DATAMATION 80®
FEBRUARY/4.00 U.S.A.

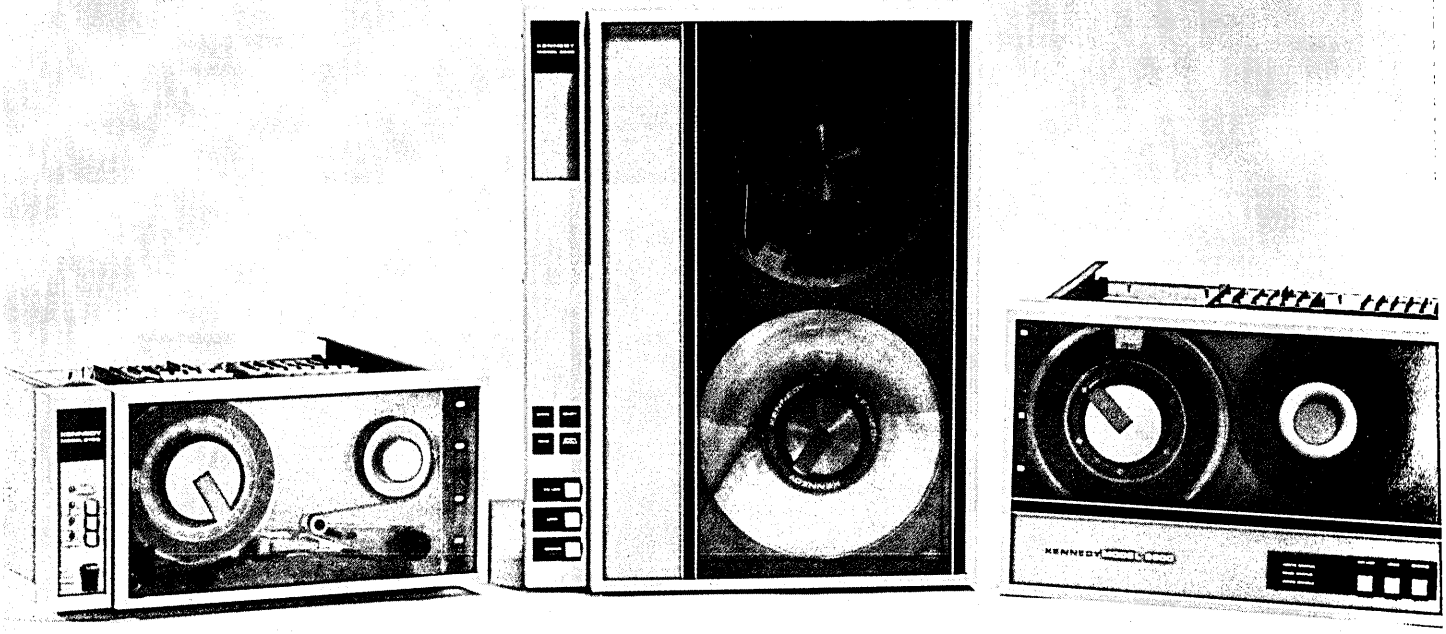
READY OR NOT: WP HITS THE OFFICE

NCC OFFICE AUTOMATION CONFERENCE PREVIEW

ALSO:
INTELLIGENT COPIER/PRINTERS, VIDEODISKS, DATA BASE MACHINES, FROEHLICH ON COMPUTER MUSIC

Carulli

Series 9000...
still the class act in digital tape transports.



Being the best in your business is neither [illegible] repetitive—it's challenging. Now that we have the most dependable and advanced tape transports in the world—what's left?

Delivering them. On time and on-line faster than anyone. That's what! They still have all the features.

- 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 [illegible] for 9-track, 800NRZI, [illegible] 1600 NRZI, PE
- 7 and 9 track NRZI and PE format control units to simplify customer electronics. Also, a variety of popular mini-computer mag tape controllers are available. Series 9000's performance is as impressive as its features, with data transfer rates to 72KHz, and tape speeds from 10 to 45 ips.

Being best is nice. So is being fast. Kennedy is both.

KENNEDY
Subsidiary Magnetics & Electronics Inc.
1600 Shamrock Ave., Monrovia, CA 91016
(213) 357-8831 TWX 910-585-3249

KENNEDY • QUALITY • COUNT ON IT

CIRCLE 1 ON READER CARD

Low-cost hard disk computers are here and field proven

11 megabytes of hard disk and 64 kilobytes of fast RAM in a Z80A computer for under $10K. Two floppy drives, too. Naturally, it's from Cromemco.

It's a reality. In Cromemco's new Model Z-2H you get all of the above and even more. With Cromemco you get it all.

In this new Model Z-2H you get not only a large-storage Winchester hard disk drive but also two floppy disk drives. In the hard disk drive you get unprecedented storage capacity at this price—11 megabytes unformatted.

You get speed—both in the 4 MHz Z80A microprocessor and in the fast 64K RAM which has a chip access time of only 150 nanoseconds. You get speed in the computer minimum instruction execution time of 1 microsecond. You get speed in the hard disk transfer rate of 5.6 megabits/sec.

EXPANDABILITY

You get expandability, too. The high-speed RAM can be expanded to 512 kilobytes if you wish.

And the computer has a full 12-slot card cage you can use for additional RAM and interface cards.

BROADEST SOFTWARE SUPPORT

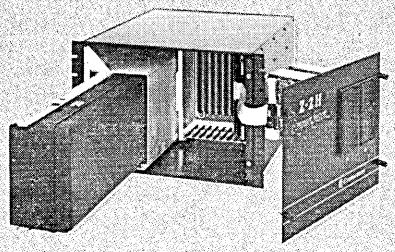
With the Z-2H you also get the broadest software support in the microcomputer field. Software Cromemco is known for. Software like this:

- **Extended BASIC**
- **FORTRAN IV**
- **RATFOR (RATional FORtran)**
- **COBOL**
- **Z80 Macro Assembler**
- **Word Processing System**
- **Data Base Management**

with more coming all the time.

SMALL, RUGGED, RELIABLE

With all its features the new Z-2H, including its hard disk drive, is still housed in just one compact cabinet.



Hard disk drive at lower left can be interchanged just by sliding out and disconnecting plug. Seven free card slots are available. Z-2H includes printer interface card.

Included in that cabinet, too, is Cromemco ruggedness and reliability. Cromemco is time-proved. Our equipment is a survey winner for reliability. Of course, there's Cromemco's all-metal cabinet. Rugged, solid. And, there's the heavy-duty power supply (30A @ 8V, 15A @ +18 V, and 15A @ −18V) for circuitry you'll sooner or later want to plug into those free card slots.

SEE IT NOW

Last summer we told you this new Z-2H would be a smash. And it is. So see it at your dealer's now. Have him put you in touch with a user—there are lots of them because Cromemco has been delivering for months. See for yourself how pleased our users are.

PRESENT CROMEMCO USERS

We've kept you in mind, too. Ask about the new Model HDD Disk Drive which can combine with your present Cromemco computer to give you up to 22 megabytes of disk storage.

CIRCLE 5 ON READER CARD

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DATAMATION®


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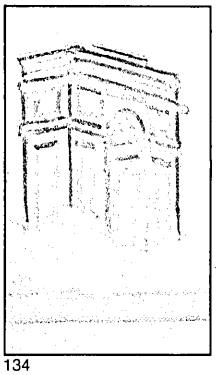
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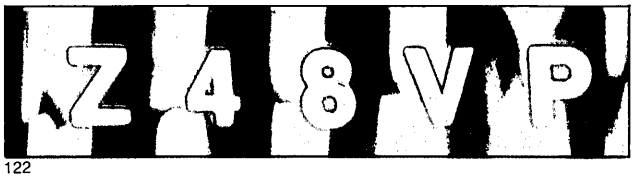

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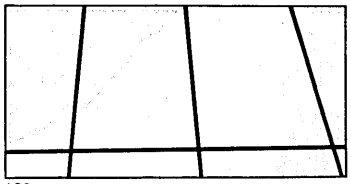
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FEATURES

NEWS IN PERSPECTIVE

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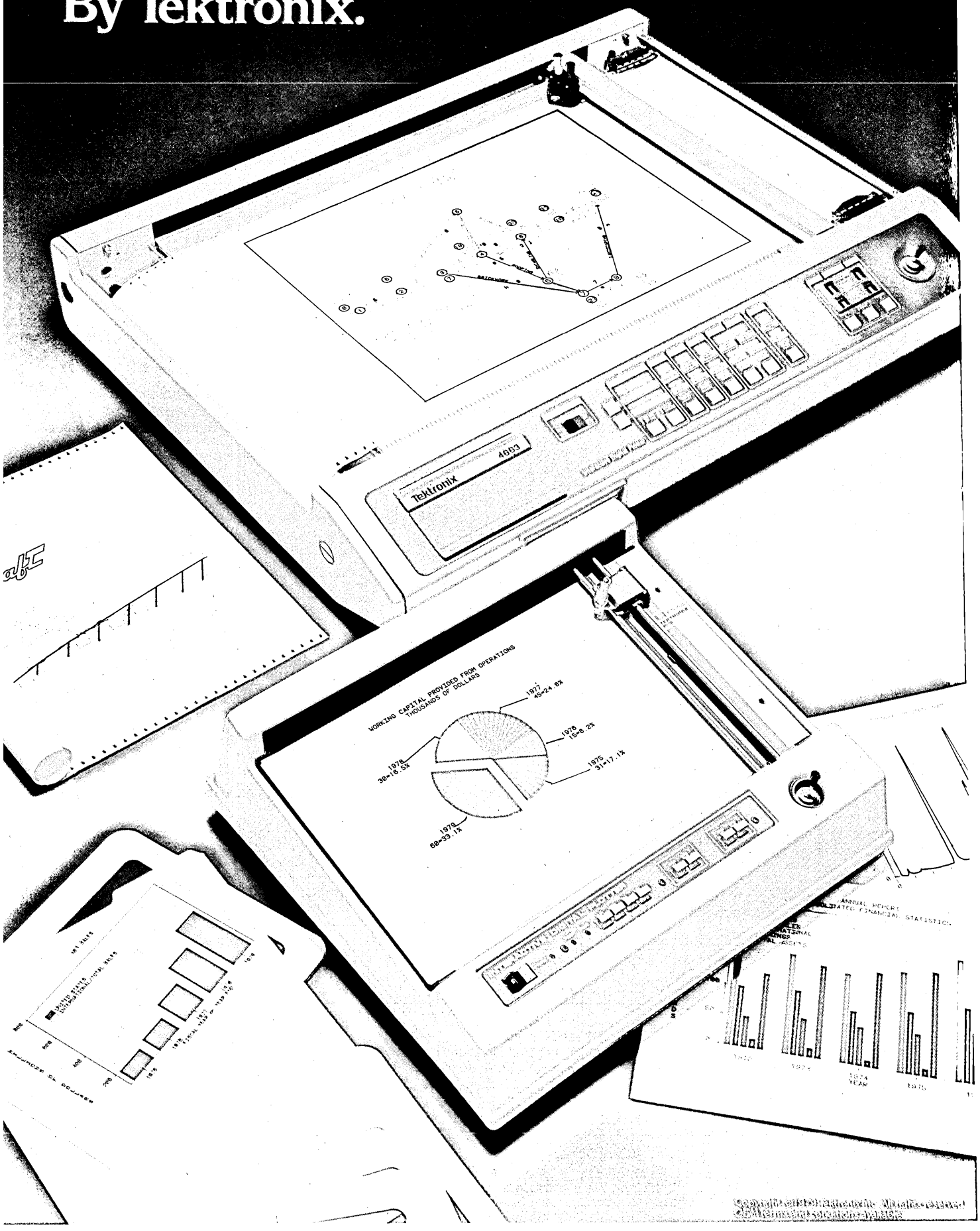
CIRCLE 7 ON READER CARD

From the graphics leader.

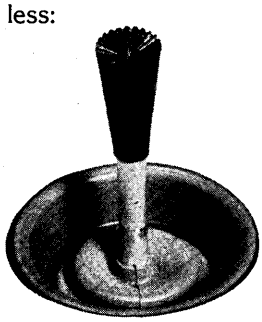
The Practical Plotters. By Tektronix.



Draw on the biggest choice of colors. But draw the line on price. That's practical!

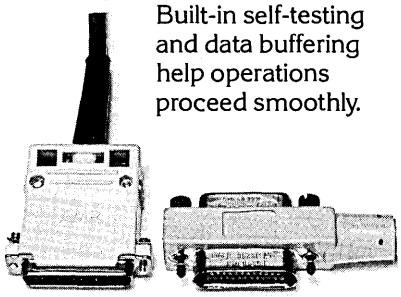
At Tektronix, we build plotters that keep your choices up and your costs down.

Practicality is why Tektronix pioneered the smart small plotter. It's why we keep your options open, with a bigger selection of ink colors, pen points and plotting media than on just about any other plotter around. Capabilities like those of our B-size (A3) 4662 prove that higher performance can actually cost less:

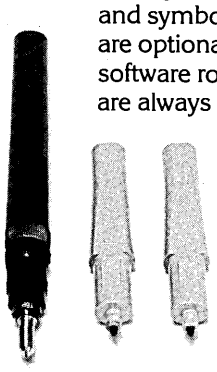


Interactivity. Plotter intelligence combined with digital technology helps you draw more realistic curve forms. Rotate and scale automatically. Digitize right from the 4662 with built-in joystick control.

Quality. In most applications, precision, repeatability and plotting speed are unsurpassed. Built-in self-testing and data buffering help operations proceed smoothly.



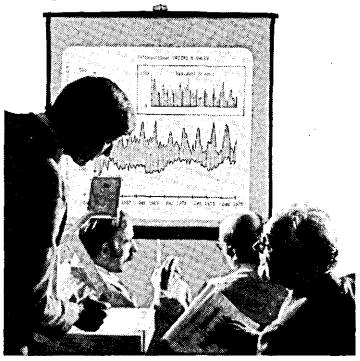
Compatibility. RS-232-C and GPIB (IEEE-488) interfaces are built-in. Foreign language and symbol fonts are optional. Easy software routines are always available.



Versatility. Select felt tip or wet ink pens. Plot on paper, film or Mylar® in up to nine colors. You can draw overhead projector presentations one minute, binder-sized reports the next.

Economy. It's not just initial cost that makes our 4662 so affordable. Simple, digital design leaves less to go wrong, makes plotting a cinch for anyone to learn.

Why pay more for a plotter that's more trouble than it's worth? Insist on capabilities that earn their keep: Call your local Tektronix representative for samples of our Practical Plotters at work. Or call our toll-free automatic answering service at 1-800-547-1512. In Oregon, call 644-9051 collect.



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Information Display Division
P.O. Box 500
Beaverton, OR 97077
Tektronix International, Inc.
European Marketing Centre
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The Netherlands

The practical plotters

Tektronix®
COMMITTED TO EXCELLENCE

TWENTY YEARS AGO/TEN YEARS AGO

LOOKING BACK

JANUARY/FEBRUARY 1960

Some things never change. A letter sent to Robert M. Bennett Jr. (IBM, San Jose, Calif.) appeared in the January/February 1960 issue of DATAMATION, and concerned the upgrading of computer conferences. Bennett was to act as general chairman on the next WJCC, and the letter, from four RAND employees (E.A. Feigenbaum, I.D. Greenwald, F.J. Gruenberger, and E.H. Jacobs) was full of suggestions to improve the quality of future conferences.

The primary objective of a conference was, and is, to give participants an opportunity to meet and talk with colleagues. The four RAND men thought more planned luncheons, post-conference hours social gatherings, or meeting places in the conference area set aside for small, impromptu groups to assemble would promote this objective.

Another situation in need of remedy was parallel sessions. The suggested solutions were simple: "There should be no more than two sessions in parallel at any one time, and then not all the time; and the total number of papers should be drastically reduced." And speaking of papers, opinion was that the program committee needed to take a firmer stand on requirements. Papers unsuited to be given orally (too technical, or too dull to keep the listeners' interest) should be refused. Nor should anyone be allowed to read a paper; anything that could be read to a group could just as easily be a handout. State-of-the-art papers (including product announcements) could be useful, but stricter requirements were necessary to avoid dullness. And papers that were simply a pat on the back for a company or person should never be permitted.

Also discussed was timing of sessions. "Session chairmen, we have found, like to be good Joes and let a speaker wander a few minutes over his time period." This was decent to the speaker, but quite rude to the next person scheduled. Nor did attendees wish to sit through a four-hour talk when they were promised a one-hour session.

Another problem touched on was registration procedure. "Registration at some recent conventions has been pretty miserable. It is ridiculous to have to sweat out a long line, then get your card to fill out, then find that the little girl has never before met the problem of making change, and then go to another line to have an identification tag typed—the point need not be labored further. A very small amount of advance planning would pay off handsomely here."

FEBRUARY 1970

Shortly before publication of this issue, an edp salary survey was conducted by The Merchants and Manufacturers Association in Los Angeles. The survey compiled information from 171 firms in the southern California area (total employment reported on was 422,569, with 7,100 in dp job classifications). A few of the participating companies were Burroughs, Lockheed Electronics, and Getty Oil. Worth noting were the salary disparities among the various companies for identical job categories.

Programmer trainee salaries ranged from $390 to $1,020 monthly, with a $700 median. People in this category rarely stayed there beyond 18 months. The intermediates earned between $580 and $1,235, and the median was $850 a month. Salaries for senior programmers ranged from $675 to $1,665, with a median of $1,025. According to the survey, a senior programmer was not considered to be in a supervisory position, nor was he classified as a permanent project leader. However, when he did move up to the supervisory spot, the salary median was $1,235 and could range from $900 to $1,920 monthly.

Median salaries for computer operators were as follows: $540 for trainees, $610 for intermediates, and $700 for seniors. Their supervisors ranged in salary from a very low $530 to $1,450, with $895 as the median. Perhaps the most striking salary range listed was for dp manager. The median was $1,460, and the category included both business and scientific application positions. The high salary in this category was a monthly $2,665, with a low of $680. ✲

NEC Spinwriters. Superterminals.

Six feature-laden models to fit any teleprinter network.

NEC Spinwriter™ terminals are fine-quality communications devices that are enriching thousands of terminal networks.

Users call them "super" terminals because Spinwriter devices are versatile, user-configurable, quiet, dependable, and print at rates up to 55 CPS.

They come in six models, including an APL/ASCII model. They have numerous operator convenience features. They are available in both RO and KSR configurations. And they offer a wide variety of forms handling options.

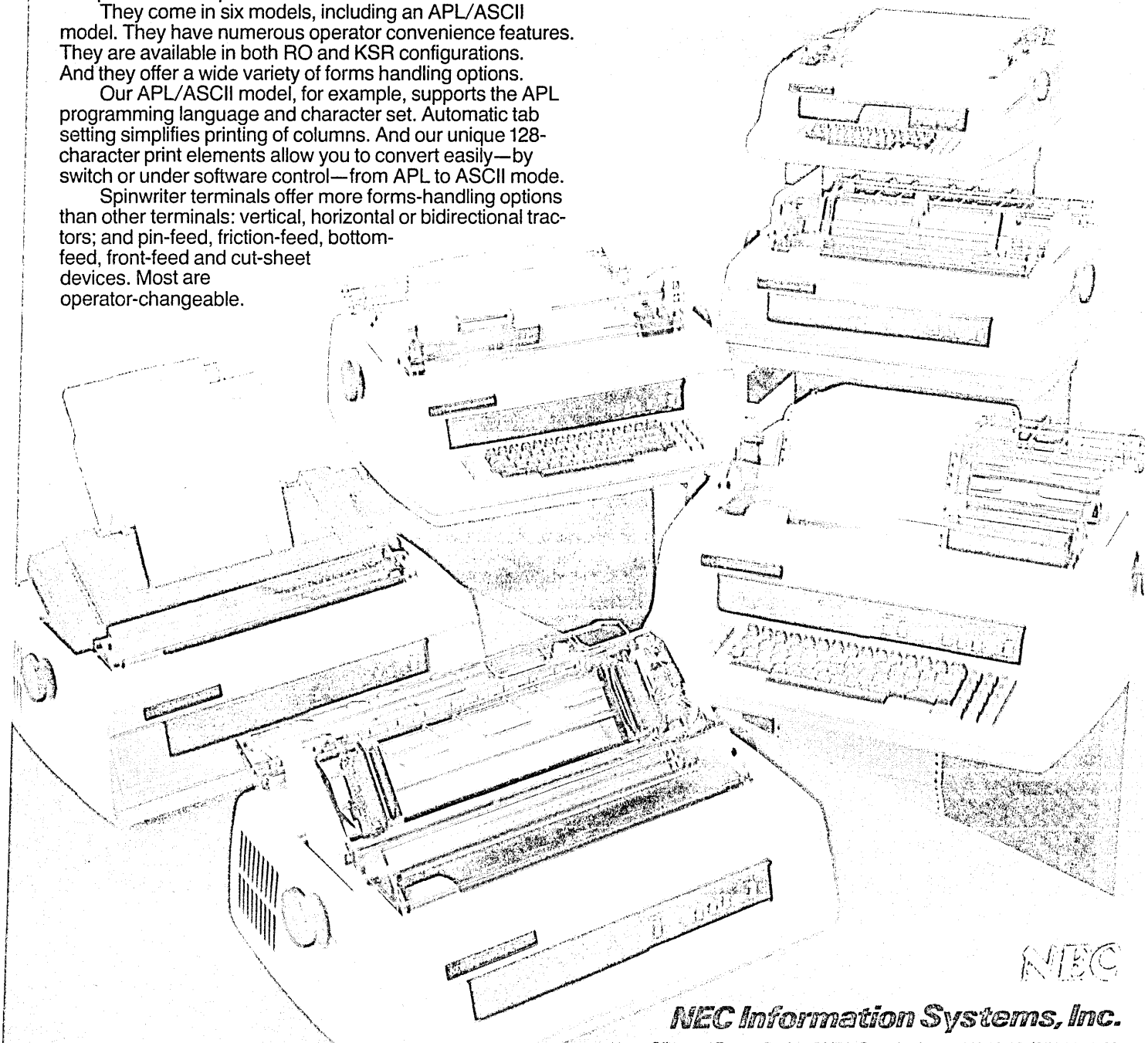
Our APL/ASCII model, for example, supports the APL programming language and character set. Automatic tab setting simplifies printing of columns. And our unique 128-character print elements allow you to convert easily—by switch or under software control—from APL to ASCII mode.

Spinwriter terminals offer more forms-handling options than other terminals: vertical, horizontal or bidirectional tractors; and pin-feed, friction-feed, bottom-feed, front-feed and cut-sheet devices. Most are operator-changeable.

NEC Spinwriter terminals are the most rugged, and the quietest, typewriter-quality terminals you can buy. Our 2000-hour MTBF assures maximum uptime. Our 60 dbA sound level lets you put them in an office.

For more information about NEC terminals, call our nearest sales office.

NEC. Going after the perfect printer.



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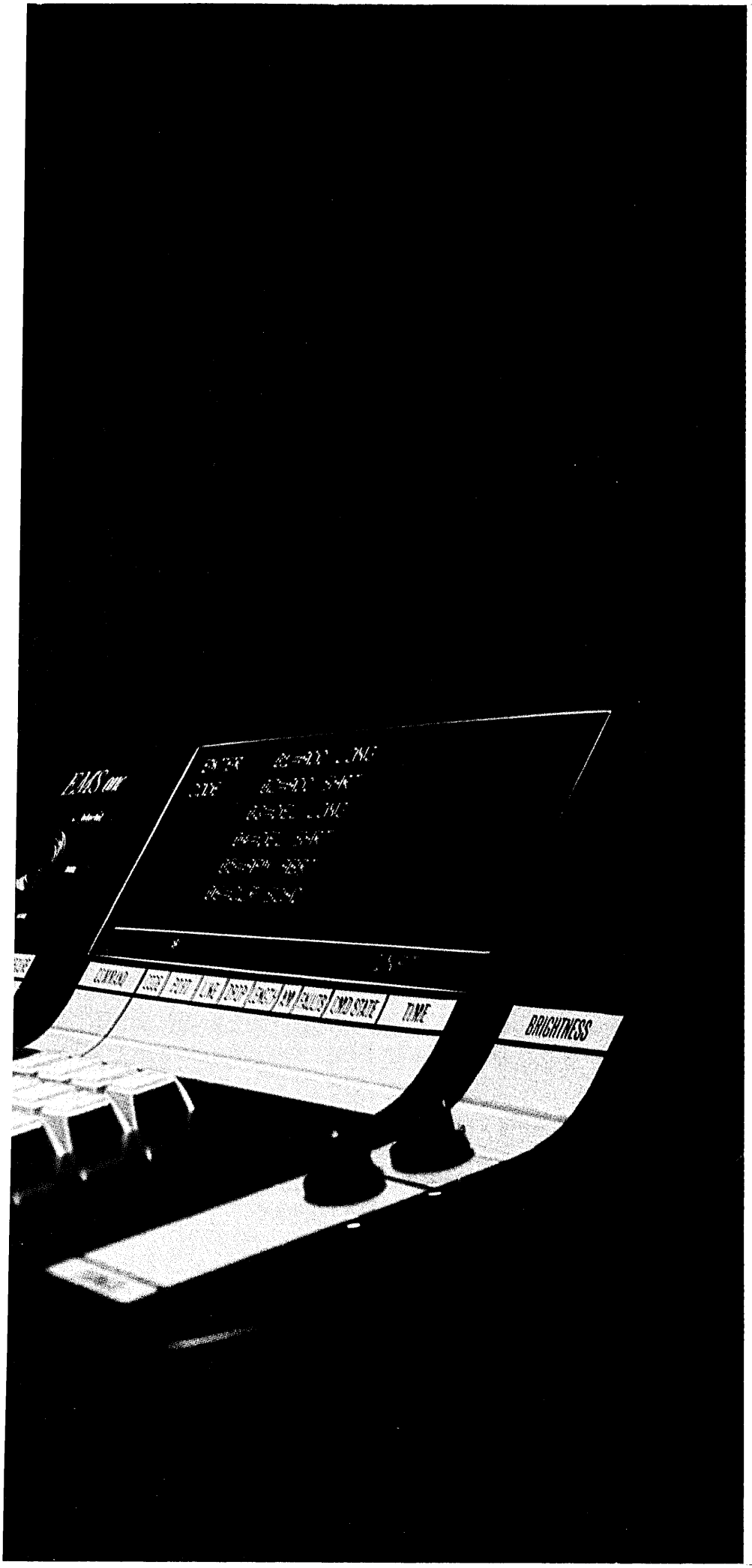
CIRCLE 10 ON READER CARD

INTERTEL NETWORK CONTROL... FOR A GOOD NIGHT'S SLEEP



It's 3:46 A.M. You're sleeping soundly because you know your day will begin smoothly. Before you left for home yesterday, you knew your Intertel EMS-One Network Control System would test throughout the night for network faults.

You're feeling confident because EMS-One is working unattended all night to give you a total status picture of your network in the morning. Only EMS-One has this automatic preventive maintenance (APM) function. It's looking at every line, modem, and interface... doing the work of a whole fleet of technicians at remote sites. A testing feat that sets EMS-One apart from any other network control system. In fact, at this very moment, APM is running tests and recording the results of these tests at the central site. All automatically. All accurately.

So when you go to work later on today, you'll have a complete printed listing of test results, giving you a clear, up-to-date picture of your network. You can then resolve or bypass problems quickly and effectively. With plenty of time left for other business activities and a second cup of coffee.

If downtime is keeping you up, look into Intertel EMS-One Network Control with APM. For a good night's sleep.

Zzzzzzzzzzzzz.

Write or call for our brochure. Intertel, Inc., 6 Vine Brook Park, Burlington, Massachusetts 01803. 617-273-0950.

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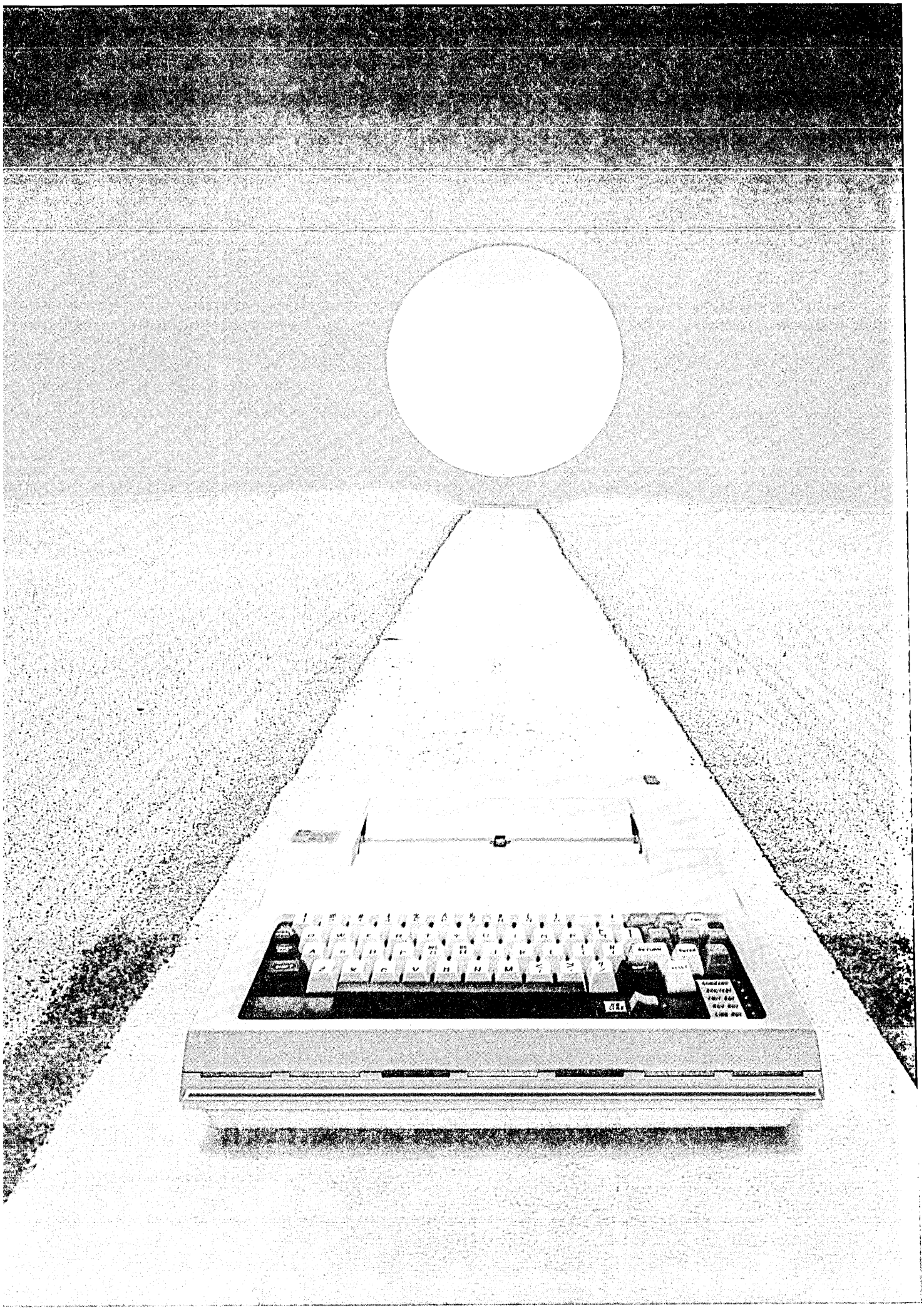
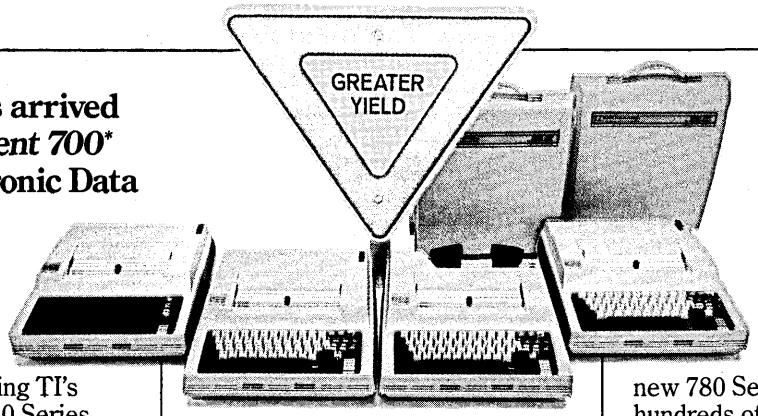
CIRCLE 11 ON READER CARD



The Sign of the 80's.



Greater yield has arrived with TI's new *Silent 700 780 Series Electronic Data Terminal Family.**

Clear the road for the most innovative thermal printing data terminals available on the market today. Introducing TI's new state-of-the-art 780 Series of 120 characters-per-second data terminals.

Every model in the four-member family features TI's innovative dual-matrix thermal printhead providing virtually silent 120-cps optimized bi-directional printing, that cuts down on print cycle time and yields four times the printing speed of conventional thermal printing data terminals.

Industries with high output printing demands will find the Model 781 Receive-Only Printer a reliable business partner. The 781 RO features an operator control keypad for referencing the terminal's operating status, a 1000-character receive buffer and 110 to 9600 bits-per-second communications speed.

Commercial applications can get top-quality performance from the desktop Model 783 Keyboard Send-Receive Data Terminal with features like a full ASCII keyboard, self-test diagnostics and programmable answerback memory.

The lightweight 17-pound Model 785 Portable Data Terminal is an ideal traveling companion for remote data access and entry applications. With a built-in 1200-bps acoustic coupler, the 785 can transmit and receive data from anywhere using a standard telephone and electrical outlet.

The Model 787 Portable Communications Data Terminal is designed to improve your communications capabilities. The 787's 1200-bps direct-connect internal modem allows users to plug directly into a standard data jack. With its memory dialing feature, the 787 can dial a stored number and provide audible feedback of the phone line's status. The 787 can also disconnect the phone line with a simple hang-up command, so you can optimize on-line communications and minimize communications costs.

Available user-oriented 780 Series options like international keyboards and protected answerback memory add even more versatility to your business communications.

TI is dedicated to producing quality, innovative products like our new 780 Series Family. And TI's hundreds of thousands of data terminals shipped worldwide are backed by the technology and reliability that comes from over 30 years of experience in the electronics industry.

Supporting TI's data terminals is the technical expertise of our worldwide organization of factory-trained sales and service representatives, and TI-CARE†, our nationwide automated service dispatching and field service management information system. That's why TI has been appointed the official computer and calculator company of the 1980 Olympic Winter Games.

XIII OLYMPIC WINTER GAMES LAKE PLACID 1980

The *80's* can be yours today. For more information on the 780 Series Family, contact the TI sales office nearest you, or write Texas Instruments Incorporated, P. O. Box 1444, M/S 7784, Houston, Texas 77001, or phone (713) 937-2016.

Fifty Years of Innovation

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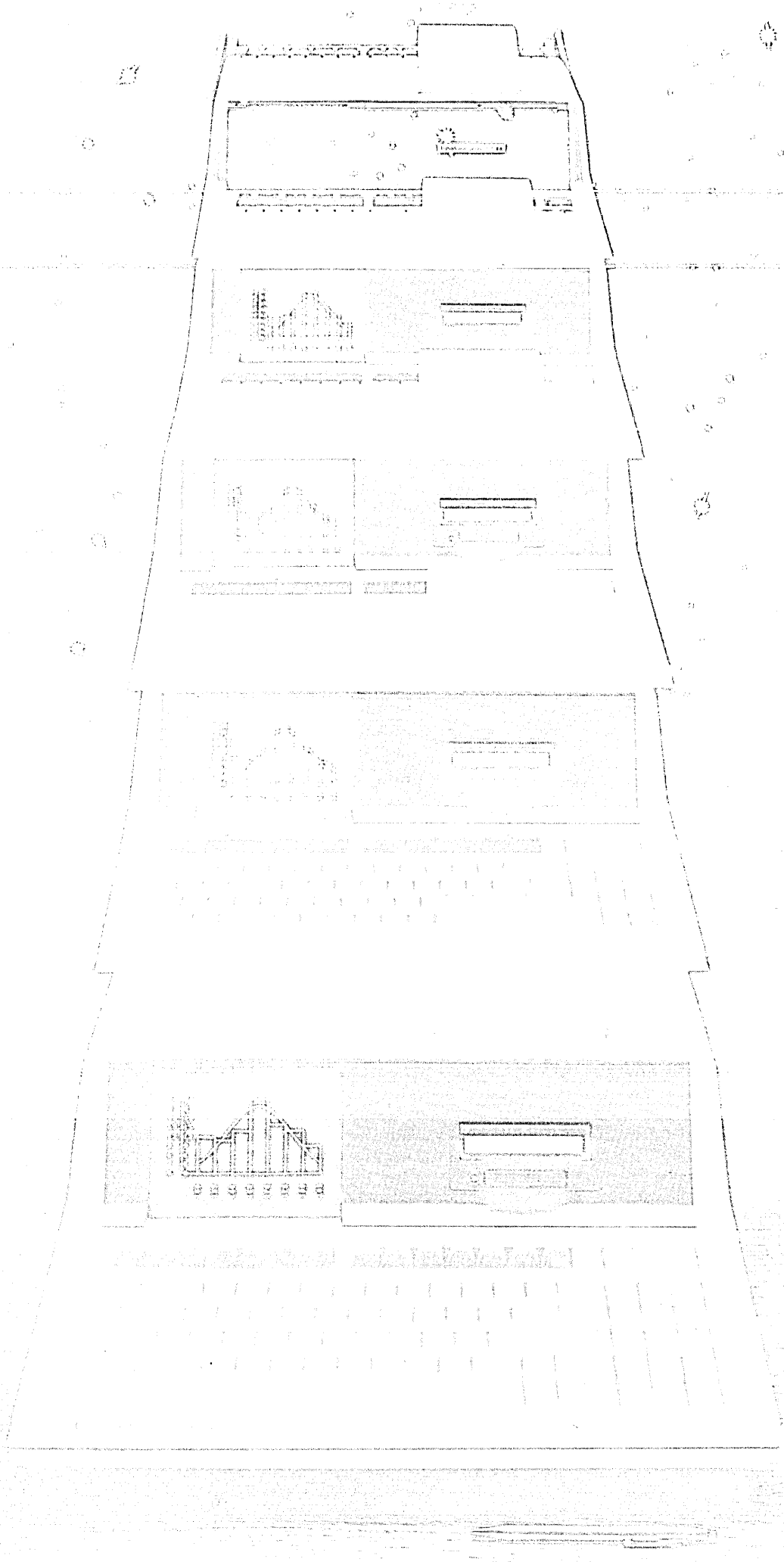
We put computing within everyone's reach.

CIRCLE 12 ON READER CARD



INTRODUCING HP-85.

A NEW WORLD OF PERSONAL-PROFESSIONAL COMPUTATION.

Imagine the new world that would unfold before you if you had a powerful, portable, completely integrated computer system at your personal disposal. And at an affordable price. That's exactly what Hewlett-Packard has just created.

THE HP-85: A PERSONAL COMPUTER FOR PROFESSIONALS.

At the lab, on your desk or in your study this 20-pound, self-contained system provides professional computing power when and where you need it. That means no more waiting for data to be remotely processed and returned.

A COMPLETE COMPUTER SYSTEM IN ONE SMALL PACKAGE.

You get all this in the HP-85:

Interactive graphics under keyboard control.

16K RAM Memory standard.

Standard typewriter keyboard with separate numeric key pad and eight user-definable special function keys.

High resolution CRT display with powerful editing capability.

Built-in thermal printer produces a hard copy of the display on command.

Built-in tape cartridge drive. Each cartridge provides 217K bytes of storage capacity.

Operating system and BASIC language, permanently stored in ROM.

A SOPHISTICATED COMPUTER AT YOUR FINGERTIPS.

Hewlett-Packard has combined these sophisticated capabilities with advanced design to give you a system that is easy to use yet uncompromised in its power.

A key to this achievement is Hewlett-Packard's choice of BASIC for the HP-85's language. BASIC is easy to learn and lets you solve complex problems in an English-like, conversational style.

Sixteen graphic commands have been added to the HP-85's extended BASIC to give you easy control of its amazingly versatile graphic capabilities. You can draw graphs, label axes, set the scale of the X and Y axes independently, plot data and control the graphics display either from the keyboard or in programs.

Other advanced capabilities include software security, flexible string commands, an internal clock, programmable beeps—more than 150 commands and statements to give you the power you need to solve your problems swiftly and easily.

DESIGNED FOR TODAY AND TOMORROW.

Whether you're in science, engineering, industry or business, the HP-85 you need today can easily be expanded or customized to meet your needs tomorrow.

You can double RAM capacity to 32K or expand ROM firmware to 80K with optional modules that plug right into the HP-85.

It's easy to enhance the system's capability by adding powerful HP peripherals like a high-speed, full-width line printer, full-size plotter, or flexible disc drives.

You can also streamline your problem solving with HP Application Pacs which offer preprogrammed solutions in a wide variety of disciplines on prerecorded magnetic tape cartridges.

The HP-85's versatility, expandability and sophisticated simplicity all grew out of Hewlett-Packard's underlying principle of excellence by design. Excellence by design means rigorous quality control and testing as well as a worldwide maintenance support network.

When you buy the HP-85, you're not just buying a computer system, you're buying the confidence that the Hewlett-Packard name brings and the knowledge that the HP-85 can expand with your changing needs.

For the address of your nearest HP dealer, CALL TOLL-FREE 800-648-4711 except from Alaska or Hawaii. In Nevada, 800-992-5710. For details on the HP-85, send the attached coupon, or write: Hewlett-Packard, 1000 N.E. Circle Blvd., Corvallis, OR 97330, Dept. **275A**

HEWLETT PACKARD

619/20

HEWLETT-PACKARD
Dept. **275A**
1000 N.E. Circle Blvd.
Corvallis, OR 97330

Please send details on HP-85.

NAME_____

TITLE_____

COMPANY_____

ADDRESS_____

CITY_____

STATE_____ ZIP_____

CIRCLE 93 ON READER CARD

The AMtext 100 gives you the best of both processing worlds.

The AMtext 100 system makes it easy to do word processing and data processing. Simultaneously.

In fact, in a recent survey conducted by Datapro, the AMtext 100 was rated the number one shared resource system—for the second year in a row.

The best of word processing.

Our unique Type-Rite software package makes any word processing job easy. You can use it to type and edit text, create forms and move columns at the push of a button. And the AMtext 100 can handle up to four systems disks. So you can store up to 320 million characters.

You also have a choice of high-quality character and line printers, ranging in speed from 55 characters per second to 600 lines per minute.

The best of data processing.

We make data processing easy, too. Our Account-Rite package can handle general ledger, accounts payable and receivable, and payroll.

And it produces management reports to your exact specifications. All records are kept confidential, because you set up your own special access codes.

Most important, you can do word and data processing simultaneously, because the AMtext 100 is a true shared resource system. Many different applications can be processed simultaneously from multiple independent work stations.

A system you can depend on.

AMtext systems are easy to learn and easy to operate. We provide thorough operator training.

And they're backed by locally-based support and service.

For more information, write to: AM Jacquard Systems, 1639 11th Street, Santa Monica, CA 90404. Or call toll-free (800) 631-8134, except in Alaska and Hawaii. From New Jersey, call (201) 887-8000, extension 777.

This ad was entirely composed on the Comp/Set system.

Comp/Set, Jacquard and Jacquard Systems are registered trademarks, and Account-Rite, AMtext, The Informationists and Type-Rite are trademarks of AM International, Inc. ©1979 AM International, Inc.

AM **Jacquard Systems**
the Informationists.

CIRCLE 14 ON READER CARD

A few lines on increasing the productivity of your computer.

You'd find it hard to be productive, too, if you were right in the middle of manipulating important data, and you suddenly received a request for information you hadn't thought about for nanoseconds.

Yet, your very expensive, highly advanced CPU has to put up with interruptions like that all day long.

If your company had a Kodak IMT-150 microimage terminal, however, your computer could spend much more of its valuable time manipulating data. And a lot less time searching for it.

That's because the IMT-150 terminal has its own intelligence—a built-in microprocessor that enables it to perform on-line lookups in seconds. At the touch of a button. Without tying up your mainframe.

The IMT-150 terminal helps your people be more productive, too. They can find needed data quicker and easier, resulting in more lookups per hour/day.

And because source information stored in superdense microimages can be linked to complementary indexes in your on-line data base, you can reduce the cost of keeping non-dynamic information in a dynamic state.

The choice, then, is a simple one.

You can increase the productivity of your computer by buying *more* expensive and sophisticated data-storage equipment, in order to handle growing information demands.

Or you can buy a Kodak IMT-150 microimage terminal.

1880 Kodak *1980*

Eastman Kodak Company
Business Systems Markets Division
Dept. DP0513 Rochester, NY 14650

☐ Please send me more information about the Kodak IMT-150 microimage terminal.

☐ Please have a Kodak representative contact me.

Name

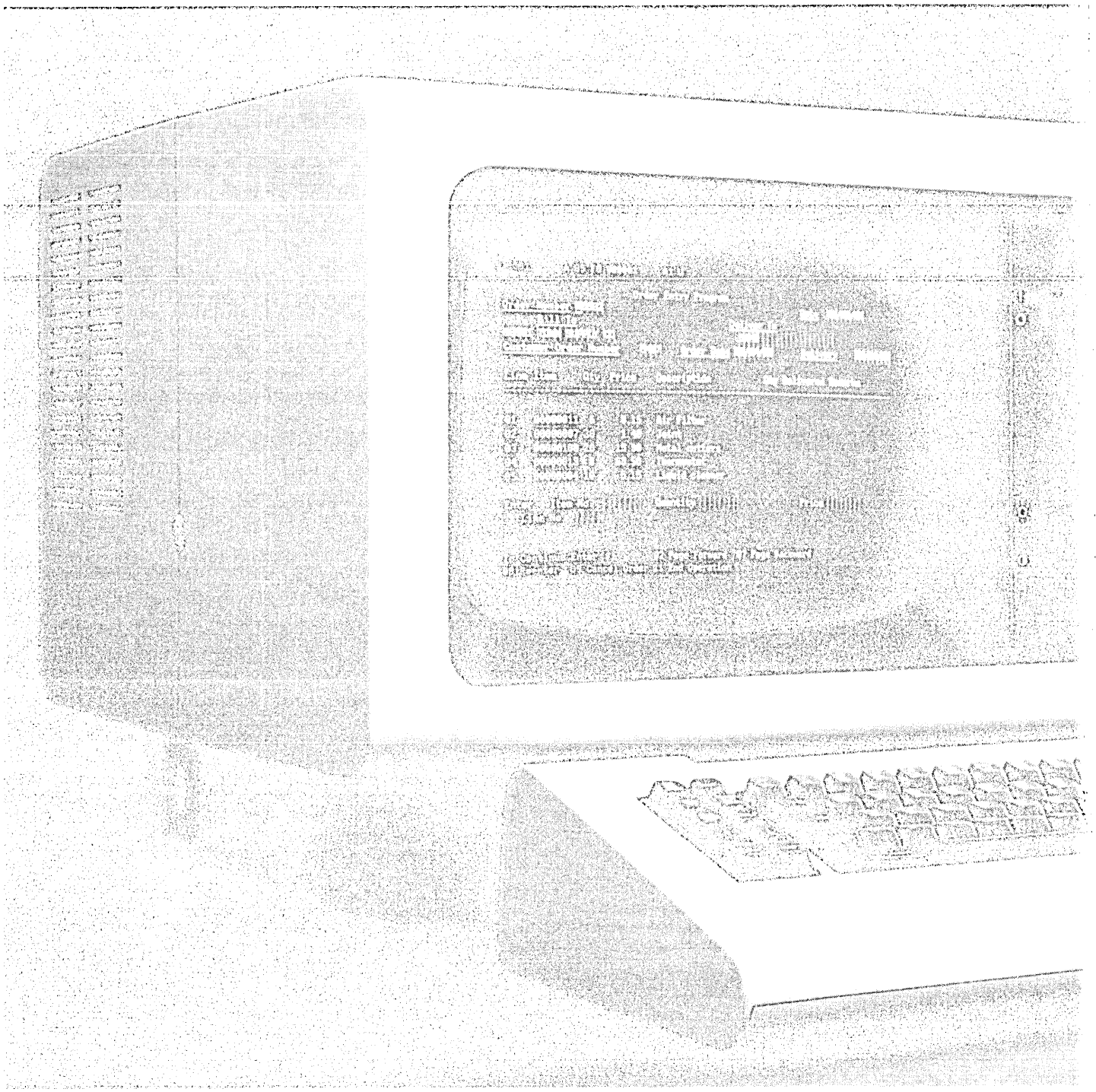
Title

Company

Address

City

State Zip



IBM introduces the 5280 Distributed Data System, the intelligent alternative, a family of products that offers intelligent terminal, remote batch terminal and data entry capabilities. The 5280 includes seven hardware components and six software support packages in a low-cost, easy-to-use system that can be tailored to your specific requirements.

One system, multiple options

You can install single station/one printer systems in some locations and multi station/multi-printer systems in others. All using the same programs. You can choose display sizes up to 1920 characters, two different printers, offering a range of speeds from 40 cps to 560 lines per minute, upper and lower case at rated speeds, condensed printing for printing on smaller forms or with up to 198 characters per line.

Data, stored on 1.2 megabyte diskettes, is available for inquiry and update. The total capacity of 9.6 megabytes addresses a wide range of remote file requirements. And with 5280 communications capabilities, the information stored on host files is also available remotely.

And, if you are moving from bisync to SDLC, there's no need to change communications adapters. A simple change of programs is all that's required. At the same time, the 5280's compatibility as a network element with other IBM systems enhances their value as well.

Software options

The 5280 offers two high-level languages: COBOL, a subset of 1974 ANSI, and DE/RPG (Data Entry with RPG subroutines) which provides advanced data entry functions with an RPG II subset for calculations. Program support packages for MRJE, SRJE and utilities for most functions are also available.

In addition, the multi-programming capabilities of the system extend right down to single data stations. For example, in order entry applications, the 5280 can be

The BTI 5000/ES. Single system prices start at just $29,950 for 10 megabytes hard disk, 4 ports. BTI Systems are delivering the best price/performance at over 2,000 installations. And the BTI 5000/ES will deliver the best for you, too. Just send us the coupon, we'll show you how.

BTI COMPUTER SYSTEMS

Tell me all about the BTI 5000/ES

Name _____

Title _____

Company _____

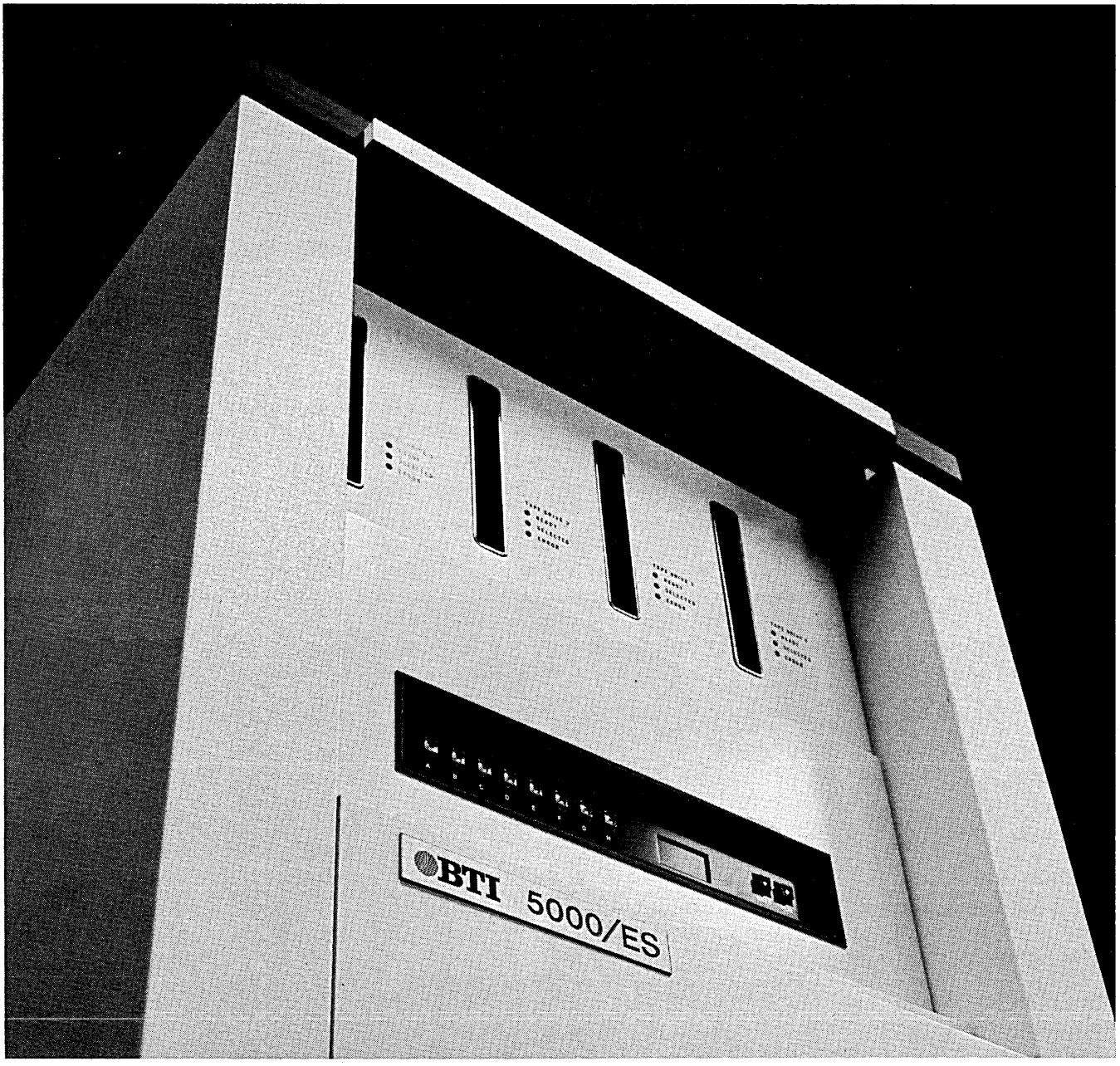
Address _____

City _____ State _____ Zip _____

Phone _____ D

870 W. Maude Ave., Sunnyvale, CA 94086

If you want to support 4 to 32 interactive users simultaneously with the best possible performance at the lowest possible cost, this is the computer that makes it possible:



CIRCLE 17 ON READER CARD

LOOK AHEAD

WATCH FOR E SERIES EXPANSION

Two IBM 4300 announcements anticipated in the next month or two include one above the 4341 that will wipe out the 3031. It'll be about twice the speed for half the price of the 3031, says Computer Financial Inc. The New Jersey firm also looks for a late second-quarter 1980 announcement of a swing machine with about twice the speed of a 3033.

A source at Advanced Computer Techniques Corp., New York, says the machine that will "obsolete" the 3031 will be dubbed the 4351 and will appear in April. He says the 4351 will offer speeds up to 1.4 MIPS (millions of instructions per second), a big boost over the 3031's 1 to 1.2 MIPS rating. He claims the 4351 cpu will cost $400,000

WAITING FOR DEC

Digital's "baby VAX," the expected VAX 580 "Comet" system, may offer 80% of the power of the VAX 780 at 50% of the price. Analysts expect the announcement soon, with another DEC product on its heels: a dual 1170 to push back Tandem Computers' challenge in DEC's prized Bell System market.

WAITING FOR DG

Users awaiting Data General's 32-bit "Eagle" system have heard of yet another delay, but expect the product announcement by March, with full software late this year.

MICROCODE TOUCHÉ

IPL Systems, the Waltham, Mass., PCM manufacturer, expects to have fully replicated IBM 4300 microcode functions on one of its own Omega machines within a month. IPL had previously confounded doomsayers when it implemented microcode-equivalent to IBM's VM-Assist, and ACPS for VM and VS/1. With the 4300 announcement of ACPS for DOS/VSE, the PCM men began Omega implementation as soon as they could get the 4300 principles of operation. IPL, now represented in Europe by Olivetti, claims to have "completely shadowed" the Grey Giant's inscrutable firmware technology.

IBM READIES SUPPORT FOR X.21

IBM has given its support to a relatively new network standard proposal, called CCITT Recommendation X.21, and is prepared to implement it on some systems as early as next April. CCITT X.21 (proposed by the Consultative Committee on International Telephone and Telegraph) is a Level 1 physical interface standard that specifies the basic electronic and circuit level connections, as does the EIA RS 232C standard. But it calls for vastly simpler designs; for example, connections with 15 pins instead of 25 pins. A spokesman for Tran Telecommunications Corp. of Los Angeles, which will also support the new standard, said it could shave the cost of interfaces by as much as two-thirds.

IBM is expected to support a non-switched version of the interface on its 3276 and 3770 terminals by April, and in May will adapt it to its 3600 and 3274 terminals. In June, X.21 would be supported on IBM's 3705 front-end communications processors and on its 8100 distributed processing system.

LOOK AHEAD

Switched network interfaces would be supported early in 1981.

To accomplish this, IBM is understood to have developed an X.21 module that could be implanted in any of the company's terminals -- all the way to word processing machines. The module would convert the systems from RS 232 to X.21 standards, depending on the market for X.21 versions.

IBM WILLING TO COMPROMISE?

A high ranking officer of IBM recently told one of our sources that while IBM would never voluntarily agree to being split into a number of separate companies, the corporation might be willing to discuss the concept of separate, arms-length subsidiaries. When asked if that approach had been discussed with Justice trustbusters, the IBM exec replied that the government has probably never thought of that idea. A Justice Department source responded that the government would consider nothing short of divestiture.

ASCII/TELETYPE CRT DUE OUT OF TELEX

Telex Computer Products, a major supplier of IBM 3270 plug-compatible terminals, has targeted the "glass Teletypes" with another plug-compatible peripheral (PCP) product. Telex will soon announce an ASCII/Teletype-compatible crt, the Telex 310 with a 15-inch display. It offers many of the features of the Telex 278, its PCP 3278 replacement. The 310 is priced at $1,250 for a single unit; $900 in quantities of 100 or more units.

TELEFILE TOUTS T-85 AT MARTIN-MARIETTA

Telefile Computer Products, which was one year late in actually introducing its Sigma 9-like computer, the T-85 (August 1979, p. 61), is on target with its benchmarks if an agreement being negotiated in late January actually comes to pass. The system was up and running CP-V (a highly touted Xerox Computer Systems operating system) early this year and would, if the agreement is consummated, be doing the same in mid-March at Martin-Marietta in Denver.

360'S BEING SOLD FOR SCRAP

A California dealer in used computers last month had a half-megabyte 360/50 with three channels in his inventory that he was willing to sell at wholesale for $6,000. That means it would retail at less than $10,000. Prices of used 370/138s and 148s are lower than they were four or five months ago, now that deliveries of the 4300s have started. But as for the 360s, "some of 'em are being given away."

Last September the dealer sold a 360/30 at $100 for scrap. Mod 40s are available for $4,000 to $5,000, and 65s are going wholesale for less than $20,000. The problem, of course, is maintenance and the real estate taken up by these older machines. Prices of some used disk drives are above their levels of last November, we hear, with the 3350 remaining "firm and high."

Last August a 155 with a DAT box sold for just over $200,000; you can probably get one today for about $50,000. A 155 without the DAT is worthless, we hear. The 168 has hit on hard times. It was selling in December 1978 for 60% of list, fell to 30% of list the following month, and today is down to about 25% of list. A 158 now fetches $400,000 to

(Continued on page 65)

A Major Enhancement

Release 8 Is The New MARK IV.

Now you can choose a major new product that can dramatically reduce the cost of programming your business applications.

It's called MARK IV® Release 8. It offers major new improvements in throughput, graphics capabilities, on-line support, and multi-dimensional arrays.

(MARK IV is the most successful application implementation software product ever sold. Today it's in use at more than 1,400 computer sites in 44 countries.)

Release 8 has been configured to deliver optimal price/performance for your operating system, data base, and virtual memory needs, and DOS-level systems at attractive prices.

Enhancement By Committee.

Many of the advantages available to you in Release 8 are the direct result of the experience of actual MARK IV users: the System Evaluation Committee of the MARK IV User Group.

The number one priority of this experienced group was array processing.

So now the new array definition capability of Release 8 lets you process multi-dimensional arrays to quickly produce aging reports, cross-foot financial reports, and statistical summaries.

Enhanced Throughput.

You achieve it through major architectural changes in Release 8 software.

You get single-step processing capability. This simplifies execution procedures and reduces I/O channel activity for report sorting.

And since Release 8 uses sophisticated compilation techniques, execution speed is comparable to equivalent COBOL jobs.

Enhanced Data Display.

Graphics is another new feature of Release 8.

You can produce vertical or horizontal bar graphs. Scatter diagrams. Absolute or relative bar graphs. And recap summary reports.

All of this display flexibility can be extremely useful in graphic management reports, forecasting, and mathematical or trend analysis.

Enhanced On-Line Support.

Release 8 now makes the MARK IV data inquiry language available for CICS and INTERCOMM environments—together with several query language extensions and enhanced IMS/DC support.

And Release 8 now provides a compatible query language for use with all of these operating systems and monitors:

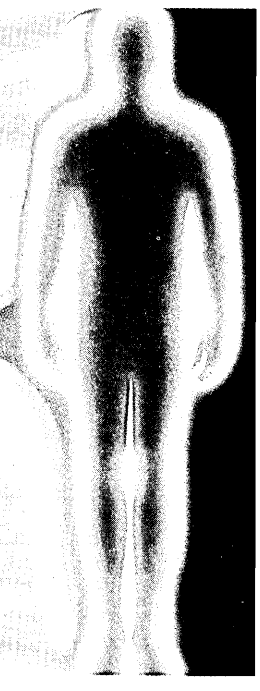
OS, OS/VS, DOS, DOS/VS, IMS/DC, CICS, INTERCOMM, TSO, and CMS—among others.

Enhancement Of The Mind.

MARK IV Release 8 is a new Implementation System from Informatics. It is a working tool. A system specifically designed to expand the problem-solving power of the human mind.

Discover all of the ways it can help you realize the maximum potential of your programming staff.

Just mail the coupon. Or, call (213) 887-9121. Telex: 69-8473



Mr. Ron Mullenaux, Informatics Inc.
21050 Vanowen Street, Canoga Park,
California 91304

Yes. Tell me more about MARK IV Release 8 and how it can enhance the productivity of my operation.

informatics inc®

The Information Management Company

D 1279

Name

Title

Company

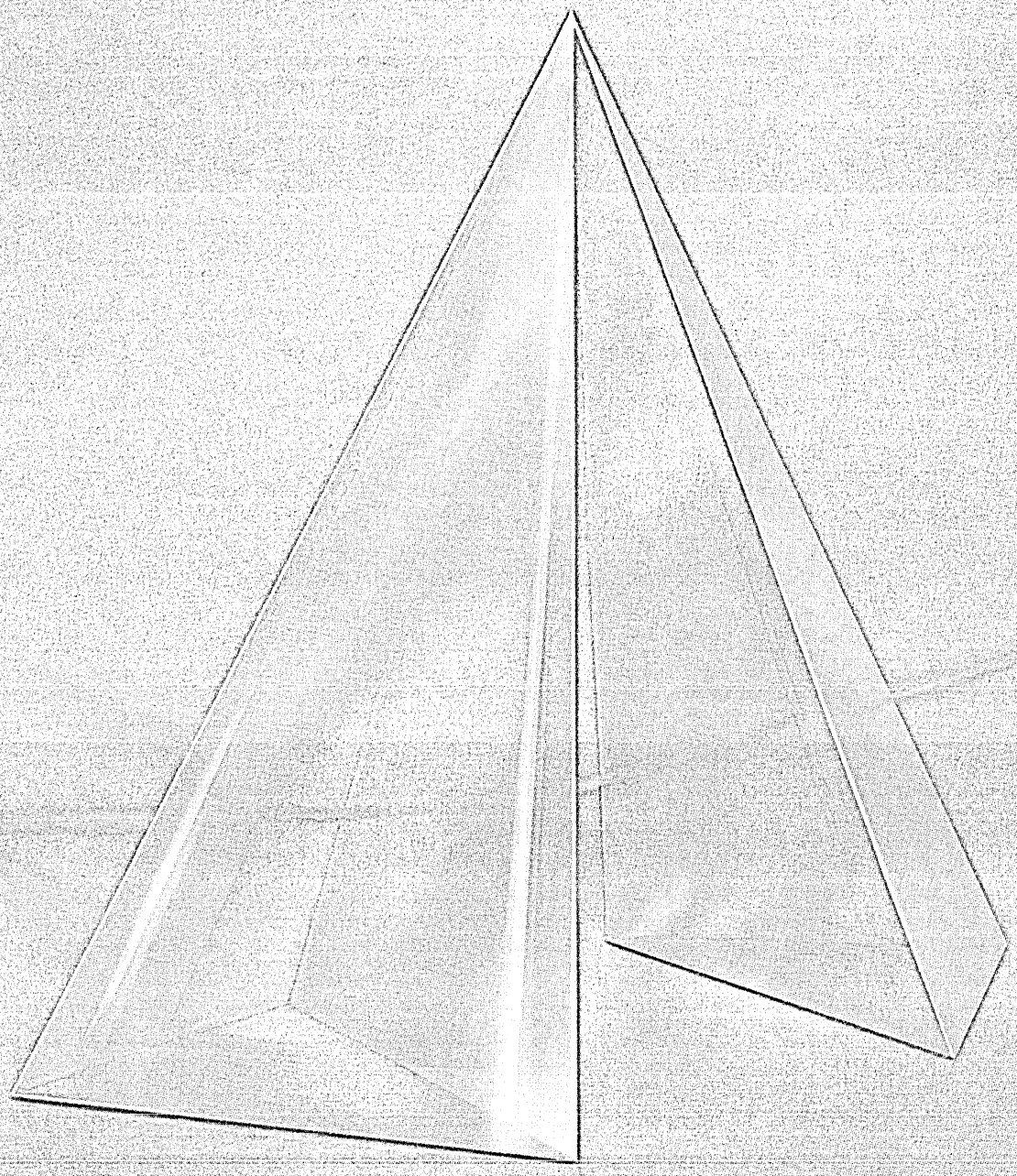
Address

City State Zip

ADAPSO REMOTE PROCESSING SERVICES SECTION

CIRCLE 18 ON READER CARD

Introducing Coordinated Network Architecture



paradyne
...the parallel force

The evolution of distributed data processing networks has resulted in features and functions being added, as opposed to being designed for overall efficiency and coordination. The result? Inefficiency, complexity and higher costs. The combined needs of the remote user, the programmer and the organization have not been satisfied.

Paradynes Coordinated Network Architecture provides the solution to the dilemma users face in implementing distributed data processing networks. Paradyne's design philosophy offers control at any level. All devices within the network appear to the host processor as locally attached. Network communication is accomplished totally transparent to the host system. The result? Efficiency, economy and true flexibility coordinating the needs of the remote user, the programmer and the organization.

The parallel foundations of Coordinated Network Architecture are Paradynes PIXNET...network communications system, and RESPONSE...distributed data processing system. PIXNET places networking intelligence in its network control units and eliminates the need for communications software on your host system. All remote units appear as natively attached devices. RESPONSE is a high performance, transaction processing system that strikes the proper balance between the remote users and the central DP staff. Control of remote systems can be implemented at any level within the network. RESPONSE utilizes a powerful 370 instruction set, with its own transaction oriented operating system, allowing conversion ease.

COORDINATED NETWORK ARCHITECTURE represents a design philosophy which is an exciting departure from the ordinary, not restricted by yesterday's ideas. A PARALLEL FORCE!

If you'd like to learn more about Paradyne and Coordinated Network Architecture, write on your letterhead or call:

paradyne Corporation, 8550 Ulmerton Road, Largo, Florida 33540 / (813) 536-4771

CIRCLE 190 ON READER CARD

CALENDAR

MARCH

NCC Office Automation Conference, March 3-5, Atlanta.

Sponsored by AFIPS in cooperation with its member societies—the Association for Computer Machinery, the Data Processing Management Association, the IEEE Computer Society, and the Society for Computer Simulation. Contact Jerry Chiffriller, c/o AFIPS, 1815 N. Lynn St., Arlington, VA 22209, (703) 243-4100.

The National Office Exhibition and Conference, March 10-12, Toronto.

The office of the future and methods of storage and transmission of information will be debated. Contact Paul Day, 2 Bloor St. West, Suite 2504, Toronto, Ontario M4W 3E2, (416) 967-6200.

Interface '80, March 17-20, Miami Beach.

Will feature the data communications/ddp conference while the Datacomm School will be held to introduce newcomers to the fundamentals of data communications. Contact Peter Young, 160 Speen St., Framingham, MA 01701, (800) 225-4640; in Massachusetts, (617) 879-4502.

Viewdata '80, March 26-28, London.

The first world conference and exhibition on computerized tv-based information, education, and entertainment. Contact TMAC, 680 Beach St., Suite 428, San Francisco, CA 94109, (800) 237-3477; in California, (415) 474-3000.

APRIL

Federal DP Expo, April 28-30, Washington, D.C.

Update on trends, applications, and state of the art of all facets of ADP. Contact Sheldon Adelson, Conference Director, 160 Speen St., Framingham, MA 01701, (617) 879-4502.

Computerized Office Equipment Expo—Midwest '80, April 30-May 2, Chicago.

Will feature the latest developments in computers, word processors, copiers/duplicators, telephone systems, and other business equipment. Contact Industrial and Scientific Conference Management, Inc., 222 West Adams St., Chicago, IL 60606, (312) 263-4866.

MAY

Micro/Expo '80, May 6-8, Paris.

Will feature four major themes: Personal Computing, New Products, Industrial Applications, and Communications. This is the largest all-micro industry trade show in Europe. Contact Christopher Chambers, U.S. Sales Manager, Micro/Expo '80, 2020 Milvia St., Berkeley, CA 94704, (415) 848-8233.

NCC, May 19-22, Anaheim, Calif.

Will cover the broad areas of management, applications, science and technology, and social implications. Contact AFIPS, 1815 North Lynn St., Arlington, VA 22209, (703) 243-4100.

CECON, May 20-22, Cleveland.

The exhibits will display new products related to instruments, components, and systems. Contact Cleveland Electronics Conference, Inc., 2728 Euclid Ave., 5th Floor, Cleveland, OH 44115, (216) 241-5515.

NAECON '80, May 20-22, Dayton, Ohio.

The National Aerospace and Electronics Conference is the oldest and best-known specialized national forum for the exchange of information on aerospace electronics. Contact Gordon Rabarus, Air Force Avionics, 140 E. Monument Ave., Dayton, OH 45402, (513) 255-2802.

JUNE

National Computer Graphics Association Conference, June 16-19, Washington, D.C.

Will include tutorials in particular computer graphic fields, conferences focusing on new developments in computer graphics, and vendor exhibitions. Contact National Computer Graphics Association, Inc., 1129-20th St., NW, Suite 512, Washington, DC 20036, (202) 466-5895.

DATA COMM, June 17-19, Geneva, Switzerland.

DATA COMM is an international forum where developments in microprocessors, mini/microcomputers and associated services can be seen, together with new equipment for data communications and distributed processing. Contact Industrial and Scientific Conference Management, Inc., 222 West Adams St., Chicago, IL 60606, (312) 263-4866.

World Computing Services Industry Congress II, June 23-25, San Francisco.

Geared toward the serious discussion of responsibilities as custodians of the international information resources. Contact ADAPSO, 1925 Lynn St., Arlington, VA 22209, (703) 522-5055.

Syntopicon VIII, June 23-26, Minneapolis.

The International Word Processing Association conference will feature one day of conference and three days of exhibits from all major vendors of text processing systems. Contact IWP, Maryland Rd., Willow Grove, PA 19090, (215) 657-3220.

World Conference Transborder Data Flow Policies, June 23-27, Rome.

Contact F.F. Bernasconi, P.O. Box 10253, 23 viale Civilita del Lavoro, Rome, (Phone) 5916 041.

SEPTEMBER

Integrated Systems Expo '80, September 9-11, Washington.

The National Micrographics Association will feature the development and promotion of the effective uses of micrographics, including interfaces with other information-processing technologies. Contact John Bidwell, NMA, 8719 Colesville Rd., Silver Spring, MD 20910, (301) 587-8202.

Federal Computer Conference, September 22-24, Washington.

Cosponsored by DATAMATION. Will address the management of change in the 1980s for federal dp users. Contact Ms. Lynn Green, P.O. Box 368, Wayland, MA 01778, (617) 358-5181.

Compcon Fall '80, September 22-26, Washington, D.C.

Theme will be Distributed Processing and Networking. Contact Executive Secretary, P.O. Box 639, Silver Spring, MD 20901, (301) 439-7007.

The Microcomputers you should take seriously.

The Challenger III Series is the microcomputer family with the hardware features, high level software and application programs that serious users in business and industry demand from a computer system, no matter what its size.

Since its introduction in August, 1977, the Challenger III has become one of the most successful microcomputer systems in small business, educational and industrial development applications. Tens of thousands of Challenger III's have been delivered and today hundreds of demonstrator units are set up at systems dealers around the country.

The Challenger III systems offer features which make their performance comparable with today's most powerful mini-based systems. Some of these features are:

Three processors today, more tomorrow.

The Challenger III Series is the only computer system with the three most popular processors— the 6502A, 68B00 and Z-80. This allows you to take maximum advantage of the Ohio Scientific software library and programs offered by independent suppliers and publishers. And all Challenger III's have provisions for the next generation of 16 bit micros via their 16 bit data BUS, 20 address bits, and unused processor select codes. This means you'll be able to plug a CPU expander card with two or more 16 bit micros right in to your existing Challenger III computer.

Systems Software for three processors.

Five DOS options including development, end user, and virtual data file single user systems, real time, time share, and networkable multi-user systems.

The three most popular computer languages including three types of BASIC plus FORTRAN and COBOL with more languages available from independent suppliers. And, of course, complete assembler, editor, debugger and run time packages for each of the system's microprocessors.

Applications Software for Small Business Users.

Ready made factory supported small business software including Accounts Receivable, Payables, Cash Receipts, Disbursements, General Ledger, Balance Sheet, P & L Statements, Payroll, Personnel Files, Inventory and Order Entry as stand alone packages or integrated systems. A complete word processor system with full editing and output formatting including justification, proportional spacing and hyphenation.

OS-DMS, the software star.

Ohio Scientific offers an Information Management system which provides end user intelligence far beyond what you would expect from even the most powerful mini-systems. Basically, it allows end users to store any collection of information under a Data Base Manager and then instantly obtain information, lists, reports, statistical analysis and even answers to conventional "English" questions pertinent to information in the Data Base. OS-DMS allows many applications to be computerized without any programming!

The "GT" option yields sub-microsecond microcomputing.

Ohio Scientific offers the 6502C microprocessor with 150 nanosecond main memory as the GT option on all Challenger III Series products. The system performs an average of 1.5 million instructions per second executing typical end user applications software (and that's a mix of 8, 16 and 24 bit instructions!).

Mini-system Expansion Ability.

Challenger III systems offer the greatest expansion capability in the microcomputer industry, including a full line of over 40 expansion accessories.

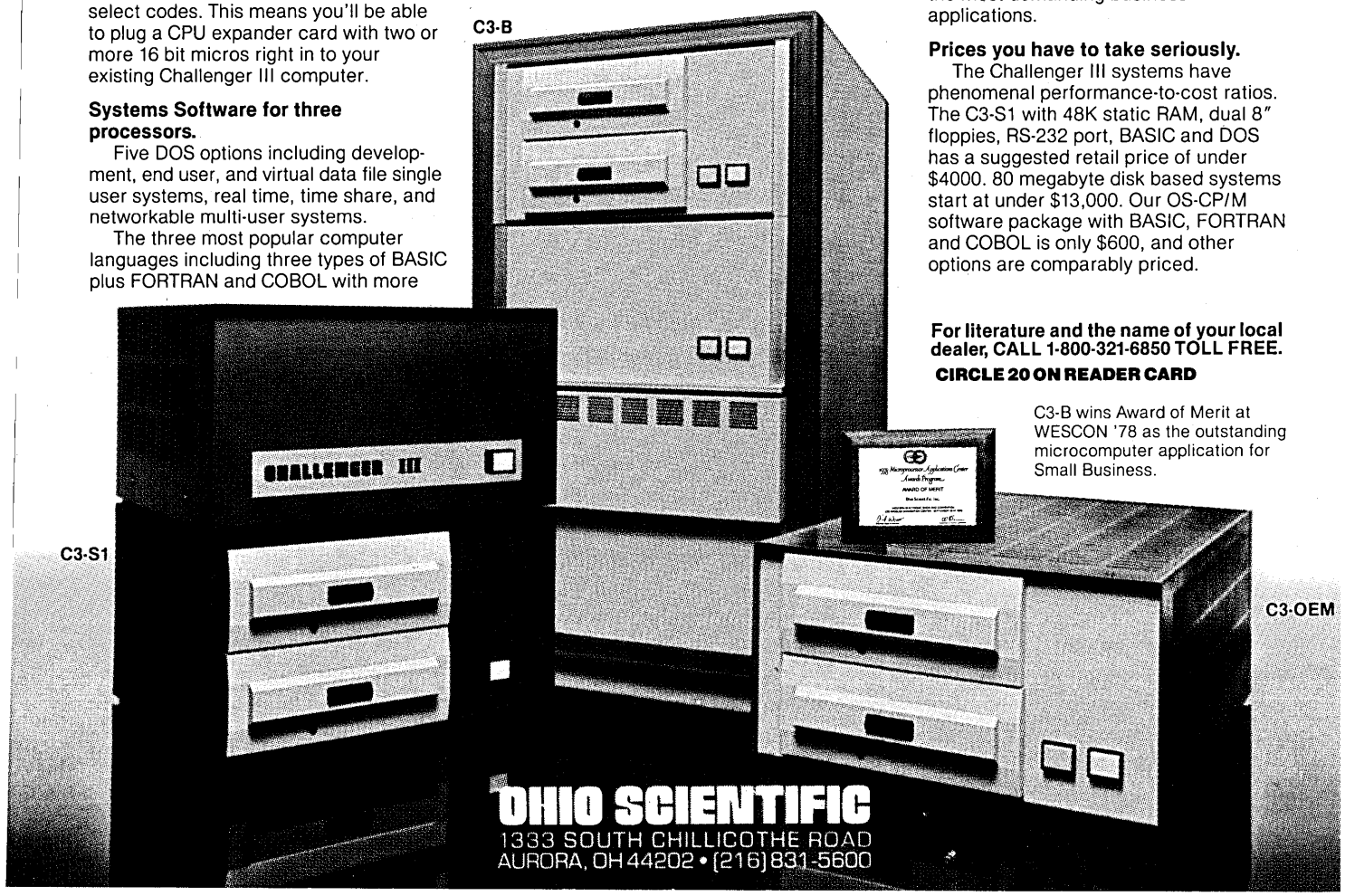
Networking and Distributed Processing

OS-65U level 3 now provides networking capabilities as well as time sharing ability allowing Challenger III based systems to be expanded to meet the most demanding business applications.

Prices you have to take seriously.

The Challenger III systems have phenomenal performance-to-cost ratios. The C3-S1 with 48K static RAM, dual 8″ floppies, RS-232 port, BASIC and DOS has a suggested retail price of under $4000. 80 megabyte disk based systems start at under $13,000. Our OS-CP/M software package with BASIC, FORTRAN and COBOL is only $600, and other options are comparably priced.

The Challenger III Series from Ohio Scientific.



For literature and the name of your local dealer, CALL 1-800-321-6850 TOLL FREE.

CIRCLE 20 ON READER CARD

C3-B wins Award of Merit at WESCON '78 as the outstanding microcomputer application for Small Business.

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We can support peak load situations, when major development projects, conversion or attrition place an unusually heavy workload on your own staff. Or we can simply furnish the technical knowledge not available within your own organization.

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Our dramatic growth reflects our professional, common sense approach. Our adaptability to a variety of situations. And our ability to create customized programs for specific needs. Our impressive track record and many satisfied clients are our best credentials.

If you'd like to know more about us, fill in the coupon. Or call. We'd welcome the opportunity to fill your data processing needs.

Please fill me in on DASD's total capabilities.

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Title _____

_____

Company _____

Phone _____

Address _____

City _____ State _____ Zip _____

If you'd like information on a specific problem, please specify.

DASD Corporation
Corporate Services Center
9045 North Deerwood Drive
Dept. DM23
Milwaukee, WI 53223
(414) 355-3405

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CIRCLE 21 ON READER CARD

A Seminar on Interactive Computing and the DTSS Associates Plan

Enter the Interactive Decade at our Seminar on Interactive Computing, to be held in Miami Beach, March 20th and 21st. (That's the same week as Interface '80, so just plan a couple of extra days in town, and make your trip all the more worthwhile.)

In the 1980's, new interactive computing tools will extend the capabilities of decision-makers and fuel the growth of organizations, large and small. And there's a real need for useful information about these new possibilities. Now DTSS Incorporated, a subsidiary of Metropolitan Life Insurance Company, will tell you about interactive computing opportunities in a comprehensive 1½ day seminar, presented by experts in the field.

WHO SHOULD ATTEND?

In-house data processing managers who want to stem the flow of interactive dollars outside their company... Managers of service bureaus who want to offer interactive features to their customers... Management consultants who want to include interactive computing techniques in their repertoire of skills and capabilities... ...*Just about anybody* who wants to take advantage of the incredible opportunities offered by interactive computing systems.

So—if you have been looking for a better way to use interactive computing services, you'll want to attend this event!

WHAT WILL YOU LEARN?

You'll learn about interactive computing and its value to the modern organization, as well as the current status of the market for interactive services.

You'll learn, from hands-on experience, how an interactive system works, and what it's like to use a computer in a fast, easy problem-solving mode.

You'll learn how you can manage, market, and utilize interactive computing services at a low investment and a low cost with the added benefit of a lucrative software exchange program—through the recently announced *DTSS Associates Plan,* which has been created explicitly to make interactive computing available to a wider community of users.

In short, you'll learn all you need to know about the expanding new world of interactive computing services, and how you can enter that field. Now.

WHO WILL PRESENT THE SEMINAR?

The seminar will be presented by experts in the field of interactive computing. They will be led by Daniel Walkovitz, President of Corporate Management Systems, Inc., a leading developer of Decision Support Systems for business.

You will also have the opportunity to experience interactive computing directly, and meet on a one-to-one basis with members of the DTSS staff, who will discuss interactive computing and the DTSS approach in detail with you.

WHERE WILL THE SEMINAR BE HELD?

The seminar will be held at the Holiday Inn Hotel in Miami Beach on March 20th and 21st. The day's schedule will be completed at noon on the 21st, giving you plenty of time to return home. So if you are planning to be in Miami anyway, why not attend an event that could make the 1980's your best decade ever?

The cost of the seminar is only $125.00. Worth it? You bet.

Just fill out the attached coupon and return it to Paul F. Henneberry, Associates Plan Manager. And don't delay. Space is limited.

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March 20th and 21st, 1980
Holiday Inn, Miami Beach

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CIRCLE 22 ON READER CARD

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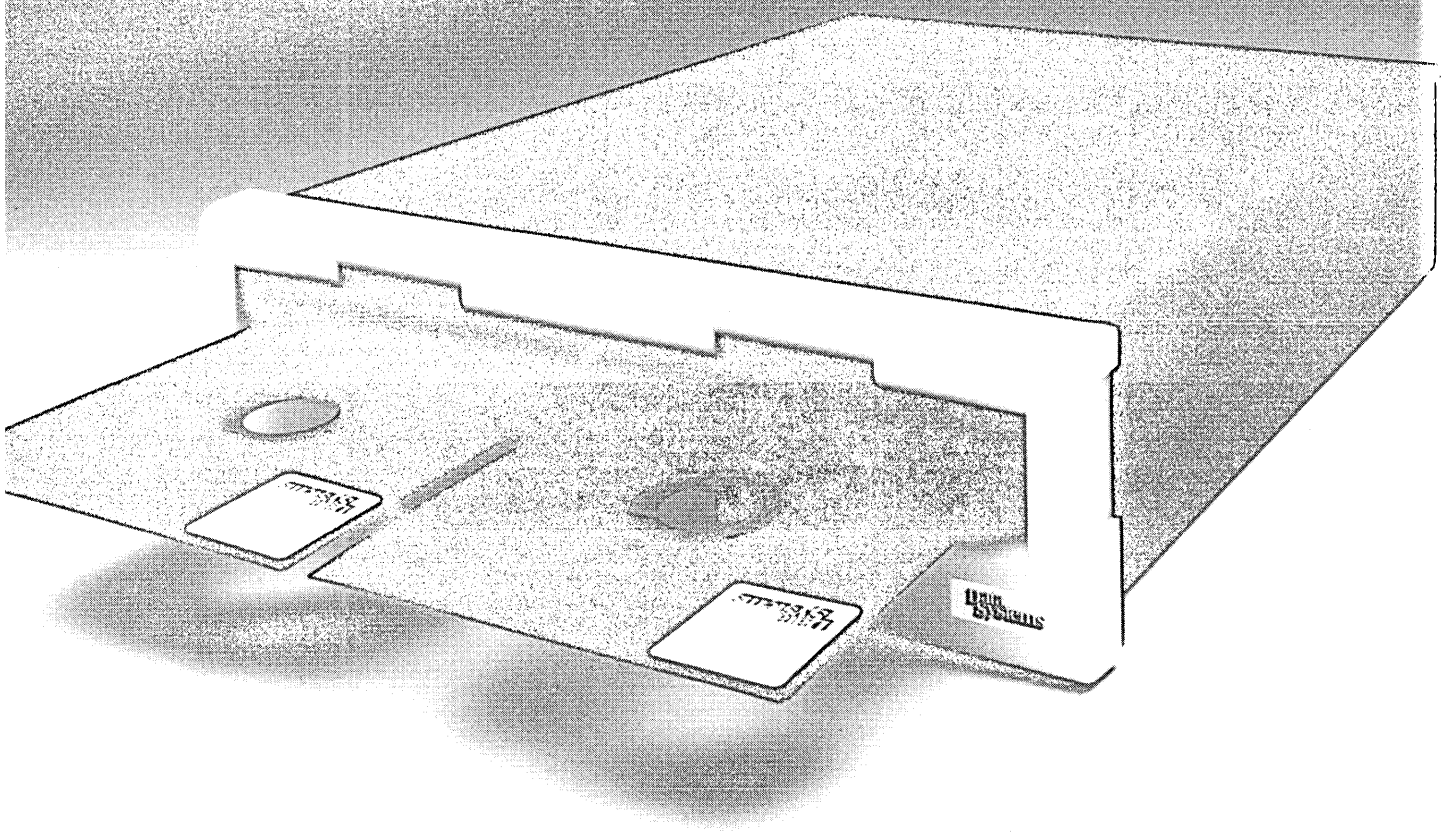

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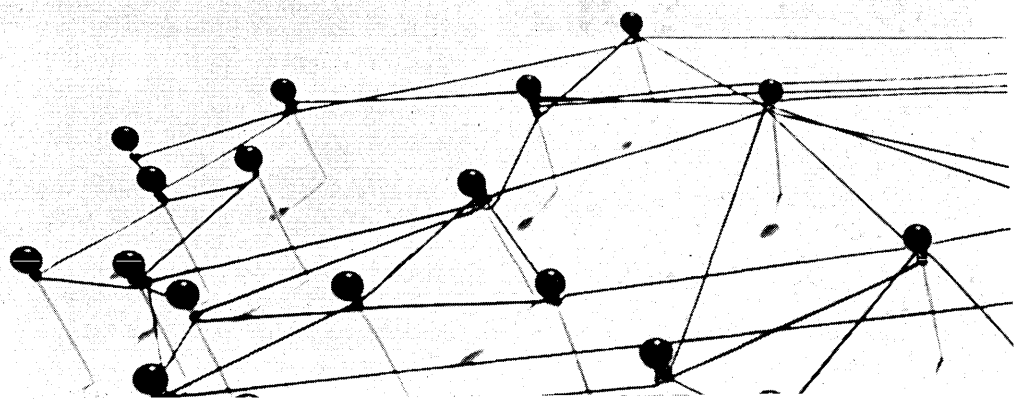

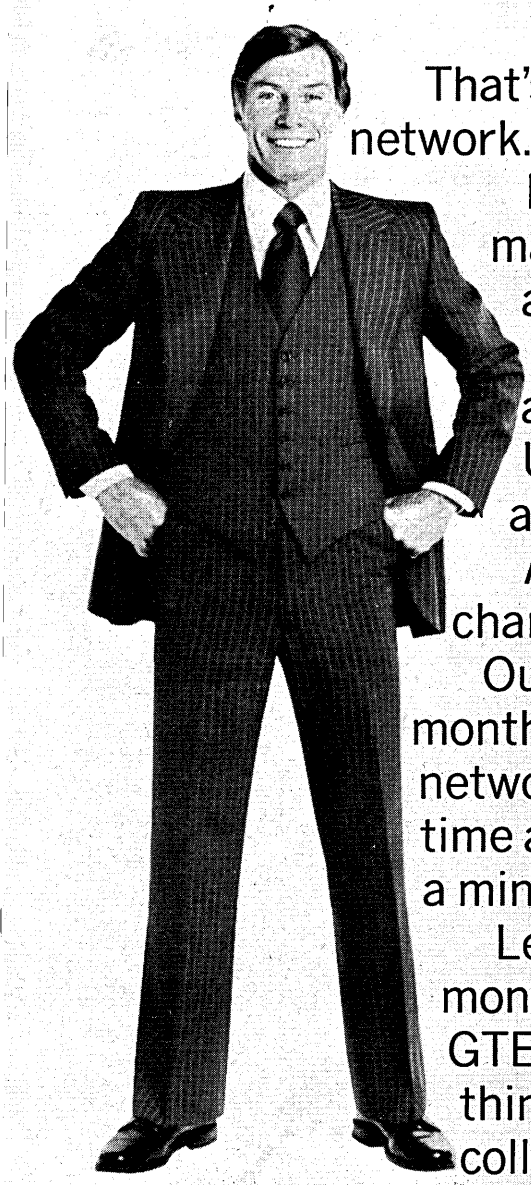

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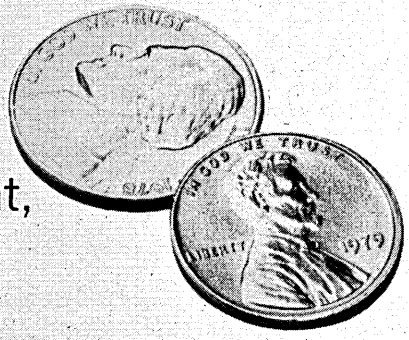
Or write Marketing Communications Department, GTE Telenet, 8330 Old Courthouse Rd., Vienna, VA 22180.



GTE Telenet
The data network

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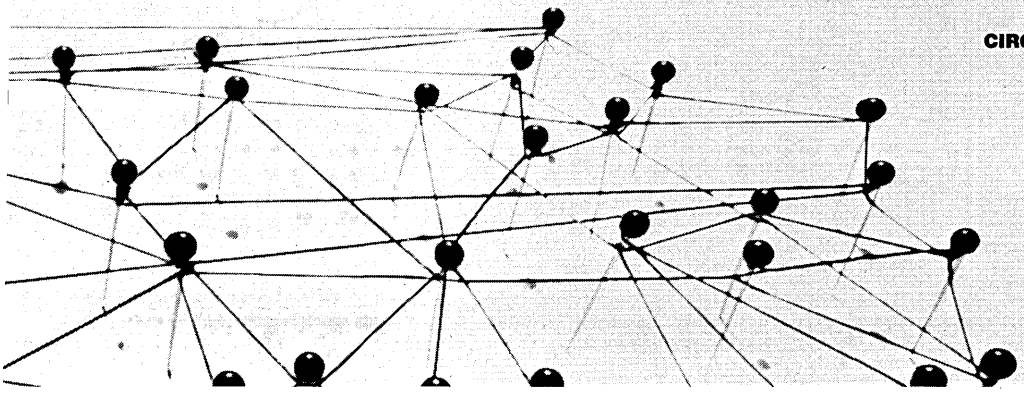
CIRCLE 24 ON READER CARD



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CIRCLE 25 ON READER CARD

LETTERS

THE REAL BUGABOO

Re: "That Old Bugaboo, Turnover" (October, p. 96), Mr. McLaughlin has missed the boat!

Have you heard these statements before? "I want to change jobs because . . . . . my boss does not appreciate me."
. . . the internal political hassle has put me in an untenable situation."
. . . this place is a nut-factory. Not only do we not know where we're going, but we don't even know where we've been!"
. . . I see where improvements can be made, but no one wants to listen."
. . . I was promised an assignment to the new project; now all I do is maintenance."
. . . all I do is put out fires or react to crises."

These are real reasons stated by real people. If managers are sitting around wondering about turnover and looking for a place to put the blame, they don't have to look very far. The problem with all of the above is upper management. The solution to all of the above is upper management.

Mr. McLaughlin at least was on the right track when he alluded to stable companies being those with loyal employees. But it is not a one-way street. If employees are to be loyal to companies, companies must be loyal to them. However, loyalty is not expressed in terms of money, rotating job assignments, hiring part-time staffs, or giving "lots of challenge" (in other words the reward for doing good work is more work), as Mr. McLaughlin's article suggests. Loyalty is expressed in terms of genuine concern, support, mutual trust, and protectiveness on the part of both the individual and the company. We all know that we as individuals do not interact with the company—we deal with the representatives of that entity, who are people in the upper management echelon.

Mr. McLaughlin gave examples of so-called solutions. One example was the Ohio company which alluded to its training program as the way to retain staff. Is it the training program that has helped retain the staff or is it that the upper management of this company has shown its employees [a path to] personal growth? I simply cannot believe this company has solved the turnover problem with a training program. I would bet the upper management of this company is doing other things similarly showing interest in its employees—and the employees are responding in like manner.

With respect to the grocery chain that gives "lots of challenge" to its employees, data processors will migrate to some extent to where the action is, but will they stay? I know of a large retail chain that offers "lots of challenge." Its turnover rate is astronomical. Either the grocery chain cited is not telling all or it has been lulled into a false sense of security and it is only a matter of time before it experiences a significant turnover rate.

Let's face the real issue squarely. Turnover is a management-caused problem and can be resolved with sound management solutions. The solutions must be based on dealing with individual employees in a manner that shows the employees you are genuinely concerned about them, will help them to develop professionally, will reward them appropriately, and will help each one to make the best possible contribution to overall company goals. The majority of employees who see this loyalty will return it to the company by producing results and sticking with that company.

GARY DUSICK
Deputy Director—
Technical Services
DP Dept.
County of Riverside
Riverside, California

"Our only way out is to call him up and put him on hold until this whole thing blows over."

LETTERS

NO COMPARISON

Re: Look Ahead (November, p. 17), a user in Los Angeles claims to have found a 370/158 "wheezing" in 90 degree heat while a 4331 next to it "hummed along" oblivious to the climatic problems. It puzzles me that while the 4331 does not need special air conditioning for the mainframe, it very definitely does need controlled conditions for peripherals.

I would also like to point out that the 4331 is not in the same performance category as a 370/158. (In fact our studies show the 4331 to be roughly equal to a 360/40 in most applications.) This is important to the conditions under which the machine can operate—please don't compare a 4331 to a 370/158.

JAMES F. BENTON
Executive Director
Computer Lessors Assn., Inc.
Washington, D.C.

DARWIN AND DP

Re: Letters (October, p. 41), it seems that the somewhat hostile letter of Peter S. Graham was essentially asking the entire dp industry to engage in some healthy introspection. Not of the methods, media, or techniques, but of the basic criteria with which we formulate and rationalize them.

The potential for abuse, as Mr. Graham points out, must not be assumed to be solely applicable to users of a system, or to the dreaded public. The systems designers and decision-makers who are mature or even genius in technology and business often pay for their superdevelopment in those areas with a lack of development in others. There is sufficient argument that one such area could be an acute, practiced awareness of one's social responsibility.

As 'technocrats,' we are responsible for the civilization's potential. And the question has been posed: will we continue to unthinkingly follow the somewhat pathetic, self-aggrandizing mores of Social Darwinism as programmed into us, or will we be able to assume a bit more personal control over our value systems?

DANIEL B. SMITH, JR.
Denton, Texas

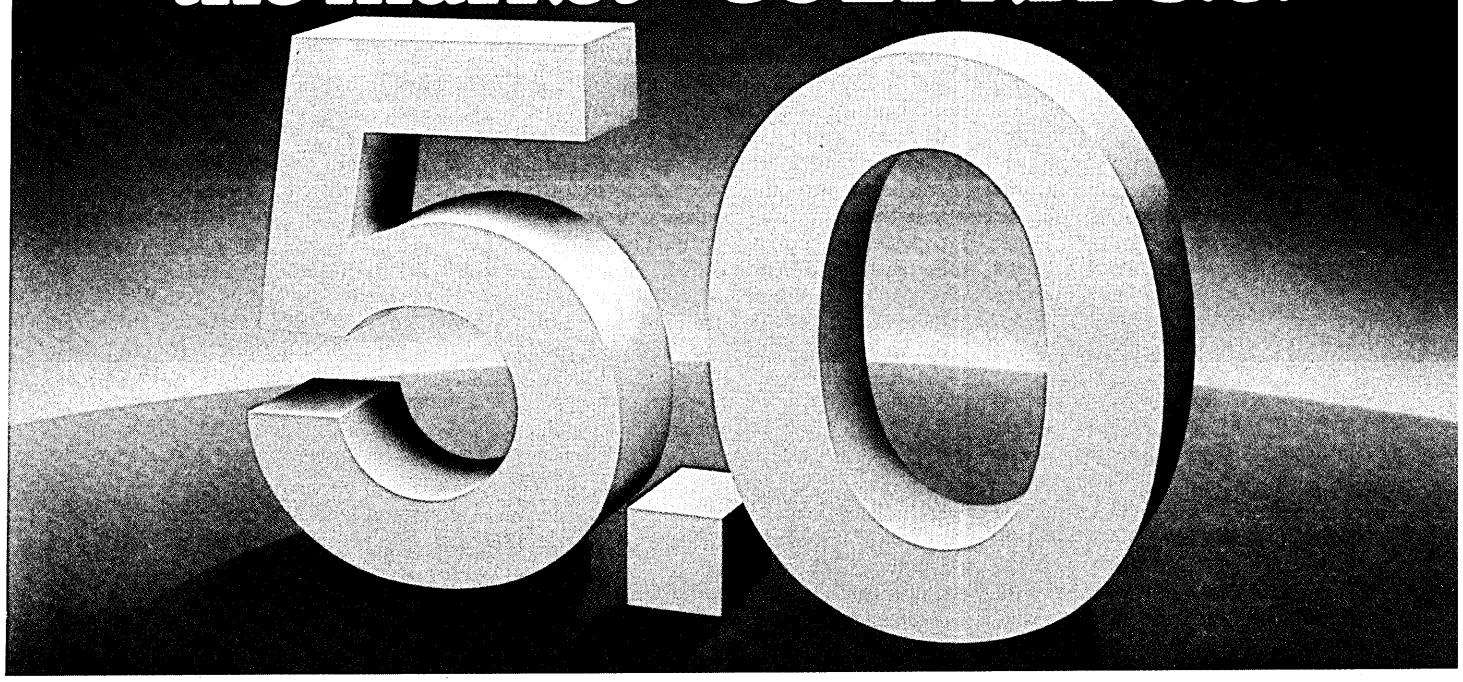
IN PRAISE OF SMALLER COMPANIES

Re: "Beginners' Software Woes" (September, p. 103), a number of the comments made cast the small firm in a very bad light. The Independent Computer Consultants Association is a national not-for-profit professional association representing small consultants all across the country. About 65%-75% of member firms are third party software companies.

Smaller firms do charge less. This is because they have less overhead, and because there is a certain level of risk a business takes in using them. This risk is offset by a lower cost. As with any product or service, it is the responsibility of the end user to weigh many variables including cost when making a decision. The fact that Mr. Raff "couldn't make it at the prices I had to charge because of the competition" is a fact of life in a free competitive society. He claims his firm must charge too little to get the business. "The average is about $20 an hour," he says. "This is not enough to survive."

I disagree. A number of our smaller member firms make it very well on $20 an hour, or in some cases, less. Consider if you will a small professional organization made up of two people. Their overhead is minimal because all work is done at client locations. There are few accounting or legal expenses. They have few business expenses other than an answering service and temporary typing help. On this basis, if they are able to work 200 billable days a year, income will approximate $64,000. It would be very easy to support a small business nicely on this amount of money. If a firm must maintain a sales force, large central offices, secretarial, accounting, and other overhead functions, it is reasonable to expect a larger fee. But this does not mean the

Introducing the most advanced report generator on the market–CULPRIT 5.0.



"Cullinane's newly released CULPRIT 5.0 is the most powerful report generator available today for use by non-programmers and programmers alike. It is at least ten times faster than COBOL, produces up to 100 reports in a single pass, and can access a broad range of both conventional and database file structures regardless of storage media. More important, CULPRIT 5.0 is consistently easy to use no matter how complex the users' reports are."

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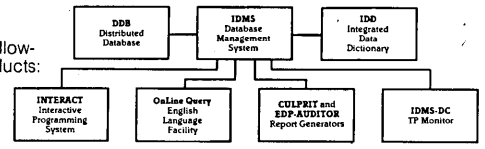

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Reports: Cullinane

CIRCLE 27 ON READER CARD

LETTERS

small firm charges too little.

A comment is also made that entry level computer users can be hurt because the software supplier may go out of business or abandon him before a contract has run out. I know from experience that this is true not only with small but also with some large firms. In many cases, the company is better off with a smaller firm. To a large firm, a $20,000 contract is a drop in the bucket. It may even be used as a training project if it is felt they cannot afford to put their best people on it. The small company sees this same contract as representing one-third of their annual income. They will provide the client the time, consideration, and attention necessary to have a successful system developed.

STEVEN A. EPNER
President
ICCA
St. Louis, Missouri

EFTS CITED AS VULNERABLE

Re: "The Head-in-the-Sand Caper" (September, p. 70): I would like to point out a slight inaccuracy. George Oram, of the Federal Home Loan Bank Board, and the late Robert Rodgers, of the FDIC, were members of the National Commission on EFT in addition to the two federal agencies mentioned.

For several years I have been developing security procedures, mostly cryptographic, for EFT systems. I have noticed in the financial industry an indifferent attitude to potential vulnerabilities as indicated in your article. The attitude seems to be that there is no reason to invest in costly equipment and reprogramming to prevent a crime that has not yet happened. I fear this will lead to ill-devised procedures installed in the face of some crisis, and that these hasty measures will not be effective and will turn the industry away from effective countermeasures.

A real danger does exist. I hope your article stimulates those in positions of trust to initiate projects to reduce the substantial exposure in currently operating networks before a catastrophe of national proportions occurs. The procedures and devices required are well within the current state of the art.

MARVIN SENDROW
Advanced Computer Security Concepts
Annandale, Virginia

WHERE TO SHARE

Re: "Computer Buffs Share Expertise Through Clubs" (Readers' Forum, September, p. 277), let me follow up with the pertinent addresses. On a national level, the Personal Computing Society, Inc. serves to link up hobbyists, computer consumers, and others interested in personal computing and desiring to share ideas, formulate standards, participate in networking, and many other projects. Further information can be obtained by writing to Box 147, Village Station, New York, NY 10014.

For those in the New York metropolitan area, write the New York Amateur Computing Club, P.O. Box 106, Church St. Station, New York, NY 10007, or better yet, call the hot line at (212) 864-4595.

ABBY GELLES
Executive Director
Personal Computing Society, Inc.
New York, New York

CORRECTION

Re: Structured Programming at Work" (October, p. 130), E. W. Dijkstra's article "GOTO Statement Considered Harmful" appeared in the March *1968*—not 1978—Communications of the ACM.

JIM BOWMAN
New Orleans, Louisiana

We welcome letters about our articles. Please keep them brief and include your name and address. Write to us at 666 Fifth Ave., New York, NY 10019. We reserve the right to edit or excerpt letters.

A new generation in network management

Spectron introduces the D-901 DATASCOPE

Spectron combines the capability of a powerful, programmable interactive analyzer and emulator with two large-capacity, versatile data storage and retrieval devices to provide the only tool you need to troubleshoot the complex problems inherent in today's sophisticated data communications networks. The capability is yours in the Spectron D-901 DATASCOPE, newest member of the DATASCOPE family of line monitors and data analyzers. The D-901 provides a new generation of performance capability, enabling you to ☐ Operate and control a remote D-901 DATASCOPE ☐ Monitor and analyze data at speeds up to 1,500,000 bps ☐ Recognize and store complex data patterns ☐ Initiate and terminate recording of data and selected control signals at speeds up to 72,000 bps ☐ Program comprehensive interactive emulation routines with simple instructions ☐ Generate and check any 16-bit dynamic BCC ☐ Perform a dynamic CRC and LRC test ☐ and much more. Plus, installing the D-901 in Spectron's new Remote Access Switching and Patching system (RASP), provides the ultimate in network management — remote control of multiple sites from a central control location.

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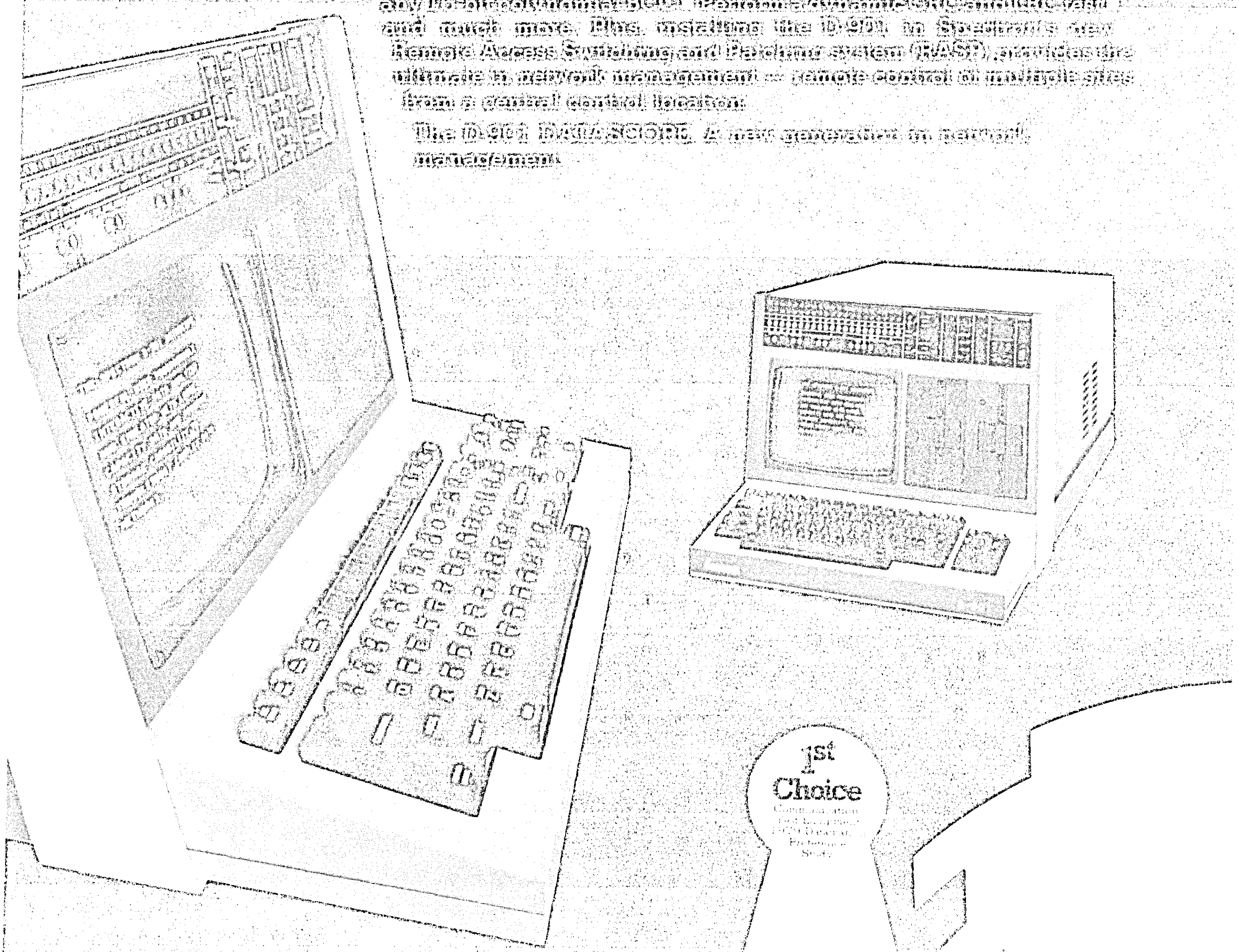

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CIRCLE 28 ON READER CARD

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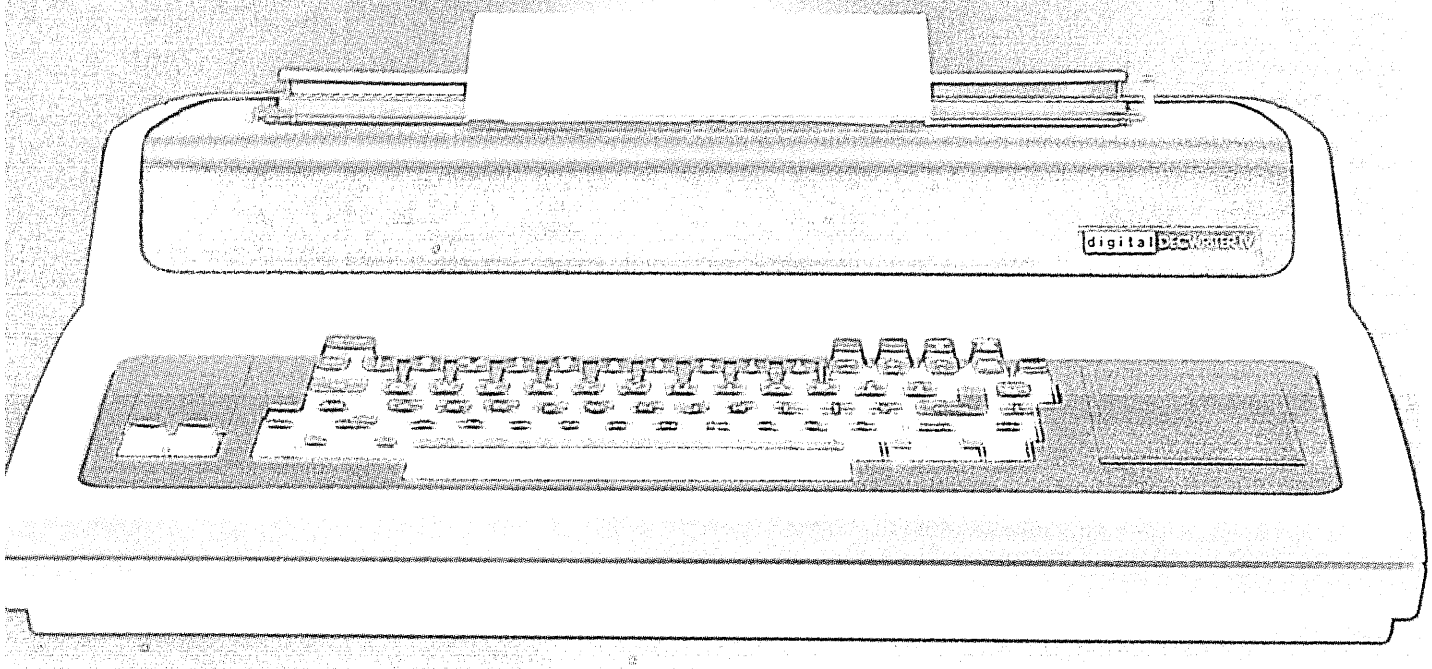
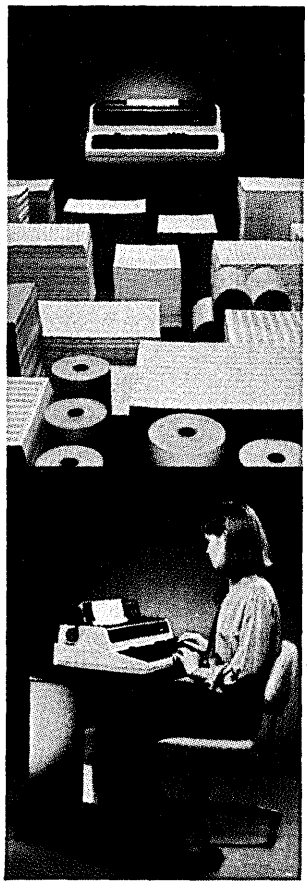


If you know anything about terminal printers, you probably know something about our LA36 DECwriter II—the largest selling terminal printer ever made.

The DECwriter II set whole new industry standards for reliability and performance.

And now there's the DECwriter IV.



With the DECwriter IV, we used the same sound thinking and proven features that made the DECwriter II so successful. True 30 CPS throughput. Microprocessor control. Switch-selectable 110 and 300 baud rates, and solid state components for unmatched reliability.

But then we added a capability to the DECwriter IV that sets it apart from the competition even more.

Unequalled flexibility in paper handling.

The DECwriter IV gives you all this flexibility because a terminal that *can't* handle all types of paper isn't just inconvenient. It's also expensive.

For instance, some terminals restrict you to using 8½" x 11" paper—sideways. Which may be fine for some jobs, but awkward for others.

Others force you to put up with the high cost and short shelf life of thermal paper. And they can't handle multi-part forms at all.

But the DECwriter IV matrix impact terminal lets you use the right paper for every job. Which means no waste. Easy filing, too.

In the standard LA 34 friction feed configuration, you can use rolls or sheet paper in any width up to 14⅞".

Take a minute to snap in the tractor-feed option, and the DECwriter IV converts to handle standard or custom forms up to four parts.

Forms as narrow as 3". Or as wide as 14⅞".

All in a portable printer no bigger than an office typewriter.

So why put up with all the restrictions you get with other terminals. Restrictions that cost you time and money.

With the DECwriter IV, one size fits all.

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CIRCLE 30 ON READER CARD

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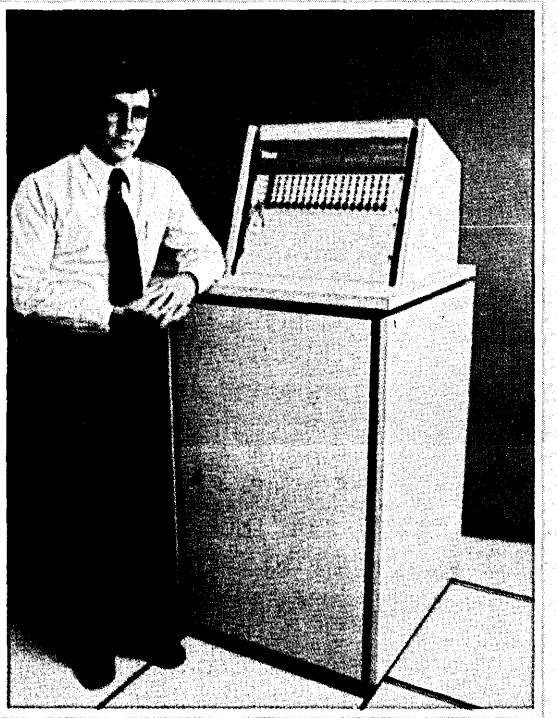

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CIRCLE 31 ON READER CARD

JOHN L. KIRKLEY, EDITOR

EDITOR'S READOUT

THE OFFICE MERRY-GO-ROUND

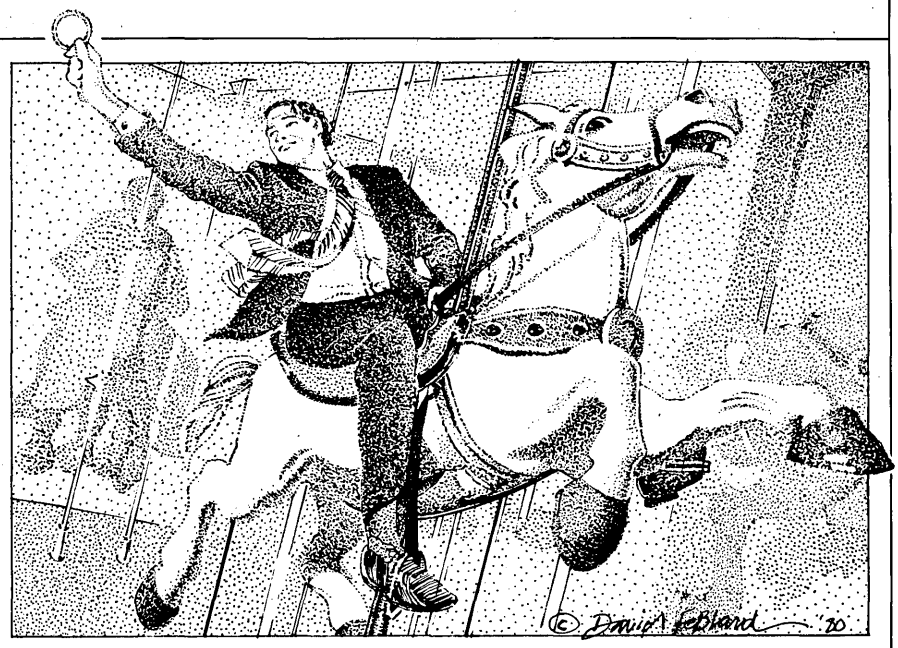

ILLUSTRATION BY DAVID FEBLAND

The computer industry merry-go-round has a new brass ring. It's called office automation, and almost every company in the business is betting that the ring is really made of solid gold.

To make it official we now have a big, glossy new show—the NCC Office Automation Conference, which will be held March 3-5 at the Georgia World Congress Center in Atlanta (see "Examining the Office of the Future," page 120). Initial exhibit space was all sold out, so conference organizers found more and filled that. Attendance figures were pegged at 15,000 but that projection may be modest. All in all, it appears that we'll have a fitting welcome to a major new show, one that some day may outstrip the NCC.

That last phrase may sound like heresy to those of us who have been in the industry for the last decade or more. We're used to the NCC being the show of shows. But the potential of the office automation industry is so huge that attempts to quantify it are, at best, only a wild guess.

For instance, depending on whom you talk to, the worldwide expenditures on administrative processing, including labor, range from $400 billion to $800 billion annually. And, as the industrialization and commercialization of human society continues, the figures will grow even larger. How much of this is adaptable to the new techniques of capturing, processing, storing, and disseminating information is unclear. But we do know that our rudimentary word processing gear, the still embryonic forays into fax and electronic mail, the attempts to develop management information systems that managers can actually use, all represent the very first stages of development.

You can be sure that in Atlanta next month there will be a number of speakers who will dwell on the enormous promise of office automation. And they're right—the potential is staggering. But there will also be voices of caution, and they will be right too. Along with the promise there is peril.

As we move automation from the factory floor and the accounting department into the office, we are on new and slippery ground.

We are moving from the objective to the subjective, from productivity that can be measured in discrete units to that strange melange of human interaction and ambiguous communication that characterizes the office environment.

Pressed for results the tendency will be to do the do-able, to automate what we did manually in the past and then point to efficiencies that can be measured in people fired or not hired. The fact that we may be perpetuating management systems or work environments that are superflous and wasteful may never be considered.

The office of our very near future may also add to a growing malaise in this country—lack of pride in work and the product of that work. Improperly implemented, our electronic gadgetry can form a technological barrier between the worker and the work—whether the individual is a secretary, manager, chief executive, or clerk.

It is also worth noting that Europeans are much more concerned about another facet of automation than we—the potential for the technological obsolescence of the individual and loss of jobs.

In the promised lotus land of the '70s, work took second place to "doing your own thing." In the '80s, work is regaining its status as a central activity of human life.

Studs Terkel, writing in his remarkable documentary *Working*, characterizes his book this way: "It is about a search . . . for daily meaning as well as daily bread, for recognition as well as cash, for astonishment rather than torpor, in short, for a sort of life rather than a Monday through Friday sort of dying."

To escape that kind of dying, to increase our productivity, to realize the potential that is implicit in this new electronic age, we must look afresh at all the time-honored ways of living and working in the office environment. We must devise new systems, new ways of implementing the technology that is developing around us.

Otherwise we will simply automate our mistakes, and, as the office environment disintegrates, we'll hear over and over again that weary refrain, "It wasn't my fault, it was the computer." ✲

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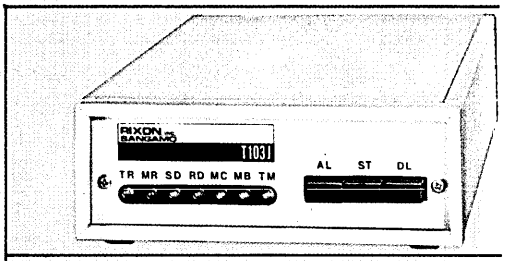

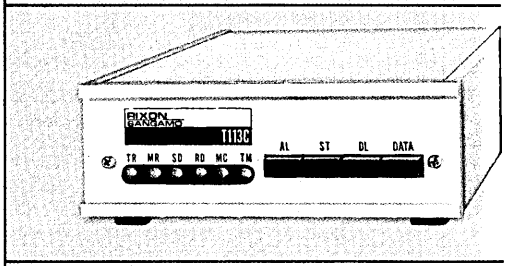

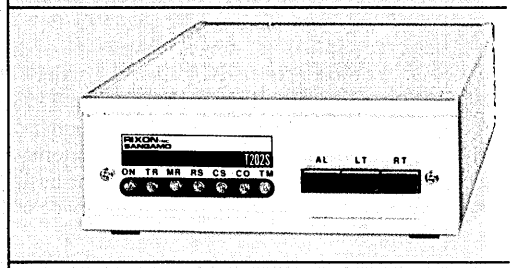

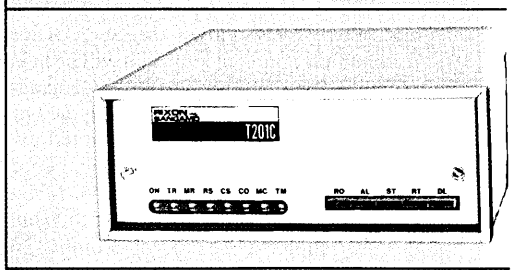

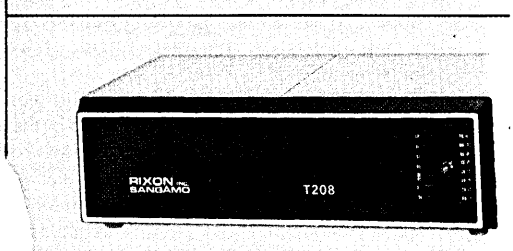

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CIRCLE 32 ON READER CARD

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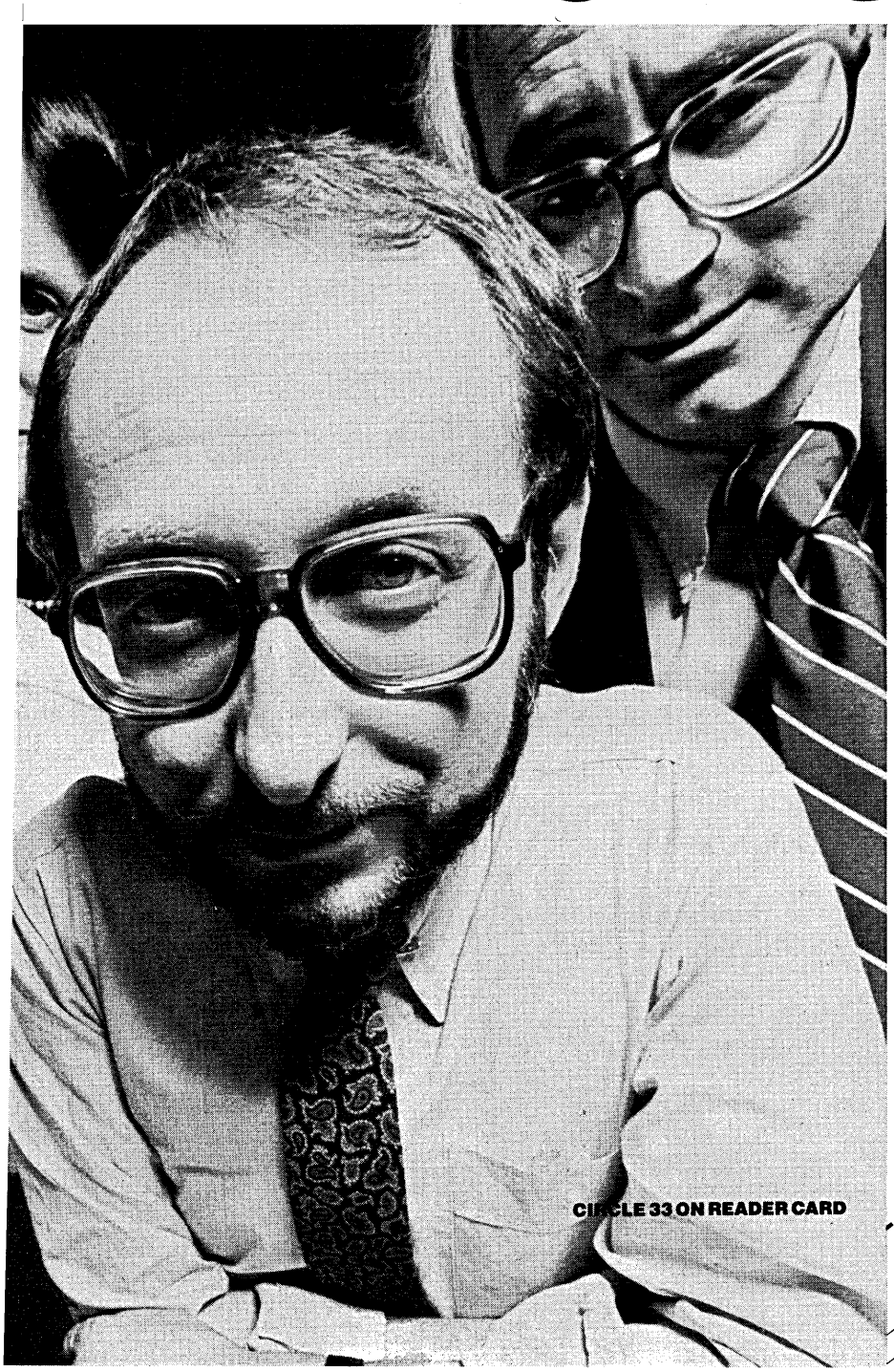

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D280

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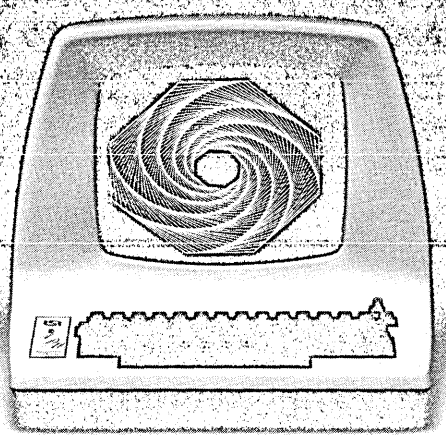
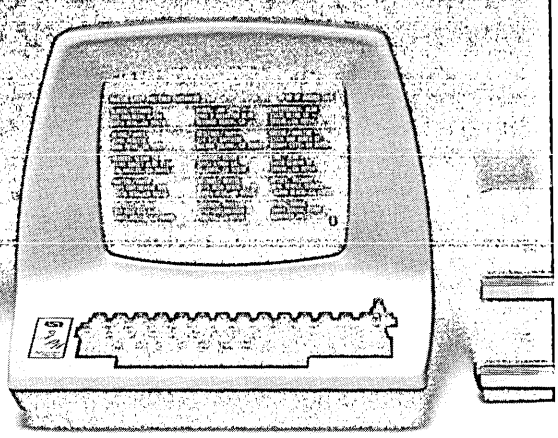
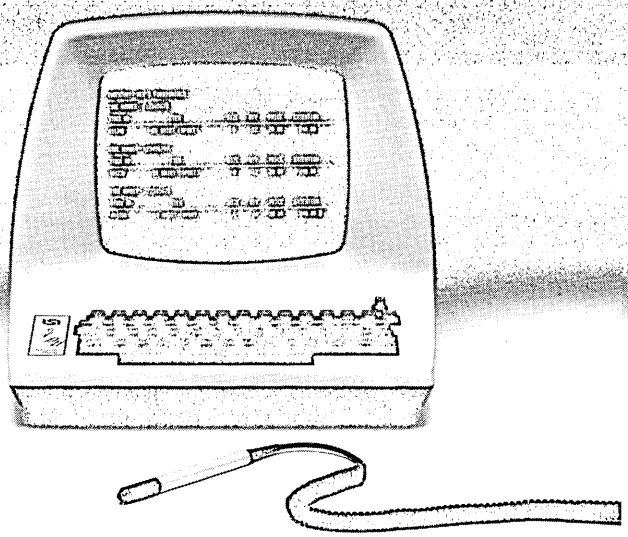
SOPHISTICATED GRAPHICS TERMINAL



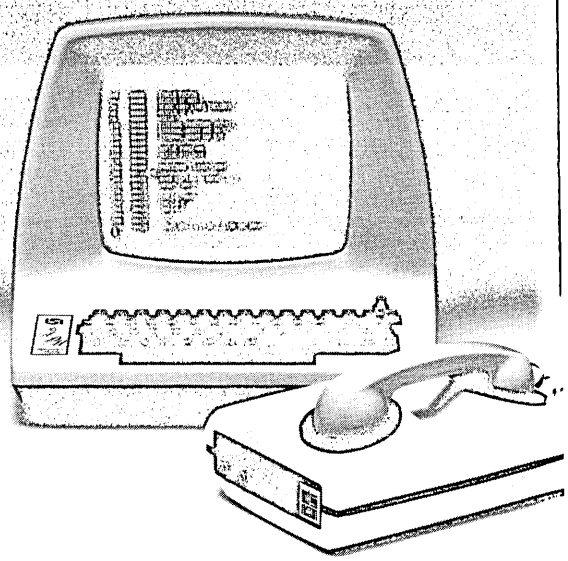
SMALL BUSINESS SYSTEM



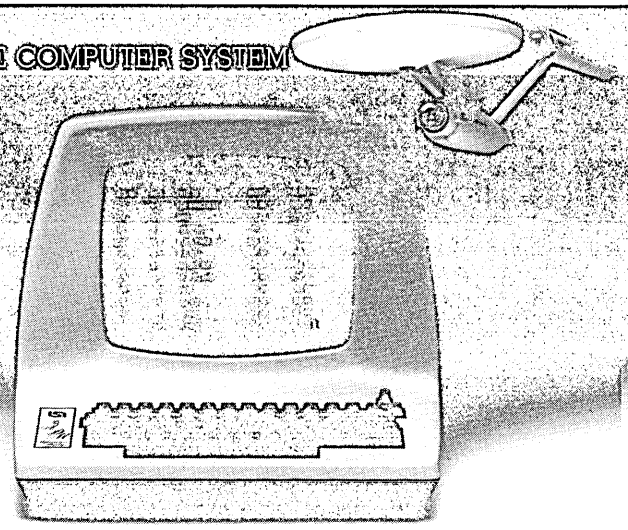
INVENTORY CONTROL



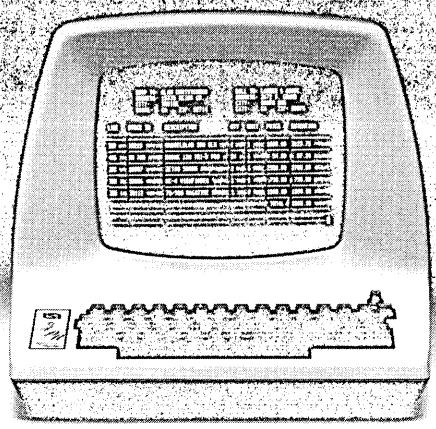
PORTABLE I/O DEVICE



HOME COMPUTER SYSTEM



VERSATILE DATA TERMINAL



What could anyone possibly do with 85,000 Dumb Terminals®?

That's how many ADM-3A's there are out in the field working right now. And more being shipped each day. Now just what accounts for such remarkable popularity?

Sure, it's the definitive dumb terminal, adaptable enough to fit a host of applications. It has a 12-inch diagonal screen. Full or half duplex operation at 11 selectable data rates. 1920 easy-to-read characters in 24 rows of 80 letters. 59 entry keys. An RS232C interface extension port. And direct cursor addressing.

But we wondered if all 85,000 Dumb Terminals were being used for just everyday data entry. So we checked around.

And found that people are using Dumb Terminals for things even we never thought of.

THE ADM-3A GOES INTO BUSINESS.

More and more OEM's are putting the Dumb Terminal into small business systems. They assemble a package that usually contains a disk, memory, a printer, and a video display terminal — the adaptable ADM-3A.

So the chances are that when you buy a small business system from someone, it'll contain, you guessed it, the amazing Dumb Terminal.

IT TAKES STOCK OF THE SITUATION.

Many businesses are using the Dumb Terminal, along with a light pen (Universal Product Code Decoder), to keep track of their inventory. The decoder is interfaced to the Dumb Terminal, and when a piece of merchandise imprinted with a Universal Product Code passes under it, the item is entered into a computer for tallying.

Simultaneously, the item is also displayed on the ADM-3A's screen — so it's instantly available for quick double-checking.

PROGRAMMERS LIKE IT, TOO.

Surprisingly enough, many computer programmers use the ADM-3A as an effective, portable I/O device. They can take it into a back room or, along with an acoustic coupler, to their homes if they wish, and compile programs nearly anywhere.

By using telephone lines, they can have direct access to a computer. Or, with the addition of an inexpensive cassette, the programmer can store the program on tape and enter it into the mainframe at a later date — with no loss of data.

THE DUMB TERMINAL PUTS ON A NEW FACE.

Some of our more ambitious customers have transformed their ADM-3A's into sophisticated graphics terminals. Simply by installing another PCB, they've enabled their terminals to perform complex plotting, graphics, and even draw charts.

And the Dumb Terminal is so adaptable that these industrious people had no trouble with installation — the graphics PCB required not the slightest cutting or soldering. It simply slipped right in and started working, all in a matter of minutes.

YOU CAN EVEN TAKE IT HOME TO MEET THE FAMILY.

We discovered that many computer buffs are using the Dumb Terminal as an inexpensive way to upgrade their systems. After all, the equipment found on most microcomputers leaves a lot to be desired. Such as the tiny five or six-inch screen, for instance.

By upgrading to the ADM-3A, they get a full 12-inch screen that's easy on the eyes. Not to mention a lot of capabilities they wanted, but just didn't get on their systems.

All for only $895.

THE DUMB TERMINAL. THE HALLMARK OF VERSATILITY.

When you get right down to it, the Dumb Terminal's applications are pretty amazing.

It can be interfaced with a staggering variety of RS232 devices. Such as cassettes, disks, floppy disk drives, printers, paper tapes, and readers, to mention just a few.

In fact, the ADM-3A is compatible with just about any RS232 device you can name. Even other video terminals, if you wish.

And people call this a "dumb" terminal?

WHAT WILL THEY THINK OF NEXT?

Who knows? But it seems that as long as there are Dumb Terminals, people will find new, unsuspected uses for them.

Of course, the ADM-3A will continue to be the same dependable data entry terminal that's made it an industry legend.

With good, reliable features and a minimum of frills. Nothing could change that. The fact is, we think that's probably the main reason that so many people have come up with so many uses for the ADM-3A.

Who said you can't teach a Dumb Terminal new tricks?

Lear Siegler, Inc./Data Products Division, 714 N. Brookhurst Street, Anaheim, CA 92803. (800) 854-3805. In California (714) 774-1010. TWX: 910-591-1157. Telex: 65-5444. Regional Sales Offices: San Francisco (408) 263-0506. Los Angeles (213) 454-9941. Chicago (312) 279-5250. Houston (713) 780-2585. Philadelphia (215) 968-0112. New York (212) 594-6762. Boston (617) 423-1510. Washington, D.C. (301) 459-1826. England (4867) 80666.

DUMB TERMINAL SMART BUY

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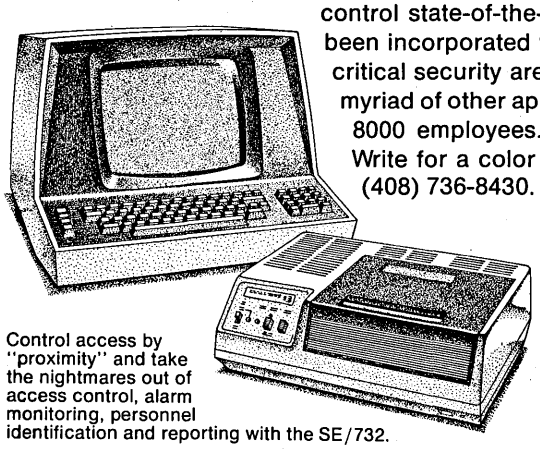
CIRCLE 34 ON READER CARD

Where there's a need for improved security control...

...Consider the Schlage 732 Access Control and Alarm Monitoring System

Schlage made the card slot obsolete with the introduction of the "proximity" concept of access control. The simple act of placing an electronically coded card within close proximity to a hidden sensor literally "opened new doors" in access control state-of-the-art. Now those same proven advantages of the proximity system have been incorporated with microprocessor technology to improve monitoring and reporting in critical security areas, personnel identification, fire alarms, parking, fuel monitoring, and a myriad of other applications. The SE/732 system effectively controls up to 32 entrances and 8000 employees. It also monitors, programs and reports in easy-to-read English text. Write for a color brochure on the SE/732, or **call toll-free (800) 538-1755.** In California, (408) 736-8430. Telex 910-339-9398. Worldwide representation for sales and service.



Control access by "proximity" and take the nightmares out of access control, alarm monitoring, personnel identification and reporting with the SE/732.

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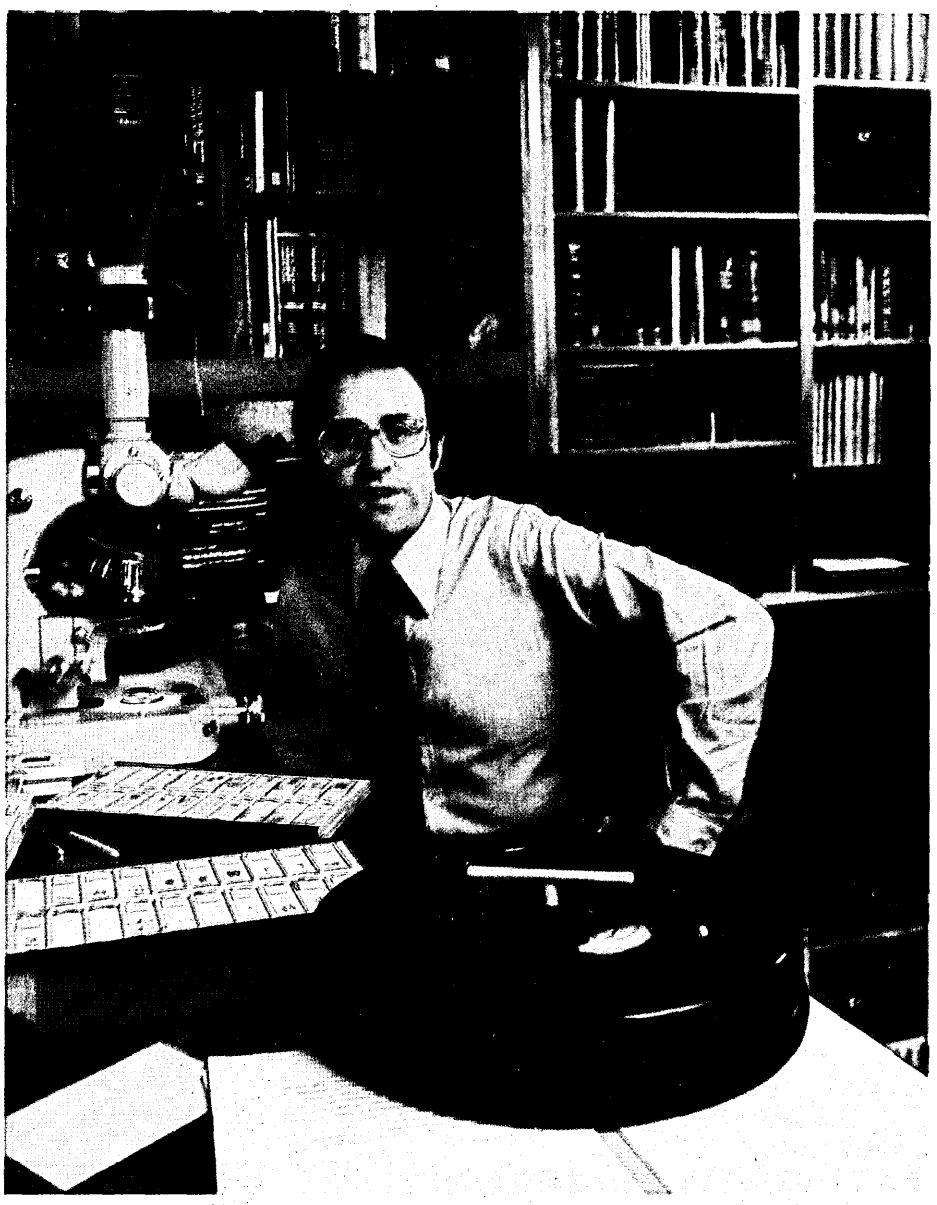
For a Free Print of "The Octopus," suitable for framing and without advertising, write on your letterhead to Schlage Electronics.

CIRCLE 35 ON READER CARD

"Our lab test results are critical to effective health care. We wouldn't trust them to anything less than Scotch® Brand Disk Packs."



**Dr. David B. Kaminsky,
Director of Laboratory,
Eisenhower Medical Center,
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Eisenhower's health care programs depend on the accuracy of almost 30,000 clinical tests every month. So its laboratory depends on Scotch 949/80 Disk Packs.

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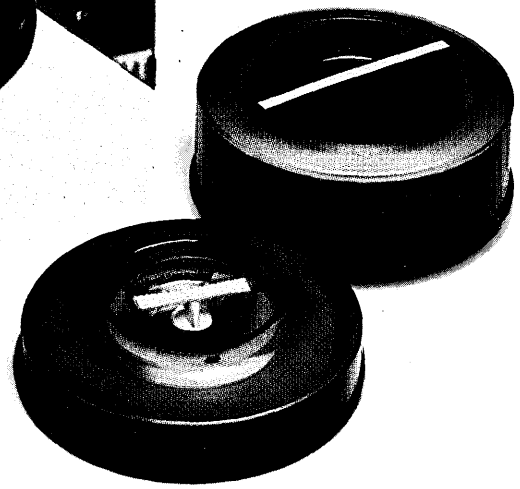
Each pack is tested to assure it exceeds industry performance standards before it leaves our plant. We make certain you can depend on every pack, because we know nothing less than the best is acceptable for your vital data.

Scotch Disk Packs are available in a wide range of configurations to meet your needs.

For information about how you can purchase Scotch Disk Packs, call toll free: 800-328-1300. (In Minnesota, call collect: 612-736-9625.) Ask for the Data Recording Products Division. In Canada, write 3M Canada, Inc., London, Ontario N6A 4T1.

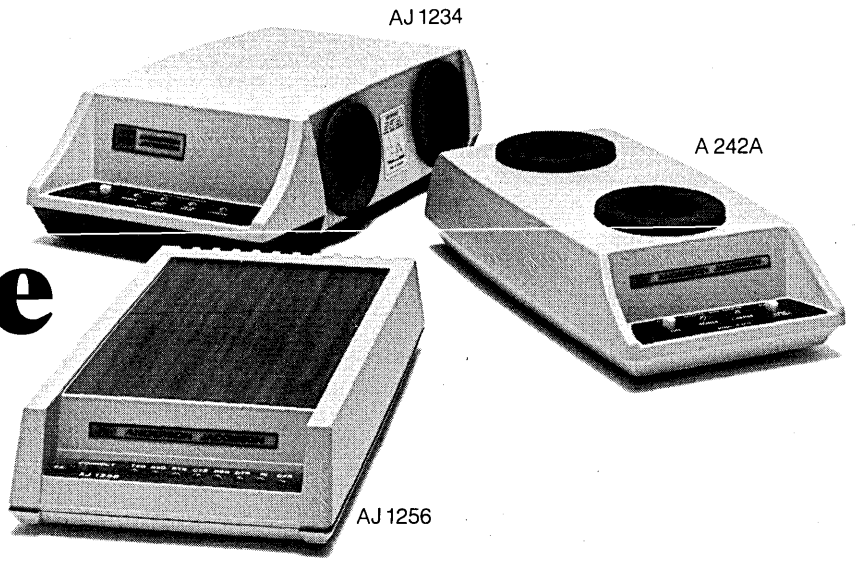
If it's worth remembering, it's worth Scotch Data Recording Products.



3M

CIRCLE 66 ON READER CARD

AJ gets into your timeshare system.



And gets the job done. Efficiently.

It doesn't matter if your system is in-house or if you're using a commercial timeshare service.

The new AJ 1234, for example, gives you all the portability of an acoustic coupler plus the reliability of a modem—all in one compact unit that operates at speeds up to 1200 bps. Every RS 232 terminal in your building can use it.

The new AJ 1256 Direct-Connect Modem—compatible with the AJ 1234 and Racal Vadic's VA 3400 series modems—also operates at 1200 bps. Just plug it into a voice or data jack and you're ready to go.

The A 242A Acoustic Coupler (over 15,000 now in use) connects to any RS 232 or TTY terminal. It's reliable, operates at speeds up to 450 bps, and is compatible with Bell 103/113 type data sets and other AJ couplers and modems.

And you can *lease* these units at low rates—even lower in combination with AJ terminals. You get the convenience of dealing with one company. And the peace of mind that AJ's national service organization gives you.

To get AJ into your timeshare system, get in touch with the AJ regional office nearest you: San Jose (408) 946-2900; Chicago (312) 671-7155; Hackensack (201) 488-2525. Or write Anderson Jacobson, Inc., 521 Charcot Avenue, San Jose, California 95131.

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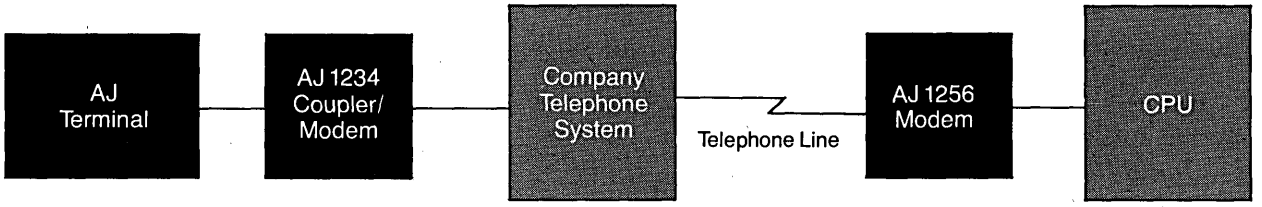
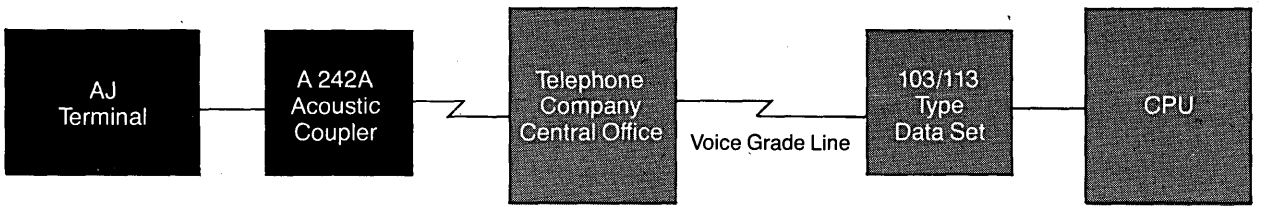


TYPICAL COMMERCIAL TIMESHARE SYSTEM



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CIRCLE 64 ON READER CARD

"OUR CLIENTS EXPECT THE HIGHEST LEVEL OF SERVICE, PERFORMANCE AND ECONOMY. WE CHOSE THE MEMOREX 3652 DISC DRIVES TO HELP US DELIVER ON THAT CONTINUING CUSTOMER COMMITMENT."

William Currie

Bill Currie is vice president of the Ottawa Systemcenter of Datacrown, Inc., one of North America's leading computer service companies and the largest in Canada. Datacrown will open a Systemcenter near Washington, D.C., in 1981. Datacrown relies on Memorex 3652 disc drives to help meet client data storage needs.

Memorex's double density disc storage subsystem is *not* designed to *just* meet the 40% annual growth rate in on-line storage demands. After all, no disc system on the market delivers more. 635 million bytes per spindle, 1.27 billion bytes per disc module, and over 20 billion bytes per disc subsystem. But companies such as Datacrown needs more than just capacity, they need **performance, reliability,** and **cost effectiveness.**

More Performance. 40% faster access times over single density products. 15% faster access times over competing double density products. Twice the fixed head capacity. Optimized mapping of the data tracks.

More Data Availability. Which means less downtime. A lot less. Thanks to any number of unique features, including damped servo system, variable settling time circuitry, proprietary bearing design and a unique HDA switching techique.

Cost Effectiveness. The Memorex double density design saves a full 23% in required floor space, 6% in power requirements, 3% in heat dissipation. Add to that the 100% saved by being a double density product and you wind up with the most efficient use of the most important resource of all... **your dollars.**

In addition, Memorex now introduces the exclusive Intelligent Dual Interface as an optional feature at no additional cost. Memorex's performance testing has confirmed that the Intelligent Dual Interface can:

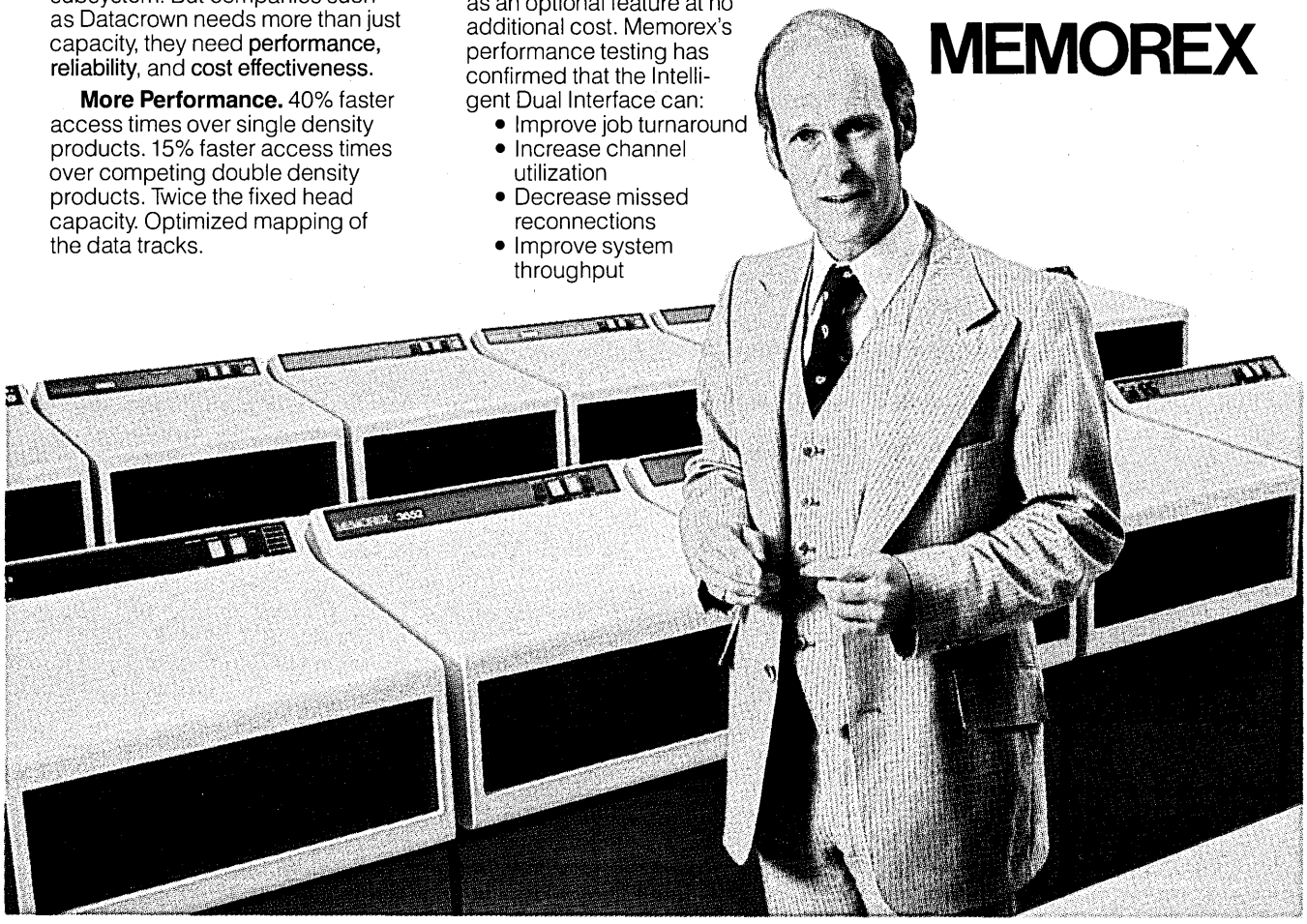
- Improve job turnaround
- Increase channel utilization
- Decrease missed reconnections
- Improve system throughput

And behind it all? Memorex experience. Four generations worth. And a reputation well served by over 30,000 spindles and one million disc packs installed worldwide, over 95% of them still in operation.

The Memorex 3652. It's a story that made sense to Datacrown. And we think it will make a whole lot of sense to you.

For more information on the 3652 disc storage subsystem, contact your local Memorex representative or write us at San Tomas and Central Expressway, MS 1449, Santa Clara, California 95052. Or call (408) 987-0701.

MEMOREX



CIRCLE 65 ON READER CARD

JAPAN SETS SIGHTS ON SOFTWARE

Buoyed by successes in hardware, Japan is now focusing on software. Its master plan is to catch up with the U.S.

by Edward K. Yasaki

PACKAGES ON THE UPSWING

Japanese users have to be educated to think in terms of software companies.

The growth rate of software sales in Japan is about five years behind that of the U.S., says Kazuro Fujimoto, president of Software ag of Far East Inc. He says he's speaking not of software sales in monetary terms, but rather the rate at which software is growing in Japan.

Fujimoto's primary product, of course, is adabas. The first installation in Japan took place in 1975. But following that first sale, to automaker Toyota Motors, there were no more sales for eight months. Believing in his product, however, Fujimoto and his salesmen persisted; in the ensuing four years, they had made 40 adabas installations in Japan, one in Singapore, and one at Philippine Airlines.

Four years ago, observes the gray-haired executive, there were some 25 installations in Japan of Cincom's Total, another 25 of Informatics' Mark IV, and only one of adabas. "The growth of my company," he says in fluent English, "is an index of the changing attitudes of Japanese users."

And that may well be a key to the future of the software industry in Japan. Those users are the targets of several programs designed to stimulate them to pay separately for software—whether they get it from their systems vendors or from software companies. The government is providing financing to encourage the development and sales of packages, and even the Software Industry Assn. at its conference in Tokyo late last year chose packages as its theme. Users of packages, and there are a few, go for such things as language processors, utility programs, and data base management systems, however, rather than applications programs.

Indeed, the best-selling package in Japan, with some 240 installations, was said to be The Librarian, from Applied Data Research. In second place was Easytrieve, from Pansophic Systems, with 120 installations, and in third place was Panvalet, also from Pansophic, according to a study published last July. No other package had 100 or more sales. Lagging further behind were Mark IV, adabas, Total, and such products as Dylakor's DYL-260, Syncsort, and Complete.

This study came up with a count of 772 installations of packages that originated abroad and 356 domestically developed systems.

One package not included in this count is an MRP (materials requirement planning) system for manufacturing companies being sold in Japan by Arthur Andersen & Co., one of the so-called Big Eight accounting companies in the U.S. The firm's Administrative Services Div., based in Tokyo and headed by partner Leighton F. Smith, has some 55 people designing and installing computer systems.

In his three-year stint there, Smith has installed the MRP system at two sites and is installing it at three more places. But the division has installed a number of other systems at Japanese customer sites for such things as general ledger, market analysis, and financial planning and control. In the use of software, says Smith, Japan is about 10 years behind the U.S.

Smith's staff has taken the MRP system developed in the U.S. and modified about half of it for the Japanese marketplace. They've added on-line inventory control, a new accounts-payable module, and an outside vendor-control system, for example, and removed such things as capacity planning and labor control.

The American company, selling something still relatively new in industry, has an educational job on its hands. It has to spread the gospel, sell the benefits of installing something called MRP. And this obviously takes time. But Smith says with a smile that he has no competition because Japanese software companies don't have such packages to offer.

Smith's generalization is valid. Users tend to rely on their mainframe vendors for software. Or they develop it in-house. But seldom do they think in terms of a software company, much less look for a proprietary package that might fit their needs or be modifiable to do the job. As a result, software houses have not been willing to develop generalized packages or to actively seek any salable software from the prolific American marketplace—until fairly recently, that is.

A survey a year ago of 400 Japanese computer users showed that 77% had used software packages but 23% had not. The users indicated they had worked with 270 packages that they had paid for, and an additional 286 that were provided to them at no cost. Users said almost 80% of the packages were supplied by their mainframe vendors, 22% originated with a foreign software company, and a mere 9% from domestic developers.

Of those who do not use packages, 56% said none fit their needs, 11% said they were too expensive, another 11% said they didn't know packages existed, and 4% couldn't find any packages that run on their computers.

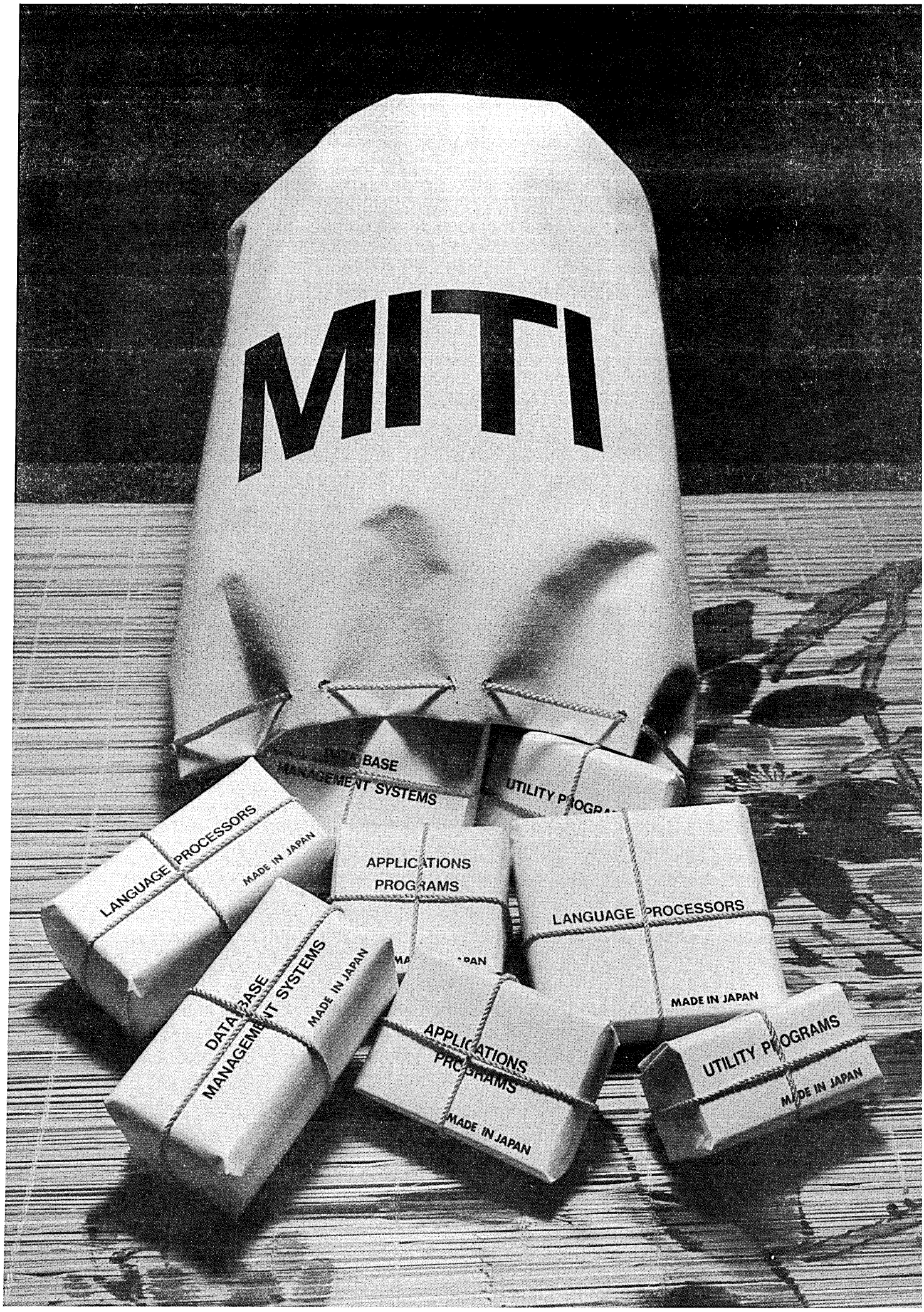
MITI ADDS MUSCLE TO THE CAUSE

Research is aimed at automating the production of software.

For the last few years, a conscious effort to upgrade the technical level of software knowhow in Japan has been under way. This is in contrast to the initial days of the computer industry, when the focus of government and private industry was on hardware. The latest in a series of government-subsidized research programs designed to improve the level of hardware technology was the so-called VLSI (very large scale integrated) circuits project, government funding of which is scheduled to end this year.

But while the funding of hardware projects was being phased out, the Ministry of International Trade and Industry (MITI) folded into the mix some money for software R&D. One of MITI's goals is to add muscle to the software industry, hopeful that some of the companies, at least, would develop software production knowhow, if not also a high degree of technical competence and innovativeness.

Toward this end, MITI has sponsored research aimed at automating the production of software—developing the capability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APPLICATIONS PROGRAMS
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to build a program by assembling it from its component parts. With such a system, it was thought, it could improve software productivity, the reliability of programs, and their maintainability. The so-called Program Productivity Development System (PPDS) was to be applicable to business dp software, including accounting, marketing, personnel, and production scheduling systems, as well as scientific/engineering computation—engineering design, operations research, and automatic control, for example.

It called for the development of software modules that could be linked into working programs; this effort began in 1973 and continues today. There also was a need for tools with which to handle the modules —to store them, to retrieve them, and to link and edit them. No claim was ever made for 100% automation, so facilities would also be required for the manual development of additional modules and their insertion into programs. An initial estimate called for the production of more than 9,000 such modules, but no one today will talk about the number of modules because it is said to be a meaningless quantity. It turns out that one group developing modules—say, in business dp—had a different definition of a module from a group working on engineering software. As a result, a module might be as simple as one line of code or as complex as a subroutine of a hundred lines or more.

The system has been demonstrated to the public, but early last fall there still had been no schedule drawn up for the system to go commercial.

The unpleasant fact is that Japanese users do not make much use of packages.

Within the Program Productivity Development System are supposed to be modules that will assist the designer in documenting what he is trying to develop and also in debugging his program. Included are such things as syntax checkers, flowchart generators, automatic documentation production aids, and cross-checking of variables. These are capabilities that have been around but, perhaps, never before brought together in one system.

One goal is to be able to write programs that are machine-independent. The output of the system is not a machine language but rather a language called CPL-B (common programming language B), which is a subset of PL/I. There are preprocessors that take CPL-B statements and convert them to PL/I that runs on the target machine. And all Japanese mainframes have a PL/I compiler.

"If PASCAL had been born two or three years earlier, I think we would have adopted PASCAL," laughingly says Hiroshi Suzuki, project leader of the PPDS project at the Joint System Development Corp., a company formed to coordinate work on the project.

Before the start of the PPDS project, the government took one of its early moves to stimulate the software industry. In 1970 it began making money available to software companies to help finance the development of salable packages, both applications programs and systems software. In the initial nine years or so of this program, some $2.8 million had been loaned out to fund the development of 84 systems, according to Fumihiko Kamijo of the Information-Technology Promotion Agency (IPA).

It is the IPA through which money is passed. Under this so-called multiclient development plan, a software house must come to the IPA with an idea for a new package it wants to develop, along with the names of clients who have promised to use it. Within five years, the software firm must return 70% of the development funds provided. Despite all precautions, sighs Kamijo, software companies are not profiting from these ventures. They normally show up with a list of 30 to 40 clients, but actually find only four or five buyers. The pattern has been for users to purchase applications programs, such as for simulation or education, and to rent systems software.

Kamijo, who is director of development and promotion at the government agency, says only 20% to 25% of the programs developed under this program have been commercial successes. A notable example is a FORTRAN language processor, of which there are said to be 80 installations, for a Nippon Electric Co. minicomputer. There also is a data generator system that prepares input data for some finite element method. More than 20 such systems are said to have been sold. Despite this lack of success, says Kamijo, the program "will be continued."

Thus the unpleasant fact remains that Japanese users tend not to use packages much. Out of a total software market of some $500 million in the 12-month period ending March 1978, sales of packages were an estimated 2% to 3%, says Teiichi Nishikawa, director of MITI's Data Processing Promotion Div. It is "nearly nothing," he laments. This lack of commerce in software packages, he fears, is partly to blame for the lag in software development and the lower level of the technology in Japan.

Accordingly, MITI has as one of its goals the elevation of package sales to 20% of total software sales by 1984. Few people view this as realizable.

To help achieve this goal, the Program Reserve System was implemented during the current fiscal year. Under this program, domestic software developers are allowed to register their program products with the IPA. When any of those packages are sold, the vendor is allowed to place 50% of the revenues into a reserve fund for five years. The amount placed into reserve is deducted from the company's annual revenues, thus lowering its tax obligations. After the five-year period, the company must pay its taxes on only 25% of the amount held in reserve.

UNBUNDLE: THE "IN" THING

More than 1,000 program products are now registered by Japan's JECC.

An indication of the extent to which Japanese mainframers have unbundled their software is provided by a look at the largest registry of program products in Japan. It exists at Japan Electronic Computer Co., Ltd., the company established by the six major mainframe makers to help finance system leases. Two years ago, on Jan. 1, 1978, JECC began maintaining a registry of programs available through the six systems companies—and a seventh, NEC-Toshiba Information Systems, which is a joint marketing company established by Nippon Electric and Toshiba.

As of Sept. 10, 1979, there were 1,060 programs registered there, most of them from Fujitsu. The breakdown shows 40 operating systems, 309 language processors, 88 DB/DC programs, 609 applications programs, and 14 miscellaneous. According to Akira Nakano, manager of the technical services department at JECC, more than 30 packages were in use and being paid for through JECC. The income to the leasing firm from this activity was averaging about $1,300 a month per package.

The numbers, however, are not terribly meaningful because the leasing company gets involved only when the user leases his system through JECC. Some mainframe companies, such as Hitachi, lease only a small fraction of their systems through JECC, preferring to handle the financing by themselves. In these cases, where the user purchases the hardware or rents or leases the system directly from the vendor, the software also is contracted with the supplier and not through JECC. Thus these statistics tell only part of the story.

But what's significant is that the mainframers have unbundled software, except for those programs that until now have been available to users at no charge. And this means that users will begin to become acculturated to the new practice of paying for software that previously had been supplied gratis by the system supplier.

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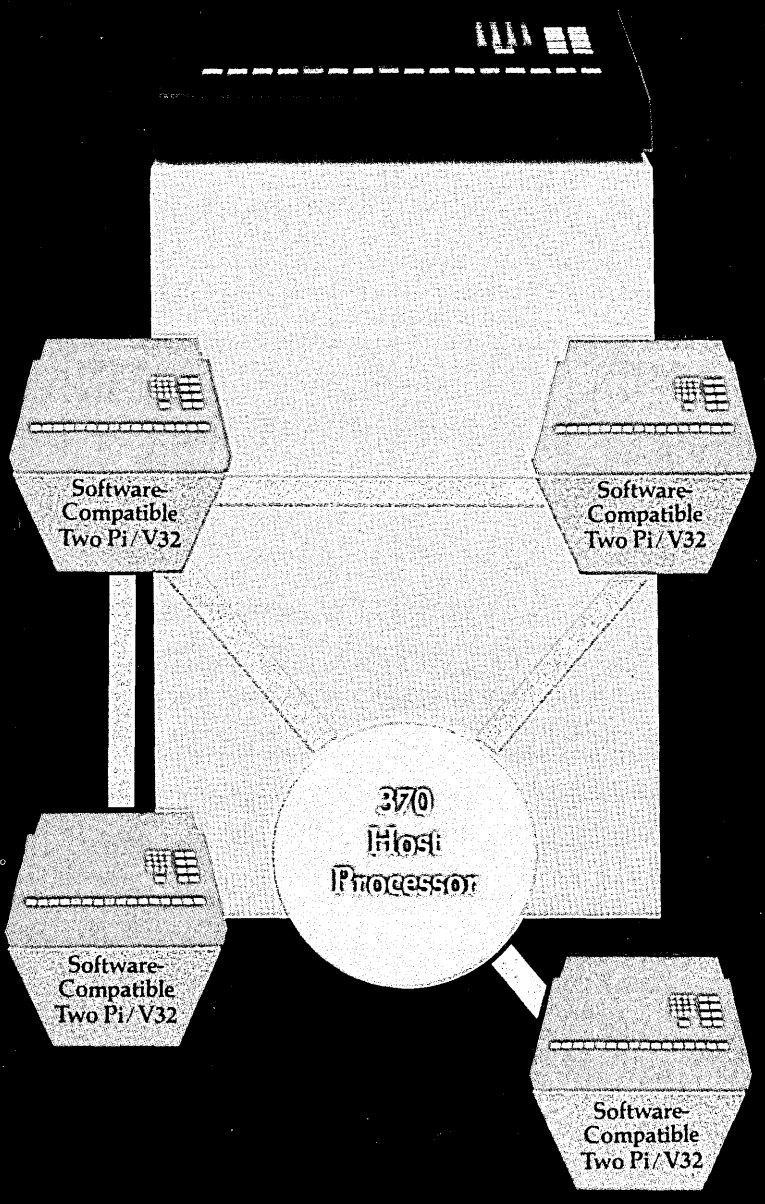

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FROM TOKYO TO TAIWAN

CAC establishes a staff of coders in Taiwan.

Many people have written about the differences between East and West. In the story below, Joseph C. Berston explains how one Japanese software company is capitalizing on its ability to segment the software production process. Mr. Berston heads Com-Stute Inc., a software firm in Yokohama, Japan, a job that has kept him in Japan for the last 20 years.

With a few exceptions, all software development in Japan is divided into three separate activities—problem definition, functional specifications development, and coding. In most cases, each activity is performed by a different group. It is a method of software production that has been perfected at Computer Applications Corp., Tokyo, a company that has no affiliations with any American firm of similar name.

CAC, founded in 1966, is one of the leading independent software companies in Japan, which is to say it is not linked with any of the mainframe manufacturers. Last year, with a staff of 240 people, it reported sales of 1.7 billion yen, or almost $7 million.

Special skills are required to look at a problem and develop a set of problem statements that accurately describe the real world. Different skills are required to develop functional specifications from a set of problem statements, and still other talents are required to code these functional specifications into a usable program. Segmenting these activities has been difficult in the U.S. for a number of reasons, but possible in Japan because of differences in the culture and work attitudes.

It is, of course, essential that the work passed onto the next group in the production of software be sufficiently detailed so that further involvement of the previous group is not required. And that's the way it is done at CAC.

The company was able to consider the establishment of a staff of coders in Taiwan, where CAC had sent some of its more experienced programmers on consulting contracts. They found the Chinese there to be well educated and quick to learn the skills required for software production. They also found that differences in wage levels between Japan and Taiwan were significant, and determined that they could capitalize on this by producing software there.

Producing problem definitions and functional specifications require contact with the customer. It therefore is not practical to perform these functions in Taiwan. Coding, on the other hand, would be practical because it required little or no contact with the customer. And it required no change in the method of operation at CAC. The only difference was that the coding group was about three hours away by air, instead of down the hall.

CAC Taiwan was founded in September 1978 as a joint venture with Systex Corp. of Taiwan. It organized a staff of some 25 software engineers, or experienced and certified programmers, including three or four from CAC in Tokyo. Functional specifications of new software are sent to Taiwan for coding and debugging and the finished programs returned to Japan.

The startup has not been without its problems, according to Shigeru Okubo, president and cofounder of CAC, but the work flows better and with fewer problems as each new job is handled. "At our present stage, we are experiencing almost no difficulties," Okubo says. "The operation is solid and smooth."

With the differences in wage levels between Taiwan and Japan, there should be a 30% to 40% reduction in costs. Ikubo explains, however, that the Chinese staff is still being trained and thus the company's experiences are not representative of a mature organization. "But I can say that all indications are that it will be a substantial (cost) reduction," he says.

OTHER COUNTRIES COOPERATE

To sell computer systems in South Korea, Fujitsu established a facility there.

Computer Applications Corp. is not the only Japanese company coming to terms with rising labor costs by producing software overseas (see above). The dominant mainframe manufacturer, Fujitsu Ltd., has a somewhat similar activity going on at its wholly owned South Korean subsidiary, Facom Korea Ltd. The operation is described below by another American, Mike Fidel, who has been completing his education and working in Japan for the last four years.

Software production was not the reason Fujitsu established a facility in South Korea. Rather, it was to sell computer systems there.

"The blueprint called only for the founding of a sales and technical support office," according to Masayoshi Kuribayashi, president of Facom Korea. The South Korean government, it turned out, had been studying general business trends around the world and concluded that the nation should get into the business of exporting software products. Fujitsu, therefore, was allowed to enter the South Korean market if it satisfied two conditions.

The first requirement, Kuribayashi says, was that Fujitsu tie up with a local company. The Japanese company would initially be allowed to have a 70% ownership position in the joint venture, dropping to 50% at the end of five years. As it turned out, says Kuribayashi, "They are still trying to find a suitable partner."

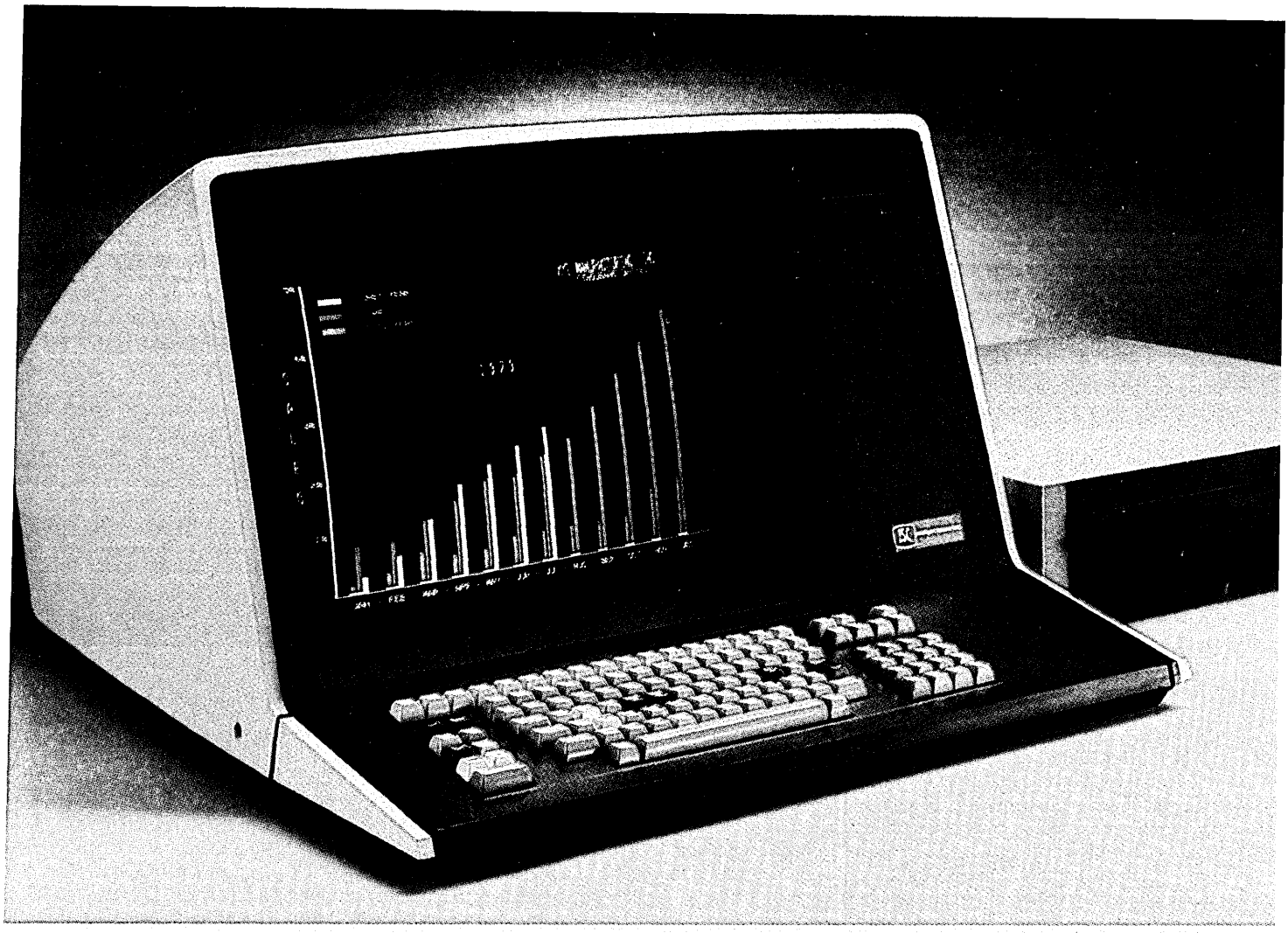
The second requisite was that Fujitsu establish a software development center to "train Korean people in the technical aspects of software production." This condition has been met, the Facom executive says. Of the 150 people at Focom Korea, about one-third are engaged exclusively in producing software that has been subcontracted to them from Tokyo. Adds Kuribayashi, "They even have an M-160 for their own use," a system equivalent to an IBM 370/148 in power.

Akihiro Ishii, vice president of Facom Korea, describes the development process as typical of most software work done by Japanese mainframe makers. Company software engineers in Japan draw up all the specifications, usually consisting of design and data layout charts, HIPO diagrams, flowcharts, and other documentation. The manufacturer can then either engage the temporary services of programmers dispatched by affiliated software houses or subcontract the work out, as is the case with Facom Korea.

"Korean programmers," Ishii says, "do all the coding and debugging with the occasional support of two resident Japanese specialists." He explains that the finished software product is sent to Japan for final integration and testing.

Ishii notes that the group began three years ago by producing systems software for a batch environment. "In fact, we were responsible for developing the fast one-pass FORTRAN compiler now being used at a number of Japanese universities," he says. His group is now said to be working on more advanced software, including subsystems for Fujitsu's OS IV/F2 and F4, which correspond to IBM's DOS/VS and OS/VS2, respectively. Optimism also shows on Yanghan Park, manager of the software development department, as he expresses his group's eagerness "to someday develop the nucleus of OS."

Since all software specifications are written in Japanese, one would expect the Korean staff to encounter language problems. Not so, claims Yoshio Mori, vice president in charge of the software development department. "Our members can read



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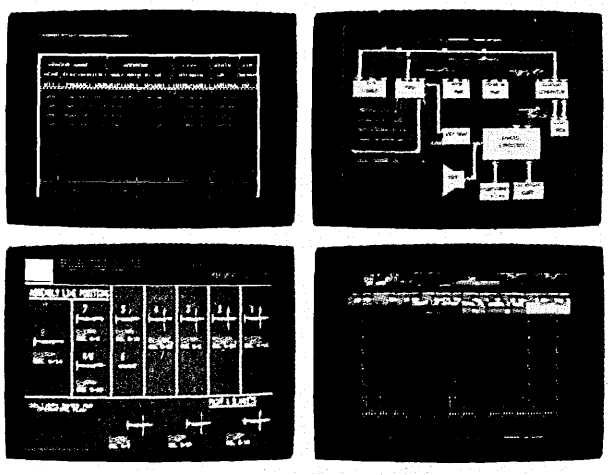

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and speak Japanese very well." He says all new employees are taught Japanese during their six-month probationary period. "As we share essentially the same grammar, Japanese is easy for them to learn. Besides which, most of our recruits have learned some Japanese while in college."

Described as a "company experiment," this is the first attempt by Fujitsu to produce software overseas. Adjustments have been made, according to Ishii, "to fit the Japanese concept for management to the Korean way of doing things." He thinks, for example, that Japanese employees tend to work together harmoniously toward a common goal, whereas Koreans tend to be more individualistic. "Management must keep a very close eye on things," he says.

If this experiment were to succeed, and it is said to be "too soon to judge," it is thought that there are only a few countries where it can be attempted. One requirement is that the overseas programmer be able to work in the Japanese language, for his instructions come to him in that form. And it helps to be somewhat close geographically to Tokyo. But Ishii also feels that software production could be undertaken in industrializing nations where there happens to be a sizable Japanese community. He cites Brazil as a likely candidate.

China is another. Says Mori: "Although our grammars are different, we use the same writing system." But for the moment, he thinks Fujitsu's experiment in Korea "just happens to be a special case."

JAPAN SIA ANALYZES REVENUES

Software companies still depend heavily on jobs from mainframe makers.

The average Japanese software company gets almost two-thirds of its revenues from software development activities, about 28% from the operation of a computer center, another 3% from the development and sale of turnkey systems, and less than 1% from the sale of software packages. That, at least, is the finding of a survey conducted by the Japan Software Industry Assn.

Much to their dislike, it was also shown that the companies are heavily dependent on jobs from mainframe manufacturers, who account for 60% of their sales; end users account for a mere 30% of sales. The large number of software houses whose future is tied directly to the continued good health of a specific mainframe manufacturer stems from the fact that Japanese mainframers farm out so much of their software needs. Some of the affiliated houses were formed specifically to serve these needs, not only performing the coding function but perhaps also dispatching personnel to the parent company as these needs arise.

At the same time, it should be noted that there are a number of major independent software companies with no ties to one mainframe maker. And such a company will often go out of its way to avoid any hint of reliance on one vendor for its business.

This can become a problem when an independent enters the turnkey systems business, perhaps acquiring a minicomputer here, a disk drive there, a crt and a keyboard from a third source, and adding proprietary software to come up with a small business system. The vendor might have to offer this system in three flavors—with an ABC minicomputer, a BCD mini, and an XYZ—not only to flaunt his independence but also to satisfy a user who prefers one brand of mini over another. From an economical standpoint, it makes no sense, but what's a systems house to do?

The same SIA survey, in which 60 major companies responded, showed that growth over the next five years would show up in the turnkey systems business, which could account for 8.4% of sales in 1984, and the software packages business, increasing to 4.8% of sales.

EXPORT MARKET ALSO EYED

Japanese are becoming aware of the benefits of proprietary software.

At a Software Industry Assn. conference in Tokyo last October, Teiichi Nishikawa of MITI said he was thankful for the excellent quality of the software packages imported into Japan from abroad because they have made people aware of the benefits to be gained from using proprietary software. In a private conversation, he adds that he is hopeful the Japanese will be able to export some packages they've developed.

And that, indeed, is the intention of the stronger software houses. Tokyo-based Computer Applications Corp., for example, has a package called ATOMS IV that is used for computer operation management. The acronym comes from automatic operation management system, and it was originally developed by Mitsui Bank, subsequently simplified and more features added by CAC. In the first year of sales, five installations were chalked up, according to CAC president Shigeru Okubo. Because CAC is selling the Mark IV system from Informatics, he said they were discussing the possibility of Informatics selling ATOMS IV in the U.S.

A system that is said to reduce computer operator personnel, called A-Auto, is being sold in Japan by Software ag of Far East Inc., whose president, Kazuro Fujimoto, is confident they can find a ready market for it in the U.S. This system, developed by Fuji Photo, the photographic supplies manufacturer, runs on IBM mainframes and performs job scheduling and monitoring. It is currently being developed into a generalized system.

"We want to do business with American corporations as well."

It's quite likely that CAC will be able to get Informatics to sell its software in the U.S. and that Mr. Fujimoto can get Software ag of North America to do the same for his packages.

But other Japanese software companies have begun opening offices of their own in the U.S. The start of this is seen in Southern California, where two companies have begun operation.

In the first year of its operation, a company called Management Information Science Intl. in Torrance has garnered two systems development jobs, one as far away as New York City. There, it is developing an on-line real-time system for Nissho-Iwai, a large trading company with a 370/148. And in nearby Gardena, MISI is developing a parts control system for American Honda, the automobile importer. MISI vice president Takeshi Sakai notes that two other automotive firms, Datsun and Toyota, are also based near by. With a staff of only 10, he's forced to concentrate his sales pitch on Japanese companies doing business in the U.S., he says, "but we want to do business with American corporations as well."

Last August, a company named DPC America Inc. opened its office in downtown Los Angeles. Like MISI, it traces its ancestry to a software and services company in Tokyo, and seeks initially to offer consulting services to companies from Japan, of which there are an estimated 400 in Southern California. Both companies are placing a lesser emphasis for now on the search for software packages that might be marketable in Japan. But DPC America's Haruyasu Nakayama says he sent several packages to Tokyo for determination on marketability.

How about selling Japanese packages in the U.S.? "That is an interesting field, too," says Sakai. Definitely, says Nakayama, although there will be a problem with documentation. He adds that an American company trying to get into the Japanese market might feel the necessity to form a joint venture, and the same might apply to a Japanese company entering the U.S. market. ✲

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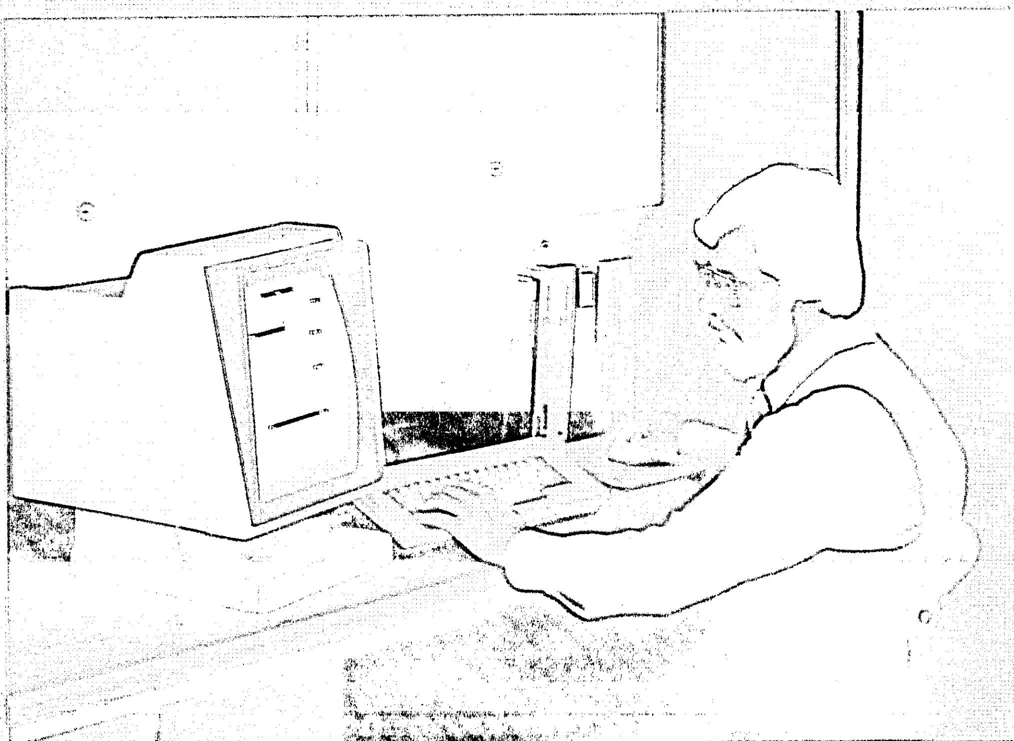

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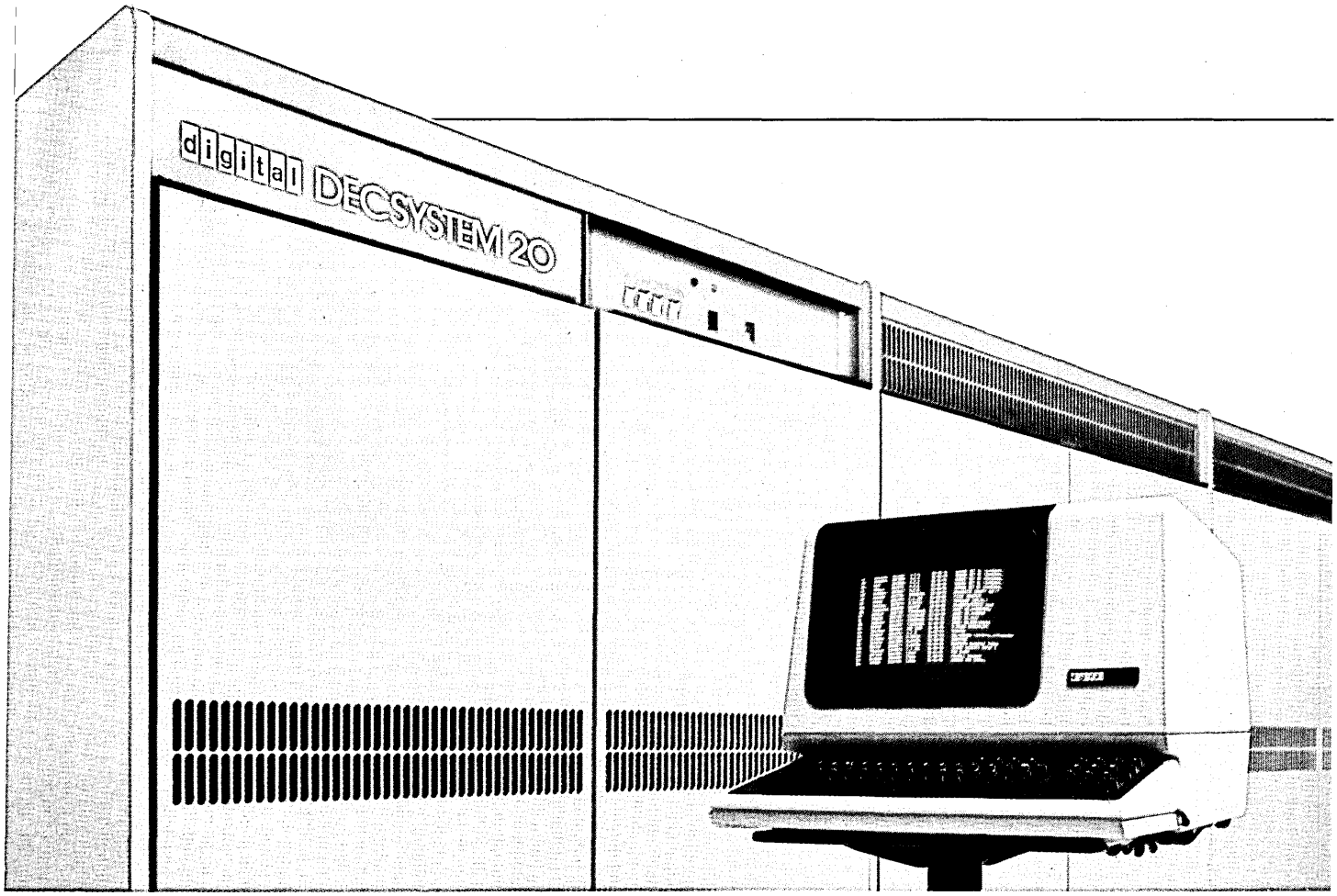

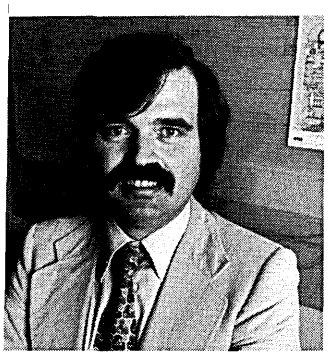

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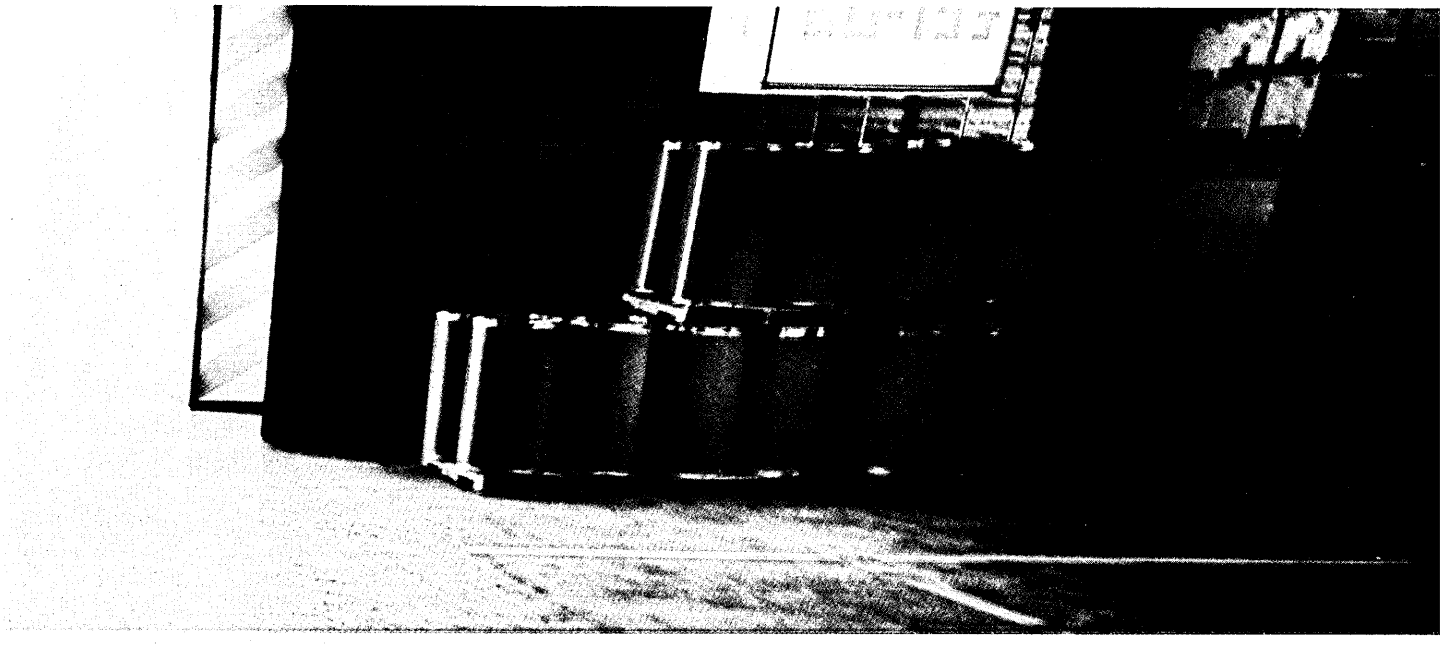

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LOOK AHEAD (Continued from p. 22)

$500,000, depending on bells and whistles. Also hard hit are 148s and 138s. According to one source, the 138 at this time next year will have minimal value.

LOW SPEED MODEMS GET NEW VITALITY

For years low speed modems have been regarded as basic black boxes that were required when data had to be transmitted. But suddenly the 300 to 1200 bit per second modem has taken on new vitality.

A breakthrough has been achieved by Universal Data Systems, Huntsville, Ala., with its 103LP that gets its power from, of all places, the telephone itself. Using standard new plastic phone plugs, the user simply connects the modem to the phone and it is ready to operate. The unit has been type-accepted by the FCC and (presumably) has the blessing of AT&T technical experts, who thus far have raised no objections. The originate-only 300 bps modem costs $195 and is reportedly the first of the series from UDS.

Another major vendor of low speed data sets is reportedly ready to announce a standard telephone that contains a built-in modem. And the tendency of small users to buy their first system at a retail store has not escaped the modem makers either. Penril Corp., Rockville, Md., is test marketing its 300/1200 bps modem at a retail outlet in the Washington, D.C. area.

IT'S STAKES TIME FOR MONEY COUNCIL

The Electronic Money Council, formed in June 1977 "to promote the positive side of electronic funds transfer (EFT)," may have broken down an important dam. It has signed up its first hardware supplier -- none other than IBM, with a $21,000 initiation fee. The association has been working hard on vendors since its inception and has wondered why their reluctance. "They have a big stake in public acceptance of EFT, as do we," said one EMC officer working on the problem. ("We" meaning the financial institutions which got EMC rolling.) Looks like it's big stakes time.

RUMORS AND RAW RANDOM DATA

With the protective wraps slipping off the International Record Carriers -- obliterating the distinction between domestic and international carriers -- look for increased mergers and joint ventures in the overlap. Recent Western Union deal with Tropical Radio and Telegraph is a harbinger. ...With the Post Office's electronic mail ambitions being knocked by the FCC, the White House, and even the Postal Rate Commission, look for independent operations in ECOM (electronic computer-originated mail) among the multinationals. Major oil companies are reportedly impatient to move in on their own.

DATAMATION INDEX AVAILABLE

The DATAMATION Subject Index of Articles published in 1979 editions of the magazine is available to readers. Until the supply runs out, copies may be obtained by circling #310 on the reader service card in the back of this issue.

NEWS IN PERSPECTIVE

COMMUNICATIONS

DECNET TAKES AIM AT SNA

With its Phase III upgrades, DECnet appears to offer the major architecture alternative to SNA.

Addressing some previously unanswered concerns of users, Digital Equipment Corp. has developed upgraded capabilities for its DECnet communications network software.

With the launching this month of DECnet Phase III, DEC has served notice that its network can provide dynamic adaptive alternate routing, will interconnect with IBM's Systems Network Architecture, and will be X.25 compatible to allow interfacing with the emerging public data networks.

Taken collectively, the Phase III upgrades appear to make DECnet the major architecture alternative to SNA. Considered individually, DEC's networking features are not now available from IBM or other vendors.

The crucial dependency of communications networks on the often fragile reliability of common carrier facilities makes the availability of backup data links vitally important. When a network link fails, it is desirable for the network to have the capability to switch to an alternate link automatically under computer control, selecting the next most efficient link to do the job. Such adaptive dynamic alternate routing has not been available for users of network architectures, although IBM and others have been working toward that goal.

DEC calls its alternate routing capability Adaptive Message Routing (AMR), and it allows one DECnet node to send messages to as many as five intermediate nodes. Each node stores a routing table for the entire network. Where more than one path exists between source and destination nodes, the network automatically selects the least cost path according to line values assigned by the network manager.

The least cost routing tables are updated whenever changes in line status occur. If service is interrupted on any link in the network, DECnet automatically reroutes the message across the next least cost path. Although least cost tables are normally used for the alternate routing capability, other criteria such as traffic loading, for instance, could be substituted, explained Michael Weinstein, DECnet product manager.

DECnet now incorporates two types of routing nodes. The first can send, receive, and forward messages; the second type, called end nodes, only sends and receives. Multitasking DECnet systems running under RSX-11M-Plus can function as either routing or end nodes while small single-user systems using core-only RSX-11s participate as end nodes only, a DEC spokesman said.

DEC has also begun a program to provide compatibility with IBM SNA networks. The first product is an SNA protocol emulator that runs under RSX-11M and allows point-to-point connections between "any mapped PDP-11 with 128K of storage" and an SNA net, Weinstein said. The SNA/PE product simulates the operation of a 3790 programmable cluster terminal controller and allows a PDP-11 system to communicate with an SNA host machine. The emulator is said to allow users "knowledgeable in SNA" to develop applications which can interface with application programs running under IBM's CICS, IMS, TCAM or VTAM.

Three levels of support are available under SNA/PE—Emulator Control (EC), Extended Emulator Control (XEC), and Application Control (AC). EC requires the least involvement for the application in SNA protocol, but has restricted support for protocol options. EC mode could be used to send data to a CICS, VTAM or TCAM application, and the user is responsible for providing an application program covering the end-user level or layer in the SNA system.

XEC provides more support of SNA, but requires the user to get more involved with the SNA layers. This mode would be required by users who want to interface with an IMS system running in an SNA network. By using the XEC mode, the user gets access to "functional management headers," which allow routing to a device or data compression. The user also has access to sequence numbers and bracketing information, according to DEC.

The AC mode is described as the most powerful method of interfacing. It gives the application direct access to the SNA transmission subsystem. The user is responsible for having the RSX-11M system cover the end user, presentation, services, and data flow control layers of the protocol, the company explained.

A future upgrade will be X.25 support, promised out within the next 24 months.

The SNA protocol emulator can support up to 61 SNA sessions and is used in conjunction with the DUP-11 synchronous line controller. It may also be implemented with the KMC programmable microprocessor for greater line efficiency, Weinstein pointed out. Up to four DUP-11s can be supported under the 3790 emulator program.

Also as part of the Phase III announcement, DECnet incorporates a multipoint capability, the ability to support

network command terminals, which were described as a form of virtual terminal, and network management capabilities.

The multipoint or multidrop feature allows up to six remote (or slave) systems to communicate over a single line with a host (or master) system. The host controls communications and polls each remote system. Multipoint configurations can exist within larger nets as subgroups enabling both master and slave systems to participate in message routing, file transfer, and resource access to other systems.

The network command terminals capability allows terminal users at one DECnet node to interact with any other node utilizing the same operating software. Interaction proceeds as if the terminal were local to the remote system and the network interface is said to be user transparent. Network command terminals provide users with direct access to programs and devices on remote systems "with minimal interruption of local processing," DEC claimed.

Network management allows control centers to be established at one or more nodes to monitor loads, error rates, line condition and node status "at any point in the network." Network management software is said to enable the network manager to evaluate network efficiency and optimize traffic flow by dynamic adjustment of line values and routing tables. The control centers can perform system and line testing online, Weinstein said.

Although the DECnet upgrades did not include a specific X.25 compatible product, Weinstein said this would be announced with the rest of the Phase III program within the next 24 months. The initial mention of X.25 support is designed to assure users that DECnet systems will be able to interact with X.25 links and nets, Weinstein explained.

A key element of DECnet Phase III is the customer support plan, which provides the user with various levels of vendor assistance. Network design, performance analysis, and customer training can be included under the plan which is customized according to customer needs.

DECnet Phase III support systems running under RSX-11M, RSX-11M-Plus, and RSX-11S will be available next month. Support for systems running under RSTS, VAX, TOPS-10, and TOPS-20 will be available soon, along with the SNA emulator software, DEC said. The next Phase III addition will be made within four months, Weinstein promised.

One-time software license fees for Phase III software are as follows: $7,000 for the SNA emulator package, which runs under RSX-11M; $3,500 for other Phase III features running under RSX-11M; $1,500 for those running RSX-11S; and $5,000 for those running RSX-11M-Plus. First deliveries are scheduled for the end of next month, according to a DEC spokeswoman.

TECHNOLOGY

FERRITE'S OUT, THIN FILM'S IN

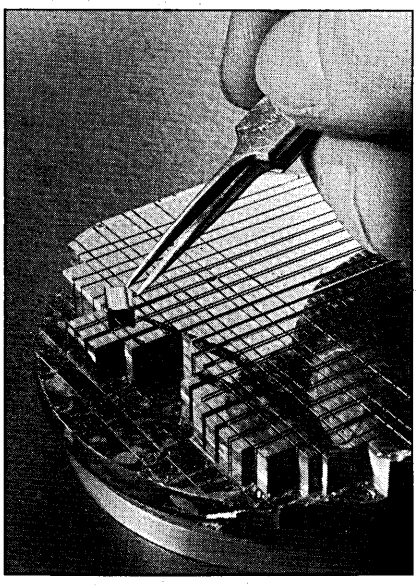
The new thin film read/write head will significantly improve disk drive price/performance.

As more users take deliveries of their IBM 3370 disk drives, a new technology is being dispersed through the community. The thin film read/write head, a significant upgrade from the ferrite heads now in use, is expected to touch off a new wave of improved disk drive price/performance specs.

"The significance of the thin film head is that it achieves higher bit densities per square inch and thus gives you more bits per dollar per drive," says Raymond C. Freeman Jr., a consultant in Santa Barbara, Calif. It does not allow you to build a cheaper drive, he explains, but "you get more bytes per buck."

In thin film heads, the semiconductor technology is applied to the manufacture of heads, making it possible for the first time to batch-fabricate them. As in the conversion from the use of core memories to semiconductor memories, the new product is no longer labor-intensive. Rather, it is capital-intensive. The winding of cores for the read/write head is replaced by a deposition process.

"It's going to make a major change in peripherals," says Joel H. Levine, director of marketing at Magnex Corp., an Exxon-affiliated company organized to produce the new heads in San Jose, Calif. The computer user, he adds, "is going to get higher performance, higher capacities, and higher throughputs from the next level of peripherals he's going to see."



The new thin film heads are like semiconductors and are made by a deposition process. MAGNEX will use a thick wafer and integrate the thin film head with the slider in one piece.

The use of thin film heads by IBM in its new 3370 disk drives, deliveries of which began only recently, is expected to provide an impetus to the wider application of this technology. Says Levine, "Finally IBM has taken the big step, which now establishes credibility for the concept and creates some very broad market demand."

People have been talking about thin film heads for years. In a limited way, it has been on the market for a few years, one user being Burroughs, on a head-per-track disk drive. But there has been no major commercial application until the IBM 3370.

Magnex's Levine explains that it is necessary for IBM to take the lead in the use of something like thin film technology. It was not until IBM came out with its own floppy disk drives, for example, that that craze began. The oems then applied their innovativeness, improved the product, and helped push both the technology and the market. The same can be expected with thin film heads, says Levine.

"I think the significant point is that they [IBM] took the first step, and now the marketplace with its innovative capabilities will go ahead and extend that into all kinds of products far beyond what IBM is offering."

There had been no major commercial application of thin film heads until the IBM 3370.

Over the shorter term, however, thin film heads promise to increase storage capacities and produce higher throughputs in disk drives, later on with tape drives as well. The IBM 3350, for example, uses ferrite heads, records at some 50 tracks per inch (tpi), and packs approximately 6,000 bits per inch (bpi). But in the newer 3370, with thin film heads being rated conservatively, data is recorded at 635 tpi and along the track at 12,000 bpi. Thus the areal density is more than doubled, to some 7.6 million bits per square inch.

Besides packing data more densely, however, the new head technology provides an additional leg up on ferrite heads. Whereas heads in the past have written onto and read from only one track at a time, requiring then a repositioning, with thin film it becomes practical and economical to produce multiple-track heads. This means, of course, that instead of having to reposition a head to read an adjacent track, a slow and mechanical process, one need only switch electronically from head to head. So, in effect, one achieves a larger cylinder and

lowers the average access time. This becomes especially significant with the smaller 8 inch disks, where there isn't too much information stored in one cylinder.

On its 3370, IBM is said to have two heads on an access arm, although only one is used. That gives them a choice; they can use the good one and in this way can improve their yields. In its initial offering, says Levine, Magnex will do likewise because in the oem world that Magnex sells to, everyone at the start does as IBM does. Getting back to the example of the floppy disk, Levine points out that initially everyone started with the same media revolving in the same direction. Only after market acceptance were the oems able to develop variations on the original theme, and the same will apply to the configuration and applications of thin film heads.

In the oem world, everyone at the start does as IBM does.

But after the initial exposure, how many heads might there be in one unit? Five to 10 as a starter, says Levine. "And it'll increase as we improve our yields."

In addition to the heads, improvements are also expected in the media, the disks themselves. The 3370 uses oxide-coated disks rather than newer plated disks, which would be able to accommodate even greater packing densities. Using thin film heads and plated disks, experts say, areal densities of from 50 to 100 million bits per square inch are possible, perhaps by the mid-1980s.

Analysts at the research firm of Input in Palo Alto, Calif., say the intermediate step between today's coated disks and plated disks will be what is called high-energy oxide coatings. In a study just released, Input sees continued decreases in prices for disk storage (see table) through the remainder of the century. The next decrement is expected early this year with the announcement by IBM of its follow-on to the 3370.

Other observers note, however, that the price of drives has remained fairly constant over the years. What brings down the price per megabit is a constant doubling in capacity, and this comes about because manufacturers keep increasing the areal densities by improving both media and heads.

The technology currently in use is something called inductive heads, which detect the presence or absence of a recorded bit by measuring a change in flux. But in the laboratories is a new technology called magneto resistive. Instead of measuring a change in flux, this thin film material is sensitive to the level of a flux. It has two main operating advantages: It can work with narrower tracks, making possible even greater areal densities, and it is not sensitive to the speed of the media passing by. This means it can be used with slower-speed tape drives, for example, and with floppy disk drives, and some 8 inch Winchester drives.

"So we're in the infancy of thin film technology," says Magnex's Levine.

—Edward K. Yasaki

DISK COSTS AND FUTURE PROJECTIONS

IBM Model	Year Announced	Cost/MBit/Month
2311	1964	$89.00
2314	1965	14.20
3330-1	1970	8.78
3340	1973	9.63
3330-11	1973	5.46
3344	1975	3.94
3350	1975	2.75
3370	1979	1.91
33XX	1980E	1.10
XXXX	1985E	.55-.80
XXXX	1990E	.30-.55

E=ESTIMATE
Source: INPUT

OFFICE AUTOMATION

SPIFFY OFFICE AT AMOCO

AMOCO has an electronic integrated office that's so popular it has to schedule tours for visitors.

"I think what we're doing is best termed mechanization," explained James Steward, manager of computer research at AMOCO Production Co., Tulsa, Okla. "We're just looking at things that are being done in the office and trying to better mechanize them."

It's a modest claim from the man who directed the implementation of what many IBMers consider the most advanced "office of the future" system up and running. Working with IBM, AMOCO—the exploration and production arm of Standard Oil of N.J.—developed a powerful electronic mail and message system on a 370/168, using the transportable VM/CMS, IBM's popular conversational monitoring OS. Steward has found it necessary to schedule monthly briefings on the system for outside visitors; and the tour is nearly booked two months ahead.

"There is no doubt in my mind that the VM/CMS faction within IBM has won the interactive contest," Steward said. "I think MVS will stay for batch-type jobs, but I think VM/CMS is going to be IBM's only major offering in interactive computing in the near future."

AMOCO calls its system EOS—Electronic Office System—and it was developed at Tulsa's AMOCO Research Laboratory over the past two years, AMOCO adapting a set of programs provided by an "unnamed" vendor. "We are not claiming to have made great strides in going in and changing the whole darn office structure," said Steward. "That is going to come, but my personal opinion is you better go through the complete mechanization stage first and then double back. It's kind of like writing a computer program. I don't care how great a computer analyst you have. There are very few computer systems ever designed that are then built exactly the same way. . . . I think the learning curve here is much greater than most people realize."

At AMOCO, the computer research staff was first drawn into the field in the early '70s. The corporation had decreed that each facility would have word processing centers in 1972, but the wp center for the lab was constantly overburdened. "The girl in charge of the wp center came up to us and said, 'You have a computer, can't you help?' " The computer center had just obtained IBM's SCRIPT program, so it consented. By 1975, with rewritten software and hardware modifications, the lab had a very efficient wp system on-line on a 370/158.

Steward said the big leap took place in September 1977, when the computer center obtained a set of programs—from the "unnamed vendor"—that were the core of an electronic mail system for VM/CMS. The two systems, the SCRIPT wp and electronic mail, have been integrated and expanded into AMOCO's Electronic Office System. "When we first got our hands on the mail system it was from a bunch of computer scientists who were used to writing commands," explained Steward, "but we've since put a lot of effort into transforming it into a menu-driven system so that professionals who had never used a computer would not be afraid of it."

The users' key to the system is the EOS "mail log," which alerts a user to incoming messages. "We've been deeply committed to interactive computing for a long time," said Steward, "and we felt strongly that our scientists should have this. We now have about 500 terminals in this building, for about 650 people. That includes just about everyone who needs one —almost every professional on staff has his own, including the vice president of research, who uses his heavily." Under VM/CMS, he said, the complete EOS demands about 3% to 4% of the 168's resources.

At AMOCO's Research Lab, "we do not have secretaries in the normal sense any more," said Steward. "I do my dictating through the word processing center. They enter everything into the computer, so I can edit it on a crt or as hard copy if I want. The

Datapoint will lease you this 420K Computer System for $1,950* a month and ship it in about 12 weeks.

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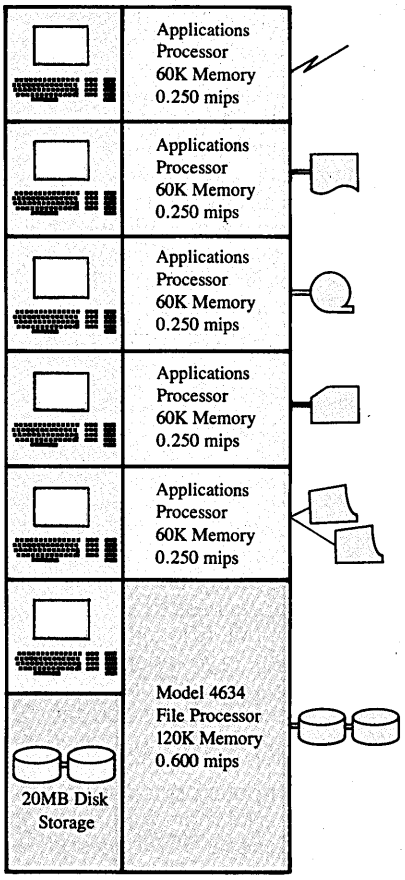

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The ARCPAC shown here, for example, can handle 1.85 million instructions per second (mips). Add on another 60K processor and the system's capacity increases to 2.10 mips. A second 60K processor added on brings it up to 2.35 mips. And on and on, almost without limit.

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You have plenty of add-on options to configure the ARCPAC precisely to your needs. These options can include additional processor power, more disk capacity, extra terminals and compatible Datapoint peripherals like printers, magnetic tape drives and others. You have a wide choice of telecommunications systems to make the ARCPAC part of a geographically dispersed network.

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document is eventually filed, however, and if it is to be transmitted to the research center there are never any more hard copies unless someone wants one for some reason.

"This system has a pretty nice audit trail on it and it has several levels of security. We're now starting to put our computer manuals into the system, but our current emphasis is to make the whole system more user-friendly and forgiving.

"We're going to be placing a lot of effort on something we misleadingly call PHONEBOOK," said Stewart. "It will start with a phone directory for the entire corporation, but it will evolve into a system of distribution lists. So if I want to send something to everyone on distribution list 122, the EOS will send it electronically where it can, and print hard copy and mailing labels where it can't."

AMOCO's lab now has fewer secretaries than it had eight years ago, when it first introduced the wp centers—although total staff has about doubled. Now, said Steward, "we have 11 women plus supervisors in the wp center and we have women who won't leave, women who no longer consider it a promotion to be made an administrative assistant to some supervisor. They'd rather work in the wp center because they find it more challenging. It's a strange phenomenon."

—Vin McLellan

MEETINGS

PTC '80 WEATHERS THE STORM

Though the natives called it "liquid sunshine," the rain didn't dampen the spirits of PTC '80 attendees. They were more concerned with stormy topics than tropical storms.

The second annual Pacific Telecommunications Conference was held in Honolulu, Hawaii, during some of the most adverse weather the island state has experienced in 20 years.

On the second day of the conference, in early January, a severe tropical storm came ashore on the island of Oahu, knocking out power and blowing gale force winds across the usually placid setting of Waikiki beach.

Although technical sessions on the second day had to be delayed several hours due to high water and electrical problems, the conference attained its major goal of forging a framework for telecommunications understanding among the countries which surround the Pacific Basin.

PEGGY KARP: Many issues in the original version of X.25 were not precisely defined.

More than 500 delegates representing over 20 countries attended the three-day event, which devoted a large number of sessions to the problems associated with bringing satellite and other advanced

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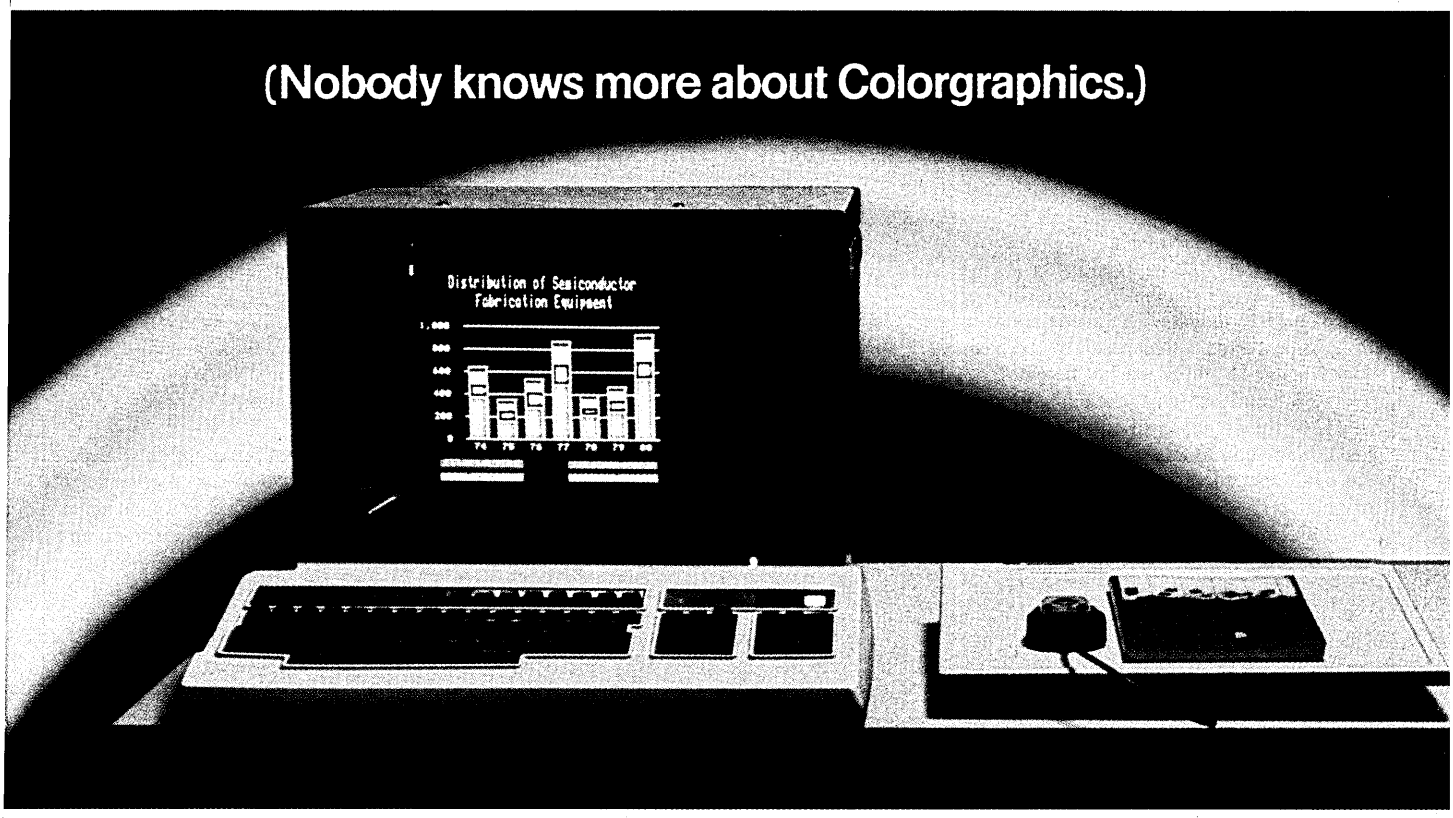

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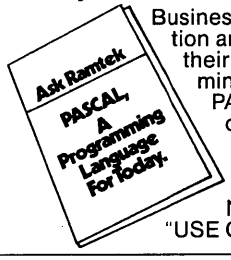

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telecommunications services to lesser developed areas of the Pacific.

A permanent organization to establish a forum for discussion of Pacific telecommunications problems and interests was established, and it was decided that PTC '81 will be held in January of next year again in Honolulu.

One of the most important issues discussed at PTC '80 was the standards-making effort now going forward to reach agreement on a universal public packet network interface.

In a highly technical paper describing the detailed problems existing within the present X.25 standard, Peggy Karp of GTE Telenet, Vienna, Va., traced the evolution of the standard which is now the basis for virtually all public packet networks.

When X.25 was originally adopted in 1976, the standard filled an immediate need for a commonly accepted protocol, Karp said. But there were many issues in the original version that were not precisely defined and thus were left for further study, she pointed out.

Up to now, the lack of a standard user interface has meant that special interfaces to packet switched networks have been designed by individual network providers. As a result, data communications vendors have had little incentive to program their products to interface with packet switched nets, since a unique interface would have to be implemented to connect to each network, she said.

Despite its shortcomings, X.25 has served to provide a sound framework for the development of a user interface to at least five operational public packet switched networks. In addition, the existing version of the standard has provided a framework for vendor X.25 implementations from such companies as Data General, Prime, and Tandem, she explained.

As emerging public data nets become operational, questions arise about the continued viability of private nets.

The proposed technical changes now being considered will eliminate remaining problem areas and unresolved issues which were present in the original version. Once these changes are adopted by the CCITT, future standards work can then concentrate on the specification of the so-called higher level protocols, Karp concluded.

One of the vital policy issues facing many countries and users was raised by Philip A. Tenkhoff of Network Communications Intl., Olympia, Wash., in a presentation titled 'Private vs Public International Networks: Coexistence or Annihilation?' As the emerging public data networks become operational, Tenkhoff said, there is some question about the continued viability of private network facilities.

Private networks developed because the public carriers could not provide the services desired by users, Tenkhoff told session attendees. These included error free facilities, volume dependent tariffs, diversity of data speeds, and high reliability—all of which were important to data communications users.

The private nets that evolved, he continued, generally lacked standards, but they were cost effective and were basically nonregulated except for their tariffs. As private nets have grown in capability and proven their operational value to users, their role as part of international nets has become uncertain.

According to Tenkhoff, this uncertainty has been caused by the emergence of public data networks. The operational value of these networks has not yet been demonstrated, he added, and many of them ran into early difficulties. Although the public data nets employ international standards and advanced technology such as packet switching, they offer restricted protocol support.

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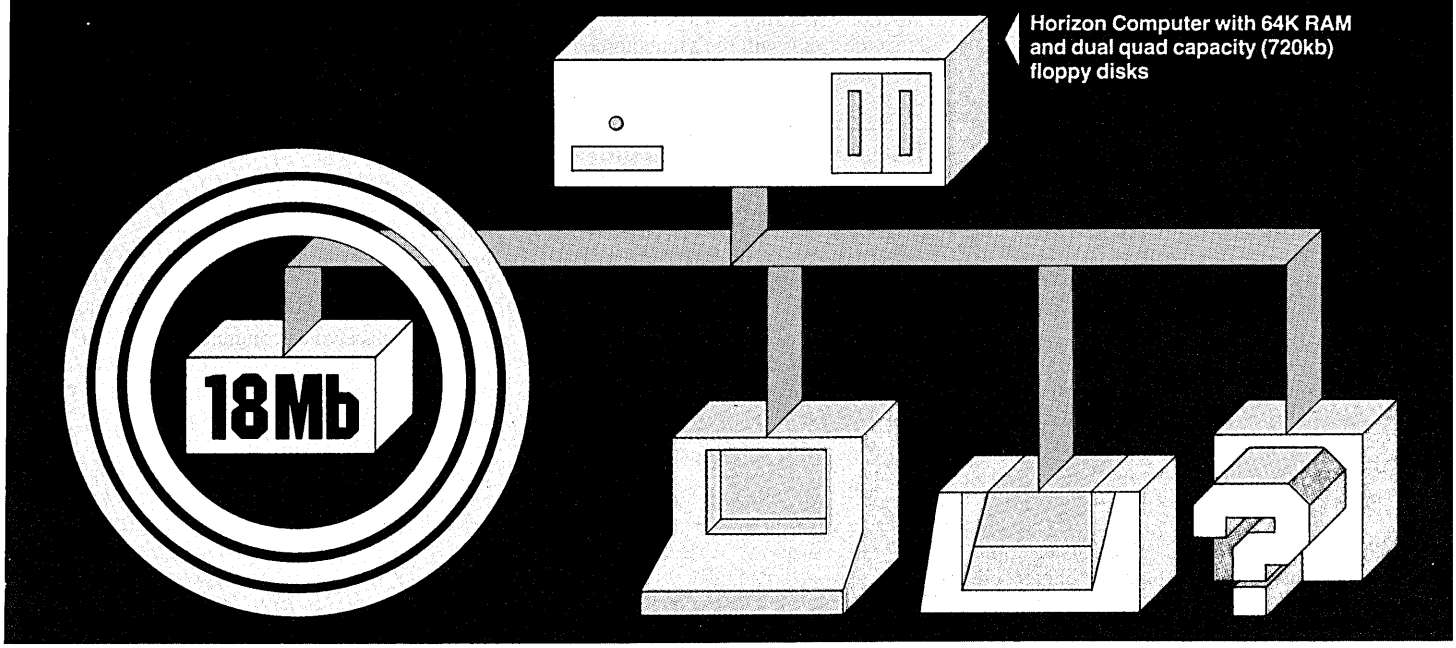

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countries are developing the public data nets there, the question arises as to whether private network facilities will continue to operate, he explained. If the availability of private lines is regulated to status quo, then there will be serious restrictions placed on users who want to expand their private networks. Tenkhoff added that the cornerstone of private networks is the leased line tariff, and there is evidence that some PTTs want to shift these flat rate facilities to volume dependent alternatives. He noted that such a recommendation has been made by Italy before an international standards body.

Despite the apparent deemphasis of private lines in many countries, there are questions about the ability of public nets to meet user demands. These X.25 networks generally do not support binary synchronous communications and batch protocols such as HASP. In addition, Tenkhoff said, they do not operate at higher data speeds. He added that there is also some question about the effect that transborder data flow restrictions will have on the public networks. In view of these many uncertainties, Tenkhoff told attendees, users are not at all clear about the potential for interconnections between public and private networks.

Behind the public versus private network debate rest questions of telecommunications policy. Tenkhoff contended that the user is concerned with cost effective facilities, reliability and flexibility of service; the PTTs, on the other hand, are concerned with optimizing revenue, maintaining control and prestige, and providing the greatest public benefit. Within this environment the PTTs want to develop national public data networks charging volume sensitive rates, and they want to discourage use of private networks by increasing flat rates and setting up usage restrictions, Tenkhoff charged. He predicted that the 1980s will see a tenuous coexistence between public and private data networks.

The emergence of videotex services will require the telephone companies to examine the impact on the phone network.

During a question and answer period, Philip Kelly of the British Post Office said the PTTs did not want to do away with private net facilities. But he did urge the development of international standards for private nets. It is expected that private network users will utilize public facilities for backup, Kelly said, but this type of usage is limited so long as private nets do not operate under common standards.

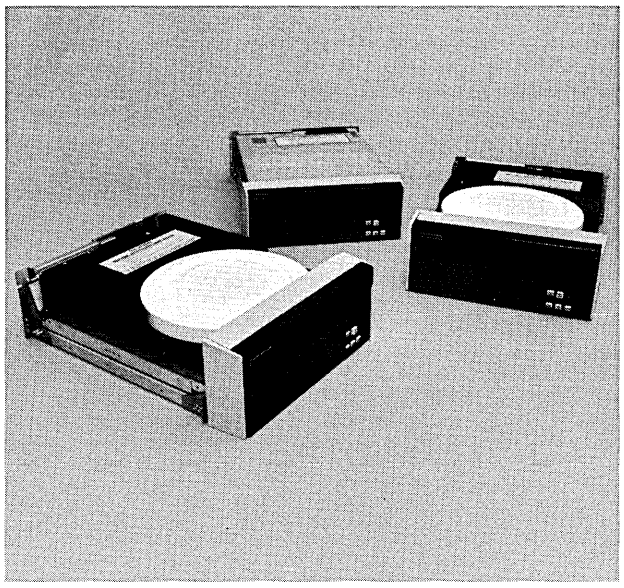
In a session discussing information retrieval services in the home, Don M. Berry of GTE Corp., Stamford, Conn. predicted that viewdata or videotex services would soon be introduced successfully in the U.S.

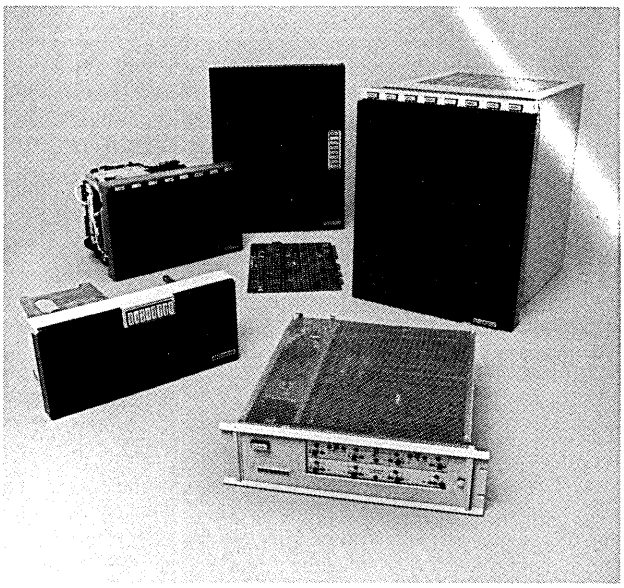
The components needed for videotex services such as inexpensive computer systems with massive amounts of storage, packet nets with distance insensitive tariffs, and special semiconductors for use in personal computers and video games are all available now, he noted.

Berry warned, however, that the emergence of videotex services will require that telephone companies examine the impact these services will have on the telephone network and particularly on the local phone net. By 1985, he predicted, half of the 100 million households in the U.S. will have terminals operating on the phone network.

According to Berry, these terminals will not replace voice communications, but instead will add new traffic to the telephone network. Letters will be replaced with electronic mail, checks will be replaced with electronic funds transfer, shopping trips will be replaced with purchasing-at-home, and magazines, books and newspapers will be replaced with video displays.

In order to handle these new services, the GTE exec claimed, telephone facilities will have to be upgraded. Today a





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voice switch is used to route videotex data to a packet switch that is connected to a packet network. Tomorrow, with the introduction of digital switches, it will be possible to go directly to the home subscriber and eliminate the need for modems, Berry said. Once the data network for videotex services is established, telephone companies will be able to supply a residential system that will provide environmental controls on gas and electricity usage, alarm services for security, CATV for video conferencing, and a variety of other services in addition to videotex, he predicted.

With digital switches, it will be possible to go directly into the home and eliminate the need for modems.

As if to answer Berry, Dennis McCaffry described a home information retrieval test scheduled to begin next spring in Canada by the Manitoba Telephone System. As director of the test, McCaffry explained that Project IDA will include tests at 100 homes in a suburb of Winnipeg. He said services to be provided will include alarm reporting, utility meter reading, 12 cable tv channels, plus a variety of videotex offerings.

—Ronald A. Frank

IBM TAKES STAND ON STANDARDS

The IBM position on important international network standards is often misunderstood, according to James E. Merkel of IBM in Raleigh, N.C. Speaking at a PTC '80 session dealing with packet switched networks, Merkel gave some definitive insights into IBM's current position in the standards area.

Those who have frequently stated that IBM is opposed to X.25 are not aware of the vendor's thinking, he told session attendees. "IBM is very much in favor of X.25 as a public packet network interface," Merkel said. Admitting that IBM had originally said X.25 was "premature" when it was first introduced, because the company felt there was more work to be done on the technical details and that it made no accommodation for terminals, Merkel said IBM now is generally in favor of the standard.

"We don't feel the same way today insofar as the technical content is concerned," he said. But the key to X.25 is its support for virtual circuits, and the standard can support up to 4,095 virtual circuits. "Our view is that this is too rich for terminals, and we are looking forward to a simpler synchronous interface," Merkel said.

Turning to a discussion of the link control level of X.25, Merkel said the CCITT X.25 recommendation of high level data link control (HDLC) includes both an asynchronous response mode (ARM) and an asynchronous balance mode (ABM). "We have some serious doubts about whether ARM should be continued since everything in the ARM can be supported in the ABM," he explained. For this reason, IBM feels the "front-runners" are normal response mode, which IBM supports, and ABM.

JAMES E. MERKEL: "IBM is very much in favor of X.25 as a public packet network interface."

Merkel next turned to IBM's synchronous data link control (SDLC), which is part of the company's Systems Network Architecture. "It is our technical judgment that SDLC is a pure subset of the international standard HDLC and is also a pure subset of ANSI's Advanced Data Communications Control Procedure (ADCCP)," he said. Despite this, he admitted that certain differences exist in SDLC. One of these is the link test that provides users with an additional command to test the data link in SDLC net. This command is now being considered by CCITT standards-making bodies for inclusion into the standard, he revealed.

SDLC also supports SNA loop operations and this is not defined in the standard, Merkel continued. And while the HDLC standard allows the use of any multiple of N bits, IBM has chosen to use eight bits. Nevertheless, SDLC should still be considered a pure subset, he suggested.

In the Level 1, or electrical interface layer, Merkel said the new RS-449 "is a step in the wrong direction" because it requires the use of more pin connections. As an alternative, X.21 is a rather simple interface and IBM supports it, he said.

Returning to his statement that IBM generally is supportive of X.25 and public data networks, Merkel reminded the attendees that IBM had played a role in getting X.25 adopted within standards-making bodies. IBM has for some time provided an RPQ interface to both the Canadian Datapac and French Transpac packet switched networks, he pointed out. More recently, IBM has indicated its support for the X.21 physical interface standard by announcing support of this interface for the DDX public data network operated by Nippon Telephone & Telegraph in Japan, he said. IBM's decision not to support X.25 in the U.S. was made strictly for business reasons and is not related to any technical capabilities.

COMPANIES

HOME IS WHERE THE WORK IS

Heights employees work from their own homes, but there's no moonlighting going on.

When Luanne James visited England in the fall of 1978 she met Anne Russell.

It was a fortuitous meeting for James and potentially for legions of homebound data processing specialists throughout the U.S.

Russell is one of the founders of F International (August 1976, p. 13), which brought an old idea—that of women working at home while caring for children—to a new industry, data processing. Founded in 1962, F International initially operated only in the United Kingdom. Today it is an organization of more than 600 people, 98% of them women, operating also in Holland and Denmark.

James had good reason to be impressed with what F International was doing. When she became a computer programmer back in the '60s, she had a young daughter to support. Her job required long and irregular hours, and child care arrangements were a problem.

She brought the ideas behind F International to the U.S. in founding Heights Information Technology Service, Inc., early last year. By December the company had handled some 90 contracts from two offices, in Oakland, Calif., and White Plains, N.Y.

Heights has the benefit of management support and advice from F International as well as training in the use of special techniques that have been developed for project specification, estimating, scheduling and control. The company has a license

to use F International's techniques and name in the U.S.

In addition to James, who also is president of Argonaut Information Systems, a software products company in Oakland, the other principal in Heights is Burton Grad, president of Burton Grad Associates, Inc., a New York-based consulting firm for computer services companies.

James formed Argonaut in 1971. She is a director of the Association of Data Processing Service Organizations (ADAPSO) and is vp of ADAPSO's Software Industries Assn.

Grad, who has been in the computer business since its inception, has worked for General Electric and, until a year ago, for IBM. Most of that time he was responsible for the production of software for use by other people.

The Oakland office has as its manager Fran Haskell, who came to Heights from the State of California, "partly as a reaction to effects of Proposition 13 [California's tax cutting initiative passed in 1978]." She has been "a programmer, a programmer analyst, a systems analyst, a data base administrator, and now I'm a generalist." Heights is her first "brand-new venture, and I'm excited."

There is one other full-time employee in the Oakland office, an assistant administrator to handle marketing, al-

LUANNE JAMES (right) hired FRAN HASKELL to "man" the Oakland office.

though not much of this has been done to date. "We get most of our contracts through the women's network, from women managers," said Haskell.

James said that while the bulk of Heights' technical panel members (they have about 30) are women, men are not excluded. Of the first 10 panelists signed up, one was a man, a father who wanted to stay at home with his children while his wife attended school.

"We employ anyone unable to work regular hours in an office and who is a professional computer programmer. This can include poets and the disabled as well as parents who want to be home with their children," said James. "But the firm is not seeking moonlighters."

The company stresses its members' professionalism and competence to clients. It requires three years of work experience from prospective programmers and at least five years from its systems analysts.

In addition to its technical panel, the firm has a nontechnical panel of typists, which for the Oakland branch numbers four. "We work on a project structure," said James. "Each contract we get is assigned to a project manager for coordination and he or she, if it is wished, can hire a typist from his or her own neighborhood." So far, Heights' biggest project has taken five people six months to complete. James said F International's biggest involved 48 people for two years.

Heights hopes to get joint contracts for its two offices and has bid on one such but didn't get it. James would like to see the operation go nationwide by 1981. "We are considering from 20 to 25 different locations, but decisions for startups will have to

—Sam Myers

MEASURE

The sight laugh: IACA that Computer performance measurement is needed long before implementation

Space Center base operation. The sputtering system, Lennon emphasizes, had nothing to do with the delay in launching the Space Shuttle. "If that had been the case, the National Aeronautics and Space Administration could have hit it with 2 million bucks in hardware and solved the problem."

The CSC people were asked to do a "post-implementation system review" to determine a less expensive way to correct a situation in which transactions were being processed so slowly—some requiring up to 30 minutes to complete. Queue lengths were increasing and at least one period of downtime a day was being experienced because of hardware failure. Users were so timorous of the system that they put their 73 terminal operators on a schedule where only top priority transactions were entered, the rest being batched for overnight processing.

Their reason: the actual workload averaged 5,000 transactions a day and there was a backlog of 2,000 to 3,000 a day. And things were getting worse. NASA was anticipating a workload for the next five years of 9,000 to 14,000 transactions a day.

And, of course, "minimum performance measurement tools were provided," because NASA and other government agencies had always done it that way," Lennon says. "If a system became overloaded, you merely added more metal."

The NASA system consisted of a dedicated Honeywell H635 computer with 256K of main memory, 16 IBM 2314 disk drives, a Datanet model 355 telecommunications front-end processor and the 73 remote terminals. It used Honeywell's Transaction Processing Executive (TPE) and its database management system called Integrated Data Store software (IDS) operating under GCOS, the general comprehensive operating supervisor. It used Honeywell-provided transaction processing application programs (TRAPS).

The data base required some 80 million words of on-line storage. Everyone thought the system was I/O bound. It wasn't. It was cpu bound, the CSC studies found.

Using a minimum of performance measurement tools, the CSC group found, among other things, that the TPE was hogging the cpu and needed more than two paths through the system or, in other words, more transaction processing applications programs.

The CSC team came to these conclusions by measuring response time and queue time problems. A software patch was added to the transaction processing journal tape to record time into the TPE and time into the TRAP, as well as time out of TRAP and time out of TPE for each on-line transaction. The data was categorized by transaction, by TRAP and by location.

It came down to a choice of two recommendations: dump the cpu or get a new transaction processing executive.

The decision was made to replace the cpu and enhance the transaction processor so that two transaction application processors could be segmented functionally into eight independent TRAPS. This software change improved the system's throughput by 60%. The decision to replace the 256K Honeywell 635 with a 512K Honeywell 66/60 improved the response time by about 40%. The system today is handling 12,000 transactions a day with an average response time of seven seconds.

Lennon says the heart of the problem was that no performance data was available when the system was being designed. "Most of it was done by intuition." And when her group took over, it found that the use of measurement probes while the system was in operation would have degraded the already unacceptable response times even further.

So the group compensated by adopting such initial measurement techniques as doing end of job statistics, doing memory dumps, and making stopwatch studies. Now, however, it is recommending that performance data be gathered every day and then analyzed and archived. "And if the reports aren't available every day, management starts screaming," she says.

"Now management is crazy for measurement," Lennon says. "They want

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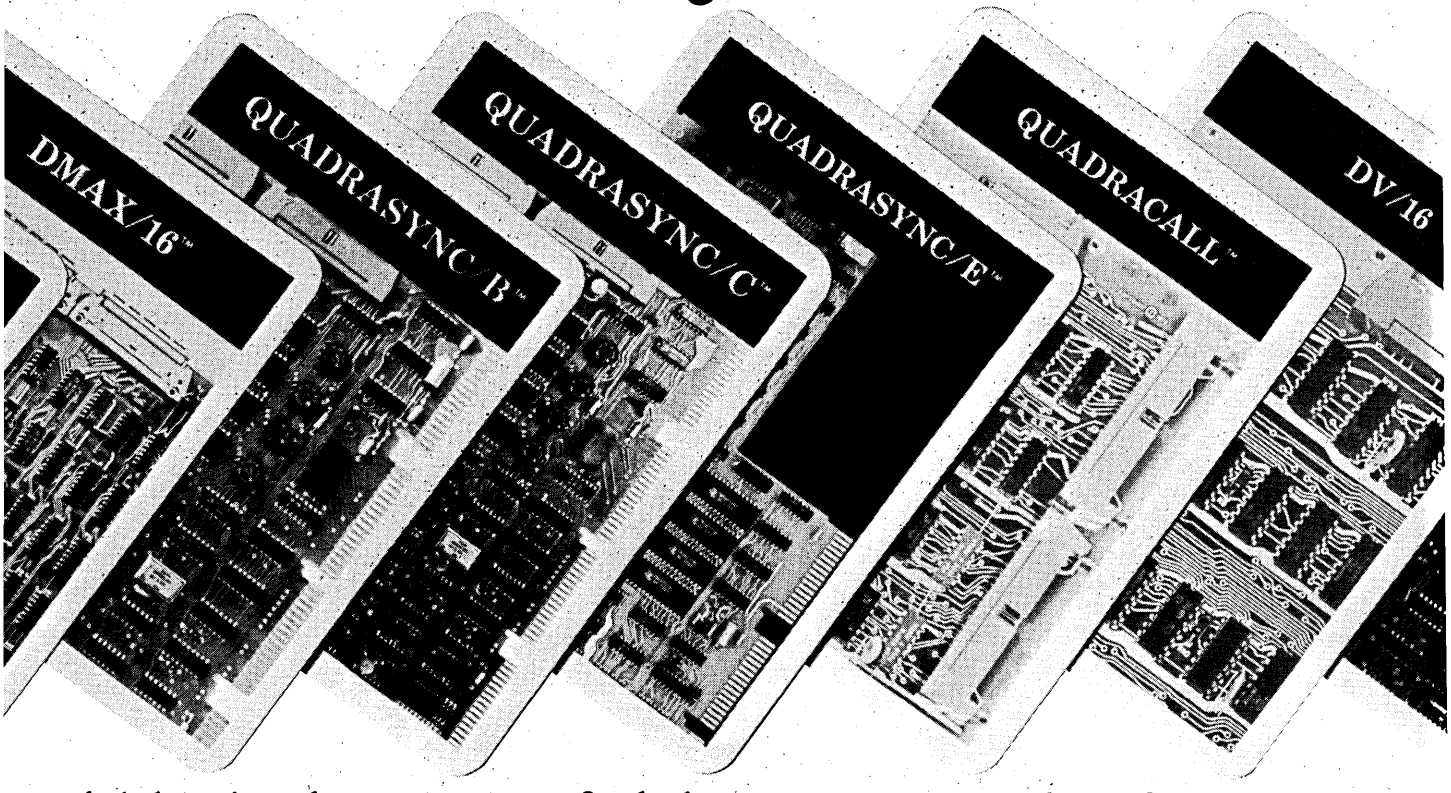

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everything we do to be measured." Of course, she adds, they could have solved the problem by hitting it with that $2 million, "or by flooding the computer room."

"My advice is: do the measurements before a system ever gets going."

—Tom McCusker

SERVICE BUREAUS

TWO YEARS AND $10M LATER

From a one-man band to 400 strong, Imperial Computer Services sets sights on nationwide network of service bureaus.

When Dwight Mensinger founded Imperial Computer Services in 1977, he had ambitious plans.

His business objective was to develop, through selective acquisitions and managed internal growth, a nationwide network of computer service bureaus serving specific target industry groups. "It was just me, and my goal was to become a $10 million service company. Actually, I was aiming higher than that but if you say that, people don't believe you."

Mensinger, who has been involved in data processing and banking for 29 years with the Federal Reserve, Central National Bank, Cleveland, and Computer Sciences Corp., already has achieved his $10 million goal in the two years of his company's existence.

He has acquired companies, but his most prized acquisitions are the people who make up his management team. "Most of them left lucrative jobs to join me," he said. "I'm not sure why. I guess I just sucked them in as I went along." Most are people he's known for a long time and many are his neighbors in Palos Verdes Estates, Calif.

First to join Mensinger was James Power, who helped in the formation of ICS and joined full time in 1978. Power had been: president, Nitrol Corp., Los Angeles; vice president, Transaction Technology, Inc., Los Angeles; vice president, TRW Data Systems, Inc., Los Angeles; assistant operations manager, TRW Systems; and senior staff administrator, AC Spark Plug Div. of General Motors. At ICS he is senior vice president, a director, and manager of the Data Services Div.

Another early member of the ICS management team was Harold (Bud) Harfst, Jr., a senior vice president, director, and manager of the systems and programming function of the Data Services Div. "I knew Bud in Cleveland when he worked at a competing bank," said Mensinger.

ICS always has a minimum of three acquisition possibilities in the works. Not all of their acquisitions work out.

Harfst's previous positions included: vp, Leader Corp., Seattle; data processing officer, Union Commerce Bank, Cleveland; assistant manager, customer programming support, NCR Corp., Dayton, and project leader, Iowa and Illinois Gas and Electric Co., Davenport, Iowa.

Donald C. Leonard, a senior vice president and a director specializing in systems analysis and design, strategic planning, and product development for the financial sector, joined ICS in February 1978. He had been a vice president, Payment Systems Inc., El Segundo; president of his own consulting firm providing Electronic Funds Transfer (EFT), related strategic planning, and product development services; and director of special products, TRW Commercial Systems Div., Redondo Beach, Calif.

Anthony Arminio, a senior vice president and director who manages ICS' marketing function, joined in April 1978. He had been senior vice president of HMO International, Los Angeles, and Pacific regional manager, Electrolux Div. of Consolidated Foods Corp., Los Angeles.

The last principal to join, last May, was John B. Benton, who for two years served as executive director of the National Commission on Electronic Funds Transfer. He manages the ICS Planning and Consulting Div.

A recent addition to his division was Max P. Beere, who had been director of telecommunications planning for TRW Electronics in Los Angeles. Before that, as vice president in charge of marketing for Packet Communications, Inc., Boston, he developed and marketed a national data communications network service. He also was director of telecommunications systems at Tymshare, Inc., Palo Alto, Calif.

Although ICS has done consulting since its inception, it was formed as a separate operation in April 1978. "All of us participate in one way or another," said Mensinger. "We are a resource. Ours is a high level consulting practice. We maintain a half-dozen accounts we work with during the year. It gives us visibility in the marketplace and helps us to uncover potential acquisitions."

On acquisitions, he said they always have a minimum of three and sometimes more in various stages. Not all their acquisitions work out.

Their first, of Massey Data Entry Services Co. in December 1977, did. And with it, ICS gained a principal. William A Vernor, who serves as senior vice president and chief financial officer, had been vice president, finance for ADIA Services, Menlo Park, Calif., which had owned Massey.

The company looked at "virtually all" of Itel's divisions before acquiring Medical Data Systems last July.

When acquired by ICS, Massey, "which had been around for 17 or 18 years," had offices in Palo Alto, San Francisco, Santa Cruz, Hayward, Los Angeles, and Long Beach. "We tuned it down and sold off some centers,' said Mensinger, "retaining the most profitable center in Santa Clara. Virtually all of our data entry work is under contract. We are not in the business of taking on overflow work."

ICS' second acquisition, made about a week after that of Massey, didn't work out quite so well. The acquired company was Check Recovery Corp., a firm which did collection of bad checks for department stores and food chains in the western U.S. and was doing $500,000 a year in business. "They had the largest negative data base available and that's what we wanted," said Mensinger. "We retained it for one year then sold it off. We couldn't convert the data base to anything and check collection was not a business we wanted to be in."

Another which didn't work out was the acquisition of Network Data Processing of California, Los Angeles, in November 1978. It was a company providing on-line data processing and data entry services to distribution companies. "Our problem was," said Mensinger, "it was based on Honeywell hardware. Programming was in Easycoder. The development needed was not our style. We figured we could make more money by selling it." It was sold to a group headed up by former California Lieut. Governor Mervyn Dymally.

The two most successful acquisitions to date form the core of ICS' Data Services Div. The first was Carter Associates, acquired in July 1978. The 17-year-old firm specialized in providing manufacturing, financial, and sales related data processing services to 60 high technology electronics firms in the Santa Clara Valley.

The second, acquired last July from Itel Corp. (Mensinger said they looked at "virtually all" of Itel's divisions), was Medical Data Systems, a 12-year-old Long

132 columns	underline	8 function keys	row & col cntr	half & full dplx
132 COLUMNS		8 FUNCTION KEYS		HALF & FULL DPLX
132 columns	blink	8 function keys	current loop	half & full dplx
132 COLUMNS	BLINK	8 FUNCTION KEYS	CURRENT LOOP	HALF & FULL DPLX

MODEL 132-1

The Difference is Clear!

24 LINES				AUTO REPEAT
24 lines				auto repeat
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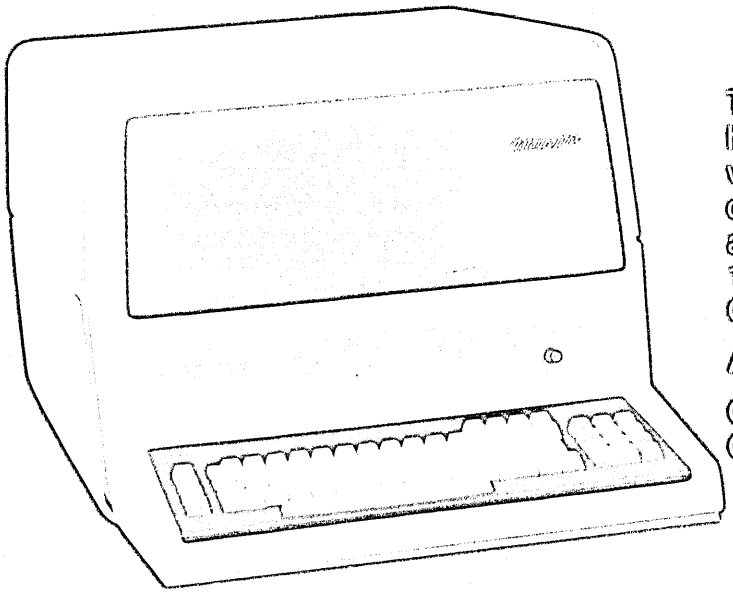
24 LINES	DUAL INTENSITY	NUMERIC PAD	MENU SET-UP	AUTO REPEAT
	dual intensity		menu set-up	
STATUS LINE	DUAL INTENSITY	CURSOR CTRL	MENU SET-UP	VT-100 OPTION
status line	dual intensity	cursor ctrl	menu set-up	vt-100 option
STATUS LINE		CURSOR CTRL		VT-100 OPTION
status line	underline	cursor ctrl	row & col cntr	vt-100 option
STATUS LINE	UNDERLINE	CURSOR CTRL	ROW & COL CNTR	VT-100 OPTION
	underline		row & col cntr	
132 COLUMNS	UNDERLINE	8 FUNCTION KEYS	ROW & COL CNTR	HALF & FULL DPLX
132 columns	underline	8 function keys	row & col cntr	half & full dplx
132 COLUMNS		8 FUNCTION KEYS		HALF & FULL DPLX
132 columns	blink	8 function keys	current loop	half & full dplx
132 COLUMNS	BLINK	8 FUNCTION KEYS	CURRENT LOOP	HALF & FULL DPLX
	blink		current loop	
24 LINES	BLINK	NUMERIC PAD	CURRENT LOOP	AUTO REPEAT



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Beach, Calif., service company providing batch data processing to more than 130 hospitals in California.

These two firms are now the northern and southern California branches of ICS respectively. For both, product development is centralized in the company's Torrance, Calif., corporate headquarters. Currently work is under way on a front end for on-line data capture and inquiry for hospital customers in southern California.

When ICS was formed, Mensinger was looking at acquisitions in four major marketplaces: discrete manufacturing, health care, the financial community, and the insurance area. They're into manufacturing and health care now. As for the financial community, "we'll get there as soon as we can figure out how the hell to do it," said Mensinger. Insurance? "We may never get there."

The company has grown from a one-man band to 400 employees in two short years. Mensinger is optimistic. "If we maintain our present growth rate, we should do $12 million in 1980 for a net profit of $750,000." But, in mid January ICS was negotiating for acquisition of a publicly held held company with a nationwide network in place, which could dramatically increase that growth rate.

—Edith Myers

CRIME BILL REVISED

In the new version of the computer crime bill, some of the computerese has been erased, as has some of the controversy.

The newest edition of the Ribicoff bill—the Federal Computer Systems Protection Act—the controversial federal statute which will define computer-related crime, is now before Congress.

A final public hearing on the jurisdictional aspects of the proposed legislation is scheduled for later this month, after which the rewritten statute will be reviewed by the full Senate Judiciary Committee. The current version of the bill, the handiwork of Senator Joseph Biden's Criminal Justice Subcommittee, has already been introduced in the House.

The new version of the bill lacks some of the familiar computerese that marked the original bill—specifically the word "access" as the criminally active verb—and is now cast in more traditional legalistic phrasing, to the apparent relief of the judicial mind; but the Biden rewrite has also removed most of the notably controversial elements of the bill.

The original Ribicoff bill claimed federal jurisdiction over any criminal misuse of computer systems owned or doing contract work for the U.S. government, financial institutions, or "any entity operating in or affecting interstate commerce." "That," explained Kathy Zebronski of the subcommittee staff, "is broader than any federal statute in current law. We cut that back to include only those computers which are owned by, under contract to, or operated for or on behalf of the U.S. government or financial institutions—or, computers which operate in, or use a facility of, interstate commerce."

The phrase "facility of interstate commerce" refers to communications links that extend the active computer system across state boundaries, she explained. The substitution greatly narrows the scope of the act.

While narrowing the statute's jurisdiction—with the narrow referent on interstate commerce and a long cautionary section on federal/state relations—the new bill simplifies many of the definitions that caused confusion in the original legislation. The original bill attempted to separately define "computer," "computer system," "computer network," "computer program," "computer software," as well as the active verb "access." The rewrite relies upon the simple concept of "use," and

Introducing RAYCODE:

The immediate solution to TSO/SPF mainframe congestion.

Users of IBM's Time-Sharing Option (TSO) know well the daily frustration of log-on difficulty, unpredictable response times, lack of user scheduling facilities and the enormous mainframe overheads required for TSO support.

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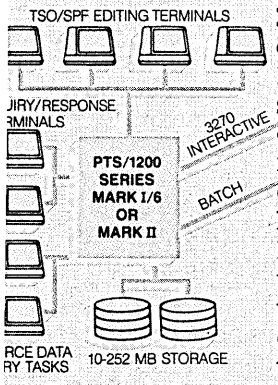

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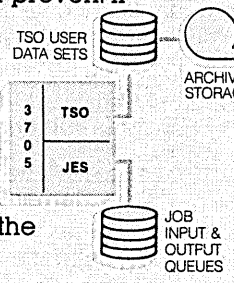

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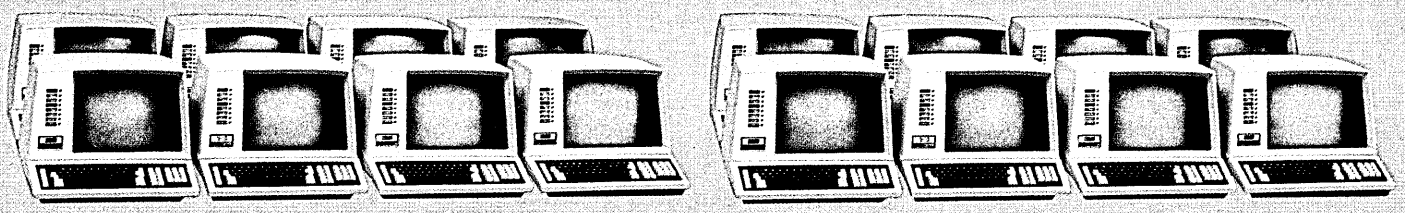

CIRCLE 61 ON READER CARD

"Here are four reasons why we switched to NCR," says Dale A. Dooley of the Iowa Transfer System.

DOOLEY:
The Iowa Transfer System is the first electronic funds transfer system to operate statewide. Over 85 percent of the commercial banks in Iowa are supporting members. We recently installed an NCR 8450 as the central element — the switch — in our network.

NCR's SCHULTE:
It's the element that makes the remote connections, so that every terminal has access to every bank on the network. All across the state of Iowa.

DOOLEY:
Our first reason for going to NCR is monetary. With NCR, our costs are substantially lower than under our previous arrangement.

Dale A. Dooley (left) is executive director of Iowa Transfer System, Inc., in Des Moines. Jim Schulte is NCR district manager.

NCR's SCHULTE:
And at least a bit lower than the other alternatives you explored.

DOOLEY:
Then there is the support we received from NCR and from you, Jim. And NCR's known commitment to EFT.

NCR's SCHULTE:
NCR representatives are specialized. All the people in my group work exclusively with financial institutions. So we are in tune with current financial trends. Other NCR representatives have parallel specialties so they can be more responsive to the problems peculiar to their industries. It's a concept that is working well for us.

DOOLEY:
The third reason is software. Only NCR could provide the switch software we needed when we had to have it.

NCR's SCHULTE:
Not only did we meet the deadline, but the transition to our system was very smooth.

DOOLEY:
Finally, our decision was influenced by the dependable performance of the other NCR systems within the network. And we have had the same experience with this system. Our uptime level has been very high — a critical consideration when you're talking about a network switch.

In the NCR office nearest you, there is an account manager like Jim Schulte who specializes in your industry and knows NCR systems. Learn how an NCR system can help you. Phone him at the local office. Or write to EDP Systems. NCR Corporation, Box 606, Dayton, Ohio 45401.

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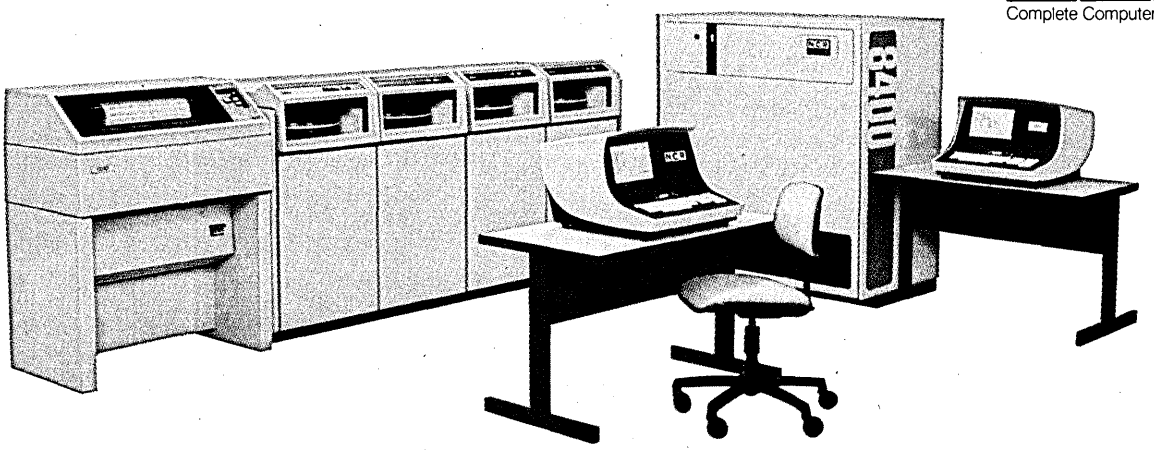


CIRCLE 62 ON READER CARD

broadens the definition of computer to include hardware, software, and any property, tangible or intangible, directly related to or operating in conjunction with the system.

In the rewrite, the subcommittee staff attempted to narrowly describe the computer systems which they sought to protect—excluding personal or home use computers, word processing systems, and (oddly) computerized newspaper and magazine typesetting systems—and then broadly defined "computer" itself, with all attendant property and products. "In other words," explained Zebronski, "once you have a computer according to our definition, most everything associated with it is also part of it."

The definition of computer in the old bill—"an electronic device which performs logical, arithmetic, and memory functions by the manipulations of electronic or magnetic impulses. . ."—had caused considerable problems. "Everybody went crazy about that," laughed Zebronski. "It seems to include digital watches, Betamaxes, and even microwave ovens."

The new definition of computer broadens the old by adding any "property" or communications facilities directly related to the system, but excludes "an automated typewriter or typesetter, or any computer designed and manufactured for, and which is used exclusively for routine personal, family, or household purposes, including a portable handheld electronic calculator."

The "typesetter" exclusion, said Zebronski, refers to multisite computerized printing operations of several national newspapers and magazines. "If you put an ad in the *Wall Street Journal*, it's conceivable that that could be a computer fraud," she said. "That's why we put [the typesetter exclusion] in. The language is very bad, but in drafting legislation, you often have to settle for something bad to get at something specific."

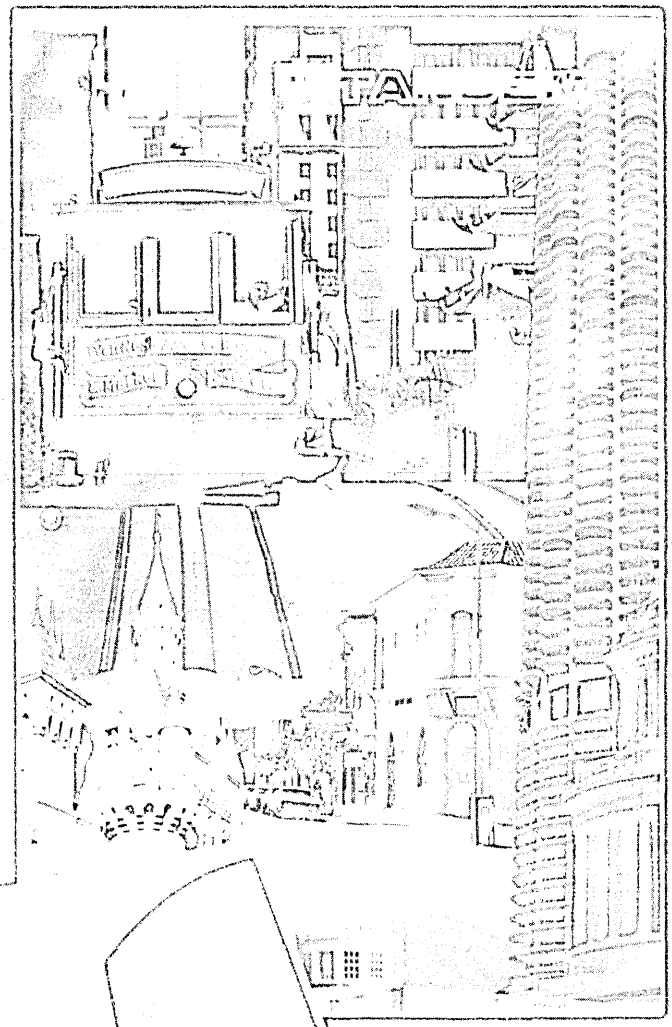
The definition of computer in the old bill "seemed to include digital watches, Betamaxes, and even microwave ovens."

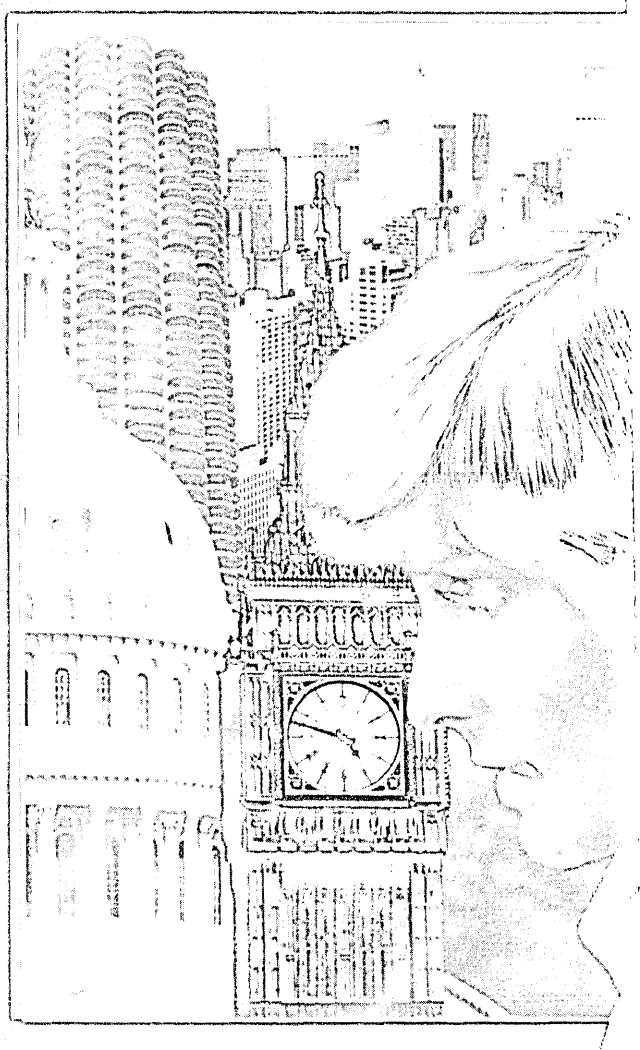
The exclusion of personal and home computers has nothing to do with whether misuse or unauthorized use of these systems should be a crime, she stressed. "It has everything to do with the traditional scope of federal interest. . . . We're fully aware that under this exclusion we're probably allowing crimes to occur, and we're hoping the states will pick up the slack with state legislation." Senator Biden, the subcommittee chairman, has publicly called for the states to enact legislation "to reach crimes not covered by federal law."

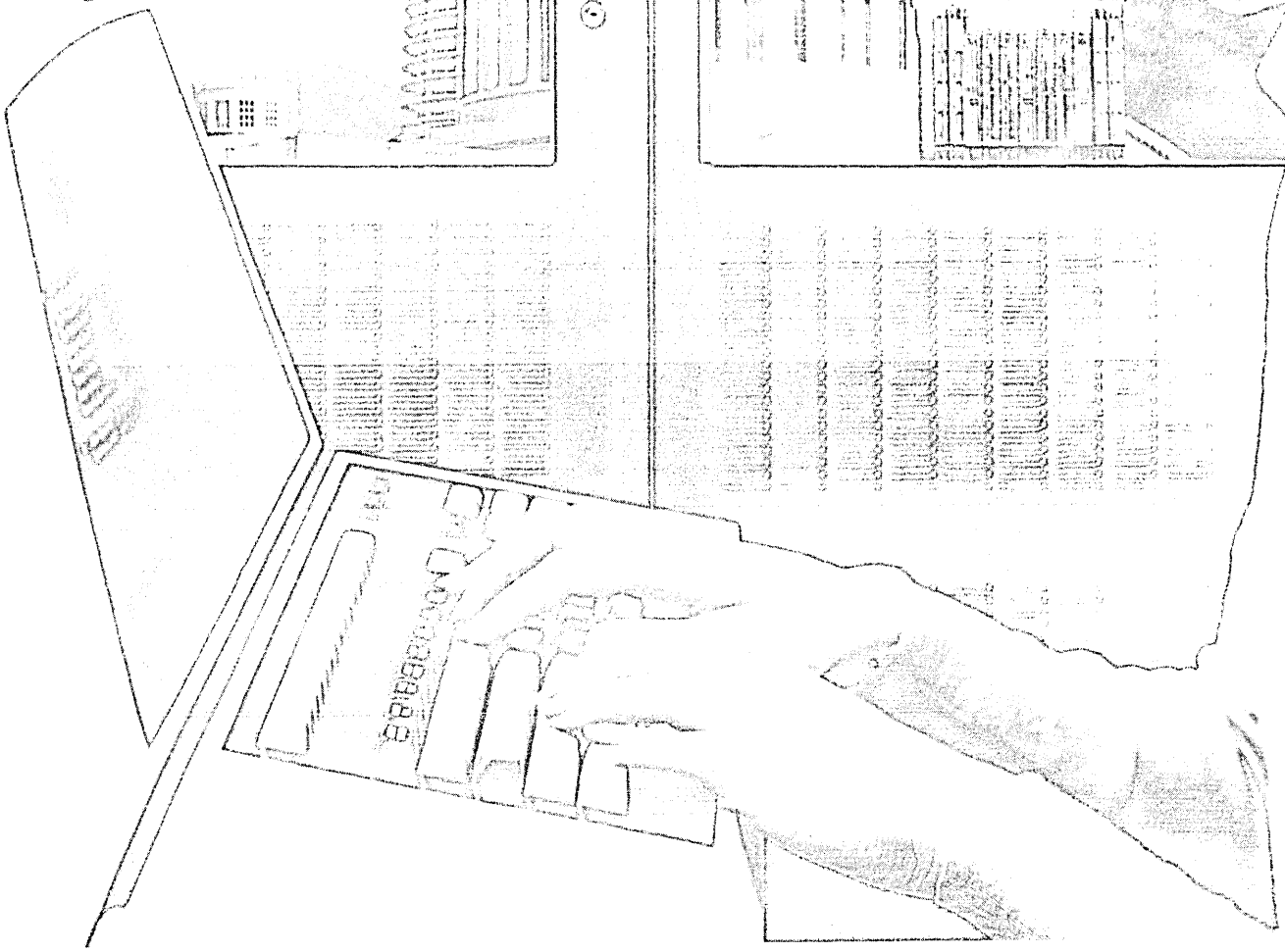
Nine states currently have "computer crime" laws; seven passed those statutes only last year, and many states have pending legislation.

With the deletion of "access" and the concept of "unauthorized access"—which in the original draft of the legislation seemed to threaten programmers who playfully used their employer's system, for "Snoopy calendars" and the like, with up to 15 years' imprisonment—the new bill relies on the traditional "theft of property," which is here defined as including computer services. The biggest concern in this area, said Zebronski, was in targeting people who access a system and overwhelm it, crashing it or just blocking the legitimate access of other users. "That, not the Snoopy calendars, was our concern. We took the unauthorized access phrasing out just to placate people. There was not the slightest possibility that someone would be prosecuted for that on the federal level."

Still, she conceded, the misinterpretation was there to be made, and so a change was necessary. The subcommittee, said Zebronski, was very aware of the fact that this legislation will probably be used as a model for many of the state statutes now being drafted, hence the concern for precision and the caution in the matter of state and federal jurisdiction.







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The Tandem NonStop™ Network Operating System

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Announcing the 4000 processor network.

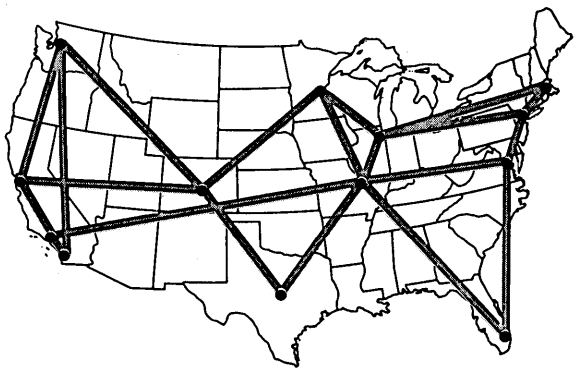
Here's how to tie together 4000 processors: Easy. Interconnected in the most beautifully simple way. Per the diagram. Point-to-point connections can be made between all centers of overlapping activities, but are not required. We can in fact tie the network together with a single continuous line. And there is no user involvement for pass-through. To get from "A" to "F," no user housekeeping penalties from "B," "C," "D," & "E." It looks exactly as if all messages were being transmitted only next door. And X25 protocol is available as well.

Introducing the distributed/ centralized data base.

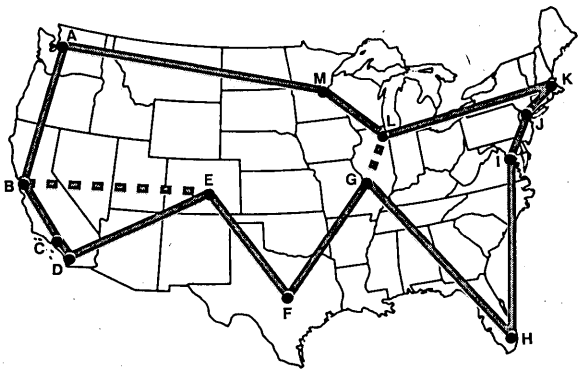
Totally transparent. With a split of geography completely invisible to the user. Not the separate interconnected data bases found in other networks but a unified data base completely and transparently accessible throughout the network. No user, and no application program, has or requires any awareness whatsoever as to the actual location of any segment of the data base in the Tandem network. With a Tandem NonStop Computer System, your data may be in Ypsilanti, but it looks for all the world like it's residing right in your own local system.

To get rid of a host of problems, get rid of the host.

Having a host system in a network is traditional. Unfortunately, it is also the traditional point of concentrated difficulties. For when the host goes down, so does the whole network. And even if the host is only suffering an intermittent difficulty, the integrity of the data base is up for grabs, not only in the host, but throughout the remote data bases as well. With Tandem's GUARDIAN/EXPAND Network, a local failure has no impact whatsoever on the rest of the



Conventional fixed network is difficult and expensive to expand and modify as needs grow. And they always do. Communication and utilization of data base records from twice removed nodes is prohibitively expensive in applications programming, so more lines are the only viable solution. And that is expensive, too.



Tandem pass-through packet switching enables "A" to communicate with "E" at no penalty in system overhead. And you can add direct lines, per "B" to "E" or "L" to "G" whenever traffic warrants without disrupting system performance or efficiency. Note that nodes can be of variable sizes, all using Tandem NonStop Systems as the common element. Efficient, powerful and extremely low cost.

system, and best-route switching automatically circumvents the trouble spot. If there is a failure in the communication link, the system will automatically go around it. The system and the network stay up and running, and best of all—the data is intact, its integrity assured.

A unique and unified operating system—free of geographic limits.

Whereas most network operating systems are created "on top" of prior operating systems, at significant penalty, Tandem's Guardian Operating System was created from day one for the multiple processor environment. It treats *all* resources within the system as files, both hardware and software, and accordingly achieves complete geographic independence, both for the user and for the user's programs. This is beautiful at any time, and it is a lifesaver when increased work loads call for an expanded system, more processors and peripherals, and perhaps a new configuration of resources. This is unique: no reprogramming is required, not even recompilation.

The long and the short of it—keeping costs down and performance up.

No one can do that like Tandem. For the differing needs at each node can be met by the expandable Tandem NonStop System in varying configurations. Single system programming works over the entire network and will continue to work regardless of growth and complexity of the system. And because this is after all a mini-based system, the costs are low to begin with and add-ons come in low-cost increments. Without one cent of penalty on the original investment.

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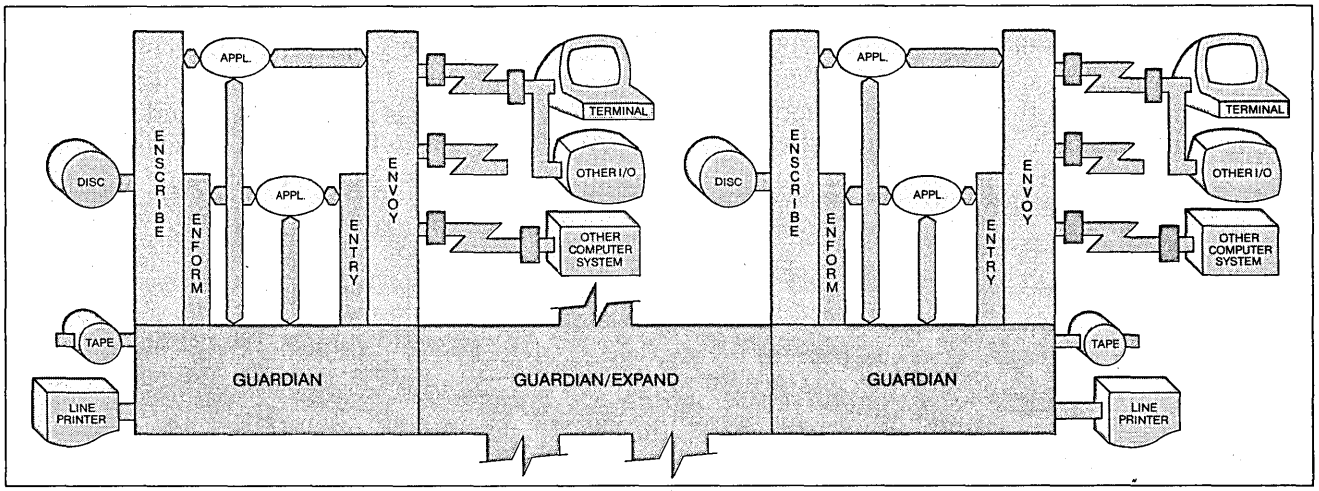

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Zebronski said the subcommittee staff has been repeatedly approached by industry people who suggested a dollar-threshold for defining federal jurisdiction, perhaps $100,000 and up. "We didn't do that because you really can't," she explained. "You can't put a value on the electronic impulses, can't put a value on lost time on the machine, can't put a value on the inability of someone else to work with the machine, or on what a program is worth to whom. It was just too difficult and unfair, so we ruled out that approach completely."

—Vin McLellan

KEY EXCERPTS FROM S. 240

Sec. 3. (a) Chapter 47 of title 18, United States Code, is amended by adding at the end thereof the following new section:
§1028. Computer Fraud and Abuse
"(a) Whoever uses, or attempts to use, a computer with intent to execute a scheme or artifice to defraud, or to obtain property by false or fraudulent pretenses, representations, or promises or to embezzle, steal, or knowingly convert to his use or the use of another, the property of another, shall, if the computer:

"(1) is owned by, under contract to, or operated for or on behalf of:

"(A) the U.S. Government; or

"(B) a financial institution;

and the prohibited conduct directly involves or affects the computer operation for or on behalf of the United States Government or financial institution: or

"(2) operates in, or uses a facility of, interstate commerce; be fined not more than two times the amount of the gain directly or indirectly derived from the offense or $50,000, whichever is higher, or imprisoned not more than five years, or both.

"(b) Whoever intentionally and without authorization damages a computer described in subsection (a) shall be fined not more than $50,000 or imprisoned not more than five years or both.

"(c) Definitions. For the purpose of this section, the term *computer* means a device that performs logical, arithmetic, and storage functions by electronic manipulation, and includes any property and communication facility directly related to or operating in conjunction with such a device; but does not include an automated typewriter or typesetter, or any computer designed and manufactured for, and which is used exclusively for routine personal, family, or household purposes including a portable hand-held electronic calculator.

financial institution means—

"(1) a bank with deposits insured by the Federal Deposit Corporation;

"(2) a member of the Federal Reserve including any Federal Reserve Bank;

"(3) an institution with accounts insured by the Federal Savings and Loan Insurance Corporation;

"(4) a credit union with accounts insured by the National Credit Union Administration;

"(5) a member of the Federal home loan bank systems and any home loan bank;

"(6) a member or business insured by the Securities Investor Protection Corporation; and

"(7) a broker-dealer registered with the Securities and Exchange Commission pursuant to section 15 of the Securities and Exchange Act of 1934."

"*property* means anything of value, and includes tangible and intangible personal property, information in the form of electronically processed, produced, or stored data, or any electronic data processing representation . . . and services;

"*services* includes computer data processing and storage functions;

"*United States Government* includes a branch or agency thereof;

"*use* includes to instruct, communicate with, store data in, or retrieve data from, or otherwise utilize the logical, arithmetic, or memory functions of a computer . . ."

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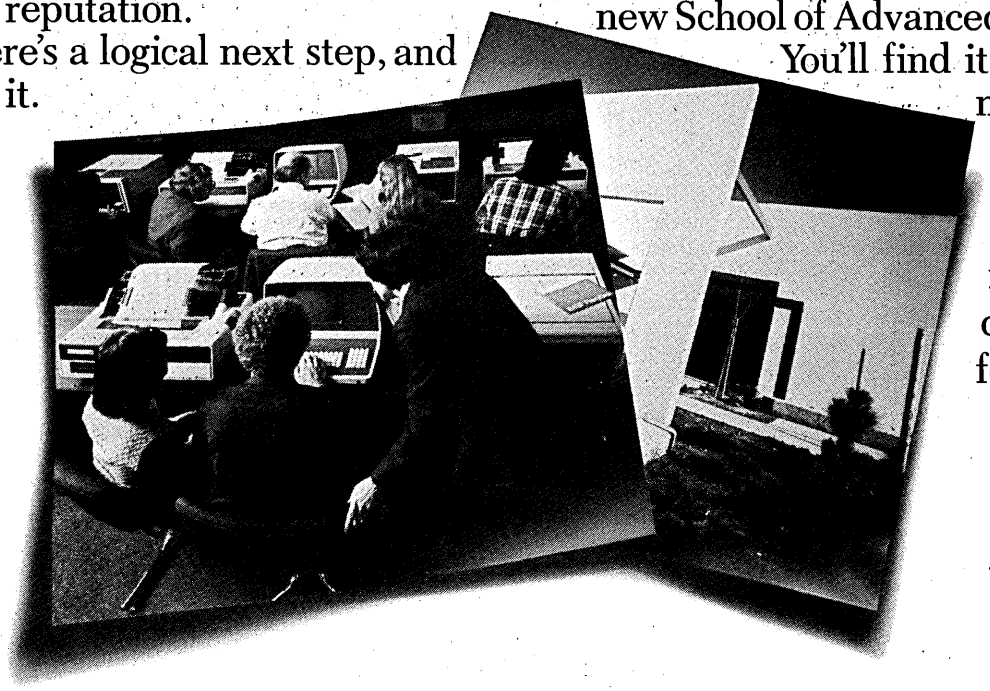

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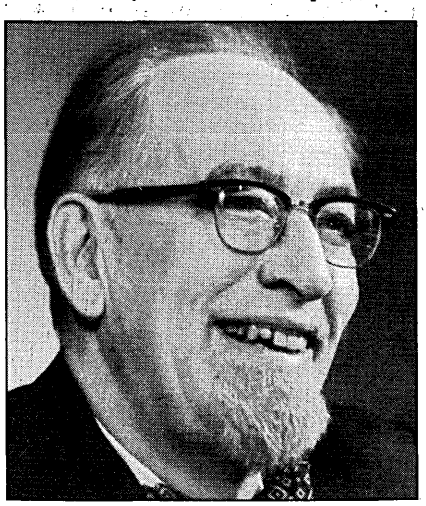
CIRCLE 68 ON READER CARD

IN MEMORY OF MAUCHLY

Dr. John W. Mauchly, coinventor of the world's first electronic computer, died Jan. 8 while undergoing heart surgery in Ambler, Pa. He was 72 years old.

Dr. Mauchly and his coinventor, Dr. J. Presper Eckert Jr., were front page news in 1946 when the War Department announced their invention of a machine that applied electronic speed for the first time to mathematical tasks. It was dubbed ENIAC (Electronic Numerical Integrator and Computer). The following years saw the team perfecting the computer, scaling it down in size, and increasing its number of functions. (In an article exclusive to the October 1979 DATAMATION, Dr. Mauchly amended and updated the ENIAC story.)

Following ENIAC, Drs. Mauchly and Eckert established their own company and developed a second computer in 1949 called BINAC (Binary Automatic Computer), the first computer to be programmed by internally stored functions. BINAC served as a test of the plans they had formulated for UNIVAC, the world's first general purpose commercial computer, whose debut installation was for the U.S. Bureau of Census in March 1951.



DR. JOHN W. MAUCHLY: He was a coinventor of ENIAC, the world's first all-electronic digital computer.

The Eckert-Mauchly Corp. was bought by Remington Rand in 1950 and Dr. Mauchly remained as director of UNIVAC Applications Research for 10 years. In 1959 Dr. Mauchly left Remington Rand (which had merged with the Sperry Corp. in 1955) and founded Mauchly Associates, a consulting company that introduced the critical path method for construction scheduling by computer. In 1967 he founded Dynatrend, a computer consulting organization. Dr. Mauchly returned to Sperry Univac in 1973 as a consultant.

Dr. Mauchly is survived by his wife, two sons, five daughters, 17 grandchildren, and two great grandchildren.

BENCHMARKS

IBM BOASTS NEW 5280: IBM last month introduced the 5280 distributed data system, a new family of low-cost products featuring intelligent terminals. Five products are available with the 5280. A representative configuration comprising a programmable keyboard/display station with main memory of 64K characters, two diskette memory drives with a storage capacity of 1.2 million characters, a 120 cps printer, and a communications adapter will lease for $517 a month on a two-year lease. The purchase price will stand at $16,600.

UNIVAC EXEC TO VYDEC: Dr. George Champine, recently named as Sperry Univac research director, has joined Exxon's Vydec subsidiary in the new post of R&D vice president. Champine was appointed to the Univac position in September to fill the vacancy created when Dr. Barry Bergerson left to join Manufacturing Data Systems as R&D vice president. Champine was Univac's third research director in one year. He said he left Univac with some regret, but felt he could not turn down the opportunity offered by Vydec. He was a Univac employee for 22 years.

OK ECOM: The U.S. Postal Rate Commission has approved a plan for a decentralized version of the Postal Service's proposed electronic computer-originated mail (ECOM) service. The new proposal would allow communications common carriers to compete for the transmission portion of the system. The plan calls for ECOM service to go into operation in the next 12 to 18 months if approved by the board of governors of the Postal Service. This new plan replaces the previously rejected proposal of a contractual arrangement between the Postal Service and Western Union, which would have given the Postal Service a monopoly over end-to-end ECOM service. The competitive electronic mail system would entail message transmission by common carriers from customers to 25 "serving post offices" (SPOs) under Postal Service Control. The Postal Service would offer connections at the SPOs to competing communications networks wishing to participate in ECOM. Customers would use the carriers of their choice to connect their own computers with the SPOs. A. Lee Fritschler, chairman of the Postal Rate Commission, said ECOM would be provided on an experimental basis until Oct. 1, 1983.

IBM LOANS AND HIKES: Following on the heels of the Oct. 4 public offering of $1 billion in notes and debentures, IBM secured a $300 million private loan with the Saudi Arabian government in the form of seven-year notes carrying 10.8% interest. Some analysts had seen the company's cash reserves declining despite projections that earnings would be up for the fourth quarter. Industry sources also feel that IBM's short-term cash flow crunch will get worse before it gets better. In a related move that serves to underscore IBM's capital needs, the company announced a price hike affecting a wide range of systems, office products, software, and various maintenance and educational services. A 7% incease in rental and lease prices was announced, along with a 5% hike in purchase prices for some dp gear and a 7% hike on some wp products. Monthly maintenance will rise 15% to 20% for some dp and wp equipment, and hourly maintenance will climb 15%. Program products, educational courses, and engineering services will increase by 10%. Caught in the crunch, interestingly, are the 4300 and 8100 series machines, which will be affected in both purchase and rental categories. All models from the 370/115 to the 3033 processors will see an increase in lease and rentals. While some analysts see the hike as a reaction to the unexpected upsurge in rental vs purchase last year, an IBM spokesman claimed the increases reflected "the increasing cost of doing business."

MAGNUSON INKS CREDIT: Magnuson Systems Corp. has signed an agreement with Bank of America for a line of credit in excess of $5 million. The agreement is tied to Magnuson's sales and represents the company's first line of credit placement. Magnuson's sales in 1979 were about $10 million, according to company president Joe Hitt.

TELEFUNKEN ACQUIRES: AEG-Telefunken of West Germany has become the largest single shareholder in Modular Computer Systems with a 25% slice that provides the small computer systems manufacturer with a $30 million cash infusion. Along with the cash, Modcomp also picked up three Telefunken representatives as directors, expanding the board to 12. Modcomp has also agreed to pay $2 million for a 25% interest in a previously announced joint venture with Telefunken in West Germany. The new company, A-T-M (AEG-Telefunken Modcomp), will take over the operations of Modcomp's West German subsidiary as well as some AEG-Telefunken computer operations. According to Modcomp spokesmen, the venture will be licensed from both parents, and Telefunken will purchase Modcomp computers for resale to certain European markets.

GTE BUYS EM&M SEMI: General Telephone and Electronics has purchased Electronic Memories & Magnetics' Semi, Inc. subsidiary for approximately $20 million in cash. Industry sources and Semi officials agreed that EM&M's lack of money to support a semiconductor operation was the main reason why one of its most profitable operations was sold.

"Because we compete on the basis of service, the Fastrain Printer was the better business decision."

Carlson Marketing and Motivation (CMM) is one of the world's largest premium/incentive organizations. Comprising some six operating companies and providing a very diverse range of services, CMM required exceptional computer response. E. C. "Skip" Gage, president, and Ed Frandle, director of operations, discuss some of these requirements.

CIRCLE 69 ON READER CARD

Gage: "We're totally service-oriented, and in the last few years our growth has been almost explosive. Obviously, data processing is a very important part of our delivery system."

Frandle: "Right now we have ten different data centers to serve our clients. We need not only the capacity to handle the volume, but also the flexibility to handle the complexity of our operations. That's why we chose Control Data's 92111 Fastrain printer—it gives us almost twice the throughput of a 1403 and yet it's completely compatible with our hardware and software. The Fastrain even accepts our existing carriage control tapes, so conversion is transparent and painless."

Gage: "We were also impressed by its print quality and reliability. Both were exceptional, given that it operates at 2000 lines per minute."

Frandle: "That's right. In one three-month period, it cranked out more than 60 million lines with perhaps one hour of downtime. I think that's pretty good reliability."

Gage: "We're getting almost twice the speed and print quality that's as good if not better. We're getting service and support whenever we need it. We're getting greater ease of operation and greater ease of conversion. For us, the Fastrain was the better business decision."

Perhaps our Fastrain printer is the better business decision for you. Call 612/553-4029 or contact your Control Data representative.

CONTROL DATA CORPORATION

Addressing society's major needs

DEC, Data General, HP communications costs are down

If you're supporting multiple remote terminals on your mini-computer system, whether from DEC, Data General, HP or anyone else, chances are you are paying a fortune in communications costs and probably not even running the terminals as fast as you'd really like to. And to add insult to injury, you have to put up with the occasional phone line glitch which drives your CRT crazy.

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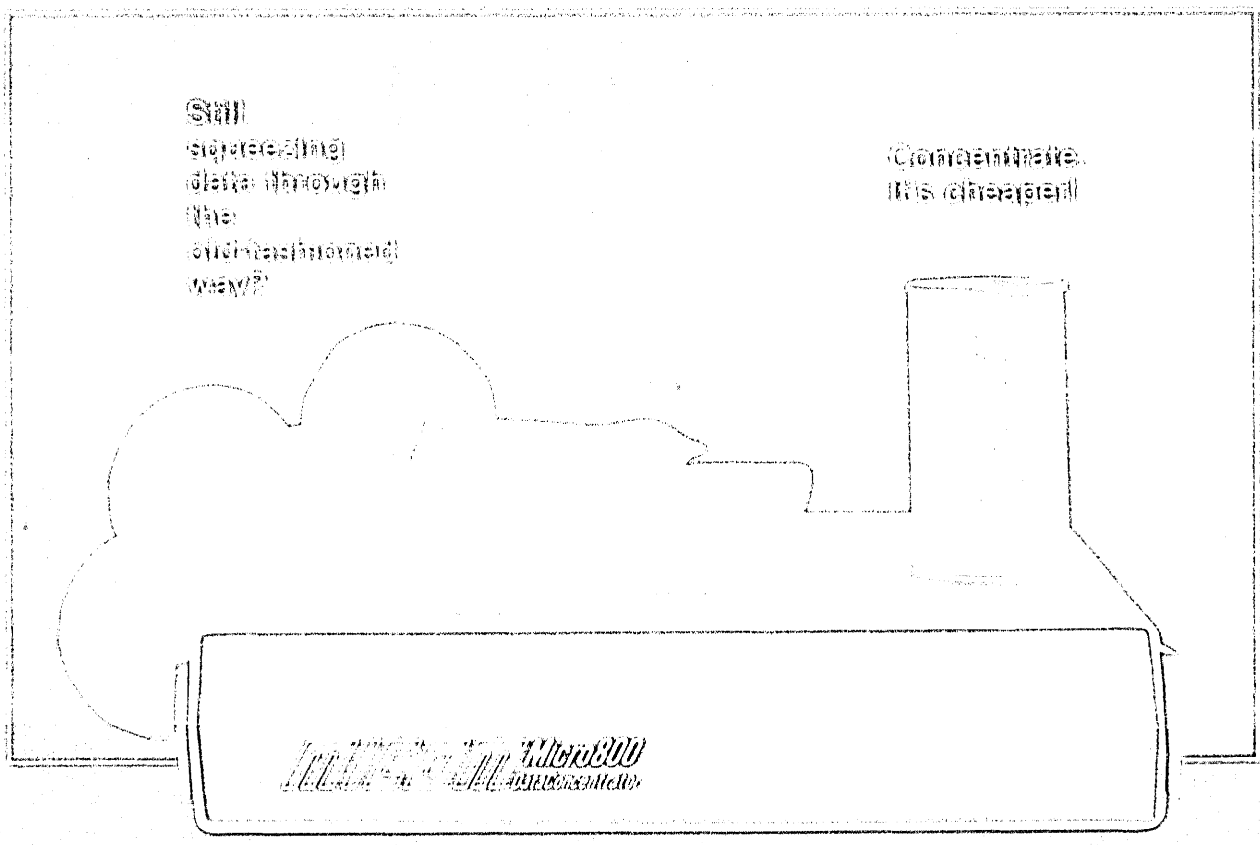
Send for complete details today . . . better still, why not call and order a pair on a 30-day sale-or-return basis. No strings attached. We know you'll love it.



While you're waiting, Wang's VS could be working.

If you're waiting for an IBM System 34 or 38, you've got a lot of time on your hands. So why not take a few minutes and closely consider just what you'll be getting a year or two down the road. Most importantly, consider your options.

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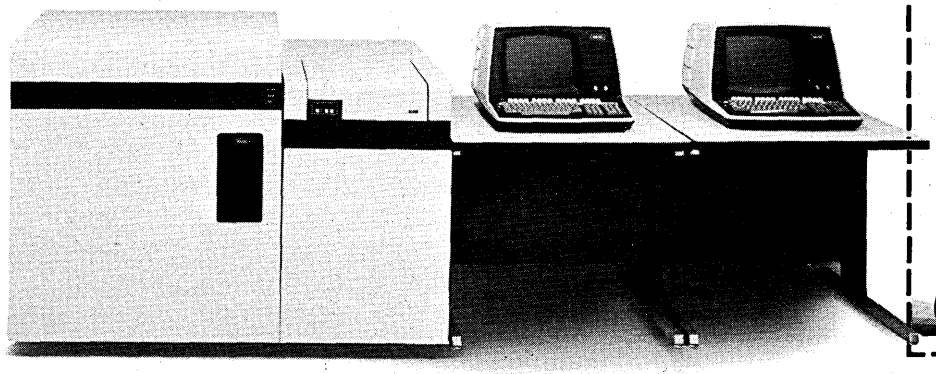

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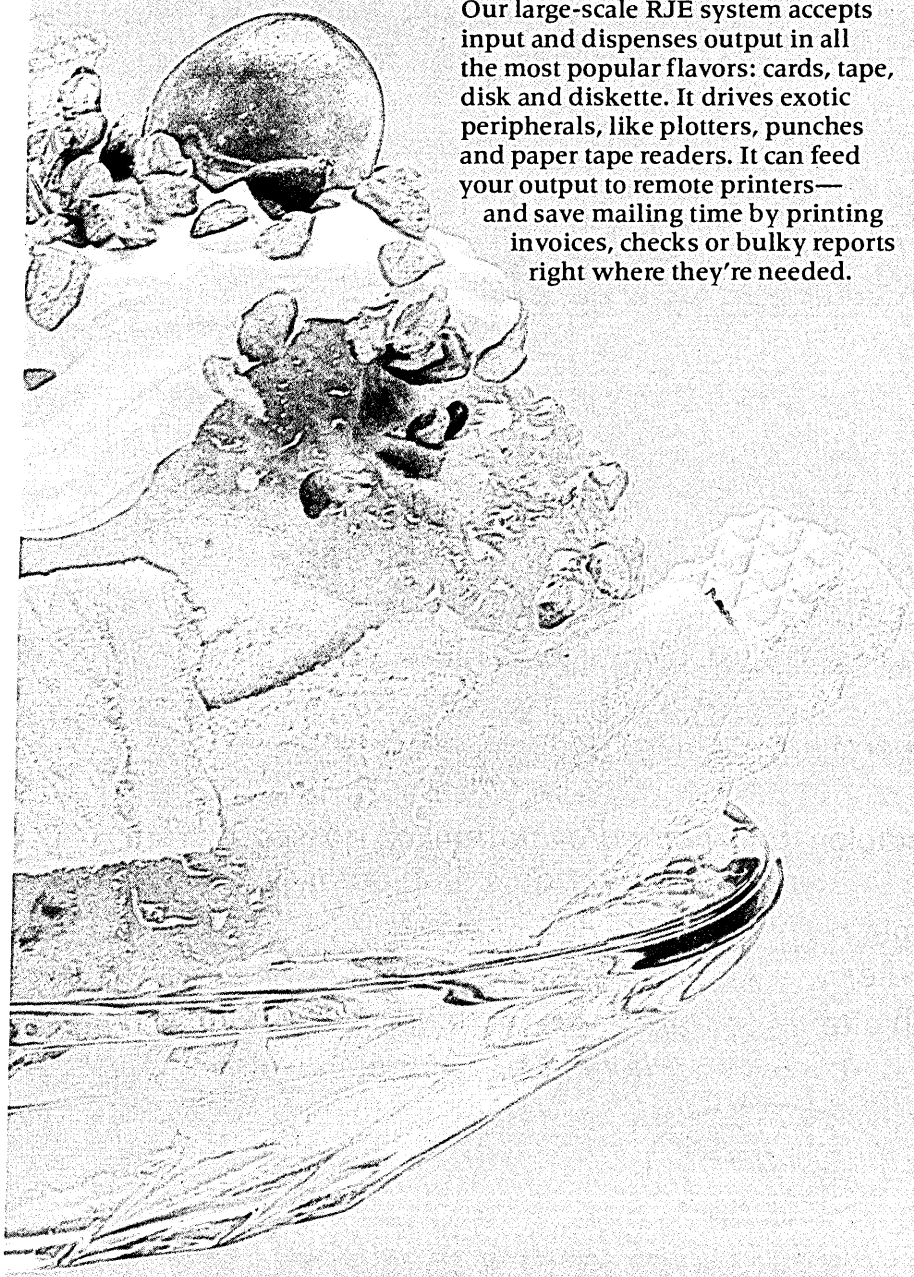

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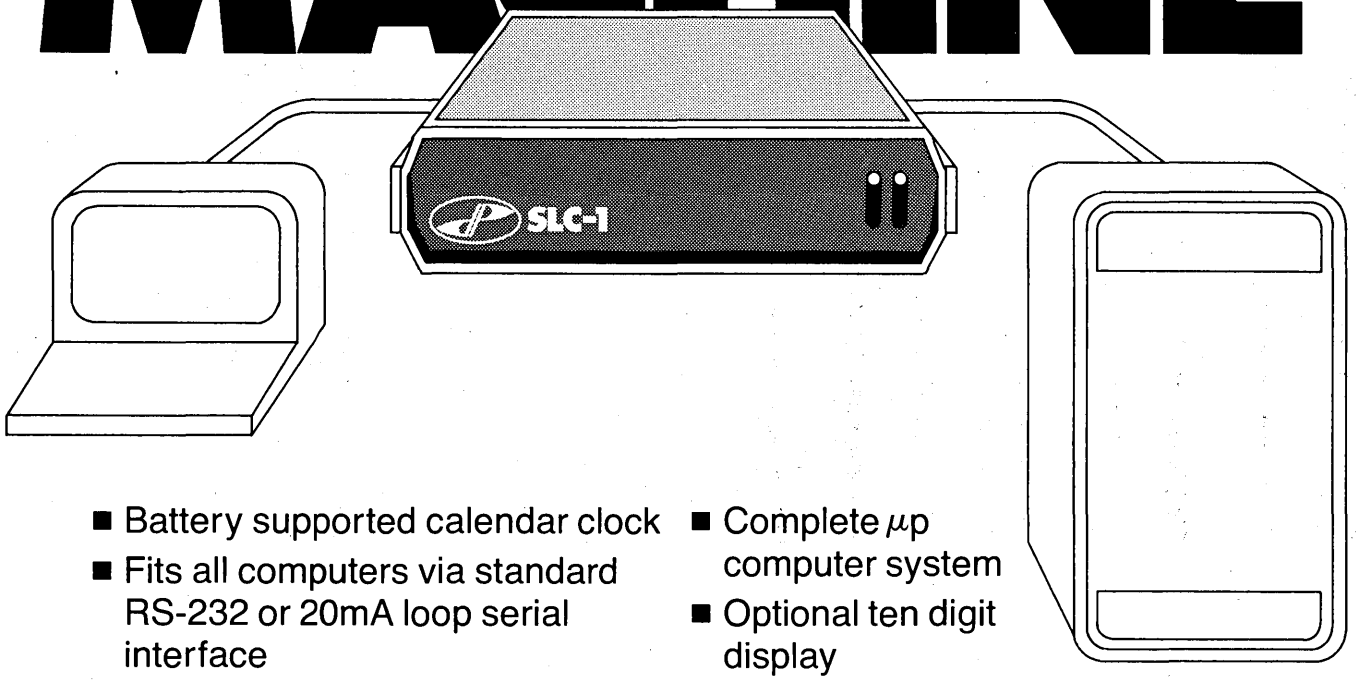

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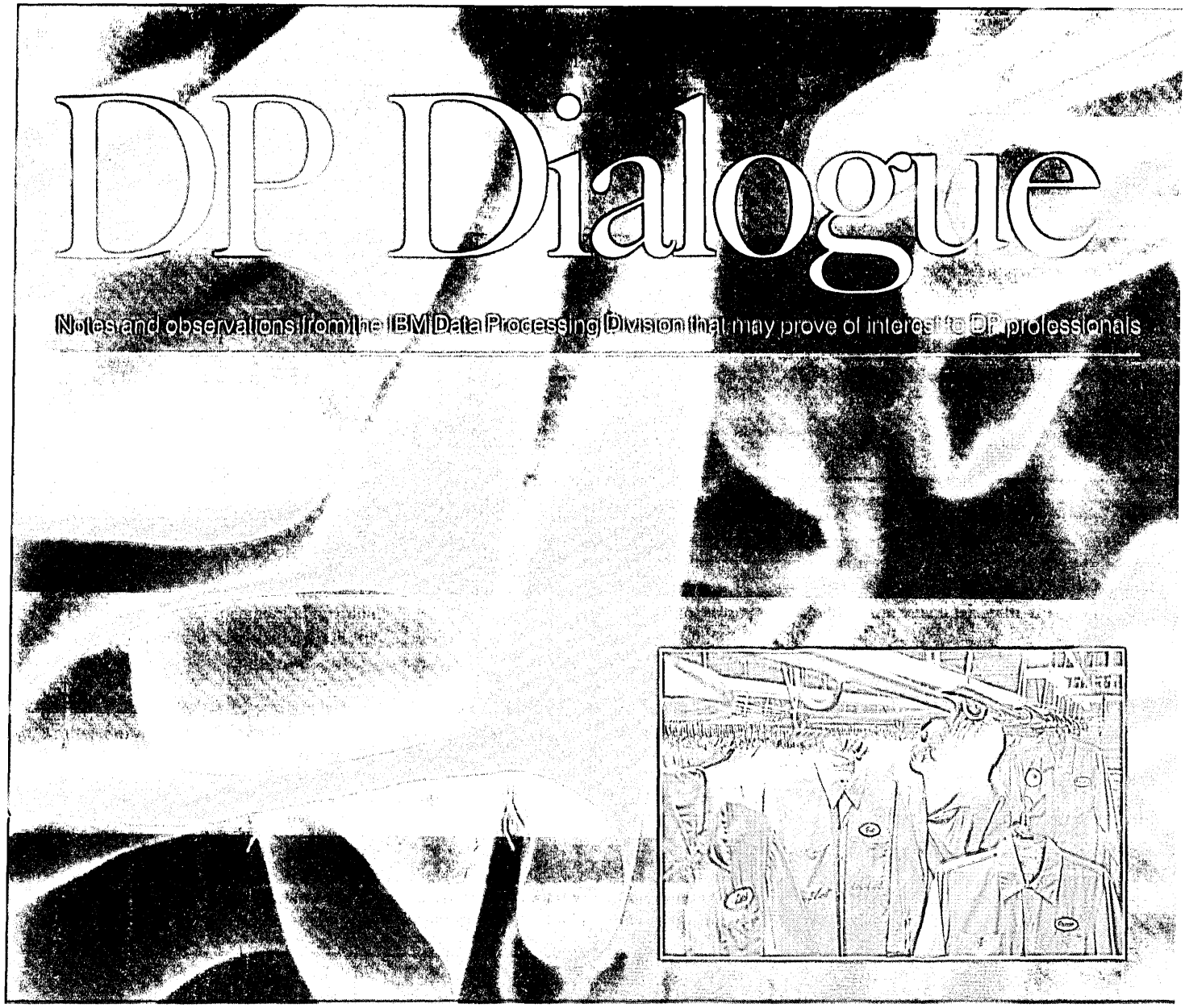
DP Dialogue

Notes and observations from the IBM Data Processing Division that may prove of interest to DP professionals



These crisp laundered shirts move to the sorting line at an Aratex processing plant. An IBM 8100 allows local management to keep close tabs on plant-level operations.

The 8100 Folds Neatly Into Place at Aratex

"We installed our first 8100 ourselves in one weekend," says Mario Calderin of Aratex Services Incorporated, "and by Monday we had our applications up and running at that plant. And they run very well: we used to incur overtime to finish a day's work at that site with five online terminals. Now, with only four terminals and the 8100, we finish the same work by 2:00 P.M."

Aratex is a major textile rental company, operating 42 plants across the United States – each with its own small computer. At five locations – eventually to be all 42 – these are IBM 8100 Information Systems. Aratex supplies uniforms, work clothes, towels and other specialized items to 140,000 business customers.

More than 400 programs, with some 150 different screen formats for terminal transactions, have been developed at the company's Encino, California, headquarters and installed in the plant computers. "With distributed data processing, company-wide work should be processed at corporate; essentially plant-level work should be done at the plant," Calderin, director of management information systems for Aratex, continues.

The remote units run as stand-alone systems most of the day, executing batch programs and accepting garment counts and other transactions entered interactively by plant employees. Once a day, an IBM 3031 Processor in Encino polls each plant site to collect the new transactions. This updates a central data base that backs up the smaller systems.

The novel "loop" communications technology of the 8100 permits devices to be placed in any convenient location, Calderin points out. "We seldom need to handle the processor," he says; "we can put it out of sight. And we can easily add terminals or printers, or move them around."

Adds Albert F. Robinson, vice president of management support services: "Centrally developing standardized systems has cut our costs tremendously. For example, plant audits go much faster, since the auditors need not learn different procedures for each site.

"At the same time, management responsibility is returned to the local level. With today's problems – government restrictions, inflation, and the like – the local manager must detect trends much faster. Which customers are becoming slow payers? Which have expiring contracts? Putting the data base at the plant site provides the manager with this kind of timely information."

Advertisement

A Bank That "Borrowed" From the Airlines

Online banking and airline reservation systems both must handle high volumes of short transactions. So when Western Bancorporation designed its online network, it chose as its operating system the Airlines Control Program (ACP).

"The capabilities of ACP fit our transaction stream beautifully," says Clayton W. Jackson, senior vice president of Western Bancorp Data Processing Company, a subsidiary of the bank holding company. "We find that ACP uses our host computer very efficiently."

Western Bancorp is an affiliation of 22 banks in 11 western states. As its first project, the subsidiary managed the conversion of the group's 22 diverse DP centers to the unified network.

Within this network, two independent data communication systems were set up. One consists of 3,663 teller terminals (IBM 3604 Keyboard Displays) in 810 branch locations, using Systems Network Architecture (SNA). The other is a bisynchronous network linking the DP centers for data collection.

At the center of the network, IBM 3705 Communications Controllers manage data traffic to and from 320 IBM 3601 Finance Communication Controllers distributed over 11 states. Yet the host computer in El Segundo, California, the headquarters of the data processing subsidiary, is only a System/370 Model 148.

According to Jackson: "Within six months, we built this data center, developed the system, and started it up in the first 21 branches, as a joint effort with IBM. We could not have come close to that without SNA."

Under SNA, most of the detailed communication programming for a teleprocessing system is eliminated.

Plans call for the use of the Advanced Communication Function (ACF) of SNA for computer-to-computer communications, Jackson adds. "A customer will be able to go to any office to draw money, and the teller's inquiry at the terminal will automatically be routed to the appropriate data base to determine if funds are available."

ACP serves a variety of financial, hotel, and other users with high-volume online applications, as well as many airline reservation systems. "With all these existing ACP installations," Jackson notes, "we know that it works, is reliable, and has the positive recovery we need for handling money."

A teller in a Western Bancorp branch in any of 11 states can access the data base in any other branch through a terminal. The Airlines Control Program (ACP) enables a relatively small host computer to handle very heavy transaction traffic.

Allis-Chalmers industrial lift trucks ready for shipment. This Matteson, Illinois plant depends on the online computer, so Allis-Chalmers uses IBM's VM/370 to help assure uninterrupted production.

VM/370 Gives Lift Truck Production a Boost

"This plant is committed to online production control by the computer," says Dave Van Duyn of Allis-Chalmers Corporation. "All its operations, and the movement of materials on the manufacturing floor, absolutely depend on it."

To insure uninterrupted data processing service, the company's Industrial Truck Division, headquartered in Matteson, Illinois, uses Virtual Machine/370 (VM/370) in its IBM System/370 Model 138. VM/370 is a system control program under which one real computer simulates several functional machines. It appears to the users of each virtual machine that they have an apparently free-standing computer, logically separate and dedicated to their application. No one virtual machine can be affected in any way by activity in any other.

"Availability is the key benefit of the virtual concept," Van Duyn adds. "I can't remember the last time a system problem affected production." He is manager of data processing and systems for the division, which manufactures fork lift trucks.

At Matteson, where engine-powered trucks are made, the production control system processes order entry, material requirements planning, inventory control, shop order release and production scheduling. It responds to inquiries regarding customer orders and shipment schedules, inventory availability, and production performance.

At the same time, other end users are running online applications in other virtual machines. Engineers access the Conversational Monitor System (CMS) to do interactive computations. Users at an Allis-Chalmers plant in Lexington, South Carolina, where electric vehicles are made, access their own virtual machine through an IBM computer. And the data processing department does interactive programming under CMS.

"Having a virtual machine dedicated to program test is particularly valuable," Van Duyn notes. "It completely isolates production work from anything that happens in an unverified program.

"As a point of interest, I have defined a virtual machine for some purposes of my own. We have a lot of equipment traffic with IBM, and I monitor the delivery schedule and the invoices interactively with CMS. In the same virtual machine, we keep track of the locations of 60 online terminals and who uses each one. I also keep on file a current copy of the configuration of our backup site. And we do word processing under CMS for some of our system documentation."

DP Dialogue is designed to provide you with useful information about data processing applications, concepts and techniques. For more information about IBM products or services, contact your local IBM branch office, or write Editor, DP Dialogue, IBM Data Processing Division, White Plains, N.Y. 10604.

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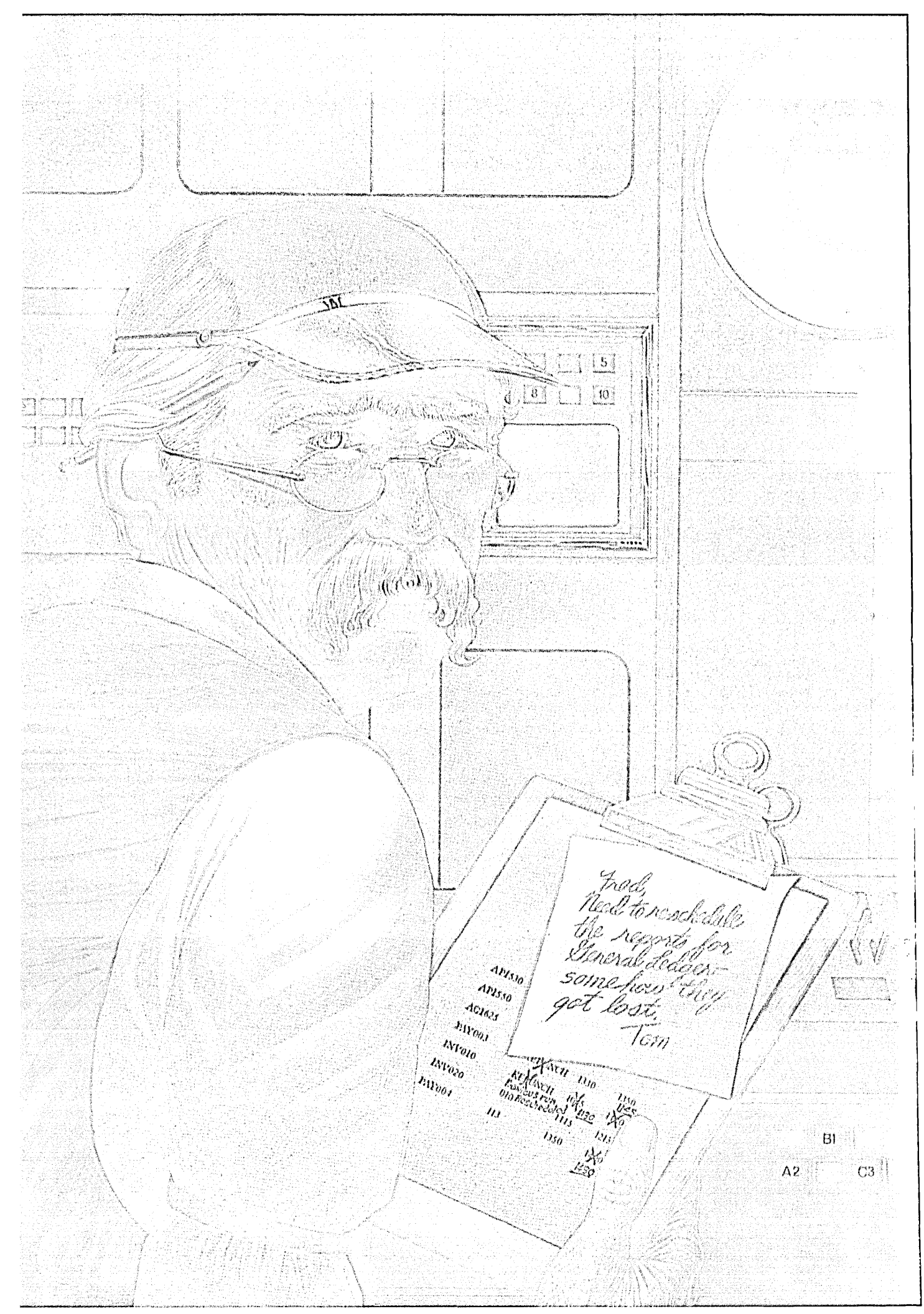
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Small Business Systems Surveyed

Microdata Reality Gets Top User Rating

Microdata Corp.'s Reality, Basic/Four Corp.'s Model 400 and the IBM System/3 models 6, 10 and 15 reaped the highest marks in Management Information Corp.'s (MIC) fourth annual small business systems users survey.

To assess how well small business systems are meeting users' needs, MIC polled 568 companies that use 689 small business CPU's.

Each respondent was asked to subjectively rate the vendors and their products on performance (whether stated equipment specifications have been realized), reliability (uptime vs. downtime), ease of use (amount of time necessary to train new personnel), service (maintenance) and vendor support (such as advance training and program assistance).

A four-point rating scheme was used (1 = poor, 2 = fair, 3 = good, 4 = excellent). The survey results were given as averages of the ratings assigned to each product in each of the five categories.

The Microdata Reality, Basic/Four 400 and System/3 Model 10 and Model 15 were the only small business systems to receive ratings of 3.0 or higher in all five categories.

Taking the average of all five categories, the Microdata Reality topped the field with a score of 3.66 (based on 27 respondents using 55 units). The Reality earned 3.8 in performance, 3.8 in reliability, 4.0 in ease of use, 3.4 in service and 3.3 in support.

Based on nine respondents with nine units, the average for the IBM System/3 Model 15 was 3.6. This system was rated 3.6, 3.8, 3.6, 3.7 and 3.3 in performance, reliability, ease of use, service and support, respectively.

Eight users with 17 Basic/Four 400's gave that system an overall rating of 3.5. In performance, reliability, ease of use, service and support, the system was rated 3.5, 3.4, 3.8, 3.4 and 3.4.

Following this order, the IBM System/3 Model 10 was rated 3.3, 3.5, 3.3, 3.3, and 3.3, respectively, by 34 users with 45 units. The System/3 Model 6 received 3.4, 3.7, 3.7 and 3.1 ratings in performance, reliability, service and support, respectively, by eight users with eight units.

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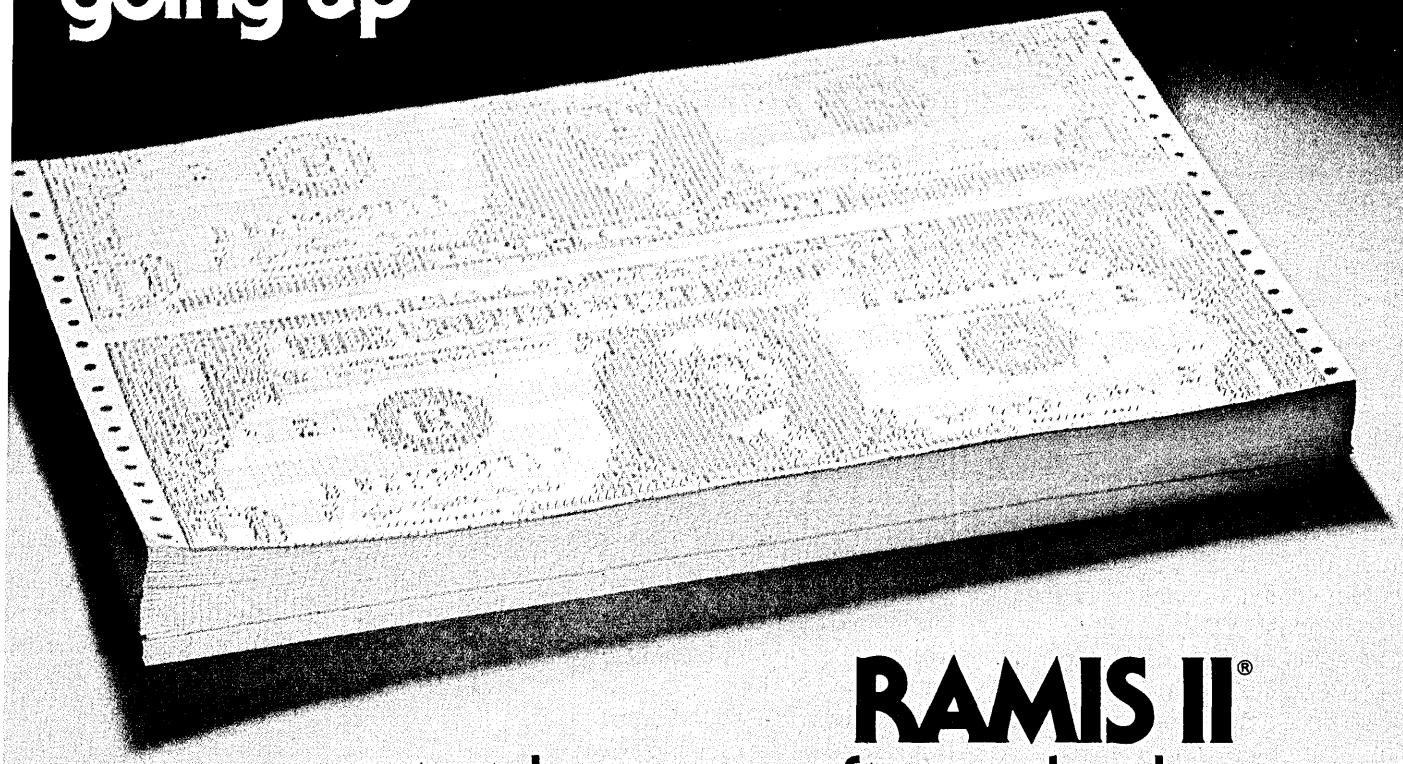

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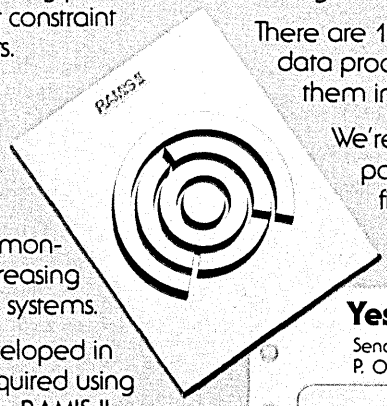

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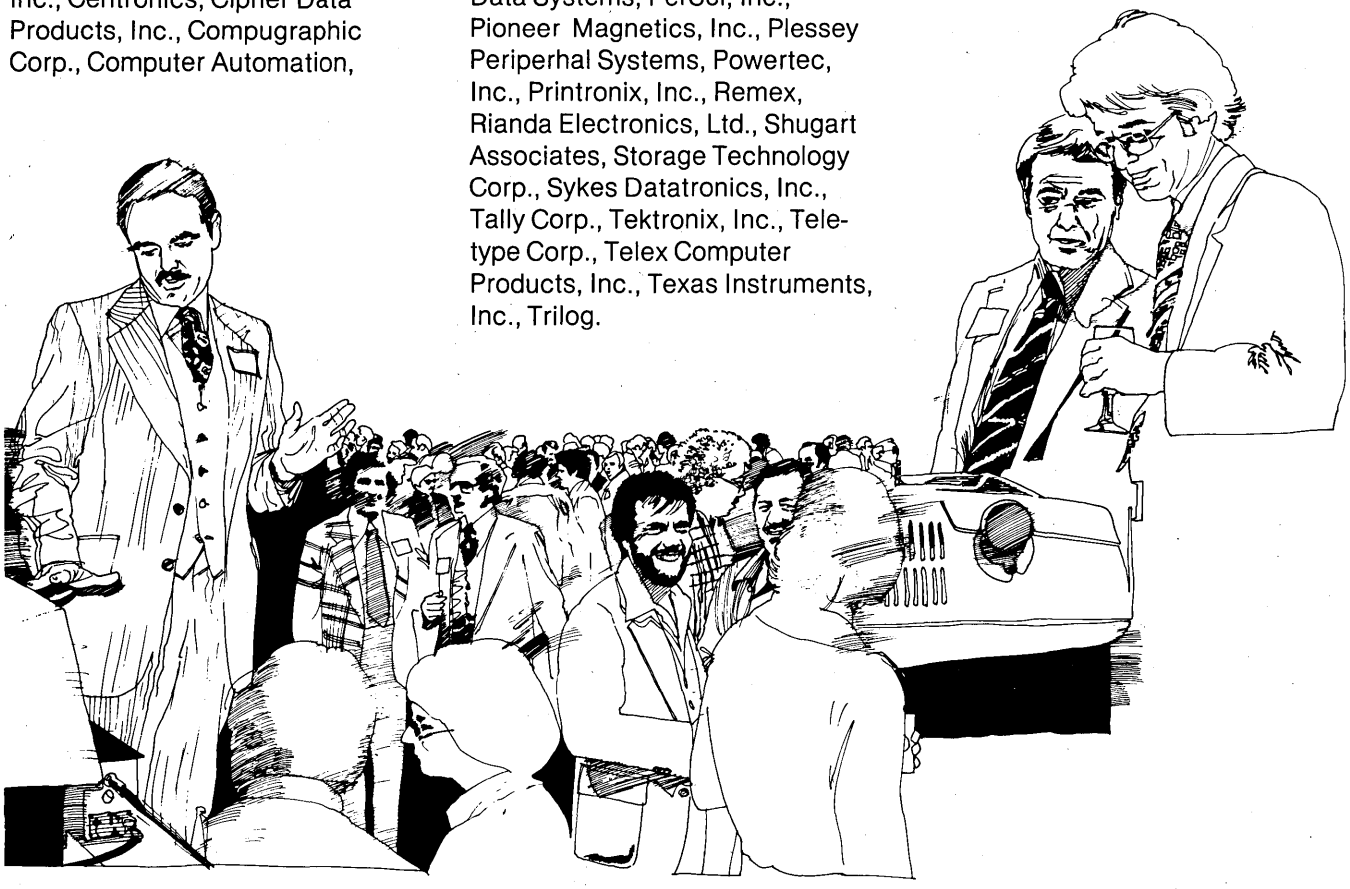

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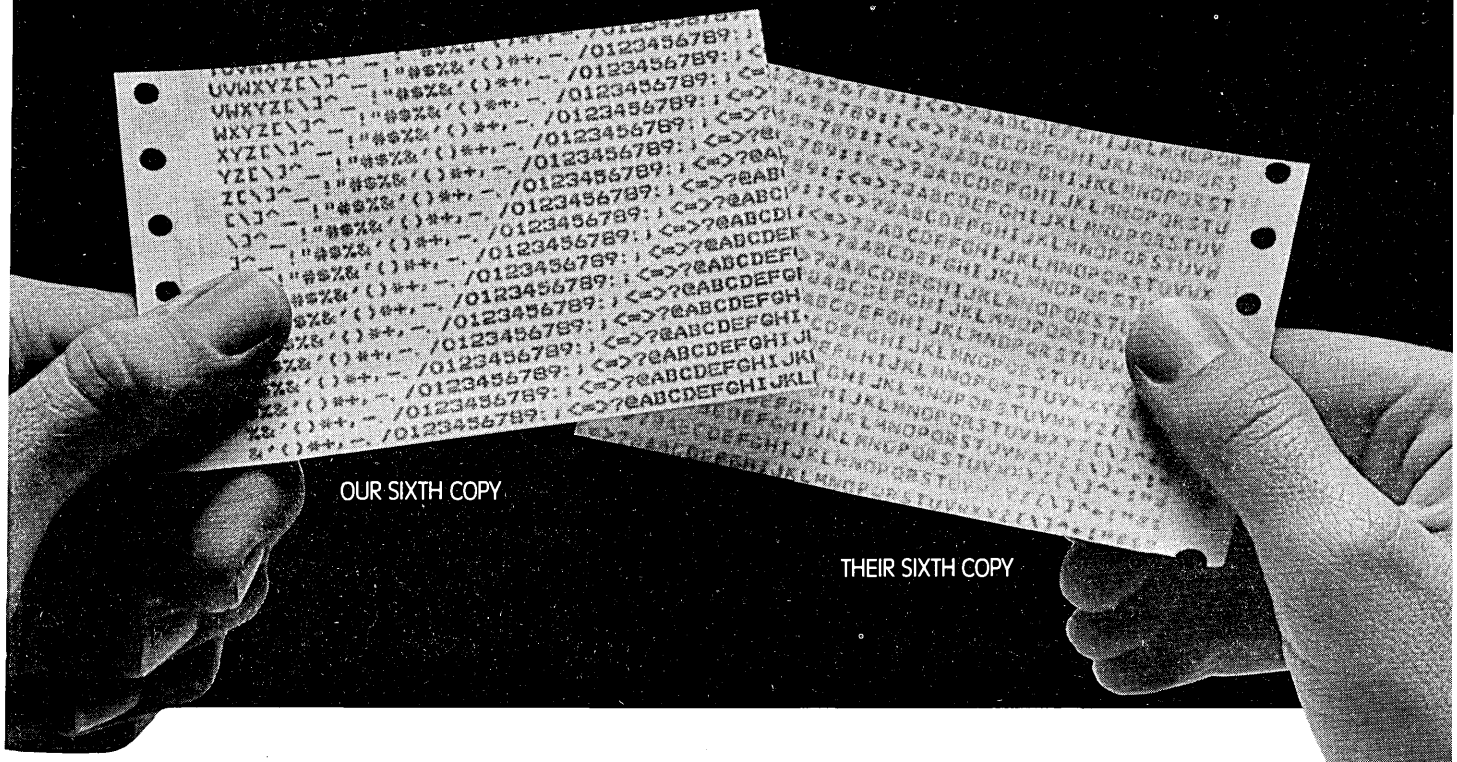

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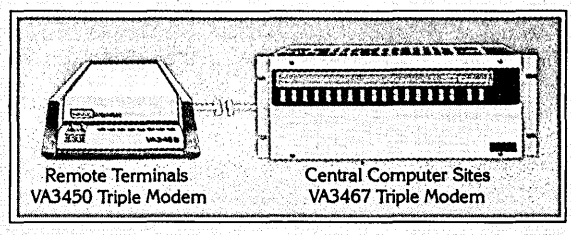

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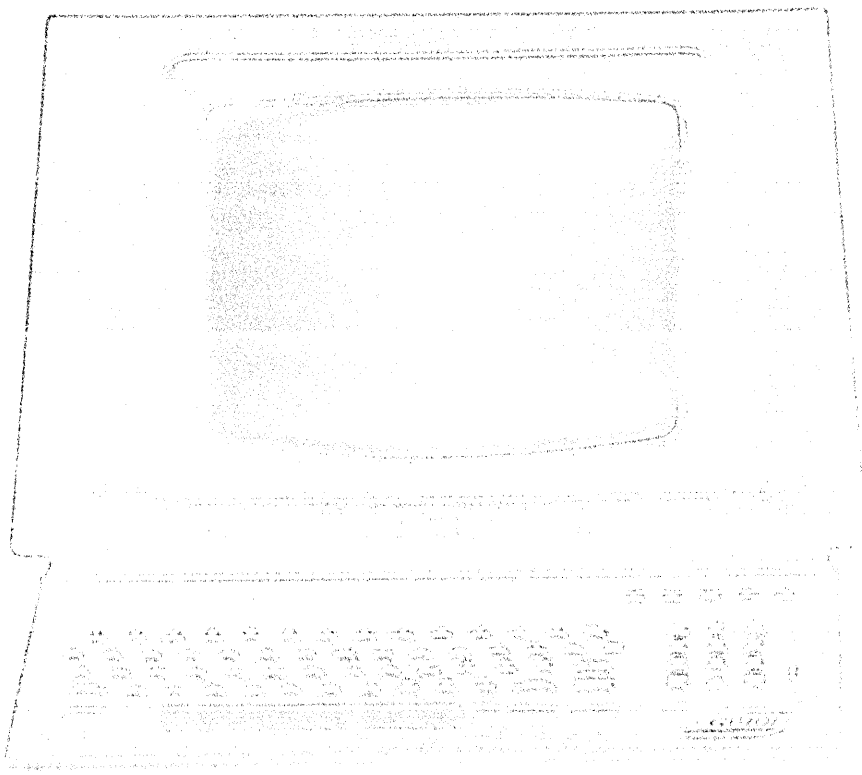

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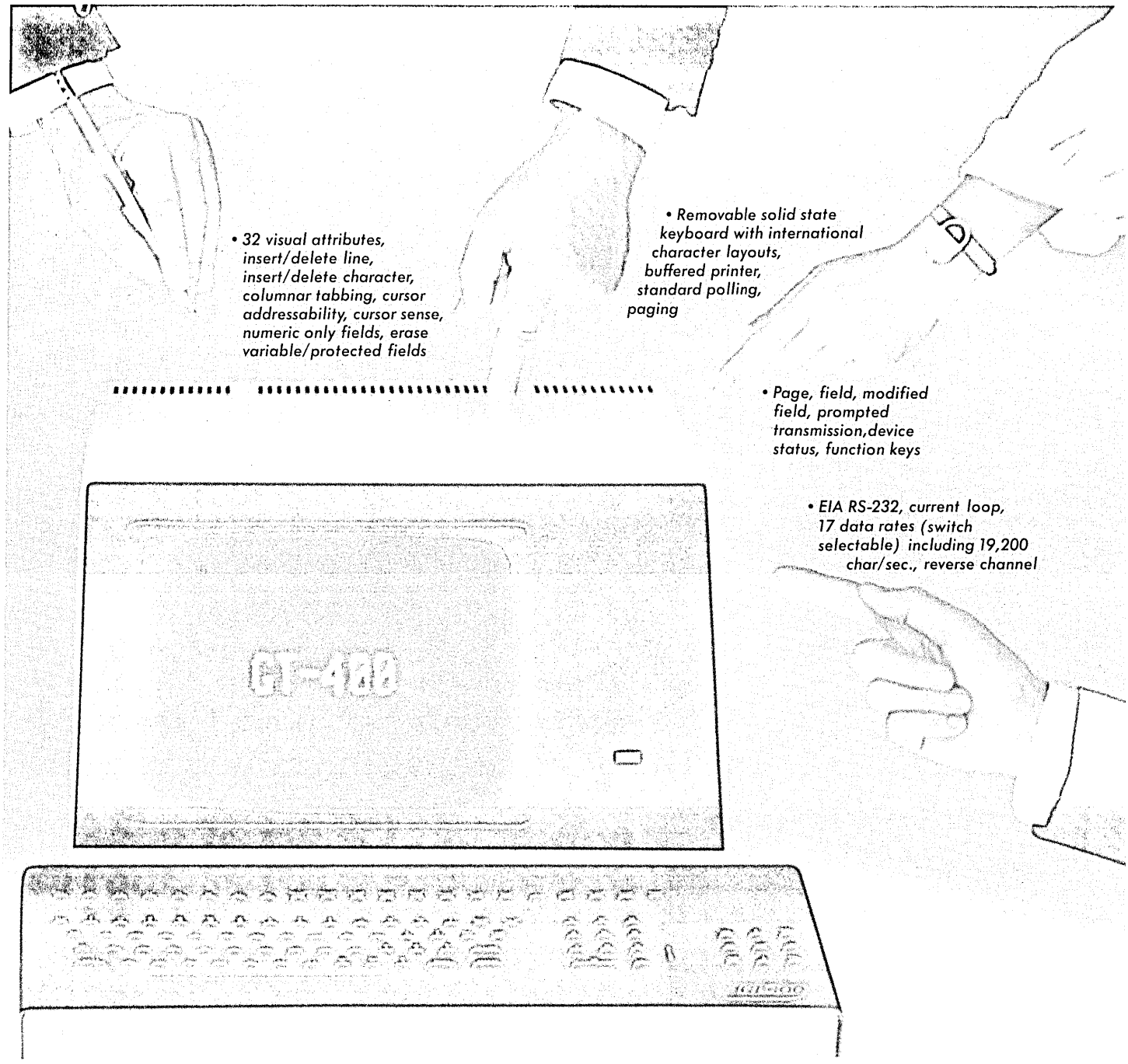

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ILLUSTRATION BY FRANK CERULLI

Despite the new product blizzard, the office continues to be the most undercapitalized portion of the labor market.

A REVIEW OF OFFICE AUTOMATION

by Amy Wohl

There is no recession in the office automation industry. The last year has seen many new product announcements and sales records set in every market segment.

Yet, what has been the effect of the new product blizzard? Have we radically changed our view of the office and the ways in which we will permit technology to change our workplace? No. The office continues to be the most undercapitalized portion of the labor market. Many secretaries continue to survive, performing significant volumes of work with no equipment beyond a typewriter and a telephone—plus reams of paper, a large eraser, and a filing cabinet. The predicted revolution in the office has not yet occurred, and it may never occur. Instead, we see an evolution of equipment and procedures which is gradually changing the physiognomy of the office.

Electronic typewriters were important in 1979. IBM entered the market and now offers every prospective purchaser of a Selectric an electronic typewriter as the current state of the art. Electronic typewriters are not only seen as the natural upgrade for electric typewriters, they are also viewed by many users as an inexpensive, low-end word processing product. Enhanced electronic typewriters with larger memories (five pages is now common) permit short documents to be recorded, revised, and automatically typed in final form. Some forward-thinking companies believe the electronic typewriter with communications capabilities will represent the first cost-effective method for linking office workstations into (primitive) document distribution systems.

It troubles word processing managers that too many companies believe these low-cost word processing devices can be placed on every desktop, providing wp within the structure of the traditional office. In many newly restructured offices, secretaries may report to secretarial supervisors who manage productivity, balance workloads, and evaluate and develop the secretarial staff. These managers know that many of the productivity

It is the user's responsibility to integrate the electronic typewriter into the automated office—or pass it by when it only offers fancy gadgetry.

gains attributed to wp came from the establishment of this professional management, and to the implementation of improved procedures, rather than from the addition of office automation.

Nevertheless, the electronic typewriter is here to stay; it is the user's responsibility to integrate it into the automated office or to pass it by when all it offers is fancy gadgetry with little or no possibility of improved productivity.

BLIND PROCESSOR DECLINES

It is likely that 1980 will be the year in which nondisplay word processors are recognized as less productive and less attractive than their sighted siblings. Also, significant decreases in price may make display systems the first choice of many users. A three-tier market is developing: first-time users may go for low-cost producers such as electronic typewriters and blind systems (with a small but growing number of new users opting for the less expensive display-based systems); more experienced users will generally choose display-based systems, particularly those with well-rounded text editing capability; and the most sophisticated users will look at multifunction display-based standalones and shared systems.

The nondisplay systems are weak in both ease of training and ease of use, and they usually offer significantly fewer functions. As pricing disappears as a justification for purchasing such systems, they will probably become less and less popular in the marketplace.

Multifunctionality was the buzzword in 1979. Practically every recent announcement nods in the direction of users who require word processors to offer more than the ability to revise text. Popular additions to the systems functions include:

- *Records of Information Processing.* Defined differently by various manufacturers, this means the ability to store data in records, and to sort records (or data extracted from records) in a variety of ways. Points go to vendors offering flexibility, ease of use, and speed. Some word processors offer these functions, but at such slow speeds as to be virtually useless for significant amounts of data.
- *Numeric Processing.* For word processing users, this is the ability to total rows and columns, or to perform mathematical manipulations (usually arithmetic) on keyed data and store the results in a particular position. Many functions require some form of simple numeric processing to complete reports generated by information processing functions. Amazingly, there are some systems, notably the IBM OS 6, that offer sophisticated records processing with no numeric functions.
- *Data Entry and Data Access.* With the widespread availability of a communications function on word processing systems, it was inevitable someone would notice these products could be used as data processing terminals. In fact, some firms justify the purchase of a wp system by displacing infrequently used data entry/access terminals. The problems here deal with converting a secretarial employee into someone who productively performs data entry/access, a task made harder by the inhuman engineering of much software, of appointing a traffic cop to decide when the multifunction terminal is a word processor and when it is a terminal. This job becomes particularly painful when downtime or overtime rears its ugly head.
- *Data Processing.* Many word processing systems are, in fact, small computers with wp software. Some vendors admit this, and are offering word processing customers the ability to write their own programs. The problems here are first, the ability of the vendor and the office staff to provide appropriately trained programmers, and, secondly, the speed and suitability of the wp system's processor.

STANDALONE SYSTEMS

Some multifunction systems are standalones. Increasingly, some are varieties of share systems. Once, all multistation word processing systems were called shared logic systems. This means that essentially dumb terminals shared the logic (or intelligence) of a minicomputer. However, with the advent of the microprocessor it became easy, and inherently more reliable, to spread intelligence throughout the system; terminals, storage systems, and even printers began to have microprocessors. These multistation systems are often called "shared resource systems." Here, it is assumed intelligence is spread throughout the system; in fact, the system may be a series of interconnected, individual standalone units, such as the new CPT and Lanier systems, or the even newer Xerox 860.

Certain resources, typically disk storage and peripherals such as printers, photocomposition output systems, OCR scanners, and other less frequently used components may be shared among a number of workstations. As with shared logic systems, emphasis is placed on lower cost, system reliability, and flexibility. Presumably, the failure of one component of a shared resources system does not mean the entire system is unusable; however, if the component is a significant one, such as disk storage, this may not provide much remaining function. Emphasis may also be on permitting individual components to be located and controlled by a group or department, rather than requiring the entire wp system to be centralized physically and placed under the control of a single manager. This is attractive to users who want to use advance technology without the organizational trauma of changing their infrastructure.

There are some people, mainly vendors, who would have the customer believe integrated systems are here. This is rarely true. While many multifunction systems permit the same system to provide both text editing and data processing, these are, at best, functions performed simultaneously and separately on different terminals of the same system. A true integrated system must go beyond multifunctionality and offer the ability to access any record—text or data—and to combine any information within the system in any logical way.

For instance, to create and process customer records and personnel records on a "word" processor, one might reasonably want to take data from these records and combine them with text to form new documents. Many systems make this process difficult, if not impossible. The next generation of systems may treat text or data information in the same way (or at least make any differences transparent to the operator). The operator will combine data with text and to edit data. Also, because office workers use English rather than programming languages, the interface between operator and system will be English words, displayed on an easily read screen.

Wang Laboratories is the ultimate success to date in the information processing industry. Starting with its WPS series in 1976, the company has steadily offered bigger and better word processing and information processing systems, including a broad variety of standalones, clusters, and large multistation systems. In the past year, Wang's offerings have broadened to include what the company refers to as Integrated Information Systems. This means that one can add dp to wp systems through the availability of BASIC on Wang's office information systems, or add wp to the Wang VS line of small- to medium-sized computers. While Wang is basically offering multifunctional systems, integration is the long-range goal, and it is already possible to perform certain combined operations. Wang has also announced a number of electronic mail facilities, including its combined VS/OIS Mailway System.

OTHER NEW WP PRODUCTS

A number of other prominent vendors have also announced wp products in the past few months. There are distinct similarities (and some differences) among these products which are worth exploring as we attempt to understand the current wp market.

In November, IBM's General Systems Div. announced the 5520, a classic shared

logic word processing system plus an electronic mail (or document distribution, as IBM calls it) scheme. The 5520 offers four system levels, with differences between models based on the number of work stations and peripherals supported and the size of the fixed Winchester disk storage.

At present, the system offers a limited amount of word processing software; the 5520 employs a particularly attractive display and its menu structure should make operator training easy. The system does not yet offer much in advanced word processing, nor does it offer any records processing (sort, select, or numeric processing). However, on a system with a powerful processor and software-loadable instructions, additional functions might be added in time. The system in its basic form (a multistation wp system) is now available. Larger models and the electronic mail package will be available in November.

It is worth noting that the electronic mail package, as described by IBM, seems to be designed with noncomputer personnel in mind. Users may store lists of addressees, complete with telephone numbers and other information. The system will handle most of the process of sending and receiving the mail, and, in background, considerably increases the amount of work that can be done at the individual station. In fact, background processing is a significant aspect of this product; many chores can be performed in background, with the system informing the operator when a task is completed or if additional input or direction is required.

IBM offers the system with a choice of daisywheel printer (a 55-characters-per-second Qume) or IBM's own 6640 ink jet printer, with its unique dual sheet plus envelope feeder. Communications to other systems are another important part of this product. Unlike IBM's other multistation wp system, the 3730, the 5520 offers peer-to-peer communications between 5520s. It also offers access to such other communicating devices as the OS 6, the WP 32, the Communicating MC-II to host computers, and to the 6640 and 6670 communicating printers.

Also in November, Datapoint reentered the wp market with new wp software for its ARC systems. In fact, Datapoint, too, chose to offer much more than word processing. Its Integrated Electronic Office announcement was geared to many aspects of office information processing. The system, which uses the ARC hardware with special keycaps for wp functions, has word processing, document distribution, and AIM, a new file retrieval package.

All this, plus such prior ARC attributes as data processing, personnel computing (user programmability), data access, and data entry. The problem is that all this proceeds in a structure designed more for dp people than for office users. It is top-heavy with codes to memorize. Some day dp vendors will learn that the method of communication used in American business is a language called English. One of the problems of the Datapoint software is that many functions use what seems like English labels, with the words used differently than in ordinary English. Happily, that is easily fixed.

A considerable strength of the system is its powerful file retrieval package. The user need only key in combinations of English words describing a document and the system will report on the documents containing these combinations. Additional words may be added until a small number of documents has been defined. To aid in the search, the user can view the lines in the document in which the specified words appear. This information retrieval works very much the way users look for documents in their files ("I'm looking for a letter from Mr. Smith to Mr. Brown, written sometime in late '78 about a trip to Washington. . .").

To the extent that technology employs familiar thinking processes, it will be quickly and positively received by office workers. Recent research shows that the more complex a system, the more frequently it must be used to be helpful—otherwise, we must review the reference manual every time we want to do anything. Systems that replicate familiar, comfortable human activities are at an immediate advantage when judged by such standards.

NEW XEROX PRODUCT

In December, Xerox announced a new standalone information processor, the 860, a software-programmable upgrade of the 850 product. In addition to information processing capabilities (including records processing with numeric processing and—unusual in this type of product—a BASIC interpreter to permit user programming), Xerox also announced a new system interconnection, the Ethernet.

The Ethernet capability has been in Xerox facilities and in a few user sites for several years. Ethernet permits a coaxial cable to be strung throughout a firm's site, with individual workstations and peripherals hooking into the connecting cable through a simple tap. In effect, any workstation on the system can then choose to function independently, using its own hardware and software, or it can choose to make use of the Ethernet connection to attach itself to any printer or storage facility on the system.

It also may provide gateways, permitting Ethernets at different physical locations to communicate with one another, or an Ethernet system to "talk" with host computers, other networks (including Xerox's own proposed XTEN network, SBS, and ACS) and other communicating devices. Controllers at the gateway provide any translation (interpretation of codes) needed. Xerox claims the system has the advantage of no central processor and hence no possibility that a failure of the cpu will bring down the entire system. As with all distributed intelligece systems, this statement is literally true, but needs further analysis. It is certainly true that each standalone workstation of a network of Xerox products could continue to function if any other station failed. However, certain key functions in the network would not be available if certain controllers malfunctioned. This would be especially important if the gateway controller (for communication function) or the file controller were involved.

How do all these announcements (and the dozens of announcements that have preceded them) fit together? Key issues are:

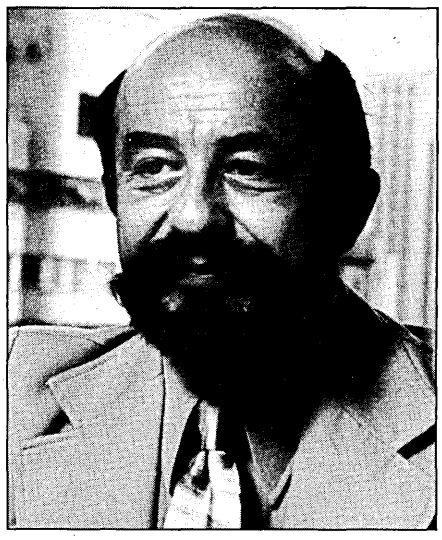
- All emphasize multistation systems, whether they are shared logic systems, like IBM's 5520, or shared resource systems like the Xerox 860 with Ethernet. Clearly, they are aimed at the larger user who needs to process significant volumes of text and data. Note the assumption by many vendors that shared systems, barely recognized a few years ago, are today a fact of life, particularly in larger firms.
- Multifunction systems, too, seem to be a fact of life. All of these products offer both word processing and electronic mail. Datapoint and Xerox emphasize such other functions as records or information processing and user programmability. In the IBM 5520, such function is conspicuous by its absence. While nods are given to extending multifunctionality beyond the secretary and to the principal, no system yet announced offers significant principal function in a way that is likely to be adopted by many non-dp users.
- Communications is everywhere, acting as "glue" to add function, storage, or utput options to systems, and to glue one system to another. Noncommunicating systems will eventually disappear entirely from the office automation market, and the communications function will also become a requirement for the low-end products—the electronic typewriters discussed earlier.
- Everyone gives lip service to the notion that systems must be easier to use by general office personnel. A serious commitment to this concept has not happened. ✲

Ms. Wohl is a principal in the office automation consulting firm of Integrated Technologies Inc., Levittown, Pa. Prior to joining ITI, she was executive editor of the Office Systems Group at Datapro Research Corp. Ms. Wohl is also a newly appointed contributing editor of DATAMATION.

First conference of its kind will explore current and future technology for the automated office.

EXAMINING THE OFFICE OF THE FUTURE

AMY WOHL, conference program chairman, says more than half of the 100 speakers are consultants. They are called in because there is no clearly defined vendor.



CHARLES P. LECHT, president of Advanced Computer Techniques, New York, will speak at a special Sunday evening gathering March 2 on "Office Automation: Fact vs Fiction."

by Tom McCusker

"Twentieth century offices are being run by 19th century office methods," said a recent press release from the sponsors of the first Office Automation Conference, to be held March 3-5 in Atlanta.

"While the office is the organization's information and communications nerve center," the press release continued, "it has not seen much of the technological advances that have brought computer technology to other line functions such as accounting and production."

There are many reasons for the neglect, such as a lack of economic incentive. But two key reasons stand out:

1. Companies seem hard put to find the right groups within the organization to examine the subject of office automation.

2. There is no clearly defined vendor of office automation systems.

"It's an area where companies have been doing more wondering than anything else," says Floyd O. Harris, chairman of the Office Automation Conference, the first of its kind sponsored by the American Federation of Information Processing Societies (AFIPS). "About 70% of the articles in trade magazines are now devoted to the subject, but real down-to-earth knowledge of office automation has not existed," says Harris, who is vice president of data processing with Life Insurance Co. of Georgia.

He observes that in his own company "There is no group of people responsible for looking into the subject and determining where we will go."

Consultant Amy Wohl, the conference's program chairman, says that since there's no clearly defined vendor of office automation systems, companies must either train a staff "or go out and buy the talent." Often, that means consultants who specialize in office automation. In fact, Wohl says, of the 100 speakers at the conference, half will be consultants.

AFIPS, which also sponsors the annual National Computer Conference, hopes it will be able to provide the kind of "down-to-earth knowledge" that Harris said is needed during the three-day conference and product exhibition at Atlanta's World Congress Center. A turnout of 15,000 persons is expected. By mid-December, it had signed up 103 exhibiting firms.

Wohl said the conference is aimed at middle and senior management with office administration responsibilities, and data processing management. They'll be asked to pay $75 for the program and the exhibits. Students will be charged $10; one-day fee is $30. (Attendees can register in Atlanta or through the AFIPS offices at 1815 North Lynn St., Arlington, VA 22209, Telephone: 703-243-4100.)

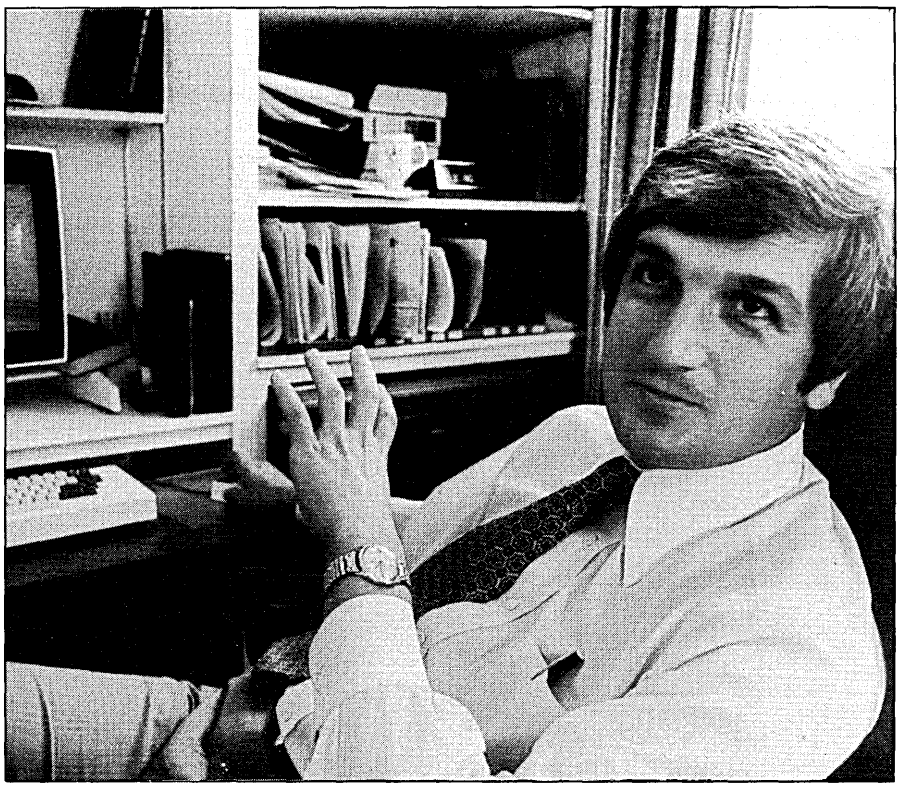
HITTING ALL LEVELS

The program reflects AFIPS' plan to reach all levels of the subject, with some sessions devoted to current technology, others to management of the technology, and the rest to future technology. In addition, 13 luncheon sessions, limited to 50 persons each, will cover office automation in such industries as law, manufacturing, insurance, banking, engineering, and government.

Questions will be the deciding factor in the success or failure of the conference. For instance, speakers at the luncheons are being asked to limit their comments to 15 minutes, with the rest of the time devoted to audience interaction. Most speakers have been asked to keep their presentations short to make room for questions.

Here are some of the titles:

Word processing: What Does it Mean for Data Processing Managers?
What Is Office Automation?
Office Automation: Who Sells What to Whom?
Why Automate?
Micrographics
Using Word Processing Within the Data Processing Center
Today's Word Processing Equipment
Modern Telephone Technology
OCR Scanners
Extending the Mainframe Environment to Support Office Automation
Implications of Change in the Office of the '80s
Who Runs the Automated Office?



RICHARD HARDEN, special assistant to President Carter for Information Management, and director of the Office of Administration, will address a conference luncheon March 3 at the Office Automation Conference.

Sophisticated Interfaces for Users
Electronic Mail
Impact of Information Processing on the Design of Office Systems
Voice Technology
Selling Office Automation to your Management
Network Technologies
Case Studies in Office Automation
Integrated Office Systems
Networking Implications

Wohl says the sessions related to current technology will be tutorial presentations about what is available now, and the speakers mainly will be users of the equipment. "Many will talk about how they did it, or what they would do if they could start all over agan." There also will be sessions entitled "Vendor Perspectives." These mainly will explain to prospective users the limitations of what the vendors can offer. "In other words," says Wohl, "the extent to which a vendor can customize your system." Knowing what is reasonable and what is unreasonable to ask of the vendor will enable a user to make better decisions on what can be done in implementing office automation systems, she adds.

WHAT IS TO COME

The future technology sessions will bring together the "research freaks," says Wohl, who'll essentially be persons involved in research and who will talk about what is to come in future offices. Steve McLellan of Salomon Bros., a New York investment firm, will head a panel on the implication of networks, as will Ira Cotton of the National Bureau of Standards.

Consultant Howard Anderson of the Yankee Group will talk about the present state of electronic mail, and later four researchers will discuss R&D in electronic mail and what to expect. Their topic: "Future of Electronic Mail."

Word processing, of course, will dominate the program because it's most often associated with electronic office procedures. Wohl says a lot of the content will be devoted to helping dp people understand how their departments can use word processing and also use it in servicing their dp users. Sam Kalon, of the IBM Office Products Div. in Franklin Lakes, N.J., will tell dp managers what they should know about word processing in a session entitled "Word Processing: What Does It Mean for Data Processing Managers?"

Alan Purchase, who will head a session entitled "Forecast of the Office Automation Industry in the '80s," says there are many questions facing the industry, including the position of Japanese firms in the market. "What is the office automation industry going to look like in the '80s? Will such well-known names as IBM, Xerox, and Exxon dominate? Will there be room for smaller companies?"

Purchase, who is director of Business Automation Industry Research at SRI International, Menlo Park, Calif., thinks there may be room for small systems houses to put together office systems. One reason, he cites, is that up to now, no one company is selling a whole office automation package, "possibly because the industry isn't ready for it." But, he says, the fact remains that no company has yet to form an Office Automation marketing organization. And, he says, the industry could be a $50 billion business late into the '80s. However, Purchase admits that it will be hard to define as technologies become more and more integrated.

"Will they be selling electronics or will they be selling furniture that embraces electronics hardware? Right now, the furniture is becoming more expensive than the hardware," Purchase says.

AFIPS officials said many of these questions will be answered by the exhibitors, depending on the nature of their exhibits and what they'll be offering. Some of the exhibiting firms:

Basic Four, Burroughs Corp., Commodore Business Machines, Compuscan, Dictaphone Corp., Digital Equipment Corp., Eastman Kodak Corp., Exxon Information Systems, GTE Telenet, IBM, Lanier Business Systems, Nixdorf Computer Corp., Olivetti Corporation of America, Sperry Univac, Vydec, Wang Laboratories, Xerox Business Systems.

Although AFIPS says early registrations indicate attendance will be from all over the U.S., organizers have been touring Georgia and states surrounding it with a four-minute film describing the conference and the subject of office automation. Traditionally, conferences draw a heavy percentage of attendance from areas close to the conference site.

Timing for the conference seems just right. Says AFIPS, "The rising cost of paper and paper-based communications, and the shrinking cost of computer technology has made office automation cost effective and has given rise to a threshold industry—the office automation industry." Although the technology to upgrade office procedures has been available for some time, it hasn't been used to any great degree. Such products as automated file storage and retrieval systems, voice operated dictation systems, intelligent copiers, optical readers and scanners, high-speed printers, computerized communications systems, and microfilm media have been on the market for years. Yet, AFIPS notes, with all this capability, 82% of all correspondence is still originated by a writer putting pen or pencil to paper.

So, says Wohl, "the successful integration of required technologies to run the automated office of the 80's will depend upon the people who manage and operate them." But integration means more than placing machines side-by-side in one room. "It means taking a management approach whereby people are intelligently integrated into office systems of the future."

Perhaps for many, the Office Automation Conference will provide the thinking for a start towards this integration.

Suppliers have highly resolved to make a good impression on the computing environment with electronic printers.

OUTPUT ALTERNATIVES

by David Goodstein

In the beginning, the computer spake not much, but when it spake, its voice was flashing lights. Then the goddess of technology gave unto the computer a teletype which sendeth and receiveth both, and it was better. Later, when the computer had more to say, the engineers of the jade palace made a line printer, and it was fast, and that was still better. And peace reigned in the seven kingdoms until the twin demons raster and ink jet appeared. . . .

Imaging—not the kind done by Madison Avenue slicksters for Presidential candidates, but the kind that deals with getting text and pictures onto paper—is hot. Wherever one turns these days, someone is initiating a survey, a study, or a seminar on electronic printing or one of its component technologies or pseudonyms. Every rock in the field of product development has a HeNe laser or ink jet nozzle lurking under it.

The impactless impression this activity leaves is one of high resolution—the era of output dominated by mechanical chain or train line printers is over. Low quality output is about to become the victim of a massive assault of marketing propaganda. Here, we will explain the history of some of the output developments and the technologies, and explore some of the implications of this impending explosion. If you read quickly, you will know about it before the salesman presently in the elevator reaches your outer office.

"Electronic printing" is the blanket term we will use to cover a range of new devices and techniques. Electronic printing is evolving as the result of and near the intersection of a number of trends in the overall computing environment. These trends are:

1. Maturation of the data base. Lower prices for RAM and rotating memories now allow information and documents to live more of their life in electronic form. This has important implications on the nature of what gets output, where it happens, and when.

2. Widespread acceptance of text and document processing terminals. The word processing gospel is creating a demand for faster, quicker, and better quality documents in the office envirommment.

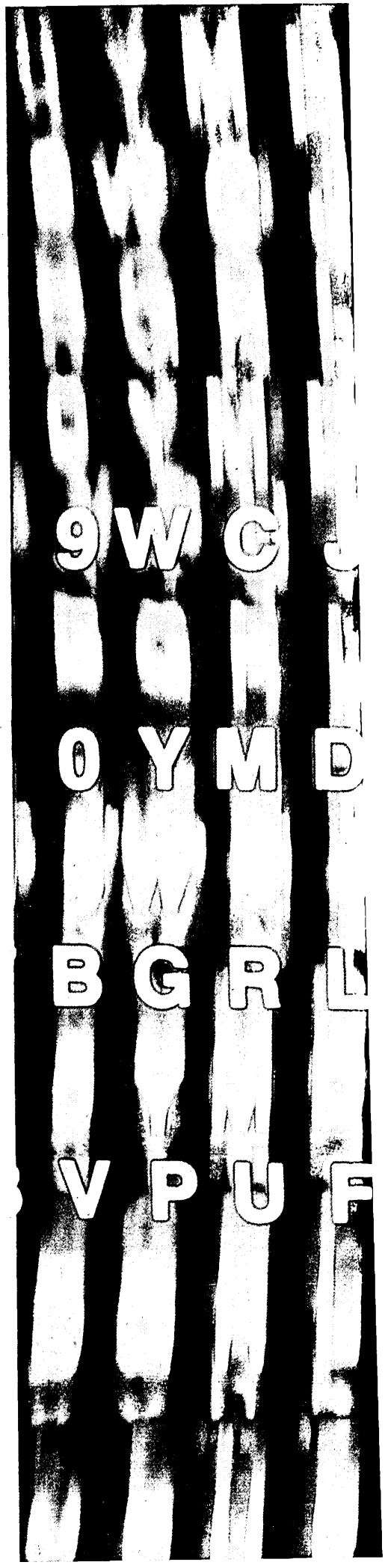
3. Rapid developments in microprocessors—now cheap enough to serve as control elements for lasers and ink jets.

4. Development of digital raster-scan techniques for character generation.

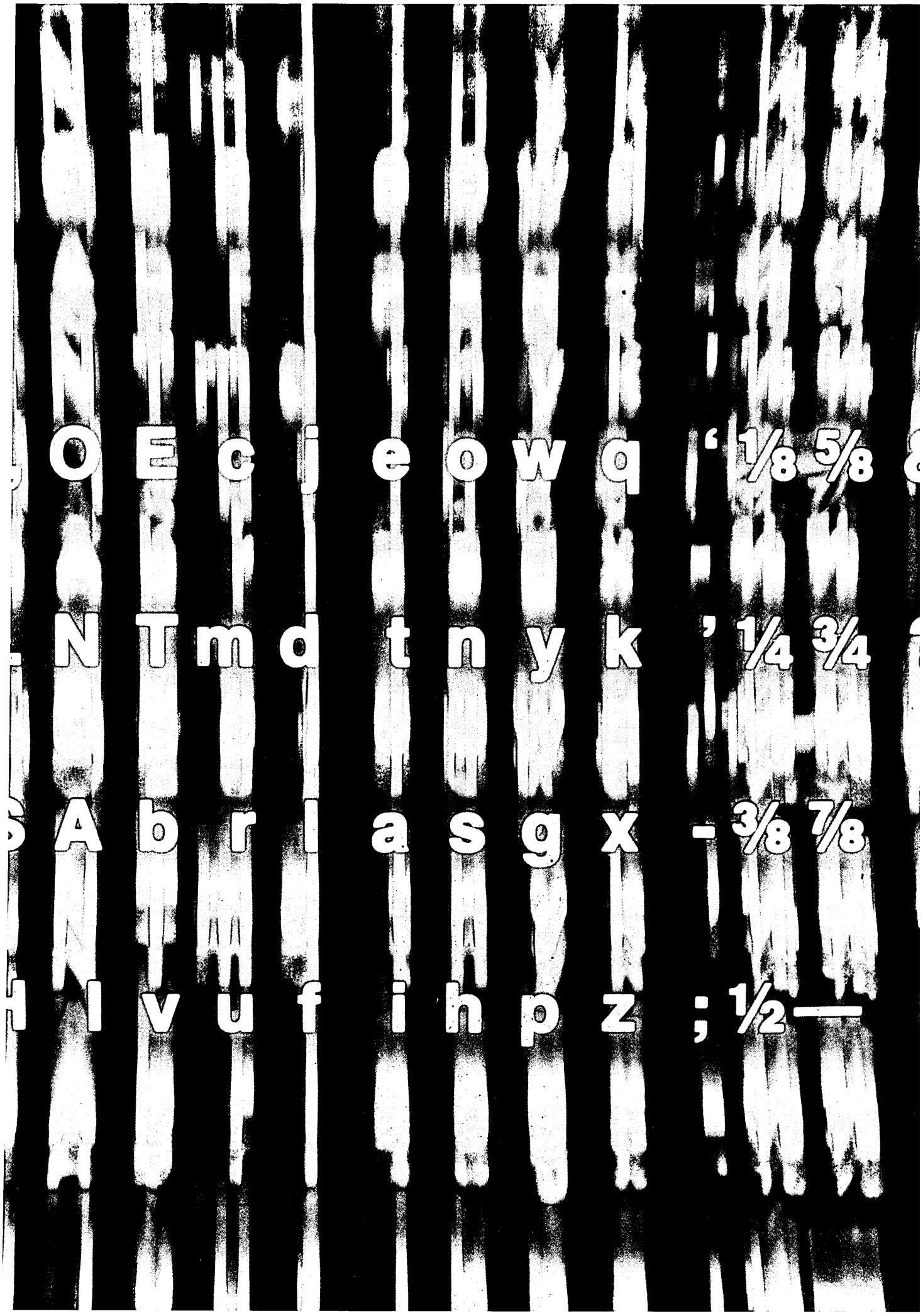
5. Cheaper network and communications facilities that make local document output desirable, and certainly preferable to centralized reproduction and distribution by traditional methods.

6. The rush by suppliers to reshape product lines to coincide with the realities of a distributed intelligence environment.

These movements have broken down boundaries of what had been separate markets and technologies. Copiers, facsimile, communications, word processing, computer printing, reprographics, and typesetting, all former individual domains, are now seen as constituents of a new generation of electronic output devices, and concepts are flowing freely from segment to segment.



PHOTOGRAPHY BY MITCHELL FUNK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Product lines are being reshaped to coincide with the realities of a distributed intelligence environment.

TABLE I
OUTPUT COMPARISONS

	CHARACTER GENERATION TECHNIQUE	OUTPUT MEDIA	RESOLUTION DOTS/INCH	CHARACTERS	NUMBER OF FONTS AVAILABLE	CHARACTER SIZE RANGE	APPROXIMATE PRICE
Sanders media 12/7	matrix/direct	plain paper	275	1,800-12,960 (depends on character resolution	6 (average) on-line	10, 12, 16.5, 18	$ 30,000
IBM 6640	ink jet/direct	plain paper	240	11,000	5 on-line 7 off-line	9, 10, 12	$ 24,000
Wang II P	crt/direct	plain paper	300	54,000	3 on-line 6 off-line	10, 12, 15	$ 32,000
IBM 6670	laser/direct	plain paper	240	108,000	4 on-line 9 off-line	10, 12, 13.3	$ 75,000
Canon Laser Beam Printer LBP-10	laser/direct	plain paper	240	30,000	N/A	N/A	$ 10,000 —oem only (no end user price available)
Xerox 9700	laser/direct	plain paper	300	360,000	4 on-line 12 off-line	4-30	$285,000— $337,000 (w/all options)
Mergenthaler Omnitech 2000	laser/indirect	coated dielectric paper (zinc oxide)	723	4,500	N/A	4.5-127.5	$ 26,000
Mergenthaler Linotron 202	crt/indirect	photosensitive paper or film	975	16,000	60	4.5-72	$ 45,000
Autologic APS-5	crt/indirect	photosensitive paper or film	1,440	80,000	100	4.5-127.5	$ 80,000

FIRST ATTEMPTS IN '60S

The first attempts to induce computer users to exploit high speed typesetting combined with cheap offset printing as an alternative to chain or train printers was in the early '60s. Photon, now part of Itek's Graphic Systems Div., actually delivered three of its P-7000 typesetters to dp installations. All three came back to the factory in record time. No one wanted to deal with the problem of adding special command codes to "straight" computer output to produce a higher quality.

In the early '70s, Xerox added minicomputers and disk storage onto copier units that it used and evaluated within its own research facilities. The first fruit of this research was the prototype delivered to the University of Toronto. This unit employed a crt for imaging (Fig. 1), and was used for direct output of library catalogs from a computer data base.

Shortly thereafter, Xerox announced the 1200 computer "line printer." This machine, unlike the Toronto unit or the research devices, used photographic character masters and a strobe-pulse of light to create an electronic image, which was then transferred to normal paper and put through a toner/fusing sequence like standard electrographic copies. It was fast and better-looking than "normal" computer line printer output, but it was not yet an electronic printer—that was the Xerox 9700. Introduced at the National Computer Conference in June 1977, the 9700 immediately established a new market. It is a direct-output electrographic duplicator, a device that creates the image directly on its final copy using xerographic principles. This is in contrast to an indirect-output device that creates an image used to make an offset printing plate.

Price competition was not important to Xerox; the 9700 was introduced at $285K a pop, with an extra $10K charge to interface it to an IBM 370. This price did not stop the rush of buyers, and when Xerox's competitors noticed this, there was a predictable wave of announcements and developments (often in that order).

BASIS OF NEW GENERATION

Wang entered the arena in December 1978 with its Intelligent Image Printer. This was followed in February 1979 by IBM's announcement of the 6670 Information Distributor. Adjectives fell like rain:

". . . a quantum advance in text generation productivity," said Wang.

"A significant step toward the much discussed office of the future," said IBM.

These offerings formed the basis of a new generation of devices most commonly called intelligent printer/copiers or ICPs.

What these devices have in common is that the input comes from either computers, communications lines, or word processing systems in electronic form; a product of a higher quality than that offered by traditional impact printers is available; the devices use some type of digital technique for image generation. The digital technique can include a variety of technologies for the imaging: lasers, ink jet, "infinite" dot matrix, CCD, fiber optics. Production of the image involves translation of the text from characters ("byte

ELECTROGRAPHIC TECHNOLOGY

We have tried to refrain from using the word "xerographic" (from a Greek phrase meaning "dry writing"). Although it is generic, it still is associated with Xerox, the company. Therefore, the term "electrographic" is emerging as the label of preference. Basic to this technology is the idea of creating an image with light on a photoconductive surface. Early machines used a selisium drum; more recent units, such as the Xerox 9200 and the IBM 6670, employ a continuous belt of photosensitive materials. Both these surfaces hold a charge of loose ions. When exposed to light, the ions leave the areas corresponding to white in the image. Minuscule particles of toner with an opposite charge are attracted to the location of the charges on the drum. This forms a copy of the image which is then transferred onto a piece of plain paper. The toner is then fused by a thermal process. This is why the copies came out of your old copier toasty warm, and why the machine's life occasionally ended in smoke and flame.

FIG. 1

FUNCTIONAL DIAGRAM OF THE 9700

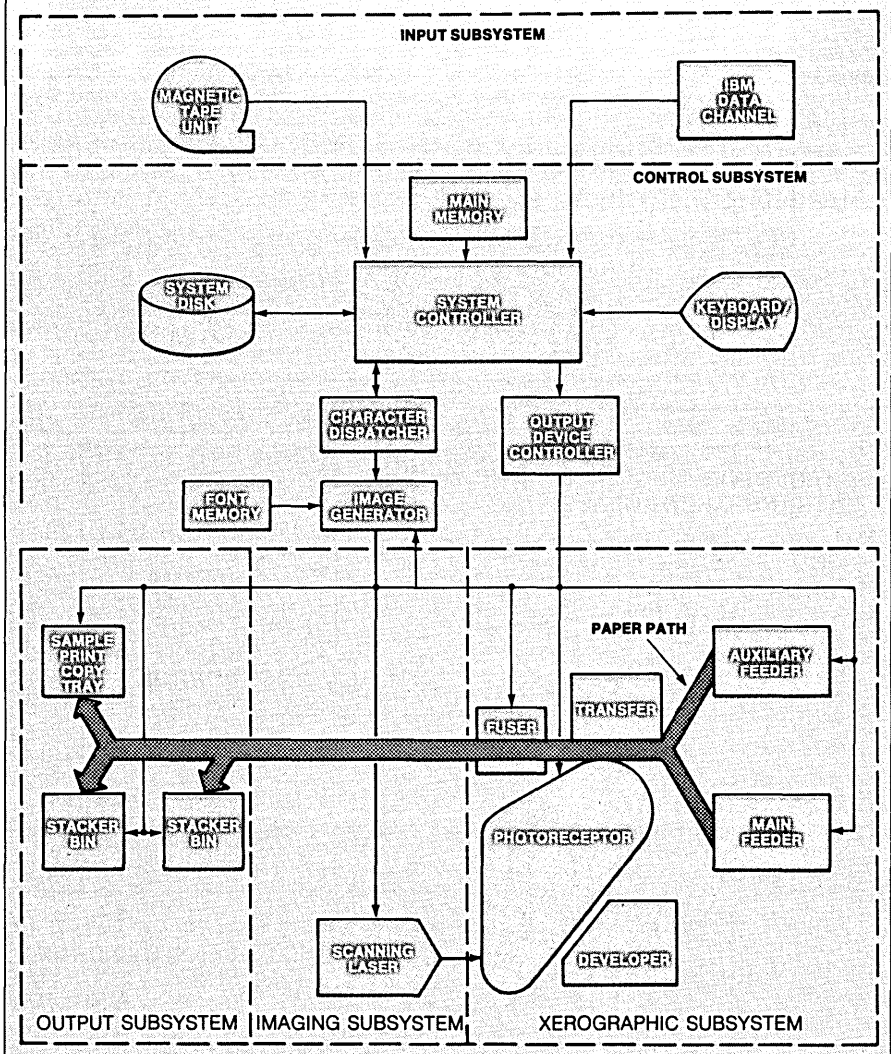
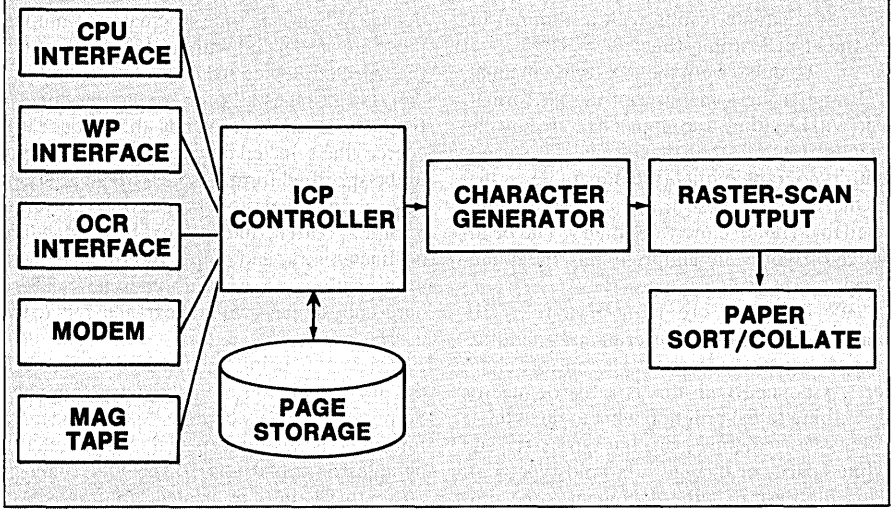


FIG. 2

ICP FUNCTIONAL CONCEPT



mode") to character dot patterns ("bit mode"). This is done by calling out a prestored pattern of dots that represent characters as sets of on/off points. The devices described above operate at 240 or 300 bits per inch. These digital font masters are then stored in a page image or bit-map memory. Each bit in memory represents a picture element (pixel) that is either white or black in the output. The pattern is sent to the beam controller of the image generator. In a laser device, the data tells the modulator when the beam of laser light is to hit the photoreceptor surface and when it is to be deflected. The pattern of hit or no-hit lays down on the electronically charged surface a duplicate of the character master pattern.

Once the page is imaged (charges have been cleared or allowed to remain from each pixel point on the photorecepter), it goes through the standard electrostatic toner/fusing cycles.

Ink jet imaging is somewhat simpler, although it uses the same concept of imaging from a bit-map memory. The actual image production is accomplished by modulating the flow of ink to the jet nozzle head as it travels back and forth across the output media.

ICPs are very attractive at the moment. Almost monthly there is an announcement of a major market study or a seminar series on the role of ICPs in our future. People whose business it is to know such things say that by 1985, most computer installations will have an ICP, particularly those shops with mainframe computers of the 370/135 size or larger. Moreover, we are informed that some 75 companies are working on ICPs and that the population of laser printers alone will be nearly 35,000 by 1985. In 1980, the outlay for these devices will top $475 million.

ICPs are not the only high quality output devices available, however. There are a number of alternatives that offer differing levels of trade-offs in terms of output quality, speed, and utilization of other installed equipment. In the distributed environment, it is likely that a mix of some or all of these alternatives—including traditional line printers—will be used, each according to the type of output required.

The next step up from ICPs is phototypesetters. Traditionally, these have been expensive and complex pieces of equipment that needed specialists for operation and maintenance and special command codes to control the size and shape of type to be produced. The end product of typesetting, furthermore, has been pieces of film or photographic paper that required chemical development, and then had to be assembled into pages by a skilled manual process. Completed pages were then used to create printing plates by a photochemical process. It is easy

There is little doubt that our concept of output is about to undergo a dramatic change.

to understand why typesetters have never been considered interesting peripherals for dp installations.

TIME FOR A NEW LOOK

However, in the last five years, progress in typesetting technology has been so substantial that it is time for a reconsideration. Most of the difficulties listed above have been resolved to a point where they are no longer obstacles. For a start, typesetters have entered a new era. Mergenthaler-Linotype's Linotron 202, introduced in June 1978, has only one moving part. Type is imaged on a crt screen at full size. Photosensitive paper is transported across the face of the tube, which has a layer of fiber-optical material bonded directly to it. This eliminates the service problems associated with previous machines (which were monstrously complex electromechanical units requiring frequent service). It also allowed a drop in price from the $150K range to the $50K range.

Complex input coding has not been eliminated, but it has at least been displaced. Several companies now offer intelligent interfaces that can take information captured on a dp or wp system and add to it the codes required to direct the photosetter, producing finished type in simple formats.

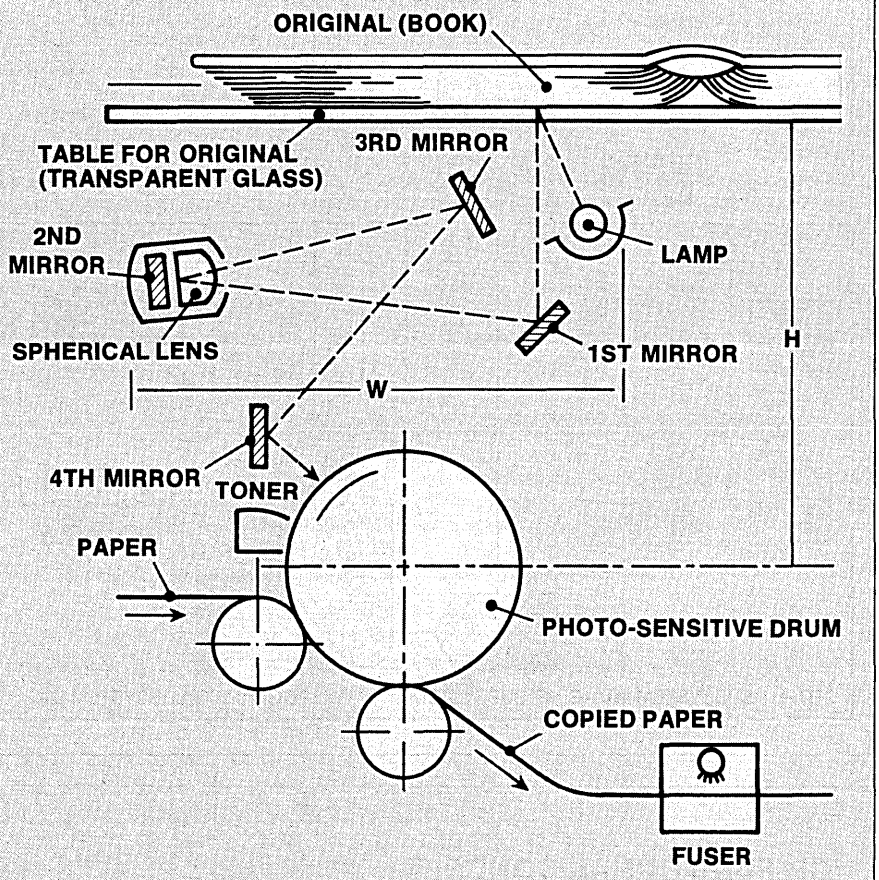
Pagination, still a big problem for traditional typesetting users, is being attacked from a number of angles. Probably the most immediate promise of a solution for dp installations is the work done by Dr. Donald E. Knuth at Stanford. Knuth, of course, is best known in the computer industry for his work in mathematics. His pragmatic attitude toward life and work is illustrated by his recent concentration on typesetting and type design, however.

Two user-friendly programs, TEX and METAFONT, were developed out of Knuth's frustration with the inefficient process of typesetting he encountered in publishing papers in mathematical journals. Convinced that the composition process must be simpler than it appeared, he took a year off from other projects and did an initial implementation of Tau Epsilon Chi (TEX), a system that allows typographically unsophisticated users to produce typeset versions of their own documents for publication. The system is being rewritten in PASCAL and is scheduled for release to the general computing community this year.

METAFONT is similar in intent, allowing users with digital output capabilities (such as the Xerox 9700) to design their own output character shapes. Both programs share the concept that a majority of the intelligence specific to the task can be built into the program. Users with more expertise can get more complex solutions out of the program, but those with less time, experience, or patience can get adequate results with a minimal investment of learning time.

FIG. 3

OPTICAL SYSTEMS OF DUPLICATOR USING SPHERICAL LENS



To quote from the TEX user's manual, "By preparing a manuscript in TEX format, you will be telling a computer exactly how the manuscript is to be transformed into pages with typographic quality comparable to that of the world's finest printers; yet you won't need to do much more work than would be involved if you were simply typing the manuscript on an ordinary typewriter."

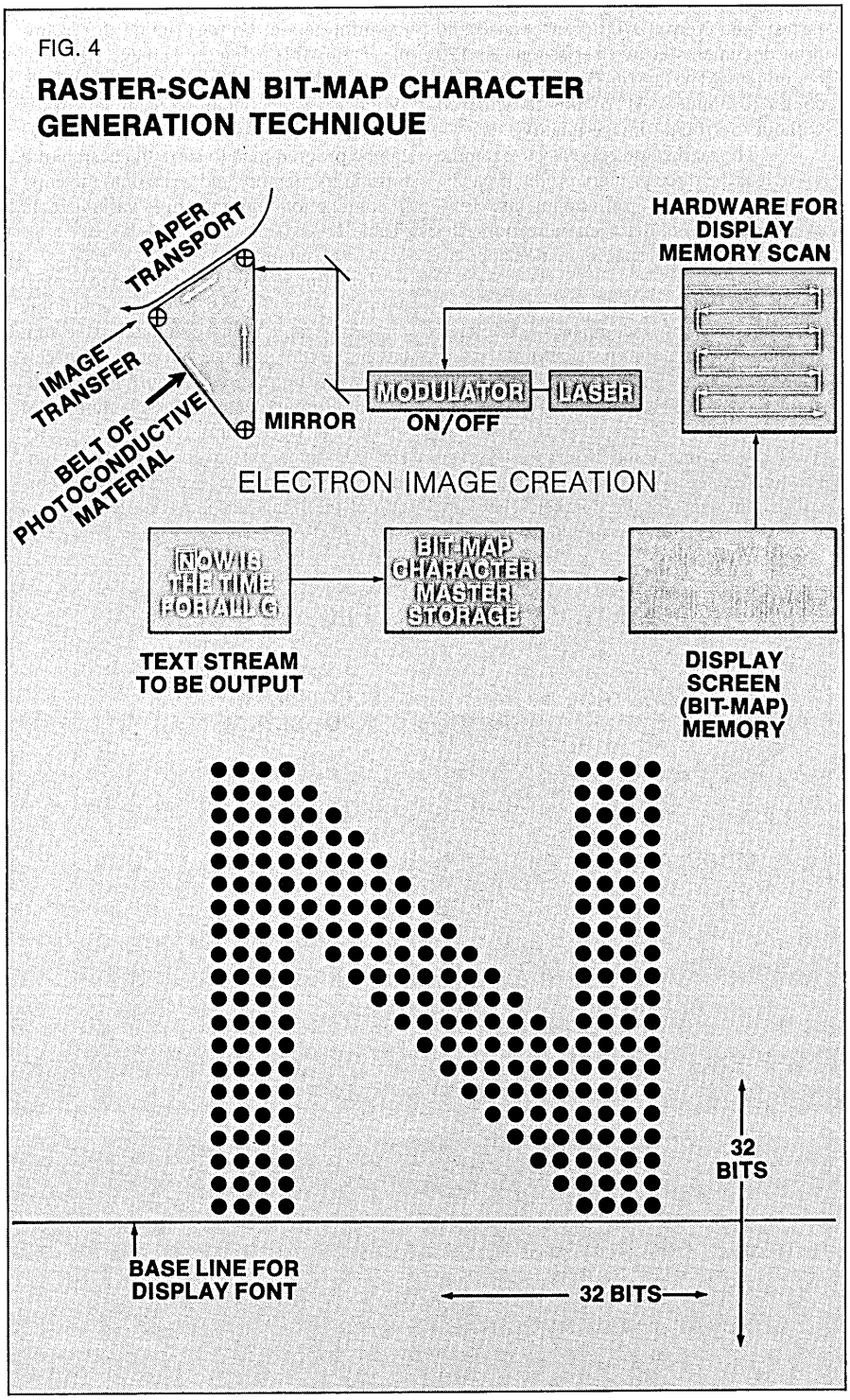
TEX involves creation of a text file containing the raw manuscript and an indication of certain events, such as the end of a chapter. Associated with this is a file of macros describing to the program what to do at those events (for example, change type size, add white space, or change to a bold typeface). This file describes the document to be produced. When it is time to create the output, these are associated with a file that describes the selected device to the TEX program.

TEX takes all of these and produces a file of text and commands that induce (or coerce) the selected device to produce output in the specified form. Users with a variety of devices could get proof copies on a line printer or ICP, correct and edit text using standard on-line editors, and output the file later with modifications to a phototypesetter. These hard-copy devices would be transparent to the user.

TEX is being widely used in universities for production of technical documents. Some are extremely complex, involving math formulas, boxes, and special characters. TEX operates on a DEC PDP-10, or PDP-20 and is presently being translated into PASCAL,

FIG. 4

RASTER-SCAN BIT-MAP CHARACTER GENERATION TECHNIQUE



presumably IBM-compatible. Similar programs under development indicate that in the immediate future, automatic output of full pages direct from a computer data base, will be commonplace. Some of these programs even include full descriptions of "standard" documents.

CAM TERMINALS ENTER

Another development that makes typesetting an attractive output alternative is the Composition and Markup (CAM) terminal. CAMs have been developed primarily to automate the composition of newspaper display advertising. Some units are now being offered that solve page makeup problems for office or book production as well. Most of these terminals operate by direct interaction. Operators need no knowledge of typesetting; a good eye for size of headlines, body copy, and captions is enough.

The first company to target a specific market for a CAM terminal was AM International. Long a power in corporate reprographics departments, AM has watched the growing trend toward high quality document production with interest. Several years ago, the company began a program that made all AM word processing products compatible with the typesetters produced by the Varityper Div. In 1979, AM introduced its 4800 CAM terminal; it allows documents to be composed and typeset by secretarial personnel.

More complex and powerful is the system offered by Bedford Computers. This CAM terminal is an integral part of a complete system with data base capability. It is designed to perform layout and subsequent typesetting of legal, financial, mathematical, or other highly structured documents. It is also being used to compose magazine and book pages (as with TEX, it can work on an entire document at a time—the 4802 does a page at a time). What makes the Bedford system different from the TEX program is the terminal. The operator sees type represented in actual size prior to output; changes can be made in real-time and the results observed.

The Bedford system is what's needed in environments where large amounts of data base need to be quickly converted to large numbers of printing plates for long runs. Information output by a data base resident on a mainframe could serve as input to the real-time composition system; the system's pagination software would assemble the information into pages and add appropriate control codes. Pages presenting difficulties in composition, such as pages with too many footnotes or tables forced onto a page too distant from the corresponding references, would appear on the display screen. Human intervention would be used to resolve the conflict.

This is really the best of both worlds:

Most of the difficulties in the phototypesetting technology have been resolved to the point where they are no longer obstacles.

HOW ELECTRONIC COPIERS WORK

Currently available ICPs—of which there are only three: the Wang Image Printer, the IBM 6670, and the Xerox 9700—all use an electrostatic printing technique based on the same process used in plain paper office copiers. The electrostatic technique is the ability of a photoconductor drum or belt to accept light photographically reflected from a document and convert it into a latent image—or static charge—used to attract image toner particles that are subsequently transferred to a sheet of paper to form a copy. This technique involves two steps: the exposure of the photoconductor and inking of the latent image to make a reproduction.

In electronic copiers, the inking and transferring of the image is performed in the same way, but because these devices accept electronic documents rather than hard-copy originals, the exposure technique is different. What is required is a source of light that can be switched on and off very rapidly to match the speed of the incoming electronic signal. The two obvious choices are crts (as used by Wang) and lasers (IBM and Xerox).

In application, the ICP interprets data input and instructs its light source to paint the photoconductor with light to form a latent static image. This is done in a controlled manner, with the light source sweeping the total image area in a back-and-forth raster format. Each "on" and "off" of the crt or laser appears as a small dot on the photoconductor with the total image composed of a dense grid of these dots. The appearance of this grid is not accidental: each ICP is designed to paint a certain number of dots per square inch—the resolution factor.

While some ICPs have higher resolution factors than others, it is the way in which the dots are laid down in conjunction with one another that often provides the competitive edge in copy quality. The IBM 6670, for example, has a dot resolution of 240 × 240 dots per inch, while the Wang Image printer has 300 × 300 dots per inch. Presented with only those figures, one might assume the Wang unit had better copy quality when in fact the IBM machine prints material of equal or better quality simply because the dots are laid down on paper in a more attractive manner. None of the current ICPs has perfect copy quality.

While the copying technique described seems complicated and cumbersome, it can take place at very high speeds and provide quality output at high production levels. Even the slowest of the units—Wang's—can print 18 pages a minute. The fastest, the Xerox 9700, can expose and print documents at two per second or 120 per minute. (The IBM 6670 has a speed of 36 copies a minute.) All of this is achieved without sacrificing image quality.

The market today is easy to examine —each of the three primary products can be used in both wp and dp environments. However, aside from that generalization, the products are worlds apart in market application.

Prior to the appearance of these products, many companes explored straightforward nonimpact printing using continuous forms and cut sheets in the computer world: Xerox with its model 1200, IBM with the 3800 laser printer, Siemens' 3352 laser printer, and Honeywell's Page Printing System. While these products are still significant in the market, they are limited in the ability to manipulate incoming information. Forms printing, for example, is possible using the Honeywell PPS or the IBM 3800, but only by using a premade cylinder master containing the image of the desired form. By contrast, the Xerox 9700 can be programmed to store the design of a form in its memory and write onto the copy in conjunction with incoming variable data (Table I).

In summary:

- Wang Image Printer: Designed to coexist with the Wang's OIS series of shared logic processors and Wang computers, the unit has limited intelligence but provides excellent quality output for both wp and dp applications. It requires an excessive number of service calls per month (one call for every 10,000 copies) due to the technology employed at this volume level. The copier portion of the Image Printer is derived from a Royal RBC-IV copier.

IBM SCHEMATIC OF COPIER-LIKE PRINTER

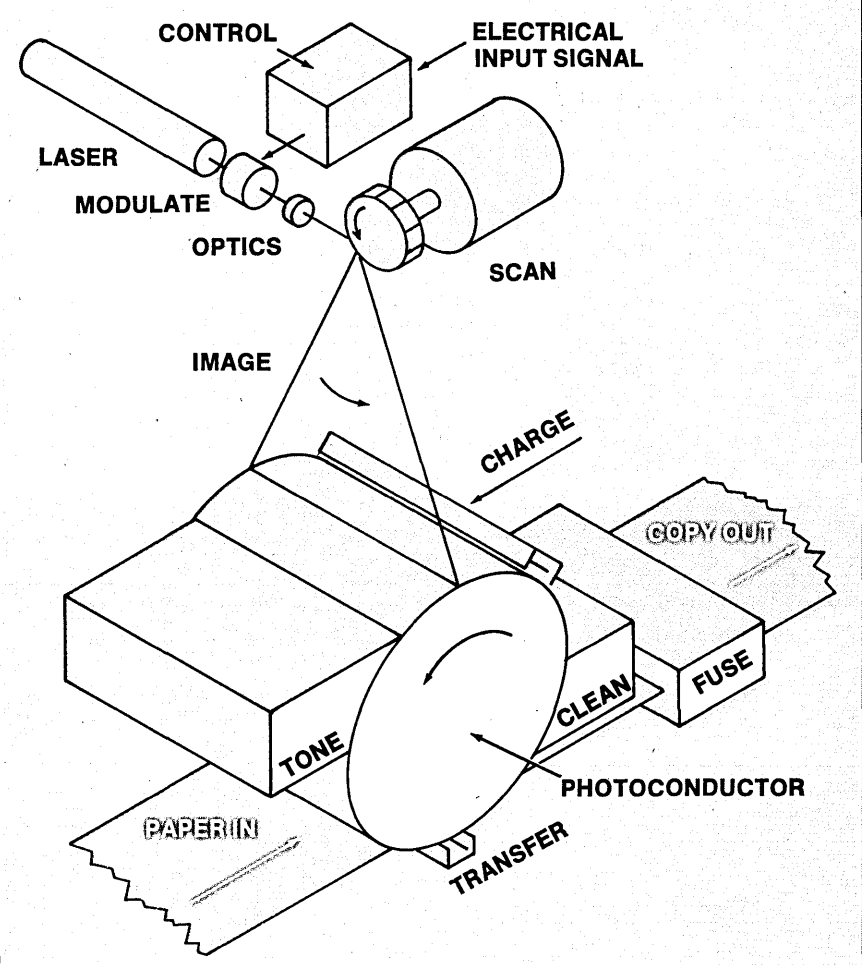


TABLE I.

CURRENTLY AVAILABLE ELECTRONIC COPIERS

MODEL PRINTER TYPE Process	**Wang Image Printer** Electrostatic with crt light source, fiber-optic face-plate light transference, dual zinc-oxide sheet master photoconductors in belt form, plain paper with dry toner and heat fusing.	**IBM 6670 Information Distributor** Electrostatic with red helium-neon laser light source, organic photoconductor roll on a drum, plain paper with dry toner and hot roller fusing.	**Xerox 9700 Electronic Printing System** Electrostatic with blue laser light source, selenium photoconductor belt, plain paper, dry toner with hot pressure roller fusing.
Input	On-line from Wang OIS/100 Series controllers (up to a maximum of 24 stations) or from Wang computer.	Off-line with magnetic cards from IBM wp or on-line with wp or cpu via communication line.	On-line with host computer or off-line through 9-track magnetic tape. Optional communications with Xerox wp.
Input Buffer	Two pages	100 pages	800+ pages
Image Resolution	300 × 300 dots per inch	240 × 240 dots per inch	300 × 300 dots per inch
SPEED First Copy Time	10 seconds	About 16 seconds from mag cards About 6.5 seconds from comm. line.	8 seconds
Multicopy Rate	18 pages per minute	Up to 36 copies per minute	120 pages per minute
Recommended Volumes	30,000 to 40,000 copies per mo. (claimed by Wang)	30,000 to 70,000 copies per month	500,000 to 2 million copies per month
PAPER SUPPLY	Dual paper trays, 300 sheets each. 8.5″ × 11″ to 8.5″ × 14″ sheet sizes.	Dual paper trays (2100 and 600 sheets) 8″ × 10.5″ to 8⅞″ × 14″ sheet sizes	Dual paper trays (2,500 and 400 sheets) 8.5″ × 11″ sheet size
FONTS Type & No. On-Line	3 (2 in ROM, 1 disk loadable)		12 fonts digitized and stored on internal disk.
Total No. Available	6	9	200 plus custom
Character Set	128 per font	6 fonts in ROM	64, 96 or 128 per font.
PRICING Purchase	$32,000	$75,000	$285,000
Service on Purchased	$365 per mo. (incl. 30,000 copies) 30,001+ copies per mo. at $.015 each.	$355 per mo. (incl. 5,000 copies) 5,001+ copies per mo. at $.022 each.	$3,900 per mo. (incl. 1.7 million per mo.) 1.7 million + copies per mo. at $.0015 each).
Rental	$1,375 per mo. (incl. 30,000 copies) 30,001 + copies per mo. at $.015 each.	(24-month plan) $1,375 per mo. (incl. 5,000 copies); 5,001+ copies per mo. at $.025 each.	Various plans ranging from $5,000 to $9,000 per mo. plus copy charges.
COMMENTS	Communications through OIS Series word processors. Alternating paper tray feeding. Condensed format printing. Font mixing within document. 10-, 12- and 15-pitch type styles plus one proportional spacing font. All format and control instructions generated by word processor.	Can communicate with IBM word processors and computers. Can be used as a convenience copier (36 cpm). Contains 11 on-line format programs. Available fonts incl. two 10-pitch, three 12-pitch, three proportional and one 13.3 pitch. Alternating paper tray feeding. Condensed format printing. Two-sided copying. Variable programs.	Proportional spacing by programmed typestyle Forms creation and completion. Prints 3 to 18 lines per inch. Prints 4 to 30 characters per inch (pitch). Prints 4- to 24-point character sizes. Stored formats. Graphic and logo generation. Optional two-sided copying, microfiche output and communications with wp. Condensed format printing.

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• IBM 6670 Information Distributor: The most impressive of the currently available units for word processing applications possesses intelligence for stored formats, communications, copy manipulation, and the merging of input from various sources. The copier portion of the 6670 is derived from the IBM Series III copier.

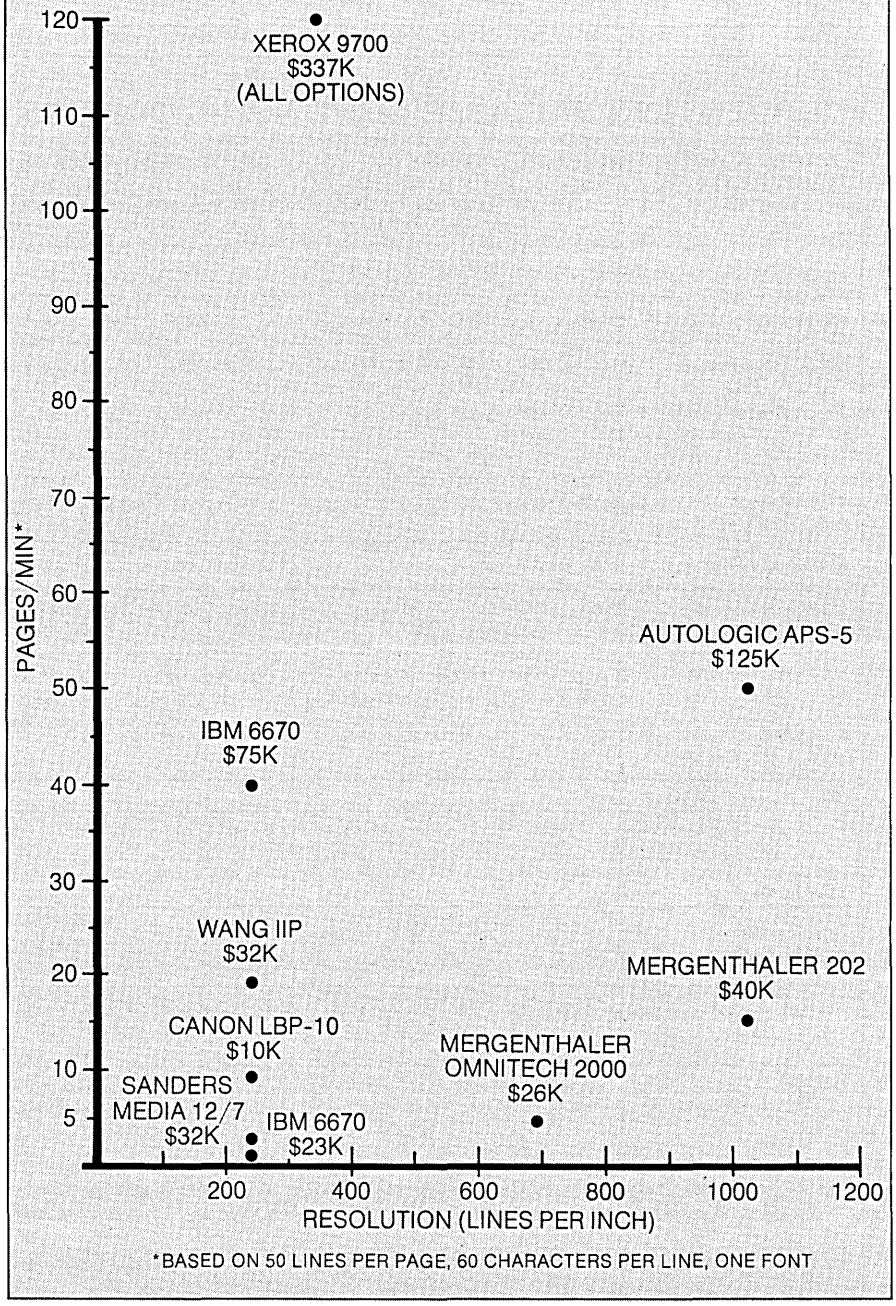
• Xerox 9700 Electronic Printing System: The most powerful of the three products is priced high and is considered to be a dp device, although a recently announced option allows the Xerox 850 word processor to communicate with the 9700. It offers high-quality output at two pages per second and typesetter-like font and character-size selection; the copier portion is from the Xerox 9400 copier.

—Thomas B. Holmes

Thomas B. Holmes is managing editor of the Office Automation Group at Datapro Research Corp., a division of the information services group of McGraw-Hill Book Co. He holds a BS degree in communications. He is responsible for four multivolume reports about office automation.

FIG. 5

SPEED VS RESOLUTION

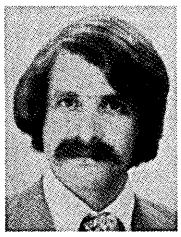


bull work by the machine, brain work by the person. These developments are, in our opinion, essential to opening up higher resolution typesetting technologies for use in the wider market.

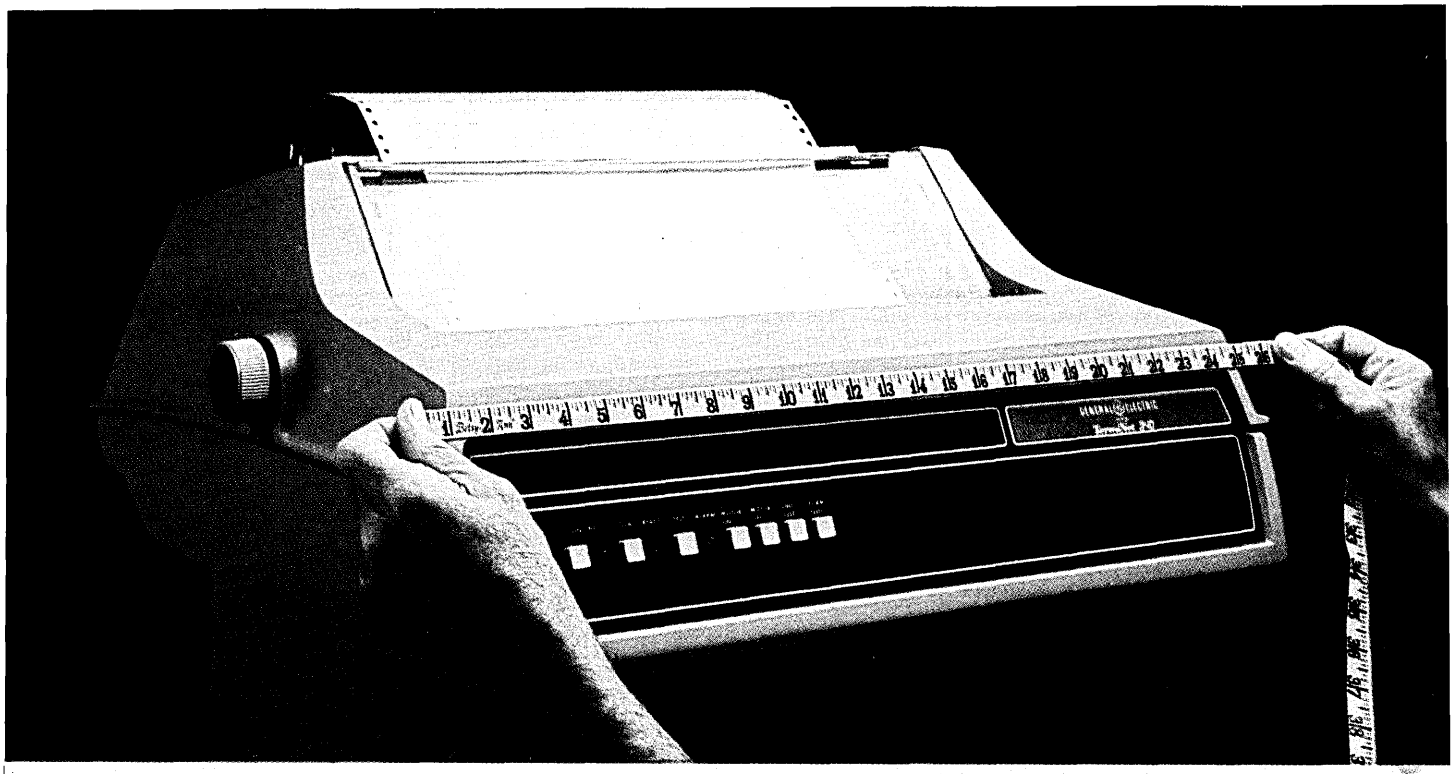
There is little doubt that our concept of output is about to undergo a dramatic change. Intelligent printer/copiers offer a happy solution for reproduction of moderate sized documents in short runs. Typesetters, fronted by programmed pagination intelligence and using quick offset for final imaging, provide an extremely desirable alternative for longer document runs.

We have seen the future, and it goes ta-pocketa, ta-pocketa. . . ✻

DAVID HENRY GOODSTEIN



Mr. Goodstein is self-employed as a consultant in automation of typesetting for newspapers and commercial typesetters. He has given seminars on display composition terminals for NCA, MIT, and the Institute for Graphic Communication. He has been active as a programmer and systems analyst since 1964.



Solid engineering and 340 lpm speed make the TermiNet 340 a more rugged, productive line printer.

Any way you measure them, TermiNet® 340 line printers are more productive performers

Don't let the compact size of the General Electric TermiNet 340 line printer fool you. Because no matter how hard you work it, it won't quit on you. It's that tough, that dependable and that much better than typical line printers. And it's available now.

A true 100% duty cycle printer

Unlike ordinary line printers, the TermiNet 340 can take the punishment of the broadest range of operating environments—from front office to factory floor—without complaining. The key reason? A tough, ruggedly engineered design. As a result, it keeps on performing under tough-use conditions when other line printers would sputter and break down.

Engineered to stay on the job.

From top to bottom, the compact TermiNet 340 line printer is engineered with long-life components designed to keep the printer on-line. And businesses on schedule.

One reason: extra-thick, heavy-duty, environment-resistant materials chosen for the base and housing. Together, they provide this rugged printer with the impact strength, dimensional stability and resistance to adverse environments needed to keep working.

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The fact is, TermiNet 340 line printers are such productive workers, they require very little attention and very little maintenance once they're up and running. Should service be needed, you can count on getting these printers back on-line in a hurry. That's because of convenient self-test features that make troubleshooting easy and fast. And because of a responsive nationwide service network that keeps downtime to a minimum and operating costs low.

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We recognize that the market and the opportunities in the minicomputer industry are vast.

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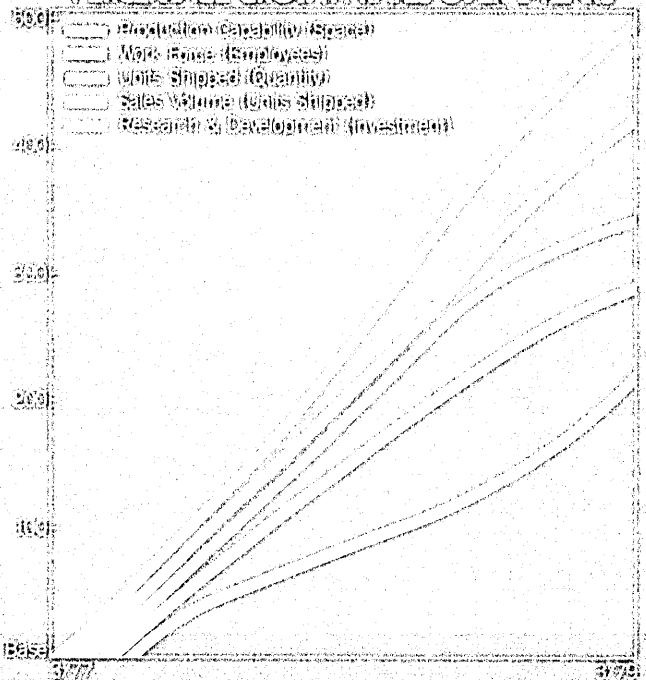
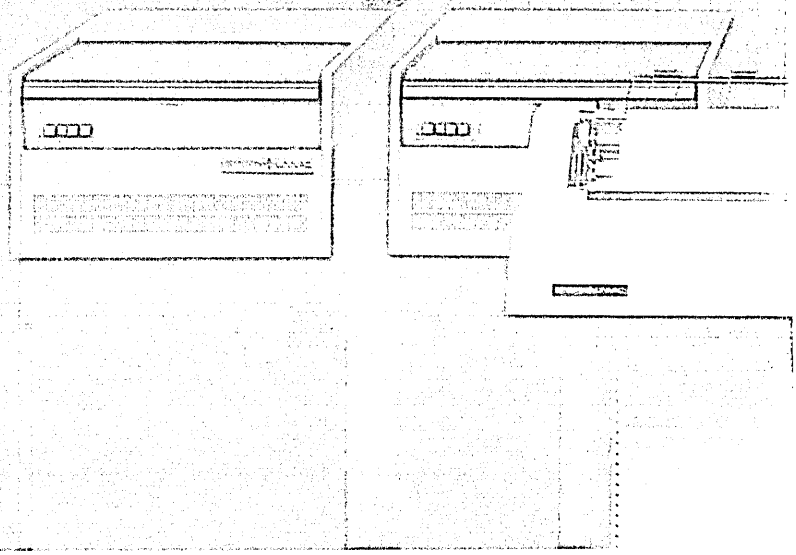
We not only build the minis, we provide complete support with competitively priced peripherals and software. In fact, we offer QL-77, an easy-to-use query language and we were one of the first vendors to provide Pascal.





Sperry Univac was the company that developed SUMMIT, the operating system that allows you DDP capabilities with either IBM or Univac hosts.

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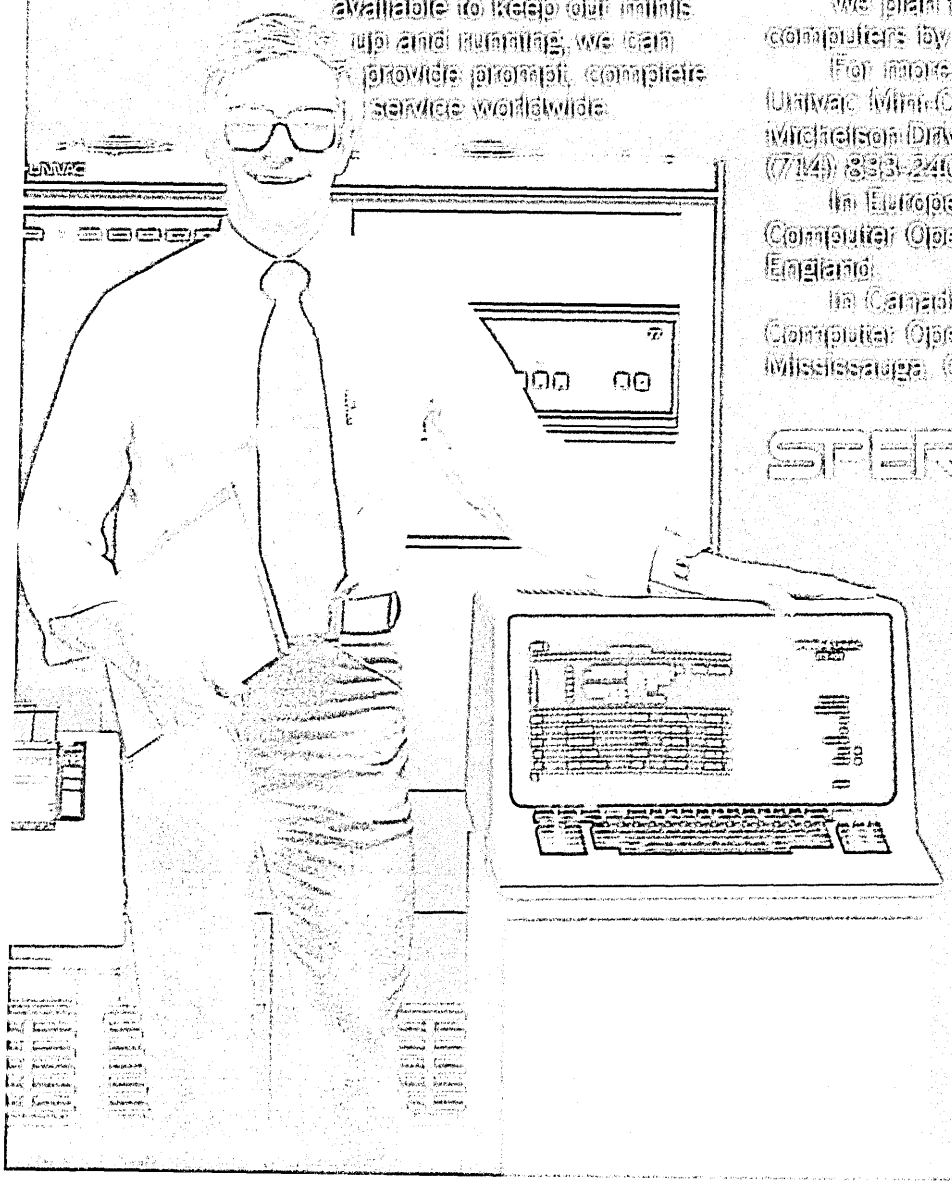

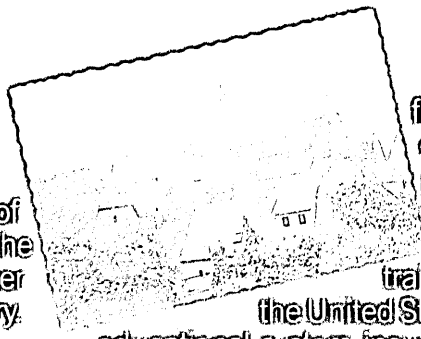

And that service is the finest available. We've established a major computer education center in Princeton, New Jersey and several regional training schools throughout the United States and Europe. Our educational system insures the degree of excellence and competency in our service staff necessary to maintain our equipment at peak performance.

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In Europe, write Headquarters, Mini-Computer Operations, London NW10 8LS, England.

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SPERRY UNIVAC

CIRCLE 10-0 ON READER CARD

Prototyping software before production paid off in a product that was easy to use and had a number of useful features.

DESIGNING TRANSLATOR SOFTWARE

by Paul Heckel

The Craig Translator, designed to translate words from one language to another, is also a general purpose computer that can run a variety of programmed cartridges. Along with similar products such as Texas Instruments' Speak and Spell, it is a forerunner of many inexpensive, small, handheld intelligent products with alphanumeric I/O. Because hardware is now composed of a few common components such as microprocessors and memories, the role of software and the challenge in its design is becoming singularly crucial. So, as we expected, the task of designing the software for the Craig Translator was formidable indeed.

The prototyping approach used by those of us responsible for developing the product should be useful to developers of other microprocessor-based products where human factors are important. Attention to human factors in the beginning of the software design accounted for the later success of the product in performing the difficult task of translation.

The software engineers responsible for the translator faced four major problem areas.

First, what the translator would do and how it would do it, as perceived by the user, would mean the difference between success and failure in the marketplace.

Second, in order for the translator to have a large enough vocabulary to be useful, a good data storage compression structure had to be designed.

Third, the microcode was going to be sizable, yet the space available to run it was limited. Cost considerations required the selection of a single-chip microprocessor. Thus the software engineers were confronted with the blivit problem: how to fit 10 pounds of spinach in a five-pound sack.

Finally, the designers faced a tight time schedule; even worse, the pressure to complete the design became more severe when it was discovered that a competitor was making a similar product. (The total software effort took about seven months. The beginning of product design to product in the marketplace was one year.)

While all these problems proved solvable, attempting to deal with them simultaneously provided a real challenge.

The first major decision was to build a black box prototype configured on an 8085 microprocessor. The prototype used a 16-character display, a 44-key keyboard and was about 3 × 5 × 7 inches in size, operating on an internal battery (Fig. 1). It ran programs either from internal 2716 EPROMs or from an Intel program development system operating in debug mode. Some of the 2716 EPROMs were used to store test languages.

Once the program had been debugged, the emulator could be disconnected and the 8085 replaced in its socket. PROMs for the program could be blown and plugged into the other 2716 sockets. The result was a portable, self-powered prototype that could be readily demonstrated anywhere.

The prototype software was written in PLM rather than machine language, thereby speeding the programming and making it easier to change. During this initial programming stage, some critical decisions were bypassed. For example, we had yet to select the microprocessor for the production version. We had not designed the final data structure.

During the initial two months of the project we implemented the original specification. Also during that time, and to a lesser extent during the following months, we provided new versions. Each version was tested by various engineers and assessed as a marketable product; as a result, several problems were discovered. More than 30 versions of the prototype were tested. At the same time, progress seemed slow and painful, but the result was a product that was easy to use, had a number of useful features, and was capable of being implemented on a single-chip microprocessor.

FOCUS ON USER PROBLEMS

The prototype forced us to focus on some problems of human engineering. We were convinced we had to address the problems users would actually experience, rather than those problems the designers imagined might be important, and we used the prototype to help us do this.

First, because the designers could play with the black box, they focused upon what the black box actually did, rather than on the abstraction of a specification. By so doing, the frequent trap of writing and rewriting a software specification was avoided. Although software, marketing, and engineering were occasionally unhappy, they all shared some common perceptions of the final product. The repeated updating of the prototyping reduced the number of last minute, unpleas-

ILLUSTRATION BY DENNIS ORLOF


CHANGER DES
CHEQUES DE VOYAGE

Progress seemed slow and painful: more than 30 versions of the prototype were tested.

ant surprises.

We caught some potential problems early. Certain features had undesirable side effects. Other features were just plain misunderstood. For example, in the beginning "rotate" was implemented to handle the problem of fitting more than 16 characters on the display. We changed it to establishing operation like the moving sign in Times Square to give the translator more pizzazz. We had misinterpreted the original specification, but we were able to catch the specification ambiguity and fix it.

We also developed the idea of flashing question marks. It was our policy to try out as many suggestions as possible as quickly as possible. This kept ego involement in specific ideas to a minimum. Several ideas worked their way into the final product, while others were discarded.

Ideas that were discarded were singular and plural case endings, past tenses, and masculine and feminine genders. It was of utmost importance that new ideas could be evaluated more objectively when people could implement them rather than merely discuss them.

Throughout the prototyping phase we were quite aware of the limits imposed by a single-chip microprocessor. The 3870 we chose contained only 64 bytes of RAM, whereas the prototype 8085 had used a 256 byte RAM chip. Thus, in prototyping we could ignore the restrictions on ROM and RAM as long as we were careful not to commit ourselves to design decisions which would prove impractical in the 3870 production version. By avoiding such restrictions during the prototype stage we focused on developing the ideal product. We postponed dealing with the constraints of the final 3870 version until we had to.

In several cases we were able to come up with elegant solutions to quite complex problems. For example, we were able to solve the homograph problem. Many words in a language are homographs—words that are spelled the same but have two distinct meanings. "Watch," for example, can mean "to look at" or "wristwatch." In French, the first is: *regardez,* the second *montre*. Our initial response to such words was to ignore them. That is, we chose to leave "watch" out of the dictionary altogether, or to assign, arbitrarily one of the two meanings. While only a small percentage of dictionary words are homographs, they occur frequently enough to become problems in almost every language.

We solved the "watch" problem by adding a parenthetical qualifier at the end. Thus "watch" has two dictionary entries: WATCH (SEE) and WATCH (CLOCK). When the user types WATCH, the translator alternately flashes question marks, because WATCH, as such, is not in the dictionary. The user can

FIG. 1.
PROTOTYPE BLACK BOX

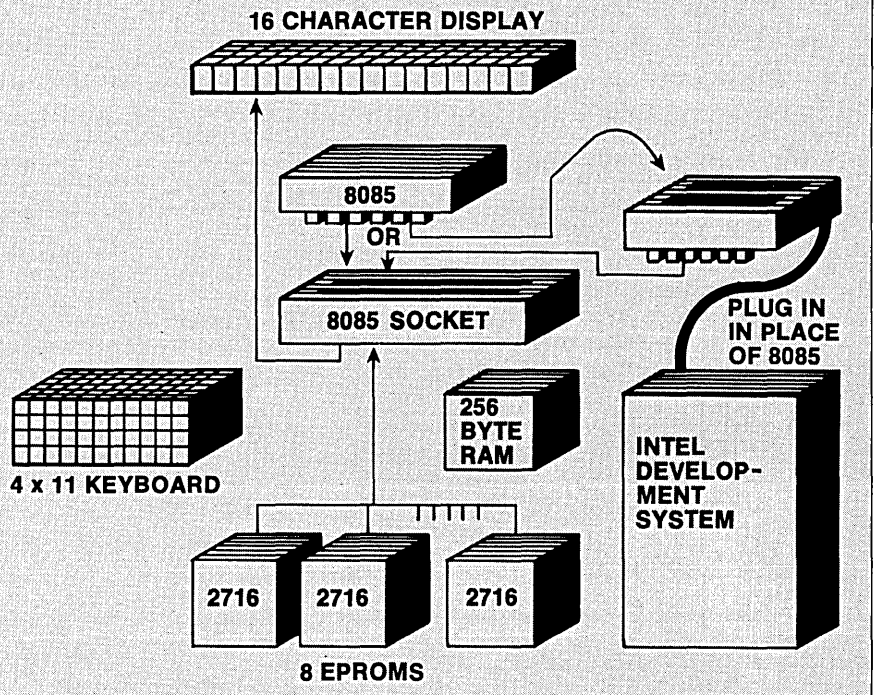


FIG. 2.
PROTOTYPE DATA STRUCTURE

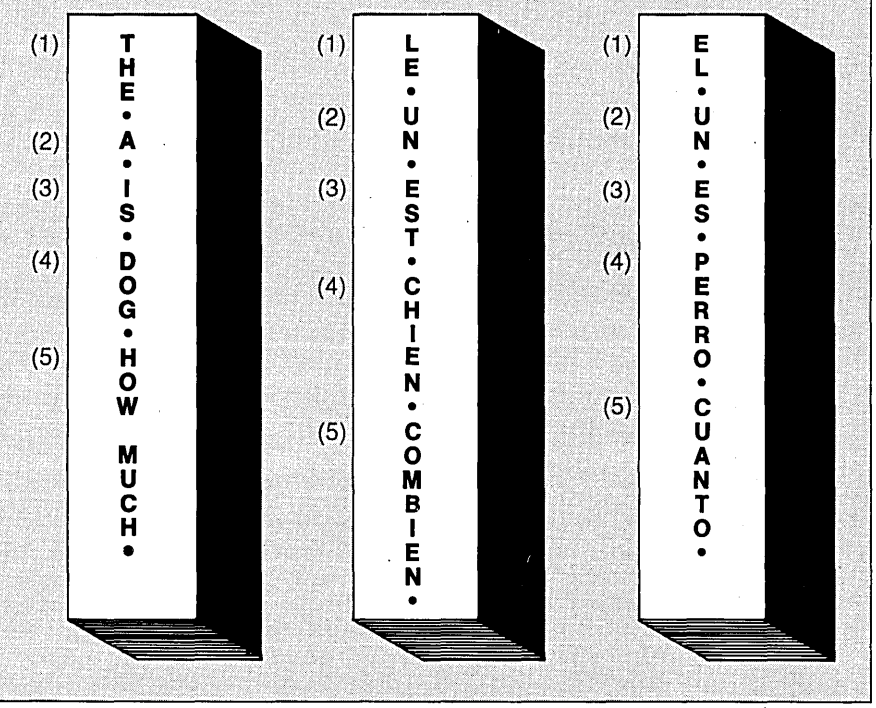


FIG. 3.
BIDIRECTIONAL MAPPING TABLE

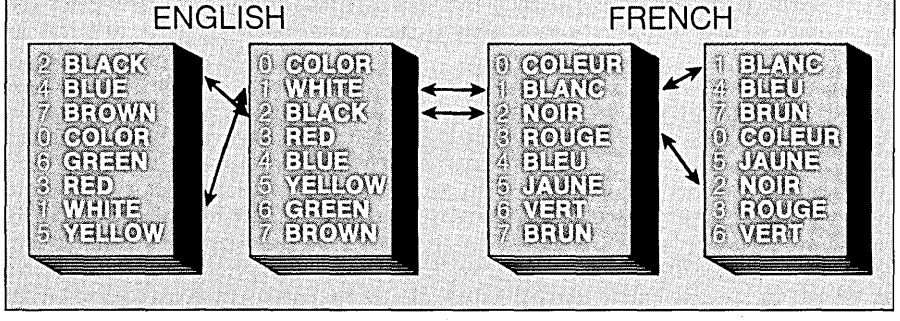
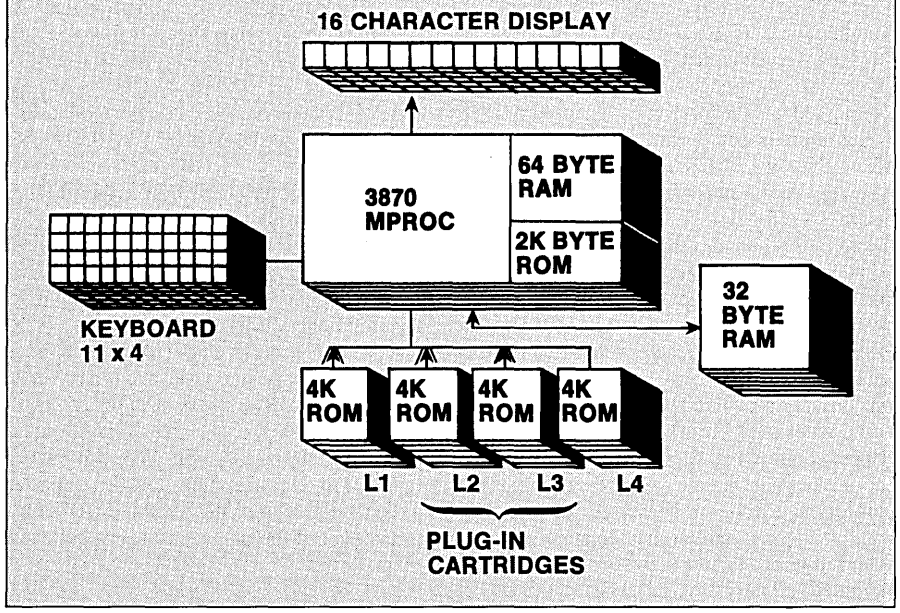


FIG. 4.
PRODUCTION VERSION OF TRANSLATOR



then hit the Search key, and the device alternately displays WATCH (SEE) and WATCH (CLOCK). He then hits a space key when the one he wants is displayed. It turned out that the additional code required to program this procedure was quite small.

DATA STRUCTURE CHOSEN

The black box was critical to the human engineering, but it proved invaluable in other areas as well. In the first prototype we employed a very simple data structure: we just stored words, one after another, in the language cartridge. Thus, in the English cartridge we stored the ASCII characters THE*A*IS*, and in the French cartridge LE*UN*EST* (Fig. 2). The asterisks served as "end of word" characters. If the user keys in the word IS, the program counts the words until it finds the word IS, which is word number three. If translating to French, the translator counts to the third word in the French cartridge, EST, and displays it. This approach would be unacceptable in the production translator. First, 8 bit characters would limit us to about 650 words in a 32,000 bit ROM. However, we eventually achieved 1,150. Second, accessing any word could require searching the entire dictionary cartridge. (We evaded the problem of building a language compiler at this point by using the 8085 assembler to generate the language cartridges.)

Early in the project Richard Schroeppel, a specialist in data compaction, joined the project. Working with him we designed the final data structure. This data structure was first implemented in the prototype. Schroeppel built a language compiler to generate the language ROMs. During the initial prototyping we had defined the interface to the symbol table routines in a general way. Thus, we were able to redefine the data structure by replacing the data structure subroutines.

This is another place where prototyping really paid off. By keeping the data structure decision and language compiler out of the critical path, we gained two additional months that enabled us to explore alternatives before reaching a decision. Then we tore out the old data structure routines and replaced them with the new ones without affecting the user interface.

In the production data structure words are stored in alphabetic order; a table provides bidirectional mapping between a word's alphabetic position and its language invariant word number (Fig. 3).

If we had been forced to make the data structure decision much earlier, we would probably have picked an inferior structure. In fact, one major data structure decision was postponed to within a few weeks of releasing the final code. We were faced with two alternatives for one of the data substructures, and our concern was centered about the amount of code the preferred one would require in the single-chip processor. One method was a list of alphabetic positions indexed by the language word number. A second method was a bidirectional mapping algorithm. We chose to implement both in the prototype and thus had the compiler generate both. Not until almost all of the production code was debugged and running did we make our final decision to choose the bidirectional mapping algorithm.

The index list of alphabetic positions was simple to implement. It was fast when mapping from the alphabetic position to the language invariant word number—it required only one indexed load. However, mapping from the language invariant word number to its alphabetic position required searching the list, which required referencing on average half of its entries—500 items for a 1,000-word dictionary.

We also implemented a bidirectional mapping algorithm, a sophisticated mathematical technique that allowed mapping in each direction by referencing only about $2 \log_2 (N)$ words. For a 1,000-word list this meant referencing only 20 words in each direction (rather than 500 in one direction, one in the other). This algorithm took substantially more code, however, and thus we could not be sure we would be able to use it in the production version.

After the production prototype was working and we realized the bidirectional algorithm would fit, we decided to use it. If we had been forced to make the decisions earlier we undoubtedly would not have been willing

It was the policy of the designers to try out as many suggestions as possible as quickly as possible to keep ego involvement to a minimum.

to take the risk that the bidirectional algorithm would fit, and would not have committed to it.

During the time we considered which mapping algorithm to use we generated both from the language compiler and ran both on the 8085 prototype and eventually the producton version.

Once the prototype was working, we concluded the code would not fit in the single-chip microprocessor without taking out several features. This was a critical point in the project. We had selected the 3870 because it could store 2,048 bytes of program memory, was sourced by three vendors, and was inexpensive compared to the alternatives. However, the instruction set made it difficult to program. Furthermore, the development tools were abysmal. Our initial estimates indicated that the code would just barely fit in the 3870. These estimates proved wrong because the code ended up requiring 5,000 bytes instead of 2,000. However, the original estimate did not include a calculator or several other features that we added later.

TWO COURSES PURSUED

We decided to pursue two independent courses of action: we would do straight 3870 machine coding of the prototype code, and simultaneously, we would bring up an interpreter version. As it turned out, the interpreter version had several advantages over the machine-coded version.

- It enabled the translator cartridges to store code as well as data.
- It provided calculator functions.
- If our code size estimates were wrong, it permitted us to use an external ROM for part of the application code.

A company that had developed a FORTH interpreter was brought into the project. It brought up an 8 bit version of its interpreter for the translator. It quickly became obvious that, for the reasons specified above, the interpreter version should be employed in the production machine: the code would not fit without it.

Eventually we not only added an external ROM but also 32 bytes of RAM (to the 3870's 64 bytes) to make the program fit (Fig. 4). While we had hoped to avoid both courses of action, we were able to integrate these changes within a few weeks once they proved to be necessary.

While the 3870 software effort was in progress, the prototyping effort continued, but at a slower rate. New data structures were implemented. Several new ideas were tried. Some, such as recognizing phrases (how much = *combien*) were retained.

Continuation cartridges were also discarded because they made the code run too slow. During the concluding phases of the project, the 3870 software group was deliberately not advised of all the changes in the user interface. Its problem was hard enough without having to track a moving target. For this reason it was told only about major changes.

Some features, such as case endings, were implemented in the prototype, then taken out. Others evolved over time. An example of a feature that evolved was the Search mode. The original version of the Search mode did not subtract letters from the end of the words. Until we added the subtraction feature, Search was limited in its ability to identify words that were similar in spelling to the word the user had keyed in.

When the 3870 effort, began we gave it a final target but continued to modify the prototype. During this period, the prototype effectively buffered the 3870 effort from ideas that didn't work out, such as case endings. Only when the 3870 version began working did we redirect the people's aim toward the somewhat changed prototype.

The prototype approach had still another advantage. The 3870 dictionary cartridges were identical to those of the prototype, so language cartridges could be debugged on the prototype. Thus the 3870 programmers could eliminate bad test ROMs from their list of potential problems.

We did not write the traditional software specification for the project until we were more than half through the 3870 development effort. In fact, our initial plan was to do without a specification entirely. Instead, we intended to use the prototype as the specification. There were several reasons for this decision. First, two distinct versions of the specification evolved, the black box and the high-level PLM program listing. Any questions about what the translator should do could be answered by either running the prototype or looking at the PLM listing. Secondly, the inevitable misunderstandings and contradictions in a written specification were avoided. Finally, the absence of the specification directed everyone's attention to what the prototype did, rather than to a piece of paper that represented an abstract version of the final product. In general, this proved to be a good approach. However, lack of a software specification did create some problems. We had no list of the features in the prototype to ensure that:

- We had implemented everything.
- We had tested everything.
- We could determine all of the capabilities quickly.

We were obliged to write an English language specification. As it turned out, the prototype and the English language specification complemented each other.

When the first version of the specification was written, we considered it complete. However, it went through several changes during the remaining two and one-half months. (We maintained the specification on the development system and used the text editor to update it.)

Features alone do not make a product better, although unused features can sometimes be important for marketing reasons. What makes the better product is how the features help the typical user in normal circumstances. A translator is a dynamic product. Thus, the best way to evaluate it is to play with it to see whether it seems useful, friendly, easy to use, and interesting—or, alternately, gimmicky, frustrating, difficult, and dull.

In looking back over the project, there were some disappointments. It took longer than we originally expected. Seven months were required for the software effort. It took more memory than expected, requiring the addition of ROM and RAM.

However, the software prototype proved beneficial in four ways:

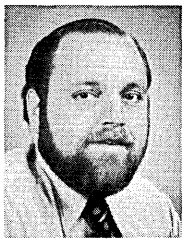
- We could keep trying new things.
- The prototype was a good model of the final product, and thus everyone involved had similar expectations about what the product would do.
- Several decisions could be postponed for a few months without affecting the critical path.
- We could focus our efforts on opportunities rather than problems.

There may be development projects where such advantages are not so crucial, but these advantages are clearly beneficial in the development of innovative products.

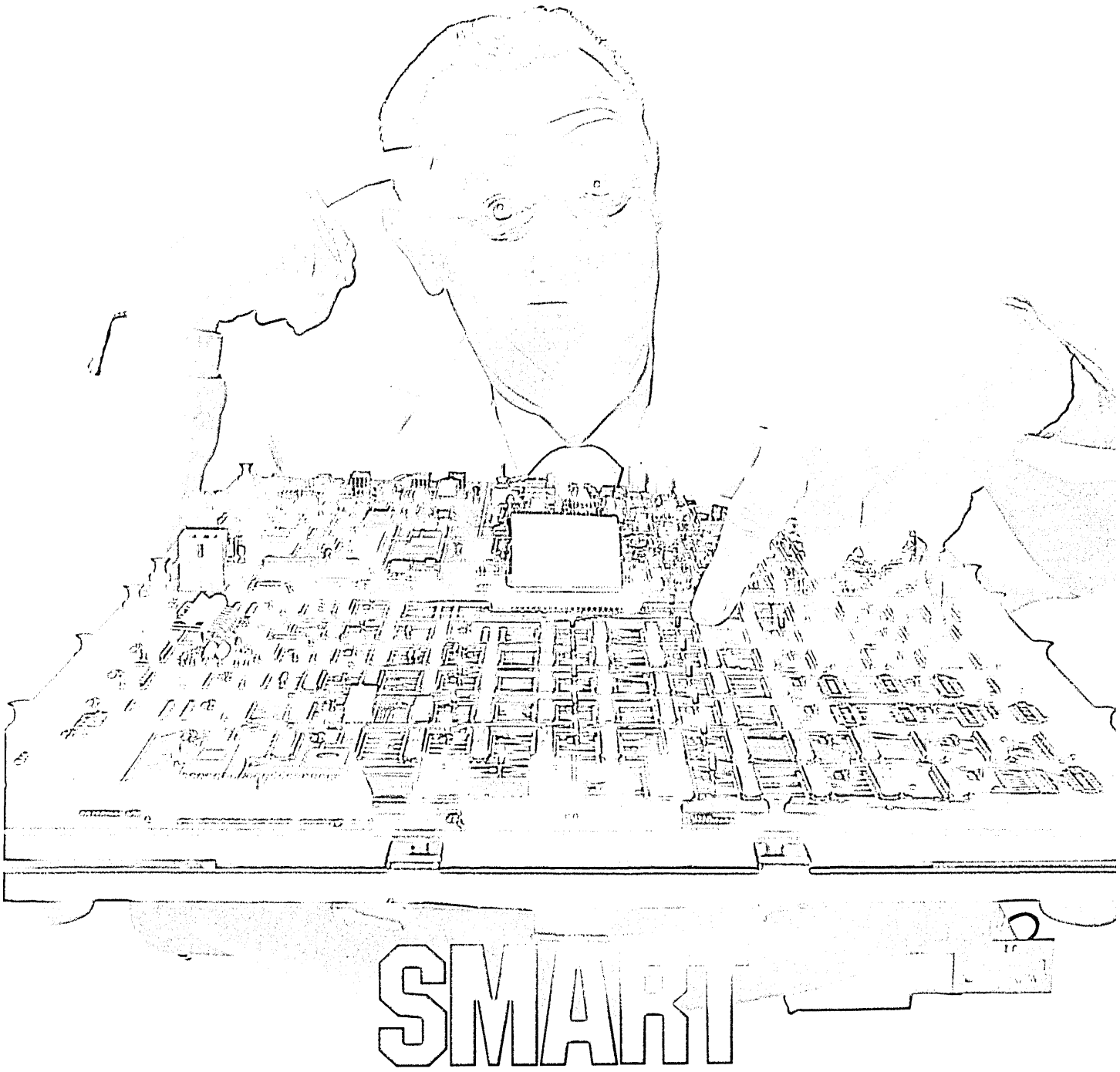
The prototyping approach is not a cure-all; there are many ways to misuse it. An important part is the person in charge of the prototyping. He must be able to single out and eliminate pitfalls that will prove impractical in the production version. It is also important to be receptive to trying several different features, even if the manager doesn't believe in them. *

Technical Publicaton No. 54, "The Craig M100 Language Translator," is available from Interactive Systems Consultants, P.O. Box 2345, Palo Alto, CA 94305.

PAUL HECKEL



Mr. Heckel heads Interactive Systems Consultants in Los Altos, Calif., where he specializes in developing small (under five pounds) software-intensive products. He is currently working on intelligent telephones and sales tools.



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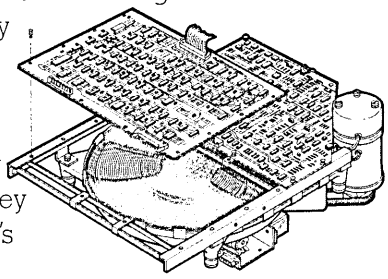

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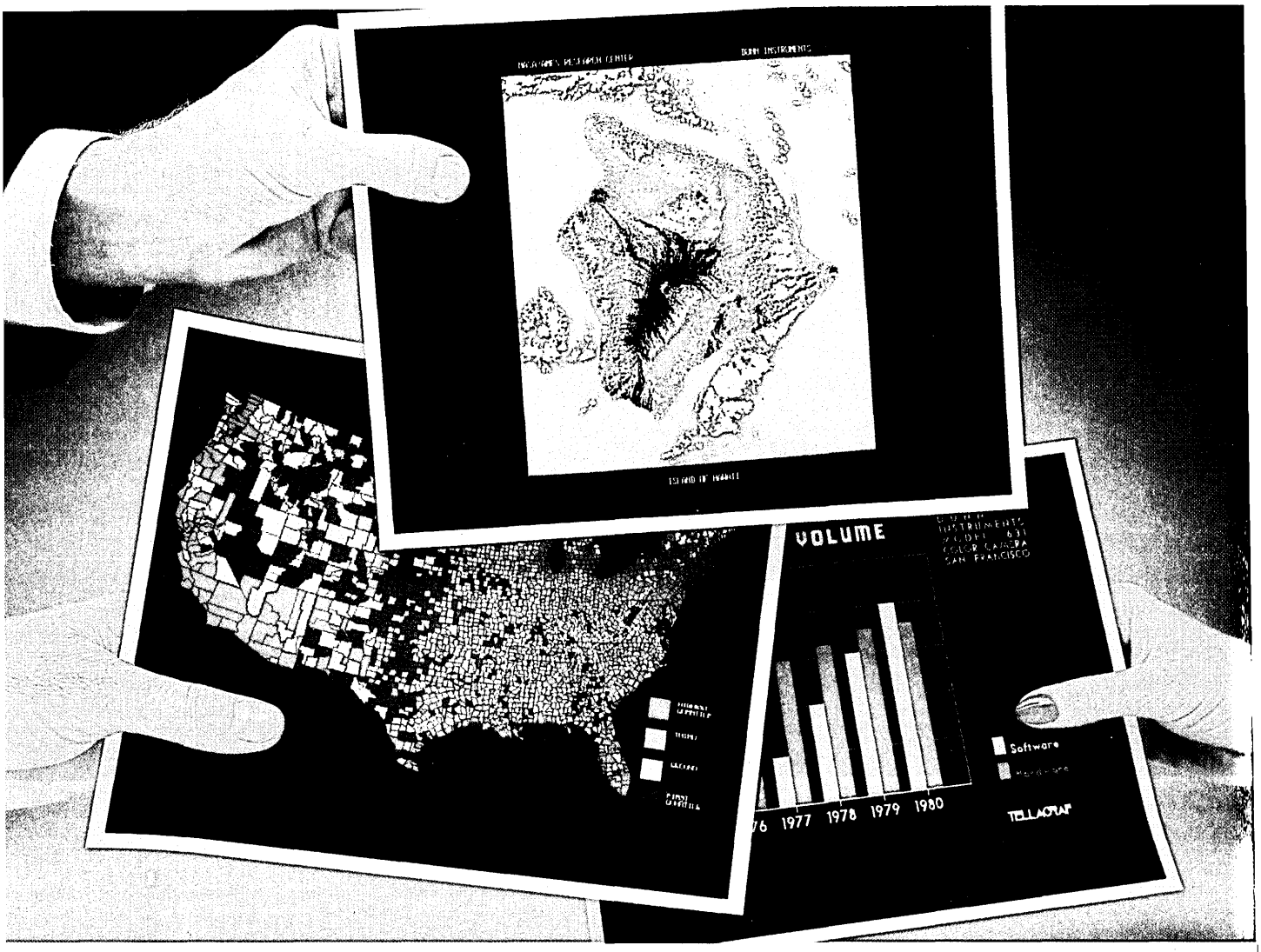

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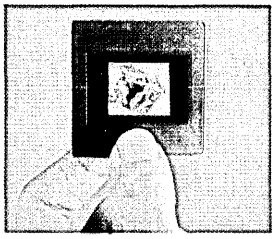

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How to develop user views, which are logical representations of data needed to answer a question, make a decision, or provide informational education.

DBMS: DEVELOPING USER VIEWS

by Robert H. Holland

The traditional approach to data base design in many corporations is to understand the user application well enough to translate it into the access method available from one or more selected data base management systems (DBMS) of the company. In this process, comparatively little attention is paid to the end user, and quite a lot is paid to the DBMS implementation of the user's application.

Fig. 1 depicts the emphasis placed in the design environment of today. The downward arrow on the left shows the areas of major concern for most data base developers. They ask what data base management system should be used, how does it interact with its host language and query language, what access methods should be used, and how should we physically map the data to disk for top efficiency. Data base developers spend almost no time asking equally important questions regarding the intended uses of the data. The data base industry has done little to increase the productivity and effectiveness of the data requirements definition portion of the design effort. The upward pointing arrow in Fig. 1 indicates the input design area of primary interest in data requirements definition.

We are interested in obtaining the data requirements of one or more applications, translating these requirements into one or more sets of subschema, then merging the subschema into a combined set called the schema. The schema then is a logical representation of a combined set of user requirements that we call user views. Later in the design process the logical schema will be translated into a physical implementation of a particular DBMS. However, the logical schema or data base is *not* dependent upon any DBMS. The general steps of logical data base design then are represented in Fig. 2.

Codd,[1] Martin,[2] and others discuss normalization once a good set of user views is available, but how does one go about getting a good set of user views to begin with?

A user view may be defined as the logical representation of data required to answer a question, make a decision, and/or provide informational education for its user. A functional system in any corporation is made up of many user views. One user of the system may logically have many views, and several employees with the same job function may have the same user view. As Fig. 3 depicts, the purpose of defining a user view is to allow the logical relationship among data elements to be identified, defined, and synthesized into an overall data base design methodology. Such a methodology seeks to eliminate problems of ill-defined or forgotten relationships. Fig. 3 shows the user of a personnel system in which the EMPLOYEE-# is used to access EMPLOYEE-NAME and SALARY. This represents a total relationship for the performance of some job-related function. It may not represent all the views of this user. In all likelihood, more views should be added before a logical data base design can be implemented.

Various sources of user views exist within corporations. They may be obtained through the following means: interviewing the end user, analyzing scheduled output reports, investigating the occurrence and purpose of special demand reports, summarizing information requirements from preformatted crt screens, determining potential on-line inquiries, and analyzing data transfer between data bases on program modules for multiple applications. When generating user views of data, the analyst should note that a single preformatted screen, or scheduled report, may result in many user views. Thus, the company has many ways of determining the perceived logical structures of data required to support its application.

HARD TO GET VIEWS

Companies using the normalization process defined by Martin have generally found difficulty in acquiring user views. The primary factors of designer concerns are education of users, definition of a user view, gathering user views, complexity of a view, and integrating user views.

Users need to be educated to the point of understanding the purpose for gathering their views of data. They must understand the definition of a user view in order to think of data in terms of individual groups of related elements. Experience indicates that after minimal education, users are capable of developing their own views.

The process of gathering user views may be performed by using standardized data

A user view permits the logical relationship among data elements to be synthesized into an overall data base design methodology.

forms or interviewing users. Such gathering processes are both tedious and time-consuming. However, the industry has seen companies that do not properly develop user views spend approximately 80% of their dp resources in restructuring, reorganizing, and reloading data bases. Thus, corporate resources are squandered on unneeded maintenance.

Another problem area for designers is deciding how complex a view should be. Designers should keep in mind that a view should be the smallest set of data elements required to answer a particular question, allow the user to make a decision, and/or provide educational information. Corporations developing user views have had difficulty deciding where a view starts and where it ends. They forget that many small views are easy to recognize and define, and the synthesis methodology will allow the complex integration required for the overall corporate setting.

The process of integrating user views is also time-consuming and fatiguing except for the smallest data base designs. Productivity in this part of the design process can be greatly enhanced by automated canonical synthesis which generates normalized data bases.

Such software is now available on the market. The initial key to corporate success in data base management is to draw well-structured user views of data. Normalization of these views is the foundation logical design upon which all future physical data bases will be built.

User views should be drawn as a bubble chart as shown in Fig. 4. In this figure the following symbols apply:

- The elipse represents a data element.
- Single arrow links mean that the first data element identifies the second data element. Thus, the head of a single arrow link identifies zero or one occurrence of a data element.
- Double arrow links mean that the data element at the tail of the arrow identifies zero, one, or many occurrences of the data element at the head of the arrow.
- The asterisk denotes a key or concatenated key through which other data may be identified.
- The double asterisk denotes a secondary key.

Three types of keys may be drawn on a user view; for completeness an attribute is also defined below:

Primary key: a data element which has one or more single arrow links leaving it.

Concatenated key: a primary key that is made up of more than one data element.

Secondary key: a data element that only has double arrow links leaving it.

Attribute: a data element which is identified by one or more of the above key

FIG. 1.
DATA BASE ENVIRONMENT

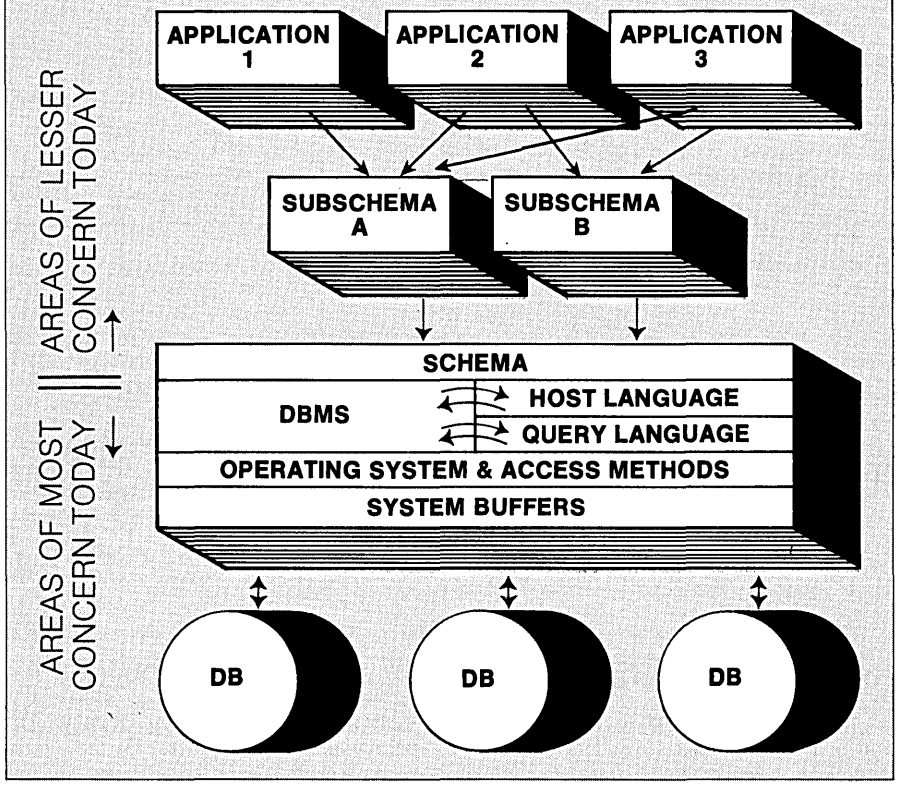


FIG. 2.
STEPS OF LOGICAL DATA BASE DESIGN

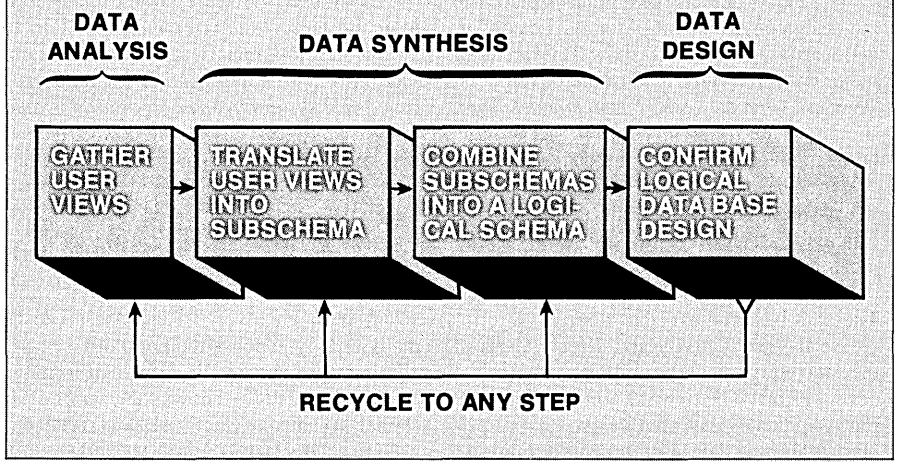


FIG. 3.
USER VIEW OF DATA RELATIONSHIPS

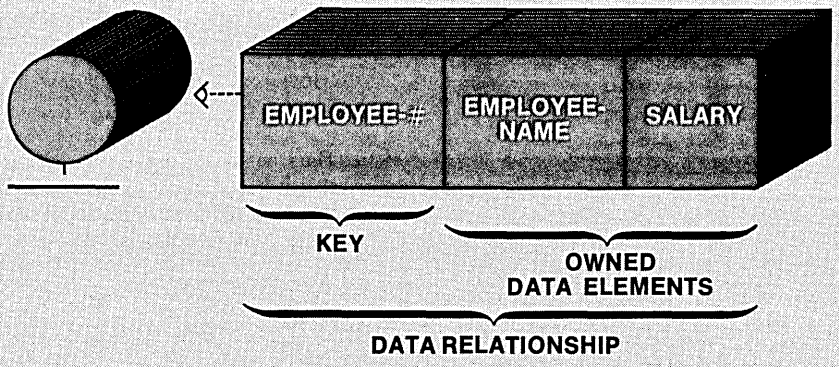


FIG. 4.
USER VIEW FOR PERSONNEL REPORT

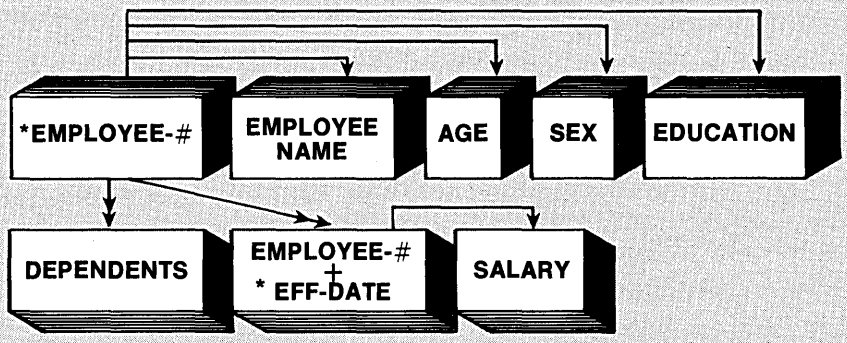
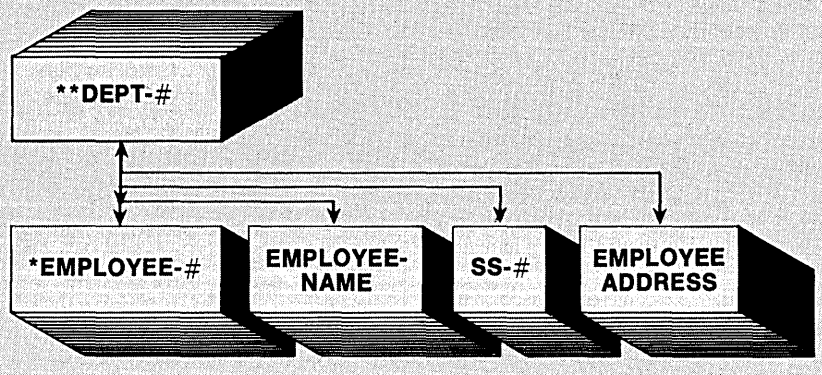


FIG. 5.
PERSONNEL ALLOCATION VIEW



types.

For the user view in Fig. 4, EMPLOYEE-# is a primary key and EMPLOYEE-# + EFF-DATE is a concatenated key. The access paths to data elements in Fig. 4 are denoted by the single and double arrow links. We see that EMPLOYEE-NAME, AGE, SEX, and EDUCATION have a single occurrence and are accessed by EMPLOYEE-#. Also, EMPLOYEE-# identified zero, one, or many DEPENDENTS and combinations of EMPLOYEE-# + EFF-DATE. In turn the SALARY for each employee number and effective data combination may be obtained through its concatenated key.

Fig. 5 shows a user view which utilizes a secondary key. The diagram shows that all the employees of a department can be identified through DEPT-#, the secondary key. EMPLOYEE-# is also a primary key through which we can identify which department a particular employee works in as well as other employee attributes.

We will not be concerned here with combining user views into a third normal form through canonical systems. Instead, the focus will be on providing a set of rules for successfully developing user views. These rules may be used by corporations to establish stable data structures.

Rule 1. Do not draw complex user views.

User views should be kept as simple as possible. They should express only one information thought or decision. Most user views can be drawn with no more than two levels of primary, secondary, or concatenated keys. Anything more complex has usually resulted from premature conclusion by the designers of the data base.

Human beings do not synthesize data relationships very well; therefore, the development of complex sets of views should be relegated to a canonical synthesis algorithm. When humans perform this function, it usually results in poorly structured non-third normal form data base designs. Such data bases have to be continuously reorganized and reloaded with each new subject or application.

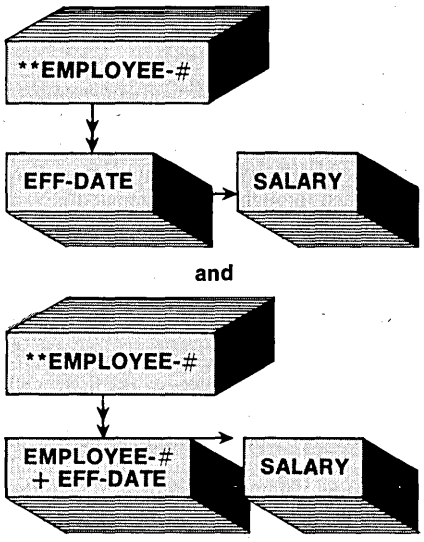
Rule 2. Use standard forms and methodology for gathering user views.

The user views gathered for a systems design must reflect the way users conduct business. Successful methods for reflecting such data relationships include views drawn from personal interviews, existing scheduled reports, special demand or exception reports, functional work transactions, and standardized data gathering forms. It is especially important for the analysts to understand the significance of these views reflecting user data requirements. A standard methodology developed internally will provide guidance for developing the type of views reflective of your organization.

The data base industry has done very little to increase the productivity and effectiveness of the data requirements definition portion of the design effort.

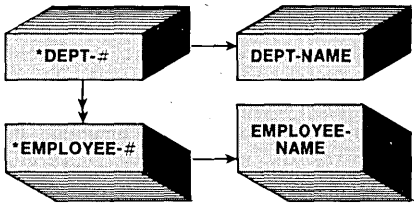
Rule 3. Make sure that concatenated keys are drawn properly.

Caution is needed in properly reflecting concatenated keys in user views. A significant difference exists between



One cannot access the salary of an employee simply by knowing an effective date. Since EFF-DATE is shown as a primary key in the left diagram above, the diagram is incorrect. The right hand diagram is the correctly drawn user view. It properly indicates the combination EMPLOYEE-# + EFF-DATE to access SALARY.

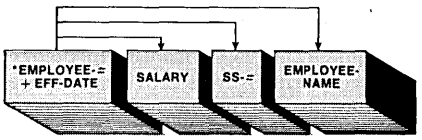
On the other hand the diagram



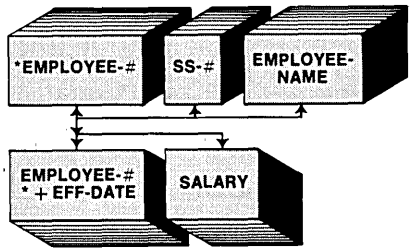
represents a correct user view for identifying all the employees that work in a department. Also, EMPLOYEE-NAME may be directly identified by EMPLOYEE-#.

Rule 4. Make sure that attributes identified by a concatenated key are dependent upon the whole key.

The following user view is incorrect in the dependency of the attributes on the concatenated key.

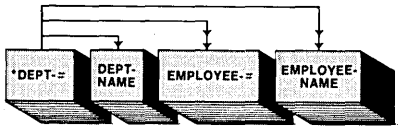


Each attribute should be dependent upon the whole key, and it can clearly be seen that SS-# and EMPLOYEE-NAME are not dependent upon the EFF-DATE portion of the concatenated key. This user view should be drawn as the following in order to be correct.

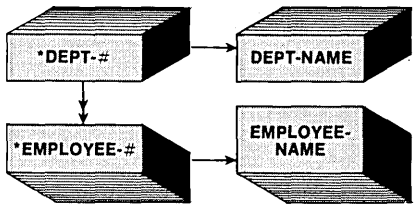


Rule 5. Do not include hidden primary keys in user views.

The following user view contains an imbedded primary key:



While many EMPLOYEE-# and EMPLOYEE-NAME attributes may be identified within a department, the above diagram shows the relationship improperly. It should be redrawn as

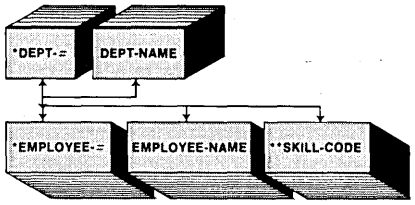


Note that in the above diagram EMPLOYEE-# is no longer a hidden primary key. Since it now has a single arrow link to EMPLOYEE-NAME, it is clearly a primary key.

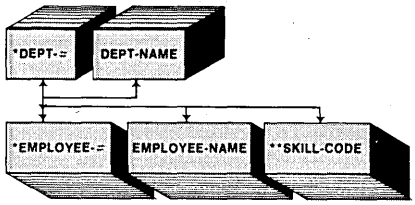
Rule 6. Investigate user views for possible secondary keys before implementation.

When user views are first drawn it is not unusual to overlook secondary key possibilities. These are much easier to identify at logical design time than restructuring the data base to accommodate them after implementation.

Secondary keys are often used to answer inverse questions raised by users. For example, the following user view may be used to identify the skill code of an employee within a department.



However, it may be anticipated that the personnel department may want to know of all the employees that have a certain SKILL-CODE. Thus the inverse use of SKILL-CODE requires that it become a secondary key. The diagram must be redrawn with a double arrow link to reflect this as follows:



Companies are urged not to make everything a secondary key as these are candidates for inverted file structures and costly to maintain; however, judicious analysis of user views will undoubtedly produce some secondary keys which should be included in the final design. This approach will save costly restructuring later. Experience shows that data base designers who follow the above rules will develop better data structures because not only will they be more stable in nature, but they will be reflective of actual user requirements. The development of user views should not be taken lightly as it is the basic standard upon which the physical data base will be implemented. ✲

1. E. F. Codd, "Further Normalization of the Data Base Relational Model" in Courant Computer Science Symposia vol. 6, Prentice-Hall Inc., Englewood Cliffs, N.J., 1972.
2. James Martin, *Computer Data Base Organization,* 2nd ed., chapt. 14, Prentice-Hall Inc., Englewood Cliffs, N.J., 1977.

ROBERT H. HOLLAND

Dr. Holland is executive vice president of the DMW Group, Inc., a computer software and consulting firm based in Ann Arbor, Mich. he is also the president of Database Design, Inc., a consulting firm in data base design software and design workshops and seminars

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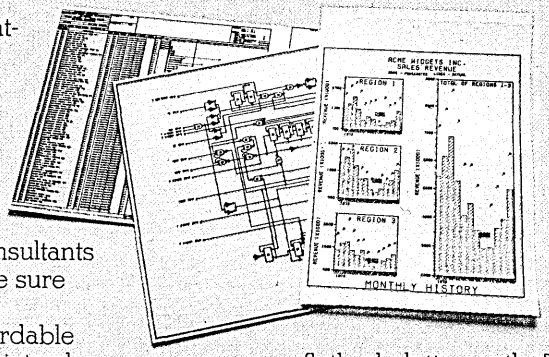

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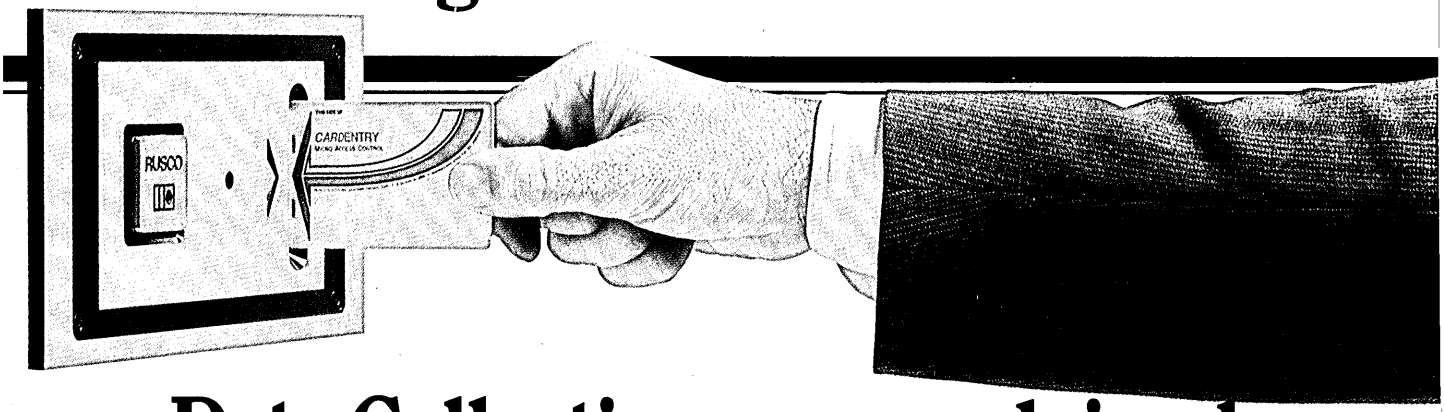

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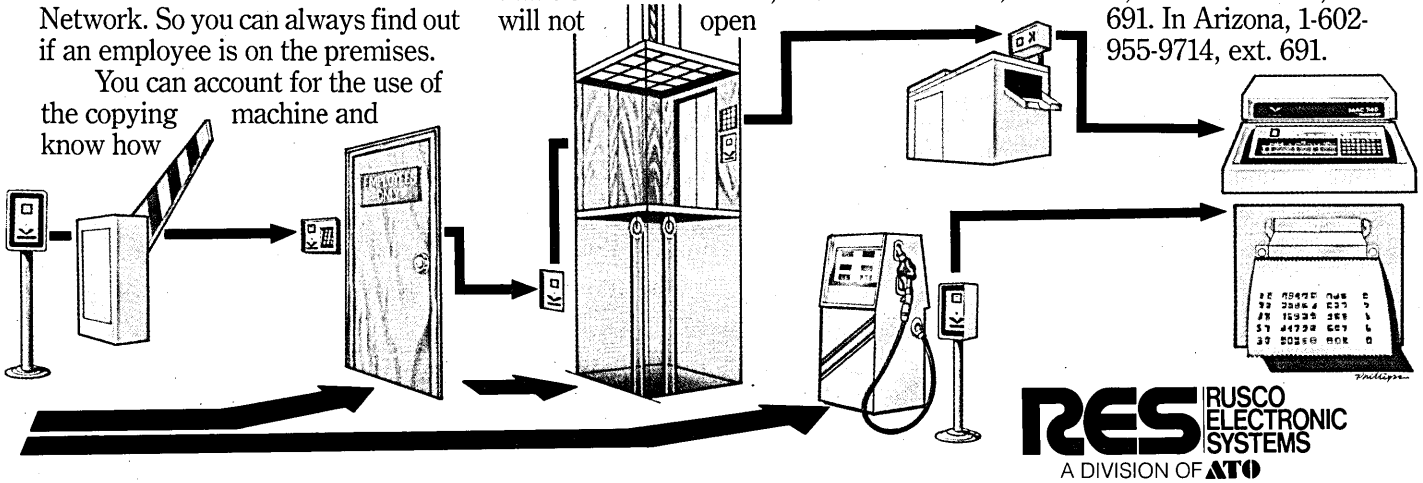

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After more than a decade of exploration, digital audio and video recording techniques are coming into their own.

THE DISK REVOLUTION

by Sarah Rolph

A quiet revolution has been modernizing the entertainment industry. Digital audio and video recording techniques that have been explored in the R&D community for over a decade are coming to fruition.

The underlying principle of both the videodisk, which is just hitting the market, and digital audio, exciting to the music industry because it evades some of the inherent limitations and complications of recording sound on magnetic tape, is that any signal can be recorded and then fetched as binary information. More information can be stored on a state-of-the-art disk than on any manageable form of magnetic media, and, while optics research promises to provide newer, better, and probably cheaper disks, present technology has enabled some interesting products, and some exciting developments are in the wings.

In the case of digital audio recording, a great leap forward in the accuracy of the sonic image is afforded because of the exactness of binary information and the immunity to background noise inherent in the recording medium. Present magnetic audio recording relies on an analog representation of sound waves—what goes on tape can be thought of as a picture of the sound. Because the signal is subject to distortion, modern audio recording techniques have brought the most minute sonic details under electronic control with computerized mixing boards and outboard devices like digital delay lines, which are used for special effects, ambient reproduction —the re-creation of, say, a concert hall's ambience—or to make a person's voice sound on key.

Digital technology continues to enhance the recording industry, as prototype digital recording and editing machines find experimental homes with enthusiastic producers and engineers. Three such machines from 3M are in top L.A. studios, Sony is very active in the field, and a number of small companies have begun to address the market. Yet, while the studios compete for the latest state-of-the-art technology, there as yet exists no mass medium with which to take advantage of the precision of digital sound. The digital disk will be that medium as soon as playback devices are on the market.

The North American Philips Company has demonstrated an audio disk player that closely resembles its commercial videodisk player, Magnavision, which is being test marketed in Atlanta, Seattle, and Dallas by Magnavox, a Philips wholly owned subsidiary. The audio player, called the Compact Disc system because the optical disk it uses is just 4½ in. in diameter, is not presently being marketed, nor have any marketing plans been made public. The interesting indication is that Philips sees separate markets for digital audio and video, whereas a combination machine is technically feasible.

THOMSON-CSF

The Thomson-CSF TTV 3620 uses this transparent videodisk. Made of thin glass coated with special resin, the disk is read with a transmissive rather than a reflective optical system. Soon 3M will be manufacturing both kinds of disks.

VIDEODISK MAKING INROADS

The videodisk as a product has begun making commercial inroads in the industrial as well as the home entertainment marketplace, as videodisk operations begin to emerge from the woodwork. Many are not yet ready to market.

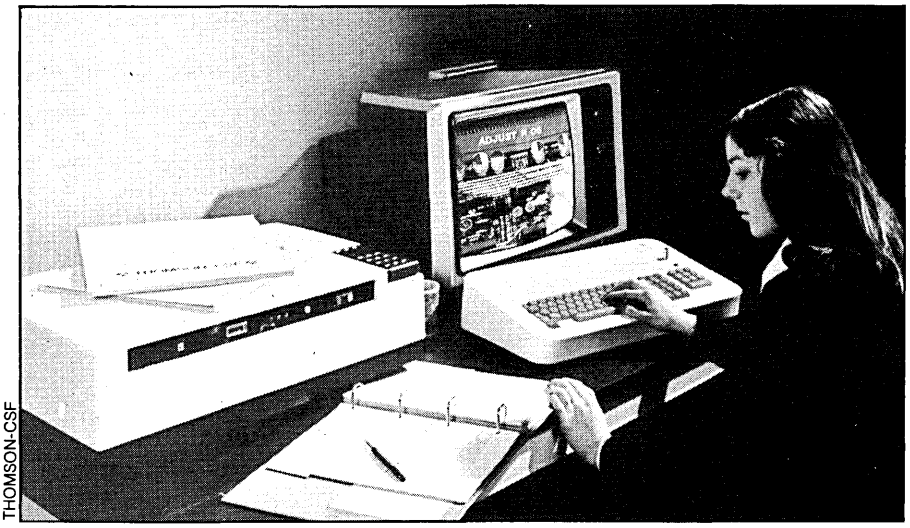
The videodisk is making waves in business circles both as a potential communications medium and a way to boost productivity through training.

Sony's microprocessor-controlled videodisk player, which will be aimed at the industrial market, has been demonstrated and is expected to be introduced this year. Commercial competition has begun in two arenas—RCA and the Philips/MCA alliance in the consumer ring, and DiscoVision Associates and Thomson CSF in the business/industrial market. DiscoVision Associates (or simply DVA to distinguish it from the still kicking MCA DiscoVision, which provides software for the Magnavision unit) is the joint venture that stunned the business world when it was announced last September. IBM and MCA went 50-50 on DVA, to which MCA contributed the basic industrial player, the PR 7820, and a disk production plant in Carson, Calif. IBM contributed a lot of cash, some patents, and, more importantly, the know-how with which to whip the Carson plant into shape for automated mass production. The IBM team has apparently been very impressive in its analysis of the facility. Says one DVA source, "The greatest strength of having IBM is its manufacturing expertise."

The PR 7820 is manufactured in Japan by the Universal Pioneer Co. Universal Pioneer was started as a joint venture of MCA and Pioneer; DVA now owns MCA's former 50%. Whether new hardware manufacturing facilities that may be needed will be built in the U.S. is unknown. The microprocessor-controlled PR 7820 sells for $3,000, or $2,250 in orders of six or more.

The TTV 3620, the Thompson CSF institutional videodisk player that also contains a microprocessor, also sells for approximately $3,000. The TTV 3620 is being sold with the ability to be hooked up to a microcomputer. The machine uses an optical disk made of glass and coated with photosensitive resin on which the binary information is microscopically carved with a laser beam, later to be read by the laser in the player. While the encoding process is similar to that used on the Philips optical disk, the read mechanism differs; the Philips system is known as "reflective," while the Thomson CSF system is called "transmissive" because the laser focuses on the binary impression rather than bouncing off it. Because of this focusing action, both sides of the disk can be played without being turned over—the laser refocuses on the second side. This gives 54 minutes of undisturbed playing time. The Philips disk offers 30 minutes a side in its present format, and an extended play format for movies is planned that would allow 60 minutes a side. For this format, Philips varies the rotation speed of the disk, for proper tracking, which does away with the freeze-frame capability.

Sony has experimented with a 60-minute-per-side videodisk by rotating it at 900 rpm, rather than the 1,800 rpm the Philips and Thomson CSF disks use. These speeds allow the use of freeze-frame because they correlate with the 525 lines U.S. and Japanese tv standard of 30 frames per second (for European tv, which carries a different standard, the videodisk spins at 1,500 rpm).



THOMSON-CSF

The Thomson-CSF 3620 being used with a microcomputer for self-paced instruction. The small keypad in the lower righthand corner of the machine is used for random access to a video frame.

Also weighing in with a 900 rpm version is the prototype JVC (Japan Victor Corp.) videodisk player, which may appear within a few months. The JVC unit uses capacitive pickup; the information on the disk is read electronically with a stylus, rather than optically with a laser. This is similar to RCA's SelectaVision videodisk process, but on a flat disk (RCA's disk has tiny grooves). The JVC machine is being developed at the Audio Research Center in Yamato, Japan, and will not only feature the 60 minute side with freeze-frame capability, but is being shown with a digital audio converter.

The freeze-frame feature is an important part of the institutional player's attractiveness. So many frames can be stored on one disk that the medium is very attractive to anyone who uses slide files. The frame-by-frame mode and the ability to go back over any portion of the material at any time also make the videodisk the most promising medium yet for truly interactive programmed instruction.

VIDEODISK INTERESTS BUSINESS

The videodisk is making waves not only in education circles but in business as both a potential communications medium and as a way to boost productivity through training and education. Hughes Aircraft has completed a project for the Army using all stills. Text on the videodisk replaces a tank maintenance manual in the experiment, which is being evaluated against a control group. The TTV 3620 was used for the project, with an interactive microcomputer program that allows the learner to continue along the branches of a procedure as the material is absorbed. Hughes is presently working on another step-by-step instructional program for a maintenance application. This time the Thomson CSF system will be used with full sound and motion, and will also be hooked up to a computer printer.

Aside from potential industrial audio-visual uses, the optical disk is being seen as a promising medium for data storage. RCA's Government Systems Div.'s Advanced Technology Labs is working on an optical disk made with a proprietary tri-layer process. Originally studied by RCA for its potential as a storage medium for broadcast applications, the optical disk is now seen as a good mass storage medium.

The Magnavox Government and Industrial Electronics Co. is also working on an optical disk data storage and retrieval system. Sources at Thomson CSF say work in the field of digital optical read-write technology is "progressing rapidly towards a product for the computer peripheral marketplace." And Philips' labs reports a working read-write prototype that initially will address the industrial market (no doubt because of the cost), but a consumer videodisk machine with recording capability may find its way into the home within the decade.

WORLD-WIDE INDUSTRY EMERGES

The emerging videodisk industry is clearly international, with a number of Japanese interests involved, the French company Thomson CSF a major force, and Philips

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With the promise of viable videodisk players, a number of sources of videodisks are gearing up. Philips will begin producing its disk in England at a $25 million plant now under construction. At least one other Philips plant will be in the U.S., as part of a joint venture with CBS Technology Corp. And 3M is entering the videodisk mastering and replication business with a proprietary process with which it will be able to produce the Philips reflective disk as well as disks for Thomson CSF (which entered into a mutual agreement with 3M last summer). The production facility will be in St. Paul, Minn. and is planned to be operational by the last quarter of this year. Disk production comesout of 3M's optical recording project of the Magnetic Audiovisual Products Div. The manager of the project, L. A. Troeltzsch, has been the director of the Mag xma/v division for the past six years, which is an indication of 3M's commitment to the videodisk.

In last December's announcement that the RCA SelectaVision videodisk player will be available through its retail tv distributors early next year, RCA president Edgar H. Griffiths heralded the start of a "brand-new *American* industry." SelectaVision will not only be entirely American, but entirely RCA. "We have invented, designed, engineered, and will manufacture this product," said Griffiths. "We will produce the software. We will sell the product—both the disk and the player. This is not an alliance between independent companies who do not always see things eye to eye. . . ."

The SelectaVision capacitive disk, which uses a helical groove in conductive vinyl read by a tiny metal-edged diamond stylus, revolves at 450 rpm, giving the system no freeze-frame capability. And while the system had been demonstrated with stereo audio, the initial version will not include that feature. The most likely reason for this is RCA's desire to keep costs down to get a jump on the market. Initial software offerings of 300 titles, half of which are feature movies including such classics as *Citizen Kane*, should help RCA's mass marketing effort to lock in users. RCA predicts it will sell 200,000 units the first year.

Industry observers predict RCA may well succeed in taking hold of the consumer market for the simple reason that its machine will be sold for almost $300 less than the Magnavision unit. Magnavision price recently jumped from $695 to $775; SelectaVision will sell for $500.

RCA badly wants this new home entertainment market. Said Griffiths in his December announcement, "When we introduce the videodisk we are going to take over first place, and I guarantee you we will never lose first place. The days are gone when RCA would pioneer, invent, and come up with a brilliant idea, only to lose it in the marketplace or lose it for financial or other commercial reasons. Those days are gone, and we're never going to live through them again." ✻

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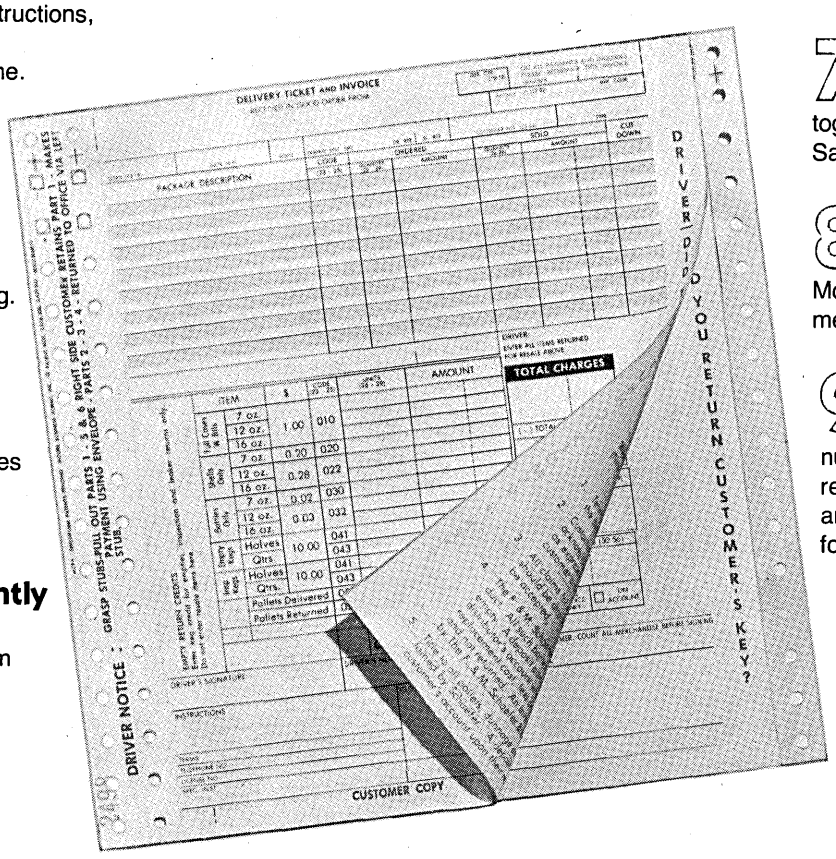

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Data base machines promise a solution to DBMS price/performance problems.

AID IN THE '80S

by Robert Epstein and Paula Hawthorn

In the '80s, computer installations will rely on special-purpose, add-on systems to handle work from overburdened cpus. One such system is the data base machine, designed to efficiently handle data base management tasks. The purpose for developing data base machines is to solve three problems:

- Most business dp involves simple operations on well-organized data. Why, then, should the software and hardware be expensive, time-consuming, and complex?
- The increasing use of one-line data bases creates a strong need for faster retrieval and updating capabilities.
- Software costs continue to rise, and there is an increasing need for the software to be independent from the hardware. Also, the software must be portable and the data management function must be hardware independent.

Data base machines promise to solve these problems; to fully appreciate their role, it is necessary to review the advantages and limitations of existing data base management systems (DBMS).

Data base management systems are based on fundamentally sound concepts. They have cut software costs, reduced the time required to write application programs, improved software reliability, and simplified software maintenance. A functionally complete DBMS provides protection, transaction management, concurrency control, audit trails, backup, and recovery, and can save a programming staff time and trouble because the data management problems have been handled. Data independence, common controlled access to data, and organized, structured approaches to solving problems are extremely valuable.

The problems with DBMS on conventional hardware are cost and performance. A functionally complete DBMS is a large, complex system requiring years of programming effort. In a conventional system the DBMS is often the largest program. With the increasing cost of software, some data management systems cost more than the hardware. Since a DBMS is a large program, it requires hardware resources (extra memory, disks, etc.) beyond what the host system might otherwise need. As well as being expensive, a complete DBMS has performance problems caused by the general-purpose machine architecture, the general-purpose operating system, and the sheer size of the DBMS.

Architecture. I/O handling within a general-purpose architecture is a key limitation. The primary function of a DBMS is the retrieval, manipulation, and storage of data from secondary storage. With conventional architecture, this work must be accomplished in the host. If a user enters the command "Print the July sales total," all of the disk blocks that could possibly contain information about the sales for July must be brought into main memory. Then the DBMS scans each block and adds the total, which it displays to the user. The data must be moved from the secondary storage to main memory, thus impacting the I/O channels as well as the cpu. A data base machine can move the intelligence closer to secondary storage.

Operating System Conflict. A second performance problem is that general-purpose operating systems often interfere with the efficient operation of the DBMS. A common example of this interference is the use of buffers in a virtual memory system. A well-designed DBMS will try to keep frequently used disk pages in main memory. Yet, in a virtual memory system, those pages can easily be swapped out to secondary storage by the operating system, thus making more total system work than if they had not been buffered at all.

Another conflict arises over the physical placement of data on secondary storage. It is advantageous for the DBMS to control where data is written on the disk. For instance, indices should be kept near the data they reference. Such control over physical I/O is nearly impossible within many operating systems.

Establishing a peaceful coexistence between a DBMS and an operating system may lead to allowing the DBMS to bypass part or all of the operating system. The other common solution is to integrate part of the DBMS into the operating system. To accomplish either of these solutions, parts of the DBMS are frequently written in assembly language, and tied very closely to the machine on which the DBMS is implemented, losing independence between DBMS and host hardware. The user pays a high purchase price and then has constant changes as computer configuration upgrades and other modifications are made.

In contrast, data base machines can be independent, back-end machines. They do not need to know with what operating system they are communicating. This independence maintans the integrity of the general-purpose operating system while allowing systems enchancements.

Big programs. The third source of DBMS performance problems is the sheer size of the program for a functionally complete DBMS. On small mainframes or minicomputers users notice a significant drag on the system response time when the DBMS is running. Unavoidably a complex system, a DBMS requires many system resources, and demands a large mainframe or top-of-the-line minicomputer. Most small business systems users, therefore, cannot complete data base systems. Implementing a DBMS on a dedicated mini used as a back-end processor offers a partial solution to the DBMS price/performance problems (see Fig. 1). The user command "Print the July sales total" is passed to the back-end system. There, the DBMS is its own operating system, free from host upgrades. However, the operating system was only one of three causes of poor performance, and a back-end mini still has the problems of general-purpose architecture and of running a large program in a small box with limited resources.

DATA BASE MACHINE SOLUTION

Data base machines promise a solution to the DBMS price/performance problems. Because a data base machine is a back-end system, it is not affected by changes in the host system, simplifying compatibility and maintenance. Because it manages its own physical resources, it does not need an operating system. Manipulating data at the secondary storage level, the data base machine eliminates the need to transfer data in and out of main memory. Most importantly, special-purpose hardware gives data base machines greater speed. Since it is not a general-purpose system, a data base machine can handle data management functions many times faster than general-purpose systems.

One example of a data base machine, the Britton-Lee Intelligent Database Machine (IDM), is shown as a back-end machine in Fig. 2. IDM is a self-contained hardware relational

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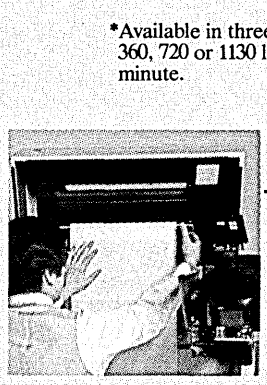

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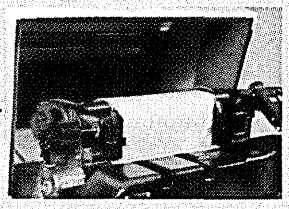

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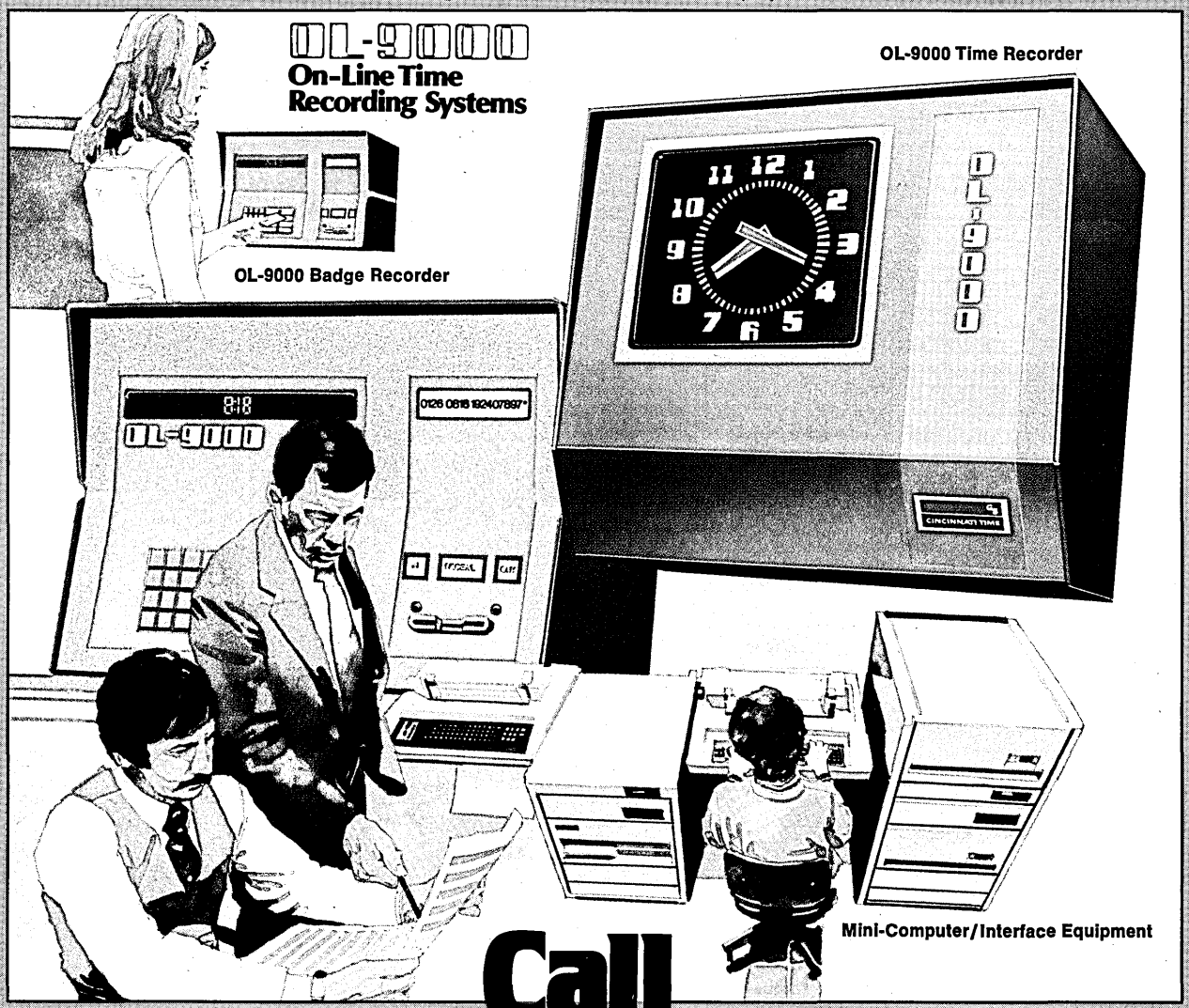

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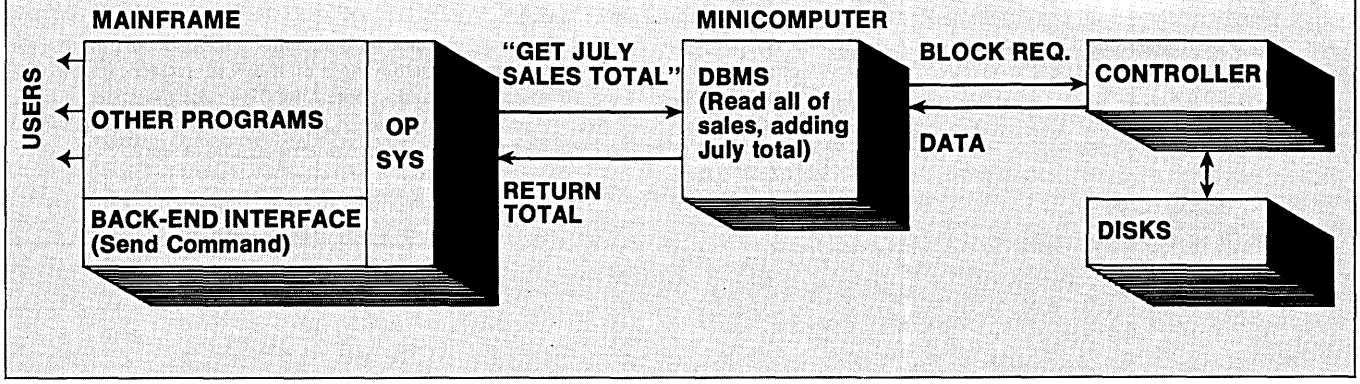
A major advantage of the data base machine: it moves intelligence close to the secondary storage and efficiently manipulates the data.

FIG. 1.
DEDICATED MINICOMPUTER BACK-END



data base system. It connects directly to a maximum of 16 moving head disks, providing basic read/write and advanced error correction and sector reassignment. The IDM communicates with a host through either bit serial or high-speed byte parallel interfaces.

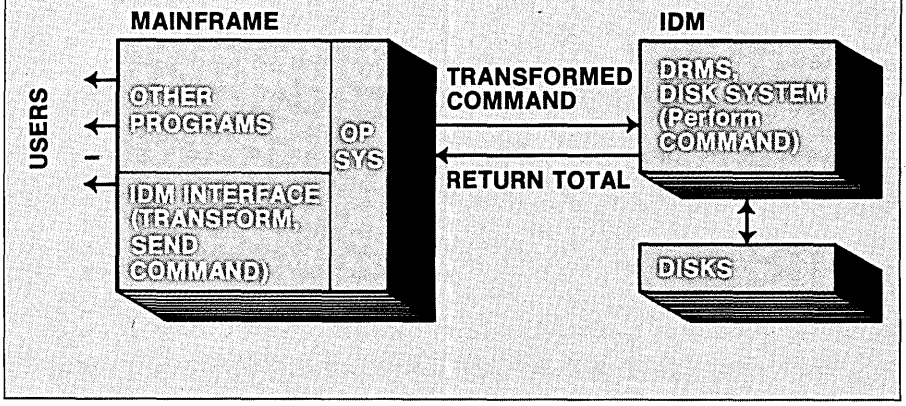
An application program running on a host computer communicates with the IDM using a binary representation of a high level nonprocedural command language. The command language allows for defining a data base, specifying indices on relations, and doing retrieval, update, and aggregations.

Incoming queries (retrieve, append, replace, or delete) are examined by IDM for validity, and then analyzed to determine how they should be processed. The processing strategy depends on what indices are present and the physical location of data and statistical information automatically maintained by the IDM. Basic computation and searching on the data base is performed by custom hardware which operates at speeds 10 times the transfer rate of the disk. The IDM automatically caches frequently accessed disk sectors. The cache size is variable and can be up to 2 megabytes in size. Speeds exceeding 20 transactions per second are possible in many applications.

To gain access to the IDM, the user (interactive or batch) issues a high level data base command. The IDM interface program in the host transforms the command to a form understood by the IDM, and sends it under operating system control to the IDM. The IDM performs the command. If data is to be returned to the user, the IDM sends the data back. In Fig. 2, only the translated command to print the July sales total is sent to the IDM. The data returned to the host is the July sales total. All the data management functions are performed in the IDM.

The relational data model was chosen because it is easy to understand, supports a high level language interface, and can reduce application software costs.

FIG. 2.
THE IDM AS A BACK-END



The relational model easily supports a nonprocedural interface. The user only specifies what is wanted ("Print the July sales total")—not how to get it. The query language is based on University of California at Berkeley's QUEL and on the IBM Research's (San Jose) SQL-2.

HIGH SPEED, LOW COST

IDM speed is limited by the speed of the secondary memory. One reason for the long delay between the first ideas for data base machines and the first commercial system is that processor technology would not support the high speeds necessary to process the data as it comes from the disk. IDM is able to process a disk block as it is read. By the time the one block is under the read head, the previous block is processed.

The IDM maintains a fast memory cache so the time to execute a command can be made much faster than disk access times if the data is in the cache.

One of the major advantages of a data base machine is that it moves intelligence close to the secondary storage and efficiently manipulates the data. The overhead of communicating with the IDM is closely related to the length of the command. IDM allows transaction commands to be stored in memory. The user program can run a stored transaction by simply naming it and supplying the appropriate parameters. This facility provides a low-overhead mechanism for running frequently used, standardized transactions.

The IDM also contains many user facilities, such as a nonprocedural language (Intelligent Database Language); a complete indexing system; constraints to limit access to relations, portions of relations, specific records; a view mechanism to allow alternate definitions of relations or collections of relations; random access files creation; and an integrated data dictionary.

Applications with a high transaction

The solution to problems of expensive, time-consuming, and complex software may be the data base machine.

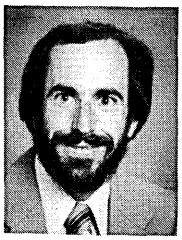
rate need a high bandwidth path between the host computer and the IDM; applications with low transaction rates are supported by both inexpensive serial interfaces and more sophisticated parallel interfaces. When backending a larger system, a simple serial interface can be used if the transaction rate is low; otherwise the host system can be interfaced to a high speed, parallel bus.

ELABORATE HARDWARE CHECKS IDM has elaborate hardware consistency checks, including the standard recovery and checkpointing features. Read retry and disk reassignment are automatically performed when media is at marginal levels.

Some previously proposed data base machines have involved using associative memory or CCDs as secondary storage. Such proposals provide high speed performance for certain types of queries for small data bases, and are very expensive. IDM uses moving head disks as the secondary storage medium.

The historical problems in developing data base machines have been problems in achieving a high level interface, to the host, and in obtaining the necessary speed. Development of relational DBMS made possible the high level interface, and technology has finally reached the necessary speed for data base machines to be a commercial reality. ✻

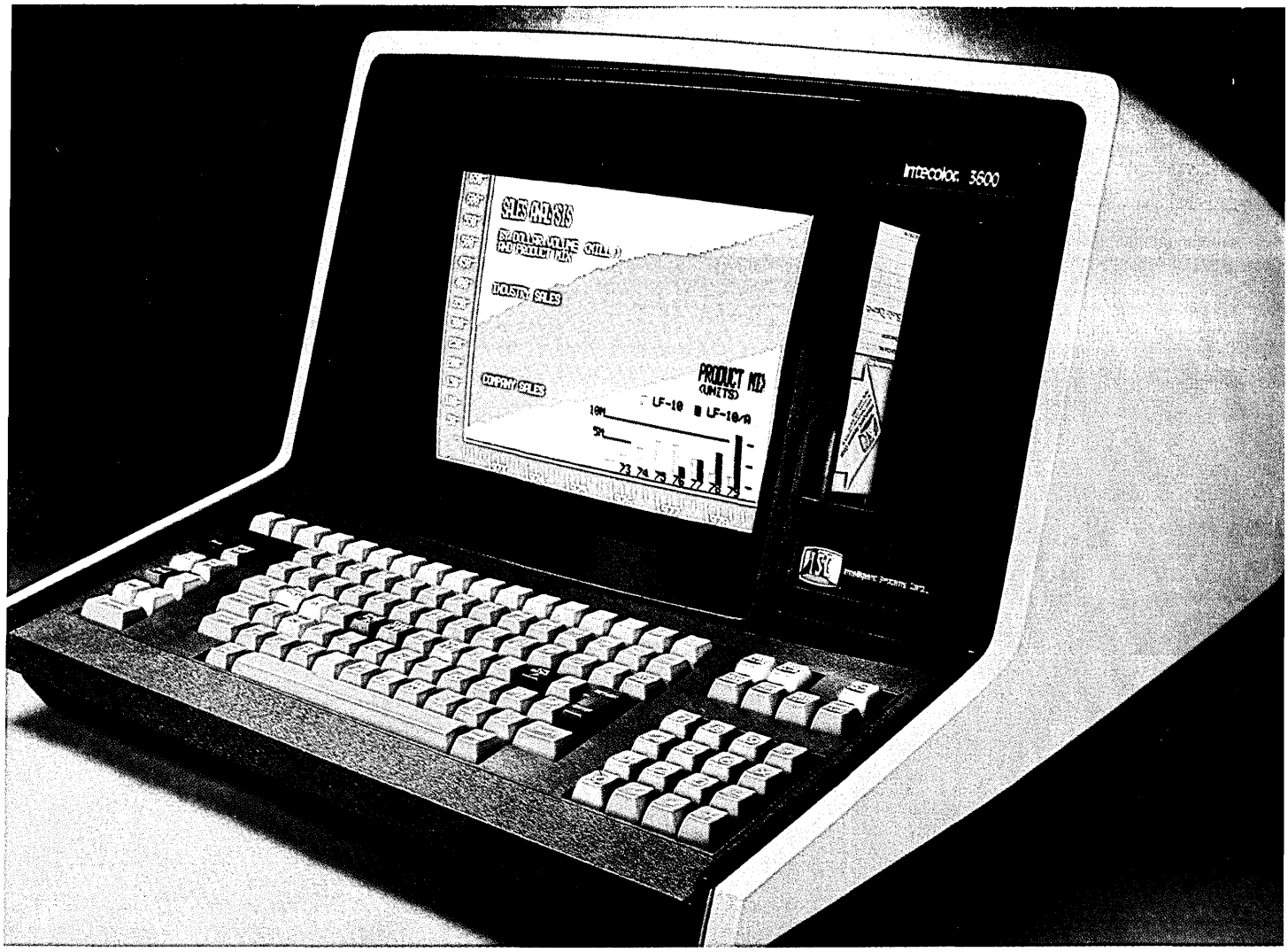
ROBERT EPSTEIN



Dr. Epstein is the author of several papers on data base management, implementation of relational data base management systems, query processing for distributed data base management systems, and data base machines. He has worked as a consultant on data base applications, was the chief programmer for the relational data base management system INGRES, and designed and implemented real-time control systems. He has a PhD in electrical engineering and computer science from the University of California, Berkeley.

PAULA HAWTHORN

Dr. Hawthorn has 13 years' experience in computer science, including six years in the performance evaluation of computer systems. Recently she has been associated with Lawrence Radiation Labs, Berkeley, where she participated in the design of data management system for very large scientific data bases. Prior to that, she worked with Project INGRES, where she studied the possible changes in system performance that would result from the use of a back-end data base machine. She has a PhD in electrical engineering and computer science from the University of California, Berkeley.



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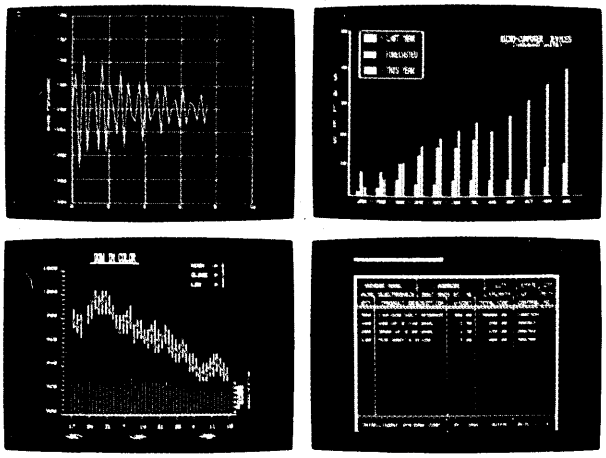

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The computer industry is undergoing a structural change that will significantly raise its exposure to business downturns.

COMPUTERS AND CYCLICALITY

by Jack Nussbaum

Most business analysts would now agree that 1979 was the beginning of a recession, although they would also insist that it is going to be a mild one in comparison to our 1974-75 experience. On the basis of the accepted definition—two consecutive quarters of negative gross national product growth—we are not yet in a recession. But most business indicators point to a downturn.

The people in the computer industry appear unconcerned; the experience to date has been that economic recessions merely cause small dips in the industry's rate of growth, as was the case in 1975, rather than resulting in absolute declines. Only during the early '70s was a marked leveling off in growth observable. The usual explanation for this good fortune is that during downturns businesses maintain computer spending to wring more productivity from operations. The long-term nature of most dp projects is another reason for the industry's insulation from the business cycle.

Depending on the severity of the current recession, past experience could very well repeat itself this time around. But can we expect this record—virtual immunity from business slowdowns—to continue? Examination of the computer industry's structural changes suggests otherwise. While the industry's growth during the foreseeable future can be expected to continue to be strong—a good deal stronger, in fact, than that of the economy as a whole—there are compelling reasons why that growth will not be as smooth or as free from interruptions as in the past.

The connection between the computer industry's business cycle and its growth can be better understood after examining the magnitude of that growth. Comparison of the computer industry's year-to-year growth with that of the GNP shows the industry's dynamic expansion (see Table I). When these rates are compounded, the computer industry is shown to have grown by a 17.6% annual rate since 1975, compared to only an 11.3% rate for the economy as a whole. These growth rates ignore inflation so they do not measure change in real terms, but they do show that since the last recession the computer business has increased 56% faster than the rest of the economy. Thus the computer industry will account for an increasing share of the GNP.

TABLE I
GNP VS COMPUTER INDUSTRY GROWTH
($ Billion)

	1975	1976	1977	1978	Compounded Annual Rate
GNP	1,528.8	1,700.1	1,887.2	2,107.6	
Annual Change		11.2%	11.0%	11.7%	11.3%
Computer Revenue*	22.2	25.1	29.6	36.1	
Annual Change		14.0%	18.0%	22.0%	17.6%

*DATAMATION FIGURES FOR THE TOP 50 FIRMS IN THE COMPUTER BUSINESS THAT ACCOUNT FOR 95% OR MORE OF THE INDUSTRY'S ACTIVITY.

This conclusion was also reached in a 1977 AFIPS study that projected the GNP share of dp user spending at 8.3% by 1985 (see Table II).

TABLE II
U.S. EDP USER SPENDING 1970-1985

	$ Billion*	%GNP*
1970	21	2.1
1975	41	3.2
1980	82	5.2
1985	164	8.3

*FIGURES ARE EXPRESSED IN 1970 DOLLARS (SEE DATAMATION, FEBRUARY 1978).

The industry's personnel expansion is another measure of the increasing share of the national economy. The same AFIPS study projects dp personnel growth between 1974 and 1985 at 29% compared to only a 20% employment rise for the overall economy.

Recent industry expansion is also related to the increased use of dp technology for various convenience applications aside from traditional bread-and-butter chores such as payroll processing and receivables and payables tracking. From the vendors' perspective, however, these convenience applications are more risky, since they are more likely targets for controlling user budgets during recessions.

VENDORS MORE RESPONSIVE

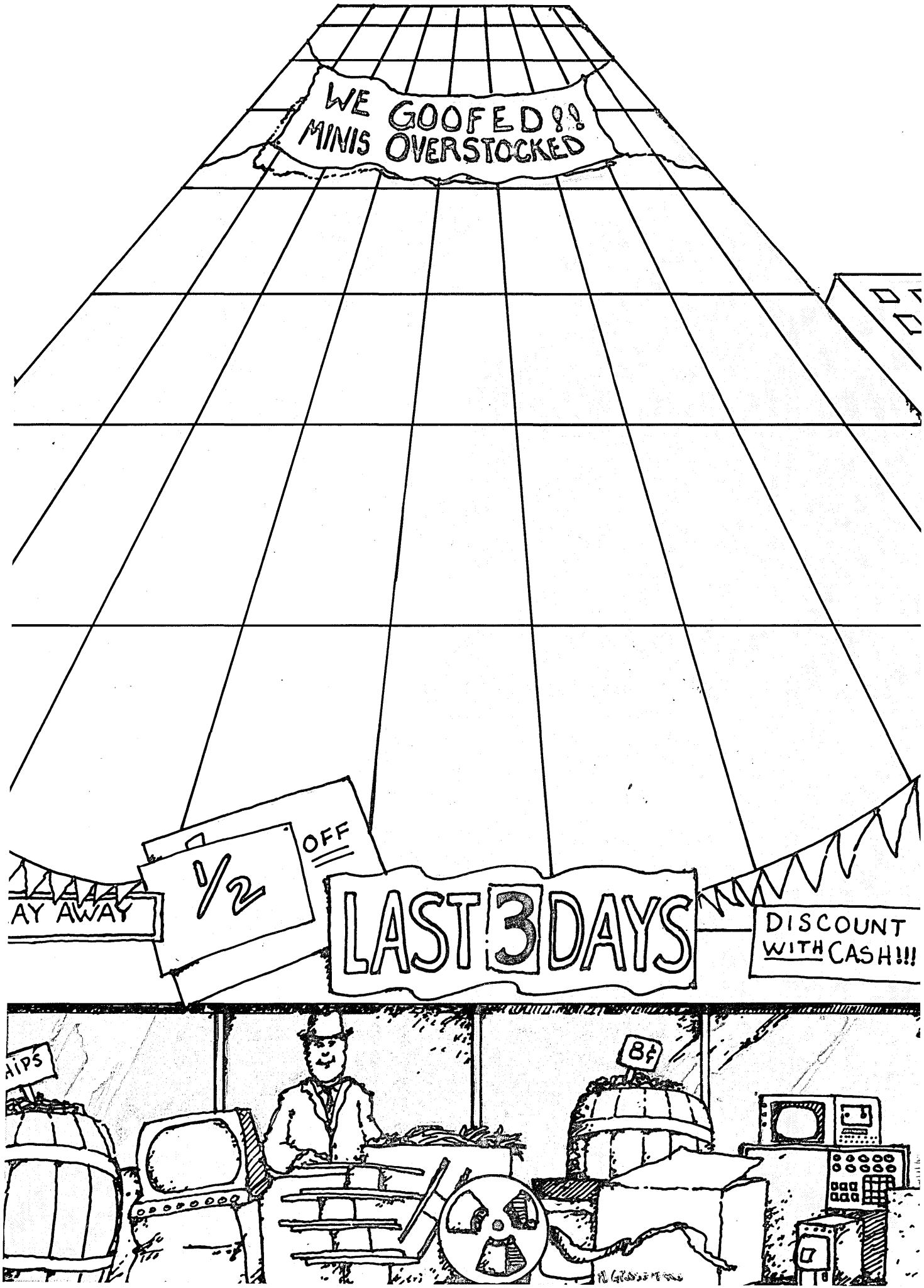
While technological innovation continues as the industry's dominant force, vendors are increasingly being forced to be more responsive to user requirements, as evidenced by the successful entry of plug-compatible manufacturers. Vendor responsiveness to user demand, made necessary by growing competition in the industry, is a radical development in an industry which historically has been powered by technologically based price/performance improvements that continue to accelerate.

The emergence of data base computers, transaction systems, and COBOL or other language-dedicated systems is one form of vendor response to user demand. The advanced state of electronic technology puts the development of these systems within easy reach, but availability owes more to vendor competition than to technological feasibility.

Vendor responsiveness to user demand is also illustrated by special purpose systems, usually industry specific, assembled by systems houses and oems. This makes vendors more dependent on specific user industries, locking them into the recessionary track of their clients.

Since 1974, unusually high interest rates and accelerating inflation have come to be closely linked, as well as associated with recessionary business conditions. And with energy costs out of control, this cyclical slowdown is likely to be the norm for quite some time. The present downturn certainly holds to this general pattern.

ILLUSTRATION BY MYRON GROSSMAN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The heightened uncertainty to which this sort of environment subjects the economy cannot be entirely avoided by the computer industry, especially as its relative size grows and as it becomes more closely intertwined with other business activities. A high interest rate and high inflation recession hits the industry with a twofold wallop. First, user demand for computer systems is likely to slacken, thereby slowing or interrupting industry growth. Second, with weaker vendors also running into financial problems and business difficulties, further dollar cutbacks are likely. This scenario may materialize even if the high demand elasticity for computers continues.

During future recessions users may assess dp-related projects the way they do other investments, on a cost/benefit basis and subject to the constraints of the prevailing business climate. Computer projects will increasingly have to be justified in financially quantifiable terms which become stringent when interest rates are at double-digit levels.

With more and more computers sold into smaller, more recession-prone businesses, and as the use of computer technology spreads into every aspect of business activity, the industry's chance of being impacted by general business downturns multiplies.

Under such conditions, it is not surprising many computer firms have recently been forced to merge or are being acquired by large, diversified companies looking to gain a foothold in a high technology.

Thus, the computer industry is undergoing a structural change that will significantly raise its exposure to business downturns. Ironically, this transformation is partly related to the industry's very success—its ability to grow faster than the rest of the economy. This heightened sensitivity to the business cycle is not necessarily expected to lend to a slower long-run rate of expansion, only to a more ragged growth curve. Vendors will have to time production and marketing campaigns more carefully. Users, too, will have to plan their projects more carefully. And investors will simply have to regard the computer industry as another growth industry, one with both ups and downs. ✻

JACK NUSSBAUM

Mr. Nussbaum is an economist and computer industry analyst. His new firm, The Economics and Technology Group, specializes in market research, technology forecasting, and economic analysis in the computer/communications business. Mr. Nussbaum spent 10 years with the New York Stock Exchange in systems planning, corporate planning, market research, and economic analysis. He was also with IBM for five years.

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PEOPLE

IN THE PICTURE

Armin Miller is like the man who invents a method to make computer systems totally secure but until there's a market for this new technology is forced to sell padlocks door to door.

Miller, in 1962, cofounded Data Disc Inc. with then Stanford Univ. business school professor Daniel Teichroew.

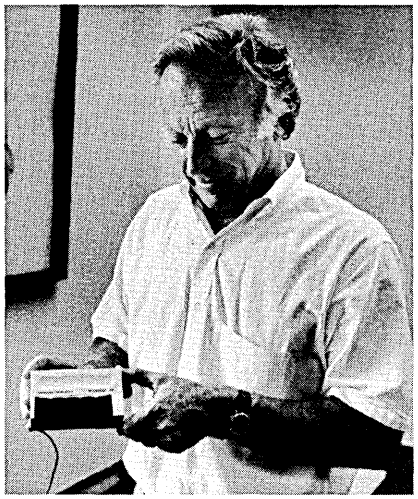
That company designed and manufactured its own heads and disks. It was the first to develop a low-mass, three-point-suspension head. This made it possible for a disk to be started or stopped with the head in contact. The spacing between head and disk was extremely small, so the bit packing density was very high. At a time when others were recording on coated disks at 300 bits per inch, Data Disc, with its thin-film plated medium, was recording at 3,200 bpi.

"We were really too early for everybody," Miller laments.

Now Armin Miller is the head of DataCopy Corp., a struggling, six year old Palo Alto, Calif., company. And this time he's into imaging systems, picture-taking systems that use a new solid-state technology, a significant jump up from the vidicon tube still used in television cameras. The newer technology, using photodiode and CCD arrays, provides an image resolution up to 20 times that of a tv set and yet runs on only 5 volts.

"Within the next 10 years," enthuses Miller, "there will be electronic cameras" that will enable the user to take still pictures in color to show, for example, on the home tv set. For facsimile transmission, one could take a picture of a page with a handheld device, instead of having to insert the document into a fax transmitter. Or, from the convenience of your desk, you could photograph a page and have it reproduced at a copier located down the hall. "That opens up an enormous market that people haven't thought about yet."

The picture taken by such a camera, of course, is nothing more than a string of ones and zeros, not ASCII code. But the uncoded information can be manipulated in a computer. "You sort on the images, instead of on ASCII code," Miller explains. One could store images in a data base, allow inquiries against that data base, and retrieve those images.



ARMIN MILLER—"We were really too early for everybody."

"That's going to be a big field," Miller says. "And that's the field we want to get into. We want to be making the input gizmos."

If the electronic camera is the business DataCopy wants to get into, however, factory source data entry is the business it is in until the market it seeks comes to fruition. And Armin Miller, who is an electronics engineer by education and background (he met Dan Teichroew when both were at the National Cash Register Co.), finds that his job is to spread the word on benefits of real-time source data entry for monitoring and controlling events as they occur in discrete manufacturing processes.

Fortunately for Miller, his is not a missionary job. In the world of manufacturing, it appears, the need for this capability already exists and the benefits to be derived are readily understood. What is lacking, he says, is the knowledge that this capability really exists, that such a reader can be purchased.

"What we're saying is, anything you can read with your eyes, we can read with our machine. Even tiny things that you can't read, we can." They're able to read alphanumerics on products, whether stationary or moving. When the environment is such that a bar code label is inappropriate, Miller's camera will read the data that has been embossed or engraved or stamped on the surface. The camera has applications in quality control as well, where it could set up to show, for example, that something protruding from the top of a product during or after assembly is at the correct height.

For uses outside the industrial environment, Miller is able to demonstrate a handheld reader that can be passed over a line of printed text, serving as a selective copier. In the future, the scanned text might be recorded onto a cassette tape and that tape could be inserted into a copier to produce readable output.

Miller, 59, says one of the drawbacks of microfilm/microfiche is the necessity of duplicating the film and physically delivering copies to, say, branch offices. That's one way of distributing data bases, but there has to be an easier way.

"That's the big problem with microfilm," Miller explains. "They can't send the image so they must send the physical film. One of the things we could do is to take a picture of the frame and transmit that image."

He talks of documents in banks and insurance companies that must bear the signature of someone, noting that sometimes you have to store the image of a page —or a map or drawing. Not everything can be reduced to ASCII, and so people must not think that everything has to be in computer code. "As the price of memory comes down, all that stuff will become more practical," he explains. "You do need a lot of memory."

THE TIME FOR SYNERGY

"The information processing industry is coming together," said Thomas O. Harbison, group vice president of Basic Four Corp., Tustin, Calif.

Harbison's new, present position is a result of the merger of two Management Assistance Inc. (MAI) subsidiaries last August. Merging were Basic Four, a producer of small business systems, and Wordstream, a manufacturer of standalone word processing systems, display terminals, and printers. Harbison had been president of Wordstream.

"Word processing is simply an ap-

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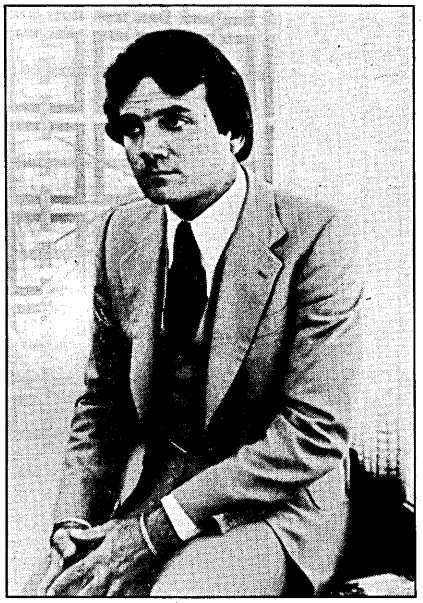


THOMAS O. HARBISON—Once managed a cemetery.

plication of computer hardware; there is nothing unique about it. It's not even as unique as point-of-sale, which does require highly specialized equipment," Harbison said.

"MAI management looked into the future and saw only one industry. We decided that now rather than later was the time to gain from synergy."

There is a great similarity between the needs and requirements of the small business systems marketplace served by Basic Four and the corporate office information marketplace Wordstream has traditionally served, according to Harbison.

He believes a big benefit from the merger will be "a broadened research and development mission." Wordstream's R&D operation, headquartered in Houston, Texas, has become, as part of Basic Four, "an office information system development mission."

Wordstream's manufacturing operation, which has also been making Basic Four's DataWord (a combination word processing and data processing system), has remained intact. Marketing, sales, administrative, and financial operations of Wordstream were moved from New York City to Tustin.

Harbison traveled between New York and Tustin during the last six months of '79 and made the final move west last month. It was the latest of many moves for the Wichita Falls, Texas native, who began his working life managing a cemetery in Houston.

An accounting graduate of the University of Texas, he was working on a master's degree in professional accounting in Houston when he saw a job notice on a school bulletin board from Earthstone's Cemetery. "It was too much to resist."

While running the cemetery, he was sold an IBM typewriter. The salesman also sold him on IBM, and Harbison was interviewed by the Office Products Division. After a friend told him he'd probably find the Data Processing Division more interesting, he tried that, and was hired as a new account rep in Houston in 1966.

Following a change to the Informations Records Division in St. Louis, and a short-lived IBM venture in printing presses, Harbison joined MAI in 1970 as branch manager in Kansas City. "It was just MAI Equipment then. In the same year he moved to help start MAI's service division in Philadelphia and was responsible for naming it Sorbus. "That's for Sorbus tree, a Greek term meaning tree of edible fruit. Our logo was a tree."

In 1972, Harbison left MAI to form his own service company, Probe One. This subsequently was sold to Computer Investors Group (CIG) and Harbison returned to MAI in 1974 to help restructure Genesis One, an MAI sales organization.

"This was really the beginning of Wordstream," he says. "We made two acquisitions." One was Texas Scientific Corp., a terminal manufacturer. The other was Avionics, an aircraft company in New Jersey that made flight precision instruments as well as the products later named Wordstream. "We kept the Wordstream part of Avionics and sold off the rest," says Harbison.

A VISIT TO L.A.

A chance stopover in Los Angeles in 1952 led John Coughlin into a 21-year career in a visit to L.A. civil service data processing.

And this brought him experience which is standing him in good stead today as a principal and vice president of Coughlin, Elkes & Senensieb, Inc., a consulting firm formed in January 1979.

Back in '52, Coughlin, just released from the Army in which he had served in a machine records unit, was on his way to San Francisco to take a job with Bank of America. Visiting a friend in Los Angeles en route, he learned of a data processing opening with the Los Angeles County Registrar of Voters and applied for it. He was hired on a temporary basis.

Coughlin stayed with the Registrar of Voters until 1956, and then worked as assistant chief of data processing, Los Angeles County Assessor's office; chief of data processing, City of Long Beach, Calif.; manager, information systems engineering division, Department of Water & Power, Los Angeles. His last civil service post, which he held until 1973, was deputy director of data processing for Los Angeles County.

A native of Jamaica, West Indies, where his father was in the foreign service, Coughlin came to the U.S. to attend Brown University, where he planned to study medicine. However, political unrest in the West Indies and the desire to assist his family in emigrating resulted in Coughlin's taking a job instead of attending Brown. As a "chaser," (an expeditor of coil winders) for a manufacturing firm in Providence, R.I., he was called upon to help design a card system for production control, and was later transferred to the tab department.

In 1956, Couglan participated in Los Angeles County's first civil service exam for programmers. "It was given at the Hollywood High School auditorium," he recalled. "Fifteen hundred people took it and they selected 22 to go into training. I was number 15." He was trained on the IBM 705 and the Univac I and II.

He was then assigned to the assessor's office, which put out a request for proposals and selected a Datamatic 1000. "it was produced by a Raytheon spin-off group, and used three-inch-wide tape and a fixed recording block. It was a maintenance monster, all pneumatically controlled."

In 1964, he went to the City of Long Beach. "I arrived as they were attempting to convert a card processing system to a tape processing system. In the middle they lost control. It was my problem to get the system back under control. We ran the whole file every day and in two weeks we found most of the errors. This gained me a measure of local fame."

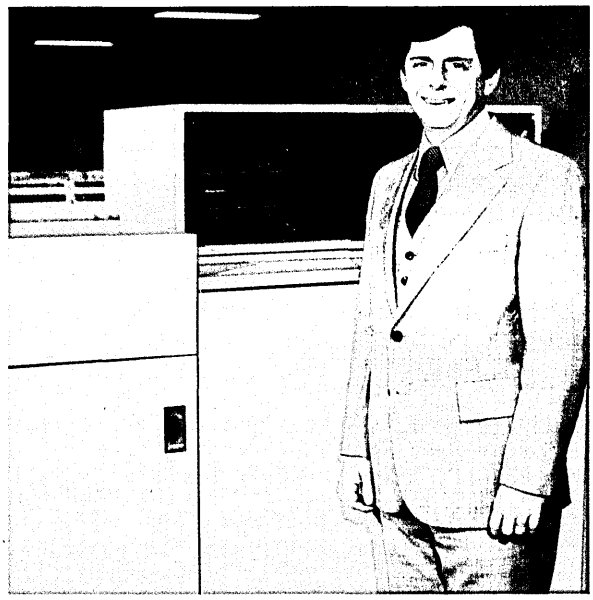
It also caught the attention of the Los Angeles Department of Water & Power, which was developing an on-line system and asked Coughlin to take charge of it. During his tenure with Long Beach and the Department of Water & Power, he continued to maintain contact with the L. A. County dp groups and to lobby for a consolidated county dp department.

In 1968, the consolidated department was authorized, and in late '68, Coughlin was back with the county.

When he finally left the county job, Coughlin joined Gottfried Consultants, Los Angeles, where he met Louis Senensieb, another principal in his current firm. He left Gottfried in August 1973, but continued to work for the firm as a subcontractor.

In 1974 he received a contract from the City and County of San Francisco to develop a long-range plan for San Francisco General Hospital. After this task, which took two years, Coughlin began working with Senensieb and Howard Elkes. Elkes and Senenslieb had worked at TRW. Together, the principals of Coughlin, Elkes and Senensieb claim experience in health care, distribution, savings and loan, and state and local government. ✲

"Our On-Line Computer Output Microfilm Recorder is extremely fast, inexpensive to use and simple to operate."



DatagraphiX recently spoke with Mr. John E. Dye, Senior Director of Information Services, Blue Cross and Blue Shield of North Carolina, about his company's decision to install an on-line COM system.

DatagraphiX: What prompted you to consider an on-line microfilm recorder?
Dye: There were basically two major reasons. Faster turnaround and operational convenience. With on-line COM we could eliminate all of the tape handling. It doesn't require extra people and there is no throughput delay. We can get microfiche duplicates to the users much more quickly than paper reports.
DatagraphiX: Previously, you used a service bureau. Why did you decide to purchase your own unit?
Dye: We did a cost justification study and found that the money we were spending on a service bureau was just about what we would have to spend for our own COM recorder. Initially, our present needs would utilize only 20% of the machine's capabilities, so we could grow without additional equipment costs. Economically, it made sense.
DatagraphiX: Why did you choose a DatagraphiX on-line COM?
Dye: I've used DatagraphiX equipment for about 15 years. I have found DatagraphiX to be a good, solid company that supports their equipment and provides reliable service.
DatagraphiX: Did you encounter any difficulties in the transition to on-line?
Dye: We were impressed with how easy it was. Our technical librarian was able to perform most of the conversions. And DatagraphiX supplied very thorough training in hardware operation and the use of its on-line software.
DatagraphiX: So you are satisfied with the reliability of the AutoCOM II®?
Dye: Very much so. Uptime is better than 95%.
DatagraphiX: What is your overall reaction to the AutoCOM II?
Dye: It meets our most demanding data processing requirements. It saves time, material, space, and money, just to mention a few advantages. Also, we believe microfiche has great advantages over paper in cost and availability. If we experience another paper shortage, we have the secure feeling that we have a backup. Like Blue Cross and Blue Shield protection, it's reassuring to know we're covered against emergencies.

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CIRCLE 112 ON READER CARD

HARDWARE

OFF-LINE

IBM researchers have fabricated and tested the smallest experimental electronic circuit elements ever reported. Called nanobridges, the devices feature thin-film stripes of superconducting niobium metal as little as 40 nm wide, 30 nm thick, and 120 nm long. The experiments represent an enlightenment in the application of recent advances in electron-beam lithography. Scientists may now explore superconductivity in electronic circuit elements even in a size range almost 1/100 of that found in existing microcircuitry. The work is an outgrowth of IBM's recently achieved ability to produce fine metal lines only 8 nm in width.

Motorola, Inc. and Rockwell International Corp. have announced a technology exchange and alternate source agreements covering Motorola's MC68000 microprocessor and Rockwell's 256k-bit bubble domain memory products. The agreement provides that Rockwell's Electronic Devices Division will receive technology to produce and independently market the Motorola MC68000-bit advanced microprocessor and selected family devices while Motorola's Semiconductor Group acquires the technology to produce and independently market Rockwell's 256k-bit bubble memory devices, one megabit linear memory modules and control modules. Motorola will be used as a source for certain support circuits designed for production applications of the bubble memory devices.

Trans Datacorp has announced development of a new hybrid flying head which permits removable Winchester disks. The new head inserts a small core of higher performance hot-pressed manganese zinc ferrite in a hard ceramic slider. Recessing the core into the slider permits the head to be loaded and unloaded, enabling drive designers to provide high density removable-pack and removable-cartridge drives.

EIGHT-INCH DISK

First it was floppies, then a small-capacity winchester disk, and now this vendor has jumped into the eight-inch Winchester disk market. Five and 10MB models are offered, featuring the same physical dimensions and mounting geometry as the vendor's widely used eight-inch floppy drives. Environmental, DC voltage requirements, and interface command structure match those of the vendor's double-density SA850/851 floppy drives.

The new Winchesters are offered in two models: the SA1002, with an unformatted capacity of 5.33MB, and the SA1004, with an unformatted capacity of 10.67MB. Formatted capacities are 4.2MB and 8.4MB, respectively. Each has a transfer rate of 4.34M bps; average access time is 70msec, and average latency is 9.6msec. Optional data separators and controllers are available. In lots of 1 to 24, the SA1002 has an oem price of $1,600, and the SA1004 is $1,980. In lots of 500 to 999, these prices drop to $995 and $1,250, respectively. SHUGART ASSOCIATES, Sunnyvale, Calif.

CIRCLE 312 ON READER CARD

PAPER TAPE READER

The 2001-3 punched tape reader is designed for applications where spooling isn't required. The 2001-3 reads at 200cps bidirectionally in step or slew mode; rewind speed is 400cps. A wide-opening cover on the read station simplifies tape loading. The reader's power supply is self-contained; standard interfacing is TTL/DTL with either negative or positive logic levels selected by a switch. An RS232 interface is optional. The 2001-3 sells for $595. EECO INC., Santa Ana, Calif.

CIRCLE 305 ON READER CARD

MAG TAPE SYSTEM

Intended for use with mini and microcomputers, this vendor's SCDR-1050 half-inch mag tape system provides IBM/ANSI compatibility. The dual density drive can operate at 1600bpi phase encoded or 800bpi NRZI. The transport operates at 45ips. ASCII control characters can select record lengths of up to 4KB. Connection to the computer is via an RS232 interface; data arriving at up to 9600bps are buffered at the interface board for subsequent DMA transfer up to the formatter/controller. A complete subsystem sells for $8,475; slave daisychain drives go for $4,850 each. Quantity discounts are available. TANDBERG DATA, INC., San Diego, Calif.

CIRCLE 311 ON READER CARD

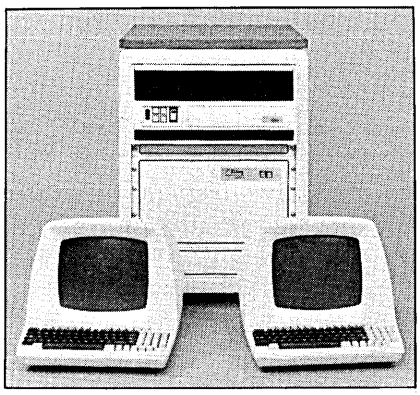
DISK SYSTEM

For use with Hewlett-Packard minis (2100, 21MX, and the 1000 series) and DEC's LSI-11 and PDP-11, this vendor's model 604 disk system provides up to 116Mb (unformatted) capacities of 14.5MB and 29MB; optionally, the drives can have an additional 144KB of head-per-track storage. Up to four 14.5MB and 29MB drives can be mixed on a controller. The vendor has a disk operating system for HP minis, as well as a disk handler for RTE users; handlers also are available for DEC RT-11 and RSX users. Prices start at $6,950 for a 14.5MB system. DICOM INDUSTRIES, INC., Sunnyvale, Calif.

CIRCLE 314 ON READER CARD

MICROCOMPUTERS

Four microcomputer systems, two of the standalone variety and two for use as building blocks, and a multiuser COBOL package herald this microprocessor-maker's expansion into the commercial, small business market. The models MCZ-1/20A and MCZ-1/25A are microcomputer subsystems intend-



ed for use as modular building blocks in systems for business and industrial applications. The 1/20A is a desktop unit, while the 1/25A is a rack-mountable unit. The two general-purpose, ready-to-run systems are the desktop MCZ-1/50 and the rack-mounted MCZ-1/70. All four use the vendor's Z80 microprocessor with 64KB of memory, and each sports interrupt-driven console capability and a floppy disk con-

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troller. All can support hard disks.

The MCZ-1/50 is packaged with an integral crt display and dual floppies; the MCZ-1/70 comes with crt and a choice of floppy or rigid disks. The building block 1/20A comes with dual floppies, while the 1/25A comes with a choice of dual floppies or a 10MB cartridge disk. Each of the four microcomputers can be expanded to four disks, either floppy or rigid. The ready-to-use 1/50 and 1/70 come with operating system software, utilities, and macro assembler. All four can optionally use higher level languages including COBOL, BASIC, FORTRAN, PASCAL, and the vendor's PLZ. Pricing starts at $6,990 for the 1/20A, $16,925 for the 1/25A, $8,460 for the 1/50, and $18,240 for the 1/70. Quantity discounts are offered. A multiterminal COBOL is offered for all four; it is priced at $950, and requires an optional serial interface board priced at $595. ZILOG, INC., Cupertino, Calif.

FOR DATA CIRCLE 332 ON READER CARD

MULTIPROCESSOR

Symmetric Multiprocessing (SMP) is the latest enhancement this vendor has made to its large-scale DECsystem-1090 mainframes. In the past, the vendor supported multiprocessing in a master/slave arrangement; SMP is said to yield throughput improvement of up to 50% over master/slave dual processors. SMP supports up to 175 active jobs of 512 transaction processing or dedicated applications terminals. Under SMP architecture, each processor is operationally equivalent; each performs computation and I/O processing. Peripherals are shared between processors. The reentrant operating system allows either processor to handle user requests for service. SMP is intended primarily for use with the DECsystem-1090 dual processor using the KL10 processor. Single processor systems can be upgraded.

A minimum DECsystem-1090, with two processors, 1MB of main memory, one disk, 16 terminal lines, and the SMP operating system, sells for $1,250,000. The system also can be upgraded from 1090 master/slave configurations for prices starting at $10,000. Existing 1090 and 1080 uniprocessors can be upgraded to SMP for $400,000 and $442,000, respectively (1080 upgrades include converting the 1080 to a 1090). DIGITAL EQUIPMENT CORP., Maynard, Mass.

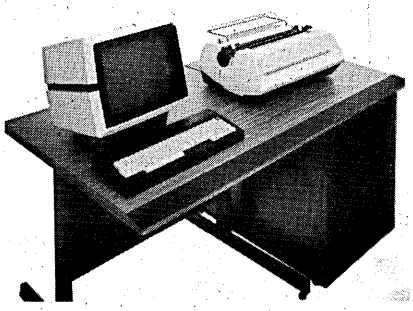
FOR DATA CIRCLE 331 ON READER CARD

SHORT-HAUL MODEM

Users of asynchronous dumb terminals can use this vendor's model 410 asynchronous line driver for communications over private lines at speeds to 19.2Kbps. The unit is compatible with Bell 43401 equipment. Its transmission range is three miles at 9,600bps or 15 miles at 1,200bps. The 410 sells for $200. MICOM SYSTEMS, INC., Chatsworth, Calif.

FOR DATA CIRCLE 334 ON READER CARD

HARDWARE SPOTLIGHT



COMMUNICATIONS TERMINAL

"Communications terminal" may be a bit of a misnomer for the CLI-441; multiprotocol, multidevice communications center seems a bit closer. The unit can send and receive over Telex, TWX, and DDD networks, as well as providing conversions between them. Additionally, text messages can be converted for transmission to facsimile machines from a number of vendors (the OCR problem of converting incoming fax messages to computer character sets is one of the few conversions not available). The 441 can, however, convert between the facsimile protocols used by different machines; additionally, fax messages can be compressed (e.g., a six-minute transmission can be shortened to reduce phone line charges, provided the receiving end has the hardware to reexpand the message).

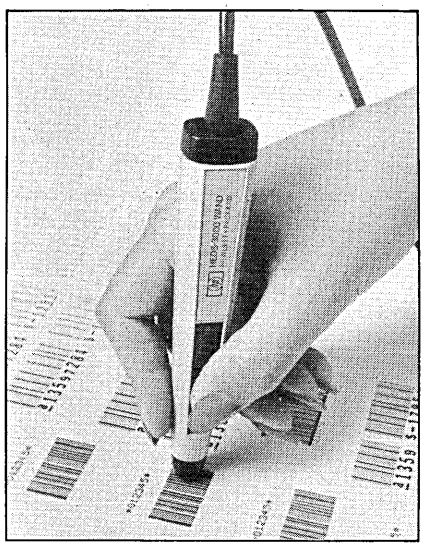
The unit has four communications channels that can be configured to interface to the networks the customer uses. The CLI-441 comes with 500KB of diskette storage (expandable to 20MB of disk) and crt; an extra crt can be added, and paper tape is offered as an option. A basic CLI-441, with crt, two communications interfaces (selected from among TWX, Telex, and DDD), 600KB of diskette storage, and a 30cps printer, sells for $11,350. COMPRESSION LABS, INC., Cupertino, Calif.

FOR DATA CIRCLE 330 ON READER CARD

BAR CODE READER

This vendor has moved into the oem market place with an optical bar code scanner that produces microprocessor-recognizable digital output. Dubbed the HEDS-3000, the unit can read all common bar code formats printed with a minimum bar width of 0.3mm (0.012 in.). The wand reader incorporates signal conditioning circuitry that provides TTL and CMOS-compatible logic level outputs. To conserve power, this circuitry is controlled by a push-to-read switch (reportedly incorporated at the suggestion of the vendor's Corvallis Division, which will use the HEDS-3000 as the basis for its bar code reader for its Model 41C top-of-the-line pocket calculator). The oem product sells for $99.50 in lots of one to 99; the Corvallis Division's version, interfaced to the 41C, is expected in the first half of this year at an as yet undetermined price. HEWLETT-PACKARD CO., Palo Alto, Calif.

FOR DATA CIRCLE 333 ON READER CARD



DISK

For use with its Eclipse models S/250, C/350, and M/600, this vendor's model 6122 disk storage subsystem uses removable media with a 277MB per drive capacity. The disks connect to the processors via the Burst Multiplexor Channel. The disk subsystem is supported by two of the vendor's operating systems: AOS and RDOS.

Model 6122 includes a two-board controller, power supply, mounting hardware and cables, free-standing drive and a disk pack; up to three additional 6122-A drives can be handled by one controller. The 6122 sells for $38,500; the 6122-A add-on drives sell for $33,500 apiece. A dual port option is an additional $8,000. DATA GENERAL CORP., Westboro, Mass.

FOR DATA CIRCLE 335 ON READER CARD

SMALL SYSTEM

This small business computer and word processing system integrator's latest offering is the model 9000. Intended for use in business offices, the 9000 consists of a microNova 602 processor with 64KB of memory, 10MB of disk, terminal, and dot-matrix printer. BASIC, assembler, manuals, training, and startup supplies are included in the 9000's $19,995 price. Business applications, data base management and report writing packages are offered for prices

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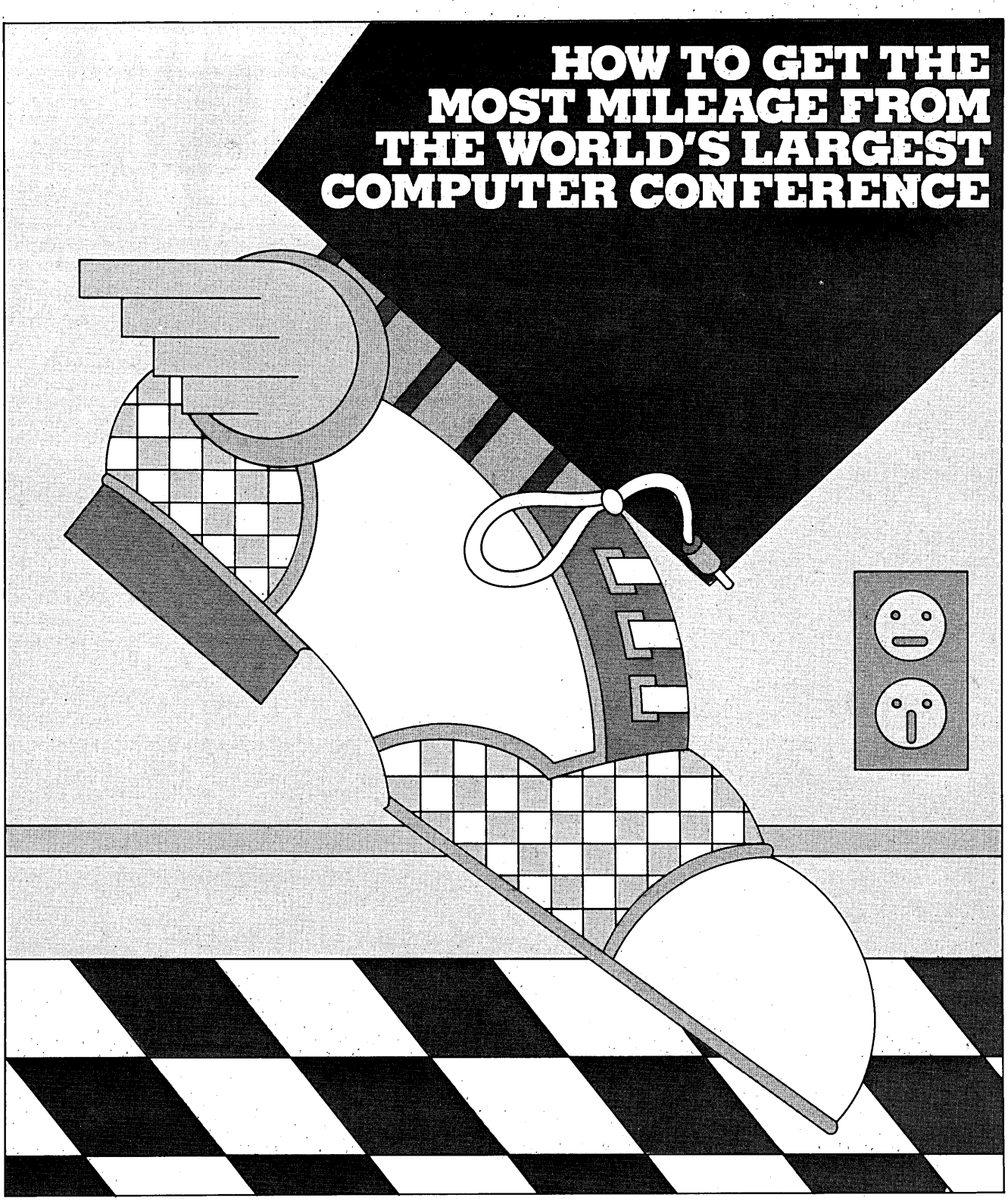

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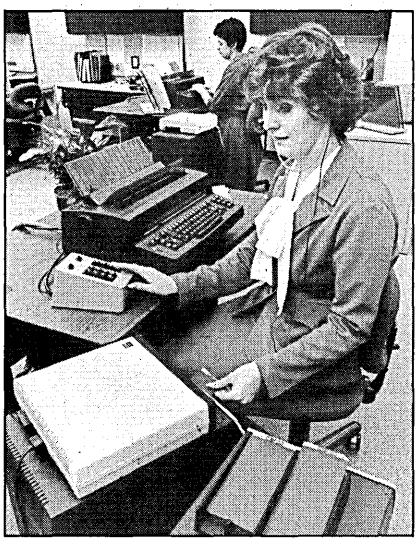
ranging from $1,500 to $2,500. COMPAL, INC., Woodland Hills, Calif.
FOR DATA CIRCLE 336 ON READER CARD

TALKING TYPEWRITER

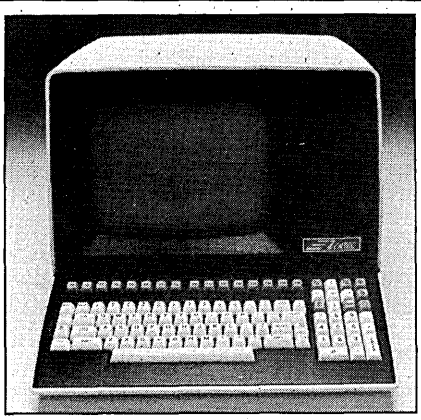
A audio feedback unit allows blind typists to prepare and proof documents on four IBM typewriters: the Mag Card II, the Mag Card/A, and the IBM Memory or Memory 100. Known as the Audio Typing Unit, the device consists of an audio keypad, an audio console, and an optional headset; the unit



attaches to any of the four aforementioned IBM typewriters. With the Audio Typing Unit, a blind operator can play back material typed or stored on magnetic media. Using voice synthesis, the unit produces sounds corresponding to the keys typed; it can read back characters, words, sentences, and special function keys, such as tab or index. The Audio Typing Unit rents for $170 per month, or it can be leased for $150 per month on a two-year term. Purchase price is $5,300. Deliveries begin this quarter in the initial market areas of New York, San Francisco, Chicago, Washington, and Austin. INTERNATIONAL BUSINESS MACHINES CORP., Office Products Div., Franklin Lakes, N.J.
FOR DATA CIRCLE 337 ON READER CARD

CRT TERMINAL

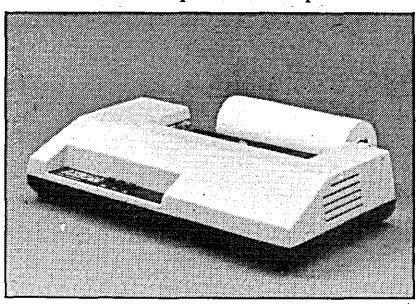
After concentrating on the oem market, this vendor has developed its Zephyr smart terminal, which will be sold both as an oem product and through a newly formed distributor network. Compatible with Lear Siegler's well-known ADM-31 and other terminals, the microprocessor-based Zephyr has full cursor addressability, editing, and protected forms mode. Its 12-inch screen displays 24 lines of 80 characters. The ASCII terminal can store two 1,920-character pages of data. Various attributes, including underscore, blinking, and reverse video are available for use. The keyboard has a separate numeric keypad, cursor con-



trol keys, 12 special purpose function keys, and 16 programmable function keys. Both RS232 and 20mA current loop interfaces are standard. Communications can be in full- or half-duplex at speeds from 110bps to 19.2Kbps. Production began last month, with volume deliveries expected this quarter. One Zephyr sells for $1,220; 100 unit price is $976. ZEPHYR CORP., Santa Clara, Calif.
FOR DATA CIRCLE 339 ON READER CARD

PRINTER

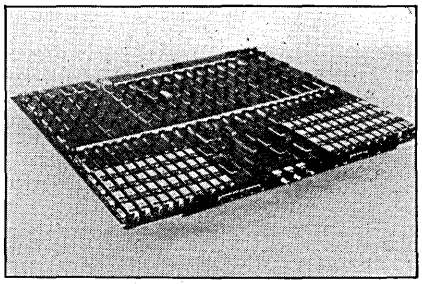
Intended for use in both offices and homes, the IMP Series of low-profile printers is available in friction feed and tractor feed versions. The impact printers can print 80, 96, or 132 character lines, with a throughput of one line per minute. The friction-feed IMP-1 can make up to three copies on 8½



inch wide paper; the IMP-2 can operate in friction-feed mode, or its tractors can be adjusted for forms ranging in width from 2½ inches to 9½ inches. Both use a 7 × 7 dot matrix to form 96 printing ASCII characters. The IMP-2 also handles graphics under software control. Each has a 512 character buffer, expandable to 2KB. Standard interfaces include RS232C, 20mA current loop, and Centronics parallel. Standard input rates go to 1,200bps, with 9,600bps operation optional. The IMP-1 sells for $695, and the IMP-2 sells for $795. Discounts are offered to oems. AXIOM CORP., Glendale, Calif.
FOR DATA CIRCLE 340 ON READER CARD

ECLIPSE ADD-IN MEMORY

The 5150 add-in memory board for Data General Eclipse computers stores 128KB and features on-board cache, error checking circuitry capable of correcting single-bit



errors, and error logging and error display. DIP switches are provided for address selection. In singles, the 5150 sells for $4,500. INTEL CORP., Santa Clara , Calif.
FOR DATA CIRCLE 341 ON READER CARD

MINIFLOPPY

In an apparent change of direction, this leading floppy maker has announced a family of four new drives with fewer tracks per inch. But this isn't a step backwards: the new units are 96-track-per-inch models, exactly double that of a standard single-track-density, 48-track-per-inch drive. According to a company spokesman, this will allow the new drives to recover data from the older, lower density diskettes. The four models introduced are the 1015-V, with an unformatted capacity of 436KB and FM/MFM recording (single quantity price $450); the 1016, which uses GCR and has an unformatted capacity of 532KB ($490, quantity one); the 1015-VI, dual-headed MFM drive with 872KB capacity ($530 for one); and the 1016-VI, also a dual-headed drive, which uses GCR encoding to achieve slightly more than 1MB ($570, quantity one). MICROPOLIS CORP., Chatsworth, Calif.
FOR DATA CIRCLE 338 ON READER CARD

MODEM

This vendor's 3002 modem runs over unconditioned and dedicated 3002 telephone lines (and other transmission media, including loaded metalic circuits and microwave links) at 4,800bps. The modem can operate in full- or half-duplex, and it can be used in point-to-point and multipoint operation. If the communications link degrades, the modem can fall back to 3,600bps operation. A dual-channel option allows the modem to support two independent channels, each at 2,400bps or 1,800bps. In single quantities, the 3002 sells for $1,200. AVANTI COMMUNICATIONS CORP., Newport, R.I.
FOR DATA CIRCLE 342 ON READER CARD

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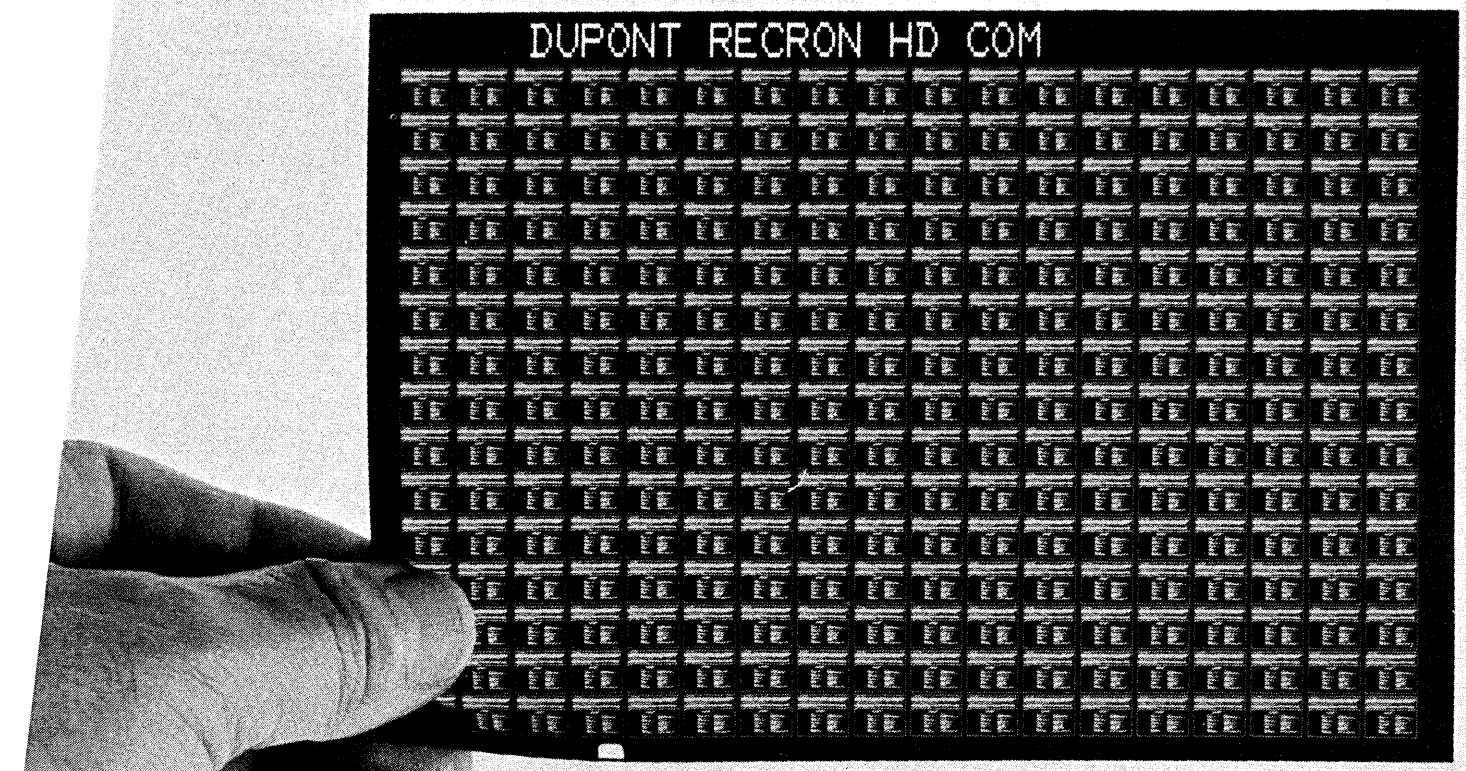

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SOFTWARE AND SERVICES

UPDATES

In New Jersey, the price of liquor is regulated by the state. Consequently, success in the market is dependent on the speed of service. The Baxter Warehouse Corp. of New Jersey has installed a Burroughs B 1815 in its New Jersey warehouse, together with two B 1700 systems and an audio response order entry system located in a second warehouse near Philadelphia. Orders are entered over special toll-free lines to two computer-linked audio response units. Baxter is able to process over 3,500 orders daily, putting it one round ahead of the competition.

IBM, with a little prodding, made a major policy change not long ago. The change will allow a customer using System IPO/E to replace any IBM program with a fuctionally equivalent non-IBM program. Prior to this a System IPO/E customer was required to order a minimum of eight IBM programs with no substitution possible. Applied Data Research, Inc., one of the prodders, requested the change because of extensions made to VOLLIE, its on-line program development system. These extensions allow VOLLIE to support the interactive installation of a System IPO/E tape and totally replace the previously required IBM program, VSE/ICCF, for this function. When using VOLLIE with System IPO/E, no changes are required to any IBM-supplied program.

Sorbus, a leading supplier of maintenance to the dp industry, has introduced two new service programs to speed computer service time. Mobile service vans already operating in California, will bring parts to technicians on the job. Twelve repair depots will be established in key areas nationwide to cut Sorbus service time on digital printed circuit boards and other computer components.

TIMESHARING

A pioneering timesharing firm has come up with what seems to be a new twist to marketing services: its Associates Plan allows customers to buy services at discounted rates and either resell services commercially at higher rates, or use the sevices in-house when there is sufficient demand to make it economically attractive. An associate (large user, small entrepreneur, or anyone between) pays a $10,000 Associates Fee to join the plan. This fee entitles the associate to $5,000 (retail price schedule) worth of computer services, and the right to buy additional services at 50% of retail (with no minimum). The associate also gets a $5,000 credit toward licensing the vendor's software for use on the associate's hardware; the vendor sees associates migrating to their own hardware as they grow (if an associate should desire, the vendor will contract for facilities management). Training, marketing support, and an Associates Group also are provided. Users can access the vendor's Honeywell 66/17 mainframe via Telenet. Associates get access to all of the vendor's software, including language processors for BASIC, COBOL, FORTRAN, and PL/1, data base management and inquiry packages, and communications software, including Datalink for interconnection to foreign mainframes. DTSS INC., Hanover, N.H.

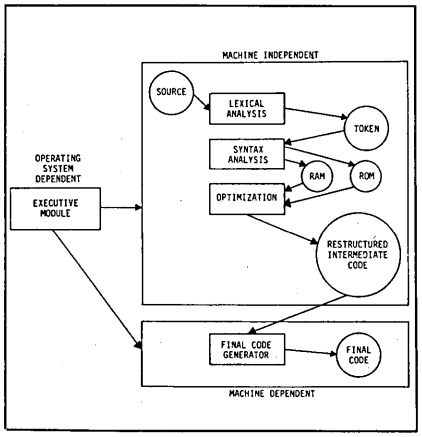
FOR DATA CIRCLE 321 ON READER CARD

5110 APPLICATIONS

About a year or so ago, Adam Osborne (a familiar name to microcomputerists) decided the best way to protect his software from bootleggers was to publish the source code and documentation in copyrighted books. He prefaced each book with the message that anyone was free to use and/or modify his programs and sell them, with the proviso that each user would need to buy the corresponding Osborne book of documentation. This company has adopted just that approach, adapting the programs for use on IBM's 5110 desktop computer. General Ledger, Accounts Receivable, and Accounts Payable are now available, with Payroll due next month. Each system sells for $250. The Osborne books sell for $20 apiece. COMPUTER SUPPORT SYSTEMS, INC., North Mankato, Minn.

FOR DATA CIRCLE 306 ON READER CARD

SOFTWARE SPOTLIGHT



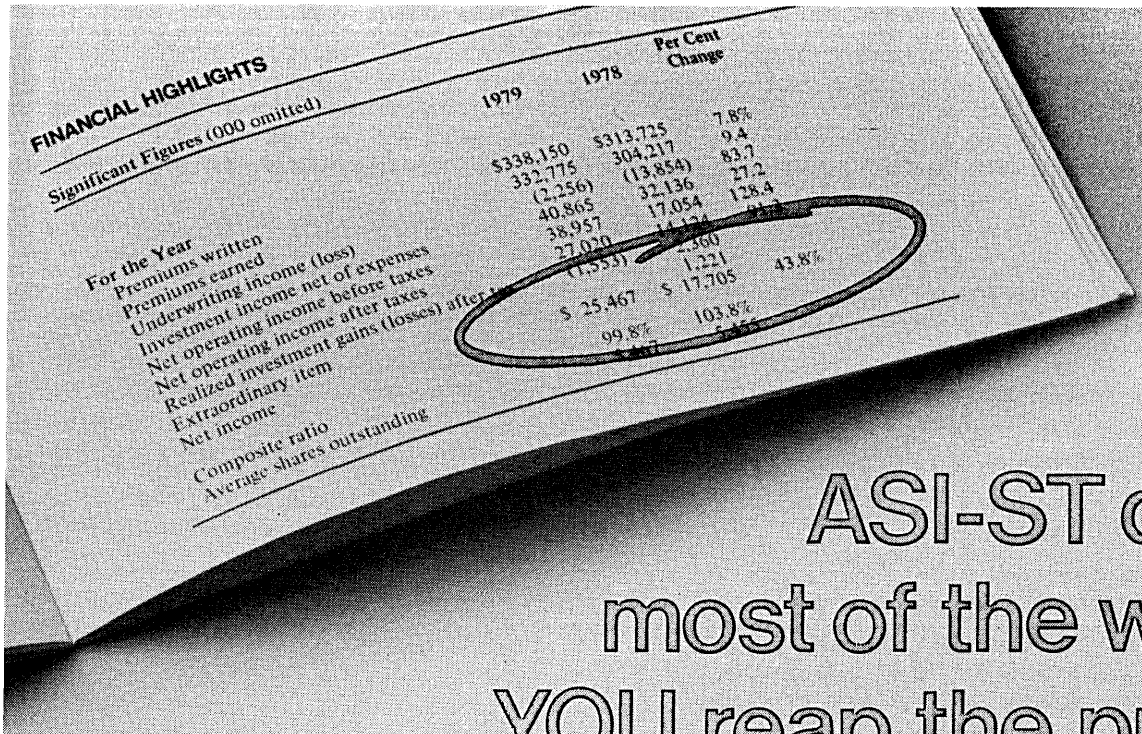
MICRO LANGUAGE

PLMX is intended to be a universal high-level programming language for all 8 bit and 16 bit microcomputers currently available or yet to be developed. The PLMX source language comprises Intel's PL/M. This means the large body of existing programs written in PL/M for 8080s or 8086s can be recompiled for use on other micros. Additionally, programmers familiar with PL/M are said to be able to pick up PLMX after an hour or so of study.

Most of the PLMX implementation is machine independent. Only an operating system dependent executive module and the final code generator differ in the various implementations of PLMX. Lexical analysis, syntax analysis, and optimization are machine independent. Source code compiles to a restructured intermediate code (again, machine independent). The final code generator takes the machine independent intermediate code and generates object code for the desired microprocessor.

Executive modules currently are offered for TEKDOS (used on the Tektronix 8002 microprocessor development system) and CP/M. Code generators for the 8080, 8085, Z80, and 6800 are ready now, with versions for the TI 9900 and RCA 1802 due early this year. Also scheduled for availability this year are code generators for the Z8000, 8086, and 68000. PLMX carries a $1,000 price tag for each combination of operating environment and target machine; discounts are offered for multiple installations of each version. SYSTEMS CONSULTANTS, INC., San Diego, Calif.

FOR DATA CIRCLE 300 ON READER CARD



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- CORNING GLASS WORKS now executes an average of more than 16,000 ASI-ST runs monthly against TOTAL data bases and standard files.
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PROGRAM GENERATOR

Developed to fulfill an in-house need and to fill an apparent gap in commercially available software for DEC Datasystems, the Requestor-oriented Information Management System/Mechanized Program Generator (RIMS/MPG) automatically generates data entry, data management, and data reporting programs. The system works with DIBOL on Datasystems running CTS-300 or CTS-500, and it also works with BASIC-Plus and BASIC-Plus 2 on RSTS/E systems. The menu-driven system is said to be usable by even nonprogrammers after about an hour of training.

RIMS/MPG comprises four modules. A Dictionary module allows users to define data elements for a given application. A module called SCREENS generates procedures for entering, changing, inquiring, and deleting records from master files. The Merge module writes the code to extract data from one or more dictionaries. Merge also performs arithmetic and logical operations on the extracted data, placing the results into either new or existing data dictionaries. The last module, Reports, generates programs to print formatted reports.

End users can purchase the package for $7,500; oems also can get the package for $7,500 (until March 1), with sublicenses for customers' systems at $100 per system. A demonstration package for RIMS/MPG is priced at $100, which can be applied to the final purchase of the package. INFORMATION AND SYSTEMS RESEARCH, INC., Monroeville, Penn.

FOR DATA CIRCLE 322 ON READER CARD

COMMUNICATIONS MONITOR

Release 2.2 of this vendor's Task/Master communications monitor for IBM mainframes includes new support facilities, additional capabilities, and new packaging options. A Remote Diagnostic Facility allows on-line transmission of diagnostic data directly to the vendor's Express Service Center (previous maintenance efforts often required on-site help or exchanging core dumps through the mails). The vendor says Express service will allow resolution of most problems within a day.

For use during application development, a System Simulation Package can be used to create streams of simulated message traffic, subject to user-supplied parameters. A generalized application simulator simulates message processing in a multitasking multithreading environment. Task/Master now is offered in four models, a Standard and an Extended version for OS and for DOS. Purchase prices range from $42,000 for Standard OS to $78,000 for Extended OS. Lease plans, educational discounts, and multisite discounts are offered. TURNKEY SYSTEMS, INC., Norwalk, Conn.

FOR DATA CIRCLE 325 ON READER CARD

FORTRAN

An implementation of the ANSI 1978 standard for FORTRAN, dubbed DX10 FORTRAN-78, complements this vendor's FORTRAN compiler offerings for its DS990 family, models 4 through 30, and other systems based on the 990/10 or 990/12 minicomputer. The vendor will continue to offer its FORTRAN (ANSI-1966 version) to protect users' existing software, while adding DX10 FORTRAN-78 for those wishing to develop new scientific, industrial, engineering, and business applications. This implementation of FORTRAN-78 includes Instrument Society of America-recommended process control extensions, a math/stat library, and interfaces to a generalized forms language, sort/merge, and data base management. A one-year software license, including software subscription service, goes for $3,000. It is also available on lease for $90 per month. Deliveries began last month. TEXAS INSTRUMENTS INC., Digital Systems Div., Houston, Texas.

FOR DATA CIRCLE 304 ON READER CARD

S/3, S/32, S/34 WORD PROCESSING

Written in RPG-II for the System/3, System/32, and System/34, this vendor's word processing package allows the user to maintain a user name and address file, a customer file, and a letter file (these files can be created and maintained by either the source entry utility or the file maintenance programs supplied with the package). The letter file can contain letters or any other textual material, such as catalogs or manuals. Upon user request, the system can print mailing labels, continuous envelopes, customer name and addresses on preprinted forms, or complete letters. The system also supports addressee selection based on a variety of criteria, including customer type, zip code, sales history, etc. The package sells for $2,500, including source code, documentation, installation, and training. OAK SOFTWARE, Oak Park, Ill.

FOR DATA CIRCLE 305 ON READER CARD

SOFTWARE MONITOR

The Comprehensive Management Facility for VS1 (CMF/VS1) is a software monitor for performance evaluation, system tuning, and capacity planning. The latest addition to the vendor's CMF product line, CMF/VS1 includes the Data Set Optimizer (DSO) system as a standard component. CMF/VS1 provides a number of services, including data collection, timing, and data output to a variety of submonitors. These submonitors capture data on system behavior, including paging activity, cpu utilization, channel utilization, control unit and device activity, and real and virtual storage utilization. Reports can be prepared in columnar formats or using graphics. CMF/VDS1 runs on 370s and 303Xs (as well as compatible mainframes) running the VS1 operating system, release 6.0 and above. CMF/VS1 is offered for an introductory price of $8,500 (good through March 31). BOOLE & BABBAGE, INC., Sunnyvale, Calif.

FOR DATA CIRCLE 302 ON READER CARD

PROGRAMMING AID

For DEC users running RSTS/E or CTS-500, XPACK is intended to improve new application development and documentation, reduce maintenance, nearly eliminate the need for redesigns, and aid in conversions. The package consists of a number of utilities and a users' guide that sets forth standards and procedures for applications development under RSTS/E. XPACK includes XPRESS, a preprocessor that allows mnemonic labels, macros, constants, and subroutine names. XREF provides cross-reference listings for programs written in BASIC+, BASIC+2, and extended BASICs. A software building and maintenance utility, XBLD, also is included. The entire XPACK package is available on perpetual licenses of $3,000; its components are available separately. MICRO-BASE ASSOCIATES, INC., Columbus, Ohio.

FOR DATA CIRCLE 301 ON READER CARD

AUDIT TOOL

For both financial and edp auditors, Panaudit allows evaluation of all aspects of internal control and provides methods for obtaining evidential material while maintaining the independence of the audit. Auditors can write their own procedures in an English-like language and they can take advantage of roughly 50 preprogrammed procedures.

Panaudit allows an unlimited number of input files, be they sequential, indexed sequential, VSAM, or data base (i.e., TOTAL, IDMS, IMS) files. Record selection capabilities include matching and merging any number of files, as well as searching files and selecting data based on input or calculations.

Generalized audit routines perform such functions as checking for invalid codes in files, identifying duplicate records, date and time calculations, random number generation, summarization, table look-ups, and aging analysis.

The system also includes a data dictionary for storing file definitions of commonly accessed files. A system ranking routine applies uniform standards to all systems under audit, ranking them in relative priority. Routines also are provided to analyze SMF and DOS/VS job accounting data. For DOS environments, Panaudit licenses for $23,000; for OS environments the license goes for $29,000; and for "entry-level systems" Panaudit can be licensed for $17,400. PANSOPHIC SYSTEMS INC., Oak Brook, Ill. *

FOR DATA CIRCLE 323 ON READER CARD

It took $300 billion to make IBM think compatible.

There was a time when IBM could do practically anything they wanted in hardware and software development. But times have changed.

User investment in software and systems, approaching $300 billion, has reached the point where a revolution in hardware resulting in the incompatibility of existing software would mean suicide, even for IBM.

A whole generation of computer buyers has grown up with the computer industry. They know computers aren't magic. They're expensive machines meant to perform specific functions efficiently. What users need is the ongoing dependability to protect their sizeable investments in software and systems.

Rumors regarding new IBM products still create apprehension in the marketplace. But the truth is, since the 360 computer line, IBM has announced the 370 Series, the 3000 Series, and the 4000 Series, each of which offered upward compatibility from their predecessor. You can bet that IBM won't deviate from this course in the future.

So we're in this together.

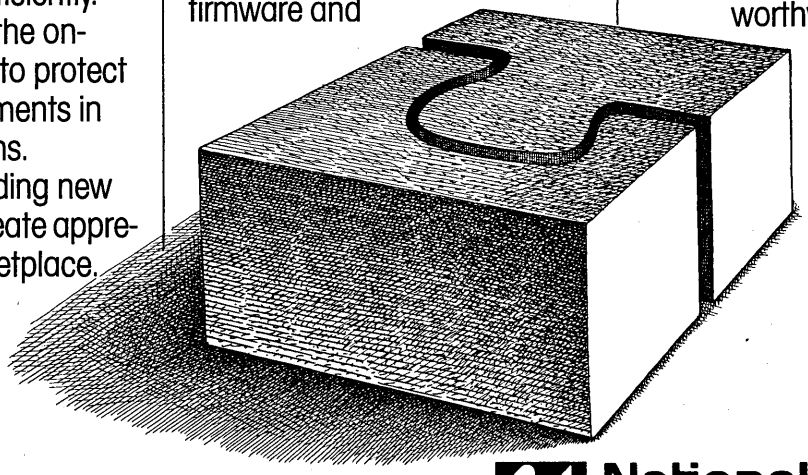
Apparently, IBM not only recognizes the compatible mainframes industry as viable, they now realize we're all playing in the same league. The independents are strong and resourceful enough to absorb and satisfy user hardware, firmware and software needs. Compatible computers have come of age. And we've made a firm commitment to that industry with the creation of National Advanced Systems.

A winning team.

National Semiconductor and Itel have worked together since 1974. National has built more compatible mainframes than any other independent manufacturer. Itel has installed more. By combining Itel's #1 Datapro-rated* service force and marketing expertise with National's proven technological and manufacturing capabilities we've developed a team worthy of the challenge.

So it looks like IBM will have to stay compatible, or else.

* Datapro Research Corporation's annual survey/1979.



National Advanced Systems

The Compatible Computer Company.

National Advanced Systems is a subsidiary of National Semiconductor.

CIRCLE 117 ON READER CARD

SOURCE DATA

RECORD REVIEW

FIRST PHILADELPHIA COMPUTER MUSIC FESTIVAL
Creative Computing CR 101

Creative Computing has recently released a musical anthology from pieces presented at the 1978 Philadelphia Computer Music Festival. This grouping is a collection of 18 cuts, mainly familiar melodies from classical, pop, and traditional works. Fifteen of the pieces are entirely computer-generated. The other three are completed with some human accompaniment. Overall, the sound quality of these short musical entries is bright, even, and chromatic. The computer is used to imitate the sound of conventional instruments—calliope, player piano, clarinet—in conventional modes. Selections range from Bach's *Fugue in G*, to the Beatles' *Hey Jude* to Wanhel's *Rondo from Sonata in B flat for clarinet and piano*.

"All art," reminded Walter Pater, "constantly aspires toward the condition of music." But the aspirations of the artists on this collection seem much lower; they have neglected the possibility of using the computer for the assembly of truly innovative musical systems. Is this recording intended solely as a sublunary sampler for the interested hobbyist?

If this recording were considered just as an advertisement for available software systems, it might have some value. A few programs, notably the ALF System with eight synthesis boards, and the Schertz, which is built from kits and surplus parts, offer some respite from an otherwise uninspired collection. Even those systems are not exceptionally resourceful, but they do display inventions which might encourage a truly creative piece of music. That's what a music festival is supposed to do.

Most of the popular tunes here (*Mexican Hat Dance* or *Yankee Doodle Dandy*) could have been more ably performed by music box or mechanical calliope. Perhaps the programmers attempted to mimic so-called real music in the hope that their systems would appear more formidable. Nowhere does one find a sense of innovation commensurate with the technological advancements offered by the software. Having the benefit of a new alphabet, the computer-musician ought to find something new to write about. Instead we have a rehash of Rimski-Korsakov and Bach. Consider the importance of the pianoforte, the saxophone: new instruments engender new music. These technicians are looking in the wrong place for their musical prototypes. Rather than presenting pale mockups of Pachelbel, they could be experimenting with the tools formulated by *musique concrète* or serialism. At least this would be more historically accurate.

This is a collection of invidious novelty. With so little attention allowed for content or performance (and so much for the technical systems), we have nothing but a collection presented by and for, in Norbert Wiener's phrase, gadget worshipers. By relying on the predictable prepared sounds of the past rather than the experimental modifications of post-modern music, these technicians create something predefined and "functional," something that is only the simulation of music, not music itself.

Automatons capable of playing ditties are nothing new: in 1738 Jacques de Vaucanson introduced to the Paris Academy of Science an android flautist that could perform a few perfunctory musical pieces. Despite their appearance, such androids are only two-dimensional simulacra, incapable of self-regulation. Without self-regulation there can be no feedback, and without feedback there is only a docile machine. Docile machines cannot make music.

Computer music is appreciated not because it sounds like music made on a tin flute or because it sounds "lifelike," but because it enlarges the achievements of the past. No attention has been paid here to the works of Stockhausen or Cage. L. A. Hiller's and L.M. Isaacson's work with the ILLIAC computer at the University of Illinois has also been neglected. Nor is there acknowledgement of Peter Zinovieff's 1968 *Partita for Unattended Computer* (where "each realization will be essentially different"). Blacher's *Incidents at an Emergency Landing* (1966) has been ignored, as has Yannis Xenakis' *ST/48* (where the initial letters of the word "stochastic" are worked by computer to serve as components of a sound space).

There are a few nice tunes. Malcolm Wright's SSM system performance of Neil Diamond's *Desiree* is pleasant and unassuming. D.H. van Lenten's 1962 recording of synthesized speech from Bell Labs (familiar for the *Bicycle Built for Two* that Mad Hal croons in *2001*) is still intriguing. These pieces are competently performed; polyphony and counterpoint are handled dexterously. But too little attention is paid to the texture of the sound. Rondeaux and chaconnes sound lifeless and out of place in these sterile surroundings. It is difficult to assess the technological versatility offered by these systems when they are presented in such conventional and restricted modes.

Is it the limited expectation of an audience that causes these musicians to limit their efforts? Can't they aspire to something beyond steamboat music or carnival tunes (which are best performed on their original instruments anyway)? The crudest of Aeolian harps would be preferable to the renditions on this recording.

Computer music offers a great range for the innovator. It's sad to hear mere tinkering with gadgetry. Future endeavors will doubtless transcend the traditional limitations of form.

Interested technicians might want to acquaint themselves with some of the music already written for computer. Two journals pertinent to the computer musician are *Computer Music Journal* (Post Office Box E, Menlo Park, CA 94025) and *Electronotes* (1 Pheasant Lane, Ithaca, NY 14850).

—Lee Froehlich

Lee Froehlich, a freelance music critic, is a student of post-modern music and was formerly music librarian at Brentano's. He is now with *Forbes* magazine in New York.

BASIC BOOKS BRIEFS

PROBLEM SOLVING AND STRUCTURED PROGRAMMING IN BASIC
by Elliot Koffman and Frank Friedman

This text emphasizes the problem-solving and structured programming techniques while teaching the BASIC language as implemented in three versions: minimal BASIC, BASIC PLUS, and extended BASIC (S-BASIC). It is designed for a programmer's first course, and only a minimal mathematical background is assumed.

The authors believe it is important to teach BASIC in the same way that other high-level programming languages are taught, and hence have stressed the development of good problem solving and programming habits throughout the textbook. There are numerous solved problems and example programs taken from a variety of application areas, each written with a top-down or

stepwise approach.

There is more than enough material for a one-semester course. The first eight chapters represent the core of the textbook while the last three chapters contain advanced material on string processing, matrices, and files. An extensive set of homework programming problems is provided at the end of each chapter, and exercises are inserted in the body. Solutions to selected exercises are provided at the end of the text along with a glossary of BASIC statements and structures.

This is an excellent text for those who want to master structured programming techniques as applied to BASIC. However, it should be pointed out that the only structured version of BASIC currently available is Dartmouth S-BASIC, although a number of extended BASIC systems (including DEC'S BASIC-PLUS and Univac's UBASIC) support the one-line IF-THEN-ELSE statement and the WHILE loop. Addison-Wesley (1979, 448 pp., $11.50).

BASIC PROGRAMMING IN REAL TIME
by Don Cassel

This is an older textbook, but certainly worthy of consideration for use today. The general approach is from the viewpoint of processing business applications in a real-time environment. The text does not presuppose prior exposure to computers or knowledge of rigorous math and yet can be appreciated by those already familiar with computers.

The book provides a very comprehensive but elementary treatment of BASIC. All problems have been run on a time-sharing system and the actual printouts are a part of the text. Exercises and programming problems follow each chapter.

The material is presented in an easy-to-understand sequence, with the first three chapters devoted to an introduction to computers, time-sharing, and computer programming fundamentals. Subsequent chapters cover topics such as arithmetic operations, data imput and output, program control statements, lists and tables, subroutines, files, etc. This is an excellent textbook for the nontechnical individual as well as for those specializing in a computer science curriculum. Reston Publishing Co. (1975, 190 pp., $9.95 cloth, $7.95 paper).

FOUNDATIONS OF PROGRAMMING THROUGH BASIC
by Peter Moulton

This book introduces the foundations of programming in BASIC. A consistent style of problem solving, procedure development, and programming has been adopted in all of the examples to demonstrate a methodology that explicitly relates the resultant program to the processing procedure and to the problem.

Several strategies for testing and debugging programs are presented, and there is a chapter devoted to flowcharts, although flowcharts are seldom used in other chapters. The last four chapters each present an application area: matrices, sorting and searching, numerical methods, and modeling and simulations. The text also contains a chapter that introduces the three elementary constructs of structured programming: IF-THEN-ELSE, WHILE-DO, and REPEAT-UNTIL. The text provides a good mix of instructional material and application examples and hence is recommended to those who want to learn programming fundamentals through the BASIC language. John Wiley & Sons (1979, 271 pp., $10.95).

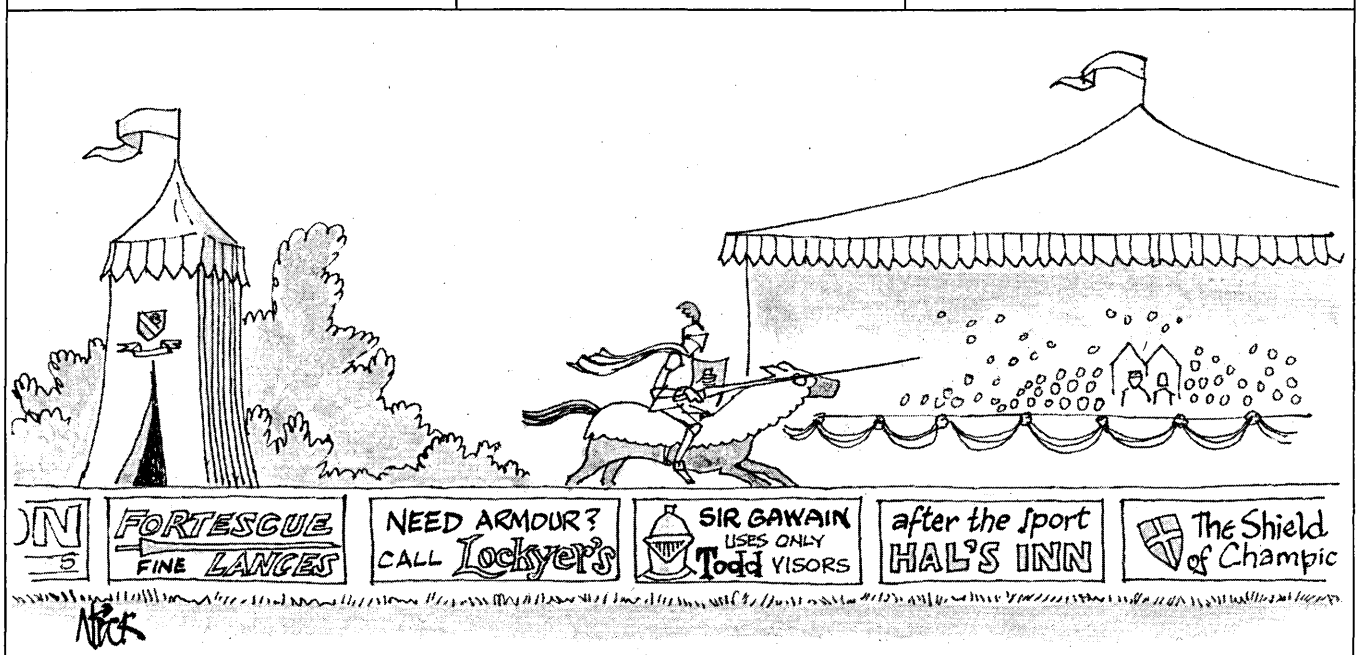
BASIC AND THE PERSONAL COMPUTER
by Thomas A. Dwyer and Margot Critchfield

This is an extremely wordy book written for the enthusiast who needs a self-teaching guide and doesn't mind wading through lots of the English languge to get at the programming language. As its title suggests, the book is aimed at the person with his or her own personal computer; in keeping with that theme, it begins with an introduction to microcomputer hardware.

The next few chapters present a self-instruction route to standard and extended BASIC, but the greater part of the text is devoted to a wide range of applications, including some in graphics, sorting, computer games and art, simulations, and business. There are numerous examples and sample programs throughout, but somehow they seem to clutter the presentation of the language itself. Addison-Wesley Publishing Co., Inc. (1978, 438 pp., $12.95, softcover).

BASIC WITH STYLE: PROGRAMMING PROVERBS
by Paul Nagin and Henry F. Ledgard

This is a good one. It's one of a series of Programming Style Guides by Mr. Ledgard, who professes, "Programmers can and should write programs that work correctly the first time." The book is designed as a guide to better programming, not as an intro to the details of BASIC, but should be of value to all programmers who have some familiarity with the language because it will help them write carefully constructed, readable programs. Using BASIC examples, it offers short rules ("proverbs") and guide-



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lines to producing more nearly error-free programs, and attempts to dispel some myths—like the industry's overemphasis on microefficiency.

In its presentation of top-down programming development, the book actually includes much general discussion which is not specifically tailored to programming in BASIC, another example of its departure from the realm the other texts live in. Hayden Book Co., Inc. (1978, 144 pp., $5.95, softcover).

THE BASIC COOKBOOK by Ken Tracton

This one is different. It is neither a BASIC instructional text nor a BASIC reference manual. Rather, the intention of this book is to supply a dictionary of terms used in BASIC with examples to illustrate all the functions and operations, as well as such mode and system commands as LOAD, RUN, LIST, etc. Each statement, command, or function is listed in alphabetical order and is provided with examples and, in some cases, a flow chart. Although the author has included a large number of BASIC terms, some are missing. However, missing terms are usually nonstandard or "machine dependent," or they are synonyms for some other way of doing the same function for which the term has been included. Tab Books, Blue Ridge Summit, PA 17214 (1978, 140 pp., $7.95).

PROBLEM SOLVING AND BASIC: A MODULAR APPROACH by Frances G. Gustavson and Marian V. Sackson

This excellent text has been designed for use in a single-semester introductory course in computer science and data processing. It presents a thorough introduction to algorithm development and computer concepts. Modular, top-down algorithm development is emphasized through nonmathematical examples that should be easily understood by most students. The approach used should allow students to focus on algorithms and related computer concepts without simultaneously confronting specific applications. The BASIC language is introduced to allow the student to learn a computer language while simultaneously learning problem-solving techniques. If what you're looking for, however, is a simplified self-teaching guide to the BASIC language, this is probably not the one. SRA (1979, 252 pp., softcover, $7.96).

INTRODUCTION TO BASIC PROGRAMMING: A STRUCTURED APPROACH by Peter B. Worland

This book is intended for teaching programming to a college-level audience. It could be used by people with a minimal technical

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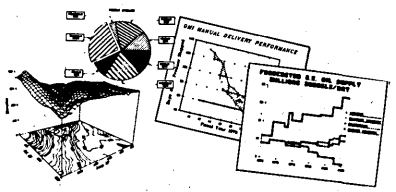

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background. It is written with a problem-solving approach. The author feels that before one can write a successful program to solve a problem, one must first thoroughly understand the problem. Thus, a significant by-product of learning to solve problems on a computer is a greater understanding of and appreciation for the problems themselves.

Where possible, the author has attempted to apply the principles of structured programming. The book is directed at beginners and progresses slowly through the first four chapters. A detailed presentation of BASIC is made along with explanations of essential system commands. Many examples of programs and exercises are provided, and since a solutions manual is available, the text could also be used for self-study. Houghton Mifflin Co. (1979, 328 pp., softcover, $10.50).

COMPUTER EFFECTIVENESS: BRIDGING THE MANAGEMENT/ TECHNOLOGY GAP
by C. Warren Axelrod

Ignore the title. This book is an academic discussion of the many alternative ways to bill for computing services. Highly theoretical in its outlook, few commercial dp managers will have the energy and interest to plow through it. Unfortunately, they will be missing a very sound discussion. But, that is the nature of the trade-off taken by the author. In an effort to write rigorously, he has probably lost the readership to whom the book is primarily directed.

Pricing for computer services has been the subject of articles and papers for over 25 years. Rarely do two people agree on a set of fundamental assumptions about how the institution should establish the pricing schedule. If there is so little agreement on the basis for charging, then it is certain that the methodologies will vary also. Axelrod touches neatly on most of the methodologies although he is somewhat weaker on *why* various assumptions are made. Consequently, while there is sound material on value-based pricing, there is little about why a particular enterprise would want to adopt this as a basis.

The working edp manager must live within a corporate culture that generates unspoken mores and a set of rules laid down in detail as "corporate policy." The use of services pricing as a means for achieving corporate goals and objectives is an extremely important matter that is neglected in this volume. While it is very difficult to measure the contribution to profit or return on equity of a given computer service, it does appear that this in the long run must be the fundamental measuring stick.

Cost and price are generally confused by dp specialists. No such uncertainty exists for Axelrod. He understands that the key is pricing and cost is only one component of the equation.

Because of the nonspecific nature of much of the material, some of the key questions on pricing that have disturbed dp managers for a long time are not directly answered. The questions include: Is dp a profit or cost center? Do we price competitively with the outside world or do we stay 15% to 20% under profit-oriented outsiders? If we run at an annual loss, where will the missing money be found?

Axelrod provides a valid framework for continuing the seemingly endless in-house discussions of pricing for computer services. It isn't easy writing; no simple solutions are presented in neatly packaged form for instant implementation. But there is a basis for discussion presented here that will appeal to dp managers who can take the time to examine Axelrod's ideas. Information Resources Press, Washington, D.C. (1979, 200 pp., $22.95).

—Philip Dorn

REPORTS & REFERENCES

MANAGING ALL THAT INFORMATION

Finding yourself being inundated with more computerized information than you possibly know what to do with? Take heart; you're not the only one. So says the FTP organization of Smithtown, N.Y. in fact, they've gathered together some experts in the information management area and put their ideas in four bound volumes. Entitled, "The Corporate Role in Information Systems Management," "Information Services—Present and Future," "Improving Information Services Productivity," "Computer, Security, Crime and Contingency Planning," the reports are geared to the middle manager who is looking for answers and guidelines.

Corporate planners who must talk the future while existing with the present will find a forecast of the technological advances most likely to occur over the next 15 years by Dr. Herbert Grosch, one of the pioneers in the computer field. Philip J. Kiviat of SEI Computer Services sets out program structures that can be adapted to a new program or help an existing one and FTP's Robert Jacobson offers planning guidelines to cover security, crime, and contingencies that occur most frequently as well as those once-in-a-lifetime happenings.

Each report is priced at $25 and is available from FTP, INC., 414 Route 111, Smithtown, NY 11787, or call Dr. Robert Carlysle at (704) 364-7960.

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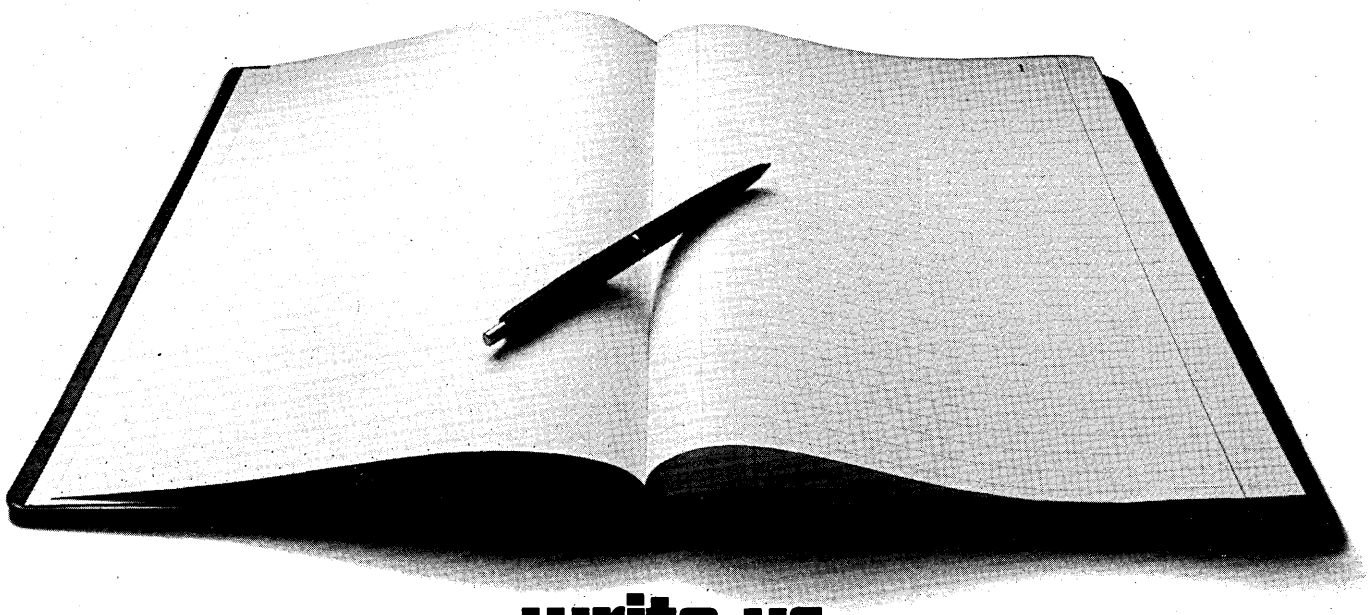

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CIRCLE 121 ON READER CARD

being offered by Datapro Research Corp. Aimed at managers, the two-volume reference is called *Datapro Applications Software Solutions*, and addresses software issues from selection and planning to installation and maintenance. In one large section software packages are listed by company and classified by application. A directory of vendors is also supplied. User groups and trade associations are listed as well, followed by a directory of management consultants. Also included is the ever-popular "Datapro User Ratings of Proprietary Software."

While the volumes are arranged and billed as a comprehensive manual for instruction, planning, operation, and "current awareness," the reference seems mostly to have been designed for the general education of the software manager. And while the volumes contain quite a lot of reading matter, some sections have little current material. Consider, for example, the section entitled Reliability and Vendor Support. One article, or report, as the pieces are called, on Software Reliability, is a 1976 paper. The rest of the section consists of a Datapro telephone survey on vendor support based on the Datapro honor roll, which shows vendor offerings for 30 software packages, and an excerpt on documentation for packaged software from a 1973 dp textbook. Many of the articles are in fact textbook excerpts, although some papers are from proceedings and other industry sources.

Selections are not necessarily geared to the same readers. Some of the selections are quite technical, some are more general, and some are theoretical. The "specific application area" of electronic funds transfer, for example, is addressed by a chapter from the second edition of James Martin's *Future Developments in Telecommunications*. The rest of this section has been put together by the Datapro staff, and includes, in the case of telephone bill paying applications, descriptions of specific systems for sale, while in the case of sales, manufacturing, insurance, accounting, and banking applications, generalized overviews are given.

The "information service" package includes the two-volume report, an inquiry service to answer questions by phone or mail, a monthly newsletter containing product and company news, and monthly supplements to the report. Supplements are planned to be 50-100 pages and are intended to update the various segments of the volumes. The source of the supplements, according to Datapro, will often be other Datapro reports.

The Solutions Series also includes volumes on the automated office and on the general field of dp. *Applications Software* sells for $330. DATAPRO RESEARCH CORP., 1805 Underwood Blvd., Delran, NJ 08075, (609) 764-0100.

TRANSBORDER DATA FLOW

AFIPS is offering two volumes about the issue of transborder data flow. Volume I, a report of the AFIPS panel on the subject, discusses particularly susceptible organizations, privacy protection, and technical and procedural considerations. A final chapter, Nonprivacy Issues in Transborder Data Flows, discusses national security and sovereignty, computer-communications economics and markets, and technology transfer. Shown here is one of the 13 figures in Vol. I. The privacy protection requirements referred to in the figure are according to the Privacy Act of 1974.

Volume II, entitled *Supporting Material on Transborder Data Flow*, contains an annotated bibliography, national laws concerning privacy in Austria, Canada, Denmark, France, Germany, New Zealand, Norway, Sweden, and the U.S. Also included are Council of Europe Resolutions and OECD draft guidelines. Volume I is $25, Volume II is $15. From AMERICAN FEDERATION OF INFORMATION PROCESSING SOCIETIES, INC., 1815 N. Lynn St., Arlington, VA 22209, (703) 243-4100.

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REQUIREMENT CATEGORY	OPERATING COST	STARTUP COST
TOTAL COST	$36.6 M	$29.5 M
GRANTING ACCESS TO INDIVIDUALS	29.2%	3.1%
ACCOUNTING FOR DISCLOSURES	25.7	2.3
PUBLICATION OF ANNUAL NOTICE	12.0	46.0
TRAINING OF PERSONNEL	9.0	23.2
CORRECTING RECORDS	5.8	1.6
NEW DATA COLLECTION PROCEDURES	4.1	4.0
SECURITY AND CONTROL	3.7	7.4
ALL OTHER COSTS	11.0	12.7
SAVINGS FROM SYSTEMS THAT WERE ELIMINATED	–0.2	–0.2

*97 GOVERNMENT AGENCIES, 6,753 SYSTEMS OF PERSONAL RECORDS, 3.852 BILLION RECORDS (86% OF THE SYSTEMS AND 94% OF THE RECORDS WERE MAINTAINED BY 20 OF THE AGENCIES).

VENDOR LITERATURE

INDEXING SERVICES

A 12-page booklet describes this vendor's products and services stemming from its annual coverage of the world's leading journals and new multiauthored books. Covering the sciences, social sciences, arts, and humanities, the vendor's products and services fall into three main divisions: index reference services, document fulfillment, and current awareness. Products described include Current Contents, a weekly service published in seven topical editions, and ASCA (Automatic Subject Citation Alert), an individualized computer-generated weekly service. Additional information can be requested using the pamphlet's back cover postcard. INSTITUTE FOR SCIENTIFIC INFORMATION, Philadelphia, Pa.

FOR DATA CIRCLE 350 ON READER CARD

TERMINAL

A folder of fact sheets describes this vendor's microprocessor-based terminal that can be configured to emulate a variety of terminals, including Teletypewriters and Burroughs TD830s. Each emulator option is detailed on a separate data sheet, and a price list is included. SYSTEMS RESEARCH INC., Okemos, Mich.

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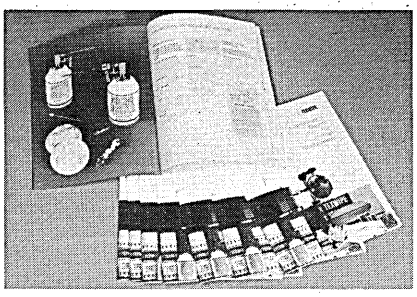

CLEANING SUPPLIES

This vendor's latest catalog presents 36 pages of information on cleaning products tailored for many contaminants that may pose problems to dp equipment. The products are designed to remove and avoid both particulate and film contaminants that interfere with the proper operation of tape drives, disk packs, crt terminals, and read/write heads; static control products also are included. The catalog describes contamination problems, and this vendor's products designed to deal with those problems. Products offered in the catalog include noncontaminating, lint-free cloths, selective solvents, presaturated pads, and cartridge and disk pack inspection and testing equipment. An order form and price sheet is included with the catalog. THE TEXWIPE CO., Hillsdale, N.J.

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The Marketplace...

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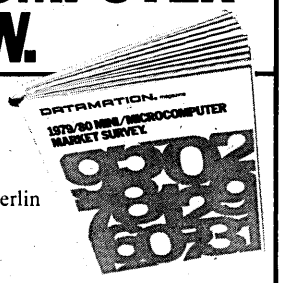

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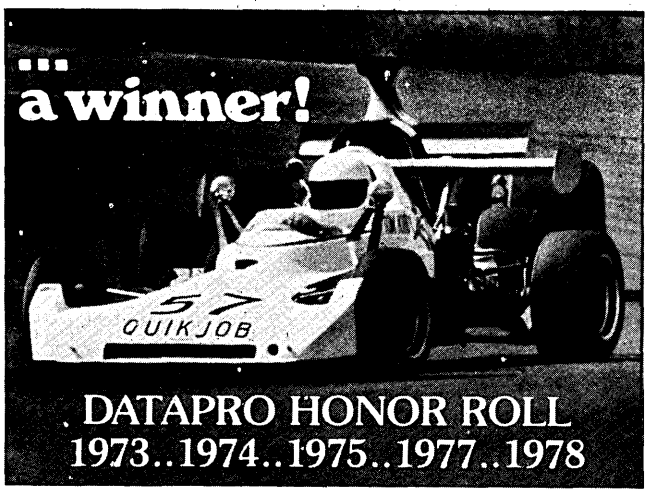

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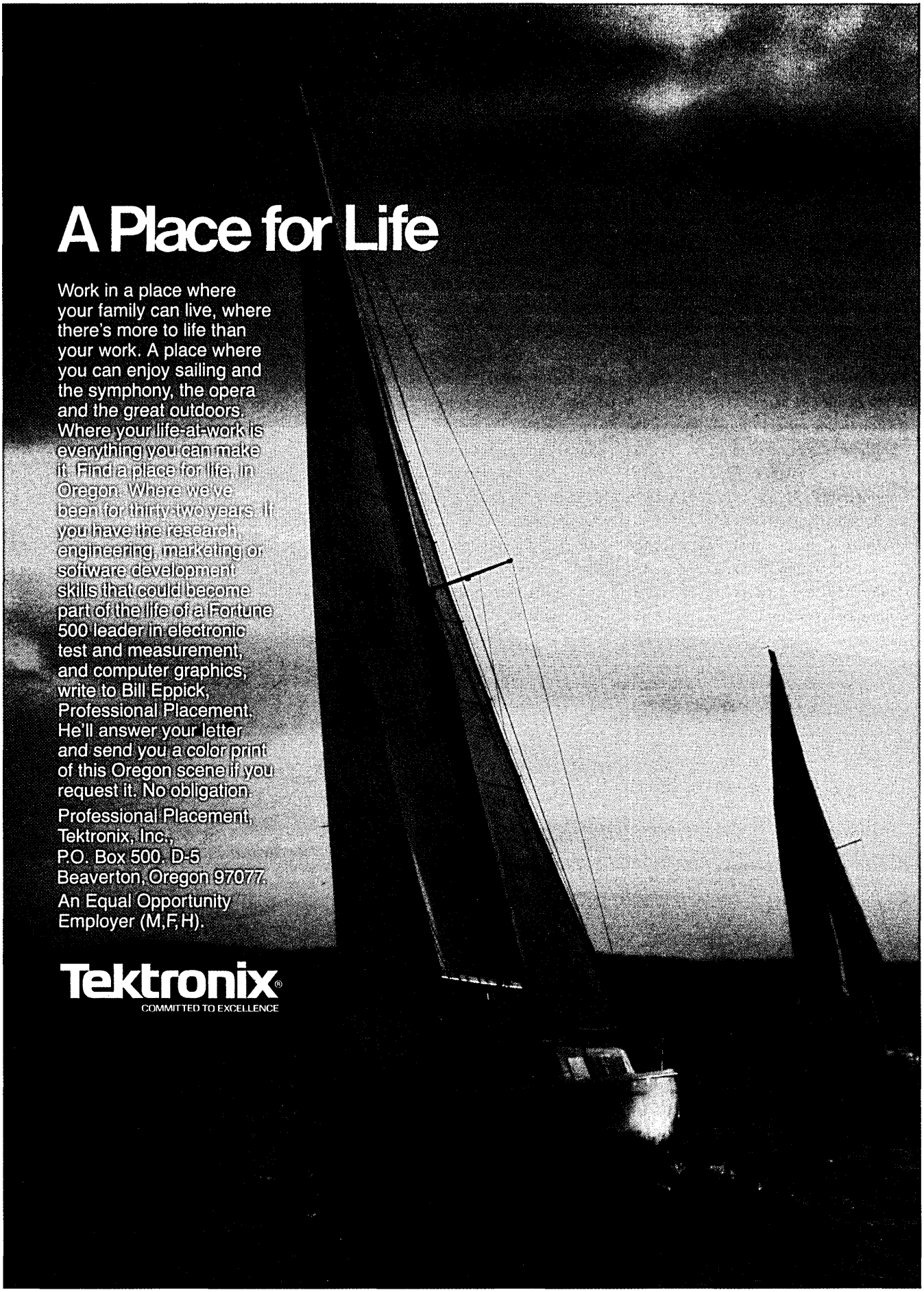
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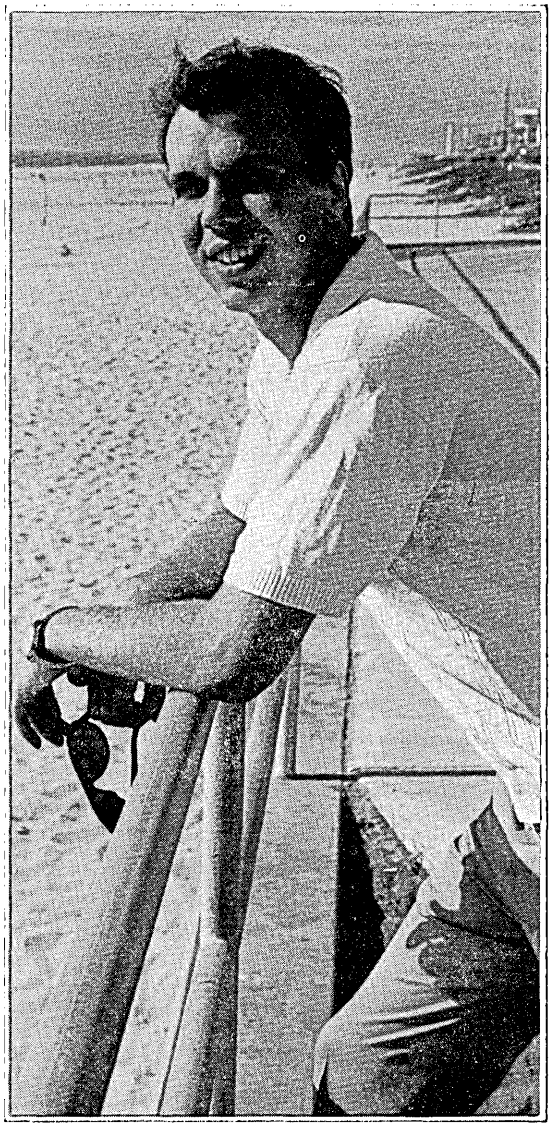

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SCIENCE/SCOPE

A new microwave sensor will allow military weather satellites for the first time to "see" through clouds to monitor meteorological conditions below. The instrument will scan a 1300-kilometer field of view every 1.9 seconds from an altitude of 450 nautical miles, sensing microwave radiation energy reflected from ice, land, and clouds. It will detect rainfall, ice masses, ocean wind speeds, soil moisture content, and other conditions, and relay compiled data within minutes nearly anywhere in the world. The information will help commanders of land, sea, and air forces in their planning of operations that depend on accurate weather forecasts. Hughes, under a U.S. Air Force contract, is to build one prototype and develop computer software for ground processing.

A unique "picture-taking" system comprising five separate sensors will help the U.S. Air Force evaluate which imaging methods may be most useful for advanced airborne applications. The Hughes-developed system consists of one sensor that sees only visible light, another that measures thermal radiation (heat), two active laser systems that detect the amount of reflected light, and a millimeter-wave radar. Variations in the gray tones of panoramas made by the sensors, particularly in those made at night and during inclement weather, reveal the advantages and disadvantages of each.

Military pilots may get help in locating ground targets from far away with a new electronic process that examines TV-like imagery and selects potential targets. The technique, called automatic target cueing, is designed to enhance the performance of such imaging devices as forward-looking infrared (FLIR) systems. It would free pilots from having to study imagery and allow them to concentrate on planning evasive action or performing other tasks. The Hughes approach checks full-frame pictures for likely targets and then further analyzes these highlights for classification. Automatic target cueing has been made feasible by advances in microcircuitry and pattern-recognition techniques.

"High technology" best describes the products, environment, and production processes of the manufacturing division of Hughes Electro-Optical and Data Systems Group. Our major programs include laser rangefinders and designators, thermal imaging systems, and missile launching systems. We have immediate openings for experienced or graduating engineers who seek the challenge and satisfaction of advanced production methods, including computer-aided manufacturing. Send your resume to Dan O'Daly, EDSMD Professional Employment, P.O. Box 92746, Dept. SE, Los Angeles, CA 90009. Or call (213) 641-5510 collect. Equal opportunity M/F/HC.

Saving money through energy management and preventive maintenance has been made easy by a hand-held infrared viewer, according to a leading zipper manufacturer. The Talon company reports that a Hughes Probeye® viewer helped save $96,000 in less than a year by pinpointing energy losses due to such problems as leaks in steam machines. The Probeye viewer creates pictures by sensing heat radiated by objects. An operator merely turns on the viewer and looks through the eyepiece. Warm areas appear much brighter than other objects in the surrounding scene. The device can distinguish temperature differences as small as 0.1°C.

READERS' FORUM

THE NEW AGE OF ANXIETY

The two most difficult problems facing Western economic systems are employee displacement and decreased productivity. The history of growing annual industrial employment has ended. Traditional blue-collar factory jobs are scarce, particularly at the less skilled entry level. The productivity of individual employees has either slumped or barely held its own (agricultural workers remaining the shining exceptions).

Stimulating employee displacement is microelectronics. And, at the same time, microelectronics represents a solution to the problems of productivity. While these points are really separate issues, they must be dealt with collectively; there are intimate connections. Simply stated, installing hardware to increase productivity is a surefire way to eliminate jobs.

Each step forward in microelectronics—reduced cost and size, increased power and intelligence—adds to the threat of people being replaced with silicon chips. No job translates into no individual income. No income means more and more government-supported welfare. Yet for the past four years it has been a demonstrable political fact that increased welfare benefits are no longer in style. The point has been proven beyond a doubt by election returns in Sweden, Denmark, the U.K., and the United States.

To where do displaced workers move? The service sector is one possibility; a government job is an easy out. But already service opportunities are drying up and, culturally, working for the government is not popular. Government workers are viewed as obstacles to productive people, paper pushers who strangle the system in coils of red tape.

There is a trap here. Displaced workers can be crammed into government jobs and become a braking force on industry. Or, they can join the ranks of the unemployed and be supported by the industrial establishment's taxes. Heavy corporate taxes dry up risk-taking and new ventures. Neither solution is acceptable.

For 20 years we have talked about the impact of industrial automation, but until the last year or two, it was not a real problem. Many forces are now acting on Western economies. There is more competition from low-labor cost areas, the growing usability of industrial robots, and worldwide worry over productivity. The temptation to introduce microelectronics grows stronger.

What can be done with microelectronics? Consider that 90% of an automobile's components weighs under five pounds. Industrial robots can sort, store, select, and assemble parts. The Society of Manufacturing Engineers predicts that 50% of the direct assembly of a car will be done by robots within 15 years. Today's first generation robot costs $50,000. This averages out to under $5 an hour of useful labor performed. That's a flat hourly rate. There are no fringe benefits, strikes, annual wage increases, or absenteeism. Today's line worker draws at least $15 an hour. The case is clear.

Worker displacement is not an appealing subject; it is easier to take a "business" attitude. Although business people in northern Europe have considered these problems more carefully than Americans have, there are still few solutions. The conflict between trade unions and corporate management continues unabated.

Two consequences have surfaced in many European countries. First, night work has gradually been outlawed, except in continous process industries. Secondly, the 35-hour work week has been accepted intellectually. While both moves provide additional jobs, they are short-range tactical solutions to long-term strategic problems. The inevitable result of extra manpower on the job is the higher cost of goods and services, and therefore, an increased inability to compete effectively.

WORLD LOOKS TO U.K.

The U.K. is the laboratory to which the world looks for solutions. The conditions—a militant labor force, obsolete industrial plants, and some microelectronics capabilities—are not found in many countries. But shifting the industrial base to high technology won't be easy. Barrie Sherman, director of research for the white-collar union, ASTMS, predicts a minimum loss of 3.5 million jobs. He adds that if the losses reach 10 million, the country will be run at bayonet point. Sherman is inclined to the view that the solution must be in worker retraining and a changing attitude toward technologically based unemployment.

The president of ITT, Rand V. Araskog, also sees the problem. In a recent speech he noted, "The geographical separation and new skill requirements of the computer industry cannot accommodate the electromechanical factory worker. We have to learn how to help people adapt to the new jobs created by the technology."

There are no easy answers. Microelectronics substitutes mechanisms for human labor. When measuring output against capital invested, microelectronic solutions look attractive. Jobs, however, are the key to most economic systems, the fuel that drives the industrial machine. The social price of the microelectronic solution is very high.

If we say "no more microelectronics," our society becomes noncompetitive internationally. If we rush ahead blindly, the society may unravel because of decreased employment.

American voters are faced with hard choices in an election year. We rarely talk about national goals and priorities except on a four-year cycle, but the political process is also a sure way *not* to arrive at a solution. Talk is "in"; answers are "out."

It is disheartening to see this nation and this industry continue to ignore these fundamental social issues. Nobody will be happy if the key decisions are made in the political sector on the usual uninformed basis. But it will happen if those people with the technical knowledge keep avoiding public airing of the issues. The problems are complex and highly sensitive. Ignoring them will not make them go away.

—Philip H. Dorn
New York, New York

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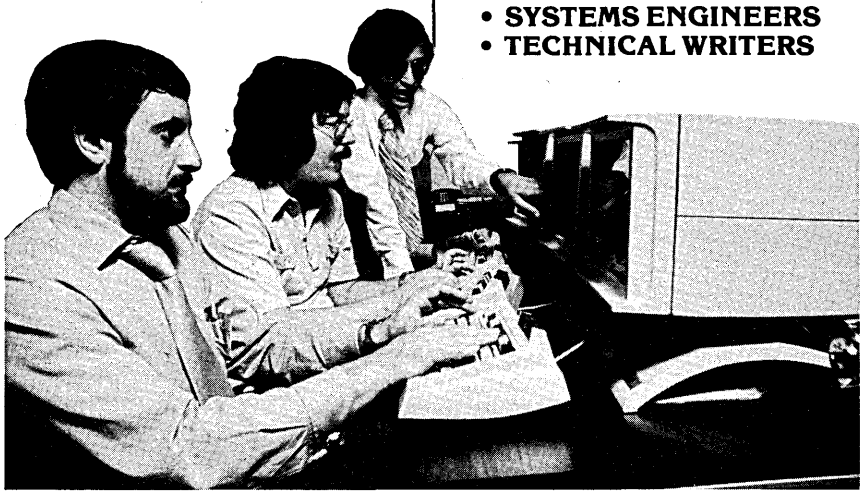

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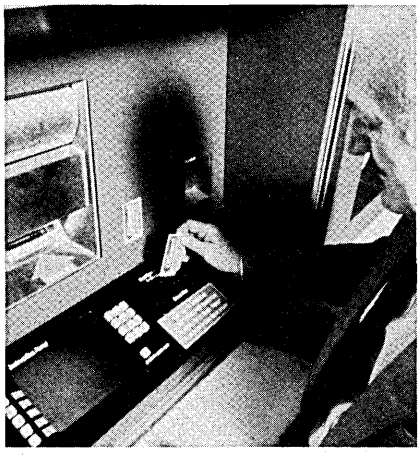

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FORUM

THE ORIGINS OF SPECIOUS

Your average chromosome contains 20 billion bits of genetic information.

So says Carl Sagan in his engaging book *The Dragons of Eden*. He goes on to say how many words, pages, and books 20 billion bits would take up, but the discussion is pretty abstract. What does it buy you to know your genes hold as much information as 4,000 books of 500 pages?

Then two chapters later—I'm noted for my speed on the uptake—it hit me. Bits could be converted into real, meaningful, human-oriented units. *Bytes*. Twenty billion bits is about 2.5 billion bytes, or 2,500 megabytes. Or to be even more concrete 13 double-density 3330s.

Now here was something a body could relate to. Sagan's book—subtitled *Speculations on the Evolution of Human Intelligence*—clearly needed extending. Who would offer additional speculations putting evolution into data processing terms?

I stepped modestly into the breach.

My first, short-lived conclusion—call it the File Speculation—was that chromosomes weren't as hot as all that. My company's individual insurance file will take *30* packs; 13 looks pretty tame by comparison.

But a moment's thought showed the comparison was invalid. Everybody's chromosomes are different from everybody else's, aren't they? So a chromosome is more like a record than a file, and 13 packs is a breathtaking size for a record.

Or look at it this way. The master record of our group insurance system is 10,000 bytes long. So a human being is roughly (2.5 billion/10,000 =) *250,000 times* as complex as a group insurance policy. This insight, which we owe entirely to data processing, ought to awe even the most jaded observer.

If a chromosome is a record, what can we say about the system that uses it? Specifically, what about its development time?

For reference we'll stick with our group insurance system, which took about five years to build. Let's assume development time varies as the square of complexity, which seems conservative enough.

Then we'd expect development of the Human System, with the chromosome as its master record, to take about ($250{,}000^2 * 5$ =) 300 billion years, give or take a hundred million. *But life on earth has only existed for 4 billion years.*

Now this was impressive. Humanity had developed at least 75 times as fast as it should have, even assuming a more or less intelligent project team trying to create it. Here was meat for generations of Darwinists and theologians. Or maybe, to extend the metaphor, a steak through the heart of random mutation.

But another moment's thought showed that this speculation too was invalid. (These moments of thought are off-putting; they're rare enough, but they come at awkward times.) Humanity doesn't *process* a chromosome—humanity is more like the set of insurance policies the master file represents.

The system that processes chromosomes is actually Organic Chemistry. It, we assume, has existed since the year dot; the Big Bang was likely its implementation dinner.

Tangentially, we can ask about the development time for the Organic Chemistry system. Zero? Or is the question meaningless because it refers to the unknowable era before the Big Bang? I prefer the latter. I've tried telling my boss his questions on development time are equally meaningless, but the results have been disappointing.

If file size and system development aren't useful models of the chromosome, what's left? Head crash? Packet switching? Structured walkthroughs? No, no, and no again. You're on the wrong track entirely; I'll obviously have to tell you.

The answer is data entry.

It works like this. The Organic Chemistry system has been chugging away on the old cosmic mainframe for eons. It has eagerly awaited whatever genetic instructions—chromosomes—resulted from our progenitors' mating (or coupling, in Yourdon parlance).

When it gets its hands on a chromosome, it somehow turns it into a being; chromosomes are transactions for the Organic Chemistry system. The better adapted of the resulting beings survive to mate, that is, generate new chromosomes. The Organic Chemistry system dutifully turns these into new and different beings. And so on.

So evolving a human being isn't like developing a system; it's really like processing a long chain of data entries. Which is exactly what we set out to establish.

And there you have it, the terminus of our journey, for I've managed to avoid the moment's thought that will crumple this third speculation and expose you to a fourth.

But having come this far the more strong-minded and creative will want to carry on. Good for you. Don't forget to write.

If you're looking for direction let me suggest you concentrate on probabilities. You know—if a million monkeys at a million typewriters typed for a million years, would they produce the works of Shakespeare? That kind of thing.

How probable is the scenario we've described? How likely is it that random inputs to any system could produce the transcendent geniuses who've given us the symphony, the theory of relativity, the ALTER statement?

Of course you'll have to allow for the fact that some mutations don't survive to procreate. With suitable changes to the data entry model, your question will then be:

If a million monkeys at a million terminals keyed for 4 billion years, would they produce Shakespeare himself?

—Kirk D. Hansen
Toronto, Ontario, Canada

NUCLEAR ENGINEERS OF THE 1980s?

Those who work in the computer industry will be the nuclear engineers of the 1980s. The loss of credibility and the self-doubt that came to nuclear engineers at Three Mile Island (TMI) will come to us as well.

There are many disquieting similarities between the nuclear reactor emergency at TMI and the problems with which we computer people deal every day.

Unexpected Anomalies. One of the problems at TMI was the appearance of a hydrogen bubble; this problem was "not analyzed heretofore," in the words of Harold Denton of the Nuclear Regulatory Commission. Computer people deal every day with bugs which were "not analyzed heretofore." The fact that our bugs are discovered at or after program execution has affected the records of possibly everyone in a multimillion-person data bank.

Compounding the Problem. At TMI two workers, trying to reroute the plumbing, opened a pipe full of radioactive gas and vented it to the outside. There have been many instances where programmers trying to fix a bug have destroyed information in data files. In one reported case, a company almost went bankrupt: critical information was destroyed first in the master file and then in the backup file. By luck and good fortune, the grandfather file was not destroyed.

FORUM

Inadequate Instrumentation Systems. Operators at TMI were misled by faulty instrument readings into nonproductive and counterproductive actions. In computer systems, operators and programmers are misled daily by error messages with quality ranging from poorly worded to incomprehensible. These messages lead them into time-wasting searches through large manuals (which themselves are too often incorrect) or through adjacent offices in search of someone with an idea of how to solve the problem.

Inadequate Emergency Plans. The Harrisburg area had an old civil defense plan that included no contingencies for the accident at TMI. Some computer facilities have untested emergency plans; a few facilities actually test these procedures periodically. But the majority of facilities have no written emergency plans.

Regulations Poorly Monitored. Auxiliary feedwater pumps are designed to prevent TMI-type incidents. However, three of these pumps in the cooling system had been taken out of service two weeks prior to the event, in violation of federal regulations. This went unnoticed; there were no on-site inspectors. Most federal government computer systems are required to perform regular security and vulnerability audits and risk analyses. However, compliance scrutiny is typically left up to the internal auditors. There is no independent, external review.

Policy Attitudes. There are also similarities between the nuclear industry approach to safety and the computer industry approach to information use. There are numerous reports on the benefits of nuclear technology, but in two decades there have been only a handful of comprehensive reactor safety studies and little work on the radioactive waste disposal problem. Similarly, in the computer industry, we have only minimal work on data accuracy, integrity or social effects. Instead, we tend to emphasize decreasing cost-per-computation.

The nuclear industry has done very little social impact analysis and the computer industry doesn't have a much better record. Work on risk assessment uses checklists, for the most part, although there is some embryonic work using probability theory and fuzzy set theory. Very recently, some halting steps have been taken to perform social impact analysis at the Office of Technology Assessment and at the Social Security Administration. But for the most part, we have been reluctant to take hard looks at these tough problems.

Public Backlash. Permission to truck radioactive wastes from TMI through South Carolina was denied. Pennsylvania refused to allow the nuclear industry to pass on TMI costs to consumers. California denied requests to build Sun Desert I and II nuclear plants because of unsolved waste disposal problems. And these are not isolated incidents. Almost every week one can read of a new delay for some nuclear plant.

There are similar instances of public skepticism regarding once-highly-touted computer innovations. There has been an effective suspension of active development of the FBI's National Crime Information Center. The proposed IRS Tax Administration System has been scrapped.

The public is increasingly leery about the effect of computers on the quality of life. In a recent Harris poll, the public opined that "computers are an actual threat to individual privacy" by a margin of 54% to 31%, a dramatic change from only three years ago. What is perhaps even more surprising is that computer executives felt the same way, 53% to 44%. Only 27% of the public thought that the privacy of personal information in computers was properly safeguarded, while 52% thought it was not. Fully 63% of the public agreed with the statement "If privacy is to be preserved, the rise of computers must be sharply restricted in the future."

The question is not *whether* this public concern will be translated into effective political interest, but *how soon*. It took the TMI accident to get some of the most powerful members of Congress to seriously question the statements of the nuclear industry. It will take a gross data bank abuse—something like the creation of 30 million electronic unpersons for a day or two—to raise the eyebrows of politicians. This abuse will occur, probably within the next five years. We will then have our very own Three Mile Island.

Forum

REFORMS NEEDED

What can we do to stave this off, or at least to mitigate its effects?

First, education must be improved to reflect the fact that the social, political, economic, and legal circumstances surrounding any system should be understood before it is designed and put into place. The nuclear industry is only now fully realizing this.

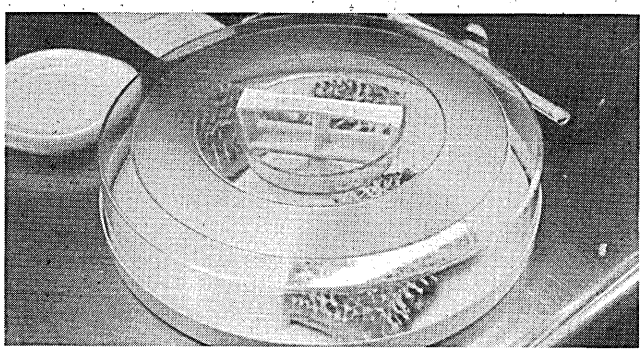
We must also improve training for security planning and auditing. There are problems in developing these programs in the university context; there is always the question of whether to put them in computer science, business, law, government, or elsewhere, since the issues are not the sole province of any one discipline. We need increased analysis of the risks and benefits of new systems in general and of systems with widespread effects (such as electronic funds transfer systems, social security, FBI systems, etc.) in particular.

Until we develop societal mechanisms to better control computer systems, we should exercise healthy skepticism about our own work and that of our colleagues. While not everyone will make the same value judgments about the social effects of various systems, it is reasonable to subject new systems to more technological reviews: Do they do what they claim? How problem-prone are they? How cost-effective are they? Do the benefits outweigh the social and technical risks and costs? This is especially important now that low-cost, high-utility microcomputer systems that sit on a desk and plug into an ordinary wall socket are here.

If a proposed system cannot provide satisfactory answers to these questions, it should be redesigned or forgotten. Only in this way will we maximize the benefits and minimize the risks that computers bring with them.

—Lance J. Hoffman
Washington, D.C.

STORAGE MEDIUM



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—Jim Gross
Sheboygan, Wisconsin

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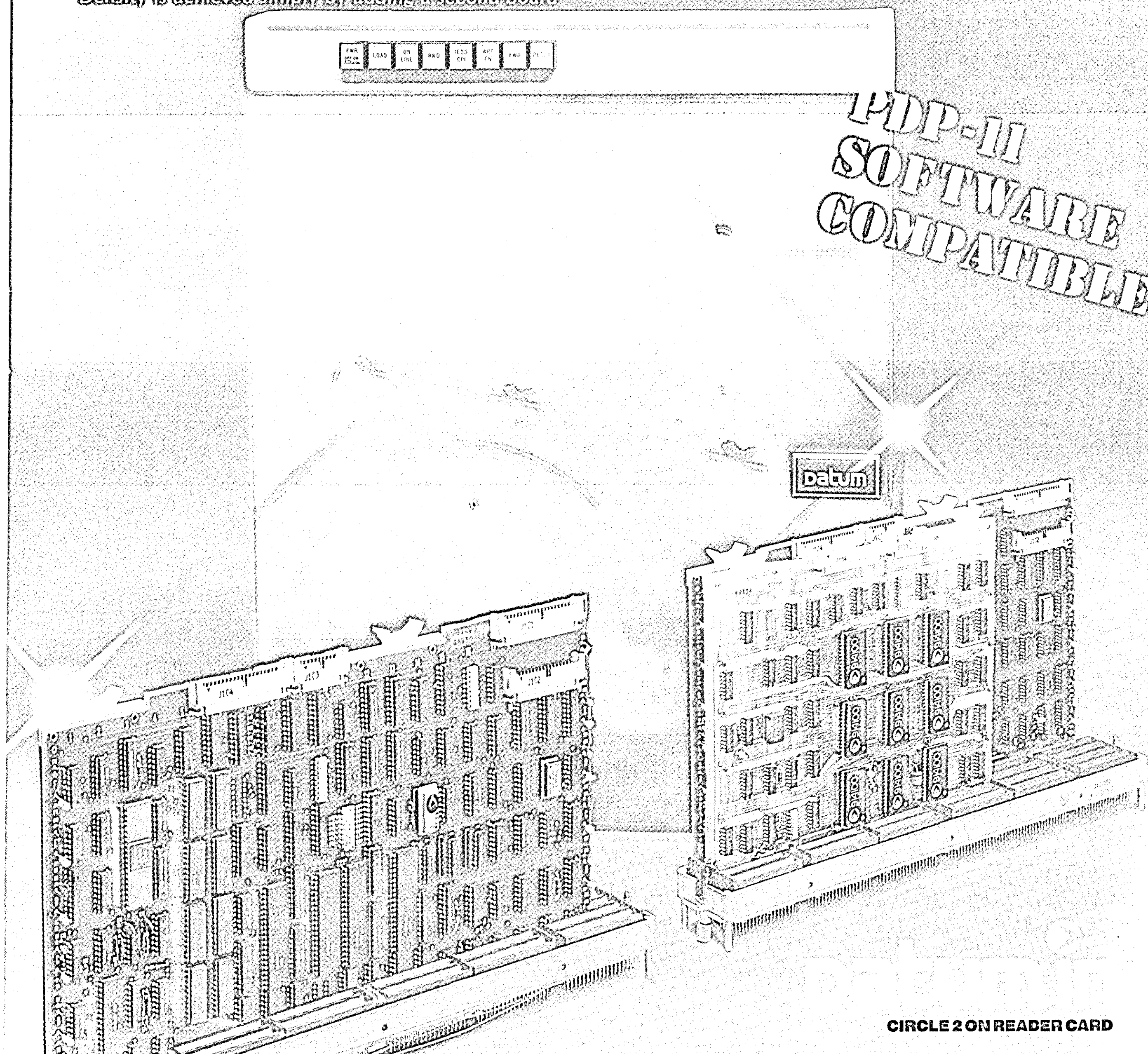

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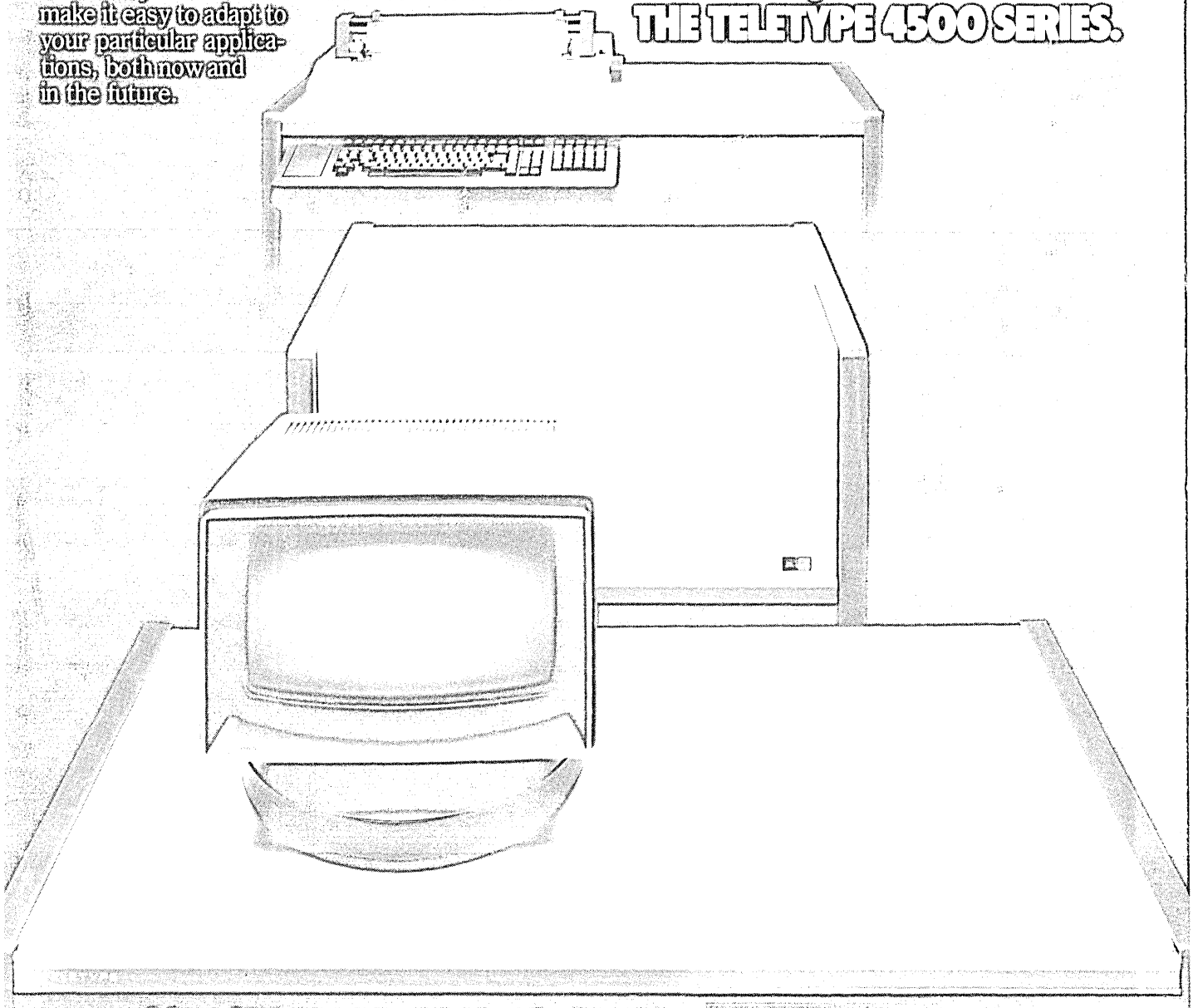

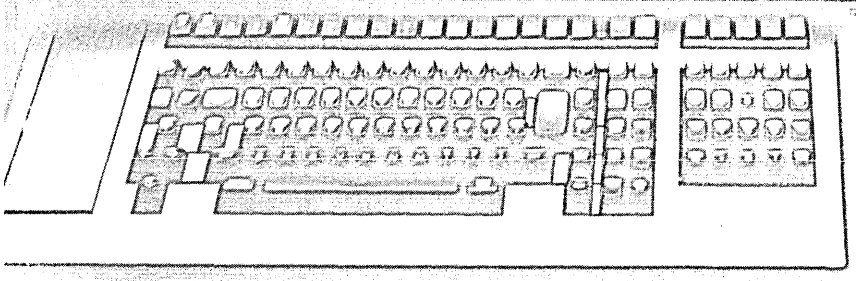

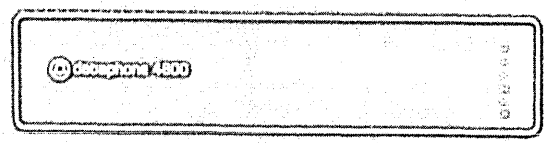

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