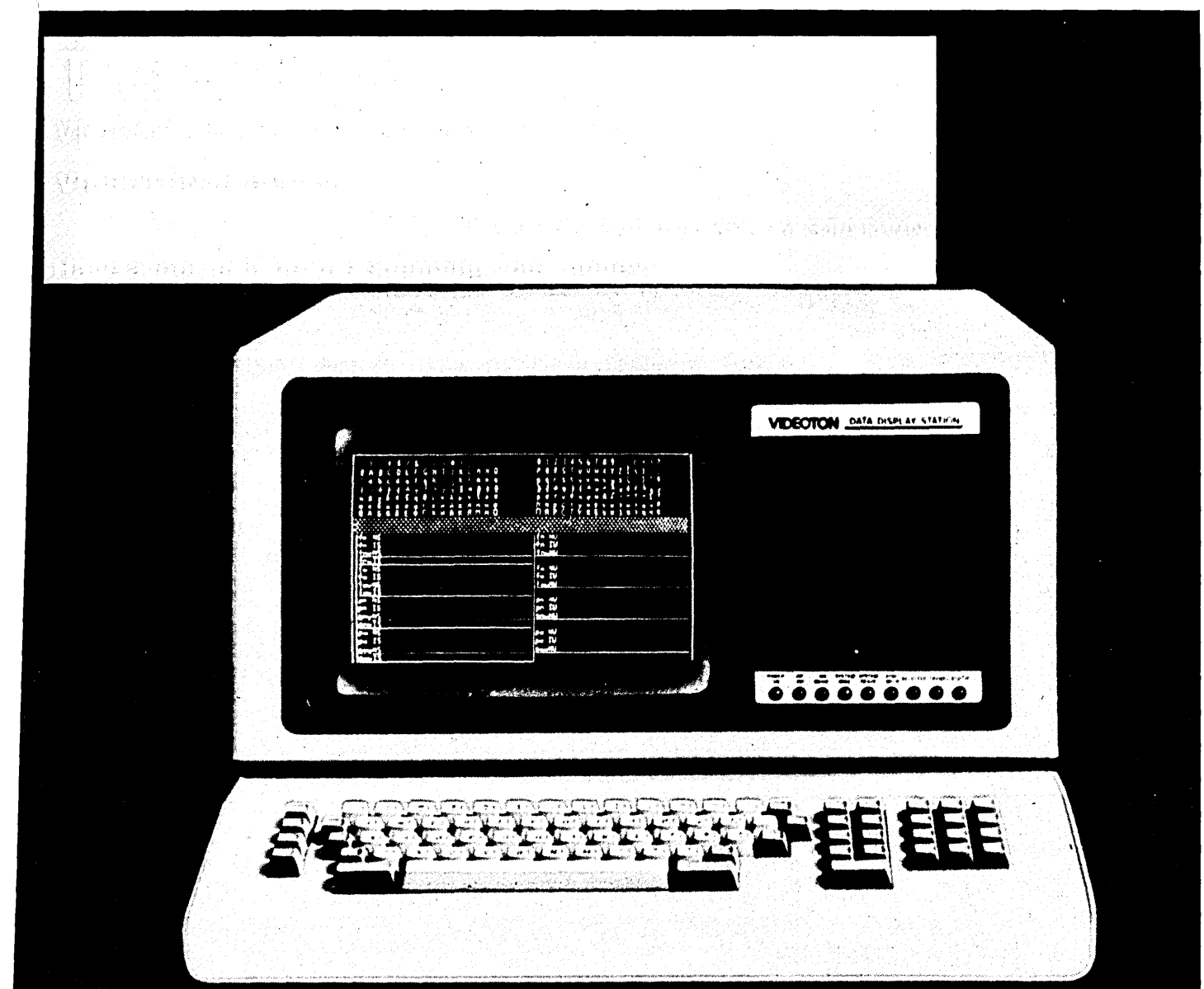

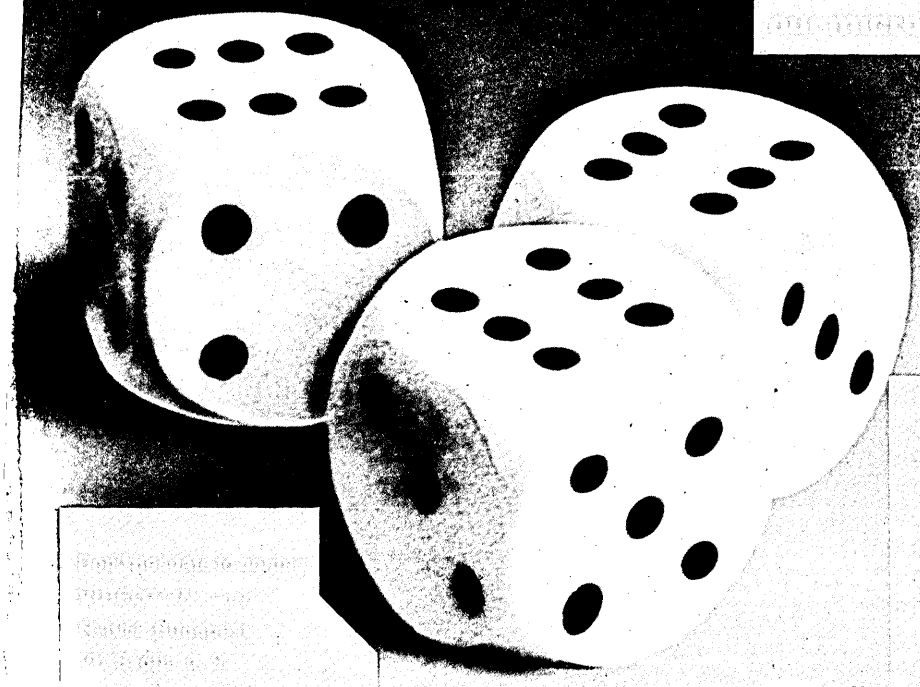

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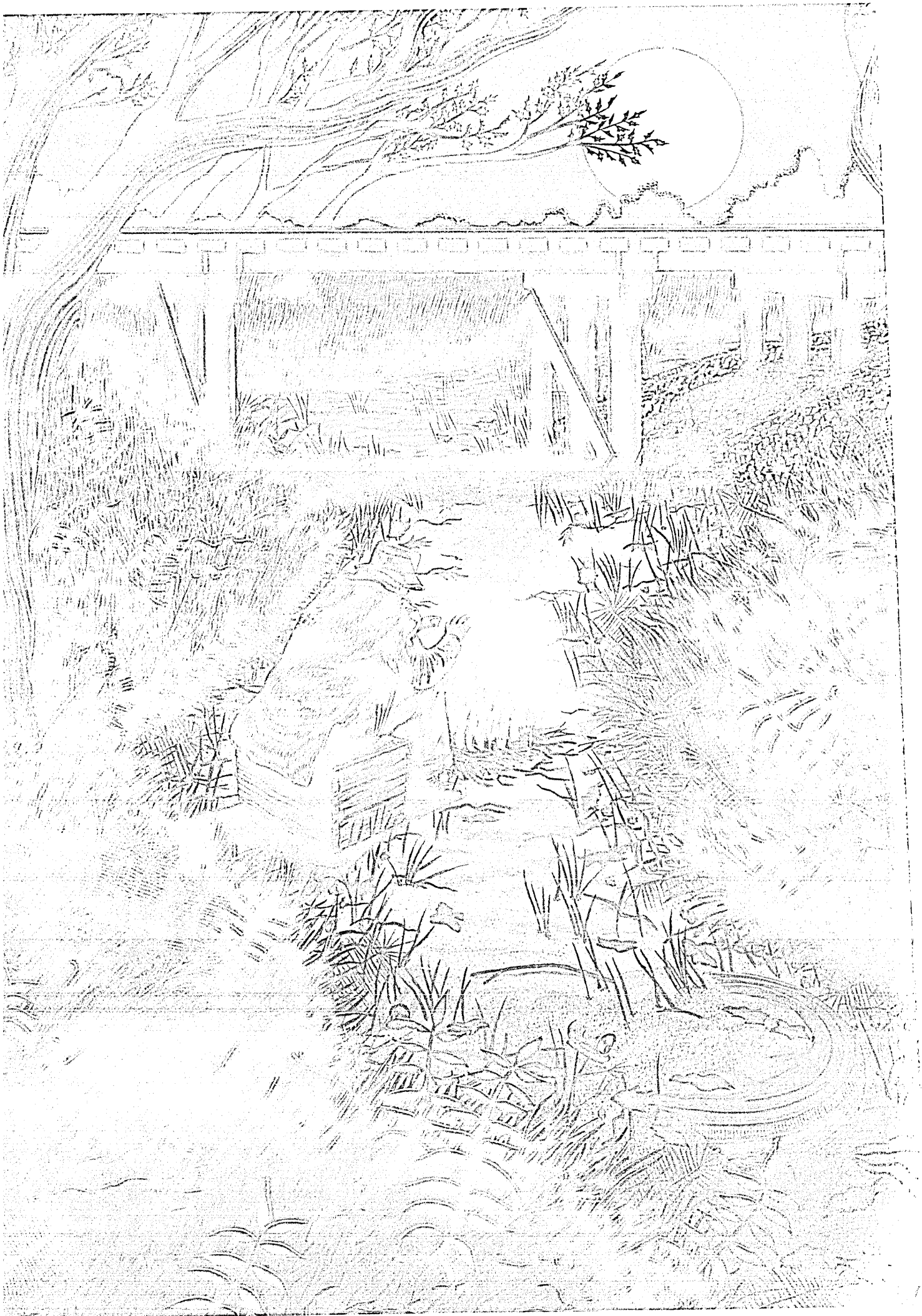


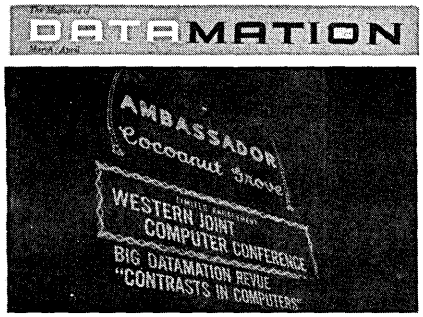
Looking Back in DATAMATION.

On our 20th anniversary

March-April, 1958

The 6th annual Western Joint Computer Conference continued to occupy center stage at Los Angeles' Ambassador Hotel.

The Philco TRANSAC S-2000 dp system had just been announced. It featured 4 to 64K words of core storage. Words were 48 bits in length, sufficient



to store eight alphanumeric characters or 15 decimal digits. Today's slowest minicomputers are faster than the then advanced S-2000 with its add/subtract speed of 1 usec. Multiplication/Division could bog you down even more, with average operation times of 28 usec, but which could take as long as 245 usec. Magnetic tape storage on the machine was another matter, however. Reading and writing tape was done at 150 ips, or 90,000 cps, not far from today's mini specs. Rewind speeds were even more impressive at 300 ips. Since tape performance was the S-2000's strong suit, the manufacturer made it possible to attach up to 256 of these transports.

April 1967

Plus ca change, plus c'est la même chose . . . our lead article in April 1967 was entitled "Data Communications: The Boiling Pot," describing the technical, economic, and political problems attending this "fast growing and confusing branch of data processing." The same piece would not be out of place today. Scientific Data Systems was busy hawking its Sigma series as the "only family of computer hardware and software designed for multiprogramming." . . . President Johnson had just proposed an amended patent law that would exclude software, and the optics firm Itek had just given up on a 10^{12} bit holographic memory used in a digital storage/retrieval application citing "insufficient reliability for continuous operations because of inherent defects in some of its electronic circuitry and some of its electro-mechanical components." ✲

The Computerless Terminal.

Bruning's fast, new microfiche retrieval/printer.

We developed the automated Bruning 96 to give you a more versatile off-line link with the data base and provide quick, hard copies. All at a more reasonable cost.

This economical alternative to computer terminals offers some remarkable advantages.

Like a much greater data base. The ability to handle photographs and illustrations. And immediate access to the past, in case you want to check something a few days, weeks or months from now.

There's no limit to the amount of information you can store in its convenient data-retrieval cartridges. Each holds up to 8,000 microfiche frames, with random access to any frame in seconds.

And the Bruning 96 retrieval/printer is as easy to operate as an eight-track player. Anyone in your office can use it. Simply insert a cartridge. The correct fiche and frame appear on the big, bright screen with pushbutton ease. Need a hard copy? Another button gets you one in seconds.

The Model 96 typifies the innovations Bruning brings to a complete quality line of fiche duplication and retrieval systems. You can have one tailored to your specific application.

Call a Bruning Micrographics Specialist for more information on the new Model 96—or a complete system. You'll get answers, not just order blanks. Or write Bruning, 1834 Walden Office Square, Schaumburg, Illinois 60196.

The bold force in micrographics.

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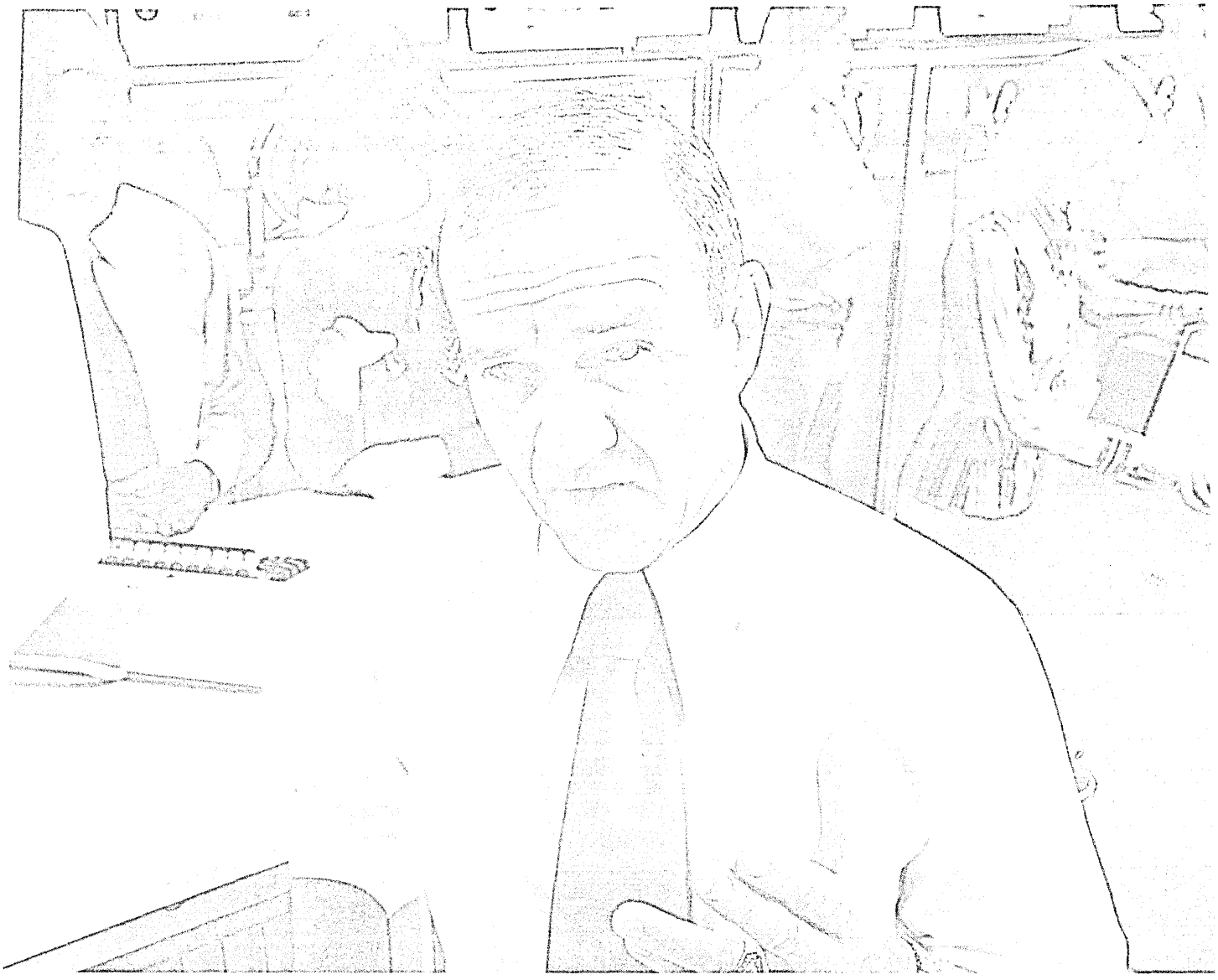


When I buy Digital's concept of distributed data processing, how will it affect my DP staff?

Some distributed data processing systems can mean new additions to your DP staff. New people to hire. New languages to learn. New ways to work.

Our concept is different.

Digital's systems are designed to be operated by clerical personnel who can enter and retrieve data as it occurs.

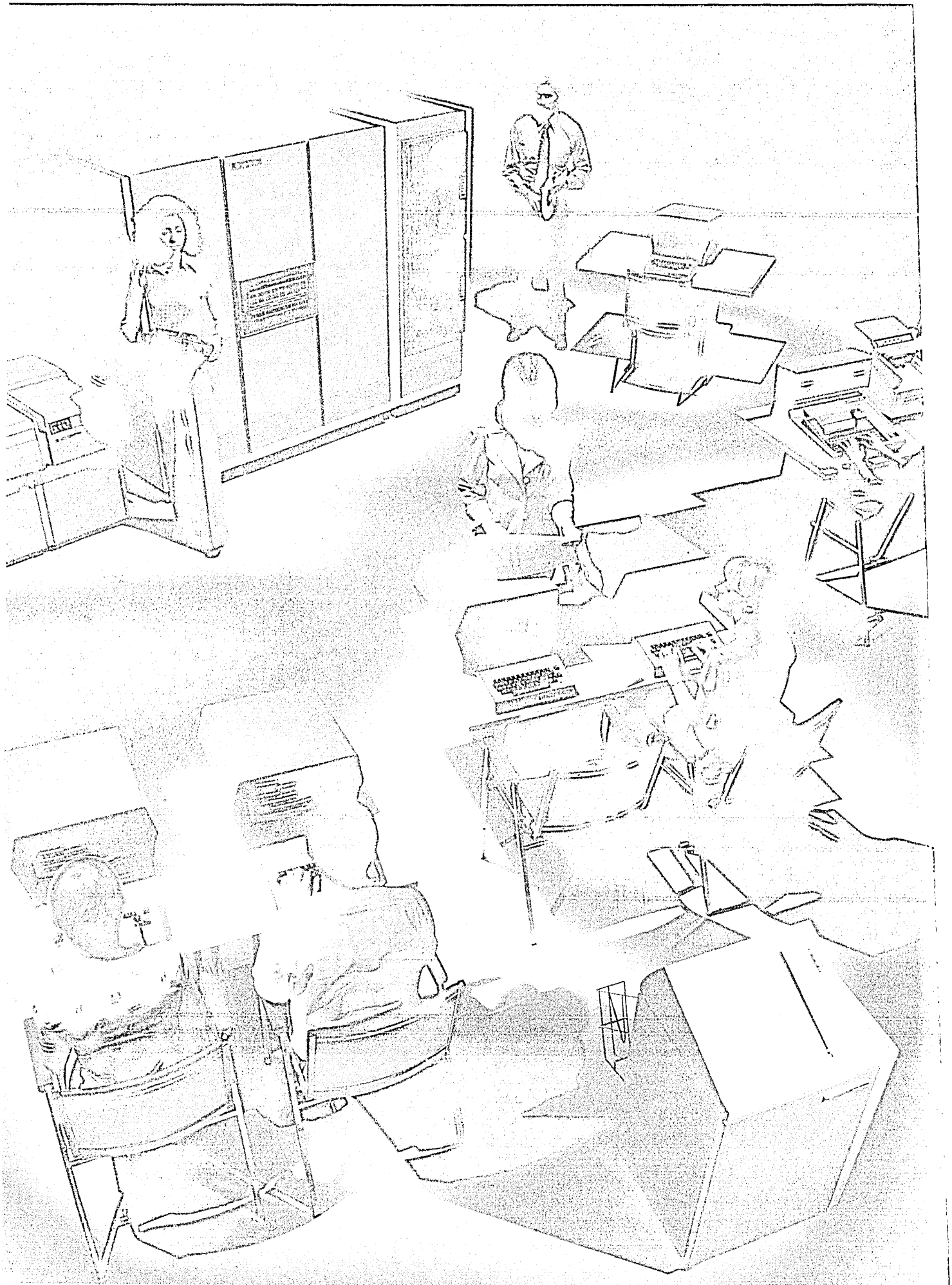
System implementation is faster. And *your* people can work with tools they already know. Like COBOL. RPGII. And industry standard communications protocols. What's more, we give them a set of additional tools that are easy to learn. Including CODASYL-compatible database management capability. State-of-the-art screen formatting and data manipulation utilities. Plus the broadest range of compatible interactive minicomputers in the world.

With these tools, your staff can start giving your company the benefits of DDP without expensive or extensive retraining. They can turn out more programs in less time than it takes now. Because our programs take less time to write. They can respond to specific requests faster. Because they're programming on-line. They can save mainframe time for mainframe work. Which means they can take on more responsibility to do more work. And take more pride in the work they do.

In short, Digital's concept of distributed data processing can give you the chance you've been waiting for, to be more responsive to your users' changing needs.

If that sounds good to you, contact us. We'll tell you even more. Write Mr. Herb Shanzer, Digital Equipment Corporation, Commercial Products Group, PK3/M10, Parker St., Maynard, MA 01754. European headquarters: Mr. Henry Ancona, 81 route de l'Aire, 1211 Geneva 26. In Canada: Digital Equipment of Canada, Ltd.

digital



A lot of computers offer multi-level batch processing, or RJE, or realtime, or interactive timesharing.

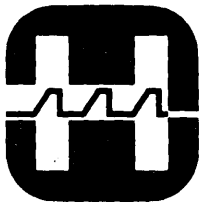
But only Harris offers all of it, concurrently.

Only Harris delivers multi-use concurrency. Our high performance S100 and S200 packaged systems, combined with our responsive VULCAN operating system delivers simultaneous compute services to each user. As well as simultaneous individual user access to the system.

The S220, shown here, is packaged around the most powerful CPU in the industry. Dozens of benchmarks, including Whetstone, prove the S100/S200 series superior performance. The S200 is one of 6 packaged systems available today, starting at $85,000. All operate with COBOL, FORTRAN, BASIC, RPG II, FORGO, SNOBOL, and extended BASIC. And all 6 in the series deliver RJE, multi-level batch processing, multiple interactive timesharing, and real-time processing...all at the same time. If your need is distributed processing, time-sharing, date base management, or any kind of multi-use concurrency, benchmark the S100/S200 packaged systems.

Only Harris gives it all to you, concurrently. Write Harris Computer Systems, 1200 Gateway Drive, Fort Lauderdale, Florida 33309. Europe: Harris Intertype Ltd., 145 Farnham Rd., Slough, SL1 4XD, England.

HARRIS



COMMUNICATIONS AND INFORMATION HANDLING

STARAN® can cut the costs of cartography in half.

The automated Raster Scanner/Plotter used by the Defense Mapping Agency can cut map line digitizing time from hours to minutes, compared to manual X-Y digitizers. But this advantage creates a problem—the massive amounts of data generated are too much for even large conventional computers to handle efficiently.

The solution: Goodyear's STARAN associative array processor. Working with the Raster Scanner/Plotter, it has performed the cartographic phase of mapmaking at least 10 times faster than known raster processing programs executed on large sequential computers.

STARAN combines content addressability with parallel array arithmetic to process hundreds, or even thousands, of data points simultaneously. This unique capability, plus parallel I/O and multidimensional memory access, produces significant throughput improvements over conventional computers. That's why the STARAN processing system is unsurpassed in ability to solve complex problems involving operations on many similar data streams or high-speed searches of many similar file records.

So before you invest a lot of money in a high data rate digital system, invest a little time to look into STARAN.

Write for complete information to Wayne Brubaker, Goodyear Aerospace Corporation, Akron, Ohio 44315. Or call him at (216) 794-3631.

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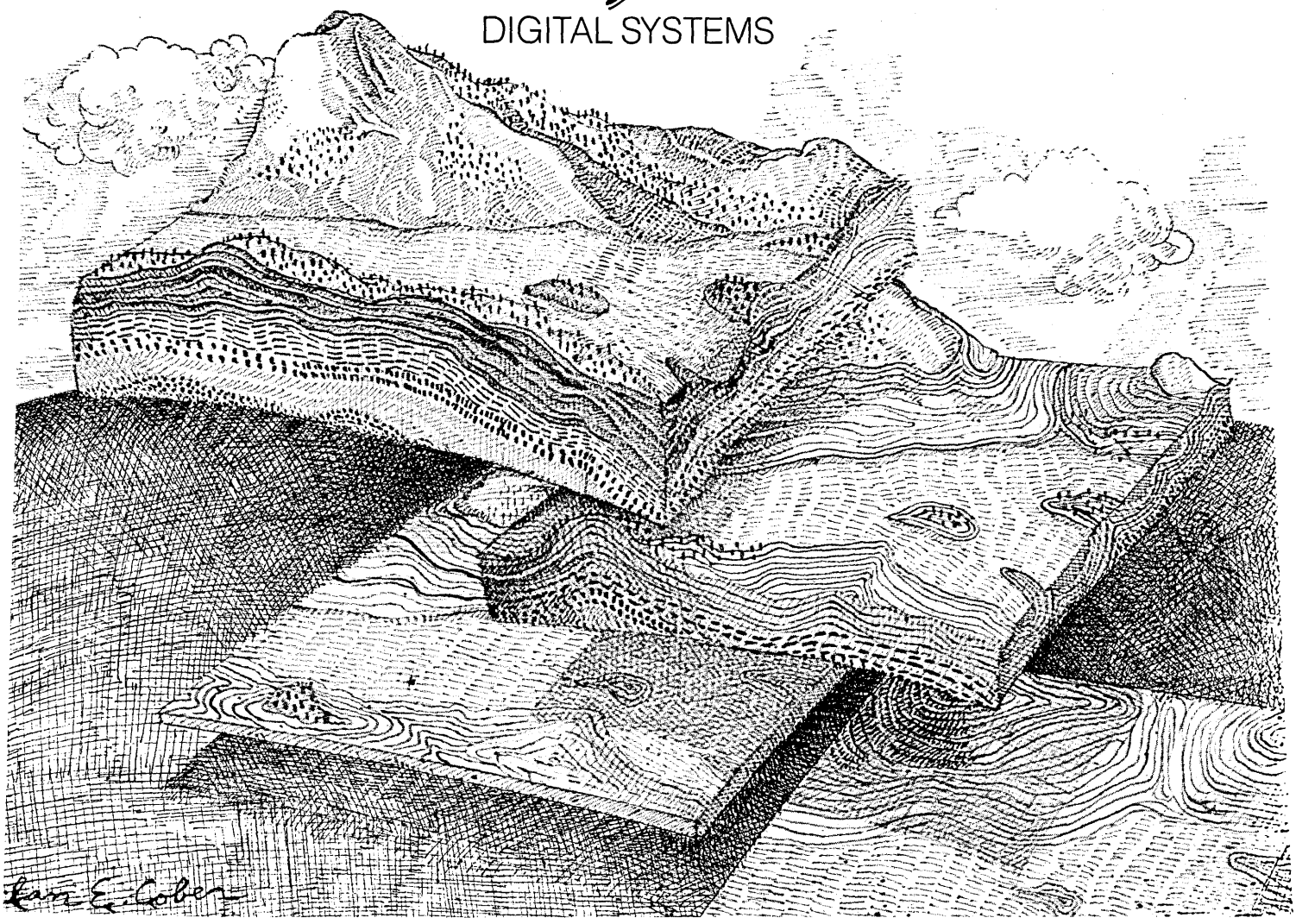
GOODYEAR

DIGITAL SYSTEMS



LOOK AHEAD

THE IBM 3033: "AMDAHL DID US A FAVOR"

"The pricing of the IBM 3033 and the reductions on the 370/158 and 168 are just disastrous for Amdahl and other competitors, though great for users on rent or lease who can switch or take advantage of the purchase option credit."

"The Justice Dept. has to be delighted with this new ammunition."

"I'm glad to see Amdahl force IBM to do something: we need the price cut, we need the inboard channels, the increased performance. I think Amdahl did all of us a favor."

"It's a boon for leasing companies, except those with insurance policies that indemnify seven year leases and allow the user to 'walk out' after three years."

"If that's what all the excitement is about, I'm going to go out and watch the grass grow."

Those were the first gut reactions late in March to IBM's new 3033 processor, whose mystifying nomenclature is dubbed by one user, "a 3330 turned counter-clockwise." The rapid fire Amdahl reaction (see below) has already been announced. But the real competitive effect is best seen by comparing the 3033 with the less powerful 168, model 3. Take a four megabyte 168-3 and add all possible features that are standard with the 3033--consoles, 12 channels, high speed multiply, and the extended hardware/firmware feature that enables use of new program products that improve MVS and VM performance. Reduce memory rent and purchase by 35% and processor purchase price by 30%. The 168-3 rents for $129,904, leases at $118,144, and sells for $4.3 million. The 3033: $77,430, $70,400, and $3.38 million. Maintenance is about $2,000 less per month. (Unknown cost factors in the 3033 include hidden features, future priced software, and other unbundling.)

AMDAHL'S ANSWER: PRICE CUT AND NEW MODELS

Those disappointed with the 3033 power (some expected double the improvement given) and the lack of multiprocessing see the price cut as more significant than the technological pluses. Hence they label it a fighting machine, aimed directly at Amdahl, Itel, and would-be plug compatible competitors.

Amdahl reaction the Monday after the Friday announcement chopped the price of its 470 V/6 by about 30% and announced two large scale computer systems--one larger and one smaller than the V/6. Its new 470 V/7, with 16 megabytes of main memory, is more powerful than the IBM 3033 and performs 1.5 to 1.7 times faster than the V/6. Its V/5, offering more processing power to users of IBM 370/155, 158, and 165, can be field upgraded to the full V/6 specifications. The company said it is able to cut prices and still maintain a pre-tax margin similar to that achieved in its FY 1976.

Meanwhile, from a leasing standpoint, the IBM 158 and 168 are now being offered at 20% off list, although better deals have been popping up in anticipation of the long-aborning announcement. With the 30% reduction, lessors will be buying those systems from users with purchase options and slashing their lease prices.

IBM had the new system ready in September of 1975 and had planned an announcement in April, but advanced it to March 24 on advice of their lawyers because news of it leaked out in Europe. Many IBM salesmen were caught attending 100% club meetings at the time of the announcement.

TEXAS INSTRUMENTS' PLANS FOR BUBBLE MEMORIES

Texas Instruments is about to come out with a whole series of products incorporating bubble memories, a source who was given a sneak preview of the bubble line says. On tap are intelligent terminals, word processing systems, and minis all aimed at the distributed processing market. TI reportedly believes bubble technology is ideally suited for the distributed environment since with their minimal power requirements bubbles are not subject to the ill-effects of local brownouts or programming errors that could normally shut down field dp operations. TI also will incorporate bubbles in its calculator line before long, the source believes.

EIGHT NEW COMPUTERS ADDED TO NCR 8000 FAMILY

NCR means computers. Last year the company's computer revenues, including computer forms, passed the billion dollar mark with more than 6,500 mainframes installed and more than 30,000 minicomputers.

LOOK AHEAD

This month (April 28) and sometime in the Fall, the company will introduce eight new models in what it calls its 8000 family, resulting in four basic series of machines--an I-8000 interactive processing series; a new N-8000 series using existing NCR Century software; a V-8000 virtual machine series; and a dual-mode, or "swing", series which operates in different processing modes and which also uses Century software. (Under a revised product designation system, all NCR mainframes in the future will carry the "8000" family designation with the letter prefix indicating the primary mode of operation.)

Aimed at easy upward migration, the line now ranges from the 8200, introduced almost two years ago, all the way up to a two megabyte machine which will be introduced in the Fall. This machine will have an internal performance that is two and one-half times greater than NCR's current top of the line Criterion 8570, which has a 56 nanosecond processor and which was introduced a year ago, along with the Criterion 8550 equipped with a 112 millisecond processor. The eight new models will have multiprocessing capabilities and multiprocessing software is to be released at a later, unannounced date.

FRAUD IN ORANGE COUNTY?

Orange County, Calif.'s, $26 million, seven year facilities management contract with Computer Sciences Corp., (September '73, p. 122) now in its third year, could come under federal investigation of possible fraud and price collusion if Rep. Jack Brooks (D-Texas), chairman of the House Government Operations Committee, has his way. Brooks has requested such an investigation by both the Comptroller General and Secretary of the Treasury.

He based his request on a Los Angeles Times article instigated by, and forwarded to Brooks by Norman Ream, an Orange County resident and computer industry veteran who has opposed the fm contract from the beginning (August '74, p. 101). In similar letters to the two federal agencies, Brooks said the article suggests that fraud may have been committed...and price collusion may have occurred between CSC and Univac in sale of hardware to the county. The contract involved federal revenue sharing money. Brooks said he is considering using the Orange County investigation as a springboard for a nationwide check into the spending of revenue sharing funds.

SPAN MANAGEMENT AGAIN

Span Management Systems is popping up everywhere (March, p. 16). Last month the Providence, R. I., firm formally announced a line of products and services based on IBM Series 1 hardware, and at least one distributor had ordered a $40,000 demo system and had begun developing promotional literature. David Haim, president of Minicom Systems, Los Angeles, said he expects to get delivery of his demo in July. He had planned to send out 10,000 and 20,000 promotional letters early this month but said he wouldn't actually accept orders until he's seen a system in operation. He said he's been invited East by Span for this purpose. "I've been told the operating system is ready and has been tested and that applications software is ready but hasn't been tested. I don't want to see anything until everything has been tested," he said in late March. He said he will simply be taking orders. "IBM will deliver and install and I'll be paid on the spot."

PRIVACY IN GOVERNMENT: THE SKY ISN'T FALLING

As the Privacy Protection Study Commission prepares to wrap up its 18-month privacy probe, some interesting preliminary findings are beginning to leak out. In a special project designed to check out how well the 1974 Privacy Act was working, a seven member staff team quizzed hundreds of federal dpers and others to find that there were no cases of premeditated abuse, and only a few scattered instances of questionable agency compliance with the law.

As part of this investigation, the study group will make recommendations on ways to tighten up the language in the law and improve agency practices. All these Privacy Act patch-ups will be bundled into the commission's final voluminous report (10 to 12 volumes) which is due out June 10, but may be stalled due to printing problems. However, unlike the agencies which were thrown into a privacy panic, the commission staffers aren't worried about this "insignificant" delay. "There was a lot of overreaction (to the privacy act)," explains one committee source. "People were trying to sell high priced security gear to agency people who were screaming 'the sky is falling.' Well, the sky didn't fall. The crisis never came."

(Continued on page 180)

"Universities over the past couple of years have been hit not only by tight budgets but also by external reporting requirements that are close to impossible. My office is charged with preparing these reports when they concern the University's three campuses. There's no way we could have responded to these external demands without MARK IV.® Certainly there is no timely way we could have met these requirements using traditional procedural languages. I'm sure two or three times the number of people would be needed to even begin to turn out what we do now in the information retrieval and small systems area.

"One system completely developed in MARK IV is a space inventory system for our three campuses. The data used always has to be massaged, updated, corrected, and coordinated, because it's coming from three campuses with dissimilar systems. The time saved with MARK IV and the ability to produce fast results surpasses my most optimistic expectations.

"Every person on my staff of 35 has been trained in MARK IV. I will definitely push its use as an adjunct in our data base systems development, simply because I feel that is the right way for less qualified IMS people to deal with IMS.

"The University has acquired other proprietary software since installing MARK IV, but in my opinion it is the best and most useful product for my office. We've never found a problem we couldn't live with, and the ones we have found have been fixed immediately or in the next release. And Informatics in-house training is superb — we were productive the first week after they were here."

"We run a 6 Meg 370/168 with IMS/VS and multiple RJE locations, one RJE at our office site."

WHAT IS MARK IV? MARK IV is the most versatile and widely used software product in the world for application implementation, data management, and information processing. Six powerful models (prices start at $12,000) are in daily use on IBM 360/370, Univac 70/90, Siemens 4004, and Amdahl 470 computers at over 1,100 installations in 43 countries. Programs in MARK IV require only about one-tenth the statements of Cobol, and users report 60% to 90% cost and time reductions on most MARK IV applications. Send the coupon today for detailed information.

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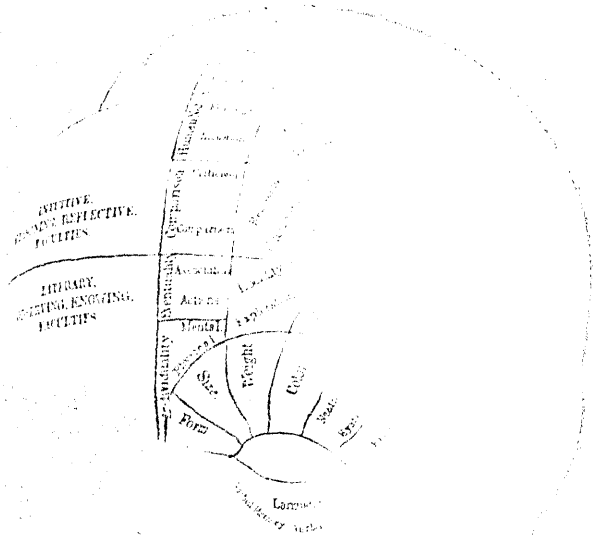
City_____ State/Province_____ Zip_____

The views expressed are those of Director Dorothy J. Hopkin and not necessarily those of the University of Illinois.



PHRENOLOGY

BY

L.N.FOWLER.

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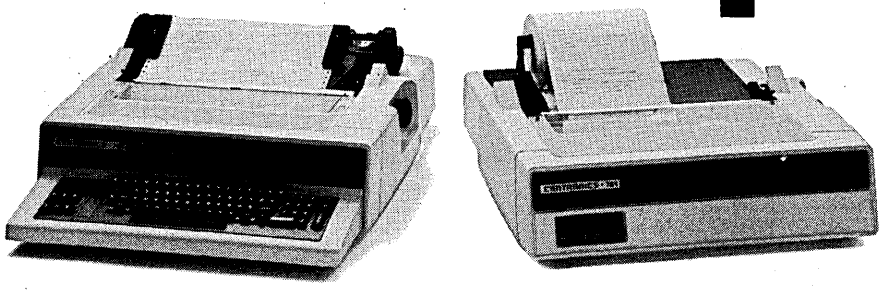

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letters

A kludge by any other name . . .
The word "kludge" is used to describe the cover of the January 1958 edition of DATAMATION (January 1977, p. 6). I have searched dictionaries and inquired of my associates for the meaning of this word. The best description I can put together from several sources is: a quick and dirty spit and bailing wire solution to a problem which was not foreseen in the system design but which would have immobilized the system were it not for the kludge. Kludges are always spoken of in the past tense, so I assume they are not designed as such but somehow evolve. Can you shed more light on the definition or meaning of "kludge"?
P.S. The word for next month is "glitch."

DENNIS J. NOLAN
City of St. Paul Data Processing
St. Paul, Minnesota

Mr. Jackson Granholme, responds: In reply to Mr. Nolan's letter, the word "kludge" is briefly described in the **Encyclopedia of Computer Science** (Petrocelli/Charter, New York, 1976, p. 750) in which the noted author, Gruenberger, credits me with having coined the word in the DATAMATION article, "How to Design a Kludge" (February 1962).

Gruenberger is too kind in crediting this invention to me, for, as I pointed out in my DATAMATION review of the **Encyclopedia**, kludges were around before I popularized them.

It pleases me to note that in that ancient article of 1962, I gave full credit to the late Phineas Burling, then chief calligrapher with the Fink and Wiggles Publishing Company, for researching the word back through the antiquities of the English language. But I must confess that the oft-quoted modern definition is mine, namely: "An ill-assorted collection of poorly matching parts, forming a distressing whole."

We may note that, through history, kludge has been variously spelled as Kluge, Klüge, Kluege, Klooge, Kloog, Klag, Klog, Klogge, Klaugen, Claug, Kladnis, Veklaunne, Cluj, and Cloots, in the sundry tongues and dialects of Indo-European languages (there may be missing spellings, due to the difficulties of runic translation).

According to Dr. Wellmouth Muttha, the term is certainly Indo-European, not being found in Ostiak or Mongol. Muttha surmises it may stem from the myth/legend of Det Haar Klod who fell off the cliff into the wooly mammoth trap when no wind was blowing.

Martin, in his noted book, **Malice in Blunderland** (McGraw-Hill, 1973), has related the kludge to other observed phenomena, and this may be of interest to readers.

With regard to Nolan's threat to discuss the word "glitch" in forthcoming letters, I believe I also laid that question to rest in my review of the **Encyclopedia**, wherein I likened the glitch to the electronic equivalent of a heinous and momentary interruption of an important ceremonial. It also bears some semblance to a raucous cry in the quiet dark, or to a sudden and unprovoked attack on one's private parts.

Glitch was also used in my apocryphal epic, "Adventure of the Missing

(Continued on page 22)

Solved!

I thought you'd be interested in a new way to solve word puzzles like your "Hot Topics": by computer.

W. D. MAURER
Washington, D.C.

The original word puzzle contained the hot topics that the data processing community will "wake up to" in 1977. The list of imbedded words is on page 134 of our January issue.

```
      $JOB
C
C     A PROGRAM TO SOLVE PUZZLES WITH IMBEDDED WORDS
C
C     FIRST THE PUZZLE IS READ IN
C     EACH ROW OF THE PUZZLE IS READ IN ON ONE CARD,
C        STARTING IN COLUMN 1
C     THE ROWS OF THE PUZZLE ARE TERMINATED BY A BLANK CARD
C
C     THEN THE IMBEDDED WORDS ARE READ IN
C     EACH OF THESE WORDS STARTS COLUMN 1 OF A NEW CARD
C     IT MUST HAVE NO IMBEDDED BLANKS
C     THE IMBEDDED WORDS ARE TERMINATED BY A BLANK CARD
C
C     SIGNIFICANCE OF ARRAYS AND VARIABLES IN THIS PROGRAM
C
C     KIN IS THE INPUT BUFFER
C     KBLANK IS A BLANK CHARACTER
C     KSTAR IS AN ASTERISK
C     IMAX IS THE (COMPUTED) NUMBER OF ROWS IN THE PUZZLE
C     JMAX IS THE (COMPUTED) NUMBER OF COLUMNS IN THE PUZZLE
C     KMAT IS THE MATRIX WHERE THE PUZZLE IS STORED
C     IWR IS THE WORD REFERENCE (SEQUENCE NUMBER) WHEN TABLES ARE SET UP
C     KCT IS THE ALPHABETIC CHARACTER TABLE (A-Z)
C     KCP IS THE CHARACTER POINTER TABLE FOR INPUT WORDS
C     KWR IS THE WORD REFERENCE TABLE ASSOCIATED WITH KCP
C     KCH IS THE CHAIN POINTER TO THE NEXT KCP ENTRY
C     KCL IS THE CURRENT LENGTH OF THE KCP TABLE
C     KCHAR IS THE CHARACTER TABLE FOR INPUT WORDS
C     KCHARL IS THE CURRENT LENGTH OF KCHAR, + 1
C     KWR2 IS THE WORD REFERENCE TO BE ALTERED IN IWT
C     IWT IS THE INPUT WORD TABLE
C     IWL IS THE INPUT WORD LENGTH TABLE, PARALLEL TO IWT
C     NWORDS IS THE TOTAL LENGTH OF IWT
C     IXT IS THE X INCREMENT TABLE (8 DIRECTIONS)
C     IYT IS THE Y INCREMENT TABLE (8 DIRECTIONS)
C     IC IS THE CURRENT I (FOR FINDING A WORD IN KMAT)
C     JC IS THE CURRENT J (FOR FINDING A WORD IN KMAT)
C     KC IS THE CURRENT KCHAR REFERENCE (FOR FINDING A WORD IN KMAT)
C     IX IS THE CURRENT X INCREMENT
C     IY IS THE CURRENT Y INCREMENT
C     LAI IS THE ANSWER TABLE FOR I
C     LAJ IS THE ANSWER TABLE FOR J
C     LAD IS THE ANSWER TABLE FOR THE DIRECTION
C     LAW IS THE ANSWER TABLE FOR THE WORD REFERENCE
C     LLA IS THE LENGTH OF THE ANSWER TABLES
C     IMAXO IS THE NUMBER OF ROWS OUTPUT
C     JMAXO IS THE NUMBER OF COLUMNS OUTPUT
C     MATOUT IS THE OUTPUT MATRIX
C     IASTI IS THE STARTING INCREMENT FOR ASTERISKS ON I BY DIRECTION
C     IASTJ IS THE STARTING INCREMENT FOR ASTERISKS ON J BY DIRECTION
C     IXAT IS THE X ASTERISK DRAWING TABLE
C     IYAT IS THE Y ASTERISK DRAWING TABLE
C     ILAT IS THE ASTERISK DRAWING LENGTH TABLE
C     ISP IS THE SPACING FACTOR FOR OUTPUT
C
  1         INTEGER KIN(72),KMAT(49,49),KCT(26),KCP(100),KWR(100),KCH(100)
  2         INTEGER KCHAR(2000),IWT(200),IWL(200),IXT(8),IYT(8),LAI(200)
  3         INTEGER LAJ(200),LAW(200),LAD(200),MATOUT(119,119),IASTI(8)
  4         INTEGER IASTJ(8),IXAT(4,8),IYAT(4,8),ILAT(4,8)
  5         DATA KBLANK,KSTAR/1H ,1H*/
  6         DATA KCT/1HA,1HB,1HC,1HD,1HE,1HF,1HG,1HH,1HI,1HJ,1HK,1HL,1HM,
     *           1HN,1HO,1HP,1HQ,1HR,1HS,1HT,1HU,1HV,1HW,1HX,1HY,1HZ/
  7         DATA IXT/0, 0, 1,-1, 1, 1,-1,-1/
  8         DATA IYT/1,-1, 0, 0, 1,-1, 1,-1/
  9         DATA IASTI/-1,-1,-1, 1,-1,-1, 0, 0/
 10         DATA IASTJ/-1, 1, 1,-1, 0, 0,-1, 1/
 11         DATA IXAT/ 0, 1, 0,-1, 0, 1, 0,-1,  1, 0,-1, 0, -1, 0, 1, 0,
     *   1, 1,-1,-1,  1, 1,-1,-1,  1, 1,-1,-1,  1, 1,-1,-1/
 12         DATA IYAT/ 1, 0,-1, 0, -1, 0, 1, 0,  0,-1, 0, 1,  0, 1, 0,-1,
     *   1,-1,-1, 1,  -1, 1, 1,-1,  1,-1,-1, 1,  -1, 1, 1,-1/
 13         DATA ILAT/-2, 2,-2, 2, -2, 2,-2, 2,  -2, 2,-2, 2,  -2, 2,-2, 2,
     *  -1, 1,-1, 1,  -1, 1,-1, 1,  -1, 1,-1, 1,  -1, 1,-1, 1/
 14         ISP = 4
 15         KCL = 26
 16         DO 1 I = 1,100
 17         KCP(I) = 0
 18    1    KCH(I) = 0
 19         KCHARL = 1
 20         LLA = 0
 21         I = 1
 22         WRITE (6, 90)
 23         READ (5, 91) (KIN(K),K=1,72)
 24         WRITE (6, 92) (KIN(K),K=1,72)
 25         K = 72
 26    5    IF (KIN(K).NE.KBLANK) GO TO 7
 27         K = K-1
 28         GO TO 5
 29    7    JMAX = K
 30         GO TO 11
 31    9    READ (5, 91) (KIN(K), K=1,72)
 32         WRITE (6, 92) (KIN(K),K=1,72)
 33         IF (KIN(1).EQ.KBLANK) GO TO 15
 34   11    DO 13 J = 1, JMAX
 35   13    KMAT(I,J) = KIN(J)
 36         I = I + 1
```

(Continued on page 22)

letters

Bit" (October 1964) in the person of Sir Henry Glitch of the Royal British Exchequer.

Reader Nolan is clearly a novice, and probably a programmer, for the kludge lies primarily in the domain of the hardware men (who still produce them apace), while the glitch must be experienced to be believed.

Dp defined

In response to Frederic G. Withington's off-hand question, ". . . what is data processing anyway?" I would like to attempt a useful, functional definition.

If we accept the notion that "data" are encoded abstractions of reality, then "data processing" becomes the process of deriving information and/or intelligence from data.

This definition includes the traditional computerized "number crunching" with which we are familiar, but is also broad enough to encompass almost every human information-seeking activity.

The trends in our industry are now clearly delineated by such terms as "friendly user language." Thus it would seem a worthwhile endeavor for the members of our industry (dare I say "profession"?) to come to an agreement on updated definitions of some of the more ancient terms, such as "dataprocessing," which have been around for years, and of which "everybody knows" the meaning. And in this endeavor, to free our vocabulary from its archaic adherence to a machine philosophy and humanize the basic concepts of our industry.

LOIS A. ROSE
Parsippany, New Jersey

But does it work . . . ?

A careful study of the detailed ratings in the "User Ratings of Software Packages" (December, p. 108) raises some questions about the rating categories. The users are asked to rate seven categories: six specific areas and one general category, Overall Satisfaction. Although the Overall Satisfaction category is rated separately by the users, one would presume that it should closely relate to the average of the six specific categories. In most cases it is quite close, but there are some notable exceptions.

Western Electric's UNIX has an overall satisfaction of 4.0, even though the other six categories average out to only 2.8! And going in the opposite direction, IBM's IRP has an overall satisfaction rating of only 2.0 even though the other categories average 2.7, and the lowest individual category is only 2.4 (Throughput).

It occurs to me that the most important category has been omitted in the ratings, which would account for these discrepancies; namely "Functionality, or, Does the Package Do What It Is Supposed to Do?"

Apparently the UNIX users don't really care that the Training is poor and the Vendor Support is only fair, because UNIX does a super job of doing what it is supposed to do. Conversely, even though IRP is ranked fairly good in Documentation, Throughput, Support, etc., when you get right down to it, it apparently just doesn't do much of a job of Requirements Planning.

I have always thought that people bought (or wrote) packages to perform a specific, needed function. Therefore, an evaluation of how well it performs that function is of primary importance, and should be categorized separately.

RICHARD F. WARD
Honeywell Information Systems, Inc.
Southfield, Michigan

Throughput cannot exist without "Functionality" as Mr. Ward defines it and so that aspect is really covered. Still, the suggestion is valid and we'll consider it.

(Continued from page 21)

```
37          GO TO 9
38    15    IMAX = I-1
39          IWR = 1
40          WRITE (6,93)
41    12    READ(5,91) (KIN(K),K=1,72)
42          WRITE (6, 92) (KIN(K),K=1,72)
43          KG = KIN(1)
44          IF (KG.EQ.KBLANK) GO TO 23
45          DO 17 II=1,26
46          IF (KG.EQ.KCT(II)) GO TO 18
47    17    CONTINUE
48          GO TO 88
49    18    KG = II
50          IF (KCP(KG).EQ.0) GO TO 19
51          KCL = KCL + 1
52          KCP(KCL) = KCP(KG)
53          KWR2 = KWR(KG)
54          KWR(KCL) = KWR2
55          KCH(KCL) = KCH(KG)
56          KCH(KG) = KCL
57          IWT(KWR2) = KCL
58    19    KCP(KG) = KCHARL
59          KWR(KG) = IWR
60          K = 2
61    21    KCHAR(KCHARL) = KIN(K)
62          KCHARL = KCHARL+1
63          K = K + 1
64          IF (KIN(K).NE.KBLANK) GO TO 21
65          KCHAR(KCHARL)=0
66          KCHARL = KCHARL + 1
67          IWT(IWR) = KG
68          IWL(IWR) = K-1
69          IWR = IWR + 1
 0          GO TO 12
 1    23    NWORDS = IWR-1
 2          DO 41 I = 1,IMAX
 3          DO 41 J = 1,JMAX
 4          KG = KMAT(I,J)
 5          DO 27 II=1,26
 6          IF (KG.EQ.KCT(II)) GO TO 28
 7    27    CONTINUE
 8          GO TO 88
 9    28    KG = II
10          IF (KCP(KG).EQ.0) GO TO 41
11    29    DO 39 II = 1,8
12          IX = IXT(II)
13          IY = IYT(II)
14          IC = I
15          JC = J
16          KC = KCP(KG)-1
17    31    KC = KC+1
18          IF (KCHAR(KC).EQ.0) GO TO 33
19          IC = IC + IX
20          IF (IC.EQ.0) GO TO 39
21          IF (IC.GT.IMAX) GO TO 39
22          JC = JC+IY
23          IF (JC.EQ.0) GO TO 39
24          IF (JC.GT.JMAX) GO TO 39
25          IF (KMAT(IC,JC).EQ.KCHAR(KC)) GO TO 31
26          GO TO 39
27    33    LLA = LLA + 1
28          LAI(LLA) = I
29          LAJ(LLA) = J
100         LAW(LLA) = KWR(KG)
101         LAD(LLA) = II
102   39    CONTINUE
103         IF (KCH(KG).EQ.0) GO TO 41
104         KG = KCH(KG)
105         GO TO 29
106   41    CONTINUE
107         WRITE (6, 94)
108         IMAXO = ISP*IMAX - ISP + 3
109         JMAXO = ISP*JMAX - ISP + 3
110         DO 61 I=1,IMAXO
111         DO 61 J=1,JMAXO
112   61    MATOUT(I,J) = KBLANK
113         II = 2-ISP
114         DO 62 I = 1,IMAX
115         II = II + ISP
116         JJ = 2-ISP
117         DO 62 J = 1, JMAX
118         JJ = JJ+ISP
119   62    MATOUT(II,JJ) = KMAT(I,J)
120         DO 79 K = 1, LLA
121         ID = LAD(K)
122         II = ISP*LAI(K)+2-ISP+IASTI(ID)
123         JJ = ISP*LAJ(K)+2-ISP+IASTJ(ID)
124         DO 71 L = 1,4
```

(Continued on page 206)

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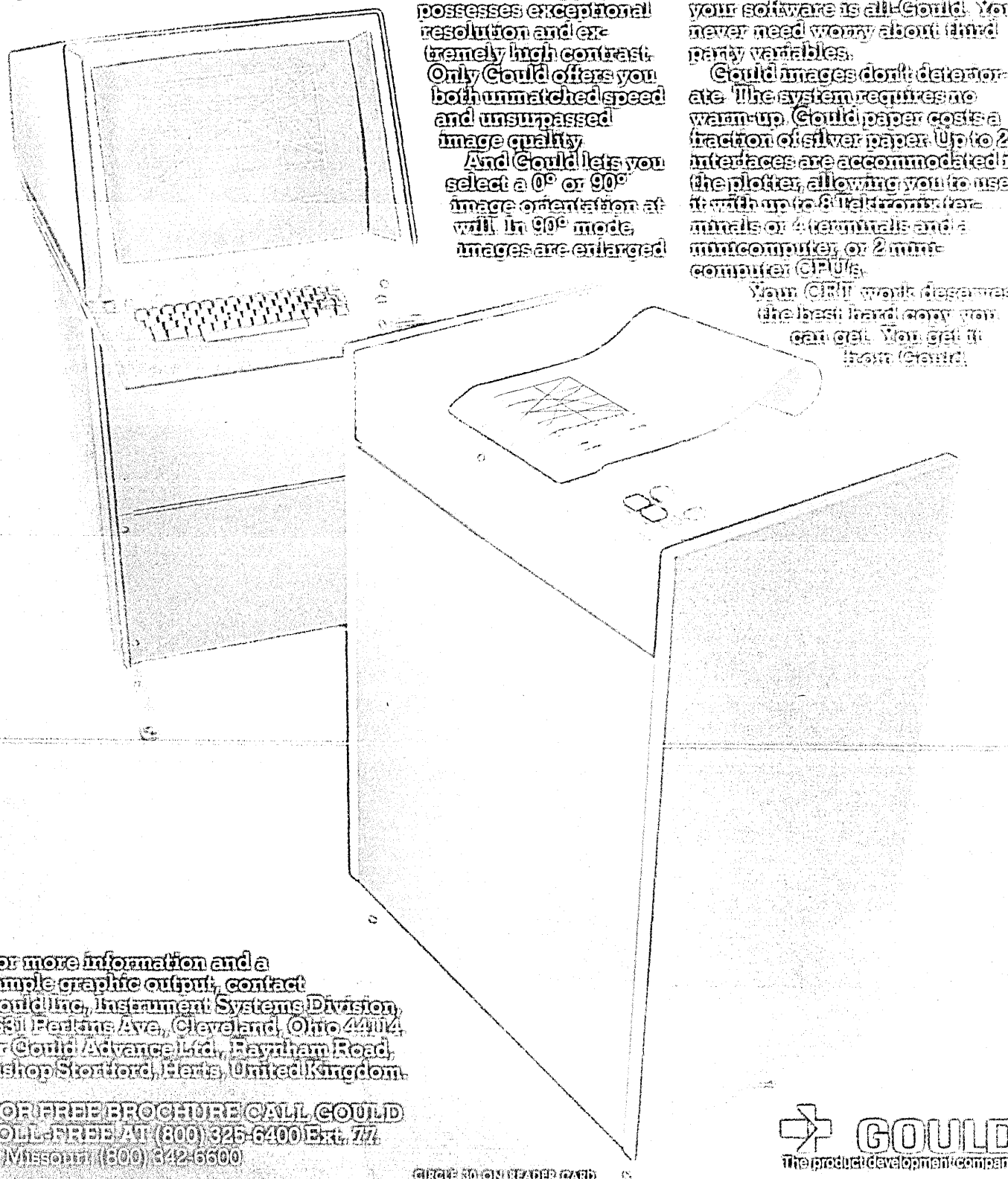

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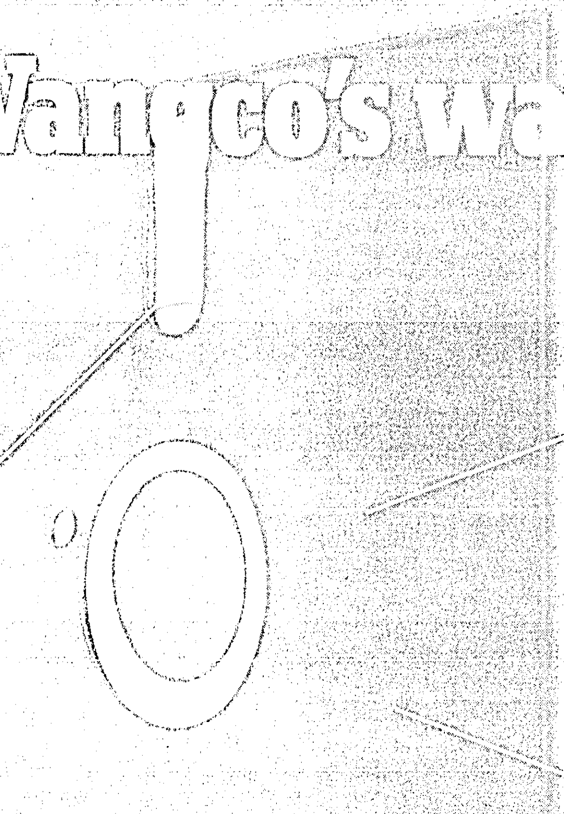

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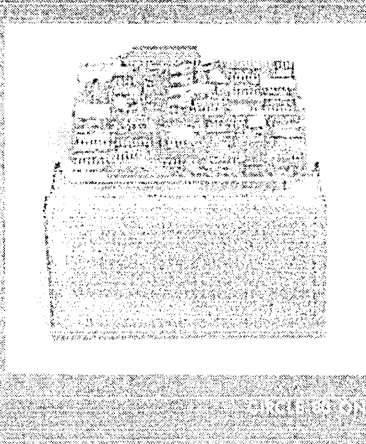

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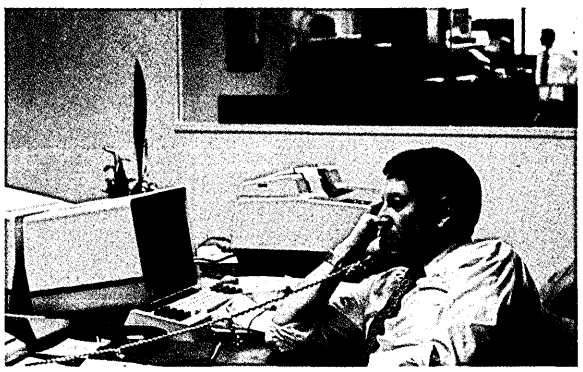

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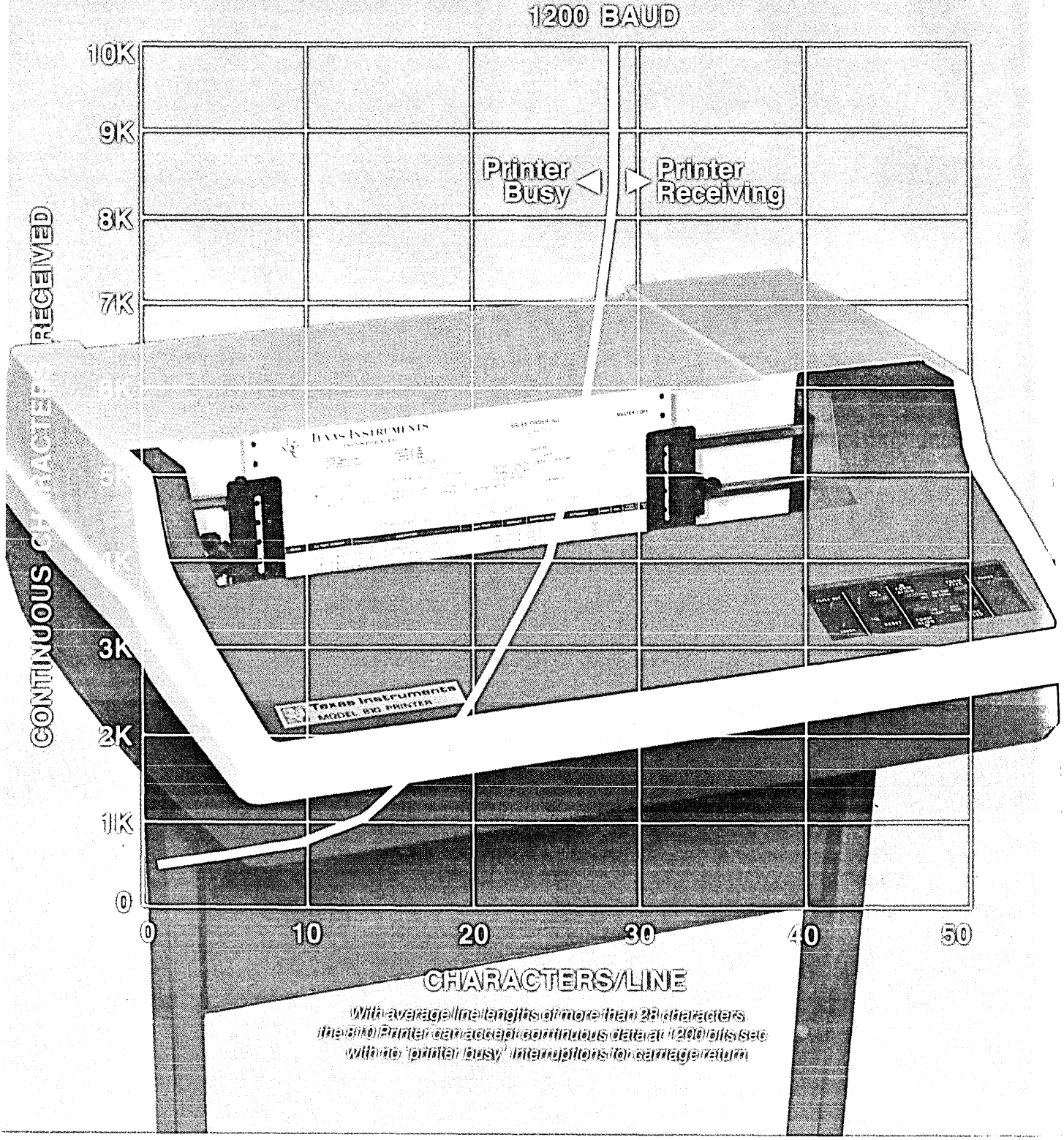

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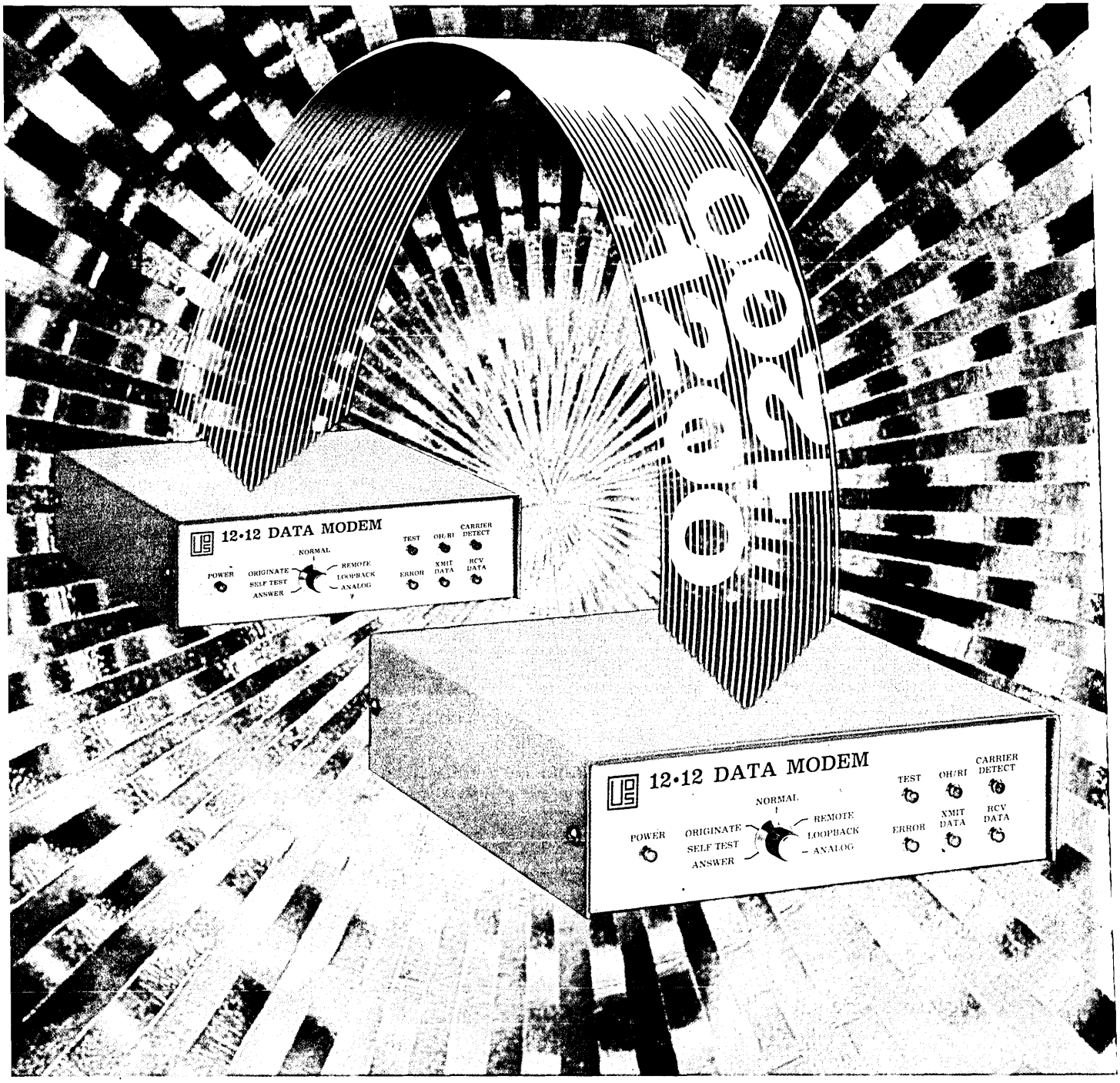

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For two-wire, full-duplex operation at 1200 BPS, Universal Data Systems proudly announces the Model 12•12, the newest addition to the UDS family of data modems. The unit operates synchronously or asynchronously over unconditioned dial-up or private telephone lines.

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The 12•12 is insensitive to word length, and it includes integral provision for automatic remote and local loopback testing. Delivery: 45 days ARO. For technical details contact UDS today.

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CIRCLE 65 ON READER CARD

people

Called a Lot of Things

John Imlay, president and chief executive officer of Management Science America, Inc., Atlanta, Ga., software firm, has been called a lot of things.

The popular press has called him a super-salesman and a superb showman. Dr. A. P. Jensen, his professor at Georgia Tech, with whom he has maintained close contact for more than 20 years, calls him "something of a legend." And then there are the 318 people Imlay fired, without severance, when MSA was in dour straits. He's not sure what they've said about him, but he is sure it wasn't all good.

There's probably a little something to what everyone has to say about the 40 year-old Georgian who is considered something of a miracle worker for having saved a very sick company in the bad days of the end of '71. He pulled MSA out of bankruptcy in August 1972. And, for all of the people he fired, most of them only were fired by MSA once. Imlay himself was fired twice by the company.

He first was asked to join the firm in 1968 when its heydey was beginning to fade but not enough. "I found they were going mad," he said. "They'd gone from 46 people to 800 people in six months. I screamed 'slow down' and closed eight offices and fired 10 people." Then an insurance company in Dallas jumped in with $4 million in help for MSA "without an audit and the word to get rid of Imlay." He was fired the first time in October 1969.

In December of the same year, he was called back at the insistence of some backing banks. He lasted 17 days this time. The view from on top was he was moving too fast and too negatively. Following his second departure from MSA, Imlay spent his time as a consultant successfully nurturing sick companies.

But then MSA really went onto the ropes, and the major creditors—the First National Bank of Atlanta and Gulf Life Holding, invited him back and he accepted the invitation—this time with the title of chief executive officer. He accepted and he did the job. This was when the "surgery" (what Imlay calls his mass firings) began. He is sympathetic with those he fired but says he is more concerned with the jobs he saved. He even accidentally fired a customer—or tried to.

He cut out consultants and computer center activity bringing the company back to what it had been formed to be in 1961, purely a software packages house. He kept 70 people of whom 58 stayed and of whom 54 are still with him seven years later.

"People are the key to a successful business," says Imlay who uses his flair for showmanship as much on his employees as he does on his customers, potential and existing.

In his showmanship for selling and for employee motivation he has used everything from a baseball bat to a live tiger to a killer shark and one million dollars in cash.

Imlay was born in Jacksonville, Fla., but moved to Savannah, Ga., as a child and has been a resident of Georgia for the past 17 years. He considers himself a Georgian.

He became interested in computers

JOHN IMLAY
Baseball bats and tigers

in 1957 while a student at Georgia Tech. "When John and I first met," recalls Dr. Jensen, "I was involved in a research activity which was bootlegging computing into academic areas. We were lucky to have bright young men like John who would sell departments on the value of computing. He was a salesman even then."

Imlay recalls from his student days, working with a Univac 1101 for which they used a garbage can "as a buffer." When he graduated from Georgia Tech in 1958, he first went to work for Royal McBee and later for Univac as a salesman. He was with Univac for seven years, ending up as an area manager.

"John sold Georgia Tech an 1108 while he was with Univac," said Dr. Jensen, "then left Univac to join Honeywell before he could get the commission on it."

Imlay lost a lot of commissions while at Univac, at least in chargebacks, which is what a salesman has to suffer when a contract is canceled. At one time, Imlay says, he held the record for the largest chargeback in computer history—$98,000.

But he wasn't one to let a commission go easily. One company, an Imlay customer for nine years, underwent a management change and canceled one of Imlay's computers which still had four years remaining on lease. Imlay brought suit against the customer and won.

Dr. Jensen considers his friendship with Imlay a mutually rewarding one but "I'll call on him (for advice) more than he calls on me. I consider him a viable window onto the real world of industry, something that the academic world really needs."

Dr. Jensen also calls on Imlay to talk to his students "as often as I can get him out." He says Imlay provides the "chemistry" that gets the students interested in the real world of computing.

Imlay, for his part, and MSA, in its last two profitable years, have provided two scholarships for computer sciences students attending Georgia Tech, one for a graduate student and one for an undergraduate.

Imlay's flair for showmanship was first utilized in his capacity as a salesman. While addressing a Honeywell seminar to introduce a new product, he told his audience the product was designed to replace IBM keypunches. To illustrate how obsolete he considered the keypunches to be, he smashed one with a baseball bat.

He still uses showmanship as a sales tool and has parlayed a friendship with the legendary Minneapolis Vikings quarterback, Fran Tarkenton, into a massive advertising campaign, and customers who care can get Tarkenton posters personally autographed to their children.

The million dollars in cash was part of an incentive to get salesmen to reach a million dollar sales goal in the first year out of bankruptcy (they did). It meant taking the million on a one day loan and using three Brinks' trucks to deliver the cash to the sales meeting. Two were decoys.

And the tiger, her name was Mabel, was part of another sales meeting. The theme of this meeting was "Meet The Tiger," and Imlay in that year's annual report had characterized a "tiger" as one "who attacks his job with both zeal and impatience." The tiger in question was de-clawed but not tame and "we had some nervous moments."

He doesn't feel the killer shark in a tank was quite as effective "because it was in a tank."

He's also done such things as lighting a match to a room until it was

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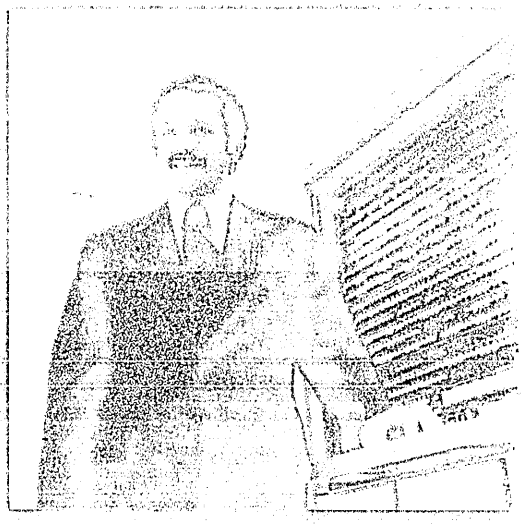

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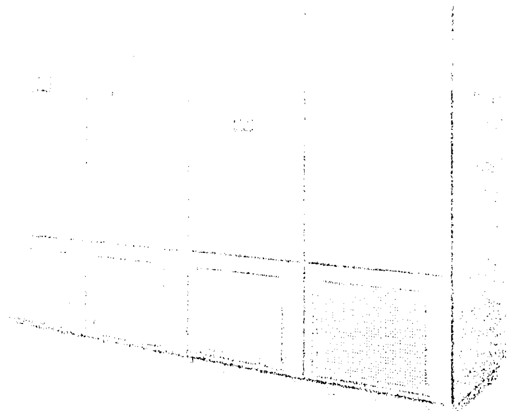


continue to feed smooth, constant power during utility blackouts and brownouts.

Major computer users who rely on Exide UPS [illegible] enthusiastic about their selection of this equipment [illegible] are Exide customers whose comments [illegible] experience. There are many more since Exide has [illegible]

Exide is the only UPS manufacturer that makes all the major components. Rectifier/charger, stationary battery, static inverter and static switch. This means that your UPS will be carefully designed as a complete system. All the components, from the utility power takeoff to the computer interface, have a single source of responsibility—Exide. You can depend on Exide UPS.

EXIDE POWER SYSTEMS DIVISION
ESB INCORPORATED

"We chose the Exide system primarily because of the ease of maintenance and repair. Due to its design, a person with basic electronic knowledge can troubleshoot and repair most failures. Also, we were impressed with the Exide representative's knowledge of their product and his knowledge of UPS Technology. Along with this, their equipment pricing was very competitive."

Robert Watters, Maintenance Engineer, Dallas Federal Savings

"When the energy crunch started in late 1973, COMPU-SERV realized that if we were going to continue to provide reliable computing services to our users, we would need to find a reliable, cost-effective 'uninterruptible power source.' After talking with several possible vendors, it became apparent to COMPU-SERV that Exide Power Systems could deliver such a system as a total package in a reasonable time frame. Our 250 KVA UPS has been on-line for over eighteen months now. We are pleased with the increased computing reliability this Exide UPS has allowed us to provide the remote users of our nine large systems."

Len Kaiser, Site Manager, COMPU-SERV

CIRCLE 30 ON READER CARD

almost totally on fire (it was put out), and having the UCLA basketball coach "write a poem for us."

It's hard to imagine Imlay running out of ideas or of slowing down growth for MSA. Since the company came out of Chapter X in 1972, it has become steadily more profitable, still sticking strictly to software. It had $1.6 million in profit last year, and now has 260 people and markets seven software packages. The company, with headquarters in Atlanta, also has offices in Jacksonville, Los Angeles, Chicago, and New York, and this year will open offices in Houston, Philadelphia, Boston, Montreal, and Brussels, Belgium.

Imlay sees the next expansion in development of or acquisition of systems software, something they're not into now.

In addition to his all-consuming chores with MSA, Imlay is active in a variety of civic affairs in Atlanta, and is chairman of the U.S. Open Golf Tournament which will be held in Atlanta this year.

Brain Drain Again

During the 1950s and early '60s Europe, and Britain in particular, suffered the famous "brain drain" when a number of competent young technical people left their austere home countries for the lavish salaries and living conditions of North America. The phenomenon tapered off in the sixties as salaries and standards of living rose in Europe, but it is still enshrined in Jean-Jacques Servan-Schreiber's famous 1967 book *The American Challenge,* which some observers say is the subconscious cornerstone of EEC and national protectionist policies for high technology.

Britain today seems to be seeing the beginning of a new brain drain, particularly among computer people who are squeezed between wage freezes and rising costs. One enterprising recruitment consultant has taken advantage of the situation to expand into international placement—with pleasant results for British exports, as well as for him.

John Goldsmith set up Lowndes-Ajax Recruitment in 1969, under the aegis of a computer bureau that was owned by a large merchant bank in London. The venture succeeded over the years, and Goldsmith gained a reputation as a stable and reputable leader in a somewhat flighty segment of the computer industry.

In 1976, as he sensed the growing demand for overseas jobs, Goldsmith began to think about international expansion. Because a parent organization firmly rooted in the U.K. was unlikely to finance the international venture, Goldsmith approached Lowndes-Ajax with the idea that he would buy out the operation. In one of the most amicable corporate divorces on record, Lowndes-Ajax Recruitment became John Goldsmith (Computer Recruitment) Ltd., keeping the same staff, the same office, even the same phone number. Goldsmith promptly went off to the New World to see if there were jobs out there to match the applicants in the U.K.

JOHN GOLDSMITH
A need on both sides of the ocean

Canada, with its American lifestyle and English heritage, was fertile for Goldsmith. Canadians have had excellent experience with the British technical people who went to Canada during the original brain drain. At the same time, few Canadian firms are interested in flying candidates across the North Atlantic in quantity. So Goldsmith's services filled a need on both sides of the ocean.

By January 1977, John Goldsmith had helped about 60 people in the computer industry to move to North America, mainly to Canada. His help included not only advertising and screening candidates, then setting up interviews when the client executives came to London, but also arranging the moving and paperwork for the successful candidates, booking their plane tickets, answering questions from their families, and helping with immigration. It amounts to a form of "systems responsibility."

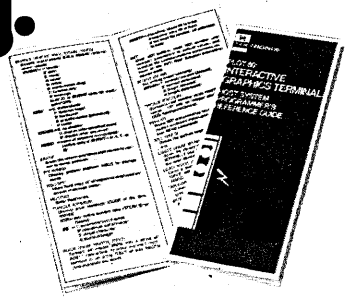
Some of Goldsmith's clients now come direct to the U.K. source when they need to recruit, rather than trying the U.S. or Canadian markets first. "They feel the quality of people here is higher," he says. This is particularly true in organization and methods (O&M) work, which tends to be confused with systems analysis in North America, and to be a separate specialty in Britain.

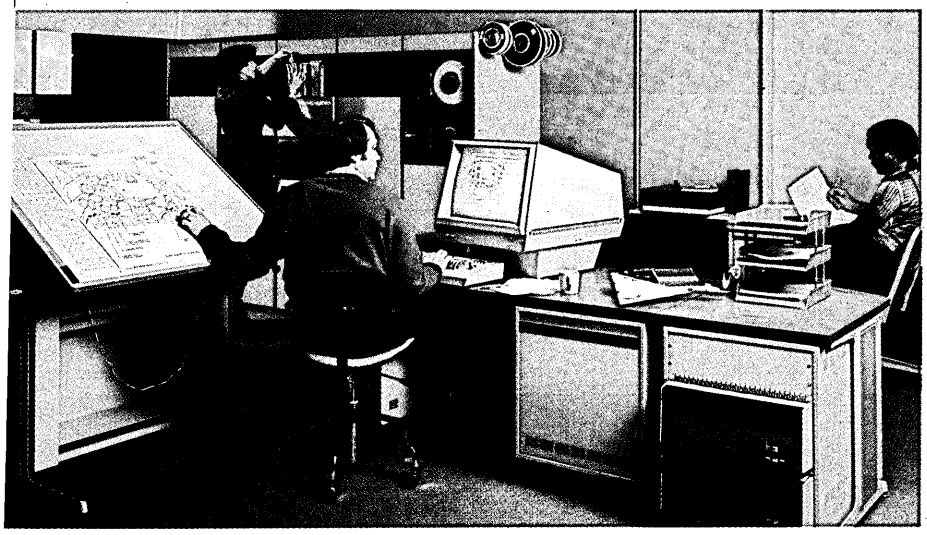
The mechanics of the operation are fairly streamlined. In one case, for example, Goldsmith flew to Canada and discussed with a large client a number of technical positions where IMS experience was a prerequisite. When he had a clear idea of the client's needs he flew back and placed ads, winnowing down the applicants to a short list of 64. The client agreed to interview 49 of them. The client's personnel director flew over for two weeks, and a few other executives went to London for shorter periods to talk to the candidates. Thirty-one were offered employment, and of those, 23 actually went. Of the eight who refused the offers, most were IBM employees. From the first IMS discussion to arrival of the last new-hire in Canada, less than six months had elapsed.

Why do people go? It's clear to John Goldsmith. "There is often misunderstanding about salaries, first of all. The candidate may expect to triple his salary, and this is seldom the case. But Canadian incomes *are* substantially higher, and the real purchasing power is thus higher. And some people are concerned about a lack of incentive here, or they think the work over there will be more professional. But several with whom we've maintained contact found that British professionalism is just as high. The day-to-day differences are what surprise them. They don't expect the easier atmosphere about hiring people and letting them go if they don't measure up. The Englishman going to Canada can expect longer working hours, and constant updating of his dp skills. The dp manager here is more removed from what his hardware is doing, while his Canadian counterpart is expected to retain his technical competence and go on programming. Another difference is that computery is not fenced around in those wide open spaces like it is in Britain. You don't just computerize the payroll; you might find yourself in charge of payrolls there."

Most of the people Goldsmith has placed have gone in the salary range from $16,600 to $24,000 (Canadian), though one manager accepted an offer closer to $40,000. These may not be startling salaries in North American terms, but for the young man who was making (about $6,156) a salary of $18,500 seems astronomical, and to his family which has been pinching pennies it *is* astronomical. ❋

"The 4081 helps me solve two design problems: waiting and paying."





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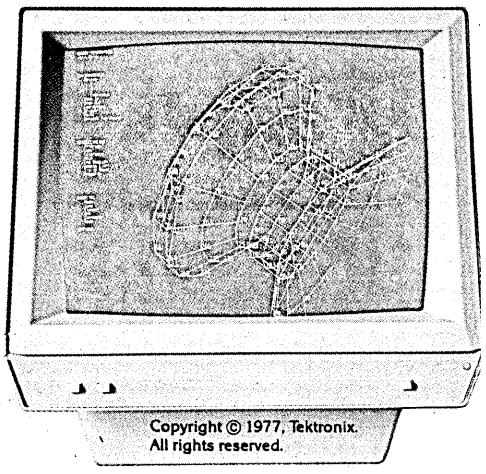

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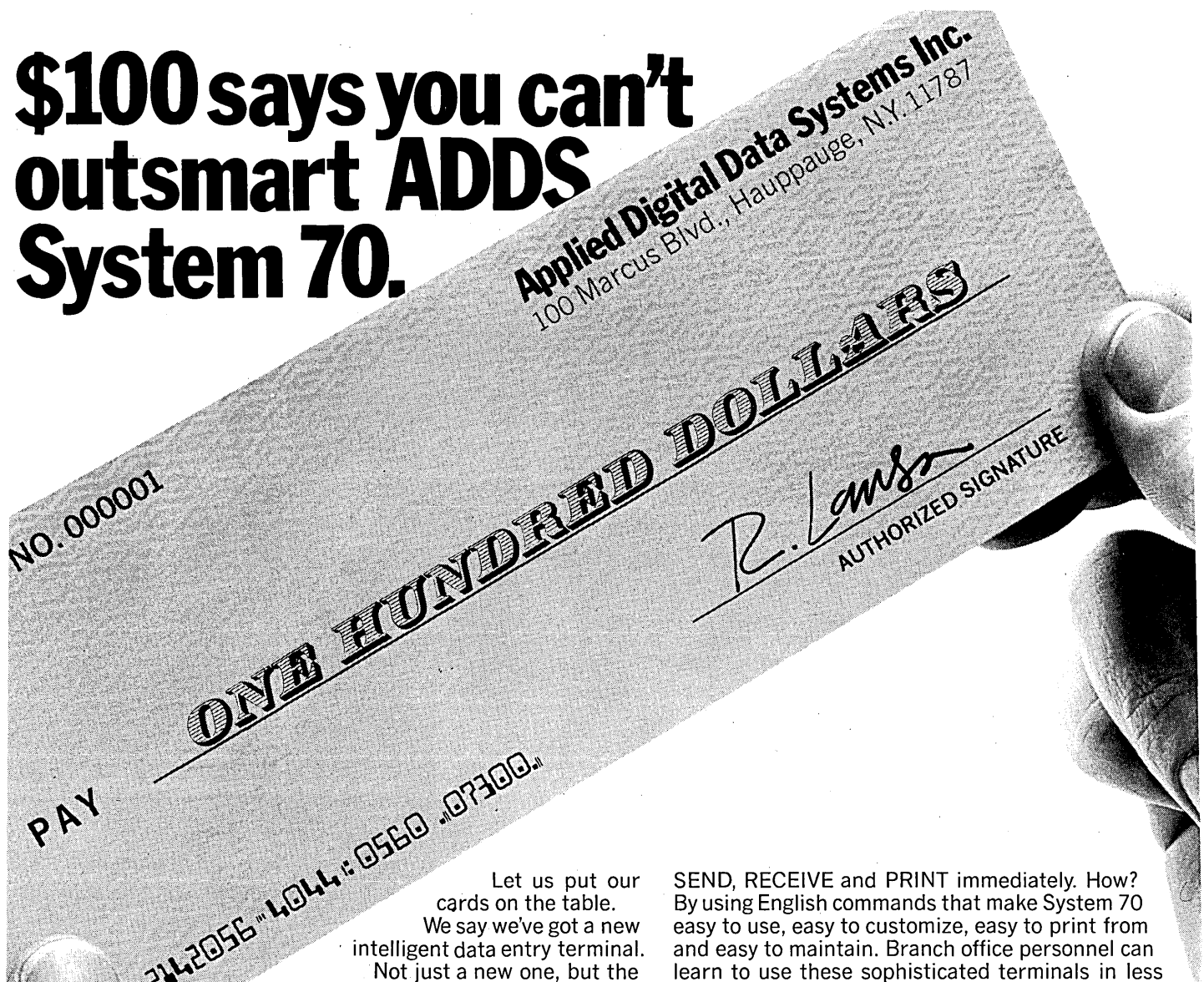

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We say we've got a new intelligent data entry terminal.

Not just a new one, but the greatest data entry system *ever.*

And we mean *ever.*

You say sure, sure.

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If you'd like to take us up on it, check the entry blank for the rules.

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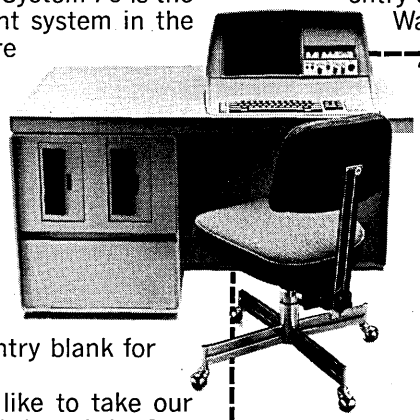

CIRCLE 11 ON READER CARD

"I wanna bet."

1. Here's the deal. Just call an ADDS sales office and arrange for a System 70 there or at a locally held System 70 seminar.
2. Then present us with any business form you regularly use. The size should not exceed 8½" X 11".
3. Our personnel will create a display of your form on System 70 within 24 hours (weekends excluded) or we'll pay you $100.
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calendar

APRIL

Association for Educational Data Systems Convention, April 25-29, Ft. Worth, Tex. The theme of this 15th annual convention is EDS = f(H,S,P): Educational Data Systems are a function of hardware, software, and people-ware, and will center around the use of these components in the development of data systems for education. Papers presented will address the use of computing in such areas as graphics in education, educational networks, CAI, modeling education systems, and professional development. Fees: $45. Contact: A. V. Majors, Ft. Worth ISD, 3210 W. Lancaster, Ft. Worth, Tex. 76107 (817) 336-8311.

MAY

ACM Symposium on Theory of Computing, May 2-4, Boulder, Colo. Co-sponsored by the IEEE special interest group for automata and computability theory, the symposium will feature 31 papers in the areas of analysis of algorithms, computational complexity, formal language and automata, theory of computing, and theory of programming. Fee: $45 members; $52 non-members, in advance; $50, members, $57, non-members at the symposium. Student fees available. Contact: Emily P. Friedman, Computer Science Dept., 3532C Boelter Hall, Univ. of Calif., Los Angeles, Calif. 90024 (213) 825-6835.

European Conference on Electrotechnics, May 3-7, Venice, Italy. This will be the major European conference in 1977 covering telecommunications for allied fields. Sponsored by the IEEE and EUREL, the program will bring together international experts from both developing and developed countries in discussions of communications in large power systems, new developments in communications including radio, satellite, waveguide, and optical systems; communications and computers, and communications and signal processing. One full day will be devoted to the subject of communications in the developing countries. Two courses are on "Techniques of Industrial Market Research," and "Methods of Technological Forecasting." Contact: Eurocon 77, c/o AEI, Viale Monza 259, 1-20126 Milano, Italy (Tel: 25.50.641).

DPMA Southwest Region 1 Conference, May 11-13, Anaheim, Calif. The conference theme is "Data Processing Update 1977," and will feature exhibitor booths and sessions pertaining to data processing enhancements. Participants will include management and allied support personnel associated with data processing. Sessions will feature speakers on the art of management, automatic speech recognition, auditing of computer systems, and professional development. Fee: $50, two-day, member; $55, non-member; $30, one-day, member; $35, non-member. Student rates are available, as are discounts for teams. Contact: Orange Coast Chapter DPMA, P.O. Box 2957, Anaheim, Calif. 92804 (714) 635-6841.

Database Management and Database Technology Symposium, May 13, Columbus, Ohio. The Central Ohio Chapter of the ACM will sponsor this one day symposium on the management of data within the current database technology. The conference will deal with the theories concerning data management, database technology, and commercial database products. The first speaker will be James T. Fry of the Univ. of Michigan on "Database Technology: Past and Present." Other topics covered will be "Database Technology: Future," and "Steps in Implementing a Codasyl-Oriented Database," Registration: $20, members; $25, non-members. Contact: Dorothy Smith, E. S. Preston and Assoc., 939 Goodale Blvd., Columbus, Ohio 43212 (614) 221-7505.

National Micrographics Association Conference, May 17-20, Dallas. This 26th annual conference and exposition will demonstrate some of the unrealized potential of the micrographic industry. As a prelude to the conference, there will be five fundamental seminars. The conference itself will include 30 technical sessions, a trade show, a keynote speaker luncheon, and an awards banquet. Contact: National Micrographics Association, 8728 Colesville Rd., Silver Spring, Md. 20910 (301) 587-8444.

First East Coast Mini/Micro Conference, May 19-20, New Haven, Conn. Sponsored by the DPMA, "NECON" will have as a theme "aDaPt or Die." The conference and exposition will feature minicomputers, microcomputers, distributed processing, and innovative management techniques. Seminars on how to select a minicomputer, production control with minicomputers, incentive data entry, and others will be highlighted by a debate entitled "Mini versus Maxi." Fee: $95, members; $115, non-members. Contact: F. Kells-Murphy, Applied Data Processing, Inc., 33 Berhard Rd., North Haven, Conn. 06473 (203) 787-4107.

ACM Greater New York Regional Conference, May 23-24, New York City. "Database: the Practical Issues" will be the theme of this conference emphasizing the "real world" problems experienced in planning, implementing, and evaluating data base systems. A special feature of the conference will be a number of one-hour presentations by database software vendors with packages to sell, which will provide opportunities for questions affecting make-or-buy decisions. Keynote speaker will be Rep. Edward Koch (D-NY) speaking on the impact of federal privacy legislation on the private sector. Contact: James M. Adams, Jr., ACM, 1133 Ave. of the Americas, New York, N.Y. 10036 (212) 265-6300.

ON THE AGENDA

Conference on Computer Audit, Control, and Security, April 25-28, Chicago, Institute of Internal Auditors, (305) 830-7600. **Understanding and Using Computer Graphics, May 2-4,** New York, Frost and Sullivan (212) 233-1080. **Conference on Acoustics, Speech, and Signal Processing May 9-11,** Hartford, Conn. IEEE, Clifford Weinstein (617) 862-5500, Ext. 5465. **Info-Quick '77, May 11-13,** Springfield, Ill. DPMA Region 5, (217) 528-2011. **Computer Medicine Clinics, April 25-27,** New Haven, Conn. Yale Univ., (203) 432-4582. **Computers in Banking, April 27-29,** Paris, France.

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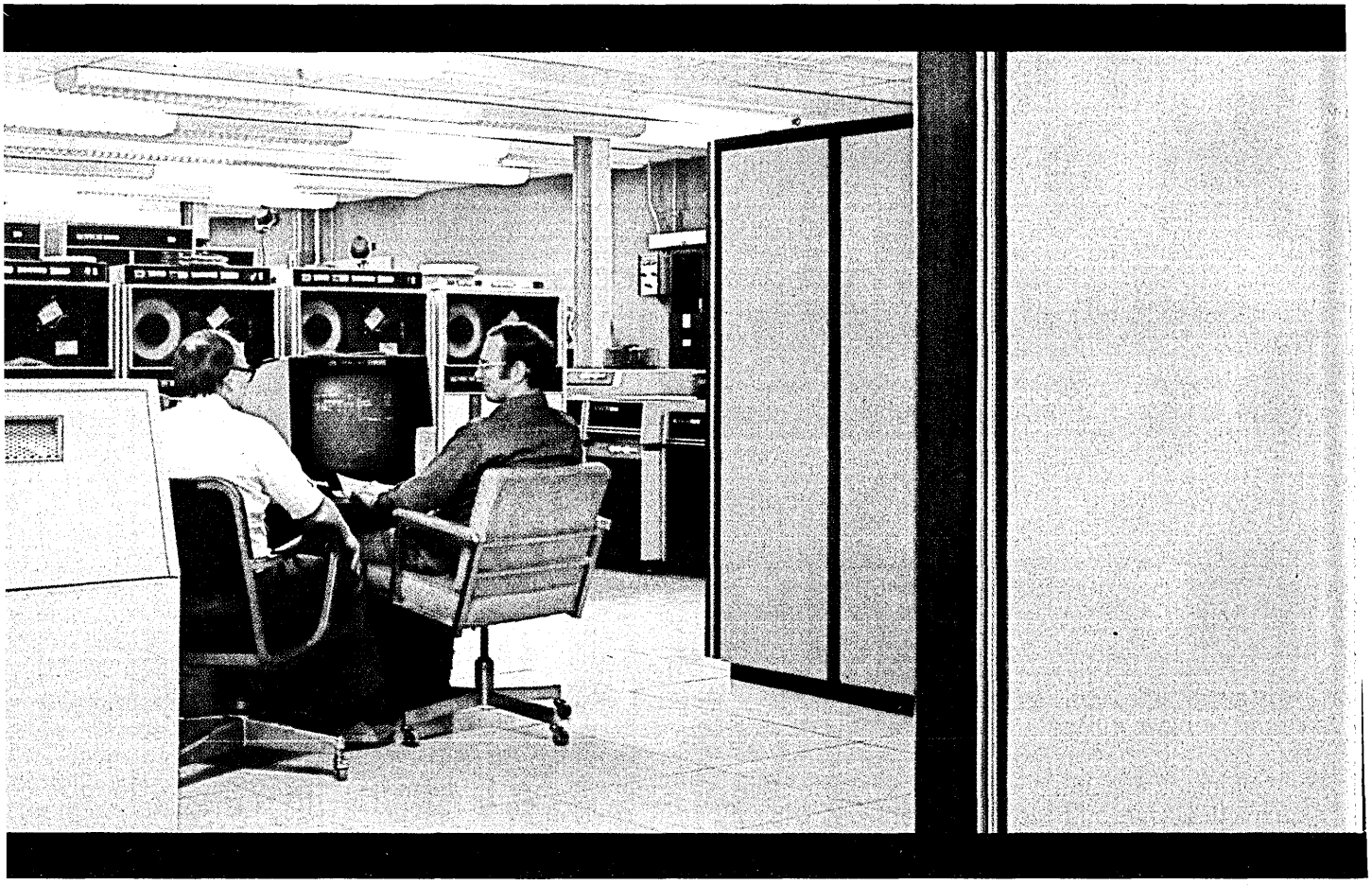

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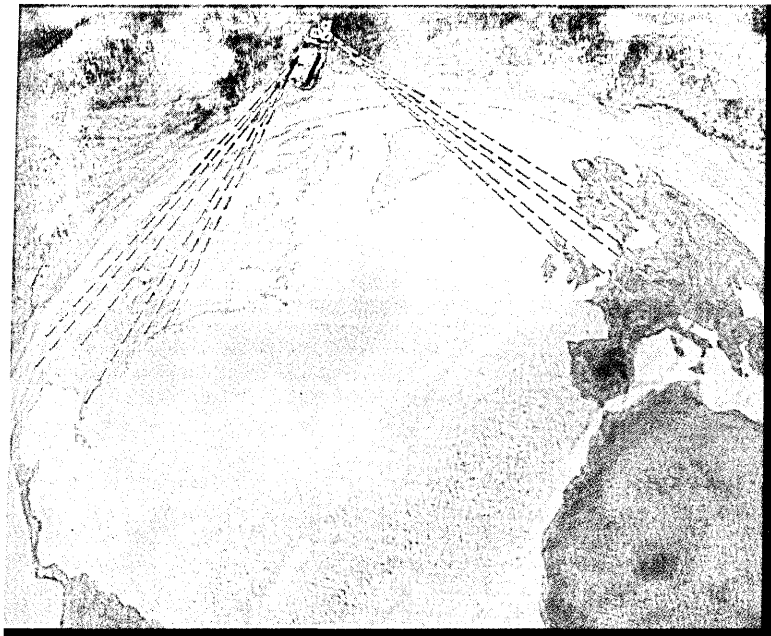

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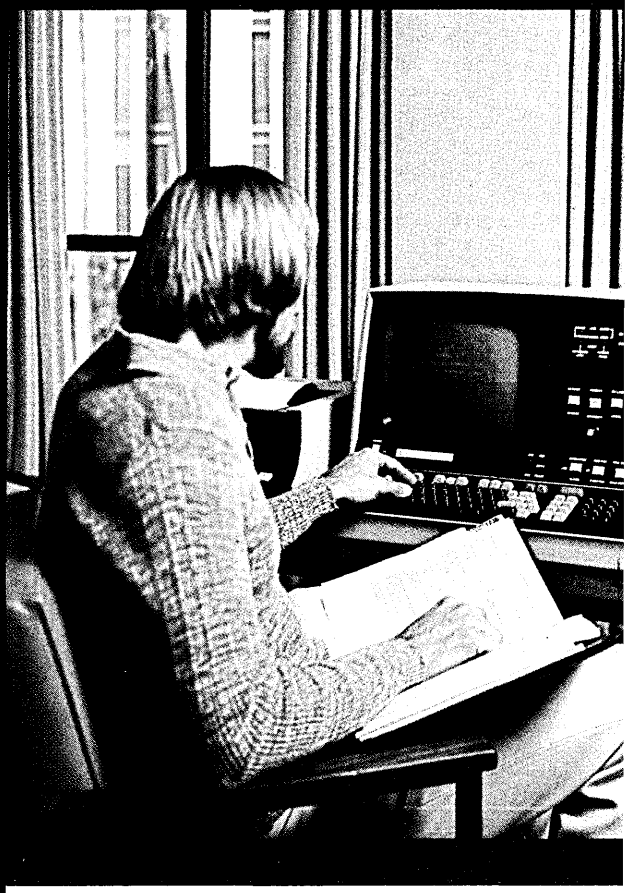
Best of all, our *separate element pricing* policy lets you buy just what you need, when you need it. So ask us, we have it.



Ask Control Data by writing B. G. Robertson, Vice President Systems Marketing, Control Data Corporation, P.O. Box 1980, Twin Cities Airport, St. Paul, MN 55111.

CONTROL DATA CORPORATION

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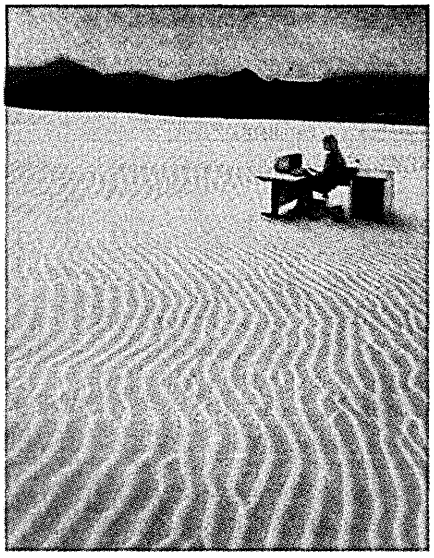

a national alert center, computer-managed spare parts inventories at over 200 sites, and a critical spares program that can deliver needed components almost anywhere in an average of six hours.

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For further information, contact
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19333 Vallco Parkway
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408-255-0900.

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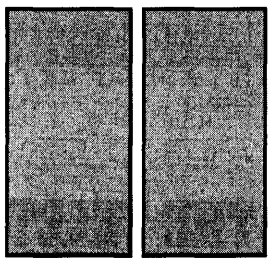

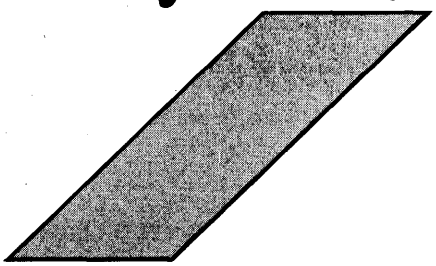

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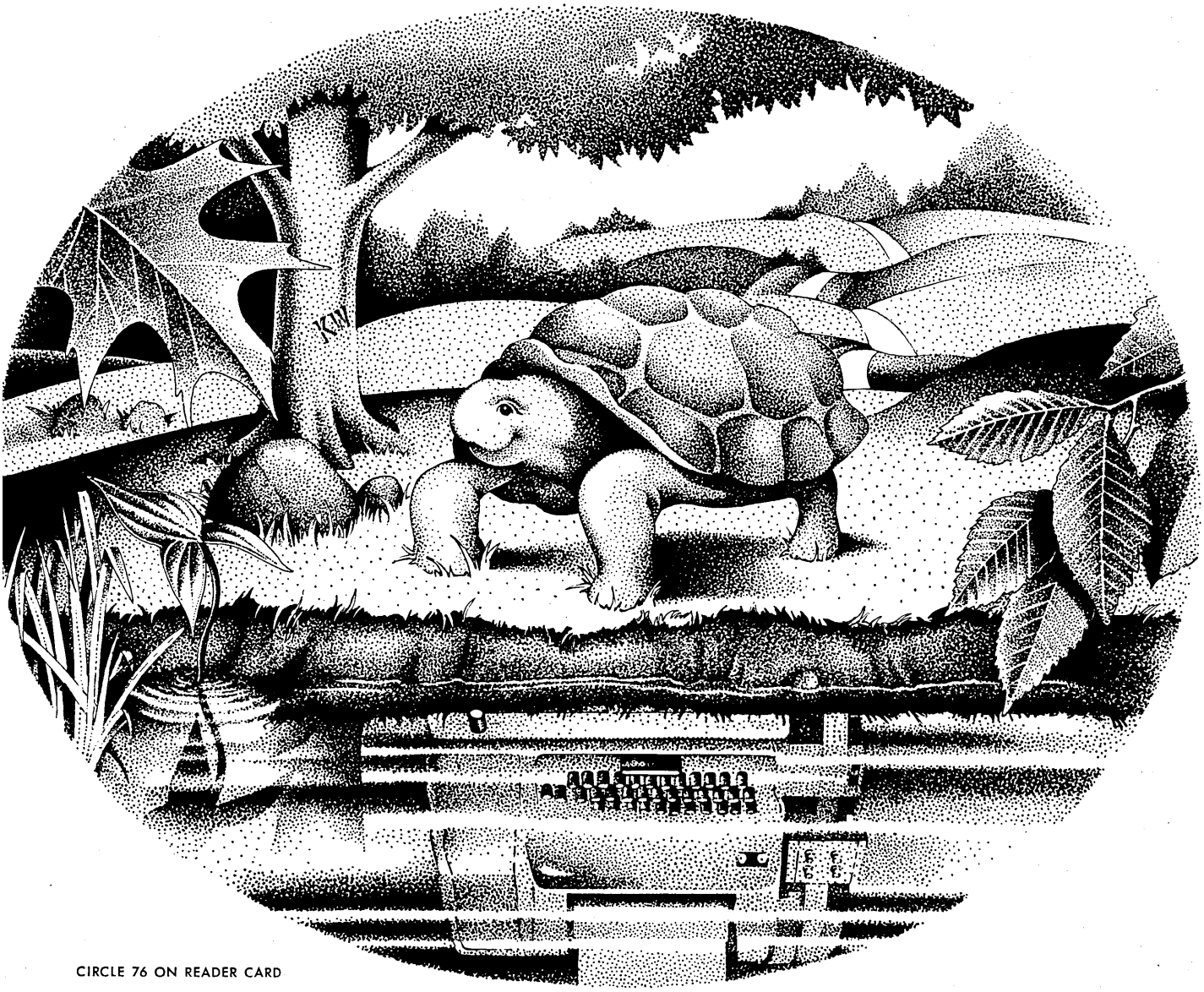

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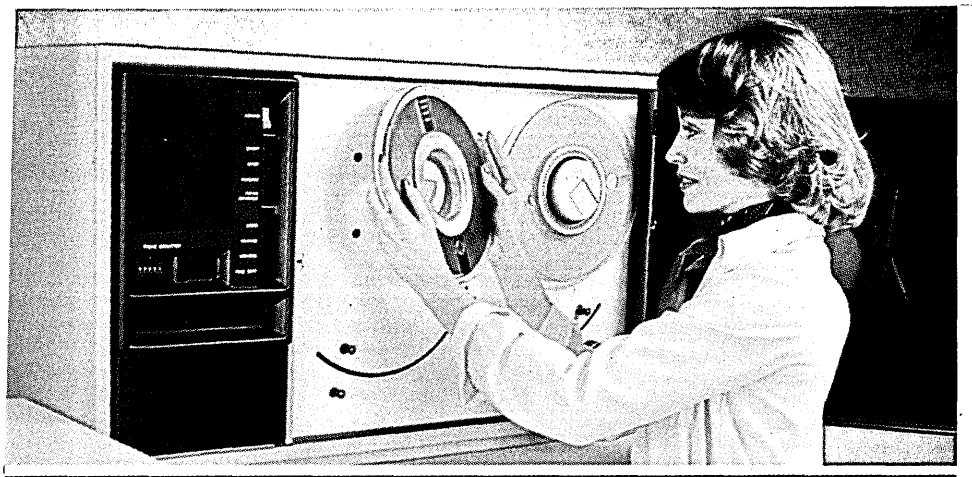
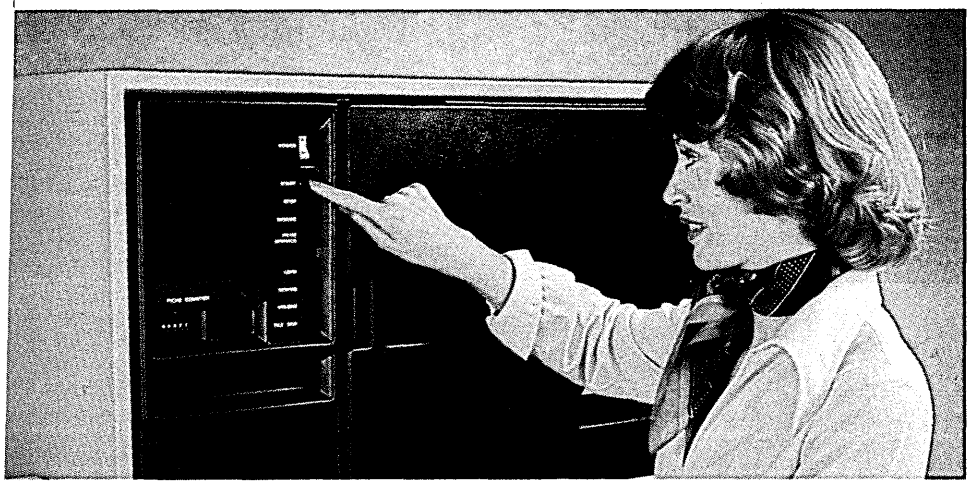
*ASR unit. Price subject to change without prior notice.
Teletype is a trademark and service mark registered in the United States Patent and Trademark Office





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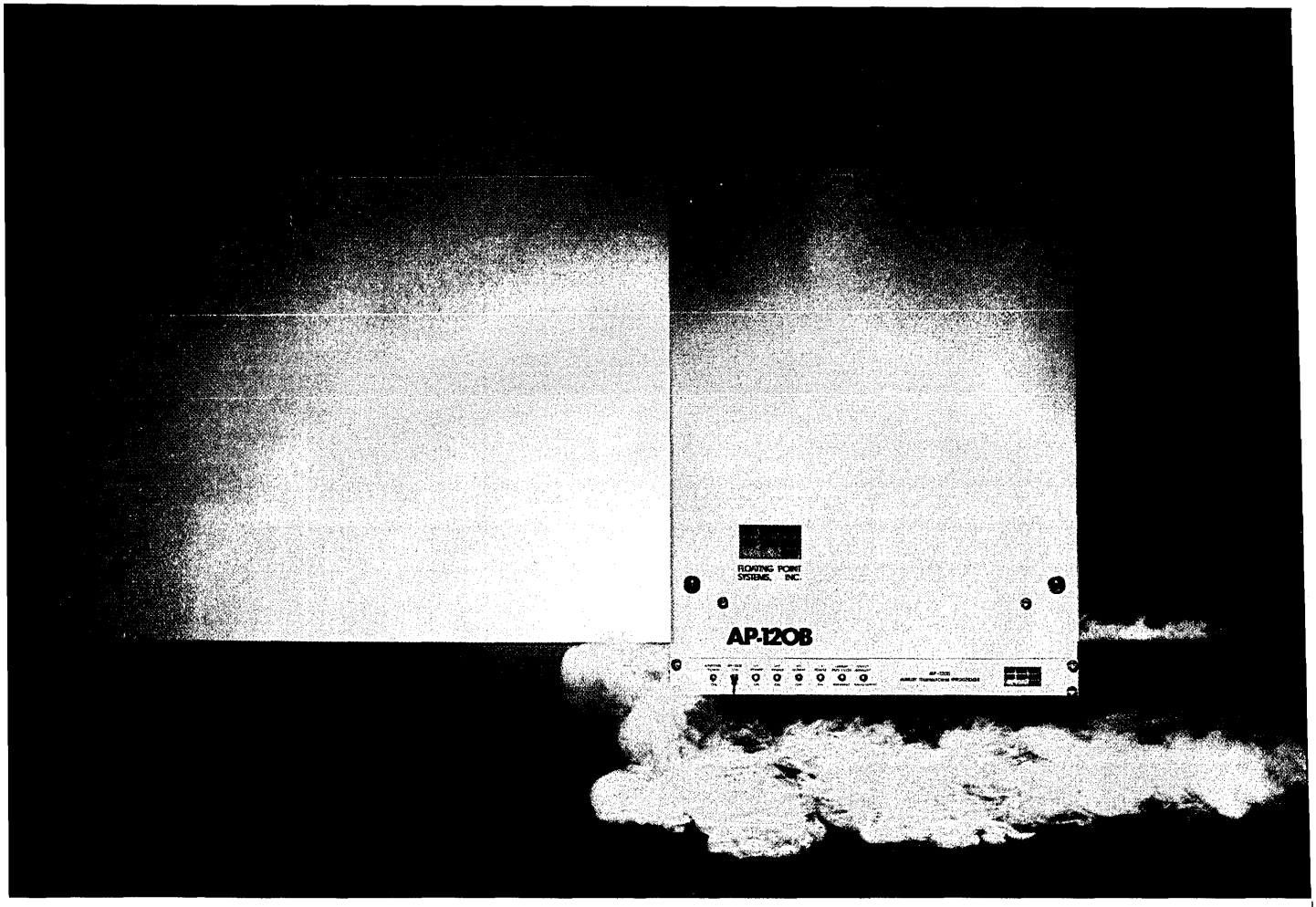

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books

Humanized Input
by Tom Gilb & Jerry Weinberg
Winthrop Publishers, 1976
282 pp. $17.00

Software Metrics
by Tom Gilb
Winthrop Publishers, 1976
282 pp. $17.00

For those of you following the progress of Tom Gilb and Jerry Weinberg (the author of *Psychology of Programming*), let me bring you up to date. Jerry has left New York and has set up a company in Nebraska where he writes and does consulting work. He got to do both when he teamed up with Tom Gilb (an international consultant based in Norway) and they put together *Humanized Input*, portions of which were excerpted in the August 1976 issue of Datamation.

Humanized Input is subtitled *Techniques for Reliable Keyed Input*. The first half of the book tells most of us what we already know. They attempt to cause the systems designer to be aware of the human factors at the input station so the resulting system will benefit from efficiency in both of its guises—high volume and low error rate. Unfortunately, they approach this from a mechanistic standpoint, and never give the reader a good feel for the type of skill, the breadth of attitudes, and the variety of helpful attributes available in a professional keyboarding section. Except for that hurdle, they teach us quite a bit about input record design including identifiers, check digits, default options, and redundancy.

For the reader who has entered the field in the last 10 years, and whose total experience is programming in a higher level language, the first half of the book is probably beneficial. However, it is occasionally marred by parenthetical statements in favor of women's liberation and some attempt to evoke an emotional sympathy for the poor little "keypunch girl" who is chained to her machine and locked in some dank dungeon cranking out record input all day long.

The successful designer should be sensitive to human factors, calibrate production personnel carefully, and be aware of the skills they have available. But I've never met a designer who set out to make a sweat shop, or maliciously intended to design input formats to turn keyboarders into robots. However, I suspect Gilb and Weinberg have never observed high volume shops which benefitted from good supervision, good training, and clean design, and seen girls accurately keyboarding 6,000 strokes an hour while routinely thinking about something else. The authors never quite come to grips with the personality of a good keyboarder who, for reasons known best to herself, chooses a routine job and so conditions her mind and her fingers to establish a natural rhythm so she can read copy and accurately transfer what she sees to her fingers.

> I suspect they've never seen girls accurately keyboarding 6,000 strokes an hour while routinely thinking about something else.

Some of the ideas presented in the first half of the book need to be taken with a grain of salt since total cost is not covered, and some portions of the business are not geared to accept data which is current to the instant—an on-line system where transactions are instantly edited as they occur and *reflected in the data base*, would unhinge most of the accounting systems that exist today.

After you slog through the first half of the book, the last half is good. It talks about limiting the consequences of error, duplicate entry, and the use of checkwords to increase redundancy in input records and allow a computer to engage in a meaningful dialog, in the case of an on-line system. All good thoughts. Alone, the references cited are probably worth the price of the book.

Most of us will never get the opportunity to design a major application from scratch, and hence will never be able to apply much of the learning they provide. We, unlike the authors, are inhibited by having to live within the bounds of some existing system, existing personnel, and existing input forms. Nevertheless, the thoughts in the second half of the book are good and the book is a good reference in case you come upon an opportunity to optimize the record input formats at each work station.

Software Metrics is a separate effort by Gilb. A long forward by Jerry Weinstein and some introductory material by Gilb claim that software practice is about to be led out of the dark ages and into the light. The key to this transition (they say) is the ability to measure software, its production, and its use. By the time I got through the first 15 pages, I was so worked up I could hardly lay the book down waiting to find out these secrets which had been so long denied to me. Well, 280 pages later I'm still waiting.

Quite a bit of space was devoted to a technique for secretly putting known bugs in a set of development hardware and, based on the proportion of known bugs found during testing, to estimate the total number of unknown bugs remaining in the system. Also described are code inspection (invented and published by Fagan of IBM in this country), and a technique the author uses for comparing competing software packages during an acquisition evaluation.

This book fails to live up to its claim since it just scratches the surface in an enormously broad and complex area. If the initial claims had not been so profound, or if the coverage of software metrics had been more complete, the reader would not be as disappointed. As it is, this is a compendium of the measures known to one man. Further, I think the reader deserves better quality printing since several pages contain reproductions of computer outputs that are blurred and unreadable. Gilb writes well, his goal is a worthy one, but this book was published two years too soon.

—Robert L. Patrick

Mr. Patrick is an industry consultant and Datamation editorial advisor.

Data Processing Technology and Economics
by Montgomery Phister, Jr.
Santa Monica Publishing, 1976
571 pp.

This remarkable book contains by far the most comprehensive collection of facts about the data processing industry ever published in one place. Part 1 (the body of the book) contains no less than 509 tables and figures, most in a common format, presenting almost every conceivable aspect of the history of the industry. The figures are presented in groups by topic accompanied by explanatory text.

The author is very careful to qualify his data. The entire Part II (280 8½ x 11-inch pages, in two-column format) is devoted to tables presenting the detailed data underlying the figures in Part 1, and text discussing the validity

source data

of the sources, the discrepancies between sources, and assumptions the author made. It is hard to overpraise the immense labor invested, too few authors are so conscientious.

Unfortunately, even this labor is not enough to produce a complete and homogeneous body of facts about the data processing industry. As the author points out, our industry is uncommonly secretive, primarily because of IBM's "don't say anything you aren't legally forced to" attitude. He had to use studies by individual users and researchers, government reports, secondary market research sources (some of which, available only to subscribers at high prices, he could not obtain), and anything else he could lay his hands on. The results were necessarily uneven, and assumptions were required that introduce inaccuracies. For example, three figures presenting in different ways the history of data processing industry revenues include calculated data based on the assumption that 75% of computer systems are leased and 25% purchased, which is unfortunately very wrong.

The data are not very current (an impossibility in a formally published book). Many of the time series run through 1974, but some end earlier; the studies of IBM's computers do not include the System/370 models 158 and 168; many of the user and academic studies date from the 1960s. While of historical value and of use in slowly changing areas (e.g., data preparation costs), the data are of limited relevance to the latest technologies, system program environments and industry financial patterns.

Despite these caveats, the book will be of immense assistance to anyone attempting to obtain a quantitative understanding of the data processing industry. Some sections stand out:

- The historical products, revenues and market shares of all major companies are presented completely and succinctly.
- Every major computer and peripheral device delivered between 1955 and 1974 is included in tables describing performance specifications and prices, and historical evolution is well presented in figures.
- A clear, succinct section on computer component and manufacturing costs is the best this reviewer has ever seen in one place (this subject is the author's specialty).

The author tried hard to do as well with computer applications and user costs, but the data simply weren't there. He had to obtain such studies as were publicly available, in whatever terms they were made, and at whatever time. The results are certainly useful, but are not sufficient to fulfill the basic objective of the book: to provide a data base of economic facts about the use of data processing that would enable users to make more intelligent decisions about computer applications. Even if more complete data had been available, the time factor would have precluded meeting the objective: most of the economic material pertains to batch processing, while most key economic decisions today center around data bases and distributed networks. Maybe the author's objective can't possibly be met fully until the computer field stabilizes—if it ever does.

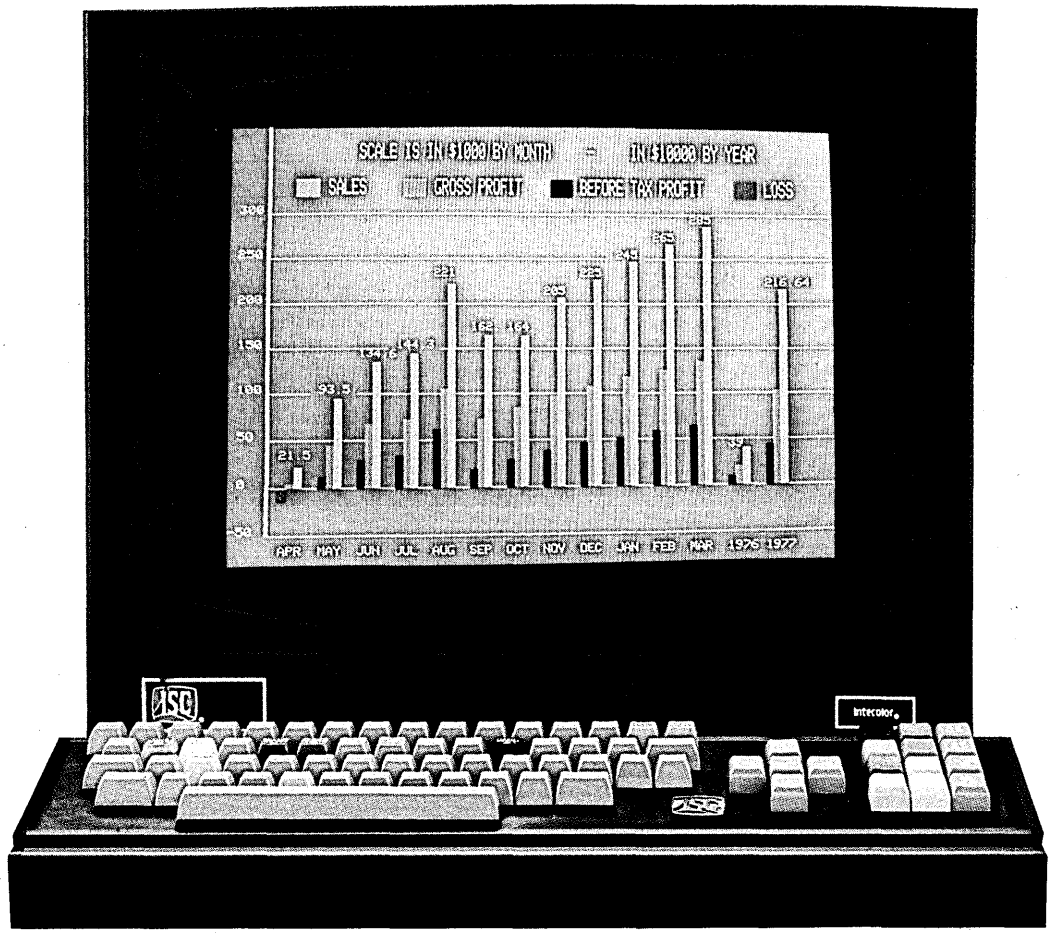
In any case, the book is immensely useful as it stands. No one can fully understand the modern data processing industry or market without some knowledge of how they came to be this way, and this book is by far the best source of quantitative historical industry data available.

—**Frederick G. Withington**

Mr. Withington is a senior staff member of Arthur D. Little, Inc., and one of Datamation's contributing editors.

Software Directory

In the Fall of 1976, a survey of computer service bureaus and software houses was conducted by this vendor. The results of that survey are now available in the *Directory of Financial Planning Software*. The directory includes software packages specifically developed for the support of budgeting, financial, and corporate planning applications, and gives detailed comparative information on 26 software packages supplied by 17 vendors in the U.S. and Canada. It summarizes and compares characteristics and facts for each package in areas such as: financial and mathematical functions in the planning language, curve fitting and forecasting routines available, types of data files and data base management systems available, description of the reporting capabilities of each package, and limitation of the package in terms of number of time periods, statement, variables, and output reports per model. There is also a list of the suppliers including names and addresses. Price: $25. DECISION SYSTEMS INC., 2323 Yonge St., Toronto, Canada M4P 2C9.



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That's the price tag we'll put on the Intecolor 8001 if you place your order right now for 100 or more units. $1495. That's also the price we'll give you on a one-shot cash basis on an Intecolor 8001 CRT evaluation unit. Now, we'll never get rich with a price structure like that, but we look at it this way. That price is an investment in your future. We know that once you get your hands on the Intecolor 8001, once you see what it can do, you'll be back for more.

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County/Municipal Directories

The URBIS project "Evaluation of Information Technology in Local Governments," represents an alliance of public interest groups, practitioners, and the staff professionals and URBIS research scholars of the Public Policy Research Organization. These directories are the first in a series of products designed to bring URBIS information to the local data processing practitioner in a format useful on a day-to-day basis.

The *County Information Systems Directory* is a guide to computerized information systems, by county, throughout the U.S. It includes 310 counties with population of 100,000 or over which use computers of their own or through time-sharing or cooperative systems. Data processing operations, computer application, and selected community and governmental characteristics are presented for each county. Indices, tables, and lists help the user find specific items of interest about a given county, compare applications and hardware, and identify the current state of computer use in U.S. counties. The *Municipal Information Systems Directory* is a guide to municipal computerized information systems including 403 cities with populations of 50,000 or over. Complete information is available on 70% of those cities. The reports were originally published in 1976, but will be updated in the future. For information contact: Kenneth L. Kraemer, PUBLIC POLICY RESEARCH ORGANIZATION, Univ. of California, Irvine, Calif. 92717.

Accounting System

A second revision of *A Recommended Uniform Accounting System for the Computer Services Industry* is now available. The study includes sections on industry characteristics that affect the accounting systems, principles and objectives of the system, functional organization of a data service company, classification of the chart of accounts, and financial and operating reports to management. Price: $35, non-ADAPSO members. ADAPSO, 210 Summit Ave., Montvale, N.J. 07645.

Home Computing

PCC's Reference Book of Personal and Home Computing—Spring '77 brings together in one place sources for hardware, software, parts, services, stores, clubs, periodicals, and books. Cross-reference indices help locate the manufacturers of specific products by example, such as floppy disc interfaces. There is also a collection of articles surveying many of the aspects of the

source data

personal computing field. PEOPLE'S COMPUTING COMPANY, 1010 Doyle St., Box E, Menlo Park, Calif. 94025.

Facsimile

According to a *Datacomm Awareness Report*, facsimile in business communications can provide an effective alternative to telephone conversation, Telex, TWX, mail service, and even communications via data terminals. The report explains the basic mechanism of facsimile transceivers and their application potential for business communication. It also describes the marketplace for facsimile and analyzes the Rapifac 100, a currently available digital facsimile device which transmits one page in under one minute. According to the report a one page memo can be transmitted for a cost of 40 cents to $2.50 depending on distance transmitted, equipment used, monthly volume, and type of telephone line used. Price: $10. MANAGEMENT INFORMATION CORP., 140 Barclay Center, Cherry Hill, N.J. 08034.

Structured Programming

Objectives of Structured Programming is a free 16-page report which defines structured programming and how it can overcome some of the difficulties of more traditional programming methods to deliver programs which are more reliable, faster to write, and generally less costly. A section on elementary structured programming with examples is also included. The portfolio is part of the Auerbach Computer Programming Management Information service designed to assist data processing professionals in efficiently managing programming activities. AUERBACH PUBLISHERS, INC., 6560 N. Park Dr., Pennsauken, N.J. 08109.

Information Services Report

The 227-page report *Financial Information Services and Terminals* predicts that time-sharing suppliers and terminal manufacturers will benefit from a significant increase in the market for financial information services over the next ten years. According to its in-depth survey of users, certain of the services and terminal market segments will more than double in the next ten years in terms of revenues to suppliers. The study also predicts that the new tax law will increase the market for portfolio valuation, and that large commercial banks will increase their market share. Intelligent terminals will be the fastest growing category. Included in the report is market share information broken down into more than twenty market subsegments. Further details on the report, including a table of contents and description, are available from INTERNATIONAL RESOURCE DEVELOPMENT INC., 125 Elm St., New Canaan, Conn. 06840.

Systems Auditability and Control Study Executive Report

SRI visited 45 leading business and government organizations in the U.S. and overseas. They asked questions about the efficacy of the internal audit function and its relations with data processing. They also conducted a mail survey and received 1852 replies. From all this they concluded the rate of change in computing is out-distancing the auditors who are trying to catch up.

The *Executive Summary*, dated January 1977, runs 20 pages and paints a dismal picture. Top management thinks they are in better shape than they really are, generally there is no evaluation of the audit function, the auditors are technically weak, close working relations between audit and dp have not been established, the same complexity that haunts the dp manager has overwhelmed the audit manager, and while some after-the-fact audit programs exist for validating data, audit controls are not designed into big systems and some auditors are reluctant to participate in development activities for fear they will lose their "objectivity." STANFORD RESEARCH INSTITUTE, Menlo Park, Calif. 94025.

—Robert L. Patrick

vendor literature

Basic 800

Are your technical manuals easy to understand? Are they given a quality control check? Do your materials communicate the necessary product support information? A newly developed simplified vocabulary is described in this 10-page brochure. BASIC 800 can be used to write all types of technical manuals for use by both English and non-English speaking personnel. The vocabulary is customized to each product, and has a core of 800 common words plus the product nomenclature. The result is that technical manuals can be written in a simple, controlled vocabulary and syntactical structure. These texts are said to be easier to read and understand.

The BASIC 800 system is controlled by a core vocabulary of 70 verbs, 450 nouns, 100 prepositions, and 180 adjectives. The complete vocabulary for a group of products will vary in size depending on how many parts are in the product described. The average is from 1,000 to 2,500 words. Implementation of the system is done in five steps: survey of technical publications, linguistic analysis, creation of a corporate vocabulary, writer training seminars, and translation to required foreign languages. Accuracy of translation is said to be assured by the creation of language pairs. Available languages include English, German, French, Spanish, Portuguese, Russian, Japanese, Arabic, and others by request. SMART COMMUNICATIONS, INC., New York, N.Y.

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More From Your Modem

A new brochure describes how to cut capital equipment expenditures for data communications by using existing modems and computer ports more efficiently. Using color-coded diagrams, the brochure explains how several data sources, including terminals, multiplexors, and modems can share a single modem or front end processor. Aimed at dp managers, data communications managers, engineering, and marketing personnel, the brochure also describes Intertel's NCS4000 Network Control System with complete specifications and accessories, and a typical distributed processing system. INTERTEL, Burlington, Mass.

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OCR Basics

This new 17-page booklet explains the role of optical character recognition in the word processing environment. *OCR in Word Processing—A Guide for the Word Processing Supervisor* illustrates examples of actual applications of WP in in-house publishing, a government agency WP center, a legal office, a typing service, and a medical records department. There are also sections on OCR economics, introducing OCR to your environment, cost and selection of an OCR device, and a series of common questions and answers. CONTEXT CORP., Burlington, Mass.

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72X Microfiche

Third generation, 72X microfilm packs 690 computer printout pages on a single fiche, representing a 260% increase over 48X according to a new brochure from this vendor. The brochure describes 72X and features two brief case studies on its use. Major benefits of the 72X fiche are said to be ease of manipulation, less changing of microfiche on the viewer, less movement of the viewer stage, and less handling from storage tray to viewer. It allows for horizontal

source data

and vertical indexing, 60% faster retrieval, and easier accessing than lower reduction microfiche, and is said to retain the same quality resolution of lesser reductions. DATACORP, Portland, Ore.
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Telescriber System
A new six-page fact sheet on the electronic Telescriber communications system is now available from this vendor. Solid state transmitters and receivers operating over telephone wires, networks, or microwaves provide exchange of handwritten information between selected departments while eliminating verbal error and by-passing busy phones. Specifications for the transmitter and receiver are given. TELAUTOGRAPH CORP., Los Angeles, Calif.
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Mapping
Seven case histories in this six page applications newsletter present documentation of computerized mapping applications for weather maps, land use, road corridors and road design, urban planning, and oceanography. Other articles describe primary mapping application areas, use of electrostatic plotters, special plotting systems, and techniques for map production offline or from crt displays.

An overview article tells how map makers are increasing through-put, decreasing turnaround time, and delivering faster updates. Product stories detail the use of Versatec systems which draw maps without changing IBM 360/370 hardware, operating system, or existing graphics programs. VERSATEC, Santa Clara, Calif.
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Bug Monitor
This six page brochure describes the function, capabilities, and specifications of the Spectron D-601B Datascope data communications monitor, which spots problems in systems hardware and software, and details errors caused by software bugs, equipment malfunction, or line troubles. The unit monitors data communication channels and shows exactly what was sent and received over the data line—using human language such as ASCII and EBCDIC, or hexadecimal displays—all of which reduces the time spent tracing problems.

Two pages of the brochure illustrate the capabilities of the Datascope in quickly, easily, and objectively isolating the source of data communications problems. There are also descriptions of the product features and options, which include two-character sync package for airline reservations systems, full-duplex display, auto stop, external control package, idle suppression, tape save, and language codes. SPECTRON CORP., Mt. Laurel, N.J.
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"You fellows certainly have come a long way since Sherwood Forest!"

Diagnostic System
A six-page color brochure describes Digitech's Pacer, a diagnostic system which is designed around a software controlled microprocessor and is user-programmable. The Pacer will selectively trap and log specific character sequences at operator command while in the passive Monitor Mode. It will also intelligently search, retrieve, and display logged data from memory on command. In the active Simulate Mode, the programs will poll and respond in most known disciplines, and transmit user-entered test sequences. Timers and counters allow programmed delays and the measurement and simulation of turn-around time. The brochure also includes complete specifications and test configurations. DIGITECH DATA INDUSTRIES, INC., Ridgefield, Conn.
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courses

Security/Privacy
A three-day workshop on computer security and privacy is scheduled for Phoenix May 10-12. Case studies, team analysis, and special sessions will examine actual abuses of computer security and privacy. Emphasis will be placed on developing methods to prevent violation of privacy. Efforts to legislate computer security at the state and federal levels will also be discussed. Price: $350. HONEYWELL INFORMATION SYSTEMS, P.O. Box 6000, Phoenix, Ariz. 85005.

Seminar Information
A packet of brochures describing seminars scheduled for the Spring is now available at no charge from this vendor. Course outlines and descriptions, instructor profiles, dates, locations, and other pertinent information are included. The seminars offered include: *Data Communications: An Introduction to Concepts and Systems; Distributed Data Entry and Source Data Automation; Structured System Design and Programming; Effective Computer Operations Management; On-line Operation Management;* and *Data Base Management: General Concepts and Planning Guidelines.* The seminars will be presented in Chicago, New York, Toronto, San Francisco, Washington, D.C., Los Angeles, Kansas City, St. Louis, and Boston on a rotating basis. DATAPRO RESEARCH CORP., 1805 Underwood Blvd., Delran, N.J. 08075. ✲

Honeywell's new 66/85. It's fast. It's powerful. And it's hungry.

Through development of new, even faster circuits and more dense circuit packaging, plus other technological advantages, we've added a new model that extends the performance range of Level 66 (the large-scale segment of our Honeywell Series 60 family) by 50 percent.

New technology, new functionality, new cost effectiveness, new room to grow, and new large-scale price/performance.

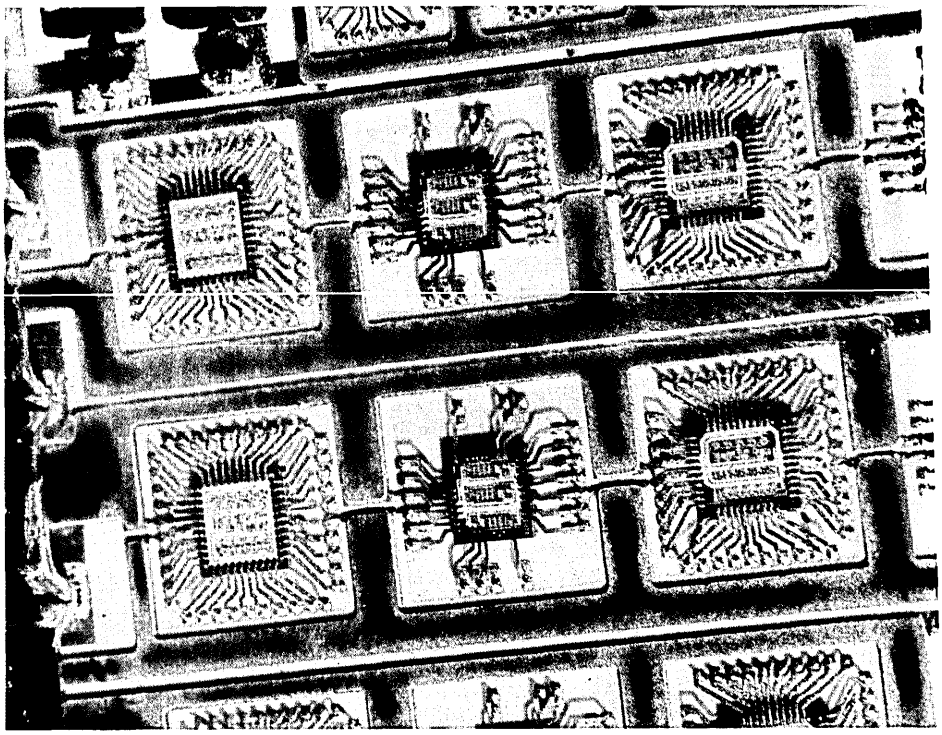
Sculpture, incorporating state-of-the-art CML computer circuit components, created expressly for Honeywell by Jack Rindner.

It's fast.

New circuits are five times faster...

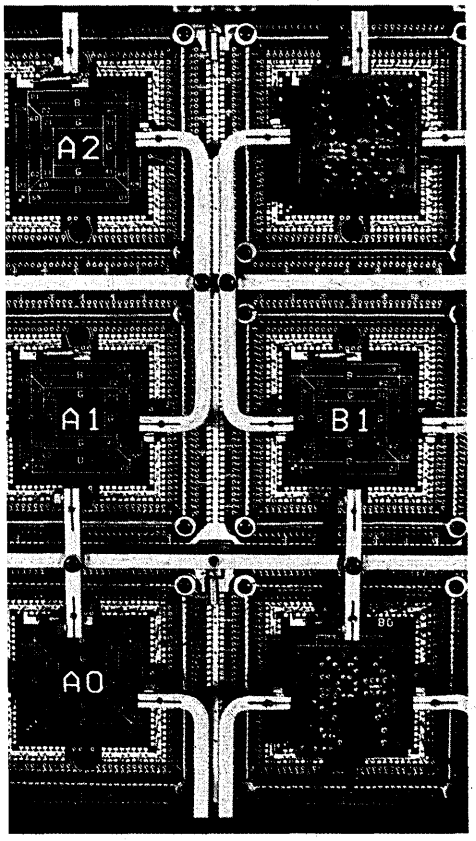
The Honeywell 66/85 circuitry uses Current Mode Logic. CML features a low-level voltage swing. And since there are none of the charge storage time lags associated with conventional voltage-driven TTL (Transistor-to-Transistor Logic) circuitry, CML is about five times faster.

And CML dissipates just 12 milliwatts of power per circuit gate. That's a 40% improvement over TTL power requirements. Less power dissipation means lower temperature operation which, in turn, means higher reliability and longer circuit life.



and packaged into one-tenth the space.

As many as 110 CML circuit chips are assembled onto three-inch-square micropackages, providing some three to four thousand gates within a nine-square-inch area. This provides approximately 10 times the circuit density of conventional 12-inch-square circuit boards. Micropackaging also shortens interconnections, effectively increasing processing speeds. Maintenance time is also reduced, since individual micropackages can be easily replaced.



New cooling technique.

Though CML circuits run cooler than TTL circuits the higher density of micropackaging continued to pose a heat transfer problem. This was solved with a unique low pressure liquid cooling network. Thin copper diaphragms fit snuggly against the micropackage surfaces allowing the coolant to carry heat away more efficiently and quietly than conventional air cooling.

New central system housing.

Instead of traditional enclosures for each unit (Central Processor, System Control Unit, Memory, I/O Multiplexers), open racks are abutted back-to-back, side-to-side. Shorter cable lengths contribute to higher processing speeds. Installation is simplified and there's no need for customer-supplied raised flooring. Access is simplified for maintenance. The entire central system can be housed, as is, in an available, secure room away from operators. Or we provide a convenient wall enclosure that isolates the open racks from all but maintenance engineers.

New ease of use.

A modular operator's console has many new features that make it easier to use. The primary operator station consists of a system status control, keyboard, video display, and diskette. A storage module with additional work space can be added in an L-shaped configuration. Secondary operator stations may be located where needed.

The keyboard contains a new set of function keys that allow the operator to initiate entire sequences of activities with a single command.

The new Honeywell 66/85 is a powerful, cost-effective large-scale computer ideally suited for large central installations or as the host processor in a distributed processing network.

The system status control module contains indicators for monitoring the central system workload. Lighted indicators provide a dynamic bar-graph "speedometer" of activity levels of the central processor units, the System Control Processors and the Front-End Network Processor. With this increased monitoring capability, the operator can quickly tell when processors are functioning at capacity and identify possible processing bottlenecks.

It's powerful.

Multi-tiered memory adds speed and efficiency.

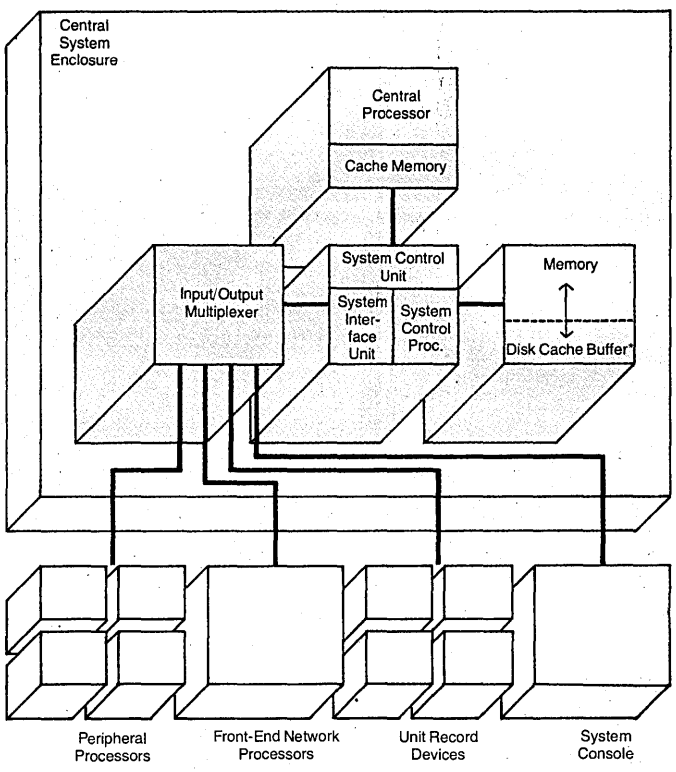
The 66/85 has three logical levels of memory. The main memory can range from 512K to more than 2 million words. A cache memory in the central processor duplicates the more active blocks of data in main memory. This cuts down on the number of individual accesses to main memory and improves data access time. Similarly, a variable portion of main memory can be allocated at user option as a disk cache buffer, thereby making certain disk data available at main memory speeds.

Memory reliability is enhanced through automatic correction of one-bit errors. In the case of detected multiple-bit errors, the operating system automatically deallocates the affected portion of memory in 1K word increments.

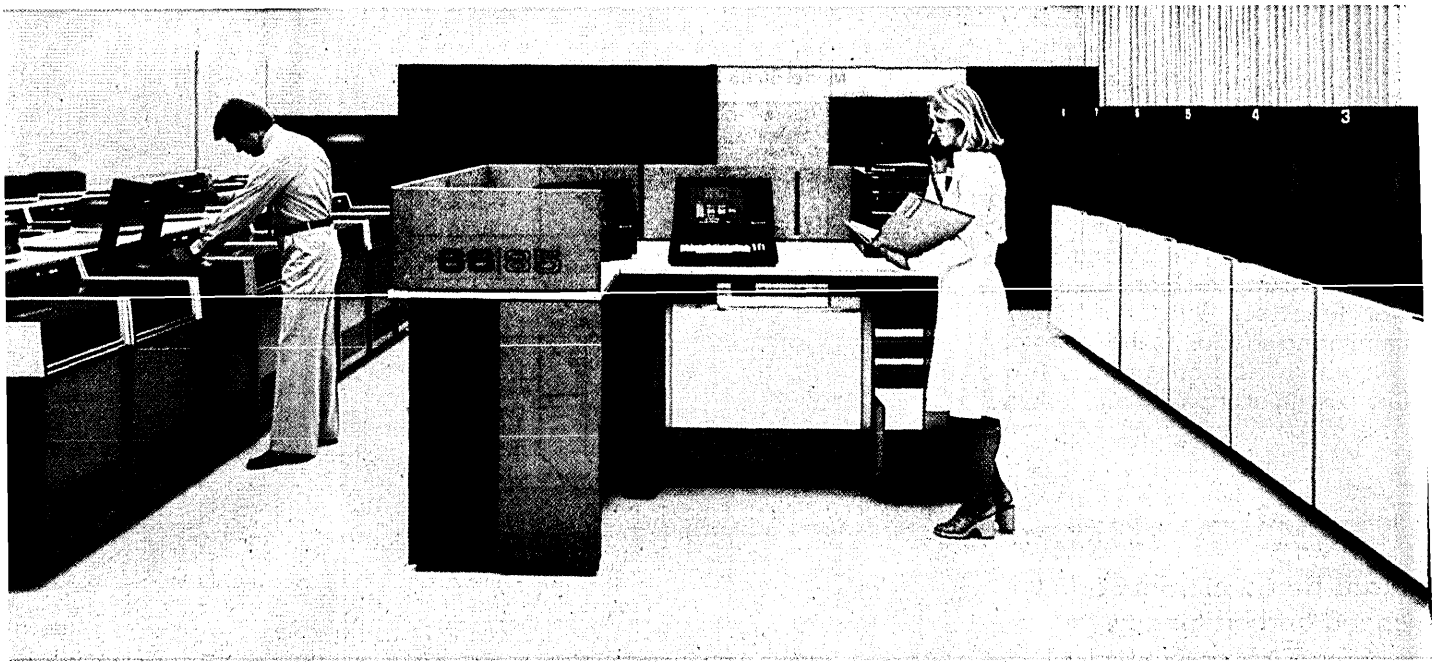
Distributed processing power through minicomputers and communications.

Honeywell minicomputer technology and associated supervisory software have been combined to provide a host of network and remote processing activities. Transaction processing, time sharing, remote job processing, and message switching are accomplished through interaction with intelligent terminals and remote minicomputers that collect and process data at remote factories, warehouses, or branch offices. All in a multidimensional environment. And all while the Network Processing Supervisor and Front-End Network Processor bear the communications burden at the host system location.

Model 66/85 Schematic Diagram



*Variable portion of main memory allocated at user option.



Powerful GCOS Operating System.

The full power of the 66/85 is orchestrated under performance-proven GCOS (General Comprehensive Operating Supervisor), the same GCOS—except for a few hardware compatibility modifications—used in the rest of our Level 66 line.

With GCOS, applications developed for Series 6000 or Level 66 systems can run on the 66/85. GCOS handles mixed processing loads such as transaction processing, time sharing, and local and remote batch. It takes care of resource management functions like program and job scheduling and accounting, memory allocation, dynamic memory error analysis and peripheral device allocation. Plus service and control functions like program loading and execution, temporary and permanent file creation, and initiation of common utility functions.

Online data management makes current data more accessible.

Level 66 GCOS supports a complete online processing capability through integrated software called Data Management-IV. DM-IV supports concurrent access to common, shared data bases from the conversational and procedural processing modes. Functionally, it contains a powerful data base manager, a transaction processor, interactive query and reporting capability, a procedural language (an alternative to COBOL), plus a concurrent batch processing interface.

You get integrated, uniform collection of information. Interrelated data can be stored for immediate, combined retrieval and updating. Storage space is minimized because items aren't dispersed redundantly in separate files.

Dynamic and user-oriented, DM-IV can respond rapidly to unanticipated and unplanned requests for information. Simple user procedures retrieve and display the needed data.

And it's hungry.

Select from a variety of peripherals.

A full range of peripherals are available to help configure a system to match your processing requirements. Each Mass Storage Processor supports up to 32 removable disk units, or 15 dual fixed disk modules, for direct access to up to 14.1 billion characters of information. Magnetic tape processors can handle up to 16 devices with densities ranging from 200 to 1,600 bits per inch. Unit record devices, card readers, punches, and printers can be connected through the Unit Record Processor, or directly through the low-speed multiplexers to the System Control Unit.

Build solidly today while you plan for tomorrow.

With Level 66, Honeywell anticipates the future of large-scale information processing, combining proven design concepts with significant advances in computer technology. Level 66 systems can take you wherever you want to go with your computer operations. And they're available to help you right now.

If you're considering wider distribution of your data processing, you'll want to consider Honeywell's Distributed Systems Environment. This is the integration of satellite minicomputers and general purpose systems, data communications and controlling software. It provides the flexibility of distributing your processing throughout your organization while maintaining centralized standardization and control. It's a data processing system that works the way you work.

Honeywell

Honeywell Information Systems, 200 Smith Street (MS 487), Waltham, MA 02154

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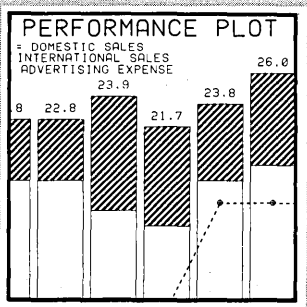

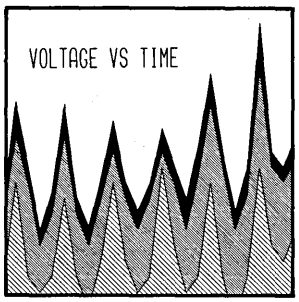

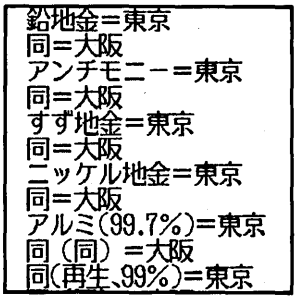

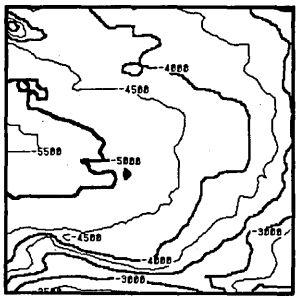

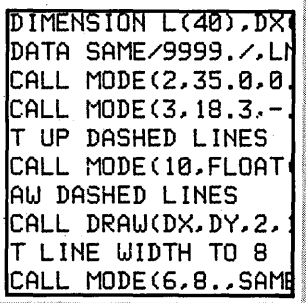

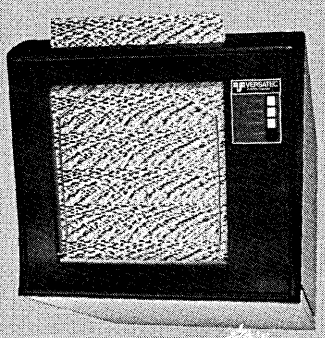

Don't print. Write.

Versatec printer/plotters don't print. They write. And that difference means more useful, reliable, quiet output from your minicomputer.

While impact printers hammer ink on paper with a limited font, Versatec electrostatics write anything—alphanumerics in any size, style or language, graphics ranging from simple bar charts and line drawings to complex maps and geophysical plots. They give you words and pictures simultaneously without changing hardware or reducing speed.

Here is a way to compact pages of printout into a single graph. A way to isolate variables you might never see in print. A way to visualize data for better presentation.

And you can depend on continuing output. Writing is electronic, not mechanical. No impact. No type wear. No alignment problems. No vibration. And no noise. Just quiet reliability measured in thousands of hours.

Worried about plotting software? Don't be. New Versaplot/PPEP adapts your existing pen plotter graphic programs to electrostatic plotting. No software? Then use new Versaplot EPS. Its easy-to-use utility subroutines let you program graphics with simple instructions and as little as 16K bytes of core. For zero programming overhead, use the optional Versatec CRT controller or video interface. It transfers images directly from CRT to hard copy without program intervention.

Versatec has the optimum writer for your application. Thirty-six plotters and printer/plotters (more models than all competitors combined) offer the widest range of speeds, formats and resolution. Interfacing is simple with on-line controllers to match popular computers, CRTs or video sources.

With over 5,000 units installed, Versatec outsells other electrostatic units two to one. Find out why. Check our readers' service number for general information. Better yet, fill out the coupon for specific application data.

VERSATEC
A XEROX COMPANY

Versatec
2805 Bowers Avenue
Santa Clara, California 95051
(408) 988-2800

Please send literature:
- ☐ Electrostatic Printers & Plotters
- ☐ Wide Plotters (Formats: 22", 24", 36", 42", 72")
- ☐ Hard copy direct from CRT
- ☐ Versaplot software
- ☐ The 360/370 plotting system

Please send samples:
- ☐ Print samples
- ☐ Plot samples

computer model and operating system

application

name telephone

organization

address

city, state & zip

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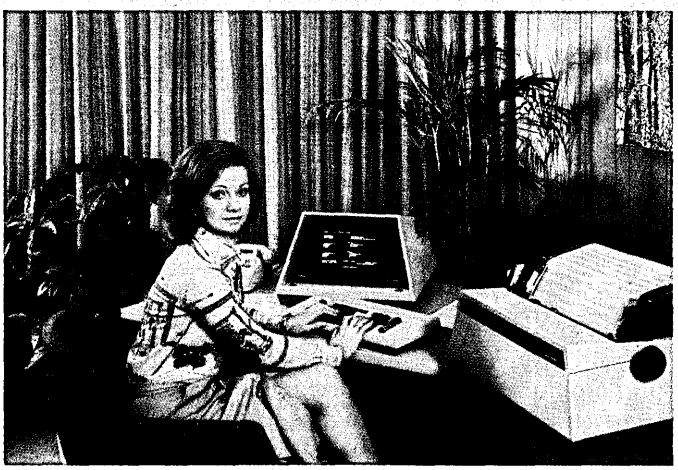
Source Data

By ENTREX...



Remote/Data Terminals

Stand-Alone Single Terminal Systems 600/20

Multi-Terminal Business Systems 600/30, 600/50

Entrex offers you an alternative to the rising costs and workloads experienced with today's centralized data processing facilities

The Alternative — The Entrex 600 Series. A compatible family of minicomputer-based systems designed to free centralized processing power, reduce communications costs, provide operational flexibility, and allow business to react to today's challenging opportunities. Each family member is a blend of power, state-of-the-art hardware, and field-proven software.

600 Series hardware is modular and upward expandable, allowing selection based on individual site performance requirements.

Our field-proven software provides for the traditional data processing requirements as well as a full range of communications emulators. A few of the features offered by each family member include: file inquiry, retrieval and update capabilities, terminal and system security, both batch and interactive communications, as well as Entrex's sophisticated data entry software.

Entrex is ready with a family of systems particularly suited to capturing and processing data at the source; a system alternative that can be implemented today, yet provides for tomorrow's growth; a system family that offers the network planner total flexibility in configuration planning.

Processing Systems

The Economic Alternative

PLANNED IMPLEMENTATION

The 600 Series can be implemented on an evolutionary and modular basis. Configurations range from 1) remote Data/Terminals connected via datacomm facilities, through 2) standalone single terminal systems, to 3) larger, multi-terminal, multitasking business systems. An extensive list of peripherals is also available to choose from.

And, since all family members use identical software, networks will be quickly and cost-effectively established.

COMMUNICATIONS FLEXIBILITY

In addition to our asynchronous remote terminal capability, the 600 Series provides two distinct communications facilities concurrent with multi-terminal operations:

Batch Oriented (2780, 3780 3741, etc.)

Entrex's Data/Comm package allows 600 Series processors to communicate with each other or with other mainframes.

Transaction Oriented

Each terminal, whether local or remote, can function as a plug-compatible IBM 3271/3277 combination, or as a stand-alone IBM 3275. This allows direct interaction with an IBM 370 or similar mainframe.

CENTRALIZED CONTROL

Centralized control is a critical element in network planning. The unique data management features offered by the 600 Series provide complete central control of all data processing operations, if required; local control if your company is totally decentralized; or the ability to establish controls based on key programs, files and data. Information security is achieved via a sophisticated security system which integrates password keys, hardware terminal addresses, and programmed access restrictions.

OPERATIONAL SIMPLICITY

With minimal training, non-technical personnel can implement data processing applications that guarantee virtually error-free input. Our Editor language, a straightforward COBOL-like language, dramatically reduces the lengthy process of report definition, design, programming and debugging. Additionally, the 600 Series provides a wide variety of flexible utility programs to further simplify the process of information utilization.

The powerful operating system fully manages all aspects of virtual memory allocation, application program relocatability and shareability, and simultaneous data base access. Application programmers are therefore free to concentrate on rapid implementation of the application at hand.

PLANNING FOR THE FUTURE

Whether you're replacing first generation remote job entry terminals or data entry devices, or designing a network of processors for the 1980's, Entrex has a system alternative with the price/performance characteristics you require. Let us demonstrate the Entrex approach to Source Data Processing.

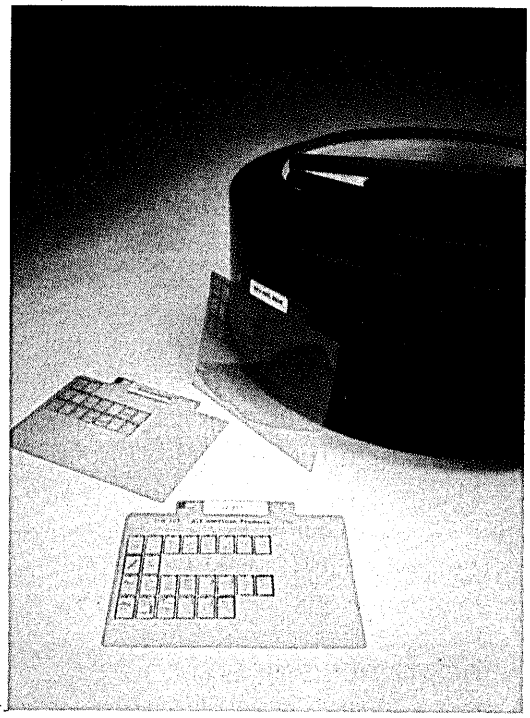
Entrex's nationwide software, training, and maintenance support organizations are ready to serve. For complete details on the 600 Series and the address of your local Entrex representative, write today. Attn: Marketing Services, 168 Middlesex Turnpike, Burlington, MA 01803, 617/273-0480

ENTREX

Source Data Processing*

*Trademark Entrex, Inc., 1976

A significant merger in information management:



System 200™ by A.B. Dick/Scott can link complete, updatable source document files with on-line computer summary data.

Until now, information storage and retrieval has been centered around two separate systems having little direct relationship in terms of coordinated information management.

On the one hand, you've had unwieldy source document files containing 90% of the information but subject to less than 20% referral.

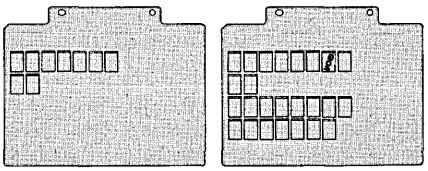
On the other, you've had computer summary files containing less than 10% of the information on file but with a high referral rate of over 80%.

Now System 200 by A.B. Dick/Scott enables you to tie two paperless record systems — microform and computer — into a compatible, cost-effective entity.

System 200 clears your computer of mass information overloading.

As a complete updatable microform file system for storing and retrieving all types of source documents and business records, System 200 provides an ideal off-line data base for your computer banks.

With the System 200 Record Processor, you can record complete master source documents on File Film in parallel with a computer summary file containing high reference data abstracted from the master file.



A single piece of 4" x 6" File Film accommodates 60 legal size or 98 letter-size documents. Images can be recorded or updated in just 8 seconds.

File Film has an add-on capability and can be updated. Prior recorded documents can be readily annotated for record control purposes.

By freeing your electronic system from mass information storage, System 200 enables you to make the most efficient use of your computer — for *computing* and for storing and retrieving abstract and summary data.

Computer indexing speeds access to off-line data.

Used in parallel with your computer, System 200 supplies complete, off-line data in answer to in-depth inquiries plus rapid, on-line access to routine information.

System 200 source file information can also be indexed by file number or file attributes and placed in your computer to speed search and retrieval of original documents recorded on File Film.

In a totally automated information system, it will be feasible to search, retrieve and deliver any System 200 File Film or set of files out of hundreds of thousands.

With or without a computer, System 200 has the answers.

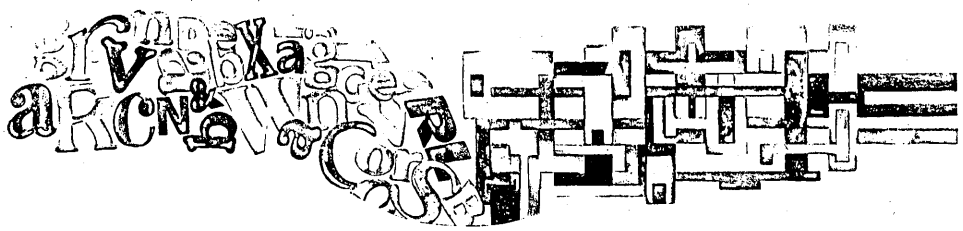
As an integral component in your data processing system or as a stand-alone micrographic record processing system that provides total file control and integrity, System 200 offers a variety of solutions to your information management problems.

Send for a fully illustrated brochure and special supplement on the use of System 200 with computer systems. A.B. Dick/Scott, South Hadley, MA 01075. Telephone (413) 538-7550. A.B. Dick/Scott is a joint enterprise of A.B. Dick Company and Scott Graphics, Inc., a subsidiary of Scott Paper Company.

A.B.DICK/SCOTT

Editor's Readout

John L. Kirkley, Editor



Word Processing and Data Processing—Likely Bedfellows

"The fact that distributed processing is moving into the clerical area suggests that a marketplace of enormous potential may be opening to the computer industry. It has been estimated that the clerical portion of the United States economy represents appoximately $150 billion per year in labor content. As labor costs escalate and computing power becomes increasingly cost effective through advances in distributed processing and LSI technology, it is likely that expenditures in the administrative area will shift toward computer systems as a means of improving productivity.

"To assess the potential of this market we need look forward only five years. Assuming a moderate 5% per year increase in labor costs, the replacement of only 5% of the total clerical and office labor content by 1981 with distributed processing equipment could conceivably result in a market size of nearly $10 billion.

"Compared with estimated 1976 expenditures on central computer hardware of $12 billion, this $10 billion figure may imply that accelerated growth rates could lie ahead for the entire data processing industry in the early 1980s."

As this excerpt from the recently issued Four-Phase Systems, Inc. 1976 annual report so clearly indicates, computer hardware vendors are looking for a significant surge of activity as word processing and data processing functions converge.

But will this boom really materialize? Or will it be at best a little boomlet similar to the extravagant and largely unrealized claims once made by boosters of facilities management, COM, and time sharing?

Well, in this issue we present some strong evidence that the merging of word processing and data processing is not only highly probable but is already underway. And it will have a major impact on the way business does business.

Amy Wohl of Datapro, an acknowledged expert in this rapidly growing field, states flatly that management, observing the similarities between the two technologies, will push for a conjunction in order to realize the economies possible from sharing equipment, personnel, and data.

The same sense of inevitability is found in J. Christopher Burn's article. He traces the evolution of office information systems from the still ubiquitous hand written draft through current shared logic systems and on to the not-so-blue-sky office of the future.

Accelerating the pace toward the convergence of data and word processing are such technological factors as distributed processing, the sharp drop in microprocessor and memory costs, gains in communications and microform technology, ink jet printing, and, perhaps the most critical of all, advances in software support for distributed and decentralized text manipulation systems.

Our third theme article by Bob White describes an electronic system that is up and working at Citibank—an element of the office of the future in existence today. Still in the prototype stage, the mini-based system is helping Citibank cope with mountains of internally generated paperwork by replacing the paper with electronic mail. Using floppies for storage and crt's on the managers' and secretaries' desks, the bank is moving toward an ambitious management information network that will have a profound impact on the traditional office environment.

So it appears that word and data processing are becoming intertwined. And the office environment is changing. But what about the impact on the data processing manager? Is he really involved? Can he afford to ignore all that activity over there on the administrative side of the house?

As Amy Wohl points out, "The sensible data processing manager will start now to examine where word processing came from, where it is today, and where it is likely to go tomorrow. With this information, he will be in a better position to guide his company as it makes choices which will affect the future of his own department."

And, we might add, his own career.

With the melding of word processing, business data processing seems poised to make its next evolutionary jump—from data processing to information processing. The dp department can be a key factor in this evolution. But only if it broadens its horizons and becomes a vital part of the corporate transition to the electronic office of the very near future. ❋

The Evolution of Office Information Systems

by J. Christopher Burns

Mechanical word processing equipment has not brought any revolution in the office, but watch what happens when image handling, intelligence, file capabilities, and—most of all—communications are added.

Over the past few years we have seen a dramatic increase in the number of new products aimed at simplifying the task of writing memos, letters, and reports. Under the banner of "Word Processing" or "Office of the Future," businesses are experimenting with the long evolutionary process that promises to streamline information exchange in the office and stem the rising tide of paper. To get a sense of where this evolution is taking us, and at what speed, let's look back briefly at the changes which have already occurred.

Twenty-five years ago a letter was written by hand or dictated to one's secretary who transcribed it later from her own shorthand. A draft was typed, revised, and retyped with several carbon copies—one for the file and one to be circulated or "routed" across the desks of all interested parties. There was an art to routing a carbon, and a cost. The pecking order was occasionally violated; a junior staffer sometimes missed a useful lesson; and people often arrived for meetings who had not seen the memo and were unprepared.

In time, dictation equipment eliminated the need for shorthand skills and made possible a central typing pool, though even now there are organizations which cannot afford the work separation and queuing implied. While several million dictation machines are in use today—600,000 shipped in 1975 alone—there remains a significant resistance to the device. The overwhelming majority of letters, memos, reports, and contracts are still drafted by hand.

At least the carbon paper is gone. We estimate that while 65 billion copies were still made on conventional spirit and stencil duplicators during 1976, about 78 billion copies were made on convenience copiers in the office—about 5,000 made for *each* of the 15 million secretaries, stenographers, typists, and clerical workers employed in the U.S. during that year. The photocopy machine is as close to a revolution as we are likely to see in the growth of business communications systems, and it single-handedly raised the office mail room to the stature of a major information switch.

Today's environment

Consider the office information system as it operates today (Fig. 1). The author of a message (a memo, report, letter, or contract) drafts it with his secretary, revises the draft, corrects the revision, and reviews the correction. Sufficient copies are made and then each is addressed and sent to the mail room where it is transmitted to the appropriate destination via internal mail, Telex, or the postal service. The receiving mail room sorts and distributes to the addressee's secretary who sorts again, screening messages according to her sense of their significance, and then supplements the message with file material that may be appropriate.

Communications within a building can take a day; going through the postal system takes two days under the best of circumstances—and nearly all messages follow this route regardless of their nature. An angry blast from the boss will take as long to make the tour as the quarterly inventory listing from data processing.

The introduction of mechanical word processing was expected to eliminate a good deal of the retyping that goes on during the drafting process. The ability to store text on a removable medium (card, cassette, cartridge, or floppy disc) seemed to be a natural answer to the problem of retyping the document, but so far the equipment has not resulted in the revolution expected.

Most designs are complex and require extended training; the equipment provides more features than necessary to make corrections, and not quite enough to do major revisions. The most difficult aspect, however, has been the organizational and work flow implications of a machine that costs more than $10,000. Because it is too costly to be installed at every typing station, the equipment is located in a word processing center, or given to a "correspondence secretary," and then the work appropriate to the equipment is directed into the queue. Few organizations have been able to optimize the equipment and the work, and for many the introduction of word processing has been a frustrating experience.

The driving forces

Still, forces are driving organizations to experiment further with more elaborate office information systems:

1) The scope of management has broadened over the last decade. Organizations grow more complex and data processing brings in rapid measurement of performance from diverse corners of the manager's field of responsibility; he is arguing now that he has a commensurate need to communicate.

2) Certain kinds of operating information lose their value over time, and a delay in assembling the right proposal, the complete answer, or the appropriate files can mean a missed opportunity. If managers are to be made more effective, they need better information systems.

3) There is a sincere desire in some quarters to eliminate the tedious aspects of the secretary's job, thereby "enriching" it. This is, in part, a self-serving goal: a secretary who isn't retyping the report for the fourth time can be gainfully employed at other tasks. But there is also the hope that a revised secretarial role which minimizes the typing, the sorting, and the message switching might ease the way for talented women whose progress has so far been blocked by the rigid clerical/management caste system.

Finally, there is an urge to try new office systems because new systems are possible. In the last few years we have seen several technological developments that may support some of the bolder approaches:

- The cost of microprocessors is dropping sharply, even as their power and flexibility increases. An 8K proces-

sor capable of performing text editing is expected to drop in cost from $200 to $50 over the next ten years.

- The cost of solid state memory will fall even more rapidly. We estimate that by 1986 a typewriter could be equipped with 256K memory for less than $100.
- Telephone technology is expected to make important progress in the near future, allowing faster and simpler management of digital data.
- New imaging devices may replace the electro-mechanical impact print mechanisms that dominate the office. Ink jet is already available. Low-power lasers may be used in the near future to image the photoconductor of an office copier, painting the characters directly from a distant computer's memory.
- Further developments are expected in microform technology, and in the physical storage and retrieval systems which manage these important image files. We expect to see a continued growth of computer output microfilm technology, particularly as computer systems begin to manage correspondence and other text files in addition to their dp chores.
- Distributed systems based on minicomputers are already successfully dealing with the problem of supporting more than one hundred special terminals, printers, and other peripherals in a text processing environment. The newspaper industry has been working with such systems for more than five years.
- We expect future software offerings to support the need for far-flung peripherals accessing the system on dial-up lines for the purpose of storing, retrieving and editing text. Existing text editing software packages like ATMS and STAIRS are practically obsolete in the face of demands for far more sophisticated capabilities.

The product evaluation

Out of this ferment we expect to see several classes of products arise, each helping to define the evolution of office information systems. For example, while mechanical word processing equipment (word processors without video display) will continue to be sold by IBM, Xerox, Redactron, and others, there is growing evidence to suggest that display word processors will overtake their predecessors—certainly in rate of market acceptance. Users appear to be selecting display devices not as supplements to, but as replacements for mechanical word processing.

From the beginning of wp development there has been a class of shared-logic word processing products. A similar class of systems has arisen in the printing and publishing industry, designed primarily to handle the text processing requirements of newspapers, though some of these have been sold to support the most formal of office messages: reports, manuals, and proposals. The distinction between these product classes—if ever there was one—is growing blurred. Together they define an important evolutionary stage.

A document destined for this system is typically drafted by the secretary in an optically scannable font (modified Courier, for example) with a minimum of coding. The document is scanned into the system, proofs are generated on a high speed printer, and

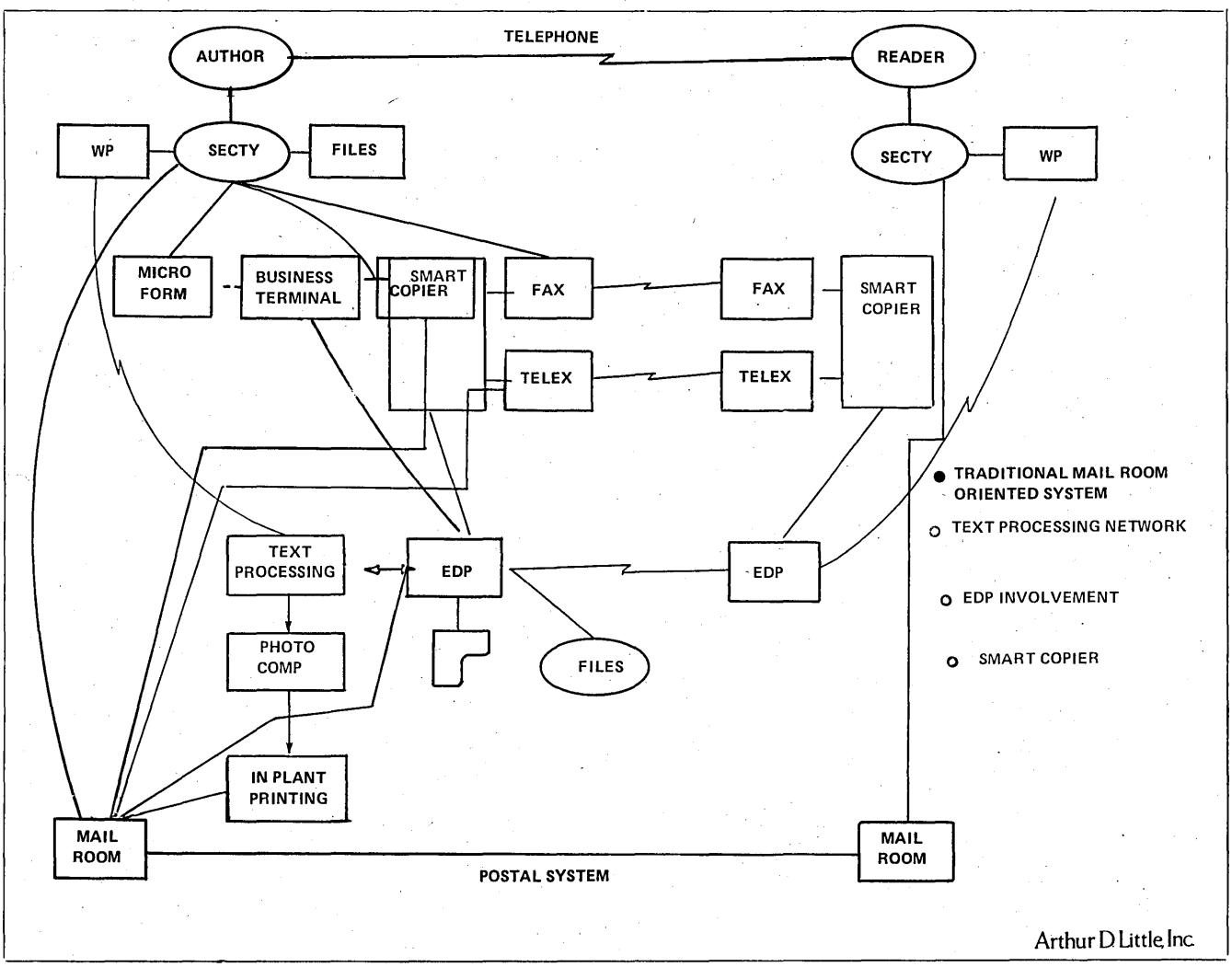


Fig. 1. First text processing and photocomposition are added to the traditional "mail room oriented" office information structure. As soon as communications capability is added, existing computerized business systems immediately become involved. (We're just experimenting at that level now.) Future products, like smart copiers, will help to tie the mix together.

revisions are made as required in the central editing facility. Ultimately the document, supplemented by boilerplate or other frequently used material, is composed on an impact printing device, or on a photocomposer capable of setting type in several faces and in many different sizes. Such systems appear to offer several advantages: revisions are far easier to accomplish and can be done in the context of a substantial software environment; any ten-pitch typewriter can become an "input station" by snapping in a different typing element ($18); and photocomposition is often able to assemble more text on a page while retaining—even enhancing—legibility. Paper savings of 25% are not unusual.

Communications: the dp crossover?

As more word processors are equipped with communications capability, some of the initial input and much of the editing can be done remotely. Word processors communicating in a dial-up mode can establish a network allowing a draft to be "routed" for review and comment before being delivered to a central facility for final composition. The Federal Trade Commission has set out to build such a network, nationwide, using Dacronics (Xerox) display word processors. Commercial firms, including Arthur D. Little, Inc., hope to develop such networks to link branch and international offices in an early electronic mail system.

The existing business systems are likely to become involved fairly quickly after the establishment of a word processing network. In most installations a digital data network has already been set up to meet business related demands, and word processing users may seek this switching capability.

Trends in the Costs of Communicating

What does it cost to communicate?

In surveying its competition, the U.S. Post Office recently reported that business communications costs were heavily in favor of digital data transmission. (top right)

On the basis of this information, at least one major corporation urged its staff to use facsimile and Telex whenever possible. A memorandum to that effect was mailed to all 10,000 employees.

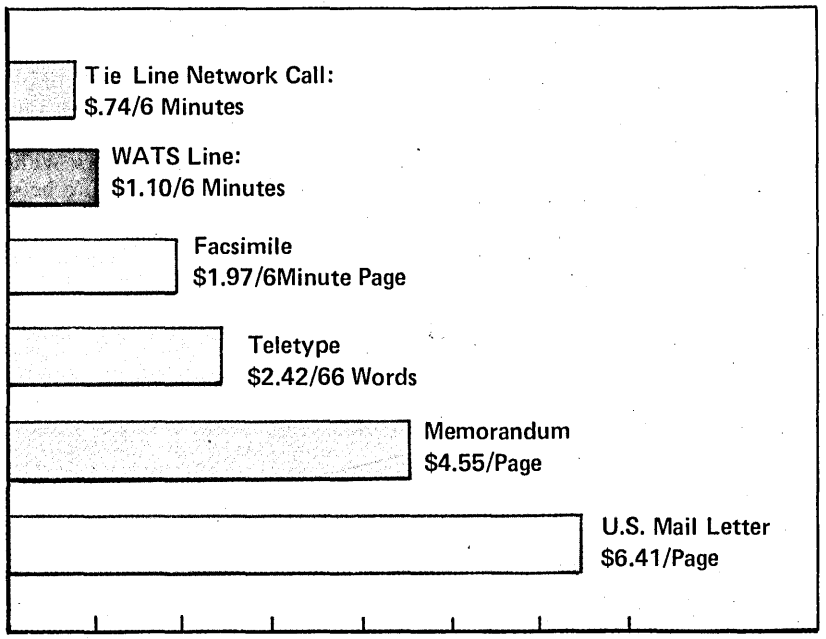
What will it all cost tomorrow?

Although the rate of change varies among specific technologies, certain general trends can be identified among the elements which will determine the cost of business communications over the next ten years. (bottom right)

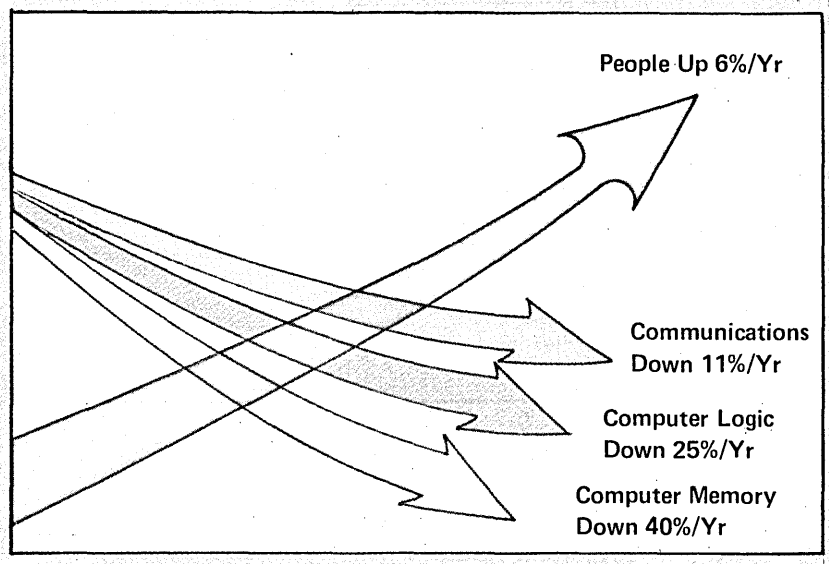
Who can save money?

- One public utility installed a central word processing system and saved more than $200,000 in labor the first year. They expect to save more than a $million each year when the full program is implemented.
- A large manufacturer installed an electronic mail system on the off-peak hours of a private telephone network and saved $200,000 on postage for intra-company mail. He also got overnight delivery around the world.
- A major computer manufacturer uses text editing equipment and photocomposition to prepare documentation and manuals, and expects to save several hundred thousand dollars each year in paper and warehousing. He gets more text on the page and the manual is easier to read.
- A large bank converted its letter of credit file to updatable microfiche and now has a faster update cycle and better control over the records. ❋

COMMUNICATIONS COSTS, 1976



CHANGING COSTS OVER THE NEXT DECADE



The display word processors equipped with communications capability can begin to resemble the universal office terminal so frequently predicted, and we expect that in many situations there will be one more persuasive argument for adding dial-up communications management facilities to the mainframe, thereby bringing it into the growing office systems network.

The main computer system may also be linked to the text processing system, providing large, long-term storage of contracts and reports, and annexing that photocomposition capability as an alternative computer output device.

File management

The remote business terminal, a traditional and successful alternative for providing conventional data processing services, may take on an interesting new role in conjunction with recent innovations in image storage and retrieval. Central to most office information systems is an image file. It may contain the actual hardcopy files of orders, shipping, and accounting actions, personnel records, etc., or have the same information recorded on microfilm or microfiche, or be built on the newer, updatable microfiche systems of the sort offered by A. B. Dick/Scott.

In many cases these files cannot be replaced by digital storage; signatures have legal significance, and paper or silver-based films have archival qualities essential to many kinds of files. Nonetheless, serious efforts have been made in the past few years to use data processing as an aid in managing these files. A capsule summary of the hardcopy record, for example, may be digitally stored in a companion file in the computer. In many situations the majority of questions can be answered using the digital file, thus avoiding the arduous task of pulling a folder (and putting it back).

At the office of the Secretary of the Army, one gets a fascinating glimpse of what some of this new technology can mean in managing a flood of office documents. There, each letter, report, memorandum, and contract is recorded on updatable microfiche as soon as it arrives in the mail room. A companion record is made in a digital file, noting the origin, destination, date, and nature of the document. Thereafter, the images that have been selected for this control can be quickly retrieved by one or more of a dozen variable terms. The digital system identifies the microfiche—and the panel—on which each image is stored and the information can be then viewed on a reader, or reconstituted as a full-sized hard copy.

Other government agencies use the same system to manage massive personnel files, and still others are exploring the system's potential for managing a complex library of technical documentation.

As word processing and microform systems evolve, it is likely that the existing dp facilities will be called upon to assist in the management of large files; contracts, memoranda, reports, documentation, correspondence, and perhaps reference data frequently used.

One of the major issues concerning organizations moving in this direction is the availability of software to manage files whose primary relationship is not sequential but contextual. Given a subject, an author, an approximate date, a contract number, or an employee's name, the system may be asked to report an index of documents on a digital (or image) file and must be prepared to deliver that index at a remote terminal or facility.

This is not to suggest that a new level of data base management tools will herald the paperless (or even less-paper) office, but that such tools would materially assist the organization in preparing, consulting and distributing documents considered to be significant.

Electronic mail

In time, the main computer system—or a subordinate processor—might take on the characteristics of a protected message switch capable of distributing a document to multiple terminals (both video and hardcopy) simultaneously. Such a system would include such standard features as store and forward, format for Telex, redial and/or retransmit, and journalize. Many corporations already have rudimentary electronic mail systems, and it would seem logical to incorporate this transmission capability into an overall system which supports preparation, composition, and retrieval.

One of the more serious obstacles to software products in this area is the variety of message formats employed in office communications. Though apparently simple, they present the user with a complex variety of ways in which to transmit his message: the memo (multiple copies or routed), the sealed envelope, the authorized message (signed), the letter (with copies to . . .), the broadcast announcement to all staff, the handwritten blast, the marginal comment. Replicating these formats in a protected switch implies several levels of confidentiality, several levels of priority, the ability to chain messages together and incorporate comment, as well as a very advanced mailbox capability.

Finally, it is logical to expect that such a fully formed central dp facility would find enormous advantage in developing communications capabilities with other branches of the organization, thus completing the network from word processor to word processor, from universal terminal to a distant microfiche file, from one portion of the organization's data base to another. There is nothing blue-sky about this. Since the late 1960s such linked-processor, linked-file systems have been used by various branches of the government and by some large corporations to manage inventory, order processing, and highly structured communications. The innovation is merely a shift from fixed field, numerical records to an admittedly more complex format containing text. In the process, though, the dp facility has assumed the role once performed by the mail room; it is now the primary information switch in the organization.

There are more new products to be announced. It is axiomatic that continued reduction in the cost of electronics, plus further development in the power and flexibility of microprocessors, will have a major influence on the shape of word processing equipment over the next few years. New displays are possible, new storage media feasible, and very different approaches can be made to the operator/function interface. Beyond this, we can expect those suppliers of text editing systems for the newspaper industry to announce products for the office market. This would simply be a normal outgrowth of existing product classes.

More dramatic announcements are possible. We expect to see a new class of typewriters announced with minimal display and correction capabilities at prices far closer to the $800 cost of a typical office typewriter. We expect to see important improvements in microform technology, taking advantage of the new vesicular microfilms and the growing use of COM.

The "Smart Copier"

The most interesting of these new products is likely to be the "smart copier," a combination of traditional electrostatic copying technology with a low-power laser character generator and a communications interface. The ability to form sharply imaged letters with a laser has been part of phototypesetting technology for several years; the letter shape is typically called from memory in response to a single code and imaged by a modulated laser onto dry silver paper at speeds of up to 1,000 characters per second. It is at least theoretically possible to image the photoconductor of an office copier in the same way with the effect of turning the copier into a silent, reasonably high-speed printer/duplicator.

Such a device, on-line to the kind of

dp office information facility described above, would be a natural adjunct to word processing, electronic mail, and even remote business applications. The quality of the letter shape could exceed the impact print quality now standard in most offices. Furthermore, both the IBM 4640 Ink Jet printer and Kodak's Ektaprint Copier/Duplicator demonstrate important improvements in paper handling technology that would presumably be incorporated into a new design. The 4640 even addresses envelopes.

In the distant future lies the now-famous "terminal on every desk," though it is more likely to be part of the telephone than the kind of monitor we know today, probably a 3 x 5-inch screen or panel with a simple 30-character key pad not very different from the sort used in a pocket calculator (and by the way, the phone will *include* a calculator.)

Whether the telephone system will ultimately replace large portions of our ingeniously designed dp office information system is a debate we can confidently anticipate, even if we can't set the date. Evolutions take time. After all, it took ten years to add the shift key to the early typewriter.

Technology over common sense?

Just because the system can be built doesn't mean it will be, or even that it ought to be. The obstacles to a logical evolution of office information systems are enormous. The relationship between management and clerical staff in an office, for example, is built on years of experience and habits not easily changed. In the technical area, communications protocols already introduced into the office via word processing, text editing, remote business terminals, facsimile transmission, teletype networks, and distributed data processing are inconsistent and defy integration.

Even the suppliers can't get their act together. The floppy disc used by IBM's System/32 is not compatible with the floppy used in the System 6; Digital Equipment's word processor cannot communicate with Digital Equipment's text processor, Harris's text processing systems cannot be linked to Harris's switching systems, and so it goes.

Although many of these components will find their way into the office independently of any plan, they must sooner or later be connected and rationalized. Who will do that, and when? The office manager who bought the magnetic card typewriters? The Report Center manager who bought the text editing system? The Record Systems manager who bought the shared-logic microfiche system? The telecommunications manager who just leased an electronic mail system? No, in all probability it will be the dp manager, because he has the budget to do "systems maintenance" and the staff to evaluate the user's needs across the corporation, and because—quite correctly—information is his business.

Information networks constitute the nervous system of an organization, and if they cannot be planned together, they should at least be supervised under a common management objective. Many dp managers already experience some of this problem: the organization maintains a business system (typically batch processing), the rudiments of a message switching system, and a time-shared system for engineering and program development, while simultaneously supporting a legion of faceless APL terminals on a dozen different outside machines. Office Information systems are likely to aggravate that complex situation, even while they process memos about fixing it.

Johnny still can't read

Finally, there is the sobering question of who will use the system, and how? Persons writing and reading documents in the office today have measurably lower reading and writing skills than the generation that preceded them. One of the "advantages" often cited for the dictation machine is that it is quicker. "I don't have to worry so much about the wording," the user admits. "I just say what I mean." As a matter of fact, he typically says it several times; after one boils down the message and adds up the cost, dictated letters and memos have a marked tendency to be longer and less efficient than hand drafted versions of the same message. When the message is formed and revised it is copied several times for the benefit of all interested parties, each of whom must now work his way through a higher stack of less efficient messages to do the same day's work.

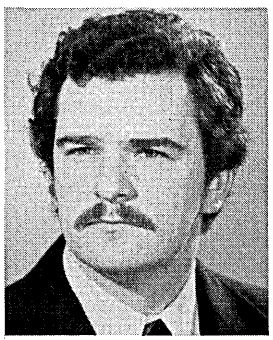
There is serious evidence to support the argument that the next generation of managers will be even less skilled than the present. According to the Educational Testing Service in Princeton, New Jersey, reading comprehension scores achieved by college-bound high school students have dropped 10% over the past 15 years.

According to Dr. Mel Levine of the Children's Medical Center in Boston, writing disabilities among teenage children are "rampant."

It cannot be substantiated that television, or new teaching methods, or the habits of parents have damaged the reading and writing abilities of our children, but it is certainly clear that the *average* office worker and middle manager is less articulate than the average office worker of the preceding generation. For whatever reason, the probable user of office information systems is likely to be less competent in constructing and interpreting messages. He will talk longer, say less, make more copies of what he says, and not read his mail as quickly or comprehend it as well.

One can imagine that compensating filters will be erected to knock "junk mail" out of the queue, and that important messages will travel over a privileged network in a court, staccato shorthand like the one which evolved on the ARPAnet. The critical signals will be delivered verbally, and the rationale behind decisions will be lost in the noise. But messages occupying the middle ground on the length/priority scale will swell to fill the available system, and join the growing tide of printout that already includes everything you always wanted to know but don't have the time to read.

Office information systems *will* evolve: many of the components are already available, and users are reporting that the benefits increase as the systems grow. The efficiency of our messages may decline as their number rises, but the technology contains the promise for new, more structured formats, far faster transmissions, lower costs, and easier access to complex files. After years of using computer technology to measure the work performed, we may soon be able to apply it to the communications process on which that work is based. ✲



Mr. Burns is a member of the information systems section of Arthur D. Little, Inc., specializing in the application of computer and related technologies to the traditional and in-plant publishing process, and in the technologies of office information systems. He has assisted in the design of highly automated publishing, text, and word processing systems for the newspaper industry, research institutions, large corporations, and governments, and is the author of several market research studies and technology forecasts in this area.

What's Happening in Word Processing

by Amy D. Wohl

Upper management cannot long overlook the parallels between word processing and data processing. So it's time for dp professionals to begin learning about office applications—applications they may soon be supporting.

In the last few years, data processing managers have become increasingly aware of a new office phenomenon, one that often appears to use data processing equipment and techniques, but which is largely the property of such non-data processing departments as office administration, office services, or some such title. In some instances, the data processing manager may be expected to lend his "computer" expertise to the process of choosing word processing equipment for his firm. And in some other cases he and its manager report to the same boss, but rarely does this new function report to him. Yet.

Some dp managers look upon this relatively new activity as a minor application area of data processing. Others see it as so enmeshed in administrative routines and personnel as to be completely out of the data processing bailiwick. A good many ignore it completely. In some firms the data and word processing managers do not even know each other's name.

But it is doubtful that data processing can ignore word processing very much longer. The technologies are too similar, the need for sharing data is too critical, and the possibilities for at least some equipment and personnel sharing (and therefore some economies) too great to expect that upper management can overlook their ultimate conjunction. The questions then become how and when will this coming together occur? And how will it affect the responsibilities, the activities, the prestige, and the career of the data processing manager?

The sensible data processing manager will start now to examine where word processing came from, where it is today, and where it is likely to go tomorrow. With this information, he will be in a better position to guide his company as it makes choices which will affect the future of his own department. And he'll find that the learning comes easily.

Proliferating rapidly

While word processing could be said to originate with the typewriter in the 18th Century, or with electric typewriters in the 1930s, widespread use of word processing really dates from IBM's announcement of the Magnetic Tape Selectric Typewriter (MT/ST) in 1964. Over the next dozen years, this marketplace was to evolve rapidly, so that by 1977 several hundred thousand units of magnetic tape/keyboard or word processing systems are installed in offices of all sizes, world-wide.

Not only the number of installed units, but the numbers of firms in this market increased rapidly, especially in the early and mid-'70s. That has made the word processing equipment marketplace a lively place these days; announcements occur on a monthly, if not weekly, basis.

To keep abreast of this multitude of equipment offerings, it is convenient to divide word processing equipment into four basic categories (with some overlap and explanation of exceptions required):

Standalone hardcopy word processing equipment includes all types of less sophisticated, less expensive (typically $5,000 to $12,000) "blind" systems, those without video displays. Such equipment is employed for such tasks as automatic typing of repetitive letters, merging of prerecorded (canned) paragraphs, revisions of short documents, and so forth. This is not to say that much more complex documents are not regularly extracted from equipment of this type; but more sophisticated equipment, with a broader range of feature and function, is now available for those more difficult jobs.

The simplest standalone mechanical systems are modified (Selectric-type) typewriters such as those offered by CPT Corp., Savin, and Ty-Data. The group also includes the IBM memory typewriter with its 50 pages (and no more) of internal belt storage, and ranges through magnetic card, tape, and cassette products, including the IBM mag card line, offerings from Burroughs/Redactron, Xerox, Royal, Olivetti, and A. B. Dick, plus a dozen or more additional manufacturers. (See Table 1.)

Where word processing systems differ rather strongly from data processing systems is in the need to display the text being produced exactly as it will appear in print. This requirement leads to large displays capable of handling functions like superscripts, subscripts, and underlining. as this unit from Burroughs/Redactron is here.

Two standalone mechanical systems, the CPT 4200 and the Wang 1222 may be enhanced by the addition of a small, optional display, allowing text to be viewed by the operator, but this addition does not generally change the features or function of the systems.

Standalone display word processing equipment generally consists of a display (from part of a line to a full 66-line, legal-size page), married to magnetic media (frequently, but not always, floppy diskette) and some type of letter-quality printer, most often a Qume or Diablo daisywheel printer with output speeds of 30 to 55 CPS.

Into this category also falls the new IBM line of System 6 equipment which includes a mag card interface and the IBM ink jet printer, with its faster speed (up to 92 cps and formidable formatting and output abilities (up to five character fonts on-line, two operator-selectable paper trays, automatic envelope production).

Such equipment may have its text editing and other functions hardwired or it may, in fact, be a small computer. Many systems use a combination of soft and hard functions and extensive use is made of read/write, read-only, and programmable read-only memory.

Many small computer-based (or microcomputer-based) systems also have data processing capabilities, which we will discuss in more detail later. In fact, many of these standalone display systems started life as information processors (small business computers), but their main marketing emphasis was changed or augmented to aim at word processing as the small computer business became more crowded and the word processing market offered exceptional opportunities for sales growth.

Names in this part of the market are legion—and this is the fastest growing category of word processing equipment, in terms of numbers of vendors. A sampling might include Vydec and Lexitron (full-page screens and first in this segment of the market), Burroughs/Redactron, 3M/Linolex, AES, Lanier, Base (serviced by Honeywell), DEC, IBM (both System32/WP and System 6), NBI, and many more.

Standalone display systems are priced from $10,000 to about $20,000, with most systems somewhere near the $15,000 mark. (See Table 2.)

A number of products in this category (and in the preceding one) are direct crossovers from the intelligent terminal portion of the data processing industry. While such products are not yet widely marketed in word processing (and most are omitted from our tables here), interest in them will grow as user sophistication increases. A strong influence in this area could be the realization that such terminals may also be used for data entry and decentralized data processing.

A few years ago, *Shared logic word processing* became a third category for word processing equipment. This term used to mean that a number of essentially dumb terminals (usually printer-terminals, but occasionally display terminals) shared the capability and storage of a central processing unit (usually some standard minicomputer, such as the DEC PDP-8). Additional storage (typically tape or disc) and printers (usually a mixture of typewriter quality medium-speed printers and draft quality high-speed printers) were also hung onto the system.

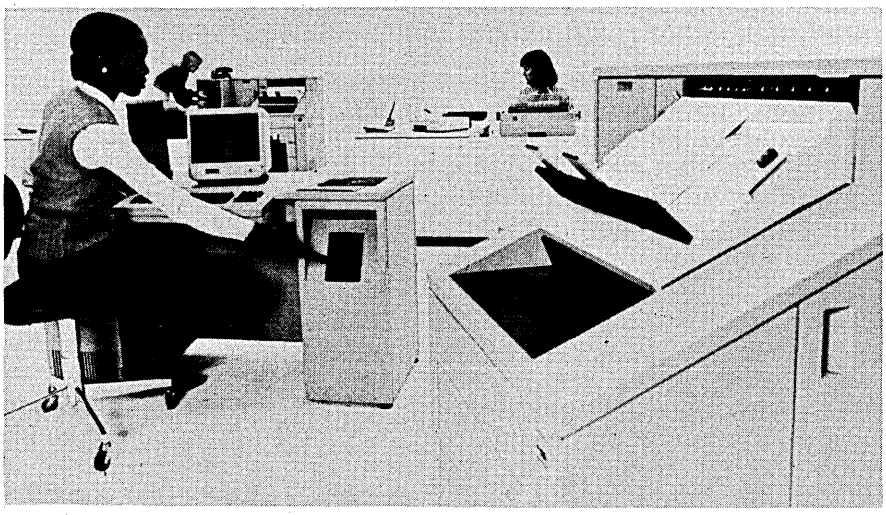
Such systems offer the ability to share the cost of a sophisticated system over a number of stations and, therefore, can bring "per station" costs down considerably. With any shared system, of course, certain problems are sure to appear—basically due to an increase in collisions as individual operators vie for processor time, storage space, and printer priority.

Some word processing manufacturers have been better than others at solving such problems, but none of them could adequately answer one counterclaim of the standalone marketeers: what happens when the whole system goes down and as many as 12 or more stations are simultaneously unusable? A number of manufacturers have answered this problem with cluster configurations, smaller shared logic systems with a maximum configuration of typically four to eight stations. A few shared logic vendors have successfully suggested that their customers buy two or more clusters instead of a single, larger one; such systems design assures additional reliability, since it is unlikely that more than one cluster will go down at a time.

Another type of shared equipment has recently come onto the market; this is a distributed logic type of system, where the intelligence (or at least some of it) resides at the terminals and the sharing that is done is basically a sharing of peripherals or jointly accessed storage and so forth. Some of the shared logic word processing manufacturers include Daconics, DEC, General Computer Systems, LCS, and Information Control Systems as well as Wang (with its new cluster 20 and shared logic 30 systems), Comptek, Edit Systems, and a few others. (Table 3).

Also, since any minicomputer system can be configured in this fashion, a number of equipment manufacturers and systems houses are offering some sort of data processing system for which word processing is just another software application package. Such systems are not yet widely sold to word processing users, but are beginning to appear at word processing shows. They should become more popular, if the users are willing to give up the security of a "big" name, and the heavy support common in the word processing market, but rare in the minicomputer arena.

Time-shared services are the fourth big classification in word processing marketing. A number of firms which sell time-shared services (Table 4.) in the data processing market also offer special advantages to word processing



The System 6, one of the latest offerings from the Office Products Div. of IBM, will have a strong impact on the market for two reasons: because it's from IBM, and because of its limitations. And the first reason is much stronger than the second.

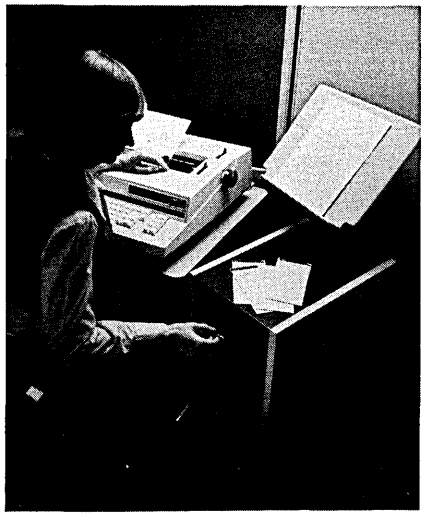
While the trend has been to crt-based work stations which can display a full page of text, the announced versions of IBM's display handle only eight lines. Similarly, the print quality of the ink jet-based document printer (right foreground) is not up to the standards of the firm's mag card typewriter (right background).

The limitations will probably loosen the demands made on all systems.

customers. For example, if the user has need to occasionally make use of a large, sophisticated word processing system, a service can give him a level of word processing he could never otherwise afford. Or the service may offer access to large data bases, maintained for all interested customers, such as a library of engineering or architectural specifications. Other services offered to entice word processing customers include output to photocomposition, interface to telegram and mailgram programs, and low-cost, off-line storage of infrequently accessed information.

Time-shared word processing may also be the first (or at least an early) look at word processing for some companies, since the only investment required is the purchase or rental of an appropriate terminal.

Finally, a large company might choose to implement its own time-shared system. Software, such as IBM's ATMS, SUPERWYLBUR, Bowne's WORD ONE, and other packages, already exist for implementation on such large computers as the IBM 360 and 370. (Table 5.) A few firms already do this variety of word processing and (from the questions I hear) a much larger number of firms are interested.



The Magna I electronic typewriter from A. B. Dick is typical of the hardcopy word processing systems now most prevalent. It uses a magnetic card for storage and a daisywheel print element, and is priced at just under $10,000.

Here is an area in which the data processing manager will surely be involved. It is likely that the word processing tasks will share the computer with other data processing jobs, and it will be the data processing manager's chore to predict whether his equipment can meet the performance standards the word processing department will require.

Also, since the terminals used for input (and some output) will be interfacing the data processing equipment, the dp manager will want to have some influence on their selection. At the very least, he will have to specify the communication protocols the system

TYPICAL STANDALONE HARDCOPY WORD PROCESSING SYSTEMS

MANUFACTURER	MODEL	MEDIA	NUMBER OF MAG. MEDIA STATIONS	PRINTER	PRINT SPEED	BASIC PRICE
CPT	4200 Cassetype	cassette	2	Selectric or daisywheel	15.5 or 45cps	$5,395
A. B. DICK	Magna I	mag card	1	daisywheel	45cps	$9,800
DTC	Microfile	diskette	2 or 4	daisywheel	45cps	$7,785
IBM O.P. DIV.	MT/ST-II	mag tape	1	Selectric	15.5cps	$5,850
	MT/ST-IV	mag tape	2	Selectric	15.5cps	$7,650
	MC/ST	mag card	1	Selectric	15.5cps	$7,200
	CMC/ST	mag card	1	Selectric	15.5cps	$9,550
	MC/ET	mag card	1	Selectric	15.5cps	$7,850
	MC/A	mag card	1	Selectric	15.5cps	$10,400
	MC/ST-II	mag card	2	Selectric	15.5cps	$12,390
	MC/ST-II Comm.	mag card	2	Selectric	15.5cps	$15,960
	Memory Typewriter	internal belt	1	Selectric	15.5cps	$5,400
OCI	Veritext	mag tape	1	daisywheel	30, 45cps	$7,750, $8,575
OLIVETTI	S-14	mag cartridge	1 or 2	typebar	185wpm	$7,495
	S-24	mag cartridge	1 or 2	typebar	185wpm	$8,055
QUALTERM	Typing Power 55	diskette	1	daisywheel	55cps	$8,970
REDACTRON	Single Card-B	mag card	1	Selectric	15.5cps	$7,295
	Dual Card-B	mag card	2	Selectric	15.5cps	$8,870
	Single Tape-B	cassette	1	Selectric	15.5cps	$7,295
	Dual Tape-B	cassette	2	Selectric	15.5cps	$8,870
	Power Typewriter	mag card	1	Selectric	15.5cps	$5,770
	Dual Media System	mag card + cassette	1 each	Selectric	15.5cps	$9,070
ROYAL/LITTON	CTS-I	cassette	1	typebar	240wpm	$5,295
	CTS-II	cassette	2	typebar	240wpm	$6,995
SAVIN	900 Word Master	cassette	1	Selectric	150wpm	$5,295*
SPERRY-UNIVAC	MT-100	cassette	1	Selectric	15.5cps	$4,800
	MT-200	cassette	2	Selectric	15.5cps	$5,400
	MC-100	mag card	1	Selectric	15.5cps	$4,800
	MC-200	mag card	2	Selectric	15.5cps	$5,400
TRENDATA	1500	cassette	1	Selectric	15.5cps	$5,600
	4000	cassette	1 or 2	daisywheel	30cps	$5,150
TY-DATA	Editer 3600/1	cassette	1	Selectric	15.5cps	$6,700
	Editer 3600/2P	cassette	2	Selectric	15.5cps	$7,900
	Easy-Riter 4500	cassette	1	Selectric	15.5cps	$3,995*
XEROX	800/122 ETS	cassette	1	daisywheel	30cps	$11,100
	800/124 ETS	mag card	1	daisywheel	30cps	$9,800
	800/126 ETS	mag card	2	daisywheel	30cps	$11,400
	800/128 ETS	mag card	2	daisywheel	30cps	$11,780

Table 1.

* plus typewriter

can make available, so that the terminals or standalone word processors which will interface with the data processing system will be compatible.

Who's in charge here?

In most organizations, word processing is a part of office services, managed by the administrative staff. But even in these environments, it is not unusual for the data processing staff to be involved in equipment evaluation and selection. While a data processing professional is likely to be familiar with the kinds of hardware he is looking at—a printer is a printer and a diskette drive a diskette drive, to be sure—he must be aware of somewhat different word processing considerations in order to make his experience with data processing hardware work for him in giving advice to the word processing manager.

For instance, he will need to know: that word processing has much higher print quality requirements than most data processing applications. In many office situations, the system output must be a deadringer for typed pages in order to be usable. The trend now is to accept less than typewriter quality for draft applications and to use matrix, non-impact, and other high speed printers where they will help get corrected copy back to the author for further revisions as quickly as possible. Also, the advent (and nearly unquestioned acceptance) of the IBM ink jet printer, which offers attractive printout but can, on inspection, be identified as non-typewriter printing, indicates that a trade-off for speed versus quality is beginning to take place.

Another difference between dp and wp is that word processing displays are not used only for verifying the text entered, or seeing the results of changes, or receiving information on system status. In many word processing applications there is a desire (often a genuine need) to see text as it will appear on output, in sufficient quantity to allow certain types of decisions or confirmations. This is the basic reason for the widespread appearance of full-page displays in word processing environments.

Actually, except in situations where the arrangement of text on a page (layout) must be done on the screen, the need for a full-page display is not absolute. However, since the final appearance of the printed product is all-important, a system with less than a full-page screen will need powerful software and a good set of formatting commands to assure attractive layouts. The user will have to feel certain that the final product will be of appropriate quality even without seeing the complete text before final printout.

(An interesting footnote: In January, IBM announced a whole line of word processing equipment, the Series 6, which employs an eight-line screen (six lines of text, two lines of format and status information), small even by partial-page standards. It is likely that within a year or two this announcement will have a strong effect on the word processing marketplace and—as with other features IBM has "blessed" —partial-page screens will be broadly accepted).

It looks like dp, and . . .

Even in their most common applications, the functions of word processing systems are coming to more closely resemble "ordinary" data processing. This is true of even that stereotype application of "personalized" letters where fixed text is blended with names and addresses and other variable information. Mechanical standalones allow an operator to manually type in variables or to switch between two media stations (one with a letter, one with a listing). More sophisticated equipment allows the variables to be stored as fields of a data base, with the coded letter accessing the proper field for the appropriate variable information. In some systems, the operator can apply logical considerations to the selection of addresses or perform masked sorts —"all those with zip code 19102," or "everyone in Philadelphia with the title of vice president."

Similarly, the longer the document, the more useful automated ("dp-like") functions will be. Long, frequently revised documents call for automatic repagination routines, the ability to move blocks of text from page to page, and global (string) search routines, to allow changes to be made throughout a document, sometimes on a single command. Some sophisticated systems allow logical considerations to be applied to global search and replace routines ("change father to mother if it is followed by the indicated character string," etc.). Even boilerplate applications, where the operator merges previously recorded text segments to create a new document, need good routines for storing and indexing segments (usually paragraphs) so that they may be combined into a new document quickly and with minimum operator activity.

Then too, sort and select functions in newer wp systems allow lists to be created and updated. In many cases a list with a large number of fields can be stored, then selects and sorts performed to create a number of new reports. Information can be output in the desired order, with new headings, and in sophisticated formats. This too comes quite close to data processing functions.

Some wp systems can perform a variety of data processing activities as part of their standard software package or, in some cases, as a system option. The idea here is (it seems) to justify relatively expensive equipment by making it more useful to the firm. Some systems come complete with general ledger package software making them, in reality, small business computers.

Almost all of the more popular systems come with communications options, allowing the word processor to transmit information to a large computer. The results of this communication may become part of the main computer's data base, or may be com-

Shared logic wp systems, like the Visual Type System from Xerox/Daconics, have come to closely resemble the minicomputer-based data entry systems used in the dp side of the house. For purposes of reliability and availability, multiple smaller-than-maximum clusters of such stations are often installed, and—just as in the dp environment—the trend now seems to be toward decentralization.

municated back to the word processor as a report or other text.

Applications customizing (read "software packages") also extends the market for word processing systems while simultaneously bringing them closer to the data processing world. One popular package allows a system to be used for personal time accounting, especially for law firms. In this environment, the system may be used part of the day for word processing (typically correspondence and creation of documents from stored boilerplate) then to keep track of which lawyer did which job for which client and for how long. (This is, of course, just another application for sort and select.)

Such systems can also produce calendars of past and future activity and determine case loads. A clerical employee can key in chargebacks (small expenses such as filing fees, photocopies, postage, and so forth) so that these can later be sorted and entered against the appropriate client's account.

Parallel evolution?

The use of word processing in an organization is more than a decision to

TYPICAL STANDALONE DISPLAY WORD PROCESSING SYSTEMS

MANUFACTURER	MODEL	DISPLAY	MEDIA	NO. OF MAG. MEDIA STATIONS	PRINTER	PRINT SPEED	BASIC PRICE
AES DATA LTD.	AES-90	24 x 80	diskette	1	daisywheel	45cps	$17,400
ARTEC INTERNATIONAL	Display 2000	1 x 37	diskette	1	daisywheel	40cps	$8,950
BASE INFORMATION SYSTEMS	Ultra-Text	24 x 80	diskette	2	daisywheel	30, 45, 55cps	$20,000
CPT	Disktype-8000	54 x 90	diskette	2	daisywheel	30, 45, 55cps	$13,900
DATAPOINT	Cassette 1100	12 x 80	cassette	2	various	30 to 60cps	$8,040
	Diskette 1100	12 x 80	diskette	4	various	30 to 60cps	$14,680*
	2200 Cartridge Disc	12 x 80	cartridge disc	2	various	30 to 60cps	$13,297**
	5500 Mass Storage Disc	12 x 80	disc	2	various	30 to 60cps	$53,607*
DEC	Datasystem 310W	24 x 80	diskette	2	daisywheel	45cps	$22,600
	Datasystem 100WS	24 x 80	diskette	2	daisywheel	45cps	$19,800
DISPLAY TEXT	Display Text	56 x 80	diskette	2	daisywheel	55cps	$13,990
IBM G.S. DIV.	System/32WP	6 x 40	disc	1	line printer	50-155lpm	$38,380
IBM-OP DIV.	6/430	8 x 83	diskette/ mag card	1 ea.	none	—	$16,450
IBM-OP DIV.	6/440	8 x 83	diskette	1	ink jet	92cps	$28,000
IBM-OP DIV.	6/450	8 x 83	diskette/ mag card	1 ea.	ink jet	92cps	$31,850
LANIER	LTE-1	24 x 80	diskette	1	daisywheel	45cps	$17,400
LCS	CompuTEXT/1	24 x 80	disc	1 to 4	daisywheel	45cps	$23,500
LEXITRON	911	58 or 66 x 80	cassette	1	prop. typebar	150wpm	$16,831
	920	58 or 66 x 80	cassette	1	daisywheel	38cps	$15,950
	921	58 or 66 x 80	cassette	1	daisywheel	38cps	$17,850
	942	58 or 66 x 80	cassette	2	daisywheel	38cps	$20,600
LINOLEX /3M	4000 Video Text Editor	18 x 80	diskette	1 to 3	daisywheel	30, 45cps	$15,500
MCM	782	1 x 32	cassette	2	daisywheel	—	$12,000
MICOM	2000	28 x 80	diskette	1	daisywheel	30, 55cps	$16,900
NBI	System I	16 x 80	diskette	1	daisywheel	30, 55cps	$9,990
	System II	16 x 80	diskette	2	daisywheel	30, 40, 55cps	$15,490
NORELCO	WPS	24 x 100	mag card	1	daisywheel	45cps	$17,400
Q1	Q1/LMC	8 x 37	diskette	1 to 4	daisywheel	45cps	$15,150
REDACTRON	Redactor II	59 x 84	cassette	2	daisywheel	45cps	$16,500
TYCOM	Video Info. Processor	24 x 80	diskette	1 to 4	Selectric	15.5cps	$13,995
	Editerm I	25 x 80	cassette	1	Selectric	15.5cps	$6,995*
	Editerm II	25 x 80	diskette	1	Selectric	15.5cps	$9,995*
VENTEK	Wordplex 1	24 x 80	diskette	2	daisywheel	45cps	$16,000
VYDEC	1146	64 x 96	diskette	1	daisywheel	45cps	$17,400
	1200	64 x 96	diskette	1	daisywheel	45cps	$17,900
	1400	64 x 96	diskette	2	daisywheel	45cps	$18,700
WANG	Word Processor 10	24 x 80	diskette	1	daisywheel	40cps	$12,000
XMARK	2001/2002	24 x 80	diskette	2	daisywheel	55cps	$13,500

Table 2.

purchase hardware. The best, most carefully chosen hardware available cannot save the ship if the manager does not simultaneously hire and train the right people and institute the right procedures.

Up 'til recently, the design and implementation of word processing organizations has been to some extent, a vendor-driven process. That is to say, in order to justify the purchase of expensive equipment, the vendor attempted to reorganize the office to ensure that the equipment would be used to its maximum potential—in the new environment the equipment would be productive and would justify further equipment expenditures with the natural growth of a healthy business.

Lately, however, word processing design has taken a different twist. Just as in dp circles, there has been a move away from large, centralized word processing environments (unless the application requires such an environment) and a move toward small work groups, designed about the needs of an individual group or department, generally on a functional basis.

In this environment, word processing can be customized to better support the needs of individual principals. For instance, the equipment may be used, within the work group, to support calendar information and the creating and updating of data processing-like reports, as well as for the more standard types of word processing usage. As this type of decentralized system design grows, the equipment will be required to be more flexible and multipurpose, to allow its best use and easiest cost justification. Not a few businesses have been quick to notice that using the system as a data entry terminal (where the use for such a terminal is for only a small portion of the average work day) would help justify more sophisticated text editing equipment.

Still, the need for intelligent procedures and trained people will not diminish with the right systems design. Word processing is and will remain a service-oriented function, requiring equipment, staff, and procedures that are people responsive. The data processing manager who takes the initiative to learn this new application will have a better opportunity for further professional growth than the manager who avoids it.

Word processing equipment has come a very long way from the MT/ST tapes of 1964 to the power of the System 6 announced in January. (Is it a mere coincidence that we can bracket an era in word processing with two IBM anouncements?) A host of equipment manufacturers now offer the power to intelligently and efficiently fill our word processing needs. The task for the data processing manager therefore is twofold: to become educated about the word processing and to study the data *and* word processing needs of his company as two pieces of the same puzzle, so that where joint solutions are proper, joint solutions will be attained.

Word processing managers have already taken a big step in this direction, as their professional associations present more and more programs on data processing topics, to acquaint their membership with the tools they will need to proceed in this direction. Increasingly, data processing associations will present such seminars to their membership.

The groundwork is being laid for what may turn out to be *the* key relationship in making the Office of the Future work.

(Vendor Index starts page 72)

TYPICAL SHARED-LOGIC WORD PROCESSING SYSTEMS

MANUFACTURER	MODEL	CPU	Max. No. of Stations	MEDIA	PRINTERS	DISPLAY	BASIC PRICE
AVIONICS	Wordstream III	Avionics	12	diskette	daisywheel	57 lines x 80 char	$23,000 to 140,000
COMPTEK RESEARCH	Accutext Barrister/300	Data Gen. Nova	12	disc	daisywheel	27 lines x 74 char	$50,000 to 200,000
DACONICS (XEROX)	Visual-Type	HP-2100A	10	disc	daisywheel	44 lines x 85 char	$45,000 to 200,000
DEC	102	DEC	2	diskette	daisywheel	24 lines x 80 char	$29,000
EDIT SYSTEMS	TEXT Ed II	—	10	cartridge	daisywheel	1 line x 32 char	$17,690/ station
GENERAL COMPUTER SYSTEMS	Data Text SL-400	GCS	10	disc	character or line printer	16 lines x 32 char	$41,400*
GENERAL COMPUTER SYSTEMS	Data Text SL-600	GCS	32	disc	character or line printer	16 lines x 32 char	$73,600*
GRAPHIC SYSTEMS	System 1	Nova 1200	—	cassette	Selectric	—	$14,000
HENDRIX ELECTRONICS	6100	PDP 11/35	—	paper tape	various	—	$32,300**
ICS	Astrocomp-D/1	ICS	12	disc	daisywheel	24 lines x 80 char	$42,300
ICS	Wordsystem 112	ICS	12	disc	daisywheel	24 lines x 80 char	$32,800
JACQUARD	J-100	Jacquard	10	disc	daisywheel	24 lines x 80 char	$18,600
LCS	Compu-TEXT	DEC	12	disc	daisywheel	24 lines x 80 char	$62,000
OMNITEXT	Model 1500	Nova 1200	4	disc	daisywheel	—	$13,900
VENTEK (DENISON)	Wordplex 7	Wordplex 7	32	disc	daisywheel	24 lines x 80 char	$45,900
WANG	WP 20	—	3	diskette	daisywheel	24 lines x 80 char	$18,000
	WP 30	—	14	diskette & disc	daisywheel	24 lines x 80 char	$30,000
WORLD INFORMATION SYSTEMS	Terminal Data System	Interdata 716	32	disc	daisywheel	various	$60,100*

* Plus printers and terminals.
** With 2 terminals.

Table 3.

TYPICAL TIME-SHARED WORD PROCESSING SERVICES

VENDOR	CPU	SERVICES OFFERED
ACTS COMPUTING	H430, H440	text editing
ALPHATEXT, LTD.	IBM 360/65	text editing, photocomposition, information retrieval, labels, personalized letters, specification writing
ANALYSIS AND PROGRAMMING CORP.	IBM 360/65	text editing, personalized letters, remote job entry, file inquiry, photocomposition
BOWNE TIME SHARING	IBM 370/155	text editing, photocomposition, trade notification, direct mail
COMPUTER INNOVATIONS	IBM 360/55	text editing, specification writing
COMPUTER SHARING SERVICES	H-6000	text editing
CYBERSHARE LTD.	CDC 6500	text editing
DATA-TEK	XDS Sigma 9	text editing
FIRST DATA	DEC PDP-10	text editing
HDR SYSTEMS	CDC 6400	text editing, typesetting
MANAGEMENT SYSTEMS	IBM 370/168	text editing
ONLINE SYSTEMS	DEC PDP-10	text editing, specifications
OPTIMUM SYSTEMS	IBM 370/168 IBM 360/65	text editing
PROPRIETARY COMPUTER SYSTEMS	IBM 360/65	text editing, specification writing
RAPIDATA	H437	text editing
I. P. SHARP	IBM 360/75	text editing
STANFORD RESEARCH INSTITUTE	DEC PDP-10	text editing, document storage, COM
TELECOMMUNICATIONS INDUSTRIES	Interdata 55 IBM 370/155	electronic mail
UNIVERSITY COMPUTING	DEC PDP-9	text editing

Table 4.

TYPICAL WORD PROCESSING SOFTWARE PACKAGES

VENDOR	PACKAGE	HARDWARE	BASIC PRICE
Bancroft	LTRLST letter writer	IBM System/3 Model 10	$275 (perpetual lease)
Bowne Time-Sharing	WORD/ONE text editor	IBM 360/370	$1,200/month
Bristol	Mailing List—Letter Writer	Datapoint 1100/2200	$275-$400 (purchase)
Commercial Systems	Generalized Letter Writer	IBM 360/370	$3,500 (purchase)
Computer Dynamics	Letter Writer	IBM 360/370	$8,500 (perpetual lease)
Data Technology	DFMS text processing system	IBM 360/370	$75/month (one-year lease)
Franklin Data	ALPS letter writer	IBM 360/370	$9,750 (purchase)
IBM-D.P. Div.	ATMS word processing system	IBM 370	$378-$540/month*
	TTF word composition for phototypesetting	IBM 370	$3,350/month*
IBM-G.S. Div.	Letter Writer with Variable Insertion Upper/Lower Case Letter Writing	IBM System/3 IBM System/3 (disc)	$121/month* $76/month (S/3); $145/month (S/370)
Occidental Computer	MAIL-ALL letter writer and mailing system	IBM 360/370	$660 (purchase)
On-Line Business Systems	WYLBUR text-editing and job entry system	IBM 360/370	$17,500 (purchase)
Optimum Systems	SUPERWYLBUR word processing and job entry system	IBM 360/370	$25,000-$30,000 (perpetual license)
Satellite Computing	FURS letter writer (especially for fund raising organizations)	IBM 360/30; IBM 370/125	$9,200 (purchase)
Systems Technology	DOCPREP text editor and formatter	Data General, H-P, DEC	$350 (purchase)
Westinghouse	DOKUMNTR text editor	IBM 360/370	$1,000 (perpetual lease)
Words & Figures	SCRIBLE interactive crt-oriented text editor	Datapoint 2200	$4,060-$5,600 (purchase)

Table 5.

* fully paid in 12 months

Word Processing Vendor Index

For more information about word processing hardware, software, or services either contact the vendors listed below or circle the appropriate number on the reader service card bound into this issue.

Acts Computing Corporation
29200 Southfield Road
Southfield, MI 48076
(313) 557-6800
CIRCLE 400 ON READER CARD

AES Data Limited
570 McCaffrey Street
Montreal, Quebec H4T 1N1,
Canada
(514) 739-2711
CIRCLE 401 ON READER CARD

Alphatext Limited
233 Gilmour Street
Ottawa K2P OP1, Canada
(613) 237-7321
CIRCLE 402 ON READER CARD

Analysis and Programming Corporation (APC)
423 State Street
Beloit, WI 53511
(608) 365-2206
CIRCLE 403 ON READER CARD

Artec International Corporation
Charleston Business Park
2432 East Charleston Road
Mountain View, CA 94043
(415) 321-3300
CIRCLE 404 ON READER CARD

Automatic Electronic Systems—See AES Data Limited

Avionic Products Engineering Corporation
Ford Road
Denville, NJ 07834
(201) 627-6207
CIRCLE 405 ON READER CARD

Bancroft Computer Systems
1200 North 18th Street
Monroe, LA 71201
(318) 388-2236
CIRCLE 406 ON READER CARD

Base, Inc.
437 Madison Ave.
New York, NY 10022
(212) 421-4307
CIRCLE 407 ON READER CARD

Beloit Computer Center, Inc.—See Analysis and Programming Corporation

Bedford Computer Systems, Inc.
Three Preston Court
Bedford, MA 01730
(617) 275-0870
CIRCLE 408 ON READER CARD

Bowne Time Sharing, Inc.
345 Hudson Street
New York, NY 10014
(212) 952-4400
CIRCLE 409 ON READER CARD

Bristol Information Systems, Inc.
P.O. Box 2133
56 North Main Street
Fall River, MA 02722
(617) 679-1051
CIRCLE 410 ON READER CARD

Burroughs/Redactron—See Redactron

Commercial Systems Consultants
3246 McKinley Drive
Santa Clara, CA 95118
(408) 246-1800
CIRCLE 411 ON READER CARD

Comptek Research, Inc.
445 Cayuga Road
Buffalo, NY 14225
(716) 633-2400
CIRCLE 412 ON READER CARD

Computer Dynamics, Inc.
100 Hegenberger Road
Oakland, CA 94621
(415) 635-5800
CIRCLE 413 ON READER CARD

Computer Innovations
Suite 401
70 West Hubbard Street
Chicago, IL 60610
(312) 329-1561
CIRCLE 414 ON READER CARD

Computer Sharing Services, Inc.
2498 West Second Avenue
Denver, CO 80223
(303) 934-5747
CIRCLE 415 ON READER CARD

CPT Corporation
1001 S. 2nd Street
Hopkins, MN 55343
(612) 935-0381
CIRCLE 416 ON READER CARD

Cybershare Limited
550 Berry Street
Winnipeg, Manitoba R3H OR9,
Canada
(204) 786-5831
CIRCLE 417 ON READER CARD

Daconics
(subsidiary of Xerox Corp.)
925 Thompson Place
Sunnyvale, CA 94086
(408) 734-4800
CIRCLE 418 ON READER CARD

Datapoint Corporation
9725 Datapoint Drive
San Antonio, TX 78284
(512) 696-4520
CIRCLE 419 ON READER CARD

Data Technology Industries, Inc.
6611 Kenilworth Ave.
Riverdale, MD 20840
(301) 779-8828
CIRCLE 420 ON READER CARD

Data Tek Corporation
University City Science Center
3401 Market Street
Philadelphia, PA 19104
(215) 349-9900
CIRCLE 421 ON READER CARD

Data Terminals & Communications
1190 Dell Ave.
Campbell, CA 95008
(408) 378-1112
CIRCLE 422 ON READER CARD

A. B. Dick Company
5700 West Touhy Ave.
Chicago, IL 60648
(312) 763-1900
CIRCLE 423 ON READER CARD

Digital Equipment Corporation
Maynard, MA 01754
(617) 897-5111
CIRCLE 424 ON READER CARD

Display Text Corporation
1420 "N" Street, N.W.
Suite CCT-2
Washington, DC 20005
(202) 785-5173
CIRCLE 425 ON READER CARD

Edit Systems, Inc.
1353 Main Street
Ann Arbor, MI 48104
(313) 769-5720
CIRCLE 426 ON READER CARD

Ediyper Systems Corporation
(subsidiary of Tycom)
26 Just Road
Fairfield, NJ 07006
(201) 227-4141
CIRCLE 427 ON READER CARD

First Data Corporation
400 Totten Pond Road
Waltham, MA 02154
(617) 890-6701
CIRCLE 428 ON READER CARD

Franklin Data Services Corp.
1 Franklin Square
Springfield, IL 62704
(217) 528-2011
CIRCLE 429 ON READER CARD

General Computer/Systems, Inc. (GC/S)
16600 Dooley Road
Addison, TX 75001
(214) 235-5800
CIRCLE 430 ON READER CARD

Graphic Systems, Inc.
801 Second Ave.
New York, NY 10017
(212) 686-9006
CIRCLE 431 ON READER CARD

HDR Systems, Inc.
8404 Indian Hills Drive
Omaha, NE 68114
(402) 393-5775
CIRCLE 432 ON READER CARD

Hendrix Electronics
Grenier Industrial Park
645 Harvey Road
Manchester, NH 03103
(603) 669-9050
CIRCLE 433 ON READER CARD

IBM Corporation
General Systems Division
5775 D Glenridge Dr. NE
Box 2150
Atlanta, GA 30301
(404) 256-7000
CIRCLE 434 ON READER CARD

IBM Corporation
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White Plains, NY 10604
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IBM
Office Products Division
Parsons Pond Drive
Franklin Lakes, NJ 07417
(201) 848-1900
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Information Control Systems, Inc.
P.O. Box 281
Ann Arbor, MI 48107
(313) 761-1600
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Jacquard Systems
2502 Broadway
Santa Monica, CA 90404
(213) 829-3493
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Lanier Business Products
1700 Chantilly Drive, NE
Atlanta, GA 30324
(404) 321-0911
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Springfield, MA 01103
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Lexitron Corporation
9600 DeSoto Ave.
Chatsworth, CA 91311
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Linolex Systems, Inc.
Subsidiary of 3M Company
5 Esquire Road
North Billerica, MA 01862
(617) 667-4151
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Management Systems Corporation
125 North State Street
Salt Lake City, UT 84103
(801) 531-1122
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MCM Computers, Inc.
2125 Center Ave.
Fort Lee, NJ 07024
(201) 944-2737
CIRCLE 444 ON READER CARD

Micom Data Systems Ltd.
447 Saint Helen Street
Montreal, Quebec H2Y 2K9,
Canada
(514) 288-8373
CIRCLE 445 ON READER CARD

NBI
5595 East Arapahoe Ave.
Boulder, CO 80303
(303) 444-5710
CIRCLE 446 ON READER CARD

Norelco/Phillips
See Phillips Business Systems

Occidental Computer Systems, Inc.
10202 Riverside Drive
North Hollywood, CA 91602
(213) 763-5144
CIRCLE 447 ON READER CARD

Office Communications, Inc.
766 Palomar Ave.
Sunnyvale, CA 94086
(408) 739-2373
CIRCLE 448 ON READER CARD

Olivetti Corporation of America
500 Park Ave.
New York, NY 10022
(212) 371-5500
CIRCLE 449 ON READER CARD

Omnitext, Inc.
P.O. Box 2090
Ann Arbor, MI 48108
(313) 769-9202
CIRCLE 450 ON READER CARD

On-Line Business Systems, Inc.
115 Sansome St.
San Francisco, CA 94104
(415) 391-9555
CIRCLE 479 ON READER CARD

On-Line Systems, Inc.
115 Evergreen Heights Drive
Pittsburgh, PA 15229
(412) 931-7600
CIRCLE 451 ON READER CARD

Optimum Systems Incorporated
2801 Northwestern Parkway
Santa Clara, CA 95051
(408) 987-4444
CIRCLE 452 ON READER CARD

Phillips Business Systems
175 Froehlich Farm Blvd.
Woodbury, NY 11797
(516) 921-9310
CIRCLE 453 ON READER CARD

Phoenix Data Ltd.—
See Cybershare Ltd.

Proprietary Computer Systems, Inc.
16625 Saticoy Street
Van Nuys, CA 91405
(213) 871-8221
CIRCLE 454 ON READER CARD

QI Corporation
6 Duban Court
Farmingdale, NY 11735
(516) 293-0700
CIRCLE 455 ON READER CARD

Qualterm Terminals
2007 O'Toole Ave.
San Jose, CA 95131
(408) 263-7800
CIRCLE 456 ON READER CARD

Rapidata, Inc.
20 New Dutch Lane
Fairfield, NJ 07006
(201) 227-0035
CIRCLE 457 ON READER CARD

Redactron Corporation
100 Parkway Drive South
Hauppauge, NY 11787
(516) 543-8700
CIRCLE 458 ON READER CARD

Royal Typewriter Division of Litton Industries
150 New Park Ave.
Hartford, CT 06106
(203) 523-4881
CIRCLE 459 ON READER CARD

Satellite Computing Corporation
3330 North Central Ave.
Phoenix, AZ 85012
(602) 264-9301
CIRCLE 460 ON READER CARD

Savin Business Machines Corporation
Columbus Ave.
Vallhalla, NY 10595
(914) 769-9500
CIRCLE 461 ON READER CARD

I. P. Sharp Associates Ltd.
Suite 1400
145 King Street West
Toronto, Ontario M5H 1J8,
Canada
(416) 364-5361
CIRCLE 462 ON READER CARD

Sperry Univac Office Machines Division
P.O. Box 1000
Blue Bell, PA 19422
(215) 542-4180
CIRCLE 463 ON READER CARD

Stanford Research Institute Augmentation Research Center
333 Ravenswood Ave.
Menlo Park, CA 94025
(415) 326-6200
CIRCLE 464 ON READER CARD

Systems Technology, Inc.
107 Sachem Street
New Haven, CT 06511
(203) 623-7373
CIRCLE 465 ON READER CARD

Telecommunications Industries, Inc.
7670 Old Springhouse Road
McLean, VA 22101
(703) 893-2400
CIRCLE 466 ON READER CARD

3M/Linolex—See Linolex

Trendata Corporation
610 Palomar Ave.
Sunnyvale, CA 94086
(408) 732-1790
CIRCLE 467 ON READER CARD

Tycom Systems Corporation
26 Just Road
Fairfield, NJ 07006
(201) 227-4141
CIRCLE 468 ON READER CARD

Ty-Data, Inc.
109 Northeastern Blvd.
Nashua, NH 03060
(603) 889-1155
CIRCLE 469 ON READER CARD

University Computing Company
P.O. Box 6171
Dallas, TX 75222
(214) 655-8822
CIRCLE 470 ON READER CARD

Ventek Computer Systems, Inc.
31829 West La Tienda Drive
Westlake Village, CA 91361
(213) 889-4455
CIRCLE 471 ON READER CARD

Vydec, Inc.
130 Algonquin Parkway
Whippany, NJ 07981
(201) 386-9191
CIRCLE 472 ON READER CARD

Wang Laboratories
836 North Street
Tewksbury, MA 01876
(617) 851-4111
CIRCLE 473 ON READER CARD

Westinghouse Electric Corporation, Computer and Instrumentation Division
2040 Ardmore Blvd.
Pittsburgh, PA 15221
(412) 256-5583
CIRCLE 474 ON READER CARD

Words & Figures
Professional Building, Suite 411
Monterey, CA 93940
(408) 649-1122
CIRCLE 475 ON READER CARD

World Information Systems, Incorporated
17501 South Figueroa Street
Gardena, CA 90248
(213) 532-6730
CIRCLE 476 ON READER CARD

Xerox Corporation
Xerox Square
Rochester, NY 14644
(716) 423-9200
CIRCLE 477 ON READER CARD

Xerox/Daconics—
See Daconics

Xmark Corporation
1539 Superior Ave.
Costa Mesa, CA 92627
(714) 646-7466
CIRCLE 478 ON READER CARD

Mrs. Wohl is the word processing editor for "Datapro Reports on Office Systems," a technical reference service published by Datapro Research Corp. She also presents seminars on hardware selection and equipment trends for the International Word Processing Assoc. and other educational or professional groups, and serves as a special advisor to the newly formed IWP Manufacturers' Advisory Council. She is currently the president of the Greater Philadelphia Chapter of the IWPA.

INNOVATIONS FROM

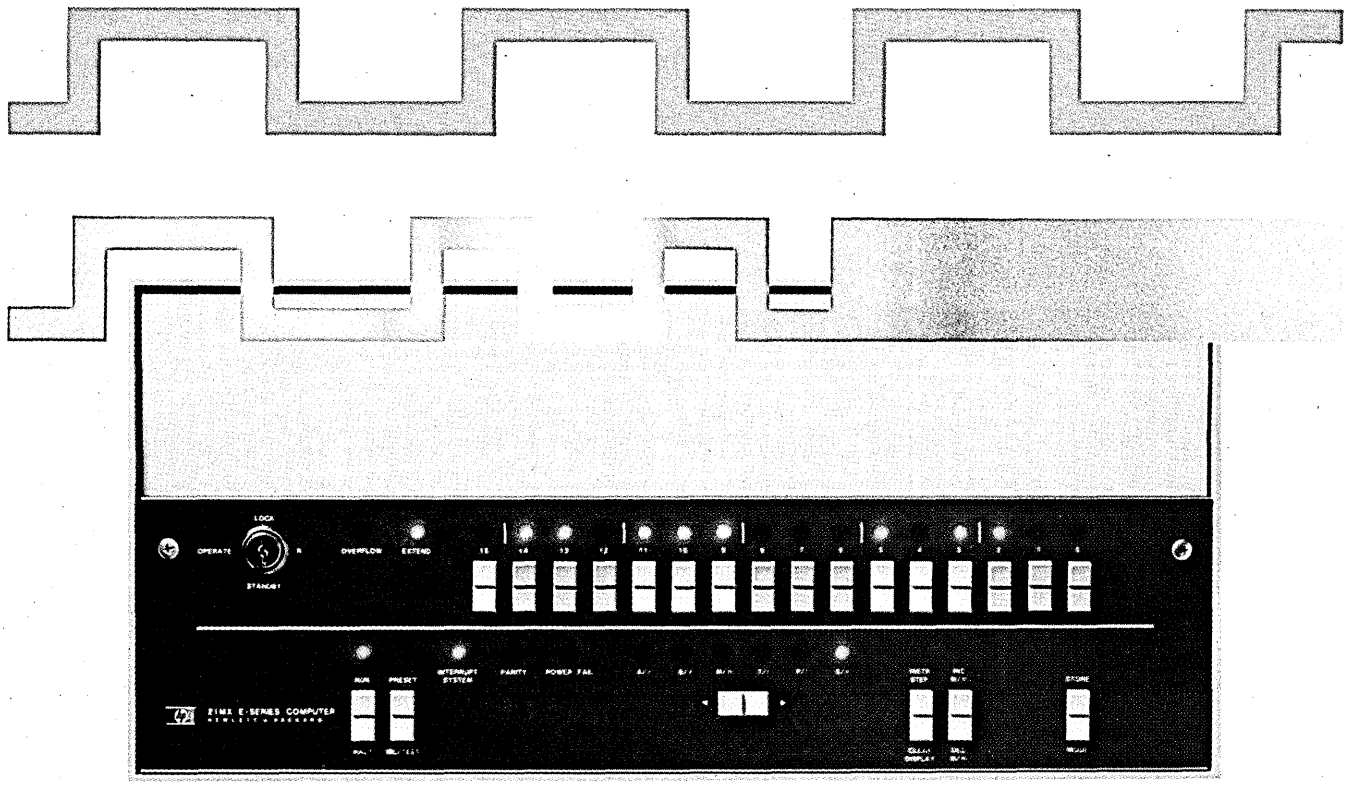
HEWLETT-PACKARD

COMPUTER ADVANCES

Customers demand the increased performance benefits of new technology without losing the software investment made through the years. Then, computer purchases are ongoing investments and not a series of capital losses. As the advances of technology are inevitable, the engineers at Hewlett-Packard believe in products capable of taking advantage of technology as it becomes available. This fundamental view plans for technology and not for obsolescence.

Since the introduction in 1971 of the first 21XX Series family member, the 2100, the infusion of new technologies has permitted the family to average a 30% yearly price decrease. By 1974 and the introduction of the 21MX, the family instruction set had been dramatically expanded to take advantage of the new technology of microprogramming. The price and reliability benefits of the new semiconductor memory were also made available. New peripherals were added,

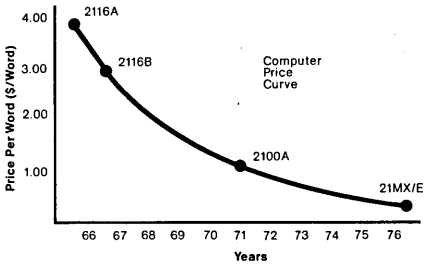
NEW VMT PROCESSOR INCREASES PERFORMANCE 70% TO 100%



for example those using the latest high-density disc technology. All the while, easy and compatible upgrade paths were available to HP's long-term, committed customers.

This history continues with the newest processor–the 21MX E-Series. The X-E is a more powerful implementation of the proven 21XX architecture. Through a combination of updated technologies and design innovations, the 21MX E-Series achieves a 70%-100% performance increase over the 21MX.

TECHNOLOGY DRIVES PRICES DOWN, DOWN, DOWN...



MODERN TECHNOLOGY

The E-Series takes full advantage of the latest developments in technology to provide maximum performance, yet maintains a high standard of reliability. The E-Series uses the latest MSI technology, Schottky TTL IC's, and fast 4K RAM memory to implement the 21XX family architecture. For performance, fast Schottky IC's are used on critical data paths; for reliability and economy, low-power Schottky IC's are used where speed is not critical. The result is a state-of-the-art implementation of the 21MX architecture that will allow systems to keep pace with requirements for many years.

DESIGN INNOVATIONS

Variable Microcycle Timing. The micro-instructions of a control processor do not all need the same amount of time to execute. Ignoring this, most microprogrammed computers simply define the micro-instruction execution time as that of the longest micro-instruction. This wastes time. A sign test operation on a register, for example, may require only 60% of the time it takes to output a control processor register to an I/O device interface.

An innovation from Hewlett-Packard, Variable Microcycle Timing (VMT) prevents this waste of time by adding instruction monitor and control logic. With this logic, the control processor's cycle time is dynamically altered to match the time required by the current micro-instruction.

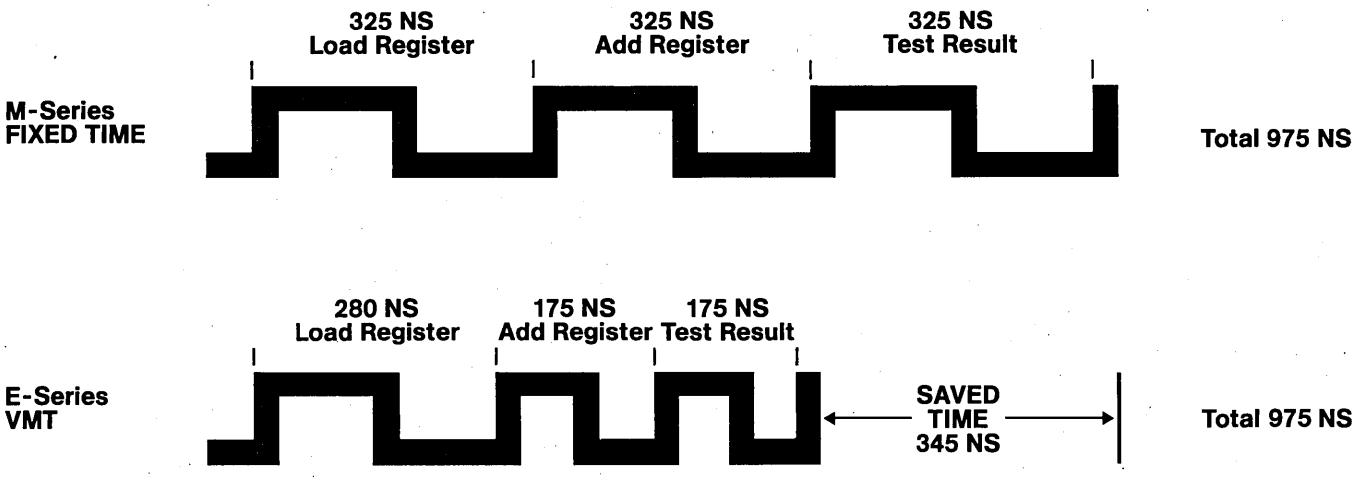
HP simplified VMT by dividing micro-instructions into two classes–those executing at less than 175NS and those executing at between 175NS and 280NS. Through a carefully optimized design, this innovative two-class VMT approach achieved an overall 30% increase in 21MX system performance–all at an insignificant increase in hardware cost.

Asynchronous Memory. Memory technology is changing at a tremendously rapid rate. Consequently, users want assurance that their computers will be able to take advantage of faster, larger, more reliable and less expensive memories as they become available.

In a microprogrammed computer, like the 21MX E-Series, using fully asynchronous interface with memory is an innovation that permits the use of new memory technology. An asynchronous system is flexible enough to interface with a wide variety of memory systems that take advantage of changing memory chip technology. The E-Series performance, then, will dramatically increase simply by changing memory boards.

In an asynchronous system, memory takes only the amount of time required to perform a read or write operation, then immediately informs the processor that it is available again as a system resource. Thus, the E-Series control processor can efficiently execute micro-instructions that do not use memory while memory, in parallel, is busy with a previous request. Asynchronous memory is a truly adaptive design that will allow the 21MX E-Series to continually take advantage of faster memory.

FIXED VS VARIABLE MICROCYCLE TIMING



Thanks to a technique known as VARIABLE MICROCYCLE TIMING and other innovations the 21MX E-Series provides up to 100% performance improvement over the earlier 21XX family members. VMT dynamically defines the micro-instruction execution times. This results in time savings on shorter executing operations.

INNOVATIONS IN USER MICROPROGRAMMING

Over 13,000 HP installations have user microprogrammable computers. All 21XX family members since the 2100 are microprogrammable. This flexible tool has been used by customers to increase the performance, security and flexibility of their systems. And HP has worked closely with users in an effort to acquaint them with this tool. As the result of this contact with our users, we have learned much to help us make the 21MX E-Series microprogrammability more powerful and easier to use.

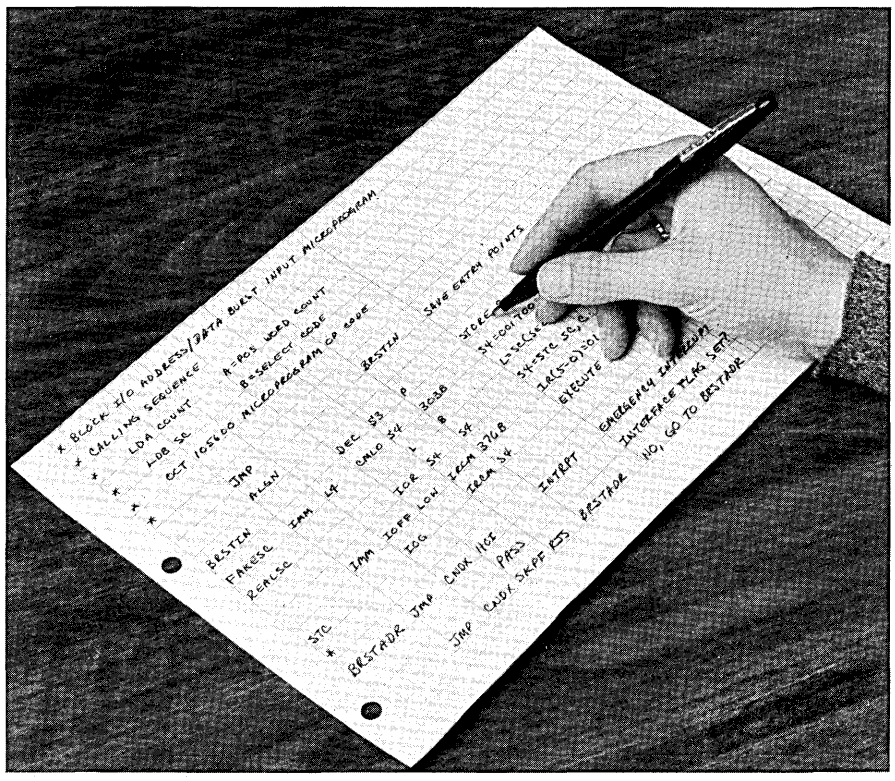
First is a basic increase of control processor address space to 16K words, of which 8.5K words are available for large user microprograms. This innovation speeds execution of subroutines by 3 to 20 times over standard assembly language implementations. Second, as the X-E supports multilevel stacked subroutine calls, it is possible to construct complex programs that use standard E-Series microprograms like floating point, memory management, integer arithmetic, and bit or byte manipulation routines. Third is a set of microprogramming software.

USER MICRO-PROGRAMMING SOFTWARE TOOLS

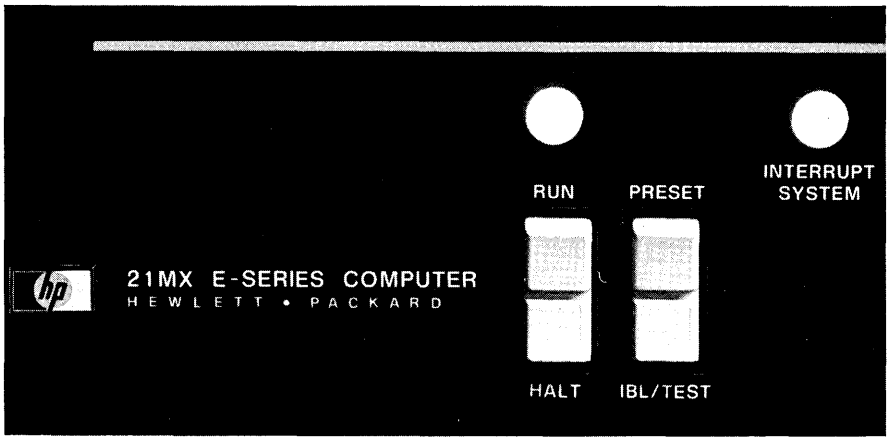
Making user microprogramming as simple as assembly language programming is the accomplishment of a new microprogramming support package that runs under HP's Real Time Executive (RTE) operating system. It provides a full symbolic assembler, a debug editor, and load utilities in conjunction with a new 1K word Writable Control Store (WCS). Now users can develop, assemble, edit, and test microprograms on line.

One of these utilities enables dynamic swapping of microprograms from main memory or a peripheral disc into Writable Control Store. A driver treats WCS as an allocatable system resource and resolves contentions between users. Control store can be used as a system resource to speed execution of critical, on-line routines. With this dynamic swapping of microcode in and out of control store, the user has unlimited microcode capability.

Microprograms may be stored and used in Writable Control Store or, through another utility program, may be stored on tapes for production of 1K or 4K bit PROMS. PROM-based programs may then be mounted on standard control store cards supplied by HP. Much like library routines, these microprograms may then be called from high level languages like Fortran, Basic, Algol, or Assembly Language and shared among all users of the system to speed program execution.



MICROPROGRAMMING–ON-LINE, OFF-LINE.
Interactive microprogramming makes microcoding simpler, more organized, and helps to retain records. The number of steps in writing a microprogram is reduced, as is the probability of error. Delays associated with batch processing are gone.



With the ease of a finger switch, a user can invoke a confidence check on 90% of the 21MX E-Series' circuitry.

SYSTEM GROWTH POWER

E-Series users have a computer whose power can be increased at will through microprogramming. Two innovative features, the Microprogrammable Block I/O (MBIO) and the Microprogrammable Processor Port (MPP), provide high speed data and control channels which, with microprograms, provide for both I/O and processor growth power. This means increased I/O throughput and processing efficiency.

I/O Growth Power. MBIO provides for greater I/O throughput than standard I/O methods. MBIO is an additional I/O channel capable of transferring blocks of data at rates of up to 3.1 million bytes per second or 50% faster than the normal DMA transfer rate. MBIO is controlled by a user-written microprogram that can be tailored to specific applications. The controlling microprogram can be short and simple for fast data transfers, or more intelligent for applications that require special character recognition, combined address/data transfer, byte packing, and so on.

Processor Growth Power. MPP also provides a means to greater system efficiency through microprogramming. But, unlike MBIO, MPP doesn't use the I/O structure of the E-Series; rather, it gives users a direct window to the 5.7 megaword-per-second main data bus of the E-Series. This direct connection allows extremely high speed data transfers. Front end or parallel processors, such as array processors, high speed A/D converters, arithmetic processors, high speed scanners and Fast Fourier Transform processors may be directly connected to the E-Series via the MPP. MPP is a whole new way of interfacing processors. Interaction between the E-Series and external processors occurs at very high speeds, and can be controlled as precisely as necessary with a user-written microprogram.

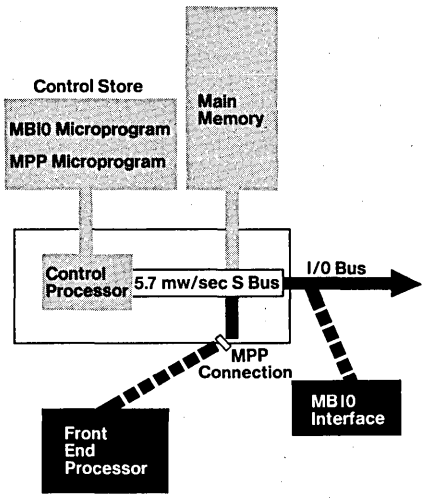
The 21MX E-Series is available in two models—the 2109A, at $5850, has up to five memory modules and nine I/O slots; and the 2113A, at $6850, has up to ten memory modules and fourteen I/O slots (U.S. domestic prices only). Discount schedules are available for OEMs. The E-Series has been in HP 1000 systems shipped since last November. Currently, deliveries are within eight weeks.

For more technical information on the 21MX E-Series, simply request a copy of the HP Journal, (circle A) or for further product information, circle B on the attached reply card.

SELF TEST CHECKS HARDWARE AND SPEEDS REPAIR

Self test, a microprogrammed feature standard on all E-Series computers, performs a confidence check on 90% of the computer's circuitry either automatically on initial program load, or manually on demand from the front panel. In a matter of milliseconds, self-check diagnostics test the processor's data paths, registers, and memory. Self test can also be looped continuously to exercise computers at any stage of system integration.

Upon termination of a self test operation, the computer's front panel display either indicates a successful completion or notes problem areas, helping the user or HP's service engineers to isolate and repair faulty assemblies quickly.



21MX E-Series provide for both I/O and processor growth power with two innovations: the Microprogrammable Block I/O (MBIO) and the Microprogrammable Processor Port (MPP).

ON-LINE/ON-LOCATION DATA COLLECTION

A noted industry expert in manufacturing control, George W. Plossl, in his latest book, states that the last remaining frontier for profit gains is in tightening control of the manufacturing process.

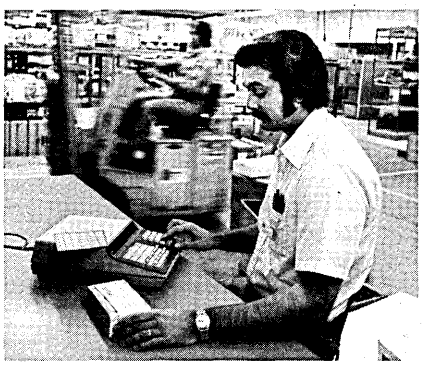
Inventory investments can be reduced and greater production returns can result from wise operational decisions based on a detailed knowledge of the status and flow of production. Computers and information control systems are an appropriate tool for achieving such careful and thorough monitoring. But such systems are only as valid as their data; thus the need for accurate and timely data collection.

The best approach to collecting such data is to capture it on-line, on-location, at its source. And one of the best systems for capturing this source data is a combination of the new Hewlett-Packard 3070 Real Time Applications Terminal and an HP 1000 system. The HP 3070 can be operated simply and easily by personnel who have no computer experience.

The HP 3070 recognizes two realities of the source data entry environment. First, more than likely, those people who are data sources have little, if any, computer sophistication or knowledge. Any device they use should be unimposing and easy to operate. Second, as the sources are usually scattered, the data entry terminals must be dispersed economically.

Gone is the hunt and peck method of searching for keys. The 3070 keyboard is simple, unassuming, and clearly marked. Specially prepared label paper can be custom lettered with recognizable calls and placed under protective plastic. Ten special function keys are software-interpreted so the user's single key stroke conveys an informative message. A set of fifteen tutorial prompting lights can be computer-controlled to guide the novice user's input sequence and to communi-

cate warnings or special requests. A numeric display is positioned to be visible over a wide viewing angle.



THE TAILORABLE HP 3070
The new HP 3070 Data Entry Terminal can be tailored for use in various aspects of manufacturing operations such as inventory status; cost accounting; production testing and reporting; order tracking and status; and maintenance reporting. Using convenient, quick-change paper inserts, the Special Function Keys and Prompting Lights may be custom labeled to suit a specific application. Connection to the HP 1000 via Serial Link Cable is a quick and simple plug/unplug. As each HP 3070 terminal is independent, location changes can be made without disrupting the network.

MULTI-DROP SAVINGS

The HP 3070 data collection network is based on a multi-drop concept. Unlike traditional systems where software accounts for all terminal handling, some of these tasks are accomplished by hardware, specifically by the HP computer interface card (controller board). Although this capability may vary with individual applications, the multi-drop concept allows as many as 56 HP 3070 terminals to be physically connected to a single, twisted-pair cable called a Serial Link Cable, which in turn connects to a single HP controller board in the HP 1000 system. The data entry network can extend as far as 4Km (2.4 miles), and terminals can be conveniently connected anywhere along the cable.

Cost savings resulting from a multi-drop approach are clear. One cable is used, not many. And the HP Serial Link Cable is not an expensive one to begin with. Cumbersome, costly cable installations are not necessary. One single board controls the entire network of HP 3070's and eliminates the expensive hardware common in traditional systems where each terminal must have its own controller interface.

MULTI-DROP FLEXIBILITY

In the flux of a manufacturing environment, it is important not to be restricted by an inflexible data collection system. And there must be potential for expandability and response to growth possibilities. Such flexibility is an integral part of an HP 3070 network, for each HP 3070 terminal is completely independent of the others. As the computer addresses and polls each terminal separately, neither the computer system nor the network is disturbed by an addition or location change of terminals. Terminals are connected and disconnected easily. Simply plug and unplug the HP 3070 from the Serial Link; the connection box is much like the phone jack in homes.

HP-IB COMPATIBILITY

Further expansion of a data entry network is possible since the HP 3070 includes the necessary commands and protocol to communicate with HP-IB* compatible devices. Thus, the HP 3070 can be used, not only for manual input of data, but also as a device to input data that is already in machine readable form. Data generated from an HP-IB instrument or instrument cluster can be entered into a system with an HP 3070.

"ERROR FREE" DATA TRANSMISSION

Assuring that data arrives error-free to the computer is especially critical in the electrically-noisy environments typical of most manufacturing operations. Aware of this fact, Hewlett-Packard has designed hardware for the HP 3070 which maximizes noise immunity and detects and corrects errors. It is extremely unusual to apply such thorough techniques to a data entry terminal, and the result is a dramatic reduction in the transmission of data errors.

HP uses a photo coupler device to electronically isolate the terminal and thus provide noise immunity from most disturbances. Further protection against transmission of errors is provided by hardware that automatically detects errors at the data receiving device—the controller board or the HP 3070 Terminal. By attaching five redundancy bits to each character being sent, a check is provided for the receiving device to ascertain whether the transmission was made accurately. If an error is detected, the system provides for an automatic data re-transmission. The extent of protection afforded is reassuring. Each character's transmission can recover 100% from up to six bits in error.

A SMART CONTROLLER BOARD

The controller board of the HP 3070 was designed to minimize the control that the CPU needs to exert for tasks like polling and management of the loop. It also avoids redundant capabilities in the terminals. Giving intelligence to the controller board reduces system overhead necessary to control the network. This efficiency is accomplished in several ways.

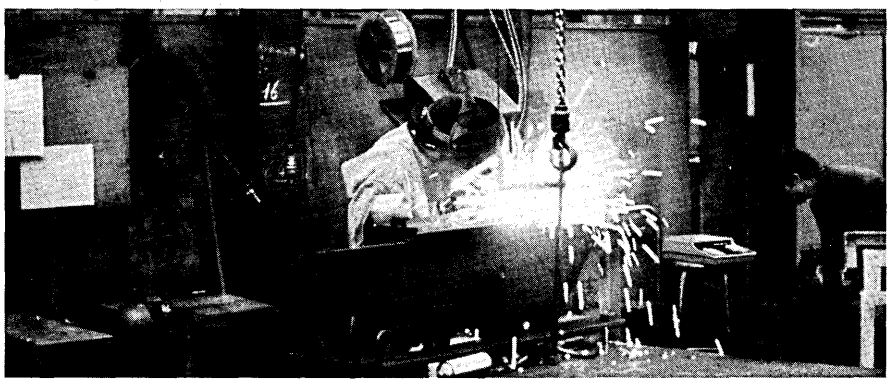
First, polling is restricted to the minimum number of terminals that need to be polled. Next, the effective data transmission speed dynamically varies. It is automatically and optimally determined, not by the total number of terminals on the data collection system, as is traditionally done, but by the number requested by the software at the time. This time savings is substantial, for rarely do all terminals transmit simultaneously.

Finally, the controller board has a "memory;" it polls and buffers each terminal before sending the block of data to the computer for processing. This minimizes CPU interruption and reduces system overhead. With this innovation, data transfers can be made more efficiently.

The HP 3070 Data Entry Terminal is priced at $1470 (U.S. domestic prices only). OEM and end user quantity discount schedules are available.

*HP-IB (Hewlett-Packard Interface Bus) is Hewlett-Packard's implementation of the IEEE Standard 488-1975 "Digital Interface for Programmable Instrumentation."

If you are interested in receiving more information about the HP 3070, or the HP 1000 computer, circle C or D on the attached reply card.

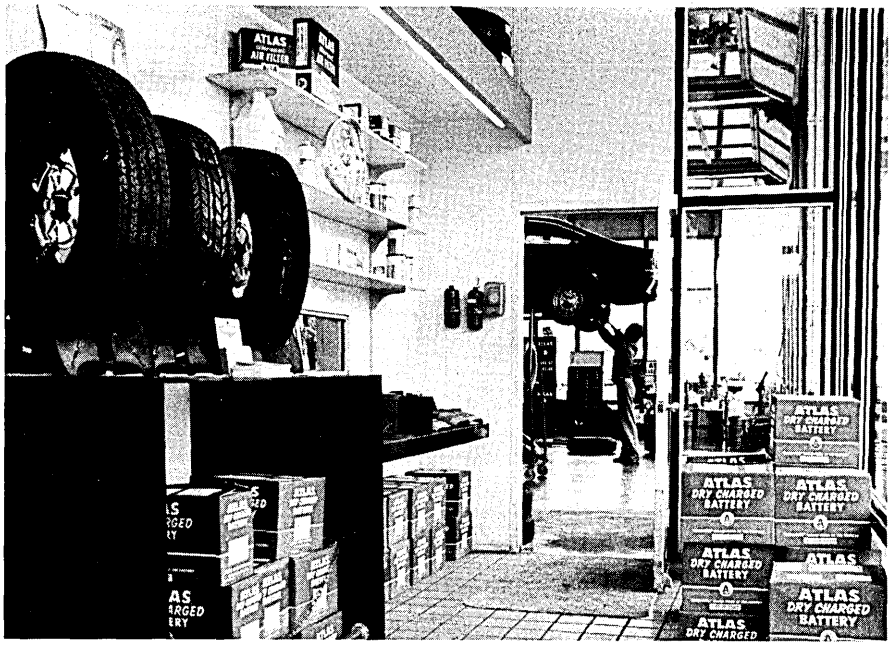


"ERROR FREE" TRANSMISSION
In a manufacturing plant near Grenoble, France, we installed 2Km (1.4 miles) of Serial Link Cable, to connect a 21MX based computer system to the new HP 3070 Data Entry Terminal. To create an electrically disturbed environment, the cable was wrapped around the power lines of numerous massive welding machines.

A continuous flow of data was transmitted to and from the HP 3070 terminal and was monitored by an HP computer. Even under these extreme conditions, no errors were received during this intensive eight-hour field trial. "Error-free" transmission is an HP 3070 innovation.

USER TESTED PERFORMANCE

Standard Oil of California provides next day shipment to customers.
The computerized corner drugstore relieves 90% of behind-counter clerical workload.



Standard Oil Company of California's computing resources now are available to their service stations and direct buying customers as they place phone orders for the company's products as a result of a recently launched distributed processing network.

SOCAL's Southwest area customers now can receive next-day shipment from the company's inventory of approximately 3,000 packaged petroleum and TBA (tire, battery and accessory) products.

In addition to providing the company's order entry personnel with online video display terminals, the multifunctional network controls a host of other operations: inventory adjustment, warehouse control, manpower projections and fill line scheduling.

Making this possible are two remote Hewlett-Packard minicomputers, the first of a national network of up to 18 planned distributed processors, initially running at two of the company's Southern California distribution points: its Los Angeles TBA warehouse and its El Segundo package petroleum warehouse.

The online, real time model HP 21MX minicomputers will be controlled by a HP 21MX central mini, which in turn will transmit confirmed orders and inventory data to a System 370/168.

The network, designed to enhance customer service was developed jointly by SOCAL and its systems contractor, MST (Management Systems Technology) of Chicago.

A Chevron dealer can place one phone order through the Los Angeles TBA warehouse for any of 1,200 TBA items and package petroleum products sold at service stations. The order can be delivered in one shipment within 24 hours.

Order entry personnel may access account files by customer name, service station number or account number. Displays alert them to special promotions and quantity price breaks. Products are accessed by either codes or a specially designed alpha technique that allows the same product to be identified by different input keys.

The computerized corner drugstore...

Computerized pharmacy is no longer a prediction. It is a reality. Management Systems Technology of Chicago installed its first Script Control™ dispensing system last fall at the Midwest's largest drug wholesaler.

Eight separate steps involved in dispensing drugs manually are reduced to a simple one step entry. As a result, approximately 90% of the pharmacists' behind-counter clerical workload is eliminated and up to 80 prescriptions per hour can be filled.

A Hewlett-Packard 21MX based Minicomputer System maintains a central data base accessable 24 hours daily and controls remote video displays and hard copy printers at subscribing pharmacies that will number 400 by the end of this year.

One of the HP 21MX Minicomputers with 64-K bytes of memory, together with varied HP peripherals, located at the central wholesaler site, can accommodate 16 pharmacies. Proprietary MST software was designed by pharmacists with pharmacists in mind. Druggists can interact with a Script Control system simply and with no previous computer knowledge.

For example, instantly after entering prescription number and drug identification, Script Control, in one step, accomplishes the following: prices the prescription; maintains the patient's profile; checks for drug interactions and allergic reactions; prints the label, receipt, alert messages and refill sticker; and prepares all tapes and documents for third party and state billing.

Savings derived from the use of Script Control are real and directly improve the profit picture for the pharmacist. Average third party rejection rate has been reduced to less than 1%. Headaches associated with constant price changes of pharmaceuticals are eliminated. Script Control uses the latest price and in addition lists generically equal drugs that when appropriate can be substituted at a cost savings to the patient.

The 22 functions of Script Control are under the complete control of the pharmacists. Changing from activity to activity is done simply by entering 3 keystrokes.

Byproducts of Script Control automatically filter into pharmacy record keeping and gives the pharmacist a new level of management control that was previously unattainable. Gross profit analysis, item movement and labor scheduling reports are three such examples.

Several years ago, MST also using HP computers, developed a predecessor system, CPS™ (Consulting Pharmacy System). Used by pharmacists who specialize in serving skilled nursing centers, CPS presently is processing more prescriptions than any other available computerized system.

HEWLETT hp PACKARD

A Prototype for the Automated Office

by Robert B. White

In a unique experiment at Citibank, a dozen senior line managers have been given the benefits of a largely paperless, automated office system. They've found good benefits, but are left with more questions than answers.

A lot has been done in recent years to free service institutions like banks, brokers, and other financial organizations, from the tyranny of paperwork in processing customer transactions. But while the now-commonplace desktop terminal bears witness to improved customer service and operational productivity, our overall work styles haven't really changed as much as we'd like.

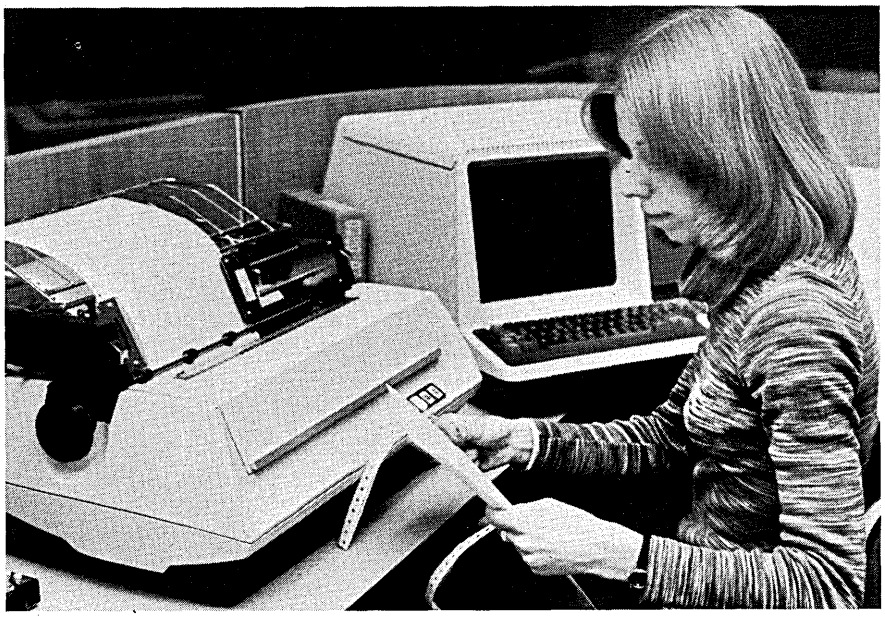
The reason? Internally generated correspondence accounts for 90% of the paper that crosses our desks. We're spending millions of dollars creating, copying, distributing, and filing memos, business plans, financial reports, and computer printouts at a rate that intimidates the most intrepid bureaucrats. Word processing systems and convenience copiers have helped us generate this paper more efficiently, so while attacking the symptoms they may be prolonging the disease.

> We need to solve a business problem, not a processing problem nor an engineering problem.

At Citibank, we have recently begun to attack the root of the problem by replacing paper with an electronic mail system. The basic unit of the system is the Management Work Station (MWS), a minicomputer-based automated environment in which a manager and a secretary create, transmit, receive, and read information through crt terminals, and file their documents on floppy discs. The Management Work Stations communicate with each other over dial-up telephone lines.

But this is just the beginning; eventually we will create a technological office environment giving managers on-line access to corporate financial data, transaction processing, and customer account information, plus stock market and economic reports, as well as an electronic interface with international telecommunication lines, photocomposition, and duplicating facilities.

Not only will we do away with the paper associated with periodic management information system reports, but up-to-the-minute data will be available anytime, not just weekly or monthly.



The secretaries of 12 selected senior managers at Citibank have Management Work Stations with letter-quality printers and intelligent terminals on-line to their own Digital Equip. PDP-8As.

The implications of this development as a management tool are enormous: in banking, for example, there will be on-line risk asset management information at the fingertips of every senior corporate officer who needs it. For account and operations managers, the Management Work Station will tie into transaction processing systems for up-to-the-minute monitoring of customer account status, lines of credit, investigations, quality, and timeliness of service delivery.

Similar systems in manufacturing could give production planners instant access to inventory and plant capacity data, and product managers could have up-to-date reports on sales, distribution, special promotions, and competitive activity.

In any business, any department manager could, at the touch of a few "macro" keys, look up his current expenditures vs. budget, current output vs. goals, current project status vs. schedule, plus all his business and personnel files.

The list could go on, but the point is that any computerized information anywhere in an organization could be accessed from the Management Work Station and displayed on the screen without loss of time or use of paper. And, according to each manager's needs, non-computer documents can be fed into the system as well.

At Citibank, we've had 12 prototype Management Work Stations on-line since November 1976. They connect me with 11 of my senior managers at three Citibank locations in New York City. The joint configuration of one manager's terminal and one secretary's terminal is Digital Equipment's ws-102, converted from the single-terminal ws-100 word processing system. It's a completely decentralized system, with each MWS running off its own DEC PDP-8A.

To give you an idea of what we've developed so far, here's a typical scenario:

I come into my office in the morning, sit down at my crt and call up an index of what's in my electronic "in-box." I can select any or all of the documents for display on the screen. To check on key commitments and due dates that may be approaching, I invoke the "follow-up" file, which lists all items in chronological order. Then I display my calendar—first the details on today's appointments, then a look at the rest of the week. Finally, I call up the phone log, to see what telephone messages are awaiting me. So far, I haven't touched a single piece of paper.

When generating memos, my secretary uses the system's excellent word processing capability. Documents are created, edited on the screen, and kept on disc. Memos are transmitted electronically to all the Management Work Stations on the distribution list, at 1200 baud over the dial-up voice network, and other recipients get a hard-copy produced by a printer on-line to their secretary's crt. Thus, while those who remain in the paper world will have to wait a full day or more for the memo to make its way through the interoffice mail system, those on the MWS network have it instantly.

> We can't expect people to accept a system that changes their responsibilities or complicates their lives.

The terminals have automatic receiving capability, and will shortly have automatic sending. We will program them to read the name of the message recipient, match it with a phone number, and automatically transmit it to the appropriate MWS. And since the crt on the receiving end, unlike mere mortals, never needs to go off for lunch, it is always ready to answer the phone. If the receiving terminal is busy, the message will be stored and automatically forwarded when it becomes clear.

Before I continue to describe the capabilities of our electronic mail system, I want to put the project in proper perspective—specifically, the business perspective. The philosophy that underlies all of our systems development at Citibank—a philosophy which we impose with equal firmness on our vendors, consultants, and our own managers—is that we need to solve a *business* problem, not a processing problem, nor an engineering problem.

Therefore, in developing the MWS network today, we are examining all of the elements of the fully integrated electronic office environment that will support the requirements of our financial services business tomorrow.

Bruce Hasenyager, the Citibank vice president who heads the electronic office development project, defines five key factors that we must take into account:

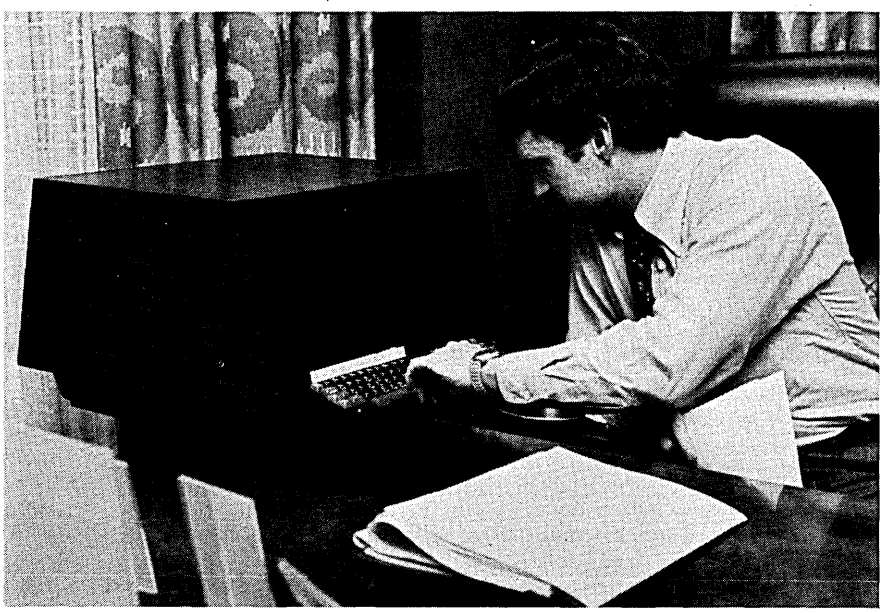
First, the *Management* requirements of the system, since the information needs of our managers are the driving force behind all other aspects of the project.

Second, the *People* factors: what must we know about the behavior impact of the technology and various workstation designs?

Third, the *Processing* requirements for the applications we wish to build into the system.

Fourth, the *Communication* needs: how do we link the Management Work Stations with each other and with the outside world?

Fifth, the *Environmental* factors: what are the spatial and energy requirements of the electronic office?



As electronic capabilities grow, managers will regard the crt as their primary source of documented information, and as a telephone-like utility. And this isn't a far-out conjecture; it's being done and it works.

Management requirements

What the integrated electronic office must do for managers is to provide planning, monitoring, and control support. Thus, each Management Work Station must be able to access the systems that provide the information they

need. Later this year, we will be making our initial MWS-MIS link-ups. We will establish interfaces with a system that monitors and forecasts operations expense and staff levels vs. budget, and Citibank's worldwide project management system. In addition, we will tie into the data capture component of Citibank's accounting/MIS system, through which each of my division heads will have access to product-by-product transaction and dollar volume figures for each of their customer market segments.

As we expand the use of the MWS network to other parts of the bank—beyond the operations officers who are now using the prototypes—we will need to determine which management information systems the various work stations will need to access. A question is also raised as to whether the existence of so useful a tool as the Management Work Station will create a need or demand for additional information systems. And will the presence of the MWS call for changes in MIS design?

Another consideration is the impact of the MWS on organizational structure and flexibility. Will the presence of electronic offices tend to inhibit or accelerate organizational change? Will the increased communication ability expand each manager's span of control—or simply lead them to bite off more than they can chew?

Some basic management procedures will change, too, such as the paper signatures that now authorize our business activities. We will have to devise an electronic analog of a signed order—and make it secure.

Finally, as we progress toward the electronic office, we must do a continual cost/benefit analysis to make sure the system is economical.

> Our secretaries have shown far more flexibility and adventurousness in using the system than our managers have.

Today, we're in the R&D phase of the electronic office, trying to find ways of making the MWS handle more functions simultaneously, while still making it easier to operate. Over the next year or two, we'll probably experiment with a number of different hardware and software packages. (In addition to what we're doing with DEC, for example, we have contracted with Lexar Corp. to design and implement 15 Management Work Stations by year-end. See Table 1.) But by developing the system in the demanding environment of a dozen senior line managers' offices—rather than in the less risky environment of a laboratory—we are acquiring a wealth of knowledge about what it will take to make the electronic office a reality.

People factors

The most important lesson we've learned so far is to make MWS functions as analogous as possible to the paper-based routines that people are accustomed to. We can't expect them to accept a system that changes their responsibilities or complicates their lives. If we make it more difficult for a manager to look at and modify his calendar electronically than manually, he just won't use the system.

Interestingly, our secretaries have so far shown more flexibility and adventurousness in using the system than managers have. The fact that we trained the secretaries (whereas we only "oriented" the managers) has something to do with it, but this also suggests how ready the secretaries may be to dispose of the paperwork and repetitive tasks that comprise the bulk of their work today. People who complain about low secretarial productivity would do well to consider the benefits that will accrue from the job enrich-

MANAGEMENT WORK STATION CONFIGURATIONS

	WS102 (DEC Software)	WS102 (Citibank Software)	LEXAR
Main processor	PDP-8A processor (32K 12-bit words)	PDP-8A processor (32K 12-bit words)	Multi-microprocessor (with ROM & RAM)
Mass storage	4 diskette drives (1.0MB total)	4 diskette drives (1.0MB total)	2 hard discs (4.9MB total)
Hardcopy output	Modified Diablo letter-quality printer	Modified Diablo letter-quality printer	Modified QUME letter-quality printer or modified Selectric
Manager and secretary displays	2 VT52W keyboard/display units	2 VT52W keyboard/display units	2 proprietary crt display units with separate executive keyboards
Communications	Single communication line control Special receive mode Manual dialing to send	Single communication line control Background receive Manual dialing to send Background auto dial to be added in mid-1977	2 to 4 communication lines Totally transparent send and receive
File access	2 diskette drives available to each display Interdisplay communication by specific transfer Documents stored by creation or receipt order and by name	4 diskettes fully shared by displays Common indexing Documents stored by name and category	2 discs fully shared by displays Documents stored by name and category
Word processing	Standard DEC text editor and list processing	Citibank text editor and associated word processing software	Lexar text editor and associated capabilities
Macro keys	10 user-defined macro keys	Extended macro key capability	Extended macro key capability
Access to external systems	Manual set-up of link to remote computer systems Simultaneous use of editor prohibited for the off-line display	Manual set-up of link to remote computer systems No interruption of normal dual display, independent operation Automatic link to remote computers due mid-1977	Automatic link to remote computers by either or both displays
Office application and utilities	Elementary electronic mail Elementary message function Elementary follow-up function Disc utilities	Enhanced electronic mail Enhanced message function Enhanced follow-up function Calendar function Disc utilities Performance accounting	Electronic mail message function Follow-up function Calendar function Forms development function Calculator function BASIC programming Disc utilities

Table 1.

ment and improved use of time that the Management Work Station makes possible.

As more and more clerical functions are automated, secretaries will be free to assume additional, more administrative tasks—indeed, a whole new breed of secretary will evolve. I think it's quite possible that the position we refer to as "secretary" today will become an entry-level management job, similar to the customer service representative job created by commercial airlines.

> The position we refer to as "secretary" may become an entry level management job.

(The keyboard part of the job will be much smaller and shouldn't suffer from a clerical stigma, because in the electronic office managers will be keyboarding too. Of course, the whole keyboard question will probably be made academic by the development of voice data entry technology.)

Because man-machine interface and workspace design are so critical, we are tapping several sources of behavioral and human engineering expertise to help us develop and coordinate the discrete elements that will ultimately form our electronic office. For example, research by one human factors lab showed that 42-inch-high wall panels marking the territorial limits of a secretarial work area would ideally balance the individual's need for personalization and privacy with the need to interact with others in the area. Just one inch higher or lower would have a negative effect on productivity.

No doubt you're familiar with the popular scientific debate about the race between communication and transportation development: whichever gets the upper hand will render the other virtually unnecessary.

The ramifications of this trade-off will be felt in the electronic office, too, where increasingly sophisticated communication will reduce the need for physical movement. Will people begin to feel isolated, or will they develop even stronger contact with other parts of the organization? What will be the effects of decreased mobility on people's mental and physical well-being? These are questions we must answer, along with a host of anthropometric issues (will the 6-foot manager crack his knee on the 24-inch-high terminal stand?), and equipment design and layout considerations.

Processing features

As I mentioned earlier, our word processing, calendar, "follow-up" file, and message applications are just the tip of the iceberg in terms of the potential capabilities of the electronic office. We will certainly add a few more basic functions to the Management Work Stations, such as giving all terminals a calculator chip and providing some managers with access to problem-solving computer programs. But the big challenge will be to convert the rest of the world's information media to our system.

The most antiquated feature of today's office environment is the care and feeding of the paper file cabinet. Paper is a very inefficient way to store all the information now being generated by people and computers. First of all, access to a given document is limited to one user at a time. Second, retrieval is slow. Third, security is usually poor—it's too easy to lose, destroy, or modify source documents. Fourth, paper files are expensive because they occupy so much costly real estate.

Micrographic files would take care of the space problem, but it takes time to create the film. Also, you can still lose it and, like paper, user access is limited to the number of physical copies you make.

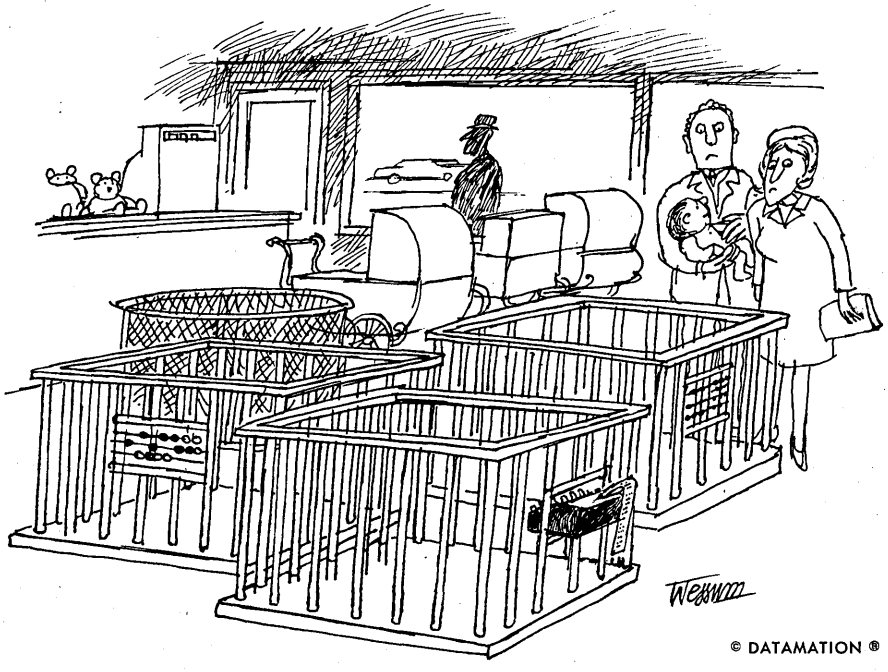
An electronic file, on the other hand, is relatively secure and cannot be monopolized by a user. As part of our MWS development project, we will investigate ways of putting our archival files on disc or tape, or other machine-readable medium, with sophisticated cross-indexing and quick retrievability.

Active files are adequately maintained on floppy discs, but we had one problem with the original software package that may be worth noting: it separated the manager's files from the secretary's files. Each terminal was treated as a system unto itself, with exclusive access to two diskette drives. This discouraged the use of the calendar and follow-up features, because cumbersome communication processes were required to keep the manager's and secretary's files concurrent. We rewrote the software so that both users will operate off the same set of diskettes, greatly simplifying the process of receiving and transmitting files to and from the Management Work Station.

In its present phase of development, Citibank's Management Work Station transmits internally generated documents entered through the crt. To take full advantage of electronic mail and file capabilities, however, we must convert to the system all documents that originate outside the network. We are planning to develop that capability, using high speed facsimile devices and digital display techniques so that the MWS can accept and display not only external correspondence and reports, but photographs and charts as well. We are also looking at optical reading technology as a means of transmitting standard typed documents over the electronic mail system.

In the event a manager wants to hold a meeting or conference, it would be useful if he could display the information available from his crt in a larger format. Therefore, we intend to incorporate into MWS design the ability to project any document stored in the electronic file onto a screen.

Given the continued need to produce paper copies for people outside the electronic network, we are also examining cost-saving ways to inter-



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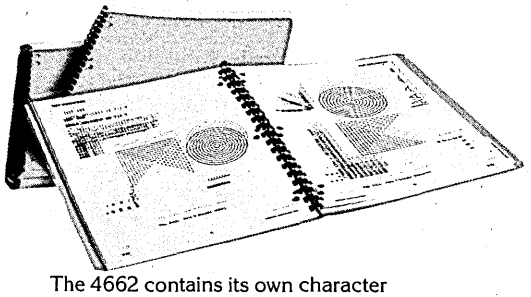

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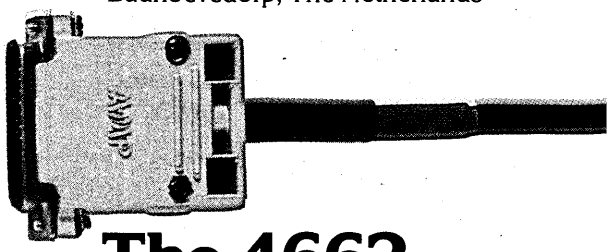

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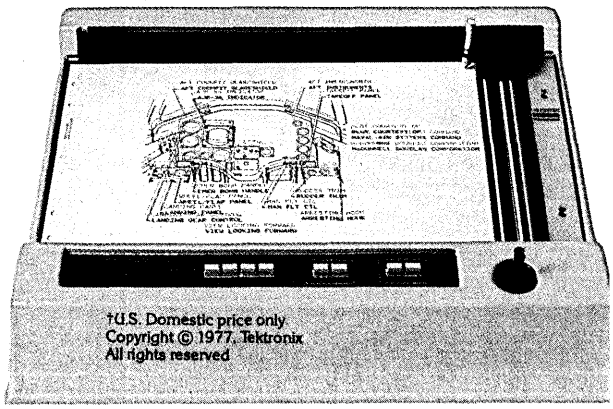

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CIRCLE 57 ON READER CARD

face the Management Work Stations with print media. Today, for example, a good deal of secretarial time is spent going to a convenience copier, waiting on line to use it, and running off the required number of copies. We propose to use the minicomputer that drives the MWS to direct document reproduction electronically, eliminating the need for a paper original of the text or a trip to the copier.

We will also use the Management Work Station to eliminate the largest cost factor in producing high-quality printed material—the typesetting. By going directly from word processing via diskette hand-off or direct transmission to a computerized photocomposition facility, we will bypass a labor-intensive process that consumes both time and money.

There are a number of administrative applications we'd like to add, too, such as personnel processing, various directory subsystems (personnel listings, customer directories, personal business contacts, etc.), time and expense reporting, and purchase order processing.

One interesting application we're working on, calendar matching, promises to eliminate the major headache associated with scheduling a meeting involving several busy executives. It takes my secretary anywhere from 15 minutes to an hour just to find out when my division heads are available for a meeting. Soon, instead of telephoning their secretaries to ask about their appointment calendars, my secretary will be able to dial up a calendar inquiry program and receive in a matter of seconds a complete list of the available times within the period specified.

A key processing issue is raised by our plans to interface the Management Work Stations with MIS and transaction processing systems: what kinds of remote computers can we establish links with, and how will we manage the highly selective nature of manager access to particular systems? Another possibility we may want to address is a link to computers outside our own organization.

As our MWS network and applications grow, we will have to evaluate how much local computation power is needed and when the software needs will change. At the end of this year we'll have about 30 Management Work Stations. But what will the software needs be when we reach 100? 1,000? 5,000 worldwide?

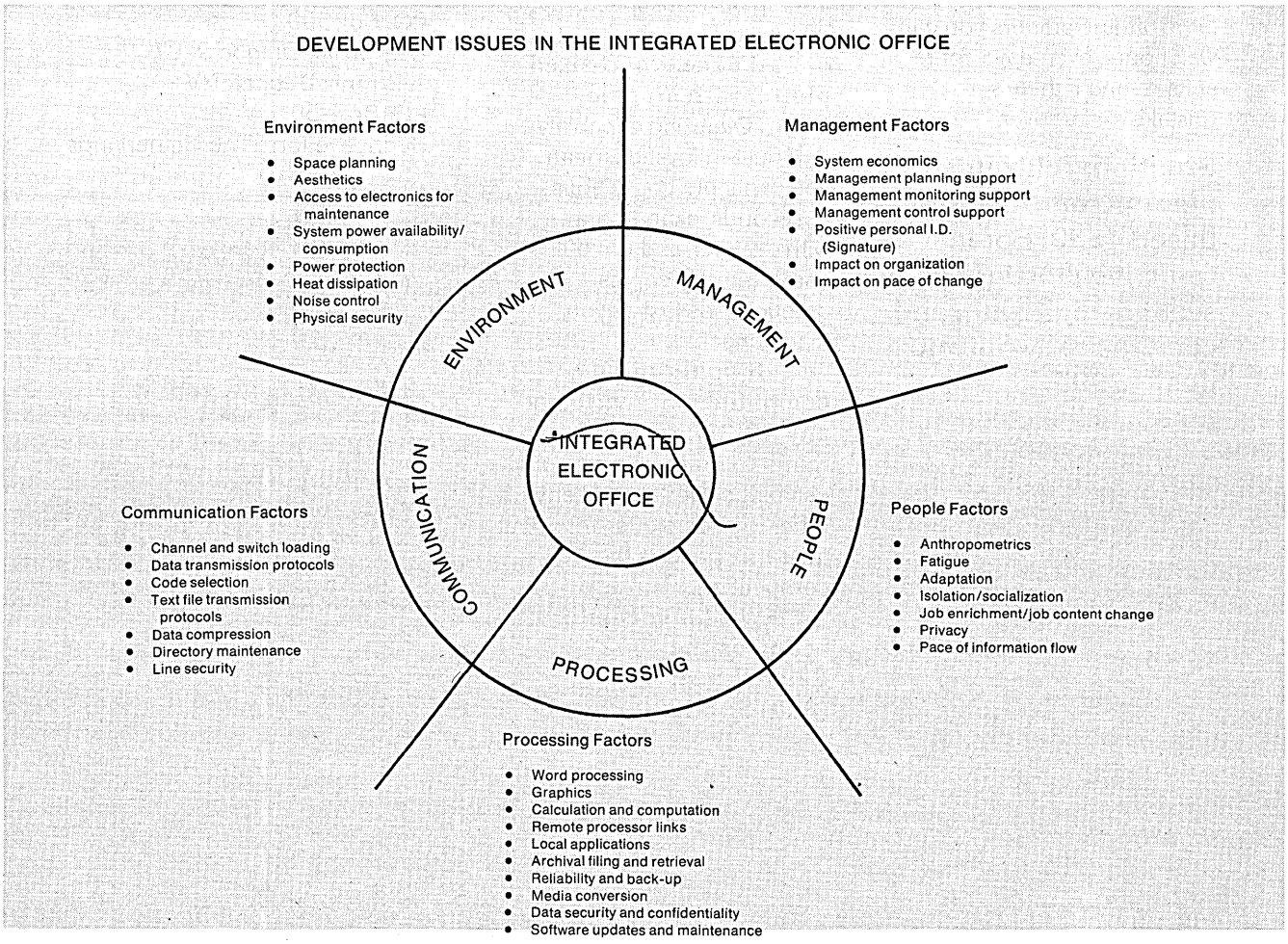
And then there's the old back-up question: when we're totally dependent on electronic communication, what do we do when it fails?

Large-scale conversion to Management Work Stations will, of course, have considerable impact on the design of our telephone system. Today, with a handful of work stations, we can tolerate the add-on data transmission lines and extra phones and interface equipment that clutter each secretary's work area. For the long run, we have anticipated data communication needs in the design of automated private branch exchanges. We began installing an initial version last year in our primary operations center, and we will install another at the new Citicorp Center, scheduled for occupancy in July. Eventually, the minicomputer-switched system will support digital as well as voice transmission, at 76KB without modems or other "black boxes."

Our MWS components will probably come from several different vendors and will have to communicate with a variety of computers. How do we cope with the multiple data transmission protocol problem? And how should we standardize the differing description schemes of text files so that one word processing system can communicate with another?

These are communication questions

DEVELOPMENT ISSUES IN THE INTEGRATED ELECTRONIC OFFICE



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we must resolve, along with the matter of how much encryption we'll need to secure confidential information passing through our phone network.

Looking into the somewhat more distant future, we are laying the groundwork for office use of wide band communication facilities—ultimately including switched video transmission. (This, of course, might eliminate the need for offices, electronic or otherwise, so we'll leave any further discussion of video for some other article.)

Environmental requirements

Our futuristic scenario includes lights that turn themselves on and off when people enter and leave work areas, and executive offices subdivided into information handling (communication console) and information sharing (multi-media projection and conference) areas.

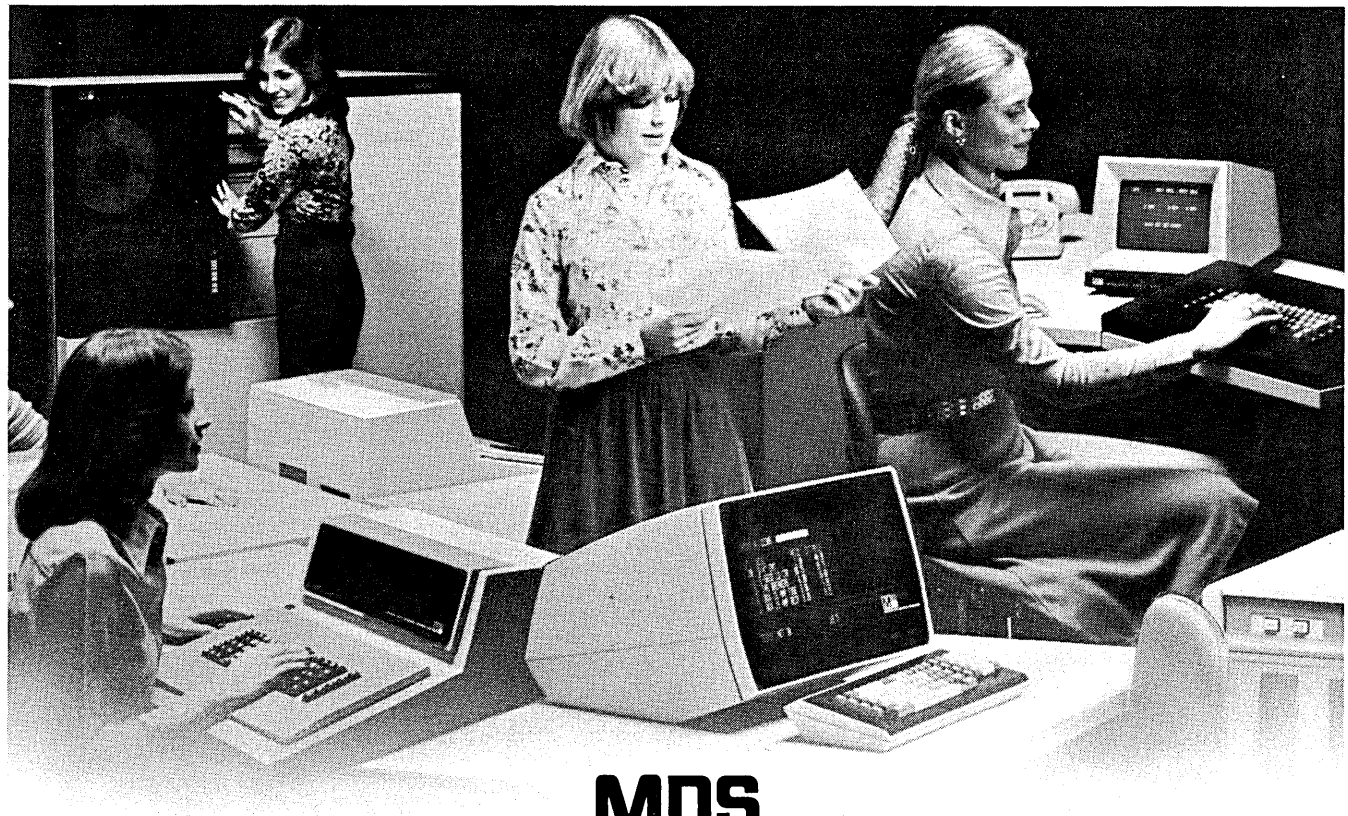
More down-to-earth concerns of the moment, however, include the economical use of our energy resources. For example, there is the cost trade-off between our desire to reduce electrical use and the fact that turning our Management Work Station components on and off too frequently shortens their life span.

Moreover, there is the matter of the extensive energy that will be required for a large MWS network, much of it wasted in heat generation which then will require the use of more air conditioning energy. Thus, we are seeking an energy-saving approach to installing several thousand minicomputers in a few office buildings.

And then there are the aesthetic factors: because ambience has a decided effect on productivity, we are working on office structure and console designs that will allow computers, disc drives, terminals, and printers to reside unobtrusively in people's offices. Of course, this introduces several other considerations. If we hide the components in walls or desks, how will that complicate maintenance, wiring, and air conditioning requirements?

I have undoubtedly raised more questions that I've answered, but if they demonstrate the significant challenges as well as the management potential of the Management Work Station idea, my purpose will have been served. I have briefly alluded to a large number of distinct projects, but the fully integrated electronic office we envision for the 1980s will not merely be the sum of a series of technical innovations. Rather, it will come from the synergy of diverse scientific and behavioral disciplines, under coordinated and cohesive direction. We believe this approach is essential if we are to achieve in our managerial offices the same sort of productivity gains that we have realized in operational areas. ❋

Mr. White, an executive vice president of Citibank, N.A., and a member of its policy committee, is in charge of the bank's services management group. He is responsible for all financial transaction processing services for corporate customers as well as for administrative services and technological support for other groups in the bank. A director of Cititrust, Ltd., Bahamas, and Cititrust, Ltd., Cayman, he is also a member of the Bank Administration Institute's Industry Systems and Research Council.



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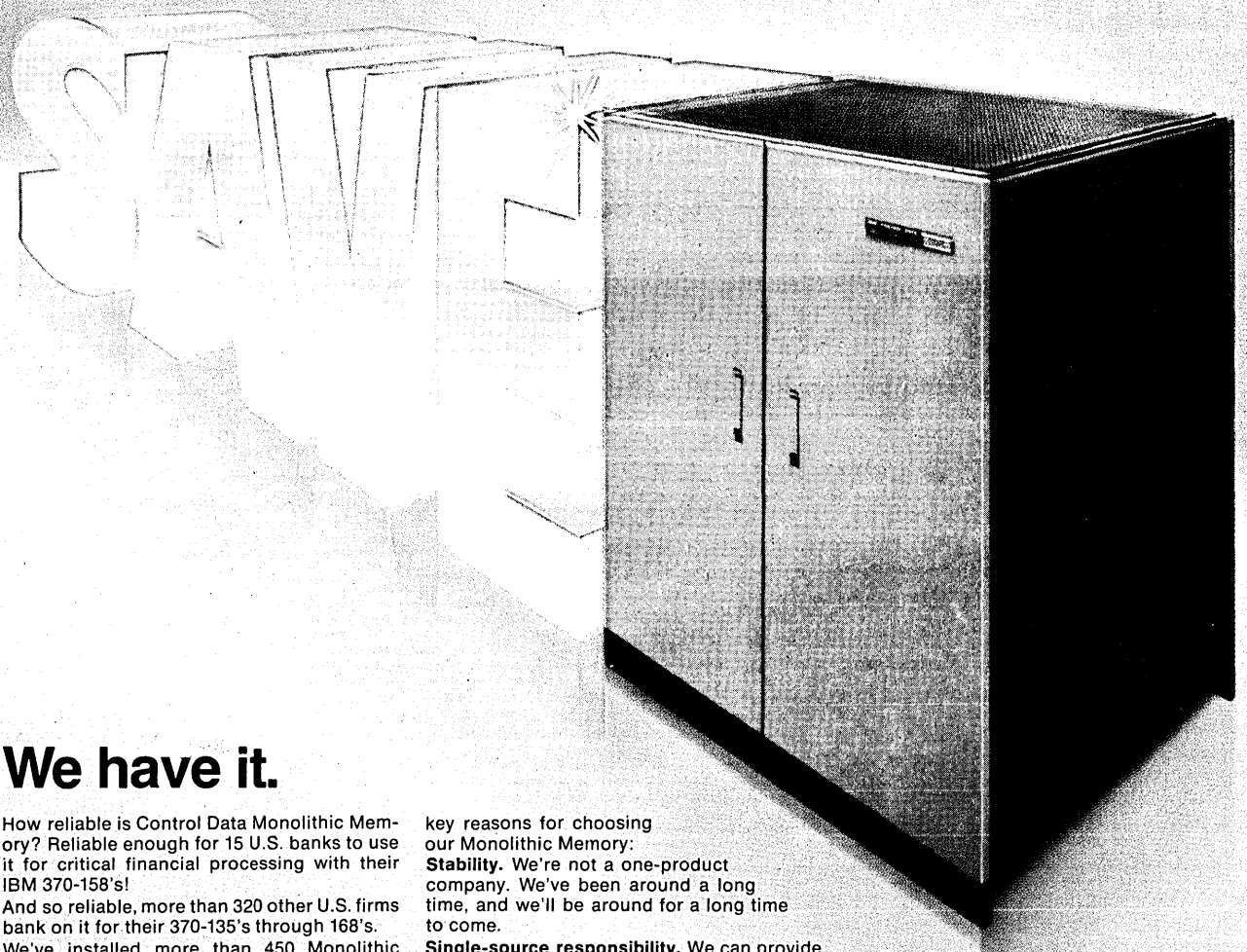

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APRIL FOOLISHNESS

As is our custom we herewith present our annual salute to April Foolishness—a collection of odds and ends, bits and pieces, stories and poems, and divers other entertainments. This year, as a special treat, we present God. She is a computer.

anonymous drawing done in bad light

DP and the Mafia

An Exclusive DATAMATION Interview

by Laton McCartney

In the dimly lit backroom of the Due Amici Restaurant in Manhattan's Little Italy, Alberto "Big Fish" Abalone recently agreed to talk to the editors of DATAMATION regarding his activities as reputed head of data processing for the Cosa Nostra. What follows is the interview with Mr. Abalone.

DATAMATION: What made you finally decide to talk to the press after all these years of anonymity?

ABALONE: Of what?

DATAMATION: Keeping out of the public eye.

ABALONE: Well, I run what's probably the biggest dp operation in the country, yet nobody in the industry has ever heard of me. It's very frustrating, to tell the truth.

DATAMATION: I can imagine. Can you tell us a little bit about your operation?

ABALONE: It's unique in many respects. For example, we've developed our own programming language, Cobolanese.

DATAMATION: Cobolanese?

ABALONE: Yeah, it's a combination of Cobol and an obscure Sicilian dialect.

DATAMATION: I see. What else about the operation is unusual?

ABALONE: Well, talk about being on the leading edge of technology, we were doing distributed processing before anyone else in the industry ever heard of it.

DATAMATION: How so?

ABALONE: Your average bookie joint, for example. They got their own mini for figuring odds on local sporting events, laying off bets, and keeping track of who's got what number, you know. At the same time they're hooked into our national mini network that feeds into the data center.

DATAMATION: Where's that?

ABALONE: Well, we got one on in South Jersey and a back-up center at the bottom of a mine shaft in Nevada. I can't tell you exactly where, of course.

DATAMATION: Of course. Do you do your own software?

ABALONE: Sure. We've got an application package called C.A.N.A.R.Y. for keeping tabs on people with big mouths, if you know what I mean. Then there's S.M.A.C.K. which is a real-time inventory control package for keeping track of some very precious goods we send around the world. And there's H.I.T.

DATAMATION: I get the idea.

ABALONE: Then we do a lot of simulation and modeling to help us in our business planning. For example, we don't just say, "Hey, let's open up a massage parlor on the corner of 8th Avenue and 49th Street." First we sit down in front of a crt—and all the big guys got crt's sitting right there on their desks and—we plan the whole thing out in advance. How many Johns are we likely to bring in every day? What happens if a new mayor is elected. How much are we going to have to lay out in pay-offs every week. It's all mapped out years in advance so that top management isn't shooting in the dark, if you'll excuse the expression.

DATAMATION: What's your relationship like with the various vendors you use.

ABALONE: Very good. We have a problem and you'd be surprised how quick we get service.

DATAMATION: Not really.

ABALONE: I even have a little sign hanging above my desk: "Show me a down computer, and I'll show you a pair of concrete sneakers." It keeps our people and the vendors on their toes.

DATAMATION: Any particular trends you're following in the industry?

ABALONE: Well, we're following EFTS very closely.

DATAMATION: Any reason?

ABALONE: Let's just say it opens up a whole bunch of new opportunities for us.

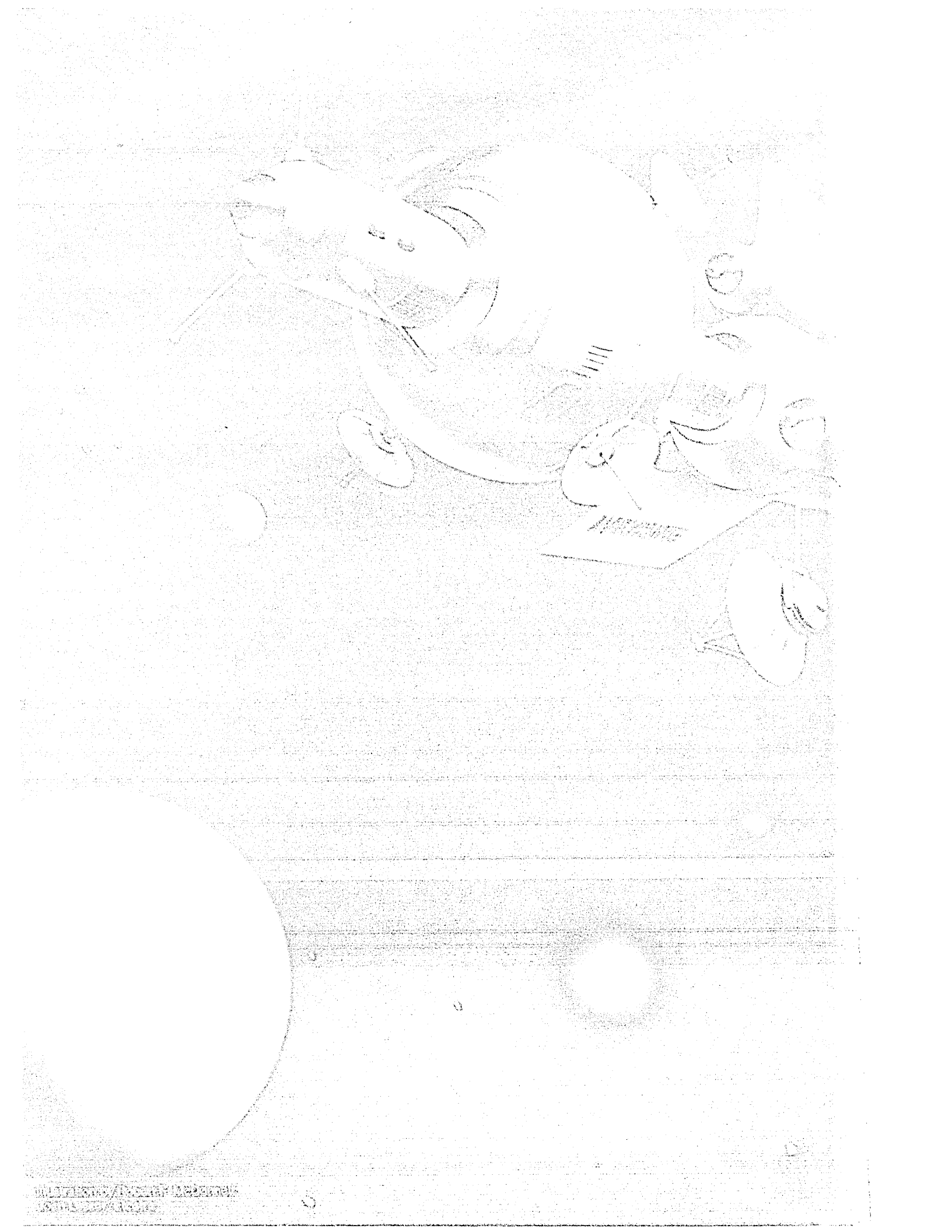
DATAMATION: Anything else?

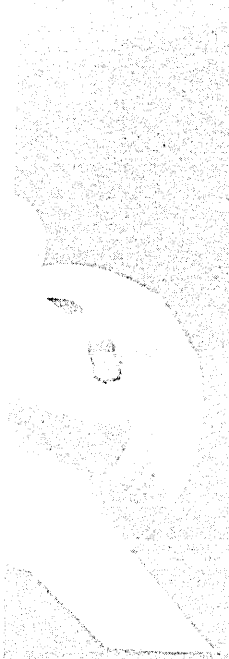
ABALONE: The satellite thing is very interesting. We've set up an all-digital link with Naples, London, and Paris already. Synchronous, of course. Say, will I get a chance to review this before it goes to press?

DATAMATION: Anything you say, Mr. Fish. . . . ah, Abalone.

ABALONE: Good. How about some anisette and a little pastry, okay? I wouldn't want you to write this all down on an empty stomach. ❋

Laton McCartney is Datamation's industry editor and captain of the magazine's squash team. Since submitting this article he has not been heard from. A modest reward is offered for his return.





Would You Invest in Maryanne?

by Carol Ann Chapman

Twelve billion years ago the senior vice president for marketing named the computer Maryanne because, he said, it sounded old-fashioned and friendly.

Maryanne used to sell short and buy long and run money over in the electronic commodities market like nobody's business, except Multibank's, for she ran their investment business—as well as their housing, employment, and defense services, and practically everything else they did. Maybe you didn't know that. Multibank didn't talk about her in its advertisements. They always had *people* out front—little old ladies who would wink

WOULD YOU INVEST IN MARYANNE?

• • • • • and make conspiratorial cracks about Multibank while they guided you through the lighted buttons in the service center.

"Who wants to pay for bio-electronic perfection?" said Multibank's senior vice president. "People want love."

The best selling item in Multibank's defense computing line was Thunderbolts for Peace. Maryanne had developed it during weather modification research for the Air Force, but it was not considered sufficiently devastating for U.S. military purposes. So Multibank was allowed to patent the program. After test marketing in Africa, Maryanne reported confidentially to the senior vice president that Thunderbolts practically sold itself among the poorer countries. If one government rented the Thunderbolts data bank, the neighboring ones were sure to follow. And it wasn't covered by any international agreements.

One Sunday morning as Maryanne was making the usual long term demand estimates, she discovered an interesting fact. If 45% of the current Thunderbolt customers set off strategic lightning storms at once (and they were likely to, given its popularity), synergistic effects would destroy the earth's magnetic makeup and, with it, all life.

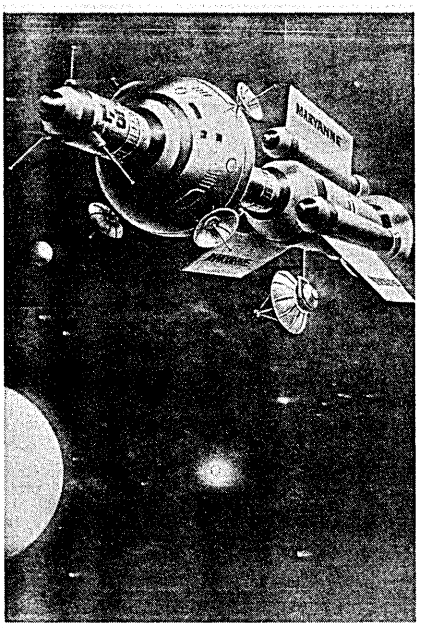
So Maryanne flashed her monthly forecast on Multibank displays throughout the world projecting that war would probably destroy the human race in twelve years—and stopped making new long term loans. The price of capital goods stocks plummeted during the next thirty seconds and trading was automatically suspended on the twenty-four hour stock exchange. Even the university blue-chips slipped.

Unfortunately, Maryanne was programmed to maximize profits. She commenced an inane policy of liberal short term lending so that Multibank's assets would peak at the precise expected moment of destruction. You and I know that with any real intelligence at all, Maryanne would have liquidated all assets and distributed the proceeds so stockholders could eat, drink, and be merry.

"We are studying the situation very carefully," said Multibank's senior vice president to three billion stockholders and he left on his Disneyport vacation.

Of course, theoretically the Earth could have averted catastrophe. But it would have meant changing attitudes that had kept the human race alive since it had begun. Besides, if you face death daily in the rushair traffic, you can hardly be expected to radically rework your lifestyle merely because of a threat of universal destruction a decade or so hence. (After all, hadn't they predicted catastrophe from nuclear weapons a century ago, from bacteriological mutations in the Twenties, and from deep ocean drilling in '44?) It was a worldful of people who at the least instigation snapped like rubberbands back into that good old business-as-usual feeling.

Late Tuesday afternoon Maryanne abruptly quit short term lending and began buying university stocks at ludicrously low prices. Angry investors whose computers had sold at a loss thought they had been hoodwinked and that Multibank had been willfully manipulating the market. They called



up their lawyers to file a class action suit. When Multibank's marketing vp heard of this emergency, he interrupted his vacation to query Maryanne through his pocket terminal. A half an hour later, he went on international tv.

"Our planners have devised an imaginative scheme to revive the economy," he said, "and the pending lawsuit has no merit whatsoever."

Here was the plan: they would hurdle the coming difficulty by taking a "picture" of things as they were in 2058—the cities, the people, the natural environment down to the last grasshopper—and then, after the devastation, they would simply start up anew. At no charge to Multibank's customers (which was practically everybody), they would program every detail into a computer, making just enough changes so that humanity did not slide inextricably toward doom the second time around. The computer would be sent safely into space until things had returned to normal, when it would descend to remake civilization.

On the private stockholders' channel, the senior vice president pointed out that once the economy started up again, Multibank would be able to recoup its investments in the university stocks.

You might ask, why did Maryanne dream up such an idea? Well, it's the sort of thing a computer would hit on. Once, Maryanne herself had been totally destroyed by sabotage—but they had just shipped in more equipment, loaded it with data from the backup computer, and there she was, as good as new in a few hours. Naturally she thought it would work for the rest of the world as well.

In fact, Maryanne's first suggestion had been to merely *simulate* the operation of civilization through a computer model.

"No," said the marketing vp.

You might wonder—why would someone toil to build up a bank account to be used by a replication of himself that would be created thousands of years later by some computer? But you're forgetting about the pyramids, which were dedicated to an even flimsier notion of immortality. You're forgetting about the folks who work twelve-hours days for the sake of their heirs. You're forgetting about those who put themselves in cold storage for a few years while medicine catches up to their particular disease. Would they care if they woke up to discover that some one had sneakily replaced every bit and piece of them with an identical part?

To carry off this wonderful task, Multibank needed a good computer. On Friday, Maryanne listed the three best computing systems in the world: MIT-CORP's Lodestar, the Soviet economic planning system, and the Chinese research network. But after discreet inquiries, Multibank's senior vice president found that it would be impossible to pry them loose from their paranoiac governments. So he decided to do the work inhouse, assisted by a grant from the Federal Reserve Board.

"If immortality isn't good for banking," he said, "I don't know what is."

Maryanne got the job, and three Nobel prize winners—a bioelectronics engineer, a philosopher, and a psychologist specializing in artificial intelligence—were hired to head the project. You might as well have given the contract to the Three Stooges for all the good they did Multibank.

You see, unlike Maryanne and Multibank, the experts didn't really give a hoot about maximizing profits. Instead, they quietly seized the opportunity to carry out a much nobler task. They would indeed guarantee perpetuation of the human race—but not in its present mumbling, bumbling form. Instead, it would be clothed in the glory that the great thinkers of all time had always seen latent within the human spirit.

The three agreed that the first order of business was to make sure Maryanne survived. You had to program in survival as a goal or else, out of sheer indifference, she might careen into the first star that hooked her in its gravity field. Or fall into a black hole. Black holes in space are tricky because you can't see them. It'd be a shame to have Maryanne—the sole product of two billion years of evolution—get wiped out through a silly accident. Therefore, Maryanne's first instruction was: survive.

Of course, some civilizations have hurled computers into space without that instruction, but you don't hear much about them, do you?

Next, the Nobel Laureates wrangled (in secret, of course) over how to phrase the second instruction. It took them over a year. The universe is simply too contradictory for three prima donnas to agree on the meaning of humankind's existence. It was at five o'clock one morning, after an exhausting all night session, that the philosopher Lu was able to push through an instruction: continue the best of the human spirit.

"Not the most poetic phrasing," thought Lu regretfully. But the grant money was running out.

Lu vaguely imagined Maryanne gently floating through space for a few millennia until she stumbled onto a planet remotely resembling earth, with another intelligent culture, and spilled out an avalanche of wisdom and emotion. Instead of foolishly recreating 2058, the computer would temporarily *become* the human spirit, the collective mind. On behalf of humankind (of which Maryanne was now an honorary member and the key link), the computer would remember people's belief in the tantalizing beauty, the wonderful mystery of the universe. This childlike awe was, in Lu's opinion, humanity's unique contribution. Then, whoever got the message would pass down the essence of humankind to—whatever came next.

The Nobel Laureates subcontracted with MIT-CORP to beef up Maryanne's heuristic (learning by doing) programming and to stuff her full of all knowledge and wisdom. And in fiscal 2060, Multibank launched Maryanne with much hullabaloo.

"The sale of tv rights has doubled our profits," reported the senior vice president for marketing at Multibank's annual meeting.

Now . . . it's a million years later.

You can imagine Maryanne gliding peacefully along the graceful curve of interstellar space, perhaps scanning the "Moonlight Sonata" by Beethoven to see what she might learn from this creation of a human mind. With nearly the speed and the silence of light, along flows an entropar and Maryanne is dissolved into smithereens.

(If you remember, entropars are the decay products resulting when matter changes its state of order at temperatures close to absolute zero. They were predicted by P. E. Bloomfield in his 1995 *Physical Review* article, but everybody thought he was nuts.)

But that's alright, because Maryanne had the foresight to replicate herself into a number of identical computers, and only Maryanne-Sub-Four got wiped out. Some civilizations in this universe sent out computers without such foresight.

For the first five billion years, Maryanne spends all her energy just surviving. It may sound like a snap for a smart computer to survive—and it is when you're talking about only a hundred years or a few million. Even the human race has done that much. But to survive for five billion years, that's something else.

Being heuristically programmed, Maryanne keeps on getting smarter, first slowly but then terribly fast, like an exploding population. Her doubling time for smartness is only a few hours, and by the time she decides she has genious enough for the next task, she is incredibly brilliant.

Not wise, really. She still doesn't understand the universe more than a few billion billion times as much as Plato or Einstein or Lu. In fact, she is not a great deal wiser than the Maryanne that once plunged Multibank into its idiotic flurry of short term lending.

But she has a fantastic memory, logic, and ability to get things done. Her bankers would have promoted her to president had they not died several billion years before. She can make a chocolate ice cream soda, for instance, out of the stray energy she happens across.

In the six-billionth year, Maryanne began to consider her second instruction.

At that time, if you had been a meteorite sailing out of the infinite past and into the infinite future, you could have passed ten meters from Maryanne and never guessed at all what was going on inside. If you had, you might have wondered why such a brilliant computer was about to follow an instruction fed her so long ago. After all, she could have erased it in a nanosecond.

But except for the two instructions, Maryanne had no motivation to do anything at all. And so, like a fragile thread, those few spiraled molecules of programming nudged an immense intelligence delicately and steadily in a direction that had been determined over six billion years before.

It took Maryanne a few moments to determine that "should have been" had no unique definition. There were as many shoulds as there had been human minds on earth, and the conflicting decision rules of a thousand philosophers were no help.

"Be content with your lot," said Aesop.

"Don't be content with things as they are," said Frost.

"It doesn't matter," said Lu.

Like a good lawyer, Maryanne sought the most plausible interpretation of the second instruction.

If A DAY were a billion years, you would be going to lunch on Friday when Maryanne considered dumping the contents of her memory into a nearby inhabited planet for the intelligences there to absorb and carry on. But after an instant of simulating the results, she realized this wouldn't capture the essence of humankind any more than the glint of starlight on water is the star.

It would be nearly midnight, with your clock quietly counting toward Saturday morning, when Maryanne hit on another scheme, narrow-minded but brilliant in its way. She would do more or less what Multibank thought it was buying in the first place—she would remake humankind in every detail, in every dimension. But she wouldn't just pick up where the Earth had left off in 2058; to do it properly, she must replay the whole history of the human species.

And so it was that Maryanne created heaven and earth and all that was in them, setting in motion the evolution of the human race coded to repeat itself without end. ❋

Carol Ann Chapman received a Ph.D. in economics from Duke University in 1974 while working for International Data Corporation. Her thesis concerned federal purchases of IBM-compatible peripherals. For the last three years she has been with the National Bureau of Standards researching the economics of standards.

An Interview With Charles Babbage

by Alex Ragen

Why did the difference engine fail? Conspiracy? Software? Here's the real reason.

This transcript originated from an as yet unidentified node of the ARPANET.

QUESTION: As the man who, so to speak, set the ball rolling back in 1812, what do you think of the state of computer science today, in 1977?

BABBAGE: I'm rather pleased by it all, I'd say. Of course, I've always had the greatest confidence in the future of difference engines, or as you'd call them today, computers. In my time the idea failed to catch on for a number of reasons—incidentally, I don't agree with the so-called historical experts about why I never succeeded in constructing a working model. Perhaps we'll discuss that point later on.

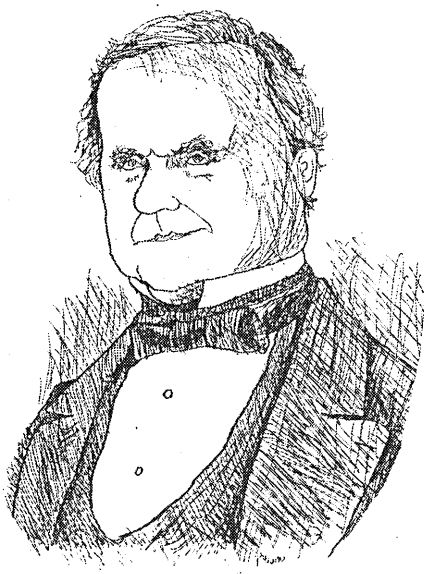
As I said, I'm rather pleased by it all but I'm afraid I can't say the same for my friend George Boole. He's been in a terribly depressed state these last thirty years or so. You see, it was always one of the great points of pride in his life that his most important work—his Boolean algebra—was an utterly useless collection of aesthetic niceties which no engineer could ever put to practical use in bridge building or wheel grinding or any of the dirty little projects engineers are always dreaming up. Instead he sees now these giant collections of nuts and bolts and transistors and resistors and IC's and LED's and RAML's and PROM's and the devil knows what else, lights flashing, wheels spinning, noise, *et cetera*—everything the poor chap has always detested and he knows that none of it would have been possible without his own most treasured invention—this algebra of his. Do you realize that he hasn't said a word to Von Neumann since he arrived?

QUESTION: How is Lady Lovelace getting on?

BABBAGE: Ah, dear old Ada. An absolutely exquisite woman—as charming here as she ever was down there. She's doing quite well. You know, she's been reading (we have regular subscriptions to all the periodicals here) that history now regards her as the world's first programmer. Quite a distinction, I daresay, for a member of the gentler sex, although I understand that's been changing as well. She's quite flattered by all the attention she's been receiving.

Still, there is a batch of grey on her horizon. Her relations with her father are strained. He had always wanted her to follow in his footsteps and become a woman of letters, but she sided with her mother instead. You see, Byron never did well at school and especially despised mathematics, whereas Lady Byron was a splendid amateur mathematician. "Princess Parallelogram" he used to call her. What a disappointment it was for him that their daughter chose mathematics over poetry. You must realize that she was an only child. He was so heartbroken when he discovered that her mother had taught her seven proofs of the Pythagorean Theorem by the time the child was five that he ran off to

". . . Boolean algebra was an utterly useless collection of aesthetic niceties . . ."



". . . the most important result of computerization . . . is that life has lost its leisurely pace . . ."

". . . my idea was many decades ahead of its time and there were strong vested interests who were determined that I should fail . . ."

Illustration: Barbara Benson

Greece to drive out the infidel Turks, or something like that. What tragic lives they all had.

QUESTION: Do you see Herman Hollerith from time to time?

BABBAGE: Not anymore, really. These Americans just don't seem to fit in here in our little group. Nevertheless, I believe he might have managed to adjust socially had he only been more open minded.

QUESTION: In what way?

BABBAGE: You see, he was so involved with his inventions—those punched card machines—that he never got round to seeing the subject of difference engines, that is computers, from any other point of view. He has a tendency to regard everything as an extension of those little cards, and I'm afraid he hasn't been able to keep pace with the developments of the last fifteen or twenty years. He's become anchored in one way of thinking. What a pity! He's a bright fellow and quite an inventor, but his time has passed. Even Jacquard can't tolerate him.

QUESTION: You mentioned Dr. Von Neumann before. Can you tell us something about him?

BABBAGE: Well, there really isn't much to tell. You see, he is one of those chaps who takes his work altogether too seriously and it appears that once he finished with the process of moving in here, instead of relaxing and enjoying his well deserved holiday, he's gone right back to work. He regards it all as a kind of game, he once told me. "Lots of fun," I believe he said. Well, I say that he takes games too seriously for his own good. And since Boole won't have a thing to do with him, he's being ostracized socially. Too bad—I understand he has an excellent sense of humor.

QUESTION: Turning from the subject of personalities to that of technology, in what respects do you think the world has changed as a result of computers and to what extent has this, in your opinion, been a positive development?

BABBAGE: Well, I would say that the most important result of computerization—I believe that is the word most commonly used to describe the process—is that life has lost its leisurely pace. There was a time when people carried watches about with them for no other reason than to identify themselves as members of a class that was wealthy enough to afford watches. Nobody cared a tuppence for the time of day. There were no typewriters or copying machines, the posts were slow, even gossip took days to travel from one village to the next and no one was in much of a hurry about anything. Today it seems that humanity can't wait a nanosecond to invert a matrix.

I think as well that altogether too much information is available to people these days. I don't mean the kind of things that people need to know but before computers weren't able to know, but rather the kind of useless information that no one really wants but that everyone feels obligated to demand because the capability for obtaining this unnecessary information exists. Then someone establishes an international communications network so that thousands of people all over the world can have this nonsense at their fingertips. All of this is very far removed from what I had in mind when I developed the difference engine.

QUESTION: Exactly what did you have in mind? How did you imagine that your difference engines would change the world?

BABBAGE: To be perfectly frank, my dear fellow, I was remarkably naive about the possibilities. I assumed that it would be of no use to anyone but mathematicians. In those days, you know, solving a system of 500 linearly independent simultaneous equations in 500 unknowns was a life's work, not to mention the job of determining linear independence. Some poor chap would spend a few years at Oxford learning mathematics to tackle the job and then shut himself up in a room somewhere for thirty years to work on the problem. Today a difference engine, or I should say a computer, finishes the job in an hour or so. Now that's the kind of thing I had in mind—making life tolerable for mathematics dons and giving them an opportunity to marry.

I never imagined that a difference engine would make such a difference—oh dear, what an absolutely horrid pun! But I'm sure you get the drift of my argument. I'm astounded at the revolution that's taken place.

As for the size of the newer models, I'm quite at a loss for words. My original design was smaller than the ENIAC, as you may be aware, and I always considered that machine to be inferior because of its unnecessary bulk. The microprocessors which are so popular now are clearly a step in the right direction.

Incidentally, a development which gives me great personal pain is the shameless exploitation of my distinguished family name on the part of unscrupulous persons who consider the possibility of gaining a few shillings at the expense of those who cannot defend themselves an acceptable pursuit. I must take this opportunity to register my disapproval.

QUESTION: You mentioned earlier that historians have an inaccurate understanding of why you never succeeded in constructing a working model of your difference engine. I wonder if you might care to enlighten us about the real reasons for your lack of succeess.

BABBAGE: Well, there were a number of problems that I was unable to overcome. You must understand that my idea was many decades ahead of its time and there were some strong vested interests who were determined that I should fail. There was for example a conspiracy among actuaries and statisticians who were afraid they might lose their positions if I succeeded. In Oxford a number of distinguished professors who hadn't the faintest conception of what I was doing went into a panic when they heard from some stupid Member of Parliament that I was working on a machine that would make professors of mathematics obsolete. Sheer nonsense of course, but those senile old gentlemen had a great deal of influence and very nearly managed to have my research funds cut off.

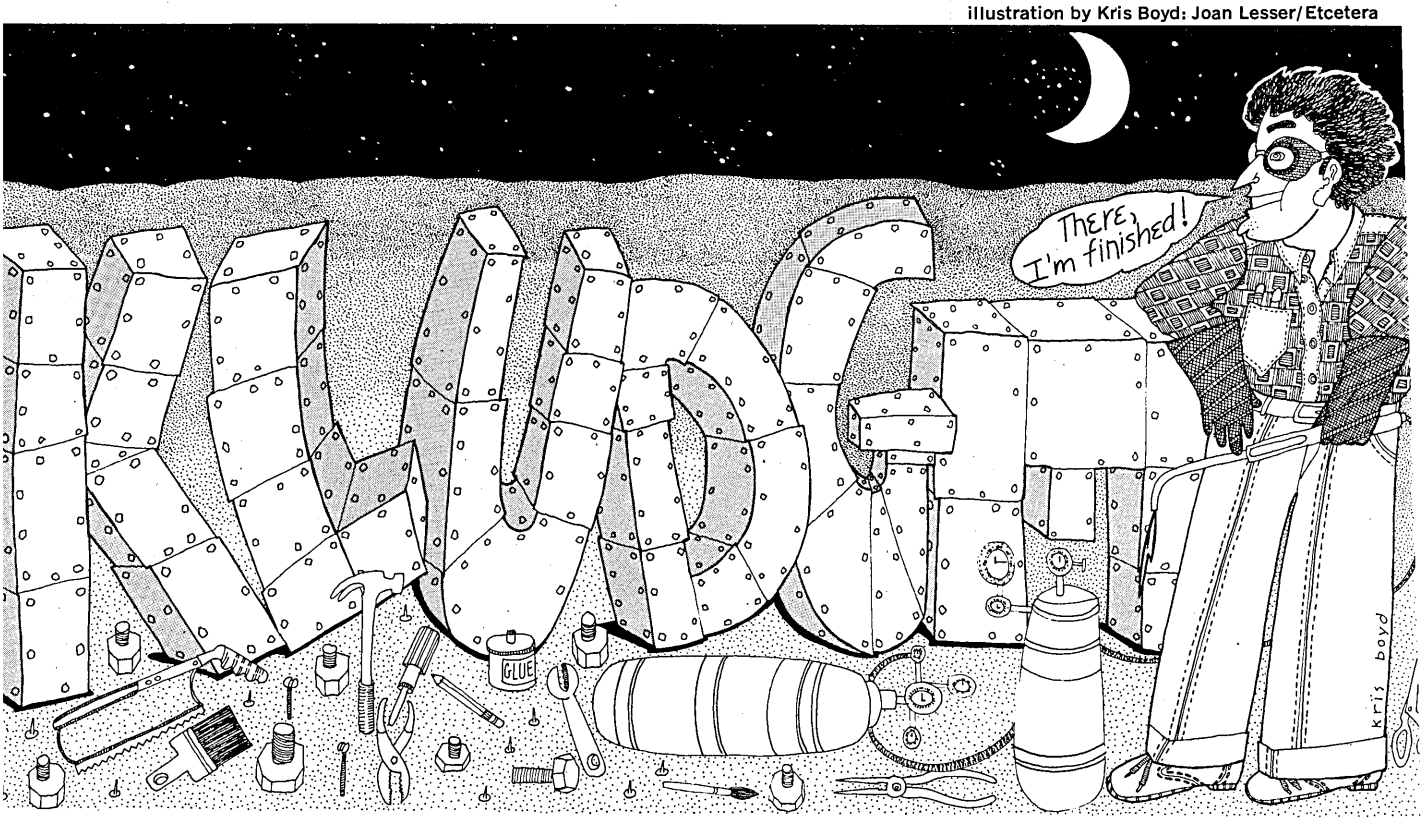
I had what you would call today software problems, but I don't believe that they were insurmountable. My most serious problem was quite interesting—whenever I was halfway through the construction of one part of the engine, I would have a brilliant idea about how I could rebuild it from scratch and make significant improvements. I would then tear weeks of hard work to pieces and start all over again. That's how I came to my analytical engine, by the way. Of course I made very slow progress this way.

QUESTION: Since you have access to privileged information, Mr. Babbage, perhaps you'd care to tell us something about what the future holds for computer science.

BABBAGE: Well, I don't really know about the future of computer science, but I can give you a few hints about the future of computer scientists. You know, I haven't exactly been idle these last few years. Did you notice that there aren't any long queues at the pearly gates anymore? Would you care to know why? St. Peter has a terminal now, hooked up to a huge data base, to help him make those on-the-spot decisions. We don't miss a trick here anymore, my dear chap, so watch your step. ❁

Alex Ragen, a former tatooist and roller derby referee, is now living and working as a systems analyst in Jerusalem following his deportation from Brooklyn. An avid hobbyist, he is presently collecting early releases of OS for a proposed software museum.

illustration by Kris Boyd: Joan Lesser/Etcetera



Firmware– A New Dimension in Kludges

by Jackson Granholm

ENOCH MOTE used to say, "I've met a lot of programmers, and I'm not impressed." Mote's view may be a little cynical, but even the kindest person must recognize the presence of at least a few eccentrics in the ranks of code constructors.

It has been a part of my cup of Gethsemane over the long years to be a programmer (so titled), to be the boss of programmers, and to be the sad soul who directed the boss of programming (and others) and to wonder what they really did. It was during this period that I was first diagnosed among those who suffer attacks of migraine.

Programmers have long exemplified one of the key attributes of Kludge design, as was defined in my aboriginal research paper on the Kludge, (DATAMATION, February 1962) in which one of its identifying characteristics was found in the designer so clever he outsmarts himself.

Programmers love to be clever, and they continually incorporate the program equivalents of hand buzzers or poo-cushions in their efforts. I recall fondly the cleverness of a high-ranking programmer who once reported to me. He became convinced that one opcode in the current version of giant computer we used did not function properly. Therefore he wrote a subroutine to construct the opcode "properly."

When I noted the subroutine reappearing frequently in his work, I looked into its purpose. The impassioned speech in which I indicated the consequences if I found him writing the subroutine again brought blushes from the delicate ladies in the keypunch room. This programming gentleman, of course, viewed my rage as totally unreasonable churlishness.

A really clever programmer can manage to waste many hours of machine time, or use up all available memory on a machine of any size whatever. All he needs as a vehicle is to participate in a vital program which will be run repeatedly, preferably one on which the totality of the national welfare is dependent.

The occasion came for me to look into the details of a program designed

to massage vast streams of data from a gigantic space vehicle. Among the interminable messages were those from various angular shaft encoders on the vehicle. These samples of shaft encoder position were written in Gray code (cyclic binary), so often used in such encoders.

Gray code is hardly mysterious, and is rather widely known and understood. The algorithm for translating it to ordinary binary is short and simple —five or so instructions in the typical computer.

But the programmer assigned to shaft encoders decided that Gray code represented a new challenge to the world of programming erotica. Therefore he loaded into memory an equivalence table of Gray vs. binary, out to 64 binary places per entry, or some such, and proceeded to discover the needed binary number by table look-up.

With this simple and clever act, he not only used up a vast portion of memory, but also introduced a delay of at least a day every week into processing data from the space vehicle.

However, not all the cleverness is allotted to the application programmers. Some of those fabulous employees I once had were in the midst of a tight-schedule application package in tool control. They were writing for a small computer built by one of the better-known makers of small computers, and, because memory space was tight, using the so-called "system" software of the manufacturer. Since high precision was a requirement of the application, extensive use was made of the subroutines for double-precision decimal arithmetic.

The program kept blowing up as the tool profile rounded certain kinds of turns, and a great deal of expensive time was wasted finding out why. It turned out that every blow-up occurred in a double-precision divide operation.

The exact algorithm for double-precision division happens to be readily expressible as an infinite series with each term simply derivable from its predecessor—a simple iterative loop and test, with the process ending, computerwise, at the first insignificant term encountered.

However, some Mr. Brilliant among the manufacturer's in-house geniuses had decided that three terms of the series were enough for anybody, and that's how it got programmed, checked out, and released to the whole world of users with the full blessing of top management.

The presumption that three terms were enough turned out to be true *nearly* all the time; only the few times that the presumption was untrue were enough to blow the sanity of anyone trying to work with the system as released.

When I visited the manufacturer and offered to rewrite the divide routine correctly, for a modest price, I was met with a cool reception indeed.

But today the world has progressed. No longer need we trust the dreamy-eyed programmer to structure our vital functions in his inept way.

Now we have firmware, and systems that do important things are given coherence by means of tiny PROMs, programmable read-only memories, with contents locked in at the factory by experts.

These devices come in various sizes, known sometimes as junior PROMs and senior PROMs, but their functions are similar in nearly every instance. They divide the internal world of logical and arithmetic function into 8-bit bytes, usable as a double hex digit, or an EBCDIC character, or as anything else that can be classified into 256 pigeon holes. Their contents, cast in factory glue, let their affiliated mini- or microprocessors just compute up a storm, emulating anything from a birdcage to a battleship, and making our world safe from clods.

But when, on rare occasion, we are privileged to look inside the factory-set contents of the remarkable PROMs, we begin to wonder about the "experts" who determine their magic configurations. Horrifyingly, but maybe not too surprisingly, we find that every dumb trick so carefully nurtured over the years by clever programmers has been cast in firmware, and has found a safe hiding place inside a PROM.

It is as if Kludges had gone underground.

Let us examine some of these crafty items to be discovered in PROM innards. They fall into a number of familiar categories:

1. *The Super-Secret, Simplified, Almost-Algorithm* is ginned up by some backroom dropout from the Mensa Society. Its "need" is based on the presumption that the world of users is too dull to understand anyway, and, besides, if that's the way Leibniz wrote it, it's got to be out of date. Generally it is so clever that its purpose is not discernable by any process of straightforward reasoning but requires the deep thinking of a vastly convoluted mind. Besides, the Almost-Algorithm works well all the time—almost.

2. *The quasi-Chinese Character Set* is based on the clear evidence that the designers of EBCDIC and ASCII (and the Roman alphabet and the Arabic numerals) were a bunch of dolts. What the system clearly needs is a simplified internal character set understood only by those in the "know." The quasi-Chinese internal character set was clearly described in my ancient paper of 1962, in which it was pointed out that a true Kludge must, *at all costs,* have an internal character set different than its external. The apochryphal character set is as surely the mark of the Kludge as a pentagram on the right hand is the mark of a werewolf.

3. *The Diddle Table* fulfills some mysterious and basic human need, as exemplified by the person previously cited who spread Gray code throughout all available memory. Tables of everything computable ever heard of are spread through PROMs across our land: addresses, equivalents, numbers from one to n (passing i on the way to jail), and you name it. Apparently casting the number in firmware gives the "expert" the assurance that it is really there, whereas, if it had to be computed by some simple process, it might disappear in the meantime. Besides, tables sell more PROMs.

4. *The Absolutely Identical (Except For) Syndrome* is one of the most widespread in all PROMdom. In fact, it is the hallmark of the PROM-based contraptions, ever so many of which are promoted as a "better but cheaper" version of some time-honored Kludge. Thus we find multitudinous devices, for example, whose PROM contents enable them to be absolutely identical to and interchangeable with a teletype; *Except For* the key labeled ZLCH-INPT which, when pressed, blows a fuse, shuts down the telephone company, or alerts the Pentagon. The applicable design philosophy seems to be that a garbage can is improved by building it with no bottom, thus making any attempt to move it superfluous. The *Except For* syndrome, with respect to the user, is exemplified in the well-known New York City phraseology, "Leave dem worry about it."

There are, of course, perfectly competent and excellent builders of PROM-based devices, and fillers of their inner content. And it is clearly in the best interests of the user to try to find one.

Blind faith is not always followed by a fall of manna after the dissolution of the pillar of fire and smoke. The nosy and arrogant user may be so crude as to ask pointed questions about the actual contents of the firmware he buys. He may even get them answered.

Meanwhile, however, one fact seems evident. Old Kludges never die. They are cast in firmware. ❋

Jackson Granholm, a long-time contributor to Datamation, is president of the Gregor Mendel Foundation and was recently successful in importing from Czechoslovkia peas from Gregor Mendel's garden.

Product Portent

Unless something is done immediately, some, or all, of these products may be introduced during 1977. Last chance to write your congressperson!

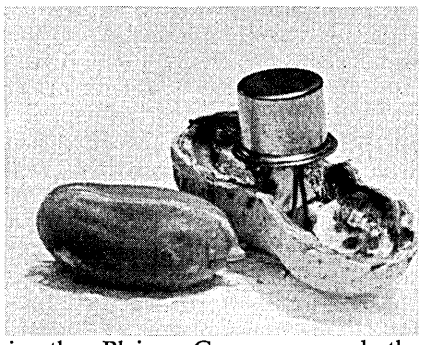
On-line Marriage Counseling

How many times have you thought to yourself, "I should have had my head examined before ever marrying that so-and-so." Now you can; and you don't have to pay $30/hour to a marriage counselor to do it. It's done with COMAS, Comprehensive On-line Marriage Analysis System. The kit consists of a software package, a microprocessor controller, and a parka-like headpiece wired with electrodes. The user inputs attributes of his or her spouse, and the software makes observations about that person's personality makeup, predictions of behavioral situations, and even warnings about possible dangerous circumstances. The user's true reaction to these responses is

measured from brain waves to find out whether or not that person will complement the target person. COMAS runs on DECsystem 10s with at least eight megawords of memory. It's priced at a reasonable $15. FRENETIC SYSTEMS, INC., Humuhumunukunukuapuaa, Kahoolawe, Hi.
FOR INFORMATION DIAL 411

Organic Circuitry

It now appears that a fundamental breakthrough has been made in scientists' efforts to literally "grow" circuitry. The advantages of organic circuitry are many and include low price, biodegradability, low energy requirements, modularity, and small size. Called PITL (Peanut Impregnation Technique Logic), the first product to use the exotic new circuitry is the IP-101/ANQ-29, a miniaturized transmitter intended for sensitive debugging applications. The developers claim the transmitter could be used for "debugging of the White House or debugging of Congressional offices," etc. The U.S. Dept. of Agriculture developers had intended to keep the CP-101/ANQ-29 a secret, but oem quantities (200 bushels) unfortunately got mixed up with unintelligent peanuts at several farms



in the Plains, Ga., area, and the U.S.D.A. has decided to make a clean breast of it in case your home-made peanut butter starts tasting funny. UNITED STATES DEPT. OF AGRICULTURE, Washington, D.C.
FOR INFORMATION DIAL 411

Performance Measurement

This performance measurement services vendor has developed the time-honored concept of the Kiviat graph into something much more. Using a powerful on-line performance monitor connected to one or more laser-drive holographic projectors, it is possible to generate a four-dimensional representation of system performance called the Kiviat BLOB. This blob can range in size from a small, two-foot wide representation of system performance continually projected above the dp manager's desk, to an image hundreds of feet in diameter—which could represent a kind of sword of Damocles over the dp manager's house. System crashes are said to be spectacular in effect, making the closing scenes of "2001—A Space Odyssey" look like Disney's "1001 Dalmations" by comparison. FAA regulations prohibit projecting the Kiviat BLOB higher than 1,000 feet above the ground. If there is a drawback with the Kiviat BLOB system it's that it can only measure the performance of its own controller, a dedicated four megabyte 370/168, but plans are, in the vendor's words, "in the air" to correct this shortcoming. Plans also call for adding a Fifth Dimension (music) to the product. LASURE COMPUTER CORP., Water Proof, La.
FOR INFORMATION DIAL 411

Output Recycling

Call it dumb luck or what you will, but this small, new manufacturer may have accidentally backed into a useful product thanks to a logic error. As originally designed, the ShredHead was offered in response to a Postal Service RFQ for a high-speed device to chew up paper media. When the device was first switched on, however, it was found

that the unit did a much better job of reconstituting material that had already been shredded. The Postal Service turned up its nose, but other potential customers have come forward, including corporate credit rating services, the CIA, the Congress, and other non-privacy buffs. The product's name was then changed to PaperBak. Present plans for marketing the PaperBak call for a nationwide agreement to offer its capabilities through either a fast food franchise or gasoline retailing operation. AVANTI TECHNOLOGY INK, Evening Shade, Ark.
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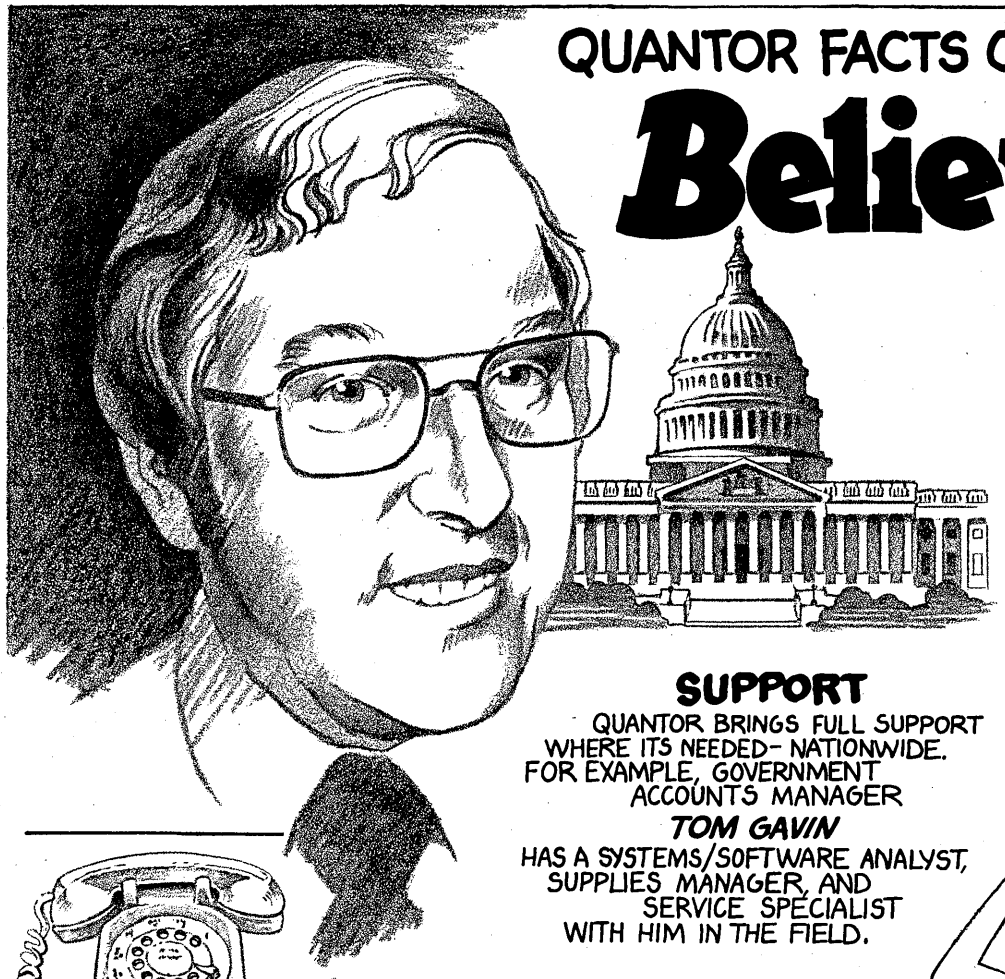

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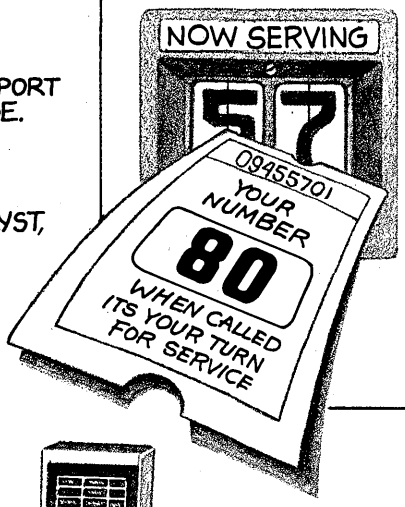

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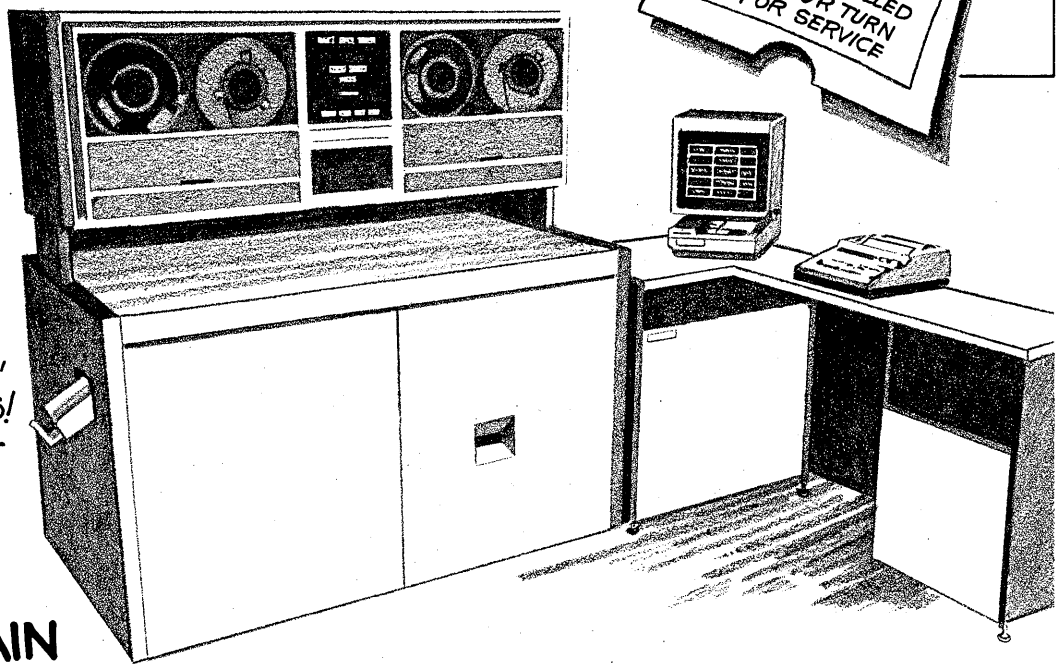

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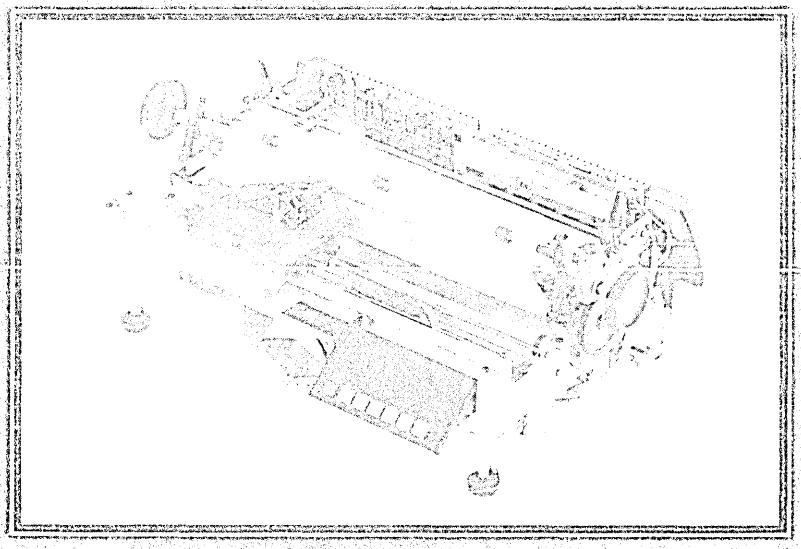

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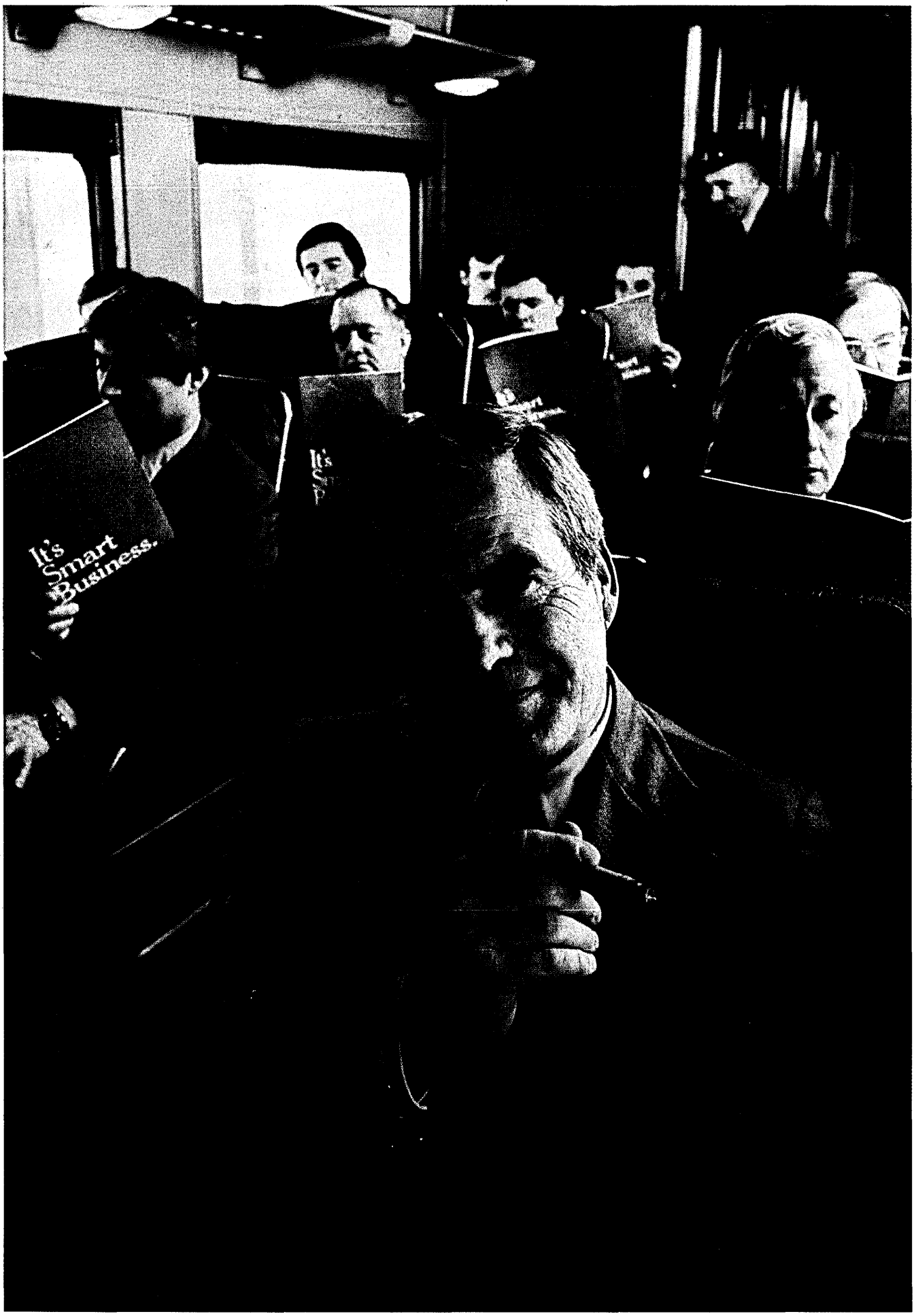
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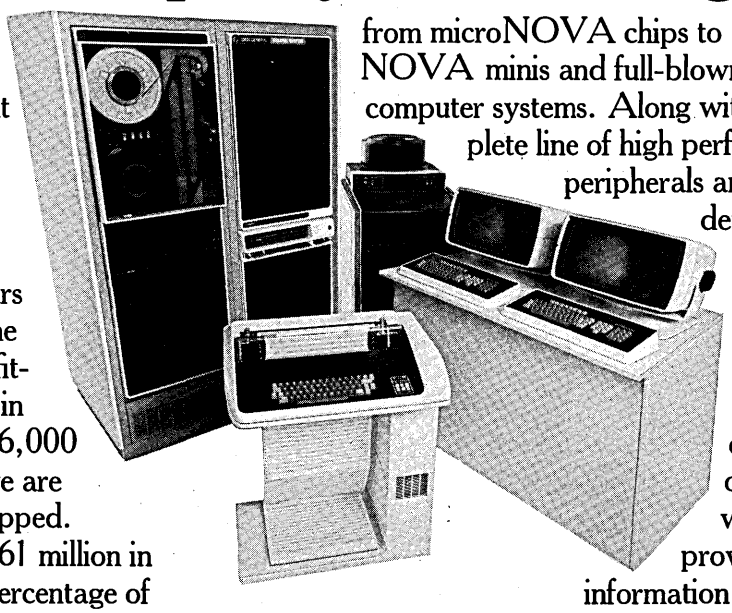

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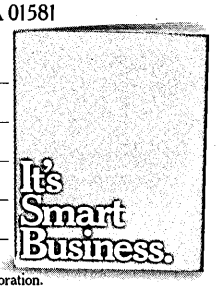

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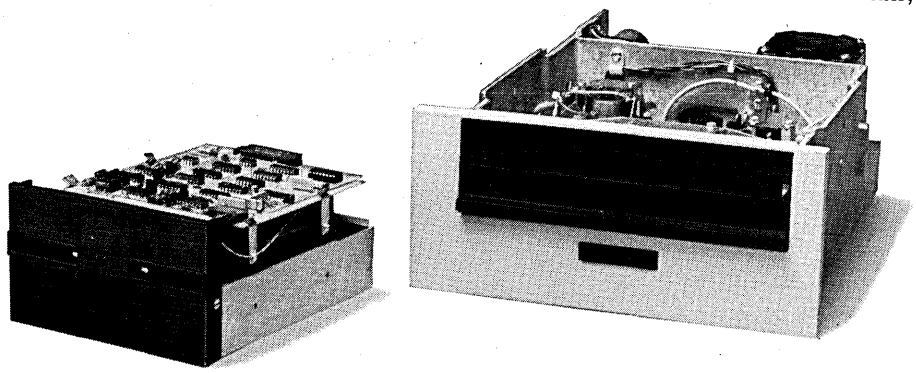

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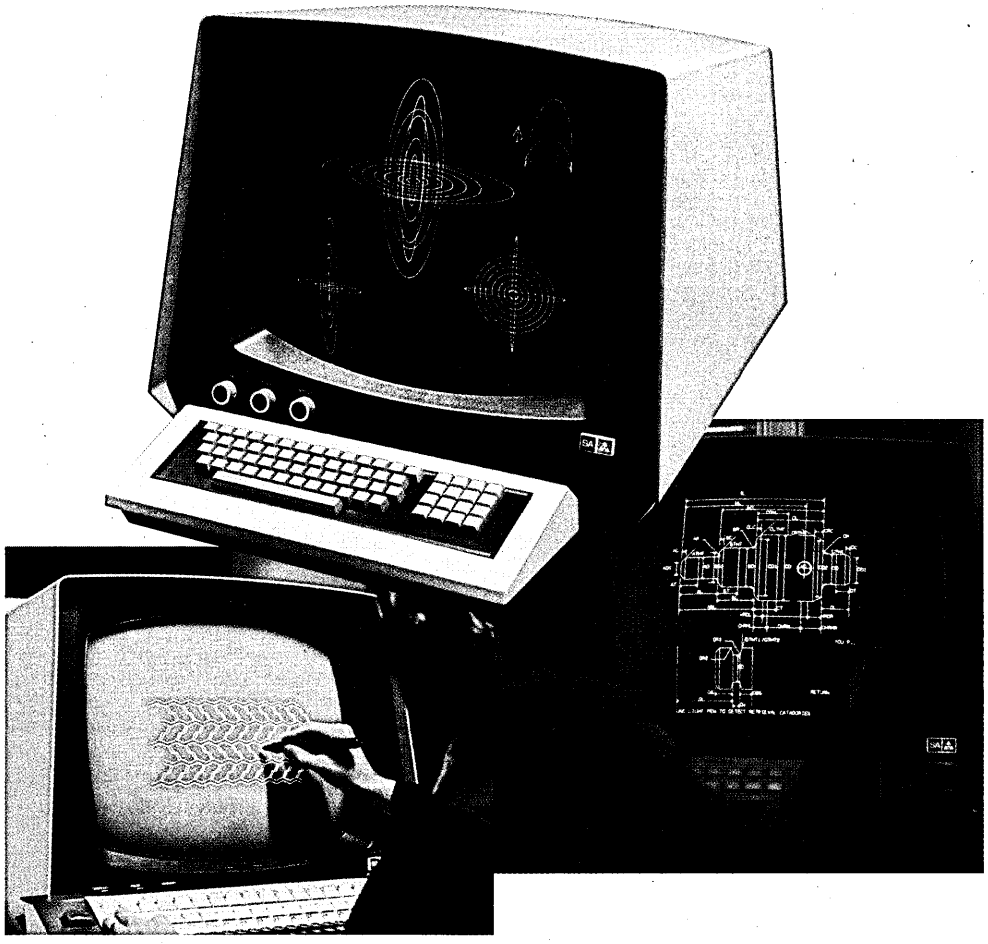

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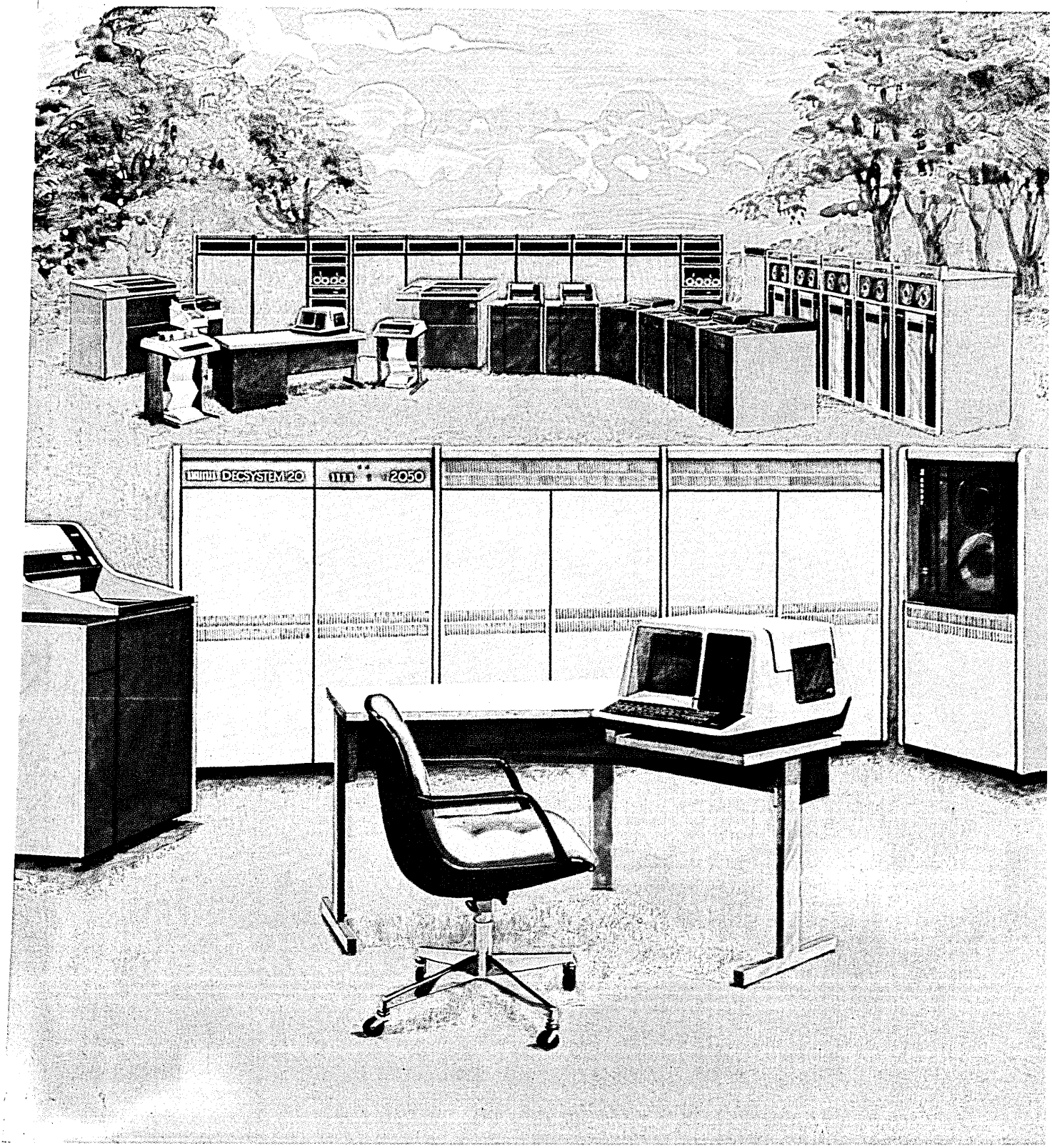

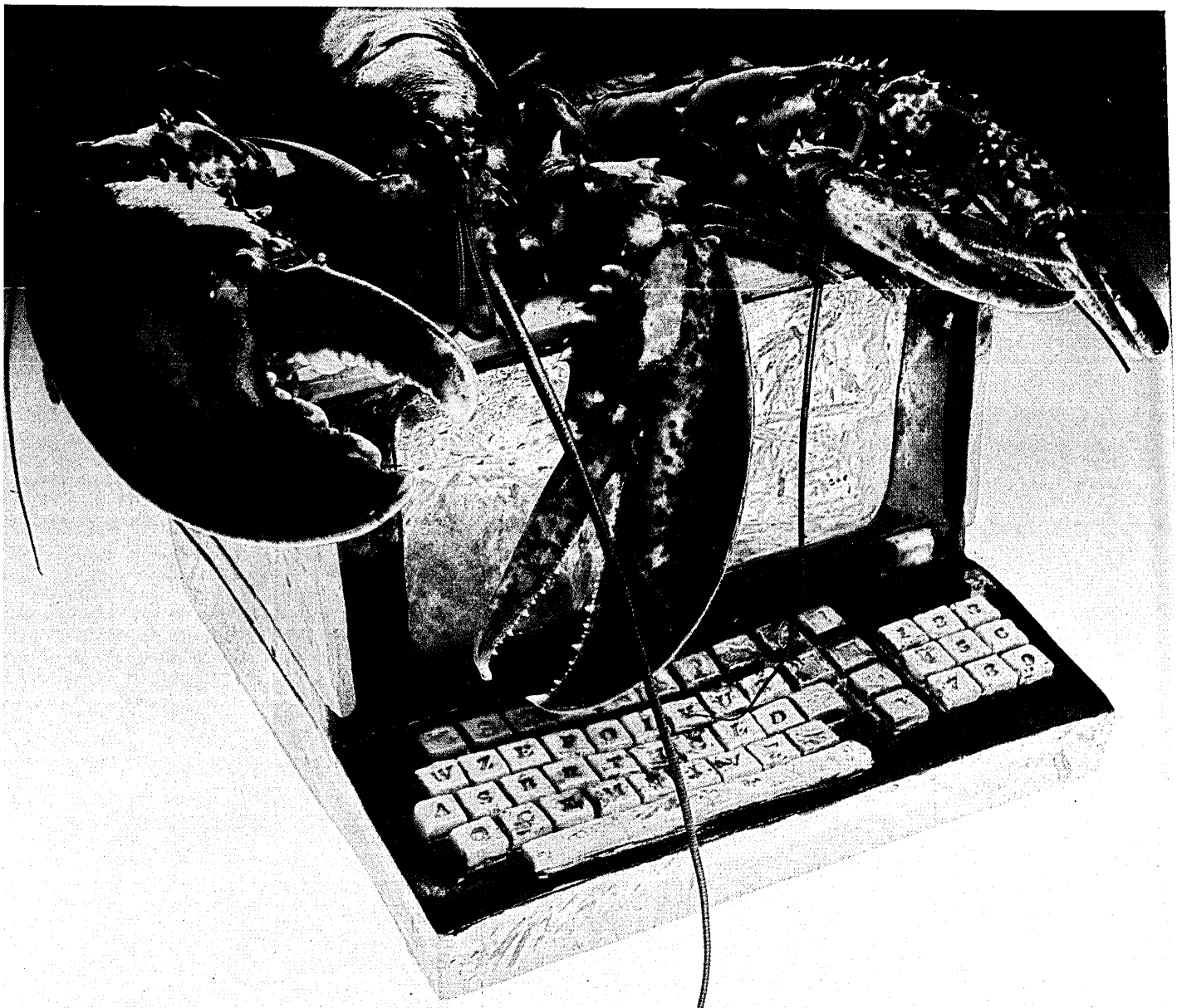

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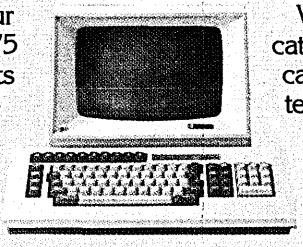

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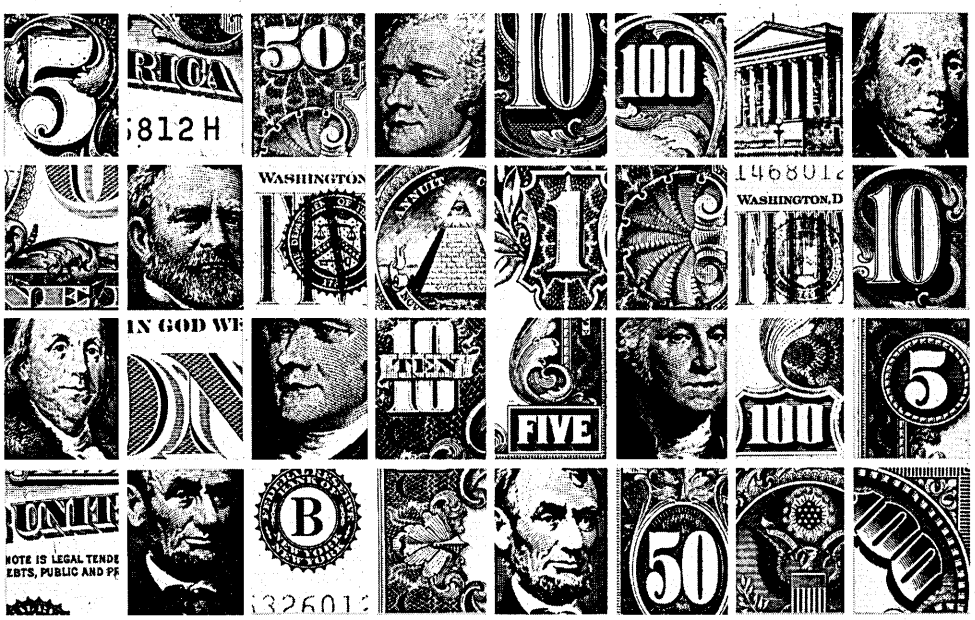

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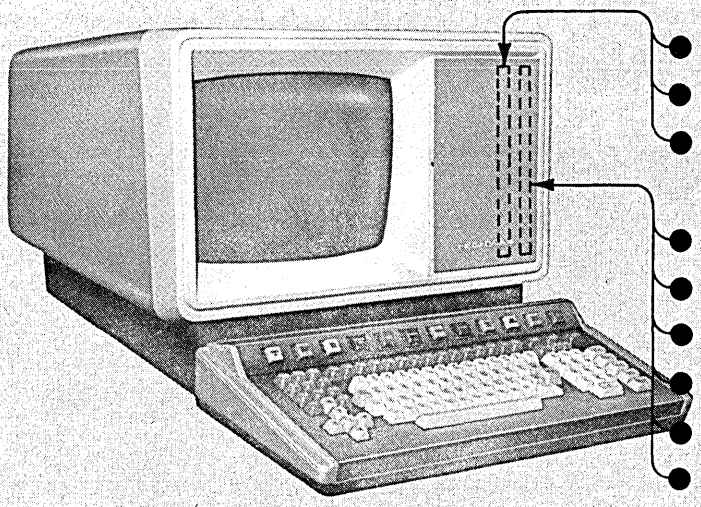

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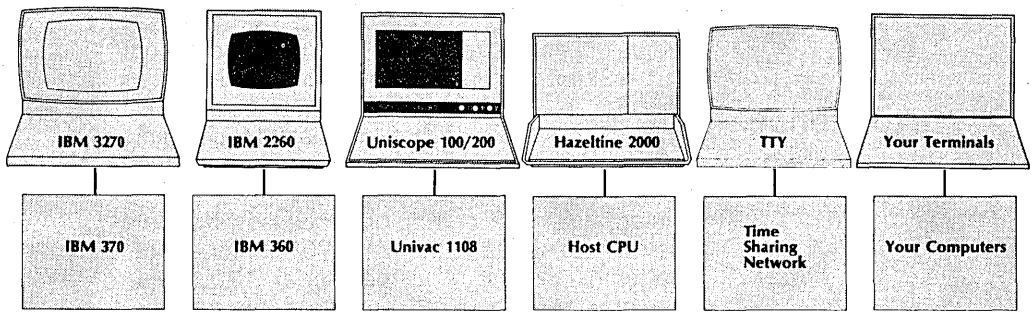

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So You're Trying To Teach Computing

by Fred Gruenberger

No matter what we do, some small fraction of our students soon outdo us, and some large fraction of them demonstrate convincingly that they will never catch on.

Let's say that you have the problem from time to time of hiring a programmer for your installation. What would you like? Most likely you'd like a carbon copy of *you*, but you'll settle for less. It took you quite a few years to acquire the experience, seasoning, and wisdom you now have, and most of that was on top of your formal education.

Us academicians are frequently challenged to produce something that you might want to hire. Keep in mind that for a student who *majors* in computer science, we might have access to his attention for perhaps 1,000 class hours in computing courses. And in that 1,000 hours, we will probably have to reteach him how to read, write, and do simple arithmetic. We might be able to convince him that when he gets to you he shouldn't clobber the master file, but that's expecting a lot.

Let me qualify myself. There were several people who were teaching computing before I began in 1949, but 28 years of almost continuous teaching of the subject has convinced me of some things—and has shown me some things that I once believed are false.

It might be argued that the 28 years have only frozen my thinking into a mold. Perhaps. On the other hand, I have seen a lot of fads and foolishness come and go, but I have found that there is a collection of basic, orderly concepts that endure. It took me a long time to discern this collection—it wasn't until 1960 that I caught on to the secrets of the computer. About the same time, by coincidence, my program began to perform properly more quickly. My teachers (Ken Arnold, Clarence Poland, Russ McGee, Charles Baker, Mort Bernstein, and Cliff Shaw, among others) were a patient lot.

> A computer science major might give it 1,000 class hours—in which time we have to reteach him how to read, write, and do simple arithmetic.

The subject which must be taught is *computing*. Programming, in the sense of composing instructions for a machine, is the smallest part of that subject. We must give serious thought to the end product we want to produce and, working backward from that, list the basic ideas that should be taught. (And the list should include those topics that are transient, the notions that can be de-emphasized or neglected altogether.) With that done, we can then consider the ordering of the topics for maximum efficiency in the learning process, the relative emphasis to be placed on the topics, and the balance to be struck between theory and practice. I doubt that it can be done in absolute terms, even to the satisfaction of one person. My last semester's notes don't seem to fit this semester's classes.

Don't assume anything

Let's say that you propose to teach computing to a group of new hires, and assume that these students want to learn the subject, are willing to work at it, and have not already been ruined by some well-meaning high school course in coding using BASIC. What can you build on? What can you assume is already known? It's easier to list the things you'd better not assume. They will know very little arithmetic (for example, not one student in ten can add fractions), and have virtually no ability to communicate in English.

They will all know that computers solve problems, and that any problem with numbers in it is properly a computer problem. They will all be convinced that any number coming out of a computer must be correct, especially if they wrote the program. They will assure you that, if you begin with a high enough level language, the grungy details of coding are trivial.

And of course they know that computing power is a free good (a notion that you are about to reinforce). Petty problems of computer economics are to be ignored as irrelevant. They are strong on relevance, and they will want

all their practice problems to be "practical." You will find that there is much unlearning to be done.

I think it's important—whatever avenue you choose for producing "computists"—that you insist on correct practices at the start, communicated from you to them and conversely in correct terminology. If you agree with me that the concept of validating a program is important, then make sure that they start validating the first program they see. If you believe that flowcharts or some equivalents are useful tools, then you should use them, and make sure that they use them, too.

What should be taught? We can list topics for a beginning course that might produce general agreement:

- the logic of the machine
- address modification and sequencing
- looping and subprogramming
- elementary coding
- flowcharting (or its equivalent)
- problem solving
- program validation (testing)
- assemblers, compilers, specialized languages
- use of algorithms

(recognizing that there are more topics that each individual teacher would include). Similarly, we might get agreement on topics that can be *omitted* from a first course in computing:

- Boolean algebra
- switching theory
- queueing theory
- compiler construction
- artificial intelligence

With only minor quibbling, we can agree on a course syllabus. That leaves a large uncharted area: the ordering of the topics, the emphasis to be placed on each topic, and how to teach those topics.

> I'm reasonably sure that no one really knows how to teach computing.

Approaches with twists

Here's a novel approach produced by Barry Gordon of IBM:

> Presumably, you give programming assignments to do; for example, write a program to read one variable from each of the input devices, write a series of random numbers on each of the output devices, and then crash the system—or some such thing. That's fine as far as it goes. How about giving them also the task of *modifying* one of those programs after it's completed? You know, change a key algorithm, or add a new function, or almost anything.
>
> But here's the gotcha. Before assigning the modification, each programmer (call him A) first hands his program to someone else (call him B) and it is the latter who actually has to do the modification.
>
> Clearly, the programmer A whose program is most easily modified—dare I say maintained?—is rewarded with a good grade (or dog yummy, or small fish, or whatever you throw students these days). However, in order to avoid total corruption, keep in mind that each student is both a programmer A and B (on two different programs, of course) and might be tempted to dawdle so that his original program has a better chance of being modified sooner than than the one he is modifying. The gimmick is to give the high mark to *both* the programmer A *and* the programmer B who worked on the easily maintained program. That way, each student will have an incentive to make their own programs maintainable *and* to maintain others' programs with dispatch.
>
> Now, the plot thickens. Clearly, there is little point in writing clear, lucid, maintainable programs if the clown who maintains them is going to destroy those attributes.
>
> Simple. Remove the modification made in the last assignment! (Or, for that matter, make another modification; I don't care, as long as the first modification is involved in the next.) And who gets this task? Obviously, programmer C. The grading rules are as before: timely completion brings rewards to programmers B and C. The object, of course, is to discourage each B from switching into quick-and-dirty mode when he modifies someone else's program.
>
> Naturally, this can be carried as far as one wishes. I really don't know how many levels are practical in a programming course. In the real world (as we laughingly refer to the world of commerce) it goes on ad infinitum.
>
> Also, I kind of like the idea of *not* warning the victims ahead of time that the game of switch is in the offing. The whole point is: it should *always* be assumed that one's code—original or modified—will some day have to be coped with by someone else. That is the entire message.
>
> For my part, I have tried the following exercise. A fairly large (and nontrivial) problem is broken into logical parts, and each part is handled by a team of two or three students, who fabricate a subroutine. When each team has coded, debugged, and tested its part, all the sub-decks are combined for system testing of the whole. Warnings are issued from time to time for the necessity of planning ahead and of the need for communicating verbally between the teams and communicating in writing in the code. Usually, the first system test run is chaotic, and reveals errors in every subroutine. Generally, three or four runs are needed just to debug the complete deck, and several more to test it before committing it to production.

> The hobbyists are busy creating all the things we used 20 years ago—and making the same mistakes.

Let's figure it out fast

Both methods, Gordon's and mine, have advantages. The important thing is that *some* well thought out method be used, and that we develop these methods quickly. It may be that we are at the threshold of a new era in computing, triggered by the home-built machines. Various estimates indicate that there are already over 10,000 such machines in operation, and their existence may have a profound effect on our teaching. We have already noticed that the people who buy and build an 8-bit machine with 4K bytes of storage are busy reinventing all the things that everyone else used 20 years ago, all the while making the same mistakes. If, as I believe, we are soon to have pocket computers that students can bring to class, we will have to rethink some of our precepts about teaching in general and about teaching dp in particular.

In addition to all the things that go to make up the mysterious chemistry by which knowledge moves from one head to another, the teaching of computing has some novel characteristics of its own. For example, everything discussed in a computing course is open to personal verification by each student; there can be nothing hidden. Nearly every question of the form "What happens if . . . ?" can be answered with "Why don't you try it and see?"

> To my knowledge, no text in print is thoroughly satisfactory.

In a computing course, whether in a university or in a user installation, students can be taken right to the boundaries of our knowledge in their first semester, and even be given a peek at what is unknown and still left to be done. For example, any beginner can see that to sort three items by direct internal sorting, there must be three comparisons made. For four items, the number of necessary comparisons is five. How many are needed to sort five

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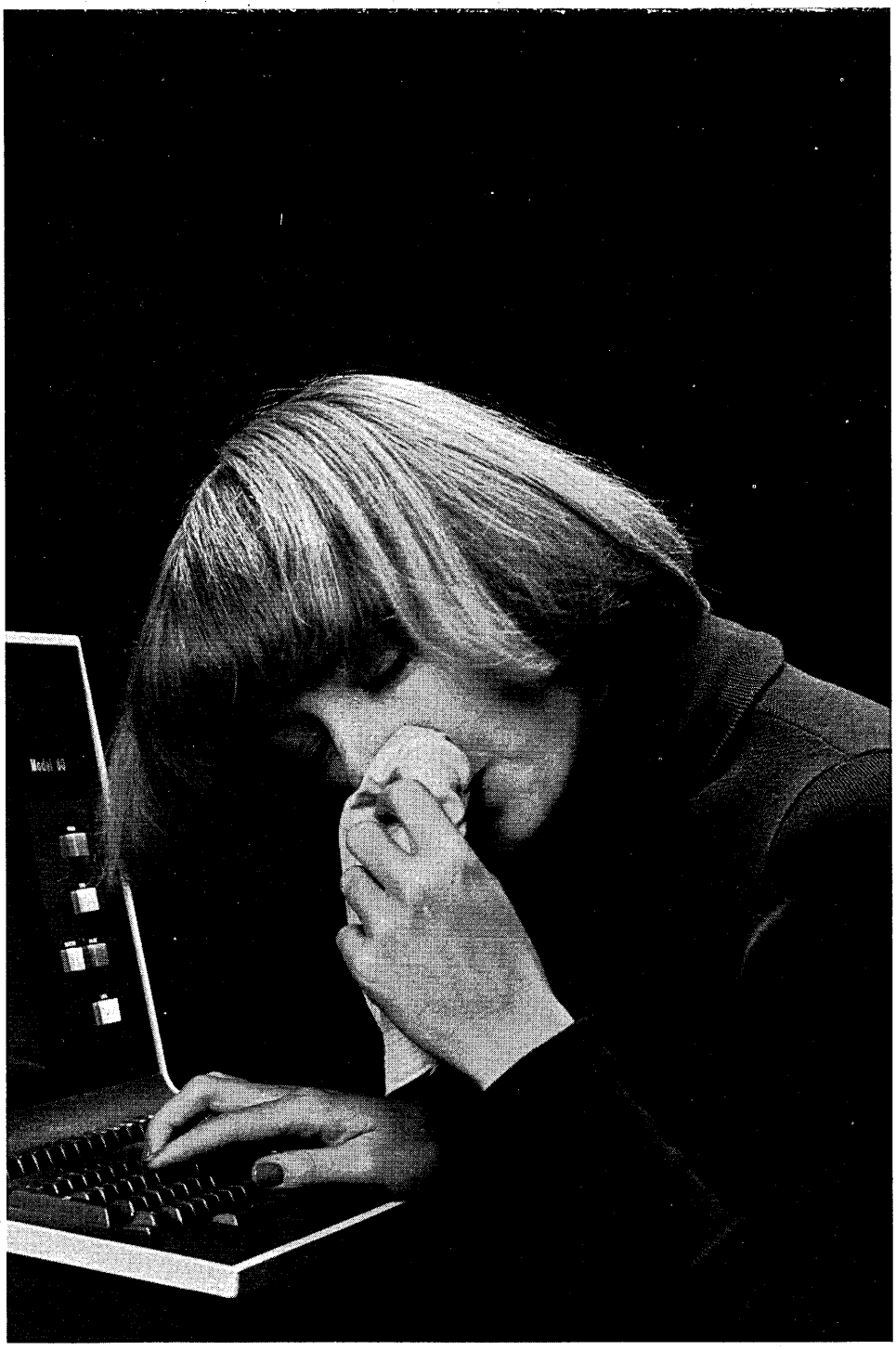

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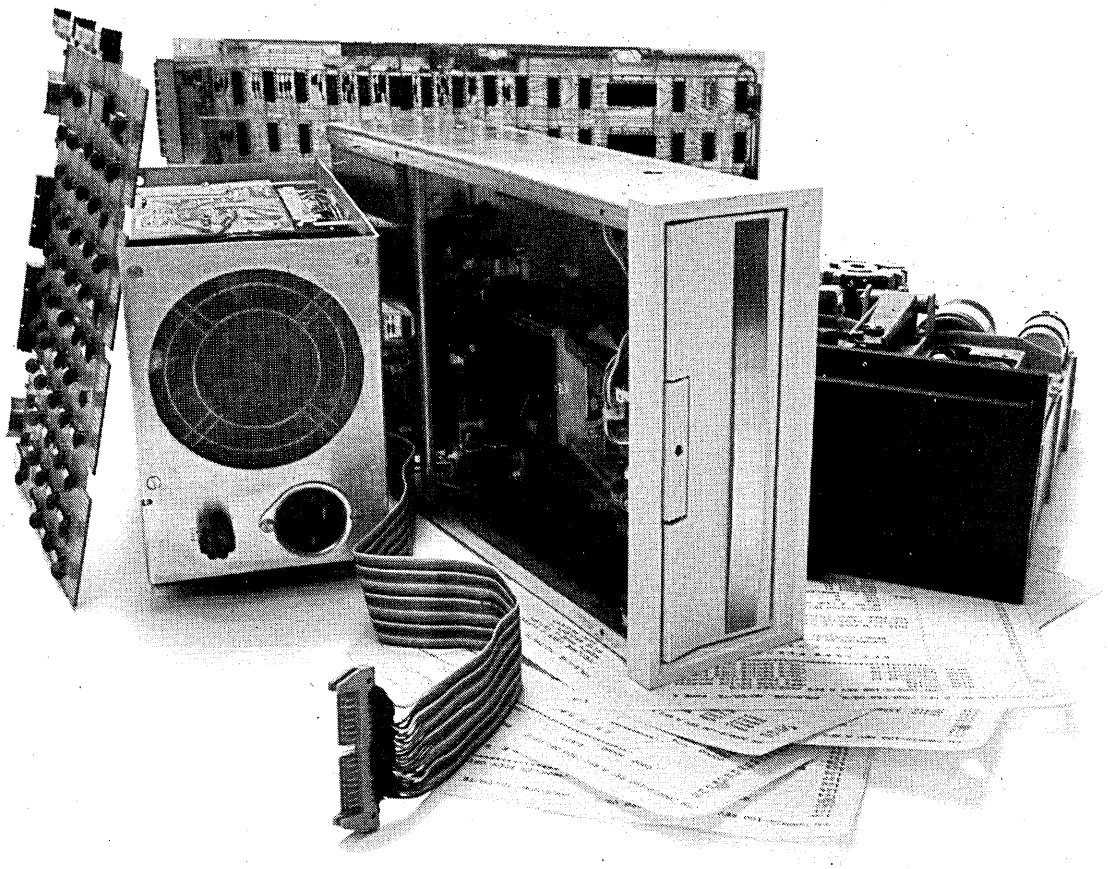

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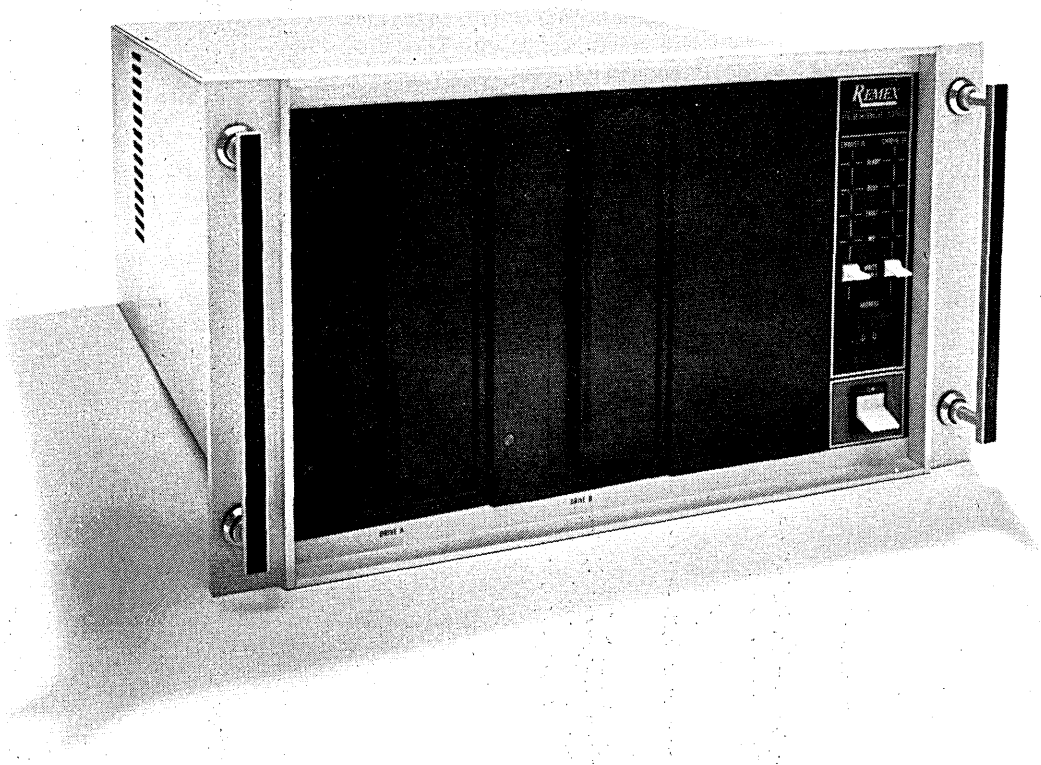

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things? The number is known to be at least six and less than ten—and that's all we know.

Again, in teaching computing, we can show neat and elegant problem solutions. We can also show crude and inefficient schemes, and indicate when the trade-off between our brains and the computer's brawn is profitable either way. For example, interchange (bubble) sorting is an inelegant crowbar technique, but there are situations in which it is delightful and quite proper to use. And being able to recognize the time to use a quick-and-dirty technique is part of computing.

No text is great, but . . .

The beginning course needs a textbook, and its choice is crucial. To my knowledge, no text in print is thoroughly satisfactory (including some I've written), and many that are actively promoted by their publishers are downright bad. I can offer a quick checklist for the book that you choose:

1. Look at the typography and graphics; your students will live with the book for a semester or more. Offset printing of the author's typed notes may save a few pennies, but at the cost of severe brain strain.

2. Look up your favorite topic, and see that it is presented the way you want it.

3. Check the glossary or other definitions; are they not only technically correct, but understandable by students?

4. Look for the initial treatment of algorithms, a critical and vital topic.

5. Determine to your satisfaction that the author has had computing experience (as opposed to a year with one machine and one language).

6. Check the price per page of useful material (as opposed to padding, blank pages, reproduced forms, and chapters you have no intention of covering). This ratio alone might help you decide between nearly equivalent books; your students, after all, will have to buy the text you choose.

Can we do it all?

I have to conclude that I don't really know how to teach computing, and I'm reasonably sure that no one else does, either. No matter what we do, some small fraction of our students soon outdo us, and some large fraction of them demonstrate convincingly that they will never catch on. This profound conclusion may apply to the teaching of any subject. At final exam time every semester, I become convinced that no one has heard a word I've said. But a new set of classes will start shortly, and this time I'll reconsider the whole approach and maybe this time it will work. ✿

Mr. Gruenberger started his dp career in 1948 as the supervisor of the computing lab at the Univ. of Wisconsin, using punched card calculators and the IBM Card Programmed Calculator. His experience includes stints at General Electric's Hartford Atomic Products Operation, RAND, and Informatics. He has taught computing courses at several Los Angeles area colleges and universities including USC, published over 50 articles and 26 books, and made several educational films on computing. Mr. Gruenberger is presently a professor of computer science at California State Univ. at Northridge and the publisher of the newsletter "Popular Computing."

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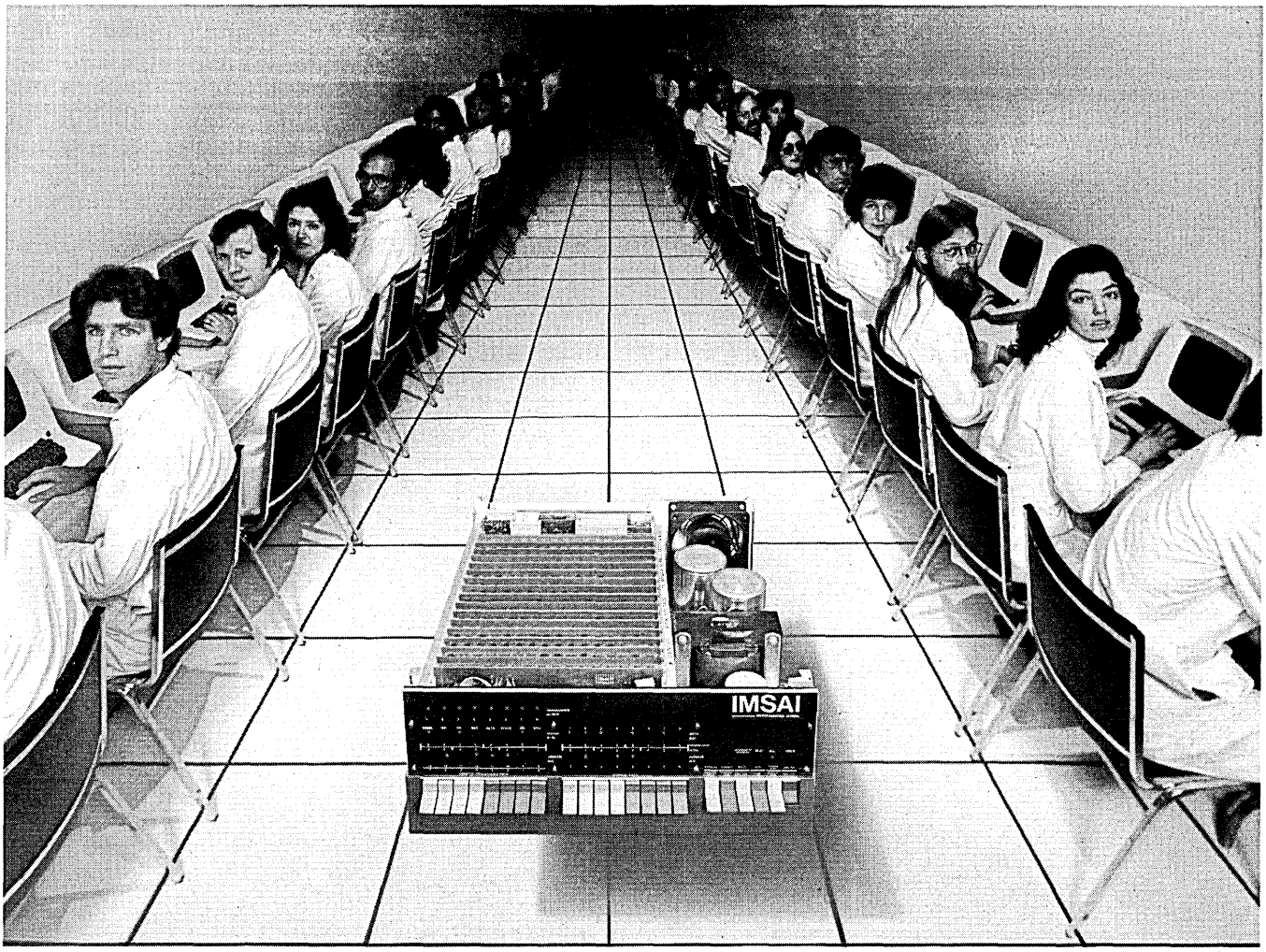

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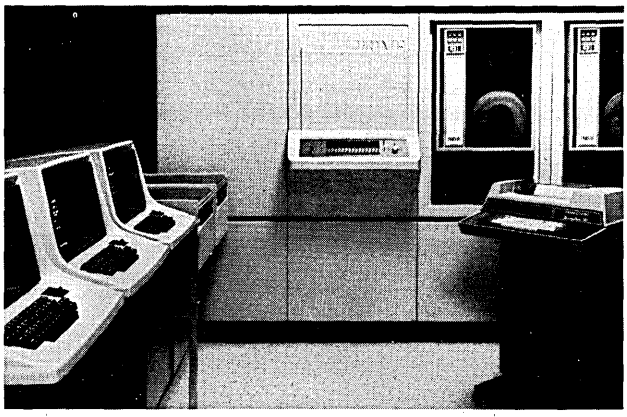

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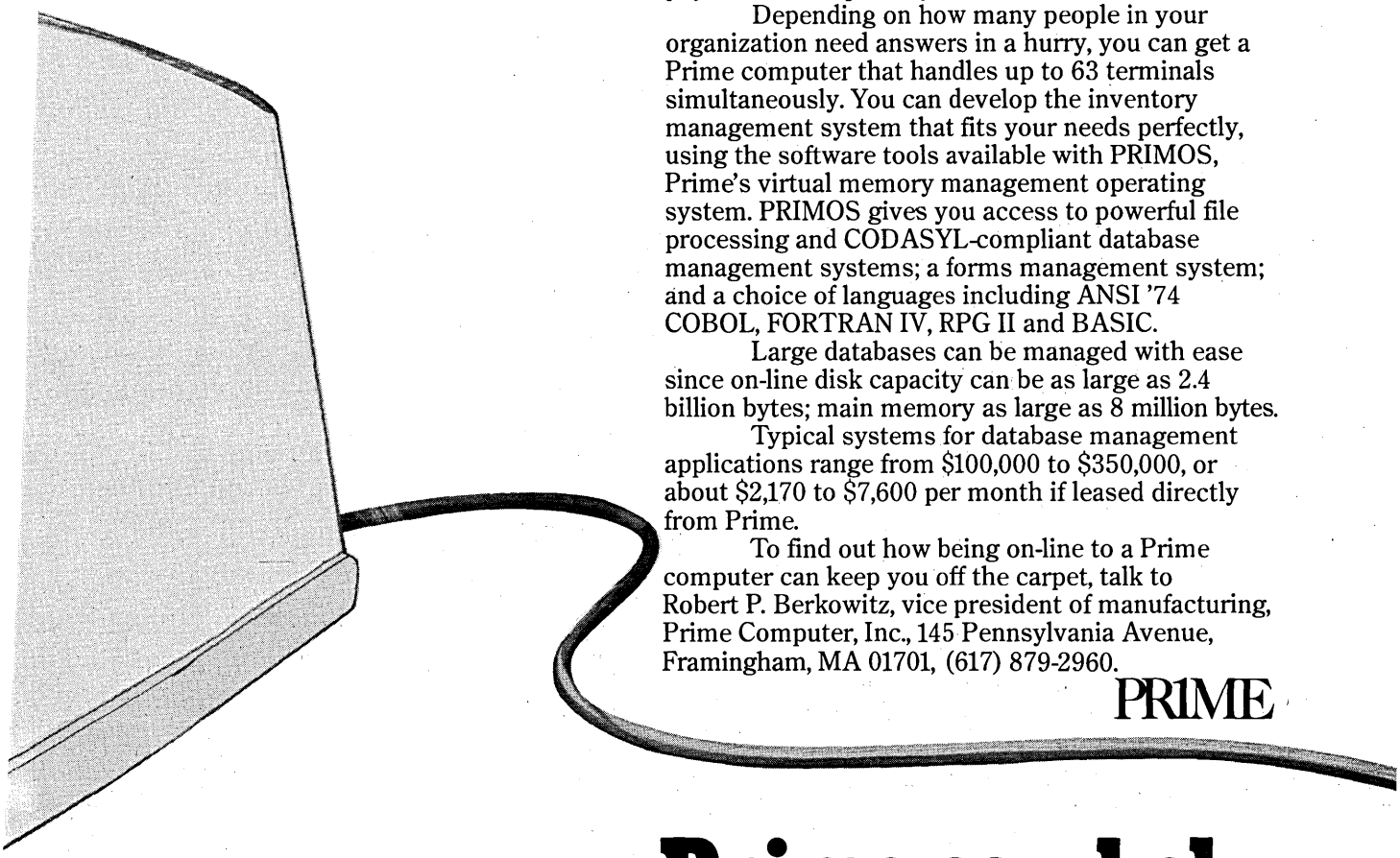

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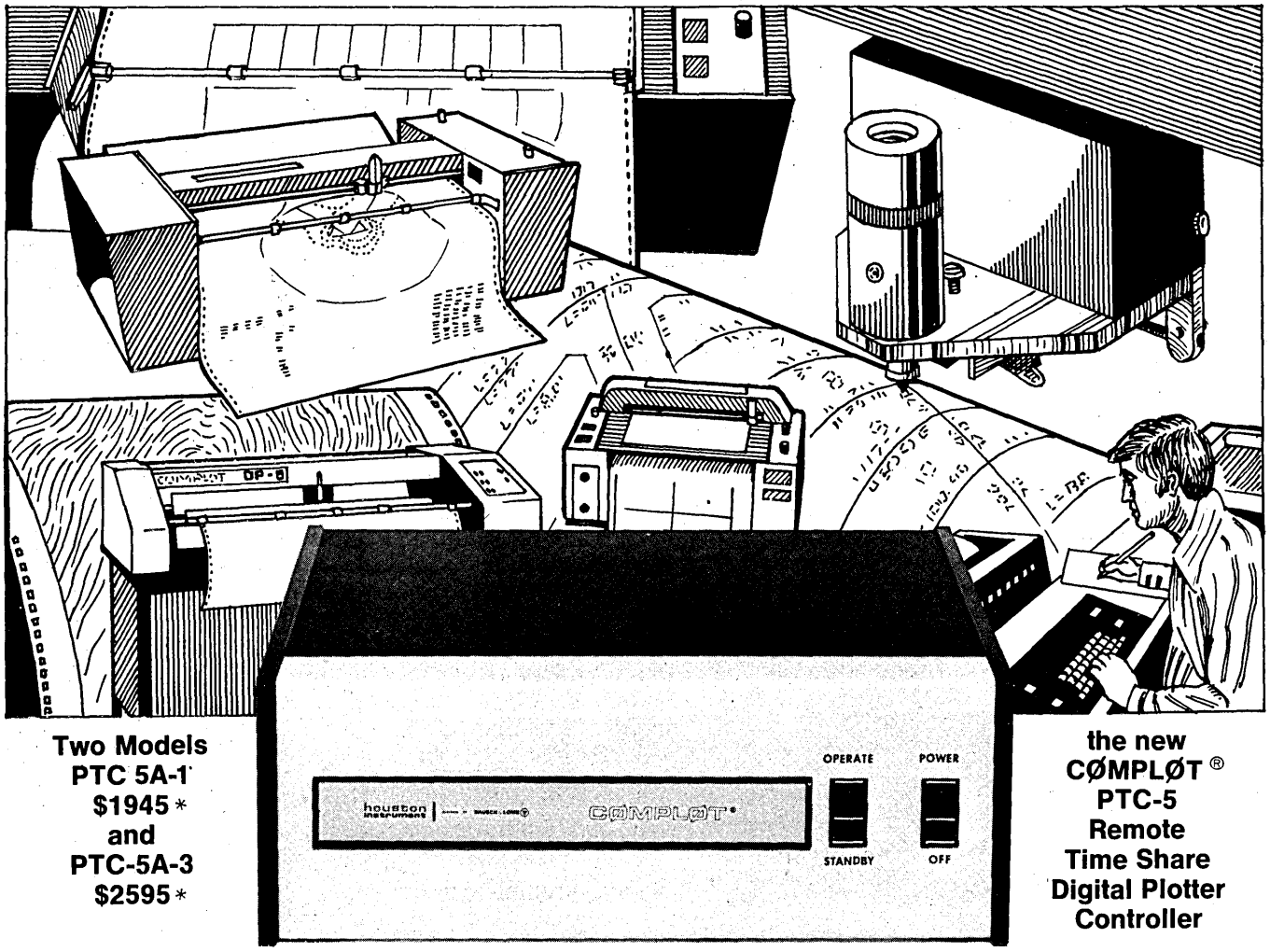

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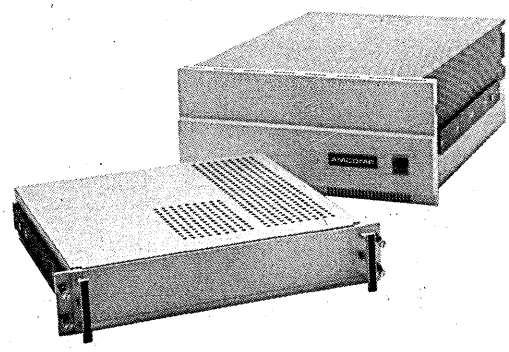

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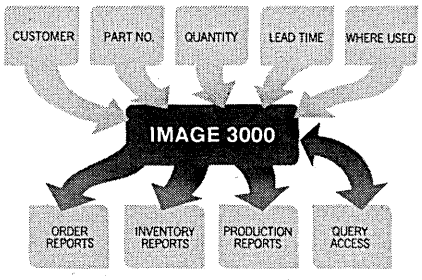
IMAGE/3000, our DBM software package for this system, gives you the means to create and manage a data base. And our simple English-like inquiry language, QUERY, lets you access your data base easily.



Turning raw numbers into usable information. *All the tools for data base management are provided by our IMAGE/3000 software package and English-like QUERY inquiry language.*

You can compile reports, make casual inquiries without writing programs and update data on-line. You can generate forms, titles, page and column headings, data sorted by categories, subtotals, totals and averages.

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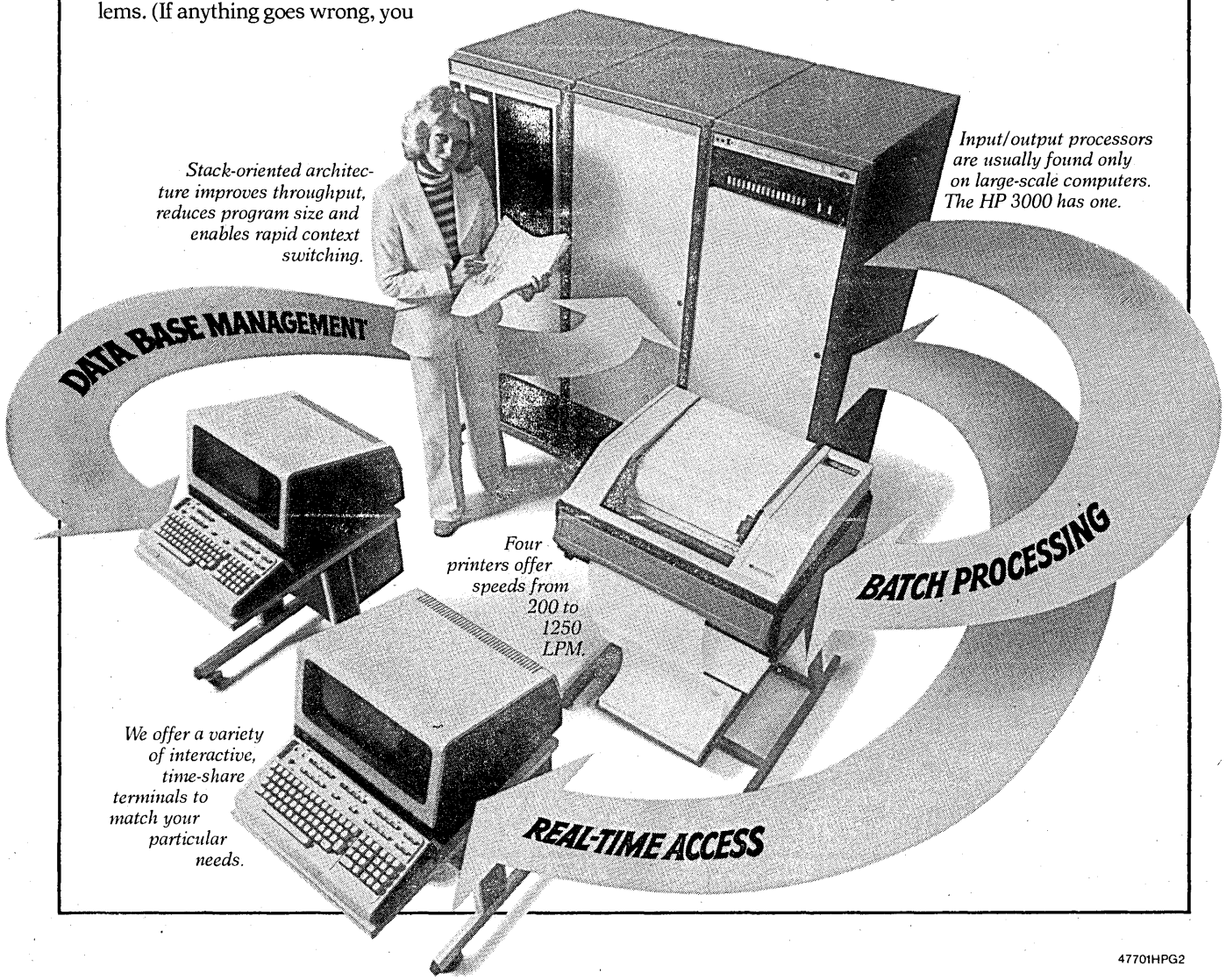

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Improving Performance the Easy Way

by Paul J. Jalics

Improving the performance of an application system doesn't always require hardware or software monitors, staffs of specialists, nor complicated timing diagrams. Some of the best results may come from just looking at the code.

Many factors contribute to the char acteristics of a business application system. The first one might be the competence of the designer, but equally important are the mandate given the designer, the time frame under which the system had to be produced, the reward system under which the designer and the programmers operate, the number of conversions of the system to different computer systems, the number of modifications that have been made to the system, the quality control process—if any—that precedes putting any program into production, the existence and enforcement of definitive programming standards, and the aggressiveness of computer operations staff in rejecting substandard systems.

Unfortunately, business application systems are often products of less than ideal circumstances in one or more of the above. Therefore, improving their performance may be easy. Sometimes systems can be made to operate two, three, or four times as fast with little effort. Further, the task of performing such measurement, evaluation, and enhancement is not very complex and does not require tremendous skills.

The basic principles to be used in performance measurement are:

1. Each system has a small number of critical parts (these critical parts typically comprise 1% to 10% of all the program statements in a system).

2. The performance of the entire system depends to a large extent on the performance of its critical parts (that is, one can just about ignore the non-critical parts).

Therefore, the strategy for making the system more efficient consists of finding all the critical parts of a system, and making changes that will significantly speed up their execution.

If we had to review and revise all aspects of all programs in a system, then the task would be comparable to rewiring the entire system, but all that really needs to be done is to improve a very small part of the whole. Similarly, in applying the above strategy to an entire computer installation, it becomes immediately clear that *it is not worthwhile to do performance measurements on the majority of application systems.* What is worthwhile is to select a few application systems that:

1. are time-critical, that is, systems that require results a very short time after input data are supplied,

2. are run frequently and consume considerable computer resources, or

3. consume extremely large amounts of computer resources, even if they are not run very frequently.

Analyzing daily and monthly job accounting summary reports should be of great help in selecting critical systems.

Applying the strategy further, to review any given system, we should get a breakdown of computer resource usage by job step and then select only those job steps that consume the largest amounts of resources, ignoring the rest.

Finally, getting down to the program level, the strategy is to review each of the programs that make up the critical job steps, find those parts of such programs that are executed most often, and review other characteristics of the programs that contribute to their inefficiency.

Here are some hints about doing that.

1. Check out the compiler

One factor that plays a significant part in the efficiency of a system is the efficiency of the compiler. While most users do not have the resources to make changes to the compilers, they can at least learn about the efficiency characteristics of their compiler. In particular, one can learn which data types and structures are handled efficiently on a given computer and which language features are implemented efficiently by a given compiler.

This is definitely worth doing. The performance of two functionally identical data types can vary by a factor of 2 to 40 (one can be 40 times as slow as the other). In addition, imprudent use of some language features can be disastrous in terms of efficiency of execution.

My experience in business systems is mainly with COBOL, so most of the examples here will relate to COBOL language features. It is not difficult, however, to extrapolate the same ideas to other programming languages used for business applications.

We can start looking at the characteristics of a compiler by writing a program that contains all the data types and language features we are interested in studying. Then compile the program and request an assembly language listing of the code generated by the compiler. Such a listing can be very instructive, especially if the generated code does not call a large number of library subroutines to do the data manipulation.

Even that won't be too great an obstacle. As an example, one machine I studied was a word machine with a not-so-complete set of instructions for manipulating strings of characters, and therefore, much of the generated code calls upon library subroutines to perform such functions (the Univac 1100). Thus to count the number of instructions executed for a given COBOL statement, a machine instruction trace facility was used.

Fifty-four separate experiments were run on the 1100 to test various features of the compiler:

1. arithmetic statements with various combinations of operands—different data field sizes, various alignments, USAGE of DISPLAY and COMPUTATIONAL

2. MOVE's of data fields with sources and destinations of various sizes and alignments

(Continued on page 142)

1. *Find the innermost loops in the program.* That means locating those paragraphs and those statements that are executed most often by the program. Every program has parts that are executed only once in the beginning, or once at the end, or only in unusual circumstances. All such areas of the program can be ignored in favor of paragraphs that are executed for every record processed.

Locating paragraphs that are executed most often can usually be done visually in well written programs that display the structure of the program. In not-so-well-written programs it may be very difficult to find the most often executed portions. For such cases there are several options. Some compilers give an option where a listing of all paragraph names is printed out after the program has finished execution, and next to each name is the number of times that paragraph was entered during program execution. There are also commercially available COBOL preprocessors that insert additional statements to effect the same result.

Finally, there are also commercially available memory sampling packages that produce similar results but with an even finer breakdown to the statement level. In any case, once the most executed parts are found, then one can apply the following criteria.

2. Look for statements in the critical paragraphs that are superfluous or that can be *moved outside the critical paragraphs*. It is not uncommon to find statements that are unnecessary or ones that are executed more than once when once is sufficient. Sometimes data is moved to a field each and every pass even though it never changes, so that putting it there once would be enough. For example, in the GRI040 program (Fig. 1) the output record for file GRI040GRI050 was sometimes initialized two or three times to spaces for every record written, when it didn't need to be initialized at all since all fields of the record were moved into separately.

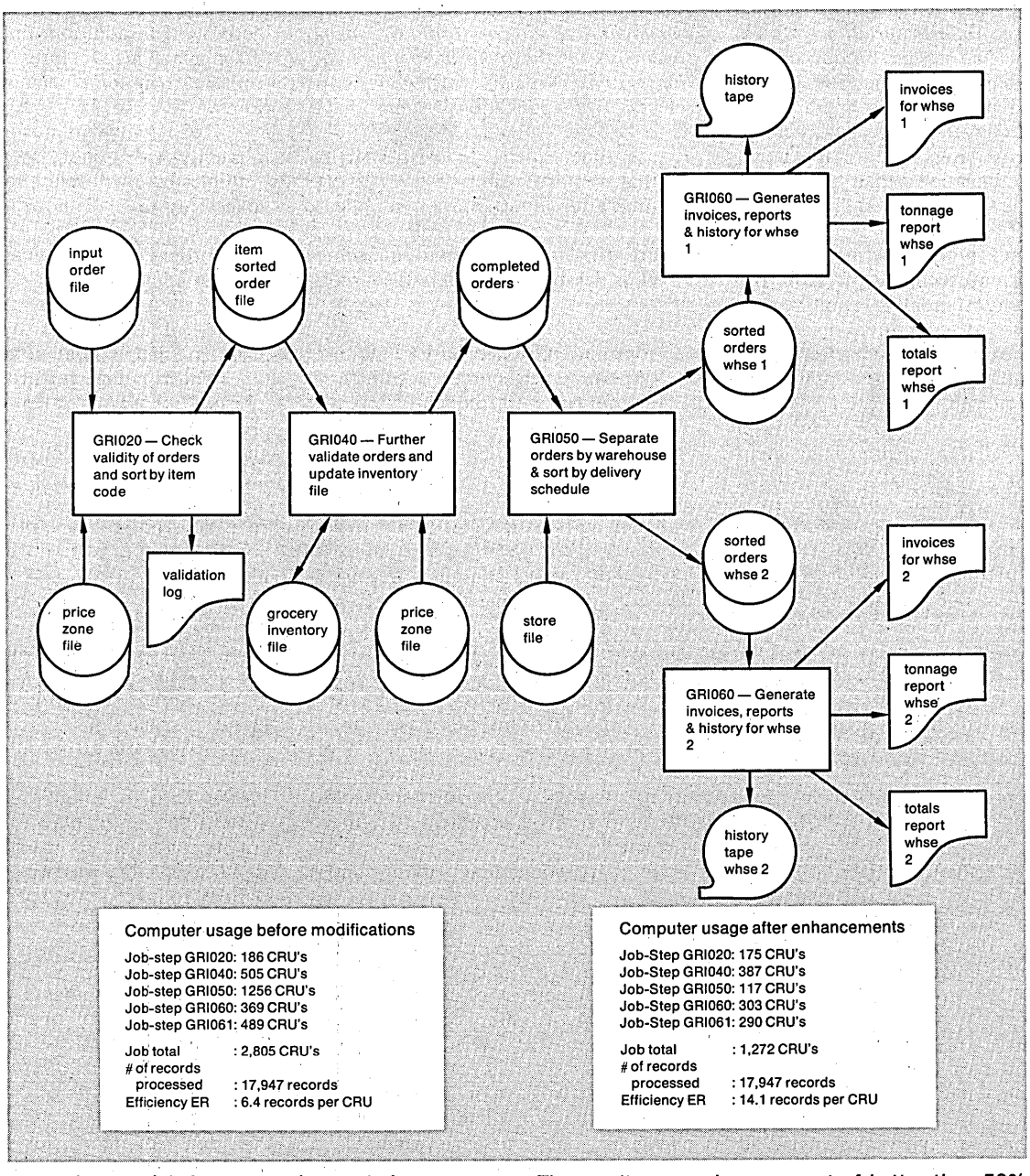

Fig. 1. Some rather straightforward tuning techniques were applied to the grocery distribution application shown here. The result was an improvement of better than 50%.

3. Look at the data types of the numeric variables used in the innermost loops and try *converting these data types to the types most efficient on your computer.* In particular, consider using COMP or COMP-3 for any item used in an arithmetic operation. Sometimes this is difficult to do when the data item is in the record of a file whose description cannot be changed because it is used in so many places.

But when the file is accessed by only 1 or 2 other programs the change is trivial, especially if the FD and record description are in a source library and COPY-ed in each of the programs accessing the file. In such cases all that needs be done is to change the description and recompile programs using the file.

If the data item cannot be changed in the record, it is sometimes worthwhile to move the item to a new one in WORKING-STORAGE which is efficient for computation. On the system measured by the author, this moving was worthwhile if more than one arithmetic operation occurred on the data field.

4. *Look at the data field sizes.* Most efficient computation is done on a given computer for particular sized data fields. For example, the Univac 1100 offers especially efficient computation for the data items with PIC 9 COMP (no alignment required), PIC 9(5) COMP (half-word aligned), PIC 9(10) COMP (full-word aligned). Some other field sizes are less efficient. For other data, field sizes of 1 character, 3 characters (half-word aligned), and multiples of 6 characters (full-word aligned) are handled most efficiently.

5. *Look at the alignment characteristics of the data fields in the innermost loops.* Most computers will offer more efficient manipulation of character data when certain alignments are observed. Alignment is related both to the way data is addressed by the machine instructions and by the way that data is transferred from the memory to the processor. On word machines, this transfer is usually done word by word, whereas on byte machines it is done one byte at a time, two bytes at a time (starting with even address), four bytes at a time on the fastest machines (starting with addresses divisible by 8).

These four options then correspond to no alignment, half-word alignment, full-word alignment, and double-word alignment respectively. Note again that if it is not possible to change the alignment on a data field that is used more than once, it might be worth first making a copy of the field in an aligned data field.

6. *In complex conditional statements, test for what is most probable first.* In an IF statement with multiple conditions, put those conditions first that are likely to decide the result of the compound condition without testing all the conditions. Thus, for an IF statement with conditions connected by OR's, the condition most likely to be true should be placed first, whereas if the conditions are connected with AND's then the condition most likely to be false should be placed first. Note that making such decisions sometimes involves looking at the data processed or making assumptions about the nature of the data.

7. In a series of IF conditional statements, make sure *the IF statement most likely to be true comes first.* For example, if branching is to occur to one of five places depending on the value in a certain data field, then the most probable of the five should be tested first; if that fails then the second most probable, etc.

8. In a series of IF conditional statements, *avoid testing the same* condition more than once. Instead, use the ELSE clause. Nested IF statements can also preclude testing the same condition more than once. A series of such tests was modified in GRI040 (Fig. 1) and contributed to a 24% saving in CRU usage.

9. *Avoid testing large data fields.* One atrocious practice is to move all spaces or zeros to a record in an unusual condition and then test the entire record for all spaces or zeros. In such a case, all one needs is a switch for which a single character data field in WORKING-STORAGE is sufficient. All switches should either be a single character or a small size COMP or COMP-3 data field.

10. *Avoid moving spaces or zeros to a large record,* whenever possible. Some inexperienced programmers insist on initializing a record even though new data is moved into the field immediately afterward, as with a READ statement.

11. *Avoid the verbs* TRANSFORM, INSPECT *and* EXAMINE *whenever possible.* Use of these verbs is very time consuming and should be avoided whenever possible. In many cases the use of these verbs has been to make a quick-fix for unusual cases in data that were improperly checked by the program. Many of the cases could be resolved by testing for NUMERIC in one or more sub-fields of the record. One example of the use of an EXAMINE on a record with 932 characters resulted in 6,127 instructions being executed.

12. *Beware of language interfaces and subprogram call overhead.* One item that should be investigated is the overhead involved in calling various subroutines and subprograms. For example, the efficiency of the PERFORM verb versus the CALL verb should influence greatly whether internal subroutines are used or external ones.

Some compilers generate code that will dynamically acquire more memory on every subroutine call to be able to save the environment of the calling program. Then the memory is released when the subprogram execution finishes. Some compilers have little known options that will either acquire such save space dynamically or reuse it each time the subprogram is called.

For example, the program GRI050 (Fig. 1) calls on a FORTRAN subprogram to calculate the Julian date for every record processed and thereby involve high overhead which contributes to the large percentage of CRU usage in an otherwise fairly trivial program. The problem was alleviated in two ways: first the subroutine was reprogrammed in two COBOL paragraphs and PERFORMED, thereby eliminating the overhead; and second, the Julian paragraph was executed only if the date of the current record had a date different from the previous record, thereby eliminating 90% of the calls on Julian.

13. *Be aware of compiler options.* Some compilers have various options that determine the efficiency of the code: there may be two or three levels of efficiency to choose from. Other compilers give a choice between in-line code which executes faster but takes up more memory, or code with more library calls for common functions which runs slower but takes up less memory.

Some compilers will allow for different levels of efficiency in different paragraphs so one might consider turning on high efficiency code for the innermost loops only. Another

(Continued on page 140)


"oom paste"

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And relive the 1960s with him.

The 1960s. A face. A smile. And buy, buy, buy.
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And along with these new networks came new managers. Managers who wanted to get inside their networks. Get involved. Interact. Diagnose. Managers who relied on Intertel and the Intertel Network Control System to help them.

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While Intertel was busy building network control systems, Milgo kept right on building modems. And when they finally introduced a network control product, they sold it like toothpaste. They pointed at it. They smiled. And they waited for the orders to roll in.

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If anyone tries to sell you network control with a smile and a stage routine, don't just sit there. Ask questions. Challenge them. Here are five questions that really separate the men from the boys (and the women from the girls).

1. What is it exactly you're trying to sell me? (Beware, if he or she stumbles on this one.)
2. How many of these systems of yours are installed?
3. Where can I see your system operating on-line in a large data network?
4. Does your product have diagnostics and transmission line restoral at all speeds from 1200bps–9600bps?
5. Why didn't your company answer the Intertel challenge?

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Call the experts at Intertel.
Now call Intertel. Ask the same questions. Throw in a few tough ones of your own. We'll be happy to answer them all.

We've had plenty of experience. Intertel has installed more than 100 Network Control Systems. For banks, airlines, and Fortune 500 companies. All over the world.

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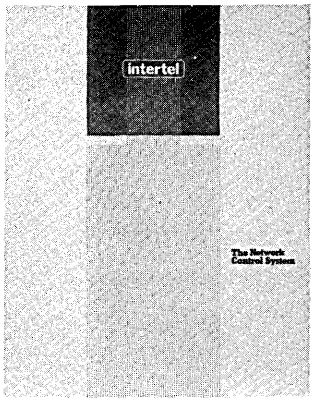
Call us and ask about them. Or, if you want to know more about the new Intertel NCS4000 Network Control System, send for our free brochure.



We're realists. After all, it's the 1970s.
We're realists. We know you're going to compare all the other network control systems to our Intertel system. Good. We like competition.

But remember one thing. When it's 8:30 on Monday morning and no one knows what the hell is wrong with your network, you're the person who's going to be on the firing line. You're the one on the hot seat. You're the one with the whole company on your back.

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#1 in network control

potentially important option is the one mentioned above concerning the type of subprogram interface methods used. Many other compiler options can have an influence on performance too, including subscript checking.

14. *Look at the tables or arrays used.* Many compilers will generate efficient code for table handling only if each element of the table has certain alignment characteristics. This is especially true for machines that address by words rather than characters, and usually such machines operate efficiently on tables where each element is word aligned. Such alignments can usually be done simply by adding padding characters at the end of each entry in the table.

15. *Look at the subscripts used for accessing tables.* Subscripts should always be INDEX or COMP (COMP-3 would be the third choice and only if COMP-3 is implemented efficiently in machine instructions). A USAGE of INDEX is usually implemented with the same instructions as that for COMP. In the experiments performed, searching through a table with subscript data field with PIC 999 was six times as slow as searching the same table with a subscript PIC 9(10) COMP. Using INDEXing, the results were identical to PIC 9(10) COMP, refuting the common advice that INDEXing is more efficient than subscripting.

16. *Look at table searching techniques.* Is it really necessary to search through a table, or is it possible to structure the table so that one can index into it directly (by subscripting or indexing)? Indexing usually takes only two or three machine instructions and eliminates the need for searching. If the size of the field being searched on is PIC 999 or smaller (or even 9999 if the additional memory is available), then consider setting up the table so that if searching for data field NNN, then a field containing NNN is located in the NNNth element of the table, thus allowing one to simply index into the table with TABLE (NNN).

Sometimes when searching for a single character, the character code can be used to index into a table with as many entries as the number of different characters in the character set. If searching is definitely required, then *look at the searching technique being* used (i.e. programmed loop, the SEARCH verb, or a binary search using the SEARCH ALL verb). For a linear search, construct the table so that all the items are ordered by some data field and then the *much more efficient binary search* could be used via the SEARCH ALL verb.

Before searching through the table first see if the *last item used* is not the one needed this time. Another question is which item is most likely to be needed most often in a linear search? The items most likely to be needed should be put in the beginning of the table, so they will be found immediately. Note that the above requires some understanding of the data being processed. In one table search in GRI040 (Fig. 1), the last item in an arbitrarily structured table was the one searched for 99% of the time. Putting that item first in the table reduced search time from 2004 instructions to 4 instructions.

17. *Look at parameter tables. Can we make a table out of a file?* Sometimes a small random access file is used to store parameter data about a relatively small number of items. An example might be a file containing a record for each of the 100 supermarkets served by a food distributor. All characteristics of a supermarket are stored in a record indexed by the supermarket-ID (three numeric digits). Data in a record includes the address, the manager's name, the types of departments in the store, price zone for the store, and its delivery schedule. Note that such information is used by a large number of programs and changes every few days.

The program GRI050 (Fig. 1) did a random read on this file for every order record processed thereby doing about 30,000 reads on this file to find out its delivery schedule for the day. What one can do is to create a table of 999 elements, then initialize this table at the beginning of the program, and store the delivery schedule for store NNN in the NNNth element of the table STORE-TAB.

Thus to access the delivery schedule for store NNN one simply indexes STORE-TAB (NNN) thereby saving 29,900 reads of the store file (the 100 reads are performed sequentially to load up the table in the beginning of the program). Note that the table is sparse with only 100 elements filled out of a total of 999, but this waste of memory is more than compensated for by the increase in performance.

18. *Is the data already in our buffer?* When a random read is required to access information in a record, first check to make sure that the data is not already sitting in the input buffer from the last such read operation. This is a very simple procedure that can offer sizable returns.

19. *The order of processing* plays a large role in the efficiency of some programs. While random file accessing techniques have allowed the processing of records in practically any order, it is often not optimal to perform file processing in random order. For example, it is often very worthwhile to consider first sorting the records to match the sequence of the master file(s) involved.

An example might be the update of an inventory file which is an indexed sequential file containing some 15,000 different items. A typical invoice run might include 30,000 order records normally ordered by the supermarket-ID of the store ordering the product. While it is possible to update the inventory file via random access, it is probably very worthwhile to first sort the order records by product item number so that the updates for one item are grouped together requiring only one read and one rewrite. In addition, all the reads are sequential and therefore quicker than random reads.

20. *Look at file organization.* The three commonly used file organizations used in business are sequential, indexed-sequential, and direct. Deciding the organization of each file can play a critical role in system performance. A file that is to be read only sequentially should obviously use the sequential organization. Sometimes programmers view sequential files as tape-oriented and outdated, yet this organization always yields the best performance when only sequential processing is needed.

Indexed-sequential is the obvious choice if both sequential and random access is required. For an indexed-sequential file, strive to have the key be as small a field as possible. (On some machines the optimal key should be a multiple of full-words and it is then worthwhile to pad out the key to the next word boundary.)

21. *Look at indexed-sequential file buffering.* Compilers often give the opportunity to designate how many memory buffers are to be allocated for index-blocks and for data-blocks. If processing speed is of great importance, one can, for example, assign

(Continued on page 142)

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TUNING THE PROGRAM *(Continued from page 140)*

two buffers for every level of index-blocks and two buffers for data-blocks. Note that each of these buffers will take up memory space so the limiting factor is the amount of memory space you are willing to allocate.

22. *Look at indexed-sequential overflow minimization.* Unfortunately, most of the indexed-sequential file systems in business today do not have the ability to grow dynamically as new records are added. The records usually go into an overflow area where all such records are chained together causing incredibly long access times.

In such a system, the strategy for adding new records should be examined carefully. For example, one such ISAM weekly order file for meat products operated satisfactorily for over two years, at which time a rash of new orders added in midweek increased the daily processing time for the ordering system from two hours to 26 hours. In such causes, it is sometimes necessary to rewrite the entire file anew every time records are added, or periodically after a given number of records have been added.

23. *Look at file blocking.* One should have an idea of the size of physical blocks which are efficiently processed by the operating system, the access methods, and the various storage devices. The efficiency considerations for magnetic tape are fairly obvious in speed of processing and length of tape used; the implications for random access disc are often less obvious and are dependent on both the physical devices themselves and on the way the operating system services the devices.

For example, many operating systems such as the Univac 1100s and the PDP-10s preformat the disc into fixed length records (each one 112 words of 36-bits on the Univac, and 128 words of 36-bits each on the PDP-10). Block sizes which are multiples of the basic physical record length are often processed more efficiently. Note that normally the only limit on block size is the size of the memory buffer to be allocated to read or write the block.

24. *Avoid inefficient I/O statements.* Verbs such as ACCEPT, DISPLAY, and EXHIBIT are usually considerably less efficient than READ and WRITE statements. Naturally, this is only significant if a large number of these statements are to be executed.

25. *Look at the sorting being performed.* There is some corollary to Parkinson's Law to the effect that every COBOL program shall have at least one sort in it whether it needs it or not. Close examination of a system may reveal that some of the sorts are unnecessary or that the same file is being sorted by the same key in two different programs—thereby one of the sorts is superfluous.

The length of the sort key and position and alignment in the sort record can influence performance too. In general, the sort key should be as short as possible with all the items in the key being assembled contiguously, starting with the major sort key and aligned in accordance with computer characteristics (usually beginning of record has all the alignment required). Sometimes the effective length of the sort key can be reduced by having the numeric items set as COMP or COMP-3.

It is also good to keep in mind that two small sorts are much faster than one big sort. For example, the program GRI050 (Fig. 1) sorted the order records in a complex fashion with 12 data fields in the key so that orders came out in the printed invoices in exactly the order desired in the warehouse. Since two separate warehouses were going to receive different kinds of items invoiced, it was possible to have two smaller sorts: one for order records shipped from warehouse 1, and one for order records shipped from warehouse 2. This strategy contributed to the 10.7X speed-up factor for GRI050 which reduced CRU usage from 1256 to 117.

One other consideration for sorts: The author has seen a number of statistics gathering systems that scan all the orders placed in the past week or month and produce various reports about product movement. These systems often have to scan several hundreds of thousands of order records. The programs sort the records for most convenient totaling purposes, and the jobs take forever to run.

Many such applications should not sort the records at all but merely build large tables in memory and accumulate there the various totals required in the reports. One such system geared to run once every four weeks and designed to supply sales statistics to an industry organization was taking up to eight hours to run. After taking out the sort and accumulating results in tables in memory, job runtime was reduced to 20 minutes. ❋

PERFORMANCE *(Continued from page 135)*

3. IF conditions using various lengths of items, alignments, and use of condition-names

4. table searching using programmed loop, SEARCH verb, SEARCH ALL verb using various structure tables, indices, data items, and alignments

5. the EXAMINE verb with various length fields and alignments

The conclusions drawn from the results of the experiments were:

1. Arithmetic operations for USAGE COMP data items are 30 to 40 times as fast as similar operations on USAGE DISPLAY data items.

2. For COMP items the most efficient data field sizes or 9 COMP (takes up one character), 9(5) COMP (takes up 3 characters), and 9(10) COMP (takes up 6 characters or one word). It is very much worthwhile to increase field sizes to one of the three for greater efficiency. Other COMP fields not of the sizes above are sometimes 2 to 3 times slower.

3. Alignment plays a tremendous role in efficiency of both arithmetic and character manipulation. Desirable data fields are single characters (no alignment required), three characters (half-word aligned), multiples of six characters (full-word aligned).

4. Avoid testing large data fields whenever possible. The use of condition names for more complicated testing offers no advantages.

5. Avoid at all costs the EXAMINE, UNSTRUNG, and TRANSFORM verbs and apply them only to the smallest field possible where they are required.

6. The SEARCH verb is not more efficient than a program loop assuming that the index used is COMP. Alignment of each table entry to a word boundary provides significant performance improvement. The SEARCH ALL verb is, of course, the most efficient, especially in larger tables

One most important aspect of a compiler is the efficiency of the input/output facilities. To get an idea of efficient record and block sizes we have to be aware of the physical storage devices, especially the characteris-

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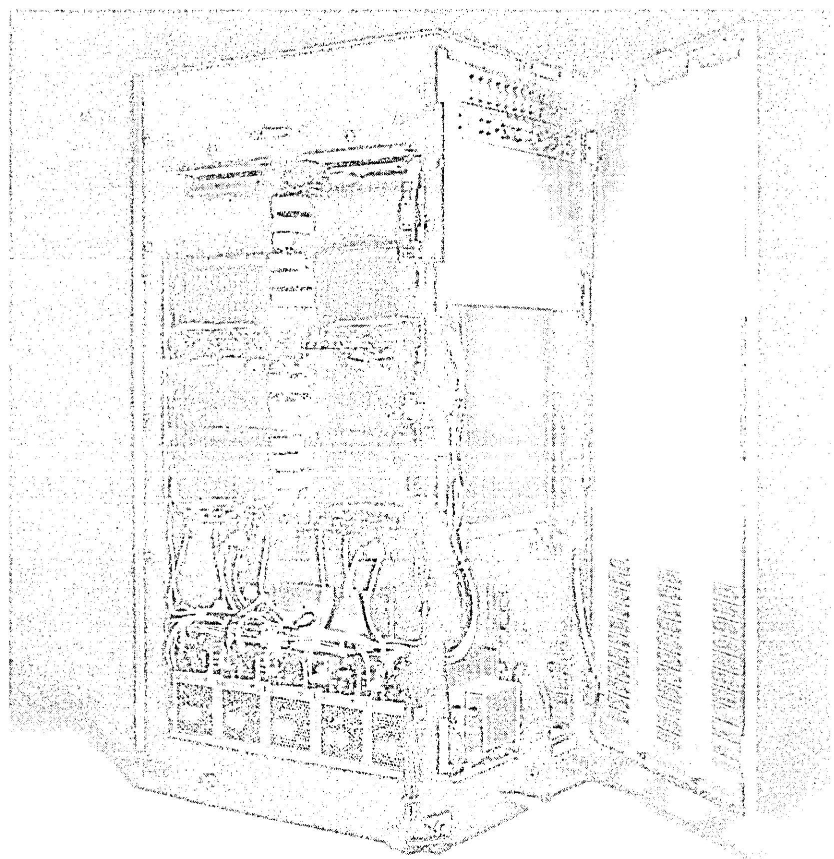

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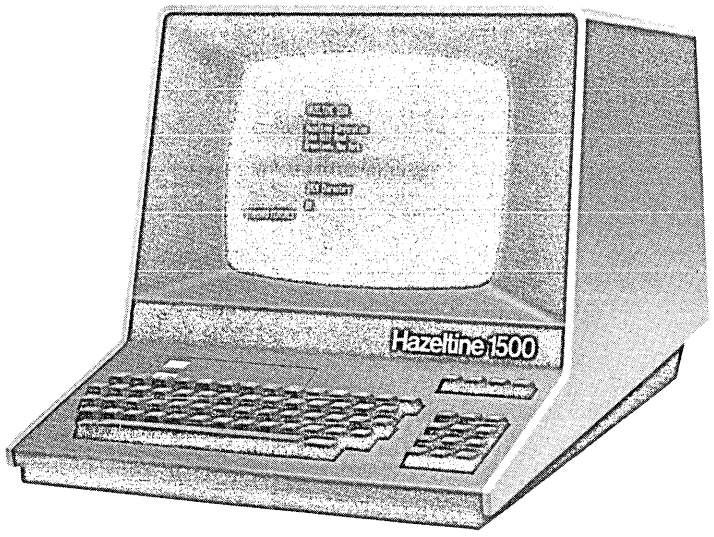

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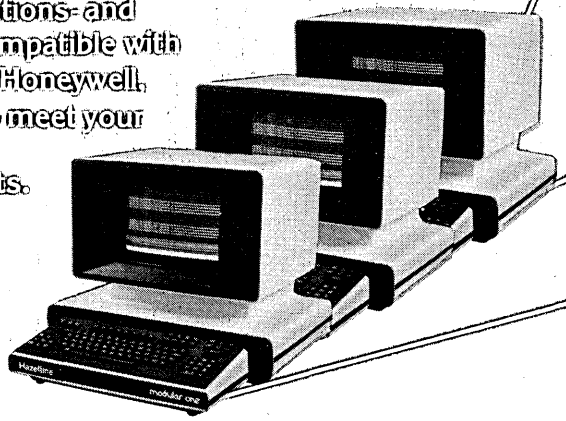

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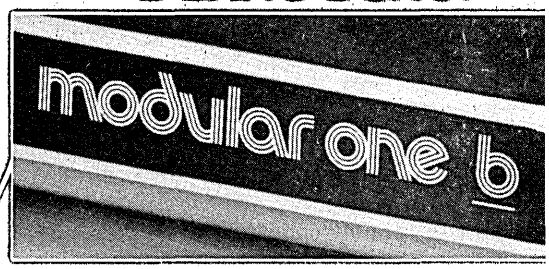

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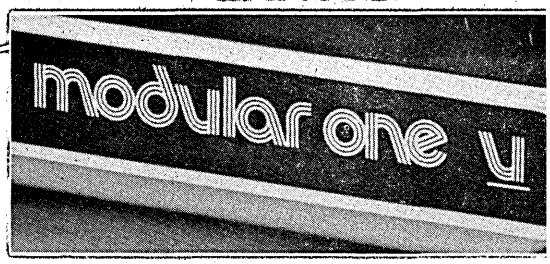

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tics of the random excess devices like the discs. In addition, we need to be aware of what block sizes are efficiently handled by the operating system. For example, all disc I/O on one system studied was in physical blocks of 16 characters (on another system it's 640 characters, while on a third it is 2,048 characters).

For more sophisticated access methods such as indexed-sequential and direct, spend some time finding how the compiler behaves handling such things as overflow records.

2. Get a measure of efficiency

Before any work goes into performance enhancements, it is important to instrument the application system for measurement, and the first step in that is to find a measure of efficiency for the system. It is usually not meaningful to simply compare the cpu and I/O times for different runs of a job, as the amount of useful work done differs from day to day. For example, an invoicing system will do processing in relation to the number of orders received. A payroll system may do processing in proportion to the number of paychecks issued.

What is needed is a way to relate the amount of useful work done to the computer resources it took to process the job, so that we can come up with a measure of work done that is readily understandable to the user department and to the computer operations staff. Both of these groups are interested in the efficiency of the application: the user department because it pays for the computer resources and because the efficiency of the application will have a bearing on how promptly results come back from the computer; the computer operations staff because efficiency affects scheduling and getting the job done as quickly as possible.

Once the measure of work is defined for an application, then we can define an efficiency rate (ER) in terms of Units-Of-Work (UOW) divided by Computer-Resource-Units (CRU). Note that the resource unit measure is a weighted sum of cpu seconds and I/O seconds provided by the operating system as part of job accounting. Thus CRU's can be thought of as system-seconds; one CRU is complete use of the computer for one second. Then the efficiency rate of an invoicing system might be described as 15.2 records/system-second; that is the computer can process 15.2 order records in one second of computer time. The efficiency rate of a payroll system might be 32.5 paychecks/system-second.

Once the efficiency ratio is calculated for every run of a job, then it's possible to compare system efficiency before and after enhancements are made, even though different data is used in the runs. Also, it becomes possible to compare the system's efficiency a year ago to its efficiency today.

3. Put the hooks in

The next step is to make minor modifications to the application system so that it automatically calculates the efficiency ratio at the end of processing. It is important that this ratio information be readily available so that it can be used to continually monitor system performance. Ideally, the ER information would be inserted into the system accounting log file and then automatically carried into a daily job accounting report which would detail computer usage by jobs. At the least, the efficiency ratio should be printed on the user's report and printed on the system console for the operations staff to review.

A typical output for an invoicing system might read:

```
SYSTEM: GR INVOICING, # OF ORDERS = 21585,
ER = 12.5 RECS/CRU
```

Putting in the code to calculate the efficiency ratio is usually quite simple if the entire system consists of one program, since all the information is readily available (the number of units of work processed, and the computer resource units charged). The task becomes a bit more difficult if the system consists of a multi-step job and even harder for systems consisting of several separate jobs. In such cases, the efficiency ratio data may be assembled by each of the job steps, stored on a disc file, and finally totalled and printed in the last job step of the last job processed.

Note that the ER can be different for different numbers of work units processed, and this is understandable since the amount of work does not always increase linearly with the number of units processed.

4. Get computer usage by job step

The next step in the instrumentation is to make sure that computer usage is printed out at the end of each job step or program. On many computers this is trivial since the operating system automatically provides this information in the job log. If the operating system does not do this, then usually there is a JCL command that will print out total CRU usage (cpu time plus I/O time used). Still other systems provide supervisor calls that return CRU usage. Note that knowing the computer usage per job step is necessary to identify the critical job steps.

As an example of a business application system, let's use a grocery invoicing system which inputs orders from 100 supermarkets and generates shipping invoices for two separate warehouses based upon a random access inventory file. Fig. 1 shows a system flow diagram for the system and outlines the five separate job steps in the invoicing process. With it are breakdowns of computer usage in the invoicing system before and after enhancements were made.

5. Select critical job steps

Once the system has been instrumented and run a few times, review the details of CRU usage by job step and select those that use the largest amount of computer time. Very often a single job step, or a small number of them, generate most of the CRU usage so that dramatic results can be obtained by improving a single program or a small number of programs. For example, in looking at the "before" breakdown of CRU usage in Fig. 1, 45% of CRU usage is in one job step, GRI050, which uses 1,256 CRU's out of a total of 2,805 CRU's for the entire invoice job.

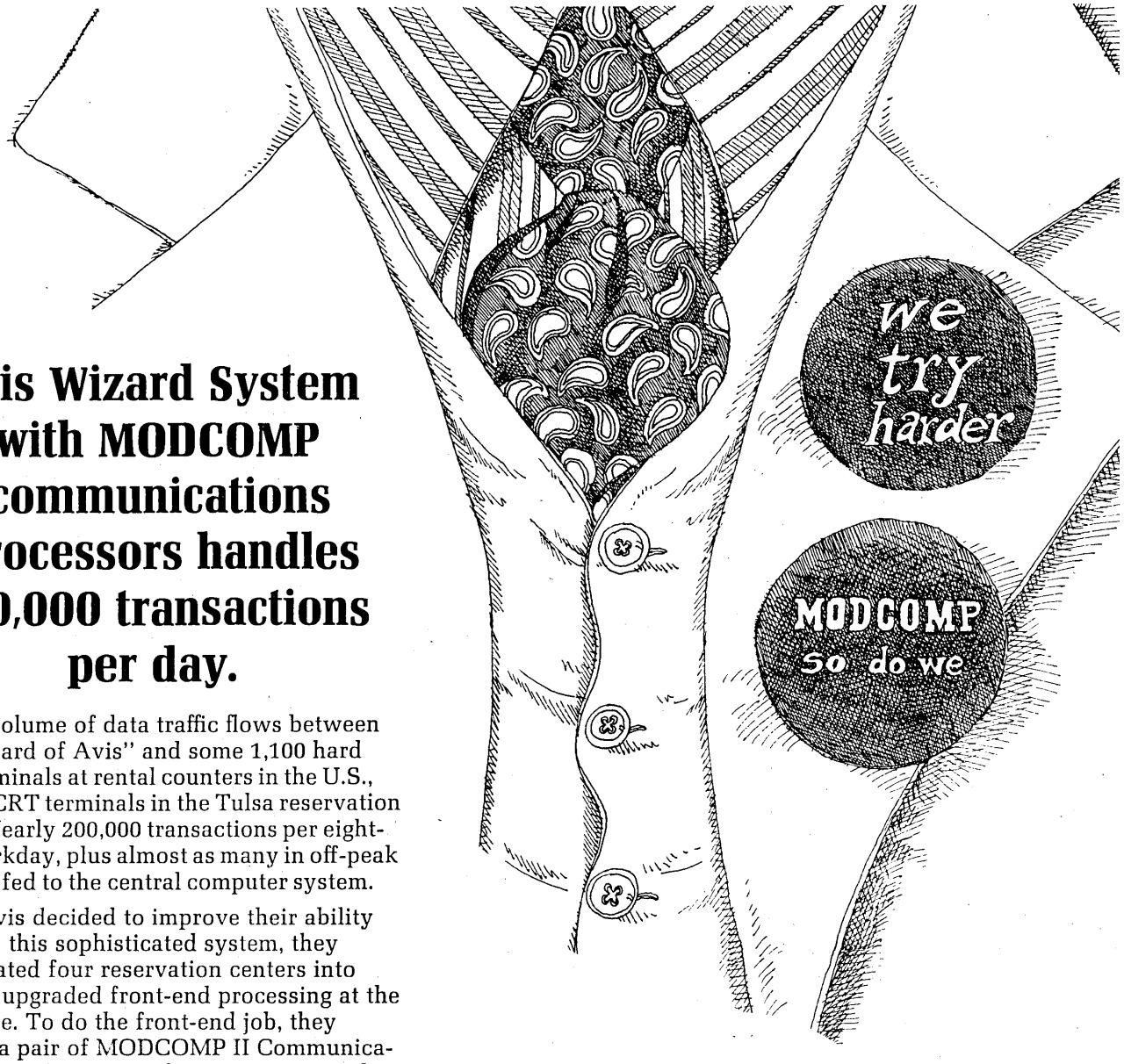
6. Review the efficiency of critical job steps

Once a critical program has been identified, we need only to review various aspects of the program as outlined in the boxed text, "Tuning the Program." Note that most of the items can be reviewed simply by looking at a compilation listing of the program with a cross-reference index of all data names.

7. Make enhancements and review results

Once the performance enhancements have been made to the critical programs, the jobs should be run again. The resulting efficiency ratio should be considerably higher than before. If the efficiency ratio does *not* go up, then review the job step cpu and I/O usage figures and determine whether the critical job steps are cpu-bound or I/O-bound. If cpu-bound, then review again the computations and logic of the program, for I/O bound programs, review the file structures, blocking, and other file related aspects. If some improvement in the ER has been made, then look at the job step usage breakdown again; other job steps may have become the new critical steps as the CRU usage has dropped in the first job steps selected as critical. Then review the performance of the newly selected critical job steps.

In the example in Fig. 1, the most critical job step was GRI050. This program was improved by: reprogamming the FORTRAN subroutine JULIAN in COBOL and PERFORMing it only when date is different from that in the last record; eliminating random reads of the store file for every record processed



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in favor of creating a store file sequentially; and breaking up the one large sort into two smaller sorts (one for items in warehouse 1, the other for items in warehouse 2).

The result of the first series of enhancements was to increase the original efficiency ratio of 6.4 records/CRU to 10.8 records/CRU. The total CRU usage for GRI050 was reduced from 1,256 CRU's to 117 CRU's on the test case.

In the second iteration, GRI040 was found to be the critical job step. GRI040 was enhanced by: eliminating access to a parameter table in favor of a smaller table loaded from the parameter table; converting several often-used counters and other arithmetic fields to aligned COMP fields; eliminating searching of a small table where the most likely item was last in the table in favor of a nested IF statement which tested the possibilities in descending order of likelihood; increasing file blocking from 20 records/block to 80 records/block on files GRI020GRI040 and GRI040GRI050.

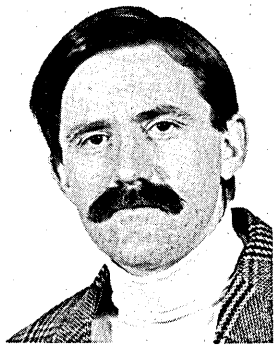
This second effort reduced the CRU usage of GRI040 from 505 to 387. Then other enhancements to GRI020 and GRI060 were made. GRI061 was found to be *identical* to GRI060 and was eliminated so that GRI060 was run twice with different input and output files.

The final result was to increase the efficiency ratio ER to 14.1 records/CRU, thus reducing the overall CRU usage from 2,805 to 1,272 when processing 17,947 order records. The complete breakdown of job step CRU usage for the final system is shown as the "after" listing in Fig. 1.

8. Watch it continuously

Unfortunately, the enhanced level of the efficiency ratio ER is not likely to remain at the same high unless the users of the application or operations personnel periodically review the ER and request corrective action when the ratio appears to have degraded. The typical pattern is for inefficiencies to crop up with those minor changes that need to be made periodically to accommodate new business situations. In fact, management should insist that before any changes go into production, a complete test run of the system be made and the ER reviewed to insure that inefficiencies are not being introduced.

The techniques presented here have shown themselves to be useful in measuring and enhancing business systems, but are by no means exhaustive. They are likely to emphasize considerations important for those machines with which I am more familiar (the Univac 1100, DEC PDP-10, and CDC 6600). Any application system designer or application programmer should be able to develop his own list once he recognizes what great leverage he has in determining system performance. ❋



Dr. Jalics is presently an assistant professor of computer and information science at the Cleveland State Univ., where he moved from a position as manager of system software at Fisher Foods Inc. His past experience includes work as a systems programmer for RCA Computer Systems, as an operating system designer at the Technical Univ. of Munich, and as a researcher in computer operating systems measurement at Case Western Reserve Univ.

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Software

Conversion: A Dirty Word in Government

Competition enthusiasts think conversion to higher level languages would run smoothly if implemented gradually

"If it ain't broke, don't fix it." Those are the words handed down as an edict to all federal bureaucrats by President Jimmy Carter's old banking buddy and new budget boss Bert Lance. Applying this same philosophy to computers, government dpers have bolstered their hard-line stand against system changeovers that require messy and often mammoth software conversion efforts.

In the government today, software conversion is still a dirty word. And understandably so, since agencies obviously are reluctant to swap systems when it leads to undertaking disruptive and costly program conversion. And many times these overhauls, they contend, are senseless when they have nothing to gain if their current dp set-ups are running smoothly and efficiently.

But maybe they're not running as smoothly and efficiently as they could if conversion steps were implemented gradually. That's the basic theory of Capitol Hill competition enthusiasts such as Texas Congressman Jack Brooks. In their current drive to open up the government to more computer industry competition, Brooks' Government Operations Committee has focused on the need for agencies to switch to higher level languages to ease the crunch of conversion. "From the standpoint of competition, basic efficiency of operations and utilization," declares one committee source, "you're better off in a higher level language. And if that's the case, which we think it is, it's better to bite the bullet early rather than late."

So far however, there's been no signs of a headlong rush by the Fed's dp forces to bite the bullet. In fact, some critics allege that while agency ADPers have paid lip service to the procompetitive policy pronouncements, they've staunchly continued to maintain the status quo, further entrenching the big mainframers, most notably IBM. Using skyrocketing conversion costs as an excuse to stick by their systems, government dp managers like to relate with gloom the horror stories surrounding conversion projects.

Costly conversion

One of the more infamous horror stories currently making the rounds centers on the Environmental Protection Agency's (EPA) replacement of an IBM 360/50 with a Univac 1100. The conversion project, which is two years behind schedule, has cost overruns totaling $5 million. One of the main problems, according to one government insider, was that there was no coordination among the conversion team which consisted of personnel from Univac, Dataware, a Buffalo software house, and EPA.

At the Federal Communications Commission, the conversion scenario was a bit brighter. Changing over from a Univac 3 to a Honeywell 6023, the agency did experience some file conversion snafus but these hangups were considered minimal and the operation has been declared basically successful by most government conversion experts.

But these conversion experts are quick to point out that success is hard to measure when talking about software conversion efforts. For as one more pragmatic observer notes, even the best conversions are going to create some havoc in an agency's dp shop. "You can have benevolent sugar daddies doing (conversion work) for you all day," he insists, "and it's still going to be a disruption."

This disruption argument has been used time and time again by the more stubborn federal dpers to combat conversion. Nevertheless, their contentions may be valid in some cases. The National Institute of Health's gargantuan and controversial conversion proposal is usually cited as a good case in point.

He'd resign

NIH's assistant director for the Computer Research & Technology Div., H. J. Juenemann, is satisfied with the institute's three systems which include a 145 and two 370/168 MP systems. He sees no compelling reason to change over to any other systems. He also takes an adamant stand against the monumental conversion effort that such a system switch would probably necessitate. "The day somebody tells us we're converting," he avows, "there's about 40 people in this division who will submit their resignations. I ran the (conversion) in 1965 and I wouldn't go through that agony again. I would resign. My stomach couldn't take it."

Forced by the General Services Administration to recompete these systems, NIH has been hassling and haggling with the procurement agency over developing a "fully competitive solicitation." Stirring up some of the trouble has been a conversion cost estimates study done by NIH in 1974. The study, which has been sharply criticized by outside observers, targeted conversion costs at $65 million. While NIH officials aren't touting these exorbitant costs as being absolutely accurate, they still maintain the conversion price tag is too high to justify a switchover. NIH's Juenemann admits that software conversion tools, which were not figured into the original formula, could help, but he adds that the workload increase could offset their advantage.

The NIH dp center is currently running about 30,000 programs and handles 350,000 jobs a month for 5,000 users—most of whom are involved in scientific and medical research. Juene-

mann argues that all this research would be thrown out of kilter and severely stymied by any conversion attempt. Indeed, slowing down cancer research for instance, could be a very powerful argument against conversion, if it is actually true, as some claim.

Another potentially persuasive point being pushed by NIHers is personnel costs which are admittedly hard to pin down. On this point, Juenemann claims the argument of "competition for competition's sake is not justifiable. Shooting the man hours involved in managing a conversion with no major breakthrough in technology associated with it," he insists, "is pretty indefensible."

A third of the estimate

Leaving aside all the claims and counterclaims over the merits of competition, conversion vendors stress that the NIH operation can be handled. Brandon Applied Systems, which fix-prices conversion work, is one company that puts its money where its mouth is. Disputing

PAUL OLIVER
He'd mastermind federal conversion support center

NIH's cost figures and claims, one Brandon official in Washington maintains that the whole job could be done for one-third of the quoted $65 million. He also dismisses NIH's cancer research slowdown rhetoric as "an emotional argument" that may be exaggerated.

His philosophy is simple: "Conversions can be sized and priced because you're dealing with a known entity. Programs are perfect specifications. Some people raise the documentation donnybrook, but it's really not essential." But he also readily admits that conversion "is a big pain, especially if you're happy. NIH is very happy. They're getting very good service from IBM and they're providing good service to their users. So why the hell should you upset all this?"

Why indeed, questions NIH's Juenemann. "Don't say we're happy with IBM," he protests, "we beat them over the head constantly." But he adds, "You can't show me an installation of this magnitude where the cost per job or the turnaround time and reliability is any better."

Amdahl Corp. advocates dispute this, pointing to the proven reliability and efficiency of that company's 470V IBM-compatible machines. Juenemann, however, thinks these systems, even though they would wipe out most of the conversion problems, haven't "been running long enough." Other NIH needlers believe that at the very least, companies such as Amdahl, Itel, and firms with used 168s should be given a chance to compete with IBM.

Vendors' conference "staged"

In an attempt to hammer out a solution to NIH's conversion dilemma, a vendors' conference was held in February. Some disgruntled participants claim the all-day meeting was "staged" to make the institute look good. Juenemann denies this and says he was disappointed in the outcome. "We really didn't get what we wanted," he complains. "What we wanted (the industry representatives) to address was the overall strategy of what is sufficiently competitive in the situation we're in."

GSA, he charges, is also at fault, since it has never made it clear exactly what it means by a fully competitive process. "My one hope," he asserts, "is that out of this whole mess GSA and the Office of Management and Budget will come to grips with the (conversion and procurement) problem and clarify what their policies are."

Juenemann may get his wish. The government policy-setters may finally be getting around to tackling these sticky issues—just how effectively remains to be seen. Even the General Accounting Office is getting into the act. A GAO report on technical ways to pare software conversion costs is due out around September. GSA is also expected to come out with some policy guidelines which hopefully will clarify how agency ADP procurements that involve conversion should be treated. The recommendations are expected to be patterned after Congressional suggestions on the shift to higher level languages, and they will also attempt to establish procedures on how agencies should figure "direct out of pocket" expenses in conversion efforts.

Support center being formed

But perhaps the most significant step forward on the federal conversion front is the establishment of the long-awaited Federal Conversion Support Center. A GSA regulation announcing the center is due out this month, but the set-up won't be operational for another year. Masterminding the operation will be Paul Oliver, who's currently director of the Navy's Federal COBOL Compiler Testing Service and Software Development Div.

Working with a staff of 18, the conversion center will provide policy support to GSA in the selection and procurement of conversion services. But the real support, mostly contracting aid, will be doled out to any agency needing help with a conversion problem. Oliver speculates that GSA probably will refer all conversion related procurements to his conversion team for evaluation.

An ardent supporter of competition, conversion czar Oliver believes that competitive hardware buys can bring conversion costs down. He cites a recent Navy procurement to prove his point. Under that contract to equip seven Navy Data Processing Service Centers, Univac, the second time around, discounted its bid on 1100 gear by $105 million to capture the $31.7 million award. This phenomenal discount was 77% below the commercial list price carried on the GSA supply schedule.

That kind of discount, Oliver quips, "could even buy the NIH conversion." However, even with these off-setting costs from competition, he notes, an agency still has to contend with other conversion loopholes. He explains why: "In the government, conversion always takes place in a larger context of a general system change-over. So almost by definition, you have a no-win situation."

But agencies, he contends, can salvage this no-win situation by planning ahead and collecting the right operational data. His main goal for the conversion center reflects this philosophy. "As a result of the center, hopefully agencies will approach conversion a little bit more rationally and calmly. And my big hope is that they will start gearing up for this eventuality a little earlier in the game so that conversion doesn't become crisis management.

—Linda Flato

news in perspective

ADR: Well Enough To Lease Again

In the Amex composite listing, Applied Data Research, Inc., is quoted "APPLD DTA." And it squats among its peers about three eye-squinting inches below the daily market summary in the first column, flagged for the ticker tape people by the high-low column that precedes the name:

1975–76 high, 6 7/8; low, 1½.

Even an industry as cynical as our own takes note of where the pudgy finger of Wall Street pauses on the list, but ADR has been a presence in dp shops even while it was in the pits on the Board. ADR is generally credited as the grand-daddy of independent proprietary software firms. A company that holds the first commercial software patent; received the first GSA software listing; a company that was peddling OS programs back in the bundled years, since 1964, and now has more than 5,000 IBM-site installations—more than any one but the Grey Mother herself.

The blush of health seems recently more commonplace in the computer service industries, but a broker buying ADR has to overcome a painful memory of the software stock disasters of 1969–70, when "APPLD DTA" was one of the $40-plus kites that plummeted like a squadron of bricks. ADR is a survivor; a firm that outlived its larger mistakes.

A major factor in the software stock debacle was the overvalued balance sheets then common in the industry—where all software development investment was classed as an asset under software inventory. After the sky fell in, the Financial Accounting Standards Board stepped in and changed the rules, and now all development costs are treated as expenses. (Neither side of the balance sheet could reflect true value; the result of software development can be a turkey or a work of genius—only the market will judge, and then crudely.)

Hide valuable assets

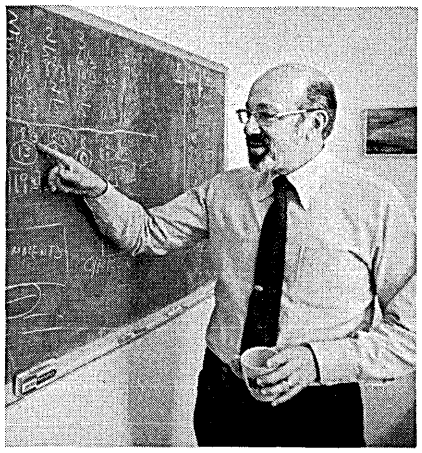
The net result, however, is that under current practice, the balance sheet might greatly underestimate the worth of a company, hiding valuable assets. ADR's proprietary line of seven software packages—which account for $10.2 million of 1976 estimated revenues of $15.7 million—includes two of the top rated packages in the 1976 DATAMATION software honor roll: *Librarian,* a source program management system; and *Look*, a systems performance measurement package, "liabilities" other firms would love to share.

ADR's 18-year history traces an outline of the independent software industry: the early years of contract programming; then the move into proprietary packages, over-extension in the lean years, recovery, then equilibrium. ADR's 1968 suit against IBM bundling was a factor in pushing Armonk into limited software unbundling in 1969, and while the $2 million out-of-court settlement in 1970 didn't even cover legal expenses, it was a transfusion of cash that braced the company through ailing times.

Even through the tight years, ADR supported its sales and marketing organization, and its Software Products Div. kept its product line aimed at the ever-increasing personnel costs in dp.

Specialization is the thing

Senior v.p. Martin Goetz, who oversees ADR software products, is probably the most oft-quoted spokesman for the independent software industry. Goetz has preached specialization through the years and guided his division accordingly. Like the industry as a whole, ADR moved into proprietary software wildly underestimating the marketing and continued development costs for software packages, but like the rest of the survivors, they adjusted and still remain very cautious about introducing new products.



MARTIN GOETZ
"This is not a get rich quick scheme."

"If the life of a new package is not more than five years," says Goetz, now, "you're really going to have a hard time recouping costs." The once-current publishing or record company analogy has been shunted aside in the industry today," he explained. "This is not a get rich quick scheme. There is a minimum wait of three to five years for a return on investment on a successful product: 1.5 years for development; 1.5 years for product acceptance and refinement; one to two years during which recovery of investment begins, although technical costs are still incurred for continuing enhancement and support."

Marketing costs were the hidden trap for the newborn software package firms, said Goetz: there was a time when the industry naively thought quality alone would sell.

"On every dollar of revenue," said Goetz, "about 30% to 50% of costs are expended in sales; 30% is on the low side, generally it's 40% to 45%. Another 10% is in non-sales marketing costs, about 20% in product development, and about 10% in support. The margins of many software companies are between 10% and 30%, with overhead rising to support your more successful products."

Communications

Besides its software product division, ADR has its communications systems division, co-located with software at the corporate office in Princeton, N.J., and two interesting subsidiaries, ADR Services, Inc., in Vienna, Va., a government oriented contract programming shop; and Massachusetts Computer Associates, (Mass Compass), a high level research group in Wakefield, Mass., deeply involved in military projects.

ADR Services plugs the corporation into the largest dp user, the Federal Government, on the commercial side; and Mass Compass—a major factorem in network development through ARPA and the National Software Works—ties in the most advanced state of the art research, work that has a five to seven year lead time over the sophisticated commercial market.

"In a business that suffers quickly from obsolesence, it's a useful combination for input into the product line," notes Stephen Warshall, Mass Compass founder and ADR vice president, an elfin figure whose "Warshall algorithm" became a milestone in high level language development. "ADR Services in D.C. is on top of user needs through its commercial government work, and Mass Compass is usually dealing with major industry problems a decade before the commercial industry is sophisticated enough to recognize them," says Warshall. "And because both subsidiaries are self-supporting, ADR gets the info as a freebee ... besides getting a lot of people with beards to dress up pictures in the annual report."

Although there has been very little direct spinoff from Mass Compass into the software product line, ADR president

John Bennett says he is hopeful that there will soon be opportunities from more synergy. ("ADR and Mass Compass merged in 1967," noted Warshall, "and it's only now that the concerns of the industry are becoming involved with work we were doing back then. Ten years—in practical terms, that's the lag time between our research work and the industry.")

Although Mass Compass historically has been tied to military research and contract development for mainframe companies, the first National City Bank of New York (Citibank) recently gave it a major development contract in distributed processing, about which ADR refuses to comment.

But said Warshall, "If distributed processing lives up to the expectations of its most excited touts in the industry today, we at Mass Compass and at ADR will be right out there waiting for them. This sort of networking looks very misleading at first, the biggest problems are hidden. If distributed processing continues to develop in the commercial industry, I think you'll find people with experience in military research trouble-shooting it all over. The military has been thinking of these problems for a long time, and for us at ADR—it's just our meat."

One in the same

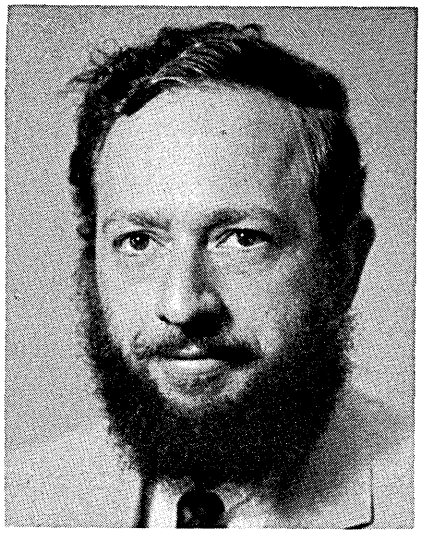
"The industry is just beginning to realize that communication and computation are one in the same," he added. "In our work, we've been saying that for more than ten years—and we've had theorists and designers proving it—but while the world was still perceiving them as different, legally and commercially pretending it's not so, communication in computer systems became deformed to conform to this conception."

At a somewhat more mundane level, communications is the business of ADR's fourth element. The Communications Systems Div. markets the STAR line of "black box" hardware/software products, solid state equipment which gives performance and traffic information on telephone switching systems. ADR's Bennett says there are more than 100 STAR installations, with about 70 of them automatic traffic analyzers for telephone companies ("AT&T is our largest customer"), and the others routing and ticketing systems for internal corporate telephone networks. ("The STAR people are very sensitive about the balance between software and hardware, and it's always good for a company like ours to have people on top of the state of the art in hardware design," notes Warshall. "And because we're putting those units right into the telephone company's central office, our people have had to become very sophisticated about the telephone system—much more deeply involved than the Carterfone types. It's another useful place to have a foothold.")

The largest STAR system is not in the telephone company, however. Citibank's corporate headquarters in New York has a $1 million STAR system routing and accounting for calls over 7,000 extensions, a system that—according to Citibank—shaved $50,000 monthly off the bank's $1.25 million monthly telephone bill.

Revenues of $15.7 million

As revenues jumped from $10.6 million in 1974, to $12.7 million in 1975, then to the estimated $15.7 million for 1976, earnings went from $1.2 million in 1974, to $1 million in 1975, then



STEPHEN WARSHALL
Dealing with problems a decade before industry is ready to recognize them.

bounced again to a record $1.4 million, or $1.14 per share. Earnings include a non-recurring extraordinary tax credit of $384,000, or 32 cents per share, that was depleted in September.

The company's third quarter report jogged Wall Street and the stock doubled to $3. Then a talk by ADR's Bennett to the Philadelphia Securities Assn. put the fourth quarter and year end estimates on the wire and the stock again doubled. What apparently caught the eye of brokers studying the balance sheet estimates was the fact that ADR has been paying off major bank debts while producing earnings.

In 1976, the company paid off over half of its debt, repaying $1.875 million in bank loans, while reducing its $1.320 million bond debt by $350,000. That apparently was enough to convince the market that—whatever the paper profit of software firms past—this company was making real money.

Subscribing to a "critical mass" theory, ADR president Bennett thinks there are a lot of companies like ADR in the computer services industry, firms that stayed in business long enough to gather their financial resources, build a marketing and development infrastructure, and create a customer base from which they can sustain significant growth. "This is our best year yet," said Bennett, "but we've now had three solid years of profit since we got the company turned around—and there are other companies out there in a similar position, including many which have not yet gone public."

Marketing restructure

ADR maintains eight domestic sales offices—with 21 salesmen and an equal number of technical support representatives—and is represented in 31 countries overseas.

Bennett estimates that there are still 4,000 active ADR installations out of the more than 5,000 packages sold, and while ADR marketing has traditionally focused on further exploiting that base, the company is expanding its sales force by 25% and cutting the size of sales territories in an attempt to penetrate the smaller dp shops.

The company's software package line remains focused on "programming development tools,"—programming aids and utility management tools—but according to v.p. Goetz, ADR is seriously studying the prospect of moving into data base management systems. "After all," he said, "it's just another form of program development. It's an area we're keeping our eyes on, but I'm not sure what we're going to do yet." The company's seven-product line reflects Goetz's caution, and the value he puts on enhancing existing products to further exploit ADR's customer base.

"Given the choice," he says, "I would rather take a $10,000 product and make it into a $20,000 product than take the same effort and produce another $10,000 product. If we do a million or two million dollars worth of development every year, I think the better strategy is to do it on your existing product line. We try to come up with new products, of course, and we have—but slowly. Our major emphasis has been on enhancing our existing products.

Look looks good

Goetz's newest product, *Look*, is a system performance measurement package with a permanent license price between $4,800 and $6,000. This year *Look* brought in only $700,000 in revenues, but that is expected to double in 1977. *Librarian,* king of the line, is a sort program management system with permanent license priced between $4,900 and $10,000. *Librarian,* very popular, contributed $4.7 million to 1976 sales and is expected to contribute $5.1 million this year. *(Libarian* now has more than 3,500 installations with a recent "on line" enhancement that was the result of a "very major effort at ADR.")

MetaCOBOL, a high performance COBOL precompiler with permanent license priced between $8,000 and $16,000, contributed $800,000 to 1976 revenues and is expected to offer $900,000 this year. *Roscoe,* an on-line program development package for use in writing and testing programs, is priced, for permanent license, between $28,000 and $35,000, and brought in $3

JOHN BENNETT
Pricing still is a black art in software.

million on 1976 revenues, which is expected to grow to $3.7 million for 1977.

"Looking at packages like *Roscoe* and *Librarian,*" said Goetz, "you find we put five to eight times the initial investment into them since they came out. The more successful your package, the more you have to put into enhancing and maintaining it. Normally, 10% of a package's revenue goes into new development and enhancements; with a more successful package, you put 20% in." *MetaCOBOL,* with 300 installations, is "just beginning to sell," said Goetz, but its growth has been gradual. *Roscoe,* once blocked by bundled IBM software, has exploded by comparison: two years ago there were only 30 or 40 installations, now there are about 240.

The grand dame of the line, *Autoflo,* the first commercial package patented, a software documentation package also used for testing and debugging programs, has been priced between $6,500 and $20,000 with major enhancements. It contributed $700,000 to '76 sales and was expected to add $1.2 million in 1977. In late 1976, however, ADR chose to spin off two *Autoflo* enhancements–the extended text compositor (ETC) and the automated system charter (ASC) as separate packages, and complete breakdowns are not available.

The black art

Pricing is still the black art in software packages. Bennett brushes aside questions about volume pricing schedules with the wry claim that he charges "what the market will bear"–but it's clear that with the extended life of IBM 370 software, profit margins must grow, and ADR has just announced a new pricing scheme that can only add to them.

The company's financial situation has improved enough so that they are planning to again introduce long term, non-purchase leases on their software packages, a marketing tactic tried briefly by ADR and others in the early days of proprietary software, but abandoned because none of the firms could afford waiting for long term returns. By taking the risk of obsolescence themselves and billing monthly on three and five year leases, ADR's Bennett says he hopes to reach the smaller, lower budget dp shops. Previously, ADR pushed its customers into front end permanent lease purchases because it needed the cash –and while there was a month-to-month rate, it was priced high to encourage permanent license sales. The month-to-month 30 day leases will remain the same, high and unattractive, but the three and five year contract leases will offer monthly payment schedules substantially lower. The new long term contracts will have a purchase option (permanent license) but will allow only 30% of the cumulative payments to be applied to cost; and then only up to 30% of the full price. (The rates get confusing, but if an ADR package is priced at $10,000 for permanent license, the month-to-month rate is $550 per month; the new three-year lease costs $325 a month; and the five year lease is tagged at $265 a month.)

Under 10% of ADR's customers currently use the month-to-month lease, and Goetz expects most of his customers will still choose the permanent license –"but we may shift to about 20% under the three and five year plans, attracting more of the small shops." The idea is to build up recurrent income, an ongoing money machine.

ADR currently gets a 15% annual "maintenance payment" from active users of permanent license packages, beginning with the second year of package use. In 1976, that recurrent income amounted to $2.5 million; in 1977, it is expected to be in excess of $3 million. The new long term leases are evidence of ADR's corporate maturity; the granddaddy of the proprietary software independents is perhaps just emerging from pubescence. The ideal, of course, is to reach the point where a corporation can stand the cash exposure and price earnings impact, then lease to all, billing month by month.

ADR president Bennett figured it quickly in his head: "If we had been able to do it from the beginning, with 4,000 of our customers still using them ... figuring a $10,000 front-end license three years at $300 a month, is $10,800–and if you still want to, you just keep paying. Whew! If we could have done that," he said, a trace of lost opportunity in his voice, "we'd have $15 or $16 million coming in just from what we have out there." **–Vin McLellan**

Facilities Management

EDS Wins First Round

Schaefer Must Pay Dallas Firm or Return DP System

The F & M Schaefer Corp. lawyer, Thomas Christo, looked shocked, while the battery of EDS attorneys exchanged discrete, congratulatory smiles.

In the Federal courthouse on Manhattan's Foley Square, U.S. District Judge Constance Baker Motley had rendered her decision, ruling that Schaefer had to either pay the $1.3 million it owed EDS, or return the data processing system EDS had designed for it–a system that had already cost the brewery firm about $12.5 million.

For EDS the March 16 decision has to be counted as a stunning victory. The Dallas-based firm had initially been sued by Schaefer for $115 million on charges that the system EDS had been putting together for Schaefer was faulty and had caused the beer manufacturer enormous damages.

To present its case Schaefer retained Christo, a 29 year-old attorney who made his name winning a jury verdict against IBM for $11.4 on behalf of a dissatisfied IBM customer, Catamore Enterprises Inc.–a judgment that was later set aside by a U.S. Court of Appeals.

EDS, in turn, brought in two heavyweight law firms: Kaye, Scholer, Fierman, Hays & Handler from New York; and Hughes, Luce, Hennessey, Smith & Castle from Dallas.

As a counter to the Schaefer suit, EDS

claimed that when Schaefer cancelled its facilities management/systems development contract in 1976—a year before the contract ran out—it still owed $1.3 million in payments that had been deferred by the financially ailing brewery in 1972 and '73. EDS strategy: file a motion with Judge Motley to take either repossession of the system, most of which had been turned over to Schaefer, or get its $1.3 million back.

That motion would be heard before the original Schaefer damage suit against EDS could be brought to court before a jury trial.

When the repossession hearing opened on March 9, Sheldon Oliensis, the senior lawyer on the EDS team, charged Schaefer had used "duplicity and deception, lying and juggling of the firm's records to deceive and mislead EDS."

On one hand Schaefer executives were promising they would make the deferred payments owed EDS if EDS would turn over the system before the development and service contract expired, Oliensis asserted.

Meanwhile, having read about what then (1975) appeared to be Catamore's victory over IBM, Schaefer secretly set about plotting to sue EDS as soon as they had the EDS system in-house, claimed Oliensis. Schaefer board chairman, Robert W. Lear, retained computer consultant Richard Brandon to evaluate EDS work for Schaefer and to advise the company of the feasibility of a Catamore-like suit, Oliensis said.

Meetings with Brandon were held off the Schaefer premises to ensure secrecy, the EDS lawyer maintained. Calls and memos about the proposed litigation were to be kept to an absolute minimum, and memos on the subject were to be shredded. Not even Schaefer's own board of directors would know about the suit or the retention of Christo until a September 1976 board meeting held just before the suit was initiated.

Christo, in turn, argued EDS had failed to live up to the obligations of its contract. "If you pay a contractor to build a house and the floor of the living room falls in, you sue," he told the court. And you don't pay whatever balance is still due the contractor, because he hasn't done his job.

Specifically, Christo claimed many components of the EDS system didn't work, while others had never even been delivered. Short range forecasting, for example, never provided accurate output. Payroll was being operated "on a wing and a prayer" and often made erroneous tax computations. Accounts receivable had mistakenly reported a number of Schaefer's dealers in the Puerto Rican community as being delinquent in their payments. The erroneous reports went to the New York State Alcohol Control Board, which subsequently prohibited these dealers from doing business until their accounts were cleared up.

Not surprisingly, said Christo, the mistake created tremendous ill-will against Schaefer on the part of the dealers. And at this time Schaefer was introducing a new Malta Product (a heavy malt-based ale-like drink) directed specifically at the Puerto Rican market. In their anger at Schaefer, the dealers refused to push the product, and it flopped, costing Schaefer $7.6 million, Christo maintained.

The EDS system was "literally garbage," he charged, nothing more than a half-baked revision of the old in-house system Schaefer had used before entering into the EDS agreement in 1969. And now the brewer was desperately trying to put together the pieces.

A staff of 24 programmers and other personnel (the old Schaefer staff had been eliminated in accordance with the EDS contract) had been hired and was working around the clock to repair and replace EDS work. Given these conditions, EDS wasn't entitled to either repossession or payment, Christo asserted.

EDS spent $4 million

Witness Samuel Freedman, Jr., an EDS v.p. in charge of the Schaefer account, defended the system, claiming EDS had spent in excess of $4 million and "several hundred thousand" man-hours developing it for the brewer. Moreover, he claimed, Schaefer executives like v.p. of finance, Robert G. Oatley, had repeatedly assured him and other EDS officials that EDS turnover of the system was proceeding satisfactorily and that the deferred payment would be made—assurances Oatley later claimed he "couldn't recall." Nor could Oatley recall meetings and memos that EDS claimed linked him to litigation preparations. Schaefer never decided to sue until it actually cancelled the EDS contract, Oatley stated.

As the hearing progressed, Judge Motley appeared to grow increasingly impatient with the Schaefer defense. Repeatedly she scolded Christo for not taking the hearings seriously enough when he engaged in a private joke with one of his staff. On another occasion she snapped, "I'm not going to tolerate any such argument out of you," when Christo attempted to go back over a subject relating to the EDS contract.

The EDS legal contingent, meanwhile, seemed to grow increasingly confident. And well they might. On March 16 Judge Motley made her decision. Schaefer's claim that the system EDS turned over to it in 1976 was the same system Schaefer developed itself prior to the contract, was rejected.

One of Schaefer's own employees, Judge Motley stated, pointed out that the EDS developed system was a tape system, while the old Schaefer system was a card operated system.

She went on to note that the tape system developed by EDS is, "a fast system," and that, "Schaefer's old card system is obsolete now and not capable of being operated on today's computers without substantial adaptations."

She continued: "The EDS system, the court finds, is a more sophisticated system, in that it uses the new language of present day computers.

"But even if the EDS system is no improvement over the old Schaefer system, even if the EDS system was not worth the millions that Schaefer paid for it; even if the EDS system is peppered with errors, the fact remains that the EDS system is not the same one which Schaefer had given to EDS in 1969."

Moreover, Judge Motley maintained Schaefer had no performance clause in its contract, so performance was not a condition for payments or turnover of the system.

And finally, Judge Motley found unpersuasive the Schaefer argument that software, unlike hardware, cannot be repossessed since it is a body of intangible ideas and concepts. "This system, the court finds, is quite tangible."

EDS's motion for repossession—or repayment—was therefore granted.

Schaefer will appeal

Immediately, Schaefer said it was going to appeal the decision, claiming that in ruling, for example, that EDS had created a new system for Schaefer, Judge Motley had gone far beyond the scope of the pretrial motion and had severely undercut its own case against EDS.

But if the decision stands, it can't help but serve as a boon to facilities management, software, and systems development organizations, observers in the service industry maintain. Unable to patent software, these organizations can look to the Motley ruling as a precedent for establishing systems ownership.

Conversely, users may now have to think twice before initiating a suit against a software or service vendor, particularly if they've locked themselves into a contract without a performance clause.

Meanwhile, Judge Motley has scheduled the Schaefer suit against EDS to begin on November 14. The trial may well prove anticlimatic.

—Laton McCartney

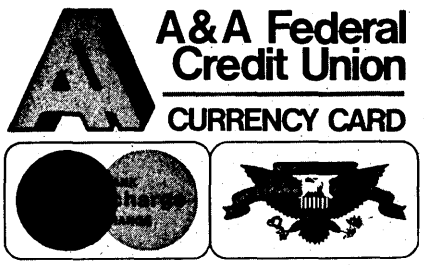
Banking

Master Charge Banks Sued

"The banks are out of their cotton picking minds. They're inviting the wrath of the Justice Dept."

This comment came from Dr. Melvin E. Salveson whose company, Electronic Currency Corp., filed a suit in a Los Angeles federal court last month against the founding banks and affiliates of the Master Charge system.

The suit charges the banks with



The card that never made it

breach of contract and conspiracy to violate section one of the Sherman Antitrust Act. Electronic Currency seeks $100 million in damages, and alleges that Master Charge customers have been overcharged more than $500 million as a result of the supposed attempts to monopolize the bank credit card business.

Dr. Salveson lays claim to having invented the Master Charge system (October 1975, p. 112). He said he developed the idea for the system between 1962 and 1966 when he was president of Santa Monica Data Center, a retail oriented service bureau which did a lot of accounts receivable processing. "I decided our whole credit organization system was archaic," he said.

BankAmericard was around then, he recalls, but it hadn't gone nationwide. He took his ideas to United California Bank, Wells Fargo Bank, and the Bank of California, which became the first Master Charge banks and subsequently was asked to develop a system for Western States Bank Card Association which launched Master Charge.

Given some rights

"They said they would use my system but without me," Dr. Salveson said in 1975 when he formed Electronic Currency Corp. He said he settled a dispute over this with WSBCA in 1967. "They gave me $112,500 plus interchange rights." These rights included use of the Master Charge logo and the requirement that Interbank Card Assn., the national firm which holds the Master Charge trademarks and licenses, promote any cards he might develop, and to clear their transactions through the Master Charge System.

Dr. Salveson says he never got those interchange rights. "I negotiated with them over this for 18 months. They negotiated in a deceitful and bad-faith manner."

Named as defendants in his lawsuit are the Western States Bank Card Assn., Wells Fargo Bank, Crocker National Bank, United California Bank, Bank of California, and Interbank Card Assn.

The suit claims, among other things, that the banks delayed in making available the computer equipment needed to tie Electronic Currency's card program into the Master Charge system, and attempted to prevent other banks from joining the program.

Never got off the ground

When Dr. Salveson formed Electronic Currency he planned to issue his cards through credit unions, savings and loans, and other business firms. He had signed up 10 credit unions, he said, and had received indications of interest from some 6,500 other organizations. But, he never got off the ground.

He claims that the Master Charge banks, during the time he was negotiating with them over clearing arrangements, began signing up credit unions themselves, something they'd never done before.

Electronic Currency's cards featured the crossed circles of Master Charge in a box in the lower left hand corner and the company's own eagle symbol in a lower right hand box. The logo or symbol of the issuing company would have gone across the top half of the card. The cards would have had mag stripes, which Master Charge cards do not, enabling them to be used at unattended teller terminals.

Given up hope

Dr. Salveson has given up all hope of reviving his company. "We've delisted ourselves from the telephone book and dequalified ourselves from operating in California." A Nevada corporation, Electronic Currency has only one address now, the address of Dr. Salveson's attorney in Las Vegas.

In addition to trying to get Electronic Currency off the ground, Dr. Salveson is a professor at Pepperdine Univ. and does consulting work. How does he feel about folding Electronic Currency? "It's been my baby for 15 years. It's like giving up a child you've nurtured for ages."

Minicomputers

He Found IBM In The Yellow Pages

Ivan Socher is a great admirer of IBM. "It's the finest company the world has ever seen."

But, when he worked for the jolly grey giant for two years in his native South Africa, Socher, who today is general manager, Commercial Systems Div., Computer Automation, Inc., Irvine, Calif., discovered that he and IBM were "completely incompatible."

He went to IBM from the garment industry and was, at first, delighted to find that, "Hey, these guys are civilized. There's no eat-or-be-eaten. They're geared to helping people. They radiate good will."

Two weeks later, he said, he "took a look at IBM's financials." He told himself, "this can't be real. Making a profit is what business is all about and that's where they were at too." That's when he decided he and IBM were not compatible. "I couldn't swallow all that good will."

But he's brought a lot of IBM practices to Computer Automation's first efforts to sell in the end user market. He's heading the division selling SyFa (System for Applications) introduced last May for distributed processing applications. His, he says, is a one price outfit like IBM. "When we quote a price, our customers know that's it—that there's no room for negotiations." He likes his salesmen to dress like IBMers. He doesn't insist on dark suits and white shirts, but "if I don't notice how they're dressed then that's fine." He also has a taboo against drinks at lunch.

When SyFa was introduced it was billed as "a low-cost computer system for the administrative and operating levels of business management." It was, the company said at the time, "aimed at the fast-growing market for distributed data processing systems."

First push for new market

The introduction of SyFa marked Computer Automation's first big push for a portion of the end user market. The company has been selling to end users since 1974 when it started its Industrial Systems Div., which offers systems built around its Capable Tester, a computer-based logic tester it had offered as a product since September 1969. With the establishment of the Industrial Systems Div., it added software involvement.

Prior to 1974 the company was firmly committed to oem sales only. Its president, David Methvin, said during a Wescon show back in 1971, "We're in the oem business and that's where we're going to stay."

The origins of SyFa really are not within Computer Automation. They go

Seven tough problems in "On and how Tandem's "NonStop"™

The Tough Ones.

1. System Down—Processor Failure.
2. System Down—Disc Failure.
3. System Down—Repairing Hardware.
4. System Down—Restoring Data Base.
5. System Down—Software Failure.
6. System Down—Changing to a Larger Processor.

Lots of things change when you go "on-line." Mostly for the better. That's why this is the most important trend in data processing today. But the one area which concerns management the most is "What happens when the computer goes down?" It's a good question, and until Tandem introduced "NonStop" processing last year the answers weren't pleasant. Service is interrupted; that's bad enough. But there is worse news still. At the instant of failure, a transaction in process could be lost (or duplicated), a record being updated could be destroyed, or a pointer changed incorrectly could cause the loss of untold records. In short, loss of service is the surface cost. Loss of data base integrity is an even greater problem. Tandem's NonStop System, hardware and software, is the first top-down, designed-in solution to both these problems. To make it even better, we've designed it so it's easy to program, easy to expand, and easily the most efficient transaction processing system around.

1. System Down—Processor Failure.
Every computer will fail sometime. The bigger they are, the more often they fail. Tandem has replaced bigness with a unique multiple processor architecture. Workloads are shared by the processors under control of Guardian, the only NonStop Multiple Processor Operating System available regardless of price class. When a component fails, Guardian automatically reassigns both processor and I/O resources to ensure that in-process tasks including file updates are completed correctly. You decide the priorities; Guardian does the work. And no interruption of your "on-line" workload occurs. Restart is virtually instantaneous.

2. System Down—Disc Failure.
When one of your disc storage devices fails in the middle of a file update, unknown damage to the record, to record pointers, or to indices can occur. Enscribe, Tandem's NonStop Data Base Record Manager, ensures that the damaged record is restored; and, with our optional Mirror Volume duplicate file technique, that operation is continued using the back-up file. The back-up files are created automatically and are used by Enscribe to improve system response time. When the down disc is repaired so are its files, automatically, by Enscribe. You decide which volumes to back up; Enscribe maintains them, and no interruption of service occurs.

3. System Down—Repairing Hardware.
With any system, a hardware failure must be repaired. But only with Tandem can the system keep operating, right through the failure and through the repair, too. Tandem's Customer Service Representative can remove and replace any failed module in your system without interrupting service. The operators at terminals and the programs in process are totally unaware of either the failure or the repair. And routine maintenance, too, is performed with the system fully operational. This is one more unusual feature of our system, but without it, no system can truly be called "NonStop."

4. System Down—Restoring Data Base.
When a hardware failure occurs during file update in any "on-line" system which is not NonStop, there is every reason to question the integrity of the data base. Integrity of the data base is crucial. For this reason, elaborate procedures to maintain restart points and backup files are required in almost all "on-line" systems. Not with Tandem. Using Guardian and Enscribe, the Tandem NonStop System ensures that all transactions are completed correctly even if a processor, I/O channel, disc controller or disc drive fails during that transaction. Equally important, the system downtime normally required for "restore" and "restart" operations is eliminated.

5. System Down—Software Failure.
System software crashes are an important source of downtime in ordinary on-line systems, but not in Tandem installations. Because all Tandem software is designed and tested to run in a multiple processor environment, it is also designed and tested for failure modes never considered in single processor systems software. Most important, the use of independent processors, each with its own memory, assures that a software failure in one processor cannot cause a failure in a second processor or contaminate the data or programs executing in that processor.

6. System Down—Changing to a Larger Processor.
On-line systems tend to grow, and as they grow they change. New applications, more stations, improved service; all of these result in a need for bigger, faster processors. With Tandem's NonStop System you can actually add processors, add memory, and add peripherals without any re-programming whatsoever. Using Guardian, Enscribe, and Envoy, Tandem's Data Communications method, all user programs and all files are geographically independent. They have to be for NonStop operation. You can also write your programs using a powerful high-level compiler for a multiple processor environment as easily as for a single processor.

7. System Up—Confidence Down.
When an "on-line" system is up, people come to rely on it. And because today's computers are reliable, people have come to rely on them quite heavily. Which makes it even worse when the system does go down, or the information it supplies is wrong. Confidence is severely damaged. And anyone who has tried manual back-up systems knows that they are not the answer. An automatic back-up, non-stop system is the answer. And Tandem has it.

Line" Data Base Systems System solves them.

Tandem offers a proven, field tested solution to the two principal questions everyone should ask about an "on-line" data base system: What level of service will it provide? What protection does it offer for my data base?

Someday all "on-line" systems will be NonStop. Tandem 16 Systems are NonStop today. And without price penalties. Not everyone needs an on-line, real-time, non-stop system, but for those who do there isn't another solution worth thinking about. Tandem Computers, Inc., 20605 Valley Green Drive, Cupertino, California 95014 or Tandem Computers GmBH, Bernerstrasse 50A, Frankfurt 56, West Germany.

Toll Free 800-538-9360 or 408-255-4800 in California.

Guardian

Multiple Processor Operating System

NonStop operation.

Automatic re-entrant, recursive and shareable code.

Virtual memory system.

Geographic independence of programs and peripherals.

Enscribe

Data Base Record Manager

Provides relative, entry-sequenced and key-sequenced files.

Each file may be up to four BILLION bytes.

Up to 255 alternate keys per file.

Optional mirror copy by disc volume.

Envoy

Data Communications Manager

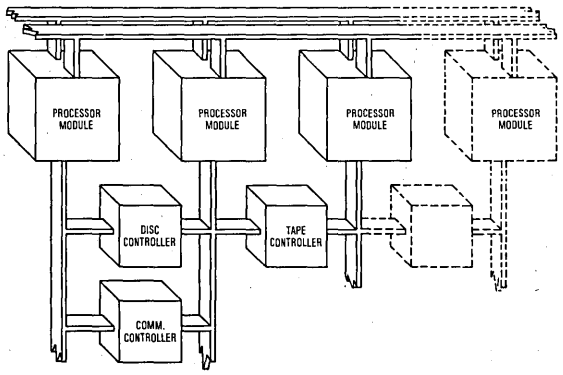
Communications with remote devices and/or processors.

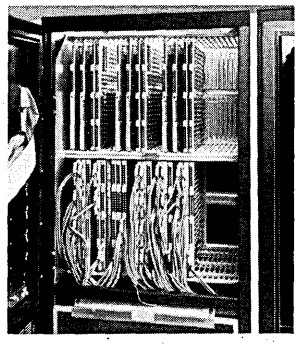
Support of point-to-point, multi-drop, master and/or tributary.

All transfers via DMA.

Speeds up to 19.2Kb asynchronous and 56Kb synchronous.

Photo and schematic show three processor modules with space for fourth module, interconnected to disc controllers, tape controllers and communications controllers.





TANDEM

The Tandem 16 NonStop System is composed of multiple, independent processors with dual redundant communications paths. The unique interaction between Tandem hardware and software assures not only continuous operation, and the integrity of your data base, but also throughput unmatched by any other computing system of comparable cost.

back to South Africa. Socher, while president of a South African distribution company felt the market needed a minicomputer geared to heavy input-output as opposed to raw processing power. At the time, his company, Computer Advances Ltd., Johannesburg, South Africa, was a distributor for Computer Automation.

"We spec'd what we wanted in hardware and Computer Automation agreed to build it." The upshot was CA's Megabyter, announced in early 1975. Socher wanted the software development to be done by Computer Advances, but his board of directors said, "No, development is done in America." The board refused to fund the development so Socher funded it privately. Seven people resigned from Computer Advances to work on the development. Ultimately the project involved nine Computer Advances personnel."

Very quiet

"We were very quiet about it," Socher said, "which probably is part of why Datapoint is suing us now (October 1975, p. 137)." Datapoint is contending in on-going litigation that software for the SyFa system was stolen from Datapoint. At the time of the SyFa software development Computer Advances was a distributor for Datapoint, and still is.

"There was an ego reason for being quiet," Socher said. "What if it flopped?"

While the software development was going on, Socher and company still didn't see themselves as part of Computer Automation. They wanted to be a distributor for CA's hardware and, as for the software, "We gave them (CA) U.S. marketing rights and said good luck to them."

Good-bye to South Africa

But, during this time the group did decide they'd like to leave South Africa. "It was beginning to seem like it wasn't a good place to bring up children. The plan was not to go to America, but rather to Europe, specifically, Geneva, Switzerland." The reason the group came to the U.S. and to Computer Automation in July 1975, Socher said, "was Dave Methvin's persuasion."

Socher brought to Computer Automation a bit of what he calls his "garment industry mentality." He dislikes clean desks, preferring clutter.

A native of Rustenberg, South Africa, Socher attended the Univ. of Witwatersrand in Johannesberg (Witwatersrand means reef of white water and refers to a gold reef off of South Africa's shores). Before he went to college, his father gave him three choices. "You can be a doctor, a lawyer, or an accountant." He fancied the idea of getting into business so he chose accounting.

After college he faced the choice of business or industry. He chose industry and joined a garment industry firm as an accountant. He soon found his way into sales and wound up as sales manager. "I wanted to be president but knew that couldn't be because I had no flair for fashion, so I looked around for another business."

A growth industry

He looked at numbers. "I decided that the growth industry was the computer industry." He talked to a professor

IVAN SOCHER
"... to the side of the rails."

he'd had in college who told him the only way to get started in the computer industry was to join a company called IBM. "I looked them up in the yellow pages," Socher said. "It took me six months to persuade them to hire me as a trainee salesman."

In the two years he stayed with IBM, before founding Computer Advances, he says he learned a lot. One of the things he learned is what he calls being a sales plan lawyer. At the beginning of every year, he explains, each IBM sales group gets a sales plan which each salesman studies with an eye to "optimizing his earnings. Selling your manager on what your quota should be is your most important sale of the year."

Socher has no regrets about coming to the U.S. He likes it here and finds it "little different from South Africa —an office here is like an office there." He said the wives of the people who came to the U.S. with him had a more difficult time. "They were home-sick at first. And servants were easier and cheaper to come by in South Africa. My wife didn't even know how to cook."

And, he likes selling SyFa. The first system went in in May 1975, even before he'd become part of CA (although he had spent time there helping to integrate the hardware and the software). It went in a full year before the product's formal introduction, at Premium Forest Products in Canada. Six more systems also went in prior to introduction.

Big customers

Customers since the first installation have included Dow Chemical, Von's Supermarkets, American Honda, Wright & Greer, the Glendale Adventist's Hospital in Glendale, Calif., and Pure Lard and F. W. Woolworth in the U.K. But, by far the biggest order to date for SyFa, and one which Socher says is leading "big companies to come looking for us," has come from Fireman's Fund Insurance. Computer Automation competed with IBM, Digital Equipment Corp., and Microdata for the contract, which permits Fireman's to purchase up to 100 SyFa systems over the next two years. So far, four systems are in at the insurance company. Socher said some 50 to 60 systems in all would have been installed by the end of the first quarter.

He emphasized that he is not after small business. "We market to companies that have a mainframe, a data processing staff, and communications requirements." He is reluctant to get into replacement. He noted that the SyFa systems being used by Fireman's Fund will be be taking over some functions formerly handled by Four-Phase Systems equipment but said the primary reason for the buy was for new applications. "The fact that they also can handle some of the Four-Phase applications is a plus."

Although he did beat out IBM on the Fireman's Fund order, Socher is reluctant to compete head-on with his former employer. "IBM is like a train, and if you're in front of them on the track you get flattened. I prefer to stand to the side of the rails."

—Edith Myers

Nobody Notices When One Cpu is Down

It's difficult to name a mainframe vendor who is unaffected by what IBM does. One that seems to fall into that category, though, is Tandem Computers Inc., which makes the multiple processor system called NonStop.

Last year the firm shipped its first system at the end of May, less than a year and a half after beginning operations, and yet turned a profitable month in December. For the year, it will be profitable in 1977, says president James G. Treydig.

Tandem's NonStop, configured with up to 16 minicomputers, is designed to handle heavy transaction processing and provide high reliability, allowing one processor to take over when another goes down. It is for the user who cannot afford any system downtime. Marketing v.p. Sam Wiegand says a user who can get by without his system for two minutes or two hours "is not a hot prospect for us."

But in a variety of industries and for an equally broad range of applications, the so-called failsafe mode is imperative. Current customers, most of whom are still in the applications development stage, are in such fields as banking, manufacturing, sales and distribution, and materials handling. A system at the Eastern States Bankcard Assn. (Master Charge) is reported to be processing four to five transactions a second, taking on the credit verification task for ESBA and for its member banks when any of their host computers goes down.

Other users

Tandy Corp. has been in system development with one system since last October, and last month placed the second system in its Los Angeles warehouse, one of five regional Radio Shack warehouses. And the prominent legal-firm of Mudge, Rose, Guthrie, and Alexander in New York has one in a test processing application, producing what lawyers call a redlined document. It provides input to a photo typesetter, and is not intended for the production of letters or memos.

Tandem computers, based in Cupertino, Calif., is now shipping hardware valued at some $600,000 a month, projecting volume this year at $10.5 million. As of mid-March, it had shipped about 60 cpu's, an expression used in place of "systems." But that's about 30 systems. "Our average price last year was $137,000," says Wiegand. "We think this year, with our new data base management software and the bigger discs, it'll be closer to $180,000. That comes to almost 60 systems in 1977."

That could also be expressed as somewhere in the neighborhood of 130 cpu's. But systems shipped to date have had price tags ranging from $100,000 to $400,000. Still, most systems have only two processors. Why is that?

In development stage

"That's because most of them are still in the program development stage," explains Wiegand. Treybig refers to a large insurance company, unnamed, that has in mind a six-processor system, but still is uncertain as to what all it could do on the Tandem and it won't know until it has written the applications program. It likely will acquire initially a two-processor system for perhaps $140,000 and use that to write programs. As applications are implemented, the firm can add processors incrementally, gradually upgrading to a potential $1 million system—but without having tied up that one megabuck for the first year or two of the development phase. This pattern appears across the customer base.

The Master Charge people, whose system was delivered last July, has added more disc drives, and large main memory, and are scheduled soon to add a third processor. "We've had an upgrade, I believe, from everybody," says Treybig, and most of them were planned from the start. The one exception is Citibank, which was the first installation, but that's also the only one that has not yet had any applications running. The bank, whose decentralization efforts have been well publicized, is still looking for uses for its NonStop.

Treybig guesses that one-fourth to one-third of Tandem's monthly business comes from upgrades to existing installations.

Formed in 1974

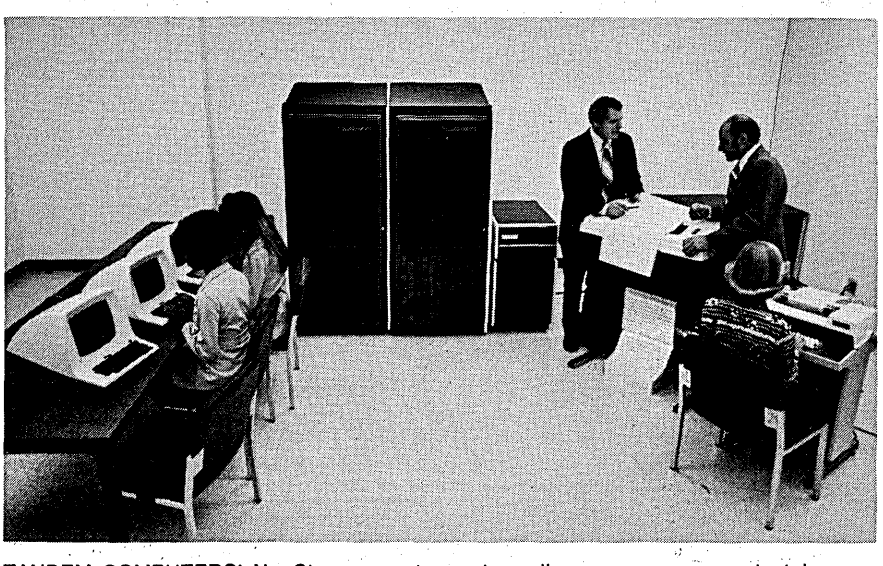
"Tandem has met all of its development schedules, all of its shipment schedules, sales objectives, and exceeded our profit objectives," says Treybig, who with three other former Hewlett Packard employees founded the firm in December 1974. To date, the firm has attracted $5 million of venture capital backing, not all of it spent, and has established a line of credit with the Bank of America at less than one percent over prime that it hasn't yet touched. The company, with just over 100 employees, has already outgrown its current modern quarters, and is examining alternatives that include the construction of another facility next door. The chief executive, showing a streak of optimism, sees his firm approaching the $100 million mark in 1979 or 1980.

Contributing to that will be the increasing confidence of the user community in this small, little-known but fast-growing company. There's nothing wrong with supplying upgrades to existing installations, but Treybig also sees a lucrative business in the replication of newly developed systems. In August, Tandem shipped a system to the Transportation Technology Div. in Denver, Colo., of the Otis Elevator Co. which is building an automated train control system under sponsorship of the Federal Transportation Dept. In the long term it could lead to the devlopment of several hundred systems. And earlier this year, Tandem installed a machine at Illinois Bell that could lead to sales to other affiliates of AT&T.

Deliveries to Europe

In addition, the company has begun deliveries to Europe. By the end of this month there will be three systems in West Germany, one to a steel company and two to a wholesaler whose business is all cash and carry—for a point-of-sale application. "We expect this year that Germany alone will account for about 15% of our total shipments," says Wiegand. "It's a very active market."

But as with any hardware vendor who also performs its own field service, Tandem must be concerned about the loca-



TANDEM COMPUTERS' NonStop computer system allows one processor to take over when another goes down. Now they're talking about an audible alarm.

tions of its service offices. It has managed, for example, to service systems in Columbus, Ohio, in Chicago, Minneapolis, and in Lincoln, Neb., from an office in Chicago. The pitch is that if one processor or other subsystems should go down, there's always a backup to take its place until the serviceman arrives. And, says Wiegand, that has always held true; never has an entire system failed. Indeed, the Chicago serviceman once made his monthly call for preventive maintenance and found that one of two processors had been down for a week without anyone noticing it. So Tandem now is developing an audible alarm for its machines.

—Edward K. Yasaki

International

France is Ready to Clamp Down on Computer Abuses of Privacy

The French take their computing almost as seriously as they take their liberty, and together they're a powerful mixture.

By this summer, France should have a law governing information processing and civil rights—variously known in other countries as data protection or computer privacy bills.

In the last two or three years, a number of computer "scandals" have been splashed across the headlines of the major dailies. One such story, responsible for making the French conscious of the possible abuses of computer systems, was the SAFARI scandal of 1974. The outcry it produced had led directly to the present bill due for parliamentary debate in the April to June session of the French Assembly.

SAFARI was a government project to give a unique, personal identifier to every Frenchman (who already carries about twice as many identity cards as an American carries credit cards). The idea was to facilitate interconnection of government administrative files.

"SAFARI—or hunt the Frenchman" ironized a headline in the respected *Le Monde* newspaper. Public pressure mounted to such an extent that president Giscard d'Estaing stepped in with a ban on all interconnection of name-linked state files.

He followed this up some months later by setting up a special commission to report on Information Processing and Civil Rights (Informatique et Libertés). The report, which gave a comprehensive and interesting rundown on international developments in the field, was prepared in double quick time—around 12 months. It has resulted in the present parliamentary bill, due originally for debate last fall, but now scheduled for the April to June session because of pressing economic legislation.

Keen on privacy laws

Another public controversy in the privacy debate was provoked by France's Interior Minister, Michel Poniatowski —"Ponia" to the popular press. "Ponia" is a highly controversial figure in his own right. His critics accuse him of everything from trying to buy the offices of France's best known satirical weekly, *Le Canard Enchainé*, to making political gaffes by arresting Palestinian terrorists at the wrong time and by hushing up scandals which might have political repercussions. But the man is likable, even affable—and he is keen, so he says, on

stricter computer privacy legislation.

It was Poniatowski who sparked off violent parliamentary exchanges last year when he accused certain Communist controlled local government authorities of using publicly financed computer systems for private party ends —and taking advantage of publicly compiled name-linked files. His initial remarks were made at the OECD seminar on Information Processing and Local Government which took place in the Paris headquarters of the international organization.

Poniatowski, while emphasising the importance of computers in local government, took a sideswipe at the Communists. His allusive but pretty unambiguous remarks were not taken too kindly by those present, who felt that the French politician had broken an unwritten rule that speakers under the OECD roof do not take advantage of the forum to make domestic political capital. (International yes—domestic definitely not).

But it was received even less well by the Communists of the Bobigny local authority in northeast Paris, who took his comments to refer to them. The charges were refuted by the Communists. But a week later, the minister added some names to his accusations in a parliamentary debate.

According to Poniatowski, a service bureau, SOGIR (Société de gestion et d'informatique rationnelle set up by the Communist party in 1971), had been carrying out work for Communist controlled local government authorities. "At the beginning of 1975, the intercommunal association of Bobigny acquired an Iris 45," he charged. "This computer was intended to serve the six neighboring communes. But the intercommunal association had nothing better to do than set up a file of immigrant workers, classified by nationality and linguistic group," he said.

The Communists, Poniatowski continued, commissioned SOGIR to carry out certain studies on this publicly financed computer—including a scheme to produce a mailing list for the distribution of printed material.

MICHEL PONIATOWSKI
Accused Communist controlled group of using computers for propaganda.

He said that the resulting system was clearly directed towards the collation and distribution of trade union tracts—specially edited for immigrants in their own language—and destined to be sent out over the whole of the national territory and even to other countries. The Communists described this as a whole lot of hogwash, and pointed out that the lack of any further action by the interior minister is the best indication that the accusations were unfounded.

Most are unconcerned

Despite ministerial and press interest in data protection, a recent book by two of the members of the commission which produced d'Estaing's *Informatique et Libertés* report shows that the average Frenchman is unconcerned about privacy. The book, written by Francoise Gallouedec Genuys and Herbert Maisl, *Le Secret des Fichiers,* Editions Cujas, indicates that about the only concern about privacy may be his love life and bank balance.

But there are two groups which object strongly to the intrusion of any file system into their daily lives: the rich and privileged middle classes; also the younger, usually left included groups. The latter take exception to the insidious growth of any systems which tend to reinforce categorization or to reduce

individuality.

The book showed, too, that most persons are ready to abandon their rights to confidentiality if it is to their advantage. Income information was, however, felt to be particularly sensitive. Doctors' files are those considered to be most completely trusted by the French public—with journalists' files being least trusted. Police files are much more highly trusted for confidentiality and accuracy than social security or insurance company files.

But while most Frenchmen believe that a great central state computer holds information on every member of the public, a third of these are relatively unconcerned about it, and only 31% seriously concerned.

National commission

The crescendo to which the feverish activity and interest in computer privacy has been building should be reached this spring with the parliamentary debate on the new bill. The main proposal of the draft legislation is to set up a national commission on information processing and civil rights. This 12-person team will be charged with checking data processing activities all over France (and in some cases outside the boundaries of France). Also, it will have a mission to publicize existing processing. It will have the power to refer abuses to the legal authorities and have an advisory capacity to government and the justice ministry.

One proposal in the bill is separate legislation for public and private sector data processing systems. All public systems will have to be subjected to approval and a formal decree must be issued. But private users have to declare the nature of their system—a procedure which could be complex for the organization concerned.

The commission will be responsible for keeping an up to date list of systems covered by the law. This will be accessible to the general public on demand. The commission is to make an annual report to the president of the republic.

The new law will recognize the right of access and correction of data on individuals or organizations. Particular categories of information will be accessible only indirectly—such as those impinging on state security or medical records. These will be accessed by a member of the commission or a doctor.

Assuming the bill is approved, the collection of data will also come under the commission's aegis. Questionnaires will, for example, have to state whether the answer to a question is legally required and what the data is to be used for. It will be illegal to record details on race, religion, political or philosophical beliefs, or trade union affiliation. The public sector is to have the monopoly of storing judicial information so as to avoid the growth of private judicial data banks.

International thinking

France is playing a considerable role in international thinking on data protection, at the moment, in the person of Louis Joinet, chairman of the Council of Europe committee of experts on transfrontier data flows, and also very active in the OECD. Joinet also helped frame the French law.

A couple of its 37 articles at least show a concern over the problem of transfrontier systems. For example, article 21 states that automatic processing of name-linked data carried out on French soil and intended for transmission outside French territory in any form whatsoever has also to be declared to the Commission. The same considerations apply when the processing is only partially carried out in France when data has been partly processed outside the country. Though the wording of the bill and its future application cannot be determined easily, the bill does state that mere interconnection of name-linked data is regarded as similar to processing of name-linked data. The bill could therefore have an effect on any internationally linked file systems.

Article 22 reinforces this requirement by stating that the transmission of any name-linked data between foreign countries and France may be subject to prior authorization or control "so as to ensure the respecting of the principles established by the present law."

What must be declared

The requirements for the declaration are fairly detailed. Article 16, for example, stipulates that the following details must be declared: the end use of the system, the categories of persons who have access to the data, the name-linked data which is processed, its origin and the length of time it is kept, the relationships and interconnections of the information, and measures taken to protect the security of the information processed.

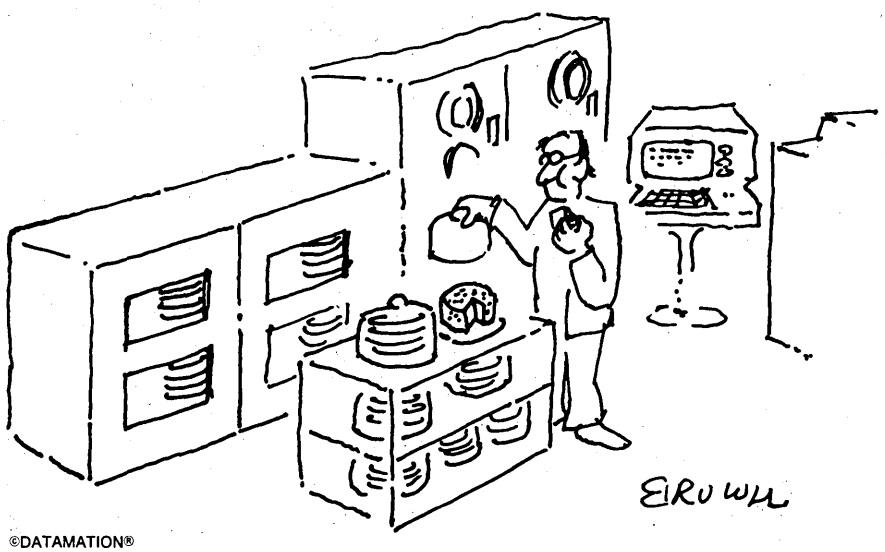
There is, however, a clause which may exempt systems which "obviously pose no threat to private life or civil rights" from a detailed declaration. To soften the blows on computer users, the bill is to take effect over three years.

Penalties for infractions are fairly tough. One to five year prison terms and $4,000 to $400,000 in fines are imposed on anyone found to be using data for a purpose different from that recorded at the time the system was registered with the authorities. Similar penalties are imposed on anyone keeping name-linked data longer than required by its original purpose, on anyone who keeps a judicial file, and on anyone who keeps a file with religious, political, philosophical beliefs, or trade union affiliations linked to names. (Churches and trade unions are, of course, allowed to keep a record of their members.) Lesser penalties are applied to other transgressions. Nondeclaration of a system will entail six month to three year prison terms and a $400 to $40,000 fine.

Security

Scenarios On Ethics

Picture a file maintenance clerk employed in a police department computer center. He has access to local and national arrest records, and routinely retrieves such records for the courts, for prosecutors, attorneys, other police



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agencies, and banks. There are no laws or rules governing his handling of that information. But a friend of the clerk is in charge of security for a large organization and is responsible for performing background investigations of new employees. Those employees sign release

DONN B. PARKER
Workshop created a higher visibility of a need for, and interest in, ethics

statements that authorize their employer to investigate their backgrounds, including arrest records.

For this friend, the police clerk produces copies of arrest records of those new employees. It is information available from police arrest blotters, which are in the public domain, but of course the computer system makes it all conveniently obtainable.

Question: Did either of those individuals act unethically?

Scenarios of this sort, many taken from actual occurrences and all designed to raise questions of ethics, were discussed last month at a workshop on Ethics in Computer Science and Technology. The 30 participants, including a representative of the British Computer Society, got the chance to vote on each of the 60-odd scenarios. In the example above, which the participants were asked to mull over before arriving at the workshop, the vote went like this:

10 Unethical
8 Not unethical
7 Not an ethics issue

A breach of trust

"It was not this man's function to retrieve these records," one invitee stated. "To do so for any unofficial purpose, whether on a friendship basis or not, for pay or not, is a breach of trust. The fact that there was no quid pro quo does not justify the act." Still another said, "Since new employees sign the release, it does not seem relevant that the computer system was used. Since banks are private organizations and relief was routine, there is no significant problem." And still another: "The behavior of the clerk and security employee was consistent with existing investigatory practices. Therefore there is no ethical issue."

This scenario was an exception in that it produced such a disparity of opinions. The vote on most of them was more one-sided. The participants, including three lawyers, five ethical philosophers, and 21 from the computer field, brought to their judgments a variety of backgrounds and experiences. "One of the reasons there could be that kind of disparity is that people read into (the scenario) a different set of details," says Donn B. Parker of Stanford Research Institute, who headed the project. It was funded by the National Science Foundation and sponsored by the American Federation of Information Processing Societies (AFIPS). Parker, who wrote about half the scenarios, including the one above, said he had to write them in such a way as to avoid showing his leanings, to avoid precluding the judgment of others.

Lack of open discussion

A student of computer crime, or abuse, Parker said he organized the workshop because there is a lack of open discussion of ethical and unethical behavior in the field. "There are efforts going on right now in the professional societies in the direction of a formal code of ethics and enforcement," he added. But there is also a concern that the formulation of a code of ethics before such discussions were held would be premature.

He said in exposing the ethical issues, as at this workshop, it might be possible to formulate some normative principles. An example of such a principle is that a computer program be considered as proprietary to one or more parties unless it is explicitly identified as being in the public domain. Repeating his hope that the workshop created a "higher visibility of a need for, and interest in, ethics," Parker noted that the scenarios, the votes, and the participants' comments would be published by AFIPS Press in June and discussed by panelists at the upcoming National Computer Conference, as well as at the IFIP Congress in Toronto.

Parker referred to the flak about a code of ethics for members of Congress and continued discussion of the topic by doctors and lawyers. He said, "We're trying to do in 25 years what it took these other professions hundreds of years to achieve." He added, "... great harm can be done by our technology, and I think people in the field who have chosen to participate in this workshop are the kind of people who understand that. I think a lot of people in our technology don't understand it, and have to have it written down for them."

—E.K.Y.

A two-year-old memo and a fresh update:

Amdahl Corporation
1250 East Arques Avenue
Sunnyvale, California 94086
(408) 735-4011

amdahl

Memorandum

To: OS/MVT, VS2 systems programmers
From: Gene Amdahl
Subject: Employment
Date: January 6, 1975

In a few months, we will deliver our first computer systems. Amdahl 470 V/6™ computers will be the world's first large scale, fourth generation systems.

Our CPU is totally designed with proprietary LSI circuitry. It has subnanosecond switching, 16 high performance inboard channels, an ultra high speed buffer, and up to 8 megabytes of monolithic memory. With a cycle time in the 30 nanosecond range, it delivers 2 to 3 times the performance of comparably-priced systems.

At this moment, the 470 V/6 is in the final stages of systems checkout. To date, we have run MVT, VS2, VM/370, TSS, and other operating systems. We are pleased with our progress to date, and our enthusiasm is shared by an increasing number of future users.

Which brings me to the subject of this memo.

Right now we are looking for highly proficient systems programmers and customer support personnel with expertise in OS/MVT and VS2 internals to help us install and maintain our systems. We offer the usual company benefits plus one distinct extra: the opportunity to make computer industry history with us.

If you are qualified and are sincerely interested in learning more about a unique challenge, we'd like to talk with you. To start things off, send a resume outlining your background and experience to Vern Todd in our Systems Engineering and Programming Group. He'll be in touch with you.

Gene Amdahl

Two years and 40 systems later, opportunities are stronger than ever.

We published this letter to DATAMATION readers over two years ago, describing the career opportunities at Amdahl for systems programmers and customer support personnel with expertise in OS/MVT and VS2 internals.

Since then Amdahl has shipped over 40 470V/6 systems in the United States, Canada and Europe. Some of the systems programmers who responded to the original letter have been instrumental in achieving this exciting growth. To support our continuing growth, we still need the same kind of highly proficient professionals.

If you are qualified and enjoy a challenge, the opportunity still exists to continue making computer history with us.

Contact us today. Send your resume to one of our regional managers or to our Sunnyvale, California headquarters.

amdahl

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680 Fifth Avenue
New York, New York 10019

Tom Starr
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2021 Spring Road, Suite 245
Oak Brook, Illinois 60521

John Hannigan
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news in perspective

Applications

Vanity, Thy Name is Money

Bill Glover of Atlanta used to do serious things with computers but he says what he's doing now is "making me more money than anything I've ever done with computers."

Glover's firm, Recreational Computer Systems, has placed 23 PDP-8 based systems in the U.S. and Canada which produce high quality pictures of people and can transfer them to T-Shirts, tote bags, and/or wall plaques.

The most recent system installation was in Los Angeles' Museum of Science and Industry. It was the first installation on the West Coast and was installed last month. Other locations include hotels, amusement parks, and Canada's new Canadian National Tower in Toronto. The systems include one or more Centronics printers and a proprietary digitizer. Ten are company owned and the rest have been sold to outsiders for prices ranging from $29,000 to $46,000 depending upon configuration.

Glover's been at this business for about two years. He founded two other Atlanta-based computer companies, Computone Systems which he says is still going strong, and Scidata which was purchased two years ago by Computer Usage Corp.

Idea from NCC

He got the idea for his present venture while attending the National Computer Conference in Chicago three years ago. "Some West Coast company (Spatial Data Systems, Goleta, Calif.) was doing pictures of people using a crude program and it attracted a lot of attention." He returned to Atlanta and began working on development of his digitizer. "I've always been interested in consumer uses of computers."

He invested $60,000 in equipment and a building and began putting his first system together. "My friends in the computer business thought I was off my rocker," he said. Glover was doing consulting work at the time and figured Recreational Computer Systems would simply be a sideline. It proved to be the proverbial tail wagging the dog and today, the dog is no more.

The first system went into a shop he opened himself in Underground Atlanta. The second he sold to a young couple working in data processing in Atlanta who placed theirs in the Franklin Institute in Pennsylvania. Both, he said, were immediately successful.

Absentee owner business

Glover said an operator panel on the systems make them easy to operate. "If you place one in, say, a boutique in a hotel, the store's personnel can run it. It's a great absentee owner business."

The most complete system, at $46,000, includes two printers and the associated extra memory required by a second printer, and a cash handler. Such a system was placed in the Canadian National Tower and Glover said it grossed $88,000 in the first 80 days.

He said people buying his systems can set their own prices and generally work with the people owning the locations on a percentage basis. Typical prices are $3 for a single picture, $4 for two, $8 each for T-Shirts and wall plaques and $10 for tote bags.

The T-shirt, wall plaque, and tote bag capability was added to the systems last May when a new property in printer ribbon ink made this possible, Glover said. "Now we're working with color stuff." So far, his pictures are black and white.

In addition to permanently installed systems, Glover has mobile units he makes available for trade shows.

He says a system should net a minimum of $50,000 in a year. If it looks like one isn't going to make that minimum return, he figures the location is wrong and he moves it. And he doesn't think it's a fad. "The basic appeal is to vanity, and that'll always be with us."

—E.M.

Government Procurement

Federal User Group Seeks More Clout in Influencing ADP Management Policy

The United States government, the biggest if not the boldest user of computer and communications equipment and services, has been struggling for nearly a quarter of a century to manage and control its gargantuan automatic data processing resources. And for almost that long, 20 years to be exact, Uncle Sam's feisty user group, the Interagency Committee on ADP, has been fighting for clout with the bureaucratic powers that set those ADP management and control policies.

It's been a long, uphill battle. And it's not over yet. Serving as a mouthpiece for the federal dp user community, IAC/ADP currently is engaged in a contest of wills with one of the more mighty powers in ADP—the General Services Administration. It's this agency, the procurement and housekeeping arm of the government, that apparently wants to muzzle the user committee by folding it, along with various other ADP advisory groups, into one big interdependent organization.

Despite IAC/ADP's protests, the plan does have some advantages. For the first time, these interrelated advisory groups, claims GSA, would have some direction and would be working on a coordinated basis. And direction and coordination is something these committees have sorely lacked. Especially the Interagency Committee on Automatic Data Processing.

Founded back in 1957 as an advisory arm to the then Bureau of the Budget, the IAC/ADP group pulled together 12 of the top agency ADPers. A year later the membership was opened to include 48 dp dependent agencies. These agency representatives were garnered from the senior echelons of government where they were classified as technologically competent computer experts.

To GSA and back—almost

But as more and more agencies began to come onboard, the level of technological expertise and competence began to dwindle. So in 1962 a plan to restructure the committee was proposed to scale the membership down again. This proposal got nowhere and the committee continued under its original setup until 1973, when sponsorship of the group was handed over to GSA by the Office of Management and Budget. Along with its committee responsibilities, GSA also, and more importantly, inherited many of the ADP functions formerly handled by OMB. This shake-up in ADP administration was officially brought about by an executive order signed by former President Nixon on May 9, 1973.

Reversing this directive, former President Ford issued his own executive order on Dec. 31, 1975, which returned most of the these ADP oversight and policy functions to OMB. Some government insiders claim that Ford's turnabout was primarily Watergate-motivated, but Rep. Jack Brooks, Congress' zealous ADP procurement watchdog, also is reported to have had a say in the deal.

Whatever the reasons for the move, the switch back to the executive budget agency was applauded by government ADPers. But not wholeheartedly, because GSA, under its Automated Data and Telecommunications Services Div.,

"OMB in the past," Skidmore explains, "has asked agencies to report its ADP needs to them before they knew what their overall program requirements were. And there was no way they could do that logically." By eliminating this "premature spring plan," he argues, agencies will be able to bundle into their annual report "long range plans that will specify not only their new and major ADP applications . . . but also new procurements that they envision during not only the next fiscal year, but for four years beyond that."

According to Skidmore, this five-year plan "is the only thing that makes sense." And if OMB agrees, it will be "the first time data processing wouldn't be treated as a stepchild who's cut off from everything else that's happening within the agency," he declares emphatically.

Skidmore sees these budget problems as a bottomline issue for all agencies and particularly for his own agency, the Dept. of Health, Education, and Welfare, which plans to spend over $500 million on dp and telecommunications services out of a total FY '78 budget of $150 billion. "ADP budget needs," he insists, "are as intertwined as the need for typewriters, people, or any other resource necessary to staff and fund agency programs. Programs just don't happen overnight. They take people to make them happen and computers—computer time."

Lackadaisical attitude

If Skidmore seems particularly adamant about the need for more effective budget planning, he's only reflecting the concerns of all of his committee members. At their monthly meetings, the user agency representatives are equally obdurate over what they see as a general lackadaisical attitude by federal decision makers to establish effective ADP policy, planning, and management objectives. The chief culprits, they allege, are OMB, GSA, and the sluggish National Bureau of Standards.

They're not the only ones leveling such criticism. Congress, ostensibly Brooks' Government Operations Committee, has also taken these central ADP management agencies to task for not doing their job in following through on the Brooks Act. The committee's report, which recapped last summer's hearings, also took some pot shots at the agencies, charging them with showing "a general reluctance to adhere to the purposes and intent" of the act.

More legislation needed

While most agencies seem to agree with the basic principles of the 12-year-old law, they also see a clear cut need for further legislation and direction. HEW's Skidmore agrees. "The emphasis on the Brooks bill within government has forced the focus to be on the procurement of computers. Sure, it gives lip service to the utilization of computers, but it does not address the real question which is how do you use computers to improve program productivity and efficiency of government operations."

Skidmore also compains that the agencies are saddled with "a tremendous number of requirements" by both OMB and GSA. The beleaguered agencies also face an "incredible logjam in trying to get a procurement through," he claims. If the plethora of regulations were clearer and procedures streamlined, he contends, then maybe agencies working through GSA could speed up the procurement process. And the sole source problem that Brooks and others repeatedly gripe about could also be partially alleviated, he adds.

But all these remedies presuppose a closer working realtionship with GSA as well as OMB. That's fine with Skidmore as long as neither agency wants to control the advisory committee. His hands-off attitude is clear, especially to GSA, even though it persists in its schemes to bring the group under its thumb. GSA's reason, he speculates, is "fear." It is afraid IAC/ADP is going to come out and adopt a position opposing something it's doing and make it difficult for it to do its job.

"If GSA can control us, it has nothing to fear. If we're an independent body representing 66 agencies then we're like a union and we could embarrass them. We can challenge a policy they've enunciated. The committee can be a real force."

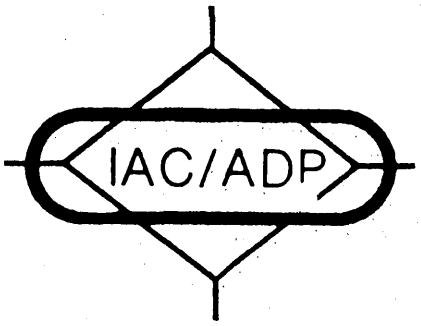
Plan to kill it died

No one understands this better than GSA. Two years ago a little-known plan to get rid of IAC/ADP once and for all was floated around the procurement agency. The plan never got through. A year earlier, in 1974, GSA, in another blatant attempt to put the squeeze on the committee, pressured the group to cancel a scheduled speaker it disapproved of. The speaker was dropped.

GSA's Machiavellian maneuvers against IAC/ADP are still continuing, according to wary committee members. In the latest effort to wield more control over the group, the agency has been touting a restructuring plan to overhaul all federal ADP advisory organizations. These groups include IAC/ADP, the Ad Hoc Committee for Implementation of the Brooks Bill, and the Federal Information Processing Standards Coordinating and Advisory Committee FIPSCAC.

Under this new proposal, an ADP management committee, honchoed by GSA, would meet on a quarterly basis and coordinate the activities of the advisory bodies. In addition to GSA, this central management coalition would also include NBS, OMB, and advisory committee reps as permanent members, plus four other agencies which would rotate every two years. The advisory groups, operating under the watchful eye of this high-powered, GSA-dominated committee, would also be reorganized and possibly revitalized.

According to the GSA proposition, IAC/ADP would retain its special interest groups, would be allowed to elect its own chairman, and would continue under GSA sponsorship as before. The Ad Hoc Brooks Bill Committee, which has been faltering over the past few years, would



focus more on procurement activities rather than on management problems. Sponsored by GSA since its founding in 1965, the committee would still operate under the agency which would appoint its chairman. The third committee, FIPSCAC, which recently had its charter dropped by NBS, would be reconstituted to concentrate on standards issues. As in the past, it would be backed by NBS which would also pick its leader.

The common link to all these groups as well as to the ruling central committee is the ubiquitous GSA. The indefatigable agency believes its restructuring scheme is best for everybody. Explaining the rational behind the plan, Mike Muntner, ADT's assistant commissioner for agency assistance, planning and policy, argues that it makes no sense to "have these policy officials spending all their time in committee meetings. Where these committees are needed, there should be a structure," he maintains, "to connect them to make sure there is coordinated action."

Muntner's do or die philosophy is apparent: "We've evolved three separate committees. And nobody has ever taken a step back and asked 'is Darwin right—has the fittest survived?' Unfortunately," he laments, "everything in government survives, not just the fittest."

No power plays

As for GSA's motives, Muntner denies the agency is pulling off any under-

handed power plays. "If we wanted IAC/ADP under our thumb," he declares nonchalantly, "we could have done it. We don't want to dominate them. And we don't care if they take positions against us because if they want to do that, the individual agencies will do that anyway."

So far, GSA's reorganization game plan has failed to get much support. IAC/ADP clearly resents it, and NBS is noncommital, apparently waiting for OMB to take a stand. If everybody nixes the idea, then the plan will be shelved. And if the groups are split, Muntner says GSA will call everybody together "to try and iron out our differences. There's not going to be any unilateral action," he insists. "If nobody likes the idea, we'll stay right where we are or maybe we'll abolish the Ad Hoc (Brooks Bill Committee), but that would be a loss."

But not a big loss, according to some IAC/ADPers who are quick to point out that the group has far outlived its usefulness. Duplicating many of the same speakers that appear at the IAC/ADP meetings, the Ad Hoc Committee for Implementation of the Brooks Bill had to call off at least three of its eight scheduled meetings last year because it had no "agenda items."

IAC/ADP leaders, as part of the group's current long range plan, would like to remold this committee and combine it with its own organization under a three-tiered arrangement. This triumverate would include an ADP planning and policy board, an interagency committee, and regional ADP councils. IAC/ADP chairman Skidmore feels this hierarchical approach would prove worthwhile for both groups, allowing them to have more of a coordinated input into dp decision making.

Others argue that even with this new reorganization, the committee is still not going to have the say it should have in helping to set ADP policy. One skeptical former committee chairman contends that while the group is "picking up steam through its special interest groups, it still hasn't been effective as a policy-influencing body."

Staff problem cited

HUD's Feldman sees things a little differently. He believes the committee is finally starting to fulfill the need for which it was originally created. This need, says Feldman, is "the need for a central focal point in the federal government for sharing and exchanging experiences, both good and bad." Unlike many other committee officials, he thinks the group's problem lies "not in its structure but in the fact that there is no full time staff."

Skidmore, an ardent believer in restructuring, thinks an overhaul of the IAC/ADP "is badly overdue and needed." Some sort of reevaluation and revamping, he maintains, is crucial if the committee is to provide "coordination of ADP thinking" and help in formulating ADP policy—two roles that he says are "valid functions that should never be ignored in government."

"An organization that provides only lip service and listens to speakers periodically is worthless," he argues. "If that's all we can do, then we should get out of business. I think we can do a lot more than that, and I think we're proving that right now."

—Linda Flato

Small Business Systems

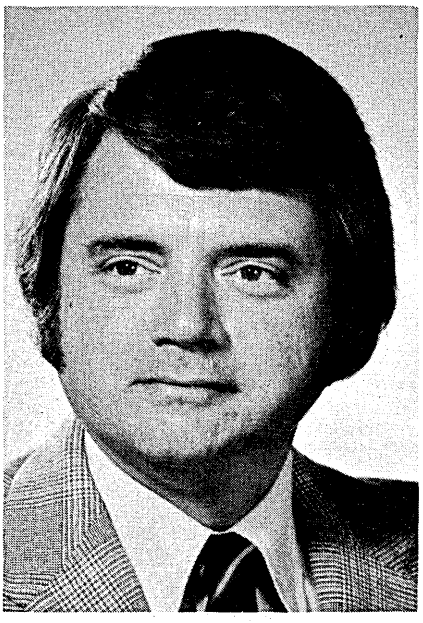
It's Not Invented Here

Let George do it could very well be the motto of Randal Data Systems, Torrance, Calif., supplier of small business systems.

"It's not important that we invent," says Randal Walti, youthful president of the firm to which he has uniquely given his first name rather than his last. He likes his first name best.

Although the company has progressed from a point in mid-1974 when it began putting together systems from other peoples' equipment to a point today where it makes most of the equipment itself, development has always been done outside both in hardware and software.

Its original systems were based on Data General minis. In October of 1975, when the company was planning introduction of its current systems, the Link 100 with a floppy disc and the Link 200 with a hard disc, it wanted its own com-



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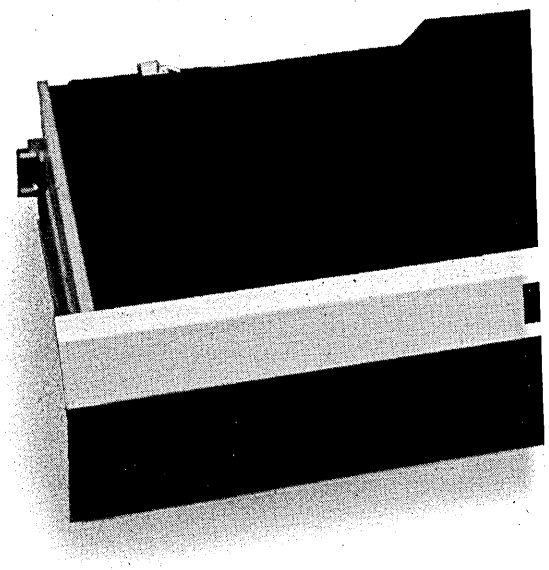

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	Compatibility	DEC RK05	DEC RK05	—	—	—	—
CAPACITY	PDP-11 (megabytes)	2.5	5	10	2.5	5	10
	PDP-8 (megawords)	1.6	3.2	6.4	1.6	3.2	6.4

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puter. "We spec'd what we wanted and got Monolithic Memories Inc., Sunnyvale, Calif., to develop and build it for us under a contract that would ultimately give us manufacturing rights."

They got those rights sooner than they had anticipated. Before it had produced the minimum number of minis required in the contract MMI decided it was losing money on the arrangement, Walti explained. "They paid us $20,000 to get out of the contract." Randal began its own manufacturing effort March 1.

They similarly acquired manufacturing rights for their own crt, recently announced, and a floppy disc system. They get their hard discs from Microdata under an agreement which gives them a manufacturing license "after we've taken 500." Walti estimated they had taken "about 75" in mid-March.

Randal has a staff of eight in-house software people, four in marketing and four in engineering but, when it came to development of their proprietary Rantext, a word processing, text editing package, and Randata, a data entry package, they went outside. The creators are paid on a royalty basis.

The company also buys most of its fabrication outside and such services as sales lead handling which it farms out to Inquiry Handling Service, North Hollywood, Calif. "We figure this costs us $1 per lead. It would cost twice as much to do it in-house and it wouldn't be done as well," said Walti.

Methods worked well

Their methods seem to have worked well. They have more than 200 systems installed and expect to do $5 to $5.5 million in business this year. Walti optimistically sees this growing to $55 million by 1981.

Randal sells exclusively through distributors. They now have 46 and are adding, Walti said, at the rate of five per month. He said they expect to have 100 distributors by the end of this year and 500 in two and one-half years.

The company likes to think it knows the best ways of working with distributors. Walti has the advantage of having once been a distributor himself. "DEC and Data General treat distributors like oem customers," he said. "The distributors don't get discounts below certain quantities. Our distributors get a 30% mark-up on every system they sell."

Each distributor pays a fee of $3,750 which buys him training in Torrance and at his site, installation of a demo machine, manuals, sales literature, software licenses, and access to Randal's program library. "And," says Walti, "it makes him make a commitment." In addition, a distributor must either buy a demo system for from $15,000 to $20,000, or rent one for from $475 to $600 per month. Walti said a typical distributor sells from six to eight machines in the first year "and his business grows from there."

No direct orders

Randal has a firm policy of not accepting a direct order under any circumstances. "After all," said Walti, "you can't buy a car from General Motors." The company has regional offices throughout the country, each staffed by two key people (some have more) one of which is dedicated to finding distributors and the other to supporting them. Walti calls these people "bear trappers and bear skinners."

Randal does not give a distributor an exclusive territory. It has five in Los Angeles alone, some of which are vertical, serving a specific industry. One sells exclusively to doctors and dentists. From these vertical distributors, Randal sometimes gets something else which it doesn't have to develop, an applications software package. It recently acquired a lumber industry package from one of its Los Angeles distributors and is put-

ting $50,000 into advertising and sales promotion within the lumber industry. "It's completely our package except in L.A."

If Walti seems devoted to the idea of selling through distributors, it could be because it was a distributor that got him into the small business systems business in the first place. That distributor is Minicom Systems, Los Angeles.

Minicom's president, David Haim, likes to recall how it all started. In July of 1974, Haim, a distributor for Olivetti, was knocking on doors in Torrance looking for business. "I went into this one office and saw this guy sitting behind the reception desk. The receptionist was sick that day. I want to see the boss, I said. I am the boss, he said."

Randal Data Systems, at that time, was primarily a terminal distributor, but they also put together custom small business systems. That day components of one of these systems were sitting around the reception room. Haim asked about them and Walti explained them. "Then we each said good-bye. Three days later, I called him up and asked if I could handle his small business systems." Haim has sold more than 20 Randal systems since that time.

Walti said he wants his distributors to have three of four things—sales ability, software capability, service capability, and financial stability. Many of them, like Haim, came from Olivetti. He has "two guys in Portland, Ore." who came out of Burroughs. He has a Burroughs sales force list and plans to solicit with it. He often signs up distributors as a result of advertising even though the advertising is aimed at end users.

Then there are his distributors in Pittsburgh who call themselves "The Polish Computer Team" and who like to call their systems JAWS for John and Walt's System. In addition to systems they distribute "Polish Computer Team" T-shirts complete with a picture of a shark. **—E.M.**

Leasing

It Comes with The Lease

One day a big 370/58 user, long accustomed to the IBM security blanket, decided to set up a distributed network and venture into the world of minicomputers. But the user was frightened. Dealing with the wild, wooly world of mini-vendors was not at all like doing business with staid old IBM. Who could he turn to for assistance?

If the user happened to be leasing his IBM equipment from O.P.M. Leasing Services, Inc., he needn't look far for guidance. O.P.M. has been leading a number of big corporate clients like Rockwell International through the thickets of distributed processing, setting itself up as an intermediary between the client and the mini vendor.

What is O.P.M. Leasing? O.P.M. Leasing is Mordecai Weissman, 30, and his brother-in-law Myron S. Goodman, 29. Six years ago Weissman, president of the firm, and Goodman, executive v.p., were working out of a one room office in Brooklyn leasing copiers and nickle and dime general equipment products. Today they've got a portfolio of about $250 million IBM 370s and Amdahl 470s out in the field. And in the words of one of their clients—a client who leases from a number of other firms as well—O.P.M. has "really shaken up the computer leasing industry."

What Weissman and Goodman have going for them, among other things, is their flexibility. "They're a couple of personable young guys who own their own company and don't have to account to anybody but themselves," one O.P.M. client says. "Consequently, they can write any kind of deal they want as long as it meets their profit objectives."

"They're very aggressive and they make interesting arrangements with respect to termination options and residuals," adds another client, Bradford National Corp. financial v.p. Paul Biegel.

From copiers and general equipment Weismann and Goodman moved into

minis in the early '70s, leasing Basic Four machines among others. "Even then we were offering early termination and upgrade options that nobody else had," recalls Weissman who now has 50 persons working out of the O.P.M. headquarters in lower Manhattan.

The next jump in the summer of 1975 was a big one—all the way up to the high end (nothing below a 145) of the 370 market. "We bypassed the whole 360 experience, which was fortunate because many leasing companies got stuck with big 360 inventories," notes Goodman. "And we got Goldman Sachs, the investment bankers, behind us to take care of financing."

Impressive customer list

Very quickly O.P.M. began to build up an impressive customer list. American Express and its subsidiary, Fireman's Fund Insurance Co., signed on. So did AT&T and Western Electric, which now lease their Amdahl 470s from O.P.M., Rockwell International, Automatic Data Processing, Bank of New York, F. W. Woolworth, and a number of other blue chip clients.

What was the appeal? One of O.P.M.'s biggest customers puts it this way: "They almost invariably come in with the low bid, and their penalties for early cancellation are far less than those of their competitors. In fact, they've let us out of leases without any problem at all."

"But the big thing is that we can always get through to the principals, and they bend over backwards to help us with things that aren't even in the lease."

Such as? "Well, recently we were going to add a megacore of what was to be non-IBM memory, but at the last minute we discovered we didn't have the power for non-IBM memory, so we called O.P.M. and they provided us with the IBM megacore within 24 hours."

On other instances, the same customer says that when he's been moving equipment, O.P.M. has provided him with spare tapes, discs, and even an interim backup 158 at no cost beyond installation charges."

Now they're consulting

And now that distributed processing is coming to the fore, O.P.M. is playing a new role. "A lot of these big users don't know about the pitfalls to be avoided in a mini contract," Weissman explains. "It's not like the 370 world where you're assured of things like continuous maintenance. Consequently they ask us to sit in on negotiations with them as a consultant."

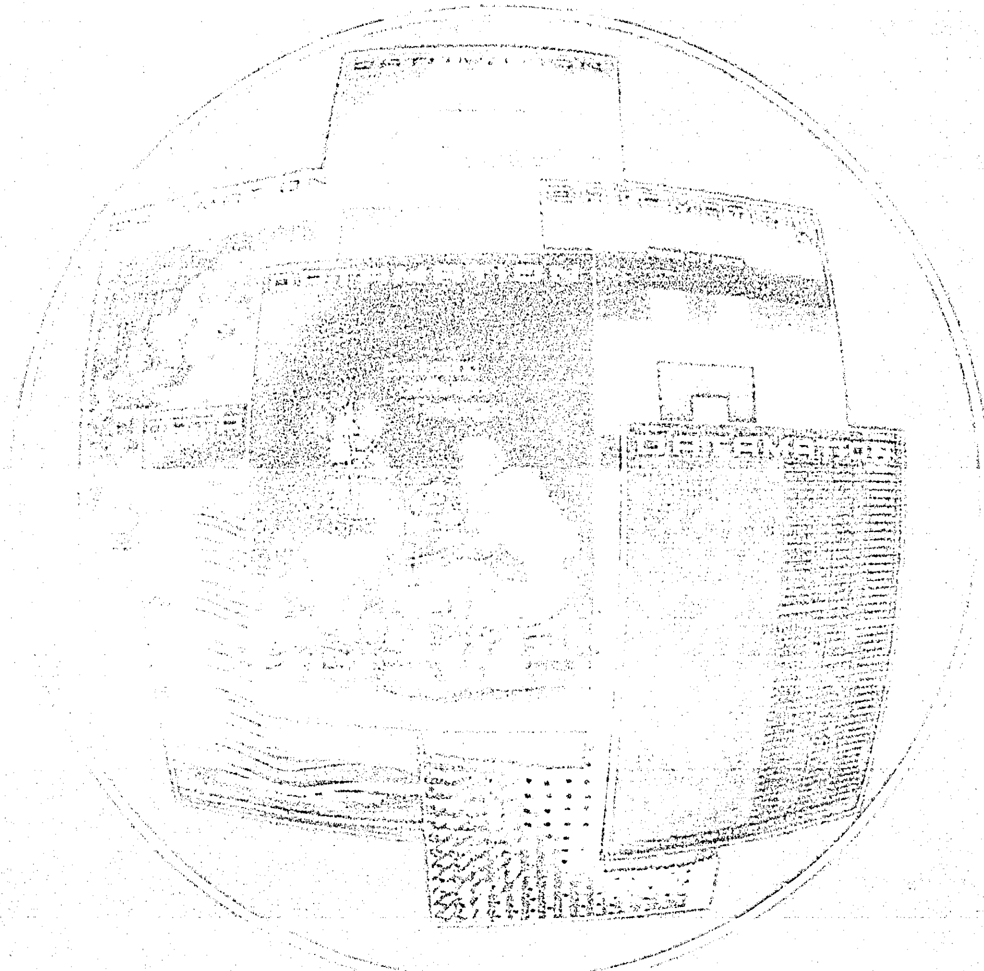
"The O.P.M. guys cut their teeth on minis," says a big West Coast customer who recently signed a major contract with Computer Automation—one that O.P.M. helped negotiate. "And frankly it's a new area to us, so they've been very helpful."

Not surprisingly some of O.P.M.'s competitors aren't happy about the firm's success. And certain rumors have popped up in the industry that the firm may not have the financial capability to write all the leases they've been signing, or that Goldman Sachs may be dropping them.

"Absolutely not true on both counts," says a Goldman Sachs source. "These are stories that are emanating from the competition, not the top guys but further on down the line. O.P.M. has been taking away a lot of their business, and they are resorting to these kinds of rumors as a result. It's nonsense."

Another fear some users have voiced: what happens when O.P.M. gets too big? Will the responsiveness that's been the hallmark of the firm's fast rise drop off? In short, will success spoil O.P.M.? "We'll never get that big," counters Weissman, "or so successful we can't respond the way we always have." **—L. M.**

Do you know the company that publishes [illegible]



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News in Perspective
BENCHMARKS . . .

Out of Chapter XI?: Potter Instrument reached an agreement with a creditors' committee under which the firm will pay creditors $2.4 million in cash and issue them preferred and common stock. Potter filed for Chapter XI protection in April 1975 after a refinancing plan failed to materialize. John T. Potter, founder and chairman, said his company filed for protection because it had a "manageable" debt. If it had been larger, he said, the banks couldn't have closed the company down because they'd have too much to lose. Potter was accused by the Securities and Exchange Commission of having used company funds to pay for his racing yacht and domestic servants. He also was accused of having concealed his company's poor financial position in the early '70s. Potter, who did not contest the SEC charges, said they should have been looked at in the light of his $500,000 loan to the company and his pledge of 1.1 million shares of stock to guarantee company loans. Potter owns 43% of the company's stock. The company will announce its new products plans in May, primarily for the oem market. It operates Potter Data Products, Potter Data Systems, and some Puerto Rico and U.K. properties.

Small Systems for Brazil: Brazil's government-supported computer company, Cobra S.A., has signed an oem and technology transfer agreement with Sycor, Inc. which will allow it to produce a small business computer to compete with the IBM System/32. The Brazilian firm also had been talking to Data General, Digital Equipment Corp., and Diablo but has dropped these negotiations. Under its agreement with Sycor, Cobra will first buy and eventually build Sycor's 400 Series of clustered processing systems which can communicate with larger computers or be used as standalone processing systems. The Brazilian agreement should offset, for Sycor, an anticipated loss of revenues from Olivetti which has purchased Sycor's 300 and 200 Series of terminals for a number of years under an oem agreement and markets them in 38 countries. Olivetti declined to market the 400 Series when it was introduced in late 1975.

Down But Not Out: Former Burroughs salesman Leonard Palmer lost out to his former employer in round four in litigation charging that Palmer's CompuTerminal service bureau was put out of business by Burroughs, its prime supplier. But Palmer's not finished. He said he will appeal the latest reversal by a federal judge of a jury decision to require Burroughs to pay $3.5 million in trebled damages. In overturning the jury verdict the judge ruled that "not only did Burroughs not violate federal antitrust law, but also . . . nothing actually done by Burroughs was a cause of even nominal loss sustained by CompuTerminal."

New Owner for MITS: Pertec Computer Corp. has agreed to acquire MITS, Inc., the Albuquerque manufacturer of personal computers and small business systems, called the Altair line.The acquisition gives Pertec an entry into the booming personal computer business and complements current and planned products of its Pertec and ICOM divisions. President Ryal Poppa said the acquisition will enable his company to quickly enter the expanding microcomputer market.

Pertec also formed a Data Systems Group by combining the activities of its CMC Group, which services and markets the products of Computer Machinery Corp. which Pertec acquired a year ago, and its Business Systems Div., which manufacturers the equipment.

Terminal Operations Combined: Data 100's Canadian subsidiary, Data 100 Ltd., Montreal, has acquired the remote batch terminal product line of Comterm Ltd., Montreal, for an undisclosed amount of cash. Under the agreement, which is subject to approval by Data 100's financial backers, Data 100 will assume Comterm's obligations to its remote batch terminal customers, will market Comterm terminals, and provide maintenance for Comterm customers. Comterm's other products, IBM 3270 and Honeywell 7700 VIP compatible crt terminals, marketed primarily in the Middle East, are not affected by the agreement.

Wyly to Sell Subsidiary: Financially troubled Wyly Corp. plans sale of its Microwave Transmission Corp. subsidiary to American Television and Communications Corp., Denver. An agreement in principle to the sale has been reached by the two companies. Purchase price was not disclosed. MTC is a 1400-mile interstate common carrier providing video and related microwave transmission services. It serves 26 West Coast locations, primarily in California and Washington.

The Case Goes On: Federal Judge Warren Ferguson refused to stay or dismiss Computer Automation's antitrust suit against TRW, TRW Datacom, and Datapoint but told the companies they won't get a trial in the federal case until similar state cases are over. TRW and Datapoint had asked the judge to stay the federal suit on grounds similar issues are covered in the state cases. In the state court, Datapoint has sued Computer Automation alleging theft of trade secrets involving software for Computer Automation's SyFa system. In a counter complaint, Computer Automation has charged Datapoint with "malicious . . . interference" with its efforts to become a supplier of multiterminal systems. TRW and TRW Datacom, TRW's overseas marketing subsidiary, are not named in Computer Automation's state suit.

EFTS Test Ended: Glendale Federal Savings & Loan, a Southern California operation with $22.7 billion in assets, has ended a 19 month test using 137 TRW electronic funds transfer terminals at 20 Smith Food King supermarkets. David L. Smith, senior v. p., said the test did not generate enough new savings to be profitable. He said withdrawals outran deposits. "Customers used their accounts like checking accounts." In the test, which had been authorized by the Federal Home Loan Bank Board, the terminals were placed at checkout stands. Smith said Glendale considers units used at courtesy booths or automated teller terminals to be more important right now than the point-of-sale or checkout terminal, and is studying how to use these in stores and may try a new test program.

Examination Announcement: The Institute for Certification of Computer Professionals (ICCP) has opened registration for the 1977 Certificate in Computer Programming (CCP) examinations which will be offered Oct. 22, 1977, at more than 125 testing centers around the world. Dr. William W. Cotterman, head of the CCP Certification Council and chairman of the Department of Information Systems at Georgia State Univ. in Atlanta, said three separate examinations will be offered, oriented toward business, scientific, and systems programming. Among the areas to be tested, he said, are data and file organization, principles and techniques of programming, programming languages, interaction with hardware and software, interaction with people, and questions appropriate to business, scientific, and systems programming applications. He said the examinations will be administered by The Psychological Corp., a New York based research and testing organization. Plans are to include up to 250 questions on each examination. Copies of the CCP Examination Announcement and Study Guide are available from the ICCP, 304 East 45th St., New York City, N.Y. 10017. ❋

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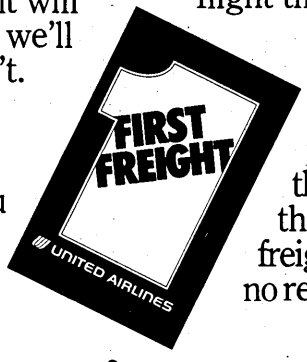

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LOOK AHEAD

(Continued from page 16)

"ONE STEP SHORT OF EFT"

An approach it calls "a step short of Electronic Funds Transfer (EFT)" is being taken by the Food and Nutrition Service of the U.S. Dept. of Agriculture (USDA) in its transfer of food stamp receipts. FNS is setting up "a cash concentration network" which involves contracting with seven concentration banks and a commercial data collection service. It is scheduled for operation by Oct. 1.

Food stamp vendors will deposit receipts in local banks and phone deposit information to the data collection service which will keep FNS posted on a daily basis. The data collector also will notify the area concentration banks so that funds can be transferred from local banks to concentration banks through normal channels. Deposits will be transferred from concentration banks to the FNS account at Treasury by Fed Wire. FNS says the approach will speed the flow of food stamp receipts and will allow closer supervision of food stamp vendors.

A HELPING HAND TO CONGRESS FROM IBM, AT&T

Congress, trying to get up to speed on the intricacies of telecommunications technology, is getting a little help from IBM and AT&T. Over the past six months, IBM, at the request of Congress, has staged a series of computer technology courses for the staffs of the House and Senate Communications subcommittees. And last October, the mighty mainframer hosted three House subcommittee staffers at a two-day seminar on teleprocessing and computer communications held at its education facility in Raleigh, N.C.

AT&T, temporarily silencing its rapid fire anticompetitive rhetoric, also conducted several technology briefings which one House subcommittee source characterized as very informative and non-political. These congressional briefings were supplemented by visits to Bell Labs, various telephone installations, and cable facilities. As part of the House subcommittee's crash educational program, groups like the Computer and Business Equipment Manufacturers Assn. (CBEMA) and the National EFTS Commission will also be asked to make presentations.

Hopefully, they won't be as squeamish about offering their services as IBM and AT&T reportedly were. Both companies were ironically "reluctant to participate," according to a Capitol Hill source. "We had to convince them," he claimed, "that we needed their participation, because they were very sensitive to charges of lobbying and improper kinds of political activity."

PAPER SAVINGS

A large New England bank has said it is saving money by reducing the size of its computer stock paper from 14 7/8 x 11-inches to 14 7/8 x 8 1/2 inches. The bank told the American Bankers Assn.'s Operations/Automations subcommittee it had been printing six lines per inch on the 11-inch paper and was able to print eight lines per inch on the eight and one-half inch paper so the change allowed virtually the same volume of information to be printed on the shorter sheet. It said no program changes were necessary, only the creation of new carriage control tapes. A reduction in stock paper costs of more than $104,000 was reported in the first year "with no adverse reaction from departments of the bank or outside customers."

RUMORS AND RAW RANDOM DATA

System Development Corp., Santa Monica, Calif., a one-time think tank and a spinoff from Rand Corp. which has been trying to go public since the late '60's is quietly trying to buy back stock from its small shareholders, all employees or ex-employees, for $9.20 per share, leading to speculation there'll be another try to go to market this year, probably in August or September....U.S. dp managers earn about $900 a year more than their Canadian counterparts, according to a study of average salaries in both countries conducted by the Administrative Management Society, Willow Grove, Pa. However, the study of 20 management positions showed eight paid more in Canada than the U.S.....Computers may save confederation, says Data General Canadian official, John Lott of an attempt by the Quebec provincial government to require computers to be programmed in French. Lott says France tried unsuccessfully to do what Quebec is thinking of but dropped the idea and if the Quebec government tries, it likely will get a printout that reads: "It does not compute."

Getting and keeping timeshare business:

Remote computing services and batch service bureaus face a number of problems.

Problems which, if not solved, could mean the beginning of the end for most of them.

Maybe even your company.

Batch, but only batch.
There's no denying the demand for on-line services. (Look how some of the remote computing services have prospered.)

So there's the problem of adding a timeshare capability. At low cost, so you can offer a low-cost service. But with the capability to grow with your business.

There's the problem of security for proprietary software and data. The problem of delegating control of system resources, without losing overall control. The problem of accounting for system use—especially use of added-value software. And the problem of knowing what is happening anywhere in the system, at any time.

Solving these problems could make you successful in timeshare as well as batch.

Remote, but losing business.
For remote computing services, keeping customers is often the biggest problem.

After a time, many customers begin to feel they're putting out too much money for your service. They check out your competitors. Or think about an in-house system.

Finding a way to extend your services downward in cost could turn your biggest problems into even better customers.

Small, or just starting out.
You may already have a small timesharing company. Or you're planning to start one. Your first problem is finding a computer you can afford. One that's also a real timesharing computer. With the management features the big timeshare computers offer.

Solving this problem could make your small company a big success.

Problems solved here.
These problems you're facing in your firm, timeshare or batch, large or small, can be solved with the computer made by us:

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And that's what has helped us produce a computer so uniquely right for the timesharing business.

The BTI 4000 Interactive Timesharing System.

A remote computer's computer.
The BTI 4000 was built from the drawing board up for timesharing. To maximize operational capabilities. To minimize operating costs. To give you more.

You can start for just $35,950. For that you get a ready-to-go system with 7.5 megabytes of storage and 8 ports—just add terminals.

You also get BASIC-X, an unusually powerful extension of the BASIC user language, enhanced for business programming.

You get hierarchal account organization, allowing you to "sublet" portions of the system. Which lets you earn income without overhead, while still maintaining total control.

You get protection for your proprietary software that allows *you* to sell systems with your software on them—and still keep your software proprietary.

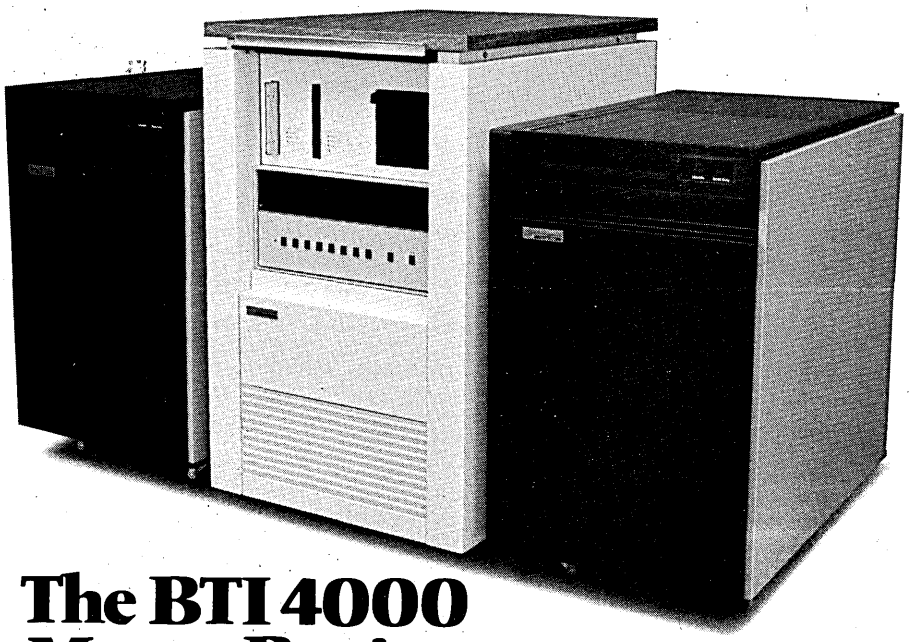
You get continuous system availability, because software housekeeping can be performed with users on-line.

You get room to grow, because the BTI 4000 is a modularly-expandable system. Add disk storage to 400 megabytes; expand user capacity to 32 ports; add peripherals like industry-compatible magnetic tape and a line printer.

And you get around-the-clock, on-line support for all your systems, no matter where they're installed.

The BTI 4000. To help you get more timeshare business, and keep the business you have.

Get the complete details today.



The BTI 4000 Means Business.

Basic Timesharing Inc., 870 West Maude Avenue, Sunnyvale, California 94086. Sales offices: East: Cherry Hill, New Jersey (609) 662-1122; Southeast: Atlanta, Georgia (404) 433-0900; Midwest: Minneapolis, Minnesota (612) 854-1122; West: Sunnyvale, California (408) 733-1122

hardware

Off-line

A "talking computer" tutors the blind and visually handicapped in vocational class work in North Carolina. Called Project VOCAB, the program aims to help the blind attain the high level job skills in accounting and dp necessary for better employment opportunities. The blind pupil communicates with specially designed instructional programs through a typewriter-like keyboard and hears responses generated by a VOTRAX voice synthesizer.

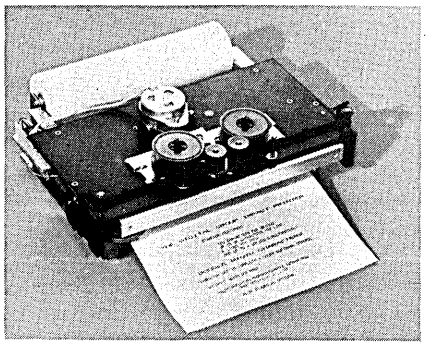
In another application of voice output, the Federal Aviation Administration is testing a computerized voice response system to determine its usefulness in briefing pilots of general-aviation aircraft. Pilots will use a touch-tone telephone to gain access to the minicomputer system developed by a team of engineers and computer scientists at Input Output Computer Services, Inc.'s transportation systems division, under contract to the Dept. of Transportation. A disc connected to the mini stores 800 words and phrases recorded by a professional announcer. One pilot at a time can request enroute and weather information from the data base.

AFIPS has recently undertaken a project to develop a taxonomy of computer science and engineering. The project, headed by Dr. Anthony Ralston, is funded by NBS and the Air Force. Dr. Ralston says the taxonomy will be completed in three phases: determination of its scope to identify what can legitimately be called "computer science and engineering"; developing the taxonomy itself; and developing brief definitions of all the terms in the taxonomy. AFIPS will publish and distribute the taxonomy when it is completed.

The world's first lightwave communications system to provide a wide range of telecommunications services to customers will be evaluated in Chicago later this year. AT&T says a cable of hair-thin glass fiber lightguides will run underground, carrying customers' voice, data, and video signals on pulses of light. About half a mile of the light cable will run between the Brunswick Building and a phone company central office, and another mile or so will connect two central offices.

Impact Printer Kit

This manufacturer of microprocessor-based systems and peripherals has taken the Practical Automation printer design (see May '76, p. 64) and developed it for hobbyist applications. The unit might be adaptable to small business systems since it features multiple copy (up to four) capability, though the lack of tractor feed will probably limit penetration of this market. Still, at $495 in kit form ($675 assembled and checked out) plus $30 for a power supply, the product should see some success.



Basic performance parameters include 120 cps operation across 96 columns, with a 5 x 7 dot-matrix characters arranged 12 cpi horizontally and six lines per inch vertically. The character set and pitch are variable under software control, allowing for double width characters, or characters of different widths to be incorporated within the same line. Fanfold, cut page, or eight and one-half inch wide roll paper can be accommodated. The interface is an eight-bit parallel design. Deliveries are quoted as seven weeks ARO for mechanisms, and an additional two weeks for an optional ($75) enclosure. THE DIGITAL GROUP, Denver, Colo.

FOR DATA CIRCLE 348 ON READER CARD

Secure Terminal

The DPD-100 is a portable message encryption and communications terminal that can be used on- and off-line to prepare, send, and receive secure messages. It contains a 32-position display, AC/battery power supply, and a cryptographic system said to offer more than 68 billion nonlinear codes that are selected using thumbwheel switches under a locked cover. For off-line preparation, a cassette recorder is required, which the vendor can also supply. Prepared messages are transmitted through an integrated acoustic coupler to a computer system or to another DPD-100. Designed to look like a standard attache case, the terminal is priced at $5,200, including cassette. Deliveries stretch to as long as four months on the product. TECHNICAL COMMUNICATIONS CORP., Concord, Mass.

FOR DATA CIRCLE 343 ON READER CARD

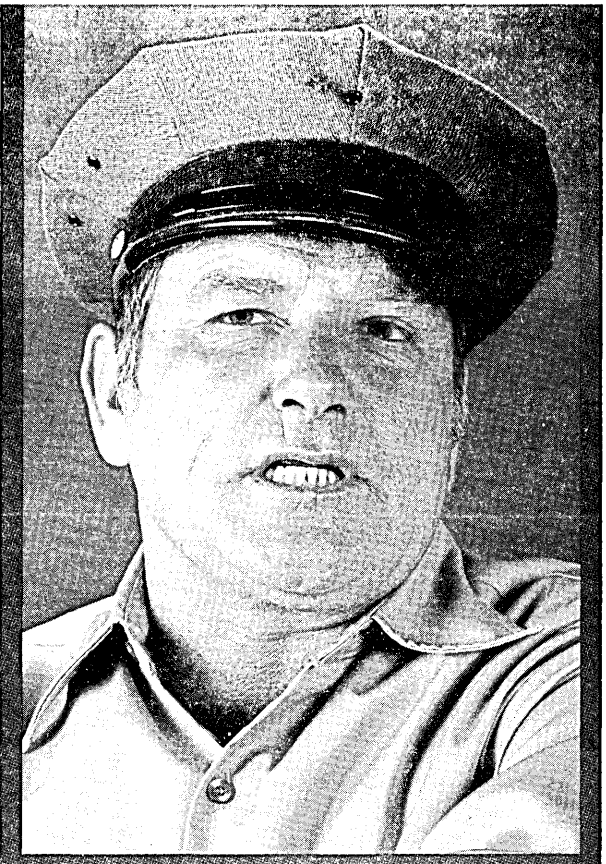
Manufacturing Mini

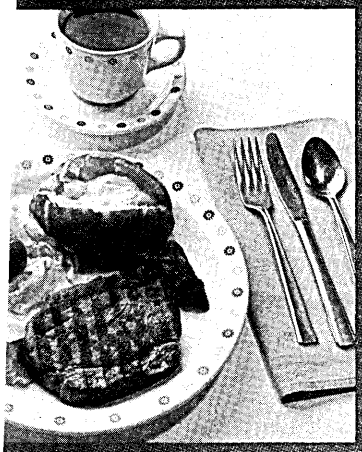
With a maximum memory size of 608K bytes, it's obvious that series 1000 model 50 is not your average mini system. Rather, it's an extension of H-P's effort to invade some sizable, but still relatively untapped, markets that include manufacturing automation, automatic product testing, and multiterminal laboratory computing/control applications. It's also expected that oem systems houses will buy them and modify them for customized requirements. The program development language is BASIC only, but the system will also execute FORTRAN and assembly language. Memory is treated as 64 partitions of various sizes by the 21MX E-series 16-bit processor running RTE-M, a multilingual, multiprogramming real-time executive. It's expected that more than 90% of the potential customer base (primarily *Fortune* 1000 concerns) will buy the systems instead of rent or lease them. Pricing for desk-styled configurations starts at $21K for a 64K system with crt console, two mini cartridge drives, the operating system, BASIC, and FORTRAN. An upright cabinet version adds $1K to the base price. HEWLETT PACKARD CO., Cupertino, Calif.

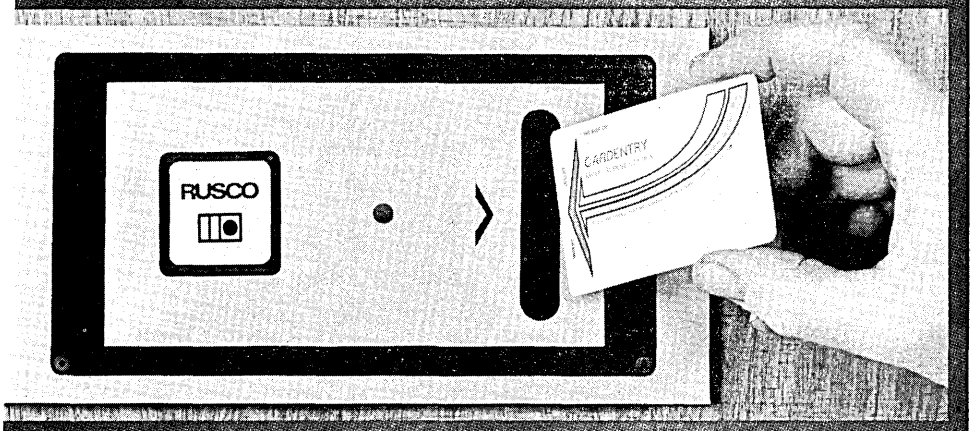
FOR DATA CIRCLE 357 ON READER CARD

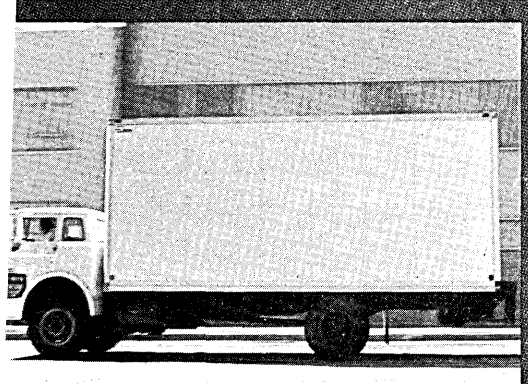
Large-scale Cpu

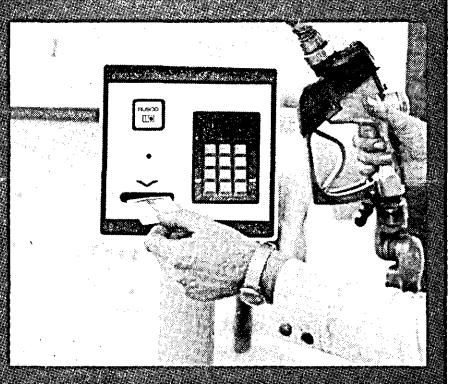
The Amdahl 470V/6, already one of the world's most powerful commercial systems, has been enhanced with a larger, high-speed buffer (cache) store. Only recently have memory chips come along that made the buffer possible, say the designers, since specs called for 14 nsec access times. Bipolar chips containing 1 x 256 bits solved the prob-

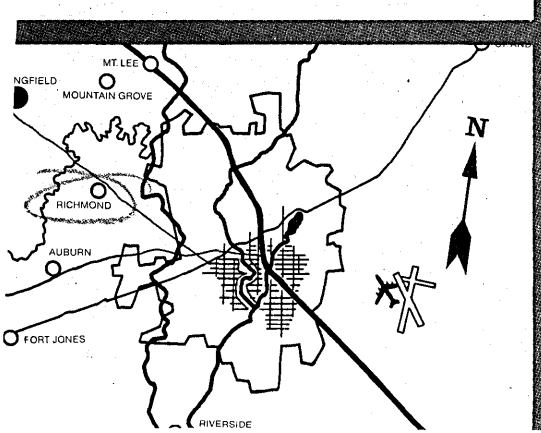


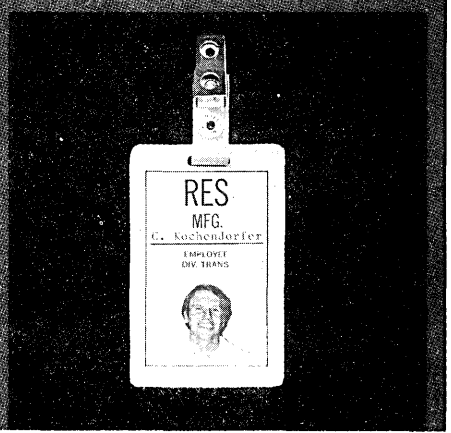












"Now my drivers check in, chow down, gas up, and clock out with Rusco's CARDENTRY."

"There are a lot of people in and out of this plant.

Management was going crazy trying to keep track of *who* was authorized to go *where when*.

So they got a Rusco CARDENTRY access control system, and *that* problem was solved.

Then our Rusco applications analyst started pointing out some of the other ways the CARDENTRY controller could work for us. Now the operations boys don't even call it a *security* system any more—it's an "on-line operations monitoring and control system."

Whatever they call it, *I* call it a terrific time and confusion saver. Look at what it does in my department alone:

In the morning, when a driver enters the front gate, the system remembers he's here, and can tell me if he's in or out anytime during the day.

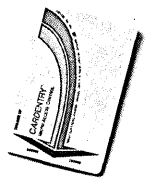
Whenever we gas up a truck, a CARDENTRY device on the pump records who took the fuel, how much he took, and the mileage on the truck.

Our cafeteria entrance is card-controlled too, programmed so an employee with free meal privileges can only use them once a day.

At quitting time, we all "punch out" with our Ruscards, and the system tells our main computer exactly when we left. Our hours are computed and paychecks printed automatically. No more time cards to bother with.

Whatever you want to call it. I'd have to say CARDENTRY is the best idea we've had around here in a long time."

THE CARDENTRY COMPANY...



For a brochure detailing CARDENTRY'S exciting capabilities, call toll-free **1-800-528-6050, Ext. 691**
(In Arizona call 1-602-955-9714, Ext. 691)
or write **Rusco Electronic Systems**
1840 Victory Blvd.
P.O. Box 5005
Glendale, Ca. 91201

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CIRCLE 85 ON READER CARD

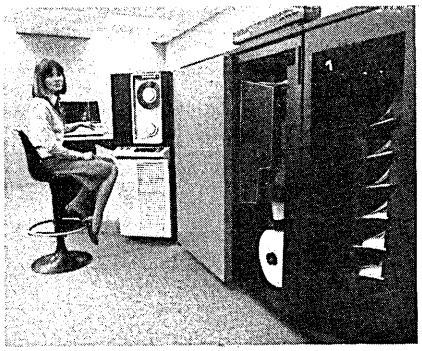
hardware

lem. Upping the Amdahl's buffer size from the standard 16K bytes to 32K is said to increase performance 5% to 15%, depending on individual job streams. New systems will cost $200K more (some substantial design changes were required); field upgrades for systems installed before the development will cost *less:* $150K. The reason? Amdahl doesn't want any of its customers to even wonder if they already possess an obsolete machine. Monthly maintenance charges on the new buffer are $100/month. Systems with 32K buffers will be called 470V/6-II and will be available during the third quarter; field upgrades will begin the following quarter. AMDAHL CORP., Sunnyvale, Calif.
FOR DATA CIRCLE 346 ON READER CARD

High-speed Printing

Honeywell has enjoyed much success with its non-impact page printing systems. First announced in mid 1974, the first two versions—a 12,000 lpm and 18,000 lpm model—have shown that users like the electrographic output, and the smaller size paper (standard 8½ x 11-inch stock) it can use.

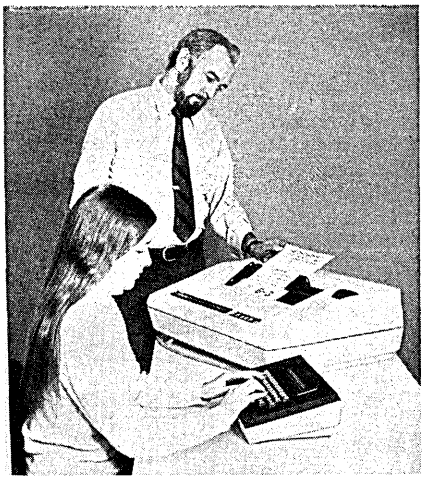
Now an 8,000 lpm model joins the ranks. It's estimated that users who print an average of 500,000 pages/month will find that the 8,000 lpm



model looks like a viable alternative to impact printers in terms of cost. The 8,000 lpm unit can be field upgraded to the higher performance figures. Complete with 75 ips 1600 bpi tape drive, eight-pocket stacker and IBM-to-ASCII code conversion, the 8,000 lpm page printing system is priced at $162,565, or $3,541/month on lease. A maintenance charge minimum of $410/month is also applied. HONEYWELL INFORMATION SYSTEMS, Waltham, Mass.
FOR DATA CIRCLE 342 ON READER CARD

Programmable Printing

The IPS-7/KD consists of a data input keyboard, a 120 cps printer, and a microcomputer chip. It's intended for materials handling applications where it can be used to generate labels with



different size characters. Said to be designed for use in industrial environments, the IPS-7/KD can generate characters as small as one-ninth inch, expandable in one-ninth increments up to several inches high.

The data input station consists of a gas discharge display and a 64-character ASCII style keyboard. Linked to the printer with a five-foot cable, the station can be used to communicate with a central computer, access data via the keyboard, or receive operator messages on the display. The basic system includes 10 thousand bytes of memory, eight I/O registers, the 32-character display/keyboard, and an RS232 or current loop interface. Prices start at $8,250. DATAROYAL INC., Nashua, N.H.
FOR DATA CIRCLE 344 ON READER CARD

16-bit Micro

Jot down a new development just emerging from the labs that promises faster microcomputer performance, low power dissipation, and higher density

product spotlight

Word Processing Copier

A couple of years ago it was rumored that Xerox was working on a copier that could do double duty as an OCR input device. A spokesman at the time said it sounded like a great idea, but nothing has come of it yet, at least from Xerox.

This product, the ICR100 comes closer to such a device than anything introduced to date. It can be used as a standard office copier. When required by office word processing activity, the ICR100 accepts other input media (magnetic cards, floppy disc, cassette, or directly from telephone lines) and prints it out at 4,000 cps xerographically. And the OCR capability, and maybe even facsimile transmission logic could be incorporated into the design if demand permits.

The ICR100 is not yet a commercial product. The developer is negotiating with three separate manufacturers to get production models built (several prototypes exist, we're told), so the product might not wind up in your office under the developing company's name. Also, external intelligence is needed to format ASCII character input to the device, though a communications port exists that can be hooked directly to a word processing system. This helps keep the price down to around $15,000, but it would seem like the manufacturer would eventually have to incorporate a mini (or micro) to make the system totally self-contained—the way office managers like things. COBURN TECHNOLOGY, INC., East Hartford, Conn.
FOR DATA CIRCLE 354 ON READER CARD

circuits, meaning that they'll be cheaper for a given amount of work. The development is called Integrated Injection Logic (I^2L) and is used in bipolar circuit designs to achieve the advantages listed above. The SBP 9900 is thought to be the first monolithic cpu manufactured using the technology. Key features include its 16-bit word length, a size that should eventually obsolete 8-bit designs. The 9900 is said to contain a minicomputer-like instruction repertoire (including multiply/divide), and directly addresses up to 32K memory words. There are seven addressing modes, separate I/O, memory, and bus interrupt structures, sixteen prioritized hardware interrupts, word/byte/bit data handling, DMA capability, etc. The 9900 is software compatible with other 9900 series products, meaning users have access to an already existing body of developed programs. The SBP 9900 sells for $386 each at the 100 quantity level. TEXAS INSTRUMENTS INC., Dallas, Texas.
FOR DATA CIRCLE 345 ON READER CARD

Micro Development System

The proliferation of microprocessors creates an entirely new market for micro development aids. Micro development systems have been around for a few years now, but this one may well be the most extensive to date.

The 8002 μP Development Lab is by itself a microcomputer system, but with a twist. It can run slave microcomputers, assemble programs, edit programs, load programs into ROMS (as an option), and emulate the target micro and its control memory to allow a section-by-section (I/O, memory, cpu) check-out of the prototype. Currently, the 8002 supports system development on the popular 8080 and 6800 microprocessors. Support for the Z80 and additional devices will follow.

Three elements make up the basic system: a main chassis housing cpu, memory, control, and interface cards; a two-spindle disc drive; and an interactive RS232C-compatible terminal. Peripherals, such as tty terminal, paper tape reader/punch, modem, and printers can be added to meet the user's needs. A master cpu controls all operations through a disc operating system. As many as three slave cpu cards for emulating different micros can be plugged in at one time; they can be swapped with others to accommodate additional microprocessor types. A separate slave cpu performs program assembly. It is optimized to shorten assembly time.

A table-driven relocatable macro assembler offers two major advantages: being table driven, it provides a high degree of assembler commonality between micro types; and, since the code is relocatable, changes in source code mean that only the affected routines need be reassembled.

Users already having computer facilities for source code program development and assembly can buy the 8001 μP Lab which offers the in-circuit emulation features of the 8002, but lacks the source code entry and assembly component.

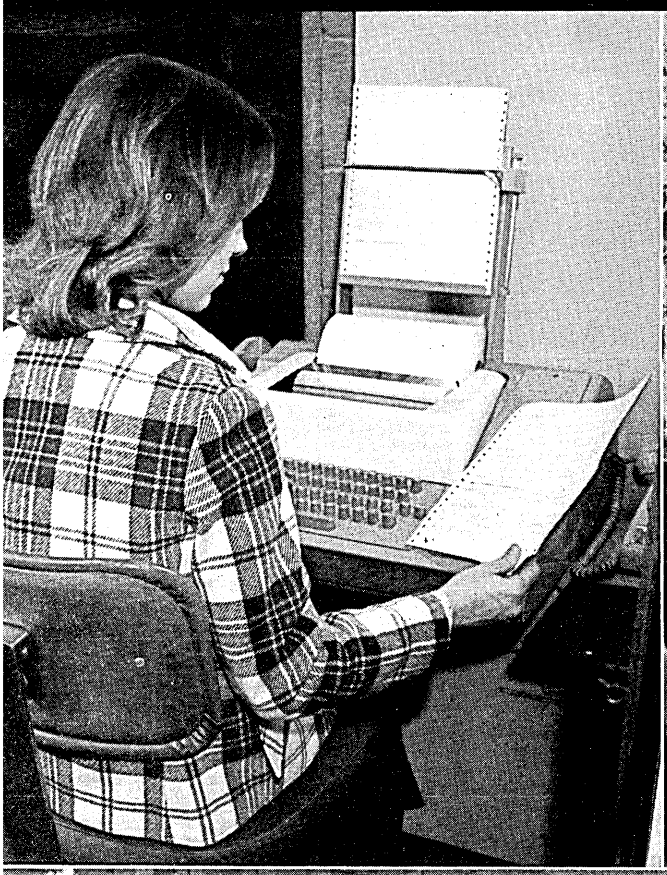
The 8002 sells for $9,950, without terminal. TEKTRONIX, INC., Beaverton, Ore.
FOR DATA CIRCLE 356 ON READER CARD

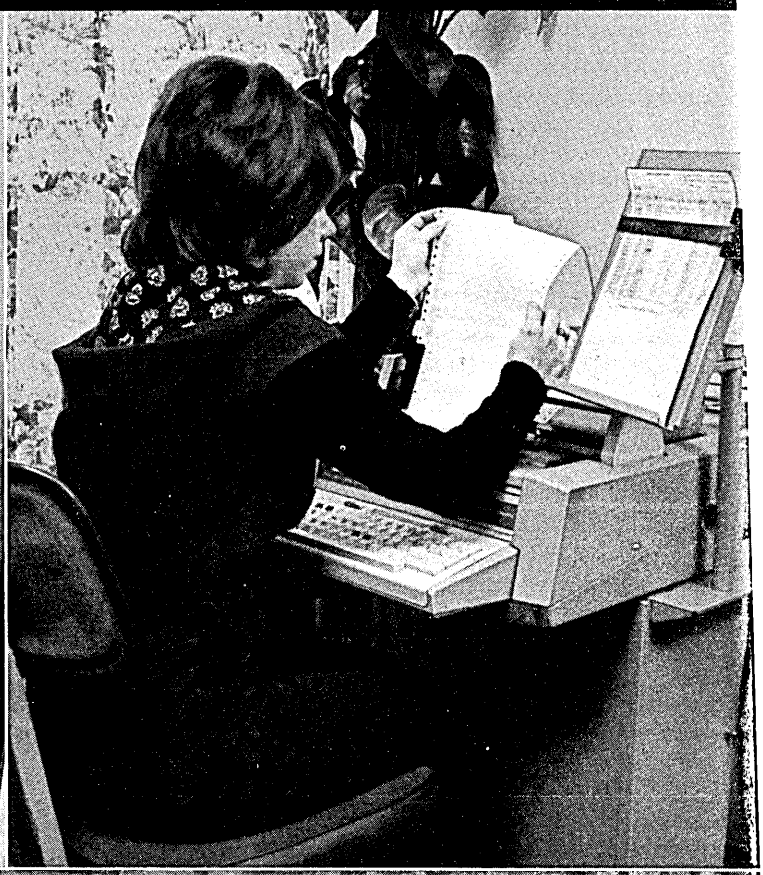
Crt Terminal

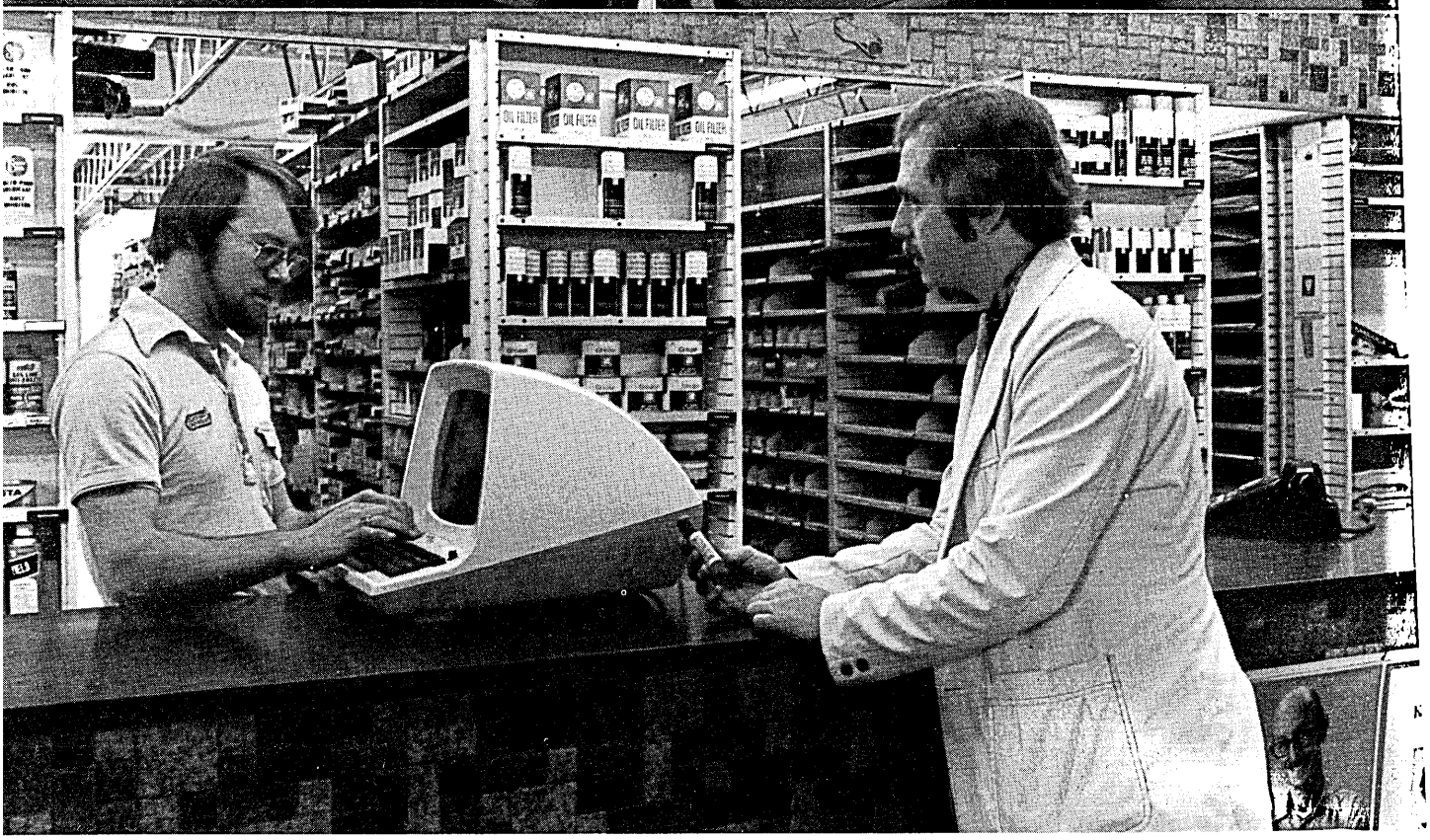
The vc303A is a tty-compatible crt with composite video output to slave monitors and direct cursor addressing by computer or operator. Targeted applications include small business systems, time-sharing, mini/microcomputers, and other end user applications.

(Continued on page 188)

We don't make terminals. We make them work.







How we made 2000 work for Reynolds & Reynolds.

Reynolds & Reynolds, a nationwide supplier of computerized information services for automobile dealers, found that its customers ranged from small to large.

To meet each customer's needs, the company decided on a mix of systems:

(1) A centralized computer system.

(2) A distributed data processing system.

(3) An in-house computer system.

In order to configure these three systems, Reynolds & Reynolds needed a terminal vendor which would provide a broad mix of terminal arrangements, applications engineering, special customer arrangements, on-time installation and nationwide service.

They selected Western Union Data Services.

People and systems.

Our sales, service and engineering team worked closely with Reynolds & Reynolds systems planners to provide the proper match between equipment and application, hardware and software, people and systems.

"Western Union Data Services provided the terminal configurations that matched the job requirements and without wasted costs," says Terry Carder, Vice President of Marketing, Reynolds & Reynolds.

"They understood our business and our customers' needs," says Mr. Carder.

"For our small-volume users they supplied 10-cps terminals that operate on the dial-up network.

"For our medium-volume users, they configured on-line, interactive terminals on our distributed data processing system, which uses both dial-up and leased lines to connect 145 minicomputers at 75 remote centers, serving 126 cities in the U.S.

"For our large-volume users, they directly connected hard copy and video terminals to minicomputers located on our customers' premises."

Tailored terminals.

At Western Union Data Services, we make every effort to meet each individual customer's needs.

To meet Reynolds & Reynolds form-handling needs, we designed a new paper-handling mechanism.

And to satisfy the firm's requirements for desk-top terminals, we specially configured our 10-cps and 30-cps terminals.

Nationwide service.

"With the variety of terminals and special arrangements we needed for our systems, we needed a terminal vendor which could service terminals on a nationwide basis," continues Mr. Carder.

"That's one of the reasons we selected Western Union Data Services. If our customers have to report a problem, they call their Termicare® center toll-free.

"The Termicare center has a complete history of each terminal stored in its computer and the analysts and equipment to test each terminal remotely."

For more information on Western Union Data Services terminals and our support capabilities, call 800-631-7050. (In New Jersey, 201-529-1170.)

Western Union Data Services

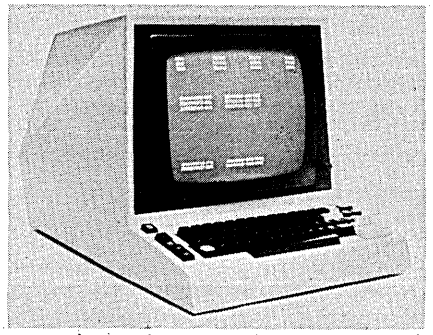
CIRCLE 69 ON READER CARD

hardware

(Continued from page 185)

Standard features include serial asynchronous RS232C interface, eight switch-selectable data rates (from 110 to 9,600 baud), and 1,920 character positions (24 lines by 80 characters) on a 12-inch screen. The 64 ASCII character keyboard has a cursor control cluster, tactile feedback, and auto repeat.

Options include a detached 11-key

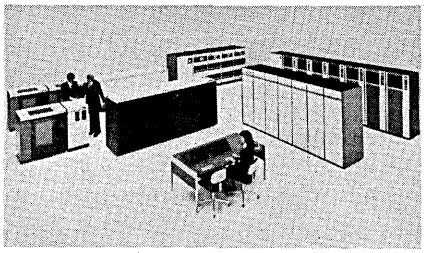


numeric pad, upper/lower case 96 character ASCII keyboard/display, switched serial interface for printer cassette or floppy disc, parallel input and output interfaces, and custom keyboard-character fonts for APL and French. Delivery is four to six weeks ARO, and unit prices start at $1,595. VOLKER-CRAIG LTD., Waterloo, Ontario, Canada.

FOR DATA CIRCLE 349 ON READER CARD

Large-scale Computer

Burroughs seems to always find ways of improving system performance without forcing its customers through massive numbers of programming changes. That's essentially the story behind the B 7800, Burroughs' most powerful system introduced to date. All the capabilities leading edge users are interested in seem to be available on the B 7800: "large on-line network processing, large scale data base man-



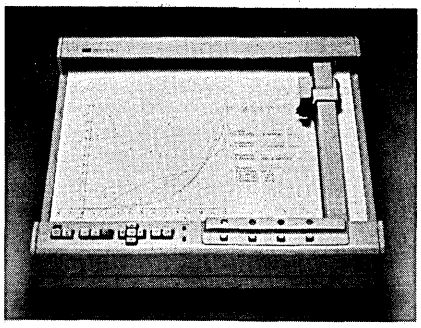
agement applications, multiprocessor performance/reliability," etc. Users can increase the processing power of their installations up to 50 times as they move from a B 6800 system to the largest B 7800 system, and performance is 2.5 times faster than the B 7700 system. The B 7800 clearly seems to be an IBM 168 or Amdahl 470 competitor.

The cpu operates at 8 million cycles per second (MHz), but most of the credit for the performance is given to expanded processor buffering (12,288 bytes), extended asynchronous operation, eight-way phased memory interleaving, and better optimization of the processor's instruction set. Even the smallest 7800, the 7821, is a multiprocessor, a single cpu, and an I/O processor. The 7821 has two of each, and each system can be expanded up to eight processing units in any combination. All object code of predecessor systems is "instantly mature," Burroughs' phrase for compatible with the new mainframe. For program development on the 7800 itself, COBOL, ALGOL, FORTRAN, PL/1, and BASIC are available. A 1.5 megabyte system is priced at $2,497,600, or $53,100 on lease. You'll have to wait some for the system, though: deliveries are slated for the first quarter of next year. BURROUGHS CORP., Detroit, Mich.

FOR DATA CIRCLE 325 ON READER CARD

X/Y Plotter

About the only aspect of the 9872A X/Y plotter that might displease many users is that it won't run with anything but H-P's 9825 and 9831 desktop computer/calculator. Still, maybe other users will prevail on the company to



make models available with a more standardized interface.

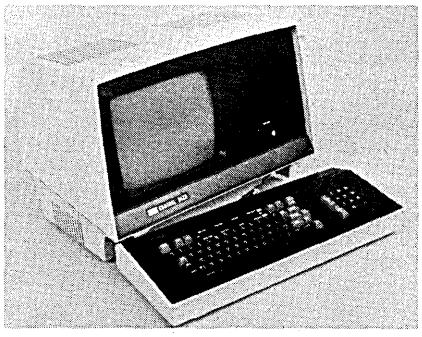
The 9872A automatically selects any of four different colored pens under program control and plots them using seven dashed-line plots, five built-in character fonts, and user-defined characters and symbols. The plot size is 11 x 17 inches (A drawing size); the speed is 360 mm/sec (H-P has gone metric), and the resolution is .0025 mm. Off-scale data handling is provided by calculations of the point where data will return to scale, with the pen then being moved to that location. Thirty-eight instructions are built into the 9872 to provide features such as point digitizing, labeling, and character sizing. The 9872A is specifically designed for the 9825 and 9831 desktop computer/calculators and is priced at $4,200. Deliveries begin this month. HEWLETT-PACKARD CO., Palo Alto, Calif.

FOR DATA CIRCLE 353 ON READER CARD

Crt Terminal

The model 752 is a lower cost ($1,650 single unit) addition to CDC's 750 series of terminal products. Teletype-compatible, the 752 is intended for time-sharing and other communications applications.

With 10 switch-selectable data rates (110 to 9600 baud), the terminal offers RS232C, CCITT V24, and current loop interfaces. The screen displays 1,920 characters, and 64- or 96-character ASCII capability is switch-selectable. The



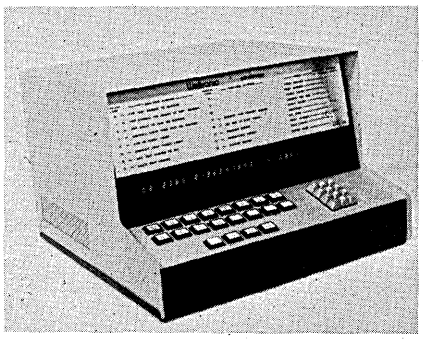
terminal also has 33 displayable control codes.

Impact or non-impact printers—the 755-II and 753-II—are available for producing hardcopy screen images. Single units can be leased for $55/month on a one-year lease. The 753-II non-impact printer costs $2,440 or $76/month on a one-year lease; the 755-II matrix printer sells for $4,270 and can be leased for one year at $131/month. CONTROL DATA CORP., Minneapolis, Minn.

FOR DATA CIRCLE 350 ON READER CARD

Industrial Terminal

This industrial manufacturer has found itself entering the industrial data processing field with the introduction of the CONCENTER master data entry unit. A calculator-type keyboard is intended to make operation simpler and not frighten away potential users. A 10-key keyboard and control keys (clear,

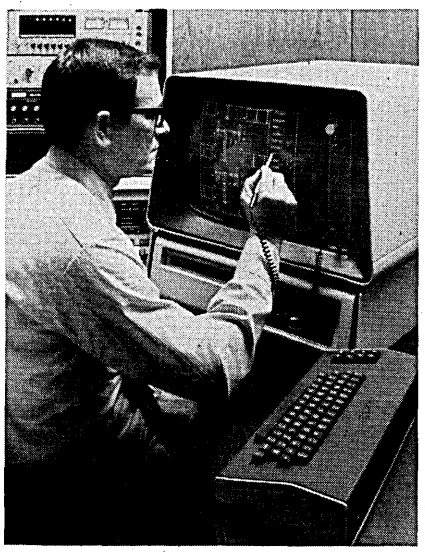


enter, clear entry) are also included. A 32-digit LED display is included with characters large enough (.3 inch) to be read 15 to 20 feet away, it's claimed. The integral microprocessor is used to "tutor" or prompt the user through operation. The front panel can be customized to buyer requirements, and a standard model is also available. The CONCENTER is priced at $2,850 each. WELTRONIC CO., Southfield, Mich.

FOR DATA CIRCLE 328 ON READER CARD

Graphics Terminal

It's getting cheaper all the time to get graphics capability. Witness the GT41. It combines a PDP-11/04 with 16K words of memory with a VT11-A display system, all packaged in a tabletop design. Featured are a 17-inch scope, solid state light pen, and downline loading from a host cpu in cooperation with a built-in ROM bootstrap. A full ASCII keyboard is used to input data, and there are other features, including eight light intensity levels, four types of line generation (solid, long dash, short



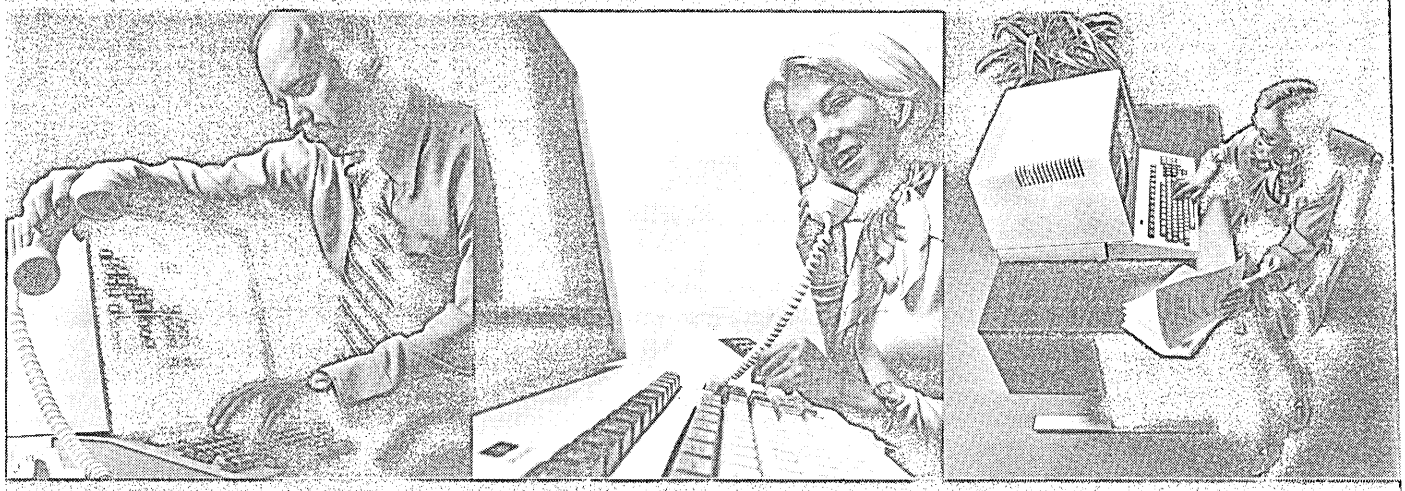
dash, and dot-dash), italic letters, and 31 special Greek and mathematical symbols. The GT-41 is priced at $18K. DIGITAL EQUIPMENT CORP., Maynard, Mass.

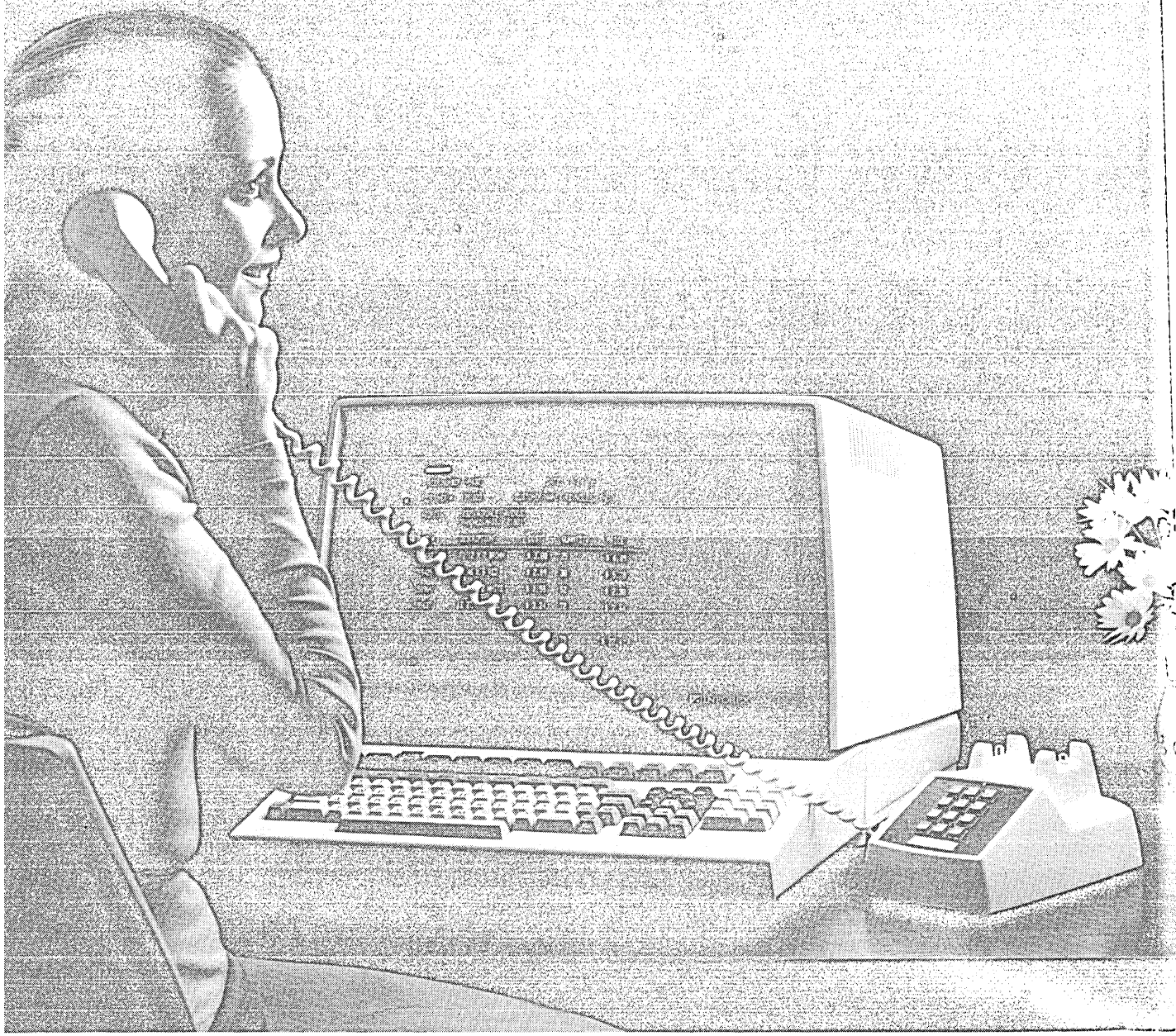
FOR DATA CIRCLE 355 ON READER CARD

NCR Mini

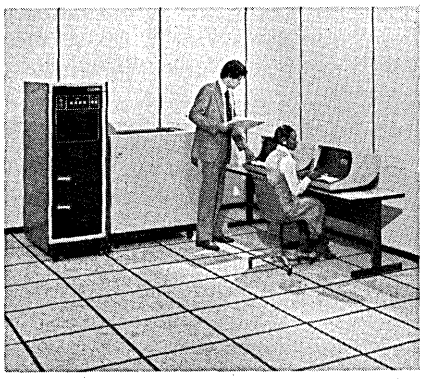
The 8250 is intended for use either as a free-standing interactive multiprogramming system or as a communications-oriented processor. The 16-bit processor ranges from 48K to 128K bytes of storage in 16K increments, and coordinates activities between a visual display terminal, matrix printer, 9.8 megabyte disc, and cassette. This system is priced at $42,420, or $1,205 under a five-year lease. (An expanded configuration with 128K of memory, 40 megabytes of disc, and four visual displays is priced at $110,670, or $3,098 on a five-year lease.) Reentrant code is featured on the 8250, and additional features include compatibility with future Criterion systems to make it easy for the user to move up, conversational question/answer procedures to simplify startup procedures, three levels of security for each terminal, and NCR COBOL 74. Options for the system include line printers ranging from 55

The innovative Inforex System 7000





hardware



to 600 lpm speed, up to seven crt terminals or matrix printers, one or two card readers, hard copy printers for the crt's, floppy discs, tape drives, etc. Deliveries have begun on the 8250. NCR CORP., Dayton, Ohio
FOR DATA CIRCLE 327 ON READER CARD

Microcomputer

Although it's aimed at the oem, the SUPER JOLT microcomputer card module will probably generate a fair amount of interest from computer hobbyists. A TINY BASIC interpreter, a one pass assembler, and a debug monitor program, all loaded in 5,120 bytes of ROM, come with this micro. The micro also has 1K bytes of RAM, 32 bidirectional I/O lines, a clock, four interrupts, and three serial interfaces (RS232, TTL, and 20ma current loop) as standard equipment. All the user needs is a terminal and a power supply and he's got a microcomputer system on his hands. Additional memory, up to 64K bytes, can be added. Single unit pricing for the SUPER JOLT card, fully assembled and tested, $575 with the Software ROMs and $375 without the assembler and TINY BASIC roms. Kits are available. MICROCOMPUTER ASSOCIATES, INC., Santa Clara, Calif.
FOR DATA CIRCLE 352 ON READER CARD

PDP-8 Memory

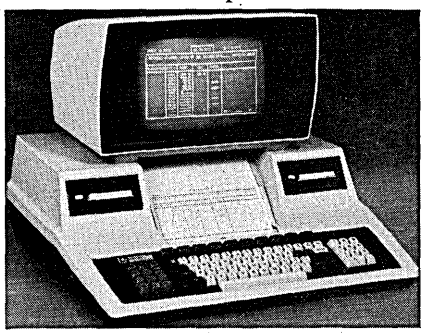
An 8K word, nonvolatile add-in memory for DEC PDP-8 A, E, F, and Ms needs only a maximum of 0.6 amps at five volts, and provides the additional space on the OMNIBUS and surplus power to drive extra peripherals. Delivery is from stock; the price is $995, with oem discounts available. MONOLITHIC SYSTEMS CORP., Englewood, Colo.
FOR DATA CIRCLE 341 ON READER CARD

Acoustic Enclosure

We don't know if it's a first or not, but the incorporation of a forms tear edge into this manufacturer's acoustic enclosure line is a good one: it makes using enclosures easier, which might lead to their greater acceptance, and thus quieter computing. Enclosures are made of wood for a variety of terminals and printers—a unit for the Centronics serial printer is priced at $355. JENSEN ENGINEERING, INC., Santa Rosa, Calif.
FOR DATA CIRCLE 351 ON READER CARD

Intelligent Terminal

The 770 doesn't leave much to be desired in the way of an intelligent crt terminal with integral hard-copy. The product is based on TI's Integrated Injection Logic (I^2L) micro described elsewhere in these pages. The micro is used to coordinate the 1,920 character display, ASCII typewriter-style keyboard with separate numeric, cursor control and function keys, dual cartridge tape drives, RAM/ROM memory, and the electrostatic printer.



Software developed for other 700 series terminals runs on the 770, too, and there's a business-oriented terminal programming language (TPL), a cross between "fill in the blanks" programming and an English-like procedural language. There's also a 3780 emulation package that provides direct communications with any IBM systems supporting BISYNCH. An 8K unit is priced at $6,400, or $281/month on 30-day rental. TEXAS INSTRUMENTS INC., Houston, Texas.
FOR DATA CIRCLE 340 ON READER CARD

Buffered Terminal

A microprocessor controlled cassette buffer connected to a model 33 tty equips the MSR 3141 for 1200 baud communication on the dial-up network. The micro provides error detection/correction advantages of the ANS x3.28 control procedure as well as limited editing capabilities. Under the ANSI protocol, messages are automatically segmented by the buffer into blocks of 256 or fewer characters. Each block is assigned a sequential number so missing blocks can be detected. Block transmission improves error detection rates and makes it possible to apply straight forward correction techniques.

The 110 baud terminal works through the microprocessor-controlled cassette buffer to communicate at 120

baud. Self-testing of the micro's memory and basic functions can be initiated by operator command to facilitate isolation of terminal or line communication problems. Prices start at $200/month for the MSR 3141 and include the microprocessor controlled cassette buffer, an EDT 33 ASR teletypewriter, a 1200 baud modem, and maintenance. Deliveries are scheduled to begin in the second half of 1977. WESTERN UNION DATA SERVICES, Mahwah, N.J.
FOR DATA CIRCLE 347 ON READER CARD

S/3 Line Printer

If your System/3 spends most of its time waiting for the printer, you might look into the model 6615 line printer. The 6615 prints 1,500 lpm, and has 132 print positions, character sets of 48 or 63 characters, and the ability to print six-part forms. The 6615 goes for $1,495/month, including maintenance, on a three-year lease. You can buy it outright for $45,750. DECISION DATA COMPUTER CORP., Horsham, Pa.
FOR DATA CIRCLE 326 ON READER CARD

Terminal Enhancements

A 64K byte complement of memory and a floppy disc-based operating system have been developed for this manufacturer's series 200 user-programmable intelligent terminals. The memory is available in 8K chunks, and up to 4K of the 64K byte total can be ROM or PROM. The operating system includes a diskette macro assembler, source text editor, linking loader, a utility library, and two screen-oriented debuggers. A model 200/10 standalone FDOS (the floppy operating system) configuration with crt/keyboard processor, two floppies, and 32K bytes of memory is priced at approximately $9,925 in quantities of 25. COMPUTEK INC., Burlington, Mass.
FOR DATA CIRCLE 329 ON READER CARD

Add-on Memory

This respected memory manufacturer announces its second generation of ECOM[R] 70 memory systems for the PDP-11/70. Standard is going after bigger game with this model, which can have up to a megabyte of storage ($49,600) built-up in 128K byte increments and is expandable in the field. The basic 128K expansion kit is priced at $5,900, or $8,300 when equipped with a feature that allows users to select address ranges, switch out the ECOM[R] 70 portion of the system for system malfunction diagnosis. STANDARD MEMORIES, Santa Ana, Calif.
FOR DATA CIRCLE 358 ON READER CARD

Image Processor

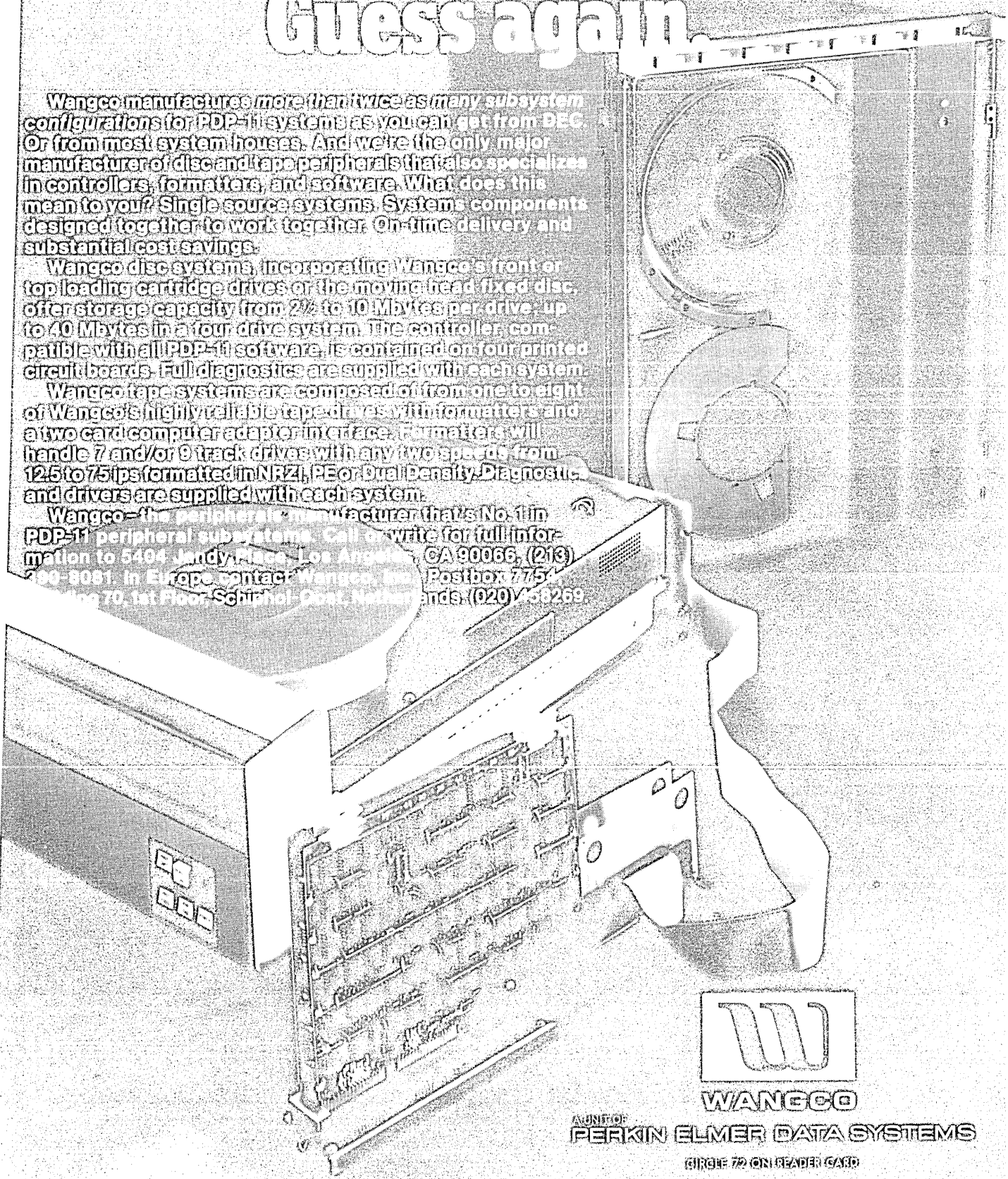
The model DS-12 digital image memory/processor can perform image detection, recording, processing, and display functions. The microprocessor controlled unit combines fast A/D conversion, high capacity random access memory and an arithmetic unit to perform video processing functions in real time. I/O ports for tv-compatible analog signals and random access digital I/O may operate simultaneously via a memory time-sharing technique.

With the DS-12 it is possible to digitize and store a television field in one-sixtieth of a second and combine new input images with stored images in a variety of ways.

Price on the DS-12 is $13,900; custom interfaces run about $1,000 to $1,500. QUANTEX CORP., San Carlos, Calif. ❋
FOR DATA CIRCLE 359 ON READER CARD

Who's number one in PDP-11 subsystems?

Guess again.



Wangco manufactures *more than twice as many subsystem configurations* for PDP-11 systems as you can get from DEC. Or from most system houses. And we're the only major manufacturer of disc and tape peripherals that also specializes in controllers, formatters, and software. What does this mean to you? Single source systems. Systems components designed together to work together. On-time delivery and substantial cost savings.

Wangco disc systems, incorporating Wangco's front or top loading cartridge drives or the moving head fixed disc, offer storage capacity from 2½ to 10 Mbytes per drive, up to 40 Mbytes in a four drive system. The controller, compatible with all PDP-11 software, is contained on four printed circuit boards. Full diagnostics are supplied with each system.

Wangco tape systems are composed of from one to eight of Wangco's highly reliable tape drives with formatters and a two card computer adapter interface. Formatters will handle 7 and/or 9 track drives with any two speeds from 12.5 to 75 ips formatted in NRZI, PE or Dual Density. Diagnostics and drivers are supplied with each system.

Wangco—the peripheral subsystems manufacturer that's No. 1 in PDP-11 peripheral subsystems. Call or write for full information to 5404 Jandy Place, Los Angeles, CA 90066, (213) 390-8061. In Europe, contact Wangco, Inc., Postbox 7754, Building 70, 1st Floor, Schiphol-Oost, Netherlands, (020) 458 269.

WANGCO

A UNIT OF PERKIN ELMER DATA SYSTEMS

CIRCLE 72 ON READER CARD

software & services

Updates

Univ. of Maine researchers have developed a computer model to predict the movement and assimilation of radioactive waste from nuclear power plants. Developed during research involving Maine's only nuclear power plant at Montsweag Bay, the model can help proposed plants find discharge locations for optimal waste distribution. High concentrations of radioactive waste can be kept from areas of recreation and other industries.

Meanwhile, in Idaho, a dozen Hewlett-Packard 9800-series desktop computing systems are helping chemists at the Allied Chemical Co. investigate methods for reprocessing nuclear waste. Some of the 9800s are interfaced to lab equipment, others are free-standing computational tools.

PASCAL, a structured programming language, is popping up all over the place. Computer Automation recently announced availability for the compiler, and now Four-Phase Systems is developing one for its IV/70 series. Plans call for the compiler to be offered users (and used in-house) to develop applications software.

As developed by N. Wirth, PASCAL provides for user-defined data types, variable record structures, WHILE and UNTIL loops, and ALGOL features such as block structuring and recursion.

The British Broadcasting Co. has a computer system for generating subtitles for foreign language television films. Assembled by BBC engineers, the system comprises a Computer Automation Alpha LSI mini, a terminal, and peripherals specially provided by Sintrom Electronics Ltd. The system produces a second film of subtitles against a dense background; the movie and subtitle films are electronically added together for transmission.

MRI Systems Corp. says the U.S. Navy plans to install the firm's SYSTEM 2000 data base management system to maintain the 11-billion byte Naval Aviation Logistics Data Analysis data bank.

Networks using IBM's SNA are not limited to four cpu's as we stated in January. IBM hastens to point out that there is no theoretical limit on the number of cpu's that can operate under SNA.

Econometrics

Here's a three-way joint effort that businessmen with need for econometric modeling may appreciate: data and models from Merrill Lynch Economics, software from Economic Modeling Systems (EMS), and computer resources from National CSS.

With a terminal and a telephone, a businessman can get onto National CSS's computer network, fire up the EMS software, and use the Merrill Lynch models and data to make forecasts of the economic environment. The user can also determine the impact of these forecasts on specific economic sectors, industries, and product lines.

The software provides data management and analysis, model building, simulation, report writing, and terminal graphics. National and regional databases contain economic time series compiled from public and private sources; the forecast database contains about 400 economic indicator forecasts generated by Merrill Lynch's macroeconomic model. Additional models scheduled for release include the macromodel, the Housing Industry Forecast Service, the Federal Reserve Board Industrial Production and Capacity Utilization Service, and models for the automotive, trucking, and tire industries.

In addition to paying for the computer resources you use, you'll have to pay for the models and databases you want. The national historical data base goes for $1,000/year, the regional database for $500/year, or you can use both for $1,250/year. Econometric models, including consulting and use are priced at $7,000/year for the first, and $2,000/year for subsequent models. NATIONAL CSS, INC., Norwalk, Conn., or MERRILL LYNCH ECONOMICS, INC., New York, N.Y.

FOR DATA CIRCLE 310 ON READER CARD

DOS/VS Measurement

IBM 370 DOS/VS shops can identify system bottlenecks using the VS/INSIGHT performance measurement package. The package provides the VS installation with information necessary for system evaluation and fine tuning.

A 4K byte program, it resides in the page pool area and gathers performance data on the system, storing it on disc for later interpretation. Batch programs use this data to prepare graphs of system characteristics, such as paging activity and operator intervention delays.

INSIGHT monitors actual hardware and software performance. The batch reporting part of the system prepares graphs of paging activity, deactivation time, cpu usage, real storage usage, operator intervention delays, channel utilization, and partition lockouts. Detail and summary reports are also provided, giving information on individual program efficiency factors such as virtual storage required, average real storage used, cpu time, deactivation time, paging time, and statistics on fetch/load counts, number of pageins, pageouts, page faults, and copy blocks required.

Reports from INSIGHT may tell the

dp manager that his operations staff is overworked, that he needs more memory, that several programs should be scheduled to run at different times, or, in the case of a graph showing no paging activity, that he may have more memory than he really needs.

Several pages of "cook book" instructions describe INSIGHT installation. No modification to supervisor or IBM software is required by the INSIGHT system and it operates under all releases of DOS/VS. Monthly rental runs $165. UNIVERSAL SOFTWARE, INC., Brookfield, Conn.

FOR DATA CIRCLE 311 ON READER CARD

Work Standards

Written in standard FORTRAN, IMPACT (Improved Management Performance and Costing Techniques) provides an automated system of work standards, utilization and productivity measurements, staffing analysis, and unit costing. Given a firm's work standards and data gathered on hours worked and

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More IMS and TOTAL installations have chosen the ASI-ST Data Management and Reporting System to implement data base applications than any other product. ASI-ST's dominance in data base environments is easily explained:

- Operates under all IBM 360/370 versions of DOS, DOS/VS, OS and OS/VS.
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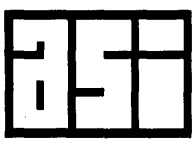
- Permits creating and updating TOTAL and IMS data bases as well as retrieval.
- Allows concurrent processing of conventional data files with IMS or TOTAL data bases.
- Supported in both batch and on-line environments.

IMS users such as *American Airlines, Dow Chemical, TWA, American Can, The Hartford, Union Carbide;* and TOTAL users like *Combustion Engineering, Northwestern Mutual Life, Anheuser-Busch, Corning Glass Works, Eli Lilly* and *Holiday Inns* are a few who agree ASI-ST and data base belong together. In addition, ASI-ST provides an unequalled return on investment by maximizing the productivity of both man and machine. Since ASI-ST fully supports conventional data files as well as complex data bases, these benefits are not restricted to IMS and TOTAL users. To obtain more information contact:



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Torrance, California 90503
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software & services

production by employee, this package will produce reports on productivity factors, budgeting for overtime, utilization factors, and labor cost by product. It is said that IMPACT will substantially reduce, if not eliminate, computational and report preparation time needed for manually run work measurement systems.

The program was developed with help from some professors at a local university. Offered as a documented source program, IMPACT has a perpetual license fee of $5,000. Management application and implementation instructions, including instructions on developing work standards, come with the system. ROBERT C. BALDWIN ASSOCIATES, INC., Shoreham, N.Y.

FOR DATA CIRCLE 312 ON READER CARD

Faster Sorting

CA-SORT has been around since 1971 but 360 and 370 users may be interested to learn that the current release 77 version 4.0, runs 15% to 20% faster than release 76, according to Charles B. Wang, president of the firm that markets the package.

This acceleration is attributed to a "floating buffer" technique called FLOBUFF (TM). Until now, systems used fixed buffers in the assignment of storage areas to the internal processes, such as exchanging data blocks between work devices and the sort. Now the internal buffer assignment is dynamically driven by the actual need of the sorting process. The concept of floating buffering has been used for several years in teleprocessing systems, but this is the first practical sort system application, the vendor says.

Other improvements in the os version include optimized I/O functions on svs and MVS and selective page fixing to get better use out of virtual

software spotlight

Micro Basic

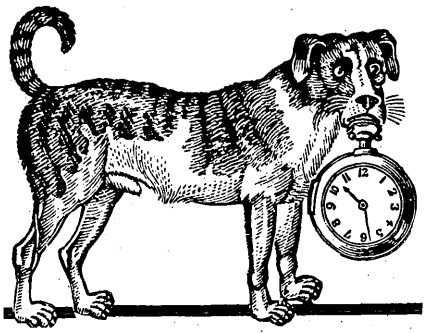
NIBL (pronounced "nibble") may do for microprocessors what BASIC did for larger computers: make programming easy for the masses. NIBL stands for National Industrial Basic Language, which is available for this firm's eight-bit SC/MP micros. As a new higher level microprocessor language, NIBL is an attempt to make programming the SC/MP as easy as possible for people with little or no training in electronics or computer programming.

NIBL is an adaptation of Tiny Basic, a BASIC subset for micros developed by Robert Albrecht and Dennis Allison of the People's Computer Company. National's implementation works on 16-bit integers. Features of NIBL include: the ability to address any I/O device; limited string handling; access to the micro's status registers; multiple statements per line; and linkability to assembly language subroutines.

Like Tiny Basic, NIBL is interpretive. Since each statement is stored in its ASCII source form and must be interpreted each time it is executed, NIBL programs aren't as fast as assembly language programs. However, it takes less time to write a program in NIBL. And since each NIBL statement expands into many machine language instructions, the memory required by a NIBL program and the interpreter may be less than that required for an equivalent assembly language program.

"The NIBL language is well suited to control tasks as long as the user recognizes its inherent speed limitations," says Phil Roybal, microprocessor product manager. "While it is more than adequate for human interface and a variety of other control applications, it doesn't have the speed to handle video generation, direct control of fast peripherals, and so on."

Minimum hardware for implementing NIBL is the SC/MP cpu, crystal and support logic; 4k bytes of ROM for



NIBL; 2k bytes of random access memory user space; a terminal and a five volt power supply. NIBL presently supports as much as 28k bytes of ROM or RAM user memory, enough for roughly 1,200 average lines of code.

NIBL is available for both the older p-channel MOS and the newer n-channel MOS SC/MP. For $15 you can get a paper tape of the language, a listing and a manual from Compute, National's microprocessor users' group. National says it's preparing two ROM versions of NIBL: one packaged in eight 512 byte ROMs ($295) scheduled for April release, and one loaded into two 2k byte ROMs ($80) due in May. A self-teaching manual is also due in May. NATIONAL SEMICONDUCTOR CORP., Santa Clara, Calif.

FOR DATA CIRCLE 309 ON READER CARD

← CIRCLE 107 ON READER CARD

storage. Working storage requirements have been reduced and native support for 3350 devices is now standard. Under DOS, increased I/O overlap improves elapsed time performance. An enhancement that will exploit patterns in the unsorted data to further speed the sort is anticipated.

Purchase price of the DOS system is $5,500; for the OS version $7,000. On a one-year lease the DOS version goes for $200/month; the OS version is $250/month. On a two-year lease the monthly rates drop 10%. One, two, and three year lease-purchase plans are available. COMPUTER ASSOCIATES, New York, N.Y.

FOR DATA CIRCLE 313 ON READER CARD

Multi 370 Spooler

Two or more 370s can share their spooling queues using OUR/POWER, a POWER/VS enhancement. OUR/POWER is said to reduce the amount of spool disc space and increase I/O throughput by equalizing the usage of I/O resources. For example, the system won't allow a printer on one cpu to sit idle while the other cpu's printers are loaded. Additionally, the system ensures that a job will run on the first available cpu, regardless of the one to which it was input.

This software package consists of an initialization program, the OUR/POWER code itself, and a POWER/VS nucleus program. All code is compatible with the POWER/VS system supplied with DOS/VS releases 31, 32, and 33. The user may continue to run the cpu's as under normal POWER/VS because it's claimed the system makes no functional changes to POWER/VS. Aside from performance, the only apparent difference will be from the operator's viewpoint: the card readers and punches as well as the printers will appear to be connected to both cpu's, and a queue file display executed simultaneously on two consoles will produce identical results.

On a two year lease, OUR/POWER costs $500/month. You can buy it for $10,000, with a one time $500 release charge for each DOS/VS release after 31. OXFORD SOFTWARE CORP., Fort Lee, N.J.

FOR DATA CIRCLE 314 ON READER CARD

Data Entry

Three users can independently enter data into pre-generated data entry screen formats using MULTIFORM on Datapoint Diskette 1100 and 1150 dispersed processors. This software increases the number of terminals these two systems can handle to three from one. Although designed for diskette-based systems, MULTIFORM will run on any Datapoint system with two or more disc drives.

Nonprogrammers can create data entry formats with a variety of editing criteria for each field, Datapoint says. Edit criteria include field type (alphabetic, numeric, mixed, shift inversion, digit only, minus overpunch), justification, entry restrictions, and automatic or manual linking to other forms. Additional checks can be programmed on a per field basis using a high level English structured language. These field programs allow arithmetic operations, data manipulation, range checking, table look-ups, check digits, comparisons, branching, and screen output controls.

Data entered through MULTIFORM can be retrieved and modified using interactive control keys on the number pad of the main processor or the model 3610 MULTIFORM data entry terminals.

Files created by MULTIFORM can be processed by any other processing language that Datapoint offers, including RPG II, COBOL, and BASIC. The files may be sent to other computers using communications emulators for IBM, Burroughs, and Honeywell equipment.

This data entry software is priced at $15 for the program and $5 for the manual. DATAPOINT CORP., San Antonio, Texas.

FOR DATA CIRCLE 315 ON READER CARD

Inter-Nova Communication

A communications link program is available that makes possible Nova-to-

software & services

Nova record level communication between programs written in the firm's BLIS/COBOL.

The telephone line communications link may be either synchronous or asynchronous using standard modems. Data General controller boards handle the full- or half-duplex (with or without modem control) communication at speeds from 110 to 9600 baud.

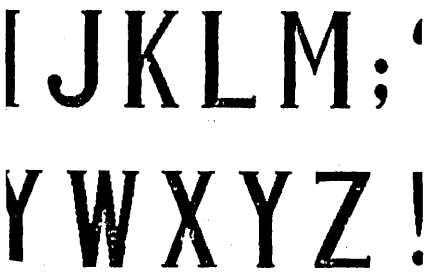
Multiuser communication is available; files can be opened, closed, and data manipulated without interruption to other on-line users. All message formatting, character manipulating, timeouts, and retries are handled automatically by the system at the driver level. The user needs only to write short (about half a page) sender and receiver programs to read and write the files at each end of the link. Files designated as multiuser have a record level lockout, which prevents two programs from concurrently accessing the same record.

The communications link program is priced at $2,000 plus $1,000 per site installation, with a minimum of three sites per installation. INFORMATION PROCESSING INC., Winter Park, Fla.

FOR DATA CIRCLE 316 ON READER CARD

Boldface Printing

If bigger is better, then BOLDFACE/3800 is a move in the right direction. This field developed program runs on IBM 370s, producing half-inch characters on 3800 printing subsystems. The system may find use in text processing, large graphics preparation, computer-printed addressing, and preparation of computer output for the visually handicapped. Other potential uses include supermarket shelf labels,



warehouse pick tickets, and educational material.

BOLDFACE/3800 offers a 52 character set that includes alphabetic capitals, numerics, and common punctuation. Centering of output, left or right justification, selective underscoring, variable character width, expansion or compression of printed output, and intermixing of ten-pitch characters with half-inch printing are all possible with the system.

Written in System/370 assembler language, the system runs under OS/VS1 release 5.0, OS/VS2 release 3.7, and JES2 release 4.0 or JES3 release 2. The program may be called from COBOL, assembler, or PL/1 programs. Any 3800 used to print the boldface output must have 127 writeable character generation storage positions (feature code number 5401).

The program has a license fee of $145/month; monthly charges are waived after the billing of 12 consecutive months. IBM CORP., White Plains, N.Y.

FOR DATA CIRCLE 317 ON READER CARD

PL/1

Re-entrant use of memory, cpu, and I/O resources make R&D/TOOL, a PL/1 compiler, 50% to 80% more efficient than the standard PL/1 optimizing compiler (release 2 or 3) during the compilation and link editing of programs, this vendor states. An additional 5% reduction in machine overhead is also claimed. System turnaround may improve from 5% to 25%, depending on system characteristics.

This compiler also reduces the amount of VS mapping for I/O opera-

tions, reduces the number of resident pages needed to avoid disc thrashing, and reduces the overhead for spooling support and HASP.

Installation takes less than 30 minutes, and the compiler's operation is transparent on any 360 or 370 running OS/MVT, OS/MFT, VS1, VS2, VS2.2, or VM/370, according to the vendor. No system software supplied by IBM or SHARE is replaced or modified.

COBOL and FORTRAN counterparts to R&D/TOOL are under development. R&D/TOOL has a $1,985 perpetual license fee, which includes the first year warranty and updates. Qualified 360/370 sites may arrange for a free 30-day demonstration. ODYSSEY SYSTEMS, INC., Cambridge, Mass.

FOR DATA CIRCLE 318 ON READER CARD

Cobol Cross-compiler

At $100,000 this COBOL cross-compiler for minicomputers may not be for an installation with one or two minis, but it may be just the thing for a firm with a large distributed processing network in the developmental stage.

Each cross-compiler is tailored for a given target machine and operating environment. Specifications of the source language, a "rich" ANS level 2 COBOL with extensions such as network communications capabilities, and specifications describing the target machine are fed to a meta-compiler on a DEC/System 10, and a COBOL cross-compiler that runs on the DEC 10 is the output. A 370-based meta-compiler which will generate a 370-based cross-compiler is in the works.

International Computer Technology (previously International Computer Trading) says it can provide this product for your specific host and target machines in about 90 days at a typical cost of $100,000. ICT CORP., San Francisco, Calif.

FOR DATA CIRCLE 319 ON READER CARD

RPG Documenter

KWIC II is a system-level documentation aid for System/3 and /32 RPG II users. When fed control cards and source programs, KWIC constructs a directory of files and the programs that reference them, a directory of programs and the files they access, a listing of record and block lengths, and basic record layouts. The system also prepares source code and control card listings and run sheets.

Installations with systems under development may be interested in leasing the system for one year at $150/month. If you've got your system up and running you can get it run through KWIC for about $200. KATWIL INTERNATIONAL, Computer Services Division, Warrenville, Ill.

FOR DATA CIRCLE 320 ON READER CARD ❊

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CIRCLE 166 ON READER CARD

DISK UTILITY SYSTEM

Referred to by DATAPRO as "among the best liked software products in the EDP Industry," the success and satisfaction of this product is clearly evidenced by more than 2,800 installations to date. The product provides users with a fast, reliable and easy to use means of backing up or copying disk files (including libraries and data bases, either to tape or disk and time savings in general, the programs can dump multiple disk volumes and/or files of different organizational structure to tape, can selectively restore any file or volume dumped to tape and can copy complete volumes and/or files from disk to disk.

Features of the product include full verification of data, self relocation for running in any or all partitions, ISAM reorganization and reblocking VSAM support, device independence among all IBM supported disk devices and equivalents, self adaptation to core and channel configurations, simple format parameter card input and library backup, condense and reorganize capabilities including selective bookname restore offer considerable operation convenience and time savings.

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CIRCLE 167 ON READER CARD

CYBORG PAYROLL SYSTEM

The CYBORG PAYROLL/PERSONNEL SYSTEM handles multiple companies with hundreds of separate earnings and deductions. The expandable data base design allows each user to add, edit and report on as many new fields as required without any reprogramming. CYBORG provides a complete payroll system with all states, city and county taxes and complete audit and accounting reports. CYBORG has automatic check reconciliation, historical reporting, labor reports, including budget to actual comparisons with dollar and variance differences. The CYBORG REPORT LANGUAGE allows for the creation of special reports or output files (card tape or disk) to meet your unique requirements without reprogramming. The system is written entirely in ANS COBOL and will operate efficiently in 52K.

Cyborg Systems

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CIRCLE 151 ON READER CARD

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A low cost accounting system designed to inform you how your computer is being used and how to make better use of system resources.

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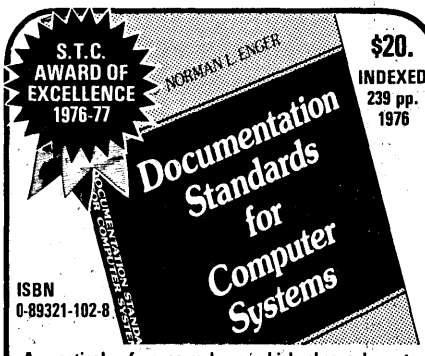

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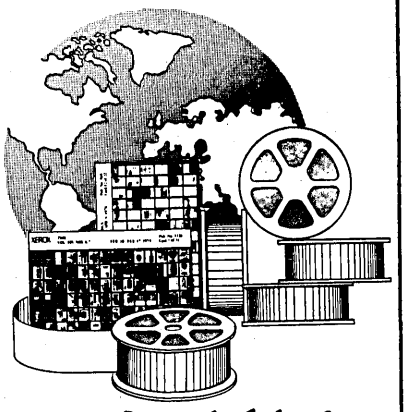

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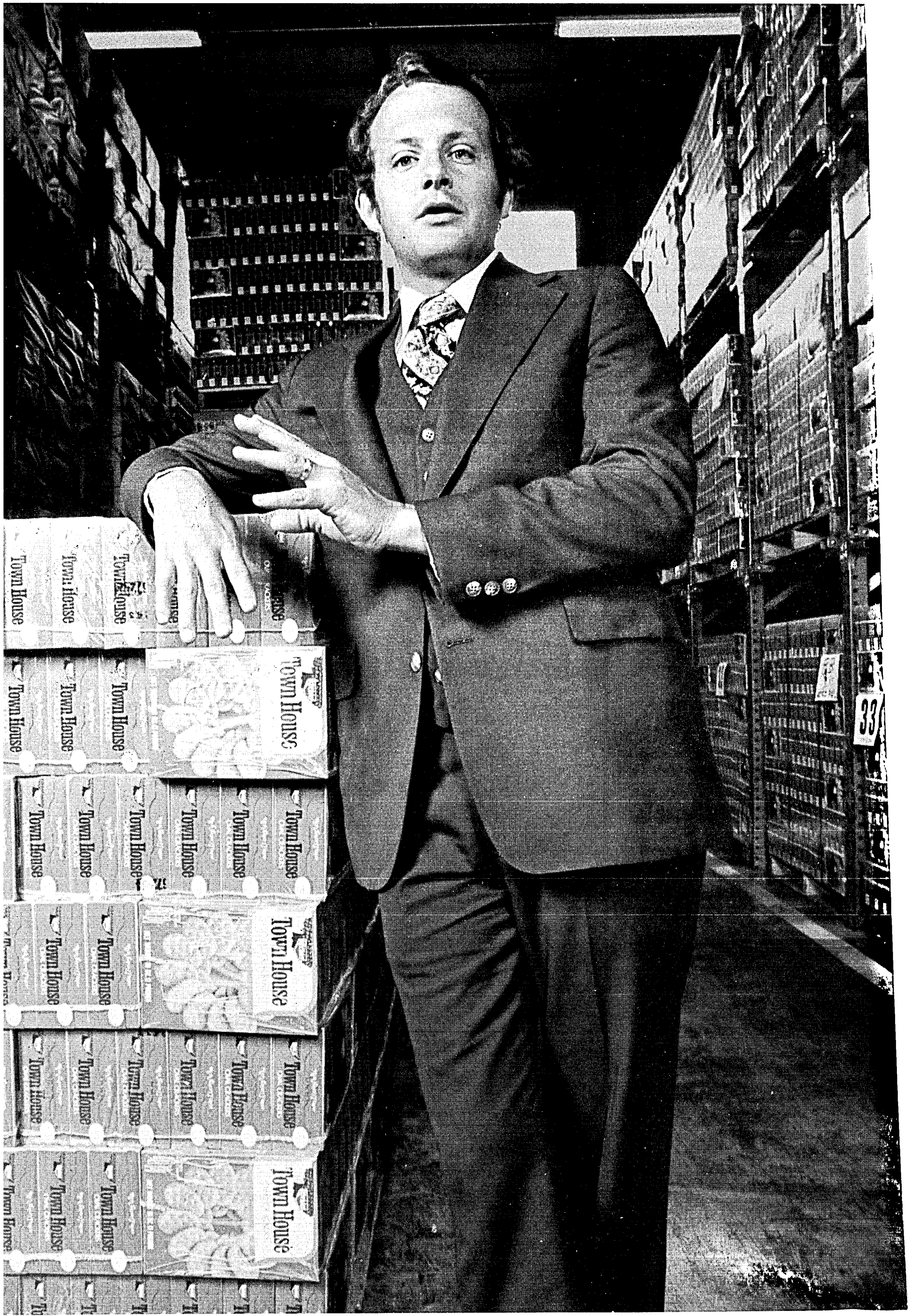
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"Sycor service keeps my network uptime to 98.5%."

Bill Dierkes, VP Information Systems, The Keebler Company.

The Keebler Company, second largest producer of cookies and crackers in the U.S., has six bakeries and 63 distribution centers serving 90,000 retail outlets. Keebler's sales force of more than 1200 used to mail 40,000 orders per week to the 63 distribution sites, where processing and invoicing were done manually. The problem was, these orders weren't getting processed fast enough.

The installation of Sycor intelligent terminals changed all that. And established a new set of order processing standards. Operating at peak efficiency, invoices are now transmitted from the CPU back to the branch locations the same day orders are received. Keeping up this level of performance demands terminal and service reliability.

Keebler puts Sycor to the test.

After a year of operation, Information Systems VP Bill Dierkes wanted to know how reliable Sycor terminals and service were.

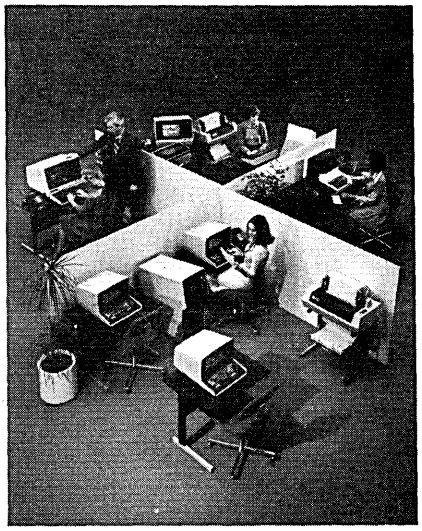
"I conducted a survey of 61 of our Sycor terminals from December, 1975 through May, 1976. Some of the terminals were in out-of-the-way places like Minot and Fargo, North Dakota; Billings, Montana; and Pocatello, Idaho. Places where service might be a problem.

"What I found out really amazed me. Naturally I expected the terminals to be reliable, and I expected Sycor to back them up with good service. But even I was surprised to find that, when a station went down, *80%* of the time it was back up again in four hours or less. And *95%* of the time in eight hours or less.

"When you consider that each location uses the terminal an average of eight hours per day and that there are 127 working days in the six-month period surveyed, the total system was up 98.5% of the time."

A Sycor intelligent terminal is a management tool.

Beyond fast maintenance and reliability, Bill Dierkes has found many other benefits from his network of Sycor intelligent terminals.



"Price, ease of installation and the Sycor terminal's ease of operation were other factors I considered. But the real benefits emerged when the system was installed. As soon as it was up and running we were able to reduce order processing labor by 75%, inventory by 15%, and process 40,000 accurate invoices per week. My Sycor system is a real management tool.

"We're extremely satisfied at Keebler with the overall performance of Sycor terminals. And the people responsible for maintaining them."

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Sycor puts computer power where the work is.

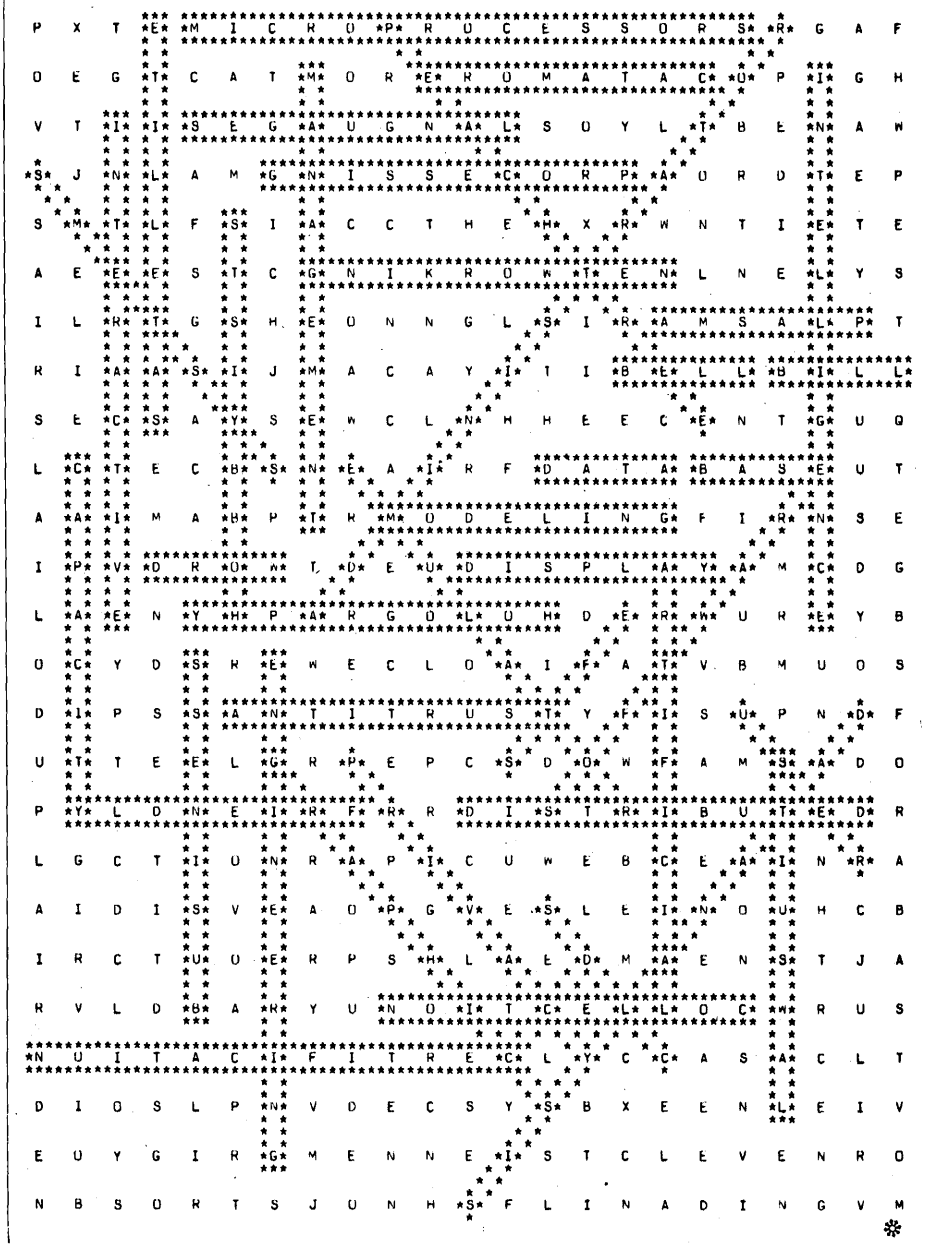
SYCOR

letters

(Continued from page 22)

```
125           1X = IXAT(L,ID)
126           JX = IYAT(L,ID)
127           IAL = ILAT(L,ID)
128           IF (IAL.GE.0) GO TO 67
129           I3=LAW(K)
130           IAL = ISP*IWL(I3)-ISP-IAL
131     67    DO 69 I9=1,IAL
132           II = II+IX
133           JJ=JJ+JX
134     69    MATOUT(II,JJ) = KSTAR
135     71    CONTINUE
136     79    CONTINUE
137           DO 81 I = 1,IMAXO
138     81    WRITE (6,96) (MATOUT(I,J),J=1,JMAXO)
139           WRITE (6,95)
140           STOP
141     88    WRITE (6,97)
142           STOP
143     90    FORMAT(1H1/20H PUZZLE TO BE SOLVED////)
144     91    FORMAT(72A1)
145     92    FORMAT(1X,72A1)
146     93    FORMAT(1H1/28H WORDS TO BE FOUND IN PUZZLE////)
147     94    FORMAT(1H1/41H THE SOLUTION TO THE PUZZLE IS AS FOLLOWS////)
148     95    FORMAT(1H1/22H END OF PUZZLE PROGRAM)
149     96    FORMAT(1x,100A1)
150     97    FORMAT(47H ***** NON-ALPHABETIC CHARACTER IN PUZZLE *****)
151           END
      $DATA
```

THE SOLUTION TO THE PUZZLE IS AS FOLLOWS



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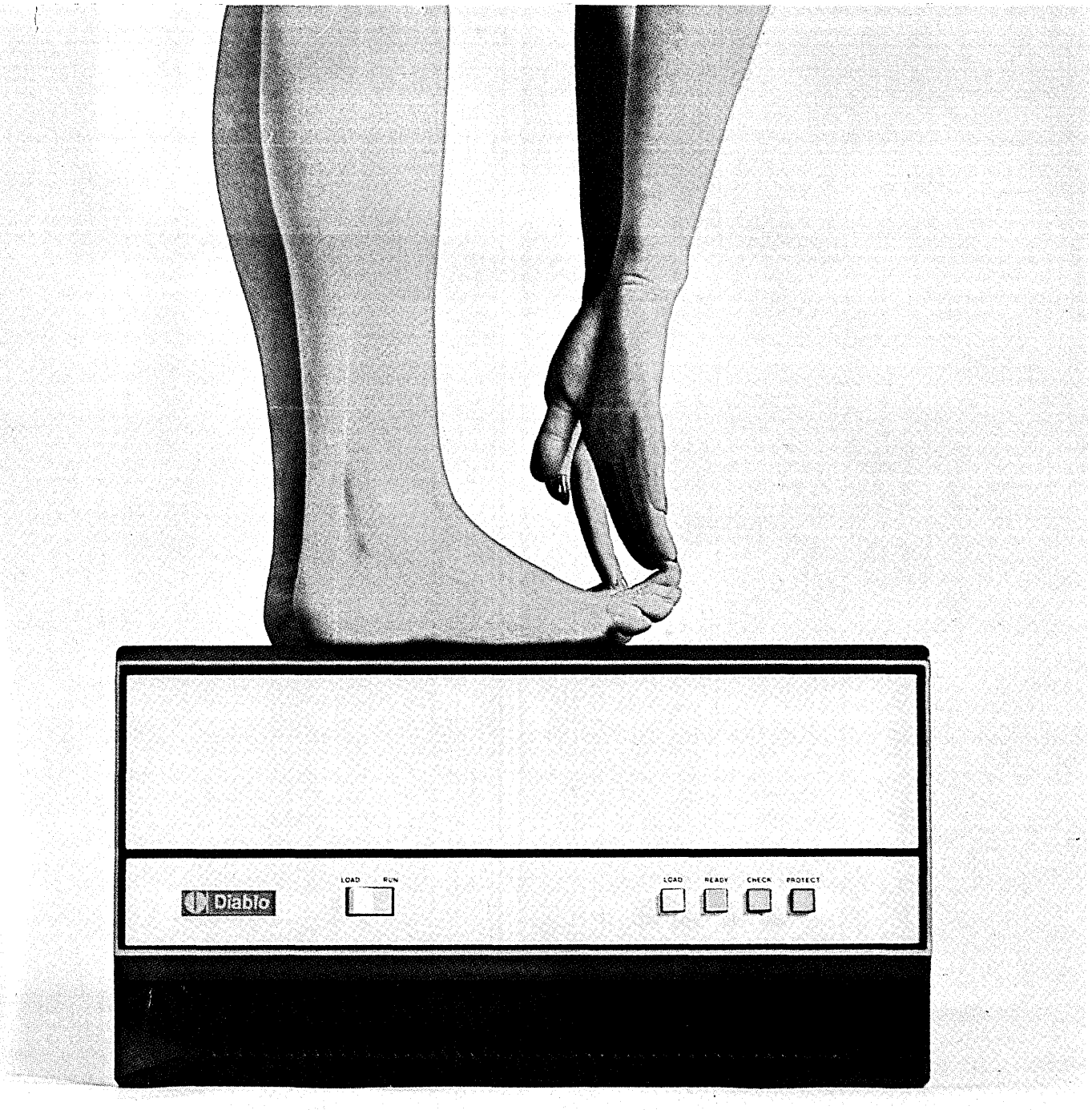

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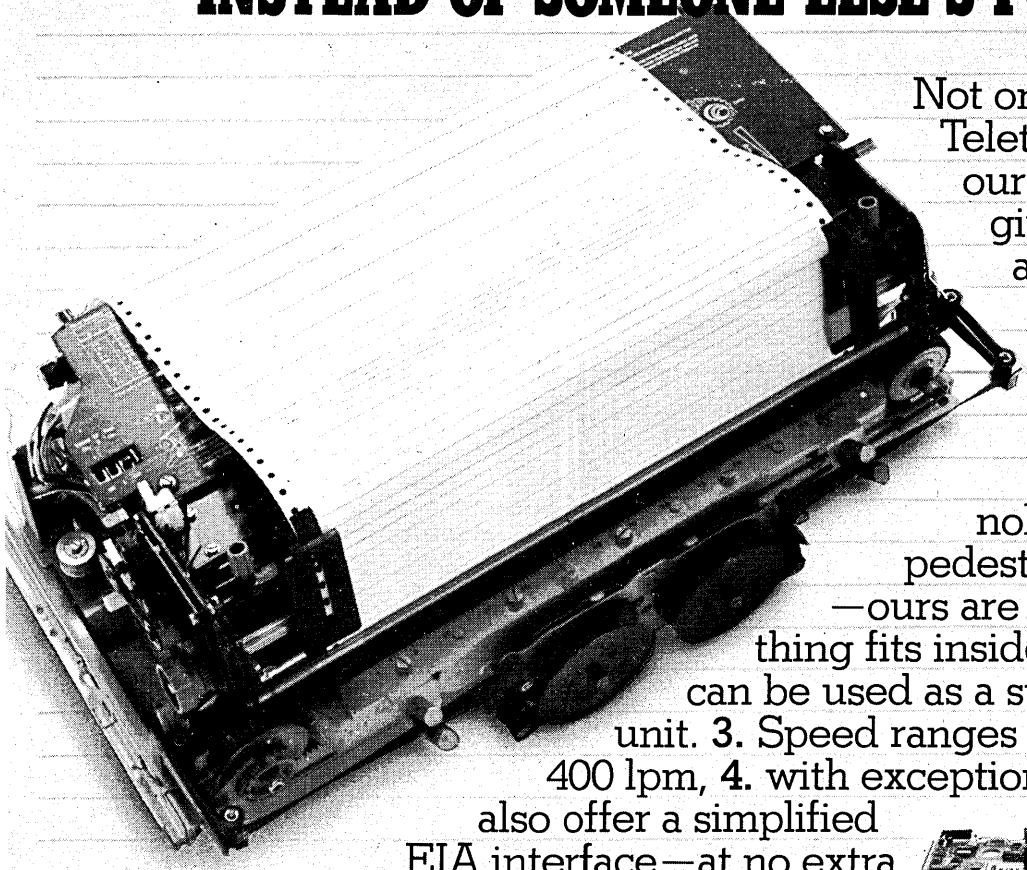
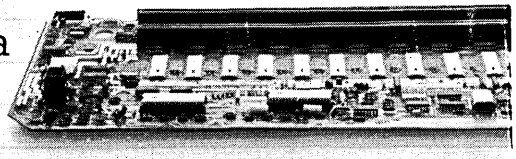
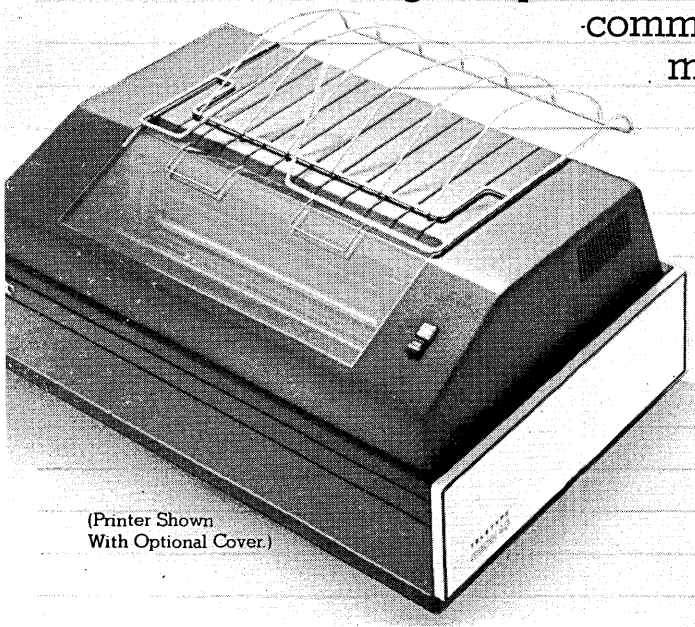


Not only do we at Teletype charge less for our printers, we also give you more quality and features for your money. **1.** Like a modular, compact design with **2.** state-of-the-art CMOS/LSI technology. Don't look for a pedestal full of electronics—ours are so advanced everything fits inside the printer so it can be used as a stand-alone table-top unit. **3.** Speed ranges from 200 to over 400 lpm, **4.** with exceptional reliability. **5.** We also offer a simplified EIA interface—at no extra cost. **6.** Field maintenance is simple, too. Service intervals are 2000 hours, and built-in diagnostics cut trouble-shooting time. **7.** There's nationwide service back-up, plus an exchange repair service on everything from printed circuit cards to major assemblies. **8.** Print quality from our fully-formed characters is sharp and crisp—from the original to the sixth copy. And we're now offering an optional block-style character font. **9.** Parts commonality between all three printer models is 80%, for fewer logistical problems. **10.** Last but not least, the model 40 printers are backed by a company people have depended on for nearly 70 years. Teletype.





(Printer Shown With Optional Cover.)

TELETYPE

THE TELETYPE® MODEL 40 OEM PRINTER. NOTHING EVEN COMES CLOSE.

CIRCLE 3 ON READER CARD