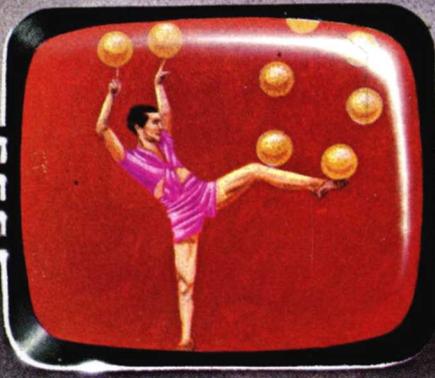


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Model 9100 (75 ips) and 9300 (125 ips) offer crystal-controlled timing, read-after-write shortened skew gate, front-accessible test panel, quick release hubs and simplified tape loading.

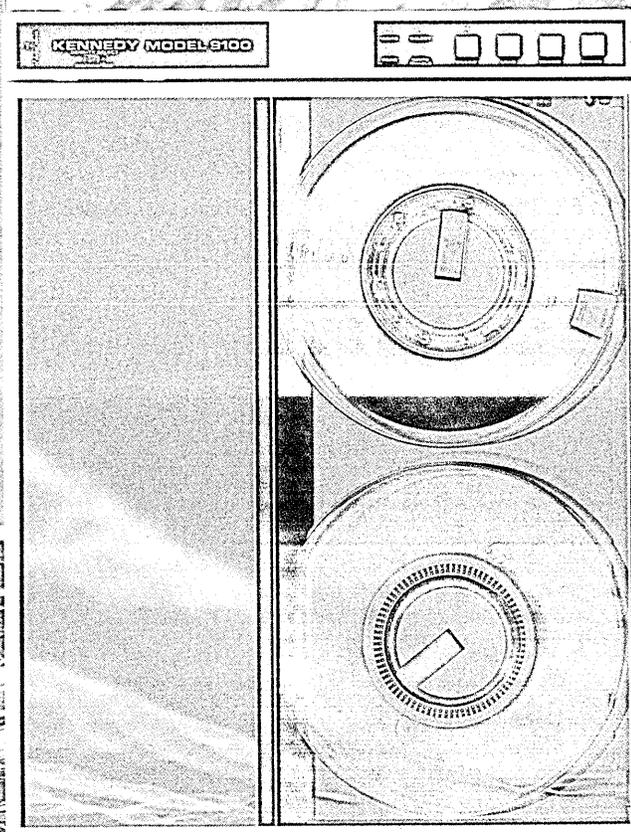
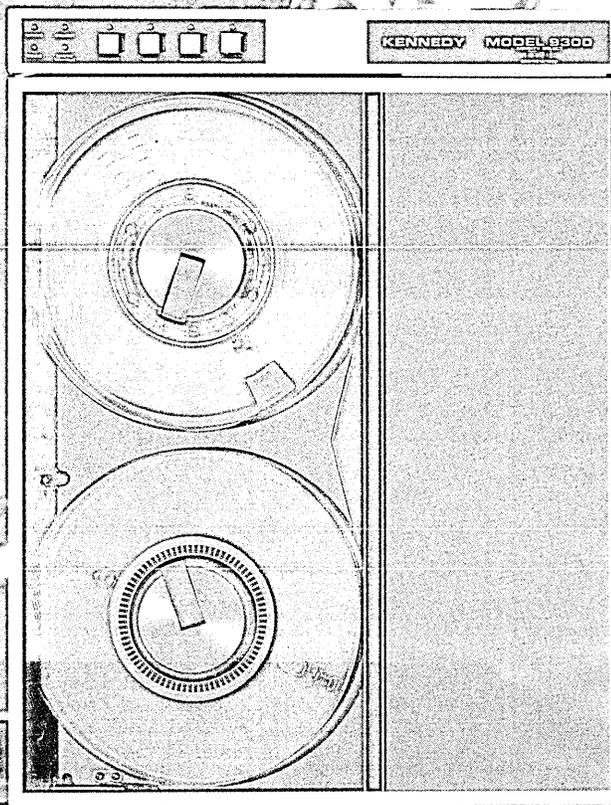
Data densities are 200/556 cpi or 556/800 on 7 1/2" dc units and 800 cpi, 1600 cpi or 800/1600 cpi on 5 1/4" dc transports. The format is NRZ1/PE.

Models 9100/9300 offer more features, more performance, and most important, more time-in-the-field than any competitive units.

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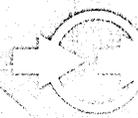
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## EXPANDABILITY

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

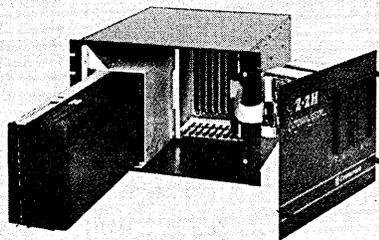
microcomputer field. Software Cromemco is known for. Software like this:

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- Data Base Management

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

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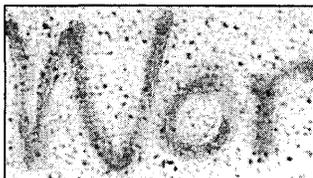
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### 146 YOU SAY YOUR DESIGN'S INEXACT? TRY A WIGGLE

**Gerald M. Weinberg**  
When in the formative stage, the judicious use of wiggly lines can help maintain perspective on the knowns and unknowns of system design.

## COVER

Maturing as an industry, remote computing now offers a wide choice of services. Illustration by Dennis Millard © 1979.

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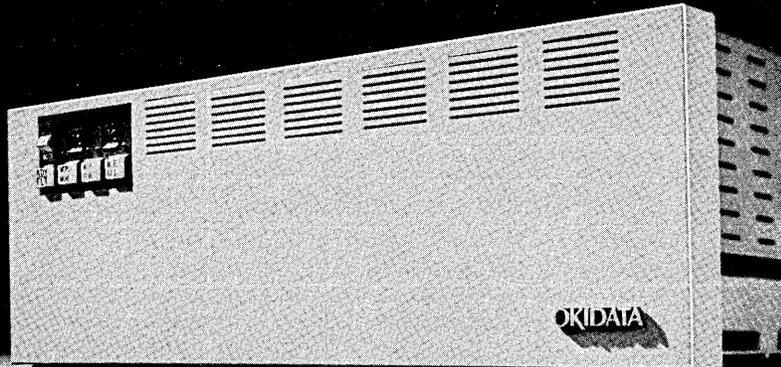
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**Senior Editor** Richard A. McLaughlin  
**Articles Editor** Wendy Reid Crisp  
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**Contributing Editors** Ralph G. Berglund  
Howard Bromberg, Philip H. Dorn, John M. Eger,  
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Russel Pipe, Carl Reynolds,  
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### EDITORIAL OFFICES

**Headquarters:** 1801 S. La Cienega Blvd., Los Angeles, CA 90035. Phone (213) 559-5111. **New England:** 161 High St., Boston, MA 02110 (617)426-2487 **Eastern:** 35 Mason St., Greenwich, CT 06830, (203) 661-5400, Telex 996343. 420 Lexington Ave., New York, N.Y. 10017, (212) 682-7760. 6605 Burlington Pl., Springfield, VA 22152. (703) 569-3383. **Southwestern:** 11500 Stemmons North, Suite 152, Dallas, TX 75299, (214) 247-5221. **Western:** 2680 Bayshore Frontage Rd., Suite 401, Mountain View, CA 94043, (415) 965-8222. **Foreign:** 20 Leamington Road, Southend-on-Sea, Essex, SS1 2SN, England; phone: Southend (0702) 611648. **TELEX 996-343**

### Art & Editorial Production

**Director** Cleve Marie Boutell  
**Advertising Production Manager** Marilee Pitman  
**Art Production Manager** James R. Griglak  
**Editorial/Production Assistant** William Pohl

### CIRCULATION

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**Marketing Research Manager** Deborah Dwellay  
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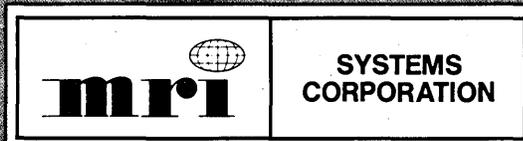
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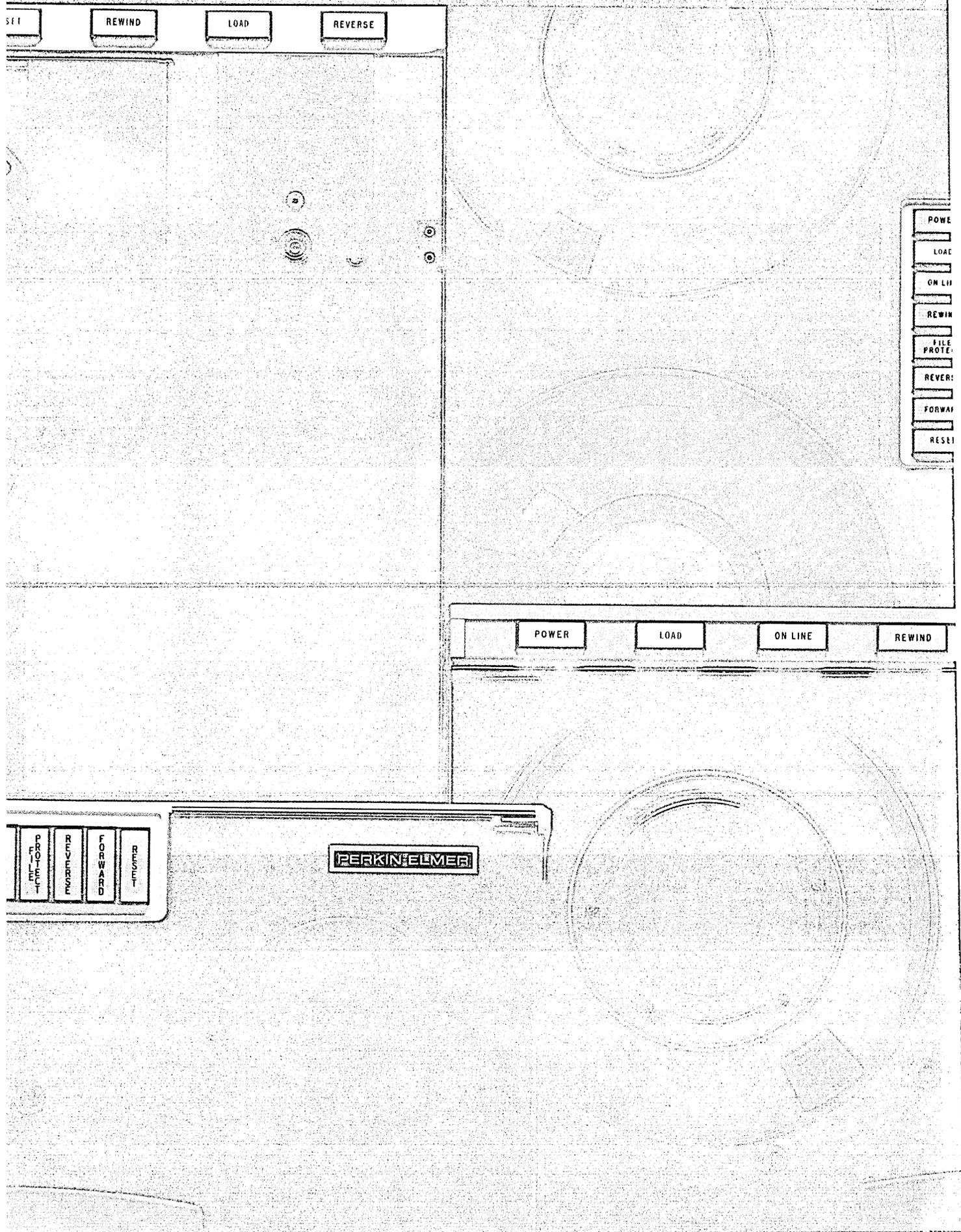
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FILE PROTE  
REVER  
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POWER LOAD ON LINE REWIND

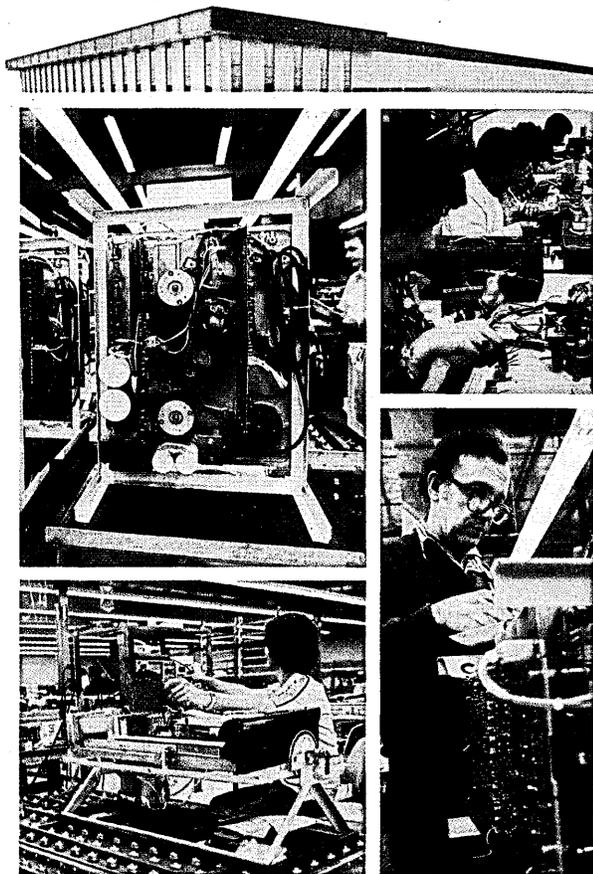
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## TWENTY YEARS AGO/TEN YEARS AGO

# LOOKING BACK

### JULY/AUGUST 1959

**Technology:** Burroughs Corp. remained a holdout in a gradual conversion by computer manufacturers to solid-state machines. A company statement said, "Despite the glamor and very active promotion of the competing solid state machines, the Burroughs model 220 (a vacuum tube device) continues to sell well. Since the release of the IBM 7070 in September of last year, Burroughs has received orders for 29 220s, 19 of them during the current year."

Meanwhile Remington Rand said its Univac Division's solid State 80s and 90s passed the 100 mark in sales.

**Startups:** Lester L. Kilpatrick, Ronald D. Cone, Eugene Seid, Robert C. Morton and Eugene W. Beckman have left Autonetics to set up their own company. The group has taken over management of California Computer Products, Inc., Downey, Calif.

**Milestones:** "It seems to me that never before in the history of mankind has the situation which is about to come upon us existed. This is the pervasion of computers and computing into every other science field and discipline. We've always thought of mathematics as the queen of the sciences pervading every other field, but computing is going to go much farther than that."—Paul Armer at a meeting on common problems in computing.

**International:** Compagnie des Machines Bull, Paris, claims to be the largest manufacturer of electronic computers in Europe and the third largest in the world.

### AUGUST 1969

**Time-sharing:** The point that should become clear is that future growth of the time-sharing industry is dependent upon its entry into the commercial applications

field. The rapidly changing technology of time-sharing must be influenced by the demands of this marketplace rather than by the design expertise of the industry innovators.—Robert F. Guise, Jr., president of Com-Share, Inc.

**Mainframers:** Under president Stanley Lang, NCR says it is definitely now in the information processing business. For the first time last year, says marketing head C. L. Keenoy, the sales value of edp products outstripped that of the other lines. But perhaps 95% of edp sales are lease instead of purchase.

**Arpanet:** The long-envisioned nationwide network linking computer centers and different makes of computers will go into operation before the end of 1969 with an initial subnetwork consisting of UCLA, with a Sigma 7; Stanford Research Institute, with an SDS 940; The Univ. of Santa Barbara, with an IBM 360/50; and the Univ. of Utah with a DEC PDP-10. The second phase of the project will take place at the end of 1970 after an evaluation of the four-member system and will incorporate six more centers into the network.

**Man of the Year:** DPMA has selected its first recipient for the man of the year award, only it's not a man. Commander Grace Murray Hopper, a well known figure in computer circles, received the award. Lately she has been working in the area of standardization, stongly backing COBOL as a universal language.

**PCMs:** Federal data processing users could save the taxpayers about \$200 million through increased use of independently made computer peripheral units, says the General Accounting Office. "At least three" independent manufacturers are selling plug-compatible tape transports 17-58% below the prices charged by "the largest computer system manufacturer (apparently IBM) and are leasing this equipment for 9-26% less," said GAO.

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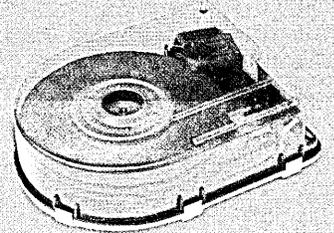
The NEC D-1200 Series is fast. Latency time of 8.3 milliseconds. Data transfer rate of 1.2 megabytes/second.

The NEC D-1200 is reliable. Its 10,000-hour MTBF is made possible by the encapsulated fixed disk and contact fixed read/write heads. Each head has its own LSI preamplifier which reduces errors by improving signal-to-noise ratio.

The NEC D-1200 is flexible. It has a dual-port option so two CPUs can share a single disk. Its address mark detector option saves system time in seek-and-search operations. Its two head-per-track options eliminate seek time and speed up overall performance. There's a front panel option with ready, fault, write/protect and off-on features.

The D-1200 is all-NEC. Circuitry, power supplies, the sealed Winchester module with its recording media, read/write heads, LSI circuits and rotary actuator are designed and built by NEC—the company with 15 years experience in developing and manufacturing disks.

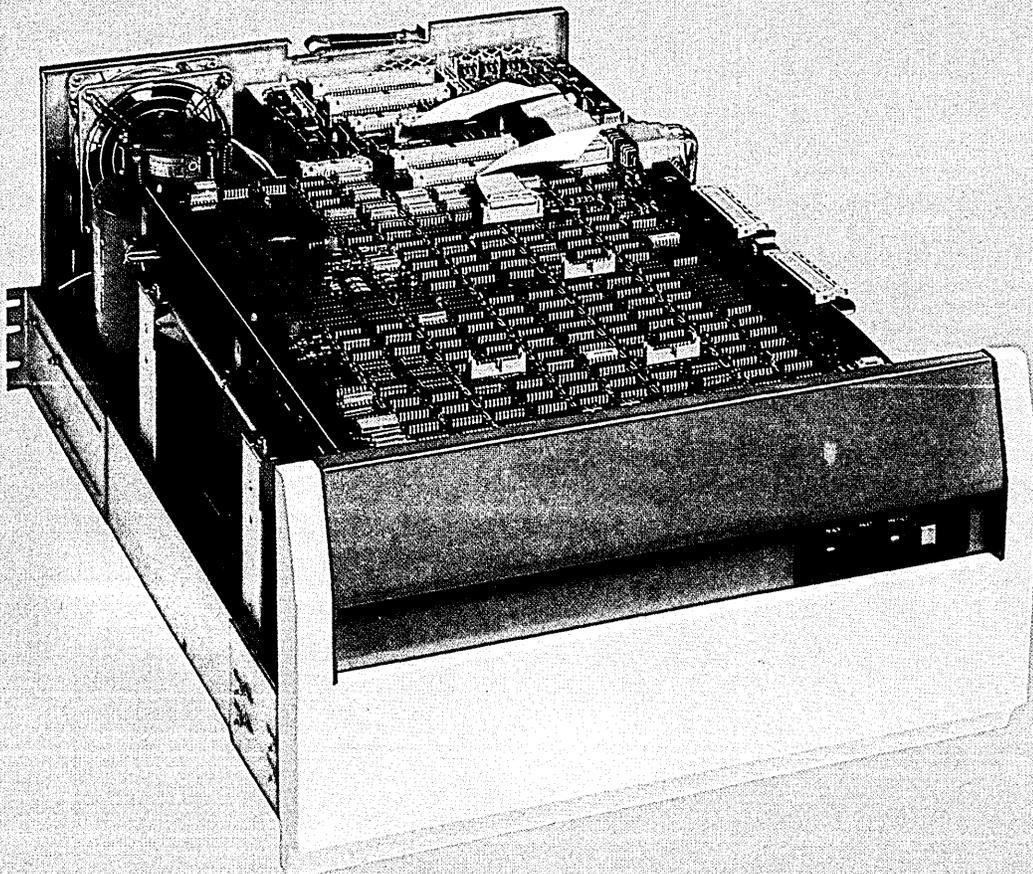
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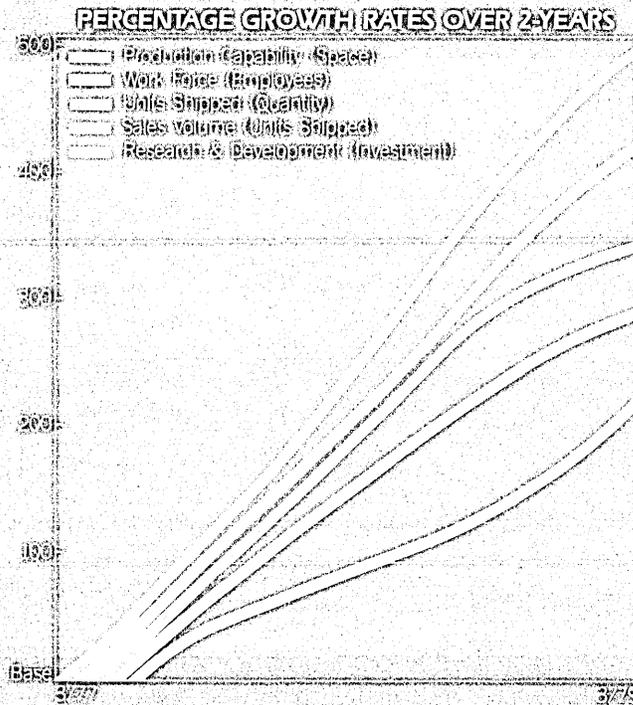
And we're still able to deliver our high performance, adaptable equipment with a reasonable price tag.

At Sperry Univac Mini-Computer Operations, we're making some big plans for our future and maybe yours.

The minicomputer industry has been growing by 20% - 35% every year. And as the industry grows and develops, applications for minicomputers appear virtually limitless.

We recognize that the market and the opportunities in the minicomputer industry are vast.

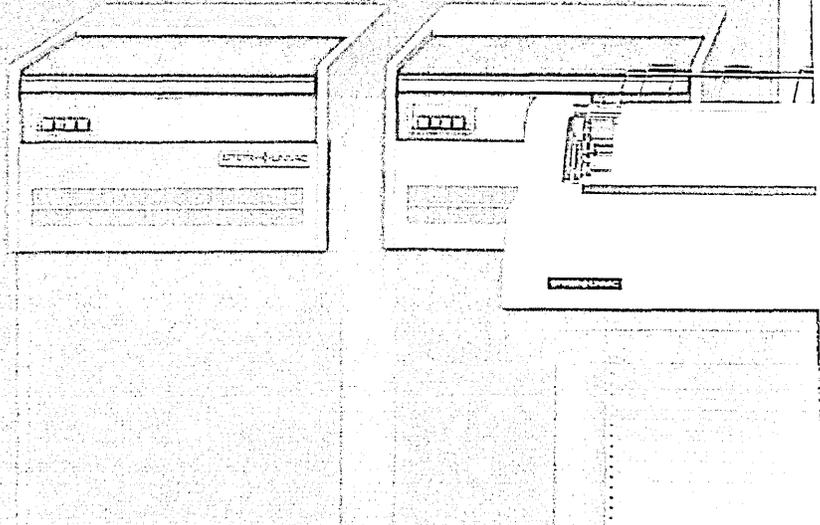
That's why, when we decided to enter the minicomputer market two years ago, we made the commitment to do it right.



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We not only build the minis, we provide complete support with competitively priced

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And we've recently introduced an array of enhancements and peripherals which include the Sperry Univac Disk Storage System, Serial Printer and the 128KB/256KB Error Correction Memory

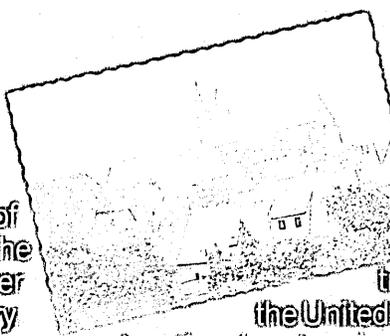
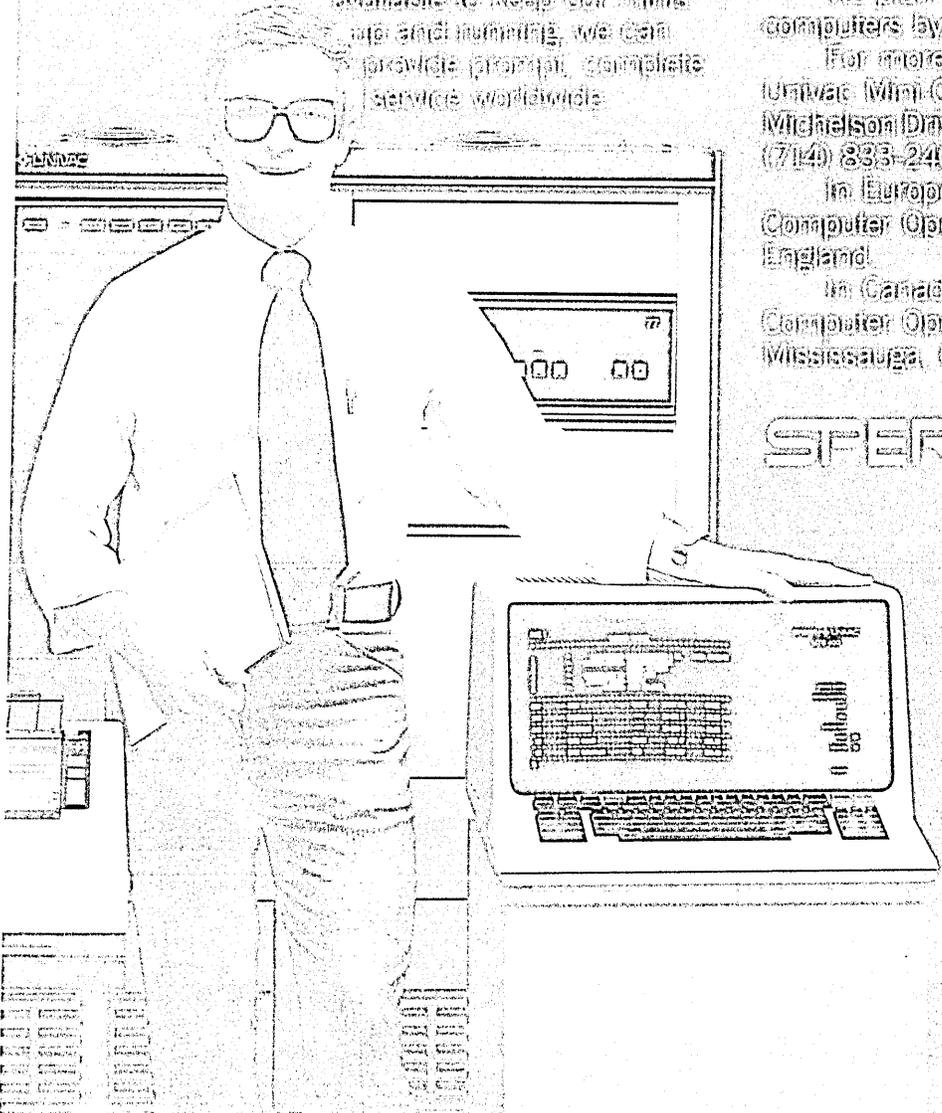
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But most important to our current and future customers, our research and development budget is five times what it was just two years ago.

**YOU'RE NEVER FAR FROM SERVICE.**

The Sperry Univac sales and service network is one of the largest and most responsive in the world. With over 8000 customer engineers available to keep our clients up and running, we can provide prompt, complete service worldwide.



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.

**PUTTING IT ALL TOGETHER.**

At Sperry Univac we have a reputation for quality, performance and service in the computer industry.

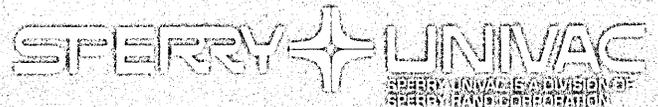
That's why we've committed ourselves to a major investment in production facilities, quality control and worldwide service. Our goal is to produce a complete line of dependable, reasonably priced minicomputers and peripherals that are as respected as Sperry Univac mainframes.

We plan to become a big name in mini-computers by doing all the little things right.

For more information, write to us at Sperry Univac Mini-Computer Operations, 2722 Michelson Drive, Irvine, California 92713. Or call (714) 833-2400, Marketing Communications.

In Europe, write Headquarters, Mini-Computer Operations, London NW10 8LS, England.

In Canada, write Headquarters, Mini-Computer Operations, 55 City Centre Drive, Mississauga, Ontario, L5B 1W4.



# Our new display terminal has a great supporting cast.



*The AJ 510 display terminal with AJ 460 Micro Diskette System, AJ 832/RO receive-only printer, and AJ 1234 acoustic data coupler/modem.*

The AJ 510, the most versatile CRT terminal in its class, excels at interactive timesharing and a lot of other jobs. And with the addition of these supporting AJ products, you can greatly expand your application flexibility.

## **Start with the AJ 510**

As a stand-alone device, the AJ 510 is ideal for jobs such as data entry, text editing, order entry, and graphics. It includes such features as ASCII, Graphics, and optional APL character sets; a bright 15-inch screen; 16 video enhancements; editing capability; a format mode with protected fields; and communications rates up to 9600 bps.

## **Now add data storage**

For convenient, low-cost data storage and retrieval, the AJ 460 Micro Diskette System offers you local data manipulation and high-speed on-line communications. Combined with the AJ 510, the AJ 460 helps you reduce telephone charges and computer connect time, while further increasing application flexibility.

## **And top quality printing**

Connect an AJ 832/RO receive-only printer and you get letter-quality hard copy output. Features include selectable data rates up to 45 cps, dual pitch selection,

vertical forms control, and more—even interchangeable "daisy" wheel printing elements so you can customize the type face to the application. Now you have a system that's ideal for form letters, contracts, and camera-ready art of all kinds.

## **And communications**

Finally, from the wide range of AJ couplers and modems, select the one that best fits your application. The AJ 1234 coupler/modem, for example, lets you take advantage of full duplex 1200 bps communications over dial-up or two-wire leased lines.

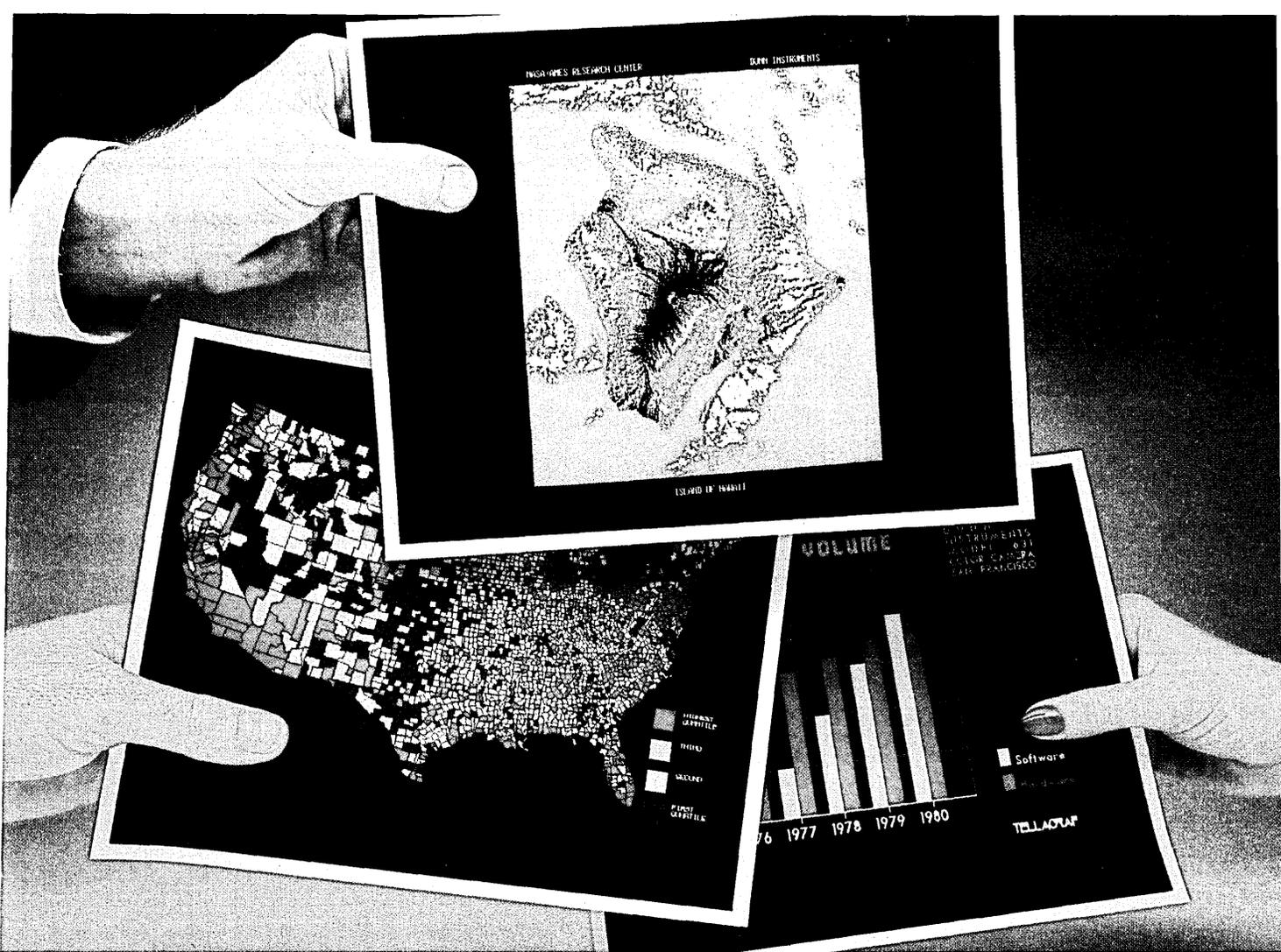
## **The final act**

We not only build all this equipment, we also lease, sell, and service it. We'll take care of it throughout its lifetime. Which makes life easier for you.

So whether you need a stand-alone terminal or one with a strong supporting cast, AJ has the answer. 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.

Also available through AJ subsidiaries in Ottawa, Ontario; Paris, France; Shepperton, Middlesex, U.K.; and distributors throughout Europe.

 **ANDERSON  
JACOBSON**

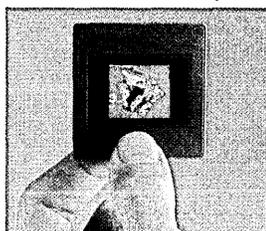


Actual, unretouched images made by the 631 System.

## Color hard copy is finally at hand!

Color hard copy: the luminescent electronic image, captured in the permanence of photographic prints and transparencies. Dunn Instruments makes it brilliant, accurate and effortless to obtain from an affordable system. At last you can hold the new computer graphics and digital images in your hands.

The source is the 631 Color Camera System. It packs a high resolution, high linearity CRT, sophisticated optics and microprocessor exposure control into a compact, fast and friendly unit. Use it with Type 808 Polacolor® 2 film for stunning 8x10 prints, instantly. Or load 8x10 transparency film for vivid



backlit displays and overhead projection. Add the optional motor-driven 35mm system to make beautiful color slides.

The 631 economically records the data from any raster scan CRT, for presentation, reproduction, access and display. Applications range from management information graphics to satellite remote sensing. Call or write to describe your hard copy needs. We'll see that you soon have your hands on full information and actual results from the 631 Color Camera System.

Dunn Instruments, Inc.,  
544 Second Street, P.O. Box 77172,  
San Francisco, CA 94107.  
415/957-1600.

## The 631 COLOR CAMERA SYSTEM

# DUNN INSTRUMENTS

"Polacolor" is a registered trademark of the Polaroid Corporation.  
LANDSAT image courtesy NASA-Ames Research.  
Cartographic study courtesy Harvard Laboratory for Computer Graphics. Management information graphics courtesy ISSCO.

From the graphics leader.

**“Almost all of our  
include computer graphic  
we just couldn’t**

**A**grico is one of the largest fertilizer manufacturers and marketers in the world. Its marketing, planning, finance, supply and distribution systems are now using a new decision-making tool: Tektronix plotter graphics.

Carol Mersch  
Information Systems  
Manager  
Agrico Chemical Co.

**O**riginally acquired to simplify monthly marketing data, the 4662 Interactive Digital Plotter from Tektronix has been quickly adopted for presentations and reports throughout Agrico management.

It's not surprising. The 4662 provides a remarkably fast, easy and economical way to obtain precise and camera-ready multi-colored bar charts, pie charts, line graphs and more, on either paper or overhead projector film.

Result: people can understand more by reading less.

“Before,” says Information Systems Manager Carol Mersch, “we couldn’t include graphic summaries unless we had five days and an artist on hand to do them.”



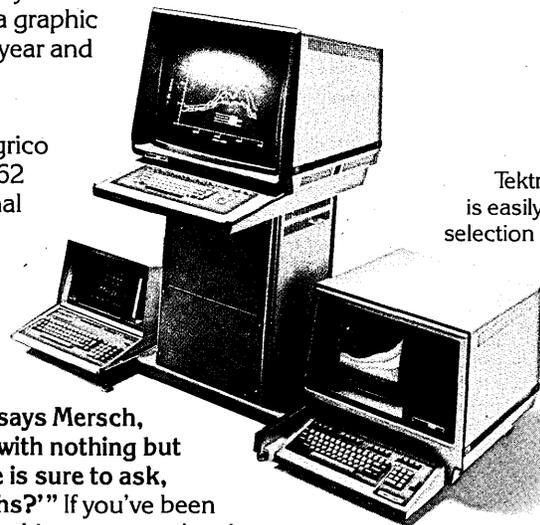
# operations reports now summaries. That's a convenience afford before."



Now, when Marketing requests a sales analysis or Planning asks for an analysis of harvest trends, they automatically receive a graphic overview of year-to-year and even week-to-week comparisons.

In the future, Agrico will be using the 4662 for three-dimensional contour plots of county-by-county sales densities, and to interactively illustrate "what if" type situations.

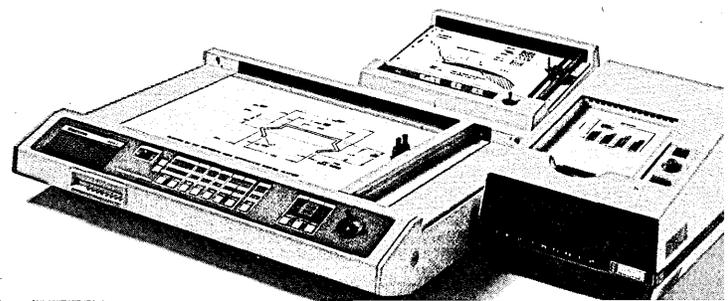
"These days," says Mersch, "if a report slips by with nothing but numbers, someone is sure to ask, 'where are the graphs?'" If you've been wondering the same thing, see your local Tektronix Sales Engineer. He'll show you the easiest, most reliable answers of them all, including B and C size plotters, copiers and our other computer graphics products. Or call our automatic answering service now, at 1-800-547-1512. In Oregon, call 644-9051 collect.



Tektronix provides what is easily the world's largest selection of desktop graphic computers, graphic terminals, even full-color graphics — all of which are plug-to-plug compatible with our plotter and hard copier devices.

**Tektronix, Inc.**  
Information Display Division  
P.O. Box 500  
Beaverton, OR 97077  
**Tektronix International, Inc.**  
European Marketing Centre  
Post Box 827  
1180 AV Amstelveen  
The Netherlands

**Tektronix®**  
COMMITTED TO EXCELLENCE



# NOW, A FULLY-INTEGRATED, MULTI-USER, INTERACTIVE COMPUTER SYSTEM FOR JUST \$29,950\*



The 5000/ES: BTI's new Entry System to the 5000 product line. It's a fully-integrated system specifically designed for a multi-user environment, featuring:

- MULTUS multi-user timesharing executive.

- Full-scale 16-bit minicomputer with the processing power and I/O capacity to support multiple concurrent users.

- 10 megabytes of hard disk; expandable to over 100 megabytes.

- 4 user ports; expandable to 32 ports.

- 6400 bpi cartridge magnetic tape.

- Unique proprietary account protection for application software.

- Optional industry-compatible magnetic

- tape; line printers to 900 lpm.

- 24 hours/day, 365 days/year maintenance support by BTI, featuring computer-to-computer remote diagnostics.

- The BTI 5000/ES is backed by experience—over 1000 BTI 5000 systems have been delivered.

- Application software is available for: accounting, financial modeling; manufacturing; medical billing; pharmacy management; school administration; text publishing; mailing list management, general-purpose data base management; and more.

- Call us for details on the new BTI 5000/ES.



\* Single quantity; attractive quantity discounts for the OEM.

BTI, 870 W. Maude Ave., Sunnyvale, CA 94086. Sales Offices: Piscataway, NJ (201) 457-0600; Cherry Hill, NJ (609) 662-1122; Braintree, MA (617) 843-4700; Minneapolis, MN (612) 854-1122; St. Louis, MO (314) 878-8110; Dallas, TX (214) 630-2431; Sunnyvale, CA (408) 733-1122; Anaheim, CA (714) 533-7161.

# LOOK AHEAD

## ICL'S NEW IMAGE: SMALL SYSTEMS

Britain's ICL will make a big push in the U.S. market next spring with a new series of small mainframes, in answer to IBM's 4300 series. The new line -- known internally as the M1 range -- is part of a new package as well as a new image for the company. Also to be launched with the new computers will be new "applications machines" based on its digested Singer line -- the 1500 and System 10, as well as new terminal processors to replace its 7500s.

ICL is trying to build a new profile at the small machine end of the market and wishes to become Europe's leading systems company. The M1 will feature three new models known internally as the 29AA, 29BB and 29CC. Its 29AAs will replace the current 2903 but at a lower price, which before the 4300 announcement was placed at \$80,000, and probably will go lower. The BB will replace the 2904. Both the 2903 and 2904 have sold steadily, if unspectacularly on the U.S. east coast.

According to ICL internal forecasts, the 29CC, at twice the power of the 2904, will sell at a rate of 4,000 units over the next four to five years.

The British company's attempt at a new profile will be bad news for ICL's big 2900 users who have increasingly been starved of new offerings. Many experts now believe that ICL is preparing to withdraw its VME operating system (equivalent to IBM's VMS) and slowly will pull out of the big mainframe sector. One source says the company wants to "become Singer in all but name."

## IBM'S "OFFENDING" POLICY ON SOFTWARE SOURCES

Sales policies at IBM's General Systems Div. are hurting entry level users by keeping larger software houses out of the small systems market such as the S/32, 34, etc. So says Commercial Software, Inc. of New York, which has taken its complaint to GSD through the services association ADAPSO. The "offending" policy is the GSD system of having salesmen refer customers to at least three third party suppliers for software.

According to CSI president Tony Abbott, "because IBM does the marketing for these suppliers, thousands of one to five-man companies have sprouted up all over the country and most of them are peddling their services at prices way below what they should be." Abbott claims that the bigger, often more stable software firms just can't compete in this market. "And many of those small companies...are collapsing as quickly as they form, leaving users in the lurch."

Interviews with small new users of IBM and other small business equipment nets one conclusion about the referral method: The quality of service ranges from horrendous to excellent. The stories get more favorable when the user is smart enough to bring in a software house before he buys his hardware.

The small third party supplier argues that he cannot survive without using IBM as his marketing arm, and, besides,

# LOOK AHEAD

the entry level user needs a referral to someone. Abbott counters that without the IBM referrals, "businessmen will meet the demand in a businesslike fashion in a competitive market not controlled by one company. IBM doesn't want to assume the cost and risk of supporting this market itself, so it is dumping the risk on someone who can't afford it." At last report, the CSI complaint had been passed up to Armonk.

## PAY-BY-PHONE COMPETITION HEIGHTENS

Competition in telephone bill paying, described by many as the "comer" in electronic funds transfer (EFT) services, is heating up. In New York City, Chase Manhattan Bank has stolen a march on arch-rival Citibank with a pay-by-phone service it started August 1. In Southern California Sears' (we're not in the banking business) Allstate Savings and Loan Assn. has been ballyhooing its pay-by-phone service, the only one available in that area, for several months.

And in Seattle, where it all began, Telephone Computing Service, Inc. is establishing a pay-by-phone service center to service financial institutions in the Northwest and other selected areas of the country. It is scheduled to be operational this fall. Chase's offering will extend its banking area. It is establishing a toll free number for users throughout the Northeast.

## SELLING MAINFRAMES WITH A SOFTWARE PACKAGE

Salesmen for Amdahl have started to use a capacity planning software tool as a sales tool. The product is an analytical software package offered by BGS Systems of Lincoln, Mass. called the Best One. Users in the midwestern U.S. report that Amdahl's salesmen occasionally have used Best One systems profiles to justify major sales.

The PCM vendor purchased one package license for its own internal operation in Sunnyvale, and then a second -- on a per use contract -- for sales prospects. BGS officials concede Amdahl may be using Best One in marketing, but stress they are not party to Amdahl sales and they have similar arrangements with other computer suppliers.

## AN EASY OUT FOR OEMS

Data General's OEM group is expanding its efforts to become a second supplier to systems houses and OEMs currently allied with other minicomputer vendors. The company's OEM marketing manager, Martin Oakes, says his salesmen will focus on OEMs who buy from the smaller minicomputer manufacturers with limited product lines. It will argue that new application packages give the OEM an opportunity to painlessly diversify his supply, reducing his exposure to vendor delivery problems.

## NEW STATUS FOR MAINTENANCE PEOPLE

A much higher status is being offered the customer engineer as computer manufacturers find that maintenance prices continue to soar while hardware prices plunge. The CE can expect better treatment as these companies offer all sorts of incentives, including a company automobile, to keep them. Russell Gerns, the manufacturing v.p. at startup Rexion

(continued on page 51)

# 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 Mullenau, 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**

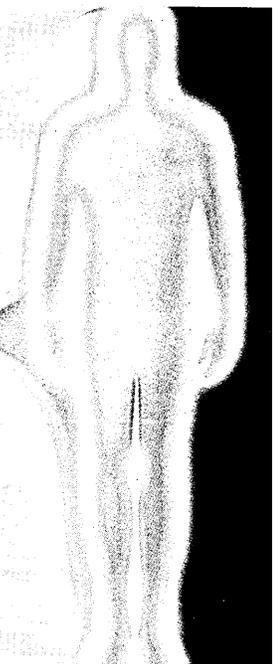
The Information Management Company



Name \_\_\_\_\_ DM 879  
Title \_\_\_\_\_  
Company \_\_\_\_\_  
Address \_\_\_\_\_  
City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_



CIRCLE 25 ON READER CARD



# VAX Performance. Ask any user.

**"VAX simply ran over the competition. In cost/productivity ratios, nothing even came close."**

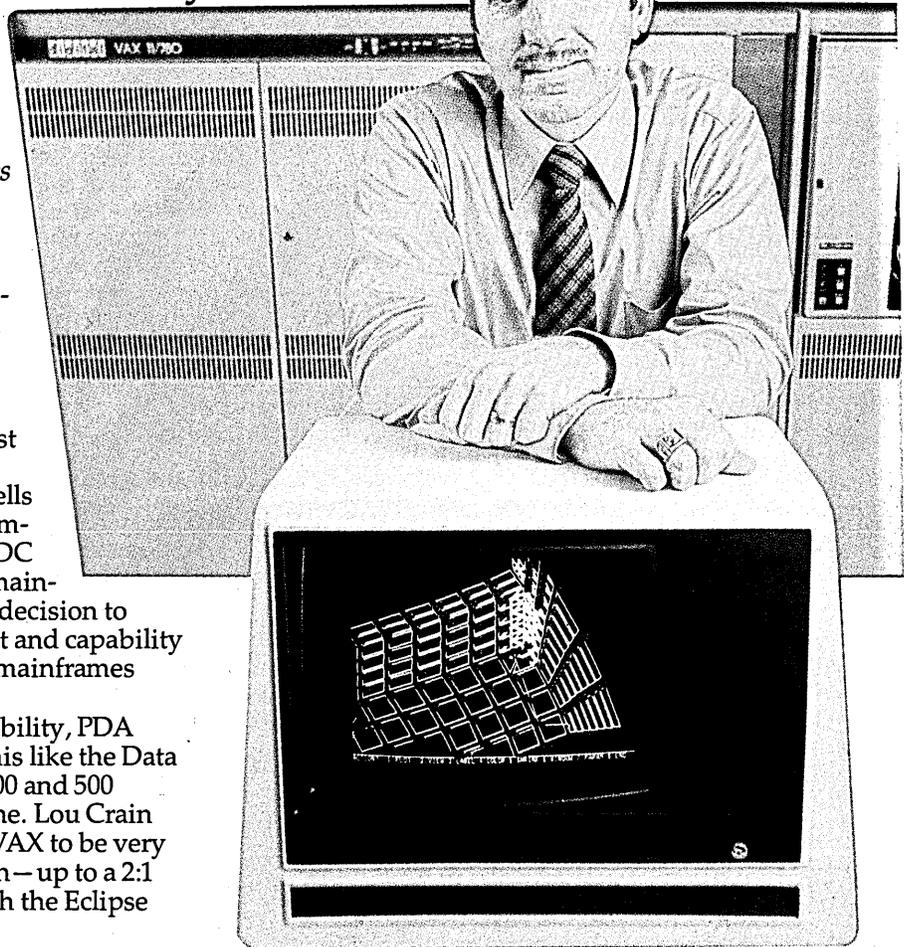
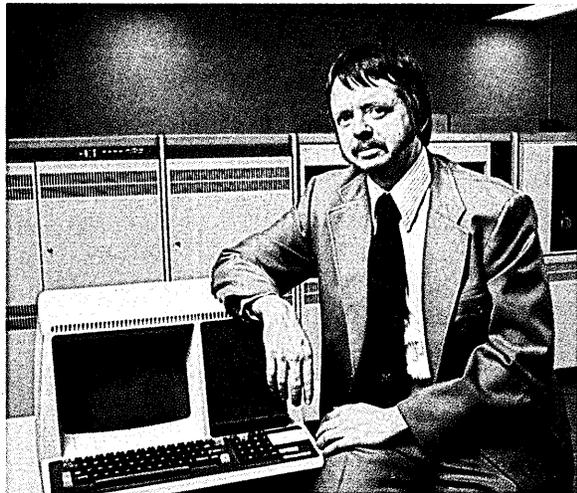
*Lou Crain, Mgr. of Software Products  
Prototype Development Associates  
Santa Ana, California*

PDA is an employee-owned engineering concern whose business ranges from fundamental research in structural analysis to the manufacture of critical aerospace components.

The VAX-11/780 is PDA's first in-house computer. Lou Crain, Manager of Software Products, tells us, "We've been doing all our computing through utilities using CDC 6600, Cyber 74 and Univac 1108 mainframes. The key elements in our decision to acquire the VAX-11/780 were cost and capability — compared to service bureaus, mainframes and competitive minis."

From the standpoint of capability, PDA considered traditional superminis like the Data General Eclipse and the Prime 400 and 500 series, plus a used 1108 mainframe. Lou Crain says, "Our benchmark showed VAX to be very powerful against the competition — up to a 2:1 performance advantage over both the Eclipse and the 1108."

"After installation," Crain concludes, "VAX has lived up to our expectations and has performed impressively. It's resulted in better



products for our customers, as well as improved cost-effectiveness. Having our own interactive capability in-house has meant an increase in engineering productivity of up to 300%."

**"VAX turns out to be twice the machine for the same amount of money."**

*Roger Vossler,  
Section Manager and Systems Engineer  
TRW Defense and Space Systems Group  
Redondo Beach, California*

Sensor data processing and distributed processing systems in support of real-time embedded applications are among the specialties of TRW's Defense and Space Systems Group.

To find the right computer, TRW continues to evaluate numerous machines — including Digital's VAX-11/780. They've also conducted numerous FORTRAN and PASCAL benchmarks.

In every test, VAX stands out as a clear winner.

Roger Vossler, Section Manager and Systems Engineer, says, "VAX is one of the best implementations we've seen of a successful integrated hardware and software system."

Since TRW's sensor data processing applications require enormous memories — over a million bytes to store a single image, for example — VAX's true 32-bit address space is vitally important. In addition, says Vossler, "VAX's I/O bandwidth capabilities are extremely important for effectively moving large quantities of real-time data at very high data rates."

Because TRW already had an investment in Digital technology, Vossler is particularly impressed with the relative ease of moving PDP-11 series programs onto VAX.

"But," says Vossler, "Even if I were starting all over again — without our Digital experience — I would still pick VAX, on the basis of its architecture, both hardware and software, and its impressive performance."

## "Implementation was faster on VAX than on 25 other machines."

*Brian Ford, Director  
Numerical Algorithms Group  
Oxford, England/  
Downers Grove, Illinois*

The Numerical Algorithms Group develops and maintains mathematical and statistical software libraries for customers in industry, science and academia.



Before VAX, NAG had implemented their complex Mark 6 Library on 25 major machines, including the Burroughs 6700, CDC 7600, Univac 1100, and the IBM 370. The average implementation time was 13 man-weeks.

VAX took five.

In Dr. Ford's words, "A successful implementation requires the correct functioning of the 345 library routines to a prescribed accuracy and efficiency in execution of NAG's suite of 620 test programs. Whilst the activity is a significant examination of a machine's conformity to the ANSI standard of the FORTRAN compiler, its main technical features are file creation, file comparison, file manipulation and file maintenance."

And implementation performance was just the start. Dr. Ford comments on VAX's impressive record of reliability after the program was up and running: "No problems were encountered in the VAX/VMS software even though approximately 3000 files were being handled. The operational availability time for the machine was close to 100%, an outstanding statistic for new hardware and a new operating system.

"VAX," Dr. Ford concludes, "is an implementor's dream."

Digital's VAX-11/780 has re-defined the level of performance you can expect from computers in its price range.

If your application requires large number crunching capability, high floating point accuracy, or lots of high-speed real-time calculations, there is simply no better system.

But don't take our word for it. Send for our new brochure. And listen to our customers.

- Please send me the new "VAX—Ask Any User" brochure and detailed Technical Summary.  
 Please contact me.

Name \_\_\_\_\_ Title \_\_\_\_\_

Company \_\_\_\_\_

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City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_

Phone \_\_\_\_\_

My application is:  Education  Medical  Laboratory  
 Engineering  Government  Resale  Other

Send to: Digital Equipment Corporation, 146 Main Street, Maynard, MA 01754, Attn: Communication Services, NR-2/2, Tel. 617-481-9511, ext. 6885.

Digital Equipment Corporation International, 12 av. des Morgines, 1213 Petit-Lancy, Geneva, Switzerland

In Canada: Digital Equipment of Canada, Ltd.

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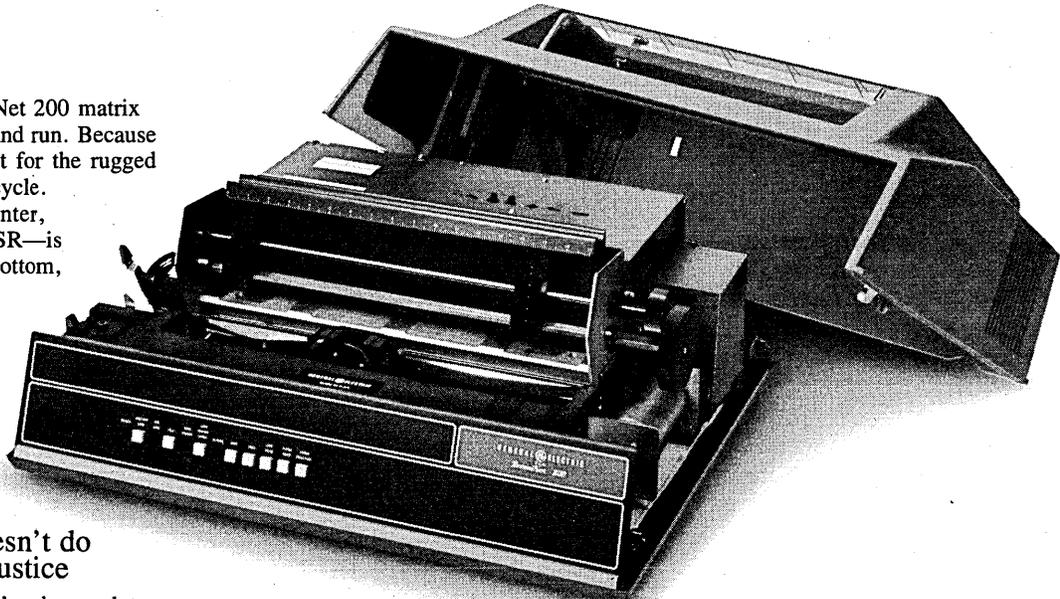
**digital**

# Just look beneath the surface and you'll see why TermiNet<sup>®</sup> printers like the 200 line live such long, productive lives.

**G**eneral Electric TermiNet 200 matrix printers will run and run and run. Because these are the printers built for the rugged demands of a 100% duty cycle.

Every one-line printer, KSR, RO, ASR and MSR—is engineered from top to bottom, inside and out, with materials and components that will keep them on-line longer.

Take a look for yourself and you'll be just as convinced.



## “Tough” doesn't do the design justice

Start with the base. It's a heavy-duty, thicker-gage metal base chosen for the extra stability it gives the entire printer. So no matter how often you move or handle our printers, printhead alignment and print quality will not be affected.

Notice how little hardware and how few moving parts there are. You know that means fewer problems, less downtime and more productive work time.

Check out the housing, too. It's molded from NORYL<sup>®</sup> thermoplastic resin. A material long recognized for exceptional impact strength, dimensional stability and heat resistance. All of which means TermiNet 200 printers are exceptionally resistant to scratches, stains, cracks and mars.

## A printhead that won't quit on you

Everything about our matrix printheads says they won't have the problems most printheads do.

First of all, their head life is at least 100 million characters. Under test conditions, in fact, our matrix heads have even exceeded 300 million characters.

One reason: they're molded from a very tough plastic selected for its excellent dimensional stability and impact strength. The bottom line? Wires that won't wear out prematurely. And longer printhead life.

Another reason: a unique bronze-filled plastic insert that enables the printhead to maintain high print quality longer.

And, unlike ordinary printers, ours has a straight-wire printhead design. There are no curved wires or jeweled guides to create friction, impair character resolution or wear out quickly.

## Servo motors cause fewer problems

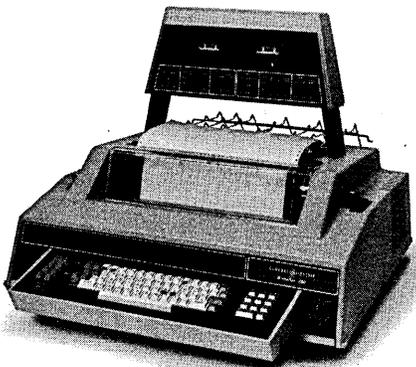
That's why, instead of conventional steppers, we opted for individual D/C servo motors to drive the printhead and paper

handling systems. As a result, operation is much smoother and more reliable. Plus, the motors last longer. In fact, test motors have undergone over 20 million reversals without a single failure.

## Need further proof?

Look at the printhead carriage. To prevent friction and lubrication problems, it's mounted on graphite bearings. Not ball bearings. Result: the carriage moves more smoothly and the life of the printing system is extended.

If you're still not convinced TermiNet 200 matrix printers are built from the inside out to keep on running day after grueling day, let us prove it to you. Write today to: General Electric Company, TermiNet 794-39A, Waynesboro, VA 22980.



TermiNet 200 MSR (ASR also available)



TermiNet 200 KSR

**GENERAL**  **ELECTRIC**

# The RIXON Alternative

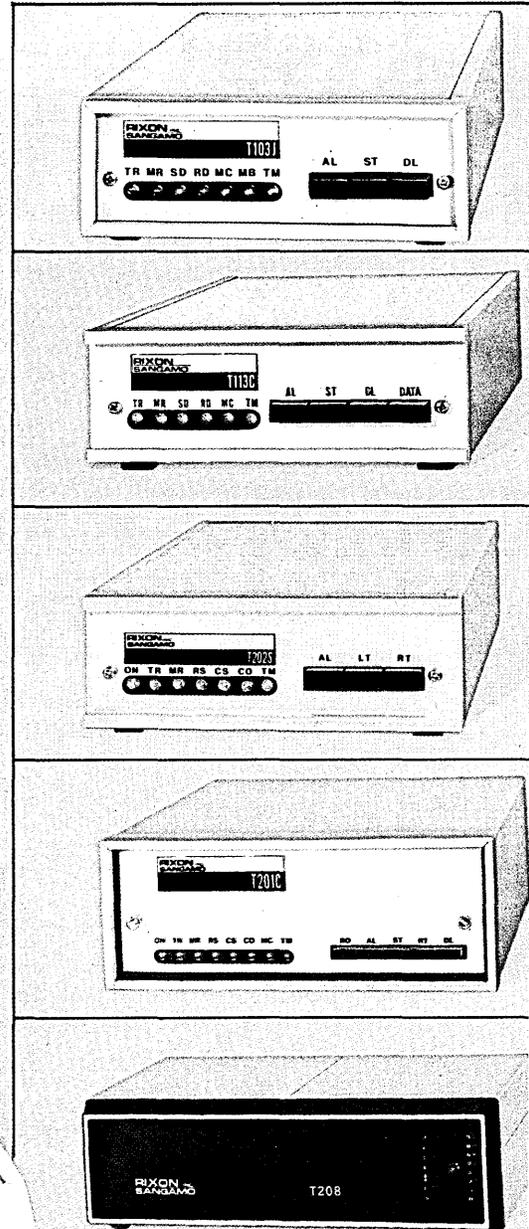
**Complete Line of FCC Registered  
DDD Direct Connect Data Modems  
Designed to Save You Money the  
Moment You Plug Them In.**

- **DIRECT REPLACEMENT** — Unplug your Bell 103J, 113C, 202S, 201C, 208B or 212A and plug in a Rixon T103J, T113C, T202S, T201C, T208B or T212A replacement. It's that easy.
- **SAVE MONEY** — Compare prices . . . the Rixon Alternative is lower!
- **YOUR CHOICE** — LEASE OR BUY — With Rixon, you can lease with a buy option or buy outright.
- **OTHER Rixon ALTERNATIVES** include . . . dial-up test center . . . exchange/repair program . . . service contract . . . the latest technology and built-in diagnostics.
- **PEACE OF MIND** — For more than two decades, Rixon has served data communications needs with quality products and service.

A satisfied customer is our first consideration.

**SEND FOR THE RIXON ALTERNATIVE KIT . . .**  
with details on our complete line of DDD data modems, a comparison chart on prices, details on our lease and service programs and more.

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(301) 622-2121 • TWX: 710-825-0071

# CALENDAR

## SEPTEMBER

### **Engineering Software, September 4-6, Southampton, England.**

Contact Dr. R. Adey, Engsoft, 6 Cranbury Place, Southampton SO2 0LG, England.

### **FOC '79, September 5-7, Chicago.**

The Second International Fiber Optics and Communications Exposition will be held at Chicago's Hyatt Regency O'Hare. FOC '79 offers the communications world what the sponsors describe as "the only complete Fiber Optics Informational/Marketing Event, including a technical program, exhibits/demonstrations, and short courses." Contact Michael A. O'Bryant, Director Expositions and Publications, 167 Corey Rd., Suite 111, Brookline, MA 02146, (617) 739-2022 and in Europe contact Hawley Russell, 5 Rue de Davioud, Paris 75016, France/525-7085.

### **Fourth International Conference on Software Engineering, September 17-19, Munich.**

Contact Dr. L. Stucki, Boeing Computer Service, P.O. Box 24346, Seattle, WA 98124 (206) 576-5118.

### **Fourth Annual Computer Show and Exposition, September 19-20, El Paso, Texas.**

For more information contact Ray Karriker, P.O. Box 1894, El Paso, TX 79950.

### **TELECOM 79, September 20-26, Geneva.**

Sponsored by ITU, the International Telecommunications Union. There will be an exhibition, book fair, and film festival. Contact Secretariat TELECOM 79, Orgexpo, 18, quai Ernest-Ansermet, Case postale 65, 1211 Geneva 4, Switzerland; telephone (022) 21 95 33.

### **International Conference on the Role of the Computer in Society, September 24-28, Dubrovnick, Yugoslavia.**

Contact R. L. Schiffman, Dept. of Civil, Environmental and Architectural Engineering, Univ. of Colorado, Boulder, CO 80309 (303) 492-7607.

### **WPOE '79, September 25-27, San Jose.**

Word processing and office equipment show and conference. Contact Cartledge & Associates, Inc., 491 Macara Ave., Suite 1014, Sunnyvale, CA 94086 (408) 245-6870.

### **The Third Annual Data Entry Management Conference, September 25-28, New Orleans.**

Over 30 sessions, panel discussions and interactive workshops will explore "1980's Years of Growth in Data Entry." For more information contact Marilyn Bodek, P.O. Box 3231, Stamford, CT 06904 (203) 322-1166.

### **MIMI '79, September 26-29, Montreal.**

The ninth International Symposium and Exhibition on Mini and Microcomputers. The theme will be "The Evolving Role of Minis and Micros Within Distributed Processing." Contact MIMI '79 Montreal, P.O. Box 2481, Anaheim, CA 92804 (714) 774-6144.

### **Northeast Computer Show, September 28-30, Boston.**

The small computer show will feature both personal and business computing, in separate areas. Contact Northeast Expositions, P.O. Box 678, Brookline Village, MA 02147 (617) 522-4467.

## OCTOBER

### **Advanced Techniques in Failure Analysis Symposium and Exposition, October 8-11, Los Angeles.**

At the Los Angeles Marriott Hotel, sponsored by the International Society for Testing and Failure Analysis. Contact Ron Clarke (213) 536-3430 or Bob Myers (213) 475-4571 for further information.

### **The Eighth NASTRAN User's Colloquium, October 9-11, Kennedy Space Center, Florida.**

Due to conference facility security all interested persons are required to notify COSMIC of their intention to attend the Colloquium. For further information contact 8th NASTRAN User's Colloquium, COSMIC, 112 Barrow Hall, Univ. of Georgia, Athens, GA 30602 (404) 542-3265.

### **1979 EMC Symposium, October 9-11, San Diego.**

For further information contact Fred Nichols, 1979 IEEE-EMC Symposium, P.O. Box 17510, San Diego, CA 92117 (213) 870-9383.

### **AICA (Associazione Italiana Calcolo Automatico), October 10-12, Bari, Italy.**

The AICA annual congress is the main meeting point for professionals and researchers in computer science in Italy. The program will focus on distributed informatics, software production, systems performance evaluation, and informatics and environment. The aim is "to promote a punctual information on the state of the art." For information contact Istituto de Fisica, Via Amendola, 173-70126 Bari, Italy 080 331044.

### **INFO 79, October 15-18, New York.**

The Sixth International Information Management Exposition & Conference. Attendance may reach 20,000. Exhibitors such as IBM, Basic Four, Xerox, Datapoint, NCR, Hewlett-Packard, Wang and Vydec have reportedly increased the size of their booths by an average 44% in comparison with last year's show. Contact Clapp & Poliak, Inc., 245 Park Ave., New York, NY 10017 (212) 687-7730.

### **Fifteenth Meeting of the Computer Performance Evaluation Users Group, October 15-19, San Diego.**

Sponsored by the National Bureau of Standards. Papers, tutorials and case studies will be presented on, among others, the following topics: installation performance; workload forecasting; network performance; fraud; security and CPE; measuring user satisfaction; workload modeling; benchmarking; remote terminal emulation; performance prediction techniques; and CPE in auditing. Contact Judith G. Abilock, The MITRE Corp., Metrek Div., 1820 Dolley Madison Blvd., McLean, VA 22102 (703) 827-7072.

### **Computer in Aerospace II, October 22-24, Los Angeles.**

Contact Richard R. Erkeneff, McDonnell Douglas Astronautics Co., 5301 Bolsa Ave., Huntington Beach, CA 92644 (714) 896-4975.

### **Ninth Annual Conference of the Association of Computer Programmers and Analysts,**

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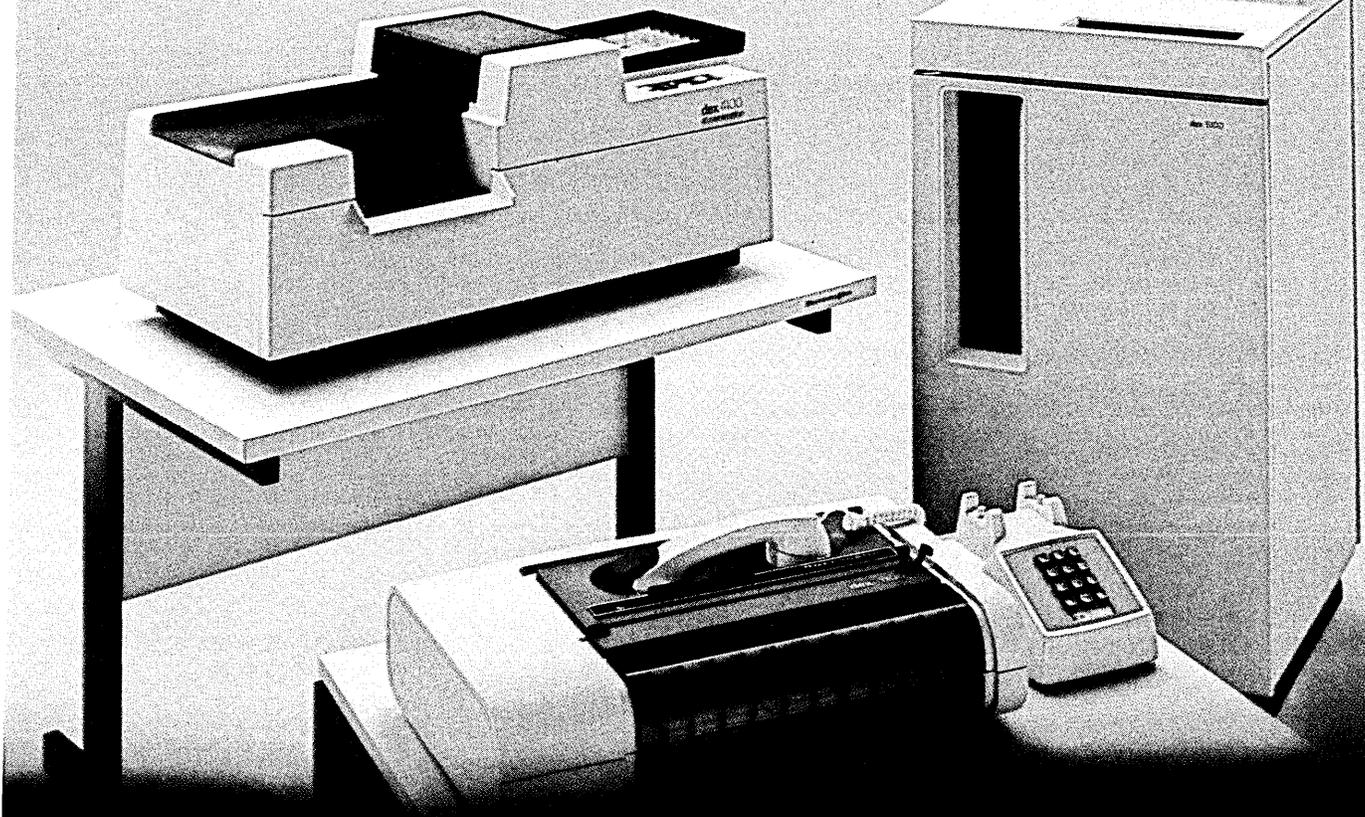
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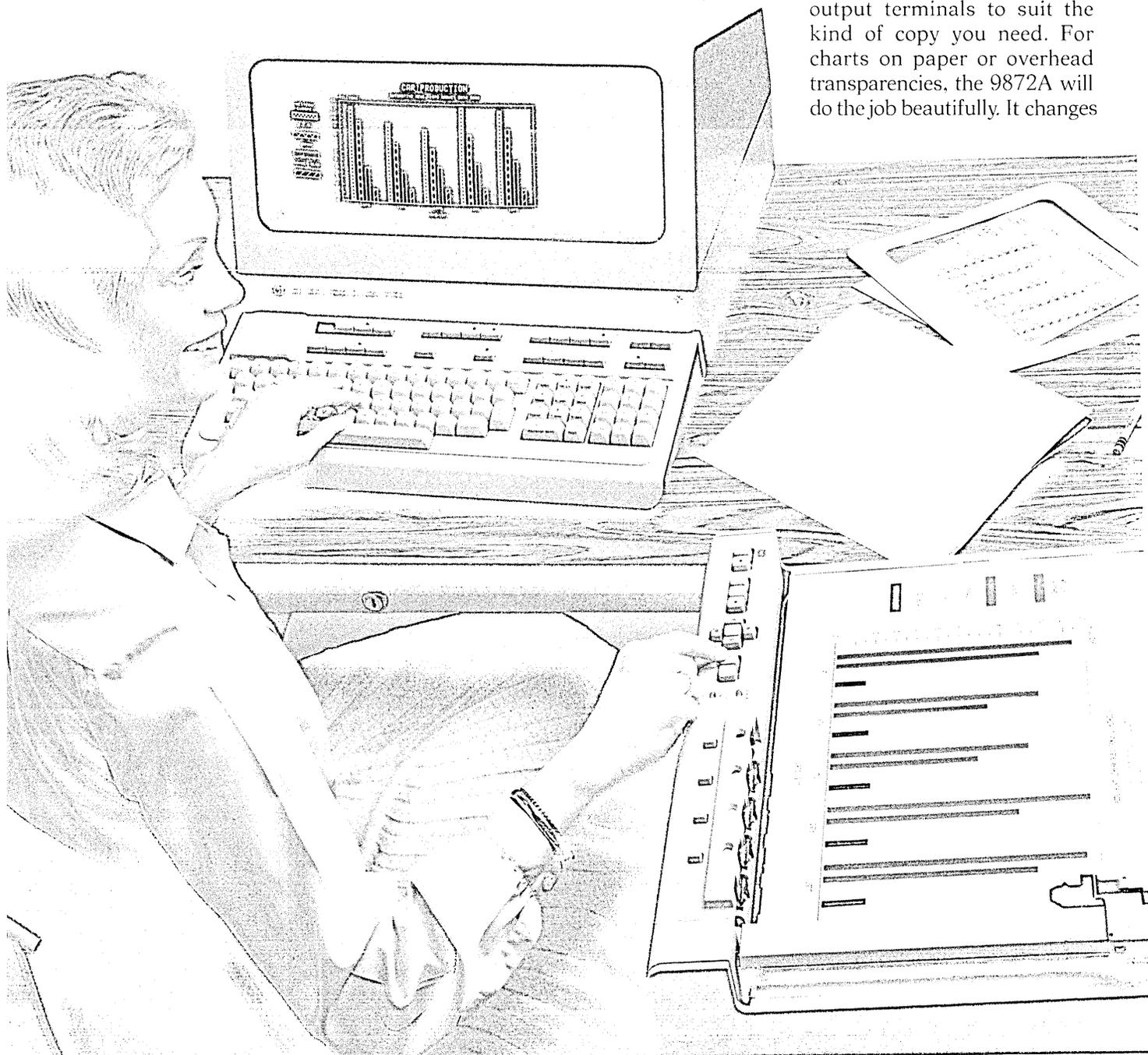
All you need is a Hewlett-Packard Graphics Workstation. It's built around our 2647A, a highly intelligent but moderately priced Graphics Terminal that lets you plot tabular data as a bar graph, pie chart, linear or logarithmic line graph. All without writing any software.

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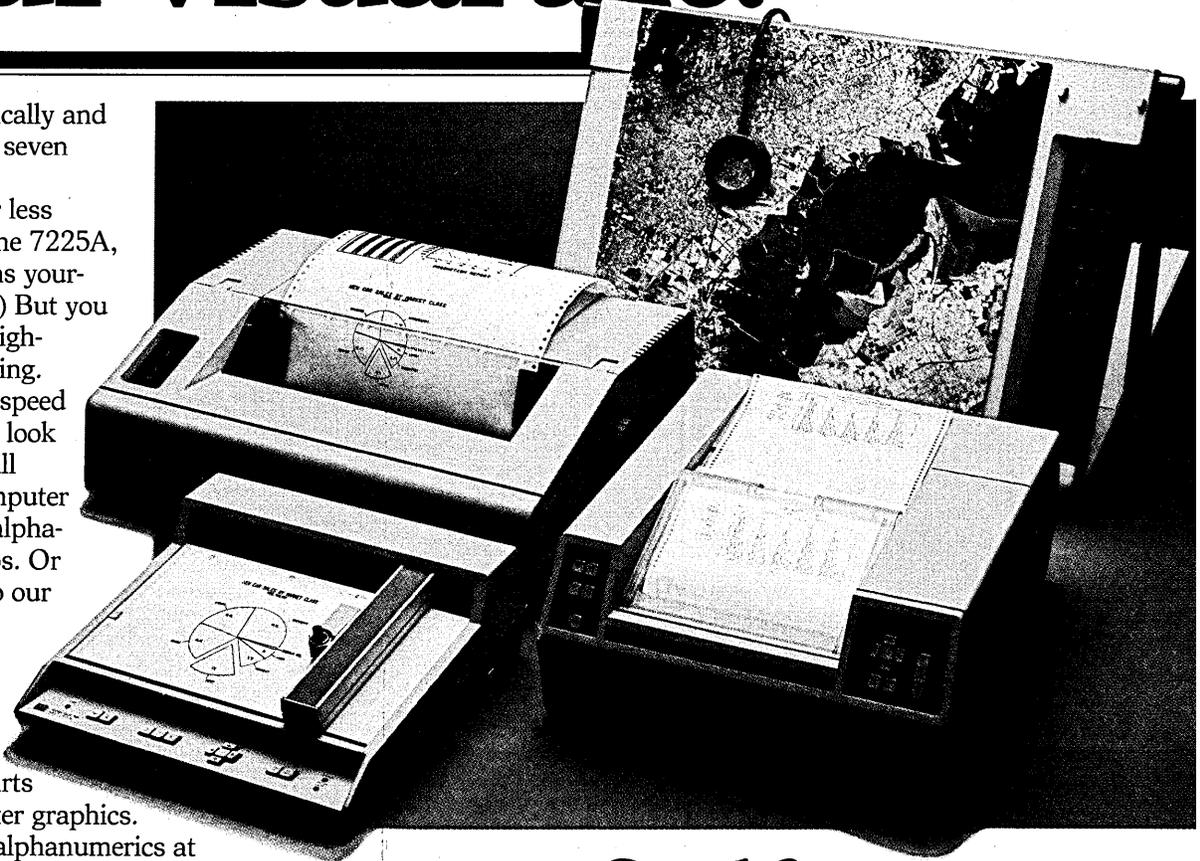
four pens automatically and will give you up to seven different colors.

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CIRCLE 42 ON READER CARD

## CALENDAR

### October 22-24, Washington, D.C.

ACPA will be sponsoring a software showcase. For more information contact Ken Burroughs, 1500 N. Beauregard St., Alexandria, VA 22311 (703) 820-3310.

### Government-Industry Data Exchange Program (GIDEP), October 23-24, Orlando, Florida.

Annual conference and workshop, to be held at the Harley Hotel, Orlando. For more information call Dennis Starling, DatagraphiX, Inc. (714) 291-9960, X1266.

### ACM Annual Conference, October 29-31, Detroit.

The theme is "Advances of the 70s—Challenges of the 80s." Contact Mayford L. Roark, Ford Motor Co., The American Road, Room 895 WHQ, Dearborn, MI 48121 (313) 323-1690.

### Interface West, October 30-November 1, Anaheim.

Conference sessions are planned on small computers and office automation systems, word processing, distributed dp, and data communications hardware, software and services. Contact The Interface Group, 160 Speen St., Framingham, MA 01701 (800) 225-4620; in Massachusetts, (617) 879-4502.

## NOVEMBER

### COMPSAC 79, November 5-8, Chicago.

The third International Conference on Computer Software and Applications, sponsored by the IEEE. The first day is devoted to tutorials. Papers are being considered in the areas of software development methodology; software management; data base management systems; data communication and computer networking; transaction and information management systems; computers and biomedicine; business office automation; design automation; application-oriented languages; reliability, maintainability and security; software testing and tools, mini/micro software, distributed system performance, human engineering of software systems, legal implications of dp technology and others. Contact the general chairman, Dr. William Smith, Executive Director, Toll Electronic Switching and Operator Services Div., Bell Laboratories, Naperville, IL 60540 (312) 690-2389.

### Federal Computer Conference, November 6-8, Washington, D.C.

Over 6,000 people attended last year. Contact the Federal Computer Conference, P.O. Box 368, Wayland, MA 01778 (617) 358-5181.

### Canadian Computer Show, November 13-15, Toronto.

Last year's attendance was 15,159. This year's show will celebrate the 10th anniversary of the Canadian Computer Show. Contact Reg Leckie, Show Manager, Canadian Computer Show, 36 Butterick Road, Toronto, Canada M8W 3Z8 (416) 252-7791, or Bill Robertson at (416) 444-0321.

### American Bankers Assn. Western Regional Workshop, November 14-16, San Francisco.

Contact the Meetings Coordinator, Operations & Automation Div., American Bankers Assn., 1120 Connecticut Ave., N.W., Washington, DC 20036 or call William Moroney at (202) 467-4332.

### The Third Western Educational Computing Conference, November 15-16, San Francisco.

Sponsored by the California Educational Computing Consortium (CECC). For further information contact Ron Langley, Director, Computer Center, California State Univ., Long Beach, 1250 Bellflower Blvd., Long Beach CA 90840 (213) 498-5459.

### INTELEC 79, November 27-29, Washington, D.C.

The International Telecommunications Energy Conference is sponsored by the IEEE Communication Society. Contact R. H. Jones, Publicity, 1979 INTELEC Committee, ITT North Electric Company, Power Systems Div., P.O. Box 688, Galion, OH 44833 (419) 468-8100.

## DECEMBER

### Winter Simulation Conference, December 3-5, San Diego.

Cosponsoring WSC 79 are the National Bureau of Standards and six leading organizations sharing an interest in computer simulation. For further information contact Stan Lichtenstein, National Bureau of Standards, Washington DC 20234 (301) 921-3181.

## JANUARY

### Communication Networks '80, January 28-30, Washington, D.C.

Communication Networks '80 is the national business communication conference and exposition. For further information contact William Leitch, Conference Company, 60 Austin St., Newton, MA 02160 (617) 964-4550.

### WINCON 80, January 29-31, Los Angeles.

Officials predict more than 500 scientists and engineers from government, military, and industry will attend to probe new technology and developments in electronics and aerospace. For more information contact Richard L. Harmon (714) 557-4700.

## MARCH

### Conference on Application Development Systems, March 9-11, Santa Clara.

For further information contact Mitch Zolliker, IBM Research, San Jose, CA 95121 (408) 256-7582.

## MAY

### The Seventh International Symposium on Computer Architecture, May 6-8, La Baule, France.

For further information contact Jacques Andre, Campus de Beaulieu, Avenue du General leclerc, 35042-Rennes Cedex, France (99) 36 48 15.

## CALLS

Papers are being solicited for the 1980 Summer Computer Simulation Conference, which will be held in Seattle July 1980. The theme will be the future of computer simulation. Three- to five-page summaries are due Dec. 1, 1979. Contact David R. S. McColl, 1980 scsc General Chairman, Manager Military Spacecraft, Boeing Aerospace Co., P.O. Box 3999, MS 84-16, Seattle, WA 98124 (206) 773-1543.

Technical papers for the Fifth International Conference on Computer Communications, October 27-30, 1980, in Atlanta, are being solicited for presentation at the regular conference sessions and publication in the official proceedings. The conference will represent an interdisciplinary forum for discussing social, economic, political, and technological implications of computer communications networks. Six copies of all materials must be sent by March 1, 1980 to: Dr. J. Salz, Program Chairman, ICCS '80, Bell Laboratories 1G-509, Holmdel, NJ 07733. For further information contact Wayne W. Adams, Sperry Univac C2SE10, P.O. Box 500, Blue Bell, PA 19424 (215) 542-4673.

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# DP Dialogue

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



*Eastern Airlines serves 104 cities in 14 countries. The Airlines Control Program (ACP) enables an IBM 3033 Processor in Eastern's reservation system to handle 5.6 million transactions a day.*

## ACP Makes the Transactions Fly for Eastern Airlines

"Over 6,000 terminals are online to this computer, generating 5.6 million transactions a day," says Howard Hall of Eastern Airlines. "It often processes 155 high-speed messages per *second* — which would swamp a standard operating system. We need high-performance software and in ACP we have it."

The Airlines Control Program (ACP) is designed for IBM systems with many terminals and a high volume of transaction processing. In addition to airline reservation systems, some applications of that kind are hotel reservations, credit authorization, car rental reservations, police car dispatching, electronic funds transfer, teller memo posting, message switching, and loan payment processing.

At Eastern, agents can ask for a display of flight schedule information, seat availability, an existing passenger name file, or

fare data, Hall explains. They can make reservations or change existing ones. And the system automatically computes the fare for 85 percent of the tickets issued.

System One, as Eastern calls its ACP system, also supports seat selection, boarding control, and automated ticketing at more than 100 airports, as well as flight plan calculations and a number of secondary services. Hall is director of System One, which utilizes IBM 3033 Processors in Eastern's Doral Computer Center near its corporate office in Miami, and serves 11 regional reservation centers.

"We respond to 240,000 phone calls on an average day," he notes. "So we need fast response at the terminal even at the busiest times. When ACP is running at its capacity of 185 messages a second, it still responds within two to three seconds. Of

course, it is much faster than that in normal periods. And bear in mind that there are an average of 10 or 11 DASD accesses per message."

Transactions enter System One in random sequence, with many terminals competing at once for service at peak times. ACP incorporates special concepts of system control to meet these extraordinary requirements.

"Reliability is as vital as performance," Hall adds. "Much of our systemwide operation would grind to a halt without the computer. Our availability averages 99.7 percent, outside the 10 minutes a day of downtime we schedule for maintenance. And we can switch to our backup 3033 Processor in two minutes or less.

"Without ACP, System One could not possibly meet our standards of performance and reliability."

# Applications Grow at International Paper- But Data Communications Costs Don't

"Integrating our communications operations into a single network has saved us \$600,000 a year," says Harry Baer, corporate director of information systems for International Paper Company, New York City. Two regional computing centers have become the nodes of the company's Integrated Teleprocessing Network (ITN), a system of 305 terminals in 115 North American and European locations. IBM's Systems Network Architecture (SNA) provides the communications support.

"Previously, we had a separate terminal network for each remote-access application," Baer notes. "Now, under SNA, one terminal can access a number of applications, and a single communication line can support a variety of terminals. Currently, the network includes 35 types of devices. We've been able to justify many more applications because the terminals and the communications links were already in place."

The network also supplanted a system, which had become inadequate, of 160 teletypewriters for administrative messages. At many locations, devices installed for data processing purposes now serve as message terminals too. In an-

other 50 locations, low-cost IBM 3770 Communication Terminals were installed for this purpose.

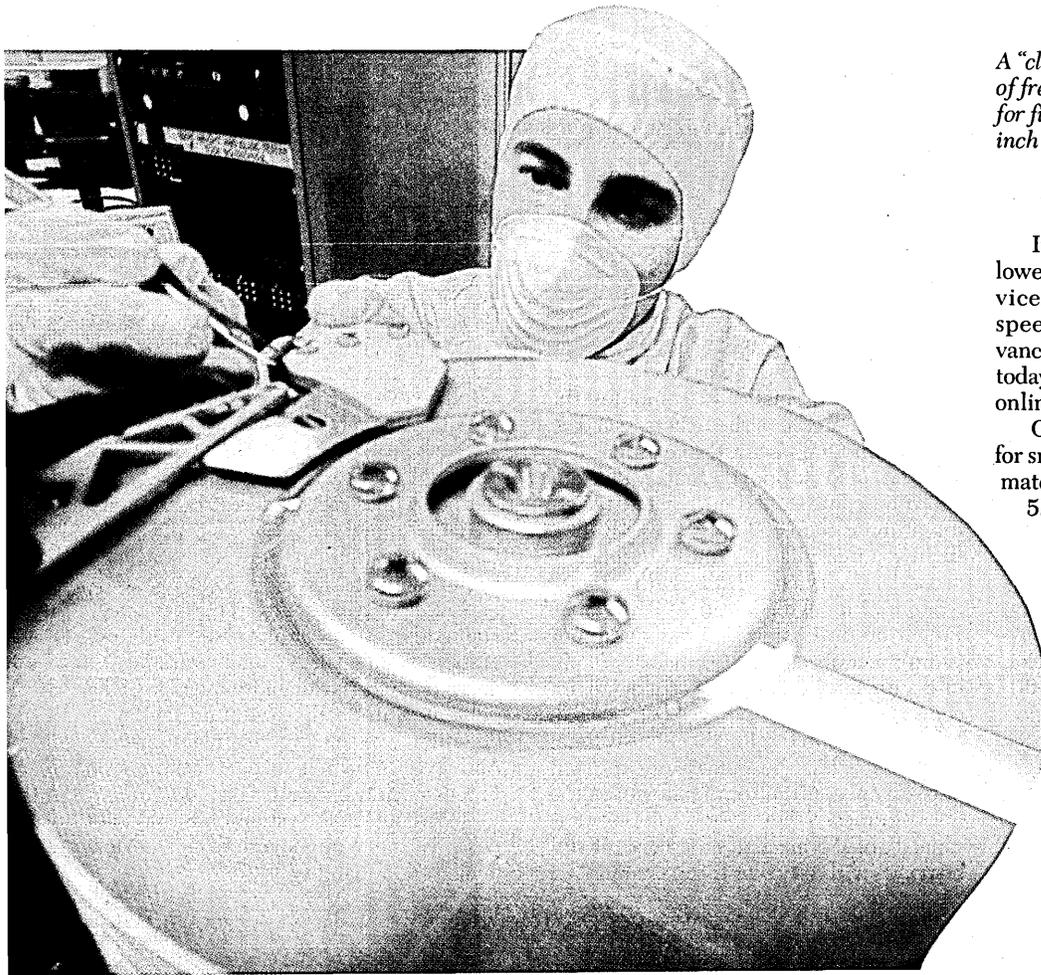
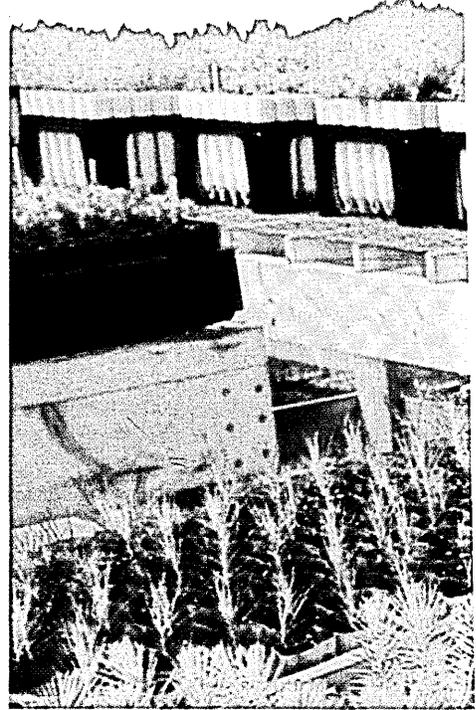
"SNA let us integrate distributed processing into the network," Baer notes. "For example, we installed several IBM 3790 Communication Systems for a business unit that wants to develop its own applications, in addition to accessing the regional computers to use the company-wide programs."

In a system with two or more host computers, the Networking feature of SNA automatically routes a request for service to the appropriate host. For example, International Paper now has an online order entry system for pulp and paper products, resident on a System/370 Model 168 in Denville, New Jersey, while an online inventory system runs on a dual Model 158 in Mobile, Alabama.

"If a salesman keys a stock availability inquiry into a terminal, the Mobile center responds," Baer points out. "If he asks for the status of an order, the computer in Denville displays the information."

"For the programmer, SNA eliminates most communications concerns. For management, operating information is much more accessible: an authorized ex-

ecutive can get financial data through any terminal in the U.S. or Europe."



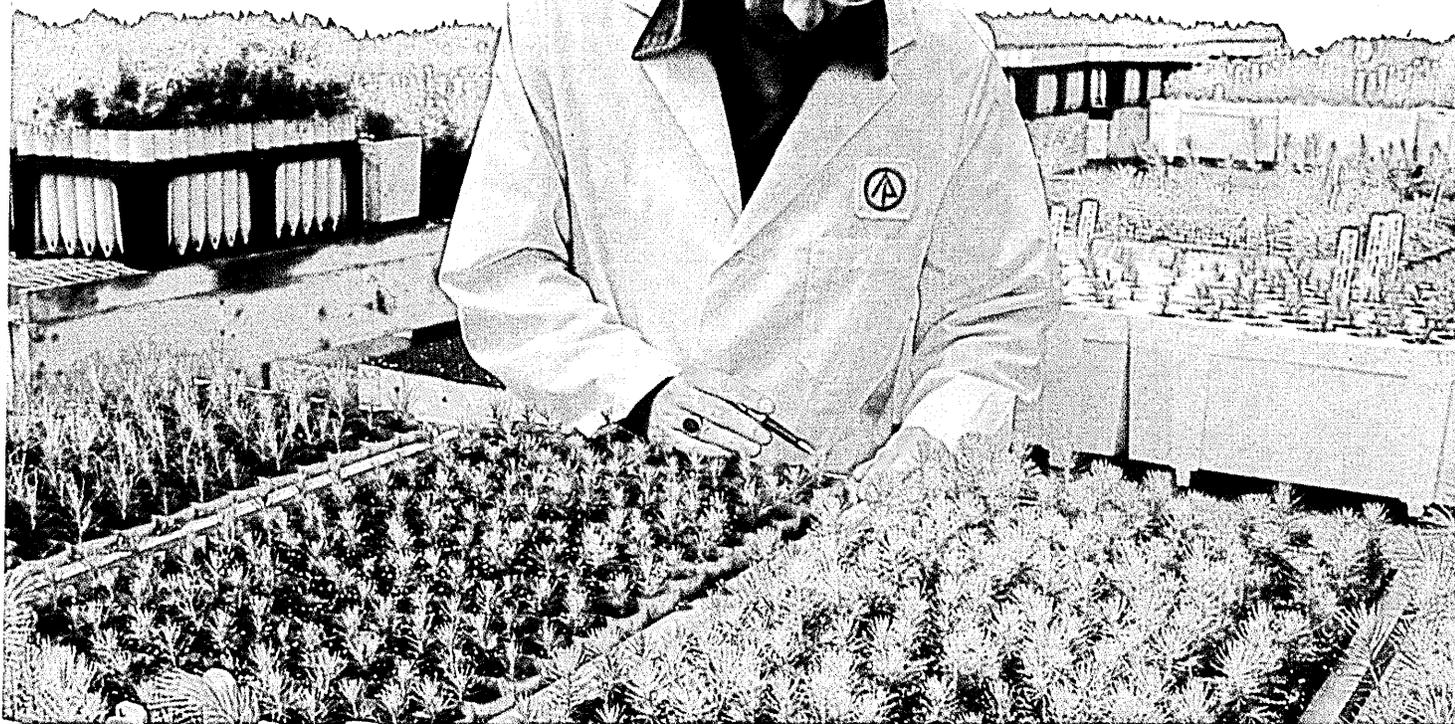
*A "clean room" held to a unique standard of freedom from contamination is required for final preparation of IBM's new eight-inch disk for the 3310 DASD.*

Important innovations are resulting in lower costs for Direct Access Storage Devices (DASD), while capacities and speeds increase. These technical advances have helped to open the way for today's growth in distributed systems and online transaction-based processing.

One such DASD product is the 3310 for smaller systems. Its new disk, approximately eight inches in diameter, holds 5.85 million bytes of data per surface—at a greater density than any previous IBM 14-inch disk. In a sealed disk-and-actuator unit of approximately two cubic feet, a spindle drives six disks with a capacity of 64.5 megabytes.

The 3310 savings are significant. It brings the monthly cost per megabyte for small-system DASD's down to the range of \$4 to \$5. And its smallest configuration costs less than the previous entry-level database file—the 3340. There are en-

*In this greenhouse, outside Bangor, Maine, research on seedlings helps International Paper Company's reforestation programs. IBM computers in Alabama and New Jersey help IP make use of another valuable resource: information.*



## New DASD Technology for Today's Data Processing

ergy savings too. It uses 76 percent less power and generates 84 percent less heat per megabyte than the 3340.

### New for Intermediate Systems

In the intermediate systems size range, the new 3370 DASD more than doubles the density of storage in bits per square inch of today's IBM DASD. A new head technology using semiconductor processes allows this significant increase in recording density. The read-write head "flies" over the disk on a cushion of air so thin it is like piloting a jumbo jet around the world at an altitude of one foot.

The base unit of the 3370 holds 571 megabytes at a cost as little as \$1.05 a month per megabyte. This compares with \$1.57 to \$5.71, depending on size, for earlier DASD.

Compared to the 3340/44, the 3370 stores 13 times more data per square foot of floor space, and nine times more data per watt of power consumed. Average access time is 20 milliseconds, compared to

25, and the data transfer rate is 1.86 megabytes per second, instead of 0.885.

One innovation in the 3370 is novel dual actuators, which serve to position two independent sets of read-write heads. The dual actuators economically permit more transactions per second against the data on a single spindle. And a new "fixed block" architecture using a more effective command set reduces interactions between the control unit and the storage devices.

The 3310 and 3370, both with error-correcting code, also set new standards of reliable performance. The 3310 storage element is a simple, sturdy sealed unit, with fewer moving parts, that needs no scheduled maintenance.

For the intermediate-system 3370, there is a new portable maintenance unit—a "computer in a briefcase"—that guides the customer engineer through the diagnostic process, performing trouble analysis automatically.

These units set new standards of relia-

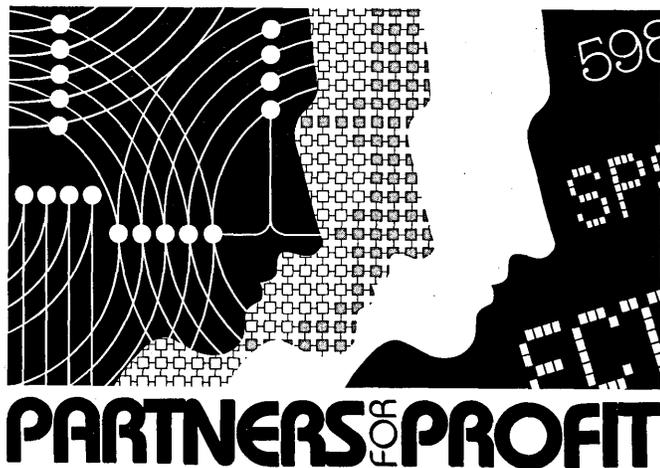
bility and energy efficiency. And their storage density, speed, and economy are fundamental to today's exciting innovations in data processing.

*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.*

Data Processing Division

# TIME's 5th Special Section on New Office Technologies

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# TIME

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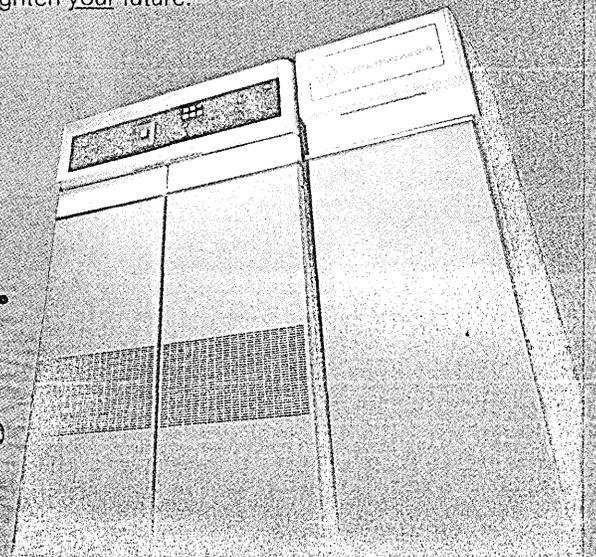
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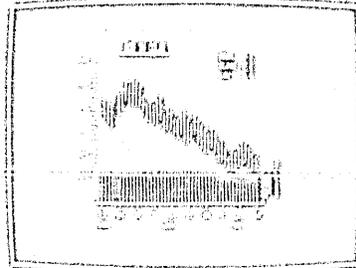
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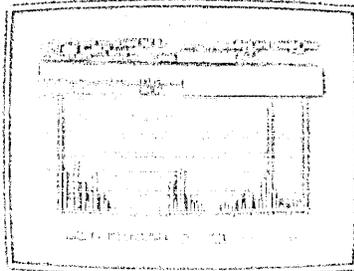


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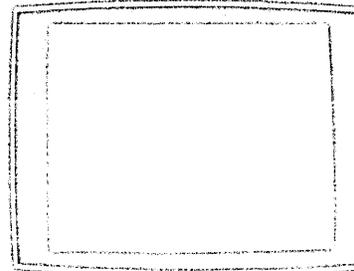
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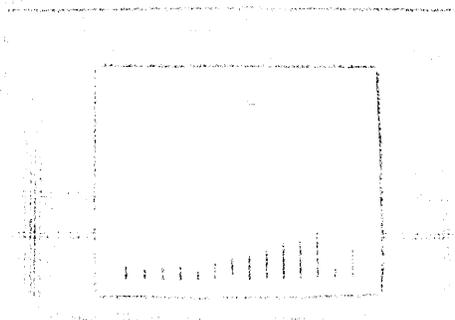
## COMPTROLLER 8085 60Kbytes



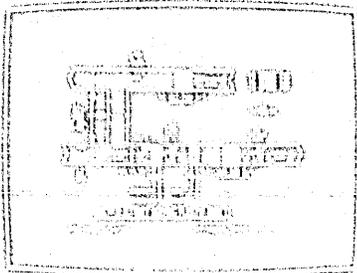
## VP FINANCE 8085 60Kbytes



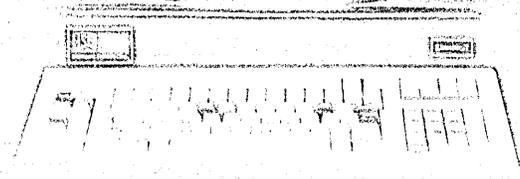
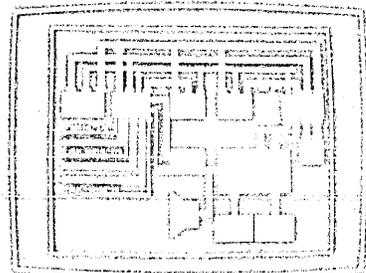
## VP MARKETING 8085 160Kbytes



## VP MANUFACTURING 8085 60Kbytes



## VP ENGINEERING 8085 60Kbytes



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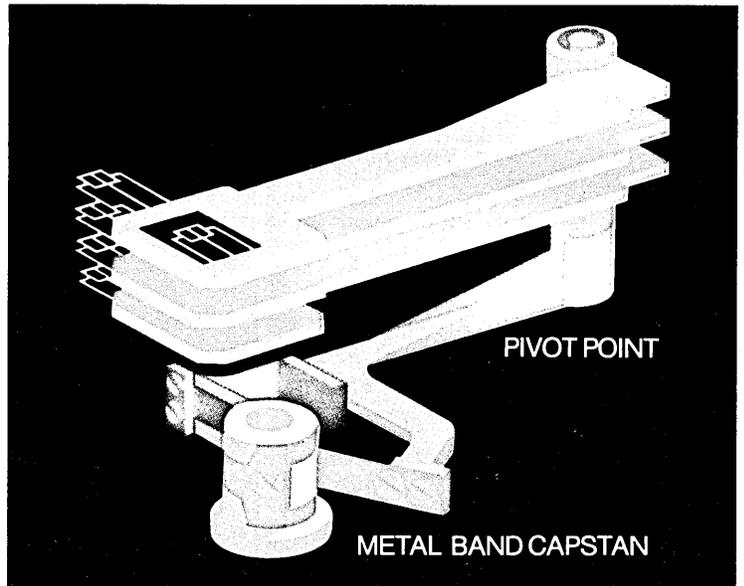
# The head in cost per



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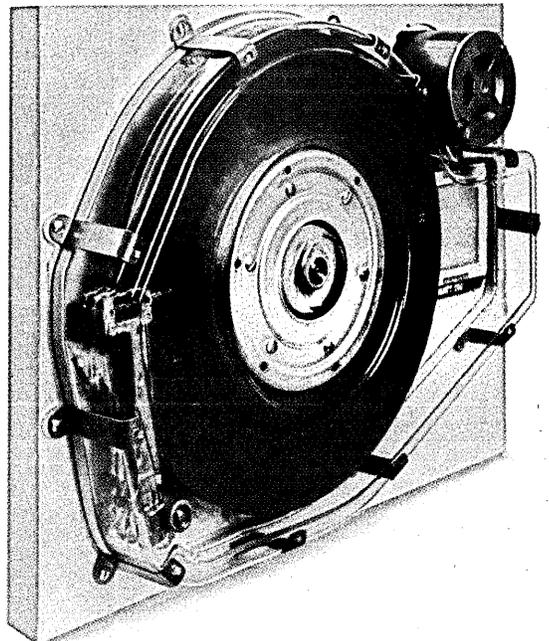
When You Think Actuators, Think Fasflex II™. Shugart's new, proprietary Fasflex II™ is another result of Shugart's headstrong commitment to R&D. This open loop band actuator is virtually wear-proof, and it doesn't require any adjustments in the field. Heat dissipation? With Fasflex II it's extremely low—only 200 watts is typical. But the Fasflex II actuator is only one of the benefits you get with the SA4000 series. The drives weigh a mere 35 pounds—that's about half the weight of comparable units. They're compact. They use only 5.25 inches of panel space, they can be easily mounted in a 19-inch RETMA rack. The drives are rugged,

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# of its class megabyte.

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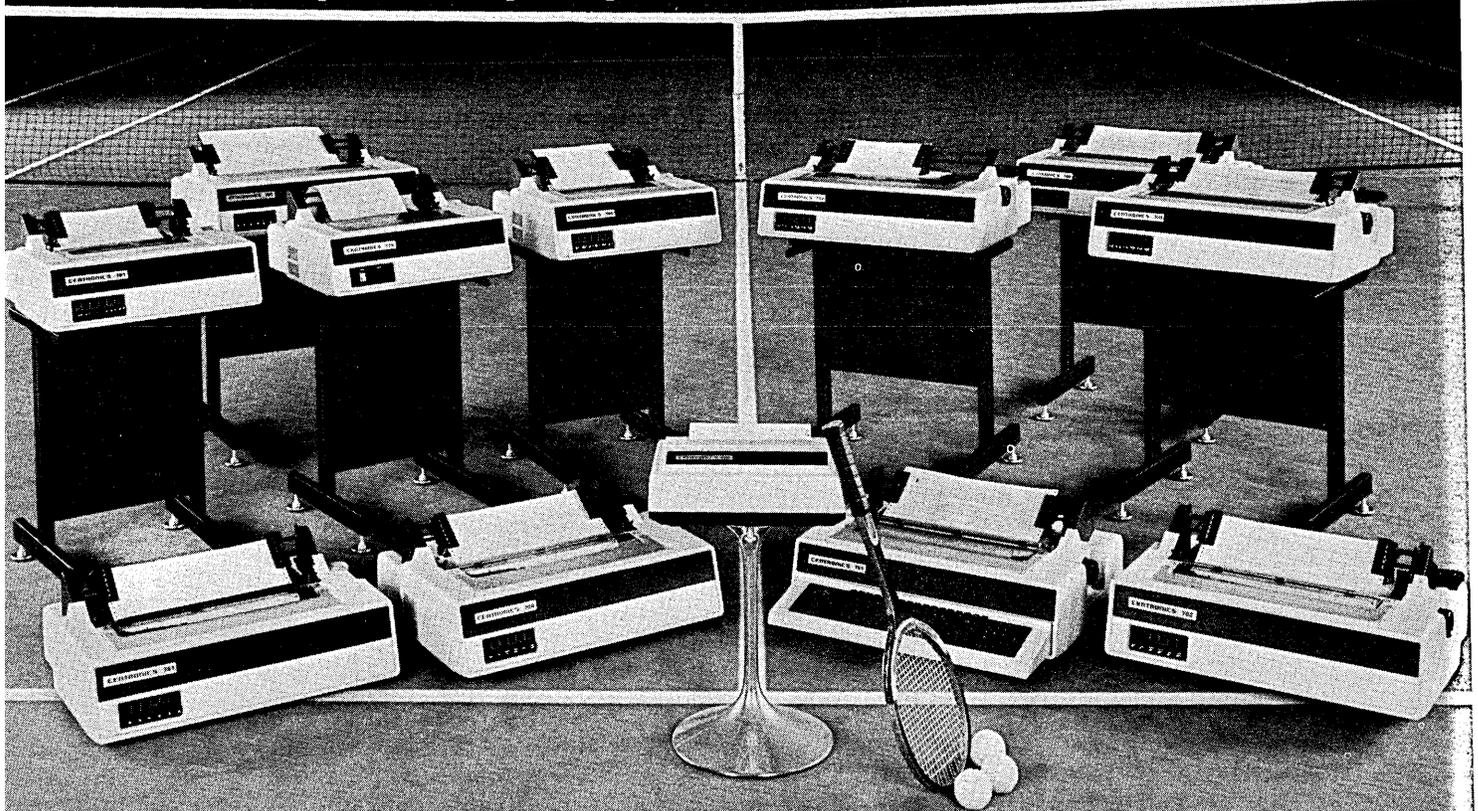
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# LETTERS

## COOKBOOK KUDOS

Re: "A Manufacturing Systems Cookbook, Part 1," by Dan Appleton (May, p. 178):

Congratulations to Mr. Appleton. His cookbook is the best expression of the concerns related to the manufacturing systems world I have ever read. Few people in manufacturing or systems recognize the full impact systems can have on the production environment. Fewer still recognize the necessary steps which have to be taken in order to be successful. I look forward to Parts 2 and 3.

ROGER S. ERICKSON  
Manager MIS/ASG  
Carborundum Company

## ANOTHER LINE

Re: Editor's Readout, "The Thin Green Line" (May 25, 1979):

When billions of dollars are plotted relative to years... "this one-dimensional representation disregards inflation." It also disregards generally accepted high school mathematical principles. Where did Descarte go wrong intersecting two number lines at right angles? Two elements . . . two dimensions?

GEORGE OESTREICH  
Eau Claire, Wisconsin

## SANDALS AND SECURITY

Re: News in Perspective (May, p. 76):

The idea that security systems are to protect information from being used by those who are unethical is quite true. But to imply that the clothes people wear, the hours they work, or their taste in music shows where they stand morally and ethically is inane.

"Weird," unorthodox behavior does not lead to a breakdown in morality or ethics. Sandals, stereos, and odd working hours do not lead to a life of crime.

Programmers have just adopted protective behavior patterns. Most programmers would gladly work a straight 9-5 day; they would be more than happy to do their testing during regular working hours. Are they allowed to? No. Programmers test only after the daily production runs are finished. This means

working afternoon shifts, even late into the night when deadlines loom... disrupting their lives for the sake of the organization. Therefore, why not dress comfortably, why not listen to good music, why not try to be creative individuals who do their job well?

STEFAN PAWLIKOWSKI  
Systems Analyst  
Algoma Ore Div., Algoma Steel  
Wawa, Ontario, Canada

## ALLOWABLE DEVIATIONS

Re: "Taking the Measure of Programmer Productivity," by Trevor D. Crossman (May, p. 144):

While Mr. Crossman claims a calculated time in man hours of  $10.6 \times \text{number of functions} + 14.9$ , Table 3 appears to be based on  $10.6 \times \text{number of functions} + 10.2$ . Using his own formula, both projects 2 and 3 would have been within the allowable deviation.

Further, the deviation formula

$(5\sqrt{\frac{750}{T^2}})$  is inversely proportional to problem size, a most unlikely relationship. A 40-function program allows 19 manhours of variance while a 265-function program only allows 8 man hours.

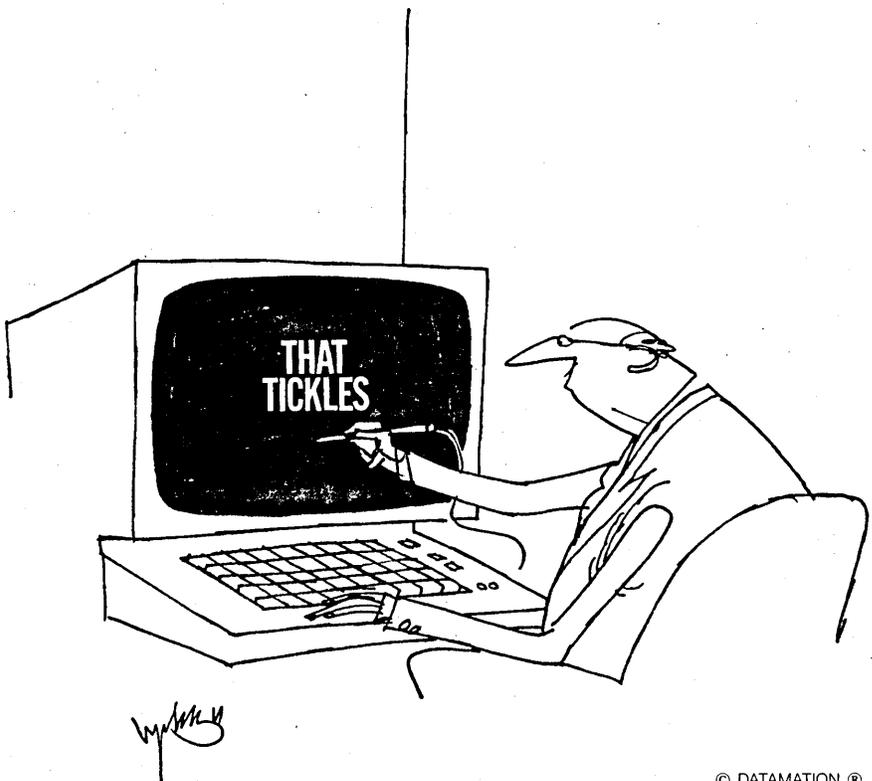
Finally, the ultimate problem is a reasonably accurate measure of the predictability of the number of functions a program will eventually contain.

CLANCY MCQUIGG  
General Research Corp.  
McLean, Virginia

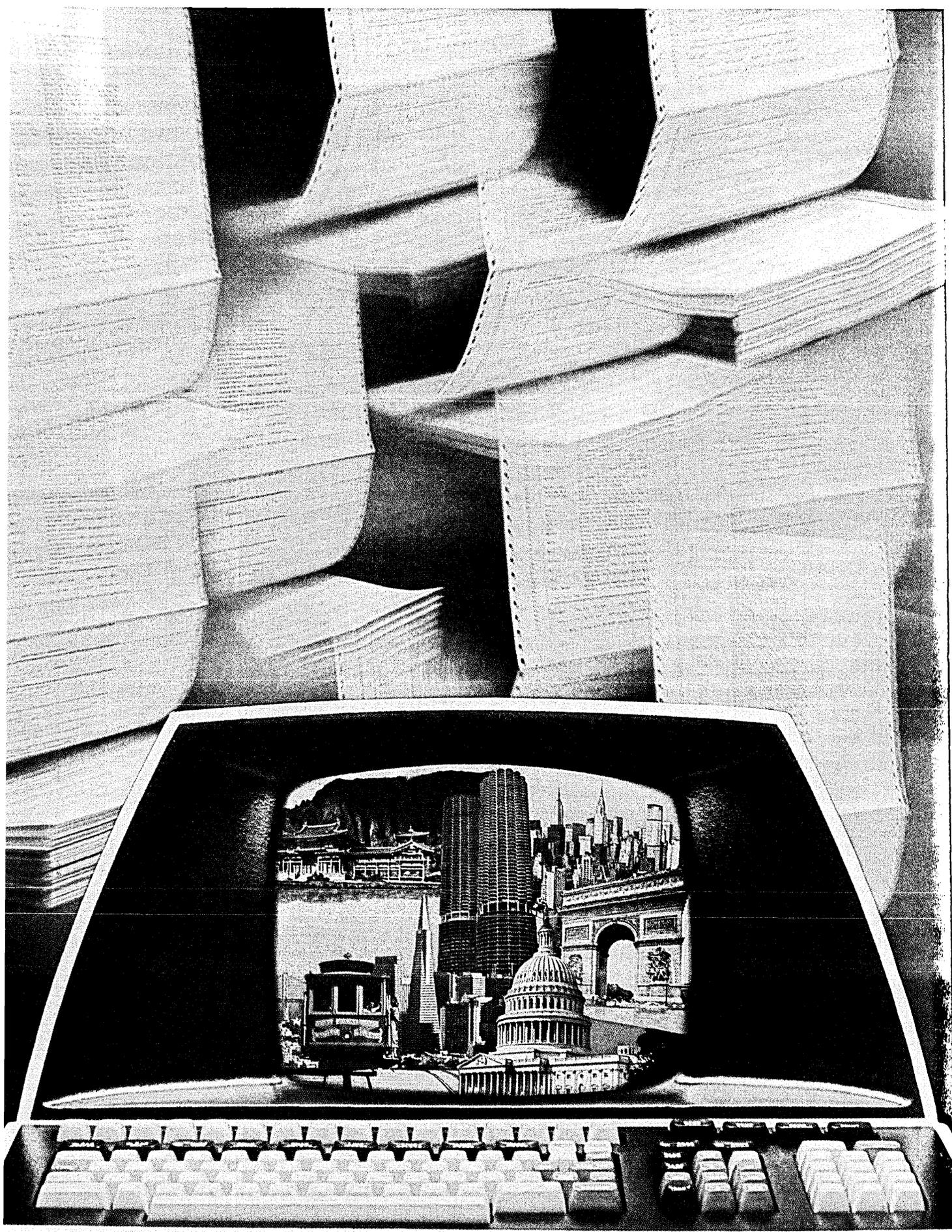
## SOFTWARE PRODUCTIVITY

Re: "Software: Productivity or Quality?" by M I. Bernstein (Forum, April, p. 227):

I don't think productivity of software developers can even be indirectly estimated using hardware capacity and the number of developers. The many uses of software and the trend toward packages does not represent "productivity" of the software producers. If anything, it represents some combination of the lack of capacity to



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## LETTERS

produce tailored software combined with the ability to produce qualities of portability and generality.

Also, I differ with Mr. Bernstein regarding "tolerances" being foreign; programs which "must produce exactly the same result" ("given exactly the same initial conditions and input data"); that software "doesn't fail in the traditional sense"; and other similar assertions. These are misconceptions that are blocking our software engineering progress. All software qualities can be specified and measured on some numeric scale. Among these qualities are reliability, maintainability, and portability. The concept of tolerance is relevant since we do not know how to engineer all multidimensional attributes of a system (including delivery date, cost, and performance) exactly to desirable levels. Some tradeoffs are necessary, and the worst-case tolerance level of, say, software reliability, is an important and useful concept.

Furthermore, as far as the "same result" is concerned, the "same initial conditions" in previous input transactions, present data base status, levels of update of related software, and exact maintenance state of applications programs, rarely occur exactly. We are always faced with the possibility of unintentionally different initial conditions. In addition, it is well known that combinations of even valid input data elements in a single transaction are so many as to defy exhaustive testing in advance. Dijkstra's example of needing 30,000 years machine time to run through all valid combinations of  $A \times B$  should suffice as a thought-provoking reminder of the problem.

I also disagree that "flaws... are imbedded from the beginning." This forgets the new flaws inserted by maintenance procedures. Even if you don't maintain your programs, your program may be dependent on a software supplier's maintenance changes. I well remember the days when IBM OS releases led IBM to officially document between 1-12,000 new bugs after each release.

"We don't know how to prevent or detect those errors at the very beginning," says Bernstein. Perhaps we don't know how to guarantee perfect software yet, but some remarkable progress has been made. The TRW Software Reliability Study is an exhaustive answer to this question; the single answer that deserves more widespread acceptance is Michael Fagan's (IBM) "inspection" method which has produced dramatic results in error reduction.

The tendency toward zero defects with full application of this method has been widely observed in both normal dp shops and in industrial environments.

The real problem, as I see it, is that we have far more useful answers than the majority of software producers can ab-

sorb in the next decade. The problem is one of awareness of the existing technology, motivation to make full use of it, and the ability to make use of it.

Finally, I wish people would stop using the term "software" when their vision is limited to the algorithm. "Software" should be taken more literally to include not only logicware but also dataware. Our concern with productivity of programmers is an uninteresting side-show to our users who pay the bills and must live with our systems.

TOM GILB  
Kolbotn, Norway

### DOCUMENTATION FIRST

Re: "A Prescription for Programming's Least Popular Phase," by John Vaughn (Jan., p. 185):

The article is excellent therapy for an industry suffering from a documentation deficiency. However, while Vaughn's prescription describes why and how to write documentation, it fails to describe when to document.

The time to document is when you are designing a system, not when you are delivering it. This avoids two problems Vaughn mentions: a tendency to skimp on documentation because of missed deadlines, and trying to use documentation to paper-over bad design.

We write full user documentation as part of the system design report. This includes mock-ups of reports and terminal conversations. The user approves the design report prior to the beginning of coding. Putting documentation first indicates a real commitment to putting the user first.

THOMAS KOENIG  
Lansing School District  
Lansing, Michigan

Mr. Vaughn replies: Mr. Koenig is right. The time to document is when you are designing a system. I believe that now, and I believed it when I helped write the National Semiconductor System Development Manual, in which the following passage appears: "The User Manual is produced during external system design. Publication of the User Manual constitutes the contract between MIS and the user organization." I didn't make the point in my article, because I felt it was task enough to get corporate dp departments to write user documentation at all. There will be time later, I thought, to tell them *when* to write it. Perhaps the time is now.

### CLEAR CODING

Re: Letters (May, p. 44):

Mr. Wagner's letter contained many fine points, but included an error in the struc-

tured code.

Before one performs the paragraph *One-Record*, the first record of the *Master-File* should be read. If the code was executed as written, *One-Record* would be processed without an input file.

It is bad procedure to have to write the processing logic to handle the first record in the body of *One-Record*, and could be an area of future problems when the program has to be modified due to a change of user demands. The code should read:

```
MAIN-LINE.  
OPEN INPUT MASTER-FILE.  
MOVE LOW-VALUES TO DATA-  
RECORD IN MASTER-FILE.  
PERFORM READ-MASTER.  
PERFORM ONE-RECORD UN-  
TIL
```

```
...  
...
```

```
READ-MASTER.  
READ MASTER-FILE  
AT END  
MOVE HIGH-VALUES  
TO DATA-RECORD  
IN MASTER-FILE.
```

BILL HUTTON  
Austin, Texas

Mr. Gildersleeve and Mr. Wagner are firing all around the target without hitting the bull's-eye. Debates over legible coding are endless and go on and on because what appears as clear code to one person may confuse another. (Isn't a programmer supposed to understand code?)

We do not badger programmers about which statements to use or not to use. This stifles the individual's curiosity and inventiveness and make the job dull. We do insist on overall uniformity and style. We also maintain that the mainstream of the program remain just that. All other paragraphs must be placed at the end of the routine just before the EOI routine. A new programmer is handed an average program and asked to study its general appearance and form. We ask him to use it as a guide when programming. Finally, we ask him to keep it simple. Debugging time is more expensive than a byte or two of saved storage.

Standardization of general form within the department facilitates training of new personnel, program debugging, and the updating of existing code.

Also, I have found that if a programmer writes a carefully phrased and structured letter in English, he will program in the same manner. Screening job applicants for this ability is important when hiring new programmers.

NICHOLAS AGRESTI  
DP Division  
City of Pawtucket  
Pawtucket, Rhode Island

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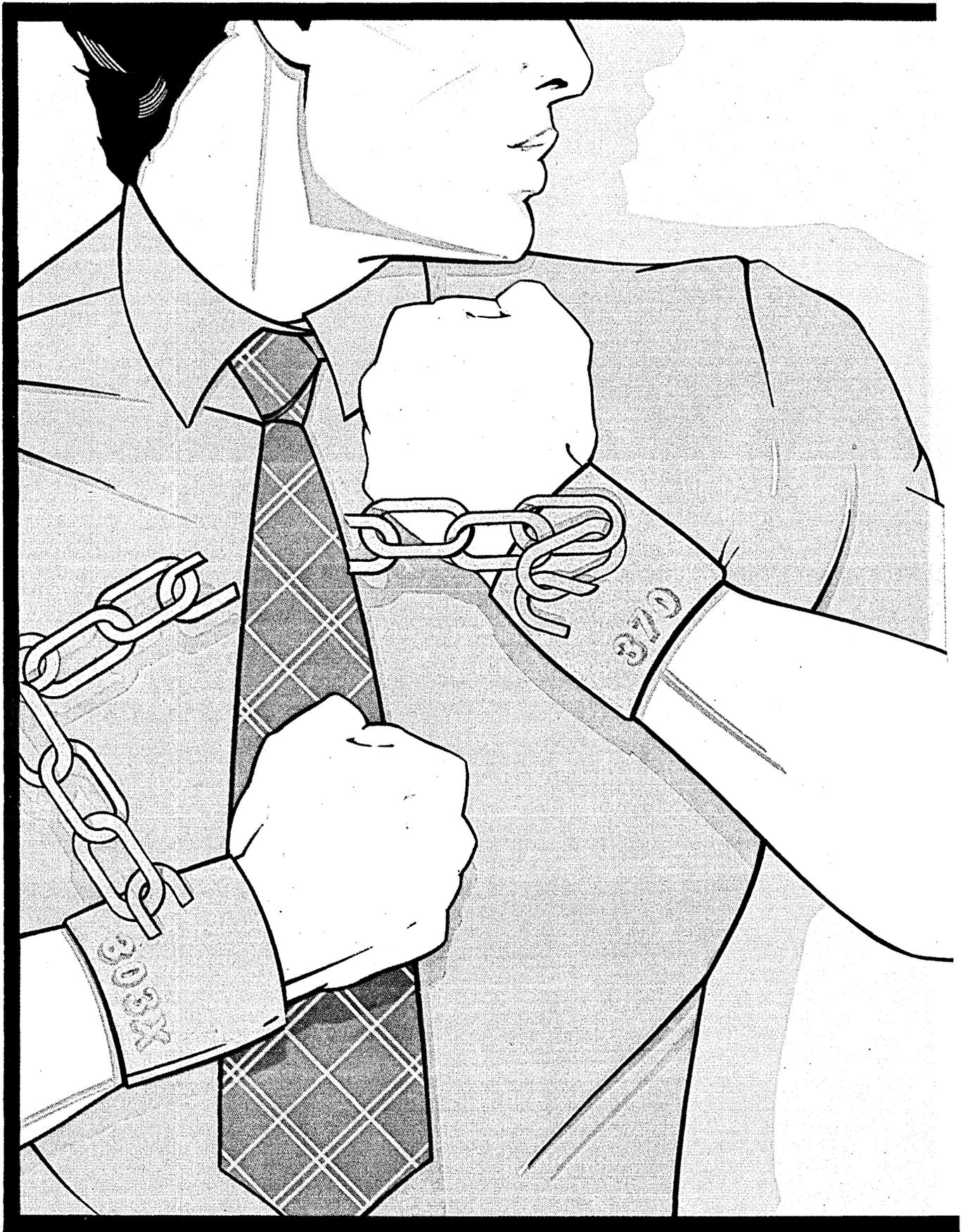
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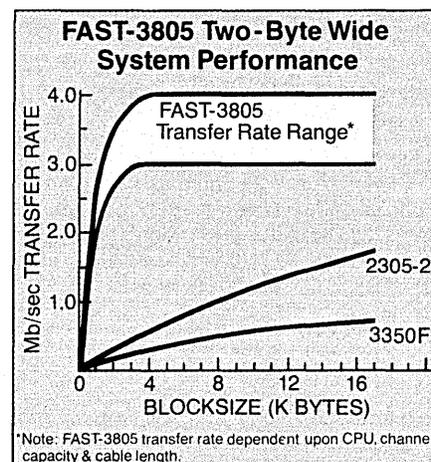
	INTEL	3350F	2305-2
Avg. Seek Time (msec)	0	0	0
Avg. Latency (msec)	0.4	8.4	5.0
Transfer (Mb/s)	1.5-4.0	1.2	1.5
Capacity (Mb/s)	12-72	1	11.2

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# EDITOR'S READOUT

## MELON AND THE COSMIC CONNECTION

Gazing out of our Los Angeles office window one recent smoggy summer day, we were delighted to hear the voice of our old friend Persiflage Melon.

Melon, successful management consultant and lepidopterist of some note, made his entrance wearing his "L.A. muf-ti"—a white shantung suit, a fiercely floral sport shirt, and malacca sword cane (Melon claims Los Angeles is far more dangerous than New York owing to the highly unpredictable and exotic savagery that the natives here are given to).

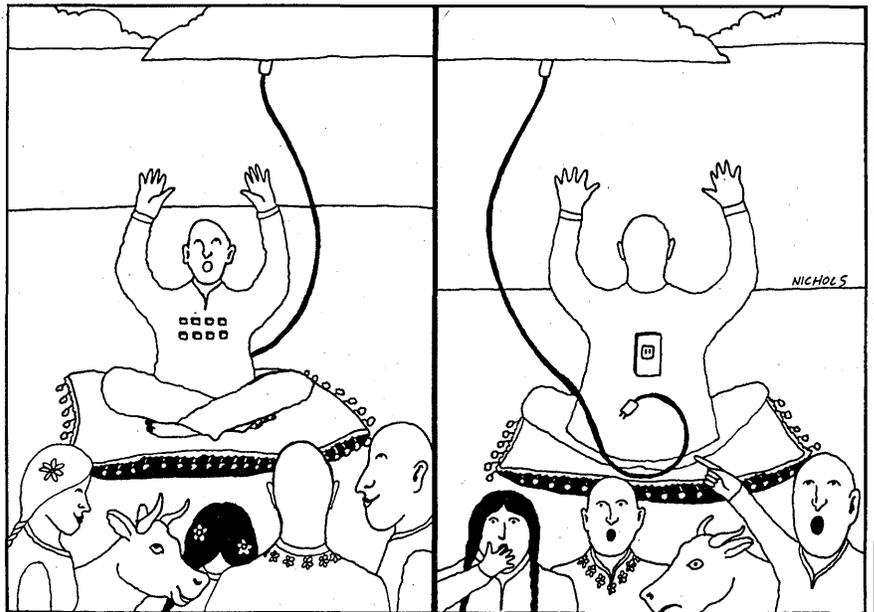
"I am here," he announced, "on behalf of a powerful client (who must remain anonymous) to investigate the programmer, systems analyst situation. My client, a large telecommunications carrier, lusts in its corporate heart after the computer industry. But it is perturbed by what it hears about manpower shortages."

It's true, we said. The programmer/analyst situation is desperate... except, of course, for the programmers and analysts who are enjoying an unprecedented demand for their talents. We asked Melon what his preliminary investigations had uncovered.

"Alas," said Melon, shooting the cuffs of his hideous orange and pistachio shirt, "the picture is indeed bleak for would-be employees of these craftsmen."

"For example, a barely pubescent college grad who's only experience is writing compilers in languages that sound like PLINK and LURCH, can demand a salary in the \$20K to \$25K range from some unsuspecting employer. And, after a few years of work experience, having learned a smattering of COBOL or FORTRAN, his asking price has skyrocketed. He's also learned that by job-hopping—much like the aerospace engineers of the mid-sixties—he can escalate his salary to something approaching an NBA draft choice.

"Furthermore," said Melon, excitedly waving his sword cane and nearly disembowling our favorite ficus, "the beleaguered employer has to contend with



the phenomenon of compression."

You mean the squeeze on salary differentials, we asked.

"Precisely! Here you have a loyal, ten-year employee, faithfully laboring in the programming vineyards for his 8% a year. Inflation has long ago decimated his salary. And now you must hire some runny-nosed junior hacker at the same salary or more than that of your trusty retainer. Compensation levels are reduced to a shambles and resentment abounds!"

Not a pretty picture, we agreed.

"And then, if you have to move your new hire across country, you have to pay even more," Melon cried. "Did you know that the Department of Labor statistics show that a family with an income in Los Angeles of \$27,000 has to make \$35,000 in New York just to break even?"

With a wry smile we told Melon that we were more conversant than most with move differentials.

"Of course, my boy," he said. "I had forgotten that DATAMATION's editorial offices are moving to New York in mid-August. As a native New Yorker I cannot but recommend the pace, vibrancy, the excitement and entertainment of the Big Apple," said Melon, breaking into an off-key version of "I Love New York."

"However, I know you'll miss Lotus Land and its esoteric diversions. I myself last night experienced one of a religious nature."

What's this, we exclaimed. You, the cynical East Coaster attending a California cult gathering?

"But this was not just your ordinary religious freak-out!" said Melon, savoring the vernacular. "No, what piqued my interest was this young fellow who had been an APL programmer in Trenton, N.J.—he decided to come west to found a new religion in Santa Monica. He calls himself Baba Digit and claims he is God's intelligent terminal."

That is a new twist, we agreed.

"He says that he is receiving cosmic revelations from the heavenly cpu and that his following—chiefly made up of Rand scientists and out of work Radio-Shack salesmen—is becoming so large that he is considering opening another ashram. Sort of divine distributed data processing," said Melon, with a smirk.

"He's even gone so far as to have a length of coaxial cable running from beneath his heavenly robes, presumably terminating in some celestial computer room in the sky."

A very impressive performance, worthy of Los Angeles at its kinkiest, we said.

"I quite agree," said Melon agreeably. "One must give Baba Digit credit. I thought the cable a nice touch. However, it was only when we got up to leave that we noticed that he was unplugged." \*



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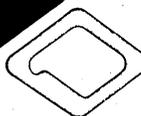
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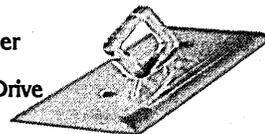
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# LOOK AHEAD

(continued from page 18)

TRANSBORDER  
DATA FLOW:  
THE PLOT THICKENS

Business Machines, Los Angeles (p.62), says he's making customer service operations a part of the manufacturing group. "For too long, service was a stepchild of marketing," says Gerns.

The CE, usually a youngster earning \$19,000 to \$23,000, is very conscious of fringe benefits. So if he's to be motivated, he should be offered career paths in a company and be compensated for performance. Says Gerns: "A CE with a company car is very hard to hire away." In recruiting CEs, says Gerns, "we'll sit down with them and put down on paper the fact that on the bottom line they'll earn much higher than with a car. But the CE says 'no, I've already got a car, the company pays the insurance, and I can drive it home, so I won't change jobs.'"

The transborder data flow plot thickens. When last we left it, nations were arguing about whether voluntary guidelines or a binding treaty are the way to control data flow without stopping it. The U.S. was leading the anti-treaty forces. We hear now that the giant multinationals are frightened of the treaty, as devised by the Council of Europe, and are pushing the guidelines as devised by the Organization for Economic Cooperation and Development (OECD). Toward that end, they're looking for some friendly government to delay the treaty makers.

Now, the guidelines are due out next spring as is the final draft of the treaty. If the treaty can be slowed down, the guidelines -- accompanied, many hope, by a strong OECD committee of international arbiters to settle disagreements -- would hold sway. But if the multinationals succeed in their tactic, the French won't like it. We hear French leaders in the data law movement are quite ready to throw their own monkey wrench into the guidelines. And if there is a stalemate, the power to control international flow may fall to the new clud of administrators of the various national data laws. Phew!

RUMORS AND RAW  
RANDOM DATA

The venerable IBM 1403 chain printer, introduced way back in 1959, gets such wide use that Control Data Corp. this month begins shipping an IBM compatible version, the CDC 32111-1 Fastrain printer that prints 2000 lines per minute, compared to IBM's 1100 lpm version, and has the controller in the same box as the printer. CDC has been making similar devices for computer manufacturers other than IBM...With a new financial lease on life (p.61) Telefile Computer Corp. didn't want to miss making a critical delivery of a Winchester type disk drive to Seattle during the recent trucking strike. So it got into the trucking business. It delivered the drive to Seattle in a small truck it uses at its facilities in Irvine, Calif.

Datamation's editorial headquarters next month will be located in New York at 666 Fifth Ave., NY 10019, Tel. 212-489-2200. The magazine will continue to maintain editorial offices in Los Angeles, Mountain View, Calif., Boston, Washington, D.C., Dallas and London.

# NEWS

## IN PERSPECTIVE

### SIGNALS OF A REAL EXPLOSION

**The eight-inch Winchester disk drives have storage capacities of just above those of floppies all the way to capacities of hard 14-inch drives.**

Lower priced and higher performance computing systems for the distributed processing, small business, and similar environments are made possible by new 8-inch Winchester disk drives. These storage devices were never before exhibited at the National Computer Conference, and yet suddenly this year a dozen vendors were showing models to attendees, on and off the exhibit floor.

"These are the signals of a real explosion coming," comments consultant Raymond C. Freeman Jr. of Santa Barbara, Calif.

"Lots of thousands of square feet of manufacturing space are being bought right now for this kind of device," enthuses David L. Britton of BASF Systems. "So I think the time has come."

The compact new drives, using 8-inch hard disks and Winchester-type heads, have storage capacities that range from just above those of floppy disks to the capacities of hard 14-inch drives. Models announced to date feature capacities down to 2 megabytes, on up to 45MB. Thus they fill a significant gap left by those two media, appearing on the marketplace at the right time.

The 8-incher doesn't hurt the floppies, says Freeman, "but it does diminish the pressure on floppies for higher capacities and higher performance levels." He observes that on the old cartridge drives the 14-inchers provided capacities down to 2.5 megabytes. "But that's a 12-year-old technology that's been waiting for a long time to be replaced. Nothing has come along to do it until the 8-inch drive. So it's basically a successor to the old cartridge drive," the newer models taking up much less space, being priced much lower, and proving much greater capacity.

Average access times of the 8-inchers range from 18 milliseconds to 70msec, but generally are about 50msec. Compared with the floppy, adds consultant Lee Walther of Cupertino, Calif., the 8-inchers are five times more expensive but hold 10 times as much, and so the cost per byte is about half. Their access times are shorter, so one gains in throughput. And, being sealed in a contained environment, they are more reliable than the interchangeable-media floppies.

The first to announce the 8-inch drive was International Memories Inc. of Cuper-

tino, in April 1978, only a month before IBM announced what was later disclosed to be the 8-inch "Piccolo" drive. Unfortunately, IMI immediately encountered financial problems that resulted in several lawsuits and delayed production. All of that is now said to be resolved and the company has begun manufacturing a fully tooled product that stores 11 megabytes in a box the size of a floppy drive.

And the first to announce a product based on the IMI drive late this spring was Onyx Systems Inc., located next door to IMI. It's a microprocessor-based desktop computer that a retailer could offer as an upgrade for current users of floppy-based small business systems. Two other IMI users are adding an interface and power supply and selling the drive for about \$5,000 to the

**First to announce the eight-inch drive was International Memories more than a year ago and before IBM announced the "Piccolo."**

personal computer market—as storage devices that cost five to ten times that of the processor to which they attach.

In smaller systems, it now appears that the 8-inch drive will replace 14-inchers. "No one can afford either the space or the cost of a 14-inch drive on a small business system," notes Freeman. And, he adds, a lot of people need more performance and capacity than a floppy can provide. The proposed solution: instead of a second floppy you use the 8-inch Winchester drive that fits in the same space.

"I believe that any new disk drive under 100 megabytes in capacity which is not already committed to 14-inch disks will use 8-inch platters," continues Freeman. He recently completed a study of the market for these devices. "I also predict that as early as 1981, the 8-inch disk drive will

**A significant market share could well go to the company that is able to ship in volume when the competition is still trying to get production underway.**

capture 40% of the oem market for fixed-media drives under 30 megabytes." And that will occur at a time (1981) when manufacturers of the 8-inchers will not yet have built up a large manufacturing volume.

Freeman sees 1979 as a product announcement year, 1980 as product qualification time, 1981 as the start of production volumes, and 1982 as the first big year of volume sales and shipment. He counts 23 companies with programs currently underway in this 8-inch market, not counting IBM or the few more who are merely rumored to be active. And yet, he notes, the scenario suggests that there's still time for others to enter this market.

But Dave Britton, who was fired as president of IMI during its tumultuous startup

period and is now with BASF Systems in Los Gatos, Calif., says, "It's late in the game now."

IMI's marketing vice president Finis F. Connor says the company has a six- to eight-month lead over its competitors, having already entered the manufacturing phase amid plans to ship more than 5,000 drives this year. This is, indeed, a significant lead, for the devices seen at the NCC appeared to be early models, not production units. And BASF's Britton says those companies would be lucky to be in production by mid-1980. A significant market share, of course, could well go to the company that is able to ship in volume when the

**In time, it will be possible to build a version with six platters that stores up to 600 megabytes in a space now occupied by two eight-inch floppy drives.**

competition is still trying to get production underway. Over the longer pull, observes Britton, the market could go to the larger, experienced manufacturers. He mentions those who have yet to announce: Shugart, Control Data, and Storage Technology.

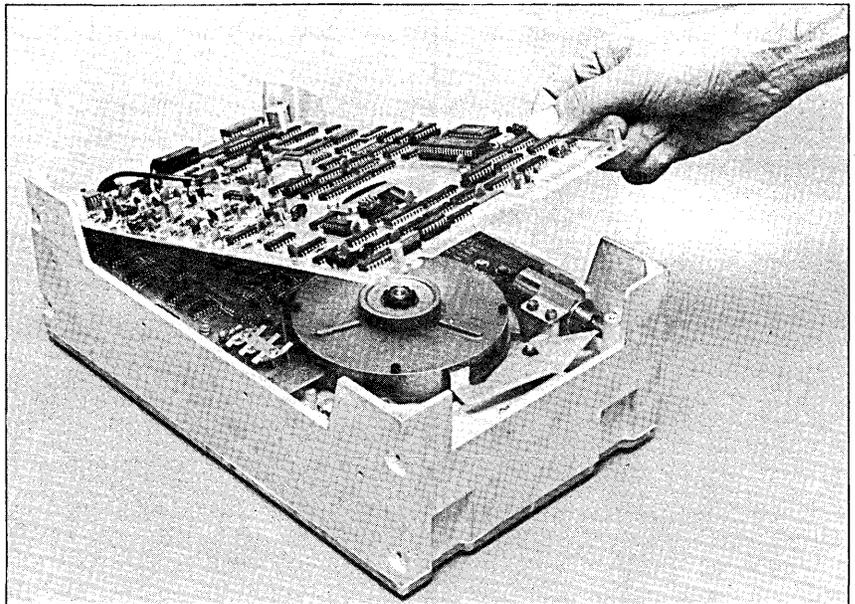
"It costs millions to put this thing into production, and lots of effort," he says. "And I'm not sure a small company (that is only now designing a product) can get there quickly enough to take market share. It's late in the game now." BASF had scheduled to be in preproduction in July, with mass production to be underway in October.

Ironically in an industry as precise as computers the 8-inch disk is not really 8 inches in diameter. There are both 200mm (7.87 inches) and 210mm (8.27 inches) disks in use. And, notes Lee Walther, "the major concern within the industry today is the availability of media." What with the unsettled issue of disk diameter (the French computer manufacturer Cii-HB has several versions of a 10½-inch drive) no media maker is into quantity production of these platters.

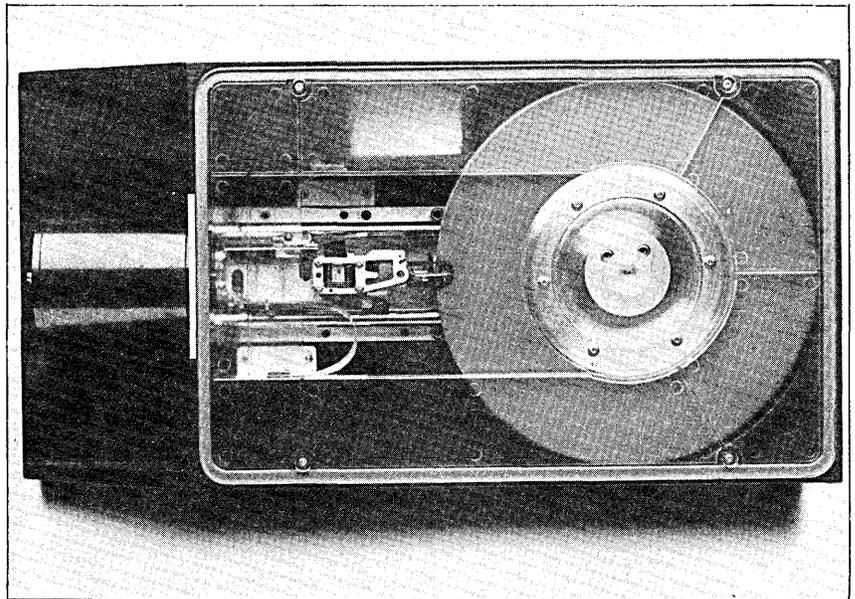
"The major problem at this point in time is that there is such a critical demand for 14-inch media that many of the companies are not willing to commit manufacturing resources to the manufacture of 8-inch media," explains Walther, and so the 8-inch platters are coming out in limited quantities.

Walther, who foresees a very large market for the 8-inch Winchester, looks not only for growth but also a split of the 8-inchers into two segments within the next 12 months. He sees those with nonremovable media, consisting of from one to six disks. And he sees models with both a fixed and a removable pack, saying this is being investigated by CDC and Memorex, among others.

In time, he adds, it will be possible to build a version with six platters that stores



MICROPOLIS CORP. is among suppliers who announced 8-inch disk drives. Electronics section of the company's Microdisk is partially visible and arranged for easy access without affecting lower, sealed section that houses storage planners and heads.



BASF's design of its 8¼ fixed disk drive, which was scheduled to be in preproduction in July with mass production underway in October.

up to 600 megabytes in a space now occupied by two 8-inch floppy drives. He explains that the data is currently being recorded on disks at some 7 megabits per square inch, but over the next seven or eight years there will be a 15-fold improvement—to 50 megabits or more. Such capabilities, of course, would use both thin film magnetic heads and thin film disk surfaces, making it possible to store 100MB on an 8-inch platter.

In short, an 8-inch Winchester disk drive is being widely touted although few production units exist. And people already are talking about giving it a capability equivalent to the highly advanced IBM 3370 disk drive, which hasn't even been shipped yet.

Says Ray Freeman, the 8-incher "is not just a flash in the pan, not merely a momentary phenomenon. It's the start of something big."

—Edward K. Yasaki

## TECHNOLOGY

# INNOVATE OR ELSE WITHER

**Question of U.S. innovation commands much attention in the White House which is expected to issue a policy statement this month.**

- **ITEM:** By 1985, Japan will boast \$4 billion in computer exports, a sum equal to computer exports from the U.S. So say some industry prognosticators.
- **ITEM:** The number of patents granted U.S. citizens declined 21% between 1971 and 1976, while patents to foreign residents grew 16%. By 1976, 37% of all U.S. patents were going to foreigners. So says the Department of Commerce.
- **ITEM:** Companies founded between 1971 and 1975 were able to raise only half as much equity capital, on the average, as firms founded between 1966 and 1970. And, firms founded in the more recent period had an average debt to equity ratio of more than 2:1, compared to the more secure 1:1 ratio that had prevailed for the previous 15 years. So says the American Electronics Association.
- **ITEM:** In the 1950s, the U.S. was credited with bringing to market approximately 82% of the world's major inventions. By the late '60s, that figure had dwindled to 55%. So says Stanford Research Institute.
- **ITEM:** Between 1970 and 1977, productivity in the U.S. inched up 2.3% annually, compared to a yearly 3.4% productivity

**"We're going to see some important policy-making in this area—and soon."**

improvement rate in the '60s. In the latter years, poor productivity growth earned the U.S. a ranking near the bottom of all industrialized nations, second only to the U.K. with a 2.1% annual climb. So says the Bureau of Labor Statistics.

• **ITEM:** Ten firms account for more than one-third of all private sector R&D dollars in the U.S.—IBM, AT&T, General Electric, Rockwell International, General Motors, Boeing, Ford, United Technologies, General Dynamics, and Lockheed. What's more, 100 big companies account for 80% of all industry R&D. So says the labor subcommittee of an executive branch Advisory Committee on Industrial Innovation.

What do all these statements have in

common, other than their negative nature? According to top government and industry leaders, these are items of evidence in support of a dire verdict: The U.S. is losing its position of technological leadership in the world, due largely to the decline in industrial innovation in the country.

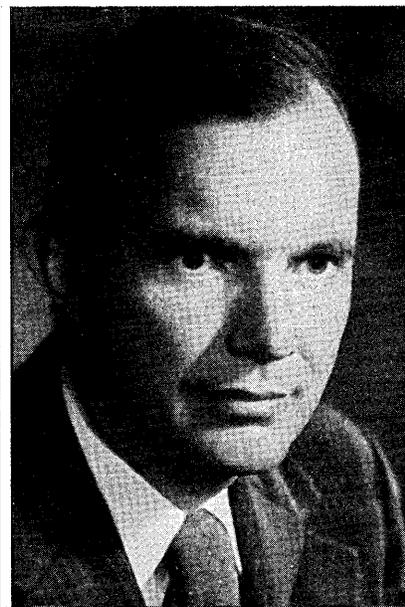
That there's a downturn in U.S. spending on research and development, the prerequisite to innovation, is no startling revelation. As the statistics show, it's a trend that began back in the '60s, sparked primarily by the dissolution of the country's space program. Now, the doomsayers tell us, it's a trend that has reached crisis proportions. Whether it's viewed either as one of the causes or one of the effects of the nation's glut of economic woes, the Carter Administration is casting about for innovation incentives as one cure for the many economic ills.

"Innovation certainly isn't as sexy a subject as energy or inflation," says a source close to the Commerce Dept. advisory committee studying the matter, "but it's one that is commanding much attention in the White House. We're going to see some important policy-making in this area—and soon."

Last August, President Carter created an interagency committee to review issues and problems related to industrial innovation. The review was to be coordinated by the Commerce Dept., with Commerce Secretary Juanita M. Kreps serving as chairperson of the committee. At that time, Secretary Kreps commented, "Our share of world manufacturing exports has been shrinking, with noticeable effects on our balance of trade. Some countries now appear to be beating us at our own game: developing and exporting innovative technology." The committee was charged with examining the impact on innovation of federal economic policy, regulatory policy, and foreign relations.

Results of the year-long Domestic Policy Review on industrial innovation were sent to the White House several weeks ago. The DPR committee's numerous recommendations, selected from reports by eight task forces comprised of representatives from 30 federal agencies as well as scores of corporate executives, labor leaders and consumer advocates, urge changes in everything from patent laws to tax laws, from regulatory restrictions to trade policy, and from antitrust law to information policy.

The final urgings of the Advisory Committee on Industrial Innovation were expected to be made public last month. However, the more "sexy" subject of energy took precedence, and Jimmy Carter took to the mountains for Camp David talks. Now, the recommendations are targeted for release from the White House this month. The expected culmination of the review on innovation is President Carter's stamp on draft legislation that will be submitted to Congress. A flock of legisla-



LEWIS BRANSCOMB—Don't rock the boat!

tive predators anxiously await this release, so they can swoop down on pieces that will fill legislative bills on everything from tax reform to regulatory relief.

One legislator decided to jump the gun. In what he calls The National Technology Innovation Act, Sen. Adlai Stevenson (D-IL) introduced a bill specifically aimed at spurring industrial innovation. The legislative proposal, S. 1250, calls for the creation of "Centers for Industrial Technology." These centers would be federally funded for joint industry-university research.

The Senate Subcommittee on Science, Technology and Space, which Sen. Stevenson chairs, held two days of hearings on the bill before calling a halt to their efforts pending release of Carter's proposals. Nonetheless, in only two days' time, the Illinois Democrat was able to identify supporters for his bill. One was Dr. Lewis Branscomb, IBM vice president and chief scientist. In addition to voicing support of the proposal, Branscomb countered claims by those prophets of doom who say the U.S. has abandoned research and development.

"It is the government, not industry, which has exhibited the most uncertainty about its science and technology investment in recent years," the IBM scientist testified. By 1980, he claimed, private industry will fund about half of all R&D in the U.S., and will perform 72% of a total \$57.3 billion national effort. "In constant dollars, industry investments in R&D have moved steadily upward, while federal activities have only recently reversed a declining trend. This is hardly a picture of American industry going down the tubes."

Branscomb also contested the notion that R&D activities are stagnant in mature industries. "While industrial R&D is heavily con-

## NEWS IN PERSPECTIVE

centrated in high-technology industries such as electronics, computers and communications, as one might expect, some of the most dramatic increases in R&D funding are emerging in industries such as iron and steel, stone, clay and glass, and machinery," he told the Senate subcommittee. "Thus, the conventional wisdom that older industries have lost their confidence in R&D is not a valid generalization."

It's perhaps not surprising that the IBM executive is more optimistic about the current state of innovation than other industrial officials. After all, he travels in circles where innovation is a means of survival. Also, as mentioned earlier, IBM is one of 10

### **IBM's Lewis Branscomb countered claims by those prophets of doom who say the U.S. has abandoned research and development.**

companies that collectively pump into R&D more than a third of the total spent by the private sector.

Indeed, the computer industry is the one most often cited as an example of innovation at work. And one need only examine trade figures from the Commerce Dept. to find that computer equipment continues to sustain a healthy trade surplus, despite an overall massive trade deficit for the country. U.S. exports of computer equipment and parts for the month of May alone totaled a hefty \$421 million. With imports in that month of \$67 million, that trade category exhibited a fat trade surplus of \$354 million. For comparison's sake, in the same month there was an overall trade deficit of \$2.5 billion.

But there are some who say the picture is not as rosy as it appears, even for the computer industry. For instance, one segment that is not broken out as a separate category in Commerce figures is semiconductor trade. While it's expected to be doing well, some erosion is known to be occurring. It is a publicly stated goal of the Japanese to at least equal, if not surpass, America's semiconductor technology in the next five years. And that's but one area of computer technology that's being invaded. It's also predicted that by the mid-'80s, Japan's computer exports will equal those of the U.S.

"If you want to know the truth, we're still running on momentum gained in the '60s," concedes an executive of one U.S. plug-compatible mainframe manufacturing company, who requested anonymity. "And, if you'll pardon the expression, we may soon run out of gas."

The decline in innovation, he claims, is not due to a lack of "brain power." Rather, it's that "the risks are great and the rewards small at a time when the cost of capital is at an all-time high." The answer to increased innovation, he adds, lies in tax reform.

Indeed, that very same suggestion was mentioned in almost every subcommittee report submitted to the Advisory Committee. In fact, tax reform was mentioned so often that some changes to current tax law are almost certain to be incorporated into President Carter's proposals.

Some key recommendations to surface in the subcommittee reports were the following:

- Increasing overall incentives for savings by individuals and investment by established corporations through use of the tax code, by such measures as allowing for more rapid recovery of capital through depreciation, eliminating the double taxation of corporate dividends, lowering corporate income tax rates, enhancing the investment tax credit, and lowering rates of taxation on capital gains.

- Allow the immediate write-off of all R&D expenditures, including those for facilities and equipment.

- Create a sliding scale tax rate for longer term investments in small businesses which spend more than a given percentage of revenues on R&D.

- Permit patents to be written off over a period shorter than their legal life. (At present, patents have a legal life of 17 years and must be written off over that period even if their economic life is shorter because of rapid technological evolution in the field.)

- Increase the support of basic research at universities.

- The Justice Dept. should encourage, not discourage, joint or cooperative research, even among large competitors.

- Market share acquired principally as a result of the introduction of new technology should not ordinarily be considered in monopolization cases.

- The Patent Office should develop an effective computer-based search and retrieval system for its own use and to provide improved search services to users.

### **"If you want to know the truth, we're still running on momentum gained in the '60s."**

- The recommendations relative to copyright of software and data bases, promulgated earlier by the National Commission on New Technological Uses of Copyrighted Works (CONTU), should be implemented immediately.

And the list goes on. Regardless of which suggestions President Carter selects as desirable or workable, one thing is certain—there will be some legislated incentives to increased industrial innovation in the near term. Congress agrees, the public agrees, and the President agrees. And, as IBM's Branscomb told Sen. Stevenson's subcommittee, the fact that the government is formulating policy in this area will in itself go a long way toward instilling confidence,

"the most essential single ingredient" for private investment in R&D.

Nonetheless, Branscomb offered a word of warning to Uncle Sam: "Erratic interventions or changes in the course of government policy, however well intended, are the greatest deterrent to industrial innovation because they escalate an already high risk associated with innovative activities for new business." In other words, the IBM man's advice is: don't rock the boat!

—Becky Barna

## POLICIES

# CANADA'S COMPUTER INDUSTRY

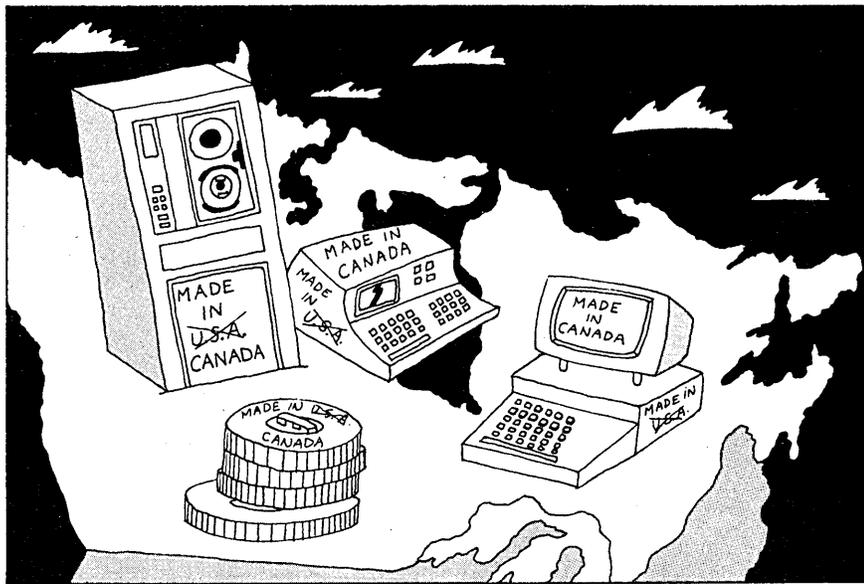
**Unlike some other nations it doesn't have a national computer policy, yet computers are a \$4 billion a year business.**

Although their gas supply is plentiful these days, Canadians are bothered by other things: their foreign exchange rate, for example (about 85 cents to the U.S. dollar), and the lack of Canadian content in many manufactured goods. And many in Canada view their computer industry as a vast subsidiary of U.S. manufacturers.

At the heart of the matter, says Zavis Zeman of the Institute for Research on Public Policy in Montreal, is the fact that "Canada does not have a computer policy."

At a four-day computer conference in Canada's old capital of Quebec City, the Digital Equipment Corp. proudly, but significantly, displayed the following sign over its exhibit booth: "Supplying 1,200 Canadians with jobs in manufacturing and sales of computers." DEC of Maynard, Mass., was one of numerous U.S.-based companies at the exhibit which dominate the Canadian computer industry. Others were IBM, which had just installed its first model 4300 computer at Kitchener, Ontario, Honeywell, pushing its page processing equipment, TRW of Canada, and a host of other Canadian subsidiaries of U.S. manufacturers.

Pure Canadian content at the exhibit were Consolidated Computers, Ltd., now affiliated with Fujitsu of Japan, a few Canadian communications suppliers, and a handful of Canadian service bureaus and software houses. The exhibit was part of a joint conference of the Canadian Information Processing Society, the Data Processing Management Assn. of Canada and the Federation de l'Informatique du Quebec, French Canada's computer sciences society.



Zeman is a project director in futures studies as they apply to technology changes at the Montreal institute, which is considered to be Canada's largest think tank. He said countries such as Brazil and Japan had created their indigenous computer industry by carefully thought out computer policies. Japan, Zeman noted, "imports, copies, and improves technology" and then

**In Canada a "debate should be started" on whether the government should support private industry in establishing long-term goals.**

aims it first at second (communist) and third world nations. "Later they will aim their products at OECD nations with upgrades to the products they've sold to the others."

The result is, said Zeman, that Japan's computer industry will be a \$16 billion industry in 1985, having doubled in three years, and its exports of computer-related equipment will total \$4 billion. "That's the same as U.S. exports," he said.

Computers, he said, will be Japan's principal foreign exchange earner in the '80s. And that's the way the Japanese have planned it all along. For example, Zeman said, Japan was investing \$40 million a year toward the training of computer salesmen throughout the world.

Zeman, a panelist at a session entitled, "Mutual Effects of Government Policies, the Information Processing Industry and the National Economy," said Canada does benefit from technology transfer from U.S. companies, protects its service bureaus from foreign acquisitions, and provides some assistance to startups. But he noted there is no state-owned mainframe computer company and no state computer leasing company.

He said he believed that in Canada a

"debate should be started" on whether the government should support private industry in establishing long-term goals for a more viable native computer industry.

"I am not saying Canada should emulate Japan or Brazil," Zeman said later in an interview. "But part of their strategy for an indigenous computer industry could be adapted by Canada." Zeman said the idea of a Canadian computer policy is hardly ever discussed.

Canada's computer industry last year produced revenues of \$4 billion for foreign and Canadian companies. About \$2.5 billion of this was in the computer services and software industries and about \$1 billion in hardware sales by U.S. firms. Canadian hardware vendors accounted for \$75 million in revenues. The computer industry also accounts for 118,800 dp related jobs among users and vendors.

That isn't all that bad for a nation of some 23 million. In fact, it could be the reason why the country doesn't talk too much about a computer policy.

"Policies always seem to be interreacting. One man's policy turns out to be another's strategy," said Choulgere Guruprasad, who heads the corporate systems

**Canada's \$4 billion computer industry accounted for 118,800 dp related jobs among users and vendors.**

branch at Canada's Supply and Services Administration. "What we need are a few well-organized programs that improve productivity because that is what the end user wants."

Describing the computer industry as the nation's single "counterinflationary tool," he said the Canadian computer industry has every right to ask its government for help (in the form of preferential treatment and subsidies, which it now receives). But

at the same time, the government and the industry should develop programs for productivity that take into consideration the needs of the computer user.

Another suggestion, during a question and answer period, was that since government has made such a mess of computer utilization, maybe it should get out of the information processing business and turn it over to private enterprise. The person who asked the question received the following encouragement from another person attending the meeting: "If anyone has ever worked in a government data processing operation, he'd understand why it would make sense to turn it over to the private sector."

—Tom McCusker

COMPANIES

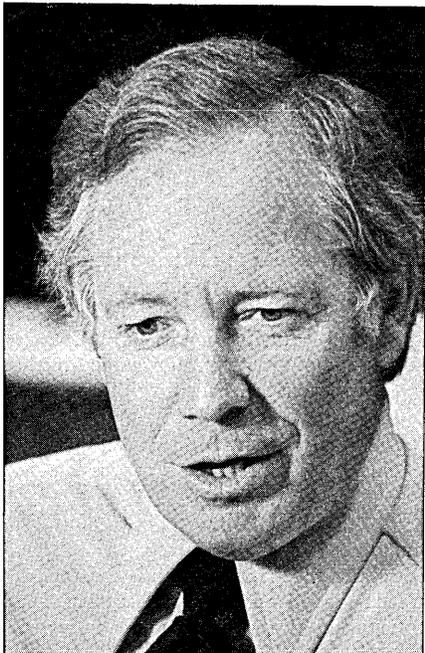
**ONCE UPON A TIME**

**California Computer Products Corp.: most of its parts are still intact but separately.**

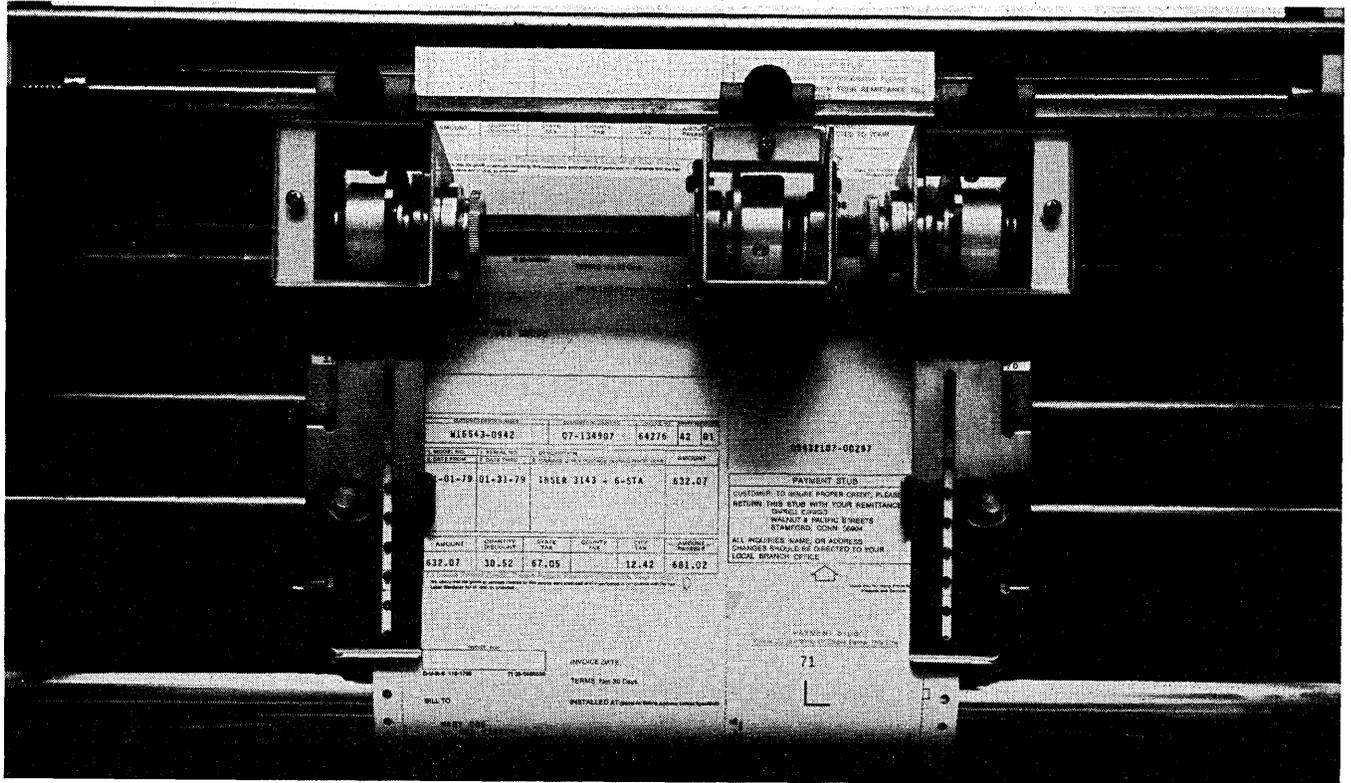
Once there was a company called California Computer Products Corp. (CalComp).

It was founded in 1959, primarily as a military research and development firm. It also sold digital plotters and by the late '60s was calling itself The plotter company.

In 1968, with the company doing well, founder and then president Lester Kilpatrick advanced \$1 million to help George Canova, CalComp's current chairman and president, launch Century Data Systems. In 1973, CalComp acquired Century and got into the IBM plug-compatible tape and



JAMES Y. PAYTON—Out at Century Data.



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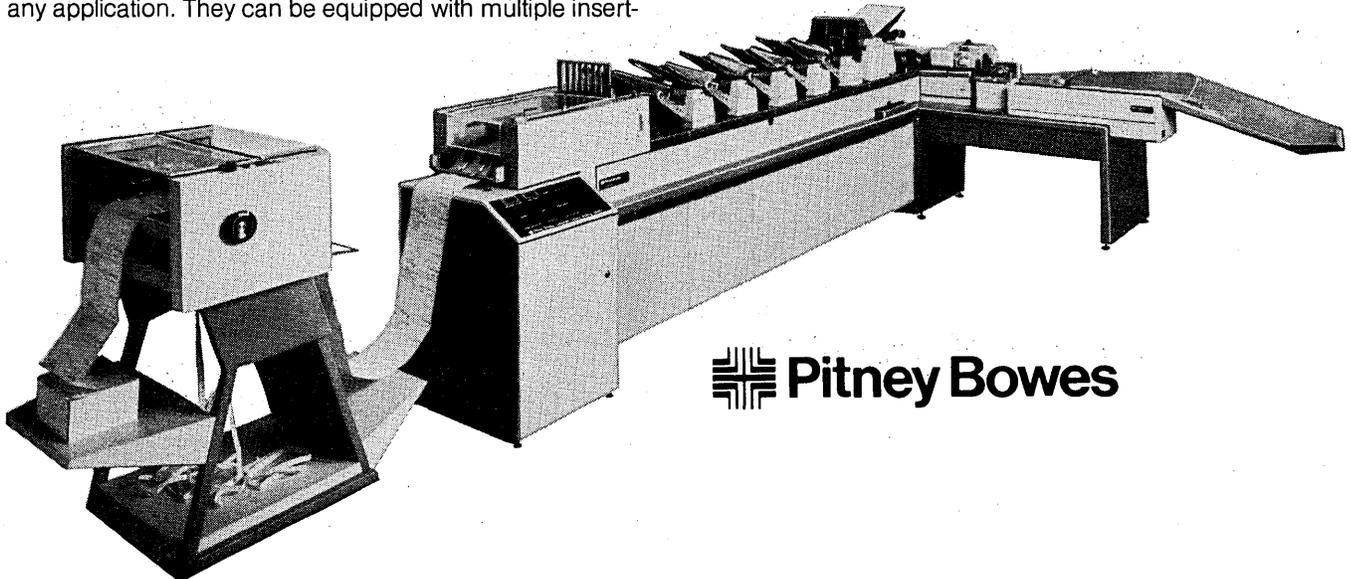
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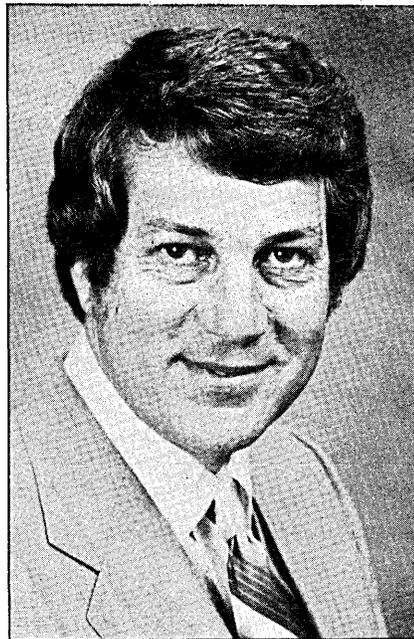


**Rental Electronics, Inc.**

DA 8/79

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## NEWS IN PERSPECTIVE



DARREL MC COLLOUGH—Has his old operation back.

disk memories market.

This, in turn, led CalComp into court with an ill-fated suit against IBM charging antitrust violations in the plug-compatibles market which probably led to the deposition by Canova of Kilpatrick who devoted the better part of his time to the case for more than a year.

It was a debt-ridden CalComp Canova took over in April 1977. As part of a turnaround attempt, he discontinued manufacture of end user IBM plug-compatible products and organized the company into five

**"I've changed companies twice, and never moved my office."**

operating divisions: Data Processing Products & Services; Graphics Products; Oem Memory Products; Interactive Graphics; and International.

And now, CalComp is negotiating with Sanders Associates for Sanders' acquisition of the Anaheim, Calif., firm. If the merger goes through, Sanders will not be getting five operating divisions. CalComp has been selling off pieces of itself since late last year.

First to go was the Oem Memory Products Div., sold to Xerox last November. In its third quarter report for the period ended April 1, Canova said: "Total proceeds from the sale of Memory Products Div. are estimated to be approximately \$28,000,000. To date, approximately \$24,000,000 has been received with a substantial portion applied to repayment of bank debt."

With the division went the majority of its personnel and the Anaheim facility it had occupied since it was Century Data Systems, Inc. "I've changed companies

twice and never moved my office," quipped Dick Charlton, an executive who has been with the operation since the early Century Data days.

And the Century Data days are back. Xerox renamed the operation Century Data Systems. James Y. Payton, who had been vice president and general manager when the operation was a CalComp division and executive vice president in its first life as Century Data, was named by Xerox to be its president.

It was a short-lived presidency. By late June, Payton was out and Tom Skelly who had been vice president of operations was running the show as acting general manager.

Various stories were being told in Orange County's computer industry circles as to the why of Payton's departure. Payton, who had once before worked for Xerox, was not available for comment at this writing. "He's away on vacation—wouldn't you be?" asked an acquaintance.

The official word from Century Data was that Payton had resigned "for personal reasons."

Other sources, close to the company, said Payton's departure was related to organizing activities at Century Data by the Amalgamated Clothing & Textile Workers Union. These sources contend that: Xerox, at the corporate level is friendly with this union; that the union did begin organizing activities at Century Data; that Payton issued an anti-union memo leading to a phone call from a highly placed Xerox executive and Payton's hasty departure. One source said Payton had gone so far as to call the Anaheim police to have union organizers thrown off the Century Data premises, but the Anaheim police would neither confirm nor deny this.

But Century Data has been growing since its takeover by Xerox. A spokesperson said the operation had 750 employees at acquisition time and now has 900. It has introduced two new products in its Hunter and Marksman lines of rigid disk drives and plans to announce two more within the next six months.

Another former CalComp divisional vice president and general manager appeared in mid-July to be regaining, in a sense, control of the operation he directed at CalComp. He's Darrel McCollough, who early this year was named president of the Braegen Corp., Cupertino, Calif., producer of IBM-compatible terminal systems.

CalComp several years ago invested \$5 million in Braegen and had indicated an interest in acquiring the northern California firm. "They (CalComp) just ceased investing," said a spokesperson for Braegen.

Braegen and CalComp this spring reached an agreement in principle for Braegen to acquire from CalComp its plug-compatible end-user business. The agreement, negotiated by McCollough, includes the CalComp sales and service net-

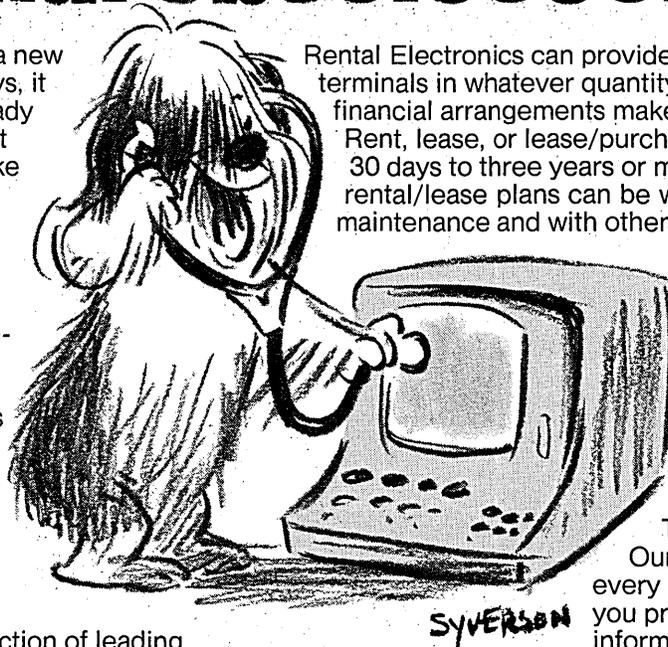
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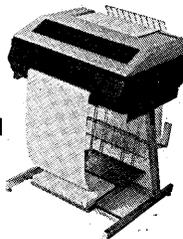


### Hewlett-Packard 2621A/P Terminals

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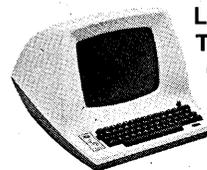
### Tally T-2000 Hush-Tone Line Printer

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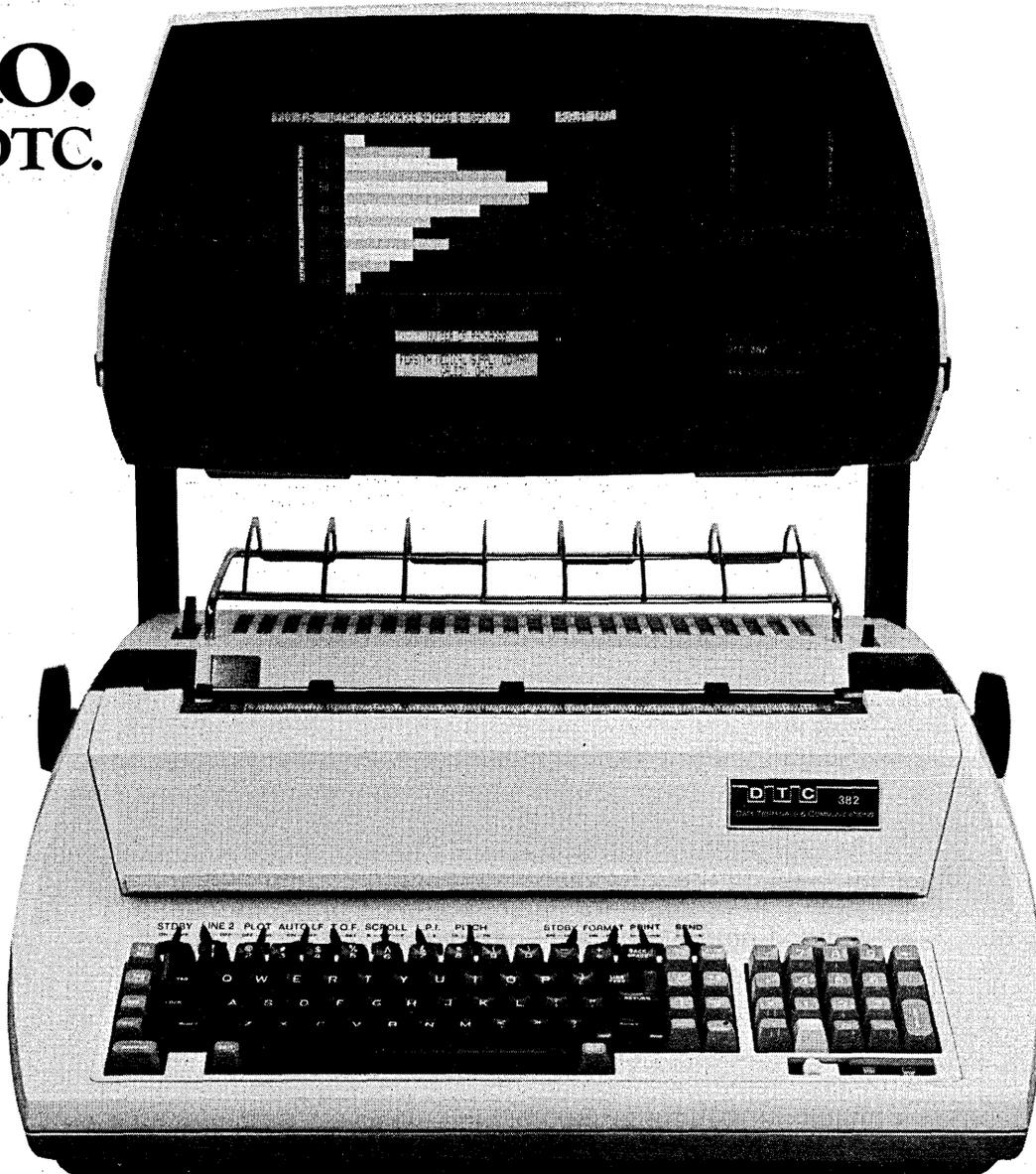
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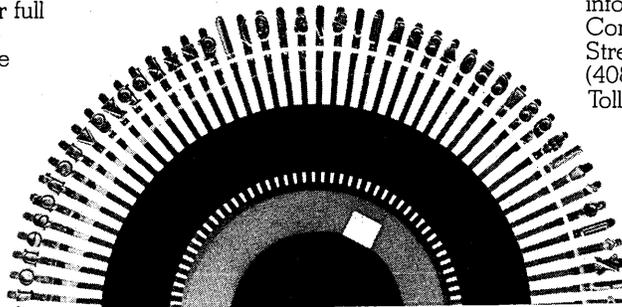
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# DTC

work for disk, tape and add-on memory end-user products, 530 employees, a 150,000 sq. ft. facility in Anaheim, and all plug-compatible end-user products including the CalComp 4350 IBM-compatible disk system, the CalComp Automated Tape Library and add-on memories for IBM 370 and 303X computers. All are activities headed by McCollough when he was a CalComp vice president. He has served on the Braegen board of directors since CalComp's early interest in acquiring that firm.

McCollough remains in Cupertino as Braegen's chief executive. He has reorganized Braegen into two distinct operations groups with Robert Theriault as vice

### **Century Data has grown since its takeover by Xerox—from 750 employees to 900.**

president of operations in Anaheim and Thomas Cleary as vice president of operations in Cupertino.

Braegen will continue service of CalComp's historical end-user products no longer being manufactured through a branch office network of field engineers which also will service the acquired CalComp products and Braegen's terminals. Paul Humphries has been named vice president and general manager of the Field Engineering Div.

The Braegen acquisition, involving \$13,500,000 in cash and securities, was expected to be completed by the end of July.

Still another CalComp sale was to Billings Computer Corp., a Provo, Utah, producer of small business systems. Billings got CalComp's floppy disk operation for an estimated \$1.8 million. Billings moved the operation from Anaheim to Provo.

And Anderson Jacobson, Inc., San Jose, Calif., data communications firm, last month picked up a somewhat hush-hush CalComp development project. The company purchased all rights and interests in a data communications product CalComp has been working on for two years. Dick Interwill of Anderson Jacobson described the product as a "system used to integrate all data processing, word processing, all digital data. It's really a PABX designed for digital data." He said the product is not out of the design stages yet and is not expected to be for another 18 months to two years. Purchase was made for a cash payment of \$500,000 and future consideration valued at \$500,000 within two years.

With the rights to the product, Anderson Jacobson got 12 CalComp designers and engineers who are continuing its development. In mid-July they were still working out of CalComp's Anaheim facility but Anderson Jacobson was looking for a rental facility nearby.

And why, with all this selling, must CalComp put itself on the sales block? Canova indicated in the third quarter report that

operations "in the third fiscal quarter produced a net loss of \$168,000 on revenues of \$35,767,000, compared to earnings of \$987,000 on revenues of \$29,114,000 in the corresponding 1978 quarter."

He said that although the quarter results included an estimated net gain of \$708,000 on the sale of the Memory Products Div., "the overall quarterly results were negatively impacted by foreign currency translation and exchange losses, foreign income taxes, increases in operating costs and expense, and increased interest expense."

CalComp entered into an agreement in principle with Sanders last May 11. To effect the first stage of the transaction, a Sanders' subsidiary, Sanders Development Corp., made and completed a tender offer of \$14.50 net cash per share for 37% of CalComp's stock.

The next proposed step will be for the remaining CalComp shares to be exchanged for a combination of Sanders common stock and cash with a combined value of \$13.50 per share, subject to adjustment based upon the price of Sanders common stock immediately prior to a CalComp shareholders meeting to be held in November. This meeting will be held following the preparation of a joint proxy statement which will include year-end financial information for both firms. CalComp's year ended on June 30, Sanders' on July 31.

CalComp's president Canova, said a spokesperson, has assured all employees that, should the merger go through, "nothing will change; we'll still be California Computer Products."

However, a source close to the company said there is "internal concern" that this is not the case, that CalComp as such will disappear. And perhaps CalComp employees are conditioned to expect change.

But possibly Canova is right and there will continue to be a company called California Computer Products Corp.

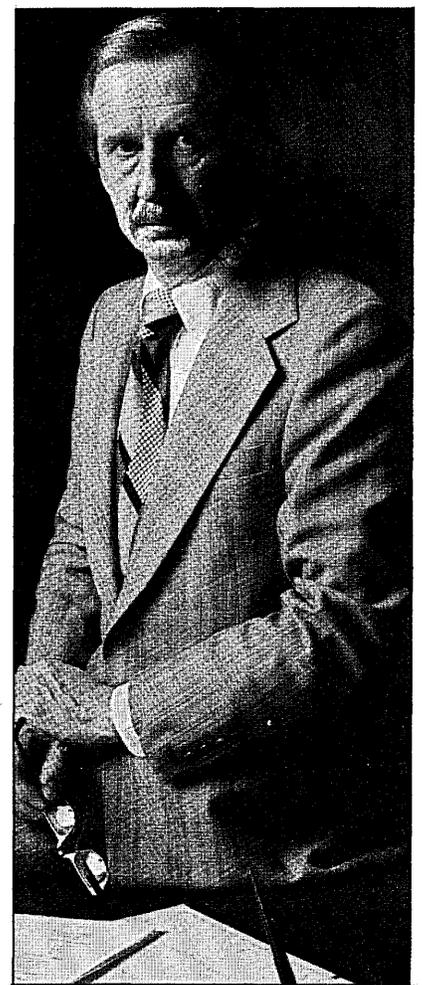
—Edith Myers

## **ONE YEAR LATER**

**Telefile Computer Corp. slipped a year with its new line of Sigma-like computers, but says it's ready to go now.**

"We lost a year of our life but we're alive and well, thank you," said Sam Edens, chairman of Telefile Computer Corp.

Telefile, since Xerox exited the general purpose computer business in 1975, has been trying to play savior to the Xerox customer base. It has hired former Xerox Data Systems employees, continued to produce Xerox-compatible peripherals and



SAMUEL V. EDENS—"We're alive and well, thank you."

was, a year ago, to have offered a line of new products including cpu's, enabling Xerox users to upgrade with their existing software.

"We now have a firm introduction for all of them," said Edens of the new products. The major product, the T-85, a Sigma 9-like computer with improved price/performance, was running Xerox diagnostics in late May and is scheduled for introduction in Europe next month and in the U.S. in October. Normal manufacturing shipments are due to begin in November.

Shipments began in June on the Telefile MIOP (Multiprocessing Input/Output Controller), billed as a cost-effective alternative for the Sigma 9s and a "first-of-its kind" for Sigma 5, 6 and 7s.

Normal manufacturing shipments are scheduled for December for microprocessor-based disk and tape systems.

"We tried to do too much too fast," said Edens of the one-year setback. "We organized our marketing department too early." Telefile's banks became nervous when introduction dates were slipped.

But in late June the company completed bank renegotiations which Edens said "will

## NEWS IN PERSPECTIVE

carry us through next year, through completion of our development period."

While the bank agreement was announced in April it actually was signed June 21 and the company held an employee luncheon June 28 to celebrate the signing. "Morale has been low, people were asking themselves why they were working for Telefile." The company had two waves of layoffs and closed down its Phoenix plant completely.

And Edens wonders about the effects of the year's delay on users. A user survey it has commissioned, which should be completed this month, asks, among other things, "Does our being a year late bother you?" Results might dictate marketing of

### **The company had two waves of layoffs and closed down its Phoenix plant completely.**

the new products under other than the Telefile name, Edens said.

But he's optimistic and points to the fact that the company reported record revenues for the first half of its fiscal year 1979, which ended March 31. He said unaudited revenues for the period increased 67% over the previous year with most of the gain in the second quarter, up more than 109% over the second quarter of FY 1978.

Revenues for the current half were \$7,609,270, and for the current second quarter, \$4,286,946, versus \$4,557,560 and \$2,049,374, respectively, for FY 1978.

Edens said the company, though showing a loss, had considerable earnings improvement during the first half compared to the previous year. Net loss for the six month period was \$428,186 (\$.35 per share) compared to a loss of \$643,398 (\$.53 per share) for the first half of FY 1978.

"The second quarter again was responsible for earnings improvements as the company was able to trim losses even more than expected to \$116,515 (\$.10 per share)," Edens said. Losses for the first quarter of FY 1979 were \$311,671 (\$.26 per share).

He feels the company is returning to its historical earnings pattern which, except for last year, has shown early losses in the first and second quarters, small losses or break even in the third quarter, and a profitable fourth quarter.

Until last year, he said, Telefile had five consecutive years of sales and earnings growth culminating with FY 1977 in which net income exceeded \$1 million on sales of more than \$11 million.

"Generally in the past, second half sales activity has significantly exceeded that of the first half, and we have no reason to expect any change this year," Edens said.

"Telefile's European subsidiaries were major revenue contributors in the first half and most of the sales came from the company's line of computer peripheral products sold and leased to Xerox computer

users."

He said "of 12 Sigma sites in Germany, 11 are our customers. There are 35 sites in England and we have 20."

And for those customers who can't wait for the T-85, Telefile still has refurbished Sigma 9s. Edens said the firm recently acquired three Sigma 9s from Cubic Corp. which Cubic had on lease from Honeywell. One, refurbished and augmented with new Telefile memory modules and peripherals, went to Xerox Computer Services. Another went to the Educational Service District 189 in Washington State.

And Telefile has marketing rights to Sigma 9s being built by Modutest, a small Westlake Village, Calif., firm. "We have a commitment on six and they could build 20 more and we would get those."

"ComShare Corp. had an agreement with Honeywell to buy new Sigma 9s," he said by way of explaining how Modutest got into the act. "But a small Phoenix company called Ace Computer closed down and ComShare hired its people who began building Sigma 9s under the name Oscar with the help of Honeywell people moonlighting." The Ace plant is across the street from Honeywell's.

"Modutest was reverse engineering logic modules and supplying logic cards to ComShare. They are now building their own Sigma 9s and we supply the spare parts."

Telefile early this year named a new president, David Scott, formerly chief executive of Interstate Electronics. Edens said Scott has reorganized the company's production, procurement, and sales staffs to make certain that manufacturing schedules and cash-flow objectives are fully met.

This frees Edens as chairman, to work in another facility with Hal Eden, president of Telefile's mainframe division, to "create a totally new generation of Sigma-type computer systems, taking full advantage of the technological breakthroughs that have occurred in the years since Xerox withdrew from computer-mainframe manufacturing."

But Edens is a man who likes to have a hand in all parts of the company and in May he was doubling as acting marketing vp while seeking a high powered replacement in this post. He was talking to a number of highly placed Orange County, Calif., computer executives.

### **And for those customers who can't wait for the T-85, Telefile still has refurbished Sigma 9s.**

But it was Edens himself who conducted an intense, two-day weekend sales meeting in late May. They came, 15 strong, from all over the country. "We had spread ourselves too thin, but not any more," said the Telefile chairman. "The guys left here all fired up to get back into the field."

—Edith Myers

## SMALL COMPUTERS

# WANG'S REXON VENTURE

**With \$2 million in seed money and an almost limitless market, Rexon Business Machines launches its RX line of computers.**

"You should always build a little optimism into your business plan," said Dr. Ben C. Wang early this summer as he admitted that his newest venture, Rexon Business Machines Corp., was about 45 days behind schedule. But he added that the company's original goal of \$2.5 million in revenues this year hadn't changed.

And in Orange County, some 40 miles south of Rexon's Culver City, Calif., headquarters, software specialist David Jay was predicting that Rexon "will be one of the major brand names in small business computers." Jay's company, Professional Business Management, Inc., is the applications software development firm for the first of

### **The market is so big, Rexon hardly ever sees any of its competitors.**

two Rexon dealers, and had been conducting Alpha tests on the machine during the first three weeks of July.

"Not only do they have a complete operating system, but their people are willing to fix anything that we find will improve it. Also, they seem to have a first rate customer support organization and that always is what makes a company go," Jay said.

Jay should know. He also does software development on such other brand names in the small business computer market as the IBM 5110, and Data General and Univac machines.

Rexon, a 47-person company, will have a staff of 100 and 38 dealers in place by year end, when it also expects to be turning out 40 machines a month. It plans to be producing 100 a month by the end of next year.

Wang, who had raised \$2 million in seed money by last November—about eight months before the company ever went into production—listed Rexon's schedule as follows: two dealers were appointed in June; Alpha tests were to begin in July; support centers and dealers will be set up in San Francisco, New York, New Jersey, Boston, Chicago, Houston, and Dallas later in the year. The 45-day delay was in naming its first two dealers in the Los Angeles area and getting the test machines

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DM 8-79

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## NEWS IN PERSPECTIVE



DR. BEN C. WANG—His newest venture is in small business computers.

into the Alpha test stage.

Its products are the RX 10, a low-priced single terminal system that will be priced at \$18,600, and the RX 30, whose prices range from \$32,000 all the way up to \$70,000 if a user selects eight terminals and maximum memory of 128K bytes and 40MB of disk storage. Rexon uses 8086 microprocessors which it says are more than twice as fast as those of all the other 16-bit devices on the market.

Its operating system, called RECAP, uses a language called Business BASIC and includes file management facilities, utility and diagnostic programs, and a multitasking executive. Users can develop new application software or use any commercially available applications programs, such as those offered on machines of the more established suppliers such as Wang Laboratories, Qantel and Basic/Four.

Wang understandably is aware that his company is somewhat late in a market that so far is dominated by giants—IBM, NCR and Burroughs—as well as the established smaller firms, Wang, Basic/Four, Qantel, Cado and a host of firms offering even lower priced items such as Pertec, SDS, Astroom, TI, and IBM with its 5110. The list goes on and on. But it's a huge market. The market research firm of Creative Strategies forecasts a 51% compounded annual growth for such lower priced items as the RX 10 and 30% for products of the RX 30 class. Wang says some 1.5 million companies doing \$500,000 to \$10,000,000 are potential customers and that only 5% of the market has been penetrated.

"We hardly ever see any of our competitors, it's so big," says Peter Zinsli, Wang's marketing whiz who used to be vp in charge of marketing strategy with Pertec.

And Zinsli says the average price his competitors get for installing a system is \$45,000.

As for big competitors, nobody at Wang is worried that the huge companies eventually will kill off the small ones when the market begins to mature. "It's a software

**"You could say that Rexon would be the McDonald's, selling the world's best hamburgers, and the dealers would provide the trimmings to customers."**

game," says Zinsli. "And no successful vendor can be a systems house in this business, not even IBM." In fact, he says, IBM salesmen often will try to convince systems engineers at a software house to quit and become a "software house," catering to the needs of IBM customers.

Rexon will offer dealers 35% off the list price, giving them about an \$8,000 leverage to develop applications software for customers. And there are, besides the mundane accounting packages (all of which usually will have to be customized), about 100 so-called vertical packages that can be offered to users by all sorts of dealers. That includes dealers already selling systems offered by the biggies as well as hardware distributors who have access to a software house, systems houses, and service bureaus.

"If you're looking for an analogy," says Wang, "you could say that Rexon would be the McDonald's, selling the world's best hamburgers, and the dealers would provide the trimmings to customers."

Wang, 51, left Scientific Data Systems

in 1969 to form Wangco to make tape and disk drives for the minicomputer industry, and sold the company in 1978 to Perkin-Elmer when it was doing \$32 million. Shortly afterwards he was offered the job of president of a reborn Scientific Data Systems, when a former SDS employee, Jack Mitchell, was thinking of opening his own small business machine company (May, p. 253). But Wang, an entrepreneur with a big ego, decided he wouldn't work for anyone else and got together with Zinsli and Russ Gerns, then vp of operations at Cipher Data Products, to form Rexon. In fact, since he was prohibited from using his own name in the company title because of the sale of Wangco, Wang thought up the name Rexon. "Wang in Chinese means king, hence the first part of our name."

He grew up in Shanghai, when it was under Japanese occupation, and emigrated to San Francisco where he worked as a busboy in Chinatown to get his bachelor's and master's degrees from the Univ. of California at Berkeley and his PhD from ITT.

"We're a second-generation company," says Wang. "We've had a lot of experience with startups before and aren't going to make the mistakes that we made with those startups—overexpanding, undercapitalized, always looking for money."

His monthly company activity reports even track the number of days the staff spends on the road (in May: nine days). This close control might even explain why the company ran only 45 days behind schedule, which isn't bad for a startup.

—Tom McCusker

## ELECTRONIC MAIL

# BUZZING DEC ON ITS EMS

**Digital Equipment Corp. will offer large customers direct connection to field service offices through its internal electronic mail system.**

Digital Equipment Corp. this fall will begin offering its internal electronic mail system to some customers, but it won't be the same system the company's been experimenting with for more than a year.

Until recently, it was widely expected—even within Digital—that the minicomputer manufacturer would purchase a license for what is known as the COMET electronic mail system from Cambridge-based Computer Corp. of America. Since January 1978, Digital has had a very successful internal pilot project offering about 800 largely management personnel access

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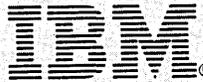
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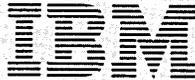
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D879

## NEWS IN PERSPECTIVE

to an on-site COMET network running on a PDP-11/70.

In May of this year, however, a DEC internal committee decided that the company was interested only in marketing an internally-developed electronic mail product and the company then terminated five months of contract negotiations with Computer Corp. of America. DEC's marketing focus was then concentrated on the potential of a parallel development effort, using a medical oriented file and message system in an interpreter-driven high-level language called DSM-11, or MUMPS.

DEC's Laboratory Data Products Group (LDP) has been using the MUMPS language since 1971, adapting work done under government funding at Massachusetts

### **DEC's laboratory data products group developed EMS function on a PDP-11/70 dedicated to MUMPS, the same system that the group uses for its business management.**

General Hospital in Boston. Developed originally to service doctor's inquiries to medical laboratories, MUMPS (MGH Utility Multiprogramming System) is apparently a language of considerable power and flexibility. The Laboratory Data Products Group developed the EMS function on a MUMPS-dedicated PDP-11/70, the same system that the group uses for its business management. In pilot operation for the past year, the MUMPS-based EMS supports 128 users locally in Marlboro, Mass., and has five remote lines for Telex and telephone connections worldwide.

According to DEC sources, Digital's Central Engineering Group is now adapting the previously standalone MUMPS interpreter into DEC's standard VMS operating system so that EMS and other MUMPS-compatible functions can be offered as a product on the supermini VAX line of machines.

A second MUMPS/EMS pilot project was recently launched in DEC's internal corporate telecommunications group. Robert Erickson, the group's manager for office information systems, says DEC this fall will expand the second MUMPS network to offer EMS to 200 domestic sales managers.

Although Erickson and other spokesmen for DEC's corporate telecommunications group have widely touted DEC's internal COMET program as a "great success," a predictable chauvinism on the part of those associated with the MUMPS development may have influenced the final marketing judgment. "A couple of our guys got this (MUMPS/EMS) up in a couple of months," said one LDP staffer. "People have been working on the other one for a couple of years and hadn't got nearly the functionality."

Comparing the COMET and MUMPS systems, Erickson described the CCA COMET system as featuring "an extremely

straightforward, easy-to-use command structure that works extremely well with both low-speed and high-speed terminals." Terminal oriented, with only 13 basic commands, COMET can be used to read messages that have been sent, compose and edit messages, send them to other subscribers, answer and forward, file and retrieve, and summarize key information about messages in file. "Particularly in the area of short, informal memos and exchanges between people, it was extremely successful and received with enthusiasm," said Erickson.

"The MUMPS system we have here is an experimental system that has more capabilities, more complex editors, and is menu-driven, so it tends to perhaps work better on a higher speed terminal," he added, "say, 1200 baud and up."

"There are pluses and minuses both ways. On one hand, you have a more capable system which some of the technical people like; and on the other side, you may have an extended training concern." One reason COMET spread within DEC so quickly, noted Erickson, "was because it was as straightforward as it was." Extending the use of office automation system internally, he said, "I know I add a burden in getting people to use it if there is any amount of training involved at all."

Although the "menu" orientation of MUMPS/EMS should ease user orientation, the extended capabilities in editing, document handling, and graphics will likely require some user training, he explained. Additional MUMPS functions offer full calendar scheduling and a subscriber "tickler file" to alert the user that he has messages waiting. In addition to COMET-like memo capabilities, the MUMPS' document-handling function allows some word processing formatting and editing, and will interface with DEC's communicating word processing system.

In May, at the 1979 COMET users' meeting, a colleague of Erickson's, Dr. Claire Messier, project leader for computer-based message systems, gave a very positive report on DEC's experience with the CCA system. Management and executive personnel make up 48% of DEC's COMET users, she said. Another 30% are staff professionals, 18% are office staff, and 3% are technical personnel. A quantitative analysis of the pilot program showed that telephone calls decreased 25%; formal interoffice memos decreased 15%; the number of meetings remained the same (but more was accomplished in less time), and overall productivity was increased.

Not including the telephone costs, DEC figures COMET costs approximately 23 cents per message and will go lower as terminal costs decrease, explained Messier. At DEC, she said, the primary uses of COMET have been: information broadcast, inquiry and response, task assignment follow-up, requests for action, meeting agen-

das, conversation follow-up, and informal discussion.

Based on their experience, Messier said, DEC management is sold on electronic mail systems because they provide easy distribution of information in a timely manner, allow quick action on urgent problems, eliminate geographics and time-zone differences, and generally increase productivity.

Its first users outside the company will be selected large customers who will use the system to be connected directly to DEC field service offices. The service may well be offered without charge, since it is apparently part of Digital's ongoing EMS development effort.

With expansion, DEC will have about 1,900 subscribers on its internal electronic

**"The MUMPS system we have here is an experimental system that has more capabilities, more complex editors, and is menu-driven, so it works better than a higher speed terminal."**

mail-systems in the coming year, said Erickson, and the company plans to push ahead cautiously but steadily to integrate EMS systems into its office environments. "We're saying to our management that this is not a cost replacement; it's really getting at the idea of making people more effective at their work. It's a productivity issue. And we're saying that this kind of system has the potential of giving a 5% productivity increase—which more than justifies the cost of it—and therefore it's time to seriously consider it."

—Vin McLellan

## FINANCIAL

# IMPRESSIVE GAINS IN QUARTER

**Notable exceptions were IBM and Memorex, but one analyst notes it's more than ever a growth industry.**

With the notable exceptions of IBM and Memorex, computer companies continued to rack up impressive financial gains based on earnings and revenues reported for the past quarter prompting one analyst to note it's more than ever a growth industry.

Even IBM's 3% decrease in net income for the second quarter is not considered traumatic, merely the logical outcome of a marketplace filled with uncertainty and a shift to leasing rather than purchase until

# Model 204 DBMS

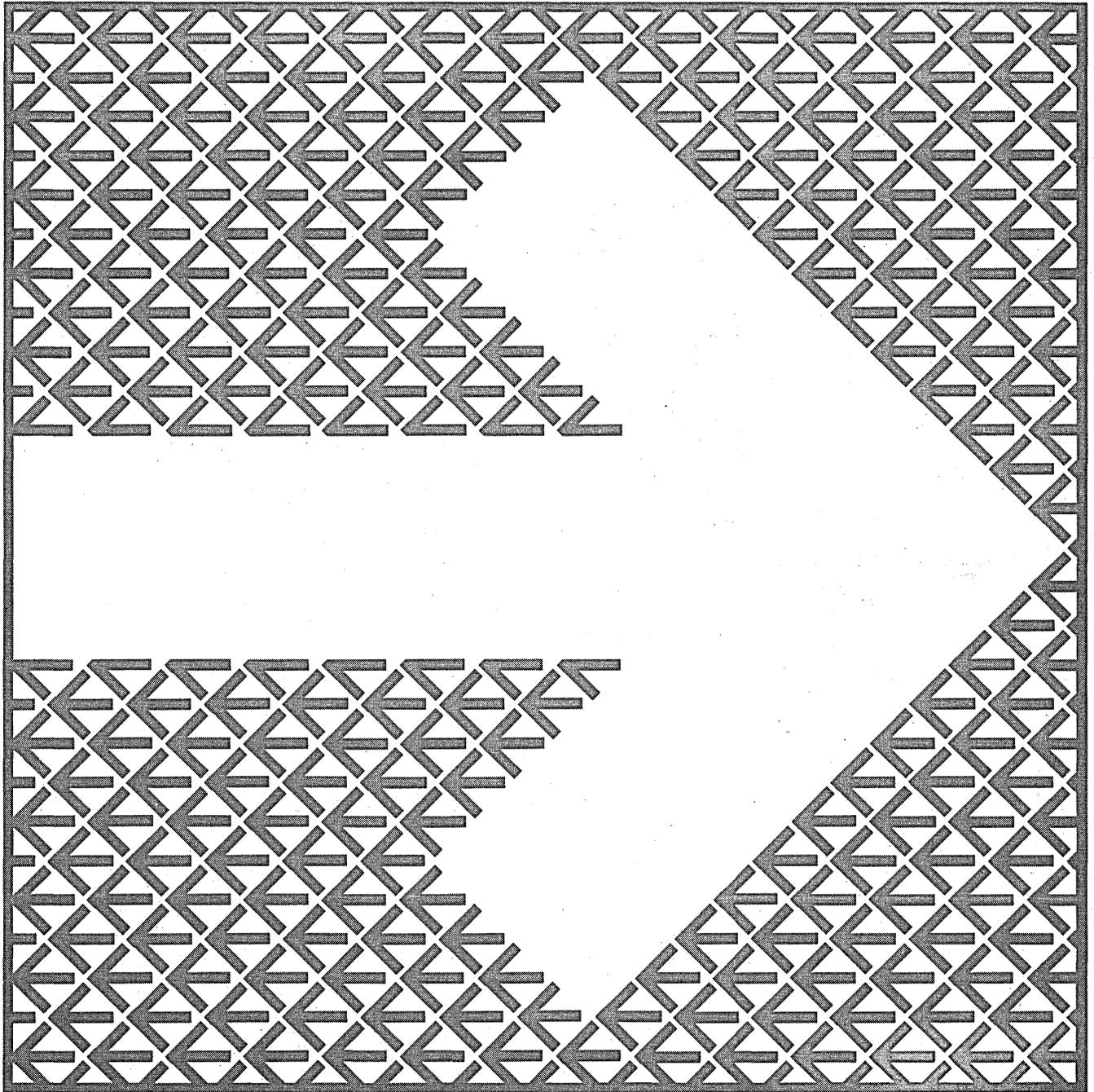
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## BECAUSE MANAGING DATA MEANS MANAGING CHANGE

**Computer Corporation of America**

things settle out. "The move to leasing is affecting only IBM and Amdahl and is seen as user anticipation of price cuts and further product announcements," says Harry Edelson, a computer analyst at Drexel Burnham Lambert, a New York brokerage firm.

Meanwhile Memorex is pointing the finger at IBM saying the giant's actions in the price reduction area were causing customers to delay purchase plans. "That, coupled

**The computer industry is essentially a labor-saving and productivity-enhancement industry which will make it less vulnerable to the whims of a business turnaround.**

with inflation, energy shortages and recession talk, combined to give us a second quarter drop," said a company spokesman. The drop in Memorex's net income amounted to 21% below last year's second quarter figures, while revenue was up 14% to \$181 million. The lower figures have caused a reevaluation by Memorex of its projected 25% overall growth this year. "Our income should exceed last year's but it won't reach the 25% increase we had anticipated," the spokesman noted.

In the Boston brokerage office of Bache Halsey Stuart Shields, Terrance Carlton sees nothing but good things for the mini-computer end of the business. "We've seen no signs of a softening of demand," he notes. And at a recent financial meeting in New York City, NCR officials used words like "strong demand," "order strength," "upward growth" to describe where it is and where it is going. So confident is NCR, it sees no problem in meeting "if not exceeding" last year's 7.4% overall growth. As Chairman William Anderson noted, the data processing industry is "essentially a labor-saving and productivity-enhancement industry" which will make it less vulnerable to the whims of a business downturn.

The Dayton-based company said its net income for the second quarter was up by 47.8% to \$58.9 million as revenues gained 17.2% to almost \$716 million. "Incoming orders in the second quarter showed a good gain over the comparable period of 1978 in which the previous record high for the quarter was recorded," says Anderson.

The dp industry will be looked on as a "defensive investment" by many during the coming months but experts are expressing caution to those looking for the astronomical growth which has characterized most companies over the past several years. "There is going to be a slowdown of sorts during the second half of this year," Edelson says. "There has to be. Some of these companies have been growing by 50% or 60% and there is no way anybody can keep that up for long."

While the likes of NCR, Sperry and Bur-



NCR'S ANDERSON—No problem in exceeding last year's growth rate.

roughs will find their growth numbers not quite so enormous, others such as DEC should find themselves coming back and watching earnings getting stronger during the coming months, a fact that will only bolster the industry, Edelson added. Burroughs' second quarter revenues totaled \$668.5 million as profits rose 20% to \$68.94 million. The company noted the last three months saw a record incoming order volume which exceeded the \$1 billion mark for the first ever for Burroughs with backlogs for the half also at a record level.

In Minneapolis, Control Data showed a 19% increase in revenues to \$535 million with a 47% increase in net income to \$37.6 million.

Over at Advanced Computer Techniques, a small New York service company, revenues were up 24% to \$17.8 million and net income gained an astronomical 104% reaching \$127,000. Computer Micrographics had revenues of just over \$4 million, a 36% increase over second quarter figures a year ago, and net income totaled \$188,509, up 30%.

A good example of the industry's overall strength was Dataram with an 18% increase in revenues totaling \$18.5 million and net income for the second quarter reaching just over \$2 million. Back on the extravagant end was Data Access whose \$7 million in revenues for the second quarter represented a 65% surge over the same period a year ago. On the net income side, it hit \$736,889, a gain of 78% over the same period a year ago.

IBM's second quarter revenues of \$5,354,954,000 were almost the same as last year's second quarter while net income totaled \$667,464,000, again a 3% decrease.

Edelson feels IBM's next two quarters will follow almost the same "flat" pattern. "Next year you will see more of a recovery," he noted. The recovery will be the result of shipments of the 8100, the System 38 and the 4331 and 4341 which began in April (p.82).

National Data Corp., Raytheon and T-Bar all look strong. National saw its second quarter revenues advance 26% over last year's to \$49.3 million while earnings advanced 33% to \$4.2 million. T-Bar, again

**Analyst feels IBM's next two quarters will follow almost the same "flat" pattern.**

small but active, posted second quarter revenues of \$4 million, 56% better than the same period last year while its net income for the period increased a whopping 60% to \$350,000.

Data General has been called soft when parts troubles prevented it from shipping as much equipment as it would have liked as the second quarter closed. Aside from that, no one appears to be disappointed in revenues of \$119 million, a 34% increase from the same period last year, or net income totaling \$12.5 million, 34% better than last year's second quarter. Honeywell posted second quarter revenues of just over \$990 million, a 15% increase over the same three months of last year and a second quarter net income of \$57.7 million, a 52% increase.

—Laton McCartney & Louise Shaw

**EDUCATION**

**RANKING GRADUATE SCHOOLS**

**Study of 71 schools shows Stanford, MIT and Carnegie-Mellon ranking highest in computer science programs.**

The universities with the top-ranked graduate-level programs in computer science are Stanford, MIT, and Carnegie-Mellon, according to a survey of academicians in that discipline. That information is of interest to academicians and their students, but probably of little use to employers wanting to hire people with a good grounding in the discipline.

But the same survey attempted to determine which educational institutions were improving and which were weakening. Respondents were asked to rate the graduate programs, not to rank the schools, and to note whether the schools listed were gain-

# Check the charts. WANG beats IBM.

IBM recently announced two new computer systems, the IBM 4331 and 4341.

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The VS has a high degree of compatibility with IBM 370 application software—even higher than IBM products like the System 38 and 8100.

	WANG VS	IBM 4331	IBM 4341	WANG VS 100
Price	\$37,000 (512K CPU)	\$65,000 (512K CPU)	\$245,000 (1 MEG CPU)	\$93,000 (1 MEG CPU)
Performance Index	1.0	1.1	3.7	6.0
Comparable IBM System	138	138	148	158
Operating System	Multi-User Interactive	BATCH	BATCH	Multi-User Interactive
System Expandability	DP, WP, TP	DP, TP	DP, TP	DP, WP, TP
Cache Memory	N/A	8K Bytes	8K Bytes	32K Bytes
Memory Range	128K – 512K	512K – 1 MEG	2 MEG – 4 MEG	256K – 2 MEG
On-Line Disk Storage	2.3 Billion Bytes	9 Billion Bytes	18 Billion Bytes	4.6 Billion Bytes
Delivery Date	10 Weeks	1-2 Years	1-2 Years	12 Months

VS interactivity is the highest of any system. That's right, any system.

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\*Industry Analysis Report for Executives, Advanced Computer Techniques Corporation, New York, New York.

# NEWS IN PERSPECTIVE



ing in quality, not changing, or declining in quality.

Those perceived by the respondents to be gaining in quality were (in alphabetical order):

- Arizona
- British Columbia
- Brown
- Cal Tech
- Colorado
- Columbia
- Delaware
- Georgia Tech
- Indiana
- Kansas
- Rochester
- UC Santa Barbara
- USC
- VPI
- Washington
- Waterloo

Those perceived to be declining in quality:

- Case-Western Reserve
- Harvard
- IIT
- Massachusetts
- Michigan
- Ohio State
- Pennsylvania
- Pennsylvania State
- Wisconsin
- Yale

The survey was conducted last fall by Richard Conway of Cornell Univ. It was sent to the chairmen of 71 universities, most of which have PhD programs in computer science; 34 responses were received. Thirty of them even rated their own programs but these self-ratings were omitted

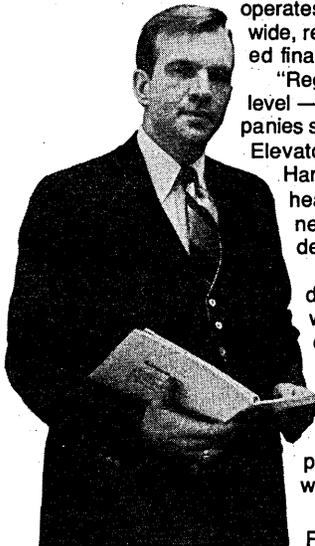
## STRONG PROGRAMS BY SUBJECT

Schools grouped by percentage of responses in which they were recommended  
(listed alphabetically within groups)

Subject	> 80%	> 60%	> 40%	> 20%	≤20%	single mention
Theory, complexity, algorithms	Cornell Stanford	Berkeley	MIT	Carnegie Princeton Toronto	Illinois Michigan Penn State Washington Waterloo Yale	Harvard Minnesota Syracuse USC Wisconsin
Programming, languages, methodology			Carnegie MIT	Cornell Stanford Waterloo	Berkeley Harvard Illinois Michigan NYU Purdue Texas Toronto UCLA USC Yale	Brown Indiana Maryland Penn Princeton Santa Cruz Syracuse
Operating systems			Carnegie MIT	Purdue	Berkeley Michigan Stanford Texas Toronto UCLA USC Washington Wisconsin	Cal Tech Cornell UNC Penn State S Barbara Waterloo Yale
Machine org., hardware		Illinois	Carnegie	MIT	Berkeley Cal Tech Stanford UCLA Utah	Mass NWestern Texas Toronto Washington
Numerical analysis		Stanford		Illinois Texas Wisconsin	Berkeley Carnegie Cornell Maryland MIT NYU Purdue Toronto Waterloo Yale	Brown SUNY-Buf
Data-base systems				Berkeley Toronto	Cornell Maryland Michigan MIT Ohio State Penn Princeton Stanford Texas Utah	Colorado Harvard Syracuse
Artificial intelligence	MIT Stanford		Carnegie		Brit. Columbia Illinois Maryland Rochester Texas Utah Wisconsin Yale	Cal Tech Penn Rutgers Santa Cruz

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Roger E. Brady  
Manager, Financial Information Systems  
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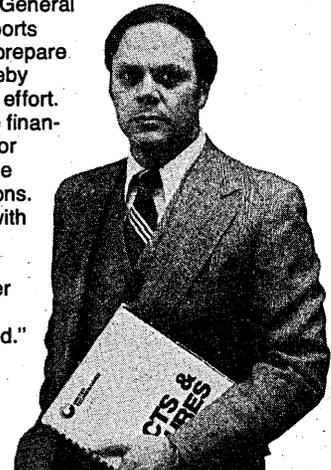


John Gritman  
Manager of Financial Services  
United Technologies Corporation

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Jerome Kelly  
Manager, Management Information Systems  
United Technologies Corporation



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## "COME, SEE THE SILLY WAYS HOW WE OPERATE . . ."

"Come visit us, see the silly ways how we operate . . . and together, we might come up with a solution."

That was the invitation offered to computer science students and their professors by George Sekely, who is director of information systems with the Canadian Pacific, the huge Montreal-based holding company with interests in land, railroads, shipping, and airlines.

Sekely talked recently at a session at a Canadian computer conference about what industry thinks should be taught in universities to prepare students for careers in the computer industry. It was a tongue-in-cheek address, but it made a point.

For instance, about systems analysts: "A lot of people coming out of school all want to be systems analysts. Nobody wants to program anymore. They all want to be systems analysts. And none of them know what it is. Which is no great surprise because very few receive adequate training in what systems analysis might be."

Sekely says he's been told by graduates of computer science schools that a systems analyst is "somewhere between the programmer and the user." He said computer users won't buy that. "You either are a user who has a problem which has to be solved or you're the professional who solves it. And as the professional, you've got to know how to solve that problem and how to communicate with the user."

"We don't need translators," Sekely added.

He said he thinks business needs "information systems professionals who are provided in their schools with a 'tool kit, a view, an ability and an attitude' that will enable them to perform well within data processing shops."

The attitude, he said, should be an awareness that you don't write huge programs anymore. You fix those that already have been written.

**"What we need are people with the ability to fix someone else's garbage code."**

"What we need are people with the ability to fix someone else's garbage code, the ability to tie it to existing code so that it will work," he said.

"It's a sad fact that there are very few brand new systems being developed. Most are tied to something else that already has been developed. We need people who know how to connect these existing things, how to respect others' work—given there is something there to respect—and know how they can work with other people."

And Sekely doesn't like too much controversy. "A system is so hard to build. We put these enormous things together and there is an incredible amount of discussion to do the job. And we have to find computing time while doing all of this.

"So there is no time for discussions that include such barbs as, 'Oh, those guys downstairs, they don't know anything about systems.' I don't like discus-

sions which say, 'Oh, those guys upstairs, they don't know anything about how to put things in.' It's a continual adversary relationship. It shouldn't be that way. People who come out of school should know about this."

Sekely believes computer science graduates should "want to solve problems, instead of changing the world (although, let's face it, the world needs changing, but he's not going to do it)." But he admitted that industry also wants people with sufficient critical ability and a little bit of political and psychological know-how.

Suggesting that "maybe we have to do away with the term systems analyst," Sekely compared the data processing function with that of other professions. The doctor is a specialist in the medical department. The chief engineer likely knows how to perform all the tasks being performed in his department. And the head of a legal firm knows how to argue a case or research it, at least.

But Sekely said the analyst, on the other hand, doesn't always understand his user's needs. "A good solution offered by the analyst isn't necessarily the solution that the user needs. If you go in and ask the user what he would like, the user feels obliged to explain to you something that is very complicated. And if you go back and give him that solution, you are not doing your job.

"It's like a doctor expecting a patient to come in and tell him that he needs a frontal lobotomy."

—T.M.

from the tabulations. Conway will not identify the schools that took part in the survey; he further makes no claims of scientific accuracy, and admits that the results "ought not to be taken too seriously."

But Conway's study was meant to improve upon an informal survey conducted earlier by James Bitner of the Univ. of Texas. Bitner had picked 21 schools with computer science programs and asked the chairmen of those 21 departments to rank the schools. The top five schools on his list were the same as the top five that Conway categorizes under perceived effectiveness of the doctoral program. They are the three mentioned at the beginning of this story, plus Cornell and UC Berkeley. From sixth to ninth in Conway's tabulation are Toronto, Illinois, Purdue, and Wisconsin.

Conway, whose study expanded the list of schools to 71, also inquired into other facets of the subject. For example, he asked his respondents to "list institutions that you would recommend as having especially strong programs" in seven different categories. These were identified as theory of computation, complexity, algorithms; pro-

gramming systems, languages and methodology; operating systems; machine organization and hardware systems; numerical analysis; data base systems; and artificial intelligence. He then grouped the schools according to the percentage of responses in

**Study was meant to improve upon an informal survey conducted earlier by James Bitner of the Univ. of Texas.**

which they were recommended (see table).

He also asked the chairmen to rate the quality of the graduate faculty at the schools. Not surprisingly the top nine schools are not much different from the first nine in the rating for effectiveness of doctoral program. In the latter, number nine is Wisconsin. But in the rating of faculty, the first nine are Stanford, MIT, Carnegie-Mellon, Cornell, UC Berkeley, Illinois, Toronto, UCLA, Purdue, and Waterloo. The nine that follow, in alphabetical order, are Maryland, Michigan, NYU, Princeton, Texas, Utah, Washington, Wisconsin, and Yale.

—E.K.Y.

## INTERNATIONAL

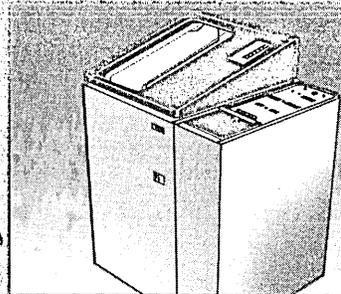
# WHO WILL FAX THE MAIL?

**Telecommunications directorate would have the post office function as a subsidiary within the PTT in areas of electronic messages.**

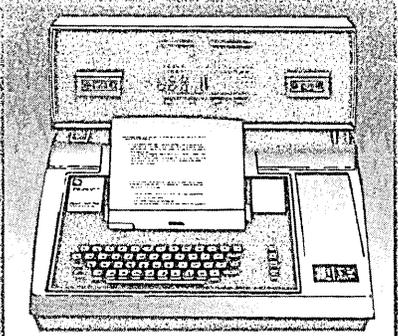
Anyone who thinks that Europe's PTT's, or Postal, Telegraph and Telephone services, are tightly knit monoliths would be surprised to learn of a battle within France's PTT for the facsimile transmission market.

The warring groups are the Directorate-General for Telecommunications (DGT) and the Directorate-General for Posts (DGP), both supposedly specialized directorates within a common government min-

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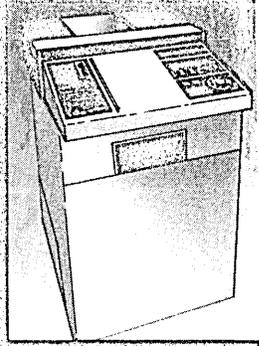


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## TRIALS OF PRESTEL AT A PARIS EXHIBIT

The British Post Office wonders if political rather than technical problems blacked out its Prestel demonstration at a French exhibit last June.

On the first day of the exhibit on telecommunications which was organized by the French computer professional society, AFCET, the Prestel demonstration worked beautifully. But a rival French television data access system, called Titan and sponsored by the French telecommunications directorate, was a flop. When the French minister for PTT passed the two exhibits in his inaugural visit, he didn't appear pleased at the contrast.

On the second day of the three-day exhibit, the British engineers on the Prestel exhibit arrived in the morning to find that their two lines had mysteriously gone dead during the night. Engineers from France's telecommunications service blamed weather interference. But weather wasn't interfering with lines to London used by other British exhibitors.

By noon, the AFCET administrative office was sufficiently concerned to put one of its telephone lines at the disposal of the British exhibit. An extension cable was run from the AFCET office to the British Post Office's exhibit, and Prestel demonstrations went back on the air. But not for long. By 4 p.m. that line, too, had mysteriously gone dead.

Certain by now that they were dogged by political and not technical gremlins, the British Prestel team packed their bags and left for home without waiting for the end of the show.

This event followed by two months another incident when Britain's Prestel viewdata service was to have been demonstrated in Paris to the Western European Union, the defense organization of European NATO members. The Union was interested in British Post Office software for a possible internal data base inquiry service.

The British had to call off the demonstration when its request to the French telecommunications directorate for a

temporary circuit between the Union's headquarters in Paris and London to access the Post Office's Prestel computer was curtly turned down.

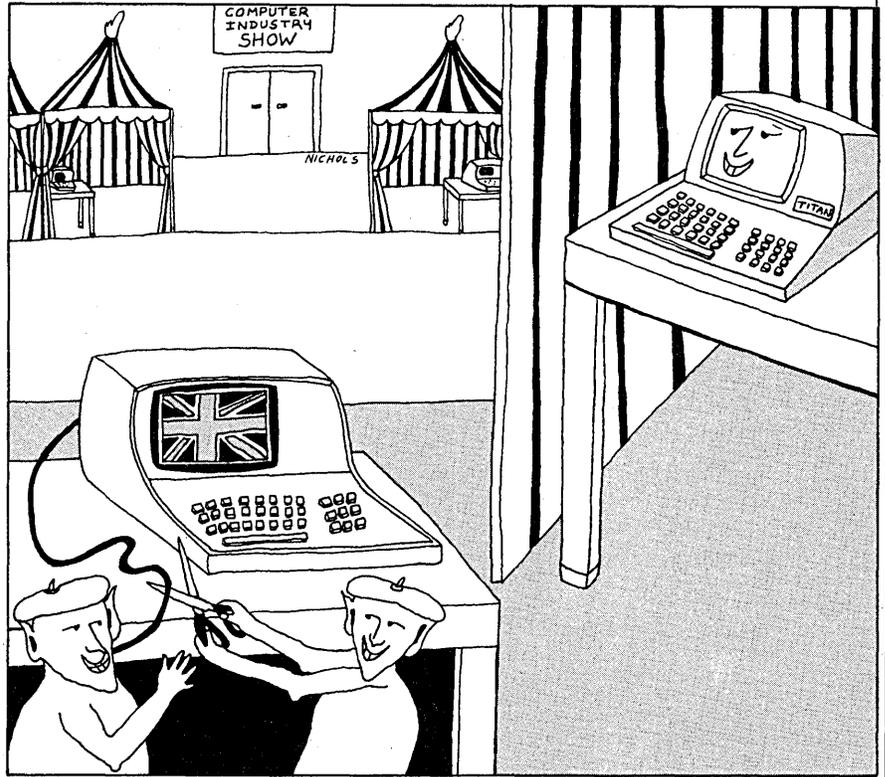
Behind these incidents lie a French attempt to prevent the British developed viewdata standard from being adopted by CCITT as the world's norm for "videotex" services. At international meetings, French delegates have been raising numerous objections and putting forward hosts of amendments to the proposed standard. The British suspect them of seeking more time for Titan to catch up to the British system, which enjoys a 12-18 month advance.

The French fear that if the British viewdata standard is adopted worldwide, British industry will have an unbeatable lead in supplying videotex hardware and

software to PTT's in other countries, as well as to the incipient boom in in-house corporate viewdata services. But other countries' observers are more likely to suspect a massive national technological inferiority complex. If such an opinion spread internationally, French industry would hardly be helped by it, and the only gainers from delays imposed on international recognition of the British viewdata standard would be the Japanese.

French engineers developing the Titan videotex system realize this better than most, and were most unhappy at the Paris tribulations of their Prestel rivals. They are hoping to exhibit Titan at other international exhibitions in other countries, and now fear that they too might be blacked out in retaliation.

—F.L.



istry, called the Secretariat for State for Posts, Telegraphs and Telephones. At issue is the telecommunications group's plans to market a French-built facsimile copier called SECRE S. 360 to telephone subscribers. Meantime, the French postal service was cooperating with the U.S. Postal Service in preparing a high-speed facsimile transmission service between post offices in Washington, D.C., the World Trade Center in New York City and the Palais des Congres at Porte Maillot in Paris. It was to have been part of Intelpost, an experimental free international postal service for selected customers, who later would pay a fee.

But the French Post Office wasn't able to start the service early this summer because it had no 50Kbps wideband link between the Palais des Congres post office and the French earth station to Intelsat IV, the satellite vehicle over which the service was going to run.

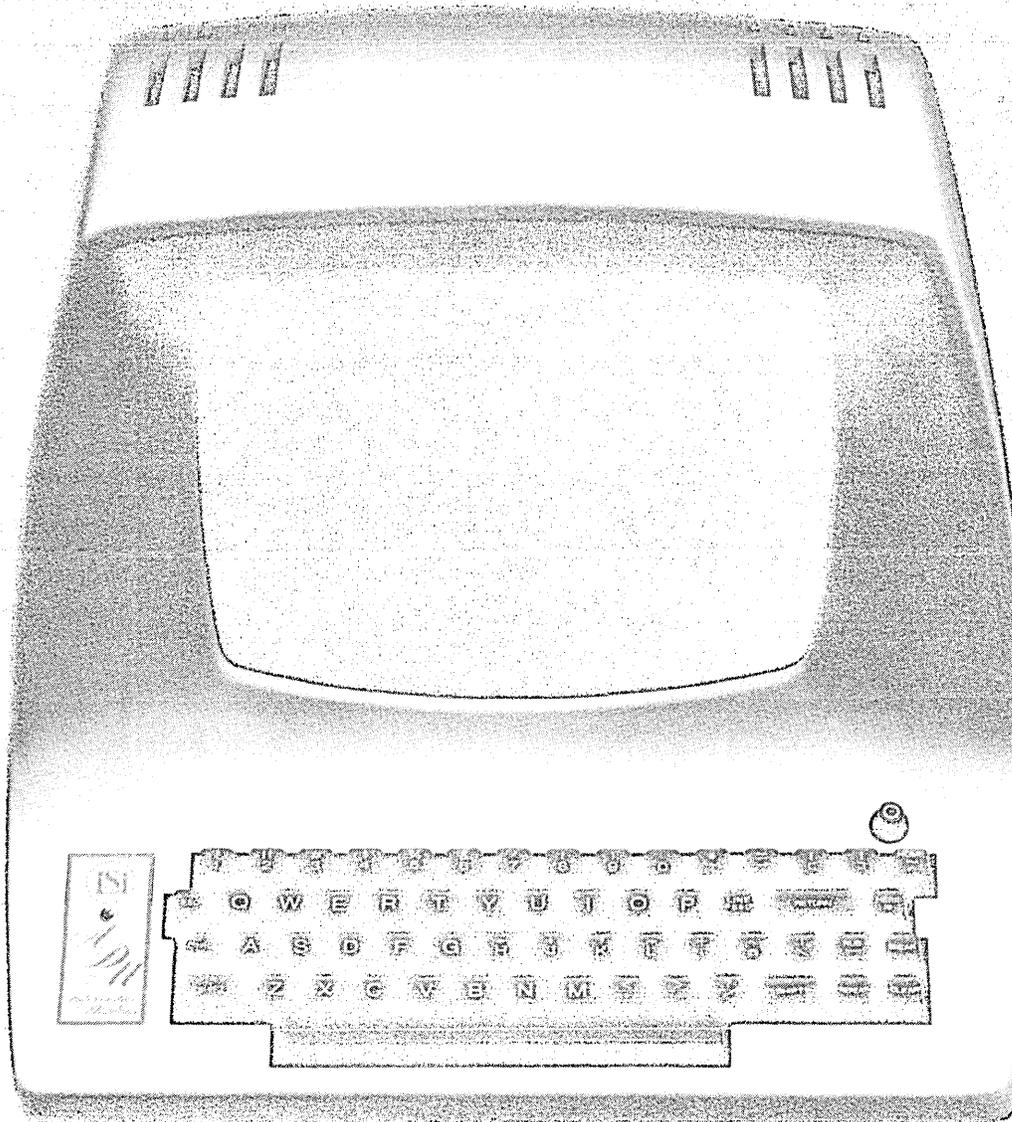
That had to come from the telecommunications directorate and the directorate simply wasn't replying to four months of Post Office requests for the circuit.

Its obstruction of the new service wasn't due just to fear of losing revenue from transatlantic Telex traffic that might be diverted to Intelpost. It explained that giving the post office the means to provide trans-

atlantic Intelpost service under its own authority would have been an important precedent that allowed it subsequently to offer a similar internal French Telepost service between Paris and the main French provincial cities. Indeed, the postal service already had publicized its plans to do so, provided Intelpost was a success within the business community.

It's considering two grades of internal Telepost service:

—Overnight, with next day delivery in the normal postman's round: this involves normal postal collection and distribution methods to/from a single central post office in each city, linked by leased wideband



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## NEWS IN PERSPECTIVE

links to other central post offices in France, on the Intelpost pattern.

—Same day, via dial-up telephone links between the secondary post offices nearest to the sender and the addressee, with special messenger delivery to the recipient.

The French Post Office thinks the provision of such services is essential to safeguard its credibility with the business community because of increasing difficulties in guaranteeing next day mail deliveries by traditional physical sorting and transport methods. But such a Teleposte

### The telecommunications directorate simply wasn't replying.

service would also impact French telecommunications sales and rentals of fax copiers to French telephone subscribers.

And that precisely is why the telecommunications arm of the PTT is opposing the experimental service. Currently, SECRE copiers are sold in France for about \$6,350 and rent for just under \$260 a month. At those prices, the telecommunications group hoped to see the number of installed fax terminals climb from 4,000 in 1977 to 56,000 by 1985. But the telecommunications R&D people also are discussing with SECRE and other French manufacturers the design and specifications for a simpler mass-produced domestic fax terminal for the 1980s that might cost no more than \$350 to \$580, provided quantities reached 5 million units. That would mean the sale of fax copiers to two out of every five current telephone subscribers—and a complete jamming of the French telephone system if all these customers tried to use their copiers to transmit all of their day's mail at 4–6 minutes per sheet from 4 p.m. onward every evening.

A French minister, Norbert Segard, who supposedly directs the PTT, shed very little light on the issue: "All across-the-counter services at post offices are the responsibility of the Directorate-General for Posts and the provision of all wired and radio message services are the responsibility of the telecommunications directorate," he said.

But Intelpost and the projected internal French Teleposte services both involve across-the-counter handling of letters, and their electronic transmission by wire and satellite. So they can't be offered without cooperation from both the postal and telecommunications sides. So the minister's ruling left unresolved the question of who would run the service and which would become the other's subcontractor.

The Post Office has contended that the telecommunications role in providing wide-band trunk capacity between main post offices ought to be no different from that of the French railways or airlines which transport mailbags as subcontractors to the Post Office.

The French telecommunications directorate, on the other hand, sees the elec-

tronic part of Intelpost and Teleposte as the most important part of the service, and would like the Post Office to have the same role of subsidiary handling agent as when it pays out postal giro checks (postal money orders), or collects revenue on behalf of other government departments.

A more precise ruling was given by the assistant to the minister at a seminar on electronic mail last June. He would allow competition between the Post Office and telecommunications directorates in the provision of across-the-counter electronic mail services.

The Post Office would be allowed to offer facsimile transmission over long distances of letters handed in at its counters or dropped in its mailboxes, with normal postal delivery at the other end. But telecommunications would also be allowed to offer the public access to both Telex and Telefax services from 300 public offices throughout France, which may be the same from which the public may currently place long distance and international telephone calls.

What was left unclear was whether, as part of this compromise, telecommunications would also be directed to provide the wideband circuits required by the Post Office for its Teleposte services, beginning with the delayed Intelpost service to New York and Washington.

—Fred Lamond

## RETAILING

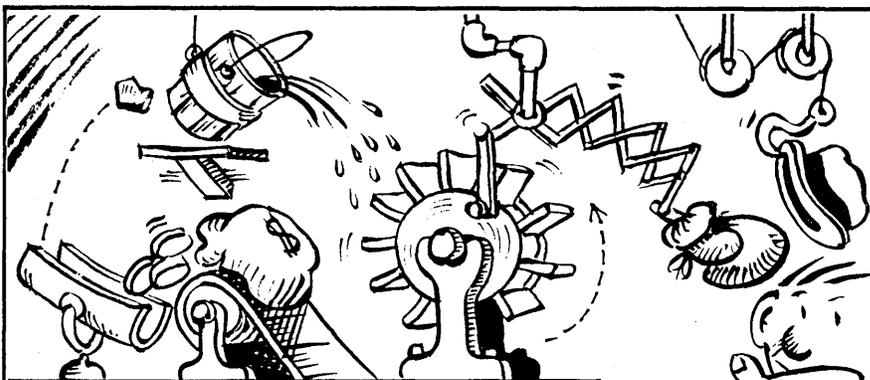
# COMPUTER ORDER CATALOG

Canada's Simpson-Sears says its six-year experimental system hasn't drawn many customers, but the store has learned a lot.

If you live in Toronto, have a Touch-Tone telephone, and are registered with Simpson-Sears, you can order catalog items by calling up a computer.

Maurice F. Anderson, general manager of data processing and communications at the Canadian subsidiary of Sears, Roebuck & Co., says, however, that customers "aren't breaking down doors to make use of the service," which essentially is an experiment. Since it first was launched six years ago, a grand total of only 3,000 persons have placed orders.

And Anderson's counterpart at Sears headquarters in Chicago, Mumford Miller, vice president of data processing and communications, says it wouldn't be prac-



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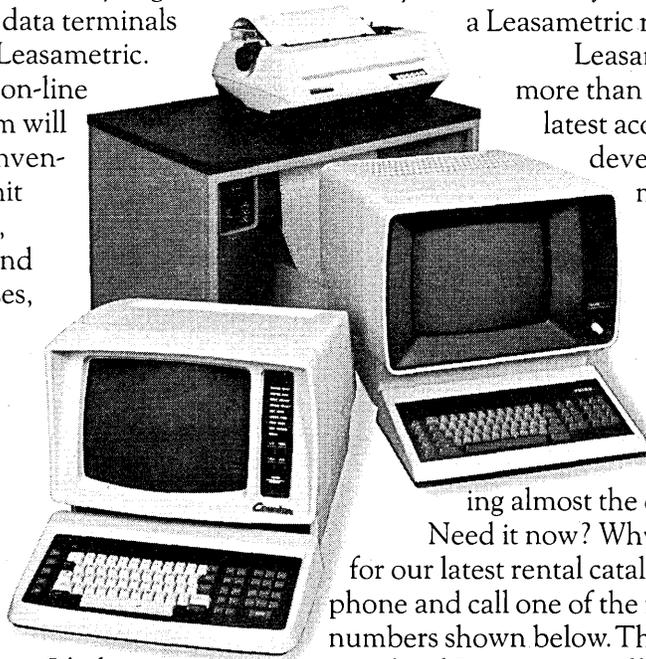
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## NEWS IN PERSPECTIVE

tical to install such a system in the U.S. "One reason is that not everyone in the U.S. has a Touch-Tone telephone."

In the operation in Toronto, a customer dials a special number at Simpson-Sears, punches in numbers directed by a voice response system—such as the customer's identification number, street address number—and then punches catalog numbers. The system would then tell the customer to dial in such other information as size or quantity, or both. Then, following an inventory search, the computer would advise the customer if the products are available from stock. If items aren't in stock the customer would be given the option of canceling the order or ordering for later delivery.

Anderson, who described the system at a Canadian computer conference in Quebec City in June, said a main advantage of the system is that the customer would get immediate information on whether an item was in stock and could be delivered immediately. Unfortunately, though, a customer "can't reach back to cancel an item." He explained that a person who ordered a blue shirt and a blue necktie, couldn't cancel the shirt he'd ordered if it turned out a blue necktie wasn't in stock.

Another advantage suggested by the Canadian retail chain is that a customer with a long name or a difficult street address, wouldn't have to repeat it to the computer as he might over ordinary telephone lines in

a manual system.

Comp-U-Shop, as the system is known, uses an audio-response system made by Periphonics, the Bohemia, N.Y., affiliate of Exxon Enterprises, that is capable of accepting data keyed on a Touch-Tone telephone and passing it to a mainframe—at present it's an IBM 3033—where the company's inventory is searched. It also contains a recording of a single word or groups of words, which when addressed sequentially, form phrases and sentences. The cpu contains the software and application programs that control the overall system.

Simpson-Sears uses the Telecommunications Access Method (TCAM) to provide input/output services between the communication devices and the application programs. A Multithreading Executive (MTEX) is a Simpson-Sears developed software module that, in effect, allows the application program to be written as though only one customer on one line had to be serviced at any time. TCAM also is used to access an IBM 2741 typewriter terminal in the customer service department which logs all activity on the system and allows clerks to monitor any irregularities that might require a call-back to the customer.

Anderson says the company probably would take a different approach if such a system were being implemented today. But he says that in six years, Simpson-Sears has learned a great deal about unattended

order handling, except for its acceptance among the public. He noted that Canadians in the Toronto area who use it pay the telephone company a \$2.75 per month surcharge for Touch-Tone telephones.

Miller of Sears says some other characteristics unique to Simpson-Sears contribute to the experiment's acceptance. First, Simpson-Sears builds shipping charges into its catalog prices; therefore, unlike in the U.S., where a customer would want to ask the Sears clerk how much the charges would be, that isn't necessary in Canada. Secondly, the Simpson-Sears catalog designations are in numerics only, where Sears catalogs bear both alpha and numerics. "The job of converting our catalogs to numerics only would be formidable," Miller says.

Anderson says the Simpson-Sears dp group has been preoccupied with more fundamental and far-ranging projects and has been prevented from converting from a limited experimental system to a wider ranging one. In fact, the group has been sustained only through a continuing mention of the system in the company's Toronto catalog. But he says that when a business finds a better way to do something, the customer will benefit also.

"I can't quote any specific discounts that might be offered because only an infinitesimal number use the system now. It might be different several years down the road."

—T.M.

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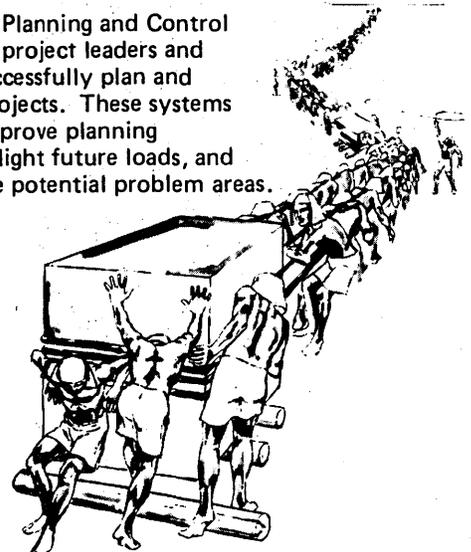
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**REELECTED:** Dr. Albert S. Hoagland of IBM's San Jose Research Laboratory was named to a second term as president of the American Federation of Information Processing Societies (AFIPS). Dr. Hoagland, manager of IBM's exploratory magnetic recording activity at San Jose, formerly was



a corporate program coordinator of advanced interdivisional mass storage programs at IBM's laboratory in Boulder, Colo. He was elected to a second term at a meeting of the AFIPS board in New York following the National Computer Conference. The board also elected Dr. Sylvia Charp, vice president; Dr. E. Ronald Carruth, secretary; and Dr. M. Stuart Lynn, treasurer. Hoagland is a member of the National Computer Conference board, a Fellow of the Institute of Electrical and Electronic Engineers and a past president of the IEEE Computer Society.

**IFIP CONFERENCE:** The triennial computer conference sponsored by IFIP (the International Federation for Information Processing) has been scheduled for next year. It will be held both in Tokyo, Japan, October 6-9, and in Melbourne, Australia, the following week, October 14-17. As in the past, this eighth world congress will feature exhibits and technical presentations, a call for papers having been issued. Accepted papers will be delivered either at Tokyo or in Melbourne and in some cases at both locations. IFIP is an international federation of professional and technical societies concerned with information processing. Its U.S. representative society is AFIPS (the American Federation of Information Processing Societies), which annually sponsors the National Computer Conference in the U.S. Additional details

are available from Donald Welsher at Datapro Research Corp., 1805 Underwood Blvd., Delran, NJ 08075.

**FIRST 4300 DELIVERY:** First IBM customer to receive its new 4300 series is Associated Catholic Hospitals, a nonprofit shared computer center in Brighton, Mass., that serves 10 hospitals in Massachusetts. IBM announced last month that the processor—a 4331—was shipped to the center last April under a test program and will be used to support such ancillary units in the hospitals as labs, radiology and pharmacies in a distributed processing approach. The 4331 will work with an IBM 3031 processor currently installed at the center. IBM, which is reported to have received orders totaling some \$10 billion for the 4300 series, is bursting at the seams trying to accommodate the orders. Some customers have been quoted delivery dates stretching out to 1982.

**REACTION TO RENTALS:** IBM will raise its rental and lease prices about 5% on most data processing products in a move to spur purchases instead of leases. Most of the changes were to go into effect Oct. 1, but some took effect immediately. Left out of the increases were the company's recently announced 4300 line, the System/38, and model 8100 smaller computers. IBM also raised monthly maintenance charges on selected equipment by 5% to 15%. The effect of leasing trends has hit IBM's earnings figures (p. 68) and the company earlier said that more customers were showing a "propensity to lease, rather than purchase."

**CALCOMP WANTS TO BE HEARD AGAIN:** Following upholding by the Ninth Circuit Court of Appeals in San Francisco of a trial court's directed verdict dismissing charges against IBM of monopolistic practices brought by California Computer Products Corp. (CalComp), the Anaheim, Calif., firm has filed for a rehearing. In a 15-page petition, CalComp's legal counsel, Maxwell Blecher, asked for both a jury trial and a full hearing before all 15 circuit court judges. The petition questioned the court's dismissal ruling that there was "no substantial evidence" to support CalComp's claim that IBM's price cuts and product introductions were illegal and caused competitive injury. Whatever the result of the CalComp petition, the Circuit Court's support of the lower court's directed verdict did impact another case against IBM, that brought by Transamerica Computer Corp. The judge in this case told both Transamerica and IBM attorneys that, based on the ruling, he will instruct the jury that, even if proven to be below costs, pricing decisions by IBM, if necessary to meet competition, may be lawful.

**SERVICES BUSINESS RISES:** The U. S. computer services business reported revenues of about \$7.5 billion last year, a rise of 19% over 1977 figures. The business also is acquisition-minded, a survey by ADAPSO (the Association of Data Processing Service Organizations) reported. It said a survey of its members disclosed that 44% of its respondents said they're planning acquisitions in 1980, compared with 32% who said they planned acquisitions a year ago.

ADAPSO also proposed changes in the Bank Holding Company Act and the Federal Reserve Board's Regulation Y to protect service bureaus from "unrestrained entry" of banks into the computer services industry. The association used a proposal by New York's Citicorp to form a time-sharing and computer services subsidiary as a case in point for most of its recommendations, which essentially asked for more specific language in rulings to curb banks' entry into the service business. Basically, ADAPSO opposed tie-in deals with banks and their customers.

**OOOPS! A NAME CHANGE:** ITEL Corp. threatened a lawsuit against another IBM-compatible supplier with a similar name, Citel Corp. of Orange, Calif. The company said it thought a lot about how much it would cost to contest the ITEL suit and then made a decision: the new name for Citel is Multiprocessors, Inc.—along with an acronym: MPI.

**CONTRACTS & LITIGATION:** Sometimes having no written contract for computers is far better than anything now offered by vendors, says specialist Dick H. Brandon. In a seminar Brandon conducted for the Association for Computing Machinery in New York, he said there are some 500 legal actions in process in the computer field and he said that was an unprecedented number. If user and vendor relations continue to deteriorate at that pace, there could be some 5,000 cases in U.S. courts by 1985. Brandon said the cause is totally inadequate contracts, which do not define user or vendor responsibilities in any reasonable way. Most cases were between users and turnkey systems vendors, facilities management companies and hardware vendors who "undersell" inadequate configurations.

**VITAL DATA:** I.P. Sharp Associates, the Toronto APL service and time-sharing company, began offering information on production, stocks and imports of crude oil and oil products into the U.S. The data is collected by the Office of Oil Imports of the Department of Energy and supplied to Sharp by the American Petroleum Institute. The data for a particular month is available through the Sharp network about 60 days after the end of the month. \*

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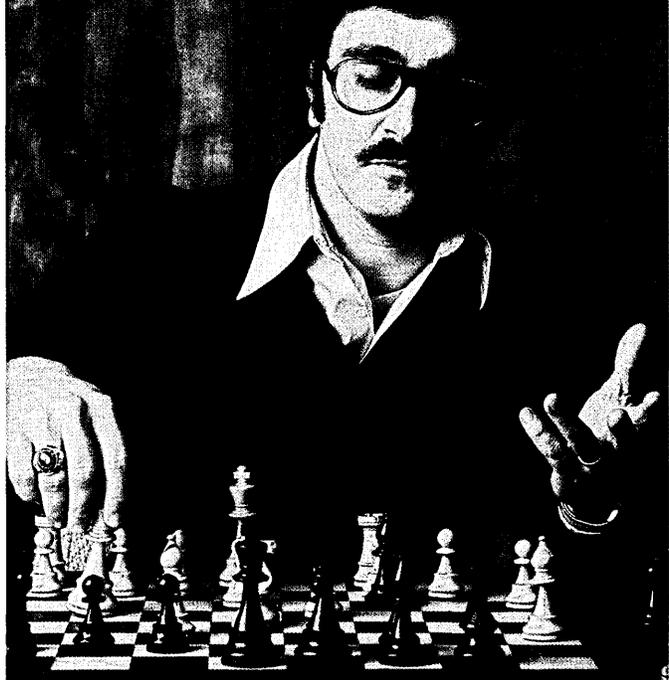
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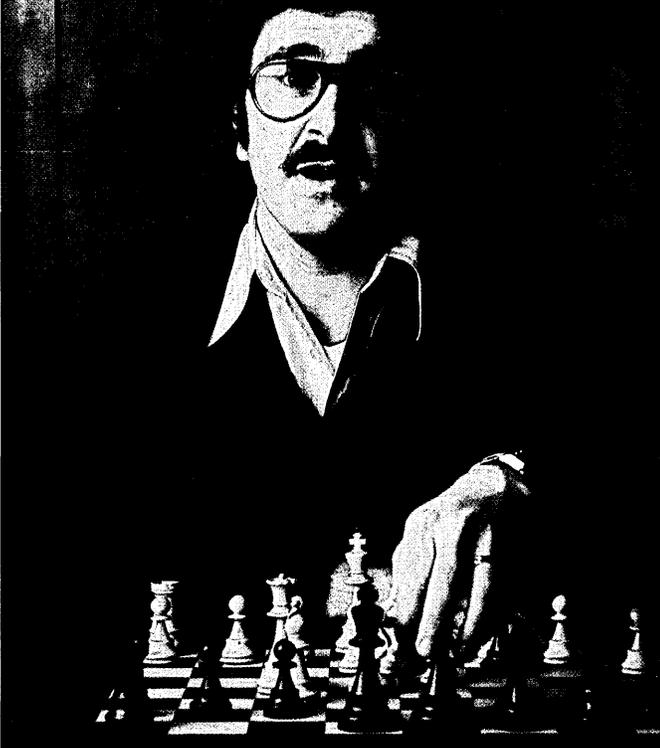
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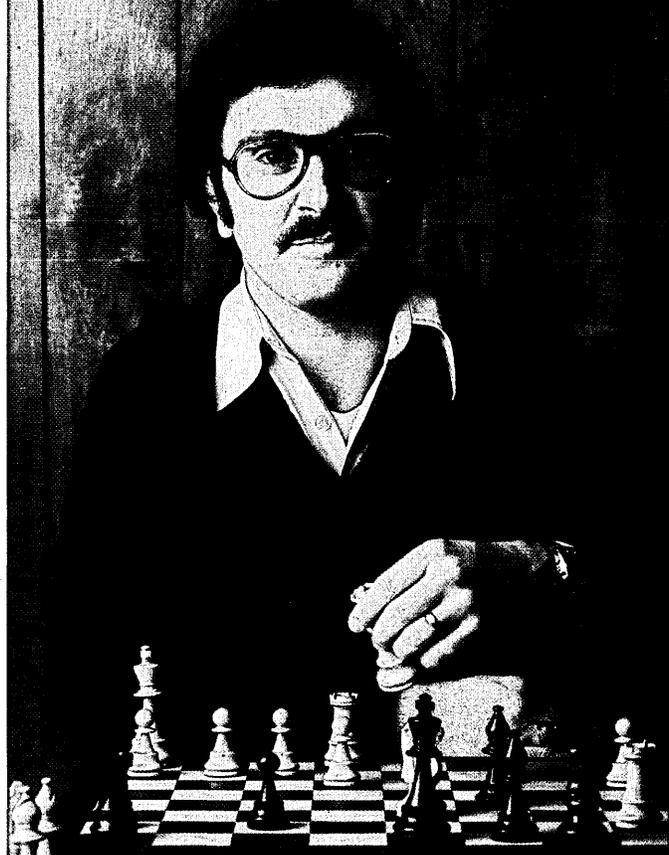
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"With DatagraphiX, there was no problem matching our recorder to our specific COM needs."



"Bringing COM in-house was the only way to keep our data processing costs in check."



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## **“TWO WORDS TURNED OUR MANAGEMENT’S ATTENTION TO IN-HOUSE COMPUTER OUTPUT MICROFILM.”**

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*DP Officer, Mr. William Mengel of Guarantee Bank in Atlantic City, N.J., met with DatagraphiX recently and spoke about his role in convincing upper management to acquire an in-house COM system.*

**DATAGRAPHIX:** “Those two words management listened to must have been fairly strong.”

**MENDEL:** “When you talk to management about new equipment that gets the job done efficiently, easily and quickly, two words immediately come to mind—*time* and *money*. A DatagraphiX Computer Output Microfilm system saves plenty of both.”

**DATAGRAPHIX:** “How do time and money relate to an in-house DatagraphiX system?”

**MENDEL:** “When you use an outside service, your performance depends on their ability to ferry your microfiche and tapes back and forth, day after day. When your COM system is in-house, you’ve got a lot more control. You don’t miss deadlines or waste money because of lost time.”

**DATAGRAPHIX:** “Was the cost of the equipment a major factor?”

**MENDEL:** “Sure, but we hit the break-even point almost immediately. And with growth projected over the next five years, in-house Computer Output Microfilm will not only pay for itself, but save us a lot of money. After mapping out the past, present and future, it’s definitely cost-effective.”

**DATAGRAPHIX:** “What were the other advantages?”

**MENDEL:** “First, the system was very simple to incorporate into our DP operation. DatagraphiX offers a wide variety of hardware and software to suit our particular needs. We had a choice between off-line recorders, minicomputer controllers and on-line recorders which let us match our recorder to our specific COM requirements.”

**DATAGRAPHIX:** “Was your decision to go with a DatagraphiX system also based on reliability?”

**MENDEL:** “We only heard good things about DatagraphiX equipment. It has a fine reputation for reliability. One-vendor service for preventative and on-call maintenance programs was also a major factor.”

**DATAGRAPHIX:** “So you’re pleased with your move to in-house COM with DatagraphiX?”

**MENDEL:** “For us, bringing COM in-house was the only way to keep our data processing costs in check.”

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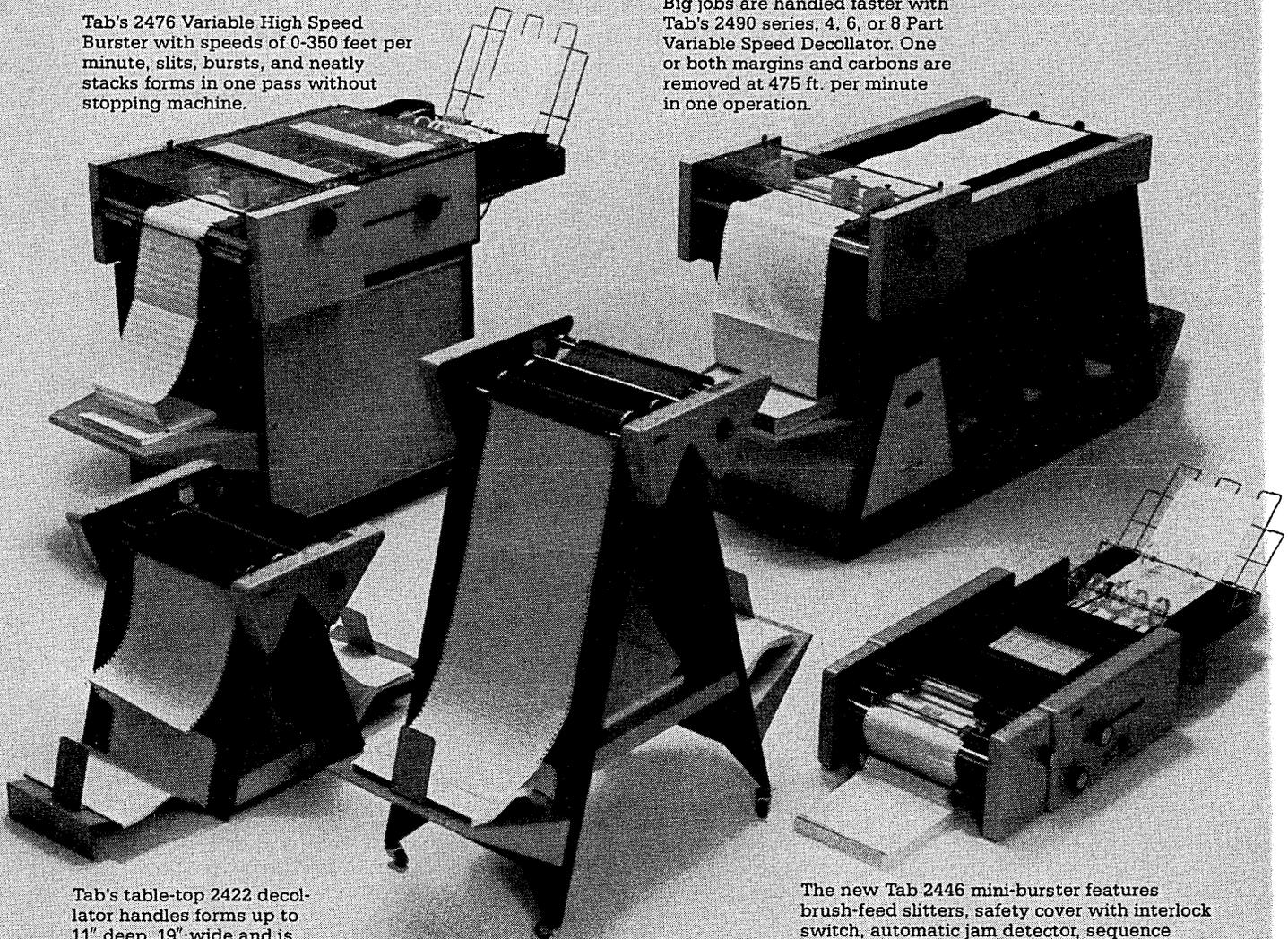
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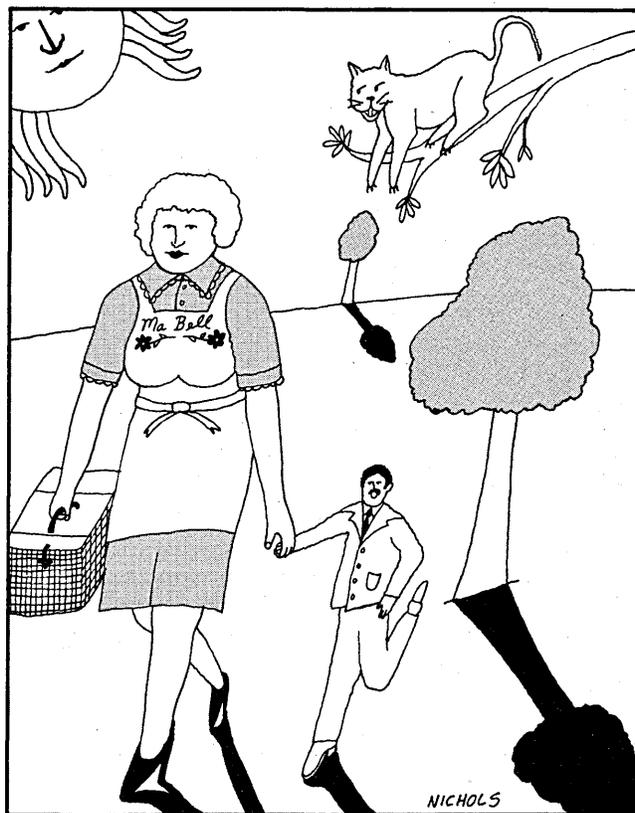
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# THE IMPLICATIONS OF COMPUTER INQUIRY III

FCC findings could result in a big plus for users of data communications services. But as soon as the commission makes its next move, the Justice Dept. is ready to pounce.



## CONTROVERSY, LEGAL BATTLES AWAIT FCC FOLLOW- ON ORDER

by Linda F. Runyan

Over the years, quite a few courtroom conflicts have erupted over some of the Federal Communications Commission's more controversial decisions. But no decision in the history of the FCC promises to spark more legal fireworks than the commission's recent rulemaking under its Computer Inquiry II proceeding.

"Whatever the commission does in Computer Inquiry II," affirms one dp industry lawyer, "is altogether likely to get back into court." These battles before the bench are almost a certainty, claims another industry attorney who declares: "A decision this big hasn't come out of the FCC in 30 years that hasn't been appealed to the courts by somebody."

Late last month, FCC followers, anxiously awaiting the follow-on order from the "tentative decision," speculated on some of the potential legal scenarios that could be played out as a result of the FCC action. While almost all observers agreed on the inevitability of courtroom clashes, they disagreed widely on the legality of the commission's newest deregulation moves.

## RULING WOULD UNSCHACKLE MA BELL TO ROAM THE COMPETITIVE MARKETPLACE

by Ron Frank

The Federal Communications Commission has come up with a solution to the question of where communications stops and data processing starts. Rather than addressing the complex technical issues associated with defining the boundary, the commission has taken a practical approach and defined the common carrier services that can be offered to users.

The solution is seen as a workable compromise by AT&T's competitors, who generally expressed support for the commission's findings in this second Computer Inquiry. Based on a recommendation by its Common Carrier Bureau, the FCC said that five types of services and equipment would be created:

- basic voice service,
- basic nonvoice service,
- enhanced nonvoice (with communications and dp applications),
- terminal equipment for basic telephone, and
- terminal equipment for combined communications and

## CONTROVERSY, LEGAL BATTLES ...

Under the provisional ruling released in May, telephone industry giant AT&T, along with other communications carriers, would at long last be able to make forays into the data processing domain. Such combination data communications-dp services, dubbed "enhanced nonvoice" by the regulators, could be offered on a tariffed-regulated basis. This approach, the FCC feels, would free Bell from its binding obligations under the 1956 Consent Decree which prohibits it from plunging into the unregulated dp business.

Some legal experts forcefully argue the FCC has no authority to tamper with the decree. "It's a clever approach to distorting the Consent Decree and to making it meaningless," insists Phil Nyborg, counsel for the Computer & Communications Industry Assn. "I think it certainly makes them (the FCC) vulnerable to legal attack."

Bernard Strassburg, former head of the FCC's Common Carrier Bureau, is even more adamant. "In effect what the FCC is doing," he maintains, "is subverting the intent of the Consent Decree. The purpose of the Consent Decree," he explains, "was to confine AT&T to those markets that required regulation. Now the commission sees no need for regulation and would like to deregulate."

Others agree that the FCC's obvious purpose is "to ignore" the decree by changing the definitions of tariffed and nontariffed services to allow AT&T to compete in the dp market. Some attorneys believe the FCC can legally pull it off. "This action of the FCC combined with the bill offered by Congressman Van Deeren really means that one way or another, within the next 18 months, the '56 Consent Decree is going to be carved into oblivion," predicts Washington lawyer Bernard Nash.

In the debate over the FCC decision, some observers feel there's been far too much attention paid to the construction and interpretation of the troublesome decree. Says John Eger, former acting head of the Office of Telecommunications Policy: "The consent decree as a focal point of whether to allow AT&T's ACS (Advanced Communications Service) is about as meaningful as trying to decide whether AT&T's Dataspeed 40 is a data communications or data processing device. It's meaningless. It's engaging in semantics."

Semantics aside, the Justice Dept., which admittedly also can't make these service differentiations, has shown no willingness to mess with the decree. While Justice officials are still in a quandary over what retaliatory response to make to the FCC, they are clearly miffed at the commission's Consent Decree moves. Anticipating this antagonism, FCC Common Carrier Bureau chief Larry Darby (who resigned last month) stated that the commission was not attempting to "render a definitive construction of the decree."

This disclaimer however didn't seem to appease Justice, which views the FCC action as a definite stab at construing the Consent Decree—a move which can only legally be done by courts. The FCC's interpretation of the decree, one Justice staffer quipped, "is about as legally binding as a cab driver's."

Another higher level Justice official candidly concedes the deviousness of the commission's tactics. "The FCC," he charges, "tried to get around the Consent Decree in such a way that they didn't appear to be interpreting it, which is the sort of thing we don't like administrative agencies to do. We like courts to do that. They tried to outsluck us on that one," he confesses.

While Justice has backed away from any effort to revamp the decree, it's also balked at enforcing it. Currently the Antitrust Div.'s judgment enforcement section, which handles the policing chore, has been noncommittal about pursuing violations by AT&T.

Any move by Justice to enforce or fiddle with the decree is believed to be highly unlikely. And that's because such action would be steeped in politics and likely to damage the Fed's AT&T antitrust suit. "Any modification or adjustment or attempt by

## UNSHACKLE MA BELL ...

dp.

The key element in the proposal is the requirement that carriers offer enhanced nonvoice services through a separate subsidiary which would lease communication facilities from the parent carrier and offer them for resale to users.

One executive at a carrier that has been competing with the Bell System for a number of years said, "Any separate subsidiary is a good idea. Basically it is going to help Bell get into the competitive arena; we will finally know exactly who we are competing with, and the user will benefit tremendously."

The FCC solution apparently will make it easier for AT&T's Advanced Communications Service (ACS) to be offered in an accepted regulatory framework without having to settle the question of whether or not it is really a dp service more than a communications service. The enhanced nonvoice subsidiaries contemplated by the commission would provide the vehicle under which ACS could be offered at an early date, according to industry observers.

These sources point out that the real question is how AT&T would behave in the marketplace when it is forced to come out from behind the regulatory protection afforded so long by conventional FCC rules. The proposed separate subsidiaries apparently would operate under a form of lesser-regulated guidelines which would simplify the process of filing rates and providing service.

There are still many questions about such lesser-regulated subsidiaries and how they would be structured. But it is possible that users would contract with "Long Lines Communications Inc." for ACS service.

If Bell is allowed to set up competitive subsidiaries that skirt conventional FCC regulations, observers feel that competing value-added, specialized, and other carriers might have the same rights. Thus an "Execunet Microwave Inc." subsidiary of Microwave Communications Inc. would have an easier time providing services to users if it were not burdened with long regulatory and court challenges. "This solution holds out great promise for finally breaking the endless regulatory logjam of the commission," according to a Washington source.

There are some that see the FCC solution as an evolutionary process that ultimately will allow Bell to get into every type of service. This scenario anticipates that after ACS there could be subsidiaries called "Bell Word Processing Inc." and "Bell Electronic Mail Inc." and so forth—all operating under the new lesser-regulated framework. The precise operating parameters of the proposed subsidiaries will have to be defined by the commission as hearings on its solution are held.

In a strictly technical sense, the creation of the proposed services extend the domain of regulation. But sources close to the commission believe that the lesser-regulated entities will be regulated in name only and will for all practical purposes operate in an almost free competitive arena.

A key question is how AT&T will react to the proposal. Initial Bell comments indicated that the telephone company still prefers separate accounting methods rather than separate subsidiaries for the services such as ACS. But competitors believe that the FCC solution will help Bell to enter the world of competition. They see the commission solution as a kind of its-really-for-your-own-good-in-the long-run approach.

Despite the promise held out by the proposed rules, many questions remain to be answered. There could be various degrees of separate subsidiaries. In the extreme, the parent company is little more than a banker and the subsidiary is completely on its own. In a more practical version, the parent shares technology and facilities so long as the arrangement is on an arm's length basis and all costs are fully accounted for to prevent the eternal predatory pricing problem. Most industry sources believe that in the end it will be just as impractical for AT&T to keep its hands off an ACS subsidiary as it will be for IBM to refrain from attaching

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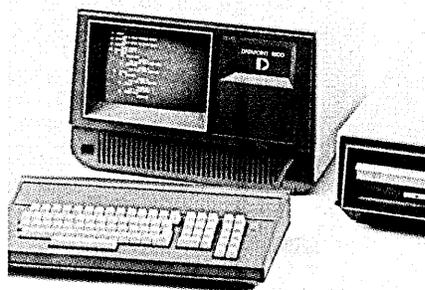
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## FOCUS

### CONTROVERSY, LEGAL BATTLES ...

Justice to enforce the decree," vows one communications lawyer, "will grind the AT&T case to a halt because it would be met with all kinds of legal defenses by Bell to get the case dismissed or settled in one fell swoop."

Legal sources speculate that the FCC decision may impact the government's IBM as well as AT&T antitrust suits. One high-powered Washington attorney acknowledges the ruling could "tend to weaken" the antitrusters' relief muscle in the IBM case. "If AT&T," he points out, "is allowed to invade even 50% of today's reflection of what the market was when liability was established in the IBM case, it undercuts Justice's relief posture—sort of leaving them with a wet soggy bag."

Fallout from the FCC decision could have even more dramatic effects on relief in the Bell suit. Declares lawyer Nash: "It's not going to change the litigation posture of the suit, but it's going to diminish a lot of the bargaining chips Justice would have had to force some kind of settlement. As a result, it's going to prevent meaningful relief short of trial."

Both IBM and AT&T are anxious to shed their government suits. Earlier this spring, board chairmen from both companies reportedly tried to persuade Congress that their sanctioned entry into new service areas would balance marketplace forces enough to make the antitrusters' relief remedies unnecessary.

This Capitol Hill pitch didn't go over big with Justice. Beset by frustrations in both cases, the agency now must mastermind a plan for dealing with the eventual results from Computer Inquiry II. One saving grace is that the department will have some time to brainstorm a strategy since the final FCC decision isn't expected for another year. And some sources predict that timetable could easily stretch into two years.

Justice, if it opts to take action against the FCC, has a mixed bag of options to choose from. Under a more subtle approach, the agency could quietly urge the Congress to hold hearings, giving it a forum for further debate. It could also head for the courts, appealing the FCC decision directly.

Another alternative is that Justice could participate in the FCC's further notice of inquiry, then hit the courts with an appeal. The New Jersey district court, the site of the original antitrust decision, is also at the agency's disposal if it wants to defend its Consent Decree arguments, or seek a modification.

The Justice Dept. isn't the only one which can test the FCC's decision in court. Virtually anyone who participates in the proceeding can also ask the court to review the commission's decision.

Most legal observers feel Justice is reasonably likely to go the appeals route. The suit would probably end up in the District of Columbia Court of Appeals, which one attorney characterized as the most activist and competitive-minded bench in the country. Opinion is mixed on the likelihood of such a suit's success. Confides one FCC fan, "I think the FCC has got everything in its favor, and I don't see how their decision can be overturned."

Other law experts believe the FCC may be on shaky legal ground in defending its decision before the courts. "There are two things," according to one attorney, "that I think are going to come out of this decision which are going to make the commission highly vulnerable to reversal on appeal. The first," he explains, "is that the FCC may end up saying it doesn't have to regulate some communications services. This obviously is contradictory since it's already reached the opposite conclusion that it has to. That's going to make them very vulnerable," he maintains.

"Another thing," he continues, "is that whatever the FCC does formally, if what it does actually is distort the definition of communications way beyond any reasonable limits, then it's clearly open to attack. So if the commission ends up tariffing dp services simply because they have a communications component, then," he insists, "the FCC has abdicated its statutory responsibility to regulate communications and only communications."\*

### UNSCHACKLE MA BELL ...

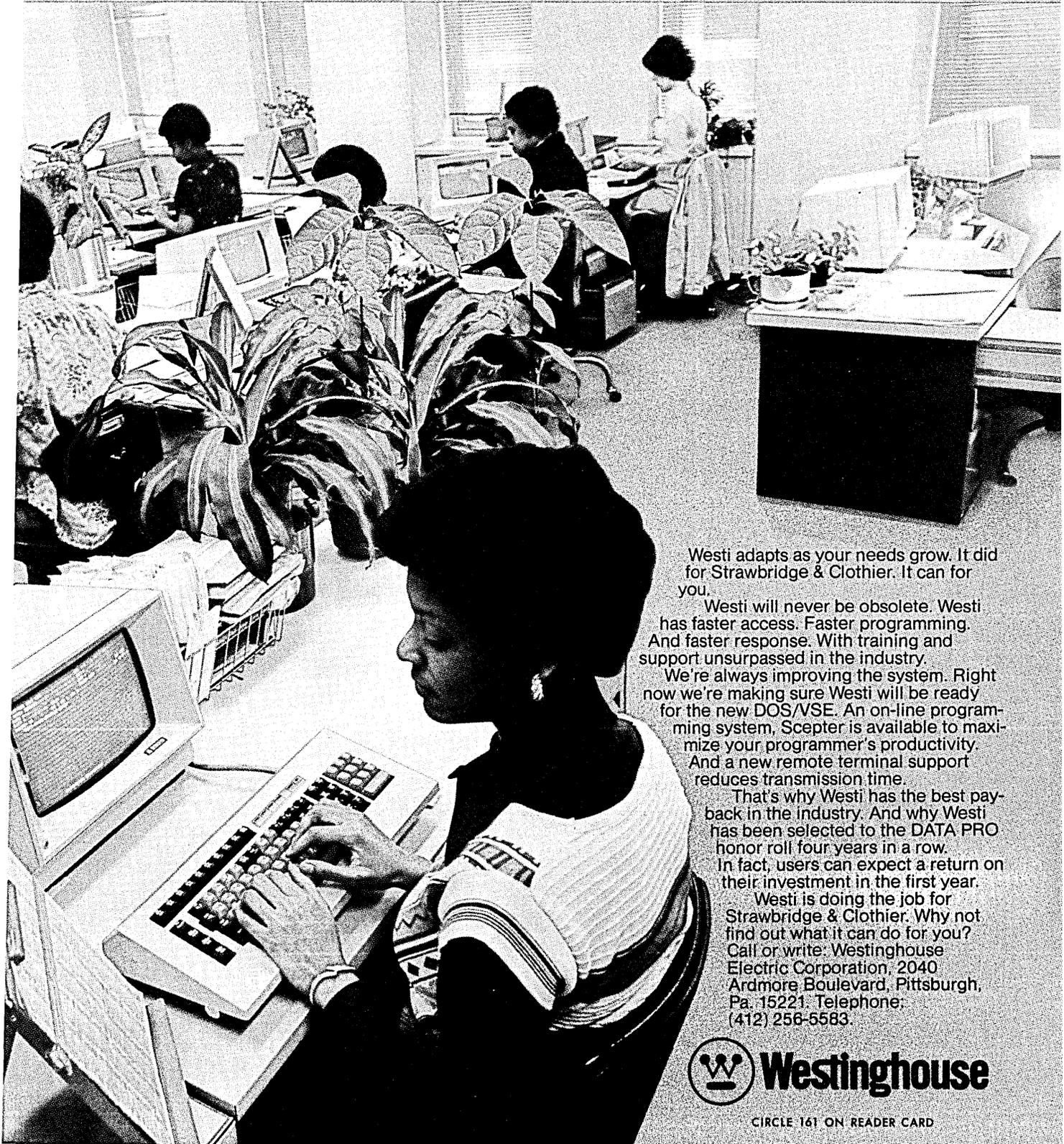
its mainframes to SBS links. The separate subsidiary solution would make such interaction possible without anticompetitive results, these sources say.

For potential customers, the promised new network services could be offered at an early date. Users typically do not worry about which vendor has an unfair economic advantage over another. The user's needs are tied to finding the most flexible service at the lowest cost. And industry observers feel that the FCC solution will help to foster that type of environment where users will have a choice of services. \*

Ron Frank is a free-lance journalist and editorial consultant specializing in data communications.

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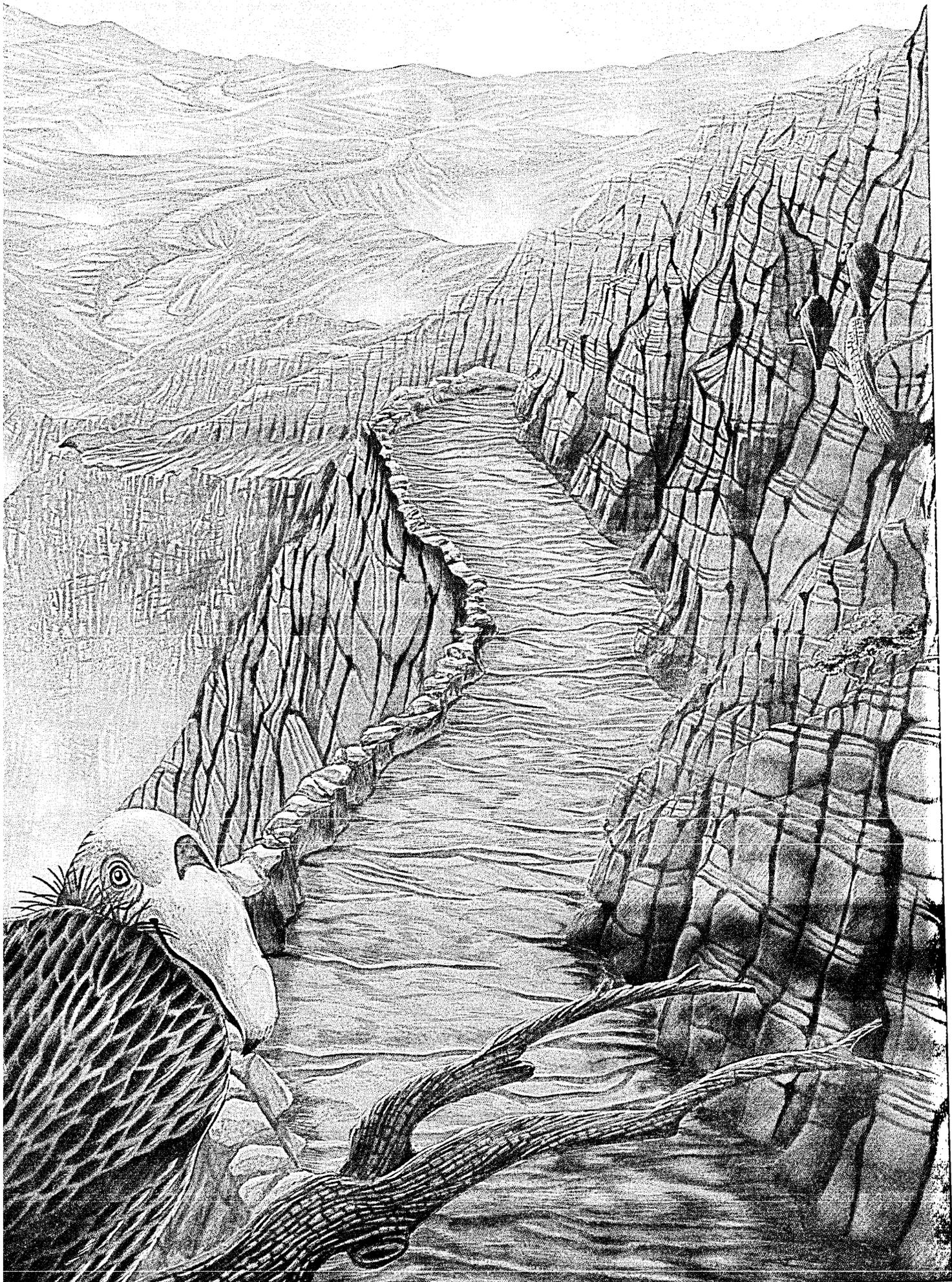
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On the other hand, if your objective is to get to OS, the UCC-2 DOS Under OS System can get the same shop there in about six months — including pre-planning. This software package allows DOS programs and DOS 1400 emulators to run on a 360/370 OS or OS/VS system *without reprogramming*. UCC-2 has already expedited over 700 conversions — without a hitch.

No muss, no fuss, at far less cost. Plus, you start getting the benefits of an OS operation about one year earlier. And, isn't that the reason why you started the conversion in the first place?

Call us about UCC-2 at 1-800-527-5012 (in Texas, call 214-353-7312) or circle 90

And, while you're at it, ask us about:

A Tape Management System that protects

data from loss or destruction (UCC-1).

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A Disk Management System that can save the cost of new disk drives (UCC-3).

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A PDS Space Management System that eliminates PDS compression (UCC-6).

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11/780 computer. For large software design projects, the PWB/UNIX System (Programmer's Workbench) allows up to 48 programmers to simultaneously create and

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information on Bell System software, write: Western Electric, Patent Licensing Manager, Post Office Box 25000, Greensboro, North Carolina 27420. Or call L. Isley, (919) 697-6530.

\*UNIX is a Trademark of Bell Laboratories.

†VAX is a Trademark of the Digital Equipment Corporation.

To: Bell System Software  
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D-2-0

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UNIX  PCAP  Other Bell System Software

Name \_\_\_\_\_

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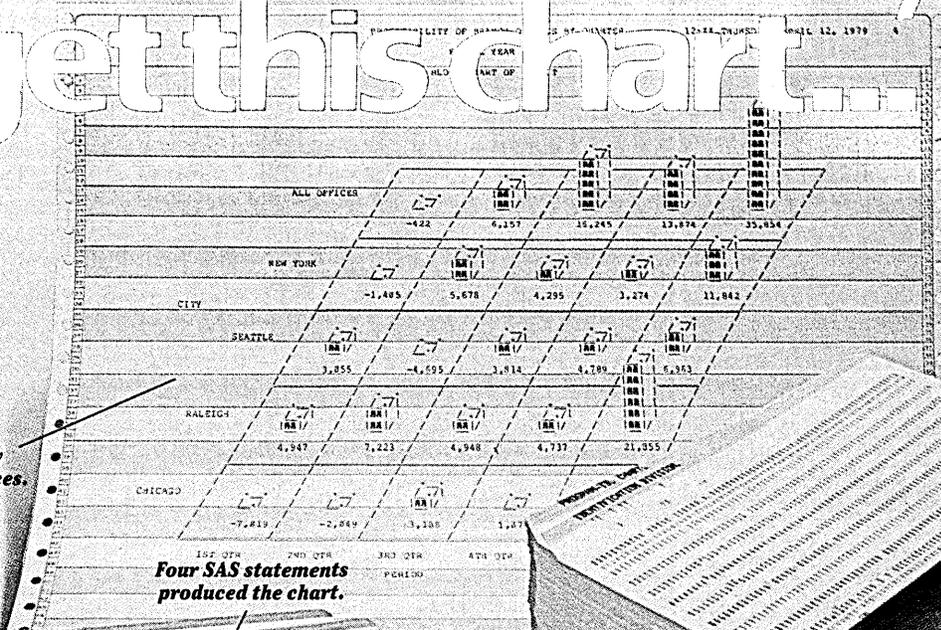
Address \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_ Zip \_\_\_\_\_

Telephone \_\_\_\_\_ Hardware \_\_\_\_\_

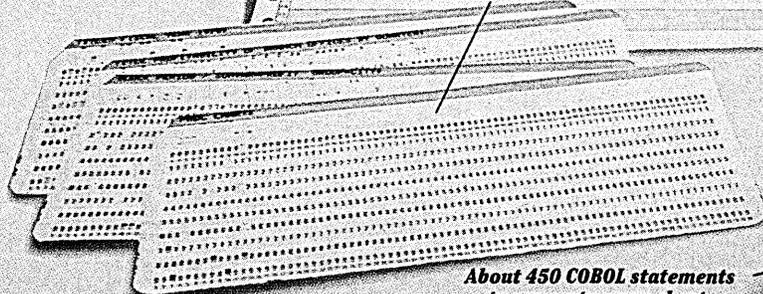


# The fastest way to get this chart...

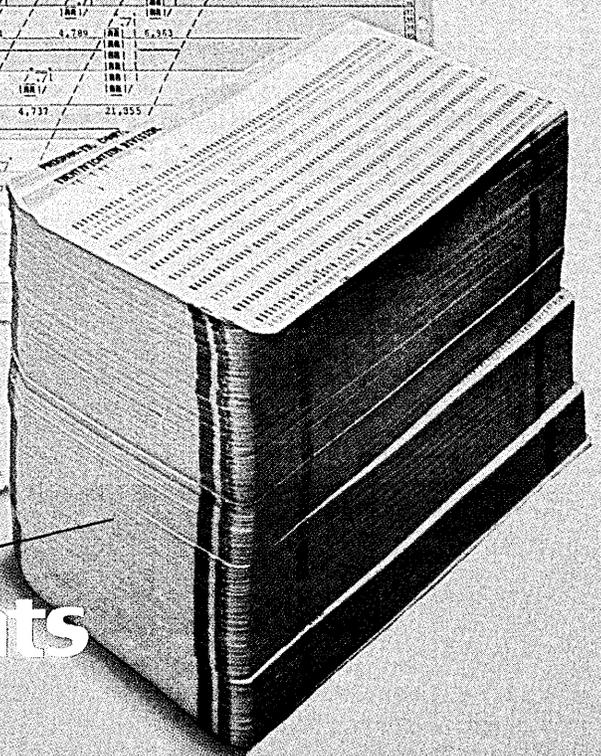


Block chart showing sales and profitability for company branch offices.

Four SAS statements produced the chart.



About 450 COBOL statements to generate same chart.



## is with 4 statements instead of 450.

SAS is a powerful, time-saving software system. In the programming task shown here, 4 SAS statements produced the same report as 450 COBOL statements. That's a typical SAS application and a routine time-savings.

But there's more. SAS can save time two ways.

First, SAS has a complete library of pre-written programs which can be used by all levels of employees for routine jobs. With a few English-like commands almost anyone can use SAS for data analysis, market research, financial reports, summary statistics, charts, plots, personnel reports and many other jobs.

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We'd like to tell you a lot more about SAS. Just write or call. But do it now. Because there's no better time to start saving time... with SAS.

SAS Institute Inc., PO Box 10066, Raleigh, North Carolina 27605. 919/834-4381.



SAS saves time.

# WHEN WE SAY WE'LL BEAT THE PANTS OFF THE COMPETITION...



## We'll beat their pants off!

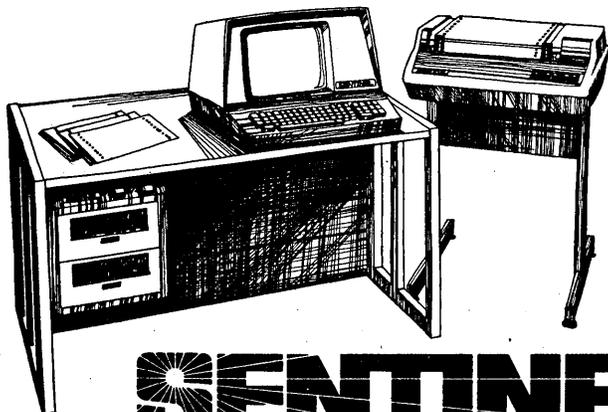
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120 megabytes and accommodating as many as 17 CRT's and 17 printers. Main memory storage can be up to one million characters, and Sentinel's Data Base Operating System provides the complete facility to implement interactive integrated information systems. In short, Sentinel offers you upgradability that is virtually unsurpassed!

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We're so confident in the capability, flexibility and pure "saleability" of the Sentinel system that when we say we'll beat the pants off the competition . . . we'll beat their pants off! That's why Sentinel is the "not-just-another-computer" computer company.

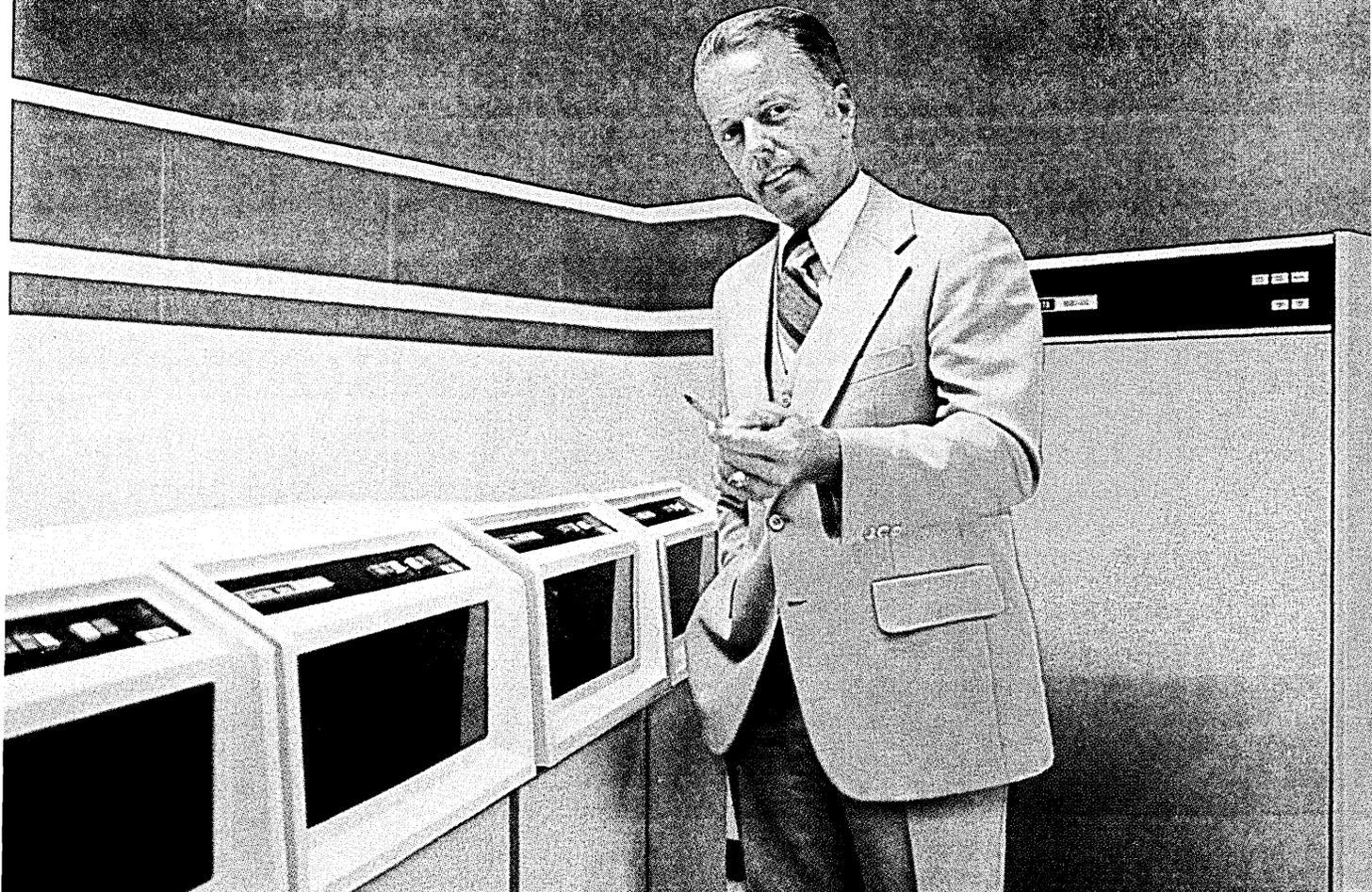
**A limited number of territories are still available for qualified distributors. Inquiries are invited. Contact or call: Mr. Jack Peters, National Sales, or Mr. Leland Cole, International Sales, for more information.**



# SENTINEL

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# "Our 33502, with 635 megabyte capacity, is the better business decision."



*Jim Cron, General Sales Manager, Peripheral Systems Marketing*

"Our 33502 has twice the capacity of an IBM 3350. So you can save dollars and floor space. And the improved technology behind our new 33502 data module offers other advantages.

"Better performance, for example. Track-to-track access time is faster than the 3330/3350 technology can offer. Average access time is faster too—19 milliseconds per 317.5 Mbyte logical volume. And you get more optional fixed head storage—1.72 Mbytes instead of only 1.14 Mbytes.

"Another technological innovation is our dynamic dual access. It gives you up to 25% greater throughput over a comparable switch configuration. And if you have a multiple CPU installation, we can offer you both string switch and dual access to provide four data paths to each spindle.

"And when you choose Control Data's 33502, you needn't worry about conversion or com-

patibility problems. It is totally compatible with all IBM 3330/3350 disks and controllers. Our Storage Controller lets you intermix 100MB, 200MB, 317.5MB, 400MB, 635MB—even Mass Storage all on the same unit.

"Besides technical considerations, there are many other reasons that make the 33502 a better business decision. Control Data's reputation is for reliability, service support and broad product experience. And there are more reasons. For the full story contact your local representative, or call 612/553-4158."

**CD** CONTROL DATA CORPORATION

**More than a computer company**

# A SURVEY OF REMOTE COMPUTING SERVICES

In a little less than two decades, remote computing has grown from an experimental technology to a well developed and widespread industry. Computer hardware and software have matured to meet the growing processing demands of multiple remote users, and service firms now offer everything from simple batch processing to turnkey application systems for installation on user premises.

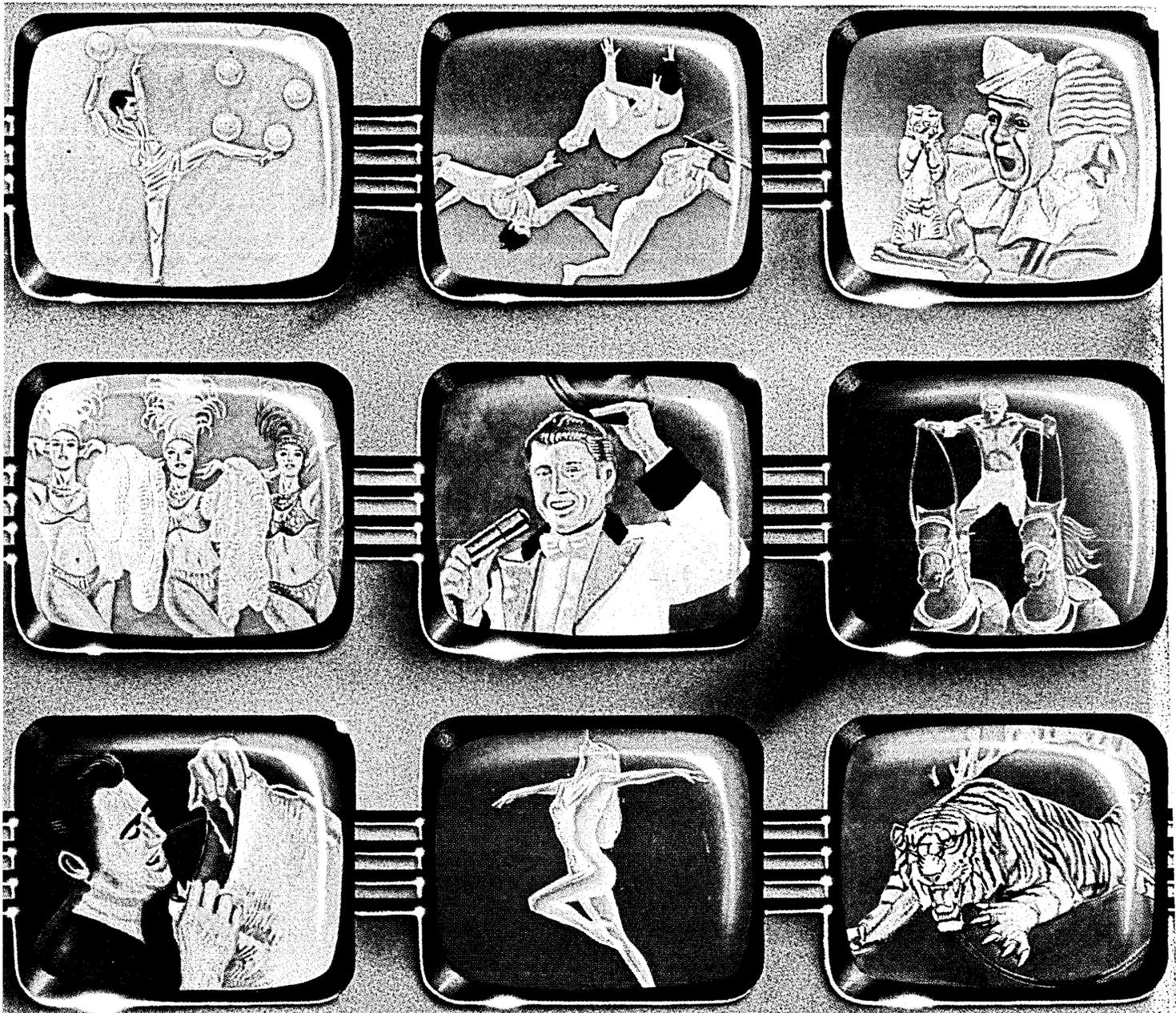
Now, at its peak, the industry faces its greatest challenge. That challenge is

the technological one that allows a mini-computer to perform many of the same interactive functions provided by service bureaus — frequently at much lower cost than the service bureaus demand. Since remote computing, especially in its time-sharing form, originally developed to spread the relatively high costs of computing systems over several users, today's shrinking cost and size of hardware make in-house systems serious threats to the service business.

However, the industry is meeting this challenge in a variety of ways, largely because it has developed many more useful attributes than simple cost sharing.

## IN THE BEGINNING

Much of the original work on time-sharing evolved at Massachusetts Institute of Technology. Technical papers on the subject were published in 1959 and 1960. In 1961 the first experimental system was demonstrated. Called the



# It's a well developed industry now, but a technological challenge must be faced.

by Maevern Varnum and Stephanie Kress

Compatible Time Sharing System (CTSS), it was developed on an IBM 709 under the direction of E. J. Corbato of the MIT Computation Center. CTSS was expanded several times, and by 1963, CTSS II was implemented on an IBM 7094 to provide concurrent access for up to 30 remote users.

Concurrently, several other experimental systems were developed at various universities and research centers, including one designed at Bolt Beranek and Newman for a DEC PDP-1 (1962). Rand Corp.'s JOSS system running under JOHNNIAC (1963), and an IBM Q-32 system from the Development Corp. (1963).

Another notable experimental system evolved as a cooperative venture between General Electric and Dartmouth College. In the spring of 1964, General Electric gave Dartmouth a GE-225 computer and a Datanet-30 Communications Processor to develop a time-sharing system with National Science Foundation funding. The resultant system, designed by Dartmouth students under the direction of Professors John Kemeny and Thomas Kurtz, featured the BASIC programming language. It became operational in July 1964.

Commercial time-sharing was introduced in 1963 when Adams Associates of Cambridge, Massachusetts, began employing a PDP-4 system to process claims of Transitron stockholders.

IBM entered the commercial time-sharing field in December 1964 with the QUIKTRAN system, running on an IBM 7040/7044 multiprocessing configuration. Featuring an interpretive FORTRAN-compatible programming language, QUIKTRAN gave customers an interactive capability for mathematical problem solving.

This feature has been adapted and condensed from the "Time Sharing" volume of the *Auerbach Computer Technology Reports* series. The volume on time-sharing runs several hundred pages, and includes detailed descriptions of the firms and services listed here (and several others), plus directories of data banks, service distributors, etc. It is edited by Ms. Varnum. Updated bimonthly, the reference is available for \$310 per year from Auerbach Publishers Inc., 6560 N. Park Drive, Pennsauken, NJ 08109.

In 1965, Keydata Corp.—an affiliate of Adams Associates—began operating a commercial time-sharing service using a Univac 491 computer. The Keydata service, still in existence today, provides business data processing (including order entry, inventory control, credit checking, and invoicing) primarily to distribution wholesalers.

Also in 1965, General Electric entered commercial time-sharing with operating centers in Phoenix and New York City. The Information Services Department (ISD) was formed on September 1, 1966; this operation has become one of the largest in the commercial time-sharing field.

The time-sharing industry enjoyed a rapid growth in the number of firms and number of customers until 1969. In that year, the industry suffered from the general business slowdown which forced many smaller organizations out of business or into mergers with larger and financially healthier organizations. This industry consolidation has continued through the '70s, leading to one very important present attribute of the services industry—its networking capabilities.

The service firm frequently offers many other benefits not easily attained with in-house systems: applications expertise, proprietary software packages, access to large scale data bases, a broad variety of programming languages; use of photocomposition, graphics, and other hardware specialized; and as-needed call on data entry, programming, and systems analysis services.

## THE SURVEY

There are scores of remote computing service firms which are able to offer most or all of those services, and just under 100 such offerings are described in the following tables. Along with the basics of facilities and location, special software and data base offerings are included, plus some pricing information.

Space limitations do not allow complete descriptions of the firms or of their offerings, thus the vendors should be directly contacted for specific additional data. Nor does the survey pretend to be 100% complete. Those firms not providing pricing information, for example, have been excluded. (And those which have provided data on their charges have sometimes used unconventional definitions or otherwise left the description uninformative; this is an industrywide prob-

lem, however, and we have reproduced the data in good faith.)

Still, it is quite clear from the tables that the user of data processing services has a wide range of choices whatever his location, and that a small company may have access to a great deal of computing power at relatively low cost.

Thus what began primarily as an attempt to defray costs will continue on the basis of its abilities to provide data communications links, centralized records keeping, specialized software and data, on-call professional services, and other data processing functions to augment those installations with their own computer resources or to provide resources to those firms which do not wish to manage that "second business" called data processing. Minis will not kill the services industry. It has more dimensions for expansion, and much more room for further growth.

## MAEVERNON VARNUM



Ms. Varnum is an editorial assistant at Auerbach Publishers Inc., and is in charge of research and production for the Time Sharing Report from which this feature has been adapted. Her past experience has been in education, and in the management of an educational film business.

## STEPHANIE KRESS



Ms. Kress is a free-lance writer and consultant for Auerbach Time Sharing Reports, and was the services' former editor. During the past five years she has worked on time-sharing, data base, and software reports for the firm. Her present position is as administrative assistant for on-line searching at the Franklin Research Center, a division of the Franklin Institute.

Vendor	ADP/First Data	ADP Network Services (Cyphernetics)	American Information Services	Avco Computer Services	Boeing Computer Services (CTS & TSO)
<b>Services Type</b>	Conversational, remote and local batch	Transaction processing, conversational, inquiry response, remote batch	Conversational, remote batch, CRJE, transaction processing, inquiry resp.	Conversational, remote batch	Conversational, inquiry response, remote batch
<b>Applications</b>	Financial modeling, statistics, data base management, engineering, text processing, graphics	General emphasis on information management services to business	Project mgmt., order entry, budgeting, payroll distribution, inventory, statistics, invoicing	Graphics, financial planning, budgeting, information storage and retrieval, library	Engineering, math, management science, financial, text, information mgmt., simulation, plotting
<b>Geography</b>	Serving U.S., Canada, and Europe from Waltham MA	Serving U.S. and Europe from Ann Arbor MI	Serving U.S. and Intl. users from Greenwich CT and Metuchen NJ	Serving the U.S. and Canada from Wilmington MA	Serving the U.S., Canada, and Europe from Washington DC
<b>Facilities Computers</b>	DECsystem-10s	24 DECsystem-10s (256K 36bit words)	IBM 370/158s	4 IBM 470/158s (16 MB)	IBM 3033 (8MB); IBM 370/168MP (8MB)
<b>Terminals supported</b>	Terminals up to 1200 baud; IBM 2780	Up to 4800baud; tty and 2741-2780; most graphics	ASCII, EBCDIC, Correspondence terminals to 30 cps; batch to 2000 baud	tty, 2741, Tektronix, 4780 and 3870, HASP workstations	Interactive to 120cps; 2741 at 15cps; batch up to 9600baud
<b>Languages/packages</b>	Cobol, Fortran, CPL, Macro, Maxbasic, Algol, AID	Basic, Cobol, Fortran, GPSS, Macro	APL, Basic, Cobol, Fortran, PL/1, RPG, DRS, IMS, assembler	Cobol, Fortran, PL/1, assembler, Interactive, Basic, Speakeasy, GPSS	VS-APL, VS-Basic, Cobol, PL/1, Fortran, Watfiv, Wylbur, assembler
<b>Data bases available</b>	Stock market, 1970 Census, Federal RR administration, AT&T tariffs	Economic data, financial, demographic, MSSS Spectral, etc.	Simmons, ARB Network Systems (advertising)	—	—
<b>Pricing</b>					
<b>Start-up</b>	No charge for start-up	\$100 start-up fee	No charge for start-up	No charge for start-up	No charge for start-up
<b>Monthly minimum</b>	No monthly minimum	No monthly minimum	No monthly minimum	No monthly minimum	No monthly minimum
<b>Terminal connect</b>	\$7.50 per hour prime time to \$5 per hour	\$10 to \$15 per hour	\$10/hour	\$10/hour for RJE; \$6/hour for TSO	\$8 to \$17/hour prime time; to \$2/hour off-hours
<b>Central processor</b>	\$0.011 per Computer Resource Unit	\$0.011 to \$0.22 per Computer Resource Unit	\$0.19/system resource unit; \$0.10 - \$0.17/cpu sec	\$380 to \$1,240 per hour (\$440 to \$810 per TSO-hour)	\$0.20 to \$0.08 per Charging Unit
<b>Disk storage</b>	\$0.12 to \$0.30 per 1K/month	\$0.06 to \$0.75 per 1K/month	\$20 to \$60 per cylinder/month (3330 and 3350)	\$100 to \$200 per month	\$1.30 to \$0.70/cylinder per day; \$0.05/track
<b>Tape storage</b>	\$2 to \$2.50/month	\$10/month	\$5/month	\$2.50/month	\$0.20 to \$0.15/day
<b>Other</b>			Surcharge for virtual memory over 320KB		Monthly storage discounts
<b>Comments</b>	Introduced in 1970	Introduced in 1969	Introduced in 1971	Introduced in 1958	CTS introduced in 1970; TSO in 1972

Vendor	Boeing Computer Services (Mainstream-EKS)	Bowen Time Sharing (Comspec & Word One)	Burroughs	Call Computer	Calldata Systems
<b>Services Type</b>	Conversational, CRJE, remote batch	Conversational, inquiry response, remote batch	Conversational, RJE, remote batch	Conversational, CRJE	Conversational, CRJE, transaction, inquiry response
<b>Applications</b>	Structural analysis, data base management, civil engineering, linear optimization, graphics, library	Text editing, specification services for construction industry, photocomp, litigation support	Banking, brokerage, financial, real estate, simulation, math	Commodity analysis, inventory, accounting, library, management information, text editing	General-purpose
<b>Geography</b>	Serving the U.S. and Canada from Seattle WA	Serving users nationwide from New York City	Serving users nationwide and worldwide from New York City	Serving users nationwide from Mountain View CA	Serving U.S., Canada and Iran from Bethpage, Woodbury NY and Newton MA
<b>Facilities Computers</b>	5 CYBER 175s (256K with 60 bit words)	2 IBM 370/155s (1MB)	Burroughs B6700 dual processor (400K words)	Basic Timesharing 3000 (32K); Data General Eclipse 300 (96K)	2 Amdahl 470s, H6607 DTSS, Cyber 73/172, 3 DECsystem-10s
<b>Terminals supported</b>	Up to 9600 bps	IBM 2741-compatible terminals up to 30 cps, ASCII (including crts)	tty-compatible; Burroughs; IBM 2780/2741, ASCII terminals, etc.	tty, all ASCII terminals up to 240cps	tty 33-35, IBM 2741, most others, including RJE
<b>Languages/packages</b>	Compass 3, Basic 2.1, Fortran, Cobol, Sort/Merge 4, SImscript, APL	Assembly, Cobol, Fortran, PL/1, RPG	APL, Algol, Basic, Cobol, Fortran	Algol, assembly, Basic, Fortran IV and V, RPG II	Assembly, Basic, Cobol, Fortran, PL/1, Snobol, RPG, Bruin, APL
<b>Data bases available</b>	—	Construction specs., Veterans Admin., DOD, AIA, and others	—	Commodities	U.S. and Canadian demographic
<b>Pricing</b>					
<b>Start-up</b>	No charge for start-up	No charge for start-up	No charge for start-up	No charge for start-up	No charge for start-up
<b>Monthly Minimum</b>	No monthly minimum	\$300 monthly minimum	No monthly minimum	\$10 monthly minimum	\$50 monthly minimum
<b>Terminal connect</b>	\$8.50 to \$19.50 per hour	\$2.95/hour	\$11.50/hour	\$6 to \$14/hour prime time \$0.99/hour off-hours	\$11 to \$14 per hour (prime time) to \$6/hour
<b>Central processor</b>	\$0.085 to \$0.20 per Computer Charging Unit	\$0.01/Process unit	\$0.38/sec (prime time) \$0.30/second (off-hour)	No charge	\$17/resource unit (batch), \$20/RU t-s
<b>Disk storage</b>	\$0.0015 to \$0.007 per sector per day	\$0.25 to \$0.28 per 1550 bytes per month	\$0.02 to \$0.03 per 1000 characters/day	\$0.63/1000 characters	\$1.20 per cylinder
<b>Tape storage</b>	\$0.10 to \$0.25 per day	Mag tape I/O: \$1.60/1KB Card I/O: \$3.20/1000	\$0.05 per file per day regardless of size	—	—
<b>Other</b>	156,250 disc sectors at \$4,950/month	Printer: \$2.90/1000 lines			Volume discounts start at \$5,000
<b>Comments</b>	Introduced in 1975	Word/One introduced in 1969; Comspec in 1970	Introduced in 1967	Introduced in 1971	Introduced in 1970

Vendor	CHI	Community Computer	Compudial	CompuServe Network	CompuTel Systems
<b>Services Type</b>	Conversational, remote batch, CRJE	Conversational	Conversational remote batch, inquiry response	Conversational	Remote batch, CRJE, inquiry response, conversational
<b>Applications</b>	Engineering, business, math, education, dbms, photocomp, modeling, financial forecasting	Accounting, finance, education, inventory control, engineering, math-statistics	Order entry, billing, accounts payable/receivable, inventory control, sales analysis	Accounting, construction, education, insurance, business, text processing	Construction, engineering, scientific, data base management, simulation
<b>Geography</b>	Serving northern and central Ohio, and central Pennsylvania, from Cleveland OH	Serving New Jersey, Delaware and eastern Pennsylvania from Philadelphia PA	Serving the mid-Atlantic states from Cherry Hill and Montclair NJ and Baltimore MD	Serving the U.S. from Columbus and Dublin OH	Serving Canada and the U.S. from 10 cities throughout Canada and from Miami FL
<b>Facilities Computers</b>	Univac 1108, Univac 1100/11, DECsystem 2050, 2 HIS 430s	3 Hewlett-Packard 2116Bs (16K 16 bit words)	NCR Century 201	12 DECsystem-10s	IBM 360/65, 2 IBM 370/168s, Univac 1108, 2 B4700s, 4 HP3000s
<b>Terminals supported</b>	ASCII to 1200baud; RJE to 20,000baud	ASCII terminals to 300baud	ASCII terminals to 120cps; tty 33-compatible	Terminals to 120 cps, HASP to 4800baud	tty 33/35; IBM 2741/ 2780; Data 100; Univac 1004; 3780; etc. Computerm; others
<b>Languages/packages</b>	Algol, Basic, Cobol, Fortran, RPG, Snobol, Fipac	Basic, Fortran, Algol	—	APL, AID, Algol, Basic, Cobol, Fortran, Lisp, Snobol, RPG	Algol, assembly, Cobol, APL, Fortran, PL/1, Snobol, RPG
<b>Data bases available</b>	—	—	—	Telstat, Compustat	Databank/Massager (econometric)
<b>Pricing Start-up</b>	\$25 Start-up charge	No start-up charge	\$0.25/record start-up	No charge for start-up	No charge for start-up
<b>Monthly minimum</b>	No monthly minimum	No monthly minimum	\$300 monthly minimum	No monthly minimum	\$100 monthly minimum
<b>Terminal connect</b>	\$3.50 to \$12/hour	\$6 to \$10 per hour	No charge for connection	\$12 to \$50 per hour	\$5 to \$10 per hour
<b>Central processor</b>	\$0.22 to \$0.30 per batch unit; \$0.04 to \$0.07 t-s	—	—	\$0.012 to \$0.023 per System Resource Unit	\$440 to \$1260 per CPU hour
<b>Disk storage</b>	\$0.20/day per 2.8KB batch; \$0.35/day per 1KB t-s	\$0.05 to \$0.20/month per 160KB	\$0.55 per 1KB	\$0.052/day per 3200 characters	\$0.02/day per data set plus \$0.03/day per track
<b>Tape storage</b>	\$0.10/day or \$2.50/month	—	—	\$9/period, \$15/mount	—
<b>Other</b>	Cards: \$0.05/day per box or \$1.25/month	—	—	—	—
<b>Comments</b>	Batch introduced in 1968; conversational in 1971	Introduced in 1968	Introduced in 1971	Introduced in 1970	Introduced in 1968

Vendor	The Computer Company (Action/APL)	Computer Innovations	Computer Network	Computer Research	Computer Resource Services
<b>Services Type</b>	Conversational	Conversational APL and ATS, inquiry response	Conversational, batch, remote batch, transaction entry, inquiry	Remote batch	Conversational, transaction entry
<b>Applications</b>	Education, engineering, financial, math-statistics, payroll, plotting, graphics	APL: business, engineering, financial, graphics, project control; ATS: word processing	Business, scientific	Brokerage accounting, CATV accounting, education	General business
<b>Geography</b>	Serving U.S., Canada, France, Belgium and Switzerland from Richmond VA	Serving the midwestern U.S.	Serving the U.S. from Washington DC	Serving the U.S. from Pittsburgh PA	Serving metropolitan Phoenix and Tucson AZ
<b>Facilities Computers</b>	IBM 370/155 (1.5MB)	—	IBM 370/158, ITEL AS/6	Honeywell 2015	5 H-P 2116Bs (32K 16-bit words)
<b>Terminals supported</b>	IBM 2741-compatible, ASCII to 120cps	IBM Selectric; ASCII to 30cps	ASCII to 120 cps, EBCDIC to 19,200baud	tty; Friden; Data 100	ASCII or correspondence terminals to 30cps
<b>Languages/packages</b>	APL	APL	Assembler, Cobol, Fortran, PL/1, Basic, Snobol, RPG, GIS/2	Assembly, Fortran, Cobol	Basic
<b>Data bases available</b>	CAB, CEDA, Oil market	CEDA	—	—	—
<b>Pricing Start-up</b>	No charge for start-up	\$100 charge for start-up	No charge for start-up	Start-up fee varies	\$100 charge for start-up
<b>Monthly minimum</b>	No monthly minimum	No monthly minimum	No monthly minimum	\$675 monthly minimum	\$50 monthly minimum
<b>Terminal connect</b>	\$13.44 to \$23.52 per hour	\$12.50 to \$21.50 per hour	\$12/hour; \$0.50/1000 cards or lines	—	\$10 to \$15 per hour; dedicated port \$1,250/mo
<b>Central processor</b>	\$0.65 per second	APL: \$0.833/Resource Unit; ATS: \$0.01	\$0.20 per Computer Utilization Unit	\$1.60 per transaction	Included
<b>Disk storage</b>	\$12.32/day per MB	\$0.25/month per 1550 bytes	\$2/month per track or \$15 to \$50/month per pack	—	\$180 to \$530/month plus \$0.30 to \$0.60/1KB
<b>Tape storage</b>	—	\$7.50/month	\$3 to \$5/month per tape	—	—
<b>Other</b>	—	APL work space \$12.50/day per 1M	—	—	—
<b>Comments</b>	Introduced in 1969	Introduced in 1969	Introduced in 1967	Introduced in 1963	Introduced in 1970

Vendor	Computer Sciences (Infonet-CSTS)	Computer Sciences (Infonet Service 370)	Computer Sciences Canada	Computer Sharing Services	Computer Solutions (Fastcomp)
<b>Services Type</b>	Conversational, remote batch	Remote batch, time-sharing, and conversational editing	Conversational, remote batch, inquiry response	Conversational, RJE, remote batch, inquiry response	Conversational
<b>Applications</b>	Data base management, financial, linear programming, math-statistics, econometrics	Math-statistics, project management	Accounting, engineering, math-statistics, science, financial, plotting, petrochemical	General business, financial, and mining	Accounting, educational, pharmaceutical
<b>Geography</b>	U.S., Canada, Europe from Los Angeles, Oak Brook IL and Beltsville, MD	Serving the U.S. from Dallas TX	Serving Canada from Toronto ON and Calgary AL	Serving the U.S. from Denver CO	Serving New York, New Jersey, Connecticut and Pennsylvania from East Orange NJ
<b>Facilities</b>					
<b>Computers</b>	12 Univac 1108s (256K 36-bit words)	3 IBM 370/168s (10 MB)	2 Univac 1108s (256K 36-bit words)	Dual Honeywell 66/17s	CSI Fastcomp V (HP 2100 Series)
<b>Terminals supported</b>	Keyboard terminals to 30cps; RJE to 9600bps	Terminals to 4800bps, direct lines to 120cps	Interactive to 120cps; RJE to 4800bps	Asynch to 1200baud, RJE to 4800baud	ASCII terminals at 10cps
<b>Languages/packages</b>	Assembly, Fortran, Cobol, Basic	Assembly, Fortran, Cobol, PL/1, Nastran, SRDC, Ansys, Easytrieve	Assembler, Basic, Cobol, Fortran, GPSS	Basic, Fortran, Cobol, GMAP	Basic
<b>Data bases available</b>	CEDA, SITE II, Diadem	—	Statistics	—	Pharmaceutical
<b>Pricing</b>					
<b>Start-up</b>	\$150 charge for start-up	\$150 charge for start-up	\$150 charge for start-up	\$50 charge for start-up	No charge for start-up
<b>Monthly minimum</b>	\$150 monthly minimum	\$150 monthly minimum	\$50 monthly minimum	\$100 monthly minimum on contract	No monthly minimum
<b>Terminal connect</b>	\$5 to \$30 per hour plus character rate option	\$9 to \$20 per hour	\$6 to \$32 per hour	\$3 to \$18 per hour	\$4.95 to \$10 per hour or \$175 monthly per port
<b>Central processor</b>	\$0.06 to \$0.29 per System Resource Unit	\$0.115 to \$0.80 per System Resource Unit	\$0.045 to \$0.80 per System Resource Unit	\$0.03 to \$0.255 per Computer Resource Unit	—
<b>Disk storage</b>	—	—	—	—	—
<b>Tape storage</b>	\$10/hour per tape drive	—	—	—	—
<b>Other</b>	\$0.03/day per page	\$0.017 to \$0.040/day per page	\$0.25 to \$0.053/day per page	\$1.60/month per 4KB	\$1/month per 1KB
<b>Comments</b>	Introduced in 1970	Introduced in 1977	Introduced in 1967	Introduced in 1967	Introduced in 1968

Vendor	Computone Systems	Comserv (AMAPS, CAS III)	Comshare (Commander I)	Comshare (Commander II)	Comshare Ltd. (Commander II and CP-V)
<b>Services Type</b>	Transaction processing	Transaction processing (on-line or batch)	Conversational	Conversational, remote batch	Conversational, remote batch, CRJE, inquiry response
<b>Applications</b>	Computer-assisted selling, linear programming, scientific applications	Material requirements planning, accounting, order entry	Banking, engineering, math-statistics, third-party programs including animal nutrition	Human resource mgmt., accounting, telephone administration, engineering, financial, math	Data management, math-statistics, business, financial, third-party programs
<b>Geography</b>	Serving the U.S. from Atlanta GA	Serving Minneapolis-St. Paul, Chicago and Milwaukee from Minneapolis MN	Serving the U.S. from Ann Arbor MI	Serving the U.S., Canada, Europe and Japan from Ann Arbor MI, Rexdale ON, London, Tokyo	Serving Canada from Brampton ON
<b>Facilities</b>					
<b>Computers</b>	IBM 360/65 (1MB)	IBM 360/65, 2 IBM 360/40s	8 Xerox 940s (64K 24-bit words)	6 Xerox Sigma 9s (512KB)	2 Xerox Sigma 9s (1MB)
<b>Terminals supported</b>	Computone TI 700, various audio terminals	tty 33/35-compatible, Data-point 1200	Most ASCII terminals to 60cps	ASCII terminals to 120cps; IBM 2780-compatible	ASCII terminals to 120cps; IBM 2780- and HASP-terminals
<b>Languages/packages</b>	—	Basic, Cobol	Assembly, Basic, Fortran, Snobol	Assembly, Fortran, Cobol, Basic, report generator	APL, Basic, Cobol, Fortran, Snobol, RPG, Assembly, Meta-Symbol
<b>Data bases available</b>	—	Manufacturing distribution	—	Financial-oriented	Financial-oriented CANSIM
<b>Pricing</b>					
<b>Start-up</b>	\$500 to \$1000 start-up	Charges based on contract and transaction type	No charge for start-up	No charge for start-up	No charge for start-up
<b>Monthly minimum</b>	\$20 monthly minimum	No monthly minimum	No monthly minimum	No monthly minimum	No monthly minimum
<b>Terminal connect</b>	\$400/month or \$0.75/min.	\$0.15/min for asynch; \$0.20/min for bisynch	\$12 to \$22.20 per hour	U.S. \$0.14 to \$0.35/min; Intl. \$3 to \$5/hour	\$11.40 to \$21/hour
<b>Central processor</b>	—	Batch transaction rate	\$0.048 per System Resource Unit	\$0.08 per System Resource Unit	\$0.08 to \$0.13 per System Resource Unit
<b>Disk storage</b>	—	\$1/month per 7200 character track	\$0.018 to \$0.033/day per 1KB	\$0.0025 to \$0.01/day per block	\$0.01/day per 2KB
<b>Tape storage</b>	—	—	—	—	—
<b>Other</b>	—	\$1/month per program	—	—	\$5/month plus \$0.04/2KB
<b>Comments</b>	Introduced in 1965 All prog. done by CSI	Introduced in 1972	Introduced in 1967	Introduced in 1971	Introduced in 1968

Vendor	Concap Computing Systems	Continental Illinois Bank & Trust	Control Data (Cybernet Services)	Data-Tek	Datacrown
<b>Services Type</b>	Conversational	Conversational, inquiry response, CRJE	Conversational, CRJE, remote batch, data entry, inquiry response	Conversational, remote batch	Conversational, remote batch, transaction processing
<b>Applications</b>	Civil and structural engineering, automatic drafting, plotting, general business	Banking and general-purpose	Structural analysis, engineering, statistical, nuclear, petrochemical, power engineering	Financial modeling, HMO, statistics, subscription fulfillment, municipal bonds	Program development, data base, project management, data entry, simulation
<b>Geography</b>	Serving the U.S. from Oakland CA	Serving the U.S. from Atlanta, Boston, Baltimore, Pittsburgh, LA, Washington, and NYC	Serving the U.S., Canada, Europe, Australia, So. Africa and Brazil from 17 intl. locations	Serving central and eastern Pennsylvania, New Jersey and New York from Philadelphia PA	Serving the U.S. and Canada from Willowdale ON
<b>Facilities</b>					
<b>Computers</b>	Satellite (based on DEC PDP-11)	DECsystem-10s	CDC 170, CDC 6000 Series, Cyber 70, Cyber 76	HP 3000 II Mod 6 (512KB)	3 IBM 370/168s (9MB)
<b>Terminals supported</b>	ASCII terminals to 300baud	ASCII terminals to 300baud	TTY to 120cps; IBM 2741; RJE to 4800baud; HASP 9600baud	Interactive to 120cps; IBM 2780-compatible	TTY, IBM 2741/3270 to 30cps; RJE to 50,000 bps
<b>Languages/packages</b>	Fortran	APL, Basic, Fortran, Cobol	APL, Algol, assembly, Basic, Cobol, Fortran	Basic, Cobol, Fortran, SPL, RPG II	Assembly, Cobol, PL/1, Fortran
<b>Data bases available</b>	—	Telstat's security data, municipal and government bond grid, RMA	Technology, economic indicators and indices	—	—
<b>Pricing</b>					
<b>Start-up</b>	\$100 charge for start-up	No charge for start-up	No charge for start-up	\$50 charge for start-up	No charge for start-up
<b>Monthly minimum</b>	No monthly minimum	\$75 to \$150 monthly minimum	\$100 for interactive	\$25 monthly minimum	No monthly minimum
<b>Terminal connect</b>	\$18/hour (surcharge for WATS service)	\$10/hour	\$9 to \$18 per hour plus \$0.10 to \$0.25/1KB of I/O	\$9 to \$12 per hour	\$3 to \$12 per hour
<b>Central processor</b>	\$0.22 cpu unit	\$0.05 per Resource Unit	\$0.18 to \$0.45 per system billing unit	\$0.07 to \$0.08 per cpu second	\$20/minute
<b>Disk storage</b>	—	\$0.04/day per 3200 characters	\$0.013 to \$0.016/day per 1280 characters; \$3/day per block 512KB	\$0.40/month per 1KB	\$0.012/day per track or \$800/mo for 5000 tracks
<b>Tape storage</b>	—	—	—	\$2/mount; \$5/month storage	\$0.09/day
<b>Other</b>	\$0.03/storage unit	\$0.11 per Dynabank Software Unit	—	25% discount for off-hours	—
<b>Comments</b>	Introduced in 1966	Introduced in 1969	Introduced in 1964	Introduced in 1971	Introduced in 1972

Vendor	Dataline Systems	Datalogics	Dialcom	Dynabank	First National Bank
<b>Services Type</b>	Conversational, CRJE, transaction entry, inquiry response, batch	Conversational, CRJE, remote batch	Conversational	Conversational, CRJE, inquiry response	Conversational, CRJE, inquiry response
<b>Applications</b>	Financial, engineering, graphics, text processing tax, accounting for lawyers	Accounting, banking, brokerage, education, engineering, finance, others	Math-statistics, business, inventory, circuit analysis, letter tracking	Portfolio management, credit analysis, trust, marketing, operational services	Bond portfolio, interactive graphics, banking applications
<b>Geography</b>	Serving the U.S. and Canada from Toronto ON	Serving Ohio, Illinois, New York and Pennsylvania from Cleveland OH	Serving the U.S. and Europe from Silver Springs MD	Serving the U.S., marketed by 3 member banks	Serving the U.S. from Columbus OH
<b>Facilities</b>					
<b>Computers</b>	4 DECsystem-10s	Xerox Sigma 7 (128K 32-bit words)	2 Prime 400s, 7 Honeywell 1648As	DECsystem-10	DEC PDP-10
<b>Terminals supported</b>	ASCII terminals to 120cps; IBM 2741-compatible	ASCII terminals to 120cps; IBM 2741 to 30 cps; RJE to 4800baud	ASCII terminals to 300baud; 134.5baud correspondence, 1200baud RJE	ASCII or EBCDIC terminals	ASCII and EBCDIC terminals to 120cps and 4800baud
<b>Languages/packages</b>	AID, APL, Algol, Basic, Cobol, Fortran, Lisp, Simula, Snobol, SPSS	Basic, Cobol, Fortran, APL, Proforma, Text, report generator	Assembly, Basic, Cobol, Fortran, Teach, Solve, report generator	Fortran, Basic, Cobol, Macro, AID, Lisp	Basic, Fortran, Cobol, Lisp, Macro
<b>Data bases available</b>	Financial, economic, brokerage, CANSIM, petroleum resources	—	FAPRS	Telstat, Robert Morris Associates data bank	Securities prices
<b>Pricing</b>					
<b>Start-up</b>	No charge for start-up	\$100 charge for start-up	No charge for start-up	No charge for start-up	No charge for start-up
<b>Monthly minimum</b>	No monthly minimum	No monthly minimum	\$25 monthly minimum	Monthly minimum varies	\$50 min. for software
<b>Terminal connect</b>	\$6 to \$14 per hour	\$5 to \$18 per hour	\$5 to \$6 per hour	\$10 per hour	\$10 per hour
<b>Central processor</b>	Batch: \$500/CPU hour	\$0.04 to \$0.16 per Computer Resource Unit	No separate charge	\$0.05 per hardware unit \$0.11 per software	\$0.02 per unit of hardware resources
<b>Disk storage</b>	\$30/month	\$0.08/month per 2KB; \$30/month off-line	\$0.50/month per 512 characters	\$1.20/month per 3200 characters	\$0.05/day per cluster
<b>Tape storage</b>	\$2 to \$3 per month	\$5/month per reel; \$2 per mount	—	—	\$5/month
<b>Other</b>	—	—	—	—	—
<b>Comments</b>	Introduced in 1969	Introduced in 1969	Introduced in 1970	Introduced in 1969	Introduced in 1969

Vendor	Fulton Data Systems	General Electric (Mark III Service)	HDR Systems	Hobbs Associates	Honeywell (Datnetwork)
<b>Services Type</b>	Conversational, remote batch	Conversational, remote batch, CRJE	Conversational, CRJE, remote batch	Conversational	Conversational, CRJE, remote batch
<b>Applications</b>	Engineering, math, accounting, payroll, inventory, sales analysis, education, banking	Financial, simulation, math, scientific, engr., petrochemical, real estate, insurance, hospital admin	Turnkey applications in engineering, text editing for specification writing, business	General applications with emphasis on hospital and medical	Finance, management, manufacturing, engineering, math-statistics, graphics
<b>Geography</b>	Serving the southeastern U.S. from Atlanta GA	Serving U.S., Canada, and Intl. from Cleveland OH, Rockville MD, and Amsterdam	Serving Nebraska and adjacent states from Omaha NB	Serving southern California from Newport Beach CA	Serving the U.S. and Canada from Minneapolis MN
<b>Facilities Computers</b>	Honeywell 6080 (256K 36-bit words) dual processors	15 Honeywell 6088s; 2 IBM 370/158s	CDC 6400 (64K 60-bit words)	Hewlett-Packard 2000	Honeywell 6080 (640K 36bit words)
<b>Terminals supported</b>	ASCII terminals to 120cps, correspondence at 15cps, IBM 2780 at 2400baud	ASCII terminals to 120cps, correspondence at 15cps, batch to 4800bps	tty-compatible to 30cps, CDC 200UT/731 to 2400baud, crts	tty 33/35/37 or equivalent	ASCII to 120cps, correspondence at 15cps, R. to 9600baud
<b>Languages/packages</b>	Basic, Fortran, Algol, assembly, Cobol, Jovial	Algol, APT, Basic, Cobol, Simscript, PL/1, Fortran, Gmap	Conversational: APL, Basic, Fortran, Cobol; Batch: Fortran, Cobol	Basic, Cobol, report generator	Algol, Basic, Cobol, Fortran, Jovial
<b>Data bases available</b>	—	Commodities, securities, currency exchange, SPSS	—	—	—
<b>Pricing Start-up</b>	\$100 charge for start-up	\$100 start-up charge	No charge for start-up	No charge for start-up	\$100 charge for start-up
<b>Monthly minimum</b>	No monthly minimum	\$100 U.S., \$50 Canada	\$100 monthly minimum	No monthly minimum	\$200 monthly minimum
<b>Terminal connect</b>	\$8 per hour	\$22 to \$4/hour, plus \$0.35 to \$0.15/1KB I/O	\$5.35 to \$10.70 per hour	\$5 to \$6 per hour \$740/month for private line	\$12 per hour
<b>Central processor</b>	\$0.03 per cpu unit	\$0.155 to \$0.13 per resource unit	\$0.07 per System Resource Unit	—	\$0.10 per cpu measure; \$0.10 per memory unit
<b>Disk storage</b>	\$1/month per 1280 characters	\$0.125 to \$0.03/storage unit	\$0.0065/day per 640 characters	\$0.20/month per 128 characters	\$0.095 to \$0.50/month per block
<b>Tape storage</b>	—	\$5/month	—	—	—
<b>Other</b>	—	—	—	—	—
<b>Comments</b>	Introduced in 1967	Introduced in 1965	Introduced in 1972	Introduced in 1969	Introduced in 1972

Vendor	IBM Canada	Informatics	Information Consultants	Information Systems Design (ISD)	Information Technology (Infotech)
<b>Services Type</b>	Conversational, remote batch, CRJE	Conversational, remote batch, inquiry response	Conversational, CRJE, remote batch	Remote batch, CRJE, conversational	Conversational, interactive, on-line
<b>Applications</b>	Scientific, engineering, commercial, civil engineering, marketing, acctg., graphics, securities	General, distribution industry services, data and microfilm retrieval, litigation support, etc.	General, emphasis on problem solving and use of turnkey applications	Structural and electrical engineering, text editing, dbms, graphics	Order processing, mass marketing and promotion, criminal and courts, electronic mail, dbms
<b>Geography</b>	Serving Canada from Montreal, Toronto, Calgary, and Vancouver	Serving the U.S., Canada, and Eupore from Fairfield NJ, Columbus OH, and Rockville MD	Serving the U.S. from Washington DC	Serving the U.S. from Santa Clara CA	Serving the U.S. from Cambridge MA
<b>Facilities Computers</b>	IBM 370/158 in each center, plus 370/145 and 370/168 in Toronto	3 IBM 370/158s, 2 370/168s	Two DECsystems KA 10 and 2050 (256K 36-bit words)	5 Univac 1108s (262K 36bit words each)	DEC PDP-11, Data General ECLIPSE, IBM Series 1
<b>Terminals supported</b>	ASCII to 30cps; IBM 2741; 3767; IBM 3720 to 4800baud	ASCII terminals to 30cps, IBM 2741/2780 HASP workstations	ASCII to 120 cps; EBCDIC and correspondence at 15 cps; IBM 2780	tty-compatible to 120cps; batch terminals to 9600baud	Most ASCII crts or printers
<b>Languages/packages</b>	Basic, Fortran, PL/1, Cobol, VS/Basic, VS/APL, assembler	Assembler, Basic, Cobol, Fortran, PL/1	APL, Basic, Cobol, Fortran, Lisp, Macro, Snobol	Fortran, APL, Basic, Cobol, Algol, assembly	MILS, Mumps Dialect
<b>Data bases available</b>	Financial, Troll (economic modeling), CANSIM	Electric power R&D, environmental, population, highway safety	—	—	—
<b>Pricing Start-up</b>	No charge for start-up	\$100 charge for start-up	No charge for start-up	\$100 charge for start-up	Pricing information unavailable
<b>Monthly minimum</b>	\$130 minimum for Call/CMS	No monthly minimum	No monthly minimum	\$50 monthly minimum	—
<b>Terminal connect</b>	\$19.30 to \$14.60/hour plus min \$4.75 for 300bps	\$6 to \$18/hour	\$6 to \$9 per hour	\$5 to \$15 per hour plus \$1 connection charge	—
<b>Central processor</b>	\$18.70/min interactive; \$9.35 batch; \$43 168	\$0.10 to \$0.05 per resource unit	\$0.0067 to \$0.001 per Computer Resource Unit	\$0.18 per resource unit, \$195/month for port	—
<b>Disk storage</b>	\$0.18 per cylinder/hour; \$0.76 per cylinder/day	\$18 to \$35 per cylinder; \$2/hour temporary storage	\$0.01/day per 640 characters	\$5/day per track for catalogued storage	—
<b>Tape storage</b>	—	—	\$6 per month	\$1 to \$2 for tape mounting	—
<b>Other</b>	—	Main memory: \$1.25/hour per 64KB above 320KB	—	25% and 50% discounts for off-hours	—
<b>Comments</b>	RJE introduced in 1967; interactive in 1969	Introduced in 1971	Introduced in 1973	Introduced in 1968	Introduced in 1976

Vendor	Inco Systems	Interactive Data	Interactive Sciences	ITEL (Utility Data Services)	Mark/OPS
<b>Services Type</b>	Conversational, remote batch	Conversational, inquiry, CRJE	Conversational, CRJE, deferred processing	Conversational, remote batch, CRJE	Conversational, remote batch, transaction entry, inquiry response
<b>Applications</b>	Math-statistics, business, report generators, simulation, dbms, graphics	General applications, emphasis on financial applications and data management	General, emphasis on problem solving and use of turnkey applications for management	Engineering, business, management, financial planning, math, dbms	Accounting, research, scientific, administrative, Q.C., financial, inventory
<b>Geography</b>	Serving the U.S. from Neptune NJ	Serving the U.S. and U.K. from Waltham MA	Serving the U.S. from Braintree MA	Serving the U.S. from Washington, Chicago, Kansas City KS, Lynchburg VA, and Metuchen NJ	Serving the New England and mid-Atlantic states from New York City and Boston MA
<b>Facilities Computers</b>	IBM 370/158, 370/168, 360/65	2 IBM 370/168s (8MB)	5 DECsystem-10s and 3 DECsystem-11s (256K 36bit words)	CDC 7600, Cyber 73, Univac 1108, Univac 1110, 2 IBM 370/158s	DEC PDP-10, PDP-11
<b>Terminals supported</b>	ASCII to 120cps; IBM 2741; IBM 2770, 2780, 3770, 3780	ASCII to 1200baud; tty; IBM 2741, 2780, 3780 to 4800baud	Terminals to 300baud; ASCII; BCD; Mohawk 2400; IBM 2780	ASCII to 1200baud; bisynch to 9600baud; CDC UT200, Univac 1004	ASCII to 30cps, IBM 2741-compatible, 2400baud batch
<b>Languages/packages</b>	APL, assembler, Basic, Cobol, Execmod, Fortran, PL/1, RPG	Assembly, Basic, Cobol, Fortran, PL/1, Xsim, Xdms	AID, assembly, Basic, Cobol, Fortran, Lisp	Algol, Basic, Cobol, PL/1, Fortran, APL	Basic, Fortran IV, Cobol, Macro, Trac, Magic-II
<b>Data bases available</b>	—	financial data, including latest stock prices, and economic data	—	Canadian and U.S. census data	—
<b>Pricing Start-up</b>	\$100 charge for start-up	No charge for start-up	No charge for start-up	No charge for start-up	No charge for start-up
<b>Monthly minimum</b>	No monthly minimum	No monthly minimum	No monthly minimum	\$20 minimum (for Univac)	No monthly minimum
<b>Terminal connect</b>	\$8/hour for VM/CMS; \$100/month for port	\$13 per hour	\$6 to \$9 per hour	\$20 to \$7/hour; private line \$500/month	\$2 to \$10 per hour
<b>Central processor</b>	\$0.875 to \$1.75 per core usage unit	\$7 per hour plus \$0.13 per unit	\$0.0067 to \$0.01 per Computer Resource Unit	\$0.07 to \$0.02 per system resource unit	\$0.025 to \$0.70 per second
<b>Disk storage</b>	\$10/month per cylinder on-line; \$0.60/hour temp	\$17.50 to \$50/month per cylinder on-line	\$0.01/day per 640 characters	\$0.0013/hour per track; \$30 to \$15 per cylinder	\$0.25 to \$1.00/month per 1KB
<b>Tape storage</b>	\$6/hour	\$10 per hour	\$1/month rental; \$5/month handling	\$0.20 to \$0.05 per day; 3420 tape: \$15/hour	\$5 per month
<b>Other</b>	\$25/hour per dedicated disk drive	Mountable disk: \$80/hour	—	—	—
<b>Comments</b>	Introduced in 1971	Introduced in 1969	Introduced in 1969	Introduced in 1971	Introduced in 1967

Vendor	McDonnell Douglas (CYBER Service)	McDonnell Douglas Automation (370 Services)	Meditech	Metridata Computing	Midwest Advanced Computer Services
<b>Services Type</b>	Conversational, CRJE, remote batch	Conversational, remote batch, transaction entry, inquiry response	Conversational, interactive on-line	Conversational, RJE	Transaction update, inquiry response
<b>Applications</b>	Business and finance, engineering, math-statistics, operations research, data base management	Engineering, business, finance, math-statistics, simulation, plotting, NC, transportation	Medical applications	Banking, brokerage, engineering, financial analysis, math-statistics, accounting	On-line financial accounting
<b>Geography</b>	Serving the U.S. and Canada from St. Louis MO and Huntington Beach CA	Serving the U.S. and Canada from St. Louis MO, Long Beach CA, and Denver CO	Serving the U.S., Canada, U.K., Australia and Holland from Boston and Cambridge MA	Serving Kentucky, Indiana and southern Ohio from Louisville KY and Chicago IL	Serving Illinois, Michigan, Indiana, Ohio, Pennsylvania and New York from Warren MI
<b>Facilities Computers</b>	Two CYBER 175s (256K words plus ECS), CYBER 74 (128K words plus ECS)	St. Louis: 8 IBM 168s; Long Beach: 5 IBM 168s; Denver: IBM 370/148	DEC PDP-15s, 3 PDP-11/70s; DG Eclipses; IBM Series 1	2 Honeywell 430s, 2 Honeywell 440s, IBM 360/65	Burroughs B3500, B4800 and B500; Varian V-75
<b>Terminals supported</b>	tty-compatible to 120cps; IBM 14.8cps; UT200, Data 100, COPE, HASP	tty to 30cps; IBM 2741 15cps; IBM 2260, 3270, 3767, 2780, HASP, others	Most ASCII terminals and printers	tty-compatible to 30cps; RJE to 9600baud	All Burroughs; FDSI; NCR; Incoterm; teller terminals
<b>Languages/packages</b>	Basic, APL, Fortran, Cobol, Simgscript	Assembly, Cobol, Fortran, PL/1, Watfiv, Watbol, Formac	Miis, Mumps dialect	Conversational: Basic, Fortran; Batch: Cobol, Fortran	Advanced assembler, Cobol
<b>Data bases available</b>	—	—	—	—	Financial
<b>Pricing Start-up</b>	No charge for start-up	No charge for start-up	No charge for start-up	No charge for start-up	No charge for start-up
<b>Monthly minimum</b>	\$25 per invoice minimum	\$25 per invoice minimum	\$800 monthly minimum	No monthly minimum	\$600 monthly minimum
<b>Terminal connect</b>	\$5 to \$24 per hour	\$5 to \$27.50 per hour	—	\$8 to \$15 per hour	—
<b>Central processor</b>	\$0.10 to \$0.46 per resource unit	\$3.35 to \$8.50 per Virtual Resource Unit	—	\$0.04 per unit of processor time and disk accesses	—
<b>Disk storage</b>	\$0.045/week per 64 words	\$12.50/week per MB; Archival: \$5/week per MB	from \$200/month for 250 KB	\$0.75 to \$1.75 per 1KB	—
<b>Tape storage</b>	\$3.50/week per 6,848 words	\$0.75/week per tape	—	\$5/month per reel	—
<b>Other</b>	—	—	fixed fee: from \$500/access to \$400/access	—	\$0.10 to \$0.35/month per account
<b>Comments</b>	Introduced in 1968	Introduced in 1967	Introduced in 1969	Introduced in 1968	Introduced in 1967



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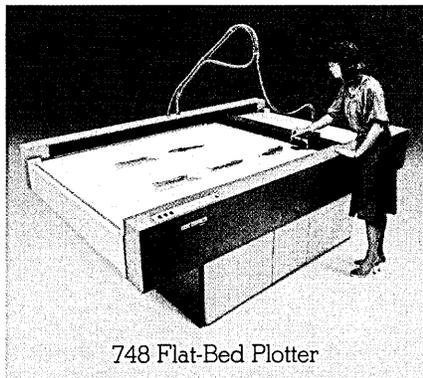
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formance, there's our 960 belt-bed plotter. It delivers big 33" x 60" vertical plotting for any "E" size plot and 30 inches-per-second speed with 4g acceleration.

And nobody handles computer graphics on a grander scale than CalComp. And that's where a top-of-the-line family of flatbed plotters — the 7000 System — literally draws away from the competition. In dozens of applications and at hundreds of sites throughout the world.

**We do some of our best work on film.**

Pen and ink plotters aren't

all we make at CalComp.

In fact, for over a dozen years, we've also been designing, building, selling and servicing exceptional COM (Computer Output Microfilm) systems.

This year we're introducing two new high-speed, high-volume COM systems, the 1581 and the 1681. The former expressly for graphics-only environments. The latter for both graphics and alphanumeric applications.

At CalComp, COM systems are an important part of the big picture.

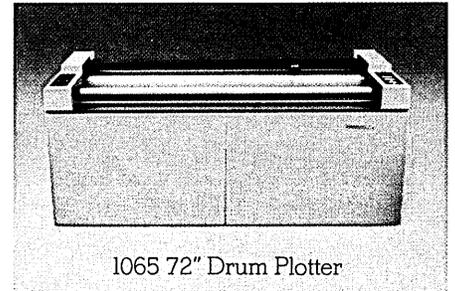
**Nobody has more experience to draw upon.**

CalComp pioneered computer graphics way back in 1960.

That gave us a significant head-start. Now, almost twenty years later, CalComp is still the leader and prime innovator in the field. With more experience and models to choose from, up and down the line,

than any other single source.

So contact CalComp today. And get the best possible answer to your specific graphics need.



1065 72" Drum Plotter

## Sales Offices:

Tempe, AZ: (602) 894-9468. Orange, CA: (714) 639-3690, (213) 430-2104.

Santa Clara, CA: (408) 249-0936.

Englewood, CO: (303) 770-1950.

Norcross, GA: (404) 448-4522.

Rosemont, IL: (312) 696-1770. Shawnee Mission, KS: (913) 362-0707.

Waltham, MA: (617) 890-0834. Rockville, MD: (301) 770-1464.

Federal Accounts Manager, Rockville, MD: (301) 770-4850. Southfield, MI: (313) 569-3123.

Bloomington, MN: (612) 854-3448.

Union, NJ: (201) 686-7100.

Cleveland, OH: (216) 362-7280.

Dayton, OH: (513) 276-5247.

Tulsa, OK: (918) 663-7392.

Beaverton, OR: (503) 646-1186.

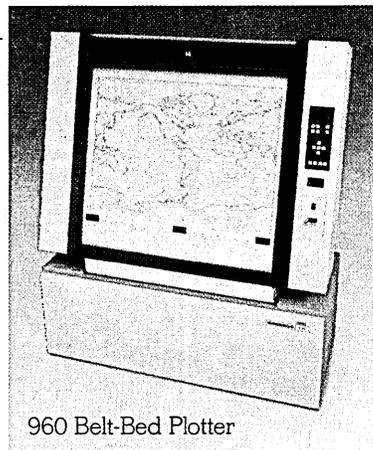
Bala Cynwyd, PA: (215) 667-2895.

Pittsburgh, PA: (412) 922-3430.

Dallas, TX: (214) 661-2326.

Houston, TX: (713) 776-3276.

Bellevue, WA: (206) 747-9321.



960 Belt-Bed Plotter

Houston, TX: (713) 776-3276.  
Bellevue, WA: (206) 747-9321.

# CALCOMP

California Computer Products, Inc.  
2411 West La Palma, Anaheim  
CA 92801, TEL: (714) 821-2011  
TWX: 910-591-1154.

Vendor	Multiple Access Computer Group	National Computer Network of Chicago	National CSS	Ohio Valley Data Control	On-Line Systems
<b>Services Type</b>	Conversational, CRJE, remote batch	Conversational	Conversational, remote batch, transaction entry, inquiry response	Batch, remote batch, conversational, inquiry response	Conversational, remote batch
<b>Applications</b>	Financial, statistical, engineering, investment, amortization schedules	Drafting, engineering, marketing, finance, math, education, engineering, business	Information management, engineering, financial planning and forecasting, statistical, simulation	Banking, accounting, cash dispensing, general commercial processing	Data base management, word processing, financial, statistical, materials management
<b>Geography</b>	Serving U.S. and Canada from Don Mills ON and Los Angeles CA	Serving the U.S., Canada, Europe, Puerto Rico and Mexico from Chicago IL	Serving the U.S., Canada, U.K. and Europe from Stamford CT, Los Angeles, Sunnyvale CA, and NYC	Serving West Virginia, Ohio, and Kentucky from Wheeling, Charleston, and Beckley WV and Belpre OH	Serving the U.S., Canada, U.K. and Europe from Pittsburgh and London
<b>Facilities Computers</b>	CYBER 73, Cyber 170; CDC 6600; IBM 370/168, IBM 360/65	Honeywell H1648, H1648A (32K 16-bit words each); DECsystem-20	IBM 370/158, 2 IBM 370/168s, Amdahl 470V/6 (up to 4 MB each)	Burroughs B3700, B4700, DEC PDP-11/10, PDP-11/34	DECsystem-10 (256K-768K)
<b>Terminals supported</b>	Terminals to 9600baud	ASCII to 1200baud; EBCDIC or correspondence at 15cps	Terminals to 120cps	Burroughs, NCR, HIS, DEC, others	Terminals to 9600baud, also plotters and crt's
<b>Languages/packages</b>	Basic, Fortran, Cobol, Compass, Algol, PL/1, assembler	Assembly, Basic, Cobol, Fortran, Solve, Tech	APL, assembly, Basic, Cobol, Fortran, PL/1, Watfiv	Cobol, assembler on Burroughs; Dibol on DEC	APL, Basic, Cobol, Fortran
<b>Data bases available</b>	—	Stock option price; stocks and bonds/commodities and futures	Telprice/770, CENSAC, Merrill Lynch Economics, ONSITE	Hospitals and savings associations; financial	Securities, demographics
<b>Pricing</b>					
<b>Start-up</b>	No charge for start-up	No charge for start-up	No charge for start-up	No charge for start-up	No charge for start-up
<b>Monthly minimum</b>	No monthly minimum	No monthly minimum	\$100 plus \$2 per ID	\$250 monthly minimum	\$5 per user number
<b>Terminal connect</b>	\$4.50 to \$22 per hour \$0.25 to \$0.43 per cpu unit, plus memory utilization and I/O times	\$5 to \$10 per hour; Port: \$500/month \$0.60 to \$1 per minute	\$12 to \$20 per hour (conversational)	\$12.50/hour	\$10 per hour
<b>Central processor</b>			\$0.08 to \$0.60 per Application Resource Unit	See below	\$0.05 per resource unit
<b>Disk storage</b>	\$9.30/month per block	\$1 per 1KB/month average	\$5 to \$22 per month; mountable: \$60/month	\$20 per 100K	\$0.05/day per 3200 characters
<b>Tape storage</b>	\$0.32/minute plus \$2.15 for mounting	\$8 per retrieval DEC 20: \$0.025 per 2560 characters/month	\$7/month per tape	—	—
<b>Other</b>				Fees from \$0.09 to \$0.30 per account per month	
<b>Comments</b>	Introduced in 1969	Introduced in 1969	Introduced in 1968	Introduced in 1965	Introduced in 1967

Vendor	Polycorn Systems	PRC Computer Center	Programs and Analysis	Proprietary Computer Systems	Pryor
<b>Services Type</b>	Conversational, CRJE	Remote batch, conversational, TSO, inquiry response	Conversational, remote batch	Conversational, remote batch, CRJE	Conversational, remote batch transaction entry, inquiry response
<b>Applications</b>	Commercial, financial modeling, job management, accounting, statistical, dbms	Business, engineering, math-statistics, plotting, HMO services, medical-record services	Accounting, inventory, portfolio management, trust accounting, graphics	Text processing, simulation, analytical, data management	General; also turnkey accounting/inventory control, sales analysis system
<b>Geography</b>	Serving the northeastern U.S. and Canada from Toronto ON	Serving Virginia, Washington DC, and southern California from McLean VA and Westwood CA	Serving the eastern and midwestern U.S. from MA, NY, PA, SC, AL, and TX	Serving California, Colorado, Arizona and the Midwest from Van Nuys CA	Serving Chicago
<b>Facilities Computers</b>	Honeywell 6060 (256K 36bit words)	IBM 370/158 (3MB); Itel AS/5 (3MB)	Honeywell 6060 (256K 36bit words)	IBM 360/65 (2MB)	DECsystem 20; Honeywell G440
<b>Terminals supported</b>	tty-compatible to 120cps; TWX 10cps; IBM 2741/2780; Centronix DCT 500	ASCII and EBCDIC terminals including tty, and IBM 2741	ASCII terminals to 9600baud	Correspondence at 15cps; ASCII at 30cps; IBM 2780, 3780, 3270	ASCII terminals to 120cps
<b>Languages/packages</b>	Basic, Fortran, Cobol, Dynamo, APL, Algol, Lisp, Snobol	Assembly, Basic, Cobol, Dynamo, Fortran, PL/1, RPG, Algol	Honeywell 6060, Fortran, Basic, Cobol 74, Algol, Jovial, Gmap	Cobol, Fortran, PL/1, APL	Basic, Fortran
<b>Data bases available</b>	—	—	—	—	—
<b>Pricing</b>					
<b>Start-up</b>	\$100 charge for start-up	No charge for start-up	No charge for start-up	\$250 charge for start-up	No charge for start-up
<b>Monthly minimum</b>	\$100 monthly minimum	No monthly minimum	No monthly minimum	\$300 monthly minimum	No monthly minimum
<b>Terminal connect</b>	\$6 to \$12 per hour	\$8 per hour (low-speed)	\$11 to \$33 per hour	\$2.85 to \$21 per hour	\$3 to \$6 per hour
<b>Central processor</b>	\$0.175 to \$0.35 per unit	\$0.15 per cpu second; \$0.0019/sec per 2K; plus I/O	\$0.0033 to \$0.22/cpu sec; \$0.0017 to \$0.0033/K/sec	\$0.01 per processing unit	\$0.08 to \$0.16 per cpu unit
<b>Disk storage</b>	\$0.10 to \$0.40/month per 1KB	\$0.008 to \$0.025/day per track	\$27/month per block	\$0.25/month per 1550 bytes	\$0.50/month per 1KB
<b>Tape storage</b>	—	—	—	\$7.50/month	—
<b>Other</b>					
<b>Comments</b>	Introduced in 1968	Introduced in 1968	Introduced in 1969	Introduced in 1968	Introduced in 1969

Vendor	Rapidata	Remote Computing	Scientific Time Sharing (APL* PLUS, VM Service)	Service Bureau (Call/370 & Call/Plus)	Shared Medical Systems
<b>Services Type</b>	Conversational, CRJE, remote batch	Conversational, CRJE, inquiry, remote batch, transaction processing	Conversational, inquiry response	Conversational, remote batch, CRJE	Transaction entry, inquiry response
<b>Applications</b>	General, specializing in financial services	Data management, forecasting and financial analysis, portfolio management, securities, etc.	Specializing in interactive financial analysis, manufacturing systems, banking analysis	Banking, financial, trust acctg., math, engineering, graphics, dbms, MRP	On-line hospital management systems
<b>Geography</b>	Serving the U.S. and London from Fairfield NJ	Serving the U.S. (except Alaska) from Palo Alto CA and Roslyn NY	Serving the U.S., Canada, and Europe from Bethesda MD	Serving the U.S., Canada, Europe, Japan from Cleveland OH and Campbell CA	Serving the U.S. from King of Prussia PA
<b>Facilities</b>					
<b>Computers</b>	DECsystem 1070 and 1080s, PDP-11, HIS 437s, DECsystem 2020	3 Burroughs B5700s, Burroughs B7700	Amdahl 470V/6 (6MB); IBM 370/148 (2MB)	10 IBM 370/158s, 53 IBM System 7 remote processors	Two IBM 370/168s
<b>Terminals supported</b>	Conversational, ASCII to 120cps; EBCDIC, IBM 2780 to 4800baud	ASCII to 120cps, correspondence/EBCDIC to 120cps, IBM 2780, etc.	EBCDIC, correspondence, ASCII to 120cps, IBM 2780, others	ASCII to 120cps, IBM 2741/2780 to 4800baud	IBM 3770, Four/Phase, DEC 11/34, 11/70
<b>Languages/packages</b>	Assembly, Basic, Fortran, Cobol, report generator	Algol, Basic, Cobol, Fortran, PL/1	APL* Plus, Fortran, Cobol, Assembler, PL/1, VS/APL	Basic, Fortran, Cobol, PL/1, assembler, VS/Basic	—
<b>Data bases available</b>	Stock market, economic, International monetary, debt market, etc.	Secondary mortgage market, securities, options, commodities	Citibank economic indicators, VH coordinates (inc. commercial costing)	FDIC, FSLIC, Site II, Dricap, international securities, stocks, etc.	Unifile*, Action*, Command*
<b>Pricing</b>					
<b>Start-up</b>	No charge for start-up	No charge for start-up	No charge for start-up	No charge for start-up	\$6,000 to \$10,000
<b>Monthly minimum</b>	\$100 monthly on contract	\$100 monthly minimum	\$100 monthly minimum	\$100 minimum monthly	No monthly minimum
<b>Terminal connect</b>	\$5 to \$30 per hour	\$12 to \$20 per hour	\$12 to \$24 per hour	\$11 to \$48/hour	—
<b>Central processor</b>	\$0.07 to \$0.08 per cpu unit and I/O time	\$0.30 per unit of Remote Computing Utilization	\$0.75 per Computer Resource Unit	\$0.06 to \$0.18 per processing unit	—
<b>Disk storage</b>	\$0.20 to \$0.60 per 1KB; Data base: \$0.10 per 1KB	\$3.50 to \$9/day per 1KB	\$10/day per 1MB	\$0.05 to \$0.75 per track per day	—
<b>Tape storage</b>	—	—	—	—	—
<b>Other</b>	—	—	—	\$0.18 per cpu unit for program surcharges	\$0.75 to \$1.25/day per patient
<b>Comments</b>	Introduced in 1968	Introduced in 1968	Introduced in 1969	Introduced in 1968	Introduced in 1969

Vendor	I.P. Sharp Associates (Sharp APL)	Systems Dimensions Ltd. (SDL)	Technical Advisors (Tech-Mac*)	Tel-a-Data	Telstat Systems
<b>Services Type</b>	Conversational, inquiry response	Remote batch, inquiry response, transaction	Conversational	Conversational, transaction processing, inquiry response	Conversational, remote batch
<b>Applications</b>	Analytical, financial, and data management applications	Civil engineering, math, finance, text processing, dbms, education, electrical engineering	Surveying and subdivision computations, drafting	Inventory control, sales-marketing, payroll, management	Emphasis on financial applications
<b>Geography</b>	Serving Canada, the U.S., Europe and Australia from Toronto ON	From Calgary, Edmonton, Montreal, Ottawa, Quebec, Toronto, Vancouver, NYC, Washington, Boston	Serving the U.S. from Wayne MI and Phoenix AZ	Serving Florida from Miami FL	Serving the U.S. from New York City
<b>Facilities</b>					
<b>Computers</b>	Amdahl V6-II (2MB), IBM 360/75 (1.5 MB)	IBM 360/85 (2MB); IBM 370/168 (3MB)	Varian Data 620 I (12K 18bit words)	Burroughs 2800	Xerox Sigma 9
<b>Terminals supported</b>	IBM 2741-compatible, ASCII to 120cps	IBM 2741, tty, BSC-compatible	tty 33/35	tty 33/35, TC 500, Incoterm 10/20, Centronics printer	Conversational to 30cps; remote batch to 4800baud
<b>Languages/packages</b>	APL	Assembler, Cobol, Fortran, PL/1, RPG, Mark IV	—	Assembler, Cobol	Basic, Cobol, Fortran, APL
<b>Data bases available</b>	Airlines, socio-economic, banking, securities, actuarial	Telstat, CASIM	—	Financial	Securities
<b>Pricing</b>					
<b>Start-up</b>	No charge for start-up	No charge for start-up	\$50 charge for start-up	\$500 charge for start-up	No charge for start-up
<b>Monthly minimum</b>	No monthly minimum	\$100 monthly minimum	No monthly minimum	\$500 monthly minimum	No monthly minimum
<b>Terminal connect</b>	\$1/hour plus \$0.60 per 1KB I/O	\$6 to \$12 per hour	\$16 to \$23 per hour	\$35 per hour (off-hour)	\$12 per hour
<b>Central processor</b>	\$0.35 to \$0.20/cpu unit	\$0.36 per task second; \$0.049 per channel sec	—	—	\$0.54/minute per page
<b>Disk storage</b>	\$0.55/day per 256KB workspace or 10KB file	3330: \$1.65/day per MB; 2314: \$20/hour per drive	\$0.50 per page	—	\$0.02/day per 2KB
<b>Tape storage</b>	—	2420: \$25/step hour; 2401: \$15/step hour	—	—	—
<b>Other</b>	All prices quoted in Canadian currency	—	Terminal connection rates do not apply in MI	Cpu tape, and disc usage included	Access to data base by subscription only
<b>Comments</b>	Introduced in 1969	Introduced in 1969	Introduced in 1967	Introduced in 1966	Introduced in 1971

# Northern Telecom

## More options make us more

Now one company has all the Sycon and Data 100 products to work with. And that broader choice of solutions means a better match for your particular needs. A more comprehensive solution than either company could previously offer.

**Today we have more field engineers, in more places, than any comparable company.**

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we won't settle for less. Right now, we have more than 60,000 hardworking systems, all over the world. We work for 95 of the top 100 firms in Fortune's 500. And we'd like a chance to work for you.

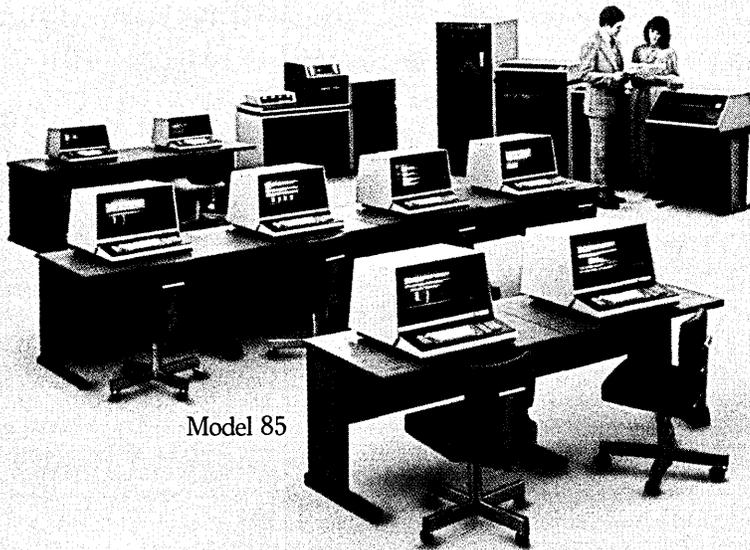
Take a look at the four ways NTSC can answer your data processing needs. For more information about any of them, write Product Marketing, Northern Telecom Systems Corporation, Box 1222, Minneapolis, MN 55440.

### Distributed Processing: Why pay for more than you need?

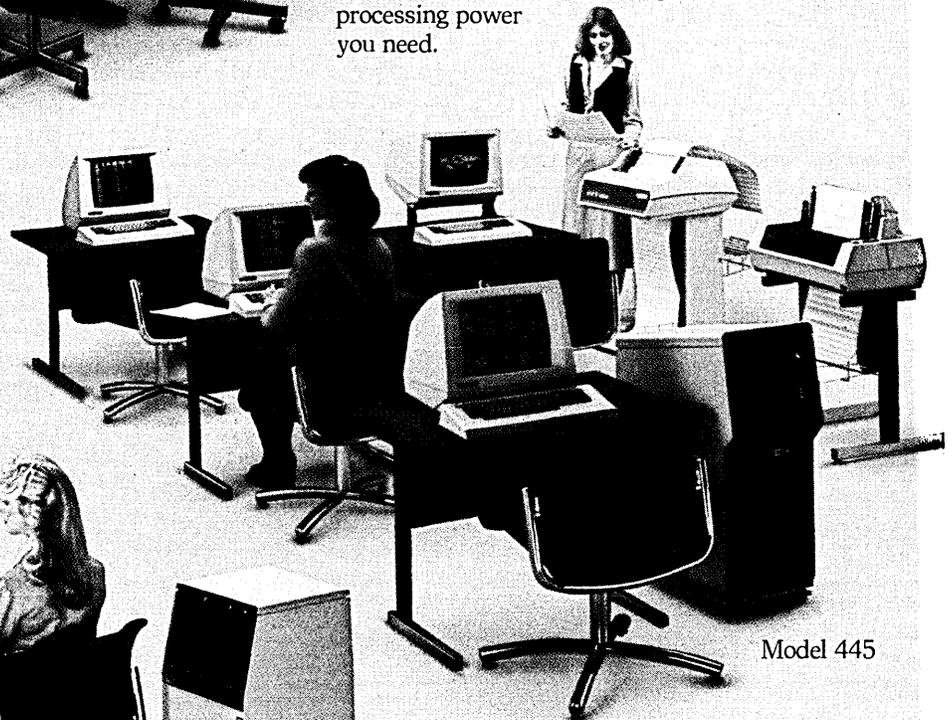
For systems with a lot of throughput, and up to 16 video display work stations, the Model 85 is hard to beat. It has large disk storage capacity and can work with our Remote Job Entry or KEYBATCH® systems.

Our Model 445 is particularly cost-effective for up to eight work stations. Its Omnitask™ operating system can run up to 16 jobs concurrently—in multiple languages.

And our 405 is a most economical way to introduce distributed processing where it's never been before. In most entry level applications, it's all the processing power you need.



Model 85



Model 445

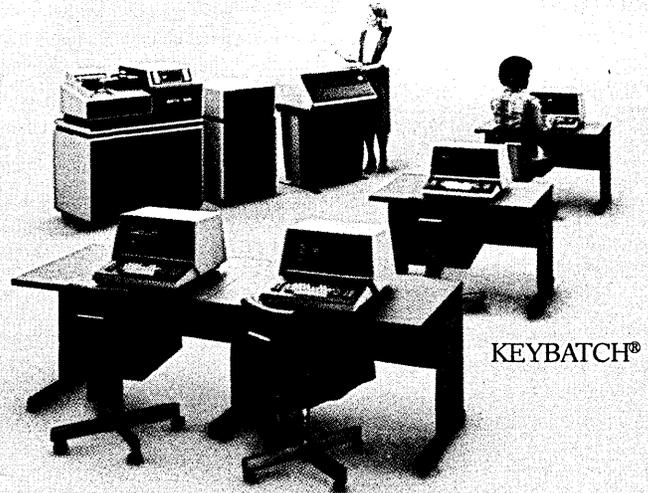


Model 405

# Systems Corporation: Most-effective than ever before.

## Data Entry: Combine key-to-disk with Remote Job Entry.

Use our Keybatch system for key-to-disk, and you won't need additional equipment to communicate with the mainframe. So one system can replace two. Keybatch gives you this twin capability without a big sacrifice in speed. And Keybatch is compatible with all major mainframes.



KEYBATCH®

## Remote Job Entry: From 2,000 to 56,000 bits per second.

With that kind of flexibility, you never have to buy more capacity than you need. There's a full line of peripherals, too. And no matter where your remote locations are, we have service people nearby.



Model 70 Series

## On Line: Here's a low-cost alternative to the 3270.

Lease or purchase, you'll find significant savings in the 290 system. Sophisticated self-diagnostics help make sure it's up and running when you need it. And best of all, it's available right now.



Model 290

Sycor and Data 100 have joined to become  
**Northern Telecom Systems Corporation**



Vendor	Time Share	Time-Sharing Resources	Time Sharing Systems	Tracor	TSC Computer
<b>Services Type</b>	Conversational	Conversational, remote batch, inquiry response	Conversational, remote batch	Remote batch	Conversational
<b>Applications</b>	Time accounting, business, marketing-sales, engineering, education, financial, etc.	Accounting, banking, brokerage, construction, education, engineering, inventory control, etc.	Scientific, accounting, work-in-process, order entry, inventory for insurance under GAAP	General applications	Time accounting, forecasting budget, engineering, financial inventory control, etc.
<b>Geography</b>	Serving the U.S. and Canada from Hanover NH	Serving the U.S. from Great Neck NY	Serving Wisconsin and Illinois from Milwaukee WI	Serving Texas from Austin	Serving Quebec and Ontario from Scarborough ON and Montreal
<b>Facilities Computers</b>	HP Series 2000 (21MX) (32K 16bit words)	Dual IBM 360/75s (1MB core, 1MB add-on core)	Burroughs B6700	Univac 1108 (64K 36bit words)	4 HP 2000Fs (48K 16bit words)
<b>Terminals supported</b>	ASCII to 120cps inc. card readers, plotters, optical scanners, others	Terminals to 120cps; plotters; crt's; IBM 2780; others	All terminals to 30cps	Univac 9200, 9300, 1004; COPE; to 4800baud	ASCII to 30cps; tty-compatible crt's to 240cps
<b>Languages/packages</b>	Basic	Conversational: APL, Batch: Assembly, Cobol, Fortran, PL/1, RPG	Algol, Basic, Cobol, Fortran	Cobol, Fortran	Basic
<b>Data bases available</b>	Guidance Information System (educational data)	NBER, securities, WPI, BCD	—	—	Guidance Information System (educational data)
<b>Pricing Start-up</b>	\$0 to \$50 start-up	No charge for start-up	\$100 charge for start-up	No charge for start-up	No charge for start-up
<b>Monthly minimum</b>	\$60 to \$640 monthly min.	No monthly minimum	\$100 monthly minimum	No monthly minimum	\$50 monthly minimum
<b>Terminal connect</b>	\$0 to \$9.90 per hour	\$13 to \$21 per hour	\$11 to \$18 per hour	No charge for connection	\$6.75 to \$26 per hour; Port: \$575 to \$2,000/month
<b>Central processor</b>	—	\$.08 per Central Resource Unit, \$120/hour batch	\$0.17 per Central Resource Unit	\$860/hour prime time \$720/hour off-hours	—
<b>Disk storage</b>	\$1/month per 1240 char. based on average usage	\$10/day per 1MB	\$0.65/month per 1KB	\$0.20 per 14K block/day	\$0.5625 to \$0.75/month per 1KB
<b>Tape storage</b>	—	—	—	—	—
<b>Other</b>	—	—	—	Service charge: \$1/run	—
<b>Comments</b>	Introduced in 1968	Introduced in 1970	Introduced in 1968	Introduced in 1968	Introduced in 1969

Vendor	Tymshare (Tymcom-370)	Tymshare (Tymcom-IX)	Tymshare (Tymcom-X)	Uni-Coll	United Computing Systems (Apex/SL)
<b>Services Type</b>	Conversational, CRJE, remote batch	Conversational	Conversational, CRJE, remote batch	Conversational, CRJE, remote batch, inquiry response, transaction	Conversational, remote batch CRJE, transaction
<b>Applications</b>	Information analysis, data base management, biomedical	General applications directed toward nonprogrammers	General applications directed toward nonprogrammers; dbms, information analysis	Emphasis on engineering, scientific, commercial and administrative	Engineering, text editing, business applications, financial forecasting
<b>Geography</b>	Serving the U.S., Canada and Western Europe from Palo Alto CA and Valley Forge PA	Serving the U.S., Canada, Europe from Cupertino CA, Valley Forge PA, Houston TX, and Paris	Serving U.S., Canada, Europe, Japan from Cupertino CA, Houston TX and Valley Forge PA	Serving the mid-Atlantic states from Philadelphia PA	Serving the U.S., Canada, London from Kansas City MO, Quincy and Waltham MA, and London
<b>Facilities Computers</b>	5 IBM 370/158s	28 Xerox 940s (64K 24bit words each)	12 DECsystem-10s (512K 36bit words each)	IBM 370/168 MP	CDC 6500, 3 CDC 6600s, CYBER 174, 2 CYBER 175s, IBM 360/65, 7 CDC 3000s
<b>Terminals supported</b>	ASCII to 120cps including crt's, plotters; also IBM 2741 to 4800bps	ASCII to 120cps inc. crt's and plotters; IBM 2741 to 4800bps	ASCII to 120cps inc. crt's and plotters; IBM 2741 to 4800bps	All interactive and RJE terminals	tty-compatible ASCII to 120cps; EBCDIC; IBM 5100
<b>Languages/packages</b>	Cobol, Fortran, Basic, PL/1, Assembler, Watfiv, System 2000, GPSS	Assembly, Basic, Fortran, report generator	Assembly, Basic, Cobol, Snobol, Fortran, Algol	APLSV, BAL, Cobol, Fortran, PL/1, TSO	Algol, APL, Basic, Super Basic, Cobol, Fortran, Super Fortran, Prose
<b>Data bases available</b>	—	CEDA	Stock market, census, economic and financial data	Wharton econometrics	—
<b>Pricing Start-up</b>	No charge for start-up	No charge for start-up	No charge for start-up	No charge for start-up	\$100 charge for start-up
<b>Monthly minimum</b>	No monthly minimum	\$390 monthly minimum	\$390 monthly minimum	No monthly minimum	\$100 monthly minimum
<b>Terminal connect</b>	\$6 to \$18 per hour	\$13 per hour	\$6 to \$18 per hour	\$6 to \$10 per hour	\$9.75 to \$30 per hour
<b>Central processor</b>	\$0.12 to \$0.29 per processing unit	\$0.065 per second	\$0.06 to \$0.14 per processing unit	\$0.28 to \$0.80/second	\$0.17 to \$0.56 per service unit
<b>Disk storage</b>	\$18 to \$30/month per cyl., or \$1/hour.	\$0.05 to \$1/month per 1KB	\$0.10 to \$0.45/month per 1KB	\$0.024/day per track; Off-line: \$35/month	\$0.50/month per 1280 characters
<b>Tape storage</b>	—	—	—	\$0.25/week	—
<b>Other</b>	Dedicated 3330: \$120/hour \$20 per hour	—	—	—	Delayed access files: \$50/month for 200KB
<b>Comments</b>	Introduced in 1973	Introduced in 1966	Introduced in 1972	Introduced in 1972	Introduced in 1969

Vendor	University Computing (CDC 6000 Service)	University Computing (Univac 1108 Service)	USS Engineers & Consultants (Intercom)	Wang Data Center	Xerox Computer Services
Services	Remote batch	CRJE, remote batch	Conversational, remote batch	Conversational, remote batch, RJE	Conversational, transaction entry, inquiry response
Applications	Scientific and engineering	Scientific and engineering	Management, mfg., math-statistics, engr., accounting, financial, sales-marketing	Payroll, personnel, pension, education, etc.	General applications, also on-line interactive business systems
Geography	Serving the U.S. from Dallas TX	Serving the U.S. and Western Europe from Dallas TX, London, and Birmingham U.K.	Serving the U.S. from Pittsburgh PA	Serving the northeastern U.S. from Burlington VT, Lowell and Cambridge MA	Serving U.S. from Los Angeles, San Francisco, San Diego, Dallas, Houston, Phil., NYC, and Hackensack NJ
Facilities	CDC 6600	9 Univac 1108s (128K 36bit words each); 1 Univac 1107	CDC 6500 (128K 60bit words), Honeywell H 6080 (256K 36bit words)	IBM 370/158-3 (OS/V5)	Xerox Sigma 7, 9, 3, 530
Terminals supported	COPE mode, UT200 simulation	TTY 33/35/37, IBM 2741, CalComp or H.P. plotters, Univac 1004, etc.	TTY (110baud), GE TermiNet (300baud), CDC 200 UT (to 4800baud)	TTY 33/35, IBM 2741, 3741; 2780, 3780	Xerox 1340, 1350; TTY 33/35/37; IBM 2741 and compatible terminals
Languages/packages	Fortran, Cobol, assembly	Conversational: CASEMP, EDIT, Batch: Assembly, Cobol, Fortran, simulation	Algol, Basic Cobol, Fortran	Algol, Cobol, Fortran, PL/1, Snobol, RPG, assembler, many others	Fortran IV, ANS Cobol, APL, Basic (general)
Database available	—	—	—	—	—
Pricing	\$100 start-up	\$100 start-up	No charge for start-up	No charge for start-up	No charge for start-up
Monthly minimum	\$50 minimum invoice	\$50 minimum invoice	No monthly minimum	No monthly minimum	\$250 monthly minimum
Terminal connect	\$20/hour; dedicated port \$300/month	\$20/hour; dedicated port \$300/month	\$9 to \$27 per hour	\$4 to \$8 per hour	\$8 per hour
Central processor	\$0.55 to \$0.16 per system second	\$0.55 TO \$0.34/second	Batch: \$400 to \$630/hour; Convers: \$0.40 to \$1/second	Based on cpu utilization plus record activity	\$8 per minute
Disk storage	\$0.012 per data unit per day	\$0.20 per block/day	\$1/month per 10KB	\$0.35/day per track; Off-line: \$25/month	\$1.60 per 1KB I/O
Tape storage	\$0.20 to \$0.10 per reel/day	\$0.20 to \$0.10 per reel/day	—	Off-line: \$0.10/day	\$0.01/day per 2KB
Other	Vol. discount over \$5,000/month	Vol. discounts over \$5,000/month	—	—	Off-line: \$25/month
Comments	Introduced in 1975	Introduced in 1967	Introduced in 1970	Introduced in 1968	Introduced in 1970

# REMOTE SERVICES VENDOR INDEX

For additional information regarding the services listed in this survey, please contact the vendors directly, either at the addresses shown below or by circling the appropriate number on the reader service card bound into this issue.

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Morristown, NJ 07960  
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**Bowne Information Systems**  
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**Call Computer**  
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**CHI**  
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Cleveland, OH 44106  
(216) 229-6400  
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**Community Computer**  
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Philadelphia, PA 19144  
(215) 849-1200  
CIRCLE 311 ON READER CARD

**Compu-Dial**  
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Cherry Hill, NJ 08034  
(609) 424-4700  
CIRCLE 312 ON READER CARD

**Comuserve Network**  
5000 Arlington Ctr. Blvd.  
Columbus, OH 43220  
(614) 457-8600  
CIRCLE 313 ON READER CARD

**Computel System**  
1200 St. Laurent Blvd.  
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K1K3B8  
(613) 746-4353  
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**Computer Co. (The)**  
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Richmond, VA 23230  
(804) 358-2171  
CIRCLE 315 ON READER CARD

**Computer Innovations**  
Suite 1616  
55 E Jackson Blvd.  
Chicago, IL 60604  
(312) 663-5930  
CIRCLE 316 ON READER CARD

**Computer Network**  
5185 MacArthur Blvd.  
Washington, DC 20016  
(202) 537-2500  
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**Computer Research**  
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Haddonfield, NJ 08033  
(609) 428-0020  
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**Computer Resource Services**

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# VENDOR INDEX

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**Datacrown**  
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search Ctr.  
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**General Electric Informa-  
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(617) 354-3000  
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**Interactive Sciences**  
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Braintree, MA 02184  
(617) 848-2660  
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**Xerox Computer Services**  
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# "We switched to an NCR system because we were growing fast," says John F. Schafer of Harrison Western Corporation.

## SCHAFER:

Harrison Western is a contracting company working primarily in the mining industry. Our business has multiplied three-and-a-half times in the last five years.

## NCR's GEORGE TILLMAN:

Sharp growth in total business can apply tremendous pressure to your data processing system.

## SCHAFER:

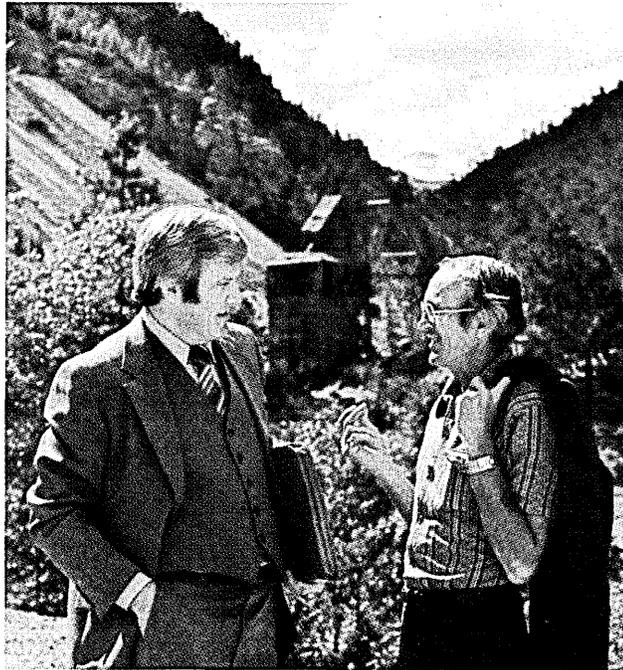
Right. We had been using our old supplier's largest minicomputer, so we had no system to grow to. We needed additional programs for general accounting applications. We were under pressure. So we began looking for another vendor with a broader base of available software.

## NCR's TILLMAN:

And you found the NCR 8200 and Migration Path Engineering.

## SCHAFER:

We selected NCR because the 8200 gave us greater hardware capability at the same price we had been paying. We also acquired the software we needed for our key applications — construction scheduling and cost accounting. And for the general accounting applications as well.



John F. Schafer (right) is data processing manager of Harrison Western Corporation, Denver, Colorado. George Tillman is an NCR district manager.

## NCR's TILLMAN:

I recall that the transition went very smoothly.

## SCHAFER:

I have been in data processing for 20 years and I know how difficult conversions can be. Our last two conversions — to the 8200 and, later, to the NCR 8350 — were the easiest I have ever seen. We unplugged the 8200 on a Thursday and the 8350 was up and running on Friday.

## NCR's TILLMAN:

That's the way it will be whenever you need more power. Your NCR system will grow right with you. All your conversions will be easy. Because NCR has Migration Path Engineering.

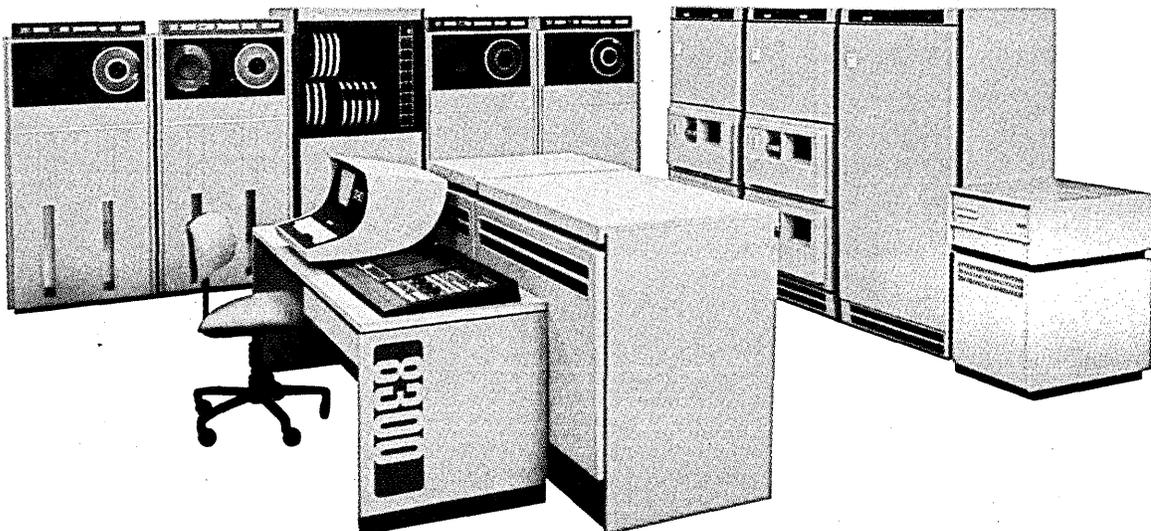
## SCHAFER:

That's what I like to hear.

In the NCR office nearest you, there is an account manager like George Tillman who knows your industry and knows NCR systems. He can help you.

To learn more about what an NCR system can do for you, phone him. Or write to EDP Systems, NCR Corporation, Box 606, Dayton, Ohio 45401.

**NCR**  
Complete Computer Systems



# Dumb terminals – the end of an era

If you are an IBM customer, or you have a terminal network from Burroughs, Univac, or some other mainframe vendor, then this ad is probably not for you. But if you have a minicomputer and your terminals do not perform automatic retransmission-on-error, or if you use timeshare or interactive graphics terminals, you don't need us to tell you data transmission errors can really sour your attitude toward the phone company, your terminal, your computer, or maybe all three!

Life can be sweeter!

MICOM's Micro500 Error Controller takes care of those phone line 'glitches' automatically, on dial-up or leased lines, with no changes required to your existing hardware or software. It delivers error-free data on telephone lines with error rates worse and 1 in  $10^4$  and through total line outages of several seconds. It also lets you use your asynchronous terminals with high-speed synchronous modems operating at speeds to 9600 bps, and even lets you use them dial-up with *half-duplex* modems at 2400 or 4800 bps.

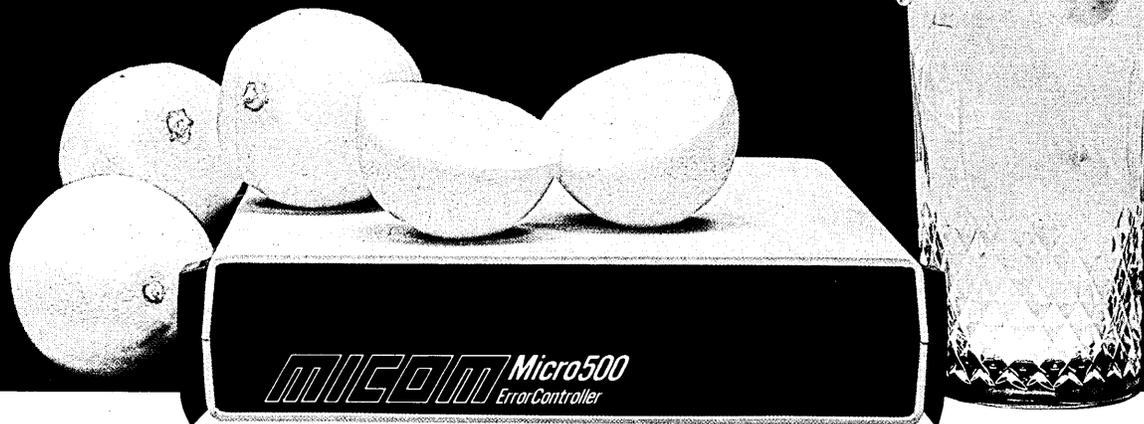
With MICOM's Micro800 Data Concentrator you can put several terminals on one line, eliminating phone line errors for all of them. Now, the Micro500 takes care of your single terminal installations at a price *you* can afford. No wonder they're saying MICOM just put an end to the dumb terminal era.

If you use a timeshare service, ask them what they are doing about eliminating errors on the dial-up link between *your* terminal and *their* computer or network access point. If they can't tell you about the Micro500, have them give us a call!

If you have your own minicomputer or timeshare system, send for complete details of the Micro500 Error Controller today . . . better still, why not call and order a pair of Micro500's on a 30-day sale-or-return basis. No strings attached. *We know* you'll love it.

Dumb terminal transmission errors souring your outlook?

Life can be sweeter with an Error Controller.



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IBM, ever alert to the sound of the future, calls its newest printer an "Information Distributor."

# WHEN IS A PRINTER NOT A PRINTER?

by Amy Wohl

Even its name tells you something. IBM's newest printer, the 6670, is not called a printer at all, but an "Information Distributor." If that sounds futuristic, it's meant to—the product is designed to serve at least two forward-thinking processes:

- Extend and reinforce the viability of IBM's huge base of installed mag card word processors by supplying a fast, high quality "super" printer. (The 6670 is much faster and offers much better quality than the previous occupant of this niche, the 6640 ink jet printer. However, differential pricing ensures both products will have a place.)

- Offer yet another merger path for those firms—and they will soon include almost every large business establishment—which are examining strategies for reaching the "office of the future." (The 6670 has particular pertinence in this area because most future office strategies include some combination of data processing and word processing function and/or hardware and the 6670 fits right into this picture.)

The IBM 6670 Information Distributor is a copier/printer, and is capable of performing a number of functions. On its simplest level, it can be used as an ordinary copier, at 36 pages per minute. Next, the system can accept input from IBM (or IBM-compatible) mag cards and create output at speeds of 30 to 36 pages per minute (after the first page, which takes considerably longer). Output may be in a variety of type fonts and formats. It is possible to program this output through a job control language encoded on additional mag cards or through the push-button system controls of the 6670. During the printing process, the 6670 reads informa-

tion from mag cards and transfers this data to an internal (nonremovable) floppy disk that holds 100 pages.

The system can also accept input over a bisync or SDLC communications line from either a communicating word processor or a computer. In this mode, the 6670 can either simply print material originally keyboarded elsewhere (just as it does when it reads from mag cards) or, more importantly, it can accept data from a mainframe computer's data base and combine it with other material to create original documents. For instance, order entry data from the computer can be combined with an acknowledgement letter on the 6670 to create typewriter quality finished documents.

Also, the 6670 can accept computer data and print it in reduced size and enhanced quality in its Data Rotate mode. In this instance, the 132-column computer printout is turned to print on the long axis of the page. A special, reduced-size typeface is employed. When computer printouts are reduced in size by reduction copying, the print quality can be no better than that of the original computer printer. When 6670 printing is used, print quality is much higher—rather like that of a typewriter with an unusually small typeface. The user can choose to employ the duplexing (double-sided printing) feature of the 6670 to place computer printout on the reverse side of a text page. Very few word processors permit text and data processing-originated material to be interspersed in this fashion.

## ANOTHER WP PRINTER?

Most word processors in use today employ either an IBM Selectric mechanism or a daisywheel printer (generally purchased from Qume

or Diablo, but occasionally manufactured by the WP vendor). These printers provide typewriter quality output at speeds from 15.5 to 75cps. While most word processing users are not willing to give up output quality, many would like to see the possibility of enhancing output speed. Since most high speed printers available from the computer industry are dismissed as offering inadequate print quality, some special attempts have been made to build a higher speed printer for the word processing environment.

The IBM 6640 ink jet printer was IBM's first foray into building a higher speed, more flexible off-line printer to support its big base of mag card systems. Generally successful, the device has several flaws: it cannot handle full rag paper; its water-based ink smears on contact with moisture; and—most importantly—its speed of 77 to 92cps turns out to not be much faster than the dual-headed version of the Qume printer (75cps). Also, the nonimpact technology of the ink jet means additional copies require extra passes, considerably reducing the throughput of the system.

The Sanders Technology Multi-Pass Matrix Printer is an impact-matrix printer that solves the carbon problem of the ink jet—it can handle an original plus several copies. The Sanders printer offers a variety of speeds inversely related to print quality. At typewriter quality, the printer makes four passes per line and offers a not-very-fast output speed of 30cps. However, as with other matrix devices, it offers a variety of print styles and sizes and a much larger character set for technical, international, and special applications. Many word processing vendors reportedly have this printer under study as

an alternative, but is it not likely to be considered as a substitute for a higher speed "intelligent" printer.

Wang announced its Intelligent Image Printer in December 1978. Configured on a Royal Bond IV copier manufactured in Japan, the IIP is an on-line printer that employs fiber optic technology to transfer an image from digitally stored data, via a one-dot-high crt, to the zinc oxide-coated photoconductor of the copier. That technology does not appear to give quite as good an image as the IBM 6670, but since both systems have similar resolutions, it may be possible for Wang to further enhance its image quality. Another major difference between these systems is in the volumes the devices are intended to support. The Wang system is configured on a medium-range copier and requires a service call to change toner and developer every 10,000 copies; also, the user must change the zinc oxide masters every 2,000 copies. The IBM 6670 does not

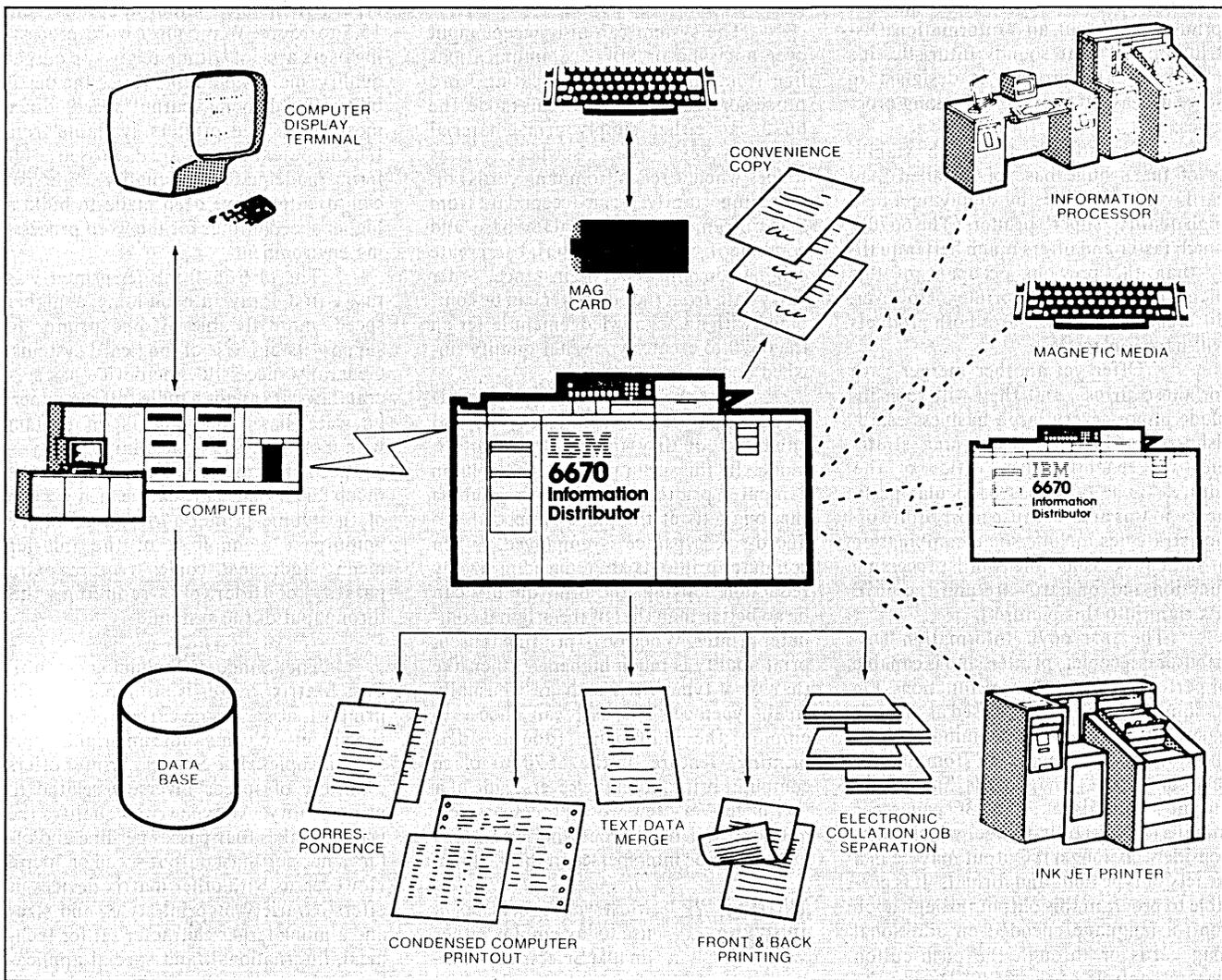
yet have a maintenance track record; however, the Copier III mechanism upon which it is based generally requires servicing about every 30,000 copies. This could be an important element in the high volume applications run by some users. Incidentally, at first the Wang device could be used as a copier but, shortly after the initial announcement, Wang removed this capability, reducing the purchase price from \$35,000 to \$32,000. This contrasts sharply with the \$75,000 price of the IBM unit. However, lease prices are almost identical—and word processing is likely to be a lease market for some time, while customers try out the new technology.

During the recent NCC, Canon and Konishiroku showed new alternatives for the copier/printer user. Both vendors offer printers intended for word processing systems, permitting high quality, high speed output. Each system offers its own twists on technology and product features. The Canon offering is a desktop

model (easy to fit into an office environment), employing laser imaging on plain paper with liquid toner. The Konishiroku (the copier is identical in technology to the Royal RBC 115) employs a crt, plus fiber optics imaging system using plain paper and dry toner. Neither is an "intelligent copier," but depends for intelligence on the host system. Both systems offer high quality output (but perhaps not quite as good as the 6670) and are likely to turn up on some word processing systems by 1980, probably in the \$15,000 to \$20,000 retail price range.

### INITIAL USE AS SUPER PRINTER

Initially, the IBM 6670 is likely to be used as a super printer by high volume IBM word processing accounts. It can be used as an off-line printer for both the older mag card units as well as mag card-based OS 6 systems. Also, the system can be used, via communications lines, as a high quality printer in



Configuration of an IBM 6670 word processing system. (Diagram courtesy of IBM.)

## While it's impossible to accurately predict what IBM will do with this printer, It's interesting to speculate on the possible enhancements.

the dp environment. This capability is critical as the Data Processing Division (DPD) begins to impact the market with its first office automation offering, the IBM 3730.

It is almost irrelevant what DPD announced—because its decision to participate is, in itself, important. For the record, the IBM 3730 distributed office communications system is configured on IBM's 3790 distributed data entry system. The product offers office-oriented menus and a fair degree of attention to human engineering considerations, but it is constrained both by the limitations of the 3790 itself—which requires a host attached for communications and many higher-level functions—and by IBM's decision to support only certain functions with vendor-supplied software. A great deal of potential functions require not only host support but also user-written programs. The genuine and full usefulness of the 3730 is possible only within a computer (read: IBM 370) supported environment, with the full cooperation of dp management. Remember, it's only a first step. The echoes of the following steps—IBM-provided programs for the host-attached environment—are already beginning to be heard.

While the 6670 is a product of IBM's Office Products Division, it fits into that new class of products positioned to serve both office and data processing needs. Many industry analysts believe the 6670 is part of a new strategy aimed at positioning IBM firmly as the prime supplier of information processing equipment for the office of the future.

Of course, the strategy of a prime marketer like IBM will, in itself, exert a certain force in shaping the future organizational structures of offices. Centralizing the word processing function was, after all, the result of the marketing need to justify expensive equipment that could *not* be justified on individual secretaries' desks. But the marketers strategy is only one piece in the puzzle. The game is multidimensional and could have many outcomes. Here are some of the major issues and arguments:

- Who will perform word processing tasks? That is a multipart question with a multipart answer. For some time, secretaries are likely to have individual typing devices; transferring tasks from this workstation to another workstation will require wasteful rekeying or a special intermediate device such as ocr. (A point not to be missed in looking at the 6670 is the fact that it is a laser device with a copier-scanner built in. How much more difficult would it be to add an ocr reader to its bag of tricks?) Most repetitive typing (automatic letter writing, standard

paragraph assembly—"boilerplates"—and long document revision) will continue to be performed in service organizations called word processing centers.

- As distributed processing continues to grow and be accepted as a concept in both dp and word processing environments, more equipment and capability will be found at lower and lower levels throughout the office. This will be encouraged by the decreasing per station costs of display-based equipment. Also, as more and more of the company's records are stored within the electronic information processing system, it will become crucial for individuals to have access. Multifunction display workstations will proliferate in offices, providing access to the organization's data—and, not incidentally, also providing the means to create and revise text, and to communicate it to other system users. It is not yet clear whether most of these workstations will be individual, intelligent, communicating terminals interconnected via their communications capabilities or a large, single system.

- In the process of spotting display workstations around the office landscape, someone will have to decide who is going to perform what functions. For instance, it will be possible for middle and upper management to use these systems not just to access information, but to create new information; it remains to be decided whether this is an efficient use of their time, given the current entry method is a typewriter-keyboard. Of course, when the day of the talking typewriter arrives—or, more seriously, when display workstations can accept voice input—how will that affect the typing function? It is likely many workers will use such technology to input their thoughts and to distribute them to their colleagues. It is also likely, given the business requirement for formatting and other tedious work, some senior managers will input "rough drafts," allow their secretaries or assistants to clean them up and format them, and then review the finished product before asking to have it distributed.

### TRANSITION PRODUCT

A transition product such as the IBM 6670 is an exciting event. It is exciting not because of what it does—although that in itself *is* exciting: copying, printing in many formats and typesets, transmitting and accepting data. It is exciting for the potential it creates; the IBM 6670 may alternately become much more than it is in its initial product offering. For instance, once laser technology is embodied within a product (as with the laser used to "paint" an image on the copier drum of the 6670), it can

also be used for noncoded input (facsimile) or for image coding (ocr scanning). Also, an intelligent communicating device used within a network environment can be a "mailbox" for sending and receiving documents, whether or not they are originally electronically recorded. Note that the 6670 is already a bridge product, joining the text manipulation of the word processor to the sophisticated records processing power of the computer. Additions to such joint activities are sure to be a part of the growth path of this product and its successors.

The 6670 could also readily be augmented in a number of ways. While it is impossible to accurately predict what IBM will ultimately do with this product or its successors, it is interesting to speculate on the possible enhancements. For instance, the product could, as mentioned earlier, become a multifunction product including ocr scanning, copying, document distribution. It also could be enhanced to provide full graphics capabilities. The output quality of the 6670 is superb, and it could be improved with certain printing enhancements to turn the system into a "dry" photocomposer, creating camera-ready output, complete with graphics. Also, as a bridge between the worlds of office automation and data processing, the 6670 virtually forces the dp manager to communicate with the office staff in order to implement the combined applications that employ the 6670 to its fullest measure. It can also allow the dp and word processing managers regions of cooperation—say, the joint use of the printer for certain types of output—from which will grow the necessary confidence and credibility to permit more complex systems to be designed and nurtured. \*

### AMY D. WOHL



Ms. Wohl is executive editor of the Office Systems Group at Datapro Research Corp., where she manages four technical

reference services, and the vendor consulting and contract publishing activities. Ms. Wohl is currently program committee chairman for the new AFIPS Office Automation Conference, a member of the program committee for INFO, and a member of the steering committee of the IWP Consultants Council. She holds an MA in economics from Temple Univ.

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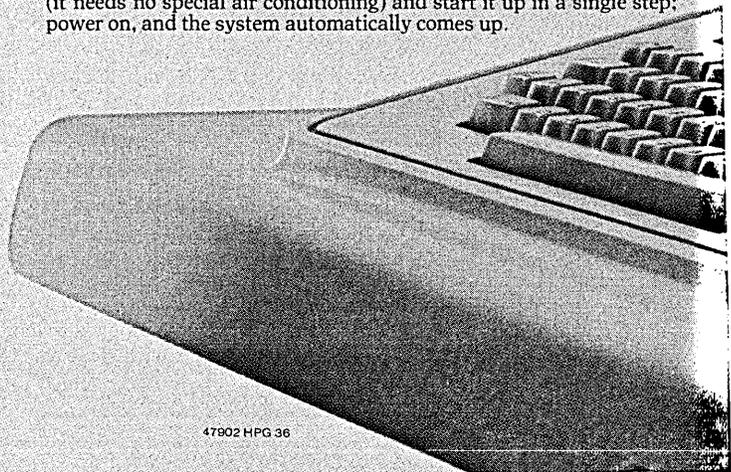
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**"Vendors are aware that education and support are vital aspects of success in word processing sales."**

# THE WORD IS WORD PROCESSING!

by Sarah Rolph, Associate Editor/Articles

While the corporate world looks to office automation to optimize that labor-intensive essential, administrative support, the office automation field looks to the corporate world for the next substantive step. The administrative needs of the organization will have to be much more clearly defined before the office of the future will make sense.

Vendors are aware that education and support are vital aspects of success in word processing sales. At A.B. Dick, in fact, management emphasizes word processing education as a prerequisite. Yet, the support vendors can provide is limited by the necessity to provide each customer with at least basic operator training. This focus on the machine puts vendors in a double bind with respect to user education—the operator is not "the user," in the vernacular of the industry; the user is any person who needs access to the information.

"Training the operators is the easy part," states Larry Spelhaug, manager of customer support and training for Xerox. Xerox's Executive Communication Exchange, or ECE, program provides prospects, who are frequently already clients, with an overview of the Xerox approach to word processing. IBM also offers an executive briefing seminar. For the company considering an organization-wide installation, it's an obvious advantage to have exposure to product lines and support arrangements along with work flow and personnel considerations before deciding on a configuration.

Still, someone must learn to use

the machine. Operator training at Xerox, as with most vendors, consists of a classroom situation and a self-paced instruction manual.

Most training classes run about two days. NBI has found that five half-day sessions work better, with the rest of each day spent back at the installation, reviewing what has been learned. Most vendors arrange for training to start on delivery, but Four Phase uses the two or so months between signing and delivery as the training period. This, however, eliminates the option some vendors offer of training at the installation itself. While A.B. Dick finds that the vast majority of its customers prefer to be trained in the vendor's classroom, Savin finds the distribution between classroom and on-site training about half and half. CPT Corp.'s training varies with the locale. Equipment is sold on a dealership basis, so CPT trains market support reps (MSR's), who in turn train CPT customers. Some MSR's will give on-site classes, others will not. CPT MSR's may also vary the training plan as appropriate.

NBI has taken an interesting step in individualizing operator training. Its instruction manual is written to be customized. Information is grouped by product feature, allowing an operator to learn only the portions relevant to the present application. A document is prepared detailing the training procedure by section of the instruction manual during a preinstallation interview, at which the application is assessed.

Most vendors offer supervisor

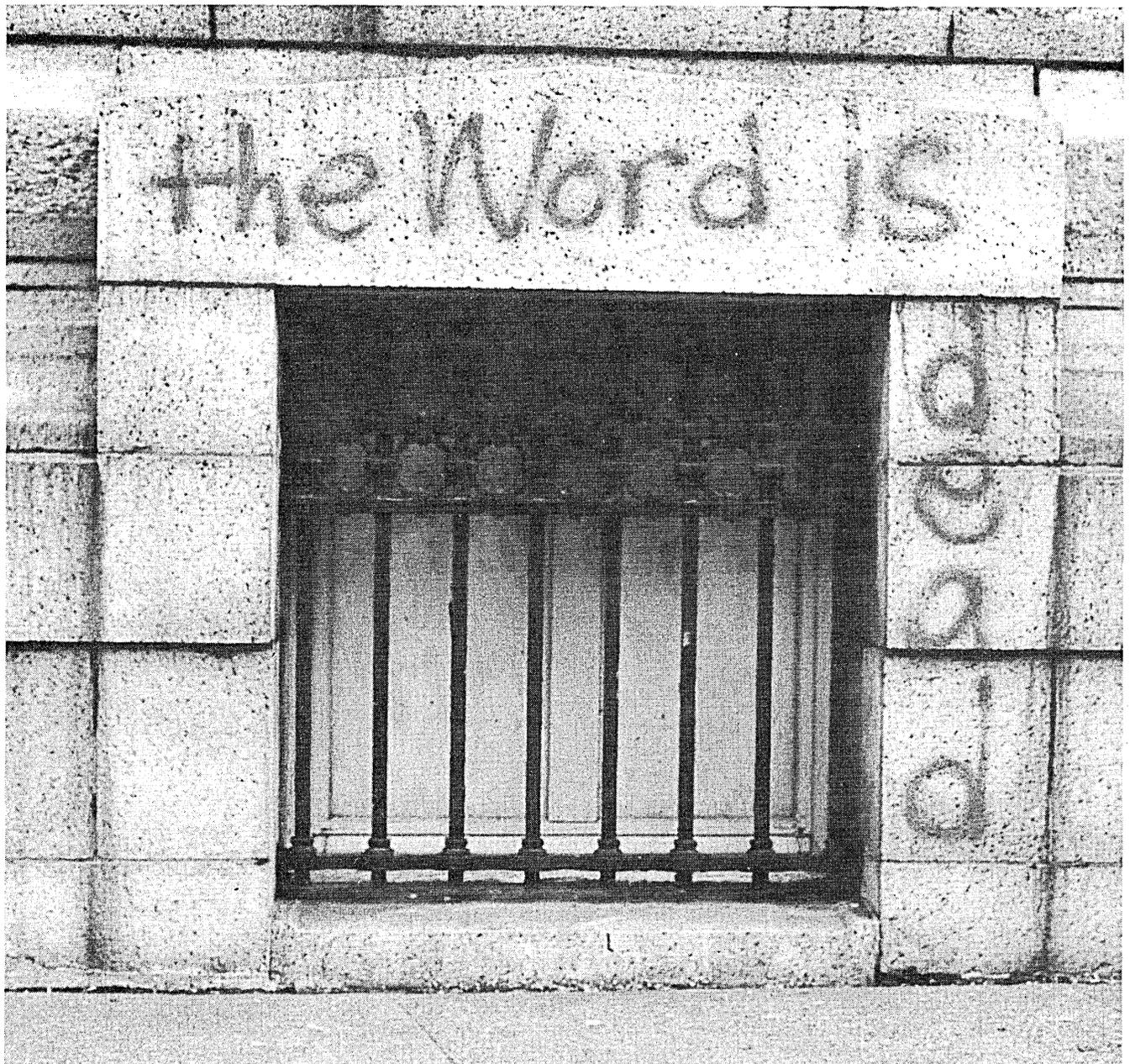
training. Vydec devotes only one day to training the supervisor/manager. Interestingly, it has organized this workshop vertically, grouping clients by industry. Four Phase offers a two-day supervisor course at branch offices. A.B. Dick offers a week-long course in Chicago for supervisors. CPT has no class for the supervisor/manager, but it is looking into such an offering, perhaps with the emphasis on management. IBM offers a management seminar in Dallas and has recently moved its class for supervisors from Dallas to regional locations. The Xerox school for supervisor/managers at the Customer Education Center in Dallas includes case studies and the use of video tape and role plays in exploring office interaction.

## SPECIAL CLASSES

Some vendors offer other special classes. Xerox offers advanced operator training, as does CPT for the 4200 and Rotary III machines. A.B. Dick offers a course for systems analysts.

Some vendors, such as Four Phase, will teach only supervisors in a classroom situation, and provide the operator with various teaching methods centered around the instruction manual. Savin says its smaller machine, the 7900 Wordmaster, is simple enough to be learned strictly from the instruction manual. Four Phase offers a step-by-step Video Teaching Guide—a workbook to be used in conjunction with the machine, the hope being that the combination is self-explanatory.

Such an approach is the trend. Self-paced instruction offers vendors a way to keep a good ratio of support reps to customers, a key problem as installed bases grow, particularly since vendors also rely on the customer support rep to provide ongoing education for the installation as needed, such as in the event of promotion, introduction of features, addition of applications, etc. Xerox sees a movement toward the exclusive use of self-paced materials for operator training, and is currently working on audio visuals. A.B. Dick's version includes mag cards or disks for use on the equipment itself in conjunction with a workbook. Its method, known as Skill Pak, is used to train not only the customer but also to train market support reps and sales people. Since 1976 Vydec has been offering its self-paced learning kit, which consists of audio cassettes, a workbook and graphics book, and diskettes with exercises as an option to its two-day training class. Qyx has reportedly made a big investment in a new self-paced learning manual for its electronic typewriter, and has hired a CAI (computer-aided instruction) consultant to implement it. And Wang's new learning guide sounds promising. Its 300-page instruc-



tion manual has been distilled to 30 pages that cover virtually the same information. The approach is graphic: explanations take the form of flow charts detailing how processes work.

Everett Butler, vice president, Customer Div., Universal Training Systems, who helped develop the new Wang manual, finds that operators can learn much faster and more thoroughly if they are taught with a conceptual rather than a procedural method. He says present operator training is at best "minimally acceptable," likening present methods to "putting beads on a string." As an example of the procedural approach, says Butler, imagine trying to explain office supplies strictly in terms of function. By the time the poor student had received procedural explanations of the staple, the paper clip, and cellophane tape, he would be hopelessly confused about attaching one piece of paper to another. This exaggeration is not as trivial as it may seem, because it really does resemble common teaching

methods. The procedural approach is earlier to teach, at least in the traditional classroom situation, and is of course equipment-specific. "Instruction should not be heavily expository," stresses Butler, "but inquisitory. Conceptually, word processing only does three things—format, locate, and edit." An ideal arrangement, according to Butler, would be to teach basic concepts first, then provide demonstration of system performance *without* the use of text, just to get across the idea that the concepts do work. Using examples of text can confuse the beginner, he explains, who has yet to learn basic distinctions such as the difference between tabbing in and indenting. Butler feels that learning manuals can be counterproductive because they demand that the operator look at the book, the work, and the screen at the same time—they overuse the eye and hand, he says, while "the ear is the better sense," though he points out that merely recording written text is not sufficient—material must

be recorded especially for the listening worker.

Butler also points out the need for communication between users and operators. Authors should talk to the operator the way the operator talks to the system, for example, but according to Butler, it is not unusual for an author to use traditional editing techniques such as to underline each use of a word to be changed in a given document rather than instructing the operator to do a global replace.

#### **USER IS PART OF SYSTEM**

The user is finally beginning to be seen as part of the system. Management activity is, of course, concerned with not only decision-making, but with the collection and distribution of information. Office automation provides an opportunity for more management efficiency. Many believe that in order to take advantage of this opportunity there must be increased awareness of the office as a business function. We must study the present, and

## What people thought would happen is going to happen with word processing.

study the work itself.

The challenge for word processing vendors, then, is to provide—or let someone else provide—education that addresses the office needs of the organization.

Vydec has begun to offer a two-day session for upper management which it says has been well attended. The workshop features discussion of such topics as productivity. Xerox encourages customers to set up their own project teams stemming from the ECE tour, and provides an impressive range of offerings to support these teams, such as use of computerized modeling techniques that provide simulation of the whole information cycle, examining variables such as types of jobs handled, handwritten input as compared with typed copy, revision content, and distribution of work.

The transition to word processing tends to create tensions between staff and management, which no doubt accounts in part for the industry's cautious stance heretofore of sticking to operator training. Yet the potential for misunderstanding is also a motivating factor in the growing attempt to provide more comprehensive support. While Vydec, unlike quite a few other vendors, doesn't like to make personnel or work flow recommen-

dations, it does provide a booklet suggesting guidelines for client studies on such matters. NBI's preinstallation interview includes a request for management involvement, at least to the extent that materials explaining the training process are left with the manager. "Upper management should understand what to expect," explains Mick McCoy, NBI's manager of marketing support. Four Phase agrees, and usually arranges training with the decision-maker (rather than the operator or potential supervisor). The customer is assigned a systems engineer, who will help the customer build his system (Four Phase users write their own application software), and who is prepared to help make the transition to word processing, as are the regional support reps. Four Phase's SE's, who outnumber the sales force, also get involved in presales activities, as do many vendor's support reps.

One wonders how well the many wp vendors will fare as word processing sales grow and as management interest in the office of the future increases. Xerox and IBM are both making substantial investments in corporate education, as well as exploring alternate methods of customer support. IBM runs a Technical Service Center in Dallas where a staff of around a dozen is available for telephone consulta-

tion. Xerox runs a similar service. Its Customer Support Center is staffed by about 34 people, and is set up with a separate toll-free number for each product, to assure that the caller gets someone familiar with his equipment.

Larry Spelhaug of Xerox notes that the participation of dp people in the ECE tour is rising, and also that the management level of participants seems to be increasing. "People are acquainting themselves [with office automation] company-wide," says R. W. Pither, manager of sales training and development at A.B. Dick, citing the increased use of Career Pak, a curriculum on office systems that was designed for junior colleges and vocational schools, as an in-house training program for customers. One industry insider predicts that the future vice president of information processing will be in charge not only of dp and wp, but all administrative systems, including personnel. "The implications of word processing are bigger than either side of the house," he said.

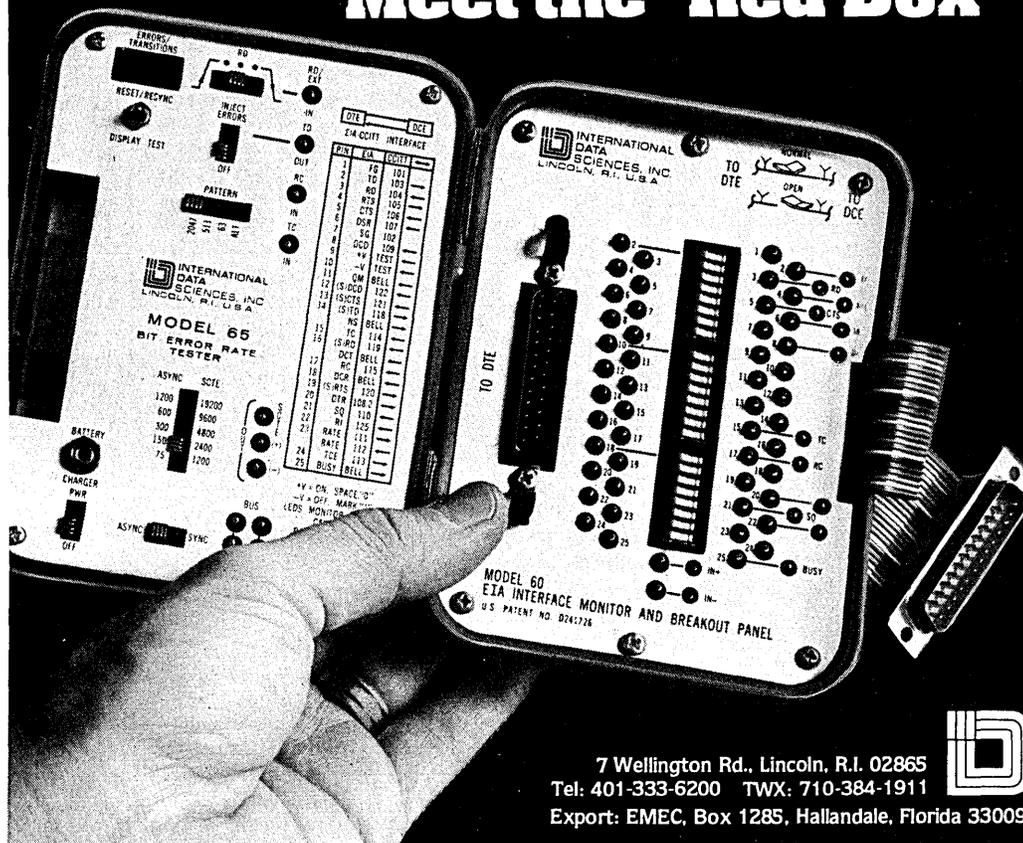
"What people thought would happen as a result of data processing," says Everett Butler, "is going to happen with word processing. The mainframe computer really has not been very close to the manager." \*

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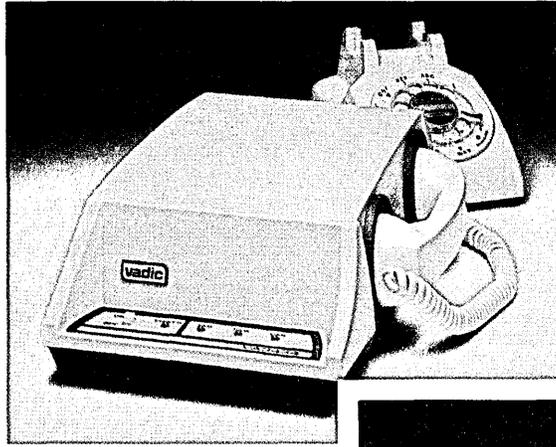
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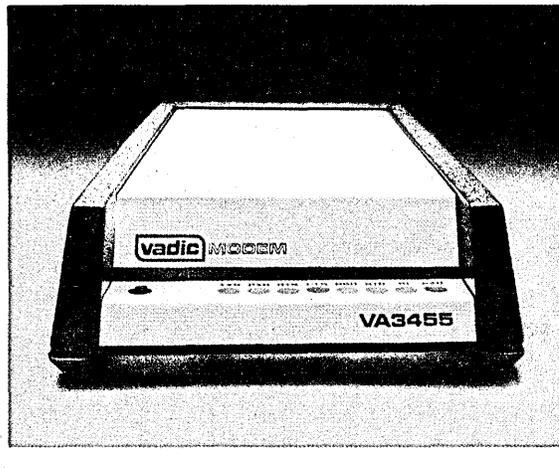


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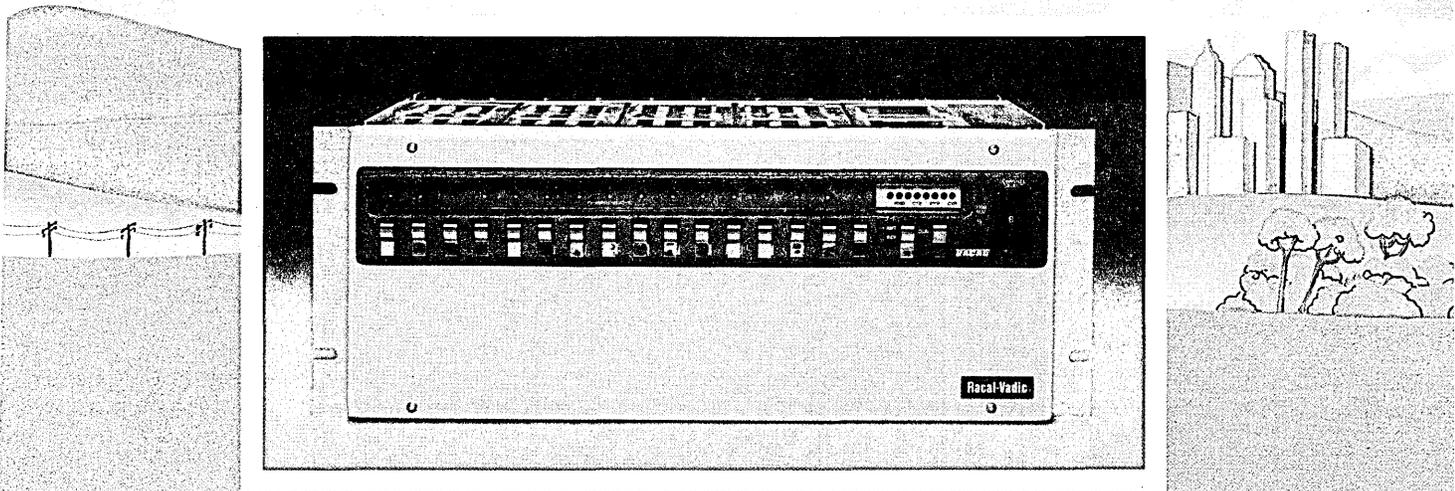
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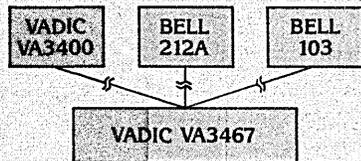
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# A MANUFACTURING SYSTEMS COOKBOOK, PART 3

by Dan Appleton

Part 1 of this series set a framework for manufacturing systems planning by providing five tests for the plan. Subsequently, in Part 2, we developed an eight-step process to produce a plan to satisfy the five criteria of Part 1. The first two parts, therefore, addressed the questions who, why, and when. They did not address how or by whom. That is the job of Part 3—implementation.

Implementation technology, or what the academicians are now calling “technology transfer,” is still in the realm of the black arts. To put it simply, we have yet to discover any sure-fire method of implementation. All we really know from studying successful and unsuccessful undertakings is that success is often, but not always, accompanied by certain factors. These factors include: top management’s involvement (not just support), user participation, planning, a steering committee, a technically competent dp staff, and a well-founded project management system.

We also know some of the characteristics which seem to accompany failure: management apathy, overzealous dp departments, unreasonably short schedules, rabid user enthusiasm, inability to finalize system design, inflexible current systems, poor communications between dp and the user, and viewing the computer as a simple cure for complex business problems—a sort of dp pill.

Since there are no hard-and-fast rules for successful implementation we need some overall strategy which will turn the odds in our favor. Certainly, a general strategy is more meaningful than a list of do’s and don’ts.

It is easiest to view implementation in the terms of the processes necessary to carry it out and the structure required to control and perform those processes. The two should not be confused. Both are necessary and each has its own distinct role to play in implementation. We will take up the processes first and then the structure. There are also some supplemental disciplines which have evolved over the last decade or two which provide a much needed third dimension to implementation. We shall call these disciplines “supporting technologies” and discuss them at the end of this article. Together, implementation processes, structure, and supporting technologies can be powerful tools.

## PROCESS, NOT PROJECT

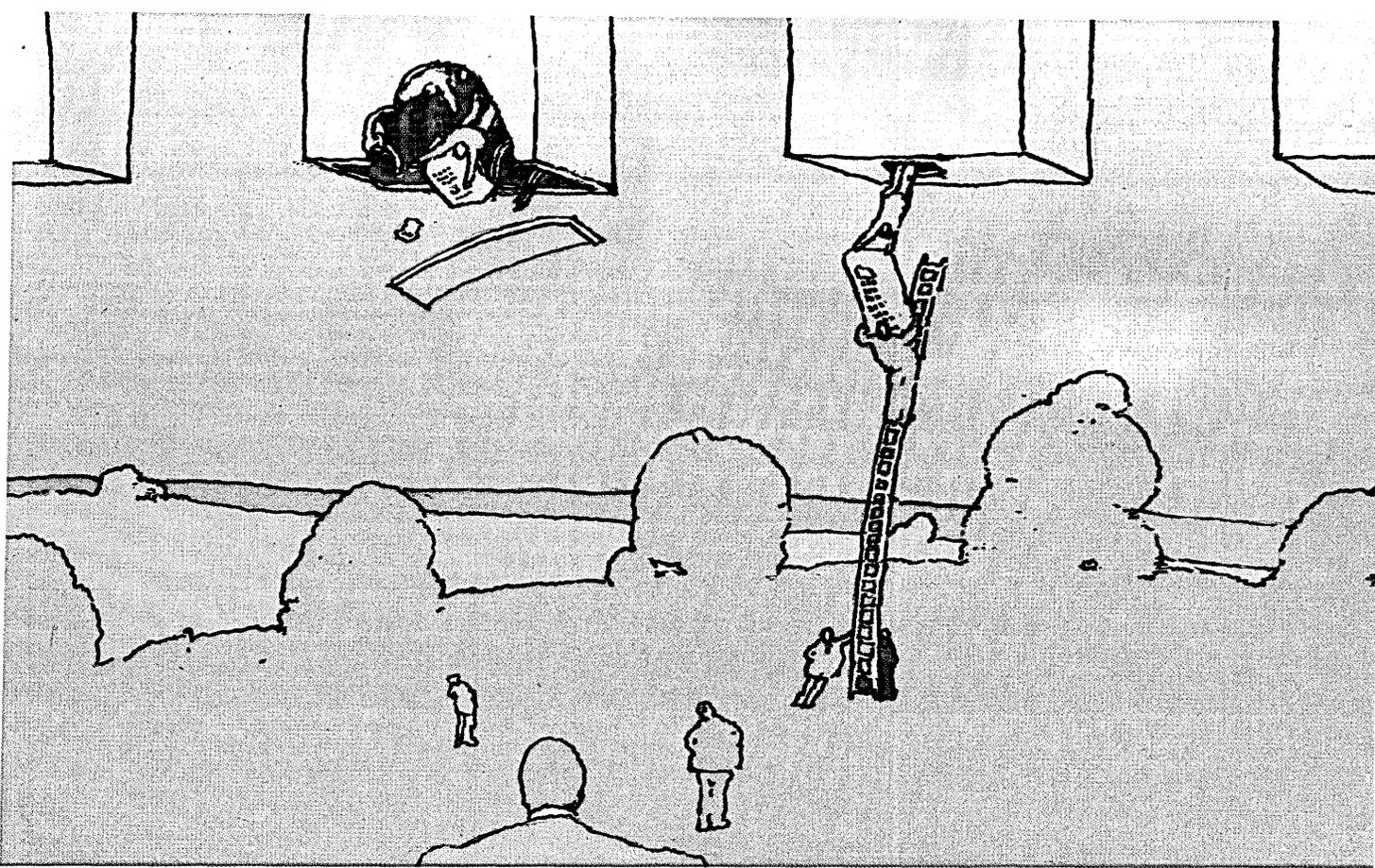
Implementation is accomplished by *process*, not by *project*. If we treat systems implementation as a project, then we must assume that it will be completed at some point in time. Not so. It is an on-going phenomenon. We are always implementing. Granted, what we implement is defined in terms of projects, but that is just a mechanism. If a firm is to live and grow, mature and prosper, it must cultivate its systems implementation processes. This is especially true when it comes to automation.

Fig. 1 is a more or less arbitrary

classification of some basic implementation processes. It is not intended to be complete—only descriptive. It identifies four classes: 1) Tempo and Perspective, 2) Feedback, 3) Legal/Financial, and 4) Technical.

### *Tempo and Perspective (TAP).*

The TAP processes are crucial to implementation because they set the direction, pace, tone and expectancy for everything else. Without them, systems implementation tends to default to the path of least resistance or the get-your-act-together philosophy. Systems developed and implemented using such philosophies never seem to stay implemented, and they tend to be parochial and self-serving rather than part of a whole. The most important of the two TAP processes shown in Fig. 1 is *requirements analysis*. As we pointed out in Part 2, it is through requirements analysis that management establishes the what, when and why of implementation. What is not so obvious is that a major purpose behind requirements analysis is the alignment of the what, when and why with the objectives of the whole firm. Misalignment can spell disaster. Part 2 described two alternate ways of aligning systems and organizational objectives, and certainly one of them should be used. The traditional way is to “deduce” the systems plan from the organizational plan, starting the systems plan more or less from scratch. The alternative approach, which Part 2 recommended for manufacturing and distribution businesses, seeks to convert a model or prototype, customizing it where necessary to the individualities of each firm, based upon its



requirements to serve specific markets.

Though requirements analysis is a critical TAP process, its companion process, project definition and management, is almost as important. Much has been published on this subject, but little of it is pertinent to low cost, effective implementation in a manufacturing environment because it is geared to the development and implementation of individualized Computer Application Systems. This is unacceptable on two counts. First, the basic problem of implementation in manufacturing is change management, *not* new development since most of the required technology already exists. The big job now is putting it together to fit the needs of individual businesses. Second, manufacturing systems implementation should not be based on individual CAS, but on data base strategies.

The project definition and management process most appropriate to manufacturing systems implementation is generally described by Fig. 2. This process is not geared toward the development of new, sophisticated CAS projects. Instead, it is the type of methodology which accompanies the implementation of proprietary software packages and data base systems. It can be generically referred to as a prototype process because it starts with a model to be implemented, and takes the shortest route toward that implementation.

As can be seen by looking at Fig. 2, the prototype process is a closed loop process. It begins and ends with the same basic step: quality auditing. This is done to ensure quality and integrity and to pro-

vide natural follow-through for the implementation process. The remaining four steps in the process are conceptual design, data base definition, heuristic analysis, and environmental test. The conceptual design step combines the scope of the project obtained from requirements analysis with the results of the operational audit. The product is a detailed project definition describing the system, scope and content. Based on approval of the conceptual design, the next step is data base definition. In this step, all data elements with-

in the scope of the system problem are identified and established within a data base structure. In the subsequent step, heuristic analysis, data elements and their relationships are added to or subtracted from the data base in accordance with their estimated utility, and an effort is made to identify the input structure which will be required to support those data elements and their structure. Thus the ultimate definition of the data base and its contents and structure comes from a trial and error methodology which ulti-

CLASS	PROCESSES
TEMPO & PERSPECTIVE	<ul style="list-style-type: none"> <li>• Requirements Analysis</li> <li>• Project Definition and Management</li> </ul>
FEEDBACK	<ul style="list-style-type: none"> <li>• Problem Reporting and Tracking</li> <li>• Computer Performance Tracking</li> <li>• Project Status</li> <li>• Audits of the Status Quo</li> </ul>
LEGAL & FINANCIAL	<ul style="list-style-type: none"> <li>• Budgeting</li> <li>• Cost Reporting</li> <li>• Purchasing</li> </ul>
TECHNICAL	<ul style="list-style-type: none"> <li>• Programming Standards</li> <li>• System Documentation</li> <li>• Computer Operation Documentation</li> </ul>

Fig. 1. Implementation processes.

mately cements the data base and establishes its input structure. The next step, environmental test, is specifically geared toward identifying routine and ad hoc reporting requirements. This can only be done effectively after the data base has been frozen and the input structure has been installed and determined to be functional.

It is the nature of management for its information requirements to constantly change. The prototype process accommodates that change by standardizing data and input structures and by dealing with reporting requirements through exception management. Reports which utilize data which has already been standardized and which is currently supported by a proven input structure are classed as "standard" reports. "Exception" reports require data which is not in the data base. These reports must be evaluated in terms of the cost of modifying the data base and input structure in order to accommodate them.

**Feedback.** These processes are necessary to keep track of implementation. In Fig. 1, we have identified four critical feedback processes, each intended to monitor a different phase or aspect of implementation. Computer performance tracking is simply a meter on the machinery. It views capacity utilization, production efficiency, throughput, response time and whatever dp equipment variables need monitoring. Project status is a formal mechanism for reviewing the progress of various projects. Auditing is a process which can be invoked to search for potential problems; problem reporting and tracking is a formal process which ferrets out implementation problems when they occur and monitors the progress of their solution. There can be many other feedback processes, but these four are indispensable.

**Legal and Financial.** These processes are fairly obvious. They are generally controlled by internal company policies, but they should be reviewed as to their appropriateness in dealing with computer and systems issues. In some cases, the legal and financial people are just as confused as the dp people about the world of computers. It is a fast-growing, supplier-driven industry with one dominant supplier, and it is making its own rules about law, ethics, and economics. The smarter a firm is about budgeting, costing, specifying, and procuring computer support, the better off it will be. To simply acquiesce to vendor sales pitches, contract terms, and conditions or pricing levels and strategies, borders on the insane. Competition in the market is furious and many companies simply cannot deliv-

OPERATIONAL AUDIT	<ul style="list-style-type: none"> <li>• Existing System Flows</li> <li>• Existing Costs</li> <li>• Unsolved Problems</li> <li>• Existing Policies</li> </ul>
CONCEPTUAL DESIGN	<ul style="list-style-type: none"> <li>• Data Base Models</li> <li>• Basic Assumption</li> <li>• What Scope is Not</li> <li>• Cost/Benefits Analysis</li> </ul>
DATA BASE DEFINITION	<ul style="list-style-type: none"> <li>• Select Data Elements</li> <li>• Normalize the DB Structure</li> <li>• Establish Prototype</li> <li>• Load Data Dictionary</li> </ul>
INPUT SYSTEM DEVELOPMENT	<ul style="list-style-type: none"> <li>• Define DB Integrity and Security Requirements DB</li> <li>• Solidify Structure</li> <li>• ID Data Sources</li> <li>• Develop Input Procedures</li> <li>• Develop Input Application</li> </ul>
OUTPUT SYSTEM DEVELOPMENT	<ul style="list-style-type: none"> <li>• Startup of DB</li> <li>• Finalize Reporting Requirements</li> <li>• Evaluate Output Efficiency</li> <li>• Build User Program Interfaces</li> <li>• Production Documentation</li> <li>• Evaluate Output Efficiency</li> </ul>
QUALITY REVIEW	<ul style="list-style-type: none"> <li>• Discrepancies</li> <li>• Run time</li> <li>• Documentation</li> <li>• Security</li> <li>• User satisfaction</li> </ul>

Fig. 2. Prototype development.

er what you thought you bought—for the price you had assumed you had paid.

Any dp procurement policy should be divided into two parts: technical and commercial. The technical side should generate a specification and conduct a selection process comparing vendors' products to the technical specification. This process should produce at least two acceptable vendors. These should receive a commercial review, starting with a checklist of terms and conditions geared to dp contracts and products. (These should be your terms and conditions, and they should be just as unchangeable as the vendors.) Different teams should handle the two selection processes, and vendors who qualify on the technical side should be told of their rating and of the importance of their commercial attitude in the final selection. *Never* combine the two processes into one, and *never* just accept a vendor's proposals.

**Technical.** This class contains all of those processes which only data processing people understand. Though management may not understand how proces-

ses such as programming standardization, computer operations documentation, or data entry control really work, the need for them is fairly obvious. There are reams of publications and hundreds of seminars on these processes. Do structured programming, HIPO, and data base administration sound familiar? These processes are critical, and if the wrong ones are used by dp, they can inhibit implementation and drive its costs out of sight.

Establishing these implementation processes will not guarantee successful implementation; however, not establishing them will, in most cases, guarantee failure. Processes appropriate to the business and its personnel should be established in each of the four classes. They should be documented, supplemented with forms, and audited periodically.

**STRUCTURE** It is natural to look first at the processes required to implement something. Intuitively, managers understand that these processes must exist;

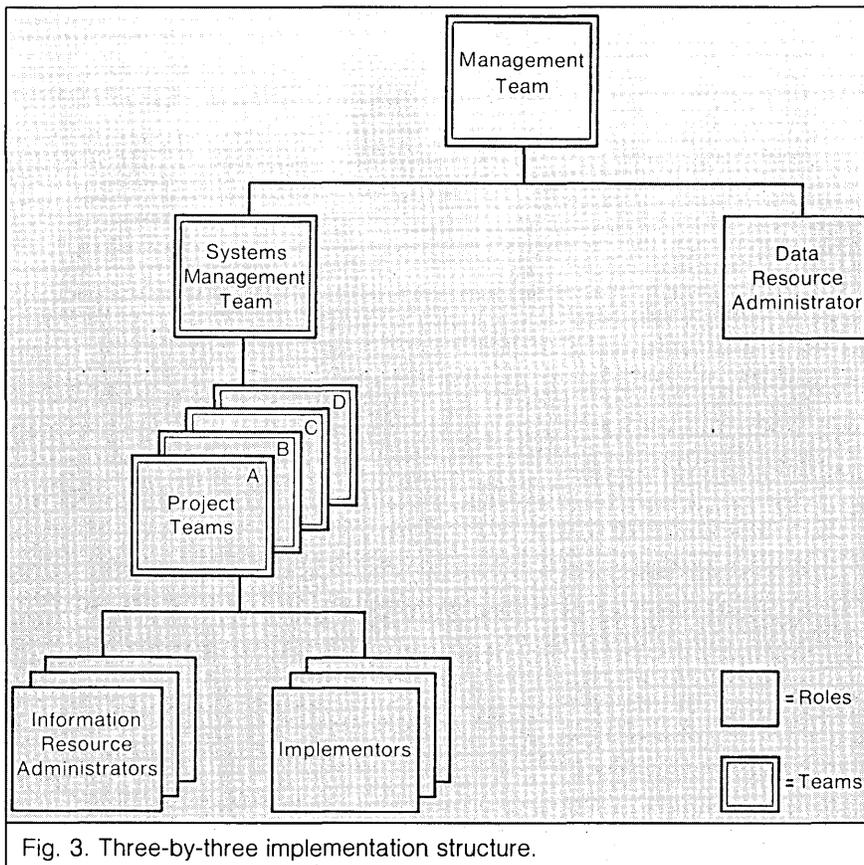


Fig. 3. Three-by-three implementation structure.

the error is in trying to force the existing organization structure to perform and sustain them. That structure was not established for this purpose. Individual managers cannot be expected to establish their own TAP, feedback, legal/financial, and technical processes for their own CAS systems. If they attempt to do so, the quality of the processes will suffer, confusion will reign, and systems overhead will skyrocket.

So, what is the answer? Very simply, it is to define an implementation structure to select, define, perform, and maintain the implementation processes.

The systems implementation structure should be people-oriented, team-oriented and participative, and geared toward the development, implementation, and monitoring of the company's management systems. This structure, if properly developed and supported, will not only help avoid the confusion and frustration that usually accompanies automation; it will also provide a good balance between data processing and user organizations.

Fig. 3 is an example of an implementation structure. It describes a hierarchy of teams and roles. There are three types of teams: the management team, the systems management team, and the project teams; and there are three distinct roles which individuals must play: the information resource administration (IRA) role, the implementor role, and the role of data resource administrator (DRA).

For purposes of simplicity and con-

sistency, we shall refer to this "ideal" structure as the three-by-three structure because of its three teams and three roles. Many variations can be played on this theme. For example, data resource administrators are sometimes called data base administrators or MIS directors. Information resource administrators can be made out of programmers or analysts assigned to specific user departments. The systems management team may, in some companies, be called the dp steering committee, or the "management team" may turn out to be a euphemism for Chief Executive Officer.

Notwithstanding these variations, all of the attributes of three-by-three structure should in some way and to some degree exist. They must also be related to one another in a structure which exists in the shadow of the organization structure. A two-by-three structure (missing one team), a one-by-two structure (missing two teams and one role) or any other variation will tend to produce less satisfactory results in terms of the time, quality and cost of implementation. To see why, we must examine the three-by-three in more detail.

*The management team.* The members of this team are all of those who are involved in conducting the planning process described in Part 2. This team controls both of the TAP processes because its role is to establish strategy and direction for the systems effort, to sanction the overall effort, and to assure alignment between the systems development activities

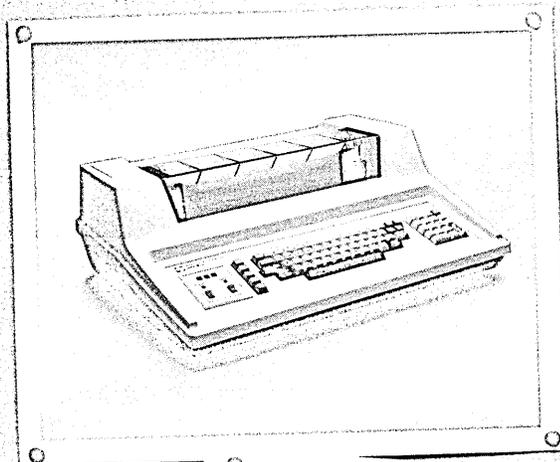
and the direction of the business. Another responsibility of the management team is to appoint the permanent working group we have called the systems management team (SMT) and to act as the court of last resort for that team.

*The systems management team.* The SMT's functions are to design the overall system from a conceptual standpoint, define development, implementation and maintenance tasks for project teams, give them the required capabilities and monies, and at regular intervals (perhaps once each six months or a year) call audit meetings of information resource administrators in order to determine what corrective action or preventive maintenance must be performed to improve the company's systems. The SMT is responsible for managing the overall system. It must define work for the data processing people as well as users and thus monitor and control the interface between the two. The SMT therefore must be responsible for controlling the systems planning model and ultimately converting that into a conceptual design document and, finally, the company's data base.

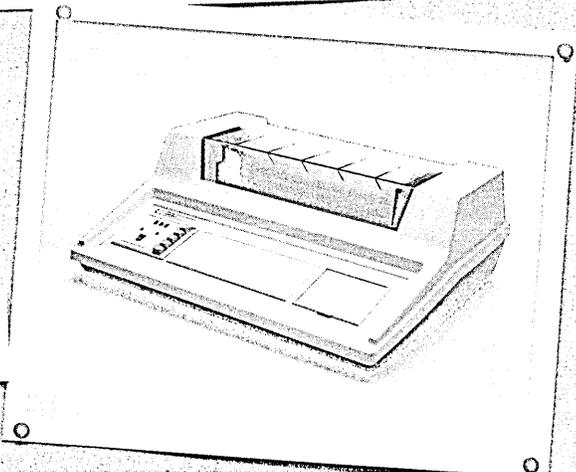
*The project team.* Project teams are variable in size and number; they are also temporary in nature. They need to have, along with the requisite power to accomplish their assigned tasks, sufficient authority (the legal right to make decisions) and influence (the capability to get something done). The project team is assigned a systems task to perform. Usually the task will be to develop a solution to a systems problem defined by the SMT and to implement that solution. It is very important that the boundaries of each project task be defined for the project team, including descriptions of what the task is and is not. Project teams can be assigned to hardware- or software-related projects. They can also be assigned responsibility for identifying modifications to the data base, or they can be given tasks to develop new input structures or reporting requirements, writing company procedures or developing and coordinating new policies. Project team schedules are controlled by the SMT, as is the choice of project team leaders and members.

Project teams consist of the implementors and the information resource administrators.

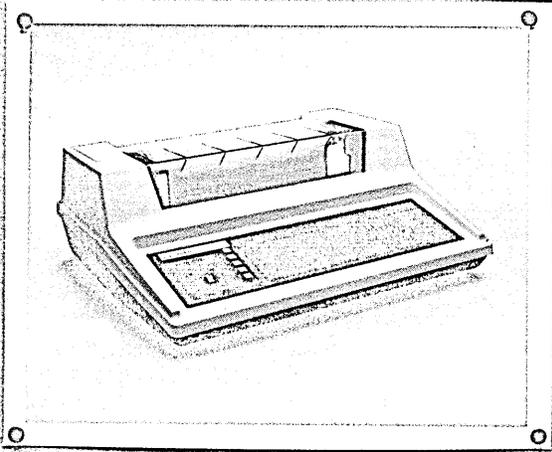
*The information resource administrator (IRA).* There is usually one IRA for each major department head. Being an IRA is not a permanent, full-time job, so usually the functions of information resource administration are assigned to someone in a department. The responsibilities of the IRA are to monitor and document all department computer input and



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computer output, identify and define all department files, develop procedures and documentation, monitor the flow of work into and out of the department, and provide feedback to the SMT about the efficiency of the department's information resources. The IRA functions not only as a positive force in developing and implementing systems, he or she also has a significant role in maintaining the systems. By calling all department IRA's together, an SMT can do a simple audit of the efficiency of the flow of information throughout the company. This audit can be used to provide for not only corrective action, but also preventive maintenance on the part of user management and dp management. IRA's are also responsible for maintaining what is normally referred to as "user documentation." They are responsible for documenting all "discrepancies" to normal computer operations, and for officially requesting data processing services in support of their departmental needs if those services are not directly related to the systems plan. The latter recommendations should be approved by the SMT before they are assigned to the data processing department.

*The data resource administrator (DRA).* The DRA shares responsibility with the SMT for controlling the data base as it reflects the systems model established in the planning process. However, he has another very important role to perform. It is the responsibility of the data resource administrator to be a catalyst and a check-and-balance to the SMT. If we were to compare the SMT to the Congress, then we could compare the DRA to the President. His responsibilities include conducting planning sessions with the SMT, making sure that the SMT considers all relevant alternatives, making sure that appropriate departments provide implementation support where required and obtaining outside knowledge and experience as required to get the job done. He is also responsible for providing technical dp support and for administration of that support. No modifications to computer hardware, communications or data bases are allowed except with the DRA's approval. The signature of the DRA should be required on all major expenditures authorized by the SMT. The DRA should be a senior-level manager who is not a member of the systems management team. He could be the dp manager, the "data base administrator," or even a consultant or a corporate MIS manager.

It may at first appear that this implementation structure is merely additional overhead. However, as presented, it requires neither additional employees nor full-time effort from existing employees.

(Management should also remember that the systems infrastructure itself represents a great deal of overhead.) The cost of inefficient or ineffective systems will, in the long run, be much greater than the cost of establishing and maintaining this people-oriented implementation structure to manage and control systems and automation.

## SUPPORTING TECHNOLOGIES

Given an implementation structure and a set of implementation processes, can we assume that a firm can successfully implement its manufacturing systems plan? Probably. Certainly, the odds favor success. But, there are some other factors which can improve the odds even more. We call these factors "supporting technologies" because they were not developed for just systems implementation and can be useful in other areas.

Of the many supporting technologies, three stand out: 1. problem solving, 2. team management, and 3. training.

Problem solving is a critical part of any management effort and no less so for systems implementation. There are many formalized problem solving methodologies, and one should be chosen to support the implementation processes.

An example of a good problem solving methodology is the Kepner-Tregoe methodology. This rigorous approach divides the basic issues of problem solving into three main categories, each of which has its own formal, forms-oriented procedures. The three categories are Problem Analysis (for existing problems), Decision Analysis (for evaluation and selection of alternatives) and Potential Problem Analysis (for anticipating problems). The complete methodology is too elaborate to explain here, but its rigor and simplicity lend a much needed dimension to systems implementation. Certainly, SMT members, project team members and the DRA and the IRA should be trained in all aspects of problem solving. These methodologies should be used for hardware and software selection, implementation problem analysis, technical procurement evaluation, and the like.

In addition to problem solving technology, there is a need for team management technology. There are many formalized systems for team management. A good example is A'S/M (Adizes' Synergetic Methodology) from MDOR, Inc. A'S/M has some very powerful techniques for defining team tasks, membership and roles, and even for defining intrateam relationships. Of equal importance is instruction on how to conduct meetings, how to man-

age conflict in meetings and how to stimulate participation of team members. Meetings are at the heart of systems implementation, and SMT members and project team leaders should be trained in this very important technology.

The third vital supporting technology is training. The need for and value of training should never be underestimated. Though there are many technologies, it is not important that just one be chosen. What is important is that it should be approached formally and professionally, employing a variety of techniques: video tape, movies, seminars, slide presentations, outside and in-house classes, etc.

A minimum training program should cover: long-range business plan, the data base model and the computer/communications technology plan (all from Part 2), the implementation processes, the implementation structure and the supporting technologies.

The concepts presented in these three articles are neither elegant nor perfect. In fact, some will insist that whatever sharpness or clarity they provide is at the price of distortion or misrepresentation because of over-simplification. However, it is hoped that this model of manufacturing systems planning is not perceived so much as a tool for explaining or predicting as it is a means of polarizing thinking and posing sharp questions. It could be useful in establishing a common language which manufacturing managers have needed for a long time. The language is a language for manufacturing systems planning. But manufacturing managers should remember that there is no one absolute right way to go about introducing automation to improve the productivity of their enterprises. The right way is the way that works, and the rightest ways are those that work the longest. To achieve longevity, management must design to long-term objectives (productivity) and they must include flexibility as part of the design. So, too, must they deal carefully and intelligently with the problems of implementation and training. None of these, of course, can be done to the exclusion of the design aspects of the system, i.e., "what you are automating." But management should remember these words from Gerald Weinberg: "Systems are thoroughly man-made. . . . When we include a given relation in a system, or omit it, we may do well or ill, but such an inclusion creates no truth, and such omission indicates no falsity. The justification for one's procedure, in this respect, is purely pragmatic. It depends upon the relevance of what is included or omitted to the purposes which the system is designed to satisfy." \*

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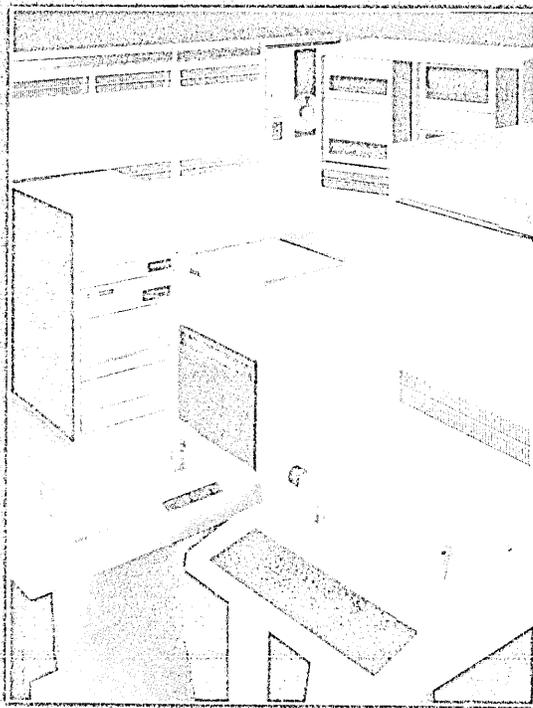
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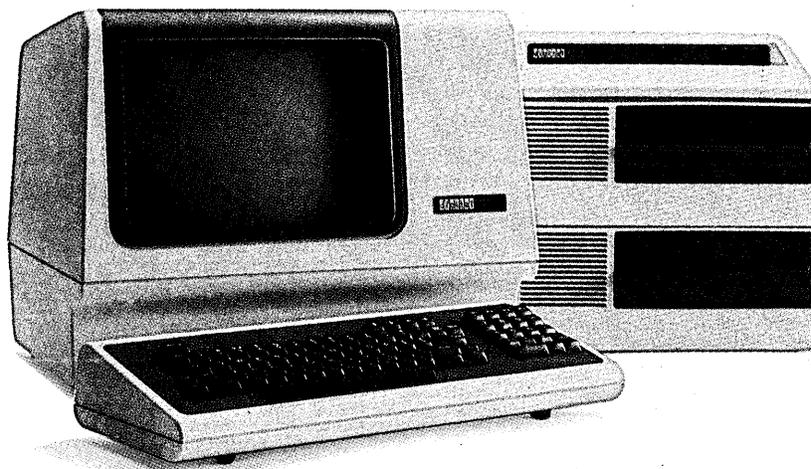
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Layered architecture, data base capabilities, improved integrity — no doubt about it, it's a hot small business system.

# THE IBM SYSTEM/38

by Dale N. Reynolds  
and G. Glenn Henry

The System/38, a small business system announced by IBM's General Systems Division last October, was developed in conjunction with several licensed programs — the Control Program Facility (CPF), the Interactive Data Base Utilities (IDU), and RPG III, an enhanced version of RPG II. These programs provide data base capabilities, improved integrity and authorization features, and other functional enhancements; fundamental to providing these capabilities is the architectural principle of layered design and implementation.

Supporting the system's integrated functions are horizontal layers, each providing a cohesive interface independent of the implementation details of the other layers.

System/38's RPG III and IDU, the top layer, provide traditional high-level language and utility interfaces. CPF, the next layer, presents two major interfaces, each of which is extendable and shields the user from implementation characteristics. The system does not, for example, require a special control language for system operators, another for work station users, and others for programmers, system utility users, and so on. Rather, it offers a single control language that gives access to all user CPF execution functions across a high-level interface.

Similarly, a single interface, the Data Definition Specification, supports both data base and device file definitions and thus permits the easy interchange of devices and data base files without modifying programs or file definitions.

However, the most significant consequence of the system's layered structure is the next layer: a high-level machine instruction set that directly supports several of the system design objectives:

- to make programming independent of machine implementation and configuration details, freeing the user from concern with the characteristics of the hardware;

- to provide high levels of integrity and authorization as fundamental capabilities built into the system with minimal overhead;
- to minimize programming development effort and reduce redundancies by providing standardized "common" functions in the machine; and
- to provide a stable, yet extendable, architectural base for future expansion and evolution.

These objectives were based on experiences with earlier systems where dependence upon specific low-level instruction interfaces limited the user's ability to exploit new technology and to implement new functions. He was limited, for example, by his dependence upon hardware-implemented address size.

In the System/38, such hardware dependencies are absorbed by microcode functions that provide an instruction interface largely independent of hardware details, thus freeing the user from responsibility for hardware addressing, allocating and addressing auxiliary storage, and concern with internal data structures and relationships.

We will describe some of the major features of the System/38 instruction interface and how it supports the advanced capabilities provided by the total System/38 offering.

**OBJECTS** The building block of the System/38 instruction interface is the object, and the system's addressing structure and operations are oriented more toward objects than to byte strings.

All data structures in the System/38 instruction interface are called objects: some are similar to the programs and data files of conventional systems; some are unique to the System/38. All object types have the same fundamental characteristics: detailed internal formats are not directly observable, the machine — not the user — manages the space required for the object, and its contents are operated upon only by using specific function-oriented instructions.

Once a data space object has been

created, for example, records may be inserted into it without concern for the actual location of the records, their internal storage format, or the management of the space they need.

A variety of instructions are provided to create, delete, and modify objects. Many of these instructions are generic, applying to all types of objects. Some objects have unique instructions associated with them. In all cases, these instructions treat an object as a self-contained logical entity and provide implicit authorization, lock enforcement, and shared or exclusive operation.

To provide these capabilities, System/38 objects are encapsulated, which is to say that their internal structure is accessible only to the machine. Object integrity is, thereby, built into the system and, should the machine instructions interface later be implemented differently, that fact would not affect, or even concern, the user.

For situations where bit- and byte-oriented operations are needed, however, a special object called a space can be created. Within this object, the user can reference individual bytes and is unconstrained in operating on these bytes. A space can occupy up to 16 megabytes and can be attached to any encapsulated object. It is, in effect, a "scratch pad."

There is no limit on the number of objects that can be created on any System/38 machine other than the size of auxiliary (disk) storage. Some objects have a size limitation of about 16 megabytes, but many, such as data spaces, effectively have no size limitation.

**ADDRESSING** The most striking difference between System/38 and conventional machine architectures is in its addressing mechanism: it is object-oriented rather than byte-oriented, and addresses are not used as data. There are pointers rather than addresses, there are no registers, and individual bytes within objects (other than within space objects) cannot be addressed.

Addressing across the System/38

interface occurs in two ways: pointers address all objects and bytes within space objects, and program operand addressing deals with program references to a space object's values.

**POINTERS** All interface addressing of objects is done by resolving user-supplied symbolic names to a pointer — a 16-byte area contained in a space object. Among the pointers available are a system pointer for addressing objects — to create or destroy them, to examine and modify their content — and a space pointer, which enables direct addressing of bytes within a space object.

Pointers, of which any number can be defined by any program, are used only for addressing. Even though pointers are embedded in space objects, they are identified in storage by special "tag" bits which enable the machine to protect the pointers' contents from misuse or accidental modification. The tag bits are not accessible through the instruction interface; instead, specific instructions are provided to set or manipulate pointers in a controlled manner and standard byte-oriented operations cannot be used to compromise pointer integrity.

In addition to identifying the object, a pointer can contain data about the status of the object, authorization characteristics and, for a space object, the assumed attributes of the bytes addressed. Thus, a pointer represents more than an address: it also defines a capability for using the object.

The resolution of symbolic names to the internal address set in a pointer is

accomplished by using an addressing object — a context. A context logically consists of a catalog of object names and their associated internal machine addresses. Different contexts may be specified to alter the execution environment. The production and test versions of files and programs, for example, can be located through different contexts. Thus, by simply exchanging the order of contexts searched in resolving a name to an address, either programming environment can be established.

**PROGRAM OPERAND ADDRESSING** Operands referenced in program instructions are defined in a program dictionary, separate from the instructions. Instruction operands are in effect index references to the dictionary entries that define such operand characteristics as data type and data length, binary, zoned, decimal, packed decimal, character, and pointer.

As for objects, the machine allocates the actual storage used for the operand values; the program dictionary defines attributes and relative location characteristics.

Having instructions refer to the dictionary for operand characteristics gives the system significantly more capability than lower-level interfaces can offer.

For example, computational instructions are generic with respect to data type and length. The instruction interface has, for example, only one numeric ADD instruction which operates on whatever data is defined in the dictionary. Thus, source and receiver operands of varying

type, length, and decimal positioning can be used, the machine performing all conversions and scaling.

Another example of additional capability is that arrays may be defined in the instruction interface. To locate specific elements of the array, instruction operands support array indexing.

Also, because applications often operate on multiple data formats, some (e.g., copy) instructions support late binding of data definition, where the definition — type, length, decimal positioning — need not be specified until the instruction is executed.

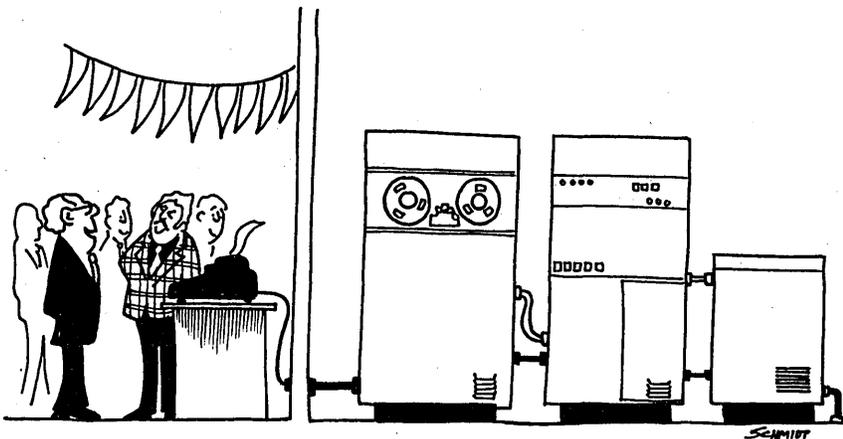
Inherent in System/38's object-oriented addressing mechanisms are high levels of integrity and authorization. The encapsulation of user information in objects prevents their misuse, it being impossible to create a pointer that directly addresses such information. Further, the addressing mechanism itself incorporates authorization checking.

Pointers are protected against invalid use or modification, and the use of the object addressed implies authorization checking. A user profile, itself an object, identifies each user and the objects he owns. A user may delegate to other profiles various authorities to operate on his objects. But processes (which are similar to "tasks") execute under a specified profile, and object-access authority mechanisms verify that the referenced objects have been authorized to that user.

**SINGLE-LEVEL STORAGE** Internal to the machine, the object-oriented addressing scheme is supported by a new single-level storage management implementation: all storage — auxiliary and main — is treated as a single, uniformly addressable space. Nor is auxiliary storage differentiated into areas of use, with different addressing mechanisms, as are conventional virtual storage systems, where data files are not included in the virtually addressed area. The System/38 hardware and microcode provide the ability to manage a very large address space (an internal address in the current implementation is eight bytes) which means that each object in the system has a unique address.

That approach allows storage to be efficiently managed by the machine using sophisticated algorithms, without user involvement or awareness. Traditional concepts of file overflow extents, file block sizes and buffers, and physical placement of data on disk, are not meaningful on System/38.

System/38's high-level instruction interface provides many powerful programming-support functions, some of



"You've convinced me—that baby sure does a lot for a minicomputer."

which are:

**Program Management.** The instruction interface provides functions that support programming constructs more directly than in traditional machines. Programs are, for instance, invoked through call/return functions defined in the interface. Argument/parameter functions provide communication between programs. The machine initiates and allocates storage for program variables within a process, and the high-level language concepts of "static" and "automatic" storage allocations are provided.

**Integrated Data Base.** System/38's data base capabilities, provided through the combination of IBM licensed programs and machine functions, are integral in its design and have a unique physical/logical file structure that combines aspects of relational, hierarchical, and network data bases. The System/38 instruction interface directly supports this total system capability.

All records stored in a given data space object (the machine container for records) have the same format. A data space index object provides for the logical reordering of records in one or more data space objects. The reordering, based on keys made up of field values in the records, can be: logical reordering of records within a data space, logical merge of like format records from several data spaces, or logical hierarchical ordering of records of different record formats from different data spaces.

The machine instructions directly provide GET, PUT, UPDATE and DELETE functions as well as supporting concurrent use of files and maintenance of data space indexes.

**Indexes.** Another of System/38's significant new features is its machine support for creating, using, and maintaining indexes on a systemwide basis.

The machine uses that capability to support such basic machine functions as data base, contexts, and storage management. It also provides access to that capability at the machine interface for use by CPF, RPG III, and IDU.

The index facility uses a multi-way tree structure designed to minimize paging overhead and also to yield the generality, performance, and range of function required for many kinds of operations.

**Processes.** System/38 can support concurrent batch and interactive processing and program development activities. It can do so, moreover, while workloads and priorities are dynamically changing, a capability arising from concentrating in the machine the functions that support those activities.

The System/38 instruction inter-

face supports multiprogramming through processes. Somewhat similar to what in other systems may be called "tasks," processes are the bases for managing work in the machine. The user initiates them and controls their number, priorities, and relationships to the cpu and storage. Having initiated a process, he leaves it to the machine to allocate and manage needed resources. This level of multiprogramming support puts all processing across all system activities under the control of a single machine provided resource-management mechanism, an arrangement that reduces overhead and more efficiently manages resources.

**Queues, Messages, and Events.** Integral in System/38's instruction interface and its process-management architecture are queueing functions that support process-to-process communications. Basically, programs may enqueue messages to system objects called queues, and dequeue messages from them. When, in the latter case, the dequeue is unsatisfied, the process may wait for a message to be enqueued. When the message becomes available, the machine schedules the process to dequeue its message and continue processing. A flexible set of functions is available for operations on queues.

A System/38 program can also monitor asynchronous occurrences that take place during execution. The monitoring is performed by an event monitor, which specifies the kind of event to be monitored and the program to be signaled when the event occurs.

The user can monitor such machine-defined events as message enqueue/dequeue, machine check, I/O request completion, and the like, or he can define and signal his own events.

The availability of event monitors, especially for applications that involve communications and distributed processing, is an important feature of System/38's machine interface.

**OVERHEAD** A major problem in implementing a high-level instruction interface is that of overhead. To minimize it and to facilitate subsequent introduction of new technology, the System/38 instruction interface does not provide direct execution. Instead, the instructions and the operand dictionary are translated at the machine interface into a program object that contains, among other things, a microcoded reflection of the program. It is an internal representation, not apparent to the user above the instruction interface.

This implementation yields the advantages of a high-level instruction inter-

face and reduces overhead at execution time. It brings execution closer to the hardware and permits direct use of hardware-assisted, complex, system-wide functions.

When development of System/38 began, it soon became apparent that the accelerating rate at which technology was evolving offered two alternatives: use those advances to provide an improved version of today's systems — with their attendant problems — or develop an altogether new, advanced system.

The latter course was chosen and, in doing so, some challenging problems were confronted. The solutions developed for many of them represent unique data processing concepts.

These concepts were implemented under nearly ideal conditions. From the outset, System/38 was designed as a total system by a single organization at a single location, and implemented with new components — factors that eliminated problems of design mismatch. Conversion aids, designed at the same time, obviated the need to provide for emulation, further advancing the system's integral design.\*

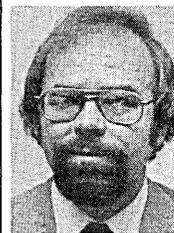
## DALE N. REYNOLDS



Mr. Reynolds is manager of design control for the System/38 high-level machine microcode. Now working in Rochester,

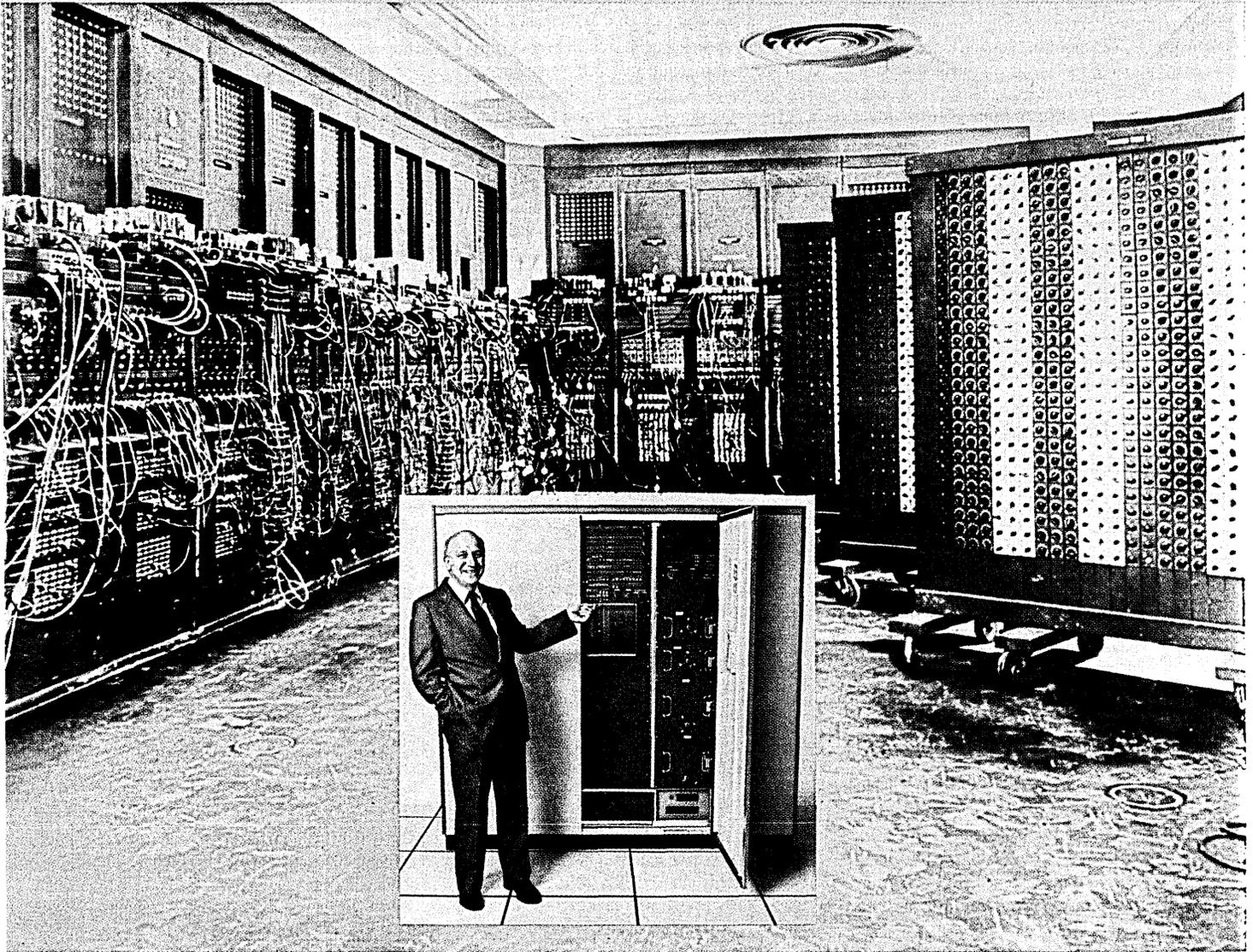
Minnesota, he has been involved since 1973 in the definition, architecture, implementation and performance of the System/38 instruction interface. Reynolds received his MS degree in computer science from the Univ. of Utah.

## G. GLENN HENRY



Mr. Henry is manager of programming for the System/38 at IBM, Rochester, Minnesota. He joined IBM in 1967 and has worked on a number of assignments on the IBM 1800, System/3 and System/32. Henry received his MS degree in mathematics from California State Univ., Hayward.

# WHO WOULD HAVE OF GOLIATH WOULD BE



Dr. J. Presper Eckert, vice president of Sperry Univac and co-inventor of the first electronic digital computer, ENIAC, poses with the 1100/60 computer (inset), and his giant computer, invented in 1946. Headlines that year announced the amazing Electronic Numerical Integrator And Computer "... that runs on over 18,000 vacuum tubes and performs 5000 additions per second!"

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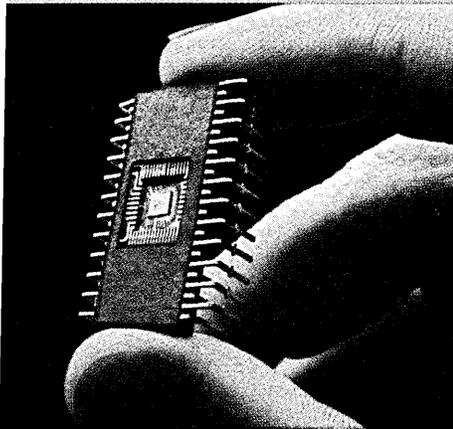
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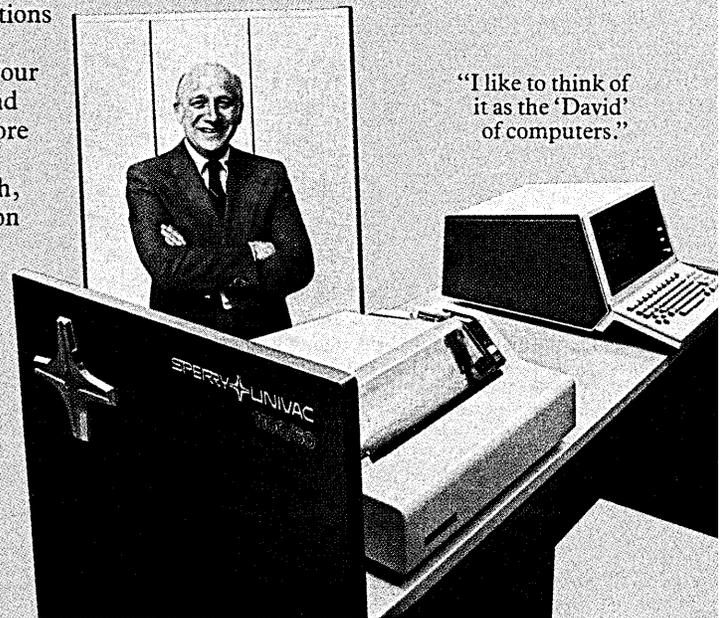
At the same time, we are introducing our new DCP/40 Distributed Communications Processor, the network control system that ties your entire system together and allows you to realize a more efficient, more flexible method of handling batch, interactive and transaction modes simultaneously.

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# 1100/60 COMPUTER.

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CIRCLE 55 ON READER CARD

When in the formative stage, the judicious use of wiggly lines can help maintain perspective on the knowns and unknowns of a system design.

# YOU SAY YOUR DESIGN'S INEXACT? TRY A WIGGLE

by Gerald M. Weinberg

"There's no sense being precise about something when you don't even know what you're talking about."

—John von Neumann

A few years ago we engaged an architect to design an office building for our rather unusual requirements—among other things, we needed a classroom with an adjoining swimming pool. Although the architect had never seen such a building before, he rather quickly sketched something like Fig. 1 for us to examine and criticize. We immediately saw that he had forgotten the fireplace in the classroom, so he added a chimney, as in Fig. 2. After an hour or so of such sketching and criticizing, he had drawn a picture that was pretty close to the building we eventually built.

Around the same time, one of my clients called in a consultant to implement a scheduling system. I happened to be present at the initial visit, to which the consultant brought a "high level sketch" of the system he was proposing to build. The "sketch," which was far too large to be printed here, consisted of carefully drawn boxes and arrows, much like those in Fig. 3.

The client seemed intimidated by the *apparent* completeness and precision of this "sketch." Very little information was exchanged, and the meeting soon ended. The consultant agreed to implement the system for a price.

A year later, when the system was delivered, it bore not the slightest resemblance to the initial "sketch." Moreover, it did not satisfy the client's requirements. When I asked the consultant what had happened to the initial design, he brushed me aside with the remark, "Oh, that was just a *sketch*. Certainly you didn't expect the finished system to look just like that."

Well, I did expect it, and so did my

client. Perhaps he knew the diagram was a sketch, but it didn't *look* like a sketch to us. That's where the trouble started. Data processing designers have always made sketches. Even Babbage sketched. But the sketch as a dp design tool has never achieved the status it holds in architecture and engineering.

Dp systems don't look like any-

thing concrete, which is sometimes embarrassing. We've probably tried to make them more substantial by representing them with straighter-than-straight lines and rightier-than-right angles. When I started designing systems, the only "tool" we had was the IBM template. We used it whenever we had the slightest chance.

In other design fields, nobody would think of using a template to draw a

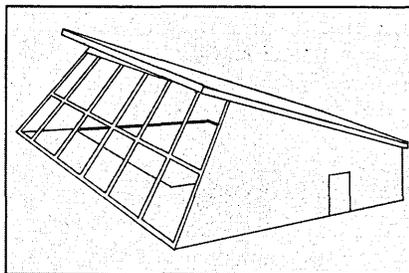


Fig. 1: Architect's sketch of a classroom/swimming pool for Ethnotech, Inc.

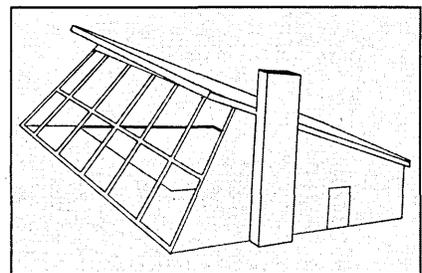


Fig. 2: Sketch with chimney added.

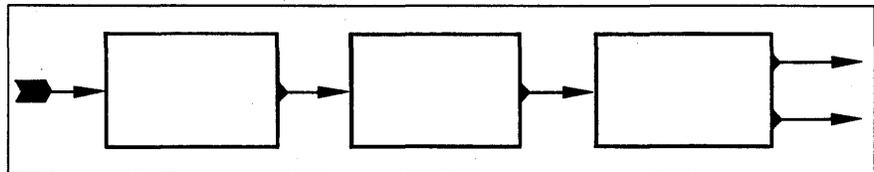


Fig. 3: Part of dp designer's "sketch."

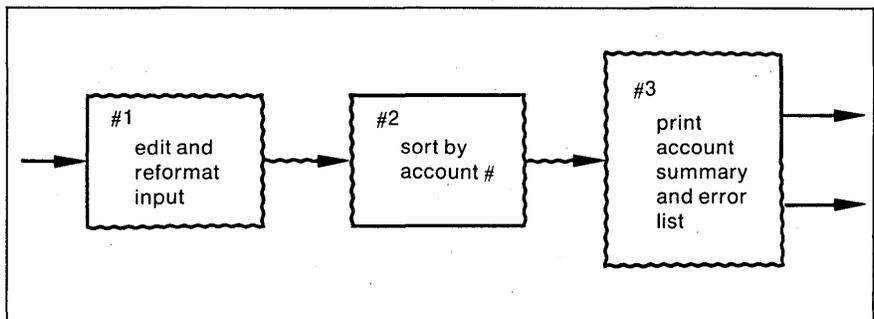


Fig. 4: A WIGGLE block diagram.

"sketch." Nor would they refer to a template drawing as a "rough." You can look at the work of an architect or engineer and *know its roughness by its appearance*. If a lot of design work has been done, it *looks* like a lot of design work has been done. If the ideas are vague, the very roughness of the sketch invites comments and criticism.

For many years I've taught a method of sketching that can be used with most of the diagrammatic techniques now used in data processing. Although it's been received with enthusiasm, it's never had much publicity, perhaps because:

1. it doesn't require a template, and
2. it doesn't have a name.

Although I'll continue to resist the template forces, I've decided to bring the baby to life with a catchy acronym: WIGGLE Charts, for Weinberg's Ideogram for Generating Graphics that Lack Exactitude.

### WHAT'S IN A WIGGLE?

A WIGGLE is merely a box or block or line with one or more rough edges. The rough edges indicate what parts represented by the box or line are imprecisely known. For instance, Fig. 4 is a sketch of a system using a block diagram form. Each box represents input coming from the left, processing inside, and output going to the right. Box 1 has a straight line at its left side, but on the right it is rough, indicating that we haven't decided what its output will be. All we know, as indicated in the diagram, is that some input will be passed to a second box. The top and bottom of Box 1 are rough lines, indicating that we don't know exactly what this process will be.

Box 2 has undefined input and output, but its process is well known to us, and clearly delimited in scope. Perhaps we have decided to use a package sort, though we don't know which one, so we haven't decided on a record format.

Box 3 takes the unknown output of Box 2 as its unknown input. By a process that's not yet well defined, it produces two outputs, one well defined and one that is known only roughly. Perhaps the first report is defined by legal requirements, or by input needs of another system, while the second output is an error report with the format left open at this stage of the design process. The rough arrows between the boxes indicate that we haven't yet decided how control will pass from one box to another. They could be subroutines of the same master routine, or steps in the same job, or separate steps manually coordinated.

Taken together, these three WIG-

GLE boxes and their arrows give a sketch of the overall design we have in mind. Perhaps more important is what they don't do:

1. They don't give us, or any reader, an unjustified feeling of precision.
2. They don't intimidate anyone who has an idea about changing some-

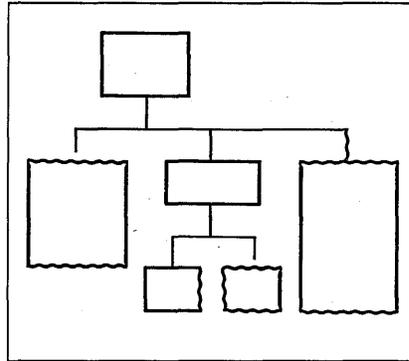


Fig. 5: A WIGGLE Visual Table of Contents from a HIPO system. (Each box has an input on left end, output on right.)

the design. The wiggle of the vertical loop is quite small, perhaps indicating that we're not sure if the loop is to be done  $N$  or  $N+1$  times. Similarly, the slanted wiggles on the decision are small, indicating, perhaps, that we don't know just where the "equal" case will go. But the wiggles dividing the right branch of the decision in-

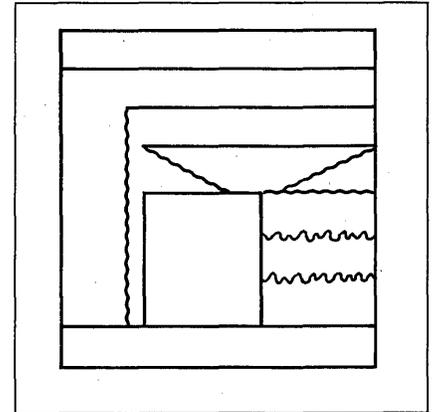


Fig. 6: A Nassi-Shneiderman WIGGLE.

thing that might improve the design.

3. They haven't wasted a lot of time drawing with templates.

Perhaps the nicest feature of WIGGLE charts is that they can be used with just about anybody's diagrammatic technique. Fig. 5 shows a hierarchic WIGGLE, or a WIGGLE Visual Table of Contents (WVTOC) for use with a HIPO system. In this application of the WIGGLE, as in Fig. 4, the overall size of the boxes can be used to indicate (roughly) how big an effort we see in building this box. Alternatively, it can be used to approximate how much execution time or other resources we expect to be consumed here.

Fig. 6 shows a Nassi-Shneiderman WIGGLE. In this chart, the extent to which rough lines wiggle indicates roughly how uncertain we are of the particular part of

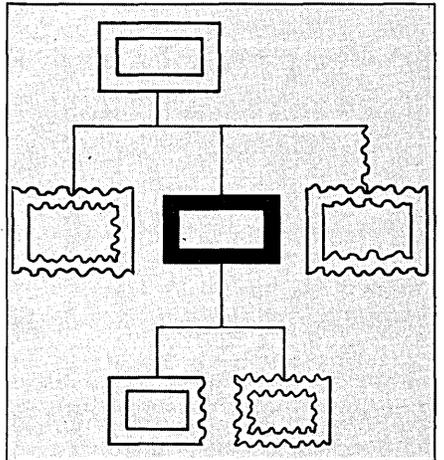


Fig. 7: A double-walled WIGGLE showing design (outer) and implementation (inner).

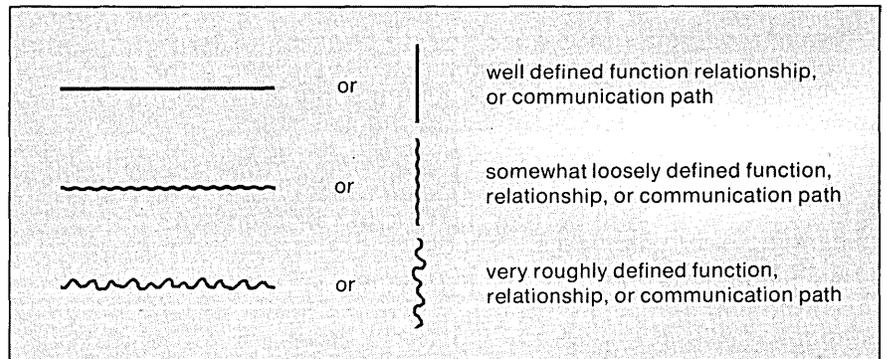
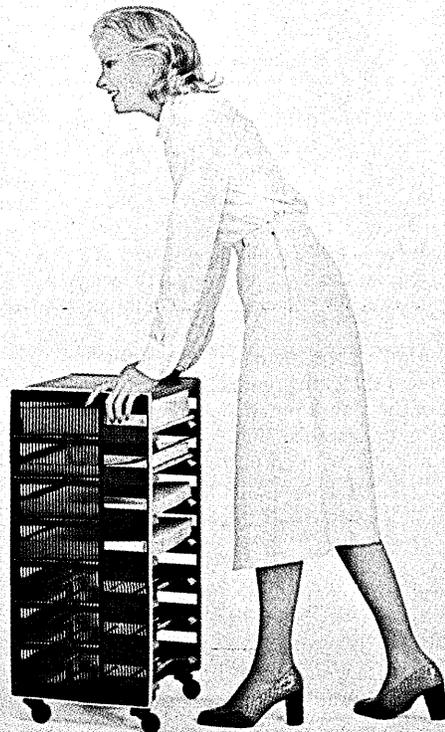


Fig. 8: The WIGGLE system condensed to a few simple rules that can be applied to any graphic scheme.



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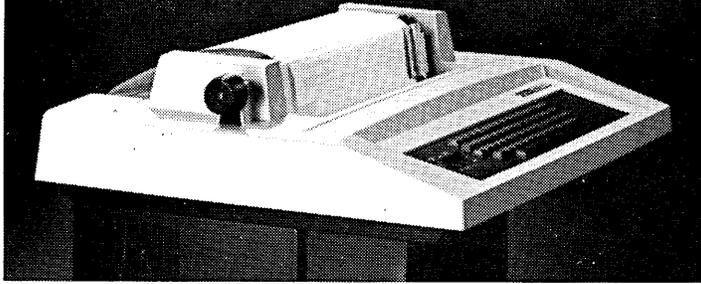


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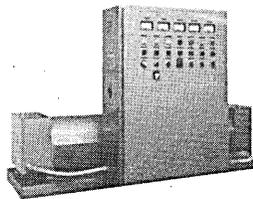
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CIRCLE 51 ON READER CARD

to three boxes are very large, indicating great uncertainty about the functions to be performed here.

### EXTENDING THE BASIC WIGGLE

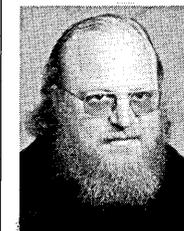
Many of our clients have picked up the idea of WIGGLE's and have extended them in many directions.

For instance, a double border on a box can represent definition (outside border) and implementation (inside border). In that notation, you can tell at a glance the status of a system that is being implemented in a phased manner, as illustrated in Fig. 7. The heavy border indicates an off-the-shelf item, which is both designed and "implemented" in the same moment. One of the lower boxes is actually implemented although the output design isn't finished. This indicated that a simplified output has been implemented, to be replaced later by a more refined output when the user has accumulated experience with the system.

Fig. 8 shows the general intuitive key for reading WIGGLE's. Why not arise and throw off your templates? Give it a try, perhaps in the privacy of your home! Or, if you've been WIGGLing all along, come out of the closet and be proud of what was once considered an untidy disease. If you have the courage, you may find, as we have, that:

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3. You don't feel that you're lying about the precision of your rough ideas.
4. You're having fun you haven't experienced since kindergarten, giggling at your WIGGLE. #

### GERALD M. WEINBERG



Mr. Weinberg is the president of Ethnotech, Inc. His current efforts are directed toward development and publication of more effective

training instruments. Among his professional positions are many years with IBM and at the School of Advanced Technology, SUNY/Binghamton. Jerry writes a regular column in DATALINK (Europe), and is series editor for both the Winthrop Computer Systems Series (books) and the Brady Computer Systems Series (audio-visual).

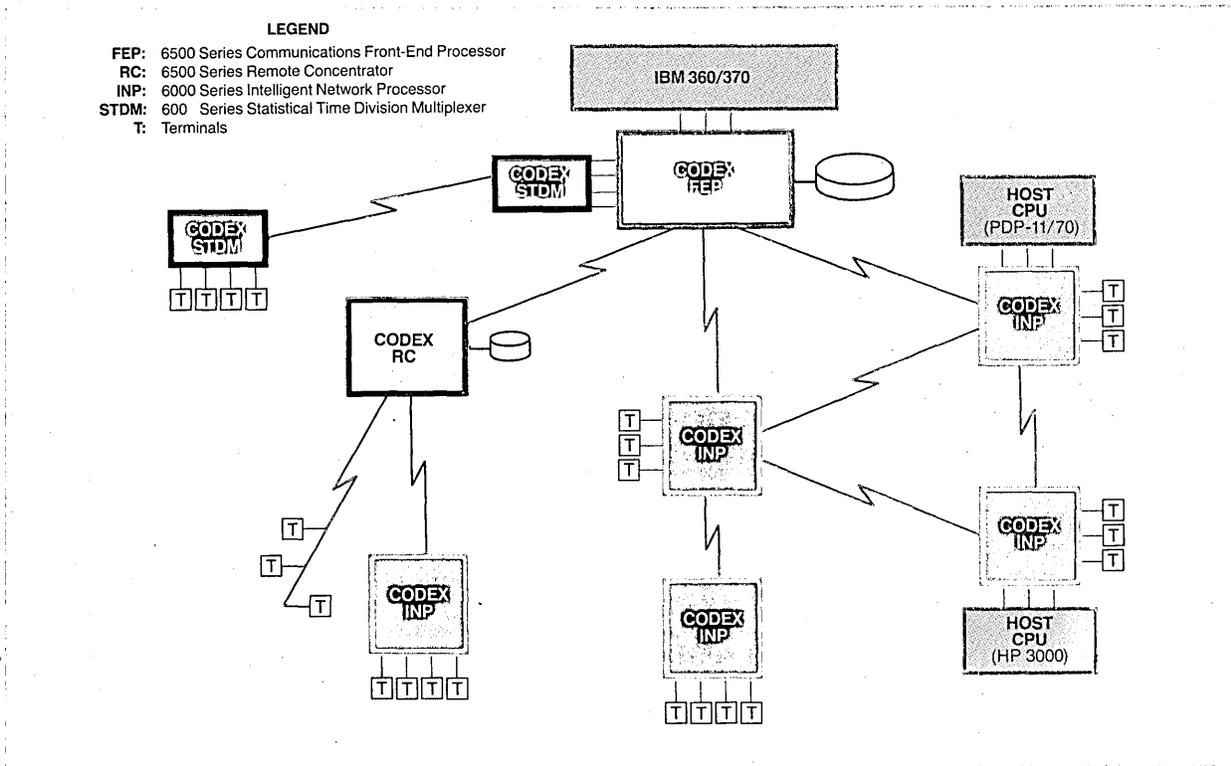
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CIRCLE 26 ON READER CARD

## OUT OF RETIREMENT

Although he's not quite 54, William C. Klink has come out of retirement twice to return to the work force, most recently last February to become president and chief operating officer of Scan-Data Corp., a Norristown, Pennsylvania manufacturer of ocr-based data entry systems.

Of course, Klink never thought of his two retirement periods as permanent. The first one only lasted four months; it was "a time to take a rest." He had just sold a steel mill—the one where he had started as a laborer in 1943.

The second "retirement" began in March 1977 when he left International Timesharing Corp. in Chaska, Minnesota. There, he had served as president and chief executive officer; he sold ITC to United Telecommunications Inc. in 1975 with the agreement he stay on for at least one year.

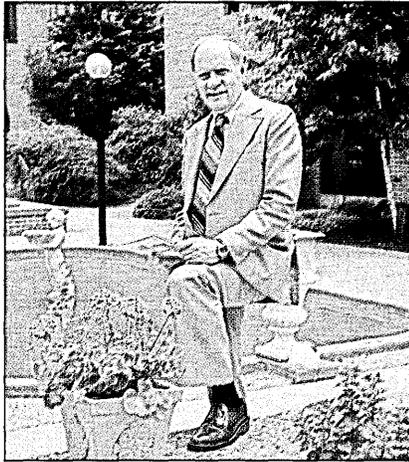
"I'd promised myself that at age 50 I'd take two years off so my wife and I could do what we wanted." What Klink did was travel and acquire classic/antique/special-interest cars at auctions or wherever else he could find them. His prizes include a 1915 Model-T Ford, a 1965 Mustang convertible, a 1973 Mustang convertible, "one of the last of the big Cadillacs" (manufactured in 1976), a 1957 Thunderbird, and a 1963 Thunderbird. His cars are not just for show, he tries to drive them all from time to time.

In his latest "retirement," Klink even moved to a retirement community—Sun City, Arizona. And while he and his wife moved into a new home in Devon, Pennsylvania in June, they're keeping the Sun City house for weekends and a possible future retirement.

Following graduation from high school in Pittsburgh in 1943, Klink attempted to enlist in the service but was unsuccessful because of a perforated eardrum. So, he joined the steel company which he later bought. How did he manage this? "I sold things and borrowed. I didn't realize I'd need working capital."

Years later, when he was in the computer business, he was in an atomic energy plant in Richland, Washington and he saw parts machined in his Pittsburgh steel mill which were for the first atomic bomb. "We didn't know what they were for."

While still with the steel mill, in



WILLIAM C. KLINK — He promised himself two years off.

1955, Klink purchased a computer, an LGP 30 from Royal McBee. "I used it for things it wasn't supposed to do, like payroll." So, when Klink was ready to come out of his first retirement, he was sought by Royal McBee. "They sent me to the Univ. of Ohio to learn how to use computers. At the end of seven months, they asked me where I wanted to work. I said, not Pittsburgh. I thought maybe Dallas. They thought San Francisco." That's where he went. "I stayed in a motel for the first month, then bought a house in Palo Alto where I've lived off and on for 25 years and still own."

Klink left Royal McBee in 1962 when the company decided to get out of the computer business. He joined Packard Bell Computer in Palo Alto where he worked for one year in the Northwest Region and sold seven computer systems to major manufacturing firms in the territory. While with Packard Bell, he decided the company's systems were too small. "I was selling to Philco at the time," he recalls. "I was doing well but Control Data Corp. was doing twice as well and, by mutual consent, I joined Control Data. They assigned me to a new division, data services. My territory included everything west of the Mississippi."

He later took over a CDC data center with "P&L responsibility." Subsequent jobs with Control Data included Eastern Regional Manager, Western Regional Manager, and General Manager, Data Services, Europe. In December 1972, he left CDC to become president, chief executive officer and chairman of the board of International Timesharing. "They made me an offer I couldn't refuse.

I was asked by a CDC officer why, after refusing to work in Minneapolis for CDC I was willing to do it for another company. The offer was the answer. It was a turnaround need and I accepted the opportunity and the challenge." While with ITC, Klink did turn the company around. "I bought a division of Honeywell and Allen Babcock Computing Inc. of Los Angeles then sold the package to UTI."

Now he's once again in a turnaround situation and he's optimistic.

"When I decided it was time to think about going back to work again, I called Bob Burns (then president and still chairman of the board of Scan-Data) and asked him how his company was doing." The next thing Klink knew he was visiting the company in Norristown and shortly thereafter he'd agreed to join.

"I knew a lot of people, people I'd worked with before at Control Data (including Burns)." And he was encouraged by a cooperative business agreement Scan-Data and Control Data signed in mid-1978. Under the agreement, Scan-Data assumed U.S. marketing responsibility for Control Data ocr products.

Klink said he has brought with him to Scan-Data some operating philosophy learned at Control Data from CDC president William Norris. "I'm big on communications. Norris was too. He had regular meetings with people from middle management on up. I carry it farther. I hold quarterly meetings with everyone from the janitor up."

He also visits every Scan-Data office at least once each month and plans to make regular visits to the company's distributors in this country and Europe.

## A TOUGH DECISION

Marisa Bellisario was beaming. Good things have been happening to the young president of Olivetti Corporation of America. Since last February, when she arrived in New York from parent company headquarters in Ivrea, Italy, Dr. Bellisario has been going at her customary pace—full speed ahead. The results are beginning to show.

The OCA announcement of its electronic typewriter in February has beaten IBM to the punch in time and technology. In just a few months, Bellisario had negotiated a contract with NBI in Boulder, Colo., to fill a void in the Olivetti word

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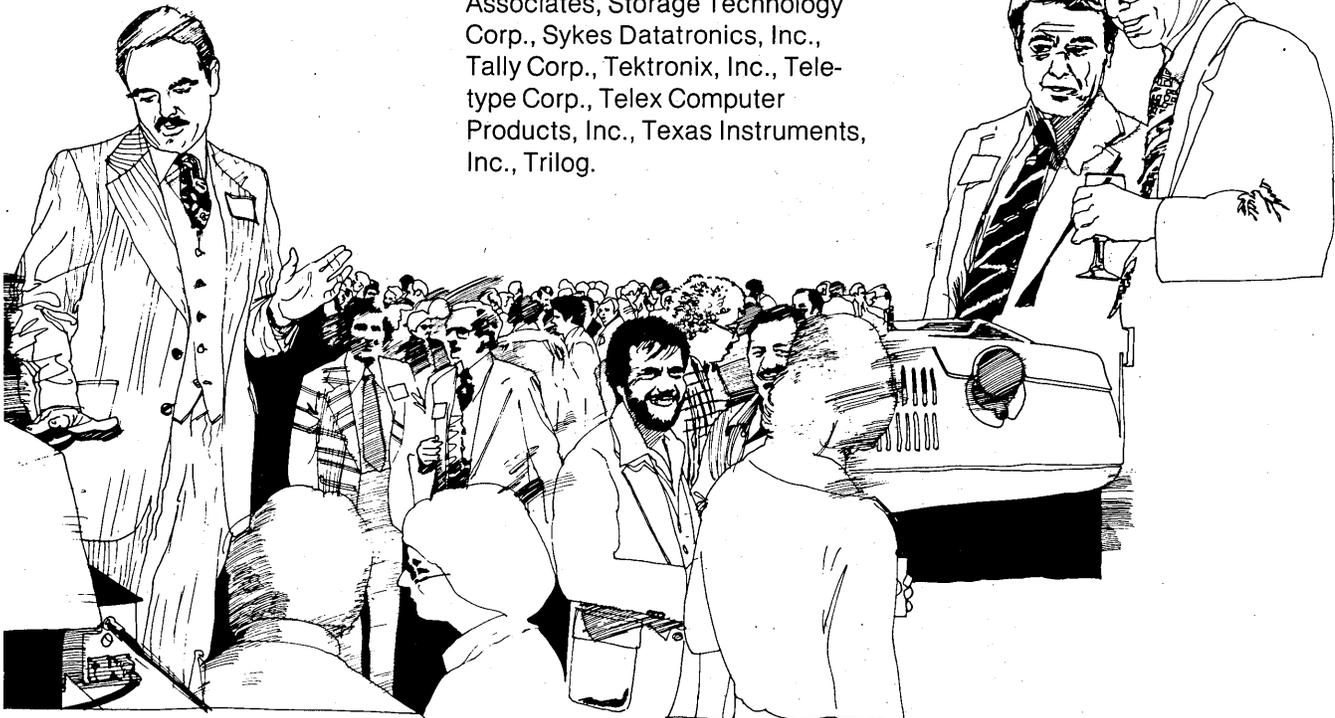
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	<u>\$1,929,861</u>	<u>\$1,703,506</u>	<u>\$1,404,229</u>

to a 132 column statistical tabulation on the same standard narrow 8 3/4" paper like this:

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	1978	1977	1976	1975	1974
INCOME:					
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OTHER INCOME, NET	10,873	16,810	20,787	13,005	12,956
	<u>\$1,929,861</u>	<u>\$1,703,506</u>	<u>\$1,404,229</u>	<u>\$1,176,209</u>	<u>\$1,026,313</u>

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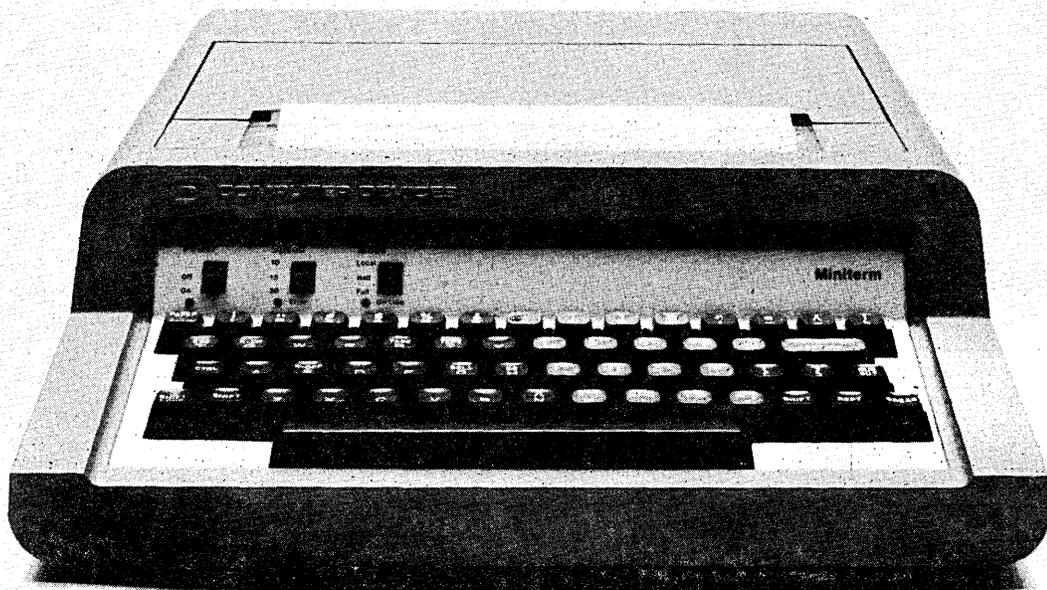
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## PEOPLE

processing line in the U.S.—a crt display unit based on the NBI 3000.

Olivetti's exhibition, "Design Process: Olivetti 1908 to 1978," had premiered its U.S. tour in Los Angeles to critical acclaim. And important news had come in from abroad: a consortium of Danish savings banks had announced Olivetti as the winner of its \$48.9 million contract for its distributed processing network. Bellisario had been the head of the distributed processing product group at parent Olivetti when the negotiations and product design had begun.

Each of these events are important

to the mammoth task now facing this new president: turning around the faltering operations of Olivetti Corporation of America. In 1978, OCA, on revenues of less than \$200 million, lost \$30 million. (Half was an operating loss.)

The electronic typewriter was significant in shoring up Olivetti's long-standing claim to some leadership in that market; it also shows that the company has successfully completed the painful transition from mechanical to electronic products begun less than 10 years ago (with Bellisario's involvement as corporate planning manager.)



MARISA BELLISARIO—Good things have been happening.

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The NBI contract was Bellisario's quick recognition that, unlike the European market, the U.S. word processing market demands page display capabilities *now*.

The Olivetti design exhibition represented two things for the OCA president. Historically, the corporation has put great emphasis on design, winning many awards internationally. Bellisario reflects that in today's office environment, excellent quality and design are both mandatory. The amorphous black box, she complains, "offends my sense of individuality; with computers becoming more and more a part of everyone's life, beautiful design is important." The exhibition, she feels, will also reassert the good image Olivetti retains in the U.S., despite its recent troubles.

The Danish savings bank order also will be critical in Olivetti's future in the U.S. Olivetti beat out incumbent supplier Datsaab and IBM and NCR.

In rapid-fire, heavily accented English, Marisa Bellisario quickly emphasized that her first priority is returning Olivetti Corporation of America to profitability by 1980. This means some rebuilding of the subsidiary's organizational foundations, now in process. It also means retrenching. Some of the Olivetti product line now offered in the U.S. will be allowed to fade away. The main emphasis will be on office products—typewriters and word processing systems—and on-line systems. While the latter, primarily in the form of the TC-800, are offered in the U.S. through three of Olivetti's 40 district offices, Bellisario does not plan a heavy push until after the return to profitability.

With characteristic candor, Bel-

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## PEOPLE

lisario readily admits that the parent company did not devise a well-focused strategy for the U.S. market. "We tried to enter too many businesses. Theoretically, a company can be very successful in the U.S., but it can not do everything at once."

The last few years were very painful learning experiences. In a hurry to establish its dp products in the U.S., OCA hired 90 new sales managers into its districts; they came from the small business computer operations of companies like Burroughs, Nixdorf, etc. Each had different ways of operating, she notes, and it

was very difficult to manage them. The result was great confusion and many left as quickly as they had arrived.

The lack of a focused strategy was costly. Bellisario notes by comparison that Olivetti offers its full product line in Italy—from calculators, copiers, and typewriters to small business computers. The sales and service force numbers 6,000. "In the U.S., we have only 2,000."

The first question asked around the world when a corporation executive is imported into another country to put out fires, is, does he understand the marketplace and the way of doing business? Put

an elegant young woman into that slot and the questioning becomes most acute.

Bellisario began her computing career right out of college, joining the infant Olivetti computer division in the early 1960s. (As she tells it, Olivetti invited her to take a programming course in Milan. She did, because "I liked Milano.") She and other graduates of universities in the area became the core of Olivetti's computer expertise. The opportunities were great, and she quickly moved into management.

The Italian market, however, wasn't big enough for Olivetti's pioneering ELEA computer, and in 1964 General Electric made a deal to buy out this operation.

Bellisario became part of the international planning team, comprised of GE's Phoenix operation, Bull GE in France, and the Italian group. This was her first exposure to trying to rationalize what was a "mess of products" and interests. And "the first thing I learned was English. I was obliged in the first few meetings not to speak, and that was very hard for me," she grinned.

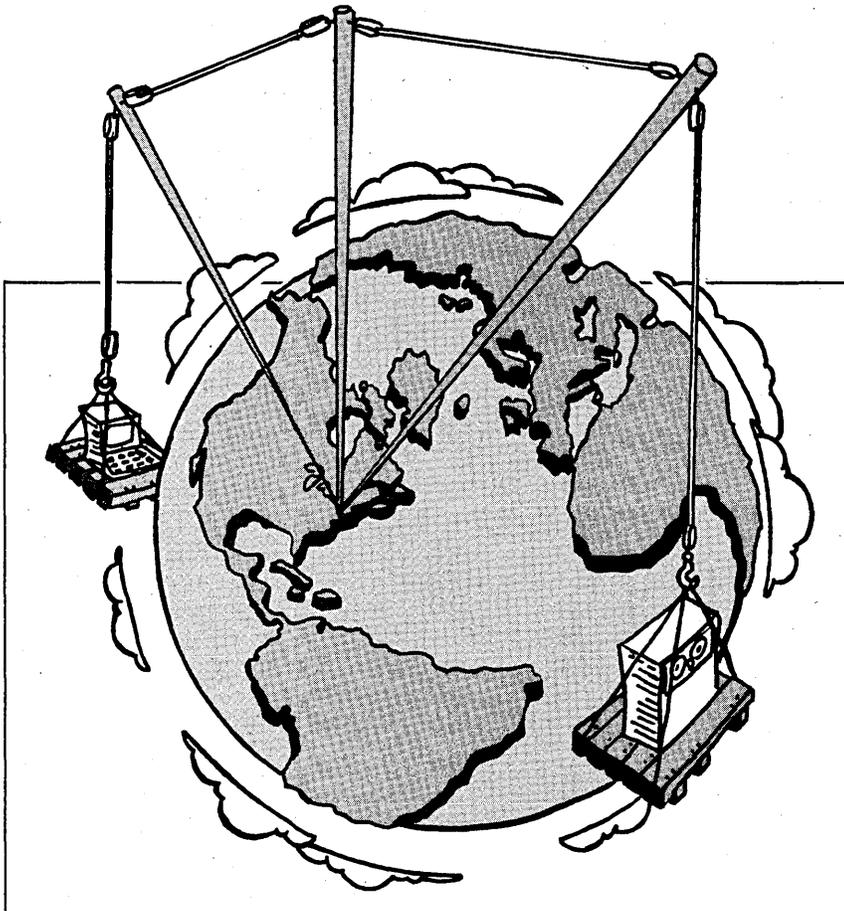
The experience was a good one. GE was a "very international and well organized company in policies, administrative systems, strategic planning techniques." She became a part of the now famous Shangri-La, GE's five-month brainstorming in Florida which was meant to devise a new product line. Bellisario's job was to head the market planning group, developing financial projections for the new line.

Shangri-La planning did evolve into some new products, but not for General Electric. In 1969, GE decided it could not afford the investment required, and sold out to Honeywell.

It was *deja-vu*. Now the disparate interests and disparate lines of these two companies had to be melded. Honeywell was more marketing oriented than GE, but more provincial, she recalls, having had almost no international dp operations. And executives there were surprised to see a woman as part of the management group.

As head of planning for what became Honeywell Information Systems Italia, she shepherded the development of a Shangri-La product that became known as the Level 62, while Honeywell Bull did the same for the Level 64.

Marisa Bellisario soon saw that there was nowhere else to go in HISI, since a talented young friend, Carlo Peretti, was ably directing it. In 1972, she moved back to Olivetti and tackled, as head of planning, enormous challenges developing there. Olivetti, an old line company, needed help in making the transition from mechanical to electronic products, and in developing intelligent terminals and distributed processing products.



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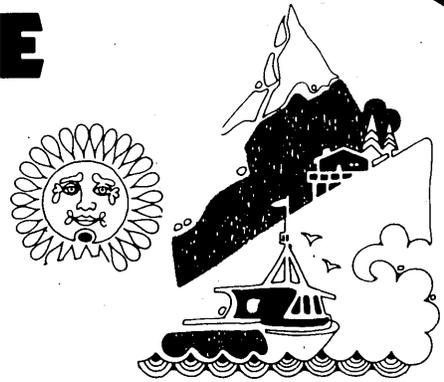
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## PEOPLE

She stayed in the planning post until 1978, when she was assigned her first line responsibility as head of all functions in the distributed processing products group.

Late last year, Olivetti had to decide what it would do with the faltering American operation. "It was a very tough decision," she said, and when the firm opted to remain in the U.S., she was given her first chance to be the top executive of a company. "This was a difficult decision for me personally," she notes, since husband Lionello Cantoni has a well established career in computing management (Fiat) and teaching.

The two decided she should tackle this assignment, which will last a minimum of three years. They will be hectic ones, filled with the problems of strategizing, reorganizing, and justifying OCA to the parent company. Bellisario now has most of her new management team in place and is busy convincing her employees in the U.S. that she means what she says and says what she means. They will have to run to keep up with her.

## AT NEW DESKS

ROBERT G. COSTAIN was named director of product planning at Pertec Computer Corp. . . . WARREN D. SEIDER was elected chairman of the Computing and Systems Technology Div. of the American Institute of Chemical Engineers. . . . EDWARD B. CODD was promoted to corporate director, management information services for Hoover Universal, Inc. . . . JACK M. MAC DOUGALL was promoted to director of worldwide marketing and technical support at Honeywell's Small/Medium Information Systems Div., Billerica, Mass. . . . GEORGE H. SOLLMAN was appointed vice president of Xerox Memory Systems, a newly formed organization within Xerox responsible for all rotating memory products. . . . National CSS appointed ROBERT FISCHER to a newly created position as president of its remote computer services. . . . Greyhound Computer Corp. formed a new subsidiary, EDP Marketing Corp. and named THOMAS A. TAKASH as president. . . . JOE MOLINA was named vice president-operations for Computer Automation's Commercial Systems Div. . . . PAUL B. SILVERMAN was appointed manager of business development and regulatory affairs for XTEN, a subsidiary of Xerox Corp. . . . JAMES E. ALEXANDER joined Pertec Computer Corp.'s Computer Systems Div. as national marketing manager. \*

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Would you enjoy the challenge of managing a major computing facility with state-of-the-art hardware and opportunities to apply your creativity to planning future development? The National Center for Atmospheric Research (NCAR) in Boulder, Colorado, has an immediate opening for Manager of its Computing Facility. NCAR is a national laboratory operated by a nonprofit consortium of 46 universities with doctoral programs in atmospheric science; it is sponsored by the National Science Foundation.

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The NCAR Computing Facility has a staff of 100 with responsibilities in scientific applications, data processing, and technical support. This large central facility supports atmospheric research at NCAR and in universities across the country. Its computing systems — the Cray Research CRAY-1, the Control Data 7600, and the Ampex Terabit Memory — provide the capabilities for large atmospheric simulation models and extensive data collection systems.

### POSITION:

As Manager, you will be responsible for planning, acquisition, systems design, and the operation of a central facility. You will interact with top management at NCAR, throughout the atmospheric science community, in government and industry, to determine user needs and acquire necessary resources, and you will monitor the effectiveness of activities and operations in order to ensure a high level of productivity and up-to-date facilities.

### QUALIFICATIONS:

To qualify, you should have demonstrated high-level skills in direct management of programs that involved planning, development, delivery, or use of scientific computing systems. You should have had substantial responsibilities in scientific computing, including solid and progressive management experience. You should hold a Ph.D. in computer science, physical science, mathematics, or engineering, or have had equivalent experience. You should be able to give evidence of the interdisciplinary knowledge needed to plan large scientific computing services, leadership skills, peer recognition (professional society office, fellowship, etc.) and good communication skills.

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# HARDWARE

## OFF-LINE

A color video graphics display chip, the Texas Instruments TMS9918, generates a standard NTSC composite video signal that can be fed directly to a monitor, or through an RF modulator to the antenna leads of a standard television. Designed as a peripheral circuit in TI's 16-bit 9900 microprocessor line, the memory-mapped device can display 15 colors. The chip has 3-D capabilities that allow objects on the screen to pass in front of one another, as if they were on different planes. The chip can generate text in a 24-line by 80-character format; character sets are held in RAM. Graphics resolution is 256 X 192. In addition to TI's 16-bit microprocessors, the 9918 can work with any processor driving a data bus at least eight bits wide.

Memorex has announced its second disk cache offering, the model 3750, for use with its model 3650 (317.5MB) disks. The microprocessor-controlled buffer memory sits between the cpu and the disk. It's slated for shipments beginning in the second quarter of next year.

Magnuson Systems Corp. and Booth Computer Corp. have entered a joint marketing agreement on Magnuson's M80 line of IBM-compatible mainframes. Magnuson also plans to extend its direct marketing operations, according to R. A. Becher, vp, field operations.

Digital Equipment chopped its memory prices for VAX-11/780, PDP-11/70, and PDP-11/34A by as much as 60%. For the VAX, pricing on 2MB of MOS error checking and correcting memory fell from \$70,000 to \$29,800.

## DP & WORD PROCESSING

This vendor, with longstanding presence in both the dp and word processing markets, chose NCC to launch a raft of products. The dp side of the house presented its largest mainframe to date, the VS 100, which (based on the vendor's figures) offers about an eightfold price/performance advantage over IBM's largest announced E-Series processor, the 4341. The word processing side joined with dp in the announcement of the Integrated Information System, a combination of both fields with entry points from either.

The VS 100, largest member of the vendor's family of virtual storage processors, is said to offer performance in the 370/158 and 3032 range, with prices starting in the neighborhood of \$69,000. The system supports both batch and interactive communications to a remote mainframe, and it handles both standalone and clustered remote workstations. The 32-bit machine has a 64-bit high-speed system bus, 32KB of cache, and provision for additional I/O processors. Main memory capacity ranges from 256KB to 2MB. The system is said to support up to 128 terminals. Separately licensed programming support products include language processors for COBOL, BASIC, RPG II, FORTRAN, PL/I, and assembler, as well as applications packages. A data management package, ADMS, will be available at no charge in January. A relational DBMS will be offered for \$15,000 come next September. For the quoted \$69,000 price, users get a 256KB processor with assembler and one other language processor; deliveries are slated for July 1980.

The Integrated Information System allows word processing users to expand into dp, and it allows vs-series computers to support word processing applications. In its basic configuration, the VS/WP Integrated Information System consists of a VS cpu, workstation (an intelligent unit capable of handling both dp and word processing functions), disk storage (ranging from 10MB to 2.3-billion bytes), and a printer. The new workstation, known as the 2246C, is basically an existing OIS workstation adapted to work on the VS; the workstation is said to handle 90% of the word processing workload. Software support on the VS provides compatibility between dp and word processing files. The 2246C workstation, available in September, sells for \$4,300; the VS word processing software goes for \$5,000.

For users moving into dp from the word processing side, the vendor has added BASIC language programming support to the existing OIS product line. OIS-based Integrated Information Systems also have the capability of sharing data between word processing and dp applications.

Tying things together, the vendor presented an electronic mail system, dubbed Mailway. Running on VS cpu's, the software supports interconnection of other VS systems, as well as OIS, WPS, and VS/WP systems. Mailway serves several functions: a post office function handles mail network management, making a VS serve as a distribution and control center; a mailbag function stores incoming mail until it is picked up by the addressee; a distribution function which either prints the mail on the printer closest to the addressee or stores it in his local system; and a gateway function, located in the distribution center, which allows access to any private or commercial data network. Scheduled for February deliveries, Mailway will go for \$2,000 per post office system.

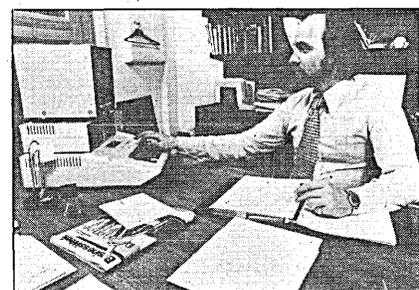
Finally, the vendor's Inter System Exchange, WISE, uses a 4Mbps coax data link to connect up to four OIS systems. WISE allows peripheral sharing, and sharing of document files (subject to security constraints). WISE will carry a \$5,000 per system price tag when it becomes available in December. WANG LABORATORIES, INC., Lowell, Mass.

FOR DATA CIRCLE 409 ON READER CARD

## PERSONAL COMPUTERS

Two of the leading personal computer vendor's chose early June to announce enhanced systems aimed mainly at professional applications.

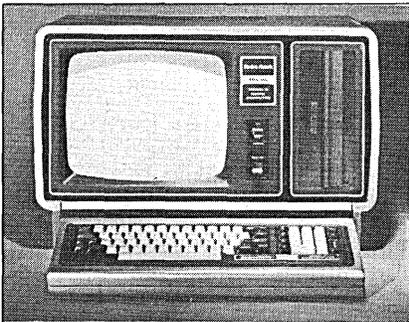
Apple Computer, which for its first two years of existence concentrated on the consumer market, chose NCC to announce its expansion into the business, scientific,



and industrial markets. The company announced an enhanced version of its popular Apple II computer, the Apple II Plus, as well as a number of business applications packages. The Apple II Plus includes Applesoft Extended BASIC (previously an added cost option) and a new auto-start control ROM. The auto-start ROM puts the computer into BASIC programming mode when it is turned on. For disk-based systems, the ROM can load and start a user specified program when the system is powered up. Screen editing is also included in the ROM. And, apparently addressing a complaint we've heard from several users who have inadvertently hit the reset key when they reached for the return, the reset key has been redefined to put the computer in BASIC mode without losing data or program instructions. The vendor also added Pascal language support, implementing UCSD Pascal as a plug-in option. Extensions have been added to exploit the Apple's color graphics and sound generation capabilities. The Pascal Language System consists of a plug-in memory card, five diskettes containing Pascal (as well as Integer BASIC and Applesoft Extended BASIC), and six manuals; a 48KB disk-based system is required to use the Pascal Language System. New business applications packages: The Cashier, an inventory control and cash register simulation system, Apple Post, a mailing list system, the Dow Jones, an extension to the existing stock Reporter system, and The Controller, a basic accounting package. An entry level Apple II Plus with 16KB sells for \$1,195, and the Pascal Language System is \$495. A packaged small business system including 48KB Apple II Plus processor, two diskette drives, video monitor, printer, and The Controller software, sells for \$4,995. APPLE COMPUTER, INC., Cupertino, Calif.

**FOR DATA CIRCLE 410 ON READER CARD**

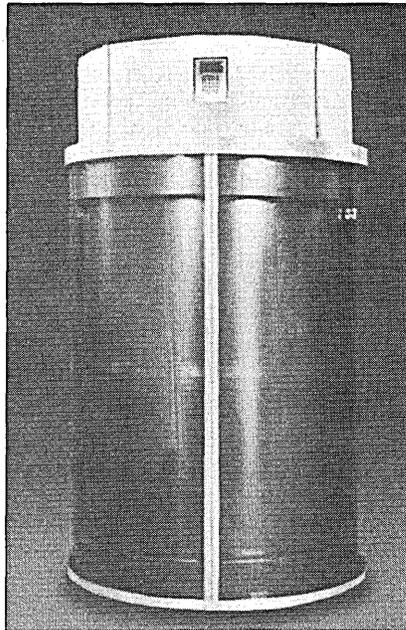
Tandy (Radio Shack) made its move at the Consumer Electronics Show, held in Chicago immediately prior to the NCC. Seeking to increase the capabilities of its popular TRS-80, the Texas electronics giant introduced the TRS-80 Model II, said to run at twice the speed of the original TRS-80 (which the firm will continue to market). Model II comes with either 32KB or 64KB of internal main memory, an integral 8-inch floppy drive, 12-inch video



## HARDWARE SPOTLIGHT

### ENVIRONMENT

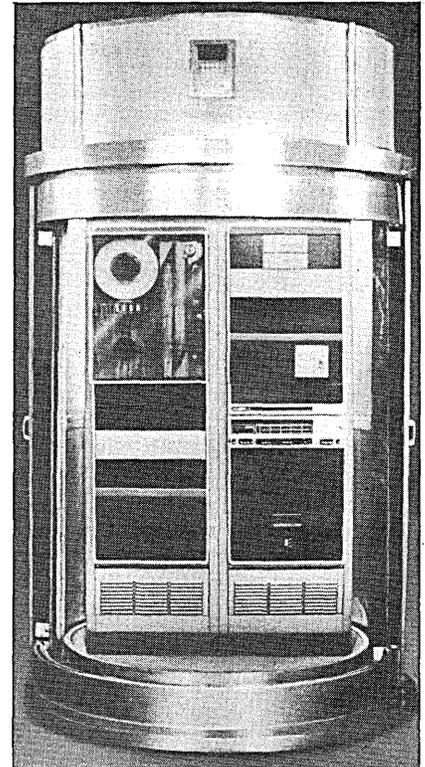
As an alternative to calling in the contractors and building a computer room, this vendor has developed the Enclosure 48, a



free-standing computer environment capable of housing your minicomputer and/or peripherals. The vendor cites a number of potential advantages to using Enclosure 48: it can be installed in significantly less time than it takes to build a computer room; it can physically protect equipment from the hands of unauthorized personnel; it protects equipment from the outside environmental hazards (dust and dirt, temperature, fire, and radio frequency interference); and, as a capital investment, it qualifies for an investment tax credit. If your system won't fit entirely in one Enclosure 48, several units can be used, so that—another level of protection—if a device catches fire, the damage should be limited to the equipment in a single enclosure, not the entire system.

monitor, a 76-key keyboard with 10-key numeric cluster (capable of displaying 24 lines of 80 characters). The system runs Level III BASIC, an upward compatible version of the existing Level II BASIC. Applications software is currently available for general ledger, accounts receivable, inventory control, mailing list management, and payroll. Model II also includes a self test feature that verifies correct operation every time the machine is turned on, and DMA disk transfers. The computer comes with two RS232 ports and a Centronics printer port. A 32KB, one diskette system sells for \$3,450. RADIO SHACK, Div. of Tandy Corp., Fort Worth, Texas Bingo #

**FOR DATA CIRCLE 411 ON READER CARD**



Enclosure 48 consists of a five-foot diameter rotating floor, surrounded by fire-rated composite paneling, automatic fire-rated doors and impact resistant plastic doors. Also included in the basic units are an uninterruptable power system, fire detection head, and an energy-efficient 12,000btu HVAC (heating, ventilating, and air-conditioning system). Options include a microcomputer system with sensor data acquisition, and an automatic Halon fire-suppression system. A basic Enclosure 48 sells for \$26,313, with options ranging from \$290 for a modem allowing remote access to the most expensive option, the \$6,975 microcomputer sensor system. TRANSACTION SECURITY, INC., New York, N.Y. \*

**FOR DATA CIRCLE 408 ON READER CARD**

### LARGE CHARACTER CRT

Founded by a blind man and backed with money from the Small Business Administration, this company aims to help develop vocational and educational opportunities for the handicapped; the firm also supplies consulting services to businesses facing up to federal regulations regarding employing the handicapped.

The Large Print Video Terminal (LPVT) is a product aimed at helping companies meet federal affirmative action computer accessibility requirements. The ASCII crt displays characters in three sizes: standard (3/16-inch), double height (3/8-inch), and giant (1 1/2-inch). Eight interchangeable foreground and background colors can be selected from

## HARDWARE



the keyboard. The terminal has a window feature that allows the user to scroll over an entire 48 by 80 screen; users can scroll horizontally and vertically. The LPVT comes with a 19-inch (diagonal) display, separate ASCII keyboard with a 16-key numeric cluster and eight-color pad, and an RS232 interface good for data rates ranging from 110bps to 9600bps (1200bps maximum speed for large print). The LPVT sells for \$9,000. ARTS ASSOCIATES, INC., Boston, Mass.

FOR DATA CIRCLE 412 ON READER CARD

### PASCAL PROCESSOR

Almost since day one of the S-100 personal computing age there has been a market

for enhanced, bus-compatible processor boards. Often the enhancement centered on replacing an 8080 microprocessor with a faster Z80; the latest upgrade to come to our attention is the Pascal-100 processor, a 16-bit, S-100 compatible add-in making use of Western Digital's Pascal Microengine chip set (see December 1978, p. 229).

The four chips developed by Western Digital combine to make a processor that runs Pascal P-code. The implementation is based on UCSD Pascal, and runs the current version of the operating system, Pascal compiler (Pascal compiles to P-code, leading this vendor to make an analogy between Pascal on the Pascal-100 and assembler on a conventional processor), screen editor, file system, BASIC compiler, graphics package, games library, utilities, and computer assisted instruction package. Benchmarks are said to show the Pascal-100 outperforming UCSD Pascal on the PDP-11/34 by a factor of two or more. The processor board complies with the IEEE S-100 standard, and it supports up to 128KB of directly addressed main memory, 16-bit data bus transfers, floating point arithmetic, and vectored interrupts. The Pascal-100 processor board is priced at \$995. DIGICOMP RESEARCH CORP., Ithaca, N.Y.

FOR DATA CIRCLE 415 ON READER CARD

### DISK & TAPE SYSTEM

Take a Winchester disk drive, a 3M cartridge tape transport, and an intelligent controller, put them together in a single package, and you've got this vendor's MSC-5900. Depending on configuration, the MSC-5900 packs up to 87.8MB of data onto its disks, and another 17.1MB onto a tape cartridge. Four storage capacities are offered: 12.5MB, 37.6MB, 62.7MB, and 87.8MB. The disk's average access time is 40msec, average latency is a shade over 10msec, and the data transfer rate is 885Kbps. The cartridge tape's transfer rate is 1.1MB per minute. The intelligent controller can handle backup and restore functions, as well as searching for specified data without host supervision. Interfaces are offered for DEC's PDP-11, Data General Novas and Eclipses, HP's 2100-series, and IBM's Series/1. In oem quantities of 100, an 87.8MB MSC-5900 sells for \$8,250. MINICOMPUTER SYSTEMS CORP., Sunnyvale, Calif.

FOR DATA CIRCLE 414 ON READER CARD

### POCKET TERMINAL

After selling several thousand of these pocket terminals in Europe, this vendor has decided to enter the U.S. market. The terminal, which can send and receive all 128 ASCII character codes, seems particu-



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LA34 DECwriter IV . . . . .	1,295	124	67	45
LA120 DECwriter III, KSR . . . . .	2,295	219	120	80
LS120 DECwriter III, RO . . . . .	1,995	190	104	70
LA180 DECprinter I, RO . . . . .	1,995	190	104	70
VT100 CRT DECscope . . . . .	1,695	162	88	59
VT132 CRT DECscope . . . . .	1,895	181	97	66
TI745 Portable Terminal . . . . .	1,875	179	98	66
TI765 Bubble Memory Term. . . . .	2,795	267	145	98
TI810 RO Printer . . . . .	1,895	181	99	66
TI820 KSR Printer . . . . .	2,395	229	125	84
ADM3A CRT Terminal . . . . .	875	84	46	31
QUME Letter Quality KSR . . . . .	3,195	306	166	112
QUME Letter Quality RO . . . . .	2,795	268	145	98
HAZELTINE 1410 CRT . . . . .	895	86	47	32
HAZELTINE 1500 CRT . . . . .	1,195	115	62	42
HAZELTINE 1520 CRT . . . . .	1,595	152	83	56
DataProducts 2230 . . . . .	7,900	755	410	277
DATAMATE Mini Floppy . . . . .	1,750	167	91	61

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larly well suited for use in maintaining remote, standalone systems, such as those used in process control. It doesn't seem as well suited for traveling salesmen types of applications, as it needs an external 5 volt, 450mA power supply. The terminal has 40 keys, a 30 character memory for received data, and an LED display that shows received data in eight character segments. The display uses a 64-character upper case and symbol ASCII subset. The terminal has an RS232 interface, 110bps and 300bps transmission speeds, and presettable parity and stop bits. The pocket terminal sells for \$395. GR ELECTRONICS, LTD., Santa Monica, Calif.

FOR DATA CIRCLE 413 ON READER CARD

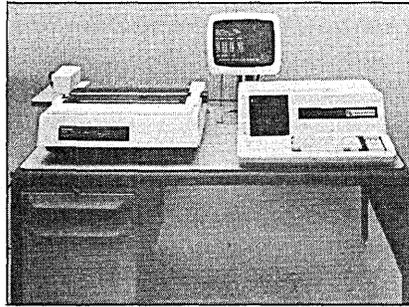
### CRT TERMINAL

The DM30 terminal is the latest addition to this vendor's Micro Bee product line. The terminal displays 24 lines of 80 characters, with a 25th line used as a status line. The DM30 has formatting and editing capabilities, two pages of display memory, and software- (or switch-) selectable communications at speeds of up to 19,200bps via an RS232 interface. Communications modes include conversational, line, page, block, and message. Cursor addressing and sensing, and 21 combinations of video display attributes are standard in the DM30. The DM30 lists at \$1,995. BEEHIVE INTERNATIONAL, Salt Lake City, Utah.

FOR DATA CIRCLE 417 ON READER CARD

### MICROCOMPUTER

The American arm of this French micro-computer maker showed its latest offering, the Micral 80-30, at the New York NCC. Offered to oem's, the unit initially is being manufactured in France, with U.S. manufacturing in planning (it may be in domestic production by now). The Z-80-based system is offered with 32KB or 64KB of memory, 16-line by 64-character free standing crt display, full ASCII keyboard, and dual double-density minifloppy drives. A parallel printer interface, compatible with Diablo daisywheel printers



and Centronics line printers, is standard; optional interfaces include RS232, IEE-488, and a 64-line TTL interface. The Micral 80-30 can run the CP/M operating system; applications programming support includes BASIC (both interpreter and compiler), and extended business BASIC (known as BAL), and FORTRAN IV. Several variations of the 80-30 are offered: the 80-25 substitutes a graphics crt for the 80-30's 16-line by 64-character display; the 80-31 provides a 24-line by 80-character display; and the 80-30D includes a 10MB cartridge disk drive. The 80-30 sells for \$4,595 in lots of 100 (the minimum order accepted); the 80-31, when it becomes available in January, is said to carry the same price; the 80-30D is \$10,345, again in lots of 100. R2E OF AMERICA, Minneapolis, Minn.

FOR DATA CIRCLE 418 ON READER CARD

### SMART TERMINAL

The MDT-405 intelligent terminal uses multiple microprocessors. At its heart is a user-programmable 8085; three additional micros handle the terminal's display, disk controller, and serial ports. The terminal is configured with a 16-line by 80-character display, dual double-density floppies (1MB total capacity, expandable with two more drives to 2MB), and a programmable 122-key keyboard. The terminal can scroll through its 32 line buffer, and characters can be displayed with a number of attributes—bright, blink, reverse video, etc. Dual serial interfaces—one for a printer, the other for synchronous or asynchronous communications at speeds of up to 9600bps—are supported. Users can program the MDT-405 in BASIC; programs developed on the vendor's development systems can be written in assembler, PL/M, or FORTRAN and the object code can execute on the MDT-405. A typical MDT-405, with 16KB of user memory (expandable to 48KB), crt, keyboard, and two diskette drives, sells for \$6,925. Applications packages are available. COMPUGRAPHIC CORP., Wilmington, Mass. \*

FOR DATA CIRCLE 419 ON READER CARD

# Tying up the 80's

Heading into the '80's, two major questions face systems managers. First, how do you keep up-to-the-minute with ever-changing systems methodologies? Second, how do you combine the benefits of the various techniques? Ken Orr is in the forefront of developing such approaches, and because of this, he has a deep understanding of the approaches of the major systems scientists: Warnier, Jackson, Constantine, Ross, and DeMarco. Ken Orr can tie these ideas together for you in his most recent seminar, "Blueprinting the Future." This state-of-the-arts seminar is aimed at professionals who are already heavily involved in structured systems development, and is an outgrowth of his 1978 comparative design methodology course. The author of *Structured Systems Development*, Ken Orr is one of the leading developers of structured technology. He has designed this seminar to address the rapid convergence of the different structured trends, incorporating major advances based on his own work in the application of structuring to data base, teleprocessing, and distributed systems design. Seminars will be held only in New York Oct. 22-26, in Chicago Nov. 5-9, and in San Francisco Dec. 10-14, with one-day management overviews preceding these dates. For early registration or information, contact Bob Otey, Langston/Kitch, 715 E. 8th, Topeka, KS 66607, (913) 233-2349.

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# SOFTWARE AND SERVICES

## UPDATES

It took Princeton's Applied Data Research some 16 years to make its first 5,000 software installations, and now in just four years the firm has doubled its installations. The 10,000th installation order came from Blue Cross of Idaho Health Service, Inc., which ordered a copy of Datadictionary. ADR believes it is the first software company to reach the 10,000 installation mark.

Computer Automation has automated software ordering and distribution for its SyFA installations. The SyFA Customer Library Exchange (SyCLE) allows a customer to enter his own order, and receive the code via down-line loading. SyCLE distributes operating systems, utilities and programming aids, and communications emulators; the library contains more than 50 programs. With the exception of special communications packages, SyCLE software is distributed without charge.

Xerox Computing Services has reduced prices on its data processing services by as much as 12.5%; additionally, the firm reduced its time-sharing rates by 10%. The company's rates are based on the application used, number of lines printed, and type of terminal used. While rates increased for lines printed, rates for each of the other categories decreased.

Prompted in part by IBM's recent move to telephone software support, Informatics now offers a telephone hotline service for its IN?UIRY/ims users. The service runs from 8:30 am to 5:30 pm, Monday through Friday.

## PERSONAL CAI

Okay, you justified that personal computer in the den by telling your spouse that it would be good for the kids and their schoolwork. But when you get home from work, teaching the kids to program may seem even less appealing than spending the evening with a tv dinner and three hours of reruns. Perhaps this vendor's computer assisted instruction packages can get you out from under the gun. Written for the Apple II computers with diskette drives, the Floating Point dictionary is designed as a teaching and reference program for Apple Floating Point BASIC. It defines all BASIC commands, and provides operating examples for the use of system commands. The program sells for \$39.95. The Total BASIC Teaching Pac includes the Floating Point Dictionary, and a 13-lesson course on BASIC programming. It sells for \$49.95. Both packages include examples of Apple's graphics capabilities. CHARLES MANN & ASSOCIATES, Micro Software Div., Yucca Valley, Calif.

FOR DATA CIRCLE 400 ON READER CARD

## SCREEN EDITOR

Microsystems developers using this vendor's Intellec-800 and Intellec Series-II development systems can now get a crt screen editor from the vendor. Credit, the editor, runs on systems with 64KB of memory and a flexible disk drive. It gives the user single-key control of character insertions, deletions, and replacements; all changes are immediately reflected on the crt. Commands are available to insert, delete, change, move, and copy lines and blocks of text. Search commands are provided, as is a HELP command. Credit also has a macro capability, allowing users to define named command sequences for often used functions. Available on single or dual density diskettes for use under the ISIS-II operating system, Credit sells for \$250. INTEL CORP., Santa Clara, Calif.

FOR DATA CIRCLE 401 ON READER CARD

## PROGRAMMING LANGUAGE

A block-structured, high-level language, SL/300 is said to give programmers using this vendor's model 300 computer systems programming control and efficiency generally associated with assembly language programming. Designed specifically for

the 300, SL/300 combines features found in other block structured languages (such as ALGOL and Pascal) with access to system features (such as bit level data access). This combination of higher level language and machine language capabilities led the vendor to develop its operating system and related system software using SL/300. The language includes a file system, a wide range of data types, data base management facilities, and a symbolic debugging facility. The language also includes dynamic array allocation, unlimited nesting of high-level statements, macro capabilities, recursive and reentrant procedures, and powerful data manipulation expressions. SL/300 can be had for an up-front charge of \$2,000 plus \$80 per month. HEWLETT-PACKARD CO., Palo Alto, Calif.

FOR DATA CIRCLE 402 ON READER CARD

## CP/M KEYED FILE SYSTEM

Microcomputers running CP/M can use a keyed file management system—Magsam—to create and access data records from CBASIC applications programs. Retrieval can be random by key, sequential by key, generic by key, sequential in physical (or chronological) order, and random by relative record number. Creation of records can be random or sequential by key; updates can use any of the retrieval modes of access. Magsam occupies 6KB of memory above and beyond that used by the operating system and applications program. The package is available in three versions. Magsam III—the top of the line—supports multiple keys, secondary indexing, and full deletion capabilities. It licenses for \$145. Magsam II is a single key system, again with full deletion capabilities. It licenses for \$99. Magsam I supports single key file structures and performs deletions by file reorganization. Its license is \$75. Each package includes the Magsam file manager, a tutorial program, file dump utility, user guide, reference card, and one year update service. MICRO APPLICATIONS GROUP, Van Nuys, Calif.

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## DATA ENCRYPTION

Datasecure uses the DES data encryption algorithm to protect data in a Datacom/DB data base from unauthorized perusal

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IMS users such as *American Airlines, Dow Chemical, TWA, American Can, The Hartford, Union Carbide;* and TOTAL users like *Combustion Engineering, Northwestern Mutual Life, Anheuser-Busch, Corning Glass Works, Eli Lilly and Holiday Inns* are a few who agree ASI-ST and data base belong together. In addition, ASI-ST provides an unequalled return on investment by maximizing the productivity of both man and machine. Since ASI-ST fully supports conventional data files as well as complex data bases, these benefits are not restricted to IMS and TOTAL users. To obtain more information contact:



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## SOFTWARE AND SERVICES

and alteration. Developed by Datacom/DB's vendor and data encryption specialists Computation Planning, Inc., Datasecure runs under all current operating systems for IBM mainframes, including 4300 processors. The package offers users a choice of three degrees of security. The strongest degree of security is provided by using the DES data encryption algorithm which encrypts data in 64-bit packets. A second mode of encryption uses the DES algorithm to generate a "long key" which is then linearly combined with the data record, providing up to a 100-fold performance increase for long records. An even faster method, said to approach 1,000 times the speed of the strongest encryption mode, uses a long key and indirect encryption. The user can make use of whatever mode is most appropriate considering the confidentiality of the data and the cost of machine time for encryption and decryption. Datasecure, itself, and its working tables are kept in encrypted form in the system library. Datasecure carries a permanent license fee of \$7,500 for the first cpu, and \$5,250 for additional cpus at the same site. Monthly license fees are \$245 and \$175, respectively. APPLIED DATA RESEARCH, INC., Dallas, Texas.

FOR DATA CIRCLE 404 ON READER CARD

### Z80 PASCAL

This microprocessor maker developed its Pascal implementation adhering closely to the specs in Jensen and Wirth's *Pascal User's Manual and Report*. At the same time, the system includes several extensions, including a TRAP procedure that allows linking to assembly language routines, an EXIT procedure that allows program termination at any point, a constant subrange designator that frees programmers from having to enumerate each element of a SET data type, and the ability to omit the tag field in a case variant record. The disk-based package runs under the vendor's RIO operating system, and consists of three major components: a compiler, a post-processor, and an interpreter. Instead of interpreting P-code, the post-processor compacts it into an object module for execution by the interpreter. This compression stage is said to optimize memory usage. The Pascal package is priced at \$950. ZILOG, INC., Cupertino, Calif.

FOR DATA CIRCLE 405 ON READER CARD

### RSTS/E TO VAX MIGRATION

The RSTS/E Operating System Simulator for VAX (ROSS/V) provides a RSTS/E environment for programs running in PDP-11 compatibility mode on DEC's 32-bit VAX-11/780 processor. An analog to DEC's Application Migration Executive which gives the VAX an RSX-11M environment, ROSS/V interfaces to programs at the

## SOFTWARE SPOTLIGHT

### PERFORMANCE MEASUREMENT

Improve, a line of performance measurement products, will be launched domestically this fall by this European software supplier. Designed for use on DOS/VS systems, Improve is intended to locate bottlenecks adversely affecting system performance. Capable of monitoring both applications and systems software, Improve checks program performance at predefined intervals and samples the program's status. Sample data are stored on disk for later analysis; histograms relating instruction location and similar reports are provided. The basic Improve package is the monitor which profiles the execution of an applications program running in the same partition; the monitor captures information on cpu and I/O utilization, as well as waits. The basic monitor package will debut with a \$6,000 price tag. To avoid DOS/VS restrictions on the use of the timer (which Improve must use), a Separate Partition Option (SPO) allows a copy of Improve running in one partition to monitor programs in other partitions.

This allows the monitoring of applications and systems software that use the timer. The SPO will be priced at \$1,600. A specially tailored package, Improve/CICS comprises the monitor, SPO, and additional capabilities for monitoring CICS applications and transactions. Its introduction price is \$8,000. These three packages look at performance from the programmer's point of view; for the operations staff, there is Improve/Real Time, which gives an instantaneous look at the system from the console or a CICS terminal. With this \$8,000 package, operators can see where the system is expending its resources. Finally, there's Improve/JCL, which takes user specifications and generates JCL. It also serves as a scheduler, handling job releasing and providing statistics. The standalone Improve/JCL package will be priced at \$7,000. As this is written, the formal launch date for the Improve line is October. CAP-CPP, INC., Princeton, N.J.

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RSTS/E monitor call level. Although ROSS/V works with applications developed in any RSTS-supported language, most use is expected to center around BASIC-PLUS programs. A subset of RSTS monitor call capabilities currently is supported; additional features are expected to be added to subsequent releases. Currently supported features include Concise Command Language (CCL) commands, shared files with multiuser read and write access, and concurrent use of multiple run-time systems. The vendor notes that most of the PEEK's at RSTS/E monitor tables and nonfile structured operations on directory structures are not (and probably never will) be supported. The vendor also notes that users will need to license RSTS/E products from DEC for use under ROSS/V. ROSS/V carries a perpetual license fee of \$10,000 for a single cpu. EVANS GRIF-FITHS & HART, INC., Lexington, Mass.

FOR DATA CIRCLE 406 ON READER CARD

### REPORT WRITER

The Answer/2 report writer is said to be flexible enough to satisfy both production and ad-hoc reporting needs. Written for IBM mainframes running DOS or OS, Answer/2 uses a free-form natural language and can produce up to 255 different reports with a single pass through the data files. The report writer's capabilities include automatic matching of input files, data independence, automatic decimal alignment and field conversion, generation of sample reports (without the user

having to supply test data), table processing, and direct and sequential processing of files and data bases. Options include transparent interfaces to IMS, TOTAL, and DL/1 data bases, and on-line support under IMS/DC, TSO, CICS, and Intercomm. A CALL support allows a link between Answer/2 and applications languages. The basic Answer/2 system is priced at \$15,000 for DOS installations, and \$20,000 for OS. Installation and first-year maintenance are included. INFORMATICS INC., Woodland Hills, Calif.

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### STATISTICAL ANALYSIS

In the latest version of this vendor's statistical analysis system, SAS79, the vendor has added structured programming constructs to its programming language, as well as a number of new routines in its procedure library. A tool for statistical, data management, and report writing applications, SAS79 now includes DO...END and IF...THEN...ELSE statements, as well as array processing and character functions. New library procedures including SUMMARY (providing statistics on large data sets), CANCORR (for canonical correlation), and FUNCAT (for computing basic minimum chi-square tests and maximum likelihood estimates). SAS79 runs under OS or OS/VS and is available for \$4,500 for the first year, and \$1,500 for subsequent years. SAS INSTITUTE INC., Raleigh, N.C. \*

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# SOURCE DATA

## BOOKS

### BASIC BOOK BRIEFS

One of the few species in the dp industry that seems to be multiplying faster than versions of the BASIC language is the BASIC language textbook.

There exists a wide variety within the ranks of these texts. Some of them are complementary to one another. Many differ in the assumptions they make about their audience. Many differ in their equipment orientation, or application orientation, or presentation. We also find that the youngest members of the species are not always the most valuable, or the most readable.

Eleven fairly recent volumes have been reviewed for us by E.A. Keith, who has been teaching BASIC programming for 11 years. Some of these volumes are reviewed simply because they are new, others are reviewed because, though not new, they do a fine job for their audience. *The reviews will be continued in another issue.*

### BASIC PROGRAMMING FOR SCIENTISTS & ENGINEERS by W. N. Hubin

As its title declares, this one is for the scientific programmer, and it is excellent for this audience. The book first describes the fundamentals of BASIC, and supplies short practice problems based on scientific formulas. It then points out the most useful features of the language, identifies pitfalls that often confuse beginners, and explains the flowchart method for clarifying and documenting the logic.

Finally, it serves up a variety of problems which are designed to help develop programming proficiency. The problems themselves are interesting but simple in concept, and they amply demonstrate many tasks the computer can do in scientific and engineering areas.

The book has a failing, however, in that it does not cover the basic system commands needed to make use of the language, nor does it describe typical terminal procedures—both of which would be beneficial to the beginner. Prentice-Hall, Inc. (1978, 198pp., \$9.95).

### SOME COMMON BASIC PROGRAMS by Lon Poole and Mary Borchers

Here's something different and definitely

worthwhile. Between its covers this publication describes some 75 programs which perform a wide variety of common, practical tasks. The programs are written in a subset of BASIC that is compatible with many versions of the language now available to microcomputer users.

The book is *not* intended as a text, but no matter, there are hundreds of publications available for that purpose. Instead, it's more of a reference to answer the question, "How would I write a program to do X?" The "answer" is there in the form of a listing, with program descriptions and remarks to help the reader follow the program logic. By avoiding the textbook form, the volume remains a useful reference for beginners and for the proficient, with something to offer for everyone. Adam Osborne & Associates, Inc. (1977, 206pp., \$8.50, softcover).

### BASIC PROGRAMMING AND APPLICATIONS by C. Joseph Sass

Another "oldie but goodie," this book ranks among the best of the BASIC books and should not be overlooked. More than that, it's a good elementary programming book. While its primary intent is to teach the BASIC language, it gets down to basics in related topics, too, including flowcharting fundamentals, program logic, and program development.

Suitable for service either as a formal college text or as a self-learning guide, it is appropriate for readers with a wide variety of backgrounds.

Chapter 1 leads off with an excellent introduction to programming in general and time-sharing in particular. Each of the remaining nine chapters is given over to a major topic (such as entering data, program loops, functions, etc.) and ends with questions and exercises, as expected. Sample programs with output and flowcharts are also present.

The author has endeavored to cover only those statements that are fundamental to most versions of BASIC. When important statements do differ in form from system to system or vendor to vendor, footnotes highlight and clarify the differences.

Six appendices provide information on computer history, terminal operation, error messages, error correction, system commands, and a glossary. Answers

to selected questions and exercises are also provided. Allyn and Bacon, Inc. (1976, 354pp., \$11.95, softcover).

### GAME PLAYING WITH BASIC by Donald D. Spencer

A good book for the computer enthusiast who has the time to play games, or the person who has convinced his management that game playing is a good way to gain familiarity with the language. The author provides a large selection of games and puzzles in BASIC, including 3-D tic-tac-toe, Nim, Roulette, Slot Machines, Magic Squares, GO, Keno, Baccarat, and others. Included with each game are a discussion of its rules, how it works, flowcharts, and sample output—all of which should be easily understood by anyone with a slight knowledge of BASIC. The last chapter contains 26 puzzles for reader solution. Hayden Book Co., Inc. (1977, 176pp., \$6.95, softcover).

### BASIC COMPUTER GAMES: MICROCOMPUTER EDITION David H. Ahl, ed.

This one is a major revision of the author's first book "101 BASIC Computer Games," which was published by Digital Equipment Corp. in 1973. It contains listings, sample runs, and descriptions of 102 "classic" games written in microcomputer BASIC for operation on Altair, Imjai, SWTPC, OSI, Xitan, Poly, Sol, PDP-11, or other processors.

Included are three versions of Lunar Lander, Super Star Trek, Horserace; guessing games, logic games, matrix games, word games, card games, plotting games, and educational games. Creative Computing Press (1978, 200pp., \$7.50, softcover).

### A BASIC APPROACH TO BASIC by Henry Mullish

Mr. Mullish developed this text for use in his programming class at New York Univ. Thus the programs illustrated were written for the HP 2000C, and include some "nonstandard" but very useful features such as logical operators (AND, OR, NOT), MIN and MAX functions, special printer control instructions (LIN, SPA, . . .), etc.

The statements are all discussed in a logical order and in sufficient detail. In true textbook fashion, each chapter is fol-

lowed by a series of examples, questions, and exercises which are related to business and finance as well as to science and mathematics.

The book is an excellent college level text for the HP machine, but its value as a self-teaching aid is limited due to the lack of answers to the questions and exercises. John Wiley & Sons (1976, 303pp., \$9.95, softcover).

### **BASIC FOR EVERYONE** by Thomas Worth

Although now three years old, this one deserves mention because of its easy to understand presentation of the language. It can be used as a school text or a self-teaching medium, and is excellent for a person with absolutely no background or exposure to computers or programming—if any such persons still exist.

The book presents the material in a logical sequence, using a minimum of technical terms, and provides a wide variety of problem examples that require no great depth of scientific, business, or math knowledge. Considerable space is spent introducing the reader to sign-on procedures, program files, program access, and program structure prior to discussing the language itself. Advanced BASIC features such as file processing, string (alphanumeric) values, and PRINT USING are also presented. Prentice-Hall, Inc. (1976, 349pp., \$8.95, softcover).

### **BASIC FOR BEGINNERS** by Brian M. J. Kavanagh

This one is a college level text written for formal instruction, but it could also be used as a self-learning text. Part of a series on languages from the U.K., it assumes no previous knowledge of computing. The book covers all the main features of BASIC, which are reasonably standard, and should thus be of value to students using almost any computer.

Reproductions of actual programs and their output are included, along with intentionally simple problems to illustrate basic points of programming. Several popular sorting techniques are also covered. Holmes McDougall Ltd., Allander House, 137-141 Leith Walk, Edinburgh EH6 8NS, Scotland (1978, £2.95, 128pp.).

### **THE BASIC IDEA** by Richard Forsyth

A simple introduction to the subject, this one is oriented to the DECsystem-10 and hence the system commands it describes, as well as the extended features presented, are all for that computer. Although it covers all of the standard language features, it might be confusing for the beginner who is not using the DEC machine. For those using the -10, howev-

er, the book seems quite clear and provides several good appendices, including one which lists the answers to all the exercises scattered through its pages. John Wiley & Sons, Inc. (1978, 160pp., \$4.95, softcover).

## **VENDOR LITERATURE**

### **FIBER OPTICS**

A 50-plus page booklet presents the offerings of this fiber optics supplier. Products ranging from epoxy to fiber cables to complete systems are covered. A variety of manufacturers are represented in the illustrated booklet. Two explanatory technical papers—"Basic Optical Data Links," and "Finishing and Terminating Optical Fibers"—are also provided. A price list, ordering information, and the vendor's warranty also are included. MATH ASSOCIATES, INC., Great Neck, N.Y.

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### **TERMINALS**

This supplier has prepared an eight-page, color catalog of the crt's and printing terminals it offers for sale, rent, or lease. Readers will find Digital Equipment, IBM, Hazeltine, Lear Siegler, Centronics, Texas Instruments, and others among the manufacturers represented in the catalog. ELECTRO RENT, Burbank, Calif.

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### **REAL ESTATE APPRAISAL**

A turnkey system for real estate appraisal is described in a four-page, four-color flier. The system is described as both a service offering available from the vendor's offices, and as a turnkey minicomputer system. A postage paid card is included for government units desiring more information. COMPUTER SYSTEMS & SERVICES, INC., Springfield, Ohio.

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### **DISKS**

A 16-page, illustrated booklet describes this vendor's "Super Series" of cartridge disk drives for oem's. The booklet explains features common to the product line, then discusses various configurations offered—front and top loading units from 2.5MB to 10MB in capacity, and a top-loading 20MB unit. The brochure also covers the company's commitment to oem's, including assured component reliability, product facilities, and product testing. A table of specifications is included. PERKIN-ELMER, Memory Products Div., Garden Grove, Calif.

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### **PRINTER CONTROLLER**

A controller allowing use of the IBM 1403 line printer with a wide variety of non-IBM

computers and several IBM computers, is described in a four-page, illustrated brochure. Also described are the vendor's tester/exerciser and spares complement (for users wishing to stock spares). A listing of interfaces shows readers what computers can interface to the controller, and the brochure notes the vendor's willingness to design interfaces for other machines. SPUR PRODUCTS CORP., Los Angeles, Calif.

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### **APPLICATIONS**

"The Sensible Way to Use Computers," a 16-page, illustrated booklet gives thumbnail sketches of more than a dozen real-world applications of this vendor's computers. Applications described include those of municipalities, schools, restaurants, telephone companies, pharmacies, and an aerospace contractor. The booklet also contains a brief discussion of the differences between interactive and batch systems. A postage-paid card is provided for readers wishing more information. DATA GENERAL CORP., Westboro, Mass.

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### **DISK**

Disk systems for IBM 370 and 303X users are described in this four-color, eight-page brochure. The illustrated booklet presents the hardware features and optional capabilities of the vendor's 4830/4350 disks. A page of spec sheets covers the 4830 controller and three models of the 4350 (3350-compatible) disk drive. A list of the vendor's sales offices is included. CALIFORNIA COMPUTER PRODUCTS, INC., Anaheim, Calif.

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### **NETWORK CONTROL**

Diagrams, charts, and reproductions of actual screen displays illustrate a 12-page booklet describing this vendor's Distributed Network Control System. After a general overview, the booklet proceeds with details on such features as the operator interface, test functions, alarm functions, network/line configurations, and backup/restoral capabilities. CODEX CORP., Mansfield, Mass.

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### **DATA ENTRY GOING DISTRIBUTED**

DEMA, the Data Entry Management Association, offers at no charge its 1979 equipment survey, which includes evaluation of data entry vendors on the basis of both equipment and services, including the factors of availability of spare parts, response time after phoning, time taken to make repairs, and programming support. The survey also examines requirements and future purchasing plans of users and managers, and compares results of the

study with results from previous years. Attitudes of DEMA members are also included. Findings show a large percentage of discontent with present data entry equipment, and a majority of respondents predicting their companies will be going to a distributed environment. Data Entry Management Assn., Stamford, Conn.

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### MICROCOMPUTER PARTS

"COSMAC Microboard Computer Systems," a 12-page, illustrated brochure, presents this vendor's Microboard product line of computer, memory, I/O, and control boards. Included are several single board computers (illustrated with a full-size photograph), RAM and ROM boards, expansion modules, power supplies, and chassis. Supporting products also are described. RCA, Solid State Div., Somerville, N.J.

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### COURSES/SEMINARS

#### PERSONNEL MANAGEMENT

A series of five-day workshops on Personnel Productivity in Data Processing will be presented in Lake Tahoe September 17-21; Washington, D.C. October 15-19; and Fort Lauderdale November 26-30.

Tuition is \$695. The agenda includes anatomy of edp jobs and workload, personnel selection and scheduling, productivity, career development, systems considerations, and organizational dynamics. Contact Keston Associates, 11317 Old Club Road, Rockville, MD 20852 (301) 881-7666.

#### MANAGERIAL EFFECTIVENESS

A seminar, Improving Your Managerial Effectiveness, is based on workshop simulations and role-playing sessions, managing to obtain objectives, communications, managing conflict and change, and improving organizational and individual effectiveness. Individual fees are \$595 for AMA members; \$685 for nonmembers. Seminar will be held in San Francisco September 17-21, Atlanta October 1-5, Chicago October 22-26, Washington, D.C. October 29-November 2, and New York November 12-16. Contact American Management Assn., 135 W. 50th, N.Y., NY 10020. (212) 586-8100.

#### RELIABILITY

A development program in Quality and Reliability, a two-day intensive seminar, will be presented September 25-26 in San Diego by the California Institute for Quality Technology. Fee is \$275; course will stress fundamentals of reliability.

Contact American Society for Quality Control, Santa Clara Valley Section, P. O. 472, Cupertino, CA 95014 (408) 255-0955 ex. 2213.

#### DISTRIBUTED PROCESSING

Minicomputers and Distributed Processing, a three-day seminar, will be held in New York City September 24-26. Course content will include discussions on peripheral equipment, microprocessors, communications networks, intelligent terminals and word processing. Sponsored by the Univ. of Chicago Center for Continuing Education. Contact U.C.C.C.E. at 1307 E. 60th St., Chicago, IL 60637 (800) 223-7450. Fee is \$545.

#### WORD PROCESSING

Word/Text Processing—Toward the Automated Office—is a conference to be held in Atlanta October 10-12 and New York City November 28-30. Highlights will cover managing wp systems, I/O considerations, executive support systems, and personnel management. Sponsored by the American Institute of Industrial Engineers; member fee is \$295, non-member fee is \$330. Contact AIIE Seminars, P. O. 3727, Santa Monica, CA 90403 (213) 450-0500.

#### DOS TO OS

A series of free seminars for DOS users who may be considering a move to OS will be held in Denver September 13 and Boston October 18. Sponsored by University Computing Co., 8303 Elmbrook, Dallas, TX 75247 (214) 688-7100.

#### RISK MANAGEMENT

Risk Management, a workshop that will provide specific guidelines for establishing internal systems for the control and reduction of claims and the cost of insurance and self-insurance administration, will be held October 11-12, Alexandria, Va. Fee is \$235. Contact Janice Fish, Training Coordinator, Theorem Institute, 1782 Technology Drive, San Jose, CA 95110 (408) 295-1427.

#### LEASING NEGOTIATIONS

Third-Party Leasing Negotiations is a seminar designed for executives who bear the responsibility for third-party leasing negotiations. Legal, financial, and computer aspects of the negotiations will be covered by the three speakers: Joseph Auer and Kenneth Brindle, officers of seminar sponsor International Computer Negotiations, Inc., and Richard Contino, an attorney and author of the book, *Legal and Financial Aspects of Equipment Leasing Transactions*. Scheduled for Hartford, Conn., November 6-8 and San Francisco, December 12-14. Fee is \$595. Contact ICN, 1331 Palmetto Ave., Winter Park, FL 32789. \*

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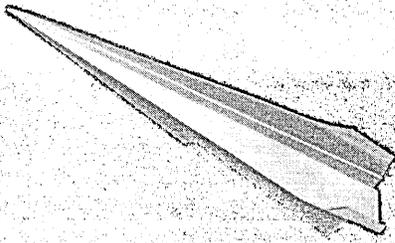
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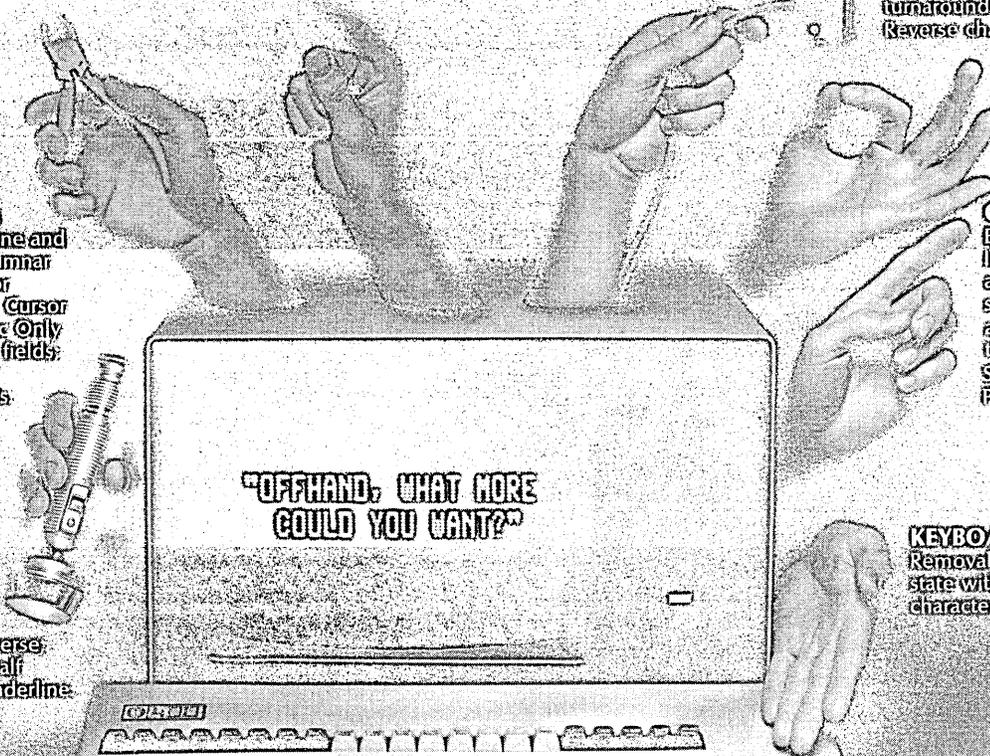


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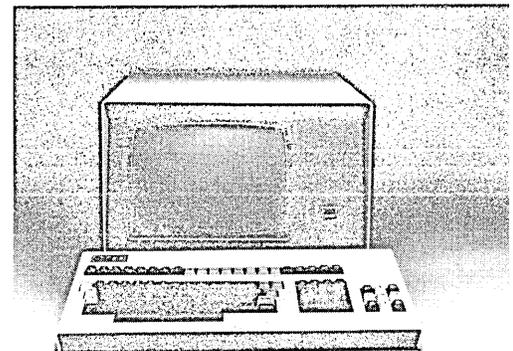
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# The Marketplace...

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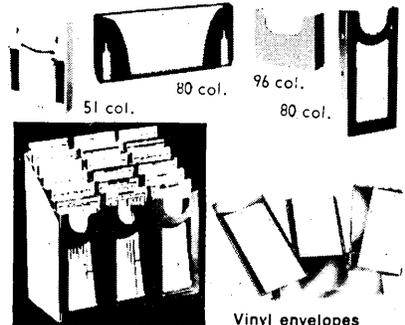
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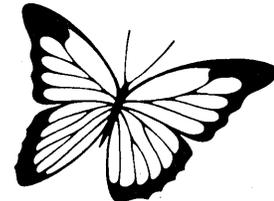
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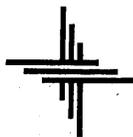
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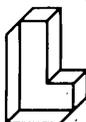
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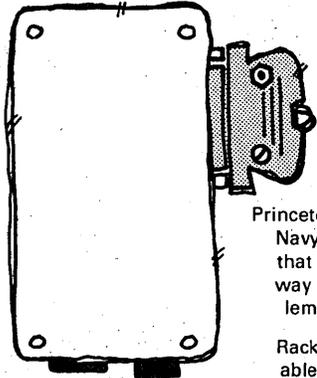
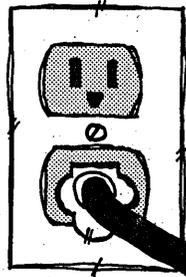
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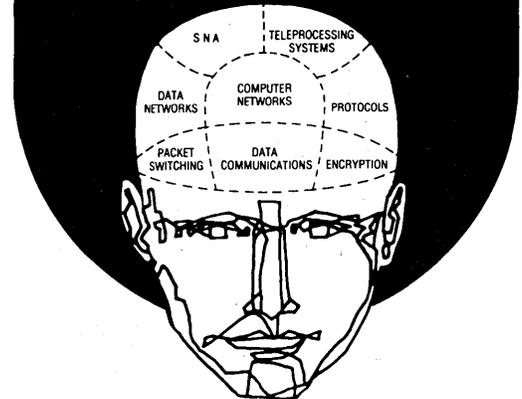
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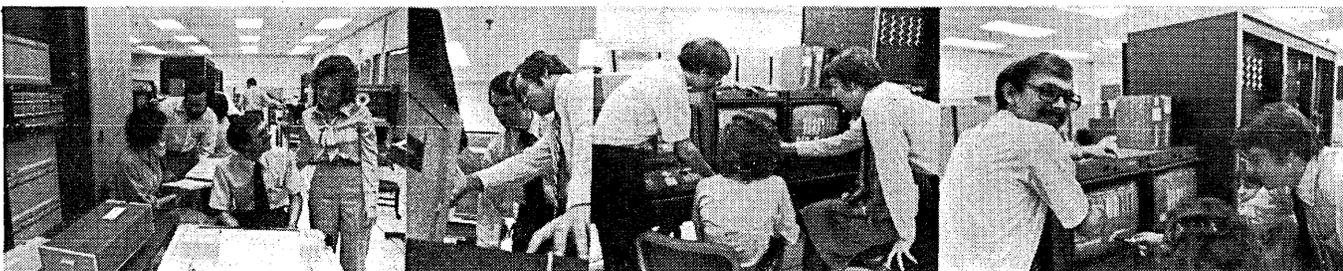
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# READERS' FORUM

## TIME TO RETIRE THE TELEPHONE?

Most businessmen hate the phone. It is disruptive, inefficient, frustrating—something out of the horse-and-buggy era and totally inappropriate to the modern business environment.

I would like to address some of the problems with the phone and relate them to electronic mail, based on my own experience with both in a business setting.

If I want to communicate with Mr. X by phone, I have to locate him. This is often hard to do and, as the modern businessman becomes more and more mobile, it becomes harder and harder. Where in the world *is* Mr. X?

If the time is during normal business hours, one assumes he is at his desk. But often he's not. He's in a meeting down the hall, he's in the men's room, he's in transit to another office—perhaps he's not in the building at all. He may be sick, out to lunch, making a customer call, in a car, in an airplane. Furthermore, I may want to talk to Mr. X outside of working hours. This is even harder. He may be at home, at relatives', out to dinner, or at the movies. One thing is certain: in today's fast-paced world, Mr. X is hard to find.

Suppose I do know where Mr. X is, and that he has a phone nearby, and that the phone is not busy. What makes me think that Mr. X is willing to be interrupted? The chances are that he is not, and I can't say that I blame him, for just as often I am not. Often I'm in a meeting, and sometimes I *say* I'm in a meeting, because I'm doing some work that I would like to continue doing. (Even to *say* I'm in a meeting requires an interruption in my work.)

So what happens? I call Mr. X and leave word. He calls back and leaves word. I call him back and leave word. He calls back ... you get the picture. I have had cases where this has gone on for weeks and by the time I got through to the other person, I had forgotten what I wanted to tell him.

I did a study of my own phone use and discovered that only 26% of the calls I placed went through on the first try. On the average I had to place four calls in order to complete one.

What were the problems? All kinds. In 38% of the unsuccessful cases, the person being called refused to be interrupted. In another 38%, the call wasn't answered (most of these were internal calls). In 14%, the called number was busy; the remaining 10% were miscellaneous problems such as the line being lost before the called party answered.

Altogether, a great deal of aggravation.

And we haven't even brought up the problem of time zones. Assuming that business executives work 9 to 12 and 1 to 5, five days a week, an executive is in his office, at best, 35 hours a

week. But if two executives are on opposite coasts, they are simultaneously in their offices, at best, only 15 hours a week. That means the problem is roughly doubled.

And what happens if we're in New York trying to communicate with Tokyo? Now the telephone window has shrunk to zero. There is simply *no time at all* during working hours that one executive can hope to reach another.

Then there is the problem of records. When you use the phone, there is no record of who said what to whom—and when. For many business purposes, this makes the call virtually worthless. In my own case, I have gotten into the habit, after all but the most trivial calls, of picking up my dictating machine and dictating the substance of the call. The dictation belt goes to my secretary, who types it out, and eventually sends me the typescript. I then scan the typescript, making corrections if necessary, and put it in for filing. So, one phone call generates a dictation task and an editing task for me, as well as a typing task, a duplication task, and a filing task for my secretary.

In the business world, one person wants to communicate with many people. While it is possible to set up a conference call on the phone, the setup is so difficult, and usually so unsatisfactory that it's very rarely done in practice. Typically, if a businessman wants to communicate with a group, he gives up on the phone and has a meeting or writes a memo.

The phone also shares a problem with all speech communication: the information density of speech is very low. Generally, the electronic transmission of speech requires about 60,000 bits per second. These 60,000 bits of speech carry about the same information as 15 characters of written text. (Try it—in one second you can read out loud a passage of about 15 characters.) But you can transmit 15 characters directly as text by transmitting only 120 bits of information, rather than 60,000 bits of speech. If you insist on transmitting speech you are transmitting 500 times too many bits. And these bits have to be paid for. In a very fundamental sense, speech is not an economic medium of communication.

### HOW'RE THE KIDS, GEORGE?

A final problem is that the conventions of our society require us to be long-winded on the phone. One must inquire about the other person's health, or the health of his family. How're the kids, George? There is the obligatory discussion of meteorological conditions. Pretty chilly out today, wouldn't you say? When I measured the length of my own phone calls, I was surprised to find that my average call took 4.8 minutes. It is almost impossible to get someone on the phone and say, "This is T.M., your plan is approved," and hang up. That would only take 3 seconds instead of 4.8 minutes. But our social conventions won't allow it.

It will probably come as no surprise to anyone who has read this far that electronic mail does not suffer from the problems of the phone. ("Electronic mail" has been used loosely to mean a variety of offerings, including TWX and facsimile. How-

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## READERS' FORUM

ever, the term is now becoming attached primarily to what is now also called "Computer Message System," and that's the kind of system I am referring to. Specifically, my experience has been with a system called COMET, which my company uses as its primary vehicle for intracompany communication, and which it offers as a product and a service.)

Electronic mail does not require locating anyone. It never interrupts. Time zones don't matter. All communications are automatically recorded and filed. One message can go to multiple recipients. Electronic mail, being based on transmission of text, has high information density. Messages are short rather than long-winded.

I have been a heavy user of electronic mail for several years. On the average I receive 14 messages per working day and I send 10. I have a data base of 13,000 messages in my electronic file, and I access this data base several times a day.

I use two terminals. One of these is a video terminal in my office. The other is a portable printing terminal which I use at home in the evenings and on weekends. I take the portable with me on trips. It weighs roughly the same as my briefcase. In addition, there are publicly available terminals at various locations in our company, primarily for the use of personnel who do not have private terminals. The terminals are a variety of brands. They are all conventional, commercially available ASCII terminals.

The process works like this. If I want to interact with the systems, I go to a terminal. The terminal in my office is directly wired to the in-house minicomputer that runs the mail system; there is no need to dial. From my home, I place a local phone call to access the computer. When I'm on a trip, I place a local call to the nearest node of the Telenet or Tymnet network, which then connects my portable terminal to the computer. Once connected, I identify myself by name and password. (If I thought that security had been breached, I would change my password—something I can do directly from the terminal. However, to my knowledge, security has never been breached.)

Once logged in, I'm ready to send a message. The system asks me for the names of the recipients. I answer by typing a name, or multiple names, or the names of a distribution list. I can send a message to everyone in the company just by typing "CCA." (It is important to note that I never worry about where the recipients are. They are only identified by name.) Next, the system asks me to indicate the subject of the message. This allows users to "scan" messages by looking at the subject, and it allows automatic retrieval by subject. Next, I type in the text of the message. The average length of my messages is 108 characters, or 1½ lines.

Is there a problem in typing? Surprisingly little. I would be absolutely incapable of typing a business letter, but I have no trouble with electronic mail. Why is that? I think there are three reasons: first, the messages are short (if I want to send a long one, I ask my secretary to type it for me from her terminal; for ordinary messages, it's much quicker for me to do it myself). Second, the system provides editing facilities, making it easy to correct errors. Third, for some reason that I don't fully understand, it doesn't bother me to send out messages with a couple of typos. (By contrast, I would not tolerate a memo going out in my name with even a single error.) Evidently the psychology of the electronic mail user is to be relaxed about such cosmetic issues.

After I have composed the message, I print it out in final form, review it and send it. The system automatically adds the date and the time, the name of the sender, and then acknowledges that the message has been sent.

To compose, edit, review, and send an average message takes me 1.3 minutes.

When I first log in, the system tells me how many messages are currently waiting for me. If I want to scan these messages, the system will output one line per waiting message, indicating sender, date, and subject. I can then choose to read any or all of these. On the average, it takes me 14 seconds to read



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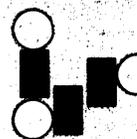
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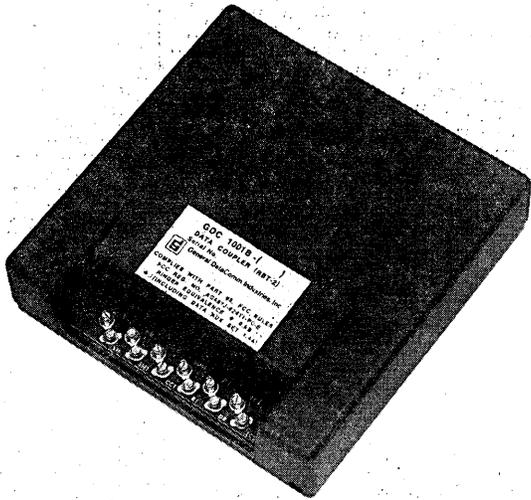
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## READERS' FORUM

a message.

Any message I send or receive is automatically put in computer memory. In addition, I can file messages in subject-matter files (such as action-item files) to which I assign my own names. On the average, it takes 5 seconds to file a message. Once filed, a message can be retrieved by sender, recipient, date, date range, and subject words. I can delete any message in my own files, and I can forward any of these messages to other people. I cannot access other people's files.

How does cost of electronic mail compare with the cost of the phone? Not an easy question to answer, considering the true cost of the phone. What is the cost of a highly paid executive chatting with another about the weather?

### WHAT'S AN EXECUTIVE WORTH?

In my view, the primary cost benefit of electronic mail is in the executive time saved. Using the example of \$50,000 a year executive, adding 30% overhead and assuming he works 1,800 hours per year, the executive costs his employer \$0.60 per minute—one cent per second.

You can subscribe to an electronic mail service (use of time-shared central computer that runs the electronic mail service) for \$60 per month, and you can rent a terminal for \$90 per month. Hence, you are in business for \$150 per month per subscriber. If a company buys an in-house electronic mail system, including terminals, and shares the terminals among a reasonable number of people, the cost can drop as low as \$20 per month per subscriber. But using \$150 as an upper bound, if our hypothetical executive can save just 12.5 minutes per working day through the use of electronic mail, he will pay for his use of the electronic mail service. If we are talking of an in-house system, 12.5 minutes per day will pay for his use of the system many times over.

In fact, it is my impression that an electronic mail system saves an executive not merely 12.5 minutes per day, but many times that amount. Take my own case. On an average working day I deal with 24 messages (I receive 14 and send 10). The time spent in doing that is 16.4 minutes. If, instead of using electronic mail, I used the phone for these messages, considering that my average phone call takes 4.8 minutes, I would be spending 1.9 hours on the phone. I would therefore waste about 1.6 hours per day. For our hypothetical executive, this would cost \$58 per working day. Over the course of a month, he would recover the cost of his use of an electronic mail service seven times over. If we are talking of an in-house system, he would recover the cost 50 times over.

The costs have not included toll charges for telecommunications—Telenet and Tymnet. In comparing the cost of electronic mail with the cost of the phone, we can consider that toll charges are roughly equivalent in the two cases. If anything, since electronic mail interactions are so much shorter than phone calls, the comparison would probably widen the gap in favor of electronic mail.

So far my cost analysis has taken account of only the executive's time in reading and writing messages as compared with talking on the phone. It has given no weight to the fact that, on the average, each phone call has to be placed four times; to the fact that if the executive wishes to have a record of the phone call he has to dictate or write it out; to the fact that electronic mail does not disrupt him many times a day; to the fact that he has no time zone problem, etc. If we took these additional matters into consideration, the cost advantage would be even greater.

But, ultimately, cost may not be the real point. Perhaps the key is that the typical executive is overworked, always short of time, and constantly hassled. Electronic mail provides relief. It makes the executive more efficient by organizing communications and freeing his time. I would be very surprised if electronic mail did not become the communication standard for the business executive in the next decade. It's simply a better way.

— Thomas Marill

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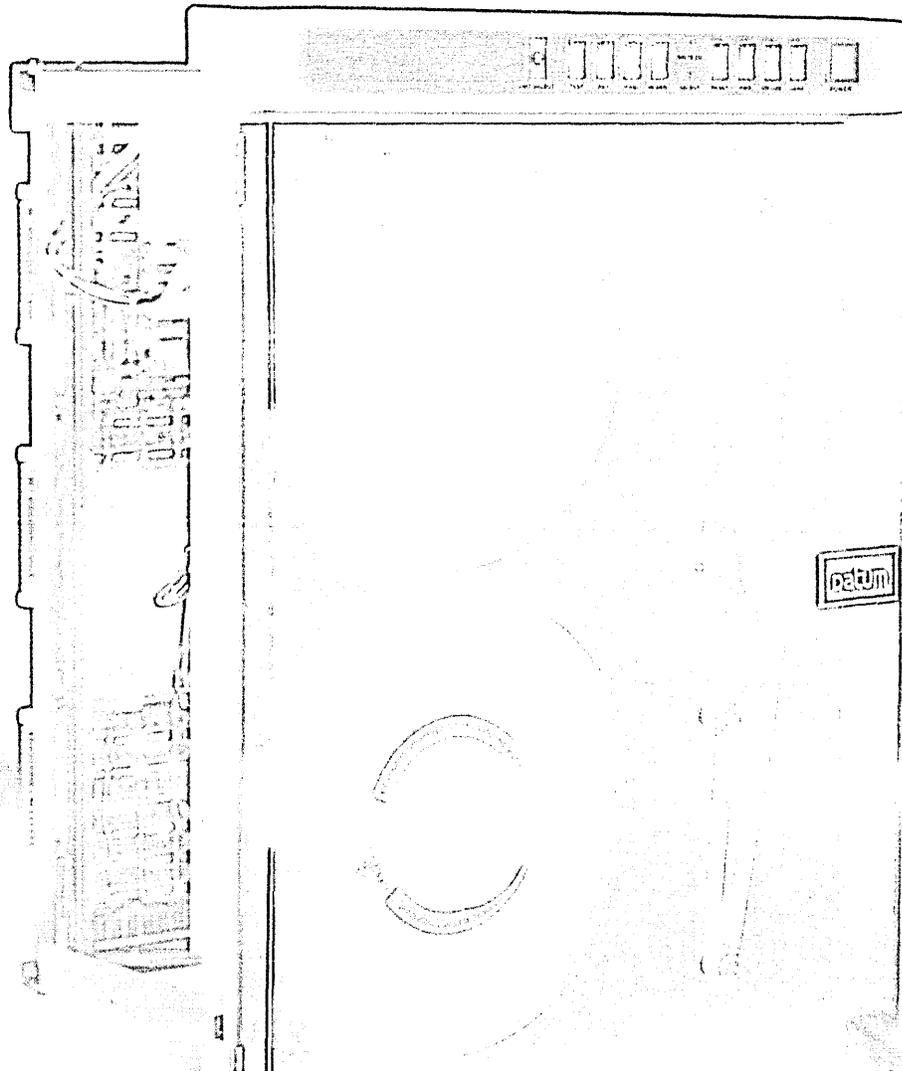
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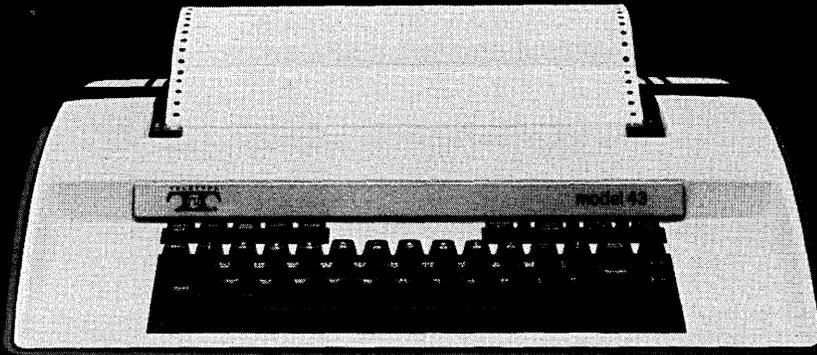
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1363 S. State College Blvd., Anaheim, CA 92806  
1363 S. State College Blvd., Ontario, CA 91764  
1363 S. State College Blvd., Jersey, NJ 07033  
1363 S. State College Blvd., Framingham, MA 01901

1363 S. State College Blvd., Anaheim, CA 92806. Tel: 714/533-6333. TWX 910/592-1289. Telex 68-6579. EUROPEAN DATUM House, Harlington, Middlesex, England. Tel: 01-697-0456. Telex 635-398. DATUM SALES 1363 S. State College Blvd., Jersey, NJ 07033. Telex 06-966857. EUROPEAN MOUNTAIN STATES, Denver, Colorado 80232. Tel: 303/693-3474. Telex 7654-5590. MIDWEST, Des Plaines, Illinois 60018. Tel: 312/296-1064. SAN JOSE, San Jose, CA 95117. Tel: 415/251-1701. Tel: 617/872-6911.

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