DATAMATION 79®

JUNE/3.00 U.S.A.

SEMICONDUCTORS

A conversation on semiconductors . . .

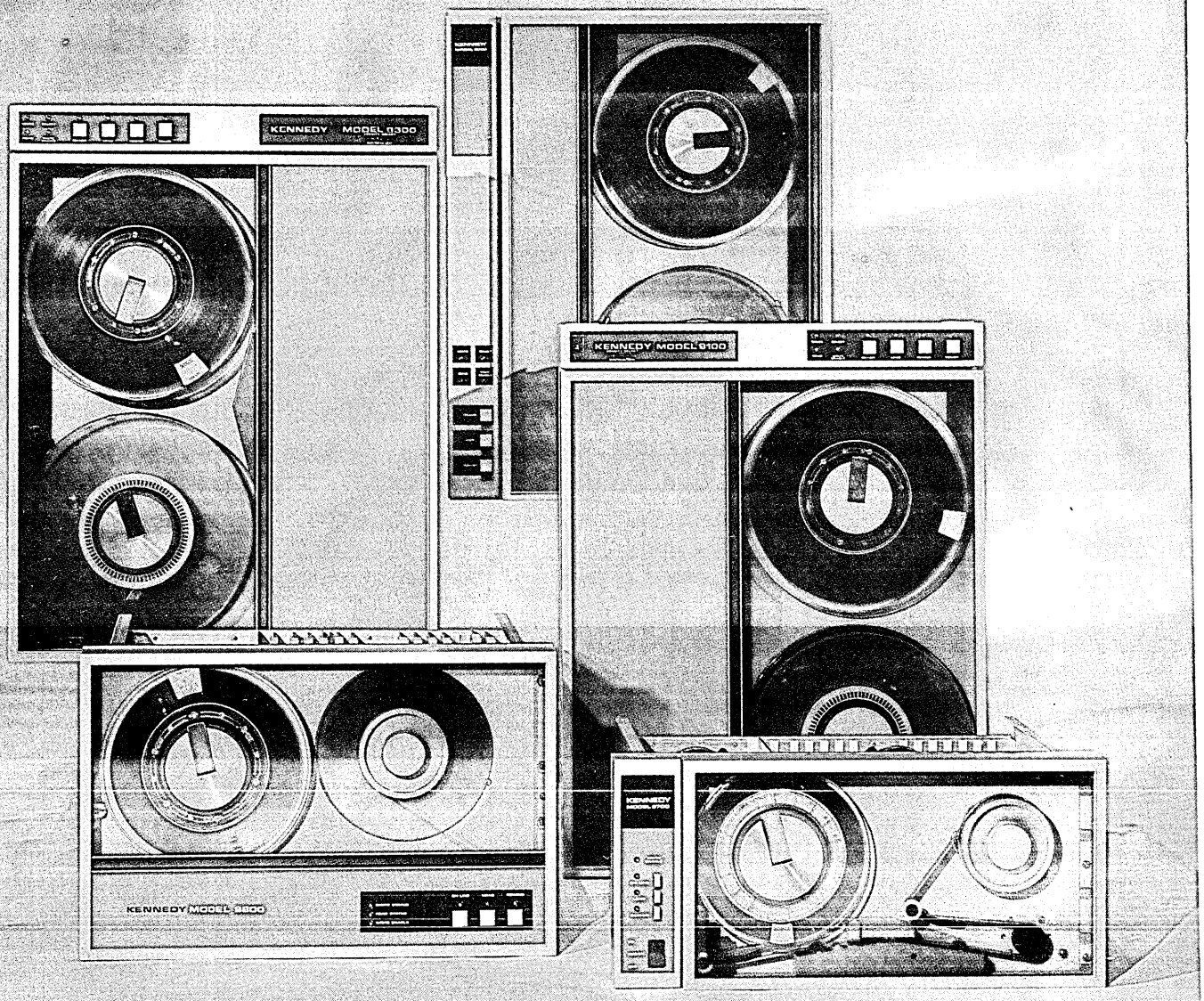
Also: Project control software . . . on estimating . . . manufacturing systems . . .

Kennedy peripheral products.

Buying is just the beginning.

There's a lot more to any company's success than just the products it sells. We know that at Kennedy. That's why we help select the Kennedy product best suited for your requirement; it's the reason we've established training seminars for people using our equipment; it's why we have virtually over-night service; complete documentation; and completely stocked service centers and parts depots in the U.S. and Europe. And always someone at the end of the phone to answer questions about service, delivery, modifications, interfacing — you name it. If you're a customer of Kennedy, you know it. If you're not, give us a call.

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

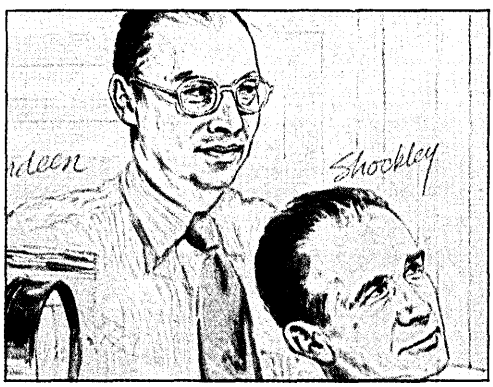


KENNEDY-QUALITY-COUNT ON IT

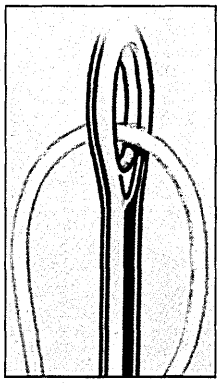
CIRCLE 1 ON READER CARD

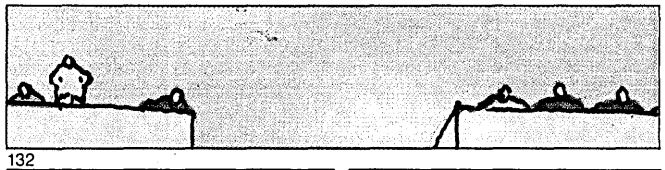
JUNE 1979/3.00 U.S.A. VOLUME 25 NUMBER 7 This issue 147,228 copies

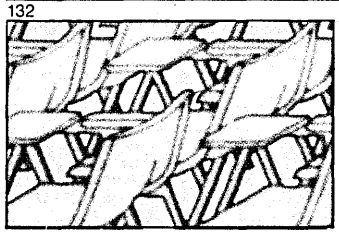
DATAMATION 79®



114


108


132


84


98

FEATURES

COVER
The history of the semiconductor from Brattain's epochal discovery to our own roundtable on the present state of the art is all laid out by illustrator Michael Haasis; © 1979.

ILLUSTRATIONS
The work in this issue is copyrighted 1979 by the following: Photography p. 41, drawing p. 211: Barbara Benson. Drawing p. 49: Mike Nichols. Photography pp. 98 through 107: Bob Reed. Illustration p. 108: Greg Curley. Illustrations pp. 114-115: Michael Haasis. Photos pp. 116-117: Bell Laboratories. Illustration p. 181, 233: Gary Lund. Illustration p. 231: Diane Teske Harris.

NEWS IN PERSPECTIVE

DEPARTMENTS

DATAMATION

Editor John L. Kirkley
Senior Editor Richard A. McLaughlin
Articles Editor Wendy Reid Crisp
International Editor Angeline Pantages
European Editor Ralph Emmett
Products Editor Bill Musgrave
Copy Editor John Waterhouse
Special Assignments Editor Becky Barna
Articles Assistant Sarah Rolph
News Editor Tom McCusker
East Coast Bureau
Manager Laton McCartney
Bureau Managers
San Francisco Edward K. Yasaki
Los Angeles Edith D. Myers
Greenwich Angeline Pantages
Boston Vin McLellan
Washington, D.C. Linda Flato Runyan
Correspondents
Atlanta Lynn Ridlehuber
Southwest Robert F. Alexander
London Fred Lamond
Paris Andrew Lloyd
Editorial Advisor Robert L. Patrick
Technical Advisor Lowell Amdahl
Contributing Editors Ralph G. Berglund
Howard Bromberg, Philip H. Dorn, John M. Eger, Martin A. Goetz, David Hebditch, William Helgason, Portia Isaacson, Louis B. Marienthal, Russel Pipe, Carl Reynolds, F. G. Withington

EDITORIAL OFFICES
Headquarters: 1801 S. La Cienega Blvd., Los Angeles, CA 90035. Phone (213) 559-5111. **Eastern:** 35 Mason St., Greenwich, CT 06830, (203) 661-5400, 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
666 Fifth Avenue, New York, NY 10019
Circulation Manager Suzanne A. Ryan
Marketing Research Manager Deborah Dwelley
Publisher James M. Morris

BPA Circulaton audited by Business Publications Audit

ABP Member American Business Press, Inc.

American Business Press, Inc.

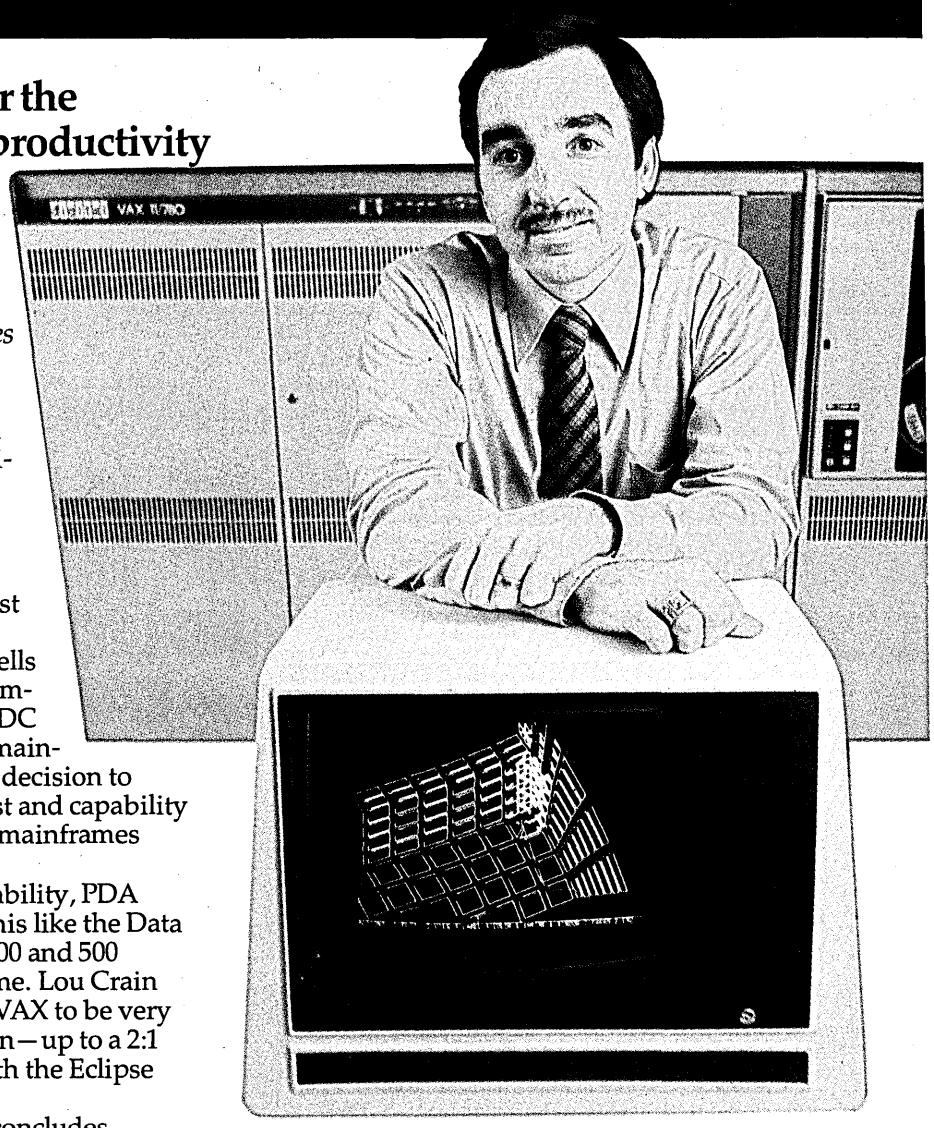
DATAMATION Magazine is issued monthly on or about the first day of every month, plus one special issue in mid-May. Published by Technical Publishing Company, A Dun and Bradstreet Company, 1301 South Grove Ave., Barrington, Illinois 60010; James B. Tafel, Chairman; John K. Abely, President. Executive and Advertising offices, 35 Mason Street, Greenwich, CT 06830, (203) 661-5400. Editorial offices, 1801 S. La Cienega Blvd., Los Angeles, CA 90035. Published at Chicago, Ill. DATAMATION is circulated without charge by name and title to certain qualified individuals in the United States and Canada who are employed by companies involved with automatic information handling equipment. Available to others by subscription at the rate of $32 (U.S. and Possessions), $42 (Canadian). Reduced rate for qualified U.S. students: $16. Foreign subscriptions: £33:50. Additional charge for airmail: £30:00. Japan, Australia and New Zealand: £38:50 (air-shipped). Sole agent for all subscriptions outside the U.S.A. and Canada is J. B. Tratsart, Ltd. 154 A Greenford Road, Harrow, Middlesex HA13QT, England. No subscription agency is authorized by us to solicit or take orders for subscriptions. Controlled circulation paid at Columbus, OH.

Microfilm copies of DATAMATION may be obtained from University Microfilms, A Xerox Company, 300 No. Zeeb Road, Ann Arbor, Michigan 48106. Printed by Beslow Associates, Inc. POSTMASTER: Form 3579 to be sent to Technical Publishing Company Circulation Office: 666 Fifth Avenue, New York, NY 10019. Publication Number: 148800. Single copy: $3.00 in U.S.A.

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

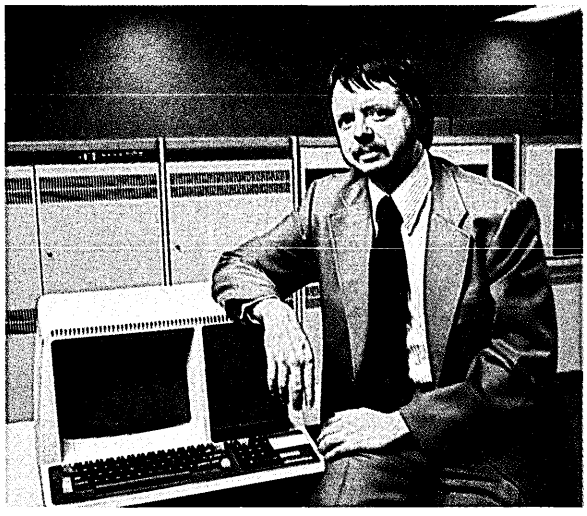


PDA is an employee-owned engineering concern whose business ranges from fundamental research in structural analysis to the manufacture of critical aerospace components.

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 _____

Address _____

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.

A-6-9

digital

CIRCLE 127 ON READER CARD

LOOKING BACK

MAY/JUNE 1959

This issue reported an investigation being undertaken by the National Bureau of Standards about the performance of magnetic tape. "Although magnetic tape is widely used in recording sound," the news brief reads, "data recording by this method has not been entirely satisfactory. Failure of the tape to record important data has at times been very costly, wasting time and money, and even destroying irreplaceable data. Because existing test procedures do not adequately measure all properties that effect performance, the danger of tape failure is ever present."

JUNE 1969

The industry was wondering about IBM's plans to unbundle. DATAMATION carried an in-depth treatment of potential ramifications. In the context of discussing IBM versus independent service, we commented editorially, "But if you get into equipment that uses new techniques like Large Scale Integration, you're probably better off using the vendor's service, since the independent service firm may be discouraged by the spare parts investment."

Unbundling grew out of the evolving definition of software with respect to the Consent Decree of 1956, which stated "IBM is hereby enjoined and restrained from conditioning the sale or lease of any standard tabulating or electronic data processing machine upon the purchase or lease of any other standard tabulating or data processing machine." Court action in June '69 saw Applied Data Research, Inc., asserting that the concept of software as "know-how to make the computer hardware operative" has "no technological or economic justification," and that software "stands on its own feet as a basic and major, and perhaps principal, component of the computer industry."

Consensus was that IBM would first price applications software separately. One ex-IBMer is quoted in our article as saying "IBM was dragged into offering applications programs by aggressive marketing people, but now the momentum in computer use in many industries is so high that IBM would not lose customers by not having Type II for them. If there is a convenient way out of this service, or at least to reduce its cost, IBM would be happy to use it."

IBM was expected to drag its feet on pricing systems software. As Martin A. Goetz put it in his Forum article, "I doubt that IBM will voluntarily relinquish its monopoly in systems software. And what is systems software anyway except those programs that a computer manufacturer chooses to implement? And what's not systems software? Well, it's those programs that the manufacturer was not pressured into implementing. That's how software is built by manufacturers . . . just enough to get by and who really cares how good it is . . . unless it may sell more computers."

"Software is software in the eyes of the law," our article quotes a lawyer with dp credentials as saying. "How would the industry like it if the courts had to judge the difference between these arbitrary classes, or between one function they perform and another? Asking for such distinctions, when even within IBM the line is not always clear between its 'types' of programs, is asking for regulation."

Which is exactly what H. Ross Perot predicts in *his* Forum in that issue. "Dismantling IBM will cause so many problems that the next step will be industry regulation," he says. "This can be gracefully brought about by the end of the '70s," he continues, "because of the dependency of our industry on communication facilities. Twenty years from now, under such circumstances, the computer industry will become just another public utility." ✲

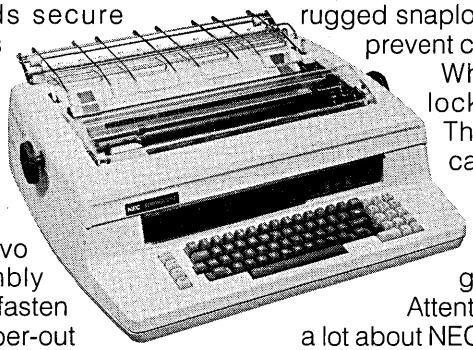
The NEC Snaplock.

A rugged little extra that makes printers more reliable.

Raise the cover of most printers and you'll find retainers that keep circuit boards secure in their connectors. NEC printers have board retainers too.

But they also have more than two dozen other locks and holddowns—far more than competitive printers.

Snaplocks, for example. NEC Spinwriter™ and Trimliner™ printers have at least 16. Six to secure servo and stepping motors, head assembly and control panel cables. Ten more to fasten the driver board, voltage regulator, paper-out switch and operator panel power switch cables.



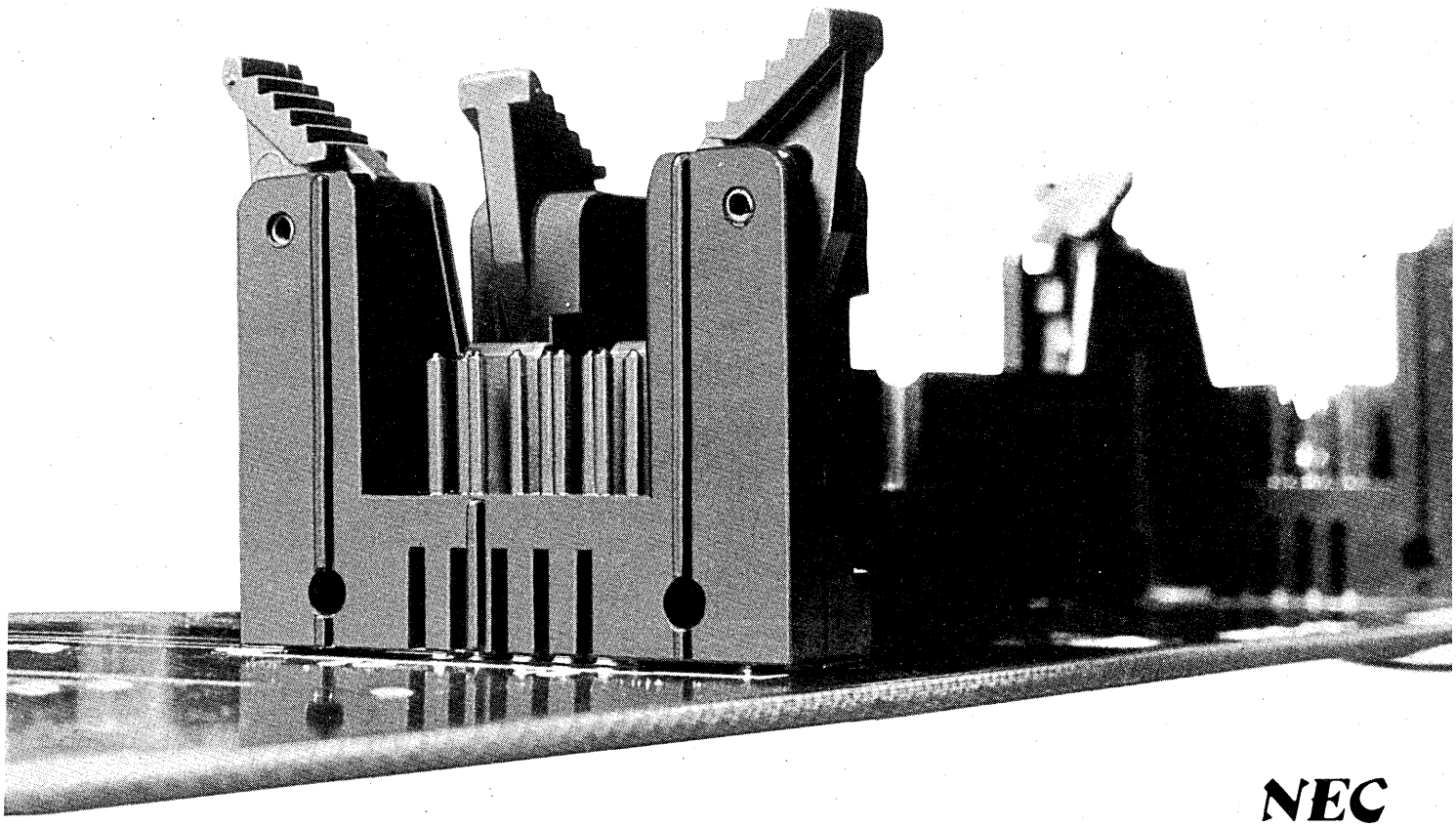
Every cable and wire connection also has its own rugged snaplock. Another 10 cable holddowns prevent cable strain and wire chafing.

What's so good about all these locks and holddowns? Reliability. They keep out the gremlins that cause printers to fail. NEC designs printers with the industry's highest MTBF. And it takes a lot of snaplocks to help us reach that goal.

Attention to the smallest detail. It tells a lot about NEC's motivation.

Send for our new printer brochures.

NEC. Going after the perfect printer.



NEC

NEC Information Systems, Inc.

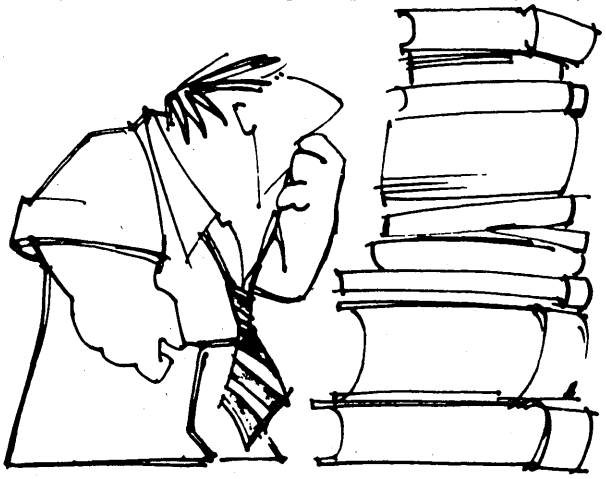
Eastern Office: 5 Militia Drive: Lexington, MA. 02173, (617) 862-3120
Central Office: 3400 South Dixie Drive, Dayton, OH. 45439, (513) 294-6254
West Coast Office: 8939 S. Sepulveda Blvd., Los Angeles, CA. 90045, (213) 670-7346
Southern Office: 2965 Flowers Rd. South, Atlanta, GA. 30341, (404) 458-7014

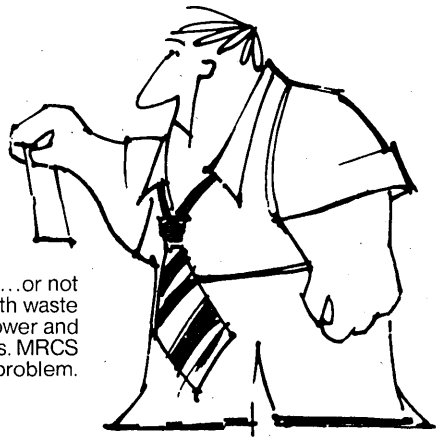
CIRCLE 83 ON READER CARD

How to get the most from your computers...*and* the people who use them.

You may have the most cost-effective computer system available. But with any such system, people are part of your investment. Is your team—machines and people—working at full efficiency?

It is, if you use MRCS (Multiple Report Creation System) from MCAUTO. MRCS can pay for itself during your first major programming development by increasing throughput. You can expect a 90% increase in productivity for simple inquiries, or save 50% in producing complex reports. It's unsurpassed for responsive and flexible information retrieval.



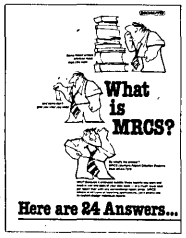


Too much data...or not enough. Both waste computer power and human resources. MRCS solves the problem.

If you have an OS/VS1 or VS2 installation, MRCS will produce exactly those reports you want—no more and no less than what you ask for—with just one pass of your data bank. At a much lower cost per report than with any conventional report writer. It's much lower priced than other report writers with similar capabilities.

But MRCS isn't just for programmers. We designed it for end-users, also, to get individual reports for any application—when needed.

We invite you to put MRCS to the test. Send for our brochure, "24 Answers..." to the most frequently asked questions about MRCS. Like the use of BAL, COBOL, PL/1 or FORTRAN subroutines; table and lookup features; purchase, lease, or teleprocessing on our computers via MCAUTOnet™; training, support, documentation and maintenance; specifications. You'll also have an opportunity to ask us *your* questions about MRCS. Send today for our brochure, and we'll help you get the most from your computers—*and* the people who use them.



W. R. Vickroy
MCAUTO, Dept. KAI-500
Box 516, St. Louis, MO 63166

☐ Please send me your "24 Answers..." brochure.

☐ Please have your representative phone me for an appointment.

Name

Title

Company Name Phone

Address

City State Zip

MCAUTO®
MCDONNELL DOUGLAS
Setting the standard in data processing.

MCAUTO is a registered trademark of McDonnell Douglas Automation Company

CIRCLE 129 ON READER CARD

It took a new company to bring new flexibility to distributed data processing.

Sycor and Data 100 become Northern Telecom Systems Corporation.

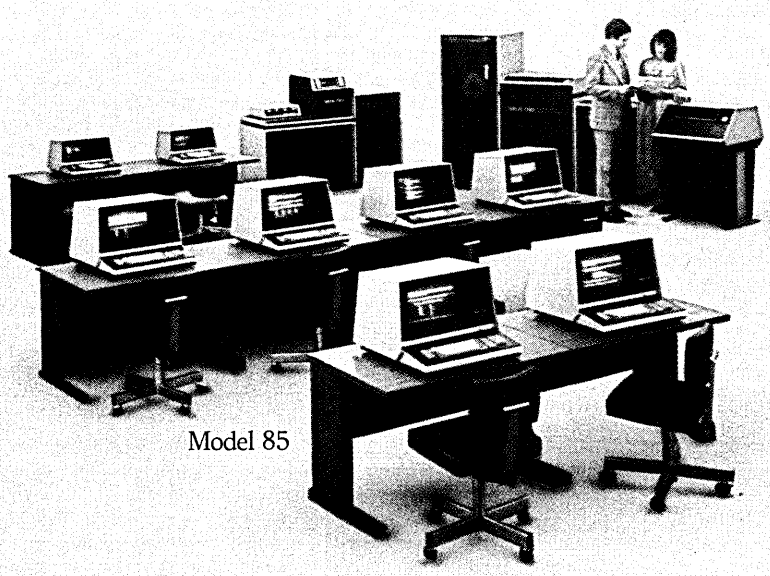
Northern Telecom
More options make us more

Now one company has all the Sycor 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.

More software support people, too. We're committed to providing the best total service in our industry. And 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.



Model 85

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.

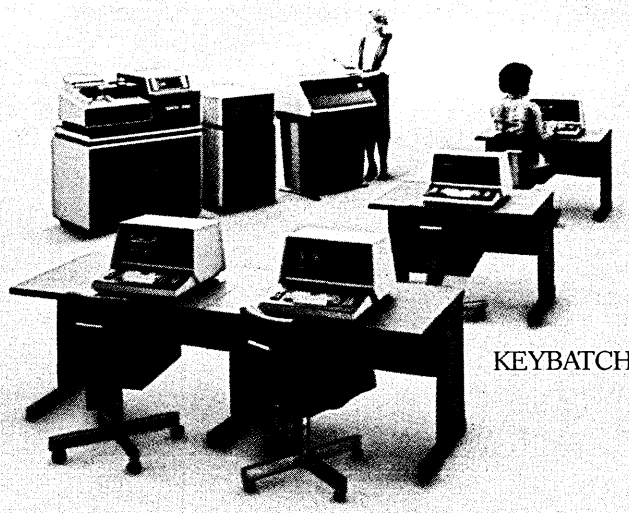
Model 445

Model 405

Systems Corporation: cost-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®

Model 70 Series

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.

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

northern telecom

CIRCLE 159 ON READER CARD

DASD®

WE'LL GET RID OF YOUR CRUNCH. FAST.

Computer Crunch comes in many different varieties. A peak load situation. A major development project. A conversion. Or attrition. Each demanding more manpower or more technical know-how than you have immediately available. Be ready. **Before** you have your next Crunch, get a taste of what DASD can do for you.

We're fully staffed in sixteen major U.S. cities, with the capability to go anywhere. Our people are the very best, each one selectively screened for their experience and expertise in the latest computer technology. And they're kept up to date with consistent training. Our line of proprietary software and conversion tools is the most comprehensive available.

When you have your Crunch, we can simply furnish the needed computer technology. Or actually work side by side with your people to contribute the extra manpower and technical skill necessary to complete a special project. We'll even undertake full project responsibility, matching our proficiency against the calendar to complete implementation under budget and on time.

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

What's more, we thrive on Computer Crunches. So, share your next one with us...and watch it disappear. Fast.

I'd like
a taste of
what DASD
can do for me.

Name _____

_____

Title _____

_____

Company _____

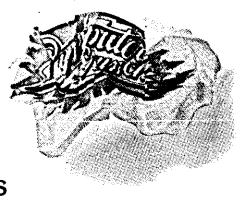
Phone _____

Address _____

City _____ State _____ Zip _____

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

DASD Corporation
Corporate Services Center
9045 North Deerwood Drive
Dept. DM24
Milwaukee, WI 53209
(414) 355-3405



PEOPLE/PRODUCTS/RESULTS

Atlanta • Chicago • Des Moines • Detroit • Hartford • Houston • Indianapolis • Kansas City • Los Angeles • Milwaukee • Minneapolis • Tampa/St. Petersburg • Philadelphia • San Francisco • Seattle • Washington, D.C.

CIRCLE 47 ON READER CARD

User-programmable intelligent terminals for distributed processing, data communications, and even standalone applications . . . **from $4500.***

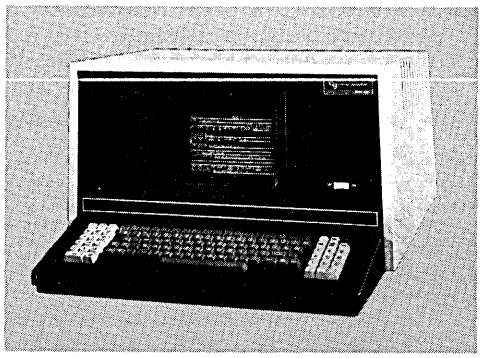
The growing MDT family. Includes the popular Mini-Disk 402, with **more** cost effectiveness than any other terminal in its class. Plus the all-new Multi-Disk 405 with **more** processing power, **more** mass storage (twice that of competitive systems), **more** product line software, **more** flexibility, and **more** reliability. And still there's more. . .

Compugraphic—over $200 million in sales—makes more intelligent terminals in a week than most of our competitors can in a month. And we back those terminals by our own 400-man field service force in the United States alone.

What's more, substantial quantity discounts position the MDT family as the most cost-effective intelligent terminals on the market for the OEM and end-user alike.

Need more information? Stop in to see us at NCC (Booth 413-415 at the Hilton Hotel). Or clip and mail the coupon below today.

*Mini-Disk MDT 402 list price with 16K RAM Memory, CRT, mini-disk, keyboard, and disk operating system.



Mini-Disk MDT 402

Multi-Disk MDT 405

Smart, Powerful—and More

compugraphic
80 Industrial Way
Wilmington, Mass. 01887
(617) 944-6555

Mail to: Compugraphic Corp., Computer Products Sales
80 Industrial Way, Wilmington, Mass. 01887

The MDT 400 family is intelligent. Tell me more.

☐ Text Editing ☐ Distributed Processing
☐ Communications ☐ Other _____

Name _____

Title _____

Company _____

Address _____

City _____ State _____ Zip _____

Phone _____

DM679

CIRCLE 43 ON READER CARD

"WITH THE MODCOMP CLASSIC, WE DON'T HAVE TO TRADE PERFORMANCE TO GET RELIABILITY."

Bill Greene, Staff Engineer
Process Computer Systems Group
Chemicals & Plastics Division Engineering
Union Carbide Corporation

Bill Greene is a staff engineer for the Process Computer Systems Group which is responsible for designing, building, testing and installing process control computer systems in the company's manufacturing plants.

Because of their experience, we gave them our new Classic 7860 super mini to test. Their experience with it was summed up in three words. "We love it."

"It's a reliable machine. And reliability is the name of the game."

"We'll trade performance for reliability anytime," said Bill. "But with the Classic, we don't have to.

"The Classic hardware is very solid. Especially for a new product. "The performance characteristics of the Classic are impressive, too. With its extremely fast floating point processor, the Classic can run through a program more than 3.7 times as fast as a MODCOMP II."

"A working computer with software that doesn't work is useless."

"We've been running the MAX III operating system for five years and the MAXNET III network extension for the past two years. They've performed well under very demanding conditions. In fact, over the past year, we've had more than 99.5% uptime on more than 30 installed MAX III systems.

"However, we're installing larger process computer networks now with more and more satellites. So we need increased host computer hardware and software capabilities.

"Our tests with MODCOMP's enhanced MAX IV operating system in the Classic have been very encouraging.

"MAX IV and the new MAXNET IV will help us relieve bottlenecks so that we can add more links and do more work with the computer. We also expect that File Manager, which can create a new file anywhere on a disc, will be a useful tool."

"We install 15-20 systems a year, so ease of implementation is important."

"Even though the Classic is a powerful and sophisticated machine, it should be an easy system for our project teams to implement. MODCOMP provides plenty of documentation and they've always been very helpful in working with us to get our systems up and running.

"In fact, we think so highly of MODCOMP and the Classic, we've already ordered two MODCOMP Classic 7860's to be used as host computers in large process control distributed networks."

It takes a tough computer to satisfy a tough customer.

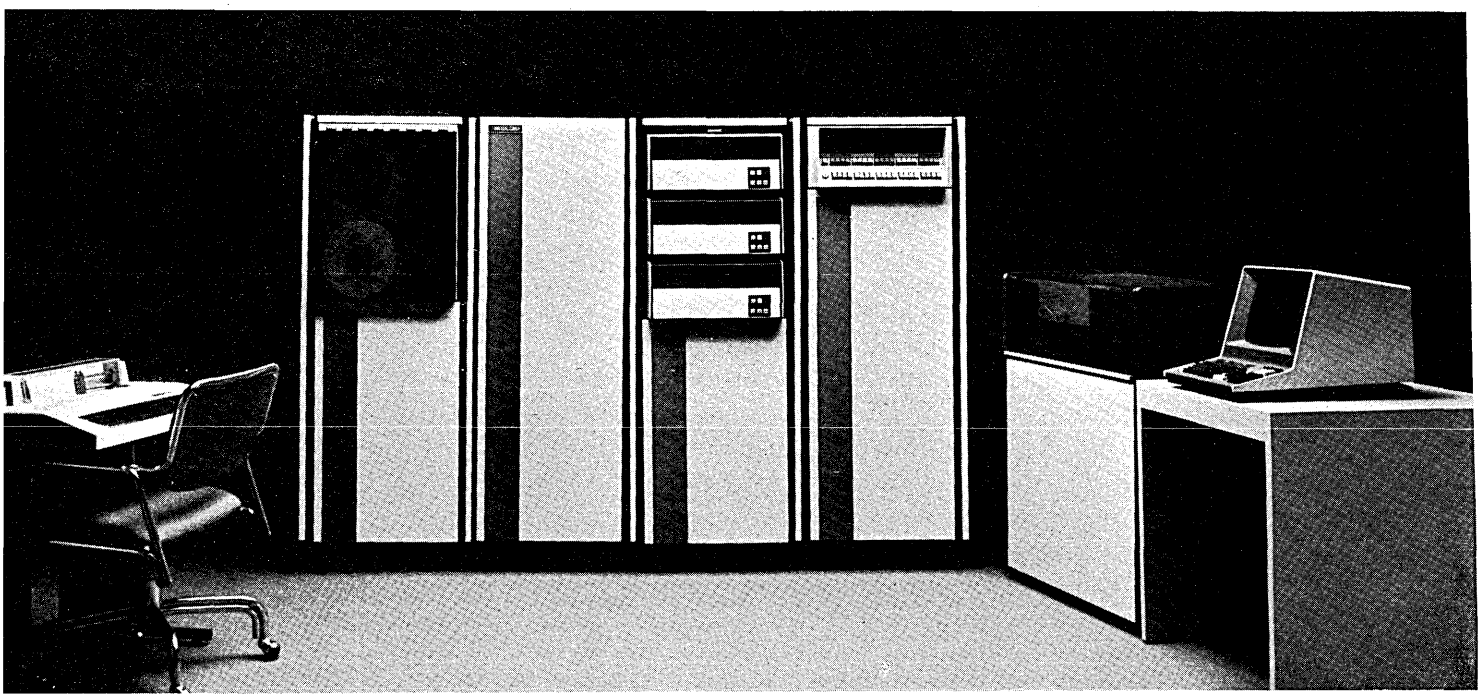
At MODCOMP, we specialize in building real-time computers. They work in chemical plants. In petroleum refineries. In steel foundries. In jet propulsion labs. In electric power plants. In some of the harshest industrial environments you can imagine. Nevertheless, independent surveys have rated MODCOMP computers the most reliable systems on the market.

If you want reliability, but you don't want to trade performance to get it, do what Union Carbide did. Buy a MODCOMP Classic.

MODCOMP®
Dedicated to your success

Modular Computer Systems, Inc.
1650 W. McNab Road Ft. Lauderdale, FL 33309
(305) 974-1380

CIRCLE 41 ON READER CARD



LOOK AHEAD

ALTERING A CONSENT DECREE

The "tentative decision" handed down last month by the Federal Communications Commission in the Computer Inquiry II proceeding has stirred considerable controversy in Washington, especially at the Justice Dept. In effect, the provisional ruling eases the way for industry giant AT&T and other carriers to enter the data processing marketplace with what the FCC calls "enhanced non-voice" services offered on a tariff basis. The commission thinks this would free Bell from provisions of the Consent Decree it signed in 1956 which prohibited it from entering the unregulated dp business.

The Justice Dept. in the past has staunchly nixed efforts to modify the Decree, feeling that Ma Bell shouldn't be allowed to enter the dp domain unless given a specific OK through a settlement agreement in the Government antitrust suit against AT&T. Said an insider at Justice: "Just let the FCC go off and do whatever it wants. It doesn't affect our enforcement judgment. We have the last word. The FCC can tell AT&T that ACS (Advanced Communications Service) and all these wonderful things are now approved. And the first time AT&T attempts to offer them," he warned, "we can drag them into court."

Not so, says an IBM spokesman -- D. N. Piccone, who is the director of Telecommunications Practices at IBM. "We think, as in so many times in the past, the Justice Dept. is just plain wrong. There are plenty of examples in the past where courts have changed the terms of Consent Decrees due to changed circumstances." And there is plenty of evidence, Piccone said, that the telecommunications marketplace has changed drastically since 1956.

NEW STORAGE DEVICES FROM MEMOREX

In development at Memorex are a number of storage devices bearing internal code names taken from the world of subatomic physics. The first of them, named Charm, is an eight-inch Winchester disk drive that derives from the "Quark" family. The peripherals maker thus joins a gaggle of companies recently announcing the tiny fixed-disk drive that fits into a floppy disk's slot. Memorex displayed a unit in New York City during the NCC, along with a double-density 3350-equivalent drive, which has already been announced by Control Data, IBM, and Storage Technology. More products from the Quark family are due out over the next year or two.

NEW HARDWARE TWIST BY TIME-SHARING FIRM

Many time-sharing companies now offer hardware to customers whose financial officers find their time-sharing bills high enough to justify an in-house system. Among them are Automatic Data Processing, and National CSS. Scientific Time Sharing Corp. planned early this year to offer an IBM-compatible processor with proprietary APL software, but postponed the move after IBM announced its 4300 line.

I. P. Sharpe Associates, Ltd., the Toronto APL time-sharing company with 3,000 customers at 600 companies, has

LOOK AHEAD

taken a different approach: It will install its APL software on a customer's existing IBM computer and also provide packet switching software for a 3705 front-end processor. This enables a company to use the machine in its own network or as a node on the Sharpe network. The APL package is supplied at $3,000 a month, plus an installation charge of $100,000. Sharpe has signed up seven customers so far, including Xerox in Rochester, N. Y., and two unnamed companies, one using a 370/155, the other an IBM-compatible Itel AS-4.

Next, Sharpe will offer APL packages on the new IBM 4341 for about $10,000 a month under a two-year lease, or for $20,000 a month on a turnkey operation in which Sharpe would install the computer on its own premises. "Time-sharing," says president Ian Sharpe, "gets a lot of visibility in a company when the charges start to get up to $50,000 a month."

SUBTITLES FROM DATUM

Datum Inc. is developing for a customer in the broadcasting industry, a device which will permit transmission of data to any television set. One considered application: selective English subtitles for the deaf. "You don't see it if you don't want to," said Datum chairman and president, Louis B. Horwitz. "It's a matter of pushing a button."

BACK-ENDS FOR THE "DUMB" 3705

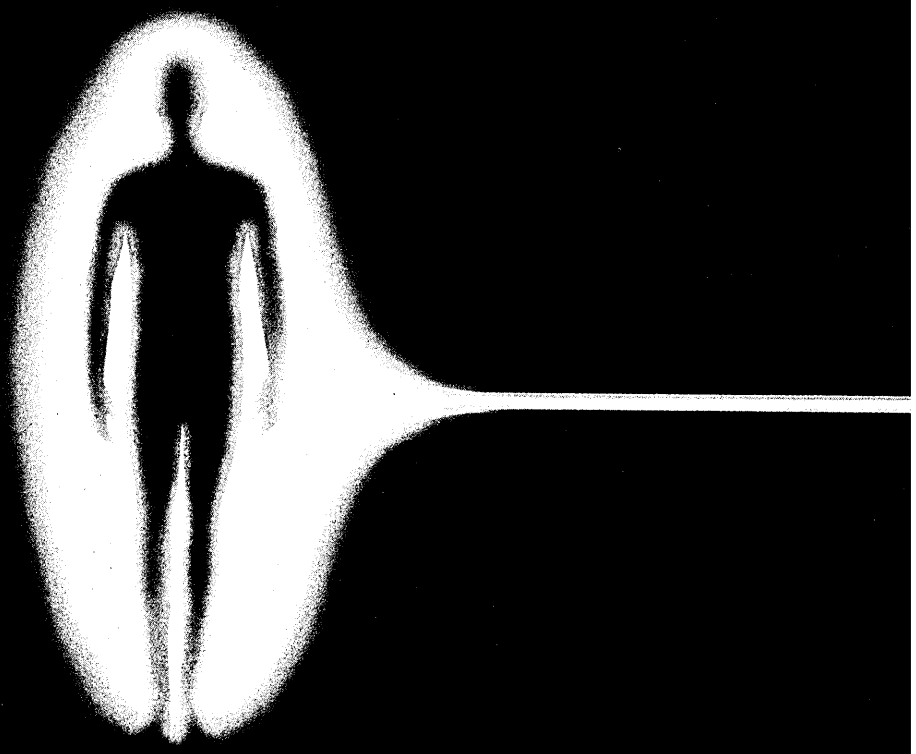
Front-ends growing back-ends? That's the concept IBM has been quietly offering some of its larger users. The mighty mainframer calls the novel approach the "Communications Management Configuration," or CMC. The proposition is based on the idea that the capabilities such front-end competitors as Comten and Computer Communications, Inc. have been pushing to displace "dumb" 3705 front-ends are really there for the asking in IBM's Systems Network Architecture (SNA) product line. All it takes, according to IBM, is to hang a 370 computer as a back-end off a 3705 and to dedicate it to network management using multihost SNA.

The end result is that the central control point for network resources is moved out of the "host" into the back-end 370, which can do message switching, attach disks and use the 370 instruction set. The CMC notion may sound far fetched at first glance and, indeed, IBM seems to be somewhat hesitant about pushing it too strongly, but "with 370 prices plummeting," as one industry insider notes," the idea could make sense if performance is not out of line."

CITIBANK's TIME-SHARING PUSH

Look for Citibank to move more aggressively into the computer services business now that Project Paradise -- the banks' widely publicized effort to decentralize its dp activities -- has wound down. Robert White, the Citibank executive who headed the Paradise Project, is now reported to be devoting a major share of his energies to buttressing the giant bank's time-sharing activities and is rumored to be looking into software as another source of new business. Some factions at the bank are strongly opposed to these activities, insiders say, arguing that Citibank should stick to banking.

(continued on page 51)



An important new concept in human energy management.

Implementation

The essence of man is his mind.

Brainpower is our most valuable natural resource. It is a precious *human energy.*

Today's highly refined computing machines offer extraordinary opportunities to put that energy to work.

To help achieve the maximum potential of that energy, Informatics created *Implementation Systems.*

Implementation Systems are *working tools* designed to let the application programmer, or the non-technical user, achieve their maximum productivity.

Implementation Systems can relieve the DP manager and his applications programmers of enormous and time-consuming work.

Implementation Systems thrust user activity out of the computer dark ages... and into step with hardware state of the art.

Focus: On the issues of the next decade.

We have seen only the tip of a great data processing iceberg. Vast new information management opportunities will surface in the next ten years, through powerful data-base and data-communications techniques.

The capacities of computers will become awesome.

New data base technologies will create unprecedented new problems.

Business will depend on computers more and more often... to perform more tasks than ever before. Increasingly complex applications will be required of computers... and programmers will have far less time to effect them.

Requirements for qualified data base specialists will increase dramatically.

Programming tools now used to interface with complex data bases will become obsolete.

The demand for data by non-DP people will continue to grow.

But new data base technologies will also create unprecedented new promise.

Information will become available where the work is done—in the user's office.

Decision makers will have rapid, easy access to the data they need.

Data base inquiries will be accomplished in conversational language, not complex codes.

Computer languages will become more solution oriented, less machine oriented.

Programming procedures will be far simpler.

We begin to fulfill the promise of these new technologies today, with Implementation Systems.

Information on the spot.

There is a problem. Increasing numbers of non-technical people need fast access to bits of information buried inside vast data bases.

Implementation Systems have a solution. Our new Inquiry line of data retrieval products provides a simple, effective query language for the non-programming user.

With Inquiry, the language for human/data base communication comes almost as naturally as chatting with a neighbor.

With Inquiry, clerical staff can find the data they need quickly, easily... without the interruption of programmers' more critical tasks.

With Inquiry, analysts can manipulate information to solve difficult "what if" problems.

With Inquiry, information is delivered instantaneously.

Yet data access must be authorized by DP managers. So data integrity is fully secured, and impact on computer resources is entirely controlled by the data base administrator.

A giant step toward bringing the power of the

Announcing our newest Inquiry product—INQUIRY IV/IMS Release 4. It's for use with IMS data base systems.

Accurate reports, generated simply.

There is a problem. Department managers need to draw information from various files and data bases, organize the data and write reports. DP managers' offices are backlogged with their requests.

Implementation Systems have a solution. Our Answer line of report writers is versatile and capable ...more powerful than a simple query language.

They are remarkably easy to learn by non-programmers. A few hours and a little practice is average.

And they are extremely easy to use.

DP staff can use them to produce error-free reports from files and data bases in a fraction of the usual time.

Or department managers and their trained staffs can produce the same documents themselves, conserving programmers' vital *human energies* for more complex tasks.

Users of data communication terminals can generate reports on-line or in batch mode with the Answer line.

Our newest report writer, Answer/2, is available at modest cost for most popular data base management systems and operating environments.

Applications built quickly.

There is a problem. The already large volume of applications to be implemented is expanding under the

Systems

pressure to keep up with new technologies.

Because of outmoded computer languages and application development methods, a lot of valuable *human energy* is wasted.

Implementation Systems have a solution. The powerful MARK IV® Application Development line can reduce the time and cost of programming and maintenance significantly over procedural languages.

These Application Development systems dramatically reduce programming work and facilitate problem solving.

For example, they automatically perform such housekeeping jobs as data access, file handling, and data conversion associated with programs written in procedural languages.

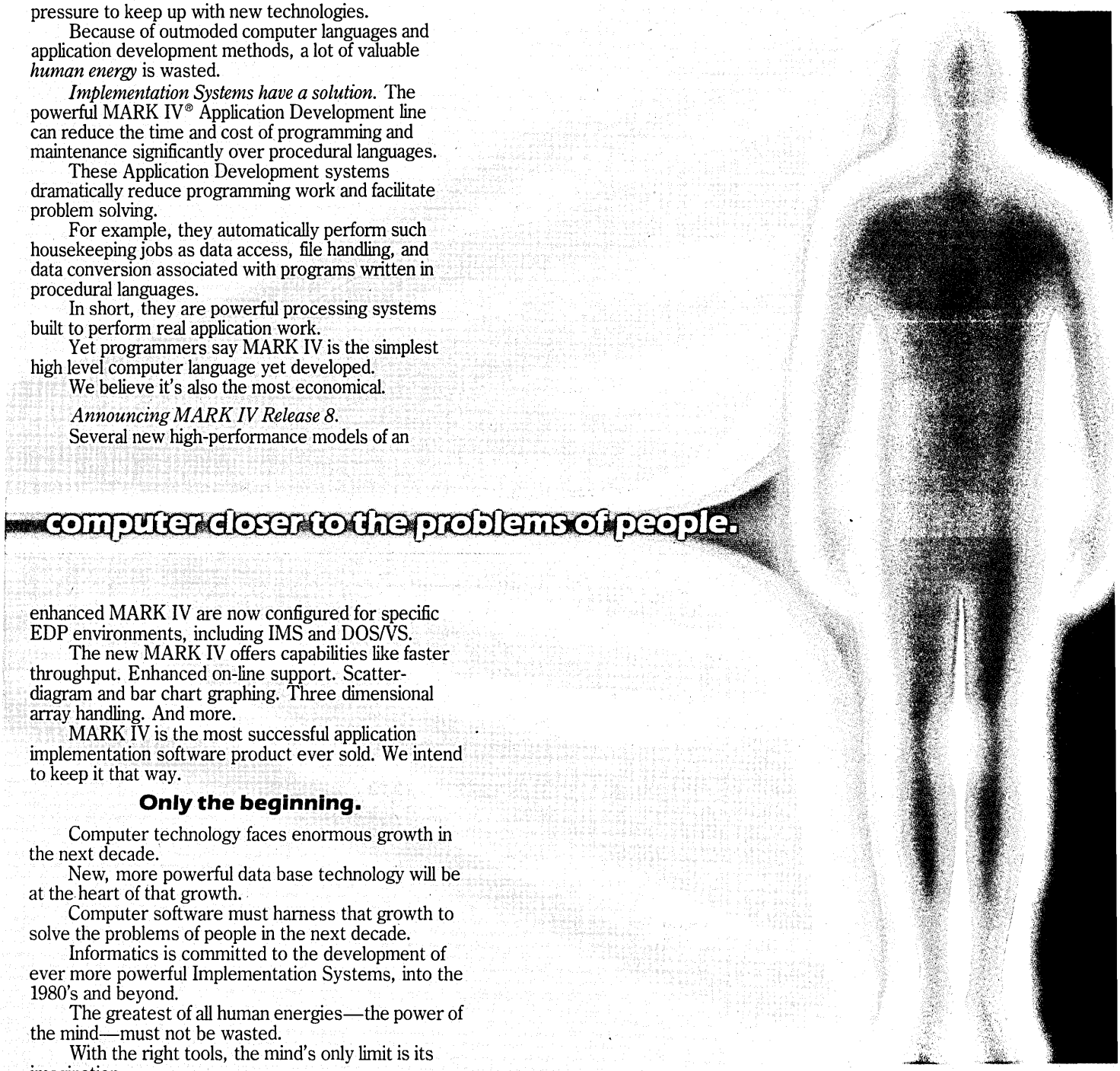
In short, they are powerful processing systems built to perform real application work.

Yet programmers say MARK IV is the simplest high level computer language yet developed.

We believe it's also the most economical.

Announcing MARK IV Release 8.

Several new high-performance models of an



enhanced MARK IV are now configured for specific EDP environments, including IMS and DOS/VS.

The new MARK IV offers capabilities like faster throughput. Enhanced on-line support. Scatter-diagram and bar chart graphing. Three dimensional array handling. And more.

MARK IV is the most successful application implementation software product ever sold. We intend to keep it that way.

Only the beginning.

Computer technology faces enormous growth in the next decade.

New, more powerful data base technology will be at the heart of that growth.

Computer software must harness that growth to solve the problems of people in the next decade.

Informatics is committed to the development of ever more powerful Implementation Systems, into the 1980's and beyond.

The greatest of all human energies—the power of the mind—must not be wasted.

With the right tools, the mind's only limit is its imagination.

Informatics Inc.
21050 Vanowen St., Canoga Park, California 91304
(213) 887-9121 Telex: 69-8473

For a more intensive investigation of the challenge of the 1980's... and how Informatics' Implementation Systems can help you meet this challenge... call or write our headquarters.

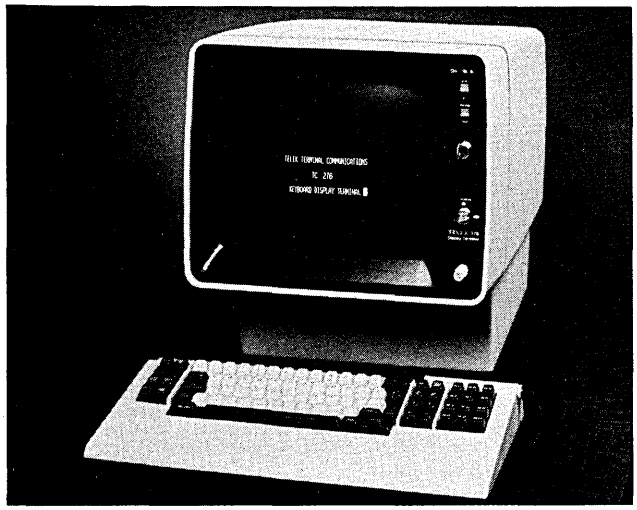
informatics inc®

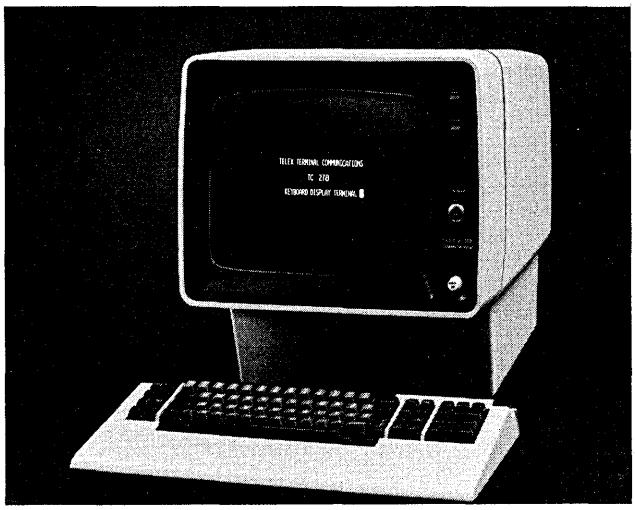
The Information Management Company

CIRCLE 81 ON READER CARD

Introducing a new standard of plug-compatible performance:

3276/3278-Compatible terminal products from TELEX.





If you are planning to upgrade your on-line application to current-generation technology, talk to us—Telex Computer Products—one of the industry's leading independent suppliers of IBM 3270-compatible terminals.

We've built our reputation on our ability to understand our customer's needs, and to satisfy those needs better than any other supplier can. We'll do the same with our new TC278 IBM 3278-compatible terminals and TC276 3276-compatible controllers.

We offer more compatibility, from line protocol to terminal performance features: BiSynch through SNA/SDLC, and operator characteristics that eliminate system changes or operator re-training. Our terminals are supported by four different controllers—IBM's and our own—for maximum configuration flexibility.

We offer proven design reliability, just as we have on the 40,000 3270-replacement terminals we've shipped to date. We're proving to our many customers, each day, that our products are built to last.

We offer nationwide service from 120 locations by our own factory-trained field engineers. We're big enough to serve your application requirements anywhere.

We offer all you expect in 3276/3278 terminal products, and then some, at prices below IBM's ($4,200 for the TC276 controller and $1,950 per TC278 terminal). Lease plans are also available.

You'll see more from us later this year, because being a leader means staying ahead. For a preview, call your nearest Telex office or fill out the coupon below:

Please send information on your new plug-compatible terminal products:

☐ TC276 Controller ____ ☐ TC278 Terminal ____

☐ Other Plug-Compatible Telex Peripherals

☐ Tapes ☐ Add-on-Memory

☐ Disks ☐ Printers

Name _____

Title _____

Company _____

Street _____

City _____ State _____ Zip _____

Telephone ( ) _____

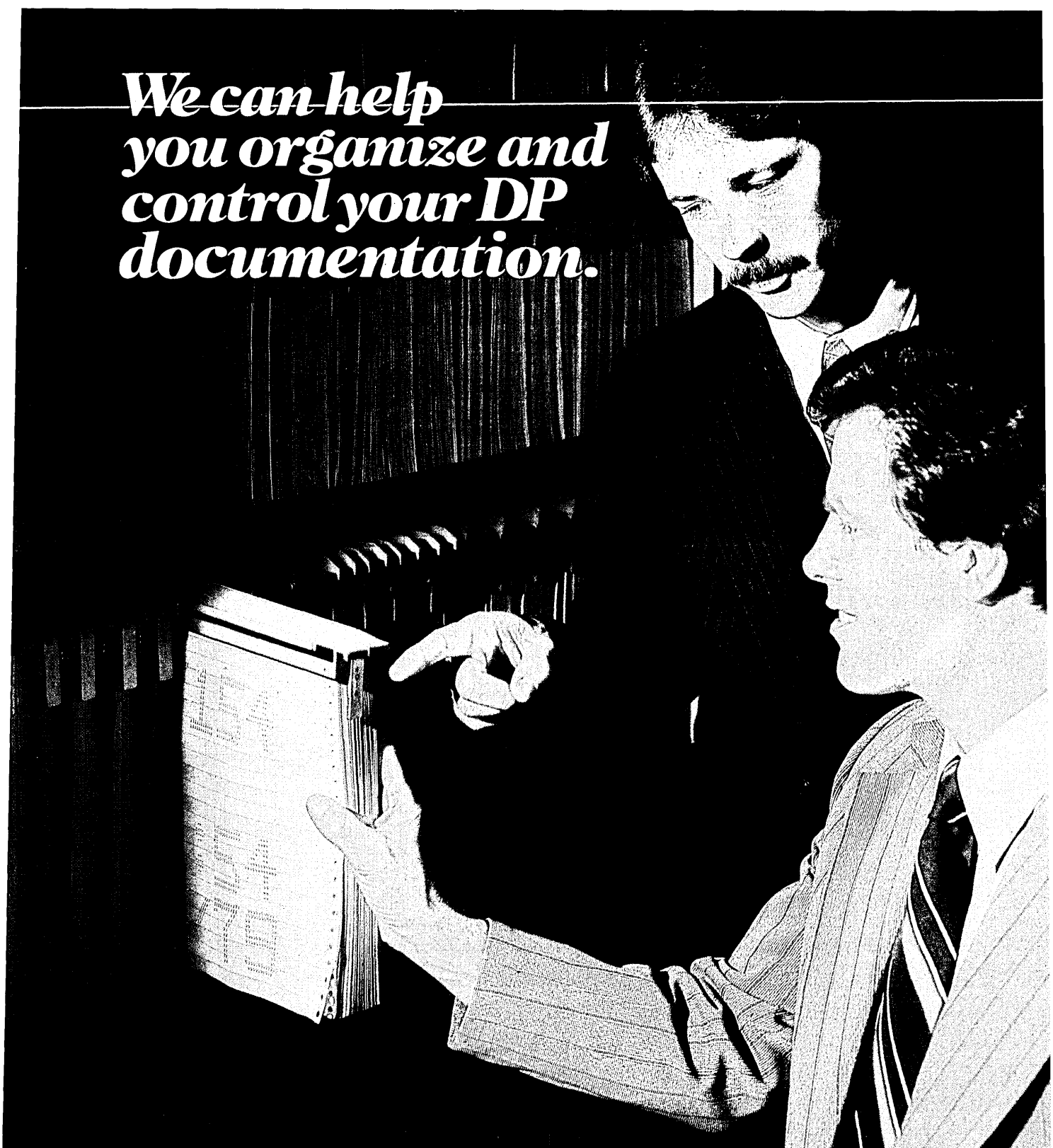
☐ Please have a salesman call

TELEX®

TELEX COMPUTER PRODUCTS
Terminal Communications Division
3301 Terminal Drive
Raleigh, North Carolina 27604
(919) 834-5251

CIRCLE 70 ON READER CARD

We can help you organize and control your DP documentation.



Wright Line men and women understand the problems of data processing documentation. Documentation is expensive to create, is regarded as a corporate asset by auditors but is useless if misplaced, lost or destroyed. As experts in DP filing equipment, Wright Line people can help you establish a Structured Filing™ network for better control and organization of completed and emerging documentation. The key to Structured Filing™ is the proprietary Documate™ System which provides a universal filing method for all sizes and shapes of documentation from cards to print-out.

Find out about Structured Filing™

If you would like to know more about how the Structured Filing concept and the unique Documate System can help you accomplish better management control and organization of your D.P. documentation, circle the readers' service number or send today for a copy of our booklet "Guidelines for Establishing Structured Filing," Wright Line Inc., 160 Gold Star Boulevard, Worcester, Mass. 01606.

Wright LINE

A subsidiary of Barry Wright Corporation

CIRCLE 108 ON READER CARD

CALENDAR

JULY

System Safety Society Meeting, July 9-13, San Francisco.

The theme of the fourth international conference of the society is "What Price Safety in a Regulated Society?" Contact Carrol Burtner, System Safety Society, P.O. Box 731, Cupertino, CA 95014.

OCR Users Association Expo, July 15-18, Boston.

Contact the OCR Users Assn., 10 Banta Place, Hackensack, NJ 07601 (201) 343-4935.

Harvard Computer Graphics Week '79, July 15-20, Cambridge.

The conference will focus on currently available cartographic and statistical data bases, graphics hardware, software, and the electronic communication of geographical information. "Highly interactive" special sessions are planned in the areas of technology transfer, remote sensing, the 1980 Census, the new nine-digit postal zip code, thematic map design, and standards. There will be exhibits of hardware and software. Contact Kathleen Quigley, Center for Management Research, 850 Boylston St., Chestnut Hill, MA 02167 (617) 738-5035.

Summer Computer Simulation Conference, July 16-18, Toronto.

The theme is "Simulation in a Rapidly Changing Computer World." Contact Dr. A. J. Schiewe, The Aerospace Corp., P.O. Box 92957, Los Angeles, CA 90009 (213) 648-6120.

AUGUST

SIGGRAPH '79, August 6-10, Chicago.

Tutorials, technical sessions, and an exposition will be featured at this 6th annual ACM Special Interest Group on Computer Graphics and Interactive Techniques. Contact Maxine D. Brown, SIGGRAPH '79 Exposition, Hewlett-Packard, 19400 Homestead Rd., Cupertino, CA 95014 (415) 326-7300.

Seventh Conference on Electronic Computation, August 6-8, St. Louis.

Sponsored by the Committee on Electronic Computation of the Structural Division of the American Society of Civil Engineers (ASCE), in cooperation with the Washington Univ. Civil Engineering Dept. The conference is expected to have ten sessions including more than 40 papers and a tutorial on computing technology. Topics to be discussed include: minicomputer applications; microprocessors and smart terminals; distributed computing; interactive graphics; structural dynamics analysis methods; non-finite element methods; finite element idealization studies; large scale linear equation solvers, eigen solvers, ordinary differential equation solvers, and non-linear methods; interactive analysis and design; supercomputers and applications; computer assisted project management; and application of computing in small offices. Contact Dr. C. Wayne Martin, 212 Bancroft Bldg., Univ. of Nebraska, Lincoln, NB 68588.

SEPTEMBER

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

Contact Dr. R. Adey, Engsoft, 6 Cranbury Place, Southampton SO2 OLG, 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 Micheal 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 Services, P.O. Box 24346, Seattle, WA 98124 (206) 576-5118.

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 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

Here's how you can be fully computerized for so much less than you thought

BUSINESS — EDUCATION — ENGINEERING — MANUFACTURING

We are pleased to announce the first professional time-sharing system in the microcomputer field.

Naturally, it's from Cromemco.

This new multi-user system will do all of the tasks you usually associate with much more expensive time-sharing computers. Yet it's priced at an almost unbelievably low figure.

Look at these features:

- **You can have up to 7 terminals plus a fast, 132-column line printer**
- **You can have a large system RAM memory that's expandable to ½ megabyte using the Bank Select feature**
- **Each user has an independent bank of RAM**
- **You can have floppy disk storage of up to 1 megabyte**
- **You have confidentiality between most stations**
- **And, make no mistake, the system is fast and powerful. You'll want to try its fast execution time yourself.**

PROGRAMMERS LOVE OUR BASIC

This new system is based on Cromemco's well-known System Three Computer and our new Multi-User BASIC software package.

Programmers tell us that Cromemco Multi-User BASIC is the best in the field. Here are some of its attractions:

- **You can use long variable names and labels up to 31 characters long — names like "material on order" or "calculate speed reduction."**
- **You get many unusual and helpful commands that simplify programs and execution — commands such as PROTECT, LIST VARIABLES, NOLIST, and many more.**
- **No round-off error in financial work (because our BASIC uses binary-coded decimal rather than binary operation). And we've still been able to make it FAST.**
- **Terminals and printer are interrupt-driven — no additional overhead until key is pressed.**
- **The conveniences in this Multi-User BASIC make it much easier to write your own application software.**
- **A line editor simplifies changes.**

BENCHMARK IT — NOW

In the final analysis, the thing to do is see this beautiful new system at your dealer. See its rugged professional quality. Evaluate it. Benchmark it for speed with your own routine (you'll be agreeably surprised, we guarantee you).

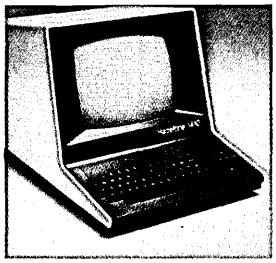
Find out, too, about Cromemco's reputation for quality and engineering.

Look into it now because you can have the capabilities of a fully computerized operation much quicker and for much less than you ever thought.

Cromemco
incorporated
Microcomputer Systems
280 BERNARDO AVE., MOUNTAIN VIEW, CA 94040 • (415) 964-7400

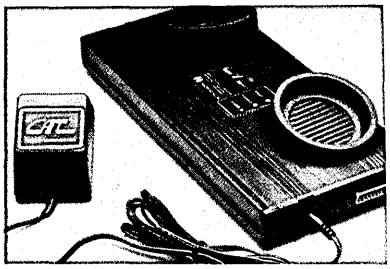
CIRCLE 71 ON READER CARD

What about service ?

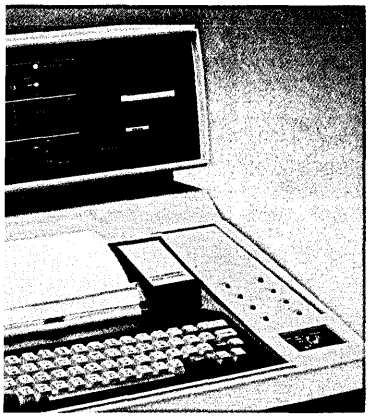


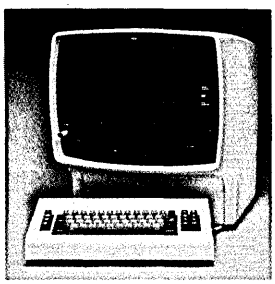
Should I buy?

Lease?



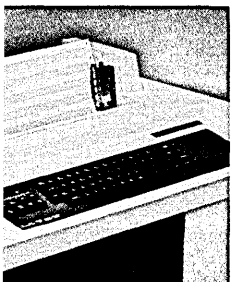
Lear-Siegler?

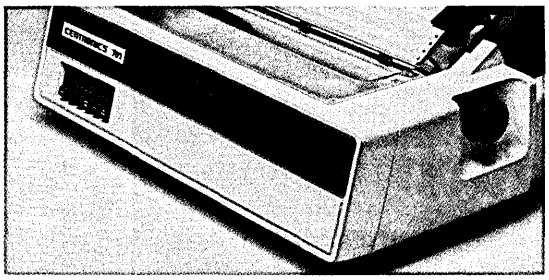




CRT's ?

Centronics?



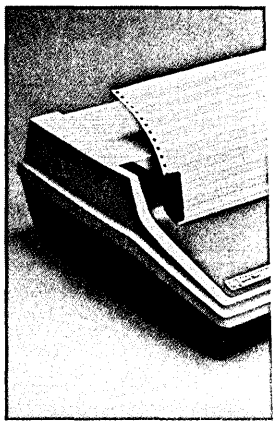


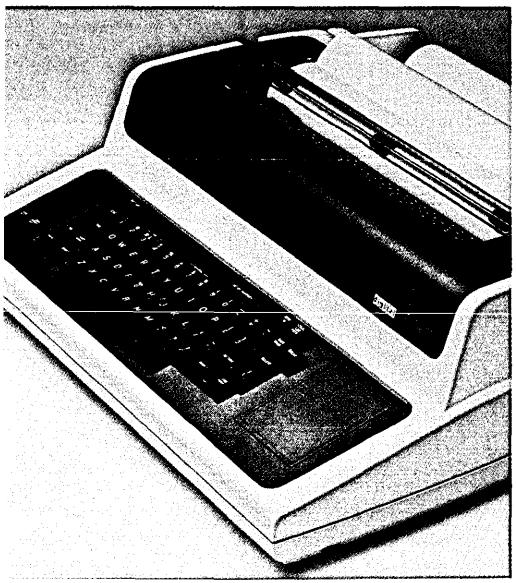
TTY ?

Hazeltine?

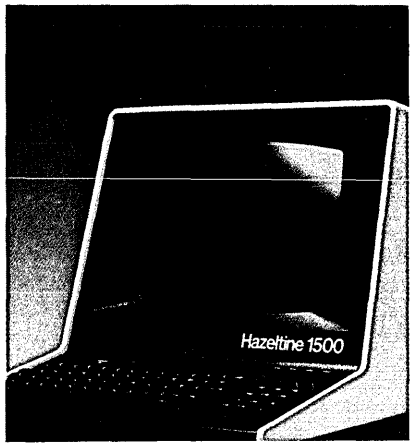
How can I reduce my costs ?

What can renting do for me ?

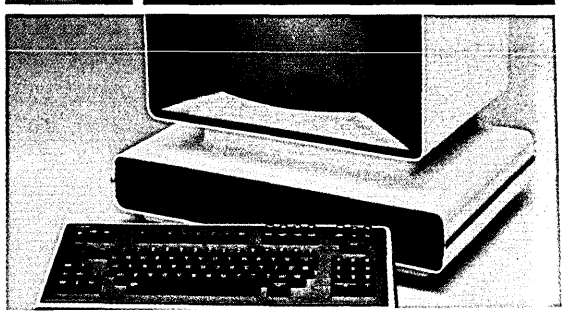




DEC ?



Texas Instruments ?



We'll put together a package of I/O solutions that works best for you.

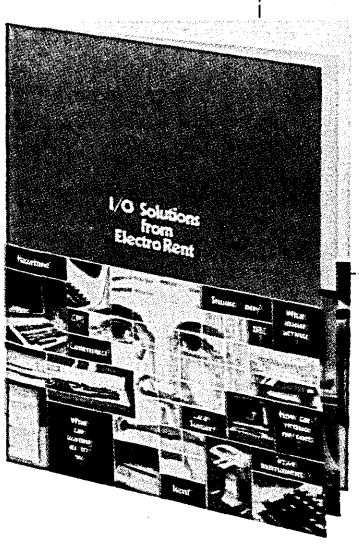
It's Friday. You were looking forward to the weekend.

But a couple of your CRT's have whined and stopped in unison. By lunchtime, your 200 CPS printer began to crawl along at 10 CPM. Then suddenly, in comes the biggest stack of unprocessed data you've seen in weeks.
What's the solution?

Get on the phone to Electro Rent fast. We're in the solution business. One of our I/O people will quickly and expertly evaluate your best hardware alternatives. He'll determine whether renting, leasing or buying new equipment is the most efficient plan for you.

Then, to complete the package, he'll see that you get the name-brand hardware and service you need, in a matter of hours, from one of our nationwide Inventory Service Centers.

But don't wait for a Fearful Friday or a Terrible Tuesday. Call our toll-free number or drop us this coupon today. We've got a lot of long-term solutions that can save you money too.



Call, toll-free **800-423-2337.**
(In California, 800-232-2173.)
Or return this coupon for our FREE, FULL COLOR I/O CATALOG.

Name_____

Title_____

Phone_____

Organization_____

Street_____

City_____

State_____ Zip_____

ElectroRent
4131 Vanowen Pl., Burbank, CA 91505

CALENDAR

WPOE '79, September 25-27, San Jose.
Word processing and office equipment show and conference. Contact Cartlidge & Associates, Inc., 491 Macara Ave., Suite 1014, Sunnyvale, CA 94086 (408) 245-6870.

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.

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 Instituto de Fisica, Via Amendola, 173-70126 Bari, Italy 080 331044.

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.

FEBRUARY

Info/Europe, February 18-21, 1980, London.
The Wembly Conference Centre in London is the setting for this dp and top management info expo. Sponsors promise easy access to the key buying influences in the U.K. and Western Europe. For information ExpoConsul, 420 Lexington Ave., New York, NY 10017; telephone (212) 953-1190.

MARCH

International EDP-Congress, March 17-21, Vienna.
ADV, an Austrian users' association, will discuss the "Chances and Limits of Information Processing." For information, Interconvention-Kongressorganisationsges, mbH, P.O. Box 35, A-1095 Wien, Germany; phone 42 13 52 or 43 41 00.

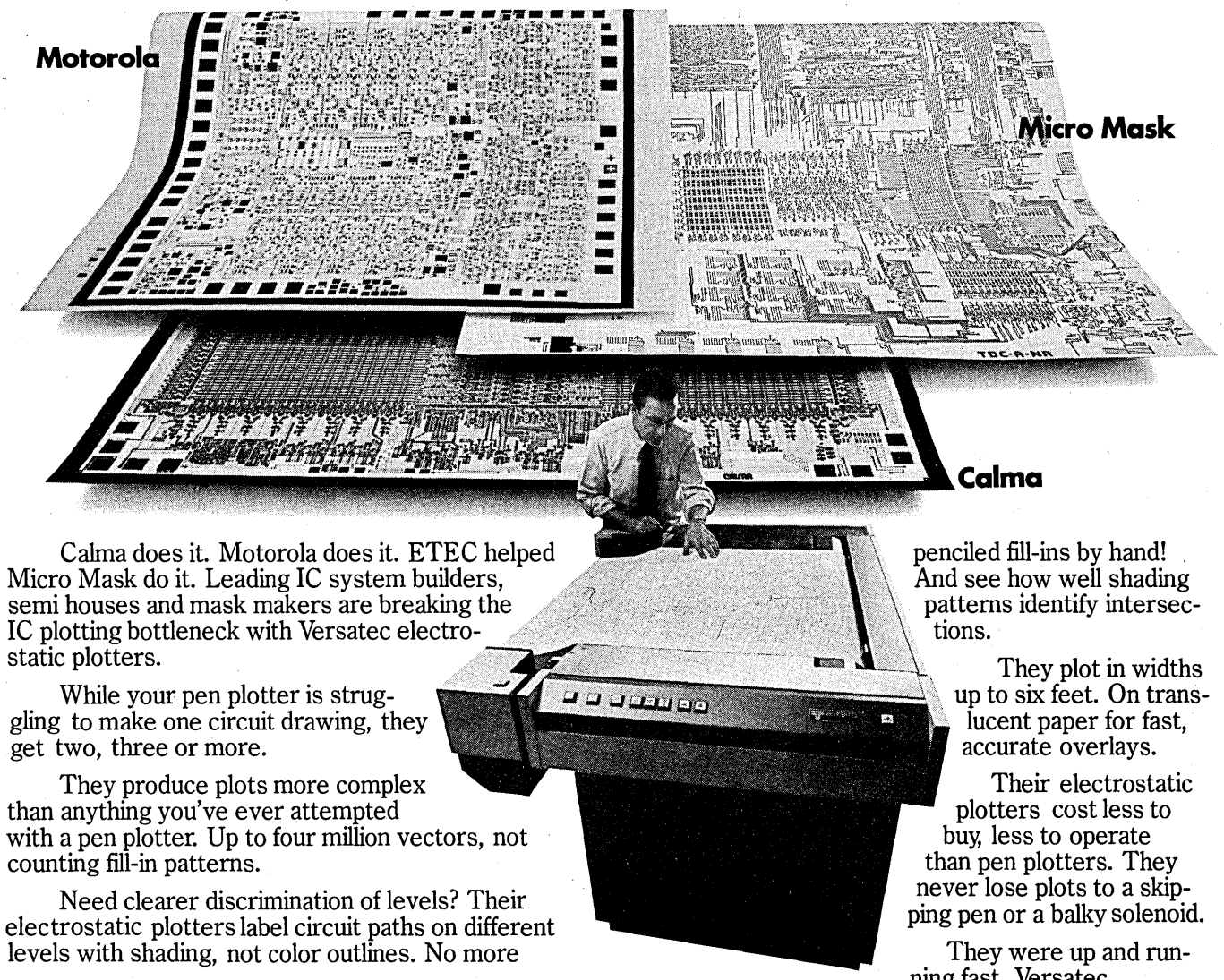
EUROCON '80, March 24-28, Stuttgart.
The fourth European Conference on Electronics will emphasize a review of significant recent developments, trends, and applications in the field of microelectronics. Contact the Conference Office, VDE, Lautenschlagerstrasse 21, D-7000 Stuttgart 1, Germany, or telephone 49-(0) 711-2059212.

CALLS

Original research and development papers are being solicited for a data communications symposium to be held in late November in Pacific Grove, California. The theme of the symposium is network user services. Recommended topics for contributions are specific applications (such as reservation services, electronic funds transfer, electronic mail and message, office automation, network information services, and teleconferencing), or general technical topics (such as network interconnection, security and privacy, voice/data/FAX integration, communication-based data base and information accessing, and local networking), or other topics relevant to the planning, analysis and design of the system for network user services. Four copies of a completed paper and a 500-word summary are due by April 1 to Dr. Wushow Chou, North Carolina State Univ., Computer Studies Program, P.O. Box 5490, Raleigh, NC 27650 (919) 737-2654. ✲

XEROX INTRODUCES THE BEGINNING OF A NEW CENTURY

Break the IC plotting bottleneck. With Versatec.

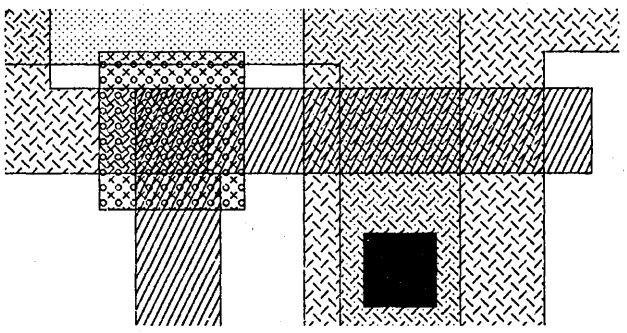


Calma does it. Motorola does it. ETEC helped Micro Mask do it. Leading IC system builders, semi houses and mask makers are breaking the IC plotting bottleneck with Versatec electrostatic plotters.

While your pen plotter is struggling to make one circuit drawing, they get two, three or more.

They produce plots more complex than anything you've ever attempted with a pen plotter. Up to four million vectors, not counting fill-in patterns.

Need clearer discrimination of levels? Their electrostatic plotters label circuit paths on different levels with shading, not color outlines. No more penciled fill-ins by hand! And see how well shading patterns identify intersections.



They plot in widths up to six feet. On translucent paper for fast, accurate overlays.

Their electrostatic plotters cost less to buy, less to operate than pen plotters. They never lose plots to a skipping pen or a balky solenoid.

They were up and running fast. Versatec hardware/software interfaces link to their computers and application programs.

They did it. So can you. Circle our number for literature, plot samples and the application report—"Plotting IC and PCB drawings." Versatec can end your CAD plotting bottleneck.

VERSATEC
A XEROX COMPANY

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

XEROX ® is a trademark of XEROX CORPORATION ®™ Versaplot is a Versatec trademark Sample plots courtesy of Calma, Motorola and Micro Mask. Shading patterns courtesy of Calma.

CIRCLE 8 ON READER CARD

DP Dialogue

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

AAA Of Michigan Accelerates User Service

The Automobile Club of Michigan insures homes, cars and boats for its members. Financial analysts at the club's Dearborn headquarters use APL, a user-oriented IBM programming language, for a wide range of studies and evaluations.

"Our users in research and evaluation groups now get promptly the small-scale analysis programs they vitally need – by writing them in APL themselves," says Charles L. Cone of the Automobile Club of Michigan. "This puts them at the head of the line, no matter how heavy the development schedule is for our major interactive systems."

The Automobile Club of Michigan, headquartered in Dearborn, is the largest insurance carrier among the clubs of the American Automobile Association. Cone, assistant director, administrative and financial operations, notes that actuaries and other analysts quickly mastered APL – a user-oriented IBM programming language.

"From our interactive business system we extracted a research file: a cross section of all policies in force. With an APL program, a user can organize or restructure this data in any way that proves useful for analysis. And we have developed a 'corporate data base' – a set of 150 separate files of financial information: losses, premiums, and so forth for the last 15 years."

The business system, online to branch offices throughout the state for claims and premium processing, runs under Information Management System/Virtual Storage (IMS/VS) on a System/370 Model 168. (APL runs on a Model 158 Attached Processor in the same center.) Research files developed from the IMS/VS data base are studied by the APL users with the aid of Data Interface, an IBM program product.

Actuaries, Cone points out, manipulate various coverages in the research file, and financial analysts enter rate changes into cash-flow calculations, to see the impact immediately. With an APL cost model, accountants ask "what if" questions, testing the effectiveness of alternate policies.

"Previously," Cone continues, "we developed this kind of analysis by giving a clerk a desk calculator and a printout of a complete file. Now we write an APL program to run against a data base, do the data reduction, and produce the desired analysis directly. The time required for one such task – a report on loss reserves – was cut from three days to one hour.

"In this way we short-circuit a two- to three-month program development cycle. Soon, our professional programmers will be doing only the difficult jobs – the big online programs – and everything else will be done by the users themselves. Today, in fact, our project people organize and test their programs in APL, defining system specifications and transcribing into COBOL only after everything is shaken down and validated."

ACCO 'Runs the Business' With DL/1

"We run the business from our data base," says Allan D. Elstien, director of data processing for ACCO International Inc., a Chicago manufacturer that uses IBM's Data Language/1 (DL/1).

"It is the ideal data-base system for us," Elstien notes. "It grows as the company grows; we can change record structures without affecting existing programs. For example, to add shop floor routings, we just added pointers to the item records."

At ACCO, a major producer of binders, paper clips, and other paper-fastening and storage products, an IBM System/370 Model 138 performs complete online customer order processing and inventory control.

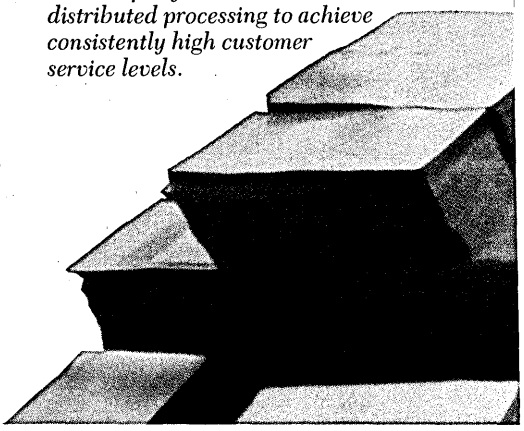
After clerks enter orders directly through online terminals, the computer sorts the items into warehouse picking sequence, generates the picking documents and invoices, tracks the order until it is shipped, extends the pricing and prints the invoice. DL/1 also keeps track of ACCO's complete inventory of products.

Online inquiry provides reliable current information on the availability of merchandise and on the status of a customer's order – including such details as when and how it was shipped, by what truck line, how much it weighed and when it is due to be delivered.

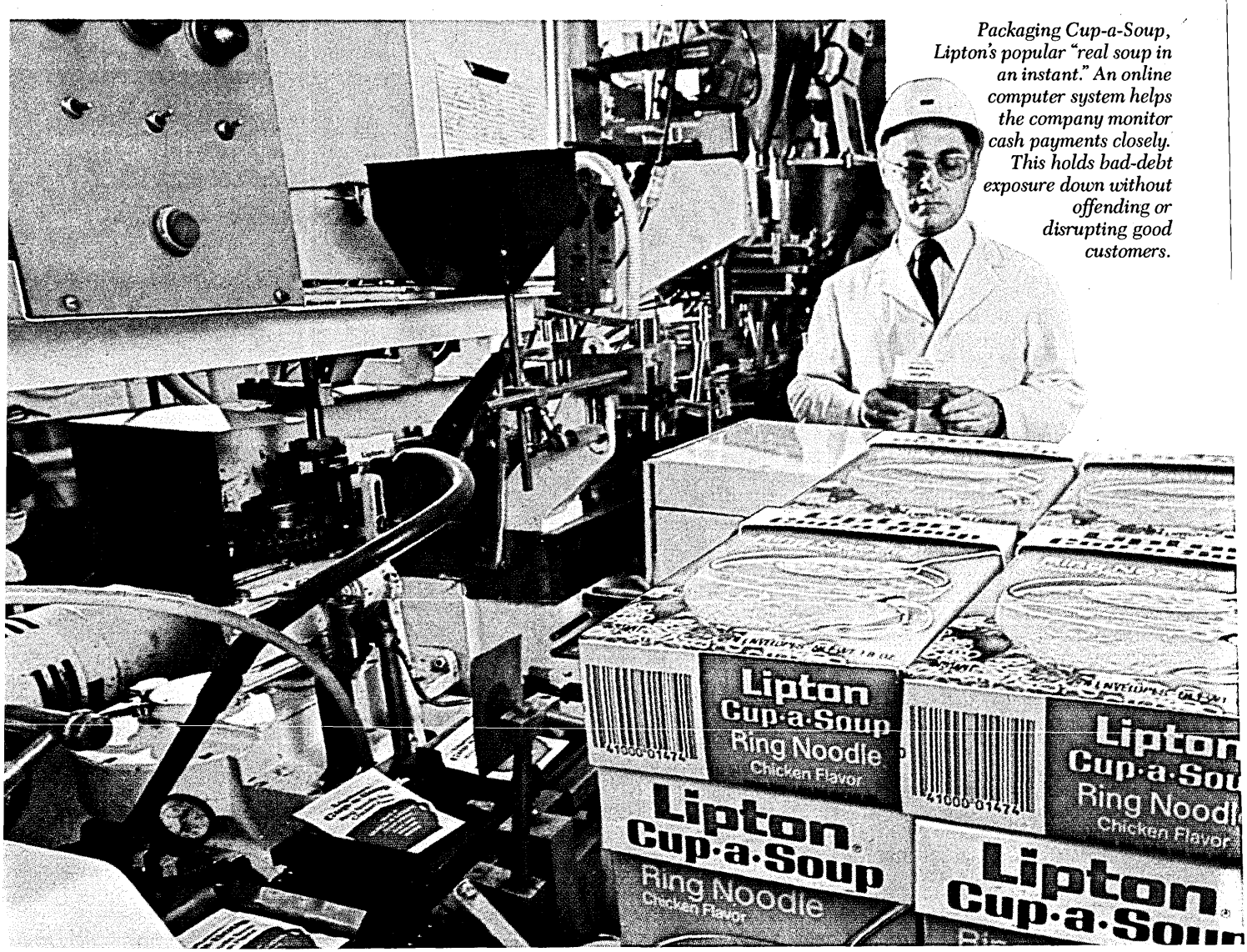
"Thanks to the centralized data base, information is now consistent throughout the company, including our four manufacturing locations," he adds; "people performing related functions are working from the same numbers. And, because we use distributed processing at each plant site, we continue to provide vital data service even when the host system is off line.

"To keep response time short, we support our user terminals through the IBM 3790 Communications Systems, offloading the central processor. And the distributed system places the data base close to the user who maintains it and takes responsibility for data entry – insuring that information will be current and free of input errors."

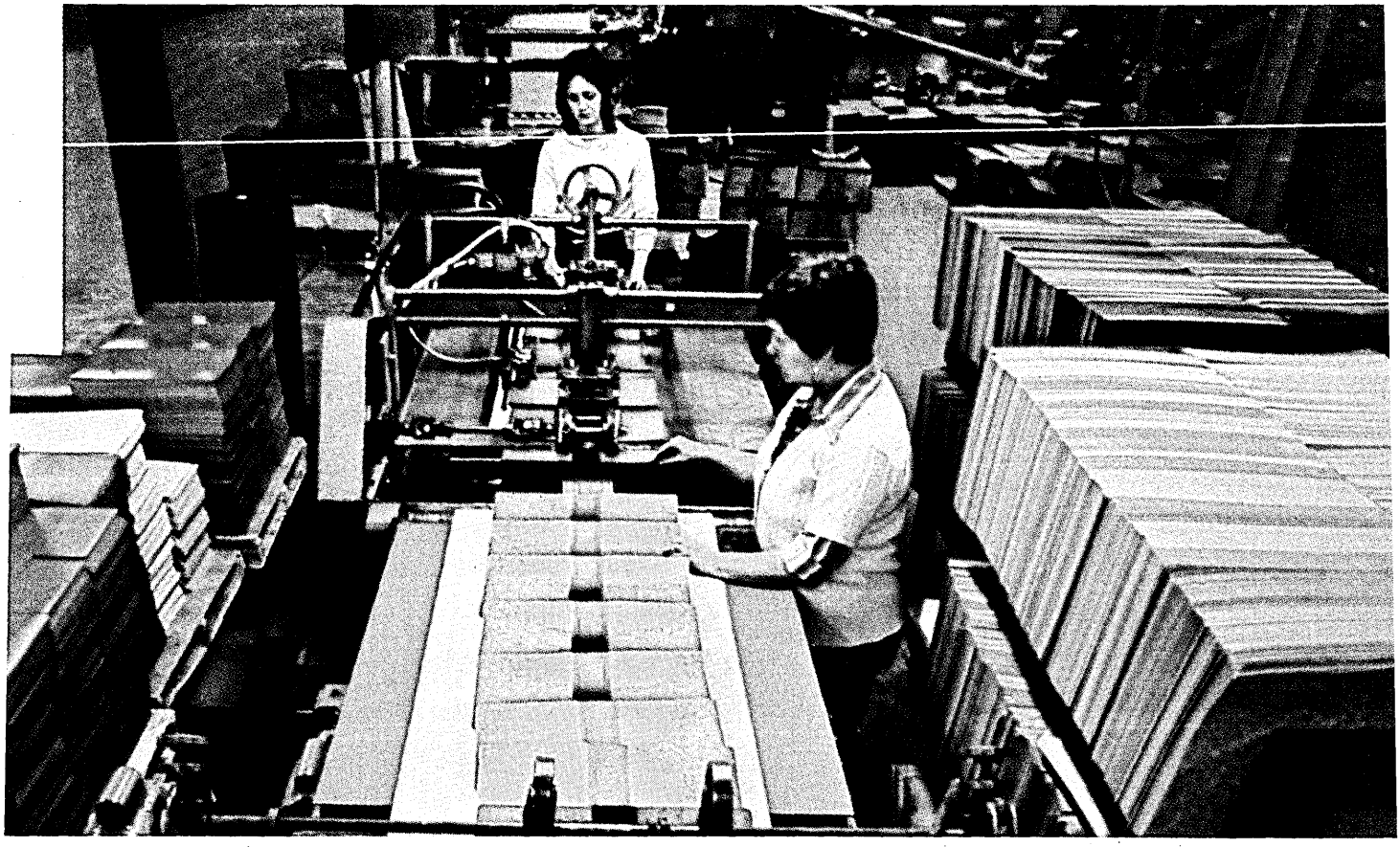
Elstien sums up: "DL/1 and the distributed network laid the foundation for the customer service and management information that power this business today."



ACCO makes these colorful data processing binders at its Ogdensburg, N.Y. plant. The company uses a DL/1 data base and distributed processing to achieve consistently high customer service levels.



Packaging Cup-a-Soup, Lipton's popular "real soup in an instant." An online computer system helps the company monitor cash payments closely. This holds bad-debt exposure down without offending or disrupting good customers.



Receivables: An Early Warning System for Lipton

"Within seconds each morning I can review the status of any one of our 4,500 customer accounts. At 9:00 A.M. we can see customers' receivables status based on sales and lockbox receipts at the close of the prior day."

Ronald Papke, corporate credit manager for Thomas J. Lipton Inc., the $600 million per year food and beverage manufacturer, is describing his computerized accounts receivable-credit management system. At night, it automatically applies sales and cash to customer accounts, marks off 55 to 65 percent of check payments against invoices, updates all customer credit history files, generates correspondence for deductions taken by customers, and produces selected reports for Papke and regional credit managers.

By day, the results are available to Papke's headquarters staff on IBM 3278 Visual Display Stations. Accounts receivable clerks mark off cash items not automatically applied at night by touching light pens to displays of invoice data. Then credit personnel use the terminals to display customer data.

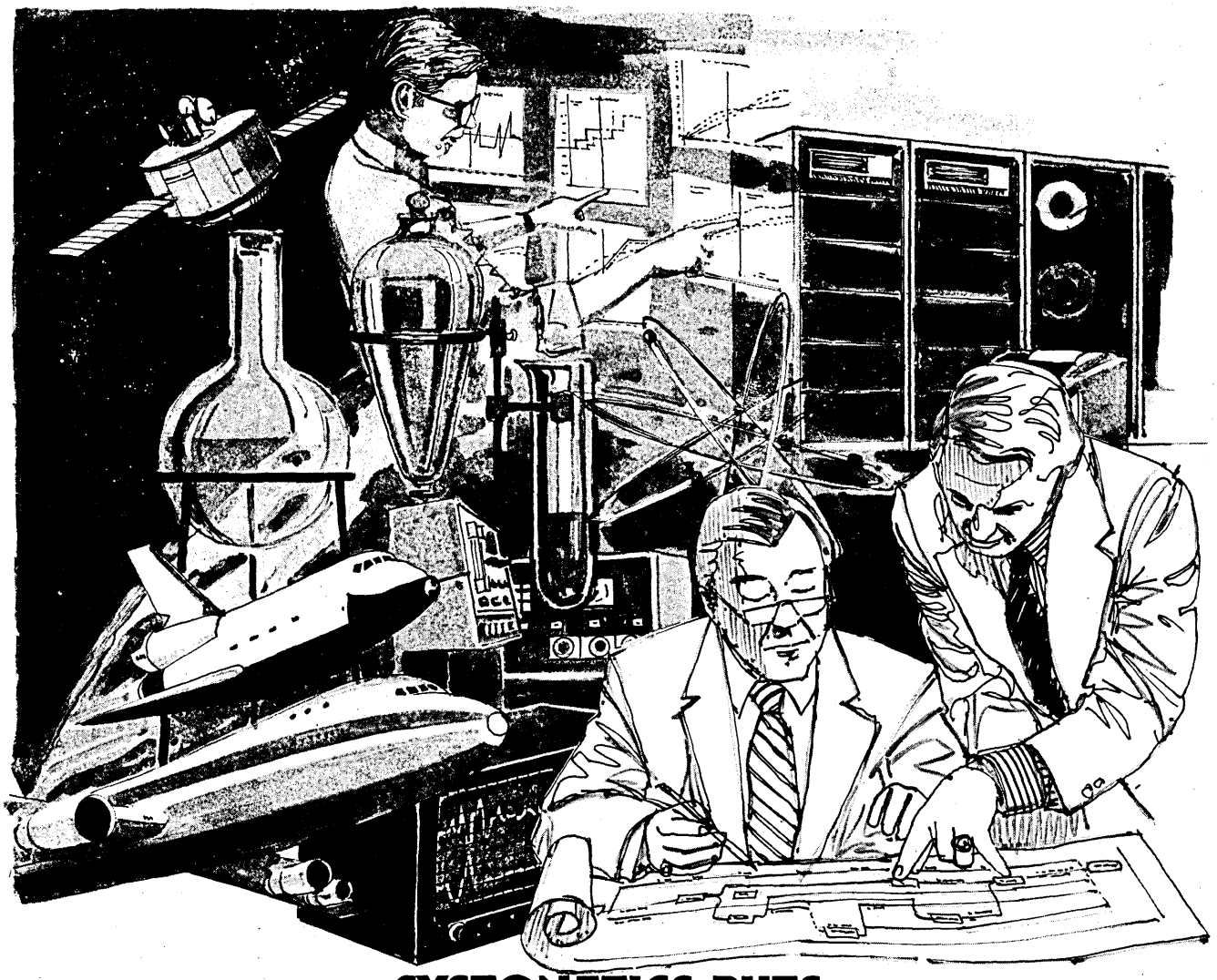
"Today we have greater control of our clerical operation," Papke notes. "In the past, we faced a heavy morning workload to meet an early afternoon cutoff for batch input. Now that we enter data online we can control our priorities. This not only increases clerical productivity, but—more importantly – the credit department has a far better picture of each customer's status."

Using the IBM Interactive Query and Report Processor (IQRP), the Credit Department selects the criteria for extracting information from the online files. They can choose, for example, total agings of all customer activity; 30, 60, or 90-day specific aging of a customer's account; or determine if and how often a customer has gone beyond discount period. All of these inquiries are entered through the terminal, which is online to Lipton's 3032 Processor at its Englewood Cliffs, New Jersey headquarters. The result can be displayed on a screen within seconds or printed overnight as a one-time or regularly scheduled report.

The light-pen cash-application system at Lipton uses the Customer Information Control System/Virtual Storage (CICS/VS), an IBM program product that manages the transactions and supports the terminals in an online system. "IQRP and CICS provided us with a relatively simple and low-cost method of expanding our previous system to meet our growth requirements," says Leonard Langley, business systems manager. "With our Credit Department's help we have been able to get maximum return on our original investment while developing systems to give our users full benefit of current technology."

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.

IBM®
Data Processing Division



SYSTONETICS PUTS PROJECT MANAGEMENT INTO PERSPECTIVE!

We'll turn your project data into error-free graphics—updated as you need it—for the visibility and control you need to keep your project on-time and within budget.

Words and numbers alone can't give you the visibility you need for effective project planning, scheduling, monitoring, and most importantly control. You need graphics!

Fast and accurate visibility...easily.

Clearly seeing how a total project "fits" together and how interdependent activities are affecting its day-to-day progress is key to effective project management. In the past this type of visibility has been expensive, error-prone and slow.

No longer.

Systonetics offers a choice of proven and easy-to-use systems to turn your project data into Time Scaled Networks, Gantt Barcharts and Cost/Manpower graphs...automatically. And with each update, your **total** project can be revised quickly, accurately and automatically.

Hands-on project management.

We've taken accepted project management theory and put it to practical use. Now you can get timely and virtually error-free reports so that your decisions can be based on total visibility...always using current and correct information.

A system to meet your needs.

Whether your projects are large or small, long or short term, in-plant or on-site...we have a system to fit your special requirements.

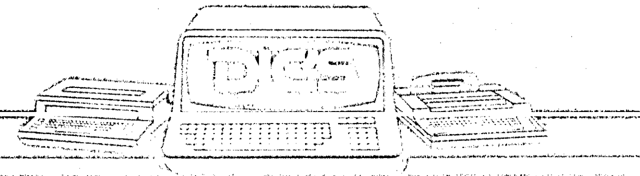
Find out how leading manufacturing and aerospace companies, engineering/construction contractors, utilities, financial institutions and government agencies are using our automated graphic systems to improve their project control... **call or write today!**

Overseas Sales Representative inquiries invited.

Putting project management into perspective.

SYSTONETICS, INC.

600 N. Euclid Street, Anaheim, California 92801
(714) 778-1600 • Telex 692-327



OPEN MARKET

Terminal Distribution Center

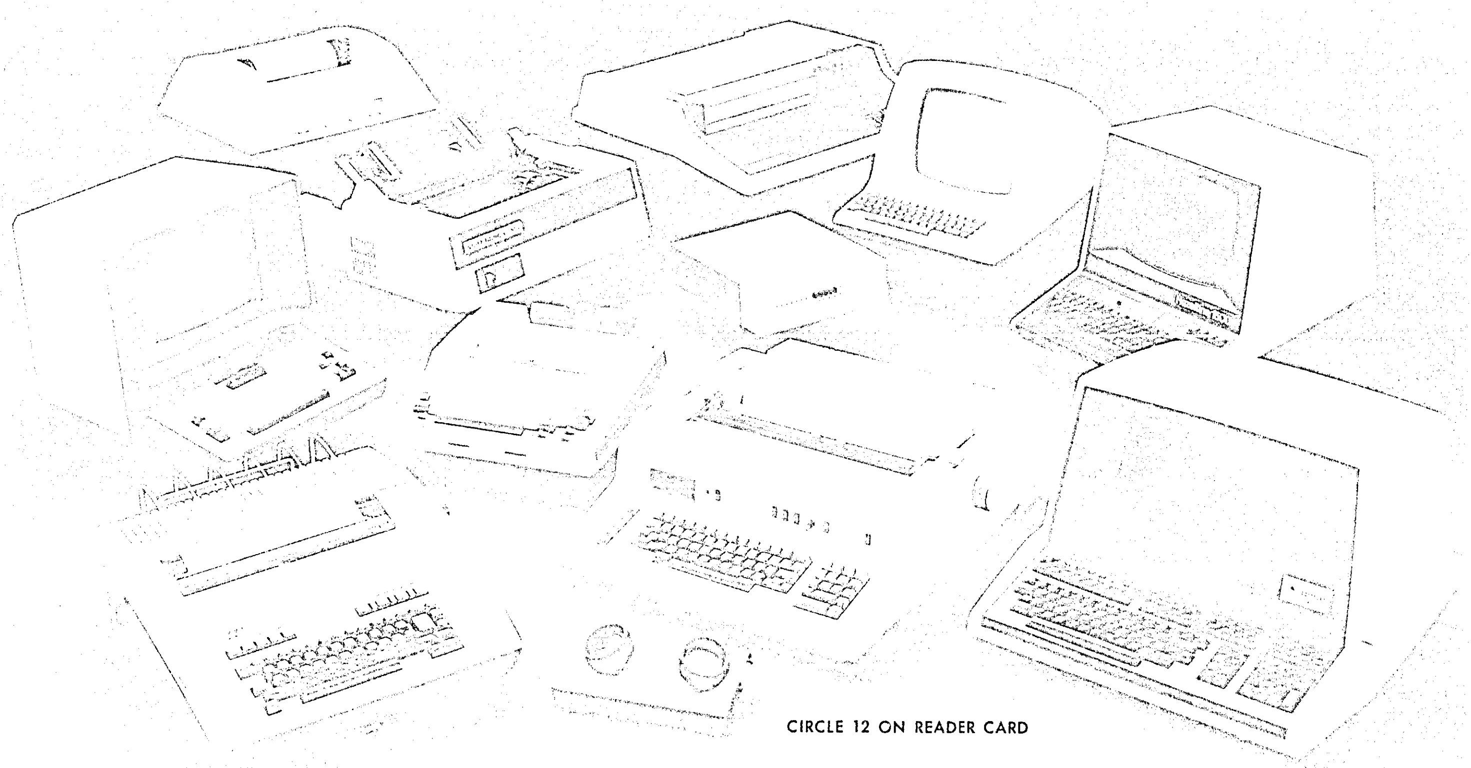
Texas Instruments	820 (fully loaded)	$1,[illegible]95.
Hazeltine	1520	1,[illegible]10.
Diablo	1650 KSR	[illegible]40.
Lear Siegler	ADM-31	1,450.
General Electric	TermiNet 200 KSR	2,[illegible]5.
Soroc	IQ 120 (w/block mode & printer port)	825.
General DataComm	212A modem	840.
Anadex	DP-8000	850.
Centronics	779 (w/tractor)	975.
Techtran	815 tape cassette	780.
[illegible]	D[illegible]C-206 acoustic coupler	[illegible]

[illegible] NY (516) 751-[illegible] · LA (213) 277-4562 · SFO (415) 254-9278

[illegible] all products from the following manufacturers:

[illegible]	Digicom	Hewlett Packard	Perkin-Elmer	Teletype Corp.
[illegible]	Digital Equipment Corp.	Informer, Inc.	Prentice Corp.	TeleVideo, Inc.
[illegible] International	EECO	Infoton	Printronix	Telray (Research, Inc.)
Centronics	Execuport (GTSI)	Lear Siegler, Inc.	Qume	Texas Instruments
Computer Devices, Inc.	General DataComm	Novation	Soroc Technology	Ven-Tel
Delta Data Systems	General Electric	Omnitec	Techtran Industries	Visual Technology
Diablo Systems, Inc.	Hazeltine Corporation	Ontel Corp.	Tek-Com, Inc.	

[illegible] MARKET is a division of THE DAVID JAMISON CARLYLE CORPORATION
[illegible] Century Plaza, 30th Floor, 2049 Century Park East, Los Angeles, California 90067
[illegible] Townsend Lane, Setauket, New York 11733
[illegible] Crest View Drive, Orinda (San Francisco), California 94563



CIRCLE 12 ON READER CARD

SUPERSORT

Is it a bird? Is it a plane? No, it's just SyncSort DOS!

(Beware of imitators in long red underwear.)

Call (201) 568-9700.

Who knows what evil lurks in your sorts?

The trouble with progress is that it always ends up inconveniencing *somebody*. Take the strange case of IBM's four DOS sorts.

Until fairly recently, these Boys from Armonk had the DOS sorting turf pretty well to themselves. We won't say they had a monopoly. But, well, we did notice that they laughed a lot on the way to the bank!

Then — shazzam — everything changed. A couple of leading-edge DOS/VS users left their windows open one day. The next thing you know in flew this big new sort. It announced that it was SyncSort DOS and that it "aimed to clean up DOS sorting" the way it had OS.

Sure, there were chuckles at first. But when the big fellow in the red suit sat down to the computer to sort the laughter stopped. Because it soon became apparent that DOS/VS really did have a "Supersort" for the first time.

Since then SyncSort DOS has flown into the windows of about 400 DOS centers. The reason is simply *superperformance.* In comparison with any one of the IBM DOS mob, SyncSort DOS will yield resource savings of:

- **30-40% reduction in Elapsed Time;**
- **30% reduction in CPU Time;**
- **40-50% reduction in Disk Work Space;**
- **30% reduction in I/O Time.**

If you'd like to see what our Supersort can do unto your sorting load, benchmark it. The benchmark is to sort selection what the fingerprint is to crime detection!

The next time a suspicious sort wearing baggy long johns and a counterfeit S pinned to its chest shows up, call us. We'll send over a SyncSort DOS faster than a speeding bullet — provided traffic isn't too bad.

As soon as it arrives, say something like: "Okay, boys, you both claim to be supersorts. Let's see which one of you can leap over this towering load in a single bound."

Only please leave the window open. Because when that other sort gets a look at the benchmark results, it's liable to take a flying leap into outer space.

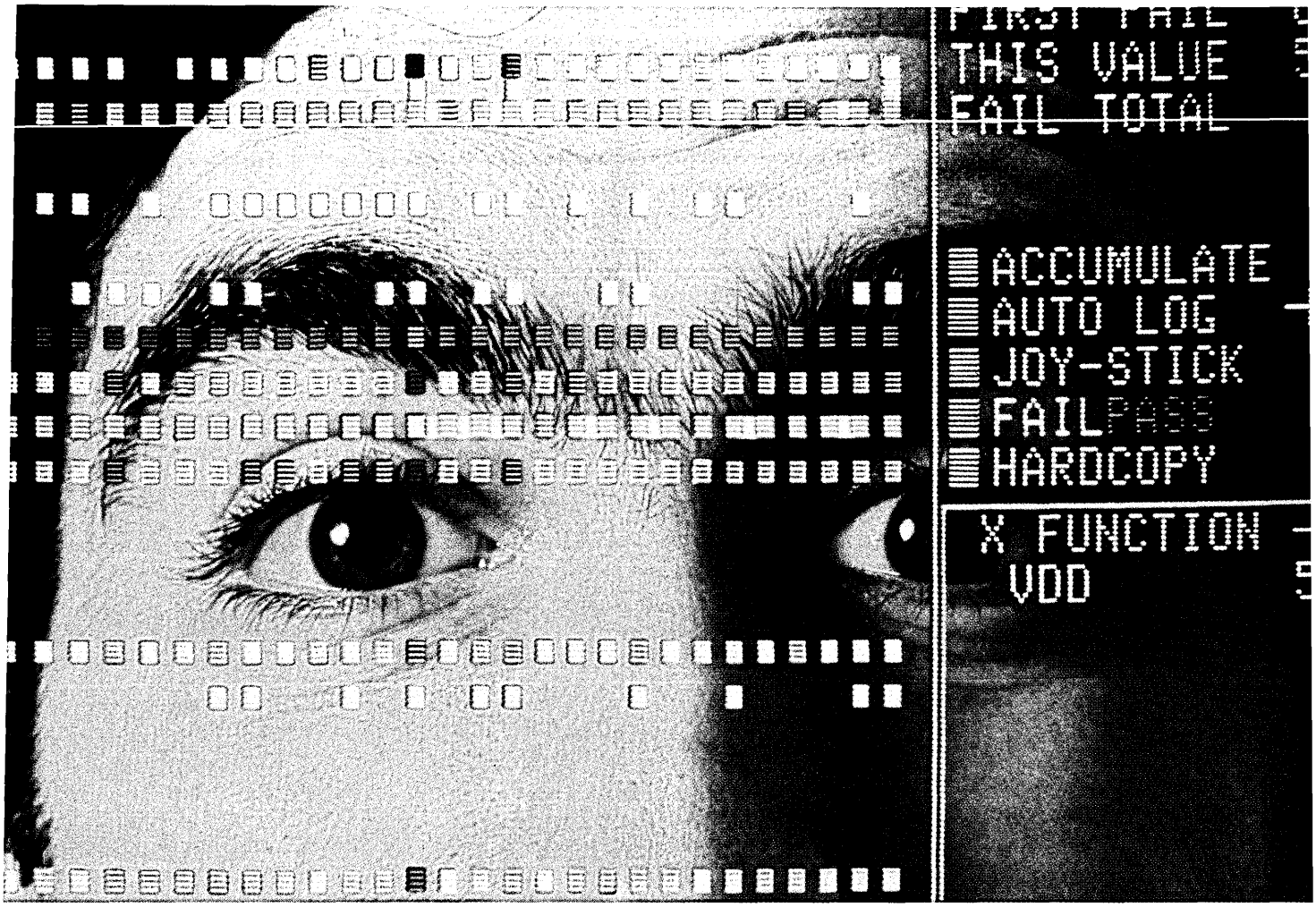
And we sure get tired of cleaning up that broken glass!

OVERSEAS REPRESENTATIVES —

Brussels: CAP/GEMINI Belgium
Dusseldorf: CAP/GEMINI GmbH
Geneva: CAP/GEMINI Switzerland
Hague: CAP-GEMINI/PANDATA
Johannesburg: Computing Benefits Ltd.
London: GEMINI Ltd.
Melbourne: Shell Co. of Australia Ltd.
Milan: SYNTAX
Paris: CAP/SOGETI PRODUCTS
Stockholm: BRA
Tel Aviv: ADVANCED TECHNOLOGY, Ltd.
Vienna: CAP/GEMINI GmbH

COMPUTER SYSTEMS Inc. 560 Sylvan Ave., Englewood Cliffs, N.J. 07632

CIRCLE 65 ON READER CARD



SEE WHAT MEMORIES ARE MADE OF.

There's a whole new crop of semiconductor memories coming to market this year.

Better 4k statics. New 16k and 64k dynamics.

Now it's just a matter of who learns to make and use them first. Because whoever does is going to have one memorable year.

Today, more and more memory users are learning their way around the new devices with the help of the Teradyne J387, equipped with Real-Time Bit Mapping.

With RTBM you get all the way inside a memory, watching bits fail under changing test conditions on RTBM's 19-inch full-color display. It's a view of device behavior you just can't get anywhere else.

Shorter device design times.

With the J387's interactive programming, characterizing new devices is a breeze. The system asks questions and the design engineer answers them in the appropriate device language.

Using either software programming or a joy stick, the engineer can control timing edges, voltage levels, and test patterns. He can then see, bit by bit, how the memory is affected, with different colors clearly indicating different bit fail conditions.

Characterization time for new devices is dramatically shortened. So you can introduce new designs faster and with greater confidence.

Moreover, RTBM gets the right individual – the design engineer – completely into the characterization process.

Duplicate actual operating conditions.

The best way to see if a device checks out is to check it out under the specific operating conditions for each application. RTBM has the speed and the capacity to do just that.

Memory users can totally qualify incoming devices, as well as the vendors who supply them.

Further down the line, this means a substantial savings. Because end-product reliability goes up while rework time to correct faults goes down.

The total system.

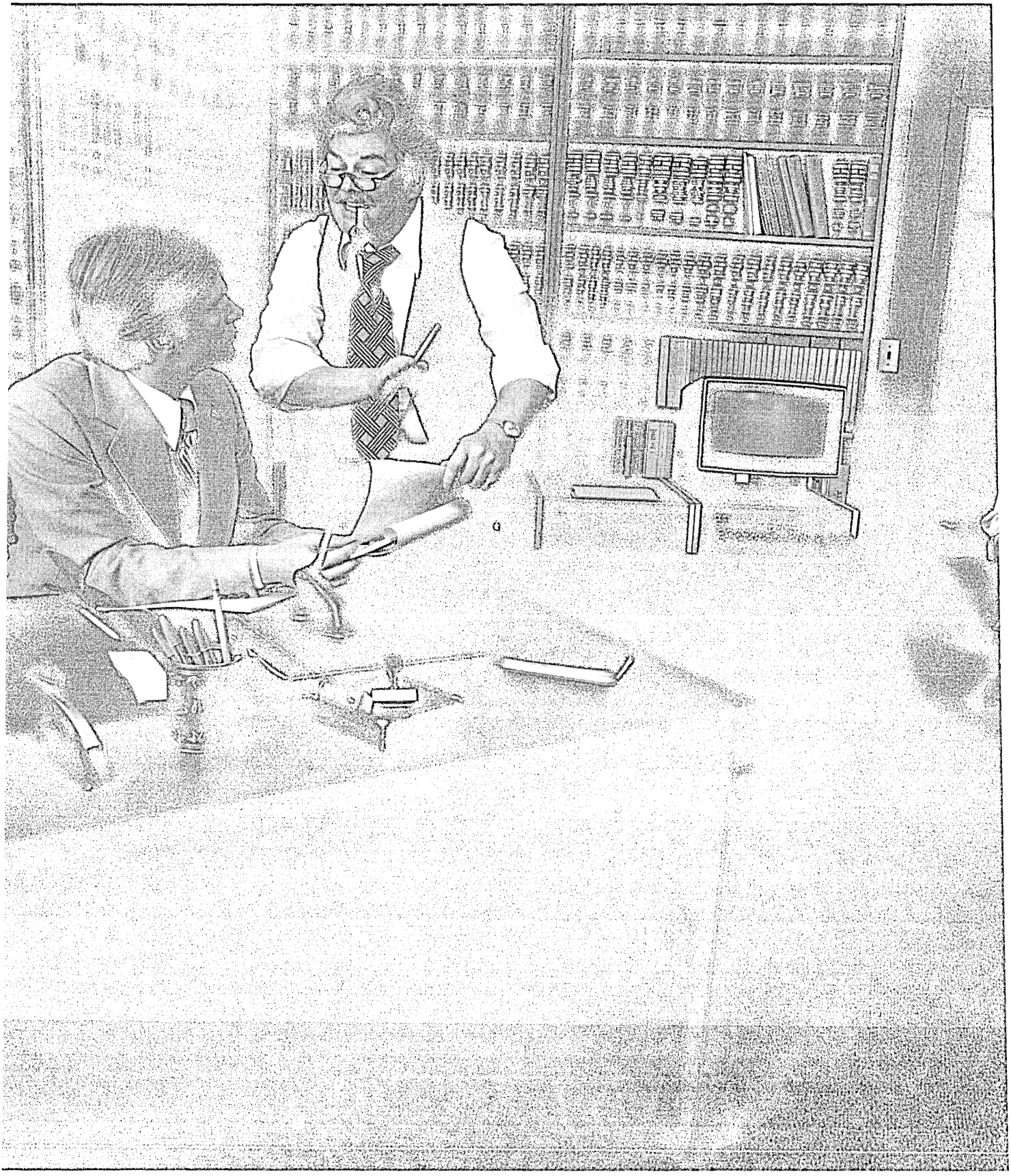
Teradyne's J387 has a lot going for it besides RTBM.

There's a Test System Administrator that integrates information from multiple systems. And a Data RAM that permits testing of RAMs, ROMs or PROMs in any mix you wish. And Automatic Edge Control that saves hours of calibration time and countless human mistakes.

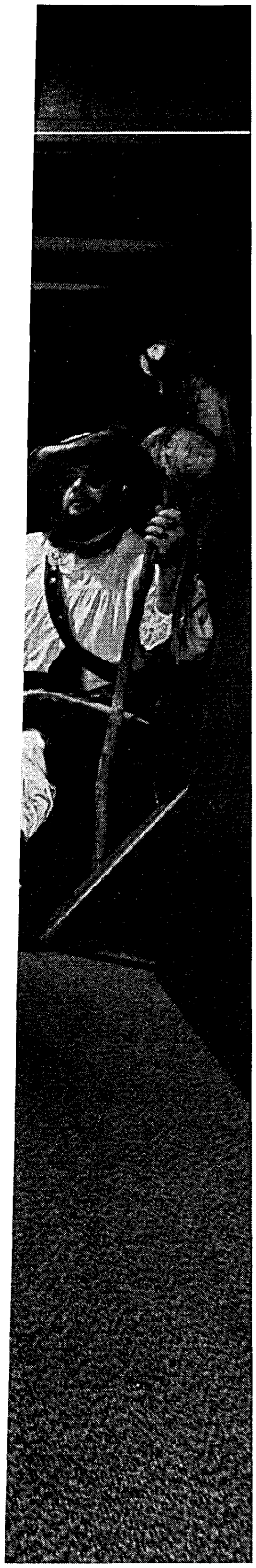
It's all part of the definite edge Teradyne's J387 can give you. Send for our free brochure. Write: Memory Product Group, Teradyne, 21255 Califa Street, Woodland Hills, CA 91367.

TERADYNE

CIRCLE 67 ON READER CARD



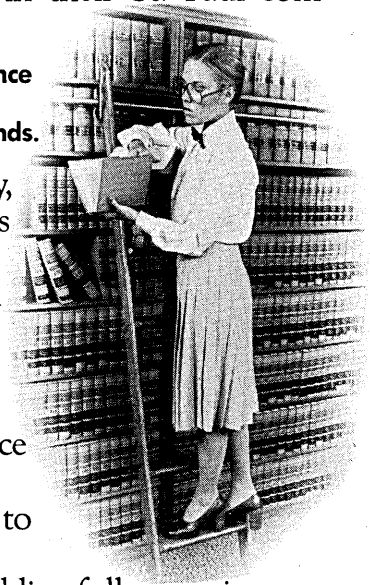
"QUICK! GET ME EVERY DECISION YOU CAN FIND ON 'BURIED TREASURE'!"



PROBLEM:

WESTLAW is West Publishing Company's answer to a lawyer's plea.

It offers direct access to a vast electronic library—the tens of thousands of state and federal cases that West, a leading publisher of law books, have in their St. Paul computer files.



Research that once took hours now takes seconds.

Ironically, WESTLAW's far-reaching success posed a problem: could data communications keep pace with its rapid growth coast to coast?

Before adding full text printouts to the service, for example, West wanted to be sure that lines and terminals could handle the longer messages efficiently.

Also, they did not want the expected surge in demand to slow down their almost instant response to inquiries.

The problem was data communications. The solution came from the Bell System.

SOLUTION:

The case for the Bell System solution was made on the basis of astute total systems planning and two Bell innovations.

One is Dataphone® Digital Service. This is the high-performance digital network that already links the nation's largest cities. It has helped virtually eliminate errors and interruptions in WESTLAW transmissions. It's also helping keep response times ultrafast.

Second is Bell's newest Dataspeed® terminal—keyboard, display unit, and high-speed printer—now used by WESTLAW subscribers.

Full text almost instantly, in print.

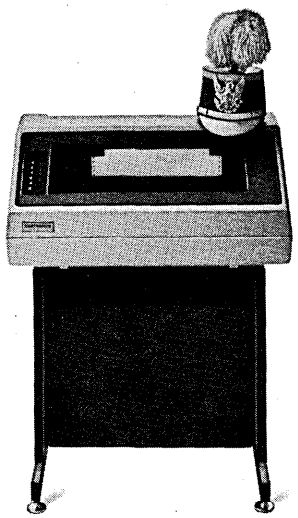
This new system plus Bell's continuing on-the-spot involvement have prompted West to look at still other ways to take full advantage of the Bell solution.

If you haven't talked communications systems with your problem-solving Bell Account Executive, you're missing something—in voice, data and network services.

The system is the solution.

Bell System

Centronics. The Band Leader.



You can't beat Centronics' band printers for price. They cost less. Up to 40% less than comparable line printers. That's a savings of thousands of dollars.

You can't beat Centronics' band printers for performance. The operator-changeable print band can be changed in seconds. No electronic modifications. No alterations. You get crisper print quality and uniform density control.

You can't beat Centronics' band printers for service. One hundred fully staffed, stocked and equipped service locations worldwide—more than any other printer company. You save money—and cut downtime. A single toll-free phone call, (800) 258-1952, gets you fast response. Any time. Any day.

You can't beat Centronics' band printers for availability. No off the wall promises. Centronics' band printers are available off the shelf. And they offer plug-to-plug compatibility with most minicomputer systems.

You can't beat Centronics' band printers for flexibility. 300 lines per minute or 600 lines per minute? Who cares? A Centronics' service technician can convert your 300 lpm printer to 600 lpm in just a few hours. Your output doubles. The band stays the same.

Strike up the band. Price. Performance. Service. Availability. And flexibility. That's a combination you can't beat. Write or call your nearest authorized Centronics' distributor or: Centronics Data Computer Corp., Hudson, NH 03051, (603) 883-0111.

CENTRONICS®
The Band Leader

LETTERS

IN PRAISE OF FOOLERY

When I read your editorial in the April issue, I was a little chagrined at another casting of stones at the means by which my teenage twins derive all the benefits of American childhood. Then I read the program for the First International Data Processing Bridges to the World Conference and Show. I must congratulate you on a very funny and remarkably true exposé of the conference business.

I would like to request permission to swipe your idea of "Basic Communications Basics." If you only knew how many times I have been tempted to put this in a schedule and let the promotion people run wild.

Congratulations on a fine piece and also to your publishers for allowing the space to print it. The world can use a few laughs.

WILLIAM D. ASHMAN
Technical Program Coordinator
Industrial and Scientific
Conference Management, Inc.
Chicago, Illinois

Permission is cheerfully given for you to use "Basic Communications Basics" —have fun!

—ed.

Thank you for the April Foolery Pittsburgh conference article. Perhaps the dp vendors, societies, and consultants will get together and give you a special award for Humorous Article of the Year. Well done!

"Humor penetrates (the incongruity of our) pretenses and unmasks our humanity," as Meredy Amyx noted in her fine Forum (April, p. 229). We all take ourselves too seriously. I suppose one indication of this is that I scanned the Pittsburgh article as far as Wilma Loop's picture before suspecting it was a joke.

Incidentally, Pittsburgh has nothing on Washington, D.C., as a city that's hard to get in, out, and round about. I hear that Washington is hosting a conference on "Complete Computer Training from Kindergarten to PhD" with a keynote speech entitled "The Irrelevance of Literature, History, Philosophy, Economics, Fine Arts, Chemistry, and Physical Education in the training of the Modern Software Scientist in an Analytical Technical VLSI ddp pcm environment." Any truth to that?

MICHAEL H. AGRANOFF
Dp Security Administrator
Hartford Insurance Group
Hartford, Connecticut

How are you going to top yourself in April 1980?

MARGARET MILLIGAN
Data Processing Digest Inc.
Los Angeles, California

OMISSION

Our corporate feelings were injured by being left out of your modem survey (March, p. 167).

Nortek introduced the AAM-11L modem in May 1978.

The AAM-11L is an auto-answer, auto-dial single board modem designed to plug directly into a DEC LSI-11 backplane. It provides asynchronous, low speed (103 style) full duplex communications.

JOHN NEWCOMB
Marketing Manager
Nortek Inc.
Portland, Oregon

COST COMPARISON

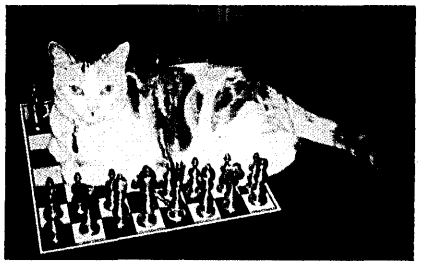
Just because IBM has reduced the price of its ETSS derivate ICCF system to match the reduced prices of the 4300 series computers, there is no reason to think NCI has been significantly "jolted" as you readily imply in your March Look Ahead section.

Experience has shown NCI time and again that IBM doesn't give anything away. They may reduce the price of software, but in the long run, it will take more hardware to run the system. They push CICS applications to sell more on-line and TP equipment. They tout the savings of VS to sell memory. They sell SPM to move truckloads of terminals. In reality, every price decrease by IBM must be looked at closely for the old ulterior motive . . . selling more hardware.

The independent software companies, however, have no ulterior motives. We have no hardware to sell. Our systems are designed to give you more usable output with existing hardware. That has been the whole basis for existence since the beginning of the independent software industry.

Yes, NCI's on-line programming system O-W-L costs more than $80 per month. But the user gets many times the difference in dollars back in productivity.

CHECKMATE COVER CAUSES CATFIT



While I realize the photographer probably was more concerned with composition than technical accuracy, I have a few observations about the cover of your February issue.

1. The edge of the chessboard can be seen in the background and it is noticed that the far corner is a white square (assuming the mirrored squares are white squares). Since a white square is always to the player's right, the pieces shown must be moving in a (nearly) left/right direction.

2. If it is assumed that the last move was white's, that is impossible because the king cannot put himself in check.

3. If it is assumed the last move was black's, that is impossible because the position shows white is in check simultaneously by a pawn and a bishop (black could have checked with only one since he has only one move and it couldn't be a discovered check).

4. Even if the mirrored squares are black squares, the position is still invalid for the same reasons (2 and 3 above).

ROBERT A. JACKSON
Project Control Administration
TRW, DSSG
Redondo Beach, California

Our chess consultant (identified in the February table of contents and pictured again here) replies: "Ah well, back to mirrored square one."

And he has a system that makes him independent of the IBM TP monitors. The O-W-L was developed by prospective users themselves, not in an ivory tower and handed to the marketplace. The result is a system that is human-engineered to meet exactly the requirements the people on the job have, and no more. And far more efficiently than IBM can do with their own existing systems.

IBM price reduction a jolt? I should say not. NCI's basic prices are already competitive. And, feature for feature, we are so far ahead of IBM, they could give ICCF away and people would still find it more cost-effective to buy NCI's products.

BRUCE A. FORSBERG
Executive Vice President
National Computing Industries
Atlanta, Georgia

ALC CONTROVERSY CONTINUES

I was somewhat surprised to read Mr. Mitchell's article in September promoting the use of assembler language for business data processing ("Third Generation Myopia," p. 233).

When I first read the article, I thought it was amusing, but on second thought, I realized Mr. Mitchell was indeed serious. I am surprised that DATAMATION would lend credence to such Dark Ages theories by publishing them as serious technical information. However, your magazine has so many good articles, it is easy to overlook an occasional article of doubtful validity.

The letter from Mr. Reeves in the March Letters (p. 46) addressed the subject very objectively—much more kindly than I would have. However, Mr. Mitchell saw fit to reply that Mr. Reeves' opinions are based on lack of knowledge of "computer programming." I do not know Mr. Mitchell's skills or background, but I do know of many former "computer programmers" who at one time thought that ALC was the only language, but have since earned promotions to management, based to a large extent on exhibited good judgment, and these managers are unanimous in their support of higher level languages for business systems programming.

Mr. Mitchell's position would have been stronger had he not responded at all, or if he had avoided the objectionable implication that those who don't agree with him are suffering from "ignorance and fear."

DICK KENNEDY
Center Manager
Computer Science Corporation
Commercial Division
Berkeley, California

I'd just like to add my voice to that of Jack Reeves in the assembler/high-level language debate.

I object to Mr. Mitchell's attempt to divide our profession into computer programmers and language programmers. I feel as Mr. Reeves does that we are all problem solvers, and whether we use assembler or high-level languages is immaterial. And lest Mr. Mitchell call me incompetent, I have written programs in COMPASS on a CDC 6500. It is my opinion that assembly language code is too cryptic, too hard to maintain, too time consuming to write and, yes, machine dependent—and people really do switch mainframe vendors.

I agree that assembly language can be useful, most notably in systems and scientific work; but due to the limitations listed above, I don't believe it should be the language of choice for "a large percentage of typical dp applications." Elegant code cannot be defended when the time needed to produce it is not cost-justifiable.

ALAN J. MEHRINGER
Computer Services Dept.
Biggs Pump & Supply, Inc.
Lafayette, Indiana

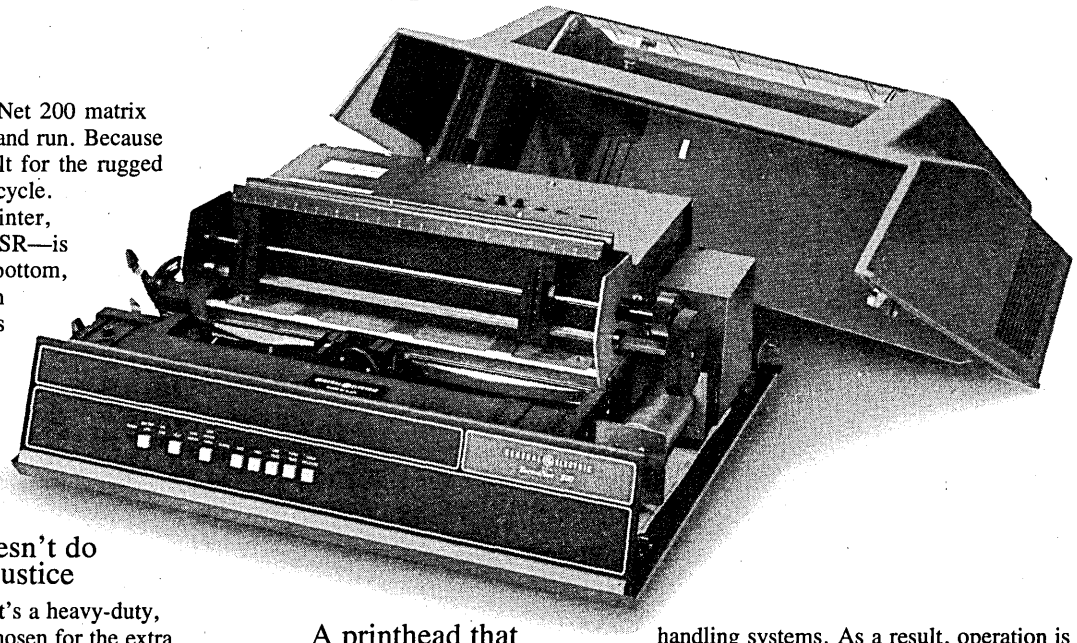
Mr. Mitchell replies: Mr. Kennedy's direct correlation between good judgment and higher level languages and

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

General 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® 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.

TermiNet 200 MSR (ASR also available)

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.

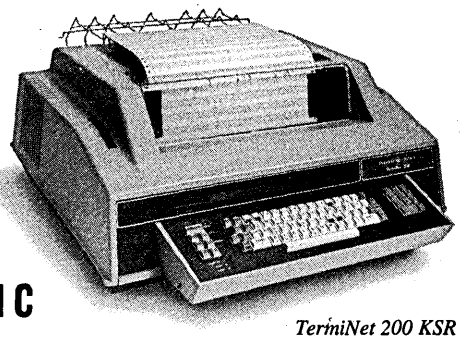
Servo motors cause fewer problems

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 KSR

GENERAL ELECTRIC

CIRCLE 40 ON READER CARD

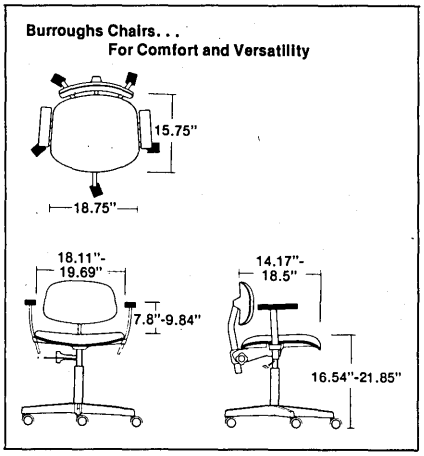
his inference that both of these are prerequisites for promotion into management strike me as a classic example of the myopic vision described in the original article. I prefer to think of good judgment as the ability, in this case, to select the most suitable programming language for an application based on the requirements of the application and the situation at hand. A competent professional will try to use the best tool for the job; a person with an inability to use some of the available tools is less than fully competent.

Contrary to Mr. Kennedy's experience, I have seen situations where reliance on high-level languages has caused projects to falter or fail and in some cases ultimately result in the *loss* of a promotion for the responsible party. The project director cited in an example in my original article is now no longer with his former organization due largely to his directive that a text processing system be written entirely in COBOL. He engineered his own failure by exercising what he *thought* to be good judgment but in fact was blind faith.

Mr. Mehringer certainly has a point but he seems to have missed mine. Programming a language is significantly different from programming a machine although I see no reason that should divide the programming profession. There are many persons competent in the former and not in the latter. Language programmers perform most of the applications programming in our business and thus are responsible for an indispensible contribution. It would be an error to say that since most of them are not competent at programming a machine, they are not competent.

NEW PRODUCT

We at Burroughs were rolling on the floor with laughter after reading your February editorial, "The Handwriting on the Wall." Our product strategy committee apparently looked at the microwave and



fast-food markets, but decided they were either too hot and greasy or would require a greater R&D investment than our expected unprofitable computer operations could generate. Profits were up only 26% in the first quarter, thus we have gone into the furniture business. Pictured here is our new chair. As you might expect from Burroughs, the chair has several advanced features, including a choice of 9 colors. The single unit price is $196 and delivery is current.

STEPHEN HARRIS
Burroughs Corp.
Bridgeport, Connecticut

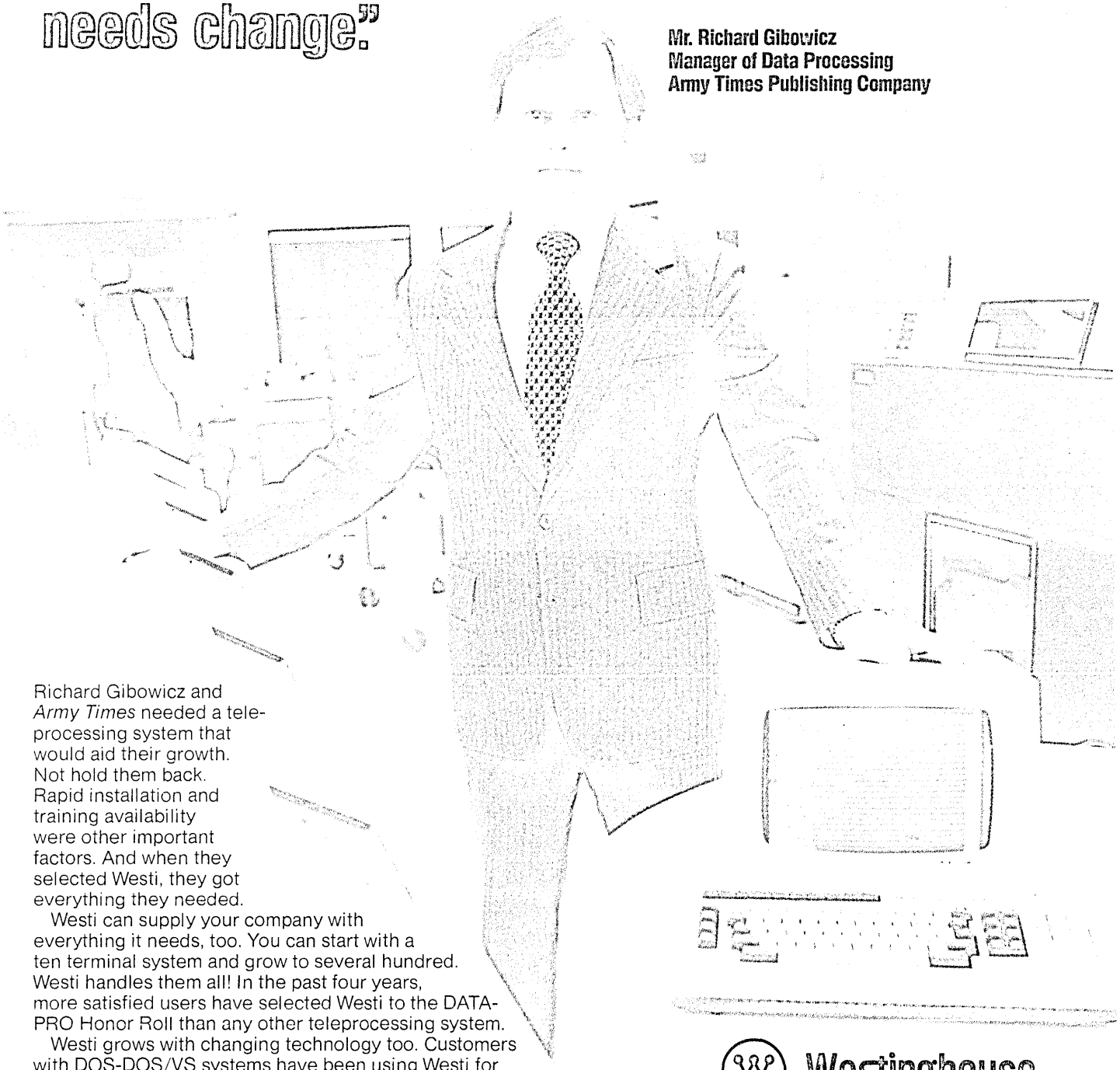
The editor replies: With profits falling to a paltry 26%, you made the right decision to jettison the computer business and get into something substantial. And we're already hearing rumors of your next innovative product breakthrough: the digital ottoman. Our only regret is that the world will never know the taste of a succulent Burroughs Burger.

CORRECTION

We regret having listed the wrong phone number for Datapoint Corp. in the March modem survey vendor index. Their number is (512) 699-7000. ✲

"Growth is the biggest single reason we selected the Westi Software System. I know it won't become obsolete as our computer needs change."

Mr. Richard Gibowicz
Manager of Data Processing
Army Times Publishing Company



Richard Gibowicz and *Army Times* needed a teleprocessing system that would aid their growth. Not hold them back. Rapid installation and training availability were other important factors. And when they selected Westi, they got everything they needed.

Westi can supply your company with everything it needs, too. You can start with a ten terminal system and grow to several hundred. Westi handles them all! In the past four years, more satisfied users have selected Westi to the DATA-PRO Honor Roll than any other teleprocessing system.

Westi grows with changing technology too. Customers with DOS-DOS/VS systems have been using Westi for years. Right now, we're making sure Westi will be ready for the new DOS/VSE and 4300 series.

Westi even helps your financial growth. It has the best payback in the industry. Most Westi users realize a return on their investment within one year. Plus, with every Westi comes a training and support staff that's unsurpassed. And if you want to increase programmer productivity even more, our on-line programming system, SCEPTER, can maximize your through-put.

Start growing with Westi today. For more information call or write: Westinghouse Electric Corporation, 2040 Ardmore Boulevard, Pittsburgh, Pa. 15221. Telephone: (412) 256-5583.

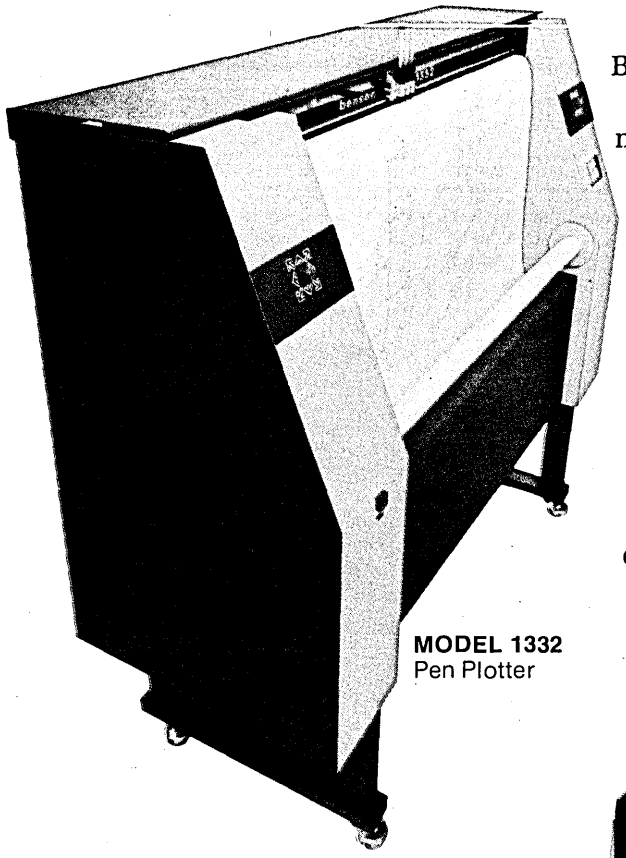
Westinghouse

CIRCLE 161 ON READER CARD

Why not the best of both worlds?

Meet the new Benson-Varian. Our pen plotters and electrostatic printer/plotters form the greatest team anywhere to make hardcopy easy.

Anyone, anywhere, who is planning to upgrade... or expand...their computer graphics hardcopy output should get the facts about us.

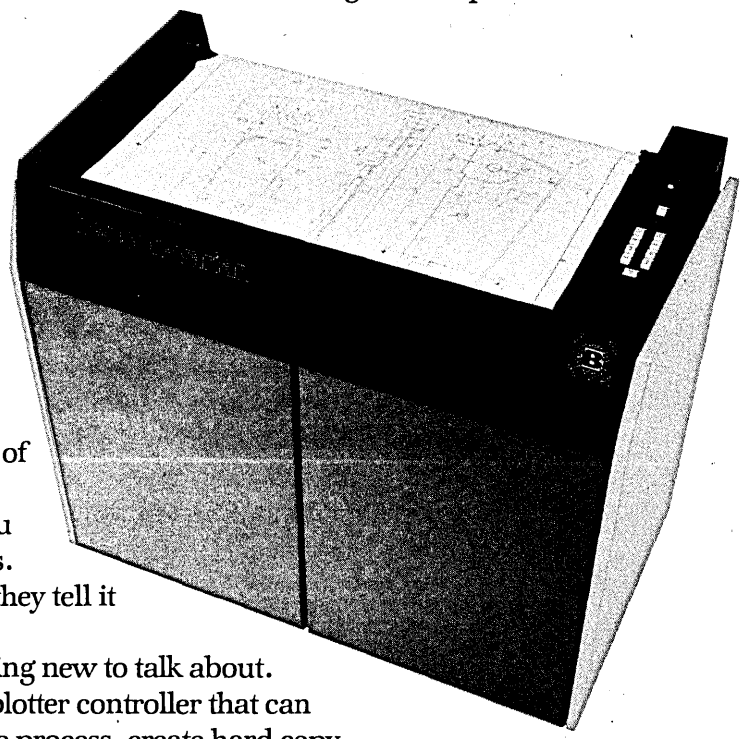


MODEL 1332
Pen Plotter

We're talking about Benson-Varian Pen Plotters and Benson-Varian Electrostatic Printer/Plotters that interface with IBM 360/370s (or any PCM), with most popular minicomputers, and even with many desk top computers. Our products simply do it all!

Benson S.A., France and Varian Graphics, Mountain View, California, have combined their expertise and product lines to provide you with a real opportunity to substantially upgrade the quality and quantity of your computer graphics hardcopy output. No one else has this to offer.

About pen plotters: Benson S.A. has the most efficient sales and service organization in Europe. Period. And, apparently, Benson plotters simply don't know when to quit. Is there any other way to earn more than 50% of the market? Benson-Varian will be manufacturing and servicing Benson products in the U.S.A.



MODEL 9236
Electrostatic
Printer/Plotter

About electrostatic printer/plotters: over the years, Varian Graphics has been a leader with technological advances in electrostatics. That's our reputation!

Recently, we added a significant number of highly qualified field sales/service personnel. You'll be amazed at the things they can tell you about our product line....or the competition's. Our people know the industry inside out and they tell it like it is.

We've also given our field people something new to talk about. Graphware® 1000, a microprocessor printer/plotter controller that can handle more than 1,000,000 vectors and, in the process, create hard copy graphics at **nine times** the speed of conventional "minicomputer output systems"....plus a new line of wide printer/plotters. Benson S.A., France will manufacture and service these products internationally.

There's a lot more to be said. To get the whole story, contact Benson-Varian in the United States or any Benson sales office in Europe.

benson-varian

385 Ravendale Drive, Mountain View, CA 94043
Telex: 345579 Answerback: BENVAR MNTV

New high resolution graphics from the leader in low-cost color.

With our 8001G graphics terminal, ISC pioneered low resolution color graphics at black and white prices. Now we're able to offer the worlds most cost effective high resolution capabilities – at prices that are true-to-ISC tradition.

Announcing the 8001H. It's based on the 48-line 19" intelligent display terminal that has revolutionized the process control industry. But the 8001H gives you the added advantages of high resolution capabilities, making it more than sufficient for all work required in process control and most other applications, including limited imaging.

The high resolution graphic hardware consists of 512 software programmable characters, each comprised of a 6 x 8 dot matrix with all 48 dots addressable by software. This translates into a 480 x 384 resolution for random vectors and symbols, resulting in a 6x improvement from the standard 8001G.

Three main modes of operation are available, including a special character mode, ISC standard plot mode, and the high resolution plot mode for drawing bar graphs, vectors and point plots. Eight brilliant communicative colors are at your disposal, to convey information quickly and accurately, with critical control over detail.

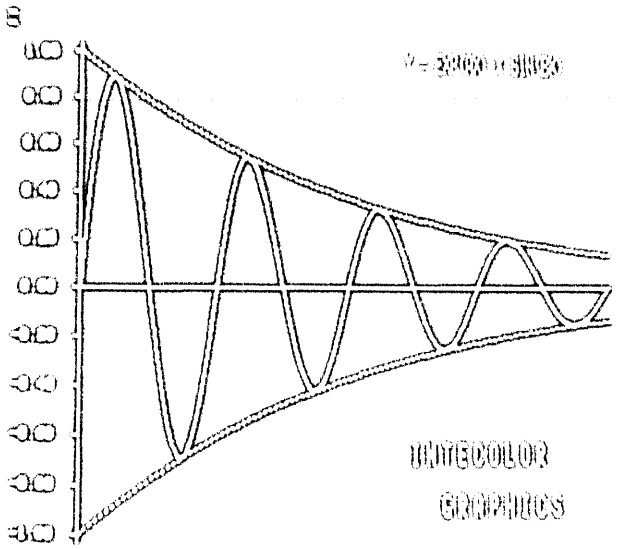
The 8001H has an 8080A microprocessor capable of handling data on a two megahertz processing cycle. It provides 2K of ROM, RS-232C interfacing capabilities, and flexible editing made still easier by a keyboard with color and numeric key clusters.

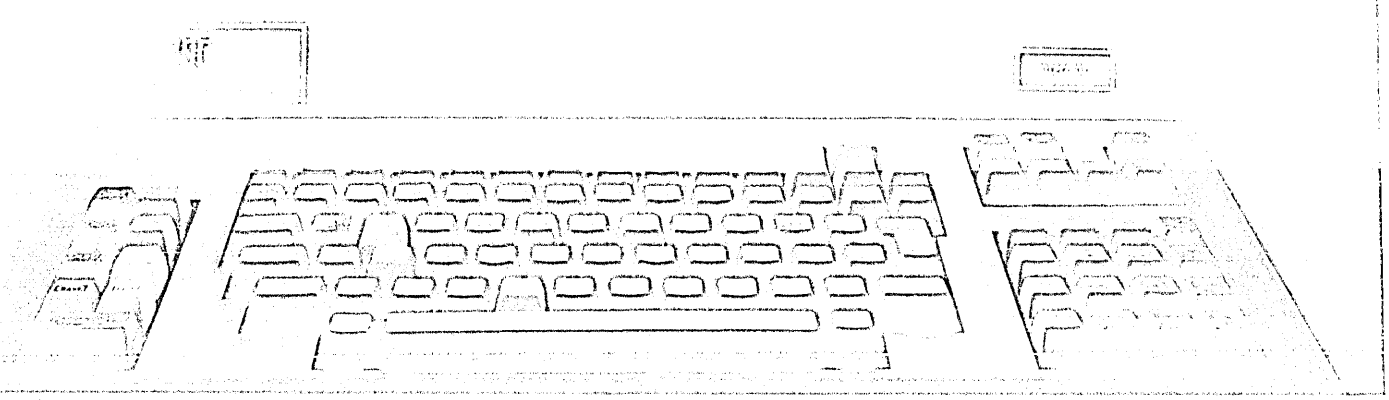
And its cost is nothing short of phenomenal. $3650 is all you pay for a single unit, $2500 each for 100 or more.

If you'd like to upgrade your present 8001G units to high resolution, hardware and software options are available for as little as $1500 per single unit, $1000 for 100 or more. All Intecolor terminals are covered by a six-month warranty, and cash with order guarantees delivery of a single evaluation unit at the 100-unit price within 30 days, or your money back.

If you need high resolution color, but have found the cost prohibitive, here's your opportunity. Now that Intecolor is perfectly capable of high resolution color, you can be, too. Call your ISC rep today.

Color Communicates Better.





Untetouched photo of screen

*U.S. domestic prices

ISC SALES REPRESENTATIVES: AL: 205/883-8660. **AK:** (GA) 404/449-5961. **AZ:** 602/994-5400. **AR:** (TX) 214/840-2169. **CA:** Alhambra 213/281-2260, Goleta 805/964-8751, Irvine 714/557-4460, Los Angeles 213/476-1241, Mountain View 415/964-9300, San Diego 714/292-8525. **CO:** 303/759-0809. **CT:** (GA) 404/449-5961. **DE:** (GA) 404/449-5961. **DC:** (VA) 703/569-1502. **FL:** Orlando 305/425-5505, Ft. Lauderdale 305/776-4800, Melbourne 305/723-0766, Tallahassee 904/878-6642. **GA:** 404/455-1035. **HI:** 808/524-8633. **ID:** (UT) 801/973-7969. **IL:** (No.) 312/564-5440, (So.) MO: 816/765-3337. **IN:** (IL) 312/564-5440. **IA:** (MO) 816/765-3337. **KS:** (MO) 816/765-3337. **KY:** 606/273-3771. **LA:** 504/626-9701. **ME:** (GA) 404/449-5961. **MD:** (VA) 703/569-1502. **MA:** (GA) 404/449-5961. **MI:** 313/227-7067. **MN:** 612/822-2119. **MS:** (AL) 205/883-8660. **MO:** 816/765-3337. **MT:** (CO) 303/759-0809. **NB:** (MO) 816/765-3337. **NH:** (GA) 404/449-5961. **NJ:** (GA) 404/449-5961. **NV:** (AZ) 602/994-5400. **NM:** 505/292-1212. **NY:** (GA) 404/449-5961. **NC:** 919/682-2383. **ND:** (MN) 612/822-2119. **OH:** Dayton 513/429-9040, Cleveland 216/464-8113, Columbus 614/436-2051. **OK:** (TX) 214/840-2169. **OR:** 503/620-5800. **PA:** 412/922-5110. **RI:** (GA) 404/449-5961. **SC:** 803/798-8070. **SD:** (MN) 612/822-2119. **TN:** 615/482-5761. **TX:** 214/840-2169, El Paso Area (Las Cruces, NM) 505/523-0601, Houston Only 713/780-2511. **UT:** 801/973-7969. **VT:** (GA) 404/449-5961. **VA:** 703/569-1502. **WA:** 206/455-9180. **WV:** 412/922-5110. **WI:** (IL) 312/564-5440. **WY:** (CO) 303/759-0809.

EUROPEAN EXPORT SALES. EUROPE: (MA) 617/661-9424. **BELGIUM:** Brussels 02-242 36-04. **FRANCE:** Rueil Malmaison 749-40-37. **GREECE:** Athens 642-1368. **ITALY:** Roma 805-647 872-457. **THE NETHERLANDS:** Poeldijk 01749-7640. **SPAIN:** Barcelona 204 17 43. **SWEDEN:** Vallingby 08-380-370. **SWITZERLAND:** Mutschellen 057-54655. **UNITED KINGDOM:** Bournemouth 0202-293-115. **WEST GERMANY:** München 089-31881. **AUSTRALIA & NEW ZEALAND:** Melbourne 543-2077, Meadowbank 808-1444, Chermside 59-6436, Wellington 64-4585, Auckland 876-570. **CANADA:** Datarnex, Ltd. (Distributor) Dorval 514/636-9774, Ottawa 613/224-1391, Toronto 416/787-1208, Vancouver 604/684-8625. **CENTRAL & SOUTH AMERICA & CARIBBEAN:** (GA) 404/394-9603. **MEXICO:** Monterrey 564-876. **FAR EAST:** (CA) 213/382-1107. **HONG KONG:** 5-742211. **JAPAN:** Tokyo 402-8596. **TAIWAN:** Taipei 02-7026284. **MIDDLE EAST. IRAN:** Tehran 891148. **ISRAEL:** Tel Aviv 266-291. **KUWAIT:** Kuwait 438 180 1/2. **LEBANON:** Beirut 221731 260110. **SAUDI ARABIA:** Jeddah 27790, Ryadh 25083-39732. **UNITED ARAB EMIRATES:** Sharjah 24059.

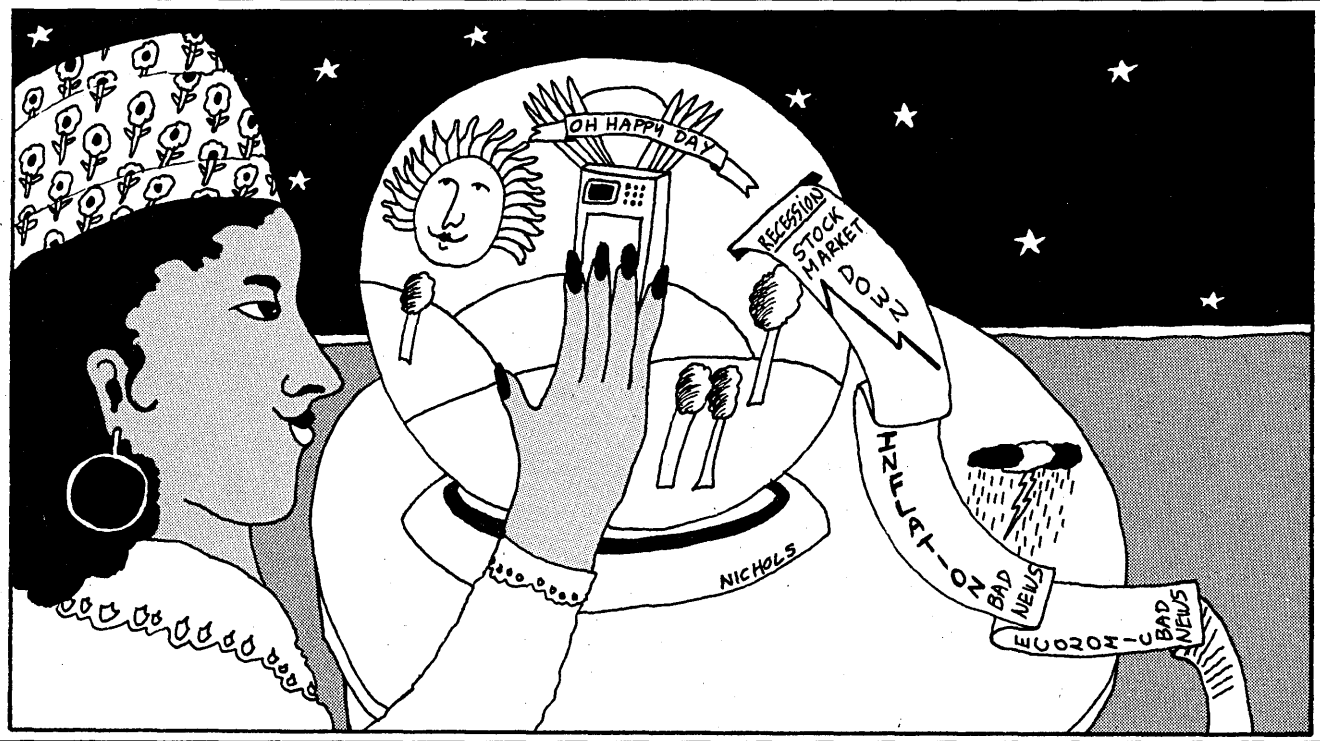
For sales and service in other countries contact ISC headquarters in Norcross, GA, U.S.A.

Intelligent Systems Corp. ☐ 5965 Peachtree Corners East ☐ Norcross, GA 30071 ☐ Telephone 404-449-5961 ☐ TWX 810-766-1581

CIRCLE 28 ON READER CARD

LATON MCCARTNEY, EAST COAST BUREAU MANAGER

EDITOR'S READOUT



THE BOTTOM LINE

A year or so ago the economists began telling us that with oil prices on the rise, the stock market in the doldrums and inflation knocking hell out of the dollar, a recession was imminent. They couldn't specify how severe it would be, or when exactly it would arrive, but a slowdown was definitely in the cards. You could bet your MBA from Harvard on it.

Okay, today oil prices have climbed even further, inflation's worse and the Dow is still floundering around in the 800s, but where's the slowdown? The numbers certainly don't reflect any downshift, at least not in the computer industry. In fact, just about every company in the field is raking in record revenues.

Data General, as an example, went from $81.6 million for the first quarter 1978, to $112.4 million for the same period this year. Honeywell jumped from $788.8 to $966.8 million; Memorex $138.8 to $177.9 million; Storage Technology $54.2 to $95.7 million.

And these increases are being manifested in all segments of the industry by both the well established heavy hitters and the newer, smaller concerns as well. Tandem Computers more than doubled, going from $5.2 to $12.4 million. Applied Devices Corp. did even better, vaulting from $7.3 to $17.3 million. The service field showed its strength with Automatic Data Processing going from $77 to $96.9 million and Computer Science revenue jumping to $343.2 million from $277.1.

Terminals and printers? Data Terminal Systems climbed to the $69 million mark and Documation hit $58.7. Respectively both generated revenues of $42.6 and $31.5 million a year ago. Small business systems and word processing? Wang showed revenues of $82.1 million from $50.9 million, while Microdata went from $15.9 to $24.1 million. And in data communications Paradyne added $3 million to its revenues ($5.2 to $8.2 million) and doubled its net income ($604 thousand to $1.3 million).

For the moment at least, then, the industry seems perhaps as healthy as it's ever been. Moreover, even if Washington tries to put the brakes on economic growth with a tighter monetary policy, indications are that the demand reflected by these impressive first quarter figures should persist well into the future.

A recently completed study conducted jointly by DATAMATION and G.S. Grumman/Cowen, the Boston-based financial research firm, shows, as an example, that a major share of dp users intend to add memory and peripherals, upgrade to larger cpu's and install additional cpu's over the next year and a half. Even at sites where big new systems have recently been installed, this demand is manifested. In fact, fully 30% of 303X sites responding to the survey said they intended to add another cpu by the end of 1980.

None of this, of course, ensures us that the economic crystal ball gazers might not ultimately see their projection come true. Meanwhile, however, the vitality of the dp industry is best gauged by a look at the bottom line. *

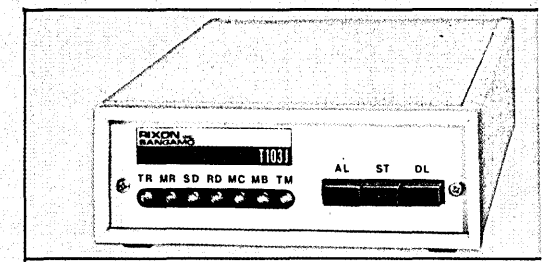
The RIXON Alternative

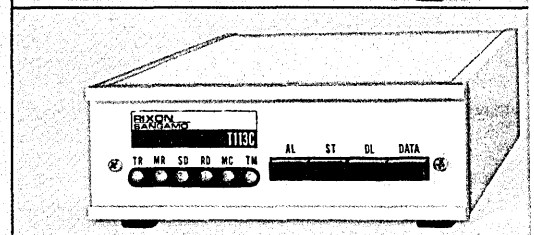
Complete Line of FCC Registered DDD Direct Connect Data Modems Designed to Save You Money the Moment You Plug Them In.

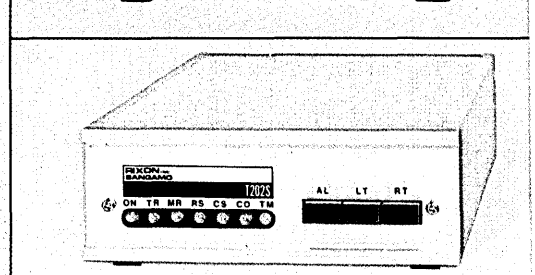
- ❐ DIRECT REPLACEMENT — Unplug your Bell 103J, 113C, 202S, 201C, 208B or 212A and plug in a Rixon T103J, T113C, T202S, T201C, T208B or T212A replacement. It's that easy.
- ❐ SAVE MONEY — Compare prices . . . the Rixon Alternative is lower!
- ❐ YOUR CHOICE — LEASE OR BUY — With Rixon, you can lease with 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.

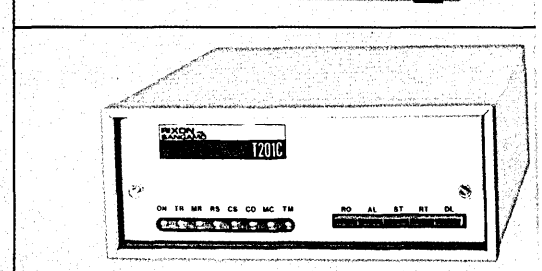
A satisfied customer is our first consideration.

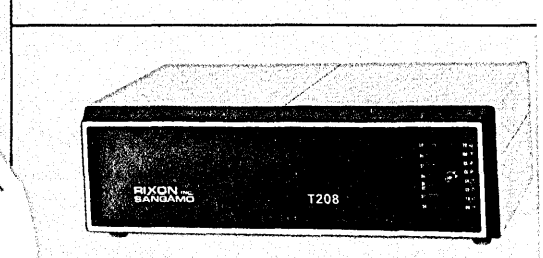
SEND FOR THE RIXON ALTERNATIVE KIT . . . with details on our complete line of DDD data modems, a comparison chart on prices, details on our lease and service programs and more.











RIXON INC. A SUBSIDIARY OF
SANGAMO WESTON

2120 Industrial Parkway, Silver Spring, Maryland 20904
(301) 622-2121 • TWX: 710-825-0071

CIRCLE 63 ON READER CARD

LOOK AHEAD (continued from page 18)

White's factions maintain however, that the computer services business represents a strong growth potential.

BARCLAY'S BANK TO LAUNCH TV EXPERIMENT

England's prestigious Barclay's bank may be the first to bring banking into the home. In September it will begin an experiment with Prestel (formerly known as Viewdata and operated by the British Post Office) under which selected customers will be able to access information via their home tv screens. Initially it will only be for information access but the potential is there for bill paying from home. A customer could call up his outstanding bills and with the press of a touch tone key direct those payments he wishes to make automatically.

HEADING OFF OBLITERATION AT THE NEB

Britain's National Enterprise Board, which has been funding ambitious new efforts in microelectronics, software, and office automation, could be obliterated by the new Conservative Government. Trying to head this off, NEB chairman Sir Leslie Murphy is formulating a plan to sell shares to the public of its computer-electronics grouping to show NEB can be run on reduced government funding. Meanwhile, the NEB's software consortium, INSAC, has a buyer in the wings in case the Conservatives want to ax it. Ironically, the rumored buyer is a U.S. bank.

CLUB MAY CLUB CLUB

Interpol, that International "club" of national police agencies, has planned to computerize its extensive records system but may face legal problems. The administrator of the new data protection law in France -- where Interpol lives and by whose laws it must abide -- intends to make Interpol justify and protect the name-linked data it passes around.

Europe's data protection bigwigs, who have formed their own club, have pledged support for their French compatriot, Louis Joinet, in keeping Interpol honest. Interpol has been examining the implications of computerizing for two years and a spokesman admits "we have made no firm decision to acquire a computer yet because there are so many problems in complying with legislation concerning computer files..."

RUMORS AND RAW RANDOM DATA

IBM has told financial analysts that for customers who missed first day orders, IBM has a 27-month lead time on the System 38, 24 months on the 303X line and 30 months or more on the 8100, depending on how the 4300 series figures firm up... While Texas Instruments struggles with communications red tape in selling personal computers in the U.S., it has already accepted orders in Holland and is negotiating with big U.K. chain store, Dixon Photographic, which wants exclusive U.K. rights...Electronic junk mail? Apparently there is such a thing. Howard L. Morgan of the Wharton School has an automated mail connection to the Arpanet. Somehow he's gotten on a "wine list" generated by users at MIT. But fortunately his system provides an electronic waste basket.

NEWS IN PERSPECTIVE

PCMs AND THE IBM E SERIES

With the price umbrella gone, profit margins enjoyed by PCMs will fall from "absolutely outrageous to merely outrageous."

It's been almost six months since IBM's announcement last January of its E Series computers, the 4331 and 4341, and the dust still hasn't settled. Some people believe the E Series was IBM's one-stroke karate chop directed at any plans the Japanese may have had to enter the U.S. market with their mainframes. But one thing is clear. The new processors define a much lower price-performance curve, and that curve constitutes a real threat to the plug-compatible computer makers.

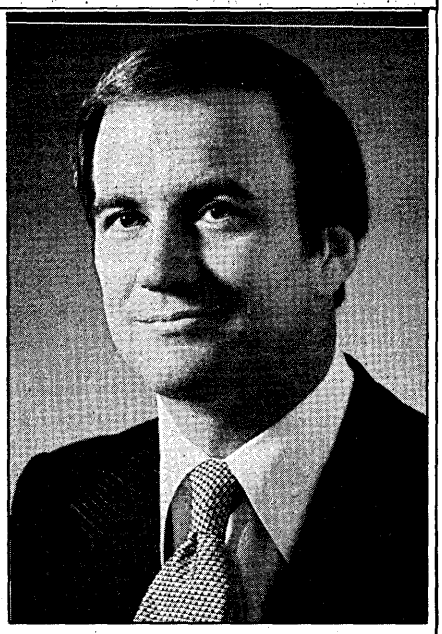
Based on hardware price and performance data available to date, Itel Corp.'s marketing staff has graphed the IBM processors, showing price along one axis and millions of instructions per second (MIPS) along the other. The new points defined by the 4331 and 4341, reflecting their low prices, look very attractive. But, warns Itel vice president Ken Hunt, "instead of an up-to-four-times price-performance improvement over the 115, 125, 138, and 148, it's like two times."

The reason for this, he explains, is that the price points fail to recognize the increased cost to the user for service, program products, other software support, a cost that could double the user's expenditures.

But Dave Martin of National Semiconductor Corp. says it is clear now that "IBM is getting what I would call box-for-box competitive." He says Big Blue is no longer content to be price competitive merely across a family of machines, but rather with each piece in the family. As a result, he adds, "... the old price umbrellas, which were created when IBM was pricing more to market than to cost, are going to erode. I think the 4300 is a good example of that. It's an aggressive price-performance product."

Without that umbrella, what's a competitor to do? Industry consultant David Gold says the new price-performance levels set by IBM mean that profit margins enjoyed by the PCM's will fall from "absolutely outrageous to merely outrageous." Dr. Gold, who has studied the plug-compatible mainframe business, says this laughingly but knowingly.

Much more upbeat about Life After the 4300 is Dr. Jared Anderson, president of Two Pi Corp. It was in April of 1978 that Two Pi announced the V32 370-compatible minicomputer, initial shipment of which began the following June. Anderson says there was widespread gloom in the peripherals industry ofter IBM sharply reduced prices on its 3270s. People were predicting that all 3270-replacement terminal makers would immediately go out of business. Instead, demand for the product skyrocketed and now every 3270 manufacturer finds he can't ship enough.



KEN HUNT OF ITEL—The price-performance is more like two times the 370 lines it replaces.

Two Pi, after the 4300, has had to "adjust all its prices," Anderson says. But it also looks like IBM has legitimatized the concept of 370-compatible minicomputers linked to large 370s. And, he observes, "It looks like at the moment we can sell all the computers we can make."

Two Pi's Dr. Anderson: "It looks like at the moment we can sell all the computers we can make."

Somehow that kind of talk from someone like Anderson becomes believable. He likes to talk, does so with more of the optimism of a salesman than of a scientist/engineer, which he is. But in sharp contrast to the Two Pi executive is Joseph L. Hitt, president of Magnuson Systems, the company that more than a year ago announced its entry into the same 370-compatible mainframe marketplace.

Hitt, who speaks in a low monotone, sounds more like the voice of doom—and yet he comes from a marketing background at Raytheon. He refuses to believe that IBM priced the 4300s as a competitive swat at the PCM's. Rather, he sees it as IBM's recognition that it must expand the marketplace if it is to continue its 15%-per-year growth.

After all, he points out, the PCM's have perhaps 300 to 400 machines installed in the intermediate range, this out of a total installed based of 12,000-plus.

"I don't think they're getting any more aggressive than they have been," he says.

The new processors, Hitt will have you believe, are directed more at the megamini manufacturers like DEC and HP, rather than at Magnuson. And they endorse the concept of distributed processing with remote 370-compatible processors. "That ought to scare the hell out of Four-Phase and the rest of the people in that marketplace," Hitt says. "That's significant." Significant, he adds, is the idea of a $60,000 machine that can run all the existing 370 software. But Hitt also readily acknowledges that companies like Four-Phase have a large customer base they could easily retain by continuing to serve the users well.

At Control Data Corp., which sells the Omega line through its Peripherals Co., Gordon R. Brown, the company's senior vice president, said CDC had to renegotiate its contract with IPL, which makes the Omega computers. It cut the price of the models one and two Omegas by 35% and in turn waived its rights to sell the Omega line exclusively. So far, though, no one else is selling the product.

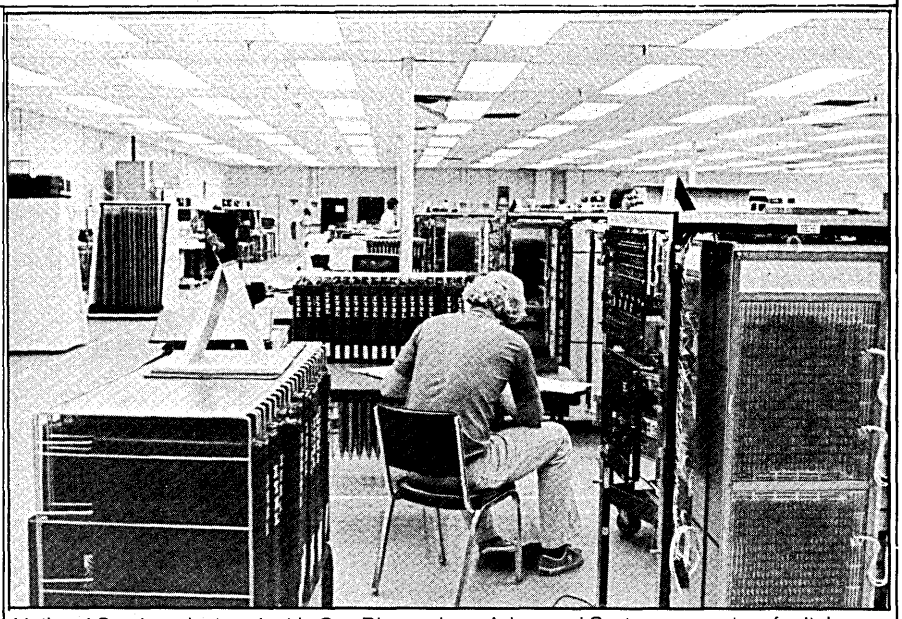
CDC also reacted to the 4300 series announcement by introducing a model 3 version which competes with large IBM machines in the model 158 to 3031 range. But Brown says that Control Data's main thrust with the Omega was to sell peripherals. He says 75% of the 40 installations so far have also acquired CDC peripherals.

"It was not our plan to sell 400 Omegas in the first place," Brown says, but to select their markets in 23 key U.S. and Canadian cities and install systems where the company had support services "and where we felt it was good for the peripherals market."

Interestingly, the PCM's may not be the only ones scurrying to respond to the 4300s. A survey performed last March found that large-scale computer users who were due this year to receive the 303X processors they had ordered earlier were doing some soul-searching. These people were either considering canceling their scheduled installation or delaying it. All this, in large measure, because the 303Xs they had ordered were on a higher price-performance curve than the more recently announced 4300s.

This is a major finding of a study performed earlier this year by Computer Intelligence Corp. and Dean Witter Reynolds Inc., the stock brokerage firm. The study consisted of interviews with more than 100 users who had 303X systems scheduled for installation in 1979.

By March of this year, 59 of those orders were considered not firm. And of that number 36 were said to stem from the 4300 announcement and three more because of the anticipation of future announcements by IBM. An additional 10% said the softness of their orders stemmed from the availability of competitive alternatives—the ability to turn to PCM suppliers or because the late delivery schedules led to other solutions. Of those who said their orders are not firm, however, only 20% said they are actually considering 4331s or 4341s in place of 303Xs. Instead, some 49% plan to install or retain a 158 or 168, perhaps until a new and lower price-performance curve is established by the anticipated H Series processors or by changes made in the price or performance of the 303Xs.



National Semiconductor plant in San Diego where Advanced System computers for Itel Corp. are being made.

A survey performed in March found that large-scale computer users who were due this year to receive the 303X processors they had ordered earlier were doing some soul searching.

The price-performance chart at Itel Corp., however, indicates that the H Series will not be priced significantly lower than the 303Xs. Indeed, if one were to plot the software/support costs into the hardware prices of the 4300s, the E Series would move up and line up approximately with the H Series.

Hunt says Itel's strategy is to develop machines that span those of IBM's at the higher end and to plug gaps left by them. Itel foresees the top-of-the-line H Series machine having a performance of 10 MIPS, the lower processors at 8, 6, and 2.5 MIPS. And anticipated additions to the E Series include one between the 4331 and 4341, plus one above the 4341 having a speed of 1.25 MIPS.

For now, however, Itel must concern itself with the user community's reaction to the 4300s. Hunt says Itel experienced a slow fourth quarter last year as users awaited the E Series announcement. But orders at Itel during February, March, and April have also been slow. In a registration statement filed with the Securities and Exchange Commission, Itel reports losses in its computer division. And the company's stock, priced as high as $37.50 last September, was selling at below $15 as this was being written.

Itel, like the other PCM's, has had to lower prices on existing processors and announce additions to the product line. It has dropped smaller machines and added to the upper end of the line, where margins are greater. The company's portfolio of installed machines are mostly 155s, 158s, 165s, and 168s. And most of its AS machines installed are of the 158-and-above range in performance. So its success has been in the medium to high end of the 370 series.

"Machines today that are known as mid-range machines will tomorrow be known as small machines," Hunt observes. "And large machines today will be mid-range machines." He sees IBM pulling its users up this scale, encouraging them to use gobs of memory, "and we're going to follow them."

Currently being manufactured for Itel by National Semiconductor are the AS/3-5 (comparable to a 158-3), the AS/7031 (about like a 3031), and the AS/7031 AP. Being manufactured in Japan by Hitachi are the AS/6 (slightly more powerful than the 3032), AS/6-2, and the AS/6-2 AP.

In April, Itel and Hitachi announced an agreement to develop jointly a series of large-scale mainframes that can be expected to carry Itel into and even above the H Series. In Japan, Hitachi has announced its development of the M-200H, which is said to have 1.7 times the speed of the 3033. According to the *Japan Economic Journal,* Hitachi has shipped 25 of the AS/6's to Itel since January '78, and an additional 50 are targeted for this year.

The company really hasn't done too badly. When it entered the PCM business, it was with the goal of installing some 200 machines in the first five years. Two years after it started shipping, it exceeded 300. But it would seem that with increasing pressures to deliver more power at lower prices, a company like Itel would have to rely less on suppliers and begin manufacturing its own. Hunt is noncommittal on that, contending that no such decision has been made but leaving that possibility open. Under certain conditions, he admits, Itel has rights to make the AS machines being supplied by National.

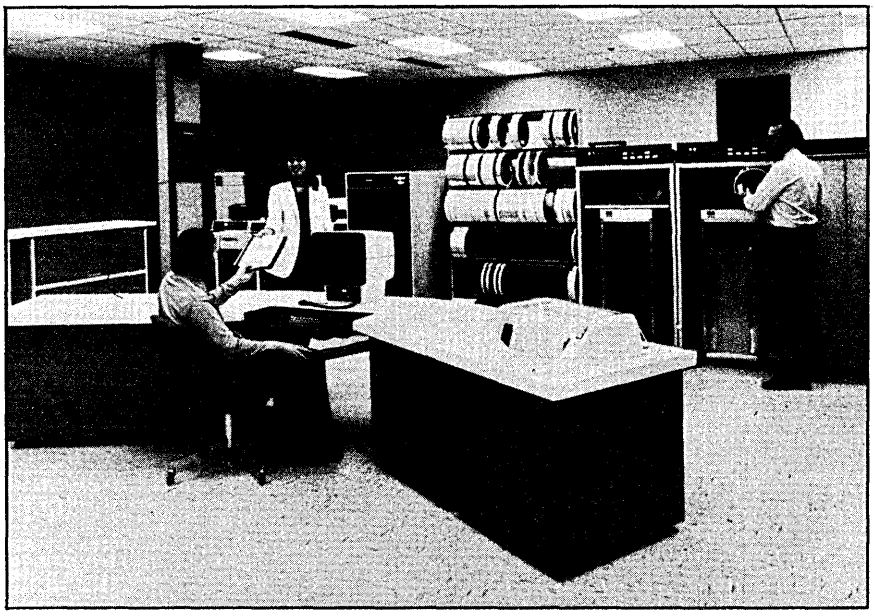
Itel's original supplier, National Semiconductor, anticipated the price squeeze from IBM. It could foresee the difficulty in continuing as a maker of computers which lacks any contact with the user. Accordingly, about a year ago it announced a non-AS computer, the System/400, which was to be sold directly to users but available also to oem's. The machine, as it turned out, sits between the 4331 and 4341. IBM says the 4331 with DOS-VS has a perform-

In April, Itel and Hitachi announced an agreement that can be expected to carry Itel into and even above the H Series.

ance of 0.88 times a 138, and the 4341 is 3 times a 138. National's S/400 is 1.5 times the 138.

But Dave Martin, vice president and general manager of the Computer Products Group, says, "We're flat late." The original target was to be in beta test during the fourth quarter of '78, into pilot production in the first quarter of this year, and into production during the second quarter. Instead, beta test is in the second quarter, pilot production in the third quarter, and production is slated to begin in the fourth quarter.

The intention was to go after the classical high-end minicomputer markets, offering a minicomputer-architected, IBM-compatible system. With the introduction of the 4300, however, National's game plan has changed. It now takes a more classical IBM plug-compatible approach. Says Martin, "One of the redirecting focuses is to accelerate the VM/370 support" on the S/400, while also supporting DOS-VSE. It appears that IBM is keying on VM as the operating system for the 4300 in the distributed processing environment. But Martin is withholding any announcement of his marketing plans and pricing scheme until the third quarter of this year.



Magnuson's M80 computer system with peripherals. Industry sources say about 20 have been delivered.

Martin contends that minicomputer makers succeeded in developing large markets for their products by pricing according to their costs, rather than what the market would bear. And their success in the business dp market stemmed from their ability to sell at, say, one-third the prices of mainframers. But that advantage is gone.

"The 4300 is a damned agressive price-performance product. And no one can put a 4331-level product to a user for one-third the price of a 4331. That ain't going to happen." But he adds that a PCM could survive by offering a "price-performance delta over IBM of 20% to 30%. It's enough for people to consider a non-IBM product. I think that's doable against that new standard called the 4300."

As for the System/400, Martin sees National making enhancements to the basic product over a period of time, much as the company has been doing with the AS mainframes for Itel. These enhancements can be expected over the first 12 to 18 months of the product's life.

"It's our belief that we can have the 400 compete with that family of E Series computers, which is the 4331 at the low end, the 4341 at the high end, and the new one in the middle. That's through cost-reduction programs, which we've mounted, and performance enhancements."

Taking a similar approach is Magnuson Systems. It started with the introduction a year ago of two 370-compatible processors. The M80/3 was 2.5 times a 138 and the M80/4 was 1.3 times a 148. Earlier this year, it added three more machines, the top slot occupied by the M80/43, rated at 1.3 times the 4341. The bottom slot is still filled by the M80/3. All except the 43 are field upgradable, and the machines are priced such that you could get the 80/3 upgraded to the next higher model, upgrade your way gradually to the top model, and the price you would have paid for the bottom processor and all the upgrades would be the same as though you had purchased the top machine at the very start.

"You don't want to take on IBM down at the low end of the marketplace, where there are no margins."

The M80/3 with 1 megabyte, rated at 1.5 times a 4331, is priced at $180,000, and the top-ranked 80/43 with 2MB is priced at $315,000. The latter will accommodate up to 16MB, the incremental megabyte priced at a familiar $15,000.

Magnuson, too, has had manufacturing problems. Joe Hitt won't say how many they've installed, except to say "quite a few." Industry scuttlebutt places it at less than 20, all this since the first shipment back in October 1978. But machines currently being shipped are the 4s and 3s. The company, which employs 170, has opened offices in eight cities. And this year it will begin implementing a remote hardware and software diagnostics capability, along the lines of Amdahl Corp.'s Amdac facility.

Hitt admits IBM has made it tougher on the PCM's, but says it's still possible to make money at this business. "You don't want to take on IBM down at the low end of the marketplace, where there are no margins," he notes. "Two Pi and National are

The only really troublesome mistakes are those that get on paper. They must be corrected (messy!), or the whole page must be retyped. Worse still, they may slip through undetected, causing all kinds of grief. So the trick is to catch and correct mistakes before they reach paper.

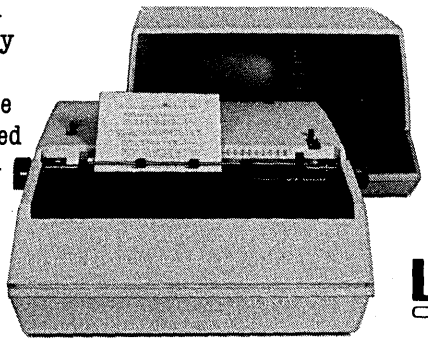
That's exactly what happens with a Lexitron word processor.

As the operator types on Lexitron's keyboard, the text instantly appears on the video display screen—big, bold and bright. Mistakes are easy to spot and correct, just by typing over them.

So far, nothing's on paper. But once the typist is sure the text on the screen is correct, the whole page is printed in about 30 seconds. In letter-quality type, with no mistakes possible. And the text is electronically stored for re-use.

With Lexitron, you'll make no mistakes today. And make no mistake tomorrow. Because the same Lexitron system you buy now—at prices starting under $10,000—will be the heart of your office of the future.

Lexitron word processors are software-based, with communications capabilities to accommodate the necessary tie-in features. Which we're developing with the financial and technological backing of Raytheon Data Systems, a leading supplier of intelligent terminals, distributed data processing and communication equipment.



With so much to gain, today and tomorrow, it would be a mistake to wait. Call or write Lexitron now. 9600 De Soto Ave., Chatsworth, CA 91311 (213) 882-5040.

Lexitron CORPORATION

With Lexitron word processing, you make no mistake.

probably two companies that can testify to that. Their prices now have to be under $60,000."

Hitt's product marketing director, Ronald Swenson, who recently joined Magnuson from Control Data Corp., notes that a fully configured 4341 software bill can exceed $2,000 a month. And he adds, you can bet that that price will rise faster than the rate of inflation. Hitt agrees.

"You know, I think with IBM's software philosophy on the 4300s they've opened up a whole new marketplace for the software people." What with the prices IBM is charging, he sees software houses coming up with alternatives.

But software is something that Two Pi doesn't want to get into. It is, however, heavily into firmware. The company's V32, says Jerry Anderson, "is microcoded from the tippy tip-top to the very bottom." Anderson calls his a very soft machine, saying, "We purposely gave up performance in all kinds of places because we wanted to be flexible." The antithesis of this design approach is seen in the Amdahl computers, which have no microcode, but get their performance from being hardwired.

"The 4300 is a damned aggressive price-performance product. And no one can put a 4331-level product to a user for one-third the price of a 4331."

Two Pi has never announced its prices, still refuses to do so, because it sells its machines only to oem's. Performance of the V32 is said to be from 15% to 20% above that of a 4331 and priced by Two Pi to enable an oem to sell it for about the same price as a 4331. Since the machine was announced in April '78, the manufacturer has completed the design of integrated peripherals controllers. A month ago, it had shipped about 30 machines. Production was at the rate of one per week, scheduled to reach one a day by the end of 1979.

The initial oem customer, National CSS, has been joined by two other customers. They are Time Sharing Resources, a Long Island service bureau, and Semiconductor Corp., an Australian distributor. A third software-services firm is said to have signed up but has not yet made a formal announcement.

None of these vendors would admit it, but they're all struggling to make a business of supplying plug-compatible computers. Magnuson Systems, following the 4300 announcement, was able to complete its financing, which was even oversubscribed. So things aren't all that gloomy. But user uncertainty, keyed to the 4300 announcement and anticipation over the H Series, is affecting the order rate of the PCM's and IBM, itself. And until this blows over, we'll have some anxious moments. —**Edward K. Yasaki**

ANNUAL MEETINGS

YEARLY IN ALL SIZES

Annual meetings large and small have one thing in common, they happen once a year.

In the spring a chairman of the board's fancy had better turn to the well-being of shareholders.

For it is the season of the annual meeting when holders of one share and of big blocks alike get their shot at corporate management. And, as do the shareholders themselves, the meetings come in all sizes.

In the computer industry the largest is the one held by IBM, the giant of Armonk. Among the smallest was one held by Datum Inc., small Orange County minicomputer peripherals manufacturer which is fighting its way back to success after a near economic collapse in 1976. Both firms held annual meetings last month, IBM in massive Golden Hall of the San Diego Convention and Performing Arts Center and Datum in a small but well-appointed meeting room in its Anaheim, Calif., facility.

IBM for 1978 reported gross income of $21,076,089,000 and earnings of $3,110,568,000 with some 146 million shares outstanding. Datum for the same period had sales of $16,457,000 and income of $1,016,000 with 1,863,000 shares outstanding.

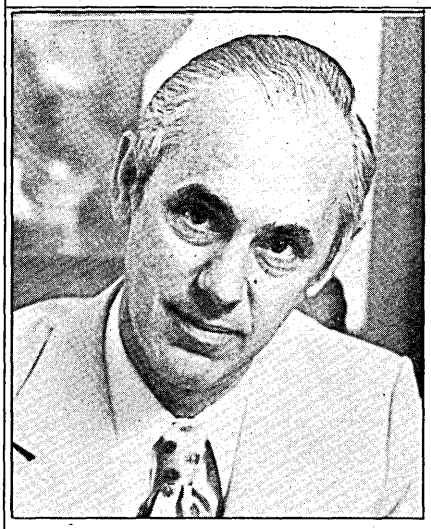
IBM's meeting attracted an attendance of some 1,500. Datum's was closer to 25. At both meetings attendees were well and conservatively dressed and well and conservatively behaved. Attendees at Datum's meeting were exclusively business people. IBM's had these, too, plus retirees and children.

The two chairmen, Frank T. Cary of IBM and Louis B. Horwitz of Datum talked about their companies. Predictably the news for last year was good and the prognosis for this year even better.

Cary said that since January 1978 IBM has announced more than 450 new hardware and software products. He talked about "their rapid rate of introduction, their improved price/performance and their unprecedented reception in the marketplace."

These announcements, he said, led to "unparalleled customer demand for our products, and throughout 1978 we continued tooling up to meet this demand."

He said the company was continuing to invest in research and development at a rate of more than one billion dollars a year. "And as a result, I believe the IBM company has a bright future, not only in 1979 but as far ahead as we can see."



LOUIS B. HORWITZ—"We're through tripping over our feet."

And he talked about the Justice Dept.'s 10-year-old antitrust suit against IBM saying its record "adds up to monumental abuse of power in a major agency of the United States government."

He said the end is "nowhere in sight. It is really no joke. With every passing day it becomes more of an outrage and a waste."

Horwitz said that Datum in 1978 "cut its bank debt in half and boosted income by 65%. It was one of the best, no, the best year in the company's history."

Overall growth, he said, was modest which "raised a lot of questions early this year. A big influence was that in the closing quarter of last year we tripped over our own feet. A supplier of a critical component ran short. We missed a ton of deliveries. Orders fell, backlog, too. That problem is behind us. We have a replacement supplier and we're bringing in a third."

Horwitz, who announced at the meeting that Datum soon will be making its "first full-blown minicomputer peripheral—our controller and our own tapes," talked about three competitors in the tape field. "Something strange happened to all of them in the past year. Wango was purchased by Perkin-Elmer and integrated into Interdata. Kennedy Corp.—and we think they're the largest—was sold to Allegheny Ludlum Steel for a subsidiary company, Arnold Engineering which wants to get into computers and Pertec is bound up in a whole set of problems it created for itself trying to penetrate the home computer market."

Cary didn't talk directly about competitors. A shareholder questioned him about a *Fortune* article he said "claimed Itel is going to give IBM a run for its money." Cary's response: "We have a Japanese computer company, IBM Japan. It's a fantastic company. Japanese companies are beginning to use sales and service organizations to distribute and service their products here. They're good competitors, tough competition."

Horwitz talked about the computer industry. "There is no recession in the computer industry at all or in sight, but that doesn't mean it's not lurking around the corner. A slowdown is possible in the third or fourth quarter of this year or the first quarter of next, but the industry could stand a temporary slowdown. We need time to catch our breath. Our industry remains strong, turbulent."

Cary pretty much restricted his comments to IBM and didn't touch on the industry in general except in a response to a shareholder question about the effects of the energy crisis on IBM. "The computer industry is less vulnerable than many industries to energy problems. At IBM we have increased our operating expenses since 1973 yet have reduced our use of energy about 40% and are trying to reduce it even further."

IBM's meeting attracted an attendance of some 1,500. Datum's was closer to 25.

The topic of home computers which

probably was at least mentioned at most if not all computer industry annual meetings this year came up at both IBM's and Datum's. Datum's Horwitz said emphatically that "selling into the home computer market is not our thing."

A shareholder questioned Cary about low-end products "of the Radio Shack type."

"We're interested in the whole home computer concept," Cary responded.

IBM's shareholders were more curious than Datum's. There were numerous questions from the floor. Either Datum's shareholders had none or Horwitz answered them all in his prepared remarks.

He talked about his company problems saying the one that concerns him most is people. "There is a shortage of engineering people. We have exceeded supply with demand. Suppliers with the same problem are stretching out lead times."

IBM's biggest problem, the government lawsuit, was the subject most raised by questioning shareholders. One asked Cary what it is costing IBM in legal fees. "We don't have an estimate but its (cost) is considerable, a great financial burden. Most expensive is not legal fees but support time, participation. This is a very, very expensive proposition."

Another questioner wondered what shareholders could do to help with the lawsuit. "I wouldn't oppose communications with people in Washington who will listen to you," said Cary.

A DEMONSTRATION—IBM's board chairman Frank T. Cary and his wife, Anne, watch the company's Bruce Perrone demonstrate the System/38 at the IBM annual meeting.

But, in answer to another shareholder who proposed formation of a political action committee, the IBM chairman said, "I would not recommend that."

A shareholder questioned what IBM has done to get the media interested in the lawsuit. "We've tried to get the media interested," said Cary, "but for the most part we've been unsuccessful, probably because the case is so long. Few journalists would see it as a career opportunity."

"It is really no joke. With every passing day it becomes more of an outrage and a waste."

Not all questions at the IBM meeting were about the lawsuit. One concerned the possible reentry of IBM into the service bureau business which it left in the early '70s when Control Data Corp. took over IBM's Service Bureau Corp. as part of an out-of-court antitrust settlement. IBM agreed at the time it wouldn't go into the service business for six years, a period which ran out last year.

"We haven't made a decision," said Cary. "We've thought about it. It's obvious we have the capability and it is a possibility for the future."

Another shareholder more directly connected to IBM's withdrawal from the service business had a more personal question. "I was transferred with SBC in the early '70s. The retirement fund set aside at that time, has it increased with inflation?"

"No, it hasn't," was Cary's reply.

A shareholder asked about the development of Satellite Business Systems (an

IBM-Comsat-Aetna joint venture) and its technical and legal obstacles.

"Our approval by the FCC has been challenged and we are appealing that. We are all moving ahead in expectation that that is not going to stand in our way," Cary answered.

Another questioner wondered about IBM's's cash reserves. "I hear the company has from $5 billion to $7 billion stashed away. What's it being used for, paying exorbitant attorney fees all the time?"

"We are not establishing reserves for losses in litigation," Cary said. "We have had large amounts of cash, $4 billion at the end of 1978 and it has been higher. Cash is not being horded for any special purpose other than to reinvest in the growth of IBM. It's (the cash reserve balance) going down."

A shareholder who identified himself as a computer consultant questioned the overlap of General Systems Div. (GSD) and Data Processing Div. (DPD) products and sales efforts. "It would appear nonproductive from a sales standpoint and frustrating from a customer standpoint to have two divisions competing."

"There are times that the System/38 and the System/34 (GSD) and the 4100 (DPD) have certain points in applications which overlap. They also have their individual strengths," Cary said. "We operate in one of two ways with customers. We have a cooperative marketing plan. If the customer wants a single proposal from IBM we operate in that fashion. We don't compete in his office with competitive proposals. Many customers want both proposals. They want to make the selection themselves. It's good for IBM, a tremendous plus for the IBM company in either mode."

And there were official actions taken at both the large and the small meeting. IBM shareholders, as expected, approved a stock split under which each stockholder would receive three additional shares for each share held at the close of business May 10. They turned down a proposal by a holder of one share that the company avoid business dealings with Communist countries. They reelected the company's 21 directors and ratified the appointment of its auditors.

Datum shareholders reelected six directors and elected a seventh, Thomas O'Rourke, president and chairman of the board of Tymshare, Inc., Cupertino, Calif.

As would be expected, tiny Datum wasn't mentioned at the IBM meeting but, as is almost always the case with smaller computer industry companies, IBM was a topic at Datum's.

Horwitz, whose company has been supplying tape systems for the IBM Series/1 minicomputers, noted that IBM will begin to supply systems in the fall. "It doesn't bother us at all. Theirs are higher priced."

The two meetings were similar and very different. Both were businesslike, well run, devoid of blue jeans, bare feet and sandals, and lacking in controversy. But, while Datum's resembled a seminar at a graduate school of business, IBM's was more like a general session at an NCC. IBM's massive display of its products occupied more space than do many trade shows. Datum's equipment was displayed on one table.

One more difference—Datum served refreshments.

—Edith Myers

COMPANIES

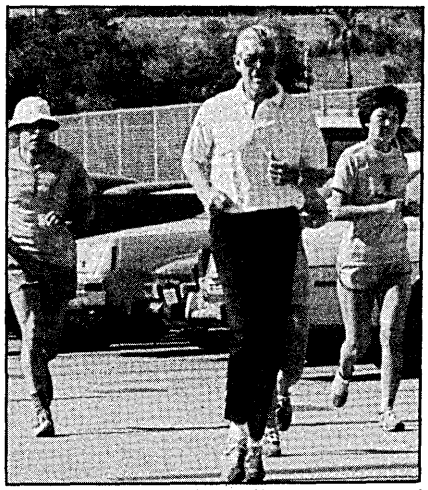
WILSON OF MEMOREX

Says IBM competitive actions have become more aggressive since it won a directed verdict in antitrust suit brought by Memorex.

Memorex Corp. president Robert C. Wilson, approaching his scheduled retirement date, says IBM's competitive actions had been reasonable until it won a directed verdict in the antitrust action brought against it by Memorex. "Since that time they have acted aggressively to restrict competition," he told shareholders at the company's annual meeting last month.

He said his company's dominant competitor's actions of late have included "dramatic price reductions, bundling, advanced technology, new products, (and) pre-announcements... As a result," he continued, "customers have been reluctant to place orders for non-IBM products. Our order rates for large data systems softened in the fourth quarter (of 1978) and continued soft through most of the first quarter."

Scheduled to retire in January, Wilson says he's agreed to stay beyond that date to assist his successor.



ROBERT C. WILSON—His retirement plans do not include running.

In a meeting with the press, he also criticized the judge in that case for directing a verdict in favor of IBM after the jury failed to reach agreement. The vote at that point was 9 to 2 in favor of Memorex. But in ruling for IBM, the judge also ordered that in any retrial of this case there should be no jury, and Wilson termed this as "arrogance of the highest order." The case is under appeal.

Wilson, who has completed five years as Memorex's chief executive officer, was scheduled to retire on Jan. 9, 1980, on his 60th birthday. But he announced to shareholders that he has agreed to stay beyond that date, if necessary, to assist his successor.

Asked by reporters what he would do in retirement, he replied, "I love to fly." He said he hadn't done any since joining Memorex and would like to return to that and do some scuba diving. He said he may serve on some corporate boards and perhaps operate a small company.

Memorex last year had revenues of $633 million, up 41% from 1977, and net income after extraordinary credit of $50.2-million, down from $56 million in the previous year.

—E.K.Y.

COMMUNICATIONS

IBM'S 1750 TELEPHONE SWITCH

Aimed only at the European market, the lower priced 1750 could be part of a grand design for the automated office of the future.

Ten years after it launched its first computer-controlled private telephone switch in France and Italy, IBM this spring reaffirmed its commitment to the European PABX market by announcing a much lower priced 1750 switching system. The manner in which IBM is selling the 1750 suggests it is part of a grand design for the automated office of the future.

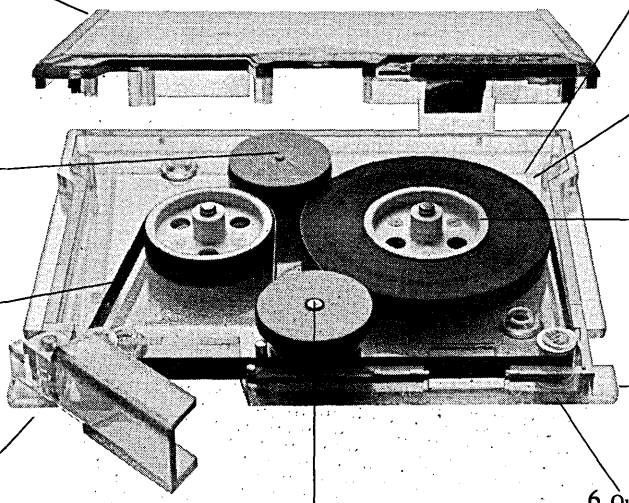
The computer giant has offered computer-controlled electronic private automatic branch telephone exchanges in France and Italy since 1969, and in the U.K., Belgium, the Netherlands, West Germany and Austria since the announcement of its 3750 switching system in 1972. In some other European countries, notably Switzerland and in Scandinavia, it is prohibited from doing so by the Postal, Telegraph and Telephone (PTT) monopolies.

The 3750 switching system is a versatile stored program space division PABX, with

Why Verbatim® re-invented the wheel.

Our patented "Belt Driven Floating Roller" is the key engineering design element in the TC-150. The Verbatim TC-150 offers at least ten improvements over the other design.

TC-150 mini data cartridge, shown actual size.



1. Our **unitized construction,** consisting of symmetrical shell halves, provides structural stability and the strength of advanced polymer. Construction is simpler and less expensive, yet the entire shell has thermal consistency. No differing rates of expansion to stress critical tape paths.

2. Our simplified Floating Roller design, employing fewer moving parts, **reduces variability** caused by environmental changes, age and use.

3. Our TC-150 mini data cartridge uses Verbatim's unique **gamma ferric oxide digital** tape. This special formulation has been extensively field proven to have long life and low head abrasion.

4. Each cartridge is **completely certified** after final assembly to be 100% error free before packaging.

5. Our Floating Roller design, which eliminates the unstable function characteristics of corner rollers, **improves recording quality** by producing repeatable tape tension across the read/write head.

6. Our metal-free advanced polymer shell design **resists static buildup.** A metal baseplate can cause damage from static electricity as the cartridge is inserted into the system. Synthetic carpets can build up big charges.

7. The Verbatim TC-150 mini data cartridge has a **broad operating temperature range.**

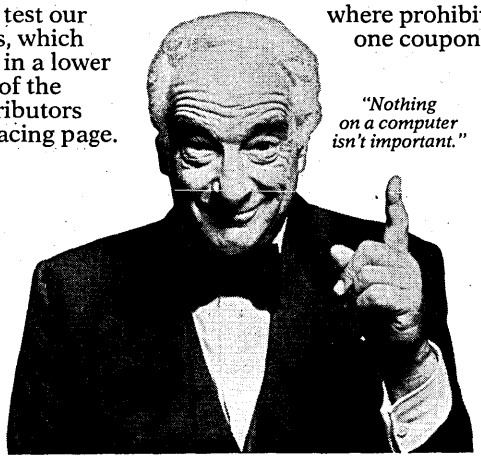
8. The tape hub material was formulated to produce a rate of thermal expansion that exactly matches the tape's. This **prevents "pack shift"** and uneven tape wear.

9. **Less power is consumed** when driving our Floating Roller cartridge because the elimination of corner rollers dramatically lessens friction.

10. Since we have **eliminated the corner rollers,** we don't need the metal baseplate which is subject to warping, dents and burrs.

Any resemblance between the Verbatim TC-150 mini data cartridge and the old fashioned 3M DC-100A and HP 9162-0061 cartridges it replaces, ends with the form factor. We completely re-engineered this useful byte-oriented data cartridge, for the good reasons noted above. You'll want to test our improvements, which happily result in a lower cost. Call any of the Verbatim distributors listed on the facing page.

Special Limited Offer: Buy a sample order of at least five Verbatim TC-150's and our distributor will give you, on delivery of your order, a coupon redeemable for one of our mini data cartridges **free.** This offer is only available through participating Verbatim distributors and is void where prohibited by law. Limit one coupon to each customer.



"Nothing on a computer isn't important."

Our distributor will also be delighted to supply you with quality Verbatim diskettes and cassettes.

Verbatim Corporation.
323 Soquel Way, Sunnyvale, CA 94086.
(408) 245-4400.
TWX: 910-339-9381.

PEOPLE WHO PLAY THE COMPUTER

Specify Verbatim®

CIRCLE 64 ON READER CARD

all of the sophisticated advanced telephone switching and accounting facilities familiar to U.S. PABX users: abbreviated dialing codes for external lines, camp-on facilities for engaged numbers and extensions, temporary call transfer, three-way conversations, call data recording and accounting, and many others. It can be interfaced to a host EDP system to allow push-button telephone handsets to collect data and/or interrogate the system files. It can control a variety of sensor-based security and environmental control devices in the building in which it is located.

The older 3750 has achieved a major share of the market where it is sold, especially in the U.K. where the number of installations exceeds 100.

But like all IBM Data Processing Div. products of the early 1970s, it's expensive, and that's where the 1750 switching system fits in. It isn't a replacement for the older 3750, but is a smaller, more compact and much cheaper compatible version of the same system.

For example, the older 3750 in its smallest configuration (32 tie-lines and/or connections to the public switched telephone network, 248 internal extensions) sells for more than $300,000 in the U.K., substantially more at current rates of exchange in strong currency markets such as West Germany. And it isn't available on rental. Thus, it can appeal only to large companies and institutions.

But since it was the first all-electronic stored program PABX with advanced telephone and data handling functions to be offered in Europe—the only one of its kind in the U.K.—it has achieved a major share of the market where it is sold. (In the U.K., the number of installations exceeds 100).

Entry level configurations of the 1750 with 100 internal extensions, on the other hand, are available for as little as $150,000 in the U.K., more on the Continent. For $200,000 one can get a system that also includes 24 external public switched telephone network and/or tie-line connections, and enough internal memory and backing diskette storage to implement abbreviated dialing code and temporary call referral tables and other advanced functions.

IBM is marketing it in a manner which suggests it is part of a grand strategy for the automated office of the 1980s. The first target market is the smaller regional office and factory sites of existing 3750 users. The 1750 telephone line interfaces, voice and data terminals are all identical to 3750 models, and the two systems' control software has compatible user interfaces, so that multiple 1750 and 3750 switches can be used in tandem with each other in private user "distributed switching" networks.

Such multiswitch networks can be programmed to administer a common extension numbering system of up to seven digits, and each switch can be programmed to give priority to pass-through calls originating from a distant 1750 or 3750 switch over those trunk calls originating at one of its own extensions. This allows private user tie-line networks to achieve satisfactory response to connection demand with a smaller amount of trunk tie-line capacity than would otherwise have been required: one large British user saved $200,000 per year in telephone tie-line rentals in this way.

As soon as each national PTT has given final type approval to the 1750 switching system, IBM will start selling it actively to medium-size users, who might require only a single 100 extension PABX for a single office. In France, the system has already been released to both Data Processing Div. (DPD) and General Systems Div. (GSD) salesmen to sell to their respective customers.

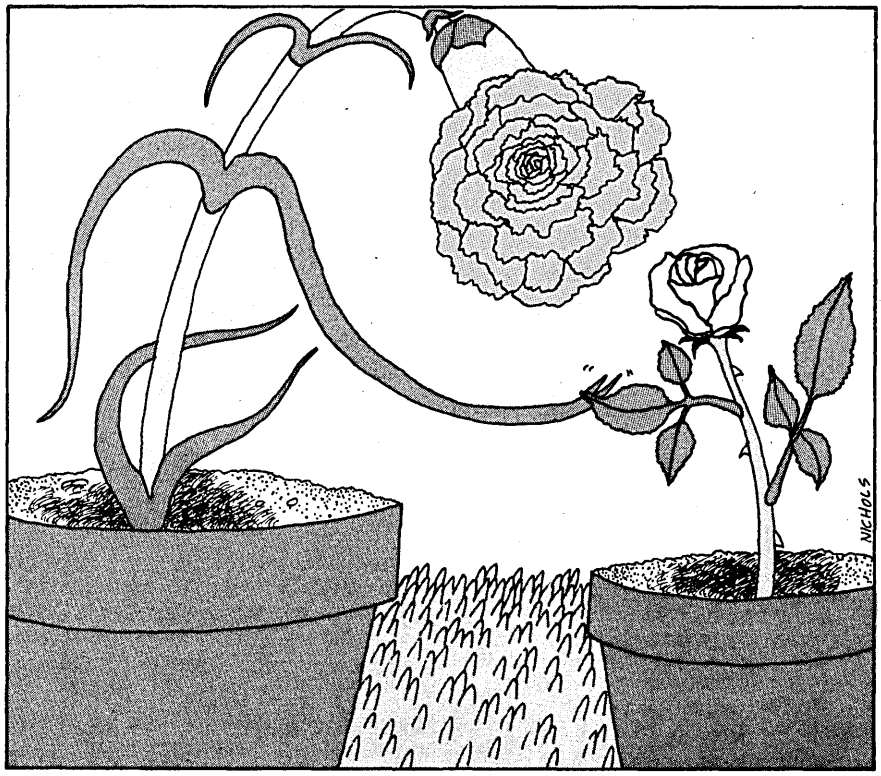
In the U.K. and most of the other European countries where it is sold, the 1750 like the 3750 is in the hands of a specialist Telephone Switching Systems sales team, that administratively is part of DPD.

The broad range of users and sites for which the 1750 has been designed is shown by the variety of different edp system models with which it can interface as data collection and/or enquiry terminal concentrator. These include not only DPD's System 370, 303X and 4300 series, but also the 8100 Information System, and GSD's Series/1, Systems/3, /32 and /34. And whereas such BSC interfaces to the 3750 switching system require a tie-line, the 1750 can also send collected data and/or online enquiries to any of the above edp and terminal systems via a temporary dial-up connection.

Unlike its older brother in the mid-1970s, the new IBM 1750 switching system will not have any part of the European stored program PABX market all to itself. Competing French, West German and Dutch telecommunications equipment manufacturers have been selling computer-controlled electronic PABX systems with advanced functions since 1977 or 1978, and in 1980 the first 1750 deliveries will coincide with the first deliveries of the British GEC SL-1 (under license from Northern Telecom Ltd.), Plessey PDX (under Rolm license), and the British Post Office's own CDSS.

Multiple 1750 and 3750 switches can be used in tandem with each other in private user "distributed switching" networks.

Moreover, these new British systems, as well as the French CIT-Alcatel CITEDIS system offered since 1977, use a more advanced all-digital time-division switching



IBM's 3750 project often has been referred to under its code name, "Carnation." Its newest PABX version, the 1750, is understood to have gone under the code name "Rosebud." And both are compatible.

technology, which allows PABX's to be cheaper, more compact, more easily maintained, and to interface digital terminals and computers more easily via standard CCITT X21 interfaces.

The only advanced technology used in the IBM 1750, on the other hand, are its 64K-bit memory chips. For the actual circuit switching it relies on the same conservative space division technique (a kind of electronic emulation of crossbar) as the 1972-vintage 3750, so as to maintain maximum compatibility between the two systems, and thus save on both software development costs and to expedite European PTT-type approval procedures.

IBM is not allowing the 1750's and 3750's relative technological backwardness to be a sales handicap any more than it did when selling System 370 in earlier years. While rival telecommunications equipment manufacturers are being tempted to emphasize their technology in their selling, IBM is putting all the emphasis on user applications, especially where telecommunications switching and edp converge. And as the world's leading edp systems supplier with the longest experience of selling computer-controlled switches on the European market, IBM is in an excellent position to do so.

One such application is electronic mail. IBM is currently running two internal electronic mail experiments: one on the leased-line network linking its British HQ offices in London-Chiswick and Portsmouth with IBM World Trade Europe-Middle East HQ in Paris; the other on the French leased-line network linking all its national and regional offices in France.

In both cases, intracompany memos that would otherwise have been sent by ordinary mail are now held on cassette backing storage on communicating MT/ST word processing systems. After office hours, when the leased-line network is no longer used for voice conversations, each office's system (mostly 370/158-3) polls each 3750 extension in turn to which an MT/ST is connected, and calls on it to transmit its stored internal memos. When it has received these, the system examines each memo's address, sorts it into an appropriate queue, and finally instructs the 3750 to set up a switched circuit path in turn to each distant addressee's MT/ST or else to the distant system's line printer.

The only advanced technology used in the IBM 1750 are its 64K-bit memory chips.

IBM does not offer its European users this internal IBM electronic mail software. But it is encouraging independent software houses to develop similar electronic mail and other industry-specific applications packages for configurations combining a 1750 switching system and a Series/1 mini, used as dedicated data collection and file enquiry concentrator by day and as electronic mail routing controller by night.

To simplify independent software houses' task in writing 1750 applications, IBM has developed a special 1750-Series/1 software interface, in which the Series/1 is host to a cross-compiler for 1750 user applications software. Any software house familiar with Series/1 programming can thus write 1750 applications, without having to learn any 1750 programming language.

Any software house familiar with Series/1 programming can write 1750 applications, without having to learn any 1750 programming language.

The 1750 switching system's much cheaper entry-level price and the hand of cooperation extended to independent software houses for programming applications for it are all strikingly similar to the strategy adopted by DPD for the 4300 series, and the 4331-based "applications machines."

IBM's emphasis on converging edp-telecommunications in European marketing may be part of a grand design for the wholly-IBM-supplied "automated office" of the 1980s.

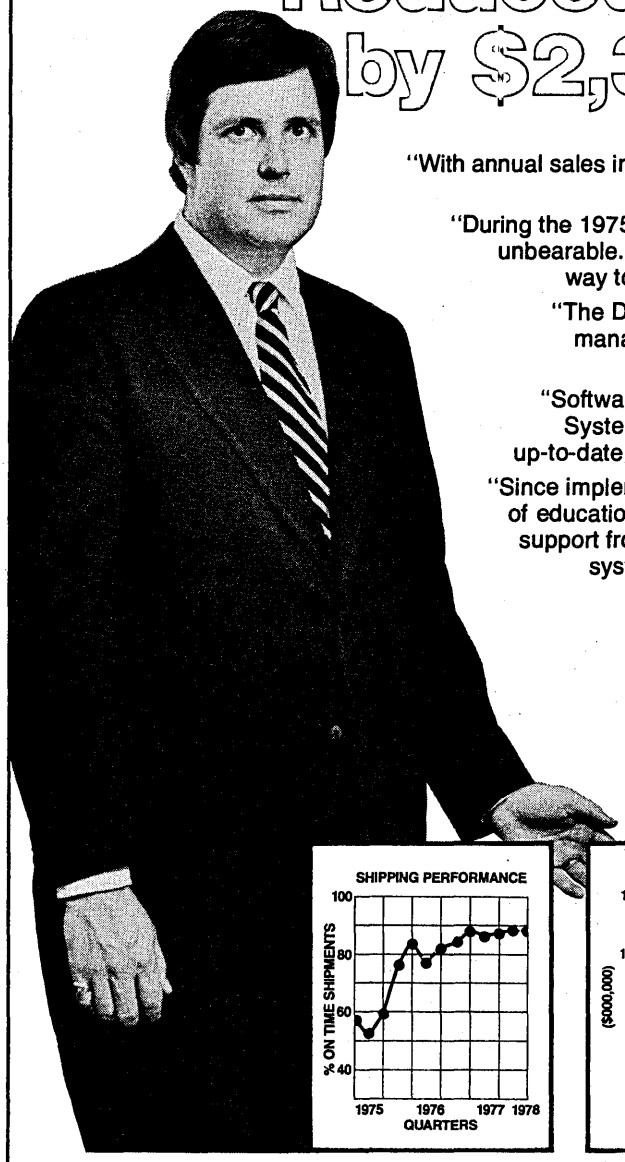
IBM's emphasis on converging edp-telecommunications in 1750 and 3750 European marketing suggests also that its European telephone switches are not an isolated selling exercise, but part of a grand design for the wholly-IBM-supplied "automated office" of the 1980s.

Other pieces in that jigsaw are the recently announced 6670 document processing system (so far announced only in North America), and IBM's stake in Satellite Business Systems. Some time within the next year or two, all these pieces should be brought together to form the complete picture.

This does not mean that the new 1750 or the older 3750 switching systems are about to be announced in the U.S. market. Their space divison switching technology and internal analog circuits are too dated to be launched at this late date on a market where more advanced time-division switches such as Rolm's have been offered for some time. But the experience that IBM has been gaining on the European PABX market for the last 10 years will help it to back any more advanced time division switch with appropriate software and applications experience when at last it announces this worldwide.

—Fred Lamond

"Koppers Company's Power Transmission Division Reduced Inventory by $2,300,000!"



"With annual sales in excess of a billion dollars, Koppers Company, Inc. is one of the nation's major diversified manufacturers.

"During the 1975 materials shortage, backlogs ballooned and leadtimes became unbearable. The Power Transmission Division knew there had to be a better way to improve customer service, productivity, and inventory turnover.

"The Division's Manufacturing Steering Committee, consisting of upper management, decided that the best solution would be the installation of a Material Requirements Planning System.

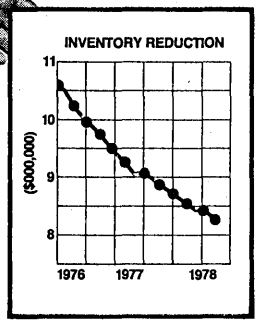
"Software International's Net Change Manufacturing Resource Planning System was ultimately chosen because it was felt that it was the most up-to-date, complete system available and the one with the most potential.

"Since implementation, we have shown measurable improvements. Because of education, involvement and commitment at all levels — plus outstanding support from Software International — we developed a production control system that allows participation by all departments in the operation.

"As of April, 1978, inventory value was reduced to $8,300,000, a reduction of $2,300,000 over a 20-month period. At the same time, we improved on-time delivery performance, thereby gaining a larger share of market.

"The system is saving us money; performance measures indicate that we have reduced overtime significantly, with savings of $74,000 in 1978 alone. Inventory accuracy, faster reaction to changing demands, and Bill of Material accuracy have also resulted."

Barry A. Bosies
Manager, Production Control
Power Transmission Division
Koppers Company, Inc.



More than software... results.

More response is a major benefit of a manufacturing resource planning system. Software International's Net Change MRP system has provided Koppers Company's Power Transmission Division with a system that has helped them produce more, deliver better, and increase profits. That's more than a software system. That's *results*!

Please send me your Manufacturing Resource Planning System literature:

My area of interest is:

- ☐ Material Requirements Planning
- ☐ Master Production Scheduling
- ☐ Capacity Planning
- ☐ Shop Floor Control
- ☐ Purchasing

Name _____ Title _____
Company _____
Address _____
City _____ State _____ Zip _____
Computer System _____
Phone _____

SOFTWARE INTERNATIONAL®

Elm Square, Andover, MA 01810 (617)475-5040
Atlanta · New York · Washington, D.C.
Chicago · San Diego · Toronto · Houston · Columbus OH
· San Francisco

D679

OFFICE AUTOMATION

LOOK MA! NO PAPER

Washington consulting firm "practices what it preaches" by setting up showcase of integrated office automation products.

It's Futureworld. It's computerized. And it's as close to paperless as any office can be. What it is is Micronet Inc.'s version of "the first fully automated office in the world." Strategically situated in Washington's posh Watergate office complex, Micronet's "Paperless Office" is the dream come true of many an office automation buff. But more than a dream, this office of the future is an actual working model used by the small office automation consulting firm in its day-to-day business operations.

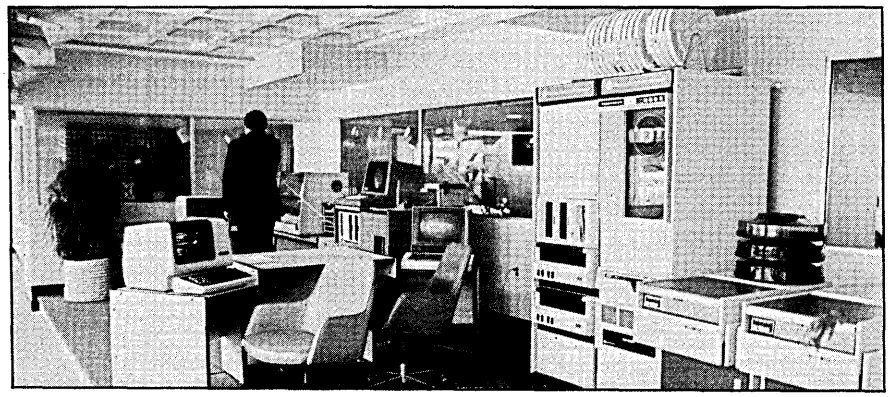
Promising deliverance from the paper jungle of the typical office environment, the showcase office combines computer, word processing, micrographics, automated retrieval, voice input, optical character recognition (ocr), and telecommunications technologies into an integrated information management system which operates in on-line and batch modes.

It handles internally-generated documents, memos and messages, and performs such traditional business chores as accounting and payroll. It also takes care of the data flow from the outside world, and has access to remote data bases with computerized retrieval, display and distribution.

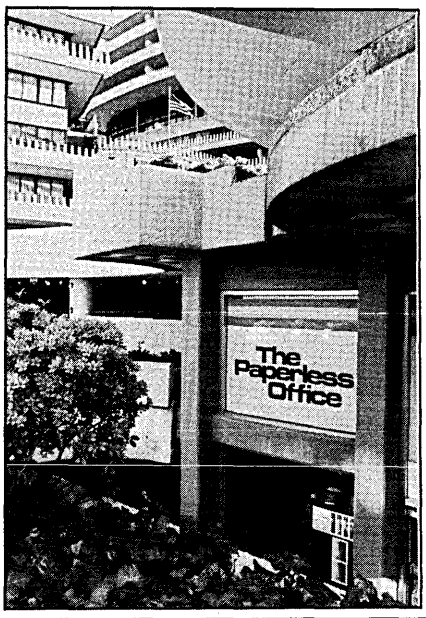
"We're not breaking any new ground," says Micronet president Larry Stockett, "but we're showing people what ground is out there." Stockett, a "practice what you preach" consultant, conceived the idea of creating a paperless office well over a year ago. At the office's grand opening last month, the 32-year-old former Californian recounted some of the steps that led up to the electronic office's dramatic debut. One crucial phase was vendor evaluation.

Each of The Paperless Office equipment and service suppliers were carefully chosen. The $600,000 worth of gear from some 17 vendors, he claims, is currently "representative of the state of the art" in office automation. (Notably missing from Micronet's supplier roster are some of the bigger guns in office automation such as IBM and Wang.)

Each of the sponsors "donated" their wares and services for Micronet's paperless office project on a $1-a-year lease basis. The biggest donator was Plessey Peripheral Systems which provided a minicomputer (Digital Equipment Corp. PDP-11/34), disk drives, magnetic tape units, microcomputer system, crt terminal, communications interfaces, line printers, floppy disks, and operating system and application software. The other 16 sponsors included: A. B. Dick Co. (microfiche camera processor), Access Corp. (computer-controlled mass microfiche storage gear), Auerbach Publishers Inc. (computer technology data), AM International's Bruning Div. (microfiche retrieval and duplicating equipment), DatagraphiX Inc. (COM recorders, readers/printers), Dictaphone Corp. (dictating equipment), ECRM Inc. (ocr gear), Hamilton Sorter Co., Inc. (furniture), Microsystems Engineering Corp. (software), National CSS (time-sharing and systems services), NBI (word processing systems), NUS Inc. (management consulting services), Exxon Corp.'s Qwip Systems Div. (facsimile equipment), Realist Inc. (micro-



LARRY STOCKETT, a consultant who says he practices what he preaches, with some of the $600,000 worth of office automation equipment from 17 vendors. Thirty-two-year-old former Californian set up the model office in May in Washington's posh Watergate office complex.



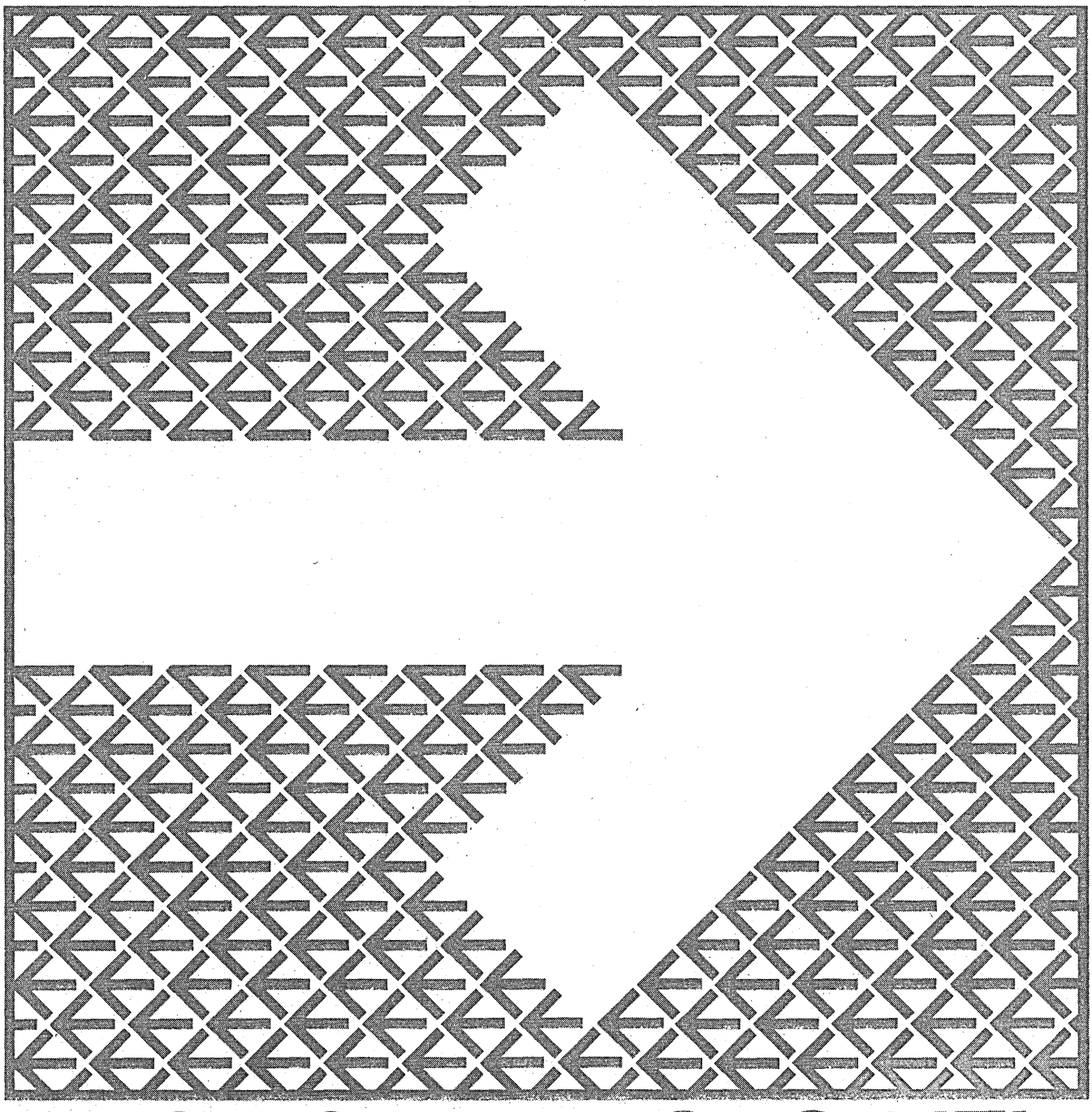
Model 204 DBMS

What happens when you need to change your existing database to meet new information requirements—new data, new reports, new structures?

With CCA's interactive Model 204 database management system, it's easy.

Our unequalled data independence makes any modification quick and simple. And our high-level user language holds your development time to a minimum.

For a complete system description, with case histories, clip your business card to this ad and send to Computer Corporation of America, 575 Technology Square, Cambridge, MA 02139. 617-491-3670.



BECAUSE MANAGING DATA MEANS MANAGING CHANGE

Computer Corporation of America

CIRCLE 29 ON READER CARD

NEWS IN PERSPECTIVE

fiche display terminals), Word Processing Associates Inc. (paper feeder and wp products), and Zytron Corp. (COM services).

The venture could be expected to pay off for these sponsoring firms since they can invite their private clients to tour the showcase facility and have access to Micronet's visitor lists.

Stockett feels the paperless plunge will pay off for his two-year-old company. His paperless office—an admittedly novel approach to office automation consulting—has already (with the help of publicity) attracted considerable local attention. Now what it has to do is attract paying clients for Micronet's office automation advisory services.

The company's big prospects are corporations and government executives who want to get in step with the paperless pace promised by automation. AT&T has already done a week-long stint at Micronet's Paperless Office and Micronet has scheduled executive briefings and a workshop for managers beginning this month.

Also this month, all of the office's systems will be "totally compatible," according to Stockett who has been pushing for the appropriate interface gear. Operational for only a few months, The Paperless Office will function in three modes—as a working office for Micronet and its 10-member staff, as a demonstration center, and as a permanent training facility for office managers in industry and government.

Micronet's message with its paperless push is clear—"today's technology can help increase efficiency in handling information in today's office." Stockett elaborates: "We use each technology for what it's cost-effective to use it for." And "as self-serving as all that sounds," confides one industry observer, "Micronet's Paperless Office, in addition to drumming up business for Micronet, could indeed prove to be an effective proselytizer for the office automation movement."

—**Linda F. Runyan**

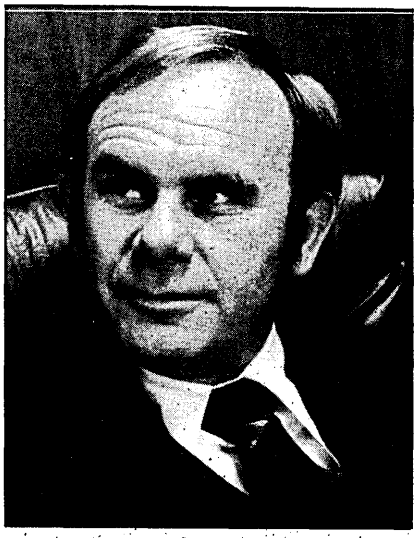
TURNAROUNDS

BACK ON ITS OWN

Cipher Data Products is thriving in its second round as an independent.

In the computer industry, many companies are born, flourish, are acquired and disappear. Others don't flourish and die. Still others are acquired and flourish the more for it. But not many come back from acquisition and then flourish after a near death.

Such a one is Cipher Data Products, San Diego producer of tape drives for minicomputers. Cipher today is growing. It is bursting the seams of a 38,000 sq. ft. facility it occupied only two years ago and is anticipating a move next February or March into a new, expandable 68,000 sq. ft. facility it is building.



DONALD M. MULLER—Taking over at Cipher Data Products.

And all since it regained independence in 1976. Cipher, formed in 1968 as an independent producer of magnetic tape transports for minicomputers, was acquired in 1972 by Computer Machinery Corp.

"We soon became mired in the parent company's problems."

"It seemed like a good deal at the time," said William Otterson, then president and chief executive officer. "But soon we became mired in the parent company's problems. For a whole year prior to CMC's being acquired by Pertec we (Otterson and other private investors) tried to buy the company back." They were successful in 1976 when CMC's acquisition by Pertec Computer Corp. was completed.

"After that it was sink or swim," recalls Otterson. "Fifteen percent of our business was CMC and that, of course, went to Pertec. We had to make up for that."

Cipher did this, he said, in less than a year. And last month, Cipher gained something else that once was Pertec's. Cipher elevated Otterson to the position of chairman of the board and elected as president Don M. Muller, a former senior vice president of Pertec.

Muller had been away from Pertec for a year before joining Cipher, as president and chief executive officer of Chemetal Resources, a company devoted to research in exotic materials.

Otterson cited Cipher's growth as the reason for bringing in Muller. "We have been growing at 80% per year and see this growth increasing significantly in the next few years." Otterson said he would be de-

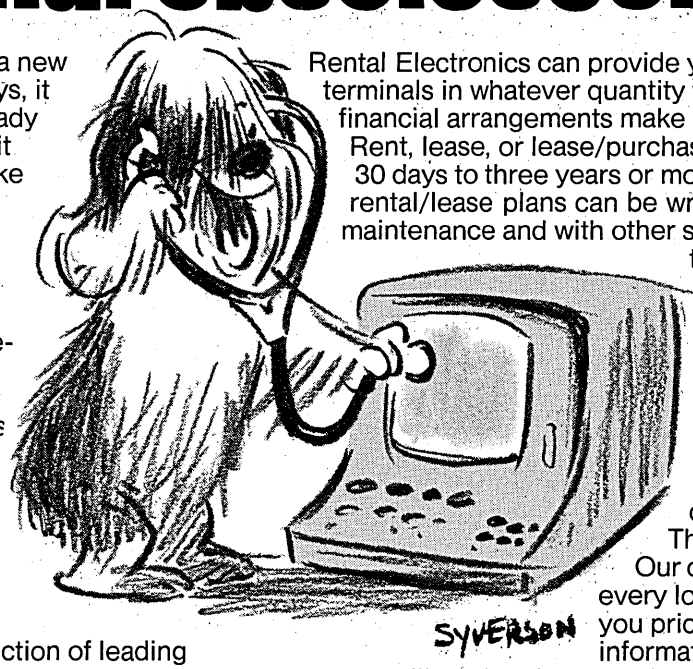
How Rental Electronics helps you avoid terminal obsolescence.

As soon as you take delivery on a new printer or data terminal these days, it seems the next generation is already being announced. Chances are, it has capabilities that begin to make your "new" equipment obsolete. Now, thanks to Rental Electronics, you can have your terminals and highest technology, too.

Renting electronic equipment instead of buying gives you immediate delivery of state-of-the-art products with no capital investment. And since our rental prices are so low, you can easily afford to upgrade to the latest in printers and terminals as new technology arrives.

Rental Electronics means the highest quality equipment, too. Choose your terminal or printer from our multi-million dollar selection of leading industry brands.

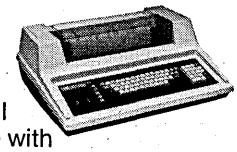
Above all, renting means flexibility. That's why Rental Electronics can provide you printers and terminals in whatever quantity with whatever financial arrangements make best sense for you. Rent, lease, or lease/purchase one to 1,000... for 30 days to three years or more. You tell us. Our rental/lease plans can be written with or without maintenance and with other special features tailored to your needs.



If you're interested in more information on renting printers or terminals from Rental Electronics, call one of our local rental centers today. They're listed opposite. Our on-line computers at every location let us give you price and availability information instantly, while you're still on the phone. In the meantime, check some of our featured rental offers below.

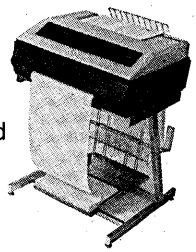
Printers and Data Terminals

Here is a sampling of the printers and data terminals available from Rental Electronics. Call or write today about your specific needs.



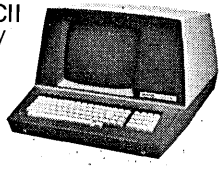
TI Model 820 Keyboard Send-Receive Data Terminal/Printer Printer operates at 150 cps on 9 x 7 wire matrix assembly printhead. Full ASCII Keyboard (ANSI-compatible) with N-key roll over. Operates in Asynchronous, USASCII, RS232C interfaces and is compatible with Bell 103, 113, 202 and 212 units. Selectable baud rates of 110 to 9600.

Hewlett-Packard 2621A/P Terminals Enhanced 9 x 15 dot character cell, full 128-character ASCII character set in 24 80-character lines. Two pages of continuously scrolling memory. RS232C and Bell 103A compatible. 110 to 9600 baud. 2621/P includes built-in printer operating at 120 cps.

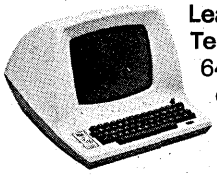


Tally T-2000 Hush-Tone Line Printer Acoustically designed enclosure. Operates at 125 (Model 2100) and 200 lines/minute (Model 2200) with standard 64 character USASCII. Line spacing switch selectable, 6 or 8 per inch.

ADDS Regent 200 Terminal 24 lines x 80 characters, 25th "status" line shows operating mode. 128 character ASCII. RS232C/CCIT V.24 communications interface operating 75 to 19.2 BPS, switch selectable. Buffered transmission, auxiliary ports.



Beehive Micro B 1A Terminal 128 ASCII character set; switch selectable scroll/non-scroll mode; X-Y addressing; 24 x 80 display format; single key memory lock; fully buffered communications to auxiliary peripheral device.



Lear Siegler ADM-3A Data Entry Display Terminal 12" diagonal, 24-line screen. 64 ASCII characters. Full or half duplex operating modes, switch selectable, baud rates from 75 to 19,200. RS232C interface, 20mA current loop.

Rental Electronics, Inc.
An AMERICAL company
... a different breed.

BACK TO INDEPENDENCE—William Otterson, chairman of the board, and Larry Hemmerich inspect a product their company is producing as a reborn independent, its 900X vacuum column tape drive.

voting his time to long range financial planning to handle the growth.

"Our first year of independence from CMC," he said, "was devoted to reestablishing our identity and credibility. We ran very tight. We were dedicated to getting production back up."

Now, said Larry Hemmerich, vice president, marketing, "we are embarked on a major development program for new products, a series of new products. We've gone from a me-too company to one that is to be watched."

"Our first year of independence was devoted to reestablishing our identity and credibility."

He said the company is aggressively pursuing development of tape drives aimed at the disk backup market. "IBM opened up a wide new market (for disk back-up by tape) when it developed the Winchester fixed disk. Tape backup is needed both for security and archival purposes."

Cipher, said Hemmerich, is devoting all its resources to tape. He talked about a competitor, Kennedy Corp. "With its (Kennedy's) acquisition by Allegheny Ludlum it's diluted engineering resources by going into disk."

Otterson said Cipher's sales currently are running at $18 million per year. "Customers prefer dealing with an independent company."

In its earlier independent period, pre-CMC, it experienced several dismal years. And Otterson does not paint the four CMC years as particularly bright. But now, he and Hemmerich predict nothing but growth and improvement.

They are particularly optimistic about Cipher's "streaming tape drive" patterned after IBM's 8809 which they say combines 100ips tape speed, high capacity and very small size with an oem price of less than $1,800.

And they bill the drive, introduced at the NCC, as "the first major technological change in tape moving devices in ten years."

But they continue to have high expectations for the company's mainstay product, the new series 900X vacuum column tape drives which they call "the first with a new concept in tape drive performance and with intelligence." The series incorporates a Z-80 microprocessor to control all functions.

In the next three years all peripherals are going to have to become intelligent, said Hemmerich, "and we're looking at that."

Hemmerich, like his new president Muller, is a one-time Pertec executive. Prior to joining Cipher Data he held a number two position in marketing with Pertec.

—E.M.

MANAGEMENT

THE WANTS OF A CFO

Financial executives prefer data processing people who know the business they're in.

What does a chief financial officer want from data processing?

The Assn. for Retail Management Information Systems (ARMIS) wanted to know so William McElfish of Carter Hawley Hale, acting ARMIS program chairman, asked CFO's from three retail organizations to provide some answers at a Los Angeles luncheon meeting.

Reliability and timeliness were high on the lists of all three financial executives.

"We've got to be able to accept all information provided to us at face value and to be able to act on it. You've gotta produce reliable statistics, not necessarily 100% accurate but good enough to be acted on," said Rudolph Hirsch, executive vice president, operations and finance, Bullocks.

David R. McMahon, executive vice president, finance and administration, May Co., was concerned with management communications. "That's an ingredient lacking in many firms. Management doesn't hear what data processing is doing until something goes wrong. It is important that dp continually tell management what's being done. Tell us what we need so that we won't, every two or three years, all of a sudden find we're out of computer power."

All three speakers spent the bulk of their alloted time talking about the kind of people they like to see in their data processing departments. "I like to hire people who will learn the business, business people who can learn dp," said Hirsch of Bullocks.

In looking for a dp manager, Barry Erdoz, vice president, finance, Broadway Stores, said he looks for someone "who can manage costs and change and act the part of the executive; a complete businessman who doesn't necessarily have to have technical brilliance; somebody who can take my job some day."

"I look for somebody who can take my job some day."

McMahon likes people who "can work well with users, who know this is the kind of business we're in."

Hirsch would like to see data processing people "try to teach a large part of the organization about dp and not be an island unto itself." He likes to "get people who want to move rapidly, who are not interested in too much leisure time. I worry when I see someone with a suntan."

He advised dp people in his audience to "learn what not to do by visiting other people. There's always somebody who's already been where you're going."

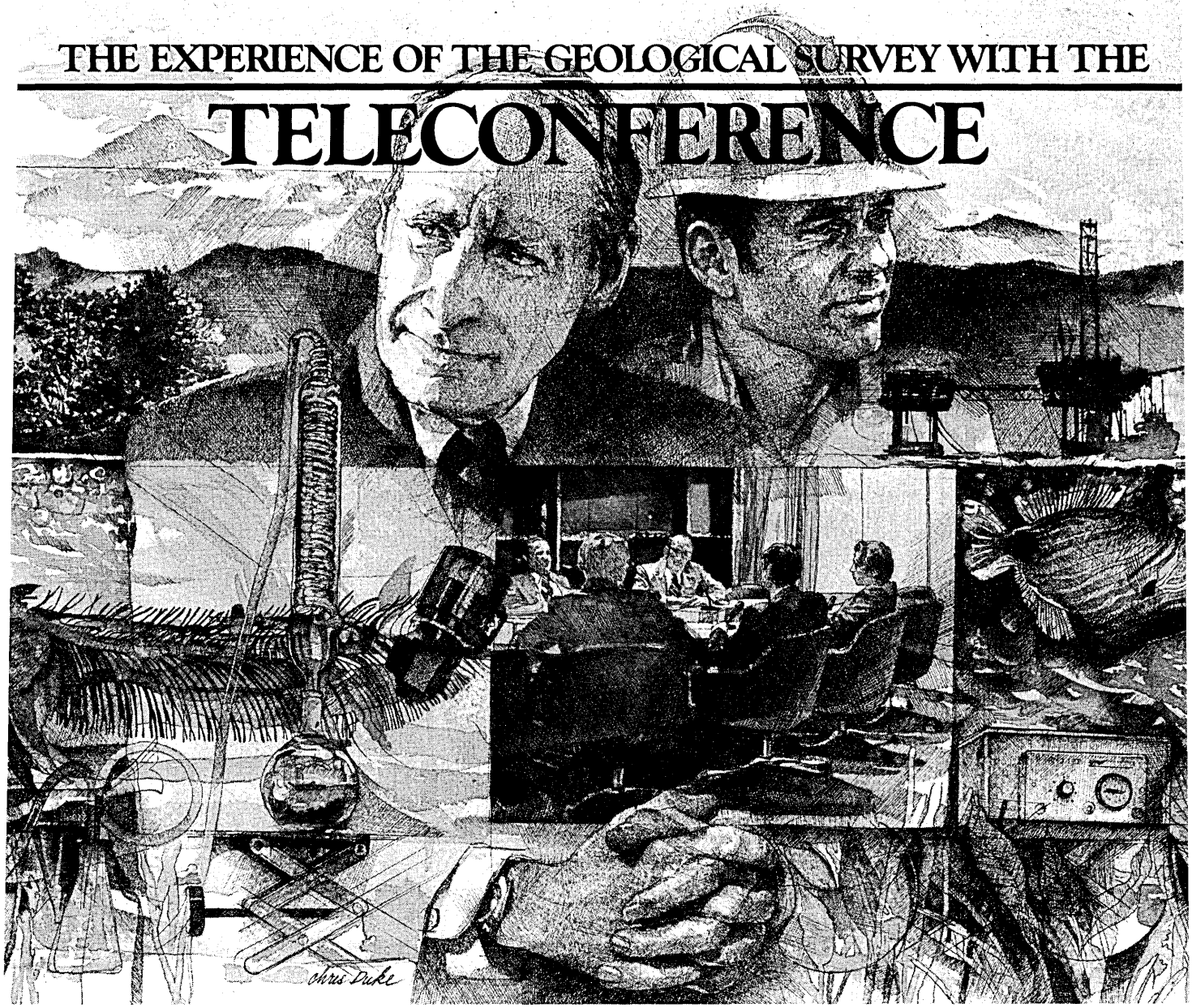
He advised "very selective" hiring. "Data processing is the only division in Bullocks that has had vacancies all year long which it has not been able to fill."

On goals he would set for dp, Hirsch listed: "Do it for less; make a lot of progress in a lot of areas simultaneously; look for the big opportunity and work hard on that one."

Too many dp people, he said, "tend to treat people like machines and machines like people. I look for people who don't do that."

As for the CFO, he advised "set objectives yourself as to what you want to accomplish with dp. You don't have to share them, just know what it is you want." He said the annual budget for Bullocks' data processing department has climbed from $400,-

THE EXPERIENCE OF THE GEOLOGICAL SURVEY WITH THE TELECONFERENCE



There's an unusual teleconference network in operation at the Geological Survey—the first of its kind. In its initial six months of operation, this network saved enough in travel to equal its cost.

Steve Frantz, Bell System Account Executive assigned to the Geological Survey's Conservation Division, explains: "Every Monday morning, the division managers in Reston, Virginia talk to field staffs at four regional offices.

"They conduct a meeting—a teleconference.

"These key people from Reston carry on a round table review of new policy, new regulations. In turn, the field people report in on their programs, problems, and needs.

"All this means that management has more effective control and can react faster than before.

"It means that travel is reduced—and with it, travel costs. Instead of being seated in an airplane, people remain seated at their desks.

"Another unusual thing about this network," Mr. Frantz points out, "is that you can dial a point outside the circuit. So it's easy to call a field location as remote as Alaska. And add it to the conference."

To get the same kind of help that the Geological Survey got, talk to your problem-solving Bell Account Executive. The Account Executive can bring Bell expertise to your problem and is the point of contact that opens the resources of the Bell System to your needs.

Bell System

000 to $4 million since the department's inception. "Sometimes you're judged by how much you spend."

To whom should data processing report? For the present, Erdoz thinks it's the CFO. "So far, we've monopolized the computer." In ten years, however, he feels 80% of all data processing managers will be reporting to the chief executive officer.

To McMahon this is not an attractive prospect. "I hate to think of data processing reporting to the CEO. His priorities are different. The CFO should be an interface between dp and the rest of the organization. When you get away from the financial systems a main problem is users not really knowing what they want."

Systems flexibility was cited as a desirable thing by all three. "You've got to think of the executive who spells out what he wants, then gets promoted or fired and is replaced by someone who wants exactly the opposite," said Hirsch. "Or the first guy could simply get smarter and want something different."

—Edith Myers

GRAPHICS

BUSINESS GRAPHICS

Use of computer generated graphics is moving beyond traditional markets into the business world.

The New York market research firm, Frost & Sullivan, Inc., has predicted the market for computer graphics software and services, at $201 million in 1978, will go to $247 million this year, reach $578 million in 1983 and hit the $1 billion level by 1986.

And the 234-page study which identifies key software suppliers and their marketing strategies indicates that "applications will move away from traditional markets to encompass financial institutions and the like."

It focuses on packages supplied by independent vendors, noting that this market will "increase more than fourfold over the next ten years. However, the captive software market will do even better, increasing more than seven times and also from a much higher base."

But, notes the study, "graphic systems are still complex and require considerable expertise ... Little has been done by the industry to develop a truly affordable system for the business user."

Integrated Software Systems Corp., San Diego, thinks it has. Its DISSPLA (Display Integrated Software System and Plotting Language), a general purpose interconnected subroutine system for plotting graphs, surfaces, and maps using computer-operated devices, was one of the top rated packages in the F&S user survey.

ISSCO's latest product, on the market one and one-half years now, is Tell-A-Graf, a software system that enables a businessman to sit at a terminal and conversationally call up graphs, charts and plots using simple English-like statements.

Originally the package ran only on IBM VOS systems. Now it is available for use

"Graphic systems are still complex ... little has been done by the industry to develop a truly affordable system for the business user."

with DEC-20 virtual systems and ISSCO is working a version for the DEC VAX-11/780.

"We have a VAX system ourselves," said ISSCO vice president Sunny Harris, "so this development is only natural." The VAX version is expected to be available in October.

"The business community is not using graphics as it should," said company president Peter Preuss. "We think Tell-A-Graf will move graphics into the business area. We think decision-makers could learn more from and would prefer looking at a curve rather than sales listings."

"Working at a video display terminal and using everyday English, a top-level decision-maker can type out instructions to produce simple plots to analyze the varying conditions of one operation or the whole company," Preuss said. "The formats can be varied to see which presents the data in the most comprehensive manner—a pie chart, or a graph, or an XY diagram. Then the best charts can be produced large size for formal presentations or as camera-ready art for page-size illustrations for inclusion in reports or for slides."

Tell-A-Graf by itself can be had for $180 per month on a minimum of one year.

Preuss said Tell-A-Graf is being used by a major car manufacturer in long term planning and by a major California bank. The first Tell-A-Graf installation on a DEC-20 virtual system was at American Management Systems, Arlington, Va. In-

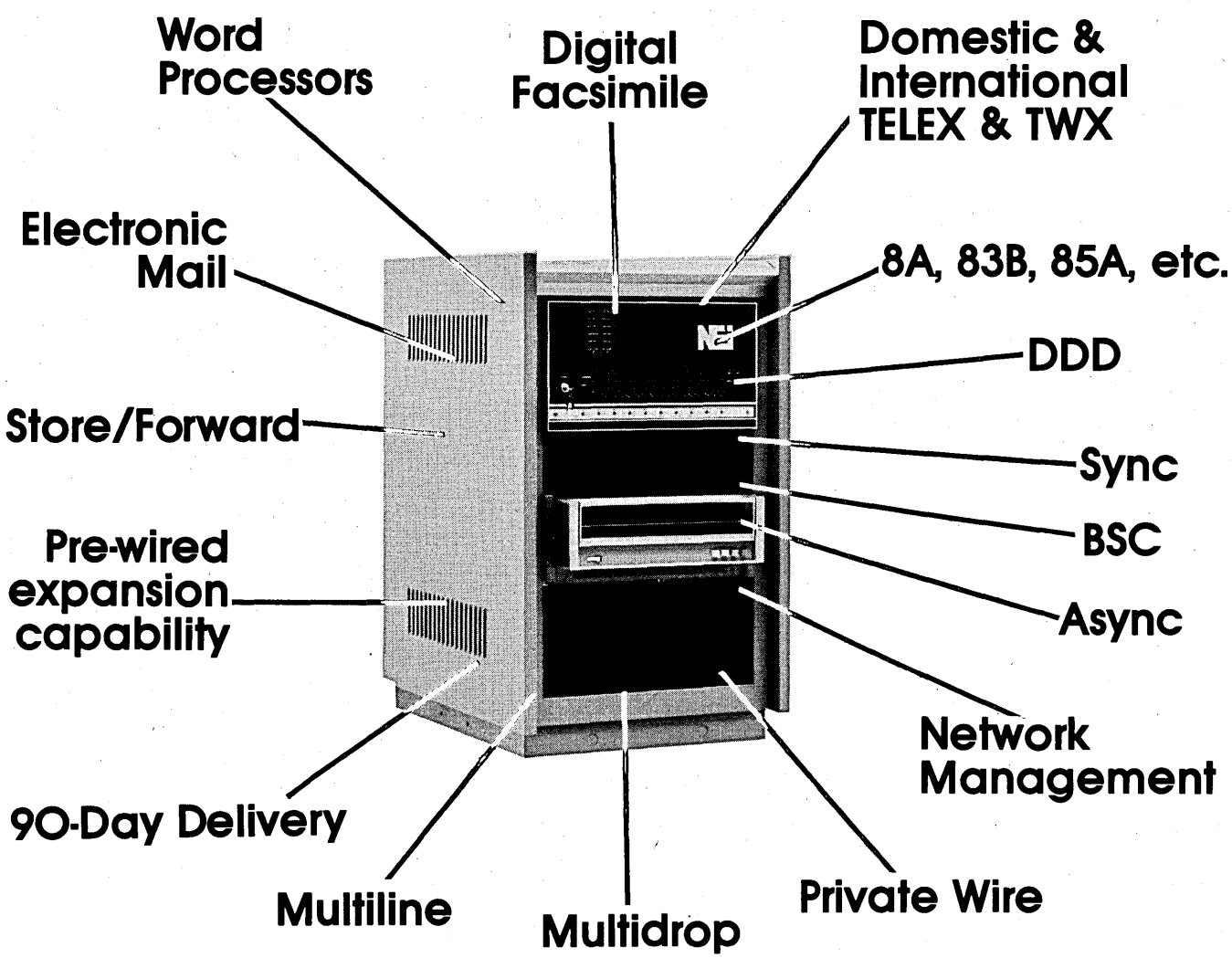
"We think decision-makers could learn more from and would prefer looking at a curve rather than sales listings."

stallations on IBM virtual systems include American Can Co., Argonne National Laboratory, the Food and Drug Administration, Continental Insurance Co., American Hoechst, and five time-sharing service bureaus.

ISSCO's first product, DISSPLA, is now on release 8.0. It is running on 18 different systems. ISSCO software, including versions of both DISSPLA and Tell-A-Graf are installed in some 140 computer installations.

CUSTOM TURNKEY

electronic mail message switching



. . . and lots more from the NORFIELD '400'

TRT DATA PRODUCTS, INC.

norfield communications division

3 Depot Place/P.O. Box 549/Norwalk, CT 06855/Telephone: 203/853-2777

CIRCLE 45 ON READER CARD

"We do well in government," said Harris. The Department of Energy is using it and other agencies accessing DOE's computer "get calls for DISSPLA and they want it. We get at least one request every six months."

Preuss in May said he'd just made his first sale in Germany. German-born Preuss wasn't exactly pleased that it had taken so long. "We've done well in Europe," he said. During the time frame in which he made the German sale, Preuss sold a system to the city of Vienna and "in 14 days I supervised four installations in Europe."

"In 14 days I supervised four installations in Europe."

ISSCO counted European sales among its earliest when the company was formed in 1970. Its first customer was the U.S. Navy and its second, Shell Oil in The Hague, Netherlands. But, said Preuss, explaining away the lack of sales in Germany until recently, "It's like wanting a ricksha—you might like to have one but where do you go to get one?"

ISSCO has moved ahead some since it was a company of people working at home with terminals (Jan. 1975, p. 103). Where in 1974 there were four doing this, now there are 30 people and they have a headquarters office. Principals still have their own terminals at home for after-hours work. "I use mine for a behind-the-back check on quality control," said Preuss.

The company had sales of $2 million last year and expects to top that this year. This is up from $1 million in 1977 and $600,000 in 1976. "Profits are good," said Preuss. "We are closely held." He's optimistic about the future of business graphics, particularly because "graphics terminals have gotten so cheap."

"It's like wanting a ricksha—you might like to have one but where do you go to get one?"

Another San Diego operation which believes in the promise of computer graphics and provides both hardware and software for it is the San Diego Div. of Hewlett-Packard. "There is a trend. People want to take computer-stored information to produce graphs, particularly in the financial area where people tend not to have a computer background. They can easily see a long term need with graphics rather than a day-to-day analysis via printouts," said an HP spokesman. "And graphics menus can be stored on tape cartridges."

The last factor was cited as holding promise for a third San Diego company, Cipher Data Products which produces tape cartridges and whose vice president of marketing, Larry Hemmerich, last month listed the fact that "the graphics market is growing," boding well for his company.

Hewlett-Packard, said its spokesman, bet on graphics in business four years ago when four corporate divisions got together and decided there was a need for a high level, transportable graphics language and developed one. Since then the company has produced both hardware and software for business graphics and is planning to make both its graphics software and its plotters independent of HP hardware.

Even the users are getting together. ISSCO has its own user group. "It's an independent organization very much supported by us," said Preuss. It is four years old and meets annually prior to the yearly meeting of SIGGRAPH (the ACM's special interest group on graphics).

ISSCO, said Preuss, is in a collecting mode. "We could easily assimilate five more people right now but we want to assimilate a critical mass of graphics knowledge. We're trying for and getting the best."

He said his company is expecting "big business from the 1980 census. We've already noticed that."

And ISSCO is looking to the future in other ways. "We're developing a university pricing scheme for DISSPLA," said Preuss. "It will mean a university can get a $45,000 package for $12,000 and somewhat less (translate nil) support than we usually give in exchange for guaranteeing to teach at least one course per semester in use of our package. We've been talking to university heads and the reaction is positive."

"People want to take computer-stored information to produce graphs, particularly in the financial area."

Preuss also is a believer in vertical integration of independently supplied software packages and is pursuing this belief in terms of contracts with other independent software suppliers. "We can buy each other's tools and sell them. It's like a General Mills or a Proctor and Gamble integrating food and household goods. It could be a cross-licensing or a development agreement or . . . ?" He said ISSCO is on the verge of its first such contract with a maker of a statistical package. "There is a heavy demand for graphics software and it fits well with statistics, data base management or whatever . . ."

And ISSCO still isn't sure what that whatever means, even in terms of use of its own products. At every meeting of its user group (the group is called Dissco and its periodical is Dissco-tech) ISSCO holds a contest for the best plot based on its products. "We want to know what our users are doing," said Preuss. "They always come up with weird things we could never anticipate."

—Edith Myers

UNIONS

FREEZING THE U.K.'S CASH FLOW

Strike this year by a handful of computer people held the British government for ransom without even a whimper of protest from the public.

For ten weeks earlier this year the British government was held for ransom by its computer staff.

During the period late February to early May almost $3 billion, largely of government cash flow, was frozen, held up or even lost forever. But unlike other all too frequent displays of union muscle, there was no public outcry, no flashes of media indignation and no hate campaigns against union bosses.

The end of it all—an end unavoidably delayed because of the month-long campaign to elect a new government—the computer staffs from Britain's central and local government departments, the civil service, netted a cool 25% pay increase plus other added benefits. This was the latest example of that new phenomenon peculiar to British unions—the selective strike.

Unlike the American all out or none out, the current British fashion is to pull out carefully selected groups of workers from strategic locations in almost hit-and-run guerrilla style. But this time with one big difference.

The machines left unattended were computers.

Computers at air traffic control and cargo handling centers, value added tax brackets (VAT) centers, Inland Revenue centers, national savings centers, land and property payment centers and so on were affected. In a nutshell, all computer centers where workers manipulate government money between its various departments.

At one complex alone, the VAT computer center at Southend on Sea, Essex, more than $800 million in VAT repayment to companies was held up and could take nearly a year to sort out. In other cases where companies are liable for value-added tax, they could escape payments altogether, say observers.

Officials from the two main unions involved, CPSA (Civil and Public Service Assn.) and SCPS (Society of Civil and Public Servants), say that the full effect of the strike will be felt for many months yet, and thus will impact both the defeated Labor government and the newly elected Conservative (Tory) government.

Encore

Digitech does it again– an unsurpassed monitoring and diagnostic instrument–the Digitech ENCORE 100.

Digitech Encore 100 can solve practically any data communications problem quickly and easily. It offers an extensive library of diagnostic and monitoring capabilities, and is virtually the most powerful instrument available.

Digitech Encore 100 is designed to the most advanced state-of-the-art. It is completely adaptable to emerging requirements such as bit oriented and high speed applications.

At the heart of the Digitech Encore 100 system is its unique tri-level programming allowing for the use of "canned" programs which can be recalled and executed with the push of a button; DICOL, the high level, universally accepted data-comm language; or COMBASIC, Digitech's most powerful language for applications of any complexity.

Digitech Encore 100 is human engineered to simplify operator use. Inherent features include a highly visual 9-inch CRT display with a unique off-line subscript feature which adds interpretative meaning to the data being observed. An integrally mounted tape unit provides for data capture and instant replay, or it may be used for program storage.

WANT TO KNOW MORE?
Mail coupon today for complete information without obligation.

- ☐ Yes, Please send me descriptive literature on the Encore 100
- ☐ Have Sales Engineer call.
- ☐ My needs are urgent. Please phone to arrange a personal demonstration.

Name_____
Title _____
Company _____
Dept._____
Address_____
City_____ State_____ Zip ____
Telephone_____

Please return complete coupon to:
Digitech Data Industries, Inc.
P.O. Box 547 Ridgefield, Ct. 06877

DIGITECH DATA INDUSTRIES, INC. P.O. Box 547, Ridgefield, CT. 06877 or call us at (203) 438-3731

CIRCLE 27 ON READER CARD

It now seems clear that the new Tory leadership is faced with one inescapable conclusion: the public sector can no longer be held down at the expense of the private one as it has been since 1975.

"If the government didn't know it before, it's aware of it now," said a civil service spokesman. "The public sector has now got teeth. With the computer we now face the most potent weapon ever taken up by the unions," he added.

Normally, to mount an effective strike the traditionally dominant unions, such as power workers, miners, railway and transport workers, would have to pull out thousands of workers across the nation to force through its demands.

"By the simple expedience of withdrawing a few hundred strategically placed programmers and computer operatives from centers throughout the land, the unions could hit Tory cash and information flows so hard that government would become impossible," said a dp manager for one local authority. "And unlike the barging and bullying we've come to expect from the power unions, the whole operation can be conducted with the grace and simplicity of a Sunday afternoon picnic," he concluded.

At present the two unions hold an impressive 85% to 90% of all civil service computer staff as members, according to Campbell Christie, deputy general secretary of SCPS.

"The fact that we now live in a computerized society makes this tool a doubly powerful weapon in their hands," said the civil service spokesman. "What we've just experienced was just a ripple of their muscle."

"With the computer we now face the most potent weapon ever taken up by the unions."

According to the unions, there was no need to take full strike action. "We deliberately left alone key defense computers as well as the Department of Health and Social Security and the Department of Employment Centers—those affecting pay and jobs," Christie said. "We wanted to avoid a public outcry."

Small investors in government savings were hit to the tune of $260 million by the holdup of the Department of National Savings computer. Lucky winners of up to $400,000 each on the state lottery were still waiting for their winnings from the computer, ERNIE. But there was hardly a whimper of protest from the general public.

"Even if there had been, they would have blamed the computer not its manipulators, as people do, and even this would have worked in the unions' favor," said one civil service observer.

"We have to face up to it," argued one local authority dp manager, a nonunion member. "Even by current union standards, the CPSA and SCPS are in a uniquely powerful position. They can strike without incurring public enmity and in small governable numbers."

This dp manager said that his installation had managed to avoid disruptions, but most centers only have some seven or eight operatives that really matter, and the unions only have to recruit two or three before the rot sets in. "Like other authorities, mine now is in a constant state of preparedness. The unions now have so much momentum they could strike over any slight from government. We don't want this. Like many other dp professionals we just want to do our jobs."

Comments like this one are described as "exaggerated" by the unions. "Our members won't just strike on a whim," replied Christie. "SCPS workers are senior, highly motivated and professional people. Like most people in data processing, they're very wrapped up in their work, very involved with computers. They take great professional pride in what they do."

Christie stressed that his members have to be strongly motivated before they'll consider a strike. "You don't just turn it on and

off at will."

But are the unions now too powerful?

Nonunionized dp staff says that in some cases since 1975 they have been forced to submit plans for the use of outside staff, software contracts, temporary staff and bureau services to the local union representative for approval. "At the end of the day we are all helpless. All we can do now is wait for the new government to establish legal powers to curb the unions and make it harder for them to strike," complained one dp manager.

The chances of this happening have been increasing enormously as the result of the election of the new Tory government, traditionally the party of the right, of private enterprise and big business. The old labor government, the left wing party, was toppled on a strong antiunion vote after the crippling wave of strikes during the winter which left rubbish piled in the streets of London.

The public has now shown itself to be afraid of the growth of "leftist" and extremists in the big unions. And the latest to be tarred with that brush is the CPSA.

So the question of what motives lie behind a new militancy of civil service computer staff has now become crucial.

"We ask for nothing more than parity with the private sector," Christie explained. "We were granted it by a 1958 agreement, but we stopped getting it in 1975. We've now shown that we'll accept nothing less than the going rate for the job in the private sector."

Christie said the civil service unions are now back on par with the private sector. "But we give a warning to the government of the future that we will fight against anything less," he stressed.

Having had its first taste of the weapons that the unions will use from now on, the new government is not eager for a confrontation and is handling the unions with kid gloves. But having forced an election on a mandate to curb union power, the Tories are at least morally bound to proceed in that vein.

"We ask for nothing more than parity with the private section."

How they proceed will be of interest to many countries including the U.S., as Britain is now eyed as a test bed of all that's good and bad in unionism.

The issues are far reaching, say observers. With further confrontation and a nationwide strike, computing science could suffer a serious reversal. One view is that without a program of public awareness training, people will blame the tool (the computer) and call for restrictions on its use in the same way they do with a gun.

Another more optimistic note was sounded by perhaps more visionary elements in the civil service: "Britain has given the world another lead by being the first country to be held to ransom by a computer—or at least the lack of one. Maybe if we all have to go through it again, we'll all receive a burst of awareness and insight into computers that could take years to evolve naturally." **—Ralph Emmett**

SOFTWARE

MODELING THE QUEUE

Software capacity planning package uses queuing theory.

A new commercial software product that packages the arcane mathematics of queuing network theory into a user-oriented capacity planning tool has been attracting considerable attention and gaining rapid acceptance at large scale dp installations.

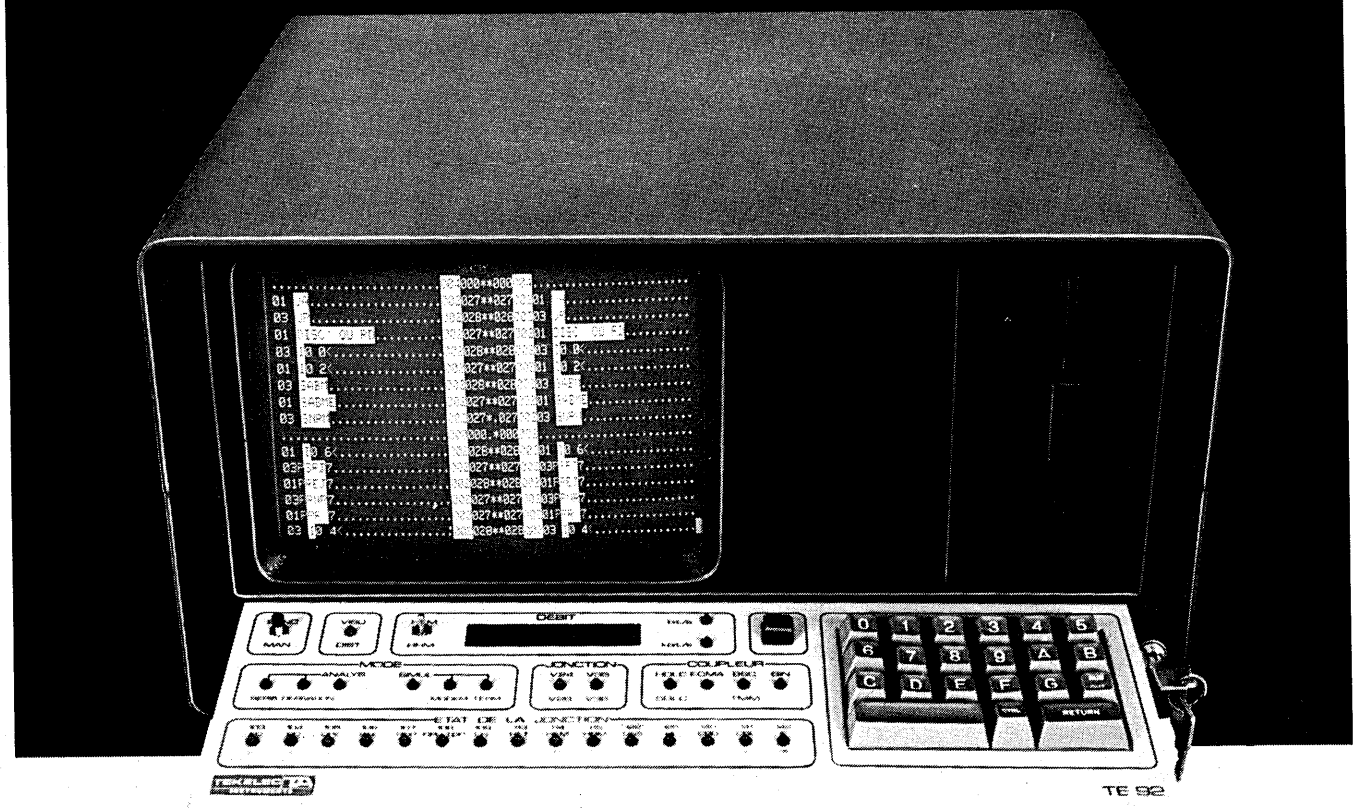
BGS Systems of Lincoln, Mass., claims its Best/1 capacity planning package, selling for $19,000, will be the harbinger for a new generation of "user-friendly" planning tools that will exploit recent breakthroughs in analytical modeling techniques—techniques as important to edp management as the latest flash in hardware and software design.

"Capacity planning has become a 'bet your company' proposition," explained vp Robert Goldberg, one of three math PhD's who founded BGS in 1975. As dp has become pervasive in business organizations, systems have become so complicated that no one can figure capacity on the back of an envelope anymore—and with the vendors' long lead times on delivery, a crunch can become critical.

"Today, capacity shortfall has tremendous dollar risks associated with it," said Goldberg, "and for those of us who realized that we had a new technology developing to meet the new need, a tremendous opportunity developed."

An area of operations research until recently largely confined to academic mathematics, queuing theory has seen "significant breakthroughs" that have greatly increased its flexibility and adaptability as a modeling tool for complex computer systems, he explained. Queuing theory provides a theoretical method to measure the impact of various workload mixes upon the availability of discrete internal resources within a system. Leaping off from original research done at Harvard by company president Harold Schwank,

The first "intelligent" tester for packet-switching



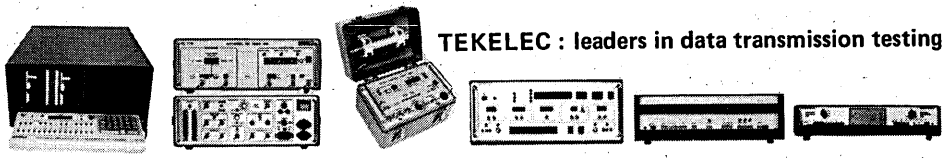
TE 92 : much more than conventional data transmission testers... It performs full monitoring of X 25 packet-switched networks and simulation of terminals and networks

The **TE 92** tests line access protocol in packet-switched data networks. It checks the conformity of the messages to X25 protocol at all levels : frame, packet and data, and displays the results in X25 mnemonics. It accepts HDLC, SDLC, BSC, ECMA transmission procedures.

As a simulator, it can establish, maintain and break a connection, controlling up to 16 virtual channels.

For additional information contact TEKELEC-INSTRUMENT, division of TEKELEC-AIRTRONIC, 6, rue Louis Pasteur, 92100 Boulogne, France, Phone : (1) 604-81-42, Twx : 204 552 F.

TEKELEC TA INSTRUMENTS



TEKELEC : leaders in data transmission testing

LOOKING FOR AN AGENT IN USA AND CANADA

SEE US AT TELECOM Geneva 79
20 - 26 Sept 1979
Booth 401

782/1 TP

CIRCLE 53 ON READER CARD

BGS developed Best/1: bundling proprietary algorithms with an isolated user-visible front-end which greatly simplifies data input.

"The beautiful thing about this," said vp Jeff Buzen, BGS's third founder, "is that the data you need for Best/1 modeling is pulled from the conventional accounting reports and software monitoring data. All the data you need to run these models is around and being collected today." Unlike most queuing models and unlike all simulation techniques, BGS models don't require days or weeks of data collection, he said. Even the standard setup demands are commensurate with the analysts' objectives: first-order models are quick and easy, with more refined models requiring progressively more effort to set up and evaluate.

That option for a "quick and dirty" reading on new workloads, equipment, or software, is one of the most attractive aspects of Best/1 to many users.

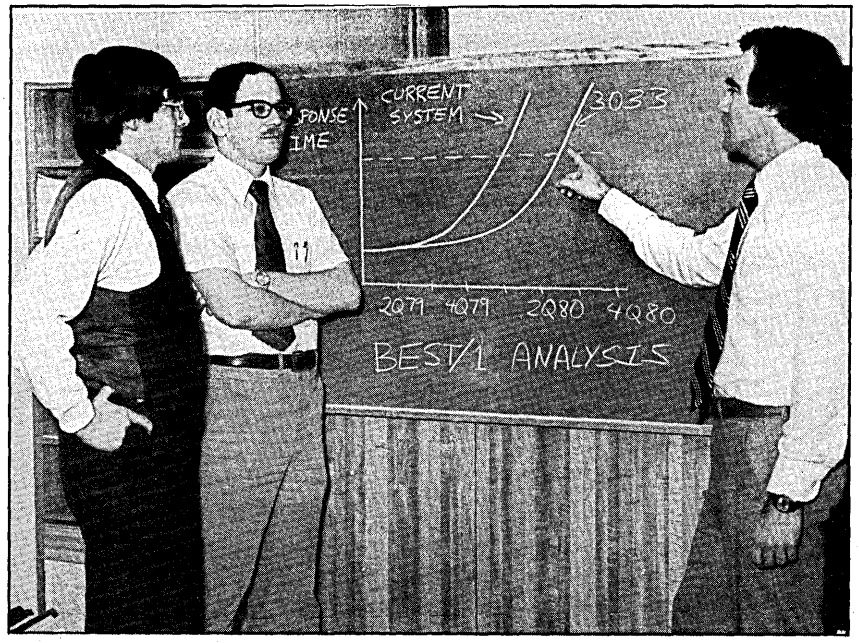
"It's a tool that can be used as a tool, not a tool that is actually a project," said John Hancock Insurance Co.'s capacity planning specialist Tom Moran. "It's one of those tools I have faith I can pick up and use right away." In performance evaluation and capacity planning, said Moran, "that's a fantastic breakthrough!"

BGS has been using versions of Best/1 in private consulting since '75; today it offers release 4. Release 5 will be introduced later this year. All users will be automatically upgraded. Although primarily focused on enhancing Best/1 and developing new software products, BGS stays involved in consulting to keep up with the state of the art, said Goldberg. Last year, marketing Best/1 for the first time, BGS sold a dozen packages to large blue chip installations: This year, he said, word-of-mouth advertising has them selling "one a week."

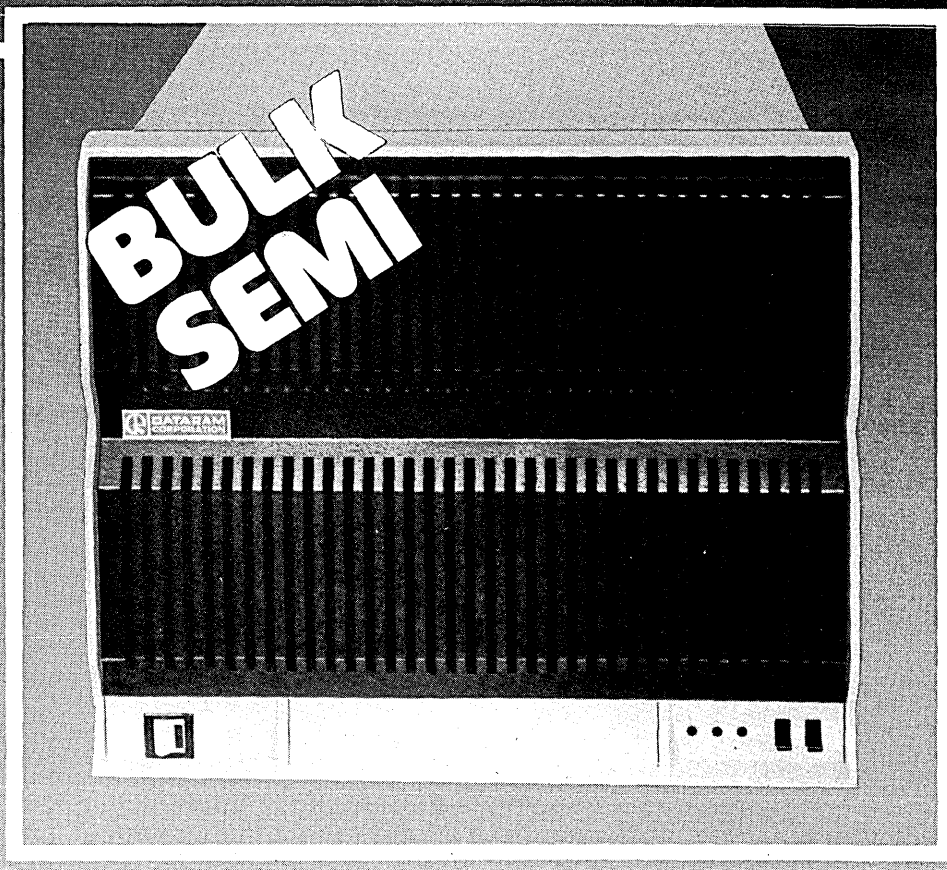
"It's the only thing I could find that would give me solid quantitative results—and without bringing in queuing theory experts."

"With Best/1 we have dramatically expanded the range of 'what if' questions that can be cost-effectively analyzed" in capacity planning, performance tuning, and system design, said Goldberg. The package can be run on almost any system that supports a FORTRAN compiler, and while it is normally accessed via interactive terminals, special options for batch processing and limited-memory minis also are offered. Applications include: determination of capacity and upgrade requirements, determination of which components (cpu, I/O, memory) must be replaced for an upgrade, evaluating upgrade hardware alternatives, assessment of the performance impact of workload growth and new applications, and optimization of OS system parameters that control internal cpu priorities.

BGS considers its prime market to be 168 installations and up, but several users of smaller systems report successful implementation. Users include Amdahl, American Can, Chrysler Corp., GE, Union Carbide, Republic Steel, the U.S. Department of Energy, Liberty Mutual Life Insurance, New York Life, and AT&T, among others.



BGS SYSTEMS FOUNDERS—(left to right) Harold Schwank, president; Robert Goldberg, vice president, and Jeffrey Buzen, vice president, see their Best/1 capacity planning package as the "harbinger for a new generation of 'user-friendly' planning tools."



DATARAM PRESENTS THE 8.0 MEGABYTE SOLUTION

Now you can have up to 8.0 megabytes of memory in a single 15¾" chassis to meet your disk emulation and main memory requirements.

It's available today in BULK SEMI, from Dataram Corporation, the people who pioneered BULK CORE.

And because Dataram designed BULK SEMI to be compatible with its popular BULK CORE modules, you can take advantage of the wide range of existing BULK CORE controllers to use BULK SEMI as main memory or in disk emulation systems for DEC®, Data General, or Interdata minis.

Dataram's 15¾" BULK SEMI system consists of a BULK SEMI Controller board and up to 16 BULK SEMI Array boards. With each BULK SEMI Array board being 512KB, the maximum chassis capacity is 8.0 megabytes.

Error correcting is standard, as are the reliability, performance, and economy of BULK SEMI. From Dataram. And only Dataram.

I'd like to learn more about BULK SEMI for my _____ minicomputer.

☐ Please send more information.
☐ Please have a salesman contact me.

Name _____

Title _____ Phone _____

Company _____

Address _____

City _____ State ____ Zip _____

Also send me information about
☐ BULK CORE ☐ BULK MINI

DEC is a registered trademark of Digital Equipment Corporation

DATARAM CORPORATION

PRINCETON-HIGHTSTOWN ROAD CRANBURY, NEW JERSEY 08512
TEL:609-799-0071 TWX:510-685-2542

Canada: Ahern & Soper Ltd., Alberta, British Columbia, Ontario, Quebec • **Finland:** Systek OY, 90-737-233 • **France:** YREL, 956 81 42 • **Italy:** Mactronics Italia, 02/35 36 041 • **Netherlands:** Technitron b.v., 020-45 87 55 • **Sweden:** M. Stenhardt AB, (08) 739 00 50 • **Switzerland:** ADCOMP AG, 01/730 48 48 • **United Kingdom/Ireland:** Sintrom Ellinor Ltd., (0734) 85464 • **West Germany/Austria:** O.E.M.-Elektronik GmbH, 07 11-79 80 47 • **Australia/New Zealand:** Anderson Digital Equipment, (03) 543 2076 • **India:** Industrial Electronic Instruments, 79281 • **Israel:** K.D.M. Electronics, 921513 • **Japan:** Matsushita Electric Trading Co., Ltd., 03 (435) 4501 • **Taiwan/Republic of China:** Syscom Computer Engineering Co., (02) 7022156

CIRCLE 55 ON READER CARD

NEWS IN PERSPECTIVE

The State of Maryland's Department of Budget and Fiscal Planning has been so pleased with the efficiency and accuracy of the Best/1 package, said Richard Riley, the budget official who approves hardware and software acquisitions for the state, that it now routinely requires a Best/1 analysis before approving any upgrades for Maryland's seven dp centers. Gene Cort, director of operations for Avco Computer Systems, said that a month after he got the package, he had already made modifications to his operating system—based on "bottlenecks" identified in the models—and was able to cut his TSO by half. "I think it's a great package," said Cort. "It's the

"All the data you need to run these models is around and being collected today."

only thing I could find that would give me solid quantitative results—and without bringing in queuing theory experts. We've looked, and there is nothing like it around."

Robert Bechtel, responsible for capacity planning for one of Amdahl's headquarters operating divisions, said he had been using queuing theory analysis prior to hearing of BGS, but found it difficult to gather input data and expensive in terms of both time and computing. "When I found out about Best/1," he said, "I essentially jumped. It's very inexpensive compared to its output. It's certainly cost effective!" Two other Amdahl divisions are now beginning to use Best/1 in their internal planning, he said. "In general, what BGS represented Best/1 to be has almost always been conservative. We're quite pleased."

Leo Lo, senior staff specialist on capacity planning for McDonnell-Douglas Automation's three huge data centers, had also launched independent queuing theory projects as part of a 1978 program to evaluate nine different capacity planning techniques (one using software physics, four using regression models, and four using queuing models). Deciding on queuing theory technology, MCAUTO went to Best/1 because it was the only fully supported package, and its accuracy under trial "was as good as any other that we'd have to spend considerably more time and money to set up and support."

At BGS, said Buzen, "We consider it a little definitive that AT&T—with Bell Labs, with a considerable statistical staff—took a look at our package when they were considering building something like it inside and decided that it wouldn't be worth the effort."

"We've had several companies think they were going to develop queuing models," added Goldberg, "then they find out about Best/1 and decide to leave the queuing theory to the PhDs and concentrate on in-house work to solve real problems."

—V.M.

CIRCLE 75 ON READER CARD

BENCHMARKS

BACK WHERE IT STARTED: California Computer Products, once a huge computer graphics concern, has returned to that business exclusively following the sale for $13.5 million of its add-on memory business, automated tape library, and IBM-compatible disk systems to Braegen Corp., a Cupertino, Calif., producer of intelligent terminals. Along with the sale, Darrell G. McCullough, former vice president of CalComp's data processing products and services division, was named president and chief executive of Braegen, replacing John Harmon who became board chairman. CalComp earlier had sold off its high capacity disk products to Xerox for $25 million and its small disk memory line to Billings Computer Corp., Provo, Utah, along with a metal cabinet manufacturing operation to a Los Angeles company. Finally, Sanders Associates agreed to acquire CalComp in a cash and stock transaction and to buy a CalComp note for $7,650,000. Sanders said CalComp would give the company graphic lines and provide outlets for Sanders' own graphic display technology. CalComp president George Canova said the recent sales of divisions will enable the company to concentrate on "our traditional graphic products and on our newer interactive graphics systems and related products."

XEROX MEMORY GROUP: Xerox has formed a Memory Systems group in Santa Clara, Calif., to direct and coordinate the oem activities of its Shugart floppy disk business and its Century Data hard disk business as well as of a new operation, Xerox Magnetics. Donald J. Massaro, president of Shugart, is president of the Xerox Memory Systems group which reports to John V. Titsworth, who joined Xerox early this year from Control Data as group president and president of the Information Products group. The new group will be engaged primarily in financial and strategic planning.

GOULD VS. FAIRCHILD: What began this spring as a rumor of a friendly merger of Fairchild Camera and Instrument Corp. into Gould, Inc., the diversified electronics manufacturer, turned quickly into a corporate rat's nest. Gould offered $54 a share for the Mountain View semiconductor manufacturer, but later sweetened this figure to $57 a share after Fairchild's directors refused the early offering and after both sides sued and countersued. But what promised to be a long and acrimonious takeover battle, ended suddenly on a Saturday in late May when the oil and electronics parts organization, Schlumberger, Ltd., entered the picture, offering $66 a share. Fairchild's board immediately accepted and although Gould said it still was studying the matter, it all but said it was dropping its offer to acquire Fairchild.

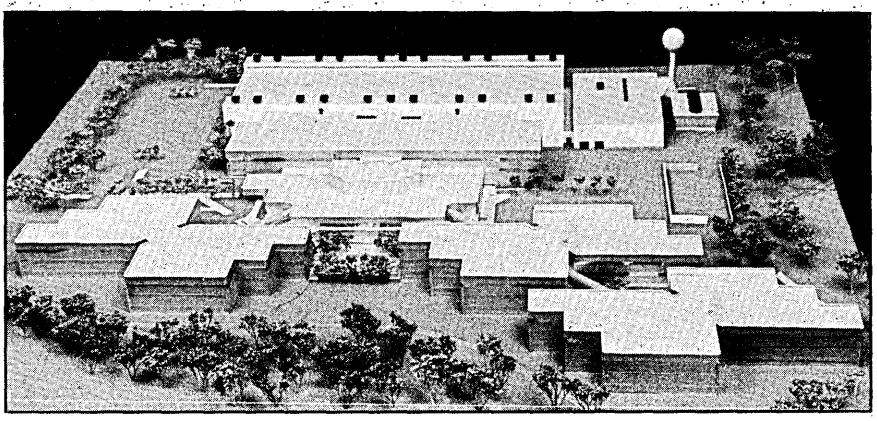
A NEW SMALL LINE? IBM reduced prices on nearly all models of its 5100, 5110 and System/32 in a move that might be a preparation for an announcement of new products in the small business line. The company's General Systems Div. cut the price of the S/32 by 30% and from 11% to 17% on the 5100 and 5110. The action followed speculation in the industry that IBM will introduce a low-end computer that would replace the 5100 and 5110 and a system called the System/30 that could replace or come in under the S/32.

MEGABIT BUBBLE MEMORY: Intel Magnetics, a subsidiary of Intel Corp., leapfrogged the bubble memory industry with its megabit bubble chip and four peripheral circuits, which it said it will offer for about $2,000 in small quantities in the first half of next year. Its competitors, Texas Instruments and Rockwell International, have introduced 256K bubble chips, but Rockwell said it will begin sampling a megabit chip in the fall of 1979. The Intel chip, called the model 7110, comes with a H/MOS bubble memory controller, called the 7220; a formatter and sense amplifier, the N/MOS 7242; a current pulse generator, the Schottky TTL 7230 and a coil driver, the C/MOS 7250. Intel said that with the support components, users of the megabit device can go immediately into system development without becoming involved in intricacies of bubble memory technology.

In a related development, Rockwell and Siemens AG signed a second-source bubble memory agreement that will allow Siemens to produce Rockwell's 256K device and for Rockwell to produce Siemens bubble products which are understood to include IC peripherals circuits.

SCANNERS CATCH ON: The Food Marketing Institute said the number of scanner-equipped grocery stores jumped from some 200 in 1977 to 562 by the end of 1978 to 744 at the end of the first quarter of 1979. Brad Hall, a district manager for NCR Corp. which leads the industry with scanner installations, said he expects 500 scanners of all makes to be installed in the rest of this year. NCR, which had 224 scanning installations at the end of 1978, said it will begin to manufacture its own scanners under a technology agreement with Spectra-Physics of Mountain View, Calif., which has been supplying all of NCR's scanning units and will continue as a supplier with "substantially increased" deliveries in the second half of 1979.

NOD TO THE COUNTESS: The Defense Dept. has selected a new software language, called Ada and developed by Honeywell, for its future applications computers embedded in U.S. military systems. The language was named Ada after Ada Augusta Byron, Countess of Lovelace, who is known as the first computer programmer for her work with Charles Babbage's machine. She was born in 1815. Honeywell received a $650,000 contract from the Defense Advanced Research Projects Agency for evaluation and for courses to explain the new language to users. The DOD doesn't consider the Ada design as final, however, and is encouraging industry participation in refining the language, whose principal designer is Jean Ichbiah of Cii-Honeywell Bull.



MCAUTO'S PLANS: McDonnell Douglas Automation Company (MCAUTO) will spend $73.3 million to build and furnish this new computer center in St. Louis that will provide 800,000 sq. ft. for some 2,000 persons in the huge service bureau business that the aerospace company operates. It will consist of a three-level computer room, measuring 170 by 450 feet, an office building for computer operations personnel, three office buildings for management personnel, programmers and analysts, a service building with cafeteria and an energy building. It will consolidate all operations except the Health Services Div. With 2,500 clients and revenues in 1978 of $286 million, MCAUTO has about 2,800 personnel in St. Louis and 5,000 nationwide and operates a total of 137 computers valued at $270 million. ✲

The Paper Tiger™ is here.

The Paper Tiger sets a new standard for low-cost impact printers. More capability. More versatility. For just $995.

You get a full upper and lower case 96-character set. Eight software-selectable character sizes. Plain paper, multiple copies. Forms length control. Parallel and serial interfaces. Multiple line buffer. Tractor feed. Automatic re-inking. 80 and 132 columns.

It's all standard with the Paper Tiger.

Unbeatable capability.

The Paper Tiger prints just about any paper form you need. From address labels to multicopy invoices and legal-size reports.

Adjust the tractor width from 1-3/4 to 9-1/2 inches. Choose from 8 switch-selectable forms lengths. Print 6 or 8 lines per inch.

Unmatched versatility.

Want graphics? Add the Paper Tiger's software-selectable full dot plotting graphics. Print illustrations, block letters, charts, graphs, and more.

Need a bigger buffer? The Paper Tiger features an optional 2K-byte memory that holds a full 24-by-80 CRT screen.

Feature \ Printer	Integral Data 440	Tally 1200	Lear-Seigler 300	Texas Instruments 810	Centronics 779-2
96-character ASCII set, upper and lower case	YES	OPTION	YES	OPTION	NO
Software-selectable character sizes	YES	NO	NO	OPTION	NO
Throughput, lines per minute @ 10 char./line @ 132 char./line	275 42	100 40	Data not available	440 64	130 21
Parallel and RS-232 serial interfaces standard	YES	NO	NO	NO	NO
CRT screen buffer	OPTION	NO	OPTION	NO	NO
Footprint (W x D = sq. ft.)	1.37	3.45	3.18	3.58	2.44
Weight (lbs.)	20	64	50	55	45
Forms length control	YES	OPTION	YES	OPTION	NO
Full dot plotting graphics	OPTION	NO	NO	NO	NO
Unit Price	$995	$2500	$1995	$1895	$1350

Comparison data from manufacturers' current literature.

And there's more.

The Paper Tiger is small, lightweight, and compact. That's because it's designed especially to work in small computer systems.

And it's built rugged and simple. For high reliability and easy maintenance. Just like the thousands of IDS printers already in the field.

See for yourself.

Check the comparison chart. Find out why this Paper Tiger just set a new standard for low-cost impact printers.

For more information, write or call. We'll send you our free brochure. Integral Data Systems, 14 Tech Circle, Natick, MA 01760. (617) 237-7610.

CIRCLE 86 ON READER CARD

Integral Data Systems, Inc.

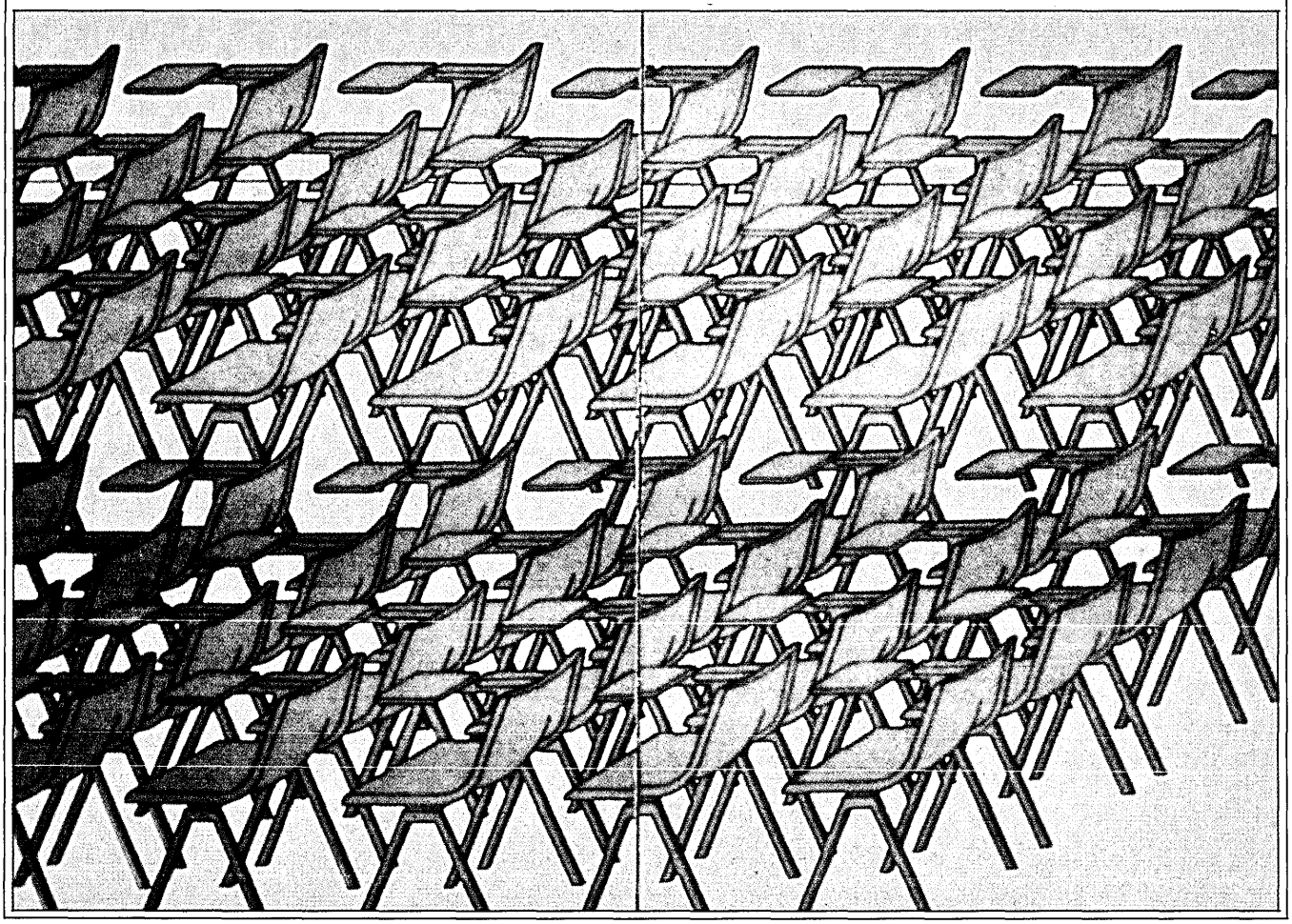
SEVENTY YEARS OF OLIVETTI DESIGN

". . . to put in order, in a precise sequence, the procession of the state of consciousness . . . toward liberation."

In its 70-year history, the Olivetti Co. has encouraged and developed outstanding designs in architecture, industrial products, graphics, interiors, and exhibitions. The evolution of the company's design philosophy and hundreds of examples of its results are traveling the country this year appearing in galleries on university campuses. Opening in late spring at the Wight Galley at UCLA, the exhibit, titled "Design Process: Olivetti 1908-1978," will be presented in September at Carnegie-Mellon Univ. and in October at Harvard.

The exhibit highlights the work of many internationally known designers and artists, including Marvello Nizzoli, Giovanni Pintori, Mario Bellini, Ettore Sottsass Jr., Marco Zanusi, Louis Kahn, Kanzo Tange, Ben Shahn, Jean-Michael Folon, Giorgio Soavi, Leo Lionni, Walter Ballmer, Edidio Bonfante, Franco Bassi, Rufino Tamayo, Graham Sutherland, and Hans von Klier. (Von Klier, a free-lance designer who is responsible for Olivetti's corporate identity designs also designed the exhibit; choosing the material from 70 years' of history, architecture, industrial design, advertising, interiors, type-face design, sociology, graphics, and exhibitions—and arranging it in a multimedia show—was a task that took over a year.) The exhibit has been curated by Professor Nathan Shapira, of the UCLA Art Department.

The individual statements of three of the designers, Von Klier, Sottsass, and Bellini, have been taped, and the narration accompanied by a series of slides, a few of which we have selected to reproduce. "To a certain degree," explains Bellini, "design has been saddled by technology; the new electronic technology, however, allows the possibility of designing the machine from basic components. We can play with it for a better configuration

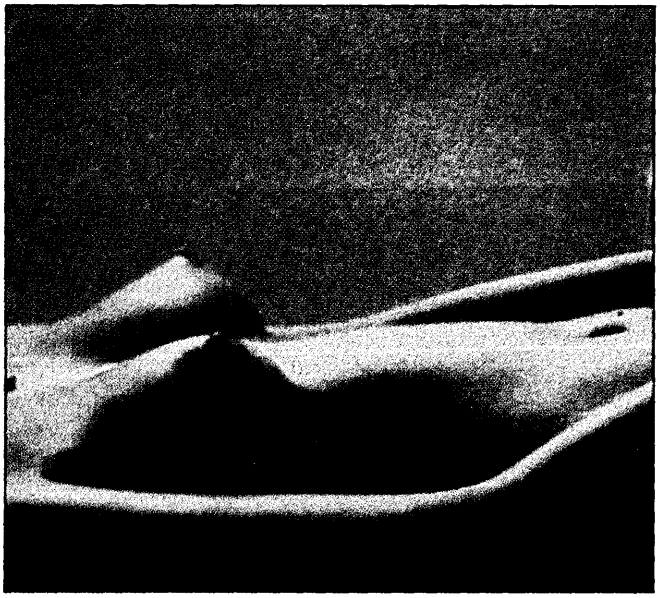


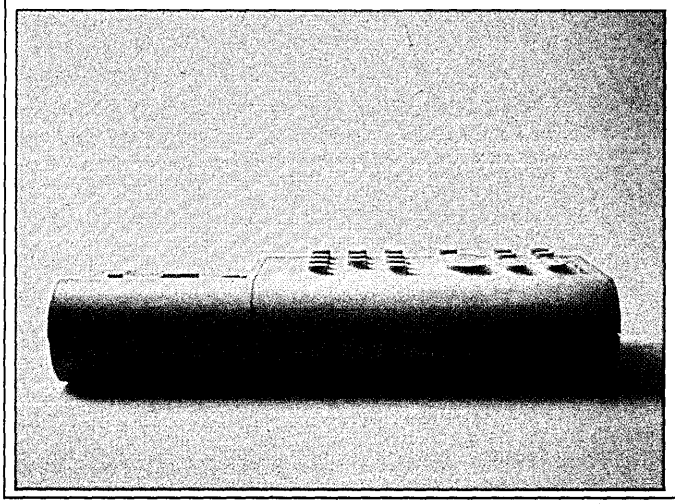
cording to human and environmental needs. There has been a strong tradition in Olivetti's engineering groups to work with designers from the first moment. That is what I call real design rather than styling."

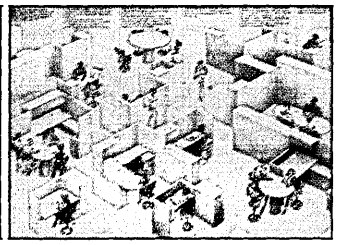
"Always," Bellini continues, "human beings have tried to domesticate their surroundings; therefore, if we use a zoomorphic approach to humanize the machine" (as with the dinosaur/calculator), "we make it more familiar, more comfortable, less formidable to the user."

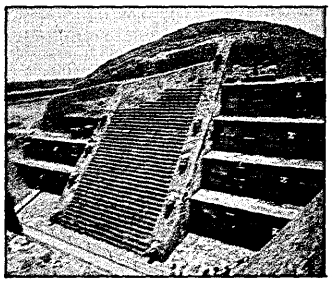
In designing the Divisumma 40 calculating machine, (see below), Bellini undertook to humanize the object, "to restore to it a meaning beyond any of its functional connotations." Bellini accomplished this, "by using form to open dialogue between man and these instruments . . . Hence, an object whose overall meaning may not be merely its calculating ability, but also its being . . . at our reach with an unusual keyboard of elastic bubbles which can renew pleasure of contact each time, a reassuring totem . . . ."

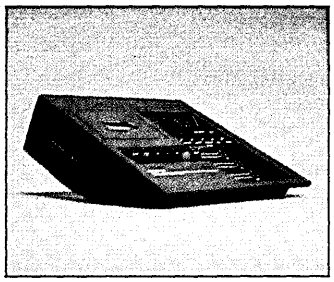
Ettore Sottsass Jr. began working for Olivetti in 1958 on the design of electronic machines. "The laboratory was in a metaphysical 19th century Pisan villa in the center of a dark cypress park. I accepted the work mostly because the project looked very romantic; they were still working in the research laboratory, and nobody knew if anything would really come of it." Sottsass, who designed the red chairs, comments, "The idea that has preoccupied me for many years is that perhaps the







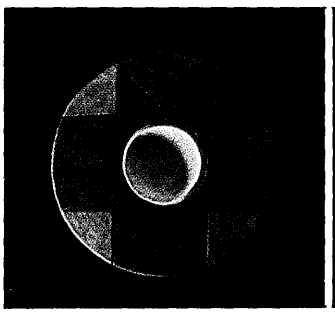


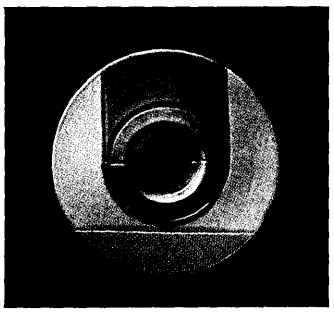


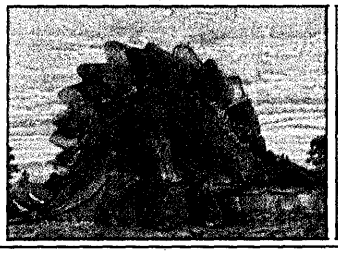
design of objects and the design of their presence in space—their grouping, their coming together, their going away—cannot be justified . . . except to act as filters to put in order, in a precise sequence, the procession of the state of consciousness . . . toward liberation."

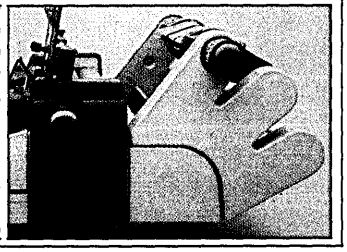
The office environment, its details—as the red chair—and its total design occupy much of the exhibit; in Bellini's presentation, the Hong Kong canal boats represent the real-world analogy of the singular nature of the "open office"—a term he disparages. "The habitat relationship between man and his environment . . . uncovers the mystifying foundation of the open plan. While a naturalistic furniture arrangement, a few green plants and panels, and a better acoustic system have made open plan environments a little more livable, there is not enough to suggest, however, that an open plan is equal to an open mind . . . nor can it be stated that democracy is an equal desk for everyone. The very term office landscape is mystifying; the environment resembles an overcrowded beach or camping site."

In the final slides, we see the Karasutra, an automobile designed by Bellini in 1972 by request of the New York Museum of Modern Art for an exhibition titled, "Italy: The New Domestic Landscape." Bellini included it in the current presentation to prove "any automobile can be seen as a particular microcosm where industrial machine design, furniture design, and architec-









HP presents visual aids

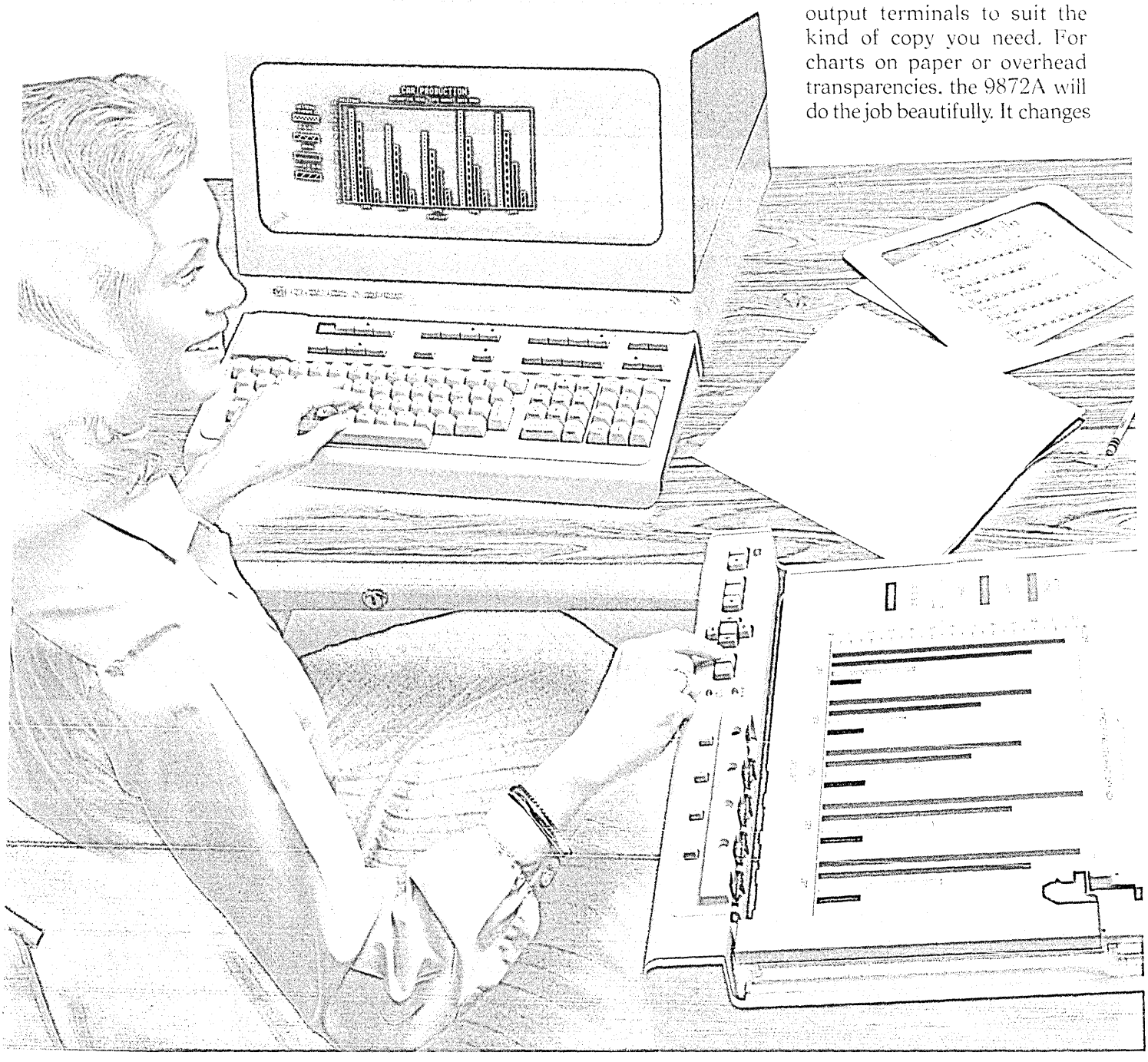
Now, with a few simple keystrokes, you can transform those formless computer printouts into clear, helpful charts and graphs.

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.

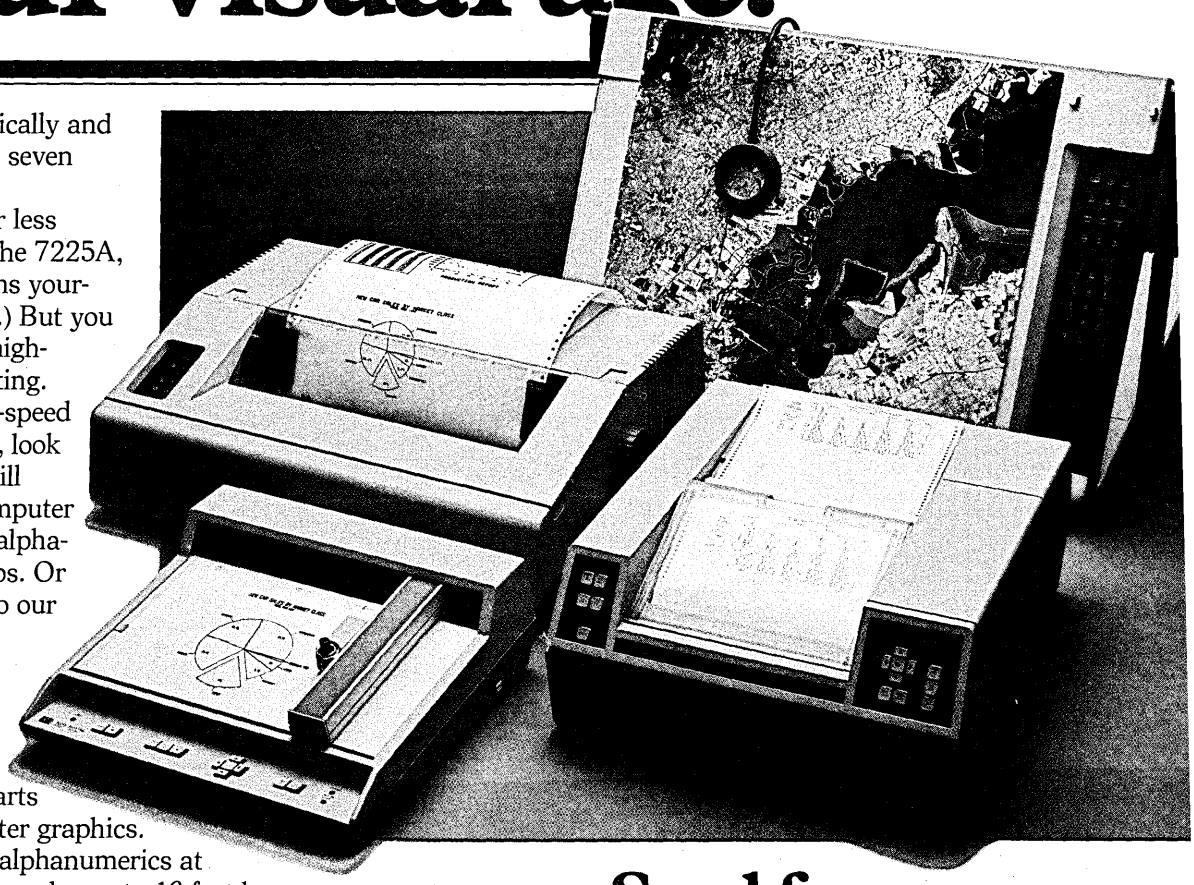
Then, if you want specially formatted data from your CPU, you can program the 2647A in BASIC or AGL, our high-level graphics extension of BASIC language. (If you don't need all its features you may opt for our lower cost 2648A.)

Four easy ways to get hard copy.

Now you pick your output terminals to suit the kind of copy you need. For charts on paper or overhead transparencies, the 9872A will do the job beautifully. It changes



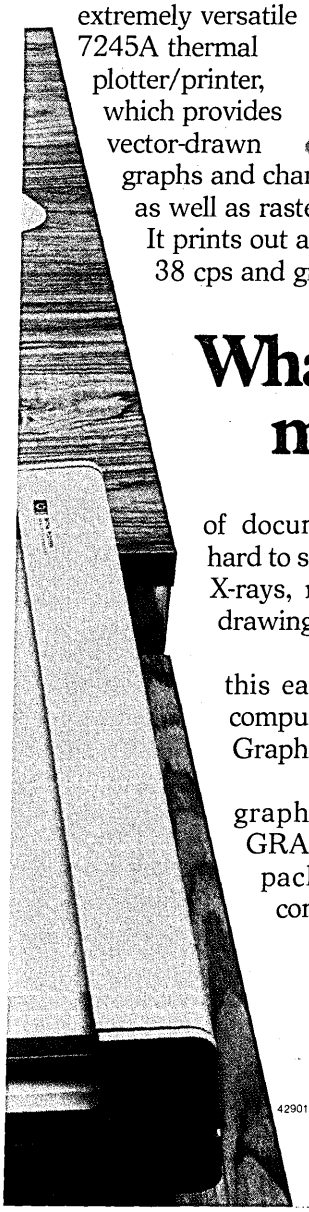
for our visual age.



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

With our less expensive model, the 7225A, you change the pens yourself. (A simple job.) But you still get the same high-quality vector plotting.

For high-speed graphics printouts, look at the 2631G. It will double as your computer printer, delivering alphanumerics at 180 cps. Or you can hook up to our extremely versatile 7245A thermal plotter/printer, which provides vector-drawn graphs and charts as well as raster graphics. It prints out alphanumerics at 38 cps and graphs up to 16 feet long.



What comes out must go in.

We've found a way to put all kinds of documents into a computer that were hard to store before. Things like photographs, X-rays, maps, strip charts and engineering drawings.

The 9874A Digitizer converts all this easily into X-Y coordinates for your computer or for local storage in the 2647A Graphics Terminal.

To simplify writing custom graphics programs, we've developed GRAPHICS/1000, a special software package that runs on the HP 1000 computer.

42901HPT12

CIRCLE 42 ON READER CARD

Send for some graphic examples.

Fill out the coupon and our new Graphics brochure will fill you in. You can also call your nearest HP sales office listed in the White Pages for a copy. Or write to Hewlett-Packard, Attn. Ed Hayes, Dept. 451, 11000 Wolfe Road, Cupertino CA 95014.

HEWLETT hp PACKARD

Yes, I want a closer look at your graphics capabilities. Send me your brochure.

Name

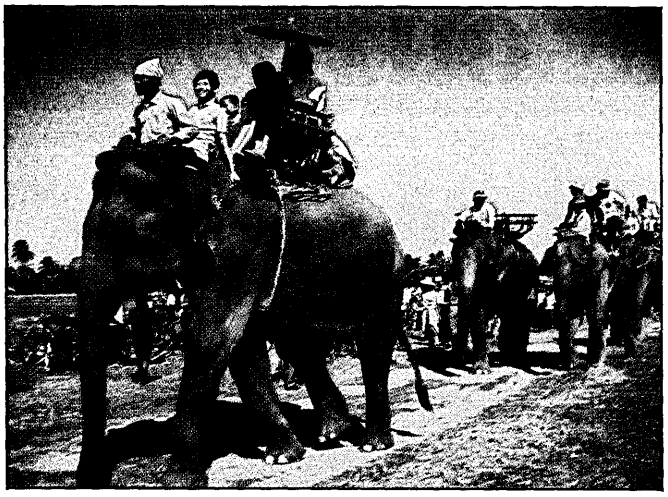
Company Title

Address

City/State/Zip

451

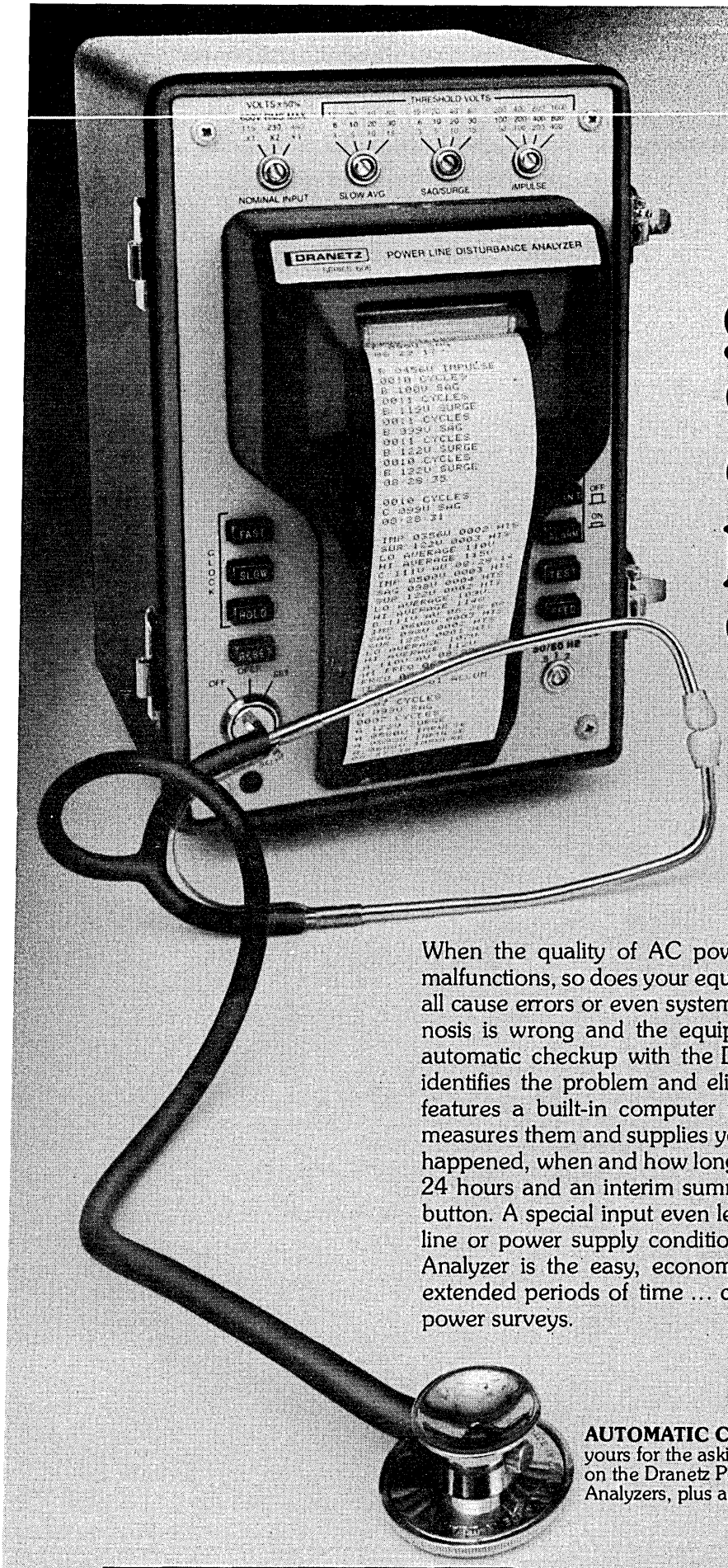
FOCUS



tural design come together. Indeed, what is an automobile if not a living, moving space with a floor, a ceiling, doors, and windows, in which, just like a home or office, we spend a substantial share of our time, have social contact, or make love?" The Karasutra is a system of movable cushions. A person can remain seated, stretch out, change positions, talk face to face, lie down, or sleep. The car can be opened all the way from its waist up "to provide an involving rapport with the landscape," as Bellini explains. "Its features stem less from the machine design than from a real concern for the habitat relationship between man and the mobile environment."

Von Klier emphasizes the goal of the exhibition, "to present to university students a process and an attitude toward design." But perhaps the greater impact is best expressed by Dr. Renzo Zorzo, director of Olivetti's cultural relations program, who says, "Industry cannot remain indifferent to culture; it participates and contributes to its definition. Passivity and neutrality are impossible—at least in an industry which must act, decide, and choose every day. Industry must be linked to that immense river of tradition. The meeting of culture and a creative industry is not a casual or episodic fact; it is an organic relationship of reciprocal influences."

—W.R.C.



give your computer constant power check-ups

When the quality of AC power, the pulse of your computer system, malfunctions, so does your equipment. Sags, surges, drifts, transients, can all cause errors or even system shut-downs. And, all too often, the diagnosis is wrong and the equipment is thought to be at fault. But, an automatic checkup with the Dranetz Power-Line Disturbance Analyzer identifies the problem and eliminates this costly error. The Series 606 features a built-in computer to detect all kinds of disturbances, then measures them and supplies you with an alpha-numeric printout of what happened, when and how long. Plus you get a complete summary every 24 hours and an interim summary any time you want at the push of a button. A special input even lets you correlate system malfunctions with line or power supply conditions. The Dranetz Power-Line Disturbance Analyzer is the easy, economical way to diagnose line conditions for extended periods of time ... check-out start-up procedures or perform power surveys.

AUTOMATIC CHECK-UP KIT...
yours for the asking including full details on the Dranetz Power-Line Disturbance Analyzers, plus application notes.

DRANETZ

DRANETZ ENGINEERING LABORATORIES INCORPORATED

2385 South Clinton Ave., South Plainfield, N.J. 07080 • (201) 755-7080, TWX 710-997-9553

CIRCLE 57 ON READER CARD

Data General introduces freedom of choice.

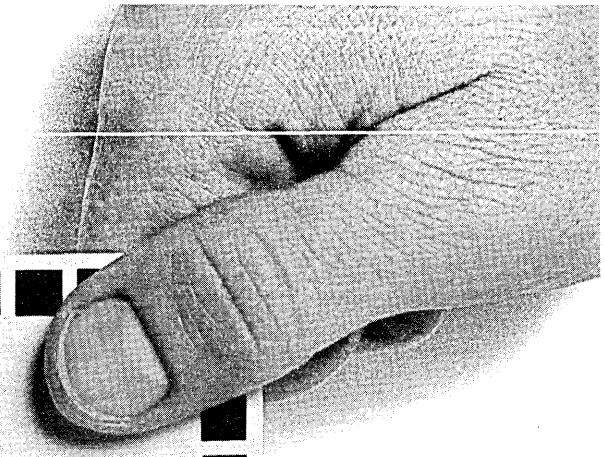
You know what IBM has to offer. Maybe you know what the others have to offer. Now it's time you found out what makes our ECLIPSE® Data Systems the most intelligent choice for your distributed data processing.

Ask us about compatibility, for instance. And ask where we rank in interactive capabilities.

We'll be happy to let you know our ECLIPSE systems offer you the widest range of compatible systems and the best interactive computing capabilities in the business.

But don't take our word for it. Just ask the competition.

ECLIPSE DATA SYSTEMS FOR BUSINESS.



General Systems Division:
I'm looking into Distributed Processing Systems with a growth path. Send me your story on compatibility.

Name_____

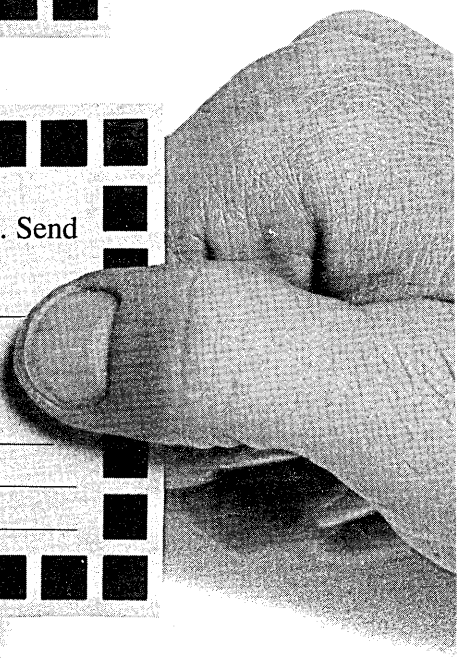
Title_____

Company_____ Tel._____

Address_____

IBM® GENERAL SYSTEMS DIVISION City_____

State_____ Zip_____



Data Processing Division:
I'm looking into Distributed Processing Systems with a growth path. Send me your story on interactive computing.

Name_____

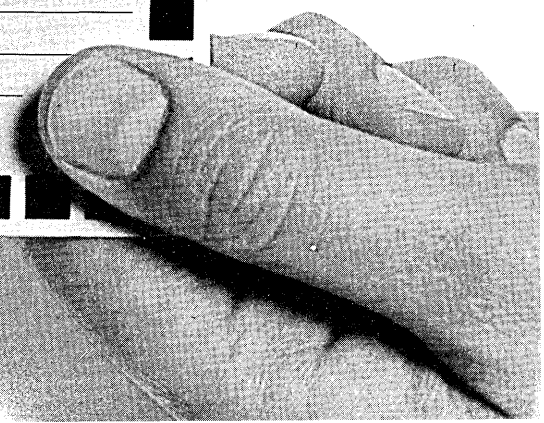
Title_____

Company_____ Tel._____

Address_____

IBM® DATA PROCESSING DIVISION City_____

State_____ Zip_____



I understand ECLIPSE Data Systems are part of the broadest line of COBOL-compatible business systems available, and are supported by an exclusive Advanced Operating System (AOS), a full range of languages, and software tools. Please send me the complete details.

Name_____ Title_____

Company_____ Tel._____

Address_____ City_____

State_____ Zip_____

Data General

Mail to Data General Corporation, Westboro, Mass. 01581.

D679

CIRCLE 15 ON READER CARD

Our Automated Funds Transfer Systems can do your bank a world of good.

As a commercial bank, worldwide funds transfer is a vital part of your operation. Streamline this vital function, and you'll go a long way toward maximizing profits. Improving your competitive position. Attracting and holding new accounts, too. And that's precisely what the new Rockwell-Collins Automated Funds Transfer Systems are all about.

As the first fully integrated, upward-compatible family of advanced, computer-based systems, our AFTS interfaces all of the available funds transfer networks. Automates much of the internal handling. Cuts costs. Reduces delays. Gives you up-to-the-minute visibility.

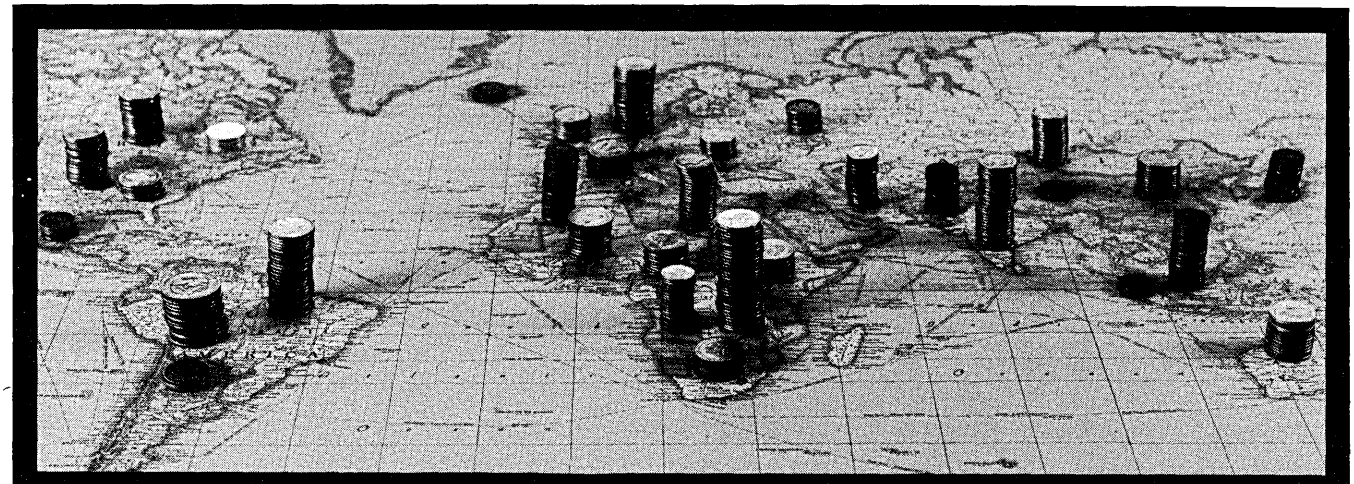
AFTS works by integrating transaction processing with communications processing and message handling. Say good-bye to error-prone file reference. Interdepartmental hand carry. Manual record keeping. Say hello to automatic storage for incoming transactions. Automatic processing for fixed-format transactions. Automatic recording of processing events. Local data base of account information. Balance checking. Current position. Reformat to match wire type. And finally, automatic recording and reporting on work load distribution by priority.

Can one of the new Rockwell-Collins AFTS systems make your operation run more efficiently? You can bank on it. For details, contact your nearest representative listed below. Collins Communication Switching Systems Division, Dept. 420-200, Electronics Operations, Rockwell International, Dallas, Texas 75207. Phone: 214/996-2336.

Rockwell International

...where science gets down to business

Dallas, Tex. (214) 996-2336 • New York, N.Y. (212) 661-6530 • Newport Beach, Calif. (714) 833-4645 • Chicago, Ill. (312) 298-5177
Atlanta, Ga. (404) 996-7112 • Washington, D.C. (703) 685-2679



The latest words in communications: Rockwell-Collins.

Brussels 242-4048 • Cairo 894531 • Frankfurt (0) 6106-4093 • Hong Kong 5-274-321 • Kuala Lumpur 27283 • London 01-759-9911 • Manila 892-742 • Mexico City (905) 533-1846
Melbourne (Lilydale) (03) 726-0766 • Paris (Rungis Cedex) 687-31-02 • Rio de Janeiro (021) 246-3276 • Riyadh 69060 • Rome (0) 6-862-415 • Seoul 74-9276 • Tehran 685-180
Tokyo 478-1278 or 478-1279 • Toronto (416) 757-1101 • Jeddah 54600

CIRCLE 206 ON READER CARD

From the graphics leader

Our plotter plus your terminal. They add up to fast graphics and color copies.

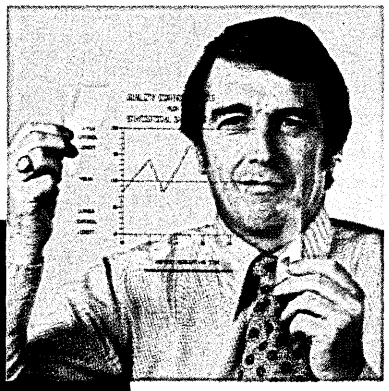
If you haven't seen the precision and performance of the 4662, you may still be using your people to do a plotter's job.

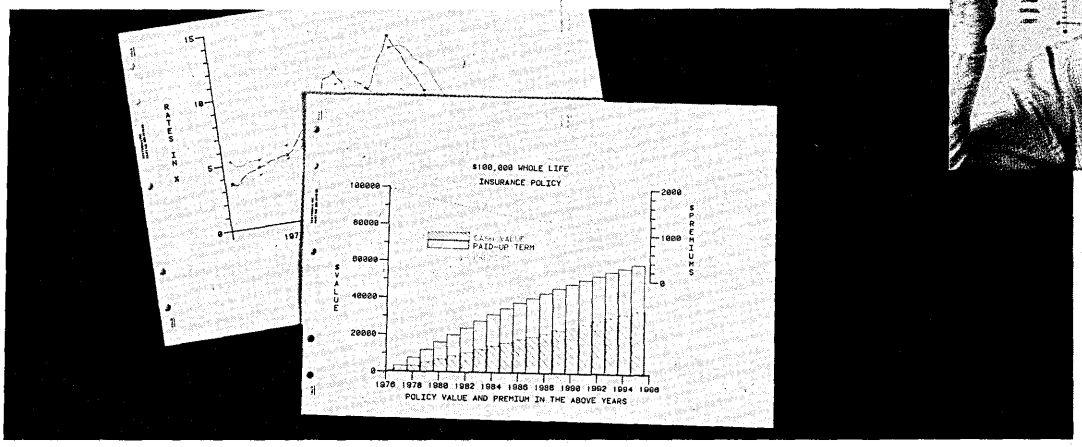
The Tektronix 4662 Interactive Digital Plotter is a state-of-the-art alternative to hand-drawn charts, graphics and diagrams. It plugs into just about any RS232-C or GPIB-compatible terminal and is supported by Tektronix' easy-to-use PLOT 10 software.

Most major timesharing services support our software. Ask yours. Whether it interfaces with timesharing or your own mainframe, the 4662 can plot in seconds what may now require hours of paid personnel time. With superior accuracy and aesthetics. With the reliability and fast service support you demand.

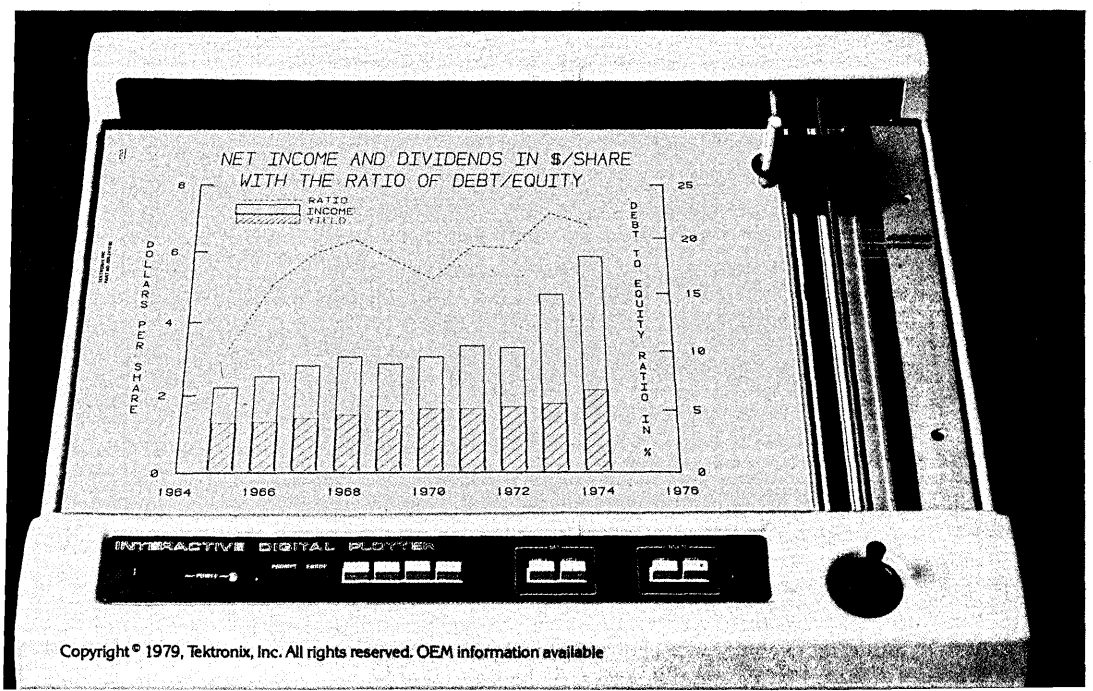
Tektronix 4662 capabilities are also available on an OEM basis. Your local Tektronix representative is ready to answer your pricing and specification questions.

Get the full story on fast new graphics from your terminal. Call your local field office, or use our toll-free automatic answering service at 1-800-547-1512 (in Oregon, call 644-9051 collect).





The 4662 can draw precise plots on paper or on acetate, providing an especially valuable graphic assist to overhead projectors.



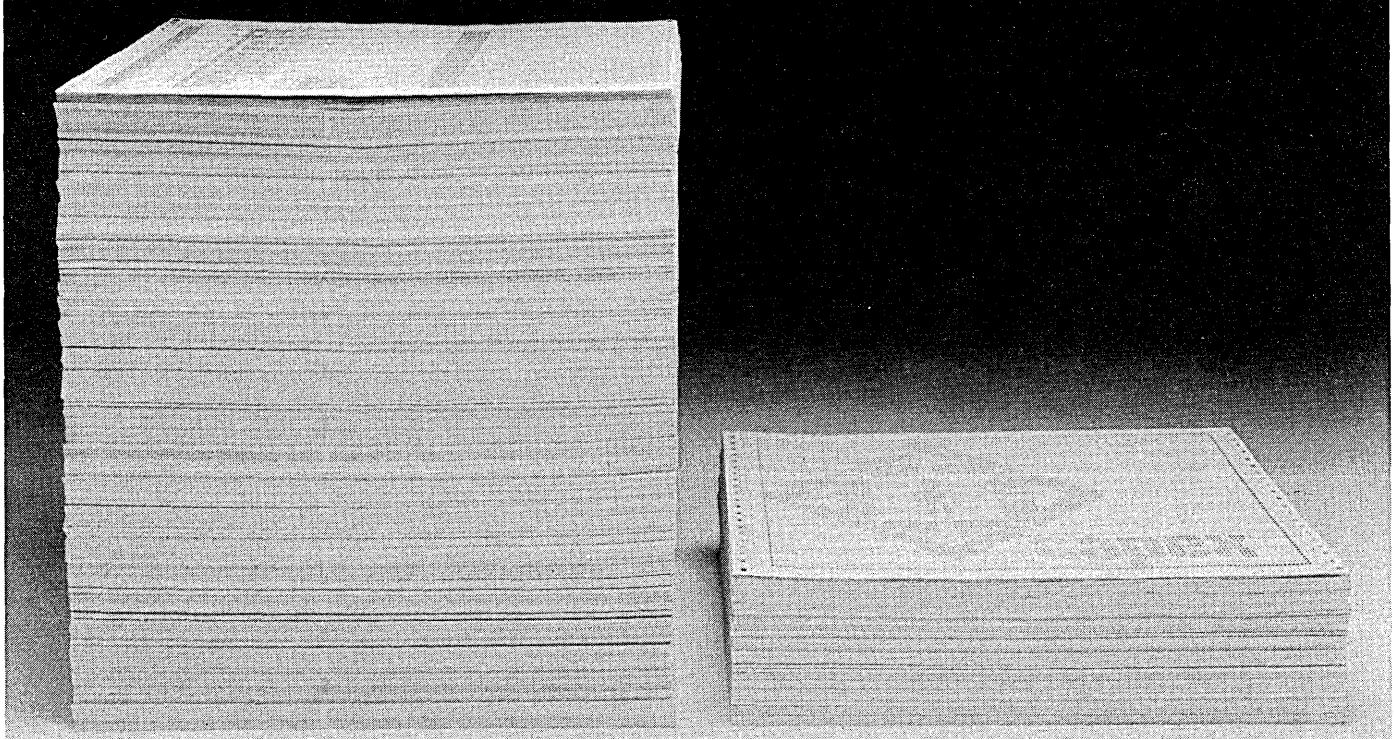
Tektronix, Inc.
Information Display Division
P.O. Box 500
Beaverton, Oregon 97077
(503) 682-3411
Tektronix International, Inc.
European Marketing Centre
Post Box 827
1180 AV Amstelveen
The Netherlands
Tel 020-471146

Tektronix®
COMMITTED TO EXCELLENCE

CIRCLE 85 ON READER CARD

New for DOS/VS

How to stack productivity in your favor.



Your current COBOL program.

Same program with OPTIMIZER III.

If you'd rather measure programs by performance than by the yard, you need OPTIMIZER III for OS and now for DOS/VS. With this powerful production tool from Capex, you can develop and maintain programs faster and easier, reduce program running time, better utilize production time, make programs more reliable. Testing is thorough; fewer tests are required. Call (602) 264-7241. We'll help you make your programs stack up.

Capex Corporation, P.O. Box 13529
Phoenix, AZ 85002

Tell me more about OPTIMIZER III and send me a free copy of "COBOL Optimization Techniques," which presents specific guidelines for improving COBOL program performance.

OS ____ DOS/VS ____

NAME _____

TITLE _____

COMPANY _____

ADDRESS _____ CITY _____

STATE _____ ZIP _____ PHONE _____

AW

Capex is a diversified software company involved since 1969 in the development and marketing of systems, operations and financial planning software. Capex software products are marketed through sales and support offices in major U.S. cities, through Capex subsidiaries in Germany, France, England and The Netherlands, and by international sales representatives worldwide.

capex CORPORATION

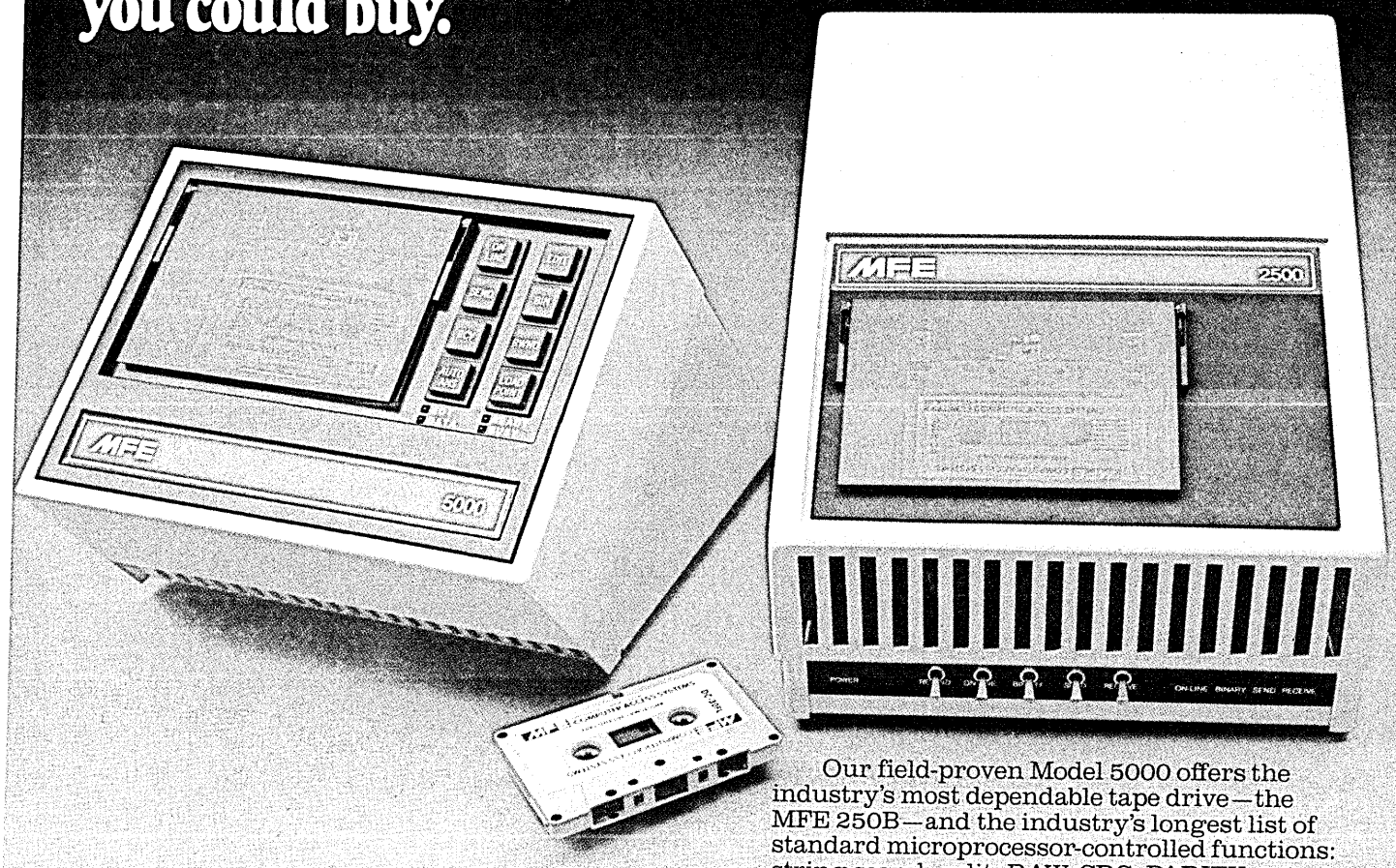
Helping business do business better.

Atlanta (404) 451-8415 • Boston (617) 329-6170 • Chicago (312) 986-8618 • Houston (713) 460-8555 • Los Angeles (213) 862-5102 • New York (201) 472-7000 • European Headquarters: Amsterdam (020)-46-15-56 • Other offices in Dusseldorf, Paris, London.

CIRCLE 20 ON READER CARD

Until now, this was the best microprocessor-based cassette terminal you could buy.

We decided it was time for some serious competition.



Our field-proven Model 5000 offers the industry's most dependable tape drive—the MFE 250B—and the industry's longest list of standard microprocessor-controlled functions: string search, edit, RAW, CRC, PARITY, auto answer, and more.

Plus an impressive 215,000-character storage capacity.

But if your application doesn't call for all of the Model 5000's advanced features—or if you're looking for even more storage—you'll be interested in our economical new Model 2500.

It incorporates our new 450B tape drive, which allows recording on both sides of the tape—for an unequalled 350,000-character capacity.

And since we gave the Model 2500 fewer standard features, we were able to give it a very attractive price—about $800 less than the Model 5000.

Both terminals can be made completely TI- or NCR-compatible, and can operate up to 2400 baud. TTY and RS232C interfaces are standard.

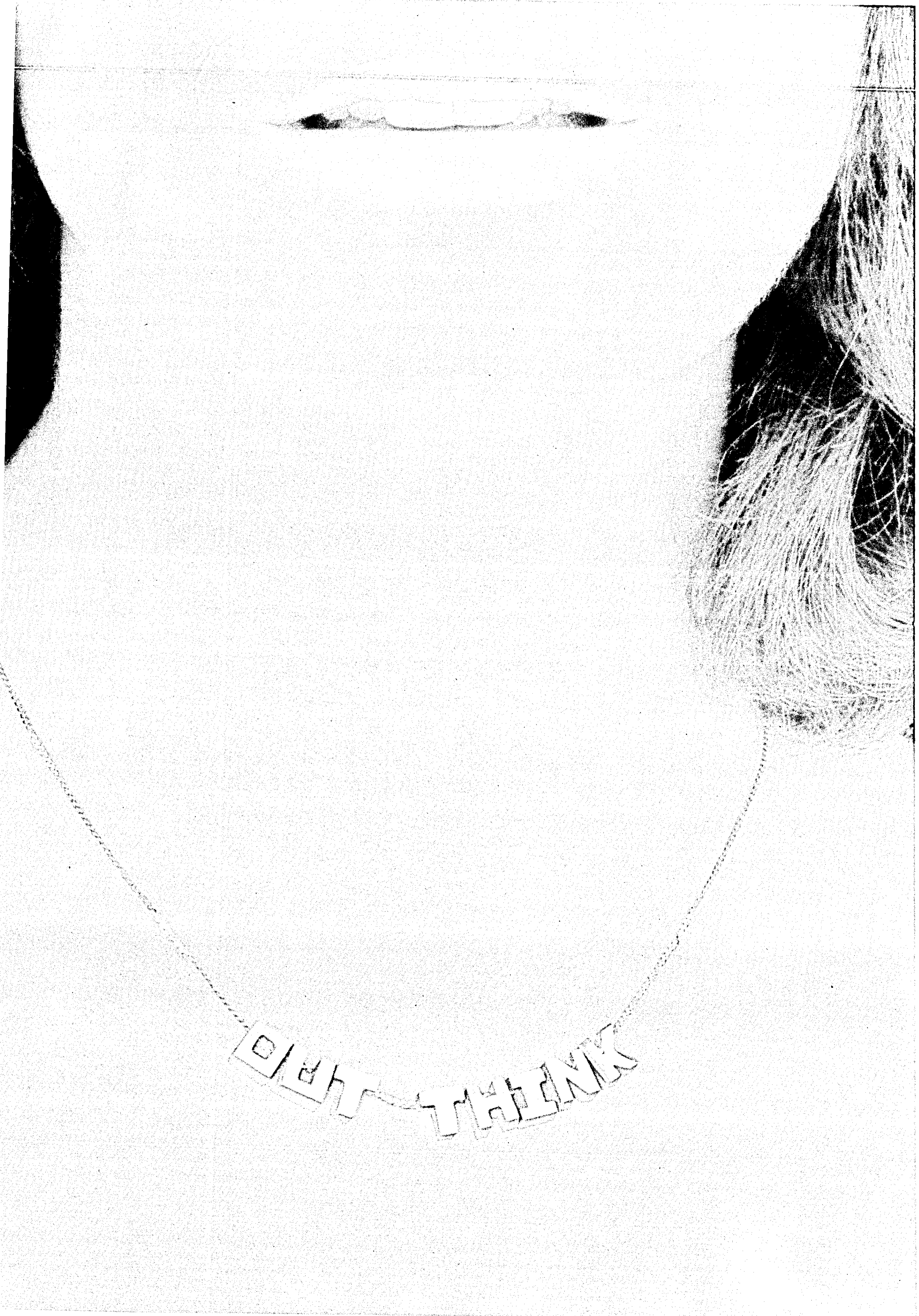
Compare either the Model 5000 or the Model 2500 with any other terminal for your specific timesharing or data-logging operation. You'll see for yourself that we're our own best competition.

Call toll free 800-258-3884. MFE Corp., Salem, N.H. 03079.

In Europe: MFE Limited, West Lothian, Scotland EH54 9BJ, Tel. (0589) 410 242. MFE Products Sa, Vevey, Switzerland. Tel. 021 52, 80, 40. (MFE has complete worldwide representation. Contact us for the rep nearest you.)

MFE

CIRCLE 203 ON READER CARD


OUT THINK

Just as gold is the universal measure of economic value, a Datapoint ARC™ system is business data processing's standard of cost-effectiveness

Many of the costs involved in modern business data processing are hidden from management view. Very frequently, the system price tag is just the beginning of the spending process.

With the Attached Resource Computer™, Datapoint has outthought its competition with a means for dramatic savings in the implementation of data processing systems.

Here's how it's done

Attached processing is a fundamentally different approach to computer system architecture. An arbitrary number of compact, inexpensive computers are linked together to form a large-scale computing facility. Some of these computers handle data file management and retrieval, while others execute applications programs. Individual computer processors are relieved from the burden of performing many different tasks simultaneously.

With complex scheduling and overhead functions eliminated, each applications processor works much more efficiently than otherwise possible. This concept combines the advantages of dispersed data processing with the greater speeds and capacity of a large conventional system.

Because of this fundamental difference in the way the ARC system operates, it opens the door to a number of economies for businesses.

Not too little, not too much

Since each company can select just the right amount of processing power and data storage capacity for its individual needs, there is no investment in costly overcapacity that you may need at a later date. Nor is it necessary to maintain a single, overworked computer while awaiting an expensive upgrade. Expansion of the system occurs in incremental steps.

Keep what you have, add what you need

Because of its modular architecture, processors and peripherals can be added to an ARC system as the work load changes. Existing software is not affected by these new additions. Thus, the largest investment in time and manpower — that of software — is preserved throughout the lifetime of the system. And there is virtually no limit to how large an ARC can grow.

The Datapoint processors attached to an ARC system are powerful, efficient, and easy for anyone to use. This means that a relatively small investment can yield a system with a large total throughput. In addition, all of the hardware components of an Attached Resource Computer are compatible. So there's no worry about the inherent obsolescence of conventional systems.

Tried and true programs

Datapoint's processor family allows you to develop programs on one processor for use on another later. Once developed, it will never stop working for you, no matter how large your ARC system becomes. If you are already using Datapoint Advanced Business Processors and peripherals, they can be employed in an ARC system with little change in software.

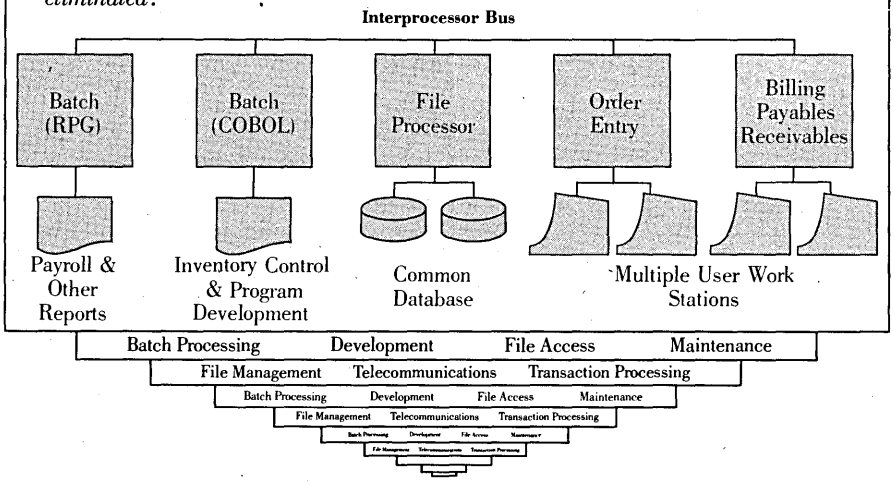
This can save on another one of those hidden costs, because operators trained to use Datapoint systems will still follow the same simple operating procedures as before. Re-training expenses are saved and the new ARC slips into place with little downtime.

Write for more information

There are even more ways that ARC can save your company money. To receive a free booklet describing the features and benefits of Datapoint's Attached Resource Computer, write: Marketing Communications Department (M62), Datapoint Corporation, 9725 Datapoint Drive, San Antonio, Texas 78284. Or simply call the Datapoint sales office nearest you.

ONE ARC™ SYSTEM!

In this ARC system, a company has combined on-line transaction processing (for the functions requiring heavy computer power and constant data access, such as billing and order entry) with batch report processing. Both types of applications share a common database. With ARC, the need for two specialized computers has been eliminated.



DATAPOINT CORPORATION

The leader in dispersed data processing™

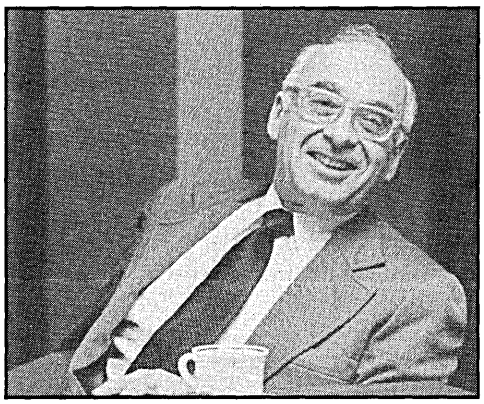
The cost-effectiveness of the Attached Resource Computer system is another example of how Datapoint out-thinks its competition to help you out-think yours.

Five field marshals pause midstream to discuss the ebb and flow of battle in the semiconductor-powered revolution of knowledge.

THE CHIP REVOLUTION... A CANDID CONVERSATION

ROGER BENDER
NEC Microcomputers, Inc.

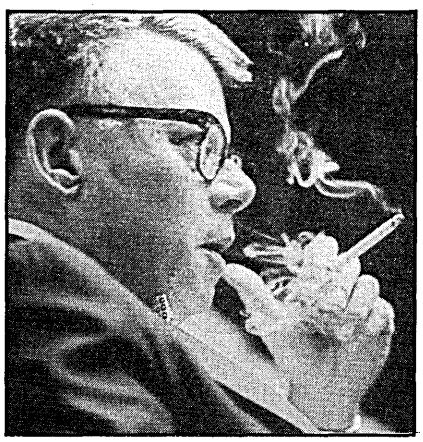
JACK CARSTEN
Intel Corporation



GUNTHER RUDENBERG
Arthur D. Little, Inc.

BERNIE LIST
Texas Instruments Inc.

DAVID CROCKETT
Hewlett-Packard


LIST: You tend to create a market...No one that I know was screaming we want a thing that says words to our kids so they can learn to spell...We just got a bunch of analog stuff along with the digital, and developed a market that's going to mushroom...

The computer and communications industries are undergoing profound change as a result of what has been termed the semiconductor "revolution." As with most revolutions, it is difficult, often impossible, for those of us in the midst of the fray to understand the advances, the strategies, and the deployment of troops and materiel. In an attempt to gain a current perspective, and to relate the implications of the revolution to the dp practitioner, DATAMATION gathered five field marshals for an informal conversation. Participating in the discussion were Jack Carsten of Intel, Bernie List of Texas Instruments, and Roger Bender of NEC Microsystems, representing the semiconductor industry; Gunther Rudenberg, a consultant on the semiconductor industry from Arthur D. Little, Inc., and David Crockett of Hewlett-Packard's General Systems Div.

DATAMATION: *Off the top, do you have any general comments or observations on what you see as the major impact of the semiconductor on the computer and communications industries?*

LIST: Well, it's hard to visualize minicomputers made out of vacuum tubes. The minicomputer industry probably wouldn't exist if it wasn't for the semiconductor—not only its impact in getting the price down, but in reducing the size and power requirements to the point where you can put a minicomputer on a board or on a single chip of silicon. And if you count up how many memory bits a mainframe computer company uses, it's mind-boggling. In active element groups, which is a bit of memory or a gate, we've got now 10^9 consumed worldwide—for the whole semiconductor industry—and it's headed to 10^{15}. That number is something like 250,000 for every man, woman, and child in the world for 10 years.

CARSTEN: The projections of the cost and the potential complexity of semiconductor devices have been accurate for at least 15 or 20 years. If you go back 10 or 15 years and realize that the number of users, at least for digital semiconductors, in consumer, automotive, and noncomputer applications, was almost trivial—in fact, people were scratching, trying to figure out what the heck anyone would use this stuff for—nevertheless, it all happened right on schedule. So, what does it all mean? Can't really say, except that the preductions have been accurate, and I think they will continue to be accurate. This photolithographic chemical processing business is nowhere near its theoretical limits. Until we start getting close to the theoretical limitations in the process, the equipment necessary to build LSI semiconductors is going to be more complex, more expensive, more automatic.

CROCKETT: That's a very good point. We have maintained a 30% per year reduction in price for equivalent function in minicomputers. We thought we'd see limits in I/O devices and peripherals, but we've had the same 30% reduction per year in I/O devices and in secondary memory; there doesn't seem to be any limits in sight there, either.

RUDENBERG: There is tremendous competitive force in the 30% per year reduction in semiconductor prices that forces innovation in the older technology. We've seen it in cores and printers and it's true in all the electromechanical devices. Those manufacturers are not about to give up the ship. They'll get denser storage, put in some smart semiconductor controllers, and, with increasing volume, achieve a competitive reduction and stay alive.

CARSTEN: The mechanical technologies that have kept up have gone to some kind of photographic technology in their smallest elements and have become a mechanical analog to some of the semiconductor technologies. The demise of core was predictable because nobody ever figured out how to string them completely automatically and eventually the human eye gave out. Most of the other technologies—disks, drums, tapes, printer heads—stayed up if they were able to use films and photographic techniques; if it was stamp-and-hammer, they got squeezed.

CROCKETT: The semiconductor industry, on one side, directly created the tools for implementing the information revolution and, at the same time, in creating these tools, has set the competitive pace. The other technologies have been forced to adapt, often quite imaginatively. For example, the semiconductor memory itself. I get asked occasionally why the new memories are sold for $20,000 per megabyte when they used to sell for $70,000 to $100,000 per megabyte, but that question completely ignores a side effect of the semiconductor revolution. The $100,000 system is a box with fan and power supply; it contains error correction and all the other good things demanded of an add-on memory for a mainframe. The $15,000 per megabyte—and while I'm talking it's probably been squeezed down some more—is a minicomputer memory that is one circuit board. We are reaping considerable side benefits from not having to put steel and iron around it and not having

extra fans required. That's one of the messages of the whole impact of LSI: with denser electronics, you're getting rid of the ironmongery.

RUDENBERG: There are other examples, too. One is graphics; certainly in plotters, the technology has changed dramatically in terms of the amount of mass that is required ...

DATAMATION: *The same is true of communications ...*

BENDER: In communications, it has become obvious that with the terminal as both a communications device and a computer device, companies at both ends are seeing it as their way of breaking out of traditional roles and into new marketplaces ...

CARSTEN: Each other's marketplace...

CROCKETT: Also, in communications, the price of lines has not come down as rapidly as expected, and so the trade-off, putting the processing in local areas, distributing it, is much more attractive with the inexpensive semiconductor technology.

RUDENBERG: Then there's the retailing of the software in the little box that just gets plugged in ...

LIST: Yes, we have solid-state software in calculators and "Speak & Spell," and it will be in our home computer.

DATAMATION: *Are you looking to a solid state language such as Fortran in the little cartridge?*

RUDENBERG: Yes, you can get a whole version of BASIC on one chip of read-only memory, and that would be a whole stack of punched cards or cassettes, which is very slowly used ...

LIST: Also easy to copy. With solid state software, you need a small factory to copy it.

CROCKETT: The cheapest way to update software used to be to send out a new reel of tape. Maybe now you send out a semiconductor part to plug in ...

LIST: ... a ROM ...

RUDENBERG: This is what I call ROM publishing—the printing press is in the photolithographic factory and the update to, say, income tax is simply mailed out every year or every quarter along with instructions. You plug it into your calculator and enter line one and line two and that's the instructions for filling out form 1040. It turns the semiconductor device into a throwaway item.

DATAMATION: *Getting back to the communications industry ...*

CARSTEN: One of the barriers in the telecom business is the limitation of the legal process. I'm sure the people who made the communications laws never anticipated any better than we did what a telephone line could be used for. I do a lot of work overseas; you overlay the patchwork of legal problems from country to country and try to sell dp equipment or semiconductors across all those boundaries, and you'll find that the technology is not just years but tens of years and sometimes hundreds of years ahead of the legal and social infrastructure. The laws are different in every country.

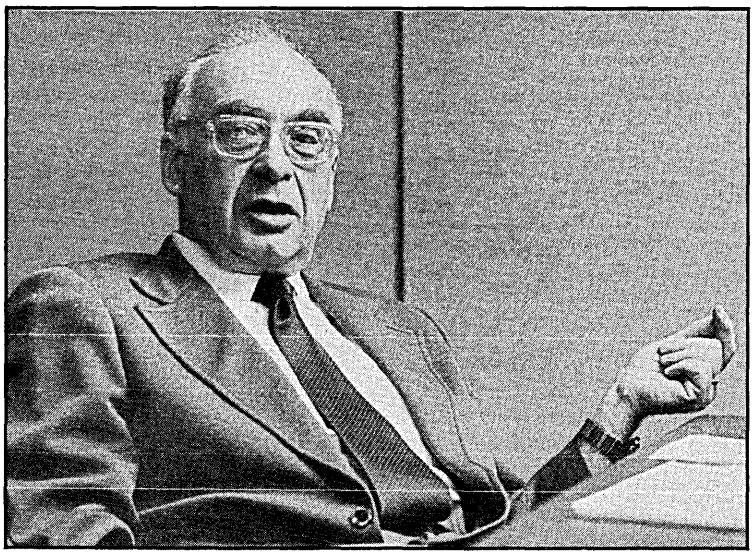
CROCKETT: There's more to it than just connecting telephone networks. We introduced a new business computer that from the beginning we designed to try to meet all international regulatory standards. We attempted to work with these regulatory agencies over two or three years, negotiating back and forth. We were trying to qualify, not for a dp environment, but for an office environment, so it had to meet totally different power requirements for each country, be very easy to switch from the different cycles and voltages, and be conversant in six languages ...

CARSTEN: Precisely the kind of thing I was talking about ...

CROCKETT: It adds a substantial amount to development costs, and yet it's the way we have to do business because over half our sales are now international ...

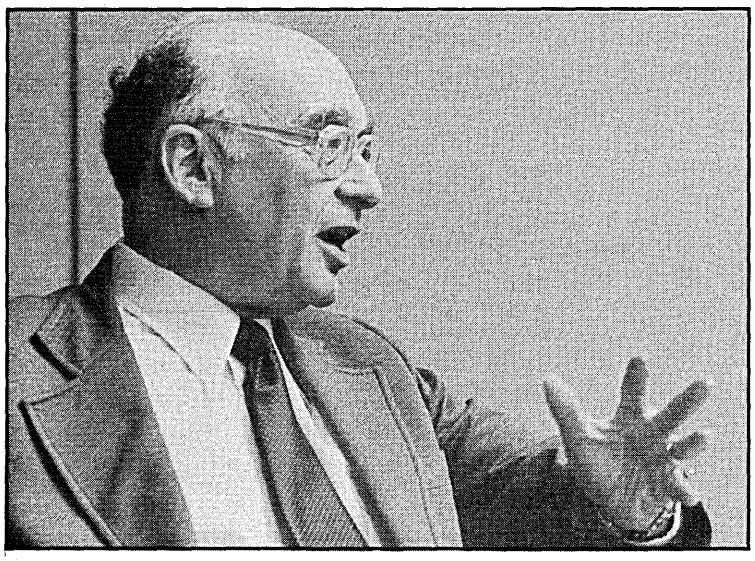
CARSTEN: There are political reasons why, in the interest of protecting local industry, these issues are not likely to be resolved. My guess is we'll end up using LSI components to steer through that maze of regulations in some standardized way so that the kind of project that Dave undertook will become a standard in and of itself.

RUDENBERG: I'm delighted to hear you say that. At breakfast we were talking about where all those new semiconductor bits were going; if you need six times as many—and they will be no more costly in three years' time than the one is now—then you can build a standardized product to take care of the international situation that will cost no more than today's product, and it will be uniform across all six countries. And, we've got another lever for the semiconductor industry to transcend national boundaries.



RUDENBERG: Computers and memory are cheap enough...we don't have to worry about using them efficiently. That's the real gift of the semiconductor industry.

DATAMATION: *Who is going to design the next generation of computers?*
CROCKETT: There's probably room for everyone. Certainly we wouldn't have made as much progress in microprocessors if the tools hadn't been supplied by the semiconductor industry, and I'm sure the semiconductor companies will be doing more and more in systems. On the other hand, it's a matter of investment. We're investing now in semiconductors, and testing them, and investing a lot in vertical integration and, at the same time, in the mainframe business we're still investing 70% of our resources in software. I don't see semiconductor houses investing that percentage, which I think is necessary to get into some of these applications.
BENDER: A four-year-old statistic says that a computer system is about 50% investment in peripherals, 30% in memories —clearly a semiconductor factor—and about 20% in the central processor. When you get down to the cpu, it's a very small percentage of total cost, and that is what people think we will attack with LSI and VLSI products in the near future—but that's not attacking the whole system. Wrap that up with a 70% investment in software, and there are still problems of marketing, of maintenance, and of applications software. The semiconductor companies are very good at memory and perhaps the cpu, but we're bereft of the rest of the facilities.
DATAMATION: *I thought you people were making hardware so cheap that system overhead was not important anymore, that the user could write inefficient programs and not be concerned about the cost of a program; that is, he could reduce programming cost by just wasting memory space.*
CARSTEN: If the cost of memory is going down 30% a year and the cost of generating software is going up at the rate of 15% a year, what is the natural conclusion?
RUDENBERG: Computers and memory are becoming cheap enough that we don't worry about the efficient use of them. That is a gift of the semiconductor industry.
DATAMATION: *Aren't these economies going to make possible user-friendliness? I believe Hewlett-Packard, for instance, has designed many of these "friendly" features with the idea that a nonprogrammer will be able to use the computer more efficiently* . . .
CROCKETT: Yes.
RUDENBERG: Absolutely. The semiconductor industry would wither if it couldn't expand its markets every time it cuts prices. With every 30% price cut, it grows another 10% or maybe 20% in dollars, so the bits shipped are almost doubled from year to year. Why? You have an elastic demand for bits, and you are going to spend the same amount of bucks for a telephone terminal year after year or a tty with more and more features. You are going to spend the same dollars for a computer to do a certain class of applications, and if it becomes cheaper—you've already got the appropriation through the budget committee—you buy more capability when you sign the purchase order.
CROCKETT: In the past, large computer systems required operators from initial program load to backing up the system to understand the command structure. The first step we're taking is removing the operator from the system so a person can work directly in solving his problem. There still has to be a programmer or an analyst, but the person does not have to know everything about setting up a data base—the computer asks questions and guides the user in setting up his own data base. And, it's as easy to service as a car because it tells you to change the filters or to put in a new typewriter ribbon. The next step is to make it possible for a nonprogrammer—someone who's not trained in COBOL, RPG, Pascal—to solve a problem. The computer can conduct a dialogue, asking enough questions of the user to aid him in setting up what he's trying to solve.
DATAMATION: *You've been discussing expanding the market and the many potential directions of the market. There are obviously limitations in the number of markets a company chooses to pursue. How do you determine, particularly when an industry is growing and changing as rapidly as this one, where in the market you are going?*
LIST: Carefully.
CARSTEN: I would guess that there are probably dozens of very important applications that will use semiconductors eyeball to eyeball, but I can't tell you what they are. We have the same myopia now as we did 20 years ago; that is, we can't really say what is going to be the major end-equipment explosion, but we can say



we will be building a million or four million bits of memory on a chip, if anyone wants such a thing. We can say the power of a fairly sizable minicomputer will be on a single chip of silicon, and we can say, in the case of analog functions, that large, bulky boxes that now fill the telephone substations and PBX closets will probably sit on people's desks.

RUDENBERG: You might say that each wave of semiconductor products gives you a leverage in at least two new opportunities: the new product itself, and the new electronic devices or systems using the product.

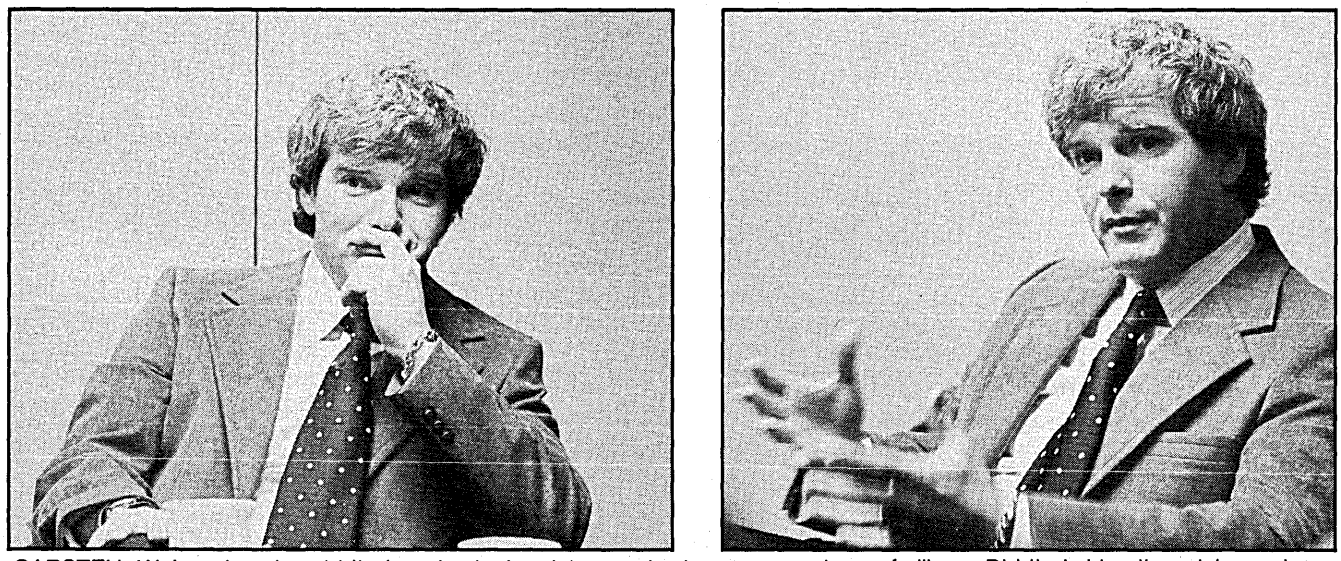
LIST: You tend to create a market. If you did a market survey in the late '60s, say one year before Hewlett-Packard brought out the first electronic calculator, you'd have an awfully hard time. You'll remember this, Jack—some of us in the late '60s thought TI shouldn't be in the consumer business. Then we said, okay, we're going to create a consumer marketing organization. Obviously we have a lot of silicon left over, so we push calculators internally. Well, the problem was that we wanted to see what the market was. We're beautiful if somebody wants to see what the market is for memory—Jack used to do it at TI, now he's doing it at Intel—you take the curves and you plot it, and you get almost to the last AEG how many there are going to be each year for the next ten years. But for those of us who were pushing TI into the calculator business, the question was, "Where is the market?" Well, there was no market because there was no $10 electronic calculator. The only market was for a $1,000 Monroe or Marchant or whatever, obviously not for consumers. So, you had a helluva time trying to visualize the market. What the industry did was to create a market for electronic calculators, and now everyone runs around with one, two, three calculators—we hope. Like the "Speak & Spell" market—no one that I know was screaming we want a thing that says words to our kids so that they can learn to spell. We managed to get the technology and a bunch of analog stuff along with the digital—and there's a market that's going to mushroom into all kinds of products. For one thing, it's a novelty if nothing else, and it's a learning aid, and that's got some sex appeal to it. So, in a sense, we've created these markets. Now, I'm not so sure we've created them as brilliantly before the fact as when we look back and think about it. I want to comment, also, on what Jack was saying. I think the software problem is at much the same stage or barrier that Jack was talking about with TTL and ECL and logic standardization. I don't know how we'll mechanize something as intellectually complex as writing software. It's trivial to invent memory now; it takes a lot of work, but it's almost mechanical. But when you deal with software, you deal with individuals who compress knowledge. I think we are probably 10 years away before somebody in the semiconductor industry, the computer maker, the universities, comes up with a process that lets us automate the knowledge-making thing we now call software; and when it happens, the memory will be another 10 times cheaper, and we will be able to afford it. Obviously, we are looking at it in our labs, and I'm sure Intel is, and I'm sure the universities are full of people who are trying to solve the basic problem of turning the intellectual process into a slice of silicon. That's the key. Somebody is going to do that, and then all these problems about software and how do I talk to my computer will go away, just like all the problems went away with TTL or DTL or RTL . . .

BENDER: The determined environment is extremely important. One of the problems with a large computer system is that no matter how long that computer system and software has been in the field, everytime there is a new class of users they are going to uncover bugs that were never uncovered before . . .

LIST: Until a year or two ago, calculators were simple enough, with four functions and then a memory and a percentage key — and that's fairly simple to check. Then, came the programs, with the TI 52 and the 59 and the Hewlett-Packards . . . and my God, there's a little bit of software in there, and sure enough somebody found in our 52 that we'd hidden a few memory registers away. We knew they were there, but we didn't intend anybody to use them because it was too hard to do with a keyboard. If a product is out, you've got to take it back and fix it, and it probably needs a new silicon chip and so you go reprogram the silicon chip and fix it.

DATAMATION: *What is the necessity of vertical integration for the computer manufacturers, particularly with the inevitability of the semiconductor manufacturers entering the world of systems?*

CARSTEN: It depends on what their expertise is now. In many instances, the barriers to penetrating a new market, whether it be upward or downward integration, depends on what the strengths of the company are. Those strengths are marketing, service, software expertise, a library of



CARSTEN: We've already said that yesterday's minicomputer is now one piece of silicon. Did that drive the mini people out of business? Hardly. Did it drive them up in complexity? Yes. Was that bad? No. . .

software—things that would be tremendously expensive for a semiconductor manufacturer to reproduce. You say, aren't we ultimately leading to receiving a bunch of modules on the back dock that we plug together and ship to our customers? Well, perhaps, but we've already said that yesterday's minicomputer is now one piece of silicon. Did that drive the minicomputer people out of business? Hardly. Did it drive them up in complexity? Yes. Was that bad? No, because the equivalent of that minicomputer today probably sells for a few hundred dollars. It wouldn't be a very good business.

RUDENBERG: Most companies, when they get to a fairly large size, look seriously at vertical integration downwards or backwards where it makes sense. You have to remember that Amdahl got a beautiful start served by the semiconductor industry and broke right smack into the computer business. Admittedly, it is now seriously considering whether it ought to make some chips itself, but that was not an initial necessity, and this is true of many other communications and computer companies.

BENDER: Two years ago, I attended a seminar for the semiconductor industry and, in response to a question from the audience, the assembled semiconductor managers extolled the virtues of vertical integration leading their companies into systems. About an hour later, another question from the audience asked about vertical integration for the computer industry and the same gentlemen thought how ridiculous it was for the systems people to integrate downward ... that they couldn't possibly manage it. I don't have an ax to grind on this particular subject, since NEC is in the peculiar situation of having both computer capability and semiconductor capability growing up within the company almost independently; being in both businesses, we can take advantage of the synergy. It does help to have both capabilities within the same organization, I can attest.

CROCKETT: Within Hewlett-Packard we now have over 10 IC facilities. We have tried to place IC facilities very close to the user group to match the technology with the problem to be solved, and we have tried to provide some functional capability or unique capability that is impossible to get from outside sources. We buy large amounts from Intel, NEC, Texas Instruments, and they're typically the parts that are not unique to any system's main memory, microprocessors, or drivers. The added advantage of vertical integration is in understanding the process of interaction among process people, logic designers, circuit designers, systems designers, software people—we get some good things going as to how the next generation of parts should look. If you have a compiler person talking to a circuit designer, and he says, "You know, I could really have a fantastic compiler if there were some special circuits that did this kind of array processing"—many ideas come up for new components. An in-house capability also helps in keeping our suppliers a bit more honest. Where we understand something about the process, the first thing we do when we have a component failure is not to send it back to the supplier. We take it apart, diagnose it, try to analyze the error condition. Then, we go back and talk to the suppliers, and as you all know, we visit our suppliers regularly! We believe having our own facility helps us control the quality of the end product, even though we buy about 90% outside.

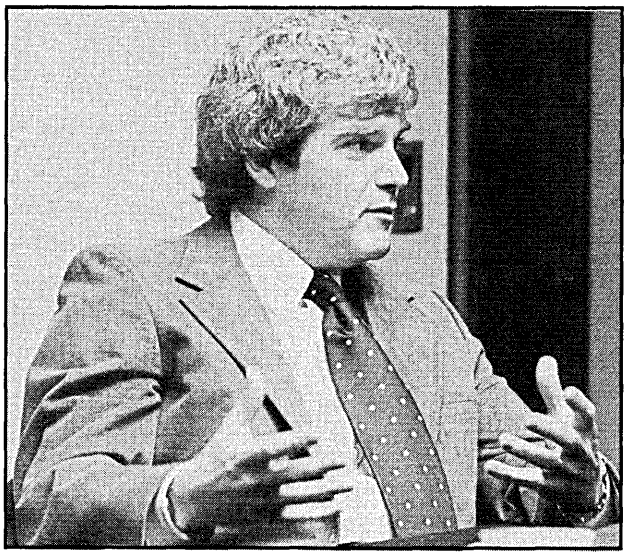
CARSTEN: There are some economies of scale that have to be carefully evaluated whether you are manufacturing printed circuit boards or semiconductors. In the case of Hewlett-Packard, for example, a selection of technologies and the products you want to build are important criteria. The least successful downward vertical integration attempts I have seen in the computer industry have been those that tried to manufacture a broad spectrum of products using a number of processes and technologies ...

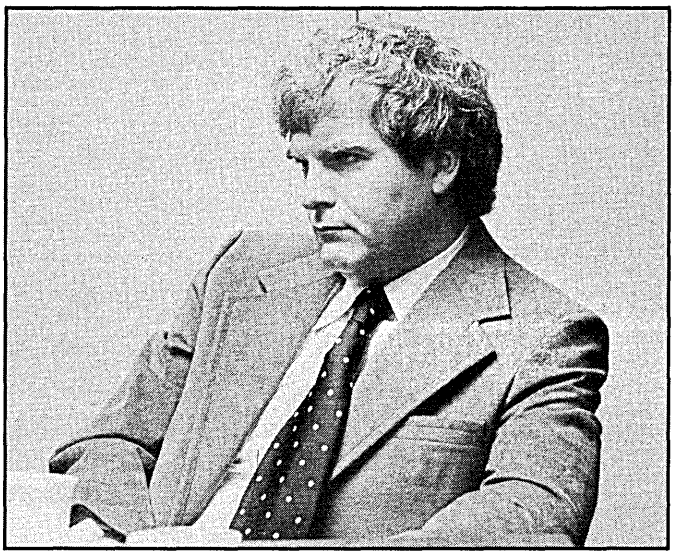
CROCKETT: Or have done it purely on a basis of trying to have vertical integration. In the past, people have gone into, say, core memories, because anyone could string them. So they went over to Singapore, set up shop, and the only reason they did it was to reduce cost. Of course, what happens is that by the time they duplicated the processes, they are about three or four years behind ...

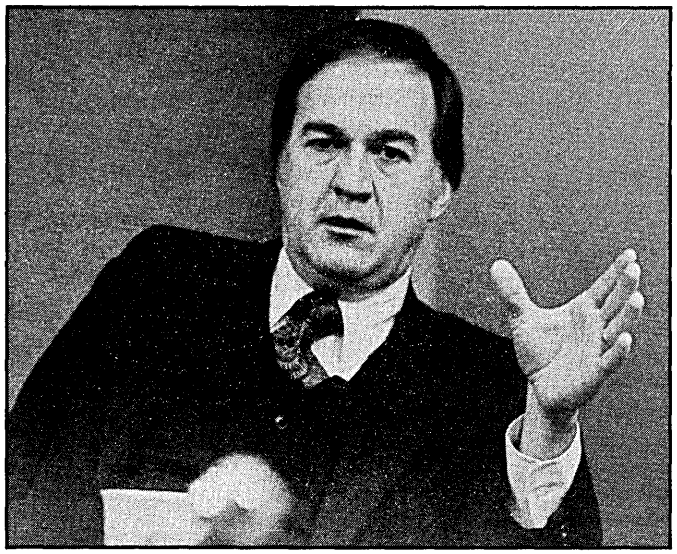
CARSTEN: The cost of a state-of-the-art manufacturing facility to build a single kind of semiconductor, like n-channel MOS, for example, has climbed in the last 10 years by an order of magnitude. You used to be able to set up a facility for about $1 million. Now you can plan on $10 million plus the bricks and mortar. This has inhibited the formation of new semiconductor companies because the initial investment has become so large.

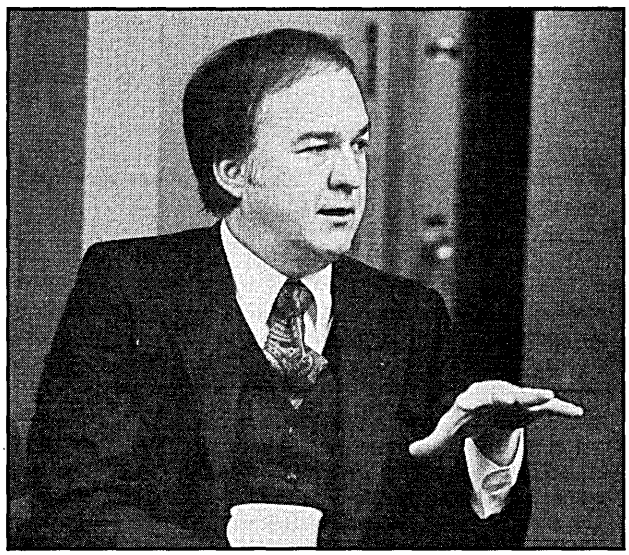
DATAMATION: *What numbers would be considered a reasonable production quantity*?

CARSTEN: Bernie and I could take some whacks at that, but I'm talking about









CROCKETT: The competition is a healthy situation. The new semiconductor parts coming from Japan were innovative and highly reliable. Our domestic suppliers had to match or exceed the quality—and they responded well.

where the manufacturing costs of the circuits begin to approach the cost of other semiconductor manufacturers so that you would at least be in a competitive position.

BENDER: If you are talking about a memory device, you are talking about millions. If you mean certain microprocessors, you're not talking about that many—maybe 100,000.

RUDENBERG: Well, it's not too difficult to figure that if you have a $10 million facility, you ought to get $5 to $20 million of products out of it per year as an economically viable amount; and if you're only trying to get out $1 million of products, that facility may cost $3 to $4 million. It is a smaller facility, but it still has to have one each of certain expensive pieces of gear. There's a popular misconception in this vertical integration. There's no question, from what I see as a consultant, for example, about the product leverage that the semiconductor affords to the equipment company. But it's a very personalized strategic consideration as to whether you ought to have a few knowledgeable guys around, or whether you ought to have an R&D or prototype facility, or if you should go all out and manufacture them by the bucketful.

CARSTEN: There is a further problem in having a semiconductor facility on the premises for R&D purposes to shorten the development cycle and produce initial prototypes—who is going to make the product? The interchangeability of semiconductor processes among producers, let alone between R&D facilities and producers, is poor, and the processes are complex—they are not duplicated from facility to facility, even within a given process family. H-P, for example, is using processes and techniques not in production anywhere else in the world. Also, the prosperity of the merchant producers right now is at a five-year high. The chances of getting anyone to build your tooling, given the difficulties involved, is remote...

CROCKETT: Certainly, on nonproprietary chips there has been good interaction between semiconductor houses and computer companies. We've gone to several companies and said, for example, this is the way in which we would like to have addressing done in memory, and we found them very responsive.

RUDENBERG: You have to give the semiconductor maker some incentives or he is not going to be interested; he has to tie up a lot of engineering talent ...

BENDER: In the case of Hewlett-Packard with its silicon-on-sapphire, or NEC, with both systems and semiconductor capability in-house, or IBM, you can trade off design and development cost in one area for design and development cost in another. But if you're doing it between companies, I don't think that will happen.

CROCKETT: That's right. We invested in silicon-on-sapphire. It has good speed and very low power; we use it for logic functions and unique processor capability. If the cost to us is more per chip than it would be to semiconductor manufacturers, it doesn't matter because we can more than offset it in terms of lower power supply costs and lower packaging costs.

LIST: We were talking at breakfast about how an entity as vast as the U.S. Department of Defense, with all its resources, has not yet figured out how to solve this problem. DOD buys nearly 5% of the semiconductor world's products now ...

BENDER: DOD just had to buy a production line to keep a part in process and in manufacture, because economically it didn't pay the contractor to keep it going ...

LIST: A few years ago, when I was in avionics, we were struggling all the time with how are we going to get one company like TI or H-P to even bid on the RFQ's to develop the new circuit the guy in the lab decided he needed for his radar? Even at the R&D level, nobody was interested. To design something, and then find somebody to make 50 or 100 or 1,000 is a tough process; DOD is trying to figure out how it can use more products from the mainstream of the semiconductor industry and still meet its tighter specs. It's not a trivial task—money alone cannot solve a problem like this.

DATAMATION: *But to use mainstream products wouldn't DOD have to be willing to accept less reliability*?

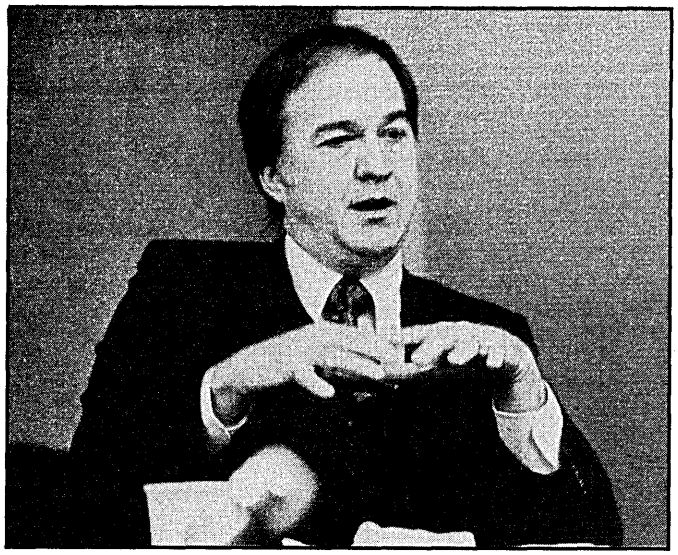
LIST: Well, it can't accept less. The semiconductor industry will have to raise its reliability level; and that's happening already because of the automotive industry. The automotive industry demands on reliability and lifetime and temperature and vibration—all the features that the Defense Dept. has been worried about for aircraft and ships—are as severe, in some cases more severe, and the only difference is that Detroit wants to buy the parts for 1/10 or 1/100th the price ...

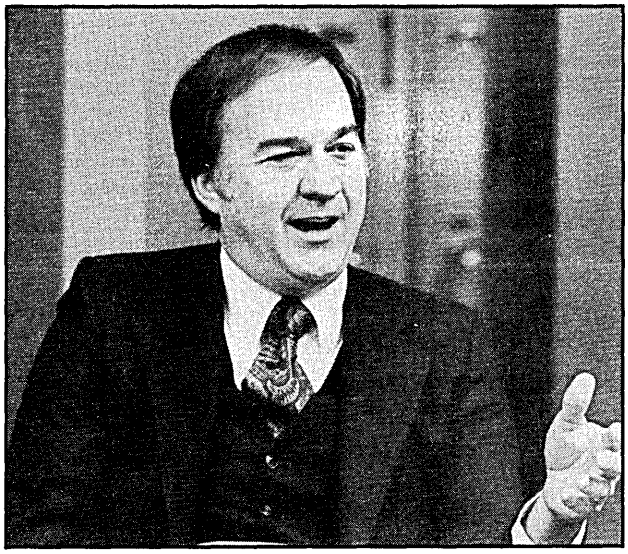
CARSTEN: And they want to buy about 10,000 times as many ...

LIST: Oh, God, yes. Ten million cars a year ... each with two or three microprocessors in it ...

CARSTEN: If everyone would drive around in a tank, it would be serendipity.

LIST: What is going to happen is that those kind of economic forces will raise





the total reliability and quality, maybe to the point where DOD can buy a more or less standard product.

RUDENBERG: That gets us back to the problems of the large computer manufacturers: their volume in units is minuscule (outside of the memory and logic in special purpose controllers), and it is difficult to persuade any semiconductor company to invest part of its facilities and design capabilities to make special chips for them.

DATAMATION: *I understand that there's something the semiconductor manufacturers have developed to get around this problem . . . logic arrays*?

LIST: In every generation there have been master slices or universal gate arrays.

DATAMATION: *Would you explain the concept*?

RUDENBERG: A gate array is a chip with 100 or 500 or 1,000 individual logic gates that are not connected across each other. Then, in the last metallization, they are cross-connected for the particular logic system that is desired. It's as if you bought a bucket of TTL parts and were going to connect them, but instead all the parts are on the 900-gate array. Then, the computer draws a mask for its final connections, and out comes a part number. Now, if you want a different interconnection, the basic masks and everything are the same until the final metallization, so you hope that it's a standard product that's made in the hundreds of thousands or millions. But each time you put out a new part number, you have a different diagram.

LIST: And that's automated with computer-aided design, so the designer, instead of sitting there soldering parts together as he did 20 years ago, sits by the crt and says "Zaaap!" and the computer does it. The price you pay is that the process is more costly in terms of silicon . . . but if you only want 10,000 parts, that's without question the cheapest way to make them. And one of the nicest things is that the semiconductor company can have the gate arrays all stacked up on the shelf; we can turn around in four weeks, six weeks —the customer can get it in small quantities very quickly.

CARSTEN: All the way back to the Wright-Patterson contracts that were let fully 15 years ago for this process, this particular pipe dream has never become a significant factor in the production of digital equipment. The biggest proponent and largest user of the process today is probably IBM, and even so, the percentage of logic that's ever been produced using the technique has been trivial—less than 1%. I can't explain why. From a logical point of view, it's so blasted attractive . . .

CROCKETT: IBM has announced several new processors using the master slice technique. The disadvantages are that it's very easy to start getting more and more parts: you end up with a fairly large number of different parts and it still doesn't have the density you get in other technologies. We are currently running at densities 10 times what those IBM parts are . . .

RUDENBERG: Everything suffers. You gain flexibility, and when that's your strategy, this is fine. The ultimate is that every morning you put a new set of engineering changes into the mass generator and the next set of chips are the April 2 modification of that basic part number. When you repair the computer, you go back and have to make a new chip to fit that exact situation. But a company that makes its circuit boards to a new design, incorporating engineering changes every day, is dedicated to flexibility, and can certainly apply that same flexibility to the chips.

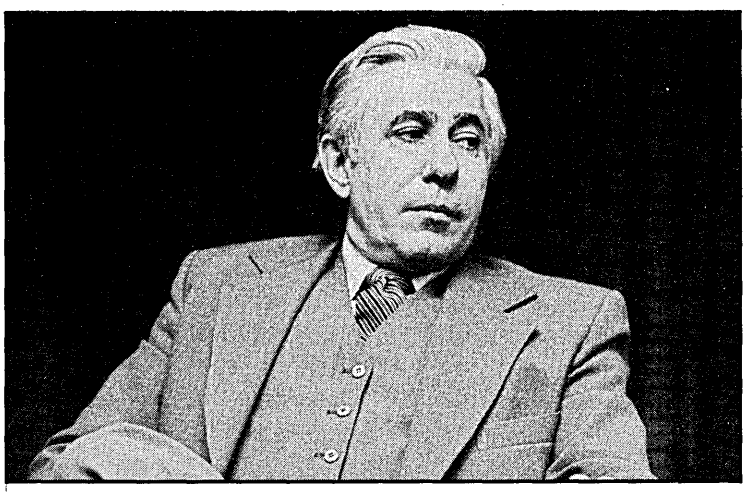
LIST: Also, it's worth pointing out that the existence of the microprocessor that can be coded for many different purposes gives the computer manufacturer a big degree of proprietariness in the form of software instead of that piece of silicon. We spent a fortune—some of it the Air Force's fortune, and some of it our own—on discretionary wiring, which is just another name for programmable gate arrays. And it never caught on. The introduction of the microprocessor set the programmable stuff back because the microprocessor is after all, programmable.

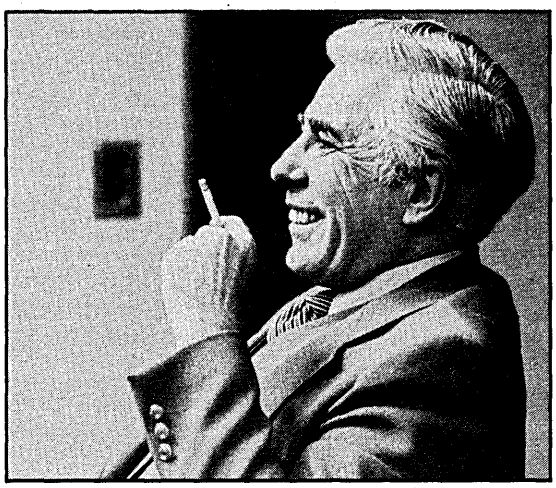
RUDENBERG: It's really only left to the very high-speed processors where the microprocessor approach is too slow. There is a third class of products, though, the PLA or programmable logic arrays, which puts the logic equations onto two or three logic levels implemented in ROM with hold circuits at the output, thereby implementing a truth table by simply reconfiguring the last mask, or even by supplying some fuses. That's been used as a circuit board technique for a long time.

CROCKETT: It's also used in chips. All the chips we produce have PLA's, and the same is true for TI and Intel. It's a systematic design tool used in the chip layout.

RUDENBERG: Computer electronics is one-third of the electronic market; it's a large single entity.

CARSTEN: Nevertheless, while memory is still a lucrative opportunity, the logic op-





BENDER: The industries that failed or were successfully invaded were those that had concentrated on the U.S. market. . . the U.S. semiconductor industry is world oriented; it invests heavily in R&D; it is not going to roll over and be absorbed by foreign manufacturers.

portunities are much greater. If there are 10 million hand-held calculators and 1,000 mainframe computers, and you're in the business of building a chip that is used one per each, which market would you rather approach? It's going to end up the same way it has before—the mainframe people will have to figure out how to use 3,000- to 5,000-gate standard logic blocks to manufacture computers. But the computer industry is not going to decline; it appears that the large captive shops in the U.S., notably Western Electric in telecom, and IBM in computers, are becoming more open to all worldwide semiconductor products.

DATAMATION: *And speaking of all worldwide semiconductor products . . . what about the threat of the Japanese industry and the British-American INMOS efforts*?

CROCKETT: As a purchaser of these parts, I think the competition is a healthy situation. The new parts coming from Japan have been quite innovative and highly reliable. It meant our domestic suppliers had to match or exceed that quality, and they responded well.

RUDENBERG: Something quite often forgotten in terms of innovative technology: the laws of physics are exactly the same in Tokyo as they are in Sao Paulo or Palo Alto or Detroit . . .

CARSTEN: The laws of physics are the same, but the laws of man are different.

RUDENBERG: The competitive thrust depends—as you rightly put it—on the laws of man, how hard people work . . .

CARSTEN: . . . the nature of the regulatory restrictions. . .

RUDENBERG: Oh! I was talking about *man*, you were talking about *law* . . .! Now, for a company that is Japan, Inc., or England, Inc., or France or Germany, the issues are very similar to the question of vertical integration. Can you develop a viable, independent production on a reasonable economic scale? Maybe yes, maybe no.

BENDER: The important issue is that these governments think it necessary to have an independent semiconductor capability or suffer the ultimate horror of becoming a second-class power. Europe now has 80% of its semiconductor parts coming from U.S. factories—whether here or in Europe, the factories are still U.S. controlled.

RUDENBERG: Every major country in the world wants to have its own national airline, its own satellite earth station, its own computer industry, and its own semiconductor industry. It's a question of national pride and the desire to be in control in those industries.

CARSTEN: It's one thing to have your own national airline, and it's another to have your own aircraft manufacturing facility —as the Concorde proved precisely. Each wave of increasing complexity in semiconductors has been accompanied by a wave of desire for each of the major powers to have its own capability. Unfortunately, the proliferation of processes and techniques, and consequently the facilities to optimize around those techniques, has caused, particularly in Europe, a lack of critical mass. If we assume for a moment that the smallest semiconductor company that exists as a viable independent economic vehicle is around $50 million a year . . .

LIST: I'd say $100 million to be safe . . .

BENDER: Or $50 million and some momentum . . .

CARSTEN: . . . still, it would seem reasonable that if one of the European countries is going to be able to have an economically viable company, it's going to need a nesting ground where its business can flourish. And right now, there is not $50 million work of n-channel silicon gate MOS, linear IC's or any other of the process technologies in any country in Europe. The business plans of most of the European subsidies include a high percentage of exports. The French want to sell to the Germans and the English; the English want to sell to the French and the Germans, etc. Japan was successful because the integrated circuit market in Japan—its own domestic demand—is as large as all of Europe combined; it had the critical mass necessary to achieve success without depending on a large export market. Now, if one country would specialize on one process to serve all of Europe, and another country another process, it might work out, but I don't think that's too likely because everyone has his favorite process —the one with the greatest growth potential—and who would want to take the others?

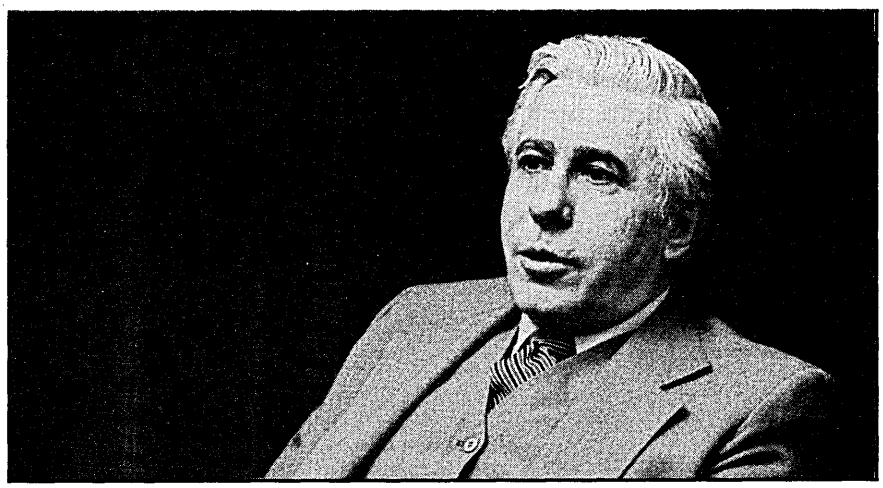
RUDENBERG: That's the way the large multinational companies allocate their products. Philips, for example, does entertainment out of the German plant, computer logic out of another, and so on.

LIST: It depends on where you put the front-end wafer fabrication; we have one in France that does p-MOS, one in Germany that does linear—someday we'll probably put in an n-MOS plant. There's no such thing as a universal front-end that makes n-MOS, p-MOS, c-MOS, linear, bipolar. . .

CARSTEN: There is such a thing but we are all fairly certain it's not the right way to go—having already tried it!

BENDER: It is a fact of life that the world market is dominated by the U.S. companies. Europe is only 20% of the total world market, and if you are starting up a business in Europe, you have to plan to compete in the U.S. market in order to build up the strength to protect your home market.

CARSTEN: We have an interesting situa-



JACK CARSTEN joined Intel in 1975 as vice president of marketing. Previously he had spent 12 years at Texas Instruments as manager of the MOS Div. He was also involved with product planning, marketing strategy, and development in various high technology product lines.

ROGER BENDER joined Honeywell in 1953 as director of planning for the Information Systems Group. In 1972 he became vice president of NEC Systems Laboratory, Inc. NEC Microcomputers was formed in 1975, with Dr. Bender as president and chief executive officer. His PhD is in mathematics.

tion here, with Intel currently only manufacturing in the U.S., Roger representing a Japanese firm, and Bernie representing ...

LIST: The world.

CARSTEN: I think we are going to see more and more worldwide producers. The Japanese will put beachheads in the U.S., the U.S. will have production beachheads in Japan, and both will try to expand in Europe.

RUDENBERG: The real basis is how well they can meet the challenges, and how well they continue to be managed. It's an international production scene and an international marketing scene. There is one thing of which I am very certain. As long as the U.S.-based companies do not lie down and play dead, as some of the consumer television manufacturers did, it will be an exciting, highly competitive business. Think of the several hundred million dollars worth of Japanese semiconductors in the Japanese tv sets that are imported into the U.S. It wasn't really a "lost" market; the tv manufacturers just went to sleep, stopped fighting, stopped working as hard as was necessary.

BENDER: The U.S. industries that failed or were successfully invaded were those that had concentrated on the U.S. market to the exclusion of the world market, and had ceased to make a sufficient investment in R&D and in new capital investment. Fortunately—or unfortunately, depending on your point of view—the U.S. semiconductor industry is world-oriented; it invests heavily in R&D, and it is not going to roll over and be absorbed by foreign manufacturers.

DATAMATION: *Any concluding thoughts*?

LIST: I'd like to end this on a high note. Back in the late '60s, Peter Drucker wrote *The Age of Discontinuity*, and in a couple chapters near the end, he defined what he called the knowledge industry. I remember reading that and saying, my God, it can't be true—but it is true, and it's happening. Drucker predicted in '68 that by the mid-'80s, half the U.S. GNP would be dedicated to the production, distribution, and consumption of knowledge, and it's happened. The last time I looked, we were running somewhere about 40%. We are turning into a knowledge industry, and it's the driving force that's keeping the computer industry and the semiconductor industry thriving.

CROCKETT: Drucker also coined the term "knowledge worker." We're just beginning to enter the era where we're making significant tools for the knowledge worker —terminals where a person is looking at several different aspects simultaneously and using the system to reach decisions, rather than just entering and receiving information.

LIST: The knowledge industry is an infinite marketplace. If you're clever enough to know how to package the products, it's not for sure you can ever fill it up ...

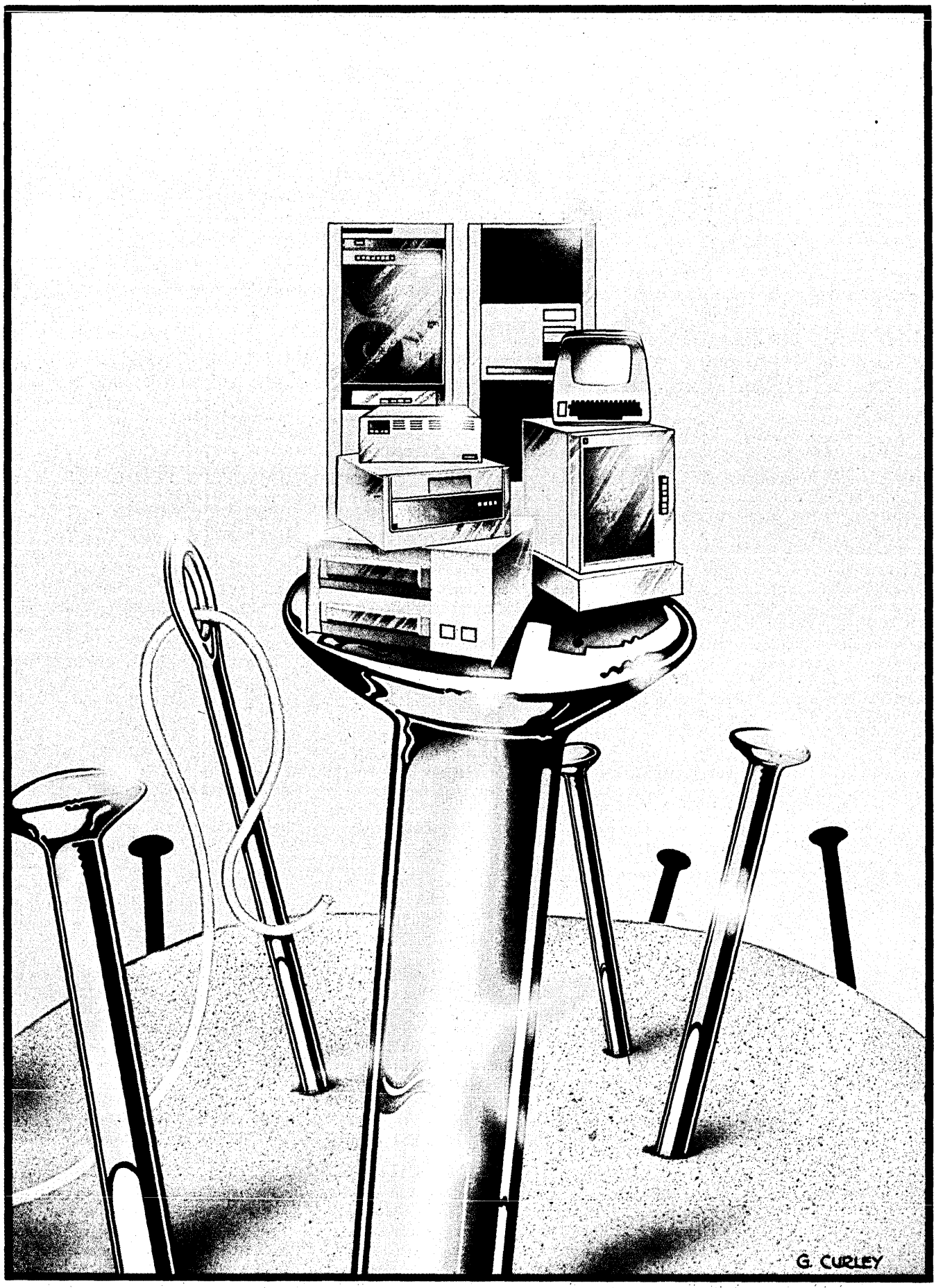
CROCKETT: In the past, computers were geared to making a financial department more productive, a purchasing department more productive, and we never asked what was necessary to make an individual more productive. Now, we view those departments, and we ask how do we make a purchasing agent more productive —the emphasis is on the individual.

BENDER: In the '60s, everyone talked about the arrival of the computer revolution, but, in fact, there was no revolution. The computer was locked away in a special room, and a few selected people interfaced with it, and passed out pieces of paper. But it's a revolution today, one in which semiconductors have played a major role. I'm not sure we're perspicacious enough to decide where the changes are leading us, but we certainly know there will be changes.

E. DAVID CROCKETT is program manager for advanced computer systems, Hewlett-Packard's General Systems Div. Most recently he has been R&D manager for HP's General Systems Div., engineering manager for the Data Systems Div. and engineering manager for advanced computer systems. He joined HP in 1972 as engineering manager for the 2100/21MX computer. Crockett holds a PhD in electrical engineering from the Univ. of Illinois; while a research assistant at that universtiy, he worked on ILLIAC II.

H. GUNTHER RUDENBERG has directed a number of assignments evaluating technological, manufacturing and market trends in the semiconductor field for industrial clients and government agencies in the United States, Europe, and Japan and Australia. He has contributed microprocessor and semiconductor memory forecasts to present ADL multiclient strategic studies on intelligent electronics, world telecommunications and impact service. He is currently senior staff member and consultant on the semiconductor and integrated circuit industry at Arthur D. Little, Inc., Cambridge, Mass. His PhD in electronics is from Harvard Univ.

BERNARD LIST is currently vp, U.S. MOS Operations, Texas Instruments Inc. His former positions include vice president, corporate engineering, at TI; deputy director, Air Force Wright Aero Labs; director, Air Force Avionics Lab, and chief scientist AFAL, at Wright Patterson Air Force Base; and manager of the systems information sciences lab at TI. List has a PhD in electrical engineering from Johns Hopkins Univ. ✱


G. CURLEY

The new technology is affecting every aspect of computer design and usage . . . and the changes have only just begun.

VLSI: THE IMPACT GROWS

by Jean-Michel Gabet

Definitions of VLSI (very large scale integration) range from a measure of equivalent-gate count greater than 1,000 gates per circuit to a minimum of 2.5mm for the width of a structural line. Whatever the definiton, the impact of this new generation of technology on the design of computers will be deep and wide. There is certainly nothing new in the idea that technology impacts the whole area of computer design and usage. The novelty here resides in the breadth of the anticipated change in the conceptualization of the computer and of the system and, by implication, the way they will be used.

The impact of VLSI on computer and system architecture will take three forms. First, there will be a price reduction for equivalent functions and performance; LSI techniques have allowed miniaturization of functions that required several boards ten years ago. Second, since the cost per function decreases, a larger set of functions can be acquired for the same basic cost. Third, VLSI will make possible the implementation of new functions mainly in programming and maintenance, which will alleviate the rising cost of operating a computer.

Availability of low-cost VLSI circuits will cause the basic cpu design to evolve toward a modularity in the implementation of the functions. This, in turn, will have implications for both the system designer and the user. Essentially, in this organization, the cpu is the slave of the control processor and the microprogram memory; the microprogram memory fully characterizes the machine in terms of instruction set capabilities. The cpu can therefore have various modes depending on what microprogram is plugged in. This is getting to be a common way to move users from older generation equipment (the cpu emulates the older machines) to the newest one.

Today, the input commands to the microprogram are, in most cases, the basic machine instructions as generated by an assembler or a compiler: all programs, regardless of their nature or the language used, are converted into a finite set of instructions that can be executed via the microprogram. This is often considered inefficient since language constructs—which are problem-dependent—are lost in the translation to machine language. In the last decade there has been a trend toward adding in the microprogram specific sequences of microinstructions to speed up execution of some language-dependent constructs. This has been the case, for example, for some FORTRAN routines (such as conversions of numbers to and from their floating point representation). VLSI offers the capability to extend and generalize this concept.

The current trend, induced by the expected return in execution speed compared to the hardware required, is to build the language-dependent microinstruction sequences in separate processors—the language processors. Not only would the execution speed gain from a more direct translation of the source code, but several of these language translators could be available on any one machine. Each program execution could then be optimized around the language used to implement it.

Going one step further and considering that, with this scenario, language compilers do not exist any longer as software products, "unbundled software" takes its full meaning. To acquire a new language capability, a user will have to buy a language processor and associated translator memory, and have this hardware physically plugged into the system.

VLSI will cause a drastic and rapid change in another area of cpu which in the long term will benefit the mainframe manufacturers: main memory space will increase in the next generation of computers, and within five years it will be common to have four megabytes in minimum configuration for medium-size systems and 16 megabytes for large systems. Several factors will be at work: the first one rests on the observation that performance is largely a function of the available addressable memory space. A number of routine operations are inherently memory bound, even in business applications: this is the case, for example, of most transactions with large data bases. The need for large arrays of data is also obvious for scientific applications such as simulations and matrix handling.

Second, large memory space will remove a number of constraints with which the operator and the programmer have had to contend. The net result is a swap between availability of hardware and staff time.

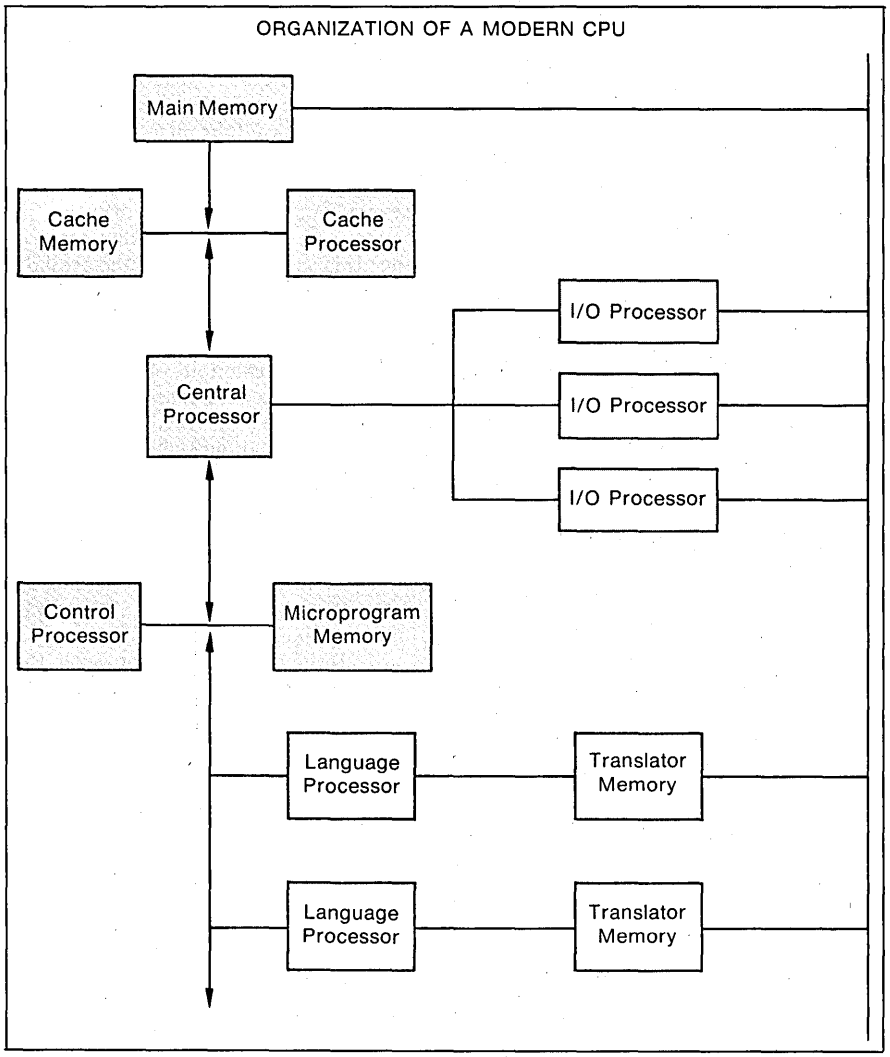
It should be stressed, however, that larger memory consumption is also a business necessity for all computer manufacturers. At current levels of memory shipment, this business will dwindle rapidly if the average number of megabytes per system remains constant: aggressive pricing of memory products will force new architectures to use memory space liberally.

This trend toward greatly increased addressable memory space is bound to favor the manufacturers who have used a 32-bit-plus architecture. Assuming that at least part of the game plan will be to migrate the 1970's users to the 1980's architectures, the task will be considerably simpler if the word format does not change in the process.

The move toward expanding memory space has already started and has touched virtually all product line announcements of the last couple of years. This will be, at least partially, the reason for a steady migration to a 32-bit architecture for minicomputers and other small-to-medium general purpose machines.

VIRTUAL MEMORY FADING

Virtual memory was the answer to the problem of programs and data sets being too large to be contained in the real addressable space. The first approach was to partition the program into overlays, taking into consideration the dependence or independence of certain parts of the program. The system would then respond to explicit commands and swap in or out those program parts according to an algorithm determined by the programmer.



The next improvement was to let the system split a program, somewhat arbitrarily, into fixed size pages or variable size segments and have it manage, through memory-fault techniques, the traffic between the main memory and the virtual memory. In the absence of indications from the programmer, the swapping algorithm was designed to maximize memory use, which is not a trivial task and is high on overhead if sophisticated enough to be efficient.

A large increase in main memory space is bound to considerably reduce the need for virtual memory techniques and associated overhead. However, it is unlikely that the concept will disappear completely since memory requirements have a tendency to grow at least as rapidly as memory availability. Furthermore, it is quite unlikely that users will accept a limitation—almost any limitation—to the size of the program or data set that can be handled, as was common 15 years ago.

A compromise will be that the page size—or segment size—could be increased to the extent that a good percentage of the programs will not need more than a single page. Moreover, there will be a noted decrease of the sophistication of the automatic algorithm in charge of memory use, with a corresponding drop of the associated overhead.

It can be shown easily that a given processing throughput can be obtained more cheaply by coupling several low-cost microprocessors than by building a single monolithic processor; this is because the cost of technology is decreasing more rapidly than the speed of technology. Unfortunately, there is a fallacy in the argument that many federated microprocessors could have the processing power of a large system, say a 370/158. Except for some specific applications such as pattern recognition, for example, there is no practical way to have a sequential program (most programs are inherently sequential in nature) execute in a parallel mode simultaneously on a smaller processor. Even if some sections of code could satisfy the parallelism criterion, the other sections that are strictly sequential would idle the rest of the processors enough of the time to destroy all cost-performance advantages of the configuration.

There is, however, another type of coupling that can take advantage of microprocessors, even in a large machine. Pipelining, a concept introduced on large arithmetic units, can be generalized to include the segmentation of any large transaction into serial subtransactions which can thus be processed on separate processors, each accepting as input data the output of the previous one. Each processor therefore becomes functionally—and perhaps physically—specialized. A centralized overall control, which is still the role of the cpu complex, has to be retained.

This concept is not particularly new and there are examples of architecture in which some of the cpu functions have been locally distributed. This is the case of the peripheral cpu's of CDC's Cyber series; in a more loosely defined form, this is also the case of the front-end processors. Another form will be crystalized in the concept of data base management back end (as will be explained below).

In terms of in-board functions, the microprocessors will have a more important role as they take over functions that were assumed primarily by the central processor or did not exist at all.

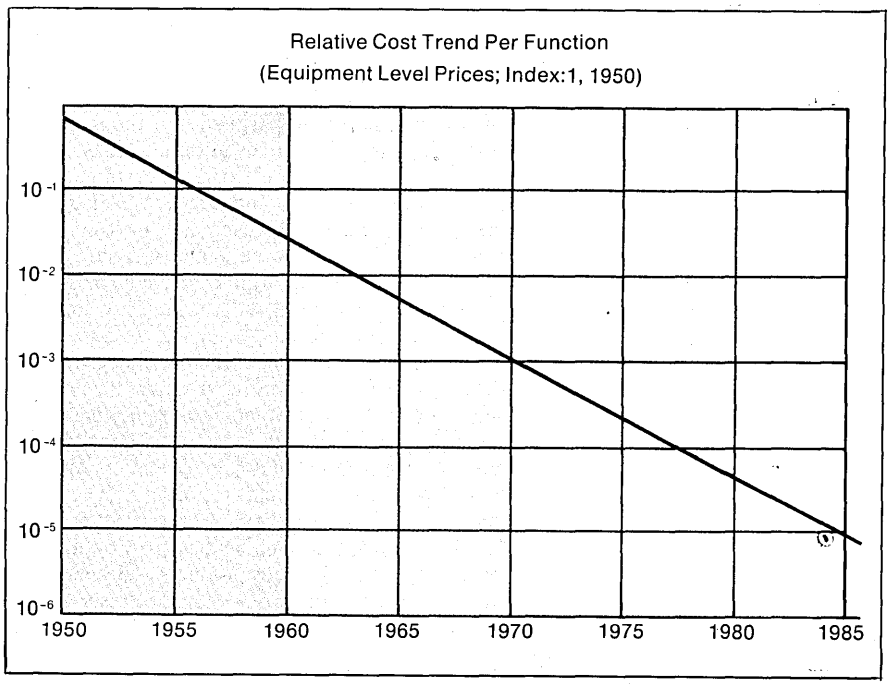
The distribution of operations can be very effective in the area of input-ouput functions. Those functions are well defined and the interface with the main cpu can be formulated without ambiguity. Moreover, within certain limits, I/O functions can be application-dependent and therefore user-programmed. This is the case not only of traditional multiplexor and fast I/O channels, but also of communication processing. Intelligent functions that can be handled through microprocessor-based I/O channels include error checking, retries, request queuing and scheduling, buffering, interrupt handling, channel diagnostics and data formatting. One of the benefits obtained through this concept is less sensitivity of the main cpu to the input/output-based activity—and therefore a computing throughput more independent of the I/O traffic. Another benefit is an increased localization of the respective functions, which makes executive software easier to design, implement, and test. The latter argument, however, involves a shift of the burden toward the design of the interfaces for software functions.

THE HIGH COST OF MAINTENANCE

One of the most crucial issues for the computer industry in the 1980s is the rising cost of maintenance, which today accounts for about 5% annually of the purchase price of a system (much more on many small systems), and increases the cost of ownership. This problem is shared by the end users who have to pay for maintenance and by the manufacturers who have difficulty controlling maintenance costs. Maintenance activity is labor-intensive and its cost follows the rising cost of personnel; it is also capital intensive due to the necessity of having spare parts inventories that do not produce revenue. It is, therefore, natural to seek solutions where the declining costs of hardware could be substituted for the rising costs of trained personnel.

Cost of the diagnosis of a failure is the first important maintenance cost component that can be helped by extra hardware. Today this is implemented to various extents by almost all mainframe manufacturers and is spreading fast to minicomputer manufacturers: the basic idea is to design, in the computer, specific input, output, and diagnostic functions that can be used to test the various parts of the circuitry. The testing can be done at the board level, as it is done on some minicomputers and some peripherals—the input function is a switch and the output function a simple LED; it can also be done in a more exhaustive way in larger mainframes. In the latter, a minicomputer is used to perform the tests and isolate the faulty board or component. In most cases, the diagnostic processor is actually bundled with the system and used by the maintenance crew for fast detection of a problem area. This technique is still new; automatic diagnosis is generally not an easy task, given the number of circuit combinations to be checked. The availability of inexpensive technology will make possible increasingly sophisticated diagnostic functions, operating from within the mainframe and monitoring the behavior of the system.

The return of a diagnostic processor can be used not only for remote hardware diagnosis but it is also a powerful tool helpful in software maintenance. A modem attached to the diagnostic processor is required. A remote operator then has access to all functions of the machine; special programs can be entered, which will test various parts of the mainframe and peripherals; the results of the tests go to a remote specialist who can analyze the situation and determine the cause of the failure. If the failure is due to a software error, in most cases it can be repaired on the spot either by patching the code directly in memory or by substituting a working sequence of instructions for the faulty one.



In the not too distant future, diagnostic hardware will be specific enough to accurately pinpoint the cause of the failure, allowing users to take the proper action, such as replacing a defective board, and thus placing the burden of the repair in the user's hands. This can be expected first for the small computers, spreading to larger machines in the late 1980s.

In all cases, hardware-based diagnostic capabilities will be a factor in reducing maintenance costs in both the areas of diagnosis and repair.

The ultimate step is, of course, to protect the system against functional failure by using redundant hardware. The cost of the hardware will be increasingly easy to justify in the face of the consequences of a system failure.

There are multiple signs that data base management will be the most dynamic application of the 1980s. Data base management merges the user's need for more sophisticated data manipulation techniques with the technological capabilities of computers. It will also be a source of revenue for software vendors and equipment manufacturers alike.

Data management, which refers to all functions associated with retrieving, sorting, updating, and filing data that belong to a data structure, is an integral part of the application: it is run concurrently with the application on the same mainframe and contending with the same general resources, such as memory space, cpu time, and peripheral availability. In reality, data base functions are fairly repetitive; they may be standardized and often require a large set of resources totally out of proportion with that of the application program itself. For example, a simple merge operation may require a very large amount of memory if it has to be done within a reasonable time. Instead of being under the control of the task that requested it, data base management functions should be performed on a specialized processor that would have the sole task of efficiently managing data structures. A nontrivial implication of this approach is the definition of a language which can be used as an interface to the data base manager.

This back-end concept could then be designed and optimized for a specific set of tasks. The processor need not be a general purpose cpu, but should be highly specialized for data moves, string manipulation, string compares, and sophisticated Boolean operations. Furthermore, any data structure handling requires a large amount of directly accessible memory, the bulk of it using magnetic bubble technology. This technology is quite suitable to be a staging device without introducing an extra level of I/O activity to get the data in main memory.

A CHANGE IN SYSTEM CONCEPT

Distributed processing is no doubt a direct consequence of LSI and VLSI. Only drastic reduction of

the cost per function could permit multiplication and dissemination of those functions throughout an organization-wide system; this applies to logic functions as well as memory functions. In the ideal case, the same functions are exactly replicated at the local sites, the common element being the control computer.

Whereas, in the past, system design rested almost exclusively on the prominence of the main cpu, in the sense that it was the element of the system to be optimized, the emphasis will be placed more and more on the system efficiency. This approach stresses the shift to the distribution of functions throughout the component of the system with two major objectives: locally, the system should be justified in terms of ease of access to, and availability of, the information; globally, it is justified through performance and quality.

System design will change as a result of this new orientation. Already the problem can be felt in the impossibility of defining a criterion of efficiency for distributed systems. As computing and memory functions drift away from the central computer site, the old concept of price/performance loses its meaning. Furthermore, it has become difficult to compare alternatives in the conceptualization stage of a distributed system, making the choice of the equipment a difficult task. The solution, to this day, rests on a careful analysis of all possible solutions, factoring all tangible and intangible benefits for each.

However, the system designer should have a clear view of a new challenge: there is no general purpose distributed system. Each end-use industry has its own requirements, and variations exist within the same industry. As always happens with new techniques, leading users are eager to pioneer the concept and make the front-end investment to implement it. The time has come, it appears, for the manufacturers to offer viable solutions based on past experience and to address current market needs.

This task will breed a new type of system analyst, less interested in the actual performance of a cpu or that of a storage device, but more involved in interface problems—hardware and software—and responsible for an efficient coordination of a set of numerous and physically or geographically scattered functions.

VLSI will not leave untouched the Achilles' heel of the computer industry: software. Software design and programming practices will change in at least three aspects, all of them aimed at reducing software costs per instruction. The first one will be the microcoding of more and more functions which until now have belonged to the software world. If the real delineation between software and hardware can be considered a combination of firmware space and changeability, it can be successfully argued that the former is getting so cheap as to remove it as an obstacle to the hardwiring of certain, sometimes complex, functions. It is also clear that as software disciplines have emerged in the last decade, some software functions are now well known and have become standard, not necessarily in their implementation—which is often machine dependent—but in their basic design and interface structure. This is true for a number of utility macroinstructions (conversion, data move, I/O operations); this is also true for language compilers and for operating system primitives. The software, ideally, should be reserved for those parts of the machine that are programmable; the tangible products—either hardware or firmware—should be reserved for those functions that are not changeable or change infrequently during the product life.

Another impact of VLSI on software deals with executive software design; executive software, or operating system software, is necessary to establish a bridge between the hardware and the user programs. Typically most executive software belongs to the category of functions that are factory modifiable (known as software revisions or updates). However, in reality, the difficulty of accurately predicting the capabilities of the operating system end-product has kept it from being firmware-implemented. Only a proven and stable executive program could find itself wholly in firmware. Design of executive software is based on two prime considerations: its functional capabilities and the amount of trade-off to be done between conflicting constraints, namely speed of execution and available space; speedy execution of a program often requires more code space. VLSI memory, because it is much cheaper and therefore will be found in more abundant quantity, will allow this trade-off to ease toward more redundant, and therefore faster, code execution.

But the most significant impact of larger available memory space will be in the programming activity itself: overall, a large effort in software development has been spent optimizing memory usage; this was the case in operating system design where resident system functions had to be carefully accounted for, where memory swapping algorithms were finely tuned, and frequently used code was compacted. This was also the case of user programming where overlays had to be anticipated, input data had to be ingeniously segmented, and assembly language was viewed as optimum.

In more than one programming shop, optimized code is still considered an art, to the detriment of the economies of the overall programming task. For decades, the software discipline has found itself trying to deal with the changing constraints of hardware and, therefore, never developed into a stable set of definitions and procedures. VLSI will, once again, upset the terms of this balance; and the programming environment will yield a new set of practices: efficient code will be increasingly defined in terms of the time it took to write, test, and document it, and less in terms of how much memory space it occupies.

Semiconductor specialists agree that there is no end in sight to the improvement of computer technology, at least at the component level. There may be quite a time gap, however, between the availability of technology and its insertion into an equipment level solution for a computer system; this gap is primarily the result of the caution exerted in the application of the new technology to system level functions: if it is too audacious, it runs the risk of either being unresponsive to the market or being supplanted by cheaper technology; if it is too conservative, it cannot be price competitive.

On the user side, VLSI will bring important changes in the area of system analysis which will force end-users to get more involved with the design of the system at large, and less involved with the optimization of the different components of the system, including the cpu. ✲

JEAN-MICHEL GABET

Dr. Gabet is currently director of research for the computer division of Gnostic Concepts, Inc., a market research and consulting firm. Previously he was project manager at Hewlett-Packard, working on the HP 3000 project. Dr. Gabet's PhD in applied mathematics is from Paris Univ. (France). Prior to earning his degree, Dr. Gabet spent two years at Cii in Paris as a design engineer and one year teaching at the National Univ. of Panama.

Both sides now

North Star Announces —

Double Density x 2 Sides = Quad Capacity!

The North Star Horizon now delivers quad capacity by using two-sided recording on our new mini drives! That's 360,000 bytes per diskette! A four drive North Star system accesses over 1.4 megabytes of information on-line! Think of the application flexibility that so much information storage can give you!

North Star has quadrupled the disk capacity of the Horizon computer but prices have increased a modest 15 percent. On a dollar per byte basis, that's a bargain that is hard to beat!

The proven North Star disk controller was originally designed to accommodate the two-sided drives. North Star DOS and BASIC are upgraded to handle the new capacity, yet still run existing programs with little or no change. Of course, single sided diskettes are compatible with the new disk system.

North Star Horizon OEM Prices (Include 32K RAM)*

Horizon 1-32K-Q	$1510
Horizon 2-32K-Q	$1945
Horizon 1-32K-D	$1365
Horizon 2-32K-D	$1655

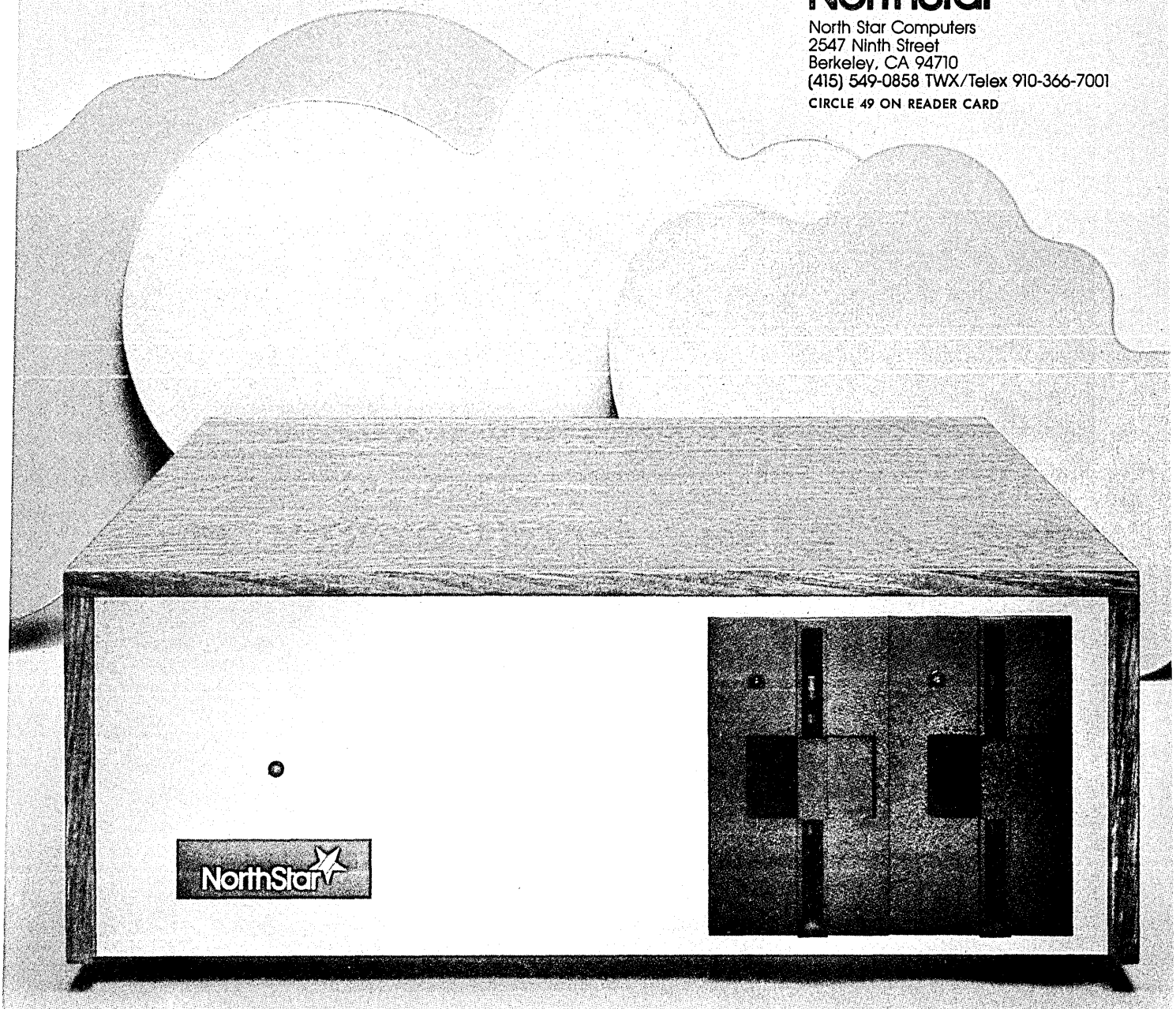
*in quantities of 100 or more.

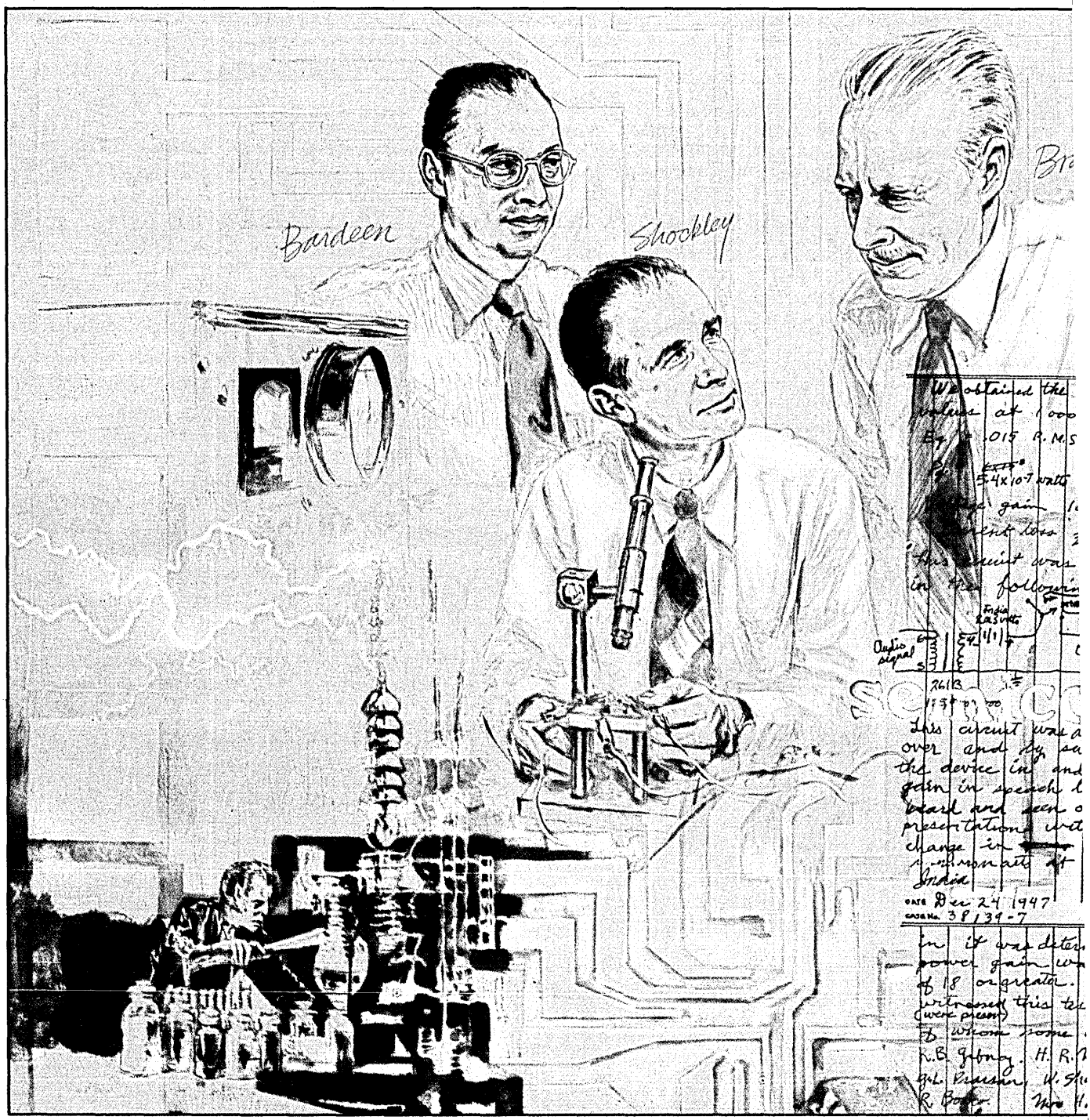
Get both sides now! Call Bernard Silverman for more information.

NorthStar

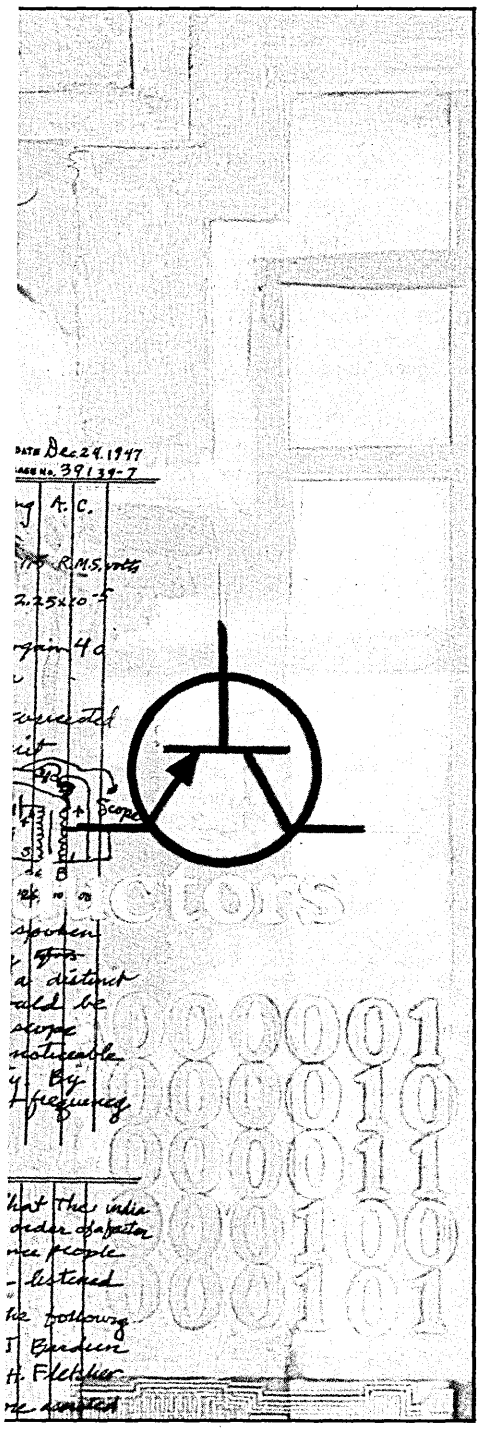
North Star Computers
2547 Ninth Street
Berkeley, CA 94710
(415) 549-0858 TWX/Telex 910-366-7001

CIRCLE 49 ON READER CARD




Bardeen
Shockley
DATE Dec 24 1947
CASE No. 38139-7

"He remembered the old cat's whiskers detectors that were used at the turn of the century, and decided to give them a try."

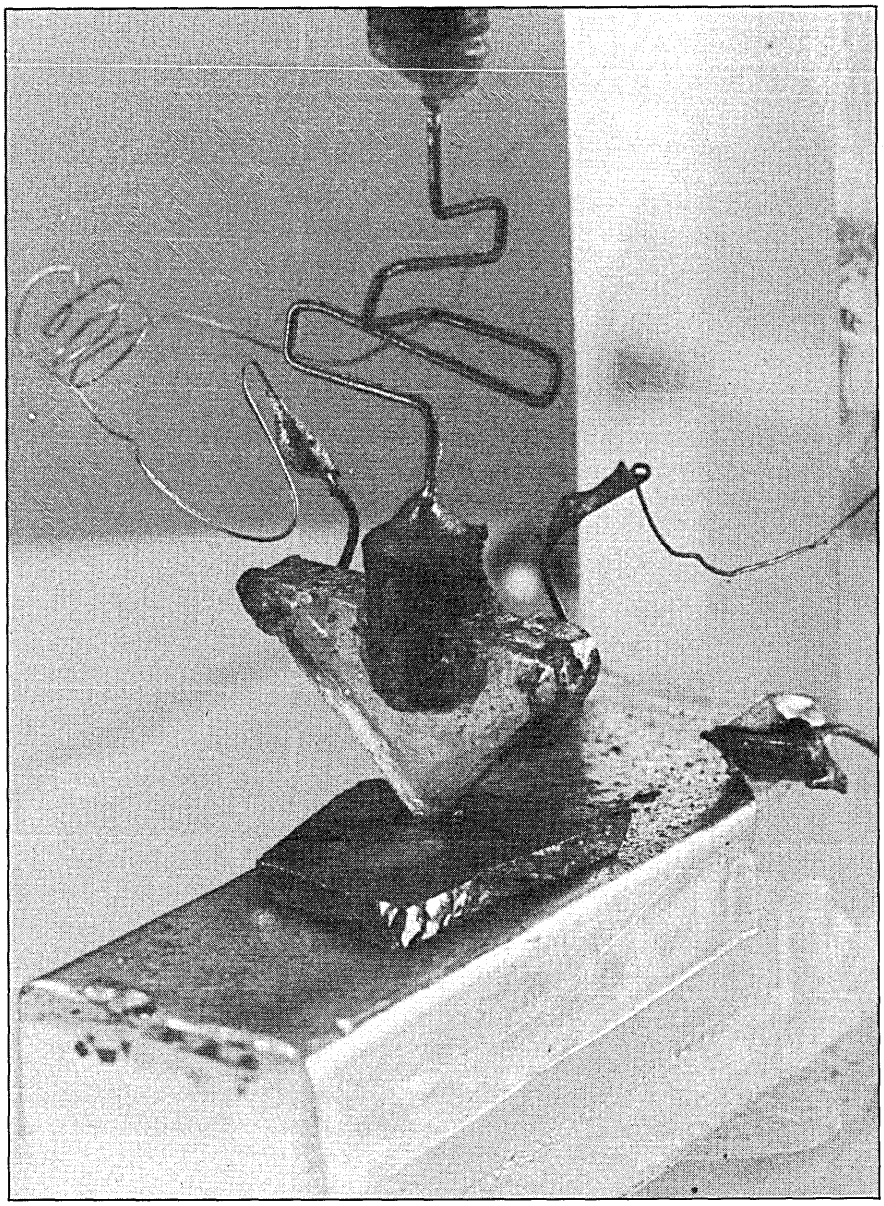


DISCOVERING THE TRANSISTOR . . . A PERSONAL ACCOUNT

by Walter Brattain

Early in 1940, Marvin Kelly, director of research for Bell Telephone Laboratories, called Joseph Becker and me to his office. He wanted us to witness a demonstration using silicon, a then little-understood semiconductor, being given by Russell Ohl, a staff member. Ohl showed us a small black rectangular block with two metal contacts. When light from a flashlight illuminated a narrow region near the middle of this piece of silicon, a photoelectromotive force (emf) of about 0.5V developed. This was hard to believe. In the first place, the contacts were not being illuminated and the photo emf was ten or more times larger than any we had ever seen. Moreover, the silicon was black and opaque to visible light. In fact, I did not believe what I saw until Ohl gave me a piece to work with in my own laboratory.

This was the first *p-n* junction. Some time before, G.C. Southworth had been having trouble getting something to detect the short radio waves (microwaves) with which he was working. At that time, vacuum tubes did not operate at these wavelengths. He remembered the old cat's whiskers detectors that were used at the turn of the century, and decided to give them a try. (A cat's whisker, named after the object it most resembles, is merely a thin, sharply pointed wire, about 0.1mm in diameter, of a conducting material. Typically it has excellent spring properties.) Southworth went to the second-hand radio market in the Cortland Street section of New York, found some cat's whiskers detectors, dusted them off, and tried them. They worked.



This first transistor, a "point-contact" device, amplified electrical signals by passing them through a tiny bit of germanium, basically the same operation performed by today's silicon junction transistors. (Photo courtesy of Bell Labs.)

Hearing about it, Russell Ohl became interested in the phenomenon. The detectors were semiconductors, made of either silicon or galena (lead sulfide). Ohl decided to concentrate on silicon. The silicon you could buy was very nonuniform in its detection properties. The detection involved rectification of the radio wave at the point of contact of the metal cat's whiskers with the silicon. Sometimes the rectification would be in one direction and sometimes in the opposite direction—sometimes not at all. Ohl asked the metallurgists at Bell Labs to see if they could not make the silicon more uniform by purifying it. John H. Scaff and Henry C. Theuerer soon found they could purify the silicon by melting it in high vacuum. Some of the ingots they made would rectify all one way and other ingots would rectify all the other way. Those that conducted best when the silicon was negative were called *n*-type and the other *p*-type. One ingot that Scaff and Theuerer gave Ohl was all *n*-type on one end and all *p*-type on the other end, and a piece cut out to include the boundary between these two regions was the one Ohl had demonstrated.

Scaff and Theuerer went on to find that the conductivity in silicon was due to very small traces of impurities. These impurities were elements in the fifth column of the periodic table, such as phosphorus, which gave excess electrons when added and made silicon *n*-type. Elements in the third column, such as indium, gave excess holes and made silicon *p*-type. When Scaff and Theuerer told Becker and me about this, we were (from our experience with copper oxide) very skeptical that the solution to the problem could be this simple!

At that time the impurities were below the level of spectroscopic detection. The odor of the ingots as they came out of the oven was traced to the phosphorus by Scaff and Theuerer. (My late wife—a chemist—made the comment then that a chemist's nose was his most sensitive detector.)

POSTWAR RESEARCH BEGINS

In January 1946, because of Bell Labs' interest in the use of semiconductors in circuit devices and the possibility of a solid-state amplifier, scientific research to enable us to understand semiconductors was resumed in earnest. The research team was headed by William Shockley and Stanley Morgan. Shockley, a theoretical physicist, worked as part of the research team he headed. John Bardeen, also a theoretical physicist, joined the group.

At the first meeting of the group, it was realized that in spite of all the work done before and during the war we were still far from a real understanding. One reason was that copper oxide and other semiconductors on which the early work had been done are very complicated solids. Silicon and germanium are the simplest, and the decision to try to understand these first was made. As elementary semiconductors, these two contained atoms that were held together by a strong covalent bond—a bond well understood quantum-mechanically. The only important defects contributing to semiconductivity had to be other atomic elements! Our work was therefore directed toward a fundamental understanding of the problem, although we were well aware of the technical importance of a semiconductor amplifier if one could be made.

Besides those already mentioned, our group included Gerald L. Pearson, who was primarily interested in the bulk properties of semiconductors; Robert B. Gibney, a physical chemist; and Hilbert R. Moore, a circuit expert who aided greatly in making measurements and devising novel circuits for our experiments. I was primarily interested in what went on at the surface where contact was made, or at the boundary between *n*- and *p*-types. Among our group, only Pearson and I had worked extensively with semiconductors before the war.

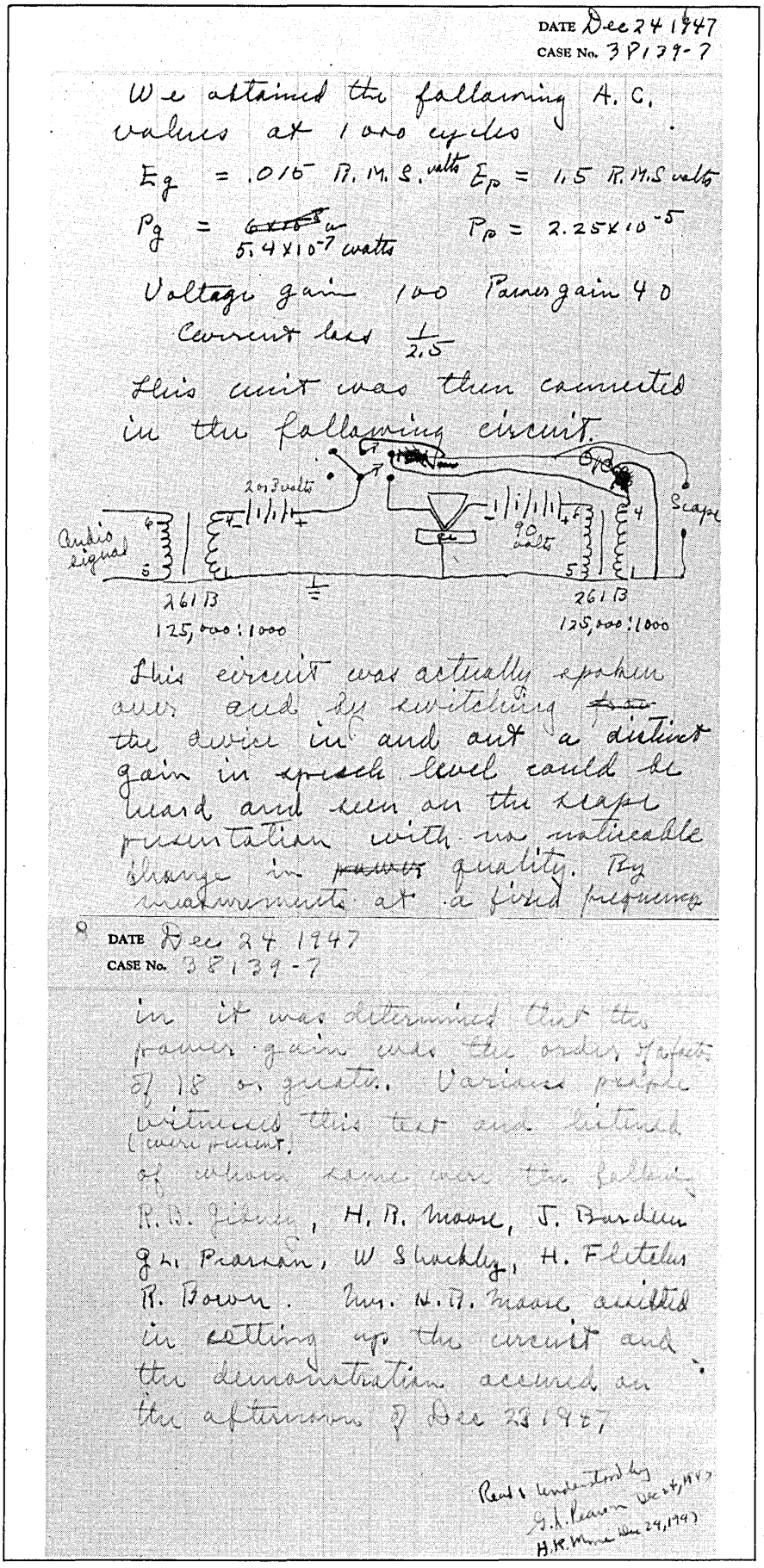
Scaff and Theuerer were in a position to furnish us with polycrystalline ingots of either *n*- or *p*-type silicon or germanium of specified resistance. This, of course, was a great help. Based on the Mott-Schottky theory of rectification, Shockley had previously come to the conclusion that it should be possible to control the density of electrons near the surface of the semiconductor by means of an electric field applied between the surface

and a metal electrode insulated from the surface. If this were true, one could vary the conductivity in the surface of a thin wafer semiconductor by means of the field and thus make an amplifier. Many experiments were devised by Shockley to test this hypothesis, but the effect was several orders of magnitude less than predicted. (The failure to confirm these hypotheses has not been published. For an account of some of the experiments, see: Brattain, W.H. and Bardeen, J., *Phys. Rev.* 74, 231, 1948.)

Moreover, several predictions of the theory did not agree with experimental results. In order for two electrical conductors to be in equilibrium there must, in general, be an electrostatic potential difference between them (contact potential). The prediction was that there should be such a potential between *n*- and *p*-type silicon and *n*- and *p*-type germanium. Experiments showed that this potential was very small, almost zero. Different metals should have different contact potentials with respect to the semiconductor. If the sign of this potential was not right there should have been no rectification at the point of contact; yet, experimentally, all metal points worked more or less equally well. Additionally, S. Benzer at Purdue found that contact between two pieces of germanium, one *n*-type and one *p*-type, did not act as one would expect. (See Benzer, S., *Phys. Rev.* 71, 141, 1947.) I believe the group as a whole slowly realized that these results were all of a piece, and it was Bardeen who successfully explained them all by applying to this problem the concept of surface states; that is, that the electrons could be trapped at the semiconductor surface, and that the semiconductor was in equilibrium with its surface before any electrical contact was made to it. (See Bardeen, J., *Phys. Rev.* 71, 717, 1947.) This, of course, implied a space-charge layer in the surface of the semiconductor equal and opposite to the charge trapped on its surface. Consequently, the electrostatic potential change between the interior of the semiconductor and the surface which was necessary for rectification was a property of the semiconductor and its surface—independent of metal contact. This theory immediately suggested new experiments.

GROUP SESSIONS INSPIRE

When any novel ideas or experimental results were obtained by any member or part of the group, it was our practice to call the group together for a presentation and discussion. These sessions were inspirational, and it was during such sessions that many of the better sug-



"...on December 23, 1947, two gold contacts less than two-thousandths of an inch apart were made to the same piece of germanium; and the first transistor was made. This was an eventful day..." (The original notes of Dr. Brattain, courtesy of Bell Labs.)

gestions for further work were made. Two suggestions for experiments came about as a result of the presentation and discussion by Bardeen of his theory. Shockley suggested that, if trapping centers for electrons on the surface were limited in number, one should be able to measure some small change in contact potential between *n*- and *p*-type samples of, say, silicon, as the samples became more strongly *n*-type and *p*-type through the introduction of more and more of the proper impurities. I suggested that if extra electrons and holes were excited by illumination in the surface region (where there must be an electric field due to the space charge), the electric field would tend to separate the excited electrons and holes, thus changing the surface charge and contact potential. Both these experiments were performed successfully.

THE QUANTUM JUMP

Walter Brattain and his supervisor and colleague at Bell Laboratories, Joseph Becker, first started work on semiconductors in 1931. At that time, they used copper oxide, one of the better-known semiconductors. Neither good insulators nor good conductors, semiconductors first gained notice because of their photoelectric properties and their use in rectifiers where they could conduct more easily in one direction than in the other. Serious attempts to understand the electrical properties of these solids began as early as 1920, when many scientists began to become interested in the problem. The advent of quantum mechanics provided the first real understanding of how atoms were bonded together into solid crystals. Quantum theory also led to the understanding of how electrons in metals were free to move and conduct electricity, and A.H. Wilson showed how that theory could explain insulators and semiconductors.

The Bell System became interested in copper oxide because of its rectifying properties and use as a modulator of electrical communications signals. There were two main problems: flow of current inside the solid and flow of current at contacts between the semiconductors and metals. At such contacts current would flow more easily in one direction than in the other (rectification), and also at such contacts illumination at the surface would sometimes produce a voltage (photoelectromotive force, or emf). A light shining on the main body of the semiconductor would also increase its electrical conductance (photoconductivity).

Others suggested that we try to reduce the temperature low enough so that the electrons trapped at the surface could be "frozen" and a field effect observed. Experiments by Pearson and Bardeen showed that this was the case.

In another experiment, I attempted to measure the change of potential at the germanium or silicon surface as a function of temperature. Condensation of moisture from the air on the cold semiconductor surface interferred with this experiment. As a result we decided to try immersing the system in an insulating liquid. The apparatus had been arranged to measure contact potential and photo emf's and, when the liquids were tried, large changes in photo emf's were observed. Some of the liquids tried (such as water) were not strictly insulating, but were electrolytes. I showed these phenomena to several members of the group, each of whom walked away without any suggestions. While I was showing these phenomena to Gibney, he suggested that I try varying the potential between the semiconductor surface and the reference electrode. When using an electrolyte we could make the photo emf very large by this means. By changing the sign of the potential we could make the photo emf go through zero and change sign. It was recognized that this was, in essence, Shockley's field effect. By using the electrolyte, we could vary the space-charge layer and potential inside the surface of the semiconductor.

These results were presented to the group as a whole, and one or two mornings later Bardeen came to my office with a suggested geometrical arrangement using this effect to make an amplifier. I said, "Let's go to the laboratory and do it." We covered a metal point with a thin layer of wax and pushed it down on a piece of *p*-type silicon that had been treated to give it an *n*-type surface. We then surrounded the point with a drop of water and made contact to the water. The point was insulated from the water by the wax layer. We found, as expected, that potentials applied between the water and the silicon would change the current flowing from the silicon to the point. Power amplification was obtained that day!

Bardeen suggested trying this on *n*-type germanium, and it worked even better. However, the water drop would evaporate almost as soon as things were working well, so at Gibney's suggestion we changed to glycol borate, which hardly evaporates. Another problem was that amplification could be obtained only at or below about 8Hz. We reasoned that this was due to the slow action of the electrolyte. Optimum results were obtained with a dc negative bias on the electrolyte when using *n*-type germanium. Under these conditions we noticed an anodic oxide film being formed under the electrolyte. We decided to evaporate a spot of gold on such a film and, using the film to insulate the gold from the germanium, use the gold as a field electrode to eliminate the electrolyte. The film was formed, the glycol borate washed off, and the gold spot with a hole in the middle for the point was evaporated. When this was tried, an electrical discharge between the point and the gold spoiled the spot in the middle; but by placing the point around the edge of the gold spot, a new effect was observed.

In washing off the glycol borate, we had inadvertently washed off the oxide film which was soluble in water. The gold had been evaporated on a freshly anodized germanium surface. When a small positive potential was applied to the gold, holes flowed into the germanium surface, greatly increasing the flow of current from the germanium to the point negatively biased at a large potential! Four days later, on December 23, 1947, two gold contacts less than two thousandths of an inch apart were made to the same piece of germanium; and the first transistor was made.

This was an eventful day, and here

CHARGE-CARRIER MOBILITY

The scattering of holes and electrons can be separated into two parts. In the case of such covalent nonionic lattices as those of silicon and germanium, one part consists of the interaction or scattering of the charge carriers by the elastic thermal vibrations of the lattice (phonons). This effect increases with temperature; i.e., the lattice reduces the mobility as the temperature rises. Electron mobility is generally greater than hole mobility at any given temperature. For relatively pure samples at high enough temperatures, this is the whole story. The mobilities are an intrinsic property of the lattice alone. At low temperatures and high impurity concentrations, the second part is important: impurity scattering due chiefly to scattering of holes and electrons by ionized impurity atoms.

It was also found that this second part depends on the added concentrations of either holes or electrons (whichever the case), which equals the difference between donor and acceptor impurity concentrations.

Emulation—Tomorrow's solution to data communications problems. Today.

The new expanded INTERSHAKE® — the fully programmable, interactive data comm emulator.

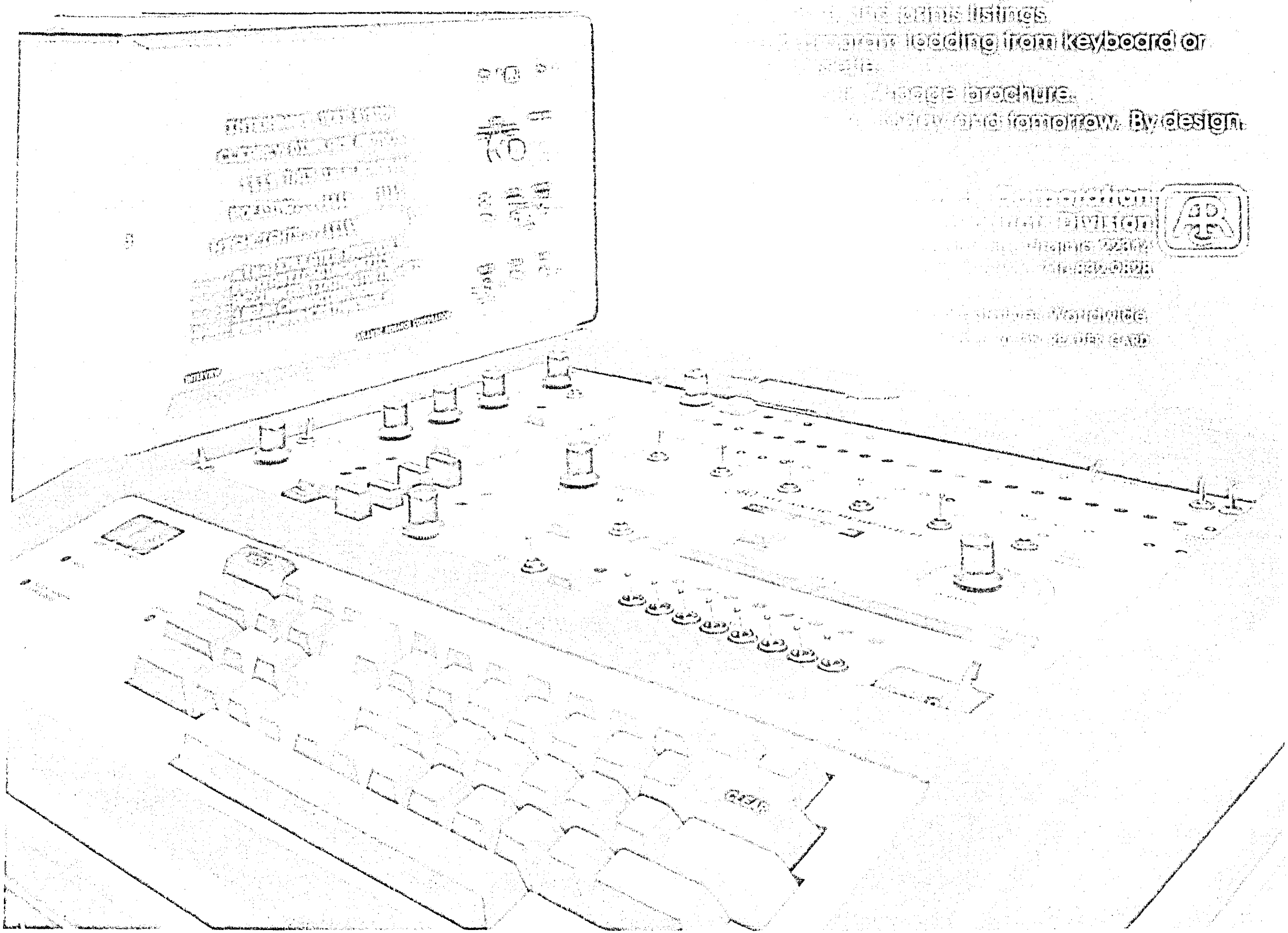
There's a difference between simulation and emulation. The difference is INTERSHAKE. By design.

Capable of testing at up to 256 Kbps, INTERSHAKE has even more power to spare at slower speeds such as 72, 56 or 9.6. That means [illegible]

Compare these features. Then join the INTERSHAKE User's Group.

- Three units in one: data monitor, analyzer and emulator.
- Fully interactive testing of packet networks, SNA, X.25 and bit-oriented protocols.
- Test IPARS, SDLC, BISYNC protocols plus 3270 and the new 3276 type terminals.
- INTERTAPE™ bulk storage may also be used independently.
- [illegible] CRT may be used independently.
- [illegible] library of programs, free.
- [illegible] school, free.
- [illegible] reduces program develop- [illegible] prints listings.
- [illegible] loading from keyboard or [illegible]
- [illegible] brochure.

[illegible] and tomorrow. By design.



[illegible] Division

[illegible] Worldwide.

"NCR's VRX has cut our run time by 36 percent," says Yasuhiko Okiyama of Sumitomo Bank.

OKIYAMA:
Sumitomo's sudden growth — from $900 million to $1.3 billion in a single year — has caused us to upgrade our EDP system. We are moving from an NCR Century 300 to two NCR V-8580's. And moving smoothly despite the pressure of increasing volume.

NCR's BOB SULLIVAN:
VRX (NCR's Virtual Resource Executive) is making a substantial contribution to increased productivity.

OKIYAMA:
We are using VRX to run our batch operations. VRX has cut our run time for these programs by 36 percent.

Yasuhiko Okiyama (left) is Vice President and Manager, Sumitomo Bank of California, San Francisco, the 92nd largest bank in the U.S. Bob Sullivan is an NCR district manager.

SULLIVAN:
Your online experience has been impressive, too.

OKIYAMA:
We have seen a 15.4 percent improvement in the handling of online transactions due entirely to the new generation hardware. And we know there will be another impressive jump in efficiency when VRX takes over the online operations. Under VRX, error recovery takes just seconds. With the old system, we needed a full minute.

SULLIVAN:
VRX offers full dynamic resource allocation and virtual memory with no rigid memory partitioning. You can run up to 35 jobs simultaneously. And Sumitomo will soon be using Online Program Development (OLPD), a feature of VRX that multiplies the effectiveness of a programming group.

OKIYAMA:
Still, the most significant point I can make about this move from the last generation of NCR equipment to the next is that our old programs continue to run. We are making the transition easily because none of our software has become obsolete as a result of the change in hardware.

SULLIVAN:
That's NCR's Migration Path Engineering. One of our primary objectives is to provide easy alternatives for our users as the demands on their systems change. To eliminate dead ends. So that every user can upgrade gradually as his volume grows.

In the NCR office near you, there is an NCR account manager like Bob Sullivan who knows your industry and knows NCR systems, including VRX. To learn more about what an NCR system can do for you, phone him at your local NCR office. Or write to EDP Systems, NCR Corporation, Dayton, Ohio 45401.

NCR
Complete Computer Systems

CIRCLE 61 ON READER CARD

1978 Datapro Survey acclaims VOLLIE best online programming system with 3.9 out of 4.0.

Bravo! Bravo!

ADR's VOLLIE, currently installed at over 450 sites, was rated best by Datapro for the DOS, DOS/VS, and DOS/VSE CICS user. It has its own online library and interfaces to The LIBRARIAN, source statement and procedure libraries that permit real-time updating. VOLLIE has RJE/RJO capabilities for submitting jobs, displaying queues and retrieving output at the terminal. Syntax Checkers for COBOL, JCL and JECL and a complete set of online utilities for data management. VOLLIE also has VOICE, its interactive online programming language with full-screen formatting capabilities.

3.9 for Overall Satisfaction. Higher than any other online programming system. Of the 261 software packages of all kinds surveyed, only seven achieved a comparable rating.

3.7 for Throughput/Efficiency. As one user told ADR: "As far as the functions it performs and the overhead it imposes on the system, it is one of the most efficient programs we have."

3.6 for Ease of Installation. All ADR products are installed by company-trained technicians, usually in two hours or less.

3.7 for Ease of Use. Commands are natural English words with few operands. VOLLIE can be used effectively just a few hours after installation.

3.4 for Documentation. Higher than any other online programming system. VOLLIE's illustrated reference manuals and Reference Card are easy to read.

3.6 for Vendor Technical Support. Higher than any other online programming system. Support is available 24 hours a day world-wide.

3.3 for Training. Higher than any other online programming system. ADR's Technical Support Representatives train users at customer sites around the world.

ADR. The leader in Datapro Software Awards 1977 & 1978 for IBM 360/370 products. Over 10,000 products installed.

Please send information on:

- ☐ **VOLLIE**™ for online DOS/VS program development
- ☐ **ROSCOE**® for OS online program development
- ☐ **On-line ETC**™ for all your word processing needs
- ☐ **MetaCOBOL**® for COBOL program development and maintenance
- ☐ **LOOK**® for real-time performance measurement
- ☐ **The LIBRARIAN**® for security and protection
- ☐ **ASC**® for system and application-level documentation
- ☐ **AUTOFLOW**®**II** for maintenance and debugging

DB/DC products:

- ☐ **DATACOM/DB** for data base management
- ☐ **DATACOM/DC** for data communications control
- ☐ **DATADICTIONARY** for data usage control
- ☐ **DATAQUERY**™ for data base retrieval
- ☐ **DATAREPORTER**™ for data reporting
- ☐ **DATAENTRY** for online data entry
- ☐ **DATASECURE**™ for privacy and protection

Name _____ Title _____

Company _____

Address _____

City _____ State _____ Zip _____

Telephone _____ Computer _____

APPLIED DATA RESEARCH THE ON-LINE SOFTWARE BUILDERS®
Route 206 Center, CN-8, Princeton, NJ 08540 Telephone: (609) 924-9100

is how I recorded it in my notes: "Using the germanium surface and the gold contacts the following circuit was set up. This circuit was actually spoken over and by switching the device in and out a distinct gain in speech level could be heard and seen on the scope presentation with no noticeable change in quality. Various people were present and witnessed this test and listened—of whom some were the following: R.B. Gibney, H.R. Moore, J. Bardeen, G.L. Pearson, W. Shockley, H. Fletcher and R. Brown. H.R. Moore assisted in setting up the circuit and the demonstration occurred on the afternoon of December 23, 1947."

After the demonstration, one of the observers, probably Ralph Brown, called back and asked if we had made our device oscillate. We replied that we had not, but that any device that amplified more than 3dB would oscillate. His response was, "Then make it oscillate and witness that," which we did the following day.

The transistor was named in my office by John R. Pierce. Bardeen and I wanted a name that would fit in with varsitor and thermistor, but we were more or less devoid of ideas when I presented the problem to Pierce. Pierce knew that our point-contact device was the dual of a vacuum tube, circuit-wise. After some thought Pierce mentioned the important parameter of a vacuum tube—transconductance—then a moment later its electrical data—transresistance. Then he said, "transistor," and I said, "Pierce, that is it." Later Pierce wrote, under a pseudonym I knew (J.J. Coupling), a story on the transistor in a science fiction journal. When I came across the article and read it I was somewhat chagrined by the last phrase: "... and an obscure individual by the name of J.R. Pierce named it."

The public announcement of our results was not made for several months. We did not wish to make our results public until we were satisfied that we understood what was happening well enough to submit a letter to *The Physical Review*. We also wanted to make more than one transistor for demonstration purposes and to allow the development people time to learn how to make transistors and measure their characteristics as active circuit elements. Bardeen and I did voice our concern that somebody else might make the same discovery and announce it first, but we were told not to worry about that. I feel Bell Laboratories should be commended for making our results public as soon as they did.

When the work that led to the transistor effect was being done, my chief concern was in understanding the physics underlying solid-state surfaces. The transistor came about because fundamental knowledge had developed to a stage where human minds could understand phenomena that had been observed for a long time. In the case of a device with such important consequences to technology, it is noteworthy that a breakthrough came from work dedicated to the understanding of fundamental physical phenomena, rather than a cut-and-try method of producing a useful device. ✲

Portions of this article originally appeared in "Genesis of the Transistor," The Physics Teacher, *Vol. 6 (March 1968), and* Adventures in Experimental Physics, *Vol. 5 (Epsilon, 1976).*

WALTER HOUSER BRATTAIN

In 1956 Dr. Brattain received the Nobel Prize in Physics jointly with Dr. John Bardeen and Dr. William Shockley "for their research on semiconductors and the discovery of the transistor effect," which grew out of the work on surface properties of solids and photo effects at semiconductor surfaces described in this article. Dr. Brattain has also done research on piezoelectric frequency standards, magnetometers, infrared detectors, and blood clotting.

Dr. Brattain grew up on a homestead near Tonasket, Washington, where his family's chief occupations were farming, cattle ranching, and flour milling. Walter rode after cattle in the mountains and worked on the cattle ranch during school vacation and for a year between his junior and senior years of high school. His senior year was spent at Moran School in Bainbridge Island, Wash. Each student at Moran had a job. Walter worked under the supervision of his physics professor, Cecil Yates, running the diesel engine that generated the power for the electric lighting system at the school.

At Whitman College in Walla Walla, Wash., Dr. Brattain majored in physics and math because he liked them. It was not until his senior year that he made up his mind to go on in physics. He received his BS degree from Whitman in 1924, his MA from the Univ. of Oregon in 1926, and his PhD from the Univ. of Minnesota in 1929. His thesis at Minnesota was "Efficiency of Excitation by Electron Impact and Anomalous Scattering in Mercury Vapor."

After completing his graduate studies, Dr. Brattain worked for the radio section of the National Bureau of Standards in Washington, D.C. He joined the technical staff of Bell Telephone Laboratories in 1929 and worked there as a research physicist until his retirement in 1967.

In the fall of 1962 Dr. Brattain started spending a week a month at Whitman teaching a laboratory course for senior physics majors. In 1964 Bell Labs arranged for him to be able to spend most of the college year at Whitman as a visiting professor. He then added a course in understanding science for non-science majors, using Wesskopf's book *Knowledge and Wonder* as a text. He continued teaching both these courses until June 1972.

In 1965 Dr. Brattain and a chemistry professor at Whitman, David Frasco, became interested in doing research on phospholipid bi-layers as a model for the surface of living cells. In 1967 Battelle Northwest Laboratories in Richland decided to sponsor this investigation. At that time Dr. Donald R. Kalkwarf of Battelle joined the team, and the three of them worked on the project until 1975. Now they are continuing the work at Whitman College.

Dr. Brattain is a member of the National Academy of Science and the Franklin Institute and a fellow of the American Physical Society, the American Academy of Arts and Sciences, and the American Association for the Advancement of Science.

He plays golf three times a week when the weather permits, and still likes to go to the mountains—the more primitive the conditions, he says, the better.

Pssst! The secret's out: Wang's Virtual Storage computer.

Wang's VS is a big secret.

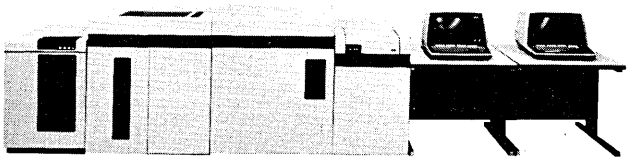
BIG 32-bit architecture. BIG 2.3 billion bytes disk storage. BIG 32 workstations. BIG 512K bytes main memory. BIG in languages too: COBOL, RPG II, BASIC, ASSEMBLER. Also BIG in range, the Wang family of virtual storage computers expands from System 34 performance to the 4300. Source, object, data, application codes are all upward compatible. You don't change a word of microcode to grow and there's no equipment swapout.

Our secret beat IBM, HP, DEC.

Try our VS to find out why it's a winner. In benchmarks and comparisons against System 34's, 3's, 360/370's, HP 3000II's, DEC 11/70's, Prime, Honeywell and Burroughs, Wang's VS won the order. At prices ranging from $50K to $300K.

Secret's out: $60 million of VS's.

In little more than a year, Wang has built $60 million worth of virtual storage computer systems. Nearly 500 are already operational in the U.S. and 40 other countries. Users range from the Fortune 500 distributed environments to the first-time owner.



Buy your VS now; get it now!

You don't have to wait 12-14 months for a fast, hot, virtual storage computer. Wang's delivering VS's NOW. LET US TELL YOU OUR SECRET. Write Wang Laboratories, Lowell, Massachusetts. Call 617-851-4111 (or we're in most Yellow Pages). Or send the coupon.

Wang Laboratories, Inc.
One Industrial Ave., Lowell, MA 01851

All right, Wang, what's your secret?

WANG

Name _____ Title _____

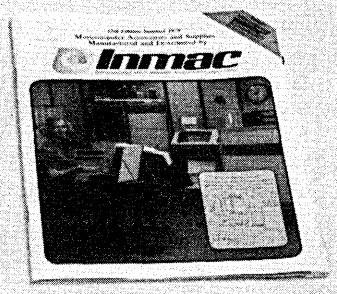
Company _____

Address _____

City _____ State _____ Zip _____

Telephone _____

DP91/D69



One way to order everything (all day on the phone)

Before he bought from Inmac, one customer required a pile of catalogs second only to Mt. Everest.

When the time came, he'd know just where to look for supplies.

A disk pack?
He'd go right to that 35-pound catalog under the philodendron.

A CRT stand?
Right to the furniture catalog. (Too bad he didn't read the fine print that said "2-month wait".)

EIA cables?
In the catalog that looked like last year's winning entry in the stump-the-engineer contest.

One day he needed a disk pack. And a CRT stand, 5 EIA cables, one box of thermal paper, 6 print-wheels and a harmonica ribbon.

If he didn't get them quick, he couldn't finish the Big Project. And top management was really breathing down his neck.

By the time he got all the catalogs together, figured out what would work with what, and made all the calls . . . 9 a.m. became 9 p.m.

And part of his order got stuck between Texas and Terre Haute.

Never again.

So he subscribed to the Inmac catalog. After all, 70 pages wasn't much for every supply he needed. Plus he could store it in a drawer.

He got rid of almost all those other catalogs. But his office looked empty. So he went out and bought a poster of Nepal.

With a great view of Mt. Everest.

Our way to order everything (10 minutes on the phone)

How you can get 1,000+ supplies and accessories. No hassle, no wait.

Order from the FREE Inmac catalog for precision performers. Magnetic media. Printer paper. Cables compatible with DEC, DGC, HP, TI and IBM hardware. Ribbons. Computer-room furniture. More. Guaranteed for 45 days. Some up to 10 full years.

Over 1,000 supplies in the FREE Inmac catalog.

Quality recognized by over 20,000 users around the world.

And you won't wait for what you need. Inmac strives to ship products the day after you order . . . from both east and west coasts.

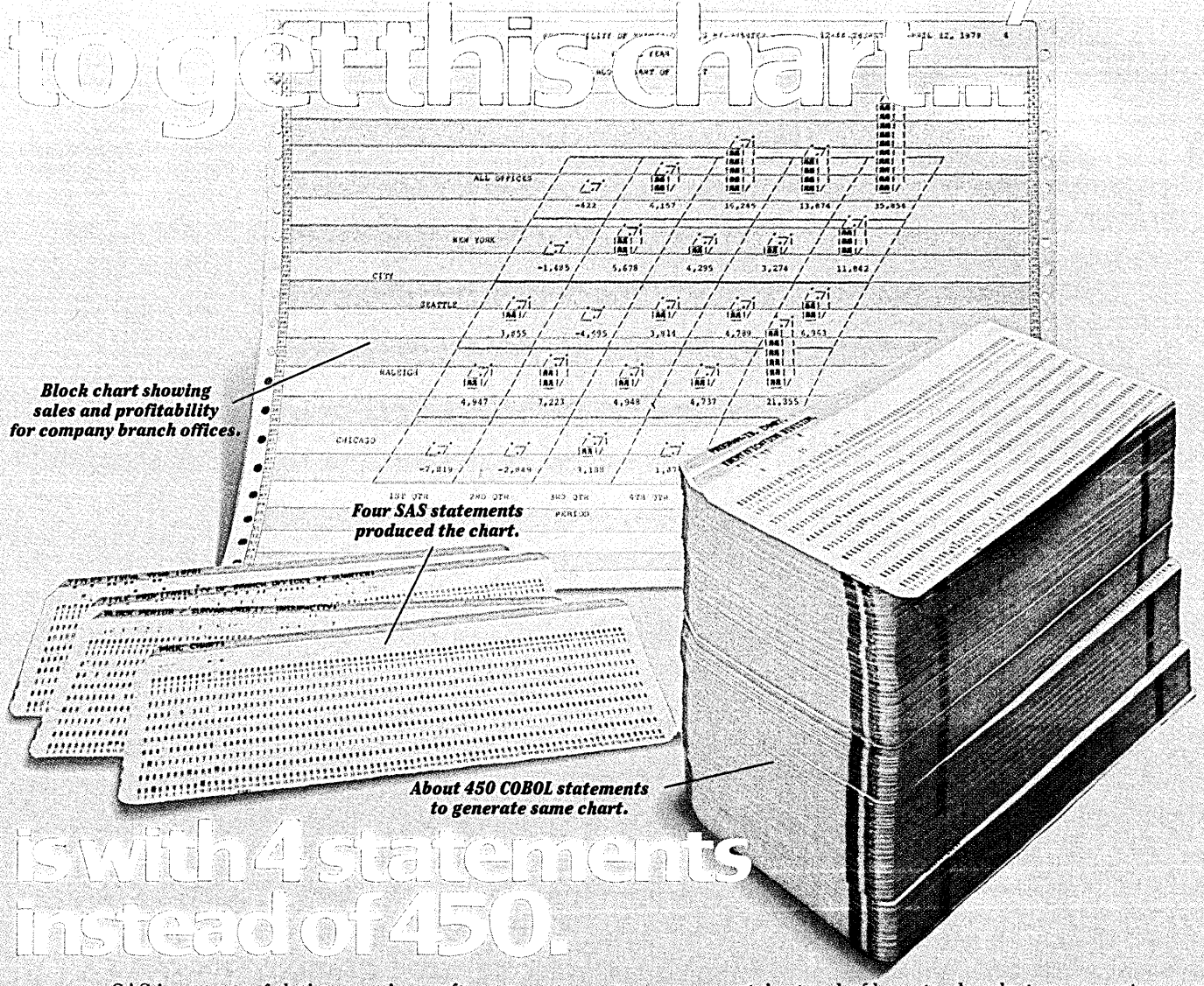
For your free Inmac catalog, circle the number below.

Formerly:
Minicomputer Accessories Corporation

Inmac
International Minicomputer Accessories Corporation
Corporate Address: 2465 Augustine Drive, Santa Clara, CA. 95051

CIRCLE 25 ON READER CARD

The fastest way to get this 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 prewritten 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.

With SAS handling all that, programmers are free to use SAS a second time-saving way – as a higher-level programming language. Unlike most other software systems, SAS is not limited to prewritten routines. A programmer can use SAS to eliminate the tedious steps in a complex task.

However it's used, SAS saves time. Because with SAS you'll be telling the computer what you want, instead of how to do what you want.

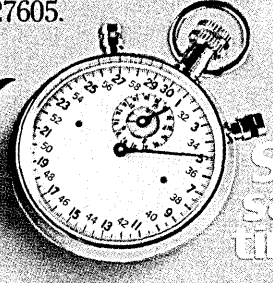
Running interactively under TSO and in batch, SAS is now saving time at more than 700 OS and OS/VS sites. And users at those sites have put SAS on the Datapro Honor Roll for the third consecutive year.

There's another nice thing about SAS. The cost. You can add SAS to your dp staff for about ¼ the cost of a new person. And after the first year it's even less than that.

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



SAS saves time.

CIRCLE 46 ON READER CARD

Ramtek Colorgraphics cover the spectrum.

When you need a color graphics terminal that's exactly right for the job you're doing, call Ramtek. Only Ramtek covers the spectrum in price, performance, options and resolution.

Used singly or in combination, every model in Ramtek's Colorgraphics Terminal family delivers all the "extras" that only color makes possible. Extra information. Extra clarity. Extra operator efficiency. They work harder for you in every application.

Going from monochrome or black and white to colorgraphics? With Ramtek, interfacing is simple. Your terminal will be on line in no time. And Colorgraphics terminals are stand-alone units that let you develop your color software without costly CPU overhead.

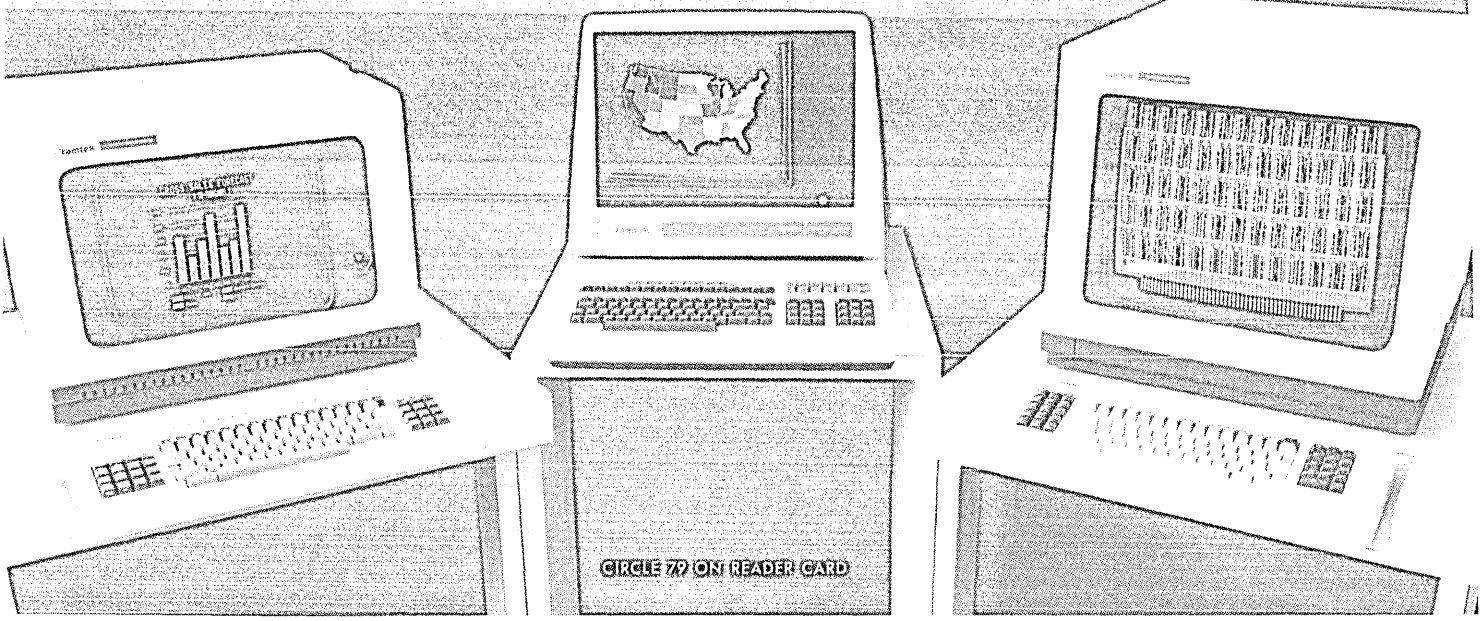
The programming language is so uncomplicated with Ramtek's unique instruction set that you can be displaying your first colorgraphics within half-an-hour. Optional RAM memory, programmable in BASIC or PASCAL, joysticks, and graphic tablets give you added flexibility.

Like to know more? Just call your nearest Ramtek office. Or, write: Ramtek, 585 N. Mary Ave., Sunnyvale, CA 94086.

The complete terminal family is ready to plug in. The 6110, our lowest-priced true colorgraphics terminal. The 6200A, more capabilities per dollar than any comparable terminal. The 6310, the highest resolution raster color terminal made.

Ramtek
Our Experience Shows.

REGIONAL OFFICES: Sunnyvale, California (408) 735-8400 • Newport Beach, California (714) 979-6351
Dallas, Texas (214) 422-2200 • Maitland, Florida (305) 645-0780 • Huntsville, Alabama (205) 837-7000
Chicago, Illinois (312) 956-8265 • Cleveland, Ohio (216) 464-4053 • Washington, D.C. (301) 656-0350
Metropolitan NY (201) 238-2090 • Boston, Massachusetts (617) 862-7720 • West Germany (089) 774070



CIRCLE 79 ON READER CARD

Meet our 101st user in Europe.

Rudi Schmidt (left) of Ford of Germany in Cologne, West Germany is welcomed as the 101st TASK/MASTER user in Europe by Christian Lebrecht of TSI Germany. Ford of Germany joins Ford of Canada, Ford of Britain and Ford US as another TASK/MASTER user.

TASK/MASTER is the world's leading independently-supplied TP monitor. Over 100 users in Europe can attest to that. They all chose TASK/MASTER after a thorough evaluation. An evaluation by the way that always included CICS.

Now with IBM's announcement of the 4300, TASK/MASTER is an even better choice than before. TASK/MASTER preserves your future flexibility. Because it's not tied to any other hardware or software, you won't get locked in to a single-vendor "solution".

If you're going on-line, make sure you look at TASK/MASTER. When you do, you'll find out why it's # 1. Clip the coupon or call us today.

TASK/MASTER. STILL #1.

a division of National CSS

turnkey systems inc.
50 washington street
norwalk, connecticut 06854
(203) 853-2884/telex 964351

tsi international ltd.
19 bedford row
london WC1R 4EB england
01-405-7304/telex 23302

☐ Send information on **TASK/MASTER.** ☐ Call me.

Name Title

Company

Address

Phone CPU


Sean Early

AT LAST, A CURE FOR "I GOT THOSE OLD THREE IN THE MORNING BLOW-UP BLUES."

The cure is the UCC-15 Job Recovery Management System. With this software package, the task of rerunning or step restarting production jobs is now as simple as changing a single JCL parameter.

UCC-15 automatically corrects the OS catalog, scratches unnecessary direct access data sets, adjusts GDG biases and starts at the proper job step. Manual errors in restarting and rerunning can be completely eliminated. The latest version of UCC-15 can also provide data base recovery when a rerun or restart is necessary.

Most of our customers tell us UCC-15 works so well, they'd forgotten they even had it. If you're tired of your phone ringing at 3 a.m., you can ring ours anytime at 1-800-527-5012 (in Texas, call 214-353-7312) or circle 90

Other UCC software packages include:

A Tape Management System that protects data from loss or destruction (UCC-1). Circle 91

A DOS Under OS System that lets you execute DOS programs under OS without program conversion (UCC-2). Circle 92

A Disk Management System that can save the cost of new disk drives (UCC-3). Circle 93

A PDS Space Management System that eliminates PDS compression (UCC-6). Circle 94

A Production Control System that makes scheduling systems obsolete (UCC-7). Circle 95

A Data Dictionary/Manager that really gets IMS under control (UCC-10). Circle 96

A GL/Financial Control System that fills the bill for Accounting (UCC-FCS). Circle 97

IMS System Aids to help manage your installation more effectively (UCC System Aids). Circle 98

A broad line of application software for the Banking and Thrift industries. Circle 99

WE'RE WAITING TO HELP YOU AT 1-(800)-527-5012

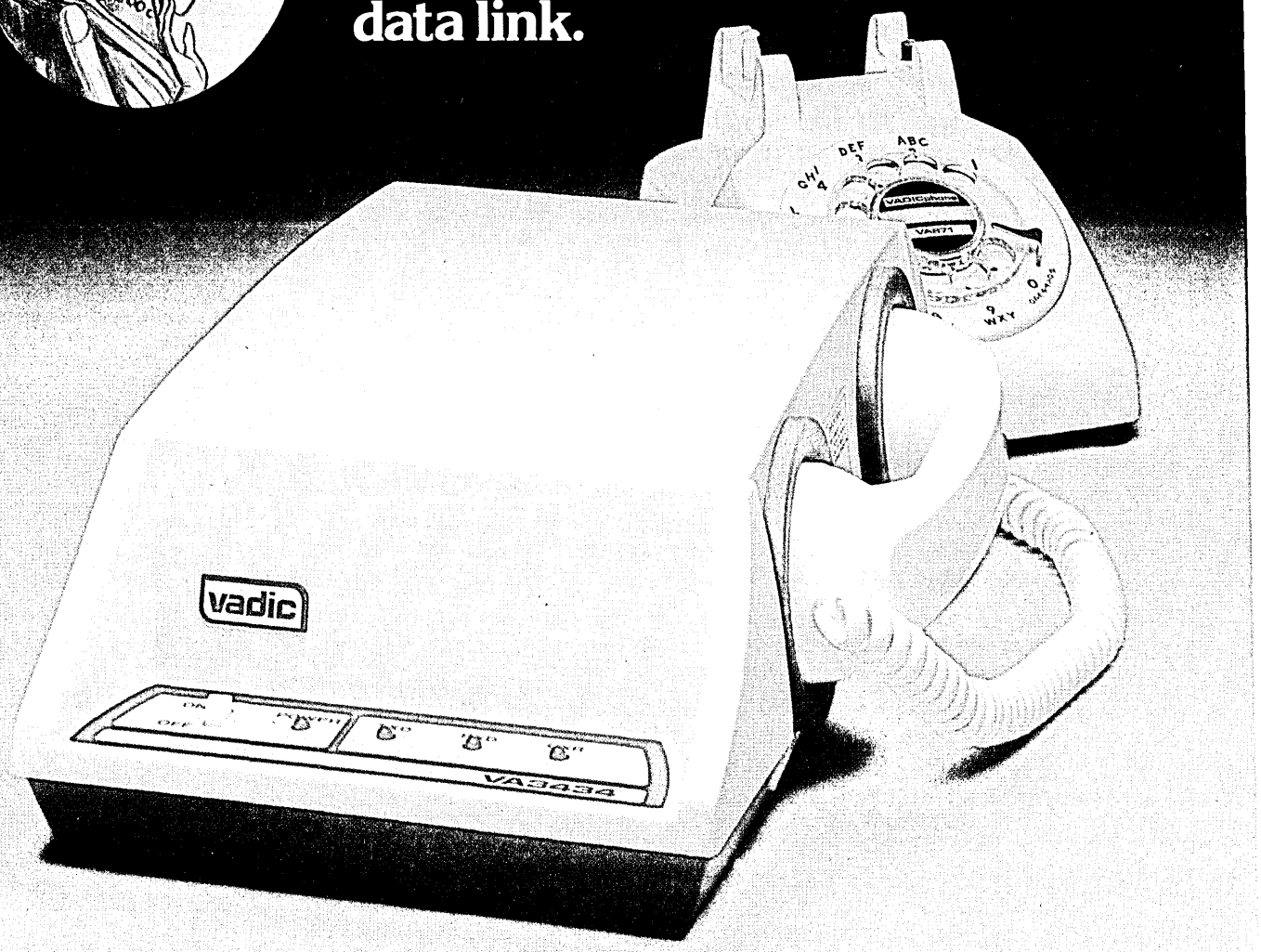
UCC

SOFTWARE

UNIVERSITY COMPUTING COMPANY • DALLAS • LONDON • TORONTO • ZURICH

Dear Ma:

With Racal-Vadic's VA3434 acoustic coupler, every telephone becomes a 1200 bps full duplex data link.



Racal-Vadic is in full production on an acoustic coupler that operates at 1200 bits per second, full duplex. Thousands are already installed and operational.

This is great news for remote terminal users who will no longer have to settle for 300 bps acoustic operation. Now, merely by replacing your present coupler with the VA3434, you can step up to 1200 bps full duplex, using the same 103 type protocol, yet retaining the portability that only an acoustic coupler provides. And since data flows 4 times faster, phone charges may be less, too.

More good news. The VA3434 is compatible with Racal-Vadic's VA3400 Series, including the VA3467 computer site triple modem.

Where can you obtain the VA3434? Easy. Just phone the nearest Racal-Vadic stocking rep. They're listed below.

Racal-Vadic

222 Caspian Drive, Sunnyvale, CA 94086
Tel: (408) 744-0810 • TWX: 910-339-9297

RACAL *The Electronics Group*

Racal-Vadic Regional Offices: West: (408) 744-1727 • **East:** (301) 459-7430 • **Central:** (312) 296-8018 • **Northeast:** (617) 245-8790

Available from these stocking reps...

Alabama: (800) 327-6600 • **Alaska:** (907) 344-1141 • **Arizona:** (602) 947-7841 • **California:** S.F. (408) 249-2491, L.A. (714) 635-7600, S.D. (714) 578-5760 • **Canada:** Calgary (403) 266-1553, Montreal (514) 849-9491, Toronto (416) 765-7500, Vancouver (604) 681-8136 • **Colorado:** (303) 779-3600 • **Conn.:** (203) 265-0215 • **Dist. of Columbia:** (301) 622-3535 • **Florida:** Ft. Lauderdale (800) 432-4480, Orlando (305) 423-7615, St. Petersburg (800) 432-4480 • **Georgia:** (800) 327-6600 • **Illinois:** (312) 255-4820 • **Indiana:** (317) 846-2591 • **Kansas:** (913) 362-2366 • **Maryland:** (301) 622-3535 • **Mass.:** (617) 245-8900 • **Michigan:** (313) 973-1133 • **Minnesota:** (612) 944-3515 • **Missouri:** (314) 821-3742 **New Jersey:** North (201) 445-5210, South (609) 779-0200 • **New York:** Binghampton (607) 785-9947, N.Y.C. (212) 695-4269, Rochester (716) 473-5720, Syracuse (315) 437-6666 **N. Carolina:** (800) 327-6600 • **Ohio:** Cleveland (216) 333-8375, Dayton (513) 859-3040 • **Oregon:** (503) 224-3145 • **Penn.:** East (609) 779-0200, West (412) 681-8609 • **S. Carolina:** (800) 327-6600 • **Texas:** Austin (512) 451-0217, Dallas (214) 231-2573, Houston (713) 688-9971 • **Utah:** (801) 484-4496 • **Wash.:** (206) 763-2755 • **Wisconsin:** (414) 547-6637

CIRCLE 82 ON READER CARD

WHAT'S NOT HAPPENING IN NEW YORK IS HAPPENING IN CALIFORNIA

INTERFACE WEST '79

. . . the only major conference and exposition of its kind in the West this year.

INTERFACE WEST '79

. . . the only major West Coast conference and exposition for:

- Users and prospective users of data communications/ distributed data processing/ networking
- Users and prospective users of small computer, word processing and other office automation systems

TWO CONFERENCE PROGRAMS

- A carefully structured conference for entry-level and step-up users of small computer, word processing, micrographic, telecommunications and other office automation systems and services.
- A professional level conference covering the state of the art in data communications/DDP and networks, including the overwhelmingly successful DataComm School.

A program for everyone concerned with increased productivity.

THE EXPOSITION

One big exposition displaying on a 100,000 square foot floor the products and services of more than 125 prominent exhibitors . . . qualified and ready to discuss solutions to your problems.

BE THERE WHEN IT HAPPENS IN CALIFORNIA

October 30, 31, November 1, 1979
Anaheim Convention Center • Anaheim, California

INTERFACE WEST

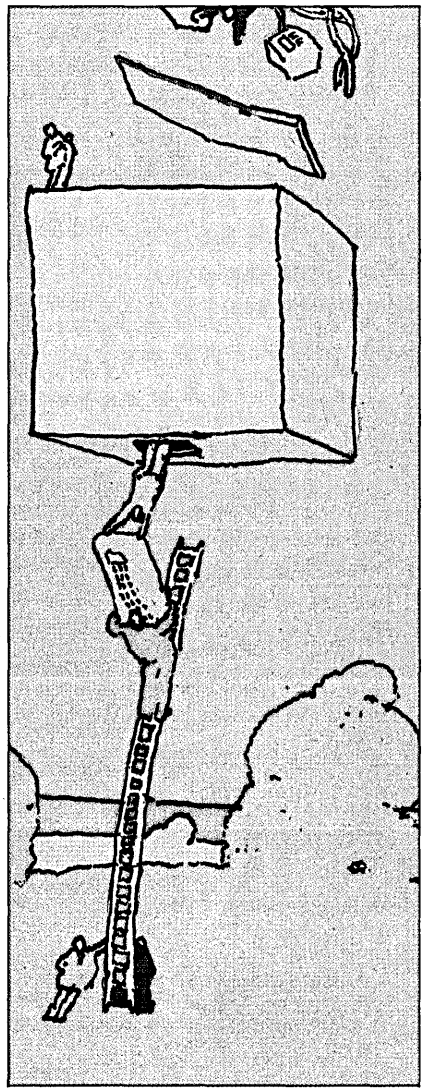
The Third Annual Conference and Exposition on Data Communications/DDP & Small Computer, Word Processing and other Office Automation Systems

Co-Sponsored by DATAMATION. Magazine

Conference and Exposition Produced by The INTERFACE® Group
160 Speen Street, Framingham, MA 01701 • (800) 225-4620, In Mass., (617) 879-4502

Eight procedural steps that should reduce planning time for manufacturing systems to about a week.

A MANUFACTURING SYSTEMS COOKBOOK, PART 2



by Dan Appleton

The five acid tests outlined in Part 1 (May, p. 178) provide the foundation for a solid, credible manufacturing systems plan. They also provide a general structure for developing a manufacturing-oriented systems planning process. That process consists of three critical steps: the long-range business plan, the manufacturing systems plan, and an automation and communication plan.

By adding procedural steps to the basic planning steps, we can create a manufacturing systems planning process consisting of eight steps:

1. Define the planning objectives (the business plan).
2. Classify the objectives as to their importance.
3. Develop basic action strategy (the system plan).
4. Evaluate the strategy against objectives.
5. Evaluate the strategy for impact on the computer/communication structure (the computer and communication plan).
6. Evaluate the strategy for potentially adverse consequences.
7. Restate the strategy in terms of projects.
8. Evaluate and reiterate.

The first step in the process, defining the planning objectives, uses the long-range business plan as its starting point. There are two alternative approaches to developing this long-range business plan: the served-market strategy and the resource-oriented strategy. The selection of the strategy is critical in establishing the manufacturing systems planning objectives. As explained, the served-market strategy is the best for manufacturing systems planning because it aligns the systems strategy with other asset strategies geared to profitably serving markets.

In developing the basic action strategy, we face a crucial dichotomy: prototype development vs. building from scratch. Evaluating an optimum strategy for impact on the computer/communication structure presents another dichotomy, this time between the data base approach and the Computer Application System (CAS) approach. The data base approach is more appropriate to long-range manufacturing systems development than the CAS approach. Computer Application Systems are less flexible and, in the long run, more costly than data base systems. Or, as stated in Part 1, the optimum manufacturing systems planning process starts with the served-market long-range business planning strategy, uses a model to develop the basic manufacturing systems plan, and translates the computer/communication structure in terms of data base rather than CAS philosophies.

Of course, we should not blindly accept this proposition; after all, it challenges many of today's shibboleths. For example, it says that not just any long-range business plan is sufficient; it must be a served-market strategy. It requires a separation of systems and computers, a concept antithetical to the existence of many turnkey software manufacturers. It also challenges the whole concept of Computer Application Systems thinking and, in so doing, strikes down the oldest data processing myth—the bedrock of conventional dp management philosophy —the application system.

The proposed philosophy links systems and resources planning, calling the former an asset—a blasphemy if there ever was one. It dauntlessly ties administrative and technical computing together. It says that computer output is unpredictable and should not be frozen or used to control the design of computer systems. As if that were not enough, it says that input systems and output systems are the mechanisms used to customize a data model (data base) to specific operational requirements (implementations), challenging the idea that any manufacturing business is truly unique; that building input systems and building output systems are different problems from building data bases; and that the same is true for computer technology and data base technology, i.e., they respond to different and conflicting forces and should be only loosely coupled. To weld them together, as most planning strategies require, is to create inflexibility. Inflexibility leads to brittleness, and since manufacturing businesses must constantly change to survive, their

systems structures are doomed from the outset to crack and fall to pieces.

Thus, what appears on the surface to be a simple proposition turns out in reality to be truly controversial. It should not just be accepted *de facto.* It *is* different, but it is also *right* for manufacturing —though it may be wrong for government or real estate or banking.

If we accept both the proposition and its corollaries, we can begin planning, following the steps mentioned earlier.

Steps 1 and 2 define, categorize, allot priorities, and weight the business' system needs. This process draws on the long-range plans for each Strategic Business Unit (SBU). Step 3 ignores needs and concentrates on selecting and customizing the manufacturing systems model. Step 4 compares the model to the needs so that an implementation strategy can be established. Steps 5 and 6 add new dimensions to the process: automation and the analysis of adverse consequences. Step 7 breaks the now complete implementation strategy into discrete tasks. Step 8 closes the planning loop, providing ground rules for reinitiation of the process.

Let's now look at each of these steps in more detail.

STEP 1 *Define the planning objectives.* Only by looking at combinations of assets and served markets (a strategic business unit), and by evaluating market attractiveness and business strengths and weaknesses, can management picture the role that systems must play in making the business into a profitable, responsive, and efficient enterprise. The necessary image is one of the firm as a marketing system. With this perspective, one can generate what we shall call Critical Systems Criteria (CSC). These CSC reflect the future anticipated needs of the business for systems services.

The problem is to identify the major CSC for the systems plan. These objectives must be defined for each SBU in terms of the five basic planning categories identified in Part 1 under the first acid test: financial efficiency, production structure, competitive position, market environment, and business life cycle. The planners must establish a complete set of Critical Systems Criteria for each of the five categories within each SBU. This is necessary because each SBU creates its own specific demands for personnel, materials, machines, facilities, systems, and computers.

It should be noted that under the served-market planning concept, all investments are planned by SBU even though the asset needs for several SBU's eventually may be combined within a single manufacturing facility. However, ultimately, if market needs dictate, physical reallocation of assets (perhaps accompanied by reorganization and relocation) will occur along SBU lines. If systems planning remains geared specifically to facilities needs rather than to the needs of Strategic Business Units, the systems themselves will eventually retard SBU performance. Their inefficiency from an SBU perspective, which may not be visible from a facility's viewpoint, may even hasten a physical split. If, on the other hand, CSC are originally derived to maximize the effectiveness of each SBU, then combined for all SBU's sharing existing facilities and finally overlaid against the existing systems, potential performance problems quickly become visible and so do possible preventive actions.

Within an SBU, objectives of financial efficiency (the first category) are obviously a critical part of the planning process. At a minimum, the planners must establish CSC for every SBU for return on investment, inventory turnover, margins, cash flow, receivables, and selling and administrative expenses.

The long-range business plan must also discuss future production structure objectives. It must address specific questions such as: What is the planned change in investment intensity over the next five years? What is the capacity forecast (in terms of the expected rate of change)? What are the average production lead times needed to serve the market? What are the expected ratios of work in process to finished goods inventory? What degree of vertical integration is predicted for the future? What is the level of customer involvement in the manufacturing process? What is the expected impact of quality control on the manufacturing process? These considerations, along with many more questions, describe how management expects the production side of business to look and function in the future. They are forecasts of expected change and growth, and their impacts will most immediately be felt in the organization and facilities structure of the business. They will also generate CSC.

It has been proven in other industries, such as banking and insurance, that systems and automation have a direct affect on competitive position (the third category). To cope with this, the long-range business plan must address issues such as market size and growth rate, market share relative to major competitors, price relative to competition, percent of sales stemming from new product areas, lead times to introduce new products, and degree of marketing intensiveness of the industry. These are the factors that ultimately control the systems and automation strategies of competitors in the marketplace. An intelligent analysis will aid a company in determining what its competitors have accomplished and are planning to accomplish with systems and computers, leading to more CSC.

Market environment is the fourth business planning category important to systems planning. Management has very little control over the market environment, but an understanding is critical to laying good long-range business plans. Management needs to understand the aggressiveness of price competition and its impact on systems, the concern of the industry for product quality, the degree of buyer fragmentation, the percent of sales needed to absorb distribution costs, the typical purchase amounts of immediate customers, the degree of government regulation in the marketplace, and the responsiveness of the marketplace to related political activity. These are but a few of the questions that must be addressed in order to assure that CSC accommodate not only the current market environment but the expected market environment as well.

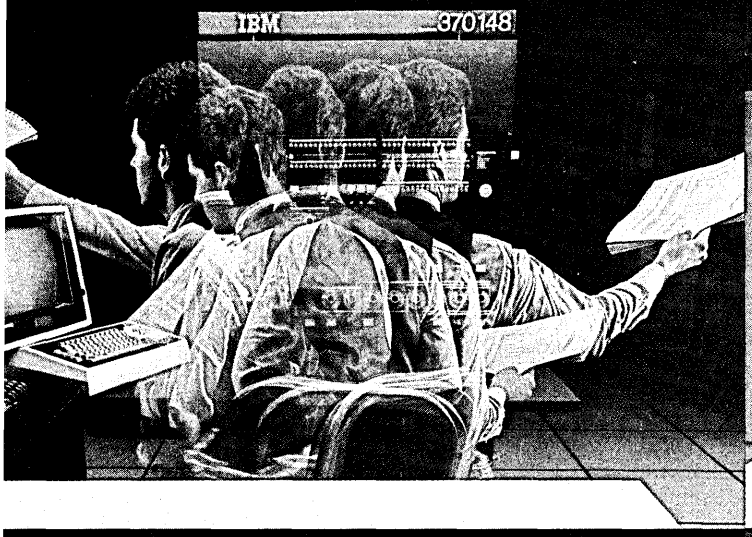
The fifth, and in many ways the most important, planning category is the strategic position of an SBU vis-a-vis the life cycle of its served markets. If management is preparing to sell the business, there is little sense in beefing up its manufacturing systems. On the other hand, in a business with an invest-and-grow strategy, investments in manufacturing systems and automation may well exceed industry averages. In a long-range business plan, management should predict the future of each of its SBU's in terms such as invest-and-grow, harvest-and-divest, or earn-and-protect. This information is critical to developing Critical Systems Criteria because it answers the basic question: "Why do we need to improve the ability of this business to function in the marketplace?"

STEP 2 *Classify the objectives.* After identifying the CSC, the next step is to integrate them, eliminating redundancies and drawing the objectives into clear focus. It is imperative that management understand and agree on the final list of criteria. After the final set of CSC has been developed, it must be given priorities by the management team. A good mechanism for developing these priorities is to use some techniques developed by Kepner and Tregoe, Inc. These techniques divide the criteria into "musts" and "wants." No plan that ignores a "must" is acceptable. The "wants" are those criteria that are desirable but need not be included if costs

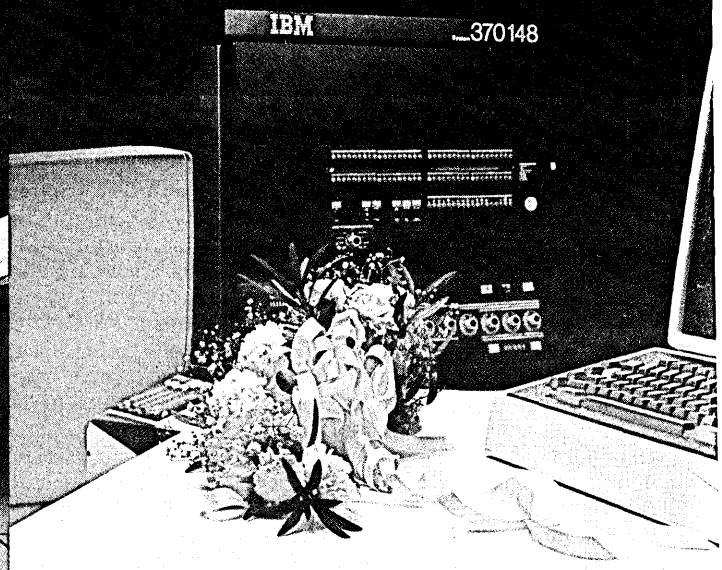
IDMS 5.0...The Only High Performance DBMS.

IDMS libère vos ressources les plus précieuses... votre personnel.

Nummer Eins in Durchlauf und Leistungsfähigkeit.



Il DBMS vincitore di premi.



IDMS har just gjort vad inget annat DBMS har gjort furut.

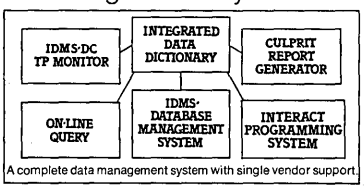
1976
1977
1978
datapro
HONOR
ROLL

IDMS le permite poner el mundo real en su computadora. Eso es flexibilidad.

Worldwide

Results today and protection for tomorrow.

Getting your database up fast and making it productive is our first concern. Making sure that you'll be able to grow and change as business conditions change is our second.



A complete data management system with single vendor support.

Many of the world's major industrial, financial and governmental organizations depend on Cullinane Corporation's Integrated Database Management System (IDMS) for efficient, cost-effective and *stable* management of their information resources.

IDMS is a technologically advanced system designed for ease-of-use, flexibility and continuing viability. It is CODASYL-compatible and fully integrated with a comprehensive family of proven Cullinane data management software products.

IDMS is the only database management system that has been named to the Datapro Honor Roll for three consecutive years.

IDMS is backed by a strong and responsive international network of service and support teams.

IDMS is backed by Cullinane Corporation's aggressive research and development program, by our commitment to keeping our users *ahead* of emerging data processing and data communications technology, and by our long-term financial stability.

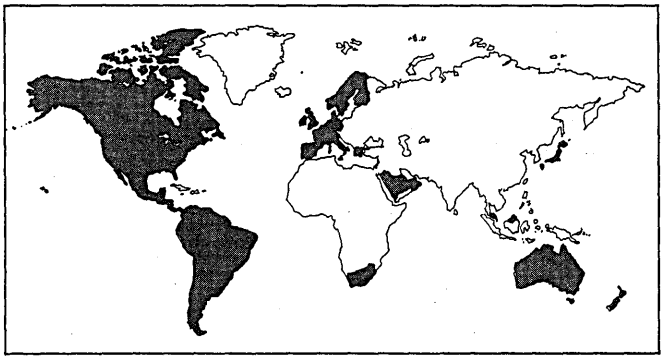
Integrated Software Systems from Cullinane:

IDMS is *the* state-of-the-art database management system for use in the IBM environment.
IDMS-DC, our teleprocessing monitor, is designed to streamline and simplify data access and programming in an on-line environment.
IDD (Integrated Data Dictionary) is an inclusive and up-to-date catalog of information on the location, definition and status of *all* data resources: database as well as conventional.
On-Line Query is an easy-to-use information retrieval tool for management and an effective monitoring facility for the data administrator.
INTERACT, Cullinane's interactive program development system, provides on-line editing, word processing and remote job processing capabilities.
CULPRIT is a fast, powerful and economical report generator designed for use by programmers and non-programmers alike.

Audit/Retrieval Software Systems from Cullinane:

EDP-AUDITOR is a set of comprehensive and independent auditing tools for use with IBM 360/370 and 303X computers.
EDP-AUDITOR/3 extends proven Cullinane audit capabilities to the System/3 environment.
CARS may be used to perform auditing tasks on any computer system which supports ANS COBOL.

Over 2000 installations at over 900 user sites worldwide.
For more information, write or call the Cullinane representative nearest you.



In North America
Cullinane Corporation, 20 William Street, Wellesley, Mass. 02181, Thomas Meurer, (617) 237-6600

In Europe
ADV/ORGA F.A. Meyer GMBH, D 2940 Wilhelmshaven, Kurt-Schumacher-Strasse 241, West Germany, Mr. Jurgen Schoon, (04421) 8021

ADV/ORGA (Schweiz) GMBH, Mainaustrasse 17, CH-8048, Zuerich, Switzerland, Mr. Klaus Ness, 1-320270

Finnsystems OY, Aleksi 15 A, 00100 Helsinki 10, Finland, Mr. Kalevi Kontinen, 90-13901

Scandsystems AB c/o Raionell Programutveckling AB, Industrivagen 1, 19123 Sollentuna, Sweden, Mr. Carl Raquette, 08-960500

M-Data, El. Venizelou 15, Kallithea, Athens, Greece, Mr. El. Michaelides, 9590-631

Praxis Calcolo, 32 Via Visconti Di Modrone, 20122 Milan, Italy, Dr. Enrico Albani, 799601

SCICON, Sanderson House, 49-57 Berners Street, London W1P 4AQ, England, Mr. William Martin, (01) 580-5599

SEMA Informatique, 16-20 rue Barbes, 92128 Montrouge, France, Mr. Jean-Luc Armengaud, 657-13-00

Cullinane Benelux, Boulevard du Souverain 348, Boite 15, 1160 Bruxelles, Belgium, Mr. Jean Herremans, 02-660-09-28

In the Middle East
Contahal Ltd., 83 Gordon Street, Tel Aviv, Israel, Mr. Leon Muzicant, 22 41 15/6

Computer Power, Ltd., Gulf International Consultancy Centre, P.O. Box 519, Bahrain, Mr. D.W. Roberts, 243865

In Africa
ICL (S.A.) (Pty) Ltd., Post Office Box 7018, Johannesburg 2000, South Africa, Mr. Michael Wilson, 725-5200

In Asia
JMA Systems Corporation, Kyoritsu Building, 3-1-22 Shiba Koen, Minato-ku, Tokyo, Japan, Hirotaki Sogi, 434-6211

Zunonos Incorporated, No. 201 35-1 Okamoto 2-Chome, Setagaya-Ku, Tokyo 157, Japan, Dr. Hisayuki Handa, (03) 709-6133

MCS Private Ltd., Inchcape House, 450-452, Alexandra Road, Singapore, 5, Mr. Robert Leong, 623244

In Australia
INFOTROL Australia Pty. Ltd., 9 O'Connell Street, Sydney, NSW 2000, Australia, Mr. John R. Nixon, 233-5244

Cullinane Australia, Suite 4, 46-48 Colbee Court Phillip, A.C.T. 2606 Australia, Mr. Kim R. Newby, 062-812063

In South America
Cullinane do Brasil, Ltda., Rua Jeronimo De Lemos 162, Grajau, 20, 560, Rio De Janeiro RJ, Brazil, Mr. Teodoro Gimenez, 021-268-8799

Cullinane Mexicana, S.A., Filadelfia No. 119-301, Mexico 18, D.F., Mexico, Mr. Alejandro Ramos, 543-8554

Database: Cullinane

CIRCLE 18 ON READER CARD

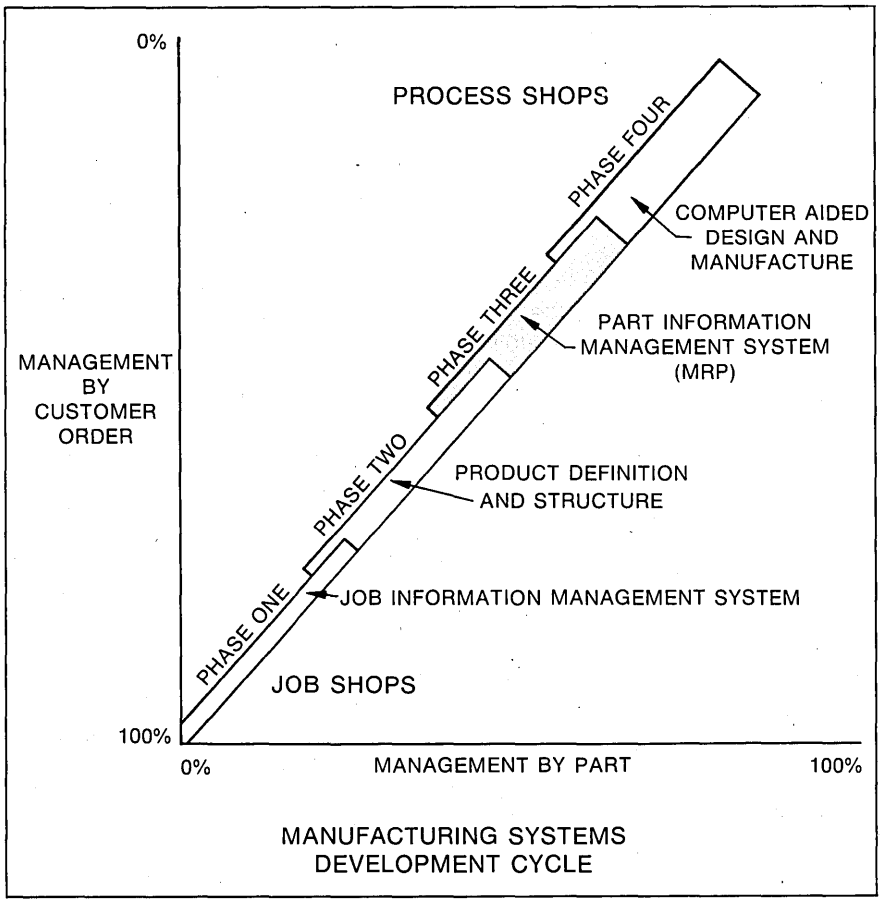


Fig. 1.

or technical difficulties get in the way.

STEP 3 *Develop basic action strategy.* Even though we call this Step 3, it should be conducted in parallel with steps one and two. This parallelism is one of the major differences between this manufacturing systems planning approach and other, more generalized, approaches such as IBM's Business Systems Planning (BSP). These other approaches derive their systems models from business needs. While that philosophy produces purely custom systems plans, and is a tedious, arduous process, in many cases, it is necessary, since not all industries have useful systems planning models. Not so with manufacturing, as we shall see.

By selecting and customizing a manufacturing systems model and comparing it to the current degree of implementation, management can develop basic action strategies to satisfy its Critical Systems Criteria. These strategies will reflect alternative methods of building and implementing manufacturing systems, with the ultimate objective of completely implementing the desired model.

Fig. 1 describes the manufacturing systems development cycle, showing how manufacturing systems evolve. The figure depicts four evolutionary phases as an SBU moves from its inception as job shop to maturity as a process-oriented business. Systems must be synchronized with the business life cycle. A pure process shop (phase four) trying to implement MRP (phase three) from an existing job shop systems structure (phase one) is potentially in big trouble.

The above example, drawn from a manufacturing systems planning model now the property of the Institute for Manufacturing Automation (IMA), is one of four primary models used in manufacturing systems planning. The other three are: IBM's Communications Oriented Production Information Control System (COPICS), Plossl and Wight's Manufacturing Resources Planning (MRP, also known as Material Requirements Planning), and the Computer Automated Manufacturing-International (CAM-I) Job Shop model. The IBM and MRP models are oriented primarily toward process shops, having little tolerance for manufacturing companies without structured bills of material, part numbers, or predictable production. Both require a high degree of control and extremely accurate feedback. The CAM-I model and the IMA model are geared to job-shop philosophies and are intended to accommodate a range of manufacturing sophistication, from custom manufacturing to cookie-cutter businesses.

Ultimately, the model should be developed by management and condensed into a conceptual design document. This document should describe the model and how it works in terms of basic manufacturing systems functions and their interrelationships. A typical outline for such a document would include such topics as: preparing a sales order information package, confirming customer credit, accepting an order, coordinating advanced purchase requisition schedules with master scheduling, rescheduling customer orders, source coding bills of material, validating purchase requirements, developing process plans, etc. The conceptual design document represents the customized model, and it should be used as the basic control for both manual and automated systems development projects.

STEP 4 *Evaluate the strategy against objectives.* The next step is to take this basic strategy and compare it to the criteria. The planners should determine the expected results, evaluate the costs, and develop the priorities. An example of CSC would be "improved return on investment." Examples of Systems Planning Model elements would be order entry, capacity planning, administrative scheduling, bill of material, process planning, etc.

The next problem is to establish an implementation strategy. This is done by grouping the relationships vertically. Systems tasks that have the maximum impact on CSC are readily identifiable. These would be expected to have the highest return on investment.

STEP 5 *Evaluate the strategy for impact on the computer/communication structure.* The key word here is structure. Regardless of whether automation is currently being used, whatever does exist is going to change as a result of this plan. As shown in Fig. 2, the structure can be pictured in two parts. The vehicle encompasses the computer hardware itself, operating systems software, communications hardware and software, data management programming languages, and a wide variety of other programming languages, such as COBOL and RPG. The other component of the computer/communication structure is the media, which includes what most people refer to as end-user applications or computer application systems or, in some cases, data base systems. To make a long story short, the computer/communications structure must be changed from the top down, starting with the systems plan, but it must be constructed from the bottom up. If the foundation of the computer/communications structure is weak, the whole plan will crumble.

Looking first at the media, the demands for automation generated in the first four steps must be converted into

STILL WAITING FOR REPORTS?

If you're still waiting, you haven't tried EASYTRIEVE. For IBM 360/370, 30xx or compatible hardware, EASYTRIEVE is the award-winning software solution for getting results from your computer.

In a matter of moments, a program can be written in English and run to provide exactly the information you require in a report you can read. EASYTRIEVE does the formatting, the figuring, the selection of just the data you need. Automatically. Quickly.

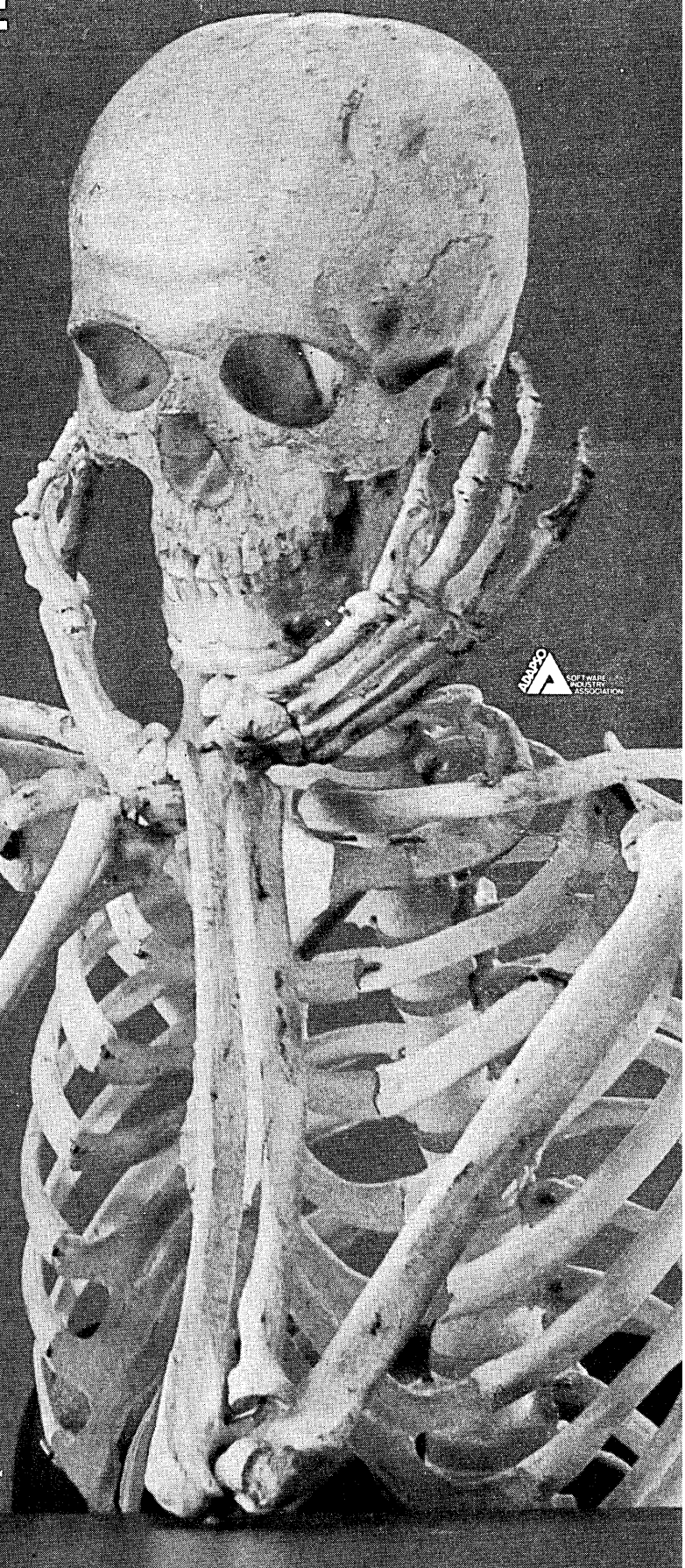
Anyone who needs information can learn to use EASYTRIEVE. Auditors, marketing people, hospital administrators, educators and other non-DP people use it every day. Yet, EASYTRIEVE is powerful enough to do systems housekeeping, computer graphics, create test data, do job accounting and budget forecasting. It works with most DBMS files and is in use with all major interactive/on-line systems.

For more information on this dynamic software tool, call us toll-free or clip the coupon below. You'll never have to wait again. EASYTRIEVE. From Pansophic, the people who bring you PANVALET and PANEXEC. Offices near you throughout the world.

PANSOPHIC

709 Enterprise Drive • Oak Brook, IL 60521

800-323-7335



PANSOPHIC DA-6
709 Enterprise Drive, Oak Brook, IL 60521

Please send me more information on Easytrieve.

NAME _____

TITLE _____

COMPANY _____

CITY _____ STATE _____ ZIP _____

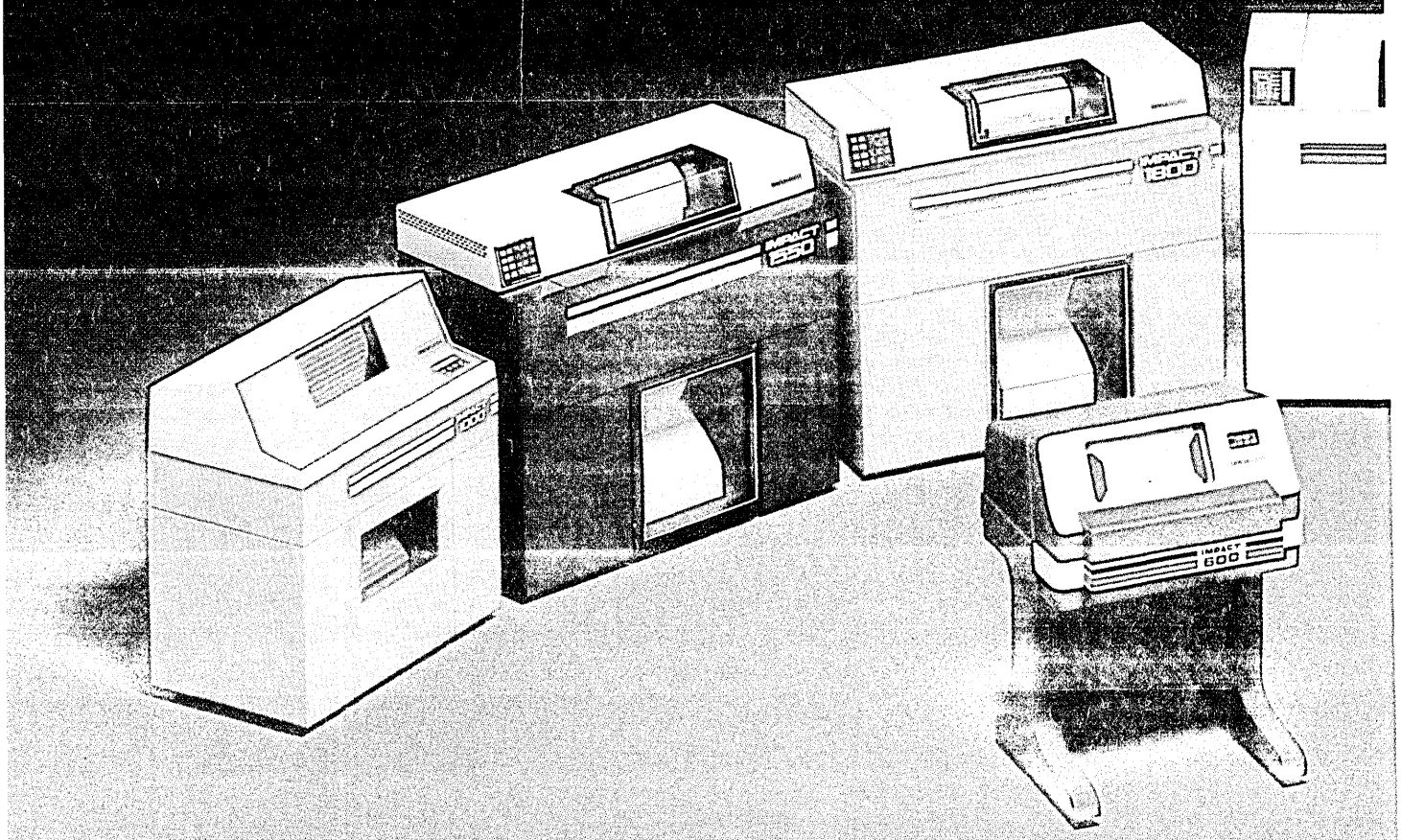
PHONE _____

HARDWARE _____

OPERATING SYSTEM _____

CIRCLE 149 ON READER CARD

Documation's New



Most Complete Line of High-Speed Impact Printers Available

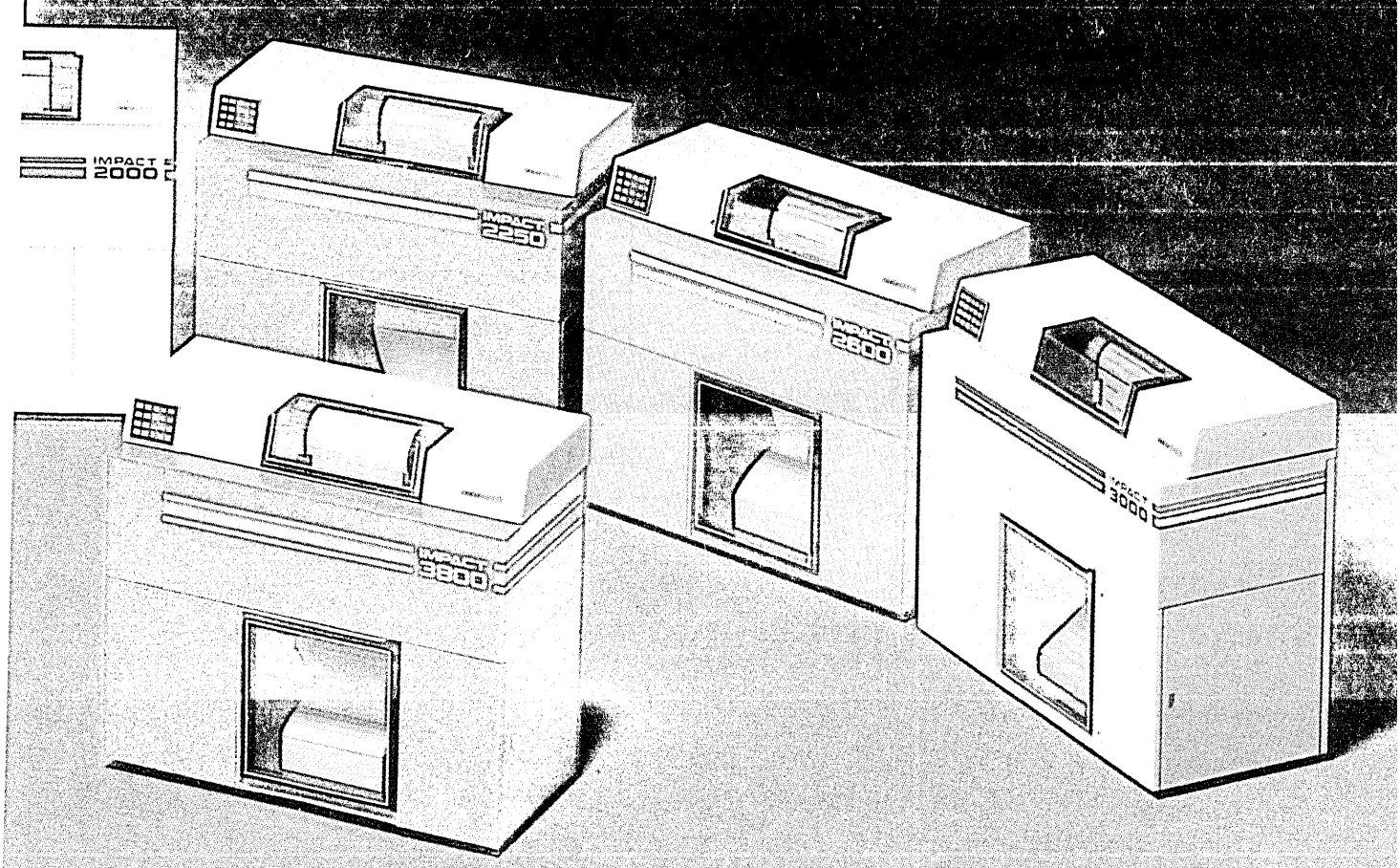
From 600 to 3800 lines per minute. With a choice of over 30 different models. With IBM and IBM plug compatible, Burroughs, Univac, mini and maxi interfaces. It's the most complete line of high-speed printers from one single source. Documation's new expanded IMPACT family of line printers. All precision manufactured in our state-of-the-art facilities for rugged dependability. Round-the-clock reliability and quality you can count on. It's a full grown family of leaders in impact printing technology that solve your varied printing requirements.

New IMPACT 600 Series — A New Dimension for Lower Speed Printing

Documation announces the IMPACT 600 Series, a whole new dimension in quality and reliability for medium workload requirements. Using the same engineering concepts and precision manufacturing techniques that developed the world's fastest impact line printers, this new series is built for heavy duty operation. For operator convenience and for low cost of ownership. Unlike conventional printers in this range, standard features include a four-tractor paper drive system, paper jam detection and impression control which improves print quality and extends ribbon life.

Atlanta, GA 955-0309 ☐ **Baltimore, MD** 667-4130 ☐ **Boston, MA** 890-2650 ☐ **Cleveland, OH** 243-0680 ☐ **Dallas, TX** 661-5256/750-6160 ☐ **Houston, TX** 932-9172 ☐ **Irvine, CA** 752-8782 ☐ **Long Beach, CA** 595-6775 ☐ **Miami, FL** 592-9655/6 ☐ **Milwaukee, WI** 257-1750 ☐ **New Seattle, WA** 575-4627 ☐ **St. Louis, MO** 576-6840 ☐ **Union, NJ** 686-5223 ☐ **Washington, DC** 827-0220 ☐ International Offices: **London** (0372)

Expanded Family



New IMPACT 3800 — World's Fastest Impact Line Printer

Documation introduces the new world's fastest impact line printer. Printing at 3800 lines per minute, the new printer is 95% faster than competitive models. In one minute it prints 57 standard 11 x 14 pages (full 132 character lines) on six part forms. New printband and hammer striker technology, and a Documation-designed low inertia tractor system made the breakthrough possible. It's another example of Documation's commitment to lead the way in impact printing technology. It's the kind of announcement the industry has come to expect from Documation.

Documation Service — A Maximum Commitment for Minimum Downtime

Documation's commitment to outstanding service is as important as our commitment to lead the way in printing technology. From our Documation Maintenance Control Center, open round the clock, to the other Documation trained field engineers and back up technicians. We continue to upgrade and refine our service network to provide preventative maintenance and response time second to none.

For more information on Documation's new expanded IMPACT family, write P.O. Box 1240A, Melbourne, Florida, or call your local Documation representative.

DOCUMATION®
INCORPORATED

Denver, CO 758-8775 ☐ **Detroit, MI** 353-8181 ☐ **East Meadow, NY** 794-1186/7/8 ☐ **Greenwich, CT** 869-4123 ☐ **Hartford, CT** 278-2010 ☐ **Orleans, LA** 241-8194 ☐ **New York, NY** 695-4195 ☐ **Oak Brook, IL** 920-0040 ☐ **Philadelphia, PA** 337-2850 ☐ **San Mateo, CA** 574-4060 ☐ 67041 ☐ **Paris** 686 8007 ☐ **Frankfurt** 76 30 95 ☐ **Spain** 416 87 60

CIRCLE 74 ON READER CARD

computer files, reports, input transactions, etc. The Computer Applications Systems (CAS) approach and the data base approach each has its own file storage concepts, input concepts, and output concepts. Under the data base approach, the systems model developed in Step 3 can be translated into a data model which in turn represents the foundation for the company's data base. As shown in Fig. 2, the data base supports the input and output portions of the media.

If the media is viewed from the top down, the vehicle must be constructed from the bottom up. It is not so dependent on specific implementations of the media as it is on the general strategy to be used. If a data base strategy is to be used, then data management software will be critical, and a data base management system (DBMS) must be used. If a CAS strategy is to be used, it is possible to eliminate the data management aspect of the vehicle, simply using COBOL or RPG or whatever productivity software seems appropriate. However, without the DBMS capabilities, the vehicle will not support a data base strategy.

A similar thing is true at the systems control level of the vehicle. If the communications aspects of the structure are not carefully evaluated, approaches such as distributed data processing or even on-line and remote job entry will be difficult to implement.

By dividing the computer/communications structure in two—the media and the vehicle—and by using the data base approach to establish management controls, the resultant dp strategy will have the maximum flexibility possible with today's, and probably tomorrow's, computer technology. It separates the high labor/low technology areas (media) from the lower labor/high technology areas (vehicle), allowing the latter to fluctuate based on cost benefits and technological improvements in the dp industry while the former fluctuates based specifically on the demands of the manufacturing business itself. This flexibility, coupled with the use of a data base approach, should provide the optimum flexibility for automation. Of course, this flexibility costs money in the short run. It is less expensive to buy turnkey applications software and computers with no data base strategy. This may be optimum for a business at the end of its life cycle. However, the cost of change is very high, not just in dollars but in areas of even more concern such as responsiveness and usefulness. Most computer systems atrophy because they cannot be changed. Trying to change inflexible systems only drives their costs out of sight.

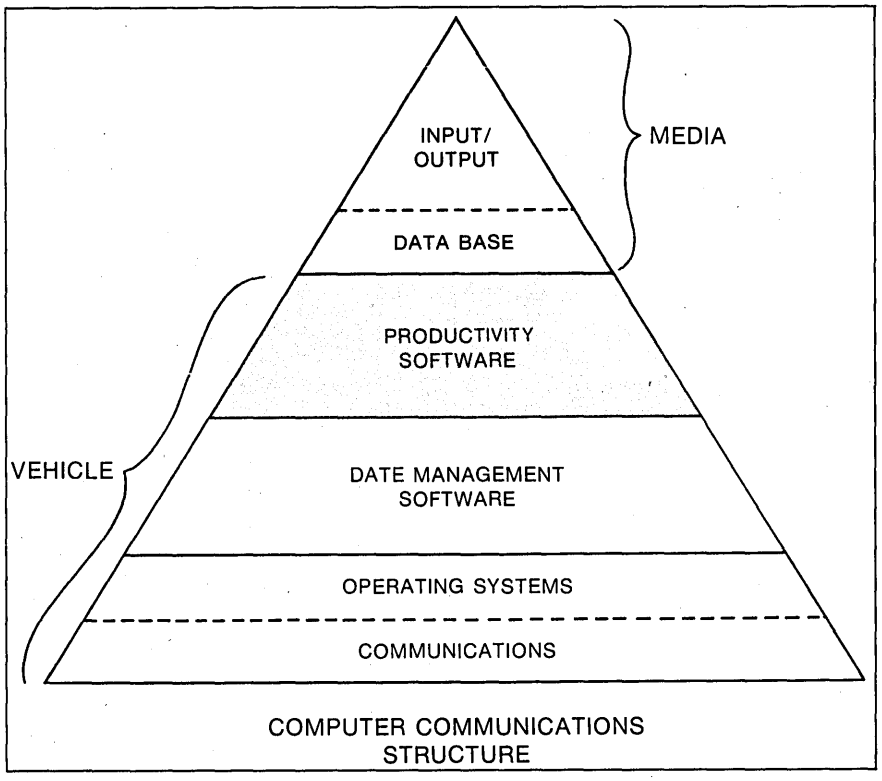


Fig. 2.

STEP 6 *Evaluate the strategy for potentially adverse consequences.* The main objective of this step is identification of activities that will inhibit the execution of the plan. The long-range business plan itself should identify areas of risk, which can in turn be applied to the manufacturing systems plan. Other potentially adverse conditions include unplanned growth or radical change, organizational changes, financial problems, and political or people problems. Each of these areas should be evaluated in terms of potential negative impact on the manufacturing systems plan.

STEP 7 *Restate the strategy in terms of projects.* In this step, the planners must identify and give priorities to specific projects (tasks) in terms of what they are *and* what they are not. They must set up project teams with the power, authority, and influence necessary to complete identified projects. They must provide schedules and budgets to the project teams, and they must set up administrative control structures for managing the projects.

STEP 8 *Evaluate and reiterate.* This last step requires that the systems planners regularly evaluate the status of the projects that have been defined and then reiterate the manufacturing systems planning cycle whenever the program begins to bog down. Certainly, the cycle should be repeated every time the long-range business plan is changed. There are, however, less obvious indicators of when the cycle should be repeated. The first is when project teams begin recommending that their projects be combined. These recommendations usually indicate that the project team is losing focus on the original objectives. Another indicator is a large backlog of user requests for new, unplanned computer programs; such a backlog indicates a lack of focus on the part of the users. It probably *does not* indicate that the programming department is understaffed. There are several other indicators that are less dramatic but just as logical that suggest when the systems planning cycle should be repeated. Without going into detail, these would be such events as a request by the CEO, poor reports by internal or external auditors, a major functional reorganization, a major change in the strategic plan, or a significant change in the upper echelons of management.

If this eight-step process is followed, a company should be able to reduce to about a week the time spent actually planning for manufacturing systems. Obviously, it will take more than a week for the first—and probably the second—round. But after the long-range business plan has been built, the systems model selected and customized, and the basic computer/communications strategy agreed upon, the rest of the process is fairly straightforward. After the second or third round, most of the planning will actually be tuning projects and refocusing the direction and understanding of both users and dp. ✲

(This is the second in a three-part series. Part 3 will appear in the August issue.)

Almost perfect.

Our new ADM-42 doesn't have quite everything. But it comes so close, you might never notice.

Because it's a complete, semi-intelligent terminal for just about any application you can name. And it does just what you want it to do, just when you want it done.

The ADM-42 is completely self-contained, and provides you with flexibility of format, security, editing, interface, and transmission. It also features a full two-page display as standard equipment. Not as an option. And it comes with a truly staggering array of options.

THE MORE YOU USE IT, THE SMARTER IT SEEMS.

We gave the ADM-42 a bright, easy-to-read 2000 character display. A full 128 ASCII character set. 16 function keys for 32 separate commands. And five separate cursor control keys.

The 42's behavior modification gives you a factory installed personality for an alternative ESC sequence lead-in—in addition to the standard ESC. And End Block character. A New Line character sequence. A field separator. And even a function sequence preamble.

Its status displays on the screen give you a conveniently wide range of information at a glance. While its special symbols indicate the entry of control characters in memory. Also, all control characters can be stored using the escape sequence or program mode. And the Field Protect Mode allows rapid data entry into forms or instruction pages.

THE ADM-42 WILL HAND YOU ANOTHER LINE.

The terminal's displayed data is formatted in 24 lines per page, 80 characters per line. And, to top it off, it comes with a 25th line established and reserved exclusively for status indicators and messages of up to 79 characters.

As if all this weren't enough, the ADM-42 has an impressive list of options. Like synchronous transmission with various line protocols. An extended memory capable of adding data space up to a maximum of 8 pages. And programmable function keys, to name but a few.

THE ADM-42 IS ONE TOUGH ACT TO FOLLOW.

The ADM-42 has just about everything. Including a microprocessor that increases reliability and ease of operation. Any way you look at it, in fact, it's one pretty smart buy.

So if you're thinking of upgrading to a more intelligent terminal, at a more than reasonable price, call us today. Or better yet, contact your local distributor.

We'll show you how easy it is to move up to the ADM-42.

The terminal that's so smart, you'll swear it's got a mind of its own.

ADM 42
Getting smarter all the time.

LEAR SIEGLER, INC.
DATA PRODUCTS DIVISION

Lear Siegler, Inc./Data Products Division, 714 Brookhurst Street, Anaheim, CA 92803; (800) 854-3805. In California (714) 774-1010. TWX: 910-591-1157 Telex: 65-5444.

CIRCLE 35 ON READER CARD

"If you're thinking about minicomputers, consider this...

Control Data's complete makes the Series/1

"Our new Certainty Series is a complete line of competitively-priced products that's ready to help you get optimum performance from the Series/1.

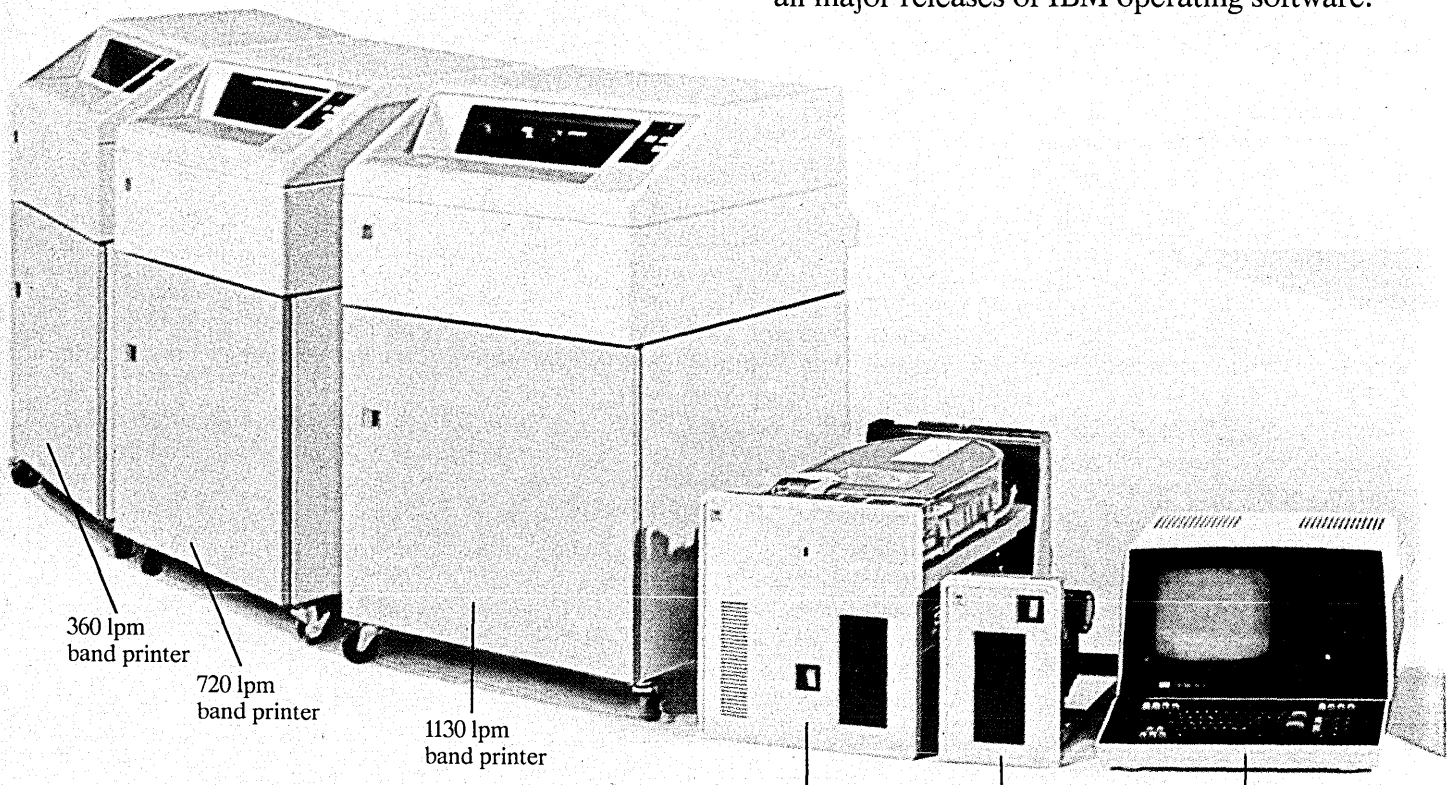
"Now you can add up to 240 Mbytes of removable storage with our Storage Module Drives. Their popular format attaches to the Series/1.

"Our Certainty line printer that gives you clean, crisp printing at 720 lpm and more. It can also cut your paper usage by 30% when you use its compressed pitch option.

"Our display stations eliminate the need for expensive video cabling. Certainty display stations use low-cost digital cabling. So you can put your terminals where your people are—up to 4,000 feet from the cpu.

"Controllers? No outboard controllers, because we incorporated all controllers and interface logic into our hardware. And we engineered Certainty Series around the Series/1 architecture, retaining the important cycle steal feature. All of these products are ready right now to be plugged into the Series/1.

"Control Data knows how important support is. With our miniperipherals, Control Data also provides the required software support of all major releases of IBM operating software.



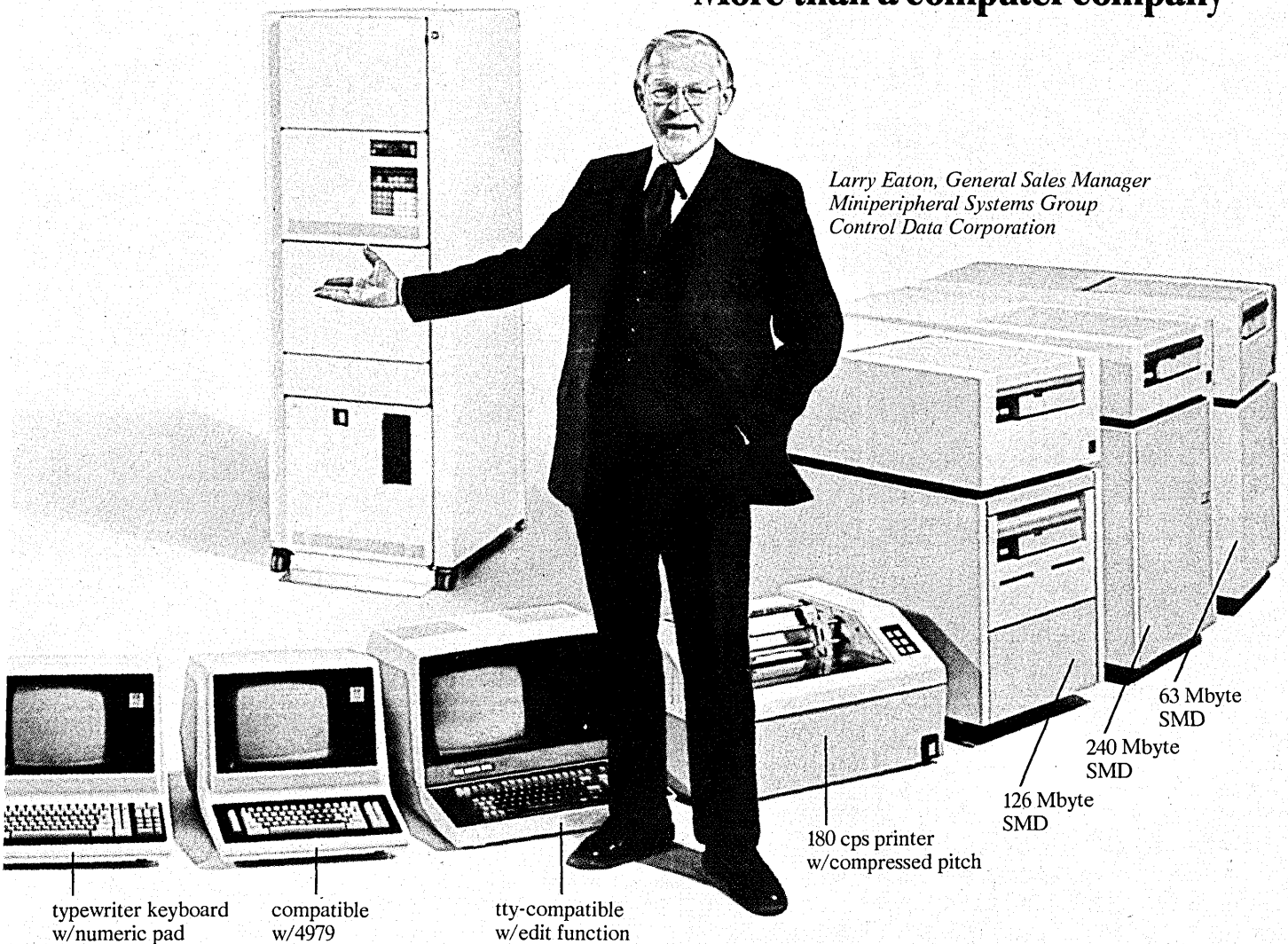
line of miniperipherals even more attractive."

"More than 4,800 Customer Engineers in our worldwide maintenance organization support our products. Our Education Company can train your people. Our Professional Services Division can help you program your applications. Through Commercial Credit, an important part of Control Data, we can provide financing for your purchase.

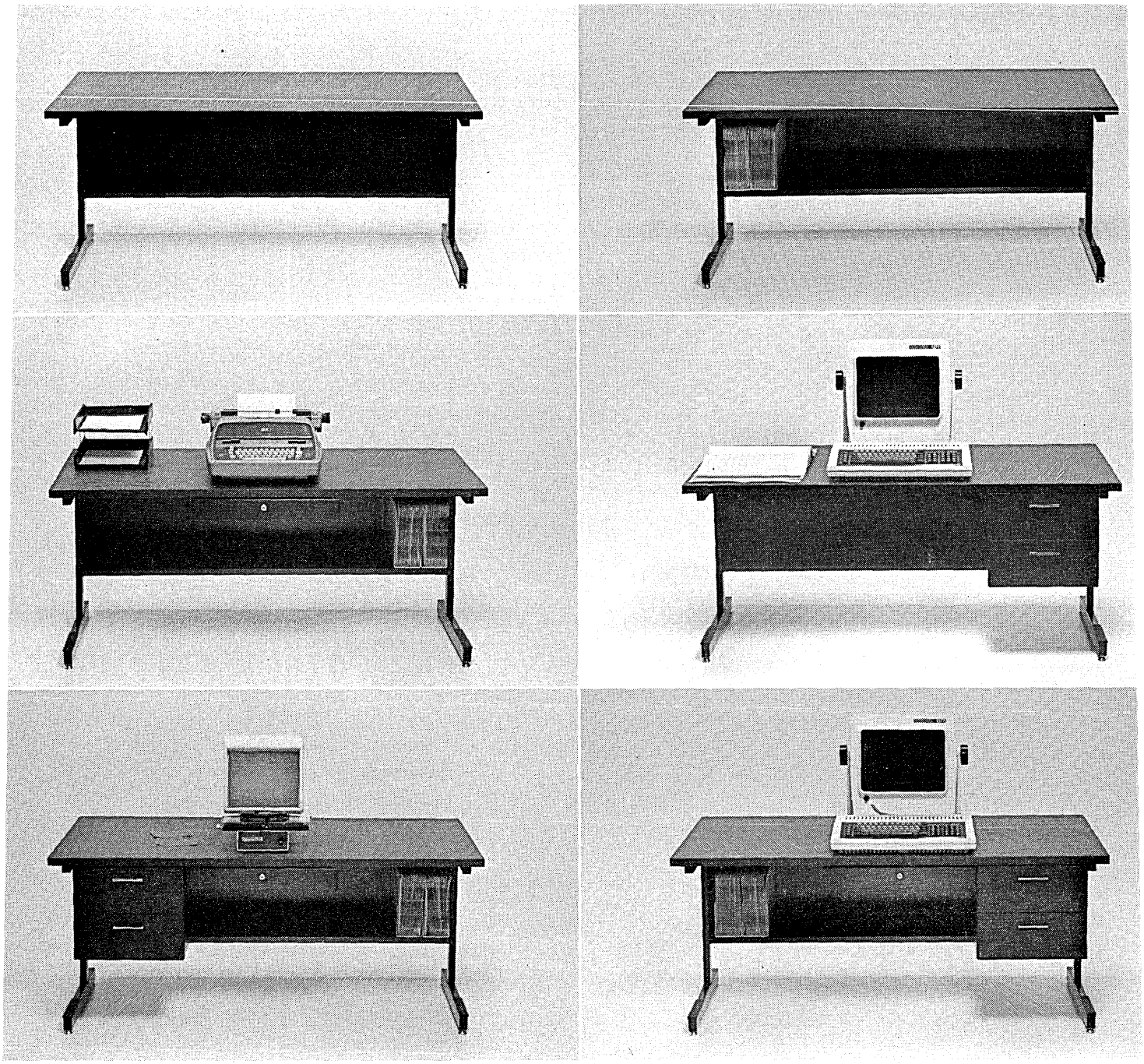
"Let us show you how our Certainty Series makes the Series/1 even more attractive. For data sheets and more information, call today toll free. 800/328-9565."

CONTROL DATA CORPORATION

More than a computer company



CIRCLE 100 ON READER CARD



The workstation that gives you the works!

Versatility is Built Into Tab's New Series 400 Data Display Desks

You need more than a desk to handle your daily work load — you need a system! Tab's new Series 400 Data Display Desks are the answer to high quality, inexpensive work-stations for data display, word processing, or clerical related applications.

You can add pedestals or customize our laminated white or rich woodgrain tops to meet your office needs. The Series 400 Data Display Desks come complete with backs, glides, and scuff pads. An optional undershelf or center drawer are also available. The results: increased work throughput executed with more efficiency and with a higher morale. For more information call your local Tab representative or write Tab Products Company, 2690 Hanover Street, Palo Alto, California 94304.

TAB
PRODUCTS CO.

CIRCLE 52 ON READER CARD

Hazeltine

Just Right!

The Leadership Line of Economy Terminals.

Hazeltine 1410

A low-priced video terminal with all the features needed for data inquiry and data entry applications, and a separate numeric key pad to make numeric entry faster, easier and error-free. Its total design, from baseplate up, is for efficiency in operation and maximum operator comfort! ***Just Right!***

Hazeltine 1500

A superb conversational terminal. ***Just Right!*** for small business systems, with remarkable clarity of display plus many features normally found in higher-priced terminals!

Hazeltine 1510

All the features of the '1500' plus buffered operation with editing. ***Just Right!***

Hazeltine 1520

All the features of the '1510' plus a unique microprocessor-based printer interface. ***Just Right!*** for local or on-line, buffered parallel or serial printing.

Hazeltine Corporation
Computer Terminal Equipment, Greenlawn, N.Y. 11740 USA
Phone (516) 549-8800, Telex 96-1435

CIRCLE 165 ON READER CARD

Hazeltine Limited
Terminal House, 14 Petersham Road, Richmond, Surrey, ENGLAND. Phone 01-948-3111

INTERNATIONAL DISTRIBUTORS

Austria: Neue Organisationsmaschinen Gesellschaft mbH (NOG) Untere Donaustrasse 13-15, 1020 Vienna; tel: 0222 24 84 14
Australia: Australian Datronics Ltd., 7-9 West Street, North Sydney N.S.W. 2060, Australia; tel: 920 384
Belgium/Luxembourg: Geveke Electronics, Div. of SHV Belgium S.A., Anatole Francestraat 119/121, B-1030 Brussels; tel: 02 241 45 50
Canada: Data Terminal Mart, 7520 Bath Road, Mississauga, Ont. L4T 1L2; tel: 416/677-0184
Chile: Sociedad Nacional de Procesamiento de Datos Ltda. (Sonda) Teatinos 554, Santiago; tel: 63111
Denmark: Trend Electronics, Britisk-Skandinavisk A/S, Tangmoseve| 99, 4600 Koge; tel: 03 65 23 45
France: Geveke Electronique S.A., 85-87 Avenue Jean-Jaures, 92120 Montrouge; tel: 654.15.82
Germany: Geveke Electronik GmbH, 4000 Duesseldorf, Schlaegelstrasse 9; tel: 0211-773082
Hong Kong/Singapore/Malaysia: Oriental Data Systems Ltd., 11/F Hutchison House, Harcourt Road, Hong Kong; tel: 5-243121
Israel: KDM Electronics Ltd., 14 Karlibach Street, Tel Aviv; tel: 26 62 91
Italy: SEGI S.R.L., Via San Giovanni Sul Muro 1, 20121 Milano; tel: 02/89 98 05
Japan: Protech Inc., 7-22-43 Nishi-Shinjuku, Shinjuku-Ku, Tokyo, Japan; tel: (81) 3384 0225
Mexico: Industrias Digitales, S.A. De C.V., Plateros No. 7-116, Mexico 19, D.F.; tel: 524-5132
Netherlands: Geveke Elektronics B.V., Kabelweg 25, P.O. Box 652, Amsterdam; tel: 020 802 802
New Zealand: CBL DATACOMM, Div. of CBL Holdings Ltd., 89 Courtenay Place, P.O. Box 6646, Wellington; tel: 857-939
Norway: Alf G. Johnsen, A/S Brennerivelen 11, Oslo 1; tel: 02 11 12 50
Spain: Infotecnos, S.A., Paris 46-48, P.O. Box 35222, Barcelona 29; tel: (34) 3 322 0303
Switzerland: Intertest, AG, Aarbergergasse 46, Ch-3011 Bern; tel: 031 22 44 81
Taiwan: Multitech International Corporation, 2nd Floor, 977 Min Shen E. Rd., Taipei 105; tel: 02/768 1232

Management hopes for shortened project time and decreased costs. There's probably a system out there that will do just that for you, but how to choose among the many on the market?

PROJECT CONTROL SYSTEMS

by Perry Petersen

The last ten years have seen a tremendous growth in the use of project control systems—CPM and PERT network scheduling. The increased availability of software is partly due to the expanding familiarity of project management with this tool. However, the continuing drop in the cost of hardware needed to operate the systems has most likely also stimulated the market. Project management, of course, is under much pressure to complete work quickly, before inflation takes a large share of the budget. Management hopes that an investment in computerized project tracking will shorten project time and decrease costs.

The heart of a computer-based project control system (PCS) is the software package, which may be specified by a planner or scheduler. It is not unusual, however, that the person who is actually doing project scheduling and cost control does not really know, aside from the system being used, what software is available. The company may have a system in place when the planner comes on board, and it may have been there for years. In this case, a need for increased capacity or reduced cost may trigger a search for alternatives. When one is looking around there is a tendency to have constraints in mind that are not necessarily valid. For example, the presence of an in-house computer does not necessarily mean that a cost-effective solution is to find a package for that machine. (How much usage will the system get?) The overall cost and effectiveness of PCS efforts are dramatically affected by a number of factors which, if recognized, can be readily reviewed. A checklist of these factors, a survey of available packages, and conferences with vendors can provide an eye-opening perspective on project control and how it may be handled.

A substantial share of the users of computerized PERT/CPM control systems are in the construction industry. I have used CPM and PERT as a contractor and as a consulting construction manager. They are commonly used in other settings as well.

The basic problems in system selection are common to all users. The actual choice of a system depends on many factors, so it is better to review a variety of alternatives and contrast them against your situation than to go with a single recommendation or a hard-and-fast rule. At a small contractor's office we considered using the minicomputer for scheduling, but since the networks were small—about 200 activities—we just calculated them by hand. In that office, of course, the need for updating was rare, since jobs were usually completed in six months or less. The Associated General Contractors CPM handbook was the reference material. It provides a good introduction to the subject of networking for manual or computer-calculated schedules. For manual calculation the Halcomb PERT-O-GRAPH circular slide rule, with the calendar year as a scale, made the work straightforward.

When the project networks are larger—say, 300 activities and up—and updating is needed fairly often, the use of a computer is a real time-saver. Not only is the computer required for quick calculations, it makes it convenient to get reports sequenced in the proper order to manage the work, and the schedule can be interfaced to other systems, such as job costing, and purchasing.

At Construction Management Consultants (CMC is a joint venture of Sverdrup Corp. and Stone, Marraccini, and Patterson) we have managed over $200 million of construction in the last five years, using an IBM System/3, IBM CPM software, and custom programming to provide the special cost reporting required. The IBM package, JAS/3, provides the scheduling ability and creates a file from which key information is used to feed a cost projection and history file. CMC-developed software provides the accounting system detail and summary reports and as a computerized index to a microfilm file of all project records.

In choosing a system, CMC was not constrained by having an in-house computer. The choice was primarily based on project requirements with a budget limit for cost-effectiveness. The in-house system was chosen based on the large volume of repetitive reporting required, since weekly updates of the schedule are performed, and reports are produced for field and office personnel.

The arrangement that CMC uses now was not put in place from an original master plan. It grew out of a desire for more control over the scheduling and cost control activities, and a need for more economical and predictable costs of operation. In 1975, the company had contracted with a scheduling consultant to computerize networks, provide schedule reports as specified, and assist in development of cost control and other applications. It became apparent during the year that the cost of this work was going to vary quite a bit in response to volume. The need for repeat runs to analyze "what if" situations made costs even less predictable.

The needs we had were: (1) weekly processing of about six schedules of 1,000 to 4,000 activities each; (2) monthly job cost processing for each schedule (the reporting was to be specially designed); (3)

Trial and error reviews eventually yield results, but are costly and time consuming.

cash flow projections and cost history, and (4) weekly processing of an index to the projects' microfilm system. There were many factors that could vary, depending on what alternative systems were found. We were willing to acquire and train personnel if that were cost-justified. We were willing to consider smaller systems because the schedule and cost reports we wanted were relatively basic. The decision to use an IBM System/3, with a combination of IBM CPM software and CMC cost software, has turned out to be a good one. The monthly cost of operation is a known constant, and there is capacity left for additional applications.

However, there are limits to the project needs the system will handle. Because the IBM package has a practical limit of a five-year schedule, we decided to look around again when jobs came up that had ten-year time frames. Also, out-of-state jobs came up. The batch runs were fine for local work, but the management at remote jobs wanted a faster response. New work also turned up new reporting requirements.

These needs have been met successfully over the last year with the use of Control Data Corp.'s Cybernet time-sharing services. Using a Texas Instruments 765 terminal, and CDC's PROPLAN software, it is convenient to set up a schedule and compute dates wherever there is a telephone. The classic benefits of a time-share system are present, and when the project moves to a time frame of under five years (typical of many construction contracts) the batch accounting and scheduling system can be used.

With the time-share system, there is the additional advantage of having a wide variety of software tools available that are helpful in project management tasks. For instance, it took custom-programming to get the cash-flow reporting capability we wanted on the System/3; on Cybernet, there is a financial planning package available that does the same tasks, with more flexibility. On the other hand, you have to watch the costs carefully since they vary with usage (as opposed to the batch system).

Usage can be a major problem in any scheduling application. A schedule usually requires numerous runs over the period of a week or so at the outset of a project. Then processing settles down to a run a week, or a run a month, until the next major update. With the essentially dedicated batch system, time is in effect wasted during some months, while the system is loaded to capacity in others. This cyclical load can be a troublesome factor to handle but, so far, it has not been a critical problem in this installation.

FACTORS TO CONSIDER

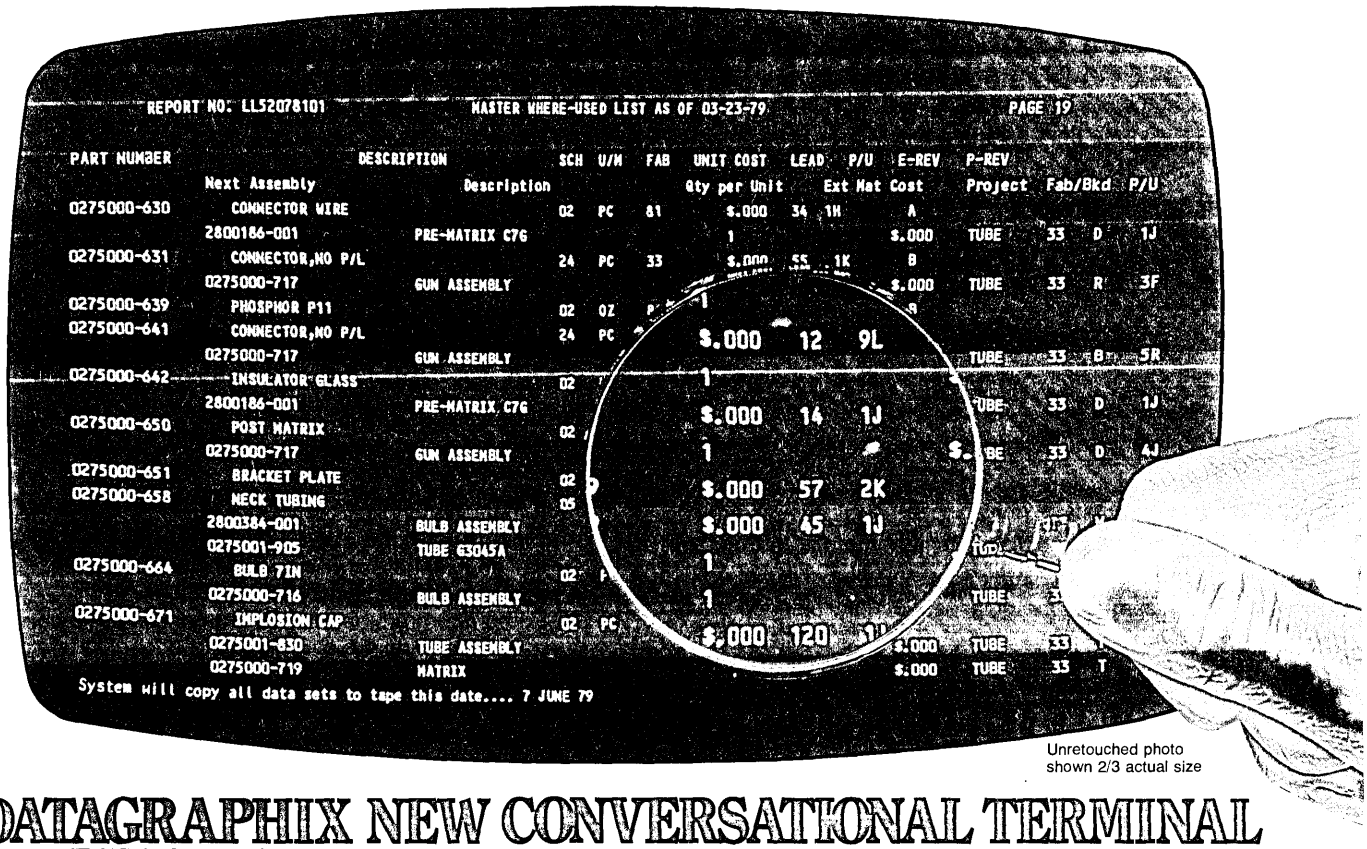
The choice of a system (or systems) can be an evolutionary process. The trial-and-error review of software and hardware will eventually yield results, but is costly and time-consuming. Even a brief analysis of the factors influencing the choice of alternative systems can save time and effort. Here are a number of factors to review when thinking about your choice:

1. *Project needs:*
   Is the project local or remote?
   What is the volume and frequency of processing?
   Are extensions of system anticipated?
   Will there be a need to interface other software?
   What are the system size constraints?
   What are the specific processing needs:
   - Length of time
   - Cost facilities
   - Resource facilities
   - Reports: number, format, frequency
   - Response time needed (one hour? two days? overnight?)
2. *Hardware:*
   Must it run on your machine or interface with another machine?
   How much memory is required for anticipated projects?
   What are the cost trade-offs among packages for your hardware, time-sharing, and terminal costs?
3. *Dp department constraints:*
   Are personnel available to interface with user?
   Are requirements of user too extensive to handle in context of routine workload?
   Does the user have experience with any packages before?
   Is there any package already on computer?
4. *User expertise and work style:*
   Schedulers often work under pressure; are they new personnel and are they familiar with various systems and problems?
   What is the degree of supervision/direction of scheduler by other management?
   What is the size of the projects?
   What will the user (scheduler) do?
   What tasks must dp personnel perform?
   What are the abilities of schedulers to schedule (amount of experience must be considered)? Work with computers? Work with people?
5. *Software package:*
   How is it to be used? (In-house, service bureau, time-share?)
   What are the costs: lease, buy, time-share; lock-in or trial period?
   Power (size of network, length of calendar, speed of processing, et al.)
   Features available vs. features required (see item 1)
6. *Literature available for package:*
   General introductory information
   Operations manual
   Technical (systems) manual
   Good examples in literature
   Self-training literature
   Is literature currently maintained and clearly written?
7. *Grade of support for package:*
   Is support from author firm or other vendor?
   Are training and operations problem assistance locally available?
   Is there program maintenance?
   Is the package to be interfaced with plotting software?
   How long has it been on the market and debugged?
   Is interface with custom software possible?

Many sources for project control systems are available, and the same software package may be available from several. For example, IBM's PROJACS and PMS IV can be installed on your equipment, or used as needed on a service bu-

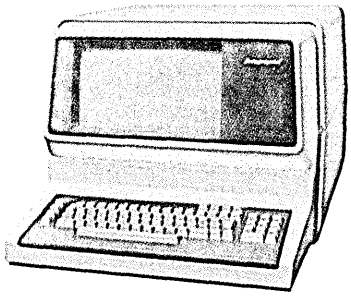
EXCEPTIONAL NEW DISPLAY. EXCEPTIONAL PRICE.

TAKE A CLOSE LOOK.



Unretouched photo
shown 2/3 actual size

DATAGRAPHIX NEW CONVERSATIONAL TERMINAL WITH FULL 132-COLUMN LINE CAPABILITY.



Take a close look at the latest addition to our family of terminals. It ends 80 column squeeze and offers unequaled character quality at a moderate price.

A closer look reveals the exceptional clarity of the DatagraphiX Charactron® shaped beam tube images. The crisp character quality is created by directing an electron beam through precise characters, etched in a matrix, onto a high resolution, phosphor coated face plate. The result is hours of comfortable viewing.

Unequaled performance comes right along with it, too. The Model 132-1™ features the benefit of DatagraphiX years of advanced microprocessor technology which makes it one of the most cost-efficient conversational display terminals on the market.

The Model 132-1 offers:

- Bright, high-resolution, flicker-free display
- ASCII 96 displayable upper and lower case character set
- 3168 Characters in 24 lines
- 132-column status line as 25th line
- 132 Tabbing positions
- Column counter for cursor position in status line
- Keyboard set-up of terminal operation
- 11-key numeric pad
- Cursor controls with host sensing and addressing
- Dual intensity

The Model 132-1. Seeing is believing.

You Are Cordially Invited To Inspect Our New Model 132-1 Conversational Terminal With Full Column Line Capability.

Come see us. June 4 through June 7, At the National Computer Conference, New York Coliseum, Booth #4422, 4th Floor.

Datagraphix®

a General Dynamics subsidiary

P.O. Box 82449 / San Diego, California 92138 / Phone (714) 291-9960 Ext. 481

DATAGRAPHIX* AND CHARACTRON* ARE REGISTERED TRADEMARKS OF DATAGRAPHIX, INC.

CIRCLE 50 ON READER CARD

The Bantam. The cocky new $599* CRT that just changed the pecking order.

User Need	Feature	P-E BANTAM	LSI ADM-3A	Hazeltine 1400	Hazeltine 1500	Adds Regent 100
Easy to read display	7 x 10 matrix for highly legible characters	Yes	No	No	Yes	No
	Black on white or white on black display	Yes	No	No	Yes	Yes
	Display set deep in hood to reduce glare	Yes	No	No	No	No
	Full 24 x 80 display	Yes	Yes	Yes	Yes	Yes
	Full upper and lower case	Yes	Option	No	Yes	Yes
	Non-glare screen	Option	Yes	No	Yes	Yes
High operator throughput, low operator fatigue	Tab stops/tab key	Yes	No	No	Yes	Yes
	Backspace key	Yes	No	No	Yes	Yes
	Repeat key	Yes	Yes	No	No	Yes
	Shiftlock key	Yes	No	No	No	No
	Separate print key	Yes	No	No	No	Yes
Convenient switching Local/on-line	Local–remote key	Yes	No	Option	Option	Yes
International Character sets	French/German/ Swedish/Danish/ British/Spanish	Option	Option	No	Option	Option
High speed numeric	Integrated numeric pad	Yes	Option	No	Yes	Yes
Convenient system interfacing	RS-232/CCITT-V24	Yes	Yes	Yes	Yes	Yes
	Current loop	Option	Yes	No	Yes	Yes
Simplified program debugging	Transparent mode and displayable control characters	Yes	No	No	No	No
Faster maintenance	Self-test	Yes	No	Yes	No	Yes
Minimum desk space	Small size	15Wx 19Dx 14H	15.5Wx 20.2Dx 13.5H	15.5Wx 20.5Dx 13.5H	15.5Wx 20.5Dx 13.5H	21Wx 23Dx 14.5H
Printer port	Printer port	Option	Yes	No	Yes	Option
Cost effectiveness	Qty. 100 OEM price	$599†	$740	Less than $550 in quantity 1000	$860	$895

*In quantities of 100.
†Qty. 1, End User Price $966.

Nobody ever offered you a tough, high quality, compact CRT like the BANTAM before. At $599 or any price. Designed for hectic office environments. And, human engineered to make an operator's life easier.

You get everything you need for cleaner input and faster throughput. An upper and lower case character set displayed on a sharp 7 x 10 dot matrix. A full 24-line by 80-character screen. A complete, sure-touch keyboard with shadow numeric pad.

You get complete tabbing. Full cursor addressing. Repeat, backspace and shiftlock keys. A transparent mode with displayable control characters to simplify host program debugging. And, a self-test mode for easy maintainability.

And, you get everything your operators need to make their jobs a joy. A hooded display that cuts glare. A wide bandwidth monitor for sharp images everywhere on the screen. Below-the-line character descenders to make reading easier. A switchable white-on-black or black-on-white display, whichever your operator prefers. An easy-to-find cursor that frames the entire character position in a transparent, inverted video block.

Plus plenty of options you can't get with CRTs costing much more. Like our low-cost Pussycat page printer. A full range of foreign language character sets. We even have a model you can switch from ASCII to full overstrike APL.

But that's not all. The BANTAM's compact good looks fit any decor. It's handsome enough for executive row and rugged enough for the stockroom. Silent? The BANTAM's fan-free design makes it quieter than an electric typewriter. And, the BANTAM only weighs 28 pounds.

Only an industry leader like Perkin-Elmer could do it. We designed a powerful, custom LSI controller chip that makes the BANTAM the one and only high quality CRT in its class.

But see for yourself. Use the comparison chart. Learn why we're so proud to add this $599 CRT to the 250,000 peripherals that bear our good name.

And, remember our terminals come equipped with a No Hassle, 800 toll-free service phone number.

One call does it all. We give you service *where* you need it, when you need it. We're there. Not just "worldwide," but wherever you are.

For more information call or write Perkin-Elmer Terminals Division, Randolph Park West, Route 10 & Emery Avenue, Randolph, N.J. 07801 (201) 366-5550. Or contact any of our sales offices. Then watch the feathers fly.

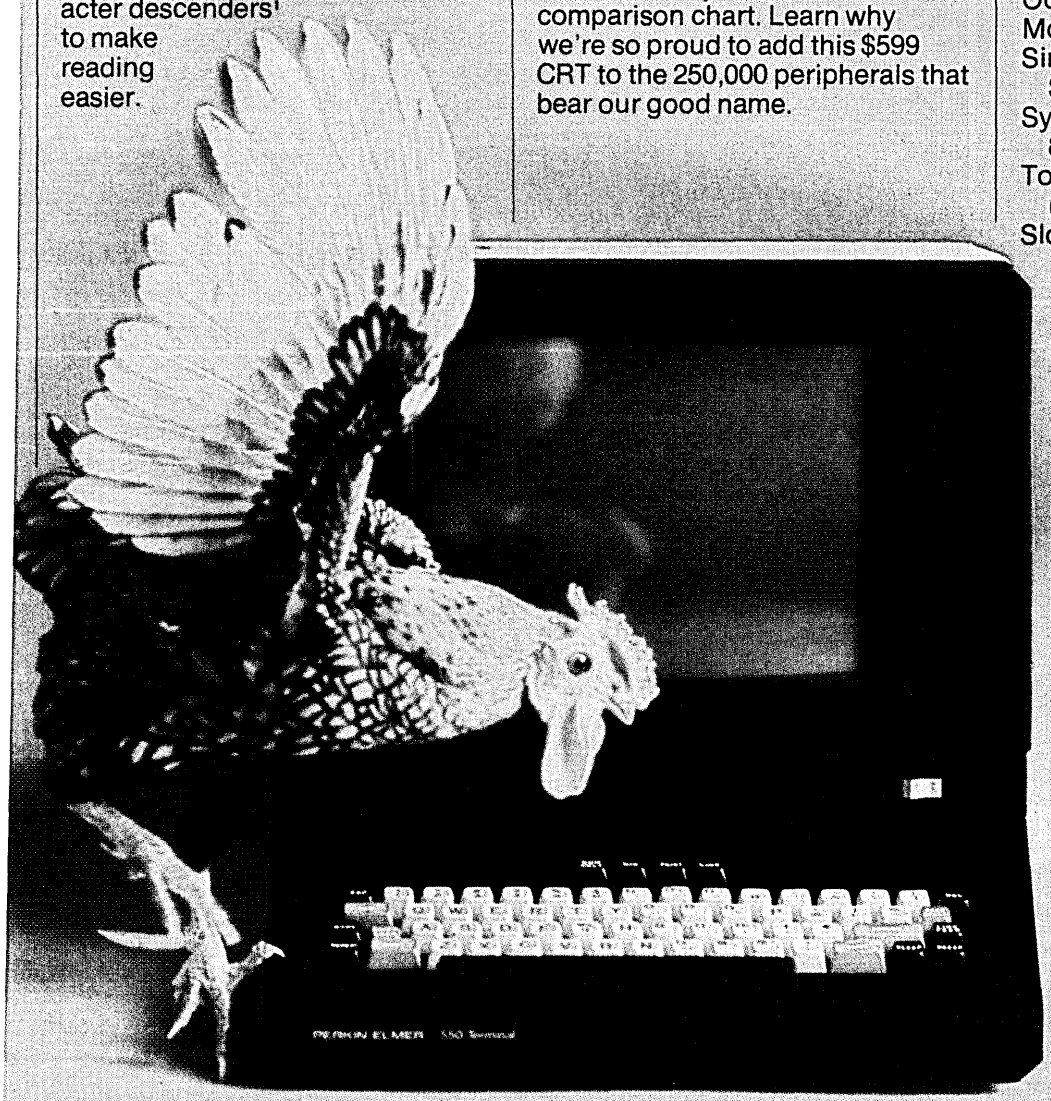
The Bantam's available at all these places

PERKIN-ELMER SALES OFFICES

Santa Clara, CA (408) 249-5540.
Tustin, CA (714) 544-9093.
Atlanta, GA (404) 393-8440.
Arlington Heights, IL (312) 437-3547.
Waltham, MA (617) 890-1305.
Oceanport, NJ (201) 229-4471.
McLean, VA (703) 827-5900.
Singapore, Republic of Singapore 2200949
Sydney (North Ryde), Australia 887-1000.
Toronto (Mississauga), Canada (416) 677-8990.
Slough, England 753-34511.
Paris, France 664-1858.
Munich, Germany 089-753081.
Schiphol-Oost, The Netherlands 020-458-269.

PERKIN-ELMER SERVICE CENTERS

Randolph, NJ; Oceanport, NJ; West Long Branch, NJ; Rochester, NY; Boston, MA; Hartford, CT; Philadelphia, PA; Pittsburgh, PA; Washington, DC; Atlanta, GA; Orlando, FL; Cleveland, OH; Dayton, OH; Englewood Cliffs, NJ; Detroit, MI; Chicago, IL; Minneapolis, MN; Kansas City, KS; Tulsa, OK; Dallas, TX; Houston, TX; Denver, CO; Phoenix, AZ; Seattle, WA; San Francisco, CA; Los Angeles, CA; Orange County, CA; San Diego, CA.



PERKIN-ELMER

CIRCLE 56 ON READER CARD

When You're Finished Processing Data... Press a Button and Process Words

You can do both with MDS Series 21 Distributed Data Processing Systems.

We've developed a great new software package that turns our Series 21 family of systems into first-class word processors. And, it's easy—just load the program and press a button.

Simple? Of course. Improve paperflow efficiency? Absolutely. Letters, reports, proposals, documents of every type, and even memos can be created, edited, stored, and quickly retrieved—at any time—for updating or revision without rekeying the entire text. Copy quality? You can be sure of *sharp, crisp* originals from the systems printer, whether you're running stationery or forms.

The word processing capability is just one of the many benefits you get with MDS Series 21 systems. There's modularity, for instance, that provides easy expansion or modification so you can grow at your own rate. A complete range of optional peripherals includes character and line printers. Tape drives and additional disk storage give you complete freedom to configure Series 21 equipment for application needs at central or remote locations.

So if you don't have a distributed data processing system that's been taught to process words—call us.

If you do have an MDS Series 21 installation and would like it to process words—we'll teach it.

Either way, you can be sure of the high quality and service that has earned MDS recognition as an industry leader.

PLEASE FORWARD MORE INFORMATION ON THE MDS SERIES 21 AND WORD PROCESSING

Name _____ Title _____

Company _____

Address _____

_____ Zip _____

( ) _____

Phone _____ DM679

Series 21 is a trademark of Mohawk Data Sciences

MDS MOHAWK DATA SCIENCES

1599 Littleton Road, Parsippany, New Jersey 07054
(201) 540-9080

CIRCLE 54 ON READER CARD

reau basis. Basically, the software is created by manufacturers for their equipment, or by independent software houses. Some of the newer packages appear to have benefited from the years of troublesome problems found in previous systems, while others have apparently had less maintenance. Even if you feel that you know about an excellent system, it pays to review a few others. In this review process, bear in mind a few helpful procedures:

- Set a trial period to find out—in practice—if the package works as advertised and if the scheduler understood what was being provided. Scheduling is a phased type of work, with each update capable of revealing new unknowns.
- Before reviewing a large number of packages, make a *written* description of what features are actually required in the system and what reporting routine is planned. Package review can become a contest for ultimate flexibility and capacity—which may never be needed (but certainly will be paid for).
- At a minimum, review the operations and training manuals, talk to a current user, and run/update a very small test network on the system(s) you like best. Give the vendor a chance to show what operating conditions could be if you chose the package. Most claim to be "fast to learn, powerful, and simple to use." Some are not.
- Find out what stage of development the package is in. Try to avoid adopting a package that will have substantially reduced support in the near future—this could be due to the increased support for a new package.

ABOUT THIS SURVEY

There are about forty packages listed in this survey. Most of the information was gathered by telephone interviews specifically for this article. Where the data was abstracted from another source, it is noted. Those who would like to meet others who have interests in this area should know about the Project Management Institute, a national organization that covers all aspects of project management. Their 1975 software survey is currently being updated and carries more in-depth information, as well as a wider definition of "project-oriented software" (see References).

While an effort was made to be comprehensive, there may be some important packages omitted. One important point that is hard to cover adequately is the availability of processing from service bureaus—batch or time-share. MCAUTO, GE, UCC, CDC, SBC, BCS, CSC, Tymshare, and others have applications in this project control system area. *Only a small part of this availability is shown in the table.*

There are systems on the market that are closely linked with these scheduling and control systems; for instance, EZPERT, a Systonetics product that draws network diagrams from schedule data. The common requirement for inclusion of all systems in the table is that they be PERT or CPM network-based.

How to use the table: Some of the information most useful in selecting alternatives is not in this table and must be obtained by reviewing the systems themselves. The most powerful systems offer features that take too much space to detail. For example, interface to data-base systems, built-in graphics capability, job cost processors, and network datafile-building aids.

The systems that are listed here are certainly sufficient to represent the full range of capabilities of the packages. If you *must* get a system to fit your computer, check the "Hardware Requirement" column. Otherwise, after you set a few important criteria, such as "network size," "length of calendar," and "method of network diagramming," you can get a general idea of how many systems could fit your needs.

If you are not too sure what range of capability is represented by the various systems, you might try sampling some literature. For examples of large, very powerful systems, you might look into MSCS, PMS IV, PREMIS, MISTER, PAC II, N5500, or others typically able to handle 30,000 activities and up. Your networks are unlikely to get that large, but the systems with the most options typically have high limits. However, the smaller packages should not be discounted. The project manager who knows what reports are wanted has the possibility of getting fully satisfactory results from a small, relatively inexpensive system.

The "Source Language" entry is provided primarily for those who are looking for FORTRAN systems, or systems they may want to customize.

"Resources" is a subject that can provoke controversy from many users. Some feel that "resource leveling"—typically, modification of schedule to meet available levels of manpower—is an important feature. It can be convenient just to be able to show that an activity will use certain amounts of a resource without special processing based on the information.

"Cost facilities" is a feature that varies a lot in the actual capability of a system. Some just store a cost for each activity and do little or nothing to process the data, while others have built-in accounting structures. It is tempting to look for a package that has all the options available. To get full value out of a system, decide in advance of reviewing alternatives what capabilities are really required. Unlimited capability and flexibility can turn into an expensive trap.

"Number, Length of Calendars" is of interest when you need more than one type of calendar per project. In construction, a five-workday calendar is used for labor, with a seven-workday calendar for concrete curing—which is dependent on passage of time only and observes no holidays. The length of your projects will determine how long a calendar you need.

It is convenient to have a "User-Accessible File" if you want to use the schedule data in other programs.

"Estimated (number of) Users" is subject to interpretation. Various sources declined to give this information on the grounds that some single "users" had many projects being monitored.

"Training" is provided by most, if only on request. Watch this area carefully in practice; some mean training in the package use only while others mean training in the use of CPM networking *and* the use of the package. The important point here is that CPM networking is best performed by personnel with substantial experience *in networking*. Even the best of systems will fail without a knowledgable user.

"Comments" are to try to show what might distinguish the package from other packages, particularly since the information in this table only lists an overview of features. Where quotation marks are shown, the comment is an actual quote from the manufacturer.

"N/A" means that the information is either not available or that the interviewee declined to provide it.

REFERENCES (See also VENDORS)

PMI Computer Software Survey 1975, Project Management Institute Technology Committee, Box 43, Drexel Hill, PA 19026.

Smith, L.A. and Mahler, P., Comparing Commercially Available CPM/PERT Computer Programs, *Industrial Engineering*, April 1978, pp. 37-39.

Paulson, Boyd C., Man-computer Concepts for Project Management, Technical Report No. 148, Dept. of Civil Engineering, Stanford Univ., 1971, Stanford, CA 94305.

Project Control Using CPM Technique, AACE Seminar, July 1978, AACE, Morgantown, WV 26505.

PROJECT CONTROL SYSTEMS: SOFTWARE SURVEY

SOFTWARE NAME	VENDOR	AVAILABLE THROUGH	SOURCE LANGUAGE	HARDWARE REQUIREMENT	NETWORK SIZE AND METHOD	RESOURCES	COST FACILITIES
ASTRA II	Honeywell	GE Mark III Honeywell & DATANETWORK	FORTRAN	Series 6000 37K Level 66 Level 66/DPS	1,920 activities Arrow	10/activity 250/project	Resource Costing
C3CPM	COMARC Design Systems	Tymshare	FORTRAN	XDS 940	1,000 activities Arrow	1/activity	No
CMCS	GSA	MCAUTO; GSA	FORTRAN	IBM 1130 IBM 360	10,000 (15,000 in development); Precedence or Arrow	4/activity	Yes
CM/4	Structural Programming, Inc.	Structural Programming, Inc.	BASIC	DEC 11 series WANG 2200	2,000 activities Precedence or Arrow (see comment)	99/project 6/activity Overload reporting	Yes
CPM	Dataline	Dataline; Dataline Timsh.	FORTRAN	DEC PDP-10	1,000 activities Arrow	No	No
CPMIS	Glenn L. White Co.	Glenn L. White Co.	ANSI COBOL	IBM 360/40 or larger; 200K	Unlimited projects 30,000 activities; Precedence or Arrow	14/activity	1/activity
CPM System	General Electric	GE Mark III	FORTRAN	(Mark III)	250 activities Arrow	Yes	Yes
CPM/30	Sperry Univac	Sperry Univac	COBOL	Univac OS/3 Systems	1,000 activities Precedence	No	No
FASNET	University Computing Co.	(Discontinued. UCC advises that N5500 is now their project control offering.)					
IBM JAS/3	IBM GSD	IBM GSD	Assembler	24K System/3	7,360 activities Precedence or Arrow	4/activity	Yes
IBM JAS/32	IBM GSD	IBM GSD	Assembler	32K System/32	14,000 activities Precedence or Arrow	4/activity	Yes
IBM JAS/34	IBM GSD	IBM GSD	Assembler	32K System/34	14,720 activities Precedence or Arrow	4/activity	Yes
IBM 5110PCS	IBM GSD	IBM GSD	APL	48K-64K 5110 or 5100	150 activities 64K; Arrow	Yes	No
IBM PROJACS	IBM DPD	MCAUTO; SBC many time-share IBM DP	—	IBM 360/370	500 nets 30,000 activities Precedence or Arrow	100 resources	2,000 rates
IBM PMS IV	IBM DPD	MCAUTO; SBC many time-share IBM DP	—	IBM 360/370	255 nets 32,000 activities Precedence or Arrow	Yes	Yes
IBM MINIPERT	IBM DPD	MCAUTO; SBC many time-share IBM DP	—	IBM 360/370	200 activities	N/A	N/A
MSC Mark II	Construction Management Systems	Construction Management Systems — Batch svc.	FORTRAN IV	IBM 360/370 Honeywell, NCR Century et al.	65,000 activities multi-projects Precedence or Arrow	10/activity Resource Leveling	10/activity Cost Leveling
MCS/90	Sperry Univac	Sperry Univac	COBOL	Univac Series 90, OS/3 VS/9	75,000 Arrow or Precedence	Yes (Passive)	Yes
MISTER	Computer Sciences Corp.	CSC's INFONET	FORTRAN	Univac 1108	6,000/project 30,000 program Arrow	12/activity Leveling	Interface to MANAGE (DMS)
MINICPM	Service Bureau Corp.	SBC (CALL/570)	BASIC	IBM 370	1,100 activities Arrow	No	Yes
MAXICPM	Service Bureau Corp.	SBC (CALL/370)	BASIC	IBM 370	3,200 activities Arrow	1/activity	Yes
MPM	Florida Power	Florida Power & GE	COBOL & FORTRAN	Honeywell	800 activities Arrow	5 categories 64,000 sub-categories	Yes
MSCS	McDonnell Douglas Automation	MCAUTO and licensed	COBOL, FORTRAN & ASSEMBLER	IBM 370	42,875 and Larger w/multi-project. Arrow or Precedence	12/activity Resource Leveling	Yes; interface with COPES
N5500	Nichols & Company	Nichols & Co. UCC	ANSI COBOL	IBM; Honeywell; Univac; Burroughs; DEC; HP	9,999 activities per project; unlimited multi-project; Arrow or Precedence	Unlimited/ activities Resource Leveling	Yes

NUMBER, LENGTH OF CALENDARS	USER-ACCESSIBLE FILE	EST. USERS	TRAINING	COST TO RENT OR BUY	COMMENT
1 calendar 14 years	N/A	N/A	Course avail. on request	N/A	"Imposed milestone reporting; extensive update capability."
Unlimited	N/A	15/month	Self-training users manual	Timeshare	"Easy to use timeshare-based system. Documentation teaches networking."
5 years (unlimited in development)	N/A	Average 10 requests per week	No (Except to GSA contrac-tors)	Program tape (or cards) & manual $39,000	"U.S. Government System; evolved from prior IBM system to suit GSA."
1 calendar 2,000 days	N/A	55 World-wide	2 weeks; on request	$16,000 purchase only	"5 sizes for Wang equipment; jobsite user/ mgt.-oriented; 9,000 activity, 10-year version available for larger equipment."
1 calendar; 1956 to 2000	N/A	12	One day every month	N/A	"Usually custom-design to fit customer's cost system; also graphics."
20 calendars 10 years	N/A	N/A	Course avail. on request	$25,000 fee	"Generally custom-installed and individually supported. Service at $75 and up per run."
N/A	Yes	N/A	"Simple to use"	N/A	"Very simple to use; small network."
To year 2049	Yes	N/A	Yes	No Charge	"CPM without resources, costing."
32 calendars 5 years	Yes	N/A	Self-Study; National Seminars	$89/ month	"Format output at execution time; precedence graphic diagram on system printer."
32 calendars 5 years	Yes	N/A	Self-study; National Seminars	$59/ month	"Format output at execution time; precedence graphic diagram on system printer."
32 calendars 5 years	Yes	N/A	Self-study; National Seminars	$71/ month	"Format output at execution time; precedence graphic diagram on system printer."
1 calendar 1977-1999	N/A	N/A	N/A	$300/ month for 12 months	"Menu-driven, interactive, user-oriented."
N/A	Yes	N/A	N/A	N/A	Large system; many users
N/A	Yes	N/A	N/A	N/A	Large system; many users
N/A	N/A	N/A	N/A	N/A	
20 calendars 14 years	N/A	12	At installation & on re-quest	$36,000 to $66,000	"Cost accounting integrated with system; 20 characters of coding."
To 2049	Yes	N/A	Yes; on request	No Charge	"Very flexible time processor; passive resource processing without leveling."
10 years+	Yes	20 to 50	Formal 2-day course	N/A	"Primarily multi-project and resource leveling."
10 years	Yes	N/A	Local office on request	N/A	"Customer can customize."
10 years	Yes	N/A	Local offices on request	N/A	"Written for management-level use; no surcharge."
Past year 2000	N/A	15 active	On request	N/A	"Very strong multi-project; unlimited activities and precedence notation in development; very flexible sorts for reports."
Past year 2000; 8 calendars	Yes	300+ World-wide installations	Self-study; 3- to 5-day classes	Interactive; License or monthly available	"One of the top systems, many additional features."
200 years	Yes	68	5 days with package; 3 day workshop regularly scheduled	$22,000	"State of the art system; Nichols can also provide project management; interfaced to EZPERT."

When you're ready to step up, call Logic Systems for your next plotter.

We're introducing a new series of computer output plotters because we know what you need. We've been providing plotter supplies since 1968 and have studied your graphics requirements for a long time. We know that your plotter must be fast and flexible for your applications. And we noted that other plotter manufacturers—especially the leaders—are not meeting your current needs. There's a spot for a new number one, and we're plotting to get there.

That's why we're introducing the new Logic-L Plotter Series.

It will accept your data format no matter what computer you're using. We've added intelligence to our controller. So whether your interface is RS-232-C, IEEE-488 or whether you're talking Fortran, Cobol, Basic, our plotter is compatible.

The new curvilinear function on our Logic-L Series draws precision curved lines, instead of jagged (and noisy) approximations. And it requires less data than vector approximations, so it's faster (and lots quieter) than other plotters. We've even priced it less than the competition.

Logic Systems:

Plotting to be number one.

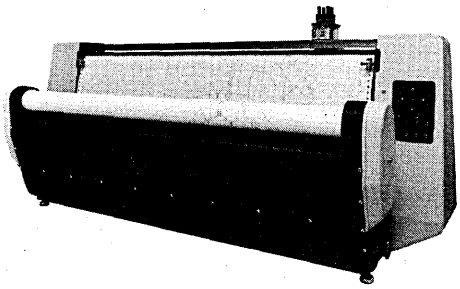
In addition to a built-in character set, you can create any symbol by downloading to the plotter. And for more flexibility in manipulating a variety of drawing media, our controller allows you to adjust the pen velocity.

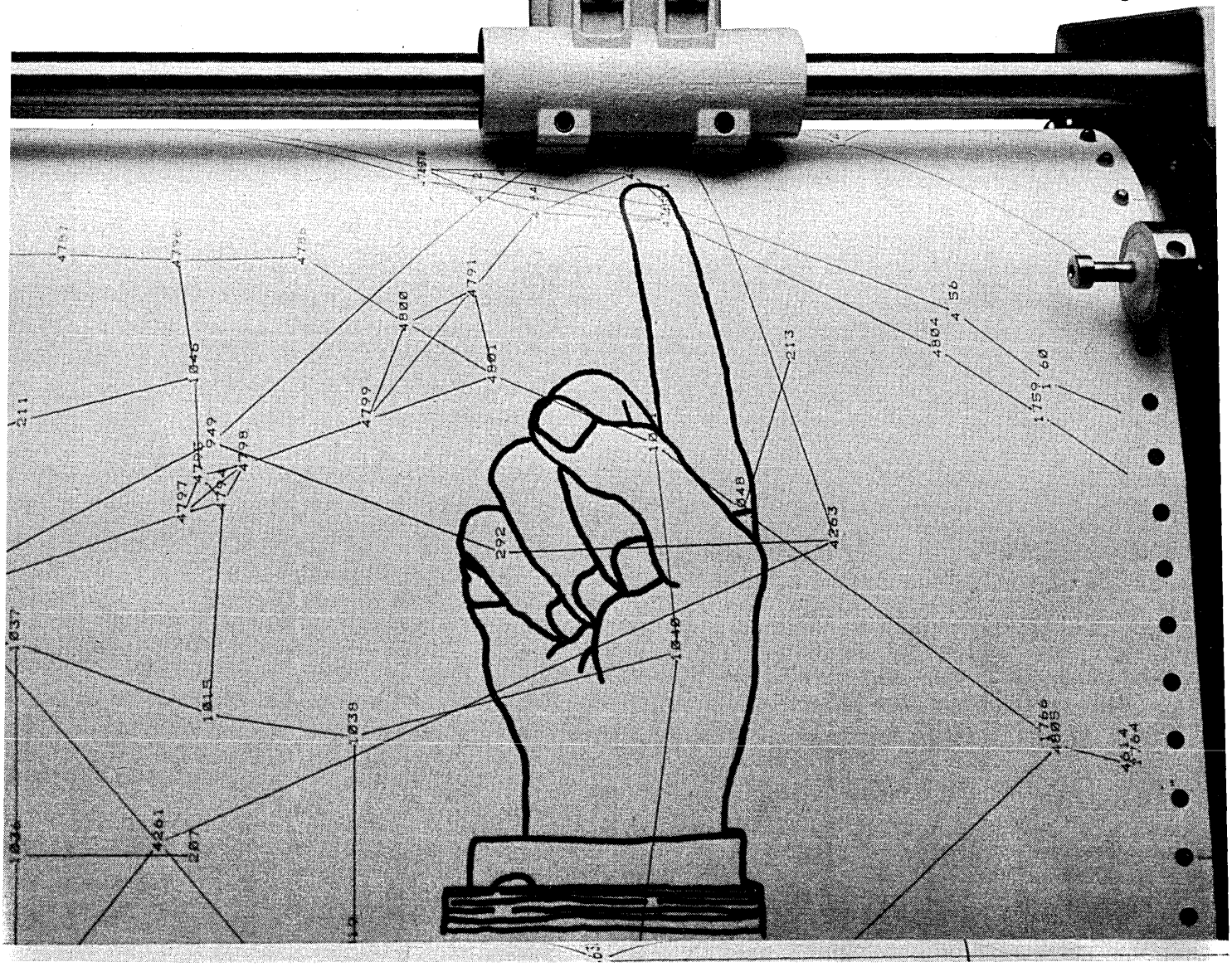
Logic Systems' plotters accept both roll and fanfold paper and range in width size from 15 to 48 inches.

Call us for more information about our flexible Logic-L Plotter Series. We'll show you how we're plotting to be number one.

Logic Systems
437A Aldo Avenue
Santa Clara, California 95050
(408) 988-3911

CIRCLE 31 ON READER CARD





Small Business Systems Surveyed

Microdata Reality Gets Top User Rating

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

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

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

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

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

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

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

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

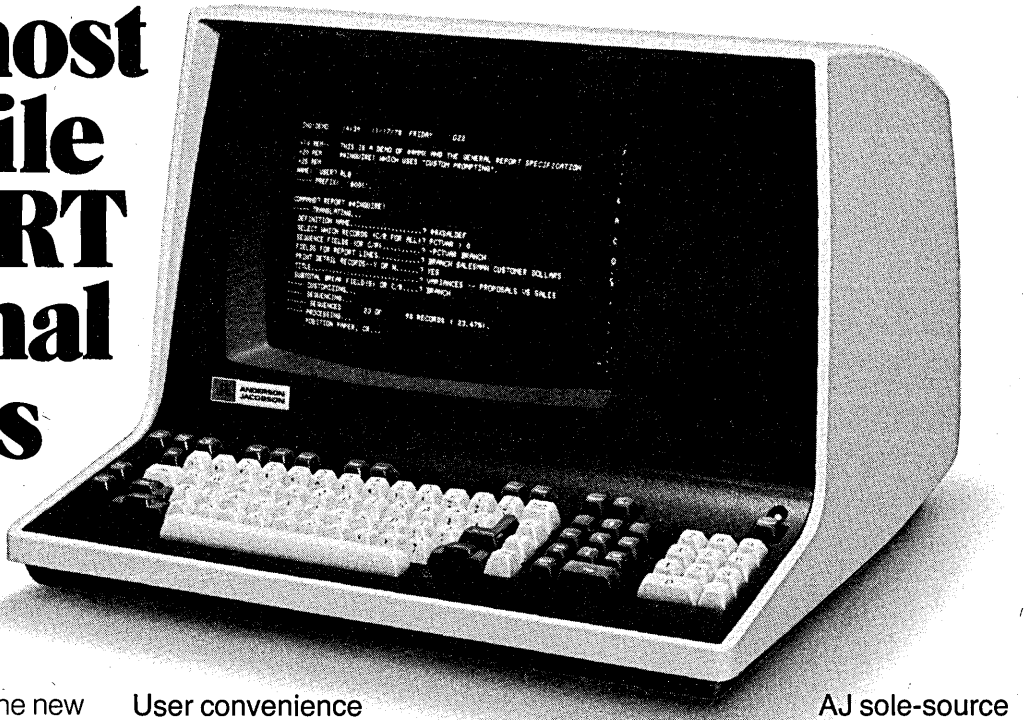
Following this order, the IBM System/3 Model 10 was rated 3.3, 3.5, 3.3, 3.3, and 3.3, respectively, by 34 users with 45 units. The System/3 Model 6 received 3.4, 3.7, 3.7 and 3.1 ratings in performance, reliability, service and support, respectively, by eight users with eight units.

PROJECT CONTROL SYSTEMS: SOFTWARE SURVEY

SOFTWARE NAME	VENDOR	AVAILABLE THROUGH	SOURCE LANGUAGE	HARDWARE REQUIREMENT	NETWORK SIZE AND METHOD	RESOURCES	COST FACILITIES
OPTIMA 1100	Sperry Univac	Sperry Univac	FORTRAN, COBOL, ASSEMBLER	Univac 1100 Series, 40K	4,095 activities/net; 4,095 networks Precedence or Arrow (32,000 activities planned)	500/net Resource Leveling	Yes
PAC II	International Systems, Inc.	International Systems, Inc.	ANSI COBOL	Running on IBM, Univac, Burroughs, DEC, Honeywell, et al.	Unlimited activities, multi-project, Arrow or Precedence	Unlimited/activity Resource Leveling	5 cost types Cost Leveling
PC/70	Atlantic Software, Inc.	GE Mark III	COBOL	Honeywell	100,000 activities, Arrow or Precedence	100+/activity Resource Leveling	Yes
PCS 11	DEC	DEC	FORTRAN	PDP-11 32K	20,000 activities Precedence or Arrow	3/activity 100/project	Yes; period, to-date, total
PCS 10/20	DEC	DEC	FORTRAN	DECsystem 10 DECsystem 20	20,000 activities Precedence or Arrow	3/activity 100 project	Yes; period, to-date, total
PERT/TIME	Control Data	CEC's CYBERNET	FORTRAN IV	CDC 6000 CYBER	6,000 events Arrow	No	No
PERT 6	Dynamic Solutions, Inc.	Dynamic Solutions, Inc.	FORTRAN; ASSEMBLER	DECsystem 10/20	4,000 activities Precedence or Arrow	32/project; Resource Reporting System	Yes
PMCS/66	Honeywell	Honeywell	FORTRAN	Series 6000 Level 66 Level 66/DPS	Unlimited activities; Precedence or Arrow	20/activity Resource Leveling	Yes
PNA	NCR	NCR	NEAT/3, Level 2	NCR 8200 + NCR Criterion 16K	2,000 to 4,000 Activities, Arrow	49/activity	Cost Variance
PPS IV	CISCO	CISCO	FORTRAN	IBM 370 CDC 6000 Univac 1108	4,000 activities	Resource Leveling, 2 modes	No
PREMIS	K & H	K & H	ASSEMBLER	IBM 360/370	64,000 activities multi-project; Precedence or Arrow	Unlimited Resources; Resource Leveling	Yes
PROCON 3	Nichols & Co.	Nichols & Co.	ANSI COBOL	IBM, Honeywell	999 and unlimited inter-project; Precedence	1/activity	Yes
PROJECT/2	Project Software & Development, Inc.	PSDI; BCS; SDL; UNICOLL, et al.	FORTRAN	IBM 360/370 Univac 1100	32,000 activities Multi-project Precedence or Arrow	Resource or time limited leveling, parallel or serial methods 16,250/ac.	Activity & WBS Processing; Report writer
PROMINI	K & H	K & H	FORTRAN	Any 64K mini	32,000 activities Precedence or Arrow	16/activity Resource Leveling	Yes
PROMIS	Burroughs	Burroughs	N/A	Burroughs	Arrow	Yes	Yes
PROSE	CINCOM	CINCOM & Service Bureaus	FORTRAN	IBM 370	10,000 activities Arrow	4/activity	Yes
PROPLAN	CDC	CDC	COBOL; ASSEMBLER	CDC 175 150K	8,000 activities 99 projects Precedence	30/activity Resource Leveling	4/activity Cost Leveling
SPRED	CSC	CSC's INFONET	FORTRAN	Univac 1108	2,000 activities Precedence or Arrow (15,000 in development)	Unlimited/activity, Yes	Yes
T/A	Time/Audit Limited	Time/Audit Limited, CSG; ACT; YORK-RYERSON	COBOL; FORTRAN; ASSEMBLER	IBM 370/155	Unlimited activities; Arrow	1/activity	Data-base module for equipment & materials.

NUMBER, LENGTH OF CALENDARS	USER-ACCESSIBLE FILE	EST. USERS	TRAINING	COST TO RENT OR BUY	COMMENT
12 calendars To year 2024	Yes	Over 100	Course avail. on request	$300/ month	"Has CalComp-compatible plotting processor."
Unlimited Calendars To year 2000	Yes	600 worldwide	4 workshop types	About $20,000 Lease $800/ month	"Easy to use and understand system and output; fast operation; interactive input."
N/A	N/A	N/A	In development	Timeshare	"Strong on manpower scheduling — originally for DP development."
3/project; 9 years	N/A	25	Users Manual	$1,500	"Interactive input with prompts."
3/project; 9 years	N/A	25	Users Manual	$2,500	"Interactive input with prompts."
10 years	N/A	150	Self-training Materials	$3,400 or $80/ month	"Interfaced to EZPERT."
10 years 2/project	N/A	N/A	Manuals; 3 day course; 5 day course with project mgt.	$35,000 purchase; Lic. $1,000/ mo.	"Proven; interactive; friendly."
99 calendars Unlimited length	N/A	N/A	Seminars and on-site	N/A	"Unlimited milestones; interactive input; extensive control features."
Unlimited calendar 9 years/activity fm. 1971	Yes	150 worldwide	At installation 2 days	$500 + $60/mo.	"Batch; well-debugged; easy to use; inexpensive."
2 calendars Variable limits	Yes	25 to 50	With installation	$15,000	"Easy to use; powerful leveler; best for short, tight projects."
Unlimited	Yes	Over 100 worldwide	3 days at customer schedule	$50,000 or lease $1,650/ mo.	"Source code provided; interactive entry with prompting; you can format input."
Unlimited	Yes	340	Self-training literature and 3 day course	$15,500 or $650/ mo.	"DATAMATION 1976 Software Honor Roll, highest rating; ICP Million Dollar Award."
100 calendars 89 years; Hours, shifts, days	Yes	Over 200 worldwide	4 days in-house or nationwide	Variable charge or lease	"Free format English type commands. Network and barchart graphics; activity splitting; flexible updating."
9 calendars; Unlimited length	N/A	10+	To suit customer	$30,000; $1,000/ mo.	"As close to PREMIS as possible for mini's. (See PREMIS)
N/A	N/A	N/A	N/A	N/A	Burroughs asks users to call local office.
100 years	N/A	20+	Yes	$100,000 or 125% of computer charges	"Very easy to learn; CINCOM also offers project management services to client."
3/project To year 2000	Yes	300/ worldwide	5 days	$10 & up, Timeshare	"Powerful resource and loop analysis; strong reporting flexibility."
10 years	Yes	20 to 50	1 day on request	N/A	"One of the simpler systems."
Unlimited	N/A	2 large	User manual (See comment)	$20,000 to $30,000	"Offer on-site assistance with network design; construction oriented."

AJ introduces the most versatile CRT terminal in its class.



Like our printer terminals, the new AJ 510 is great for timesharing—and a lot of other jobs. Because we designed it with a lot of capability.

User versatility

The AJ 510 excels at interactive timesharing. Data is easy to input and the whole inquiry-response procedure is fast and efficient. It has a full 128-character ASCII set, 16 video enhancements, editing capability, and many more features designed to give the user maximum flexibility.

User convenience

And we made the AJ 510 easy to use—whatever the application. We gave it a typewriter-style keyboard, separate numeric and cursor keypads, a bright 15-inch display, and status indicators—all designed to make the user's life simple.

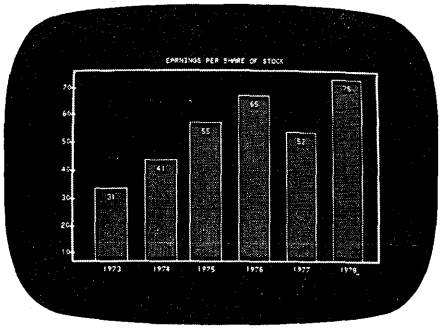
Communications versatility

The AJ 510 has two interfaces so you can connect a coupler/modem and a serial printer. Data rates are switch-selectable up to 9600 bps, in full or half duplex. Transmission can be character, line, or page-at-a-time.

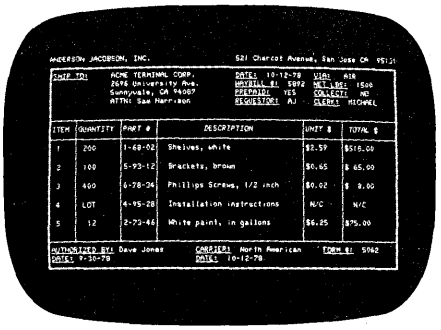
AJ sole-source responsibility

We not only build the AJ 510, we also sell, lease, and service it. Plus the couplers/modems and other AJ devices you may use with it. We take total responsibility for our equipment throughout its lifetime.

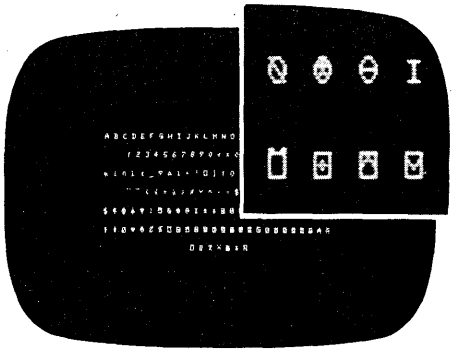
Call your local AJ office for details. Or write Anderson Jacobson, Inc., 521 Charcot Avenue, San Jose, California 95131, (408) 263-8520. Also available through AJ subsidiaries in Ottawa, Ontario, Canada; Paris, France; Shepperton, U.K.; and distributors throughout Europe.



A standard Graphics character set with a wide variety of symbols makes it practical to create forms, charts, and graphs.



Format Mode includes protected and numeric-only fields and other features to simplify applications such as data entry.



Optional APL capability includes full APL character set and special keyboard. Inset shows actual size characters.

ANDERSON JACOBSON

CIRCLE 26 ON READER CARD

The same old story

Software Aids? You've heard it all before. Increased programmer productivity, faster response to user needs, greater flexibility, money saving . . . all real benefits, and all sometimes rather hard to believe.

So when a Filetab user* says it all again we tend not to get too excited.

* *Ronald Walthew GKN*

"People ask for urgent, one-off, fairly detailed reports. Filetab gives us the resources to produce them."

But that doesn't happen very often . . . ?

"Over 700 times a year. That's 14 programs a week written with FILETAB."

Well they must be fairly trivial . . .

"Using FILETAB, yes. They average about half a day of effort each. But if we had to write them in COBOL, that would be a different story—we just wouldn't be able to cope."

Sounds like you're creating work . . .

"No, we're satisfying a need. Mind you, that was standard FILETAB. We've started using FILETAB LEVEL 6 now and the first job we did with it was develop and implement an on-line Work in Progress system."

With FILETAB? What's wrong with Cobol?

"Our best estimate for implementation using COBOL was two years, but the system was wanted in nine months. Using FILETAB we achieved that—a total of 39 FILETAB modules (say 12,000 lines of source) in 45 weeks. I would think that it's the equivalent of 40,000 lines of COBOL—so you can work out the implications of that for yourself."

OK. It gives you fast development, but you must be paying some run-time penalties.

"Well, we run between 5000 and 8000 programs every week and haven't noticed any drop in efficiency. Remember that FILETAB handles jobs much more economically. And if you look at efficiency in terms of jobs not individual programs, you won't find significant differences between FILETAB and, for example, COBOL."

Expensive, was it?

"FILETAB paid for itself the very first time we used it. And has repaid the initial investment a thousand times since."

FILETAB– that may be one man's view but it's backed by the practical experience of 800 other FILETAB users.

NCC
The National Computing Centre

The National Computing Centre Limited
Oxford Road Manchester M1 7ED England
Telephone 061 228 6333

To: **Geoff Gwyther, B33** The National Computing Centre Limited Oxford Road Manchester M1 7ED England Telephone 061 228 6333

Please send me full details of NCC's **FILETAB** for my ..... computer

Name .....
Position .....
Company .....
Address .....
Telephone .....

CIRCLE 44 ON READER CARD

VENDOR INDEX

Atlantic Software
Fifth & Chestnut Street
Philadelphia, PA 19106
(215) 922-7500
CIRCLE 300 ON READER CARD

M. Bryce & Associates, Inc.
1248 Springfield Pike
Cincinnati, OH 45215
(513) 761-8400
CIRCLE 301 ON READER CARD

Boeing Computer Services Co. (BCS)
177 Madison Ave.
Morristown, NJ 07960
(201) 540-7722
CIRCLE 302 ON READER CARD

Burroughs Corp.
Burroughs Place
Detroit, MI 48232
(313) 972-7000 (and local offices)
CIRCLE 303 ON READER CARD

Computer Sciences Corp. (CSC)
650 N. Sepulveda Blvd.
El Segundo, CA 90245
(213) 678-0311
CIRCLE 304 ON READER CARD

CISCO Inc.
810 Thompson Bldgs.
Tulsa, OK 74103
(918) 583-5791
CIRCLE 305 ON READER CARD

Construction Industry Computer Consultants, Ltd. (CONCOM)
620 Dorchester Blvd. West
Montreal, Quebec, Canada H3B1N8
(514) 866-4677
CIRCLE 306 ON READER CARD

Construction Management Systems
P. O. Box 90
Haddonfield, NJ 08033
(609) 429-4030
CIRCLE 307 ON READER CARD

Control Data Corporation (NOS, Cybernet)
Box 0
Minneapolis, MN 55440
(612) 853-4682 (and local offices)
CIRCLE 308 ON READER CARD

Dateline Systems Ltd.
175 Bedford Road
Toronto, Ontario, Canada M5R2L2
(416) 964-9515
CIRCLE 309 ON READER CARD

Digital Equipment Corp.
200 Forest Street
Marlboro, MA 01752
(617) 897-5111 (and local offices)
CIRCLE 310 ON READER CARD

Dynamic Solutions Inc.
50 Lytton Ave.
Hartsdale, NY 10530
(914) 949-6058
CIRCLE 311 ON READER CARD

Florida Power Corp.
Box 14042
St. Petersburg, FL 33733
(813) 866-4354
CIRCLE 312 ON READER CARD

General Electric (Mark III)
Suite 510
8150 Leesburg Pike
Vienna, VA 22180
(703) 637-4000 (and local offices)
CIRCLE 313 ON READER CARD

General Services Administration
Public Buildings Service
PCM/PCP
18th and F Streets
Washington, DC 20004
(202) 566-1754
CIRCLE 314 ON READER CARD

R. J. Hensen Associates, Inc.
555 Capitol Mall
Sacramento, CA 95814
(916) 441-7232
CIRCLE 315 ON READER CARD

Halcomb Associates
510 E. Maude Ave.
Sunnyvale, CA 94086
(408) 245-3131
CIRCLE 316 ON READER CARD

Honeywell Information Systems
Honeywell Plaza
Minneapolis, MN 55408
(612) 870-2520 (and local offices)
CIRCLE 317 ON READER CARD

IBM Data Processing Div.
11334 Westchester Ave.
White Plains, NY 10604
(914) 696-1900 (and local offices)
CIRCLE 318 ON READER CARD

IBM General Systems Div.
P.O. Box 2150
Atlanta, GA 30301
(404) 256-6797 (and local offices)
CIRCLE 319 ON READER CARD

International Systems Inc.
890 Valley Forge Ave.
King of Prussia, PA 19406
(215) 265-1550
CIRCLE 320 ON READER CARD

K & H Computer Systems, Inc.
Box 4
Sparta, NJ 07871
(201) 729-6142
CIRCLE 321 ON READER CARD

McDonnell Douglas Automation Co. (MCAUTO)
Box 516
St. Louis, MO 63166
(314) 232-8091 (and local offices)
CIRCLE 322 ON READER CARD

NCR Field Support
1700 South Patterson Blvd.
Dayton, OH 45479
(513) 449-3784
CIRCLE 324 ON READER CARD

Nichols & Co.
1900 Avenue of the Stars
Los Angeles, CA 90067
(213) 556-2757
CIRCLE 325 ON READER CARD

Project Software and Development, Inc.
14 Story St.
Cambridge, MA 02138
(617) 661-1444
CIRCLE 326 ON READER CARD

Service Bureau Corp. (CALL 370; CALL/PLUS)
500 West Putnam Dr.
Greenwich, CT 06830
(203) 622-2000 (and local offices)
CIRCLE 327 ON READER CARD

Sperry Univac
P.O. Box 500
Mail Station 1B222
Blue Bell, PA 19424
(215) 542-4011
CIRCLE 328 ON READER CARD

Structural Programming, Inc.
83 Boston Post Road
Sandbury, MA 01776
(617) 443-5366
CIRCLE 329 ON READER CARD

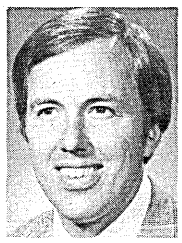
Systonetics, Inc.
600 North Euclid St.
Anaheim, CA 92801
(714) 778-1600
CIRCLE 330 ON READER CARD

Time/Audit Ltd.
80 Richmond St. West
Toronto, Canada M5H2C6
(416) 482-8092
CIRCLE 331 ON READER CARD

Tymshare
20705 Valley Green Dr.
Cupertino, CA 95014
(408) 446-6000 (and local offices)
CIRCLE 332 ON READER CARD

Glen L. White Co.
2550 Huntington Ave.
Alexandria, VA 22303
(703) 960-9100
CIRCLE 333 ON READER CARD

PERRY PETERSEN



Mr. Petersen is chief planner, Western Region, for SPCM, Inc., the consulting construction management subsidiary of Sverdrup Corp. He manages planning and control activities for clients' design and construction projects. He has learned about project control systems through experience with a construction contractor and a large property management firm. Mr. Petersen holds a BS in Civil Engineering from Cornell Univ. and an MBA from the Univ. of Santa Clara.

Meet the World Leader in Data Concentrators

Meet MICOM's Micro800 Data Concentrator, the statistical multiplexor which ended the TDM era. The Micro800 allows up to 16 terminals to share one telephone line more efficiently and more economically than ever before, and provides the added benefit of automatic error correction. And since it is virtually self-configuring, the Micro800 also offers *do-it-yourself installation* — no straps, jumpers, plug-boards or 'kluge' headers to mess with.

So if you have a time-share network and you think you can only afford error-controlled multiplexing to cities with more than 8 or 16 dial access ports, think again . . . and try our Auto-baud feature, you'll like it.

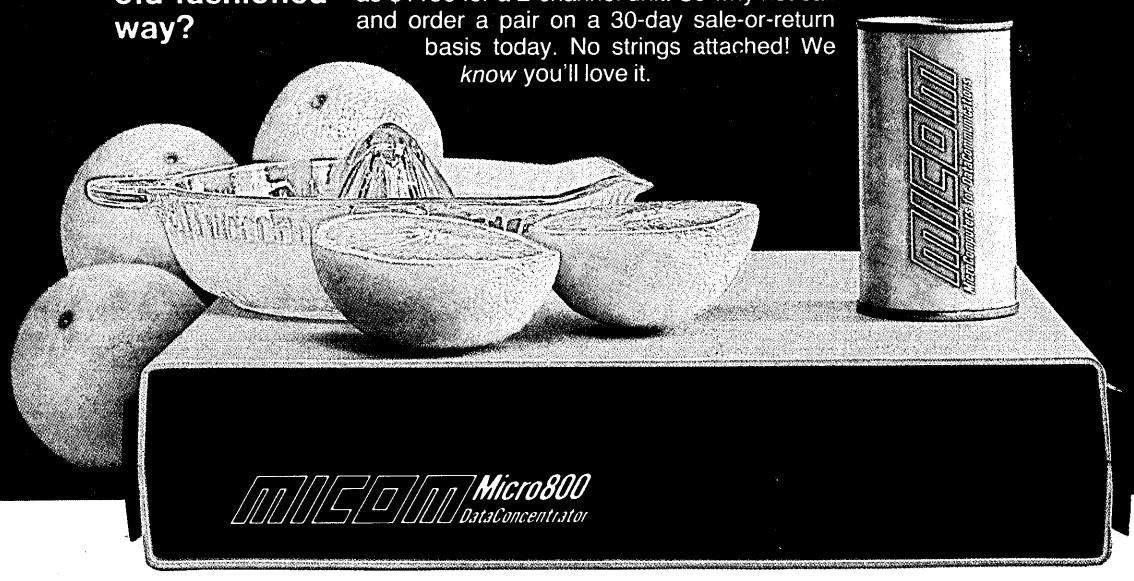
Or if you have a large private data communications network, and you can't afford to provide direct network access in your smaller locations, the Micro800 can provide economical error-controlled multiplexing into your network concentrators for as few as two terminals . . . and software demultiplexing in your network nodes may be awfully attractive.

In particular, if you have a minicomputer system with several terminals in one remote site, you are probably paying a fortune in communications costs, operating the terminals slower than you would like, and learning to live with the occasional phone line 'glitch' which drives your CRT's crazy. Why not talk with some of our Micro800 customers, supporting four 2400 bps CRT's on a single 2400 bps line, glitch-less! . . . and take advantage of our Hewlett-Packard, TermiNet® and DEC-writer® options.

The Micro800 requires absolutely no changes to the hardware and software you have installed today. Hundreds of Micro800's are already in service, and prices start as low as $1150 for a 2-channel unit. So why not call and order a pair on a 30-day sale-or-return basis today. No strings attached! We *know* you'll love it.

Still squeezing data through the old-fashioned way?

Concentrate. It's cheaper!



MICOM™ MicroComputers for DataCommunications™

MICOM SYSTEMS, INC. • 9551 Irondale Avenue • Chatsworth, California 91311 • Telephone 213/882-6890 • TWX 910/494-4910

CIRCLE 38 ON READER CARD

Some practical hints on what, when, and how to estimate.

ON ESTIMATING

by Lawrence H. Cooke, Jr.

Estimating data processing resources is one measure common to all installations; whatever the project, every company wants to know what it will cost. Most companies estimate machine and personnel resources needed to create or maintain applications but then lose the value of this information; once estimates are made, they are filed and rarely referred to again.

One practice is more common than we'd like to admit: estimates that understate system requirements are used to fire dp managers. Invariably, these managers are succeeded by others whose track records are no better.

This article examines *what to estimate, when to estimate,* and *how to estimate.* I will try to offer some insight into how we have been mesmerized into repeated failure, and how we may re-establish our credibility with senior management.

Two divergent but common schools of estimating will be summarily debunked. One is "hallway management." In this scenario, a programmer is cornered in the hallway and asked, "What will the system cost?" The second school, "scientific obfuscation," expects to integrate several variables into a formula such as: number of files, number of programmers, number of users, and rank of chief user.

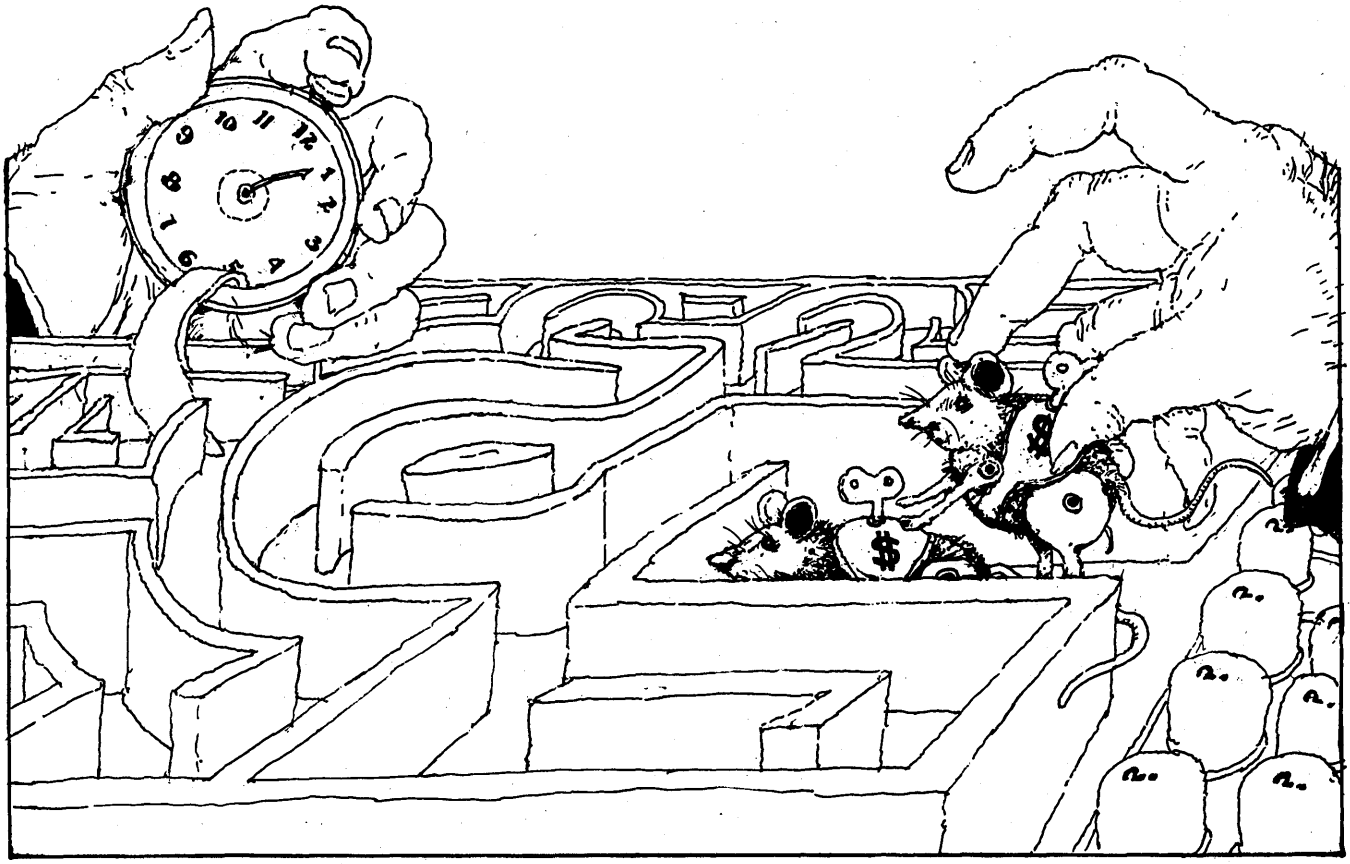
Often neither approach leads to useful results—the first suggests "I can do it in three weeks if it's my exclusive duty and if the project takes place in a vacuum." The second approach suggests "the project should take exactly 3.147 man-years and be completed on April 2, at 10:47 a.m."

Both approaches have been intentionally caricatured here to make a point. In practice, neither hallway management nor scientific obfuscation is ever so clearly drawn that the transparencies show through. Rather than dwell on our collective culpabilities in the past, though, let's move on to improving our track record.

WHAT TO ESTIMATE

Anything may be estimated. A classic example is: "Given two flies on a windowpane, guess which will move first." (This is a splendid parlor game for a house full of flies, but does little to build the credibility of the dp department—such a contest lacks the precision senior management expects of data processing.)

Most of us in dp would choose to estimate *projects.* The definition of project is "a well-defined activity to produce predetermined results at a certain point in time" (I quote Francis Frank of Keane Associates, the Massachusetts-based software firm, who used this definition in his May 1977 address to the American Banking Assn., "Project Management

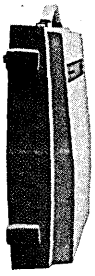


Foreign Correspondent.

The Swedish newspaper *Dagens Nyheter* gets the whole story with TI's 765 and 810.

At *Dagens Nyheter,* TI's 765 and 810 data terminals are making headlines by helping Stockholm's reporters gather news faster. And gather it more efficiently.

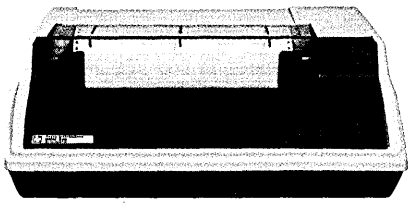
The 17-pound *Silent 700** Model 765 portable bubble memory terminal goes where the news is. And its partner, the OMNI 800* 810 R/O printer, puts that news at an editor's fingertips.


Model 765

For example, *Dagens Nyheter's* reporters take the 765 to soccer events, to Riksdag legislature sessions, to folk festivals, and to the polisstation (that's Swedish for police station).

They enter the story on the 765's typewriter-like keyboard. They edit the hard copy printout on the spot, so their articles are more detailed and correct. And transmit them at high speed to the newspaper's automatic switchboard. Or they can hold the story in the 765's nonvolatile bubble memory. By putting the 765 on staff, *Dagens Nyheter* has cut communications costs by approximately 80 percent.

At the editor's desk, the 810 prints out what the 765 sends in, at a speedy 150 characters-per-second. That's really fast-breaking news. The 765 and 810 terminals are versatile enough to gather, coordinate and transmit information from remote locations, as fast as a phone call. But they're both equally at home with realtors, accountants or insurance and travel agents.


OMNI 800 Model 810 Printer

Producing quality, innovative products like the 765 portable bubble memory terminal and the 810 R/O printer is what TI is dedicated to. And TI's over 200,000 data terminals shipped worldwide are backed by the technology and reliability that comes from over 30 years of experience in the electronics industry.

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

XIII OLYMPIC WINTER GAMES LAKE PLACID 1980

If you would like more information on the Model 765 portable bubble memory terminal or Model 810 R/O printer, contact the TI sales office nearest you, or write Texas Instruments Incorporated, P.O. Box 1444, M/S 7784, Houston, Texas 77001, or phone (713) 937-2016.

TEXAS INSTRUMENTS
INCORPORATED

*Trademarks of Texas Instruments †Service Mark of Texas Instruments

TEXAS INSTRUMENTS.
We put computing within everyone's reach.

Plan for it now!

1979 WASHINGTON D.C.

A.D.P.

FEDERAL COMPUTER CONFERENCE

Join the professionals at the year's foremost conference for Federal computer users!

If you were among the thousands who attended last year's Federal Computer Conference, you helped set a record.

The event attracted more attendees than any previous Federal computer conference in Washington history!

That isn't surprising. The 1978 Federal Computer Conference was the first to combine a comprehensive program with a full-scale exposition for Federal ADP users. From the wide range of session topics to the first-class Exposition in the Sheraton-Park's exhibit halls, the scope of the Conference was unprecedented — a *total* learning experience.

Now generally recognized as the foremost conference for Federal computer users, this year's presentation promises to be even bigger and better. You'll have a wide-ranging program of sessions and workshops. You'll have more—and bigger—exhibits to visit in the expanded Exposition. And, you'll almost certainly find more of your colleagues planning to participate. Attendance is expected to surpass even 1978's record turnout.

Structured with the guidance of Federal ADP leaders

The Conference's Program Advisory Group includes top-level members of the Federal ADP community—individuals you know, or perhaps even work with. These leaders understand the kind of program you want and work closely with the Program Chairman to provide it.

The only Federal conference co-sponsored by DATAMATION® magazine

Again this year, DATAMATION magazine has joined forces with Federal Education Programs to sponsor the Federal Computer Conference. It is the only such Conference sponsored by the leading data processing publication.

Easy to get to...easy on costs...special discounts, too

Held right in Washington, D.C. Little or no travel expense for a majority of attendees. And modest registration fees, bundled for ease and simplicity, cover everything including session notebooks and luncheons featuring prominent speakers. Special discounts for Federal personnel.

Comprehensive program plus full-scale Exposition

Three full days of sessions and workshops covering major areas of interest to you and every member of the Federal ADP community. Plus—a massive two-day Exposition featuring the latest offerings of leading companies in the computer industry.

1979 WASHINGTON D.C. ADP

FEDERAL COMPUTER CONFERENCE

Nov. 6-8,1979
Sheraton-Park Hotel
Washington, D.C.

Plan for it now!

Join the professionals at the 1979 Federal Computer Conference... the year's foremost conference for Federal computer users.

Send the coupon for full information!

Federal Computer Conference • P.O. Box 368 • Wayland, Mass. 01778.

☐ I'm interested in attending. Please send more information.
☐ My company may want to exhibit. Please send details.

Name_____ Title_____

Organization_____

_____ Tel. (_____) _____

Address_____

City_____ State_____ Zip_____

Co-sponsored by DATAMATION® magazine and Federal Education Programs
(Federal government not a sponsor)

"At CORNELL, our FPS Array Processor is providing IBM 370/168 users with 20-100 times more processing for their computing dollar."

Dr. Alec Grimison,
Physical Sciences Support Coordinator,
Cornell University

Substantial Savings

When the Cornell Computer Center attached an FPS AP-190L Array Processor to their IBM 370/168, their users could run numerically intensive scientific computations at substantial cost savings. The cost to users for CPU time on the FPS Array Processor is 15 to 35 times less than that on the IBM 370. What's more, in certain applications there is an advantage in processing time as well, leading to further savings.

High Performance

According to Alec Grimison, applications such as a Monte Carlo simulation in statistical mechanics, when programmed in the array procesor assembly language (APAL), have run on the FPS AP-190L from 2 to 3 times faster than on the IBM 370/168.

User Benefit

The result of this combined high performance and low cost of the FPS AP-190L Array Processor is a reduction in costs to system users at Cornell by as much as 95-99% — that's "20 to 100 times more processing for their computing dollar."

The array processor on the Cornell IBM 370/168 is available nationally and internationally via the Tymnet and Telenet Telecommunications networks.

Support

The FPS AP-190L is supplied with an extensive library of scientific routines, complete program development capability in both array processor assembly language (APAL) and FORTRAN, an off-line simulator, and a complete hardware/software interface for the IBM 370.

For more information on FPS AP-190L Array Processors that interface to IBM 370, 303X Univac 1100, and DEC 10 systems, call the FPS field office nearest you, or contact Floating Point Systems directly.

FLOATING POINT SYSTEMS, INC.

P.O. Box 23489, Portland, OR 97223
(503) 641-3151, TLX: 360470 FLOATPOINT PTL

FPS Sales and Service Worldwide: Boston, Chicago, Dallas, Denver, Detroit, Houston, Huntsville, Los Angeles, New York Orlando, Ottawa, Philadelphia, Phoenix, Portland, San Francisco, Washington, D.C. International offices: Geneva, London, Munich, Paris, Tel Aviv (Eastronix, Ltd.), Tokyo (Hakuto Co. Ltd.)

CIRCLE 80 FOR CONTACT BY FPS

CIRCLE 69 FOR MORE INFORMATION

and Control").

In order to stay in business in fixed-price contracting, Keane developed a two-stage method of estimating. In the first stage, a feasibility document, representing "what the customer wants," is produced on a time-and-material basis. In the second stage, "what the customer wants" is converted into a fixed-price contract on the terms "to deliver predetermined results at a fixed point in time."

While this may seem so obvious as to warrant dismissal, I agree with Frank that most dp shops do not have projects, but undertake nonprojects "to make the (blank) department *happy*." Making someone happy is obviously an endless task, and can't be accurately estimated.

Only projects can be estimated accurately. Dp exercises need not be coding projects exclusively. However, projects must end in a tangible product that is *predetermined.*

Keane went further by subdividing projects into "deliverables." This term was specifically used to mean something more than program coding that could be delivered within two weeks by human effort. The purpose of this division was to protect against the likelihood that months or years might elapse before determining whether or not a project is on target. Using the deliverables approach, earlier corrective action toward achieving the useful work intended becomes possible.

The four major project activities that produce a tangible product are:

1. A written, *signed off* feasibility analysis (what the customer wants).
2. Written, *user-accepted* functional specifications (how to do it).
3. Coded *and tested* programs (produces correct results).
4. An installed and user-accepted system (the real thing).

In system life-cycle terminology, documentation is not considered a separate category, but is included at each step. These products coincide with the analysis, design, programming, and implementation stages of the system. In terms of estimating, it demands that a physical, predetermined product be produced as evidence of the task being done.

WHEN TO ESTIMATE

Most dp estimates are made too early, before the facts are known. Dp professionals must not mislead senior management into thinking that estimates can be made too early. Information given before the facts are known is less than worthless—it is permanently damaging to dp professionals' reputations. Keane's two-staged approach, mentioned earlier, is recommended to determine first what is wanted (in writing) and then what it will cost to produce. Don't try to estimate and produce the *ultimate* system initially. Instead, shoot for something immediately productive to the user that will cut some of his costs and help his profitability. Then estimate the next stage where further gains are possible. The ideal target for a precise estimate is the $n + 1th$ stage, where n is the life-cycle stage currently being implemented. Initially, for the entire project, a ballpark estimate is appropriate. Then, in the $n+1th$ stage, identifying and estimating the deliverables offers the most control.

An example taken from space flight may be helpful to illustrate the process. Shortly after he became President, John F. Kennedy announced that landing on the moon by 1970 was a national objective. This estimate was neither a pipe dream nor a certainty. Technology had then achieved only free falls around earth's orbit.

However, the "deliverables" for the complex details had been planned out in some degree. The lunar module, docking, reentry, etc., were all on the drawing board.

At the time of JFK's ballpark objective, the feasibility had been established, the functional specs were on the way, and the project was engaged. The Apollo 11 achievement of Armstrong, Aldrin, and Collins in 1969 was the culmination of an activity that had been started years earlier.

It would have been inappropriate for Presidents Truman or Eisenhower to make an estimate for that activity; not enough detail was available to permit a "reasonable" assessment. By JFK's time, bold action and firm underpinnings of the deliverables made intelligent estimation possible.

Data processing estimates and subsequent applications progress are best done in bite-size units. Estimates are most likely to be accurate when a product is known and the estimating team has established credibility on the nth stage of the project.

HOW TO ESTIMATE

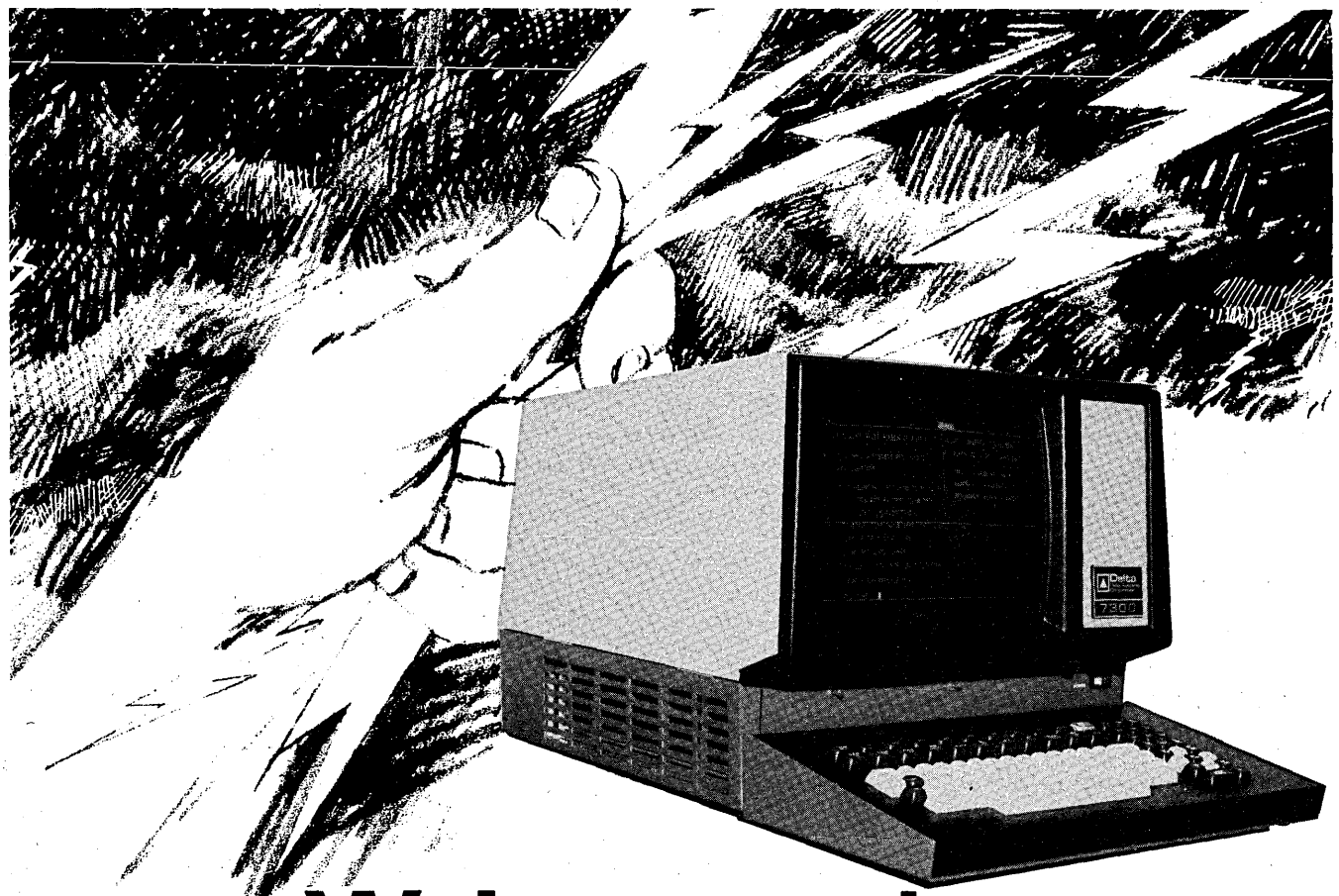
Estimators must be cognizant of and compensate for risk. As a project gets larger and more complex, it gets riskier. The bigger and more unstructured a project gets, the more unknown elements there will be, so the range of the estimate must be greater.

Professor Warren McFarlan and his colleagues at the Harvard Graduate School of Business Administration have formulated a useful concept of risk. (See pp. 517-528 of David Norton and F. Warren McFarlan's *Project Management, The Information System's Handbook,* Dow Jones-Irwin, Inc., Homewood, Ill., 1975, for an excellent treatment of quantifying risks in dp projects.) With this method, the estimator visualizes three variables as three dimensions—size, degree of structure, and technical reach (meaning technical complexity relative to the capability and experience of the company involved). For example, a project simple in the three dimensions, such as a tape-to-print program, is a low risk. A big project such as automating the "specialist" function is high risk because of its size and its unstructured nature, even though the technical reach factor is not particularly high. Installing the first teleprocessing network might be only a low-to-medium-risk project for a small installation, even though it carries a high technical reach factor, because of the size of the project, and its being relatively structured. (These three examples are graphically represented in Fig. 1.)

Since an estimate refers to a future project, an exact figure like $1,727.50 is unwise. A figure may be given for ease of reference, but everyone must know it represents a range.

At Midlantic, we have incorporated estimating into an MBO (management by objectives) program where 80% of the estimates come within 20% of the costs. The reason we don't expect to make all the estimates on target is that we have found it to be impossible. (Not even Pete Rose bats a thousand.) We have found through practice that senior management understands and accepts a tolerable level of imprecision, because they know that the added value of perfect information isn't worth the effort to gather it.

It has taken more than two years of practice, but we have achieved the 80/20 goal. Furthermore, even though some es-



We've got the POWER

for OEM's and large systems users

The new DELTA 7000 Series 16-bit microcomputer display terminals...More power to you for data preparation, text editing and distributed processing applications

The DELTA 7000 Series of multifunctional terminals is a unique combination of hardware and software designed to meet sophisticated applications in large computer systems. This combination offers you a choice of display terminals with truly outstanding performance features, including:

- 16-BIT MICROCOMPUTER for superior programmability and wide applications flexibility
- MULTIPLE SPLIT SCREEN allows you to divide the screen into independent display areas
- MULTI-CHARACTER FUNCTION KEYS permit one key to display or send a string of multiple characters or codes
- DYNAMIC FONT GENERATION enables you to design special symbols, or modify existing characters from the keyboard and have them immediately available
- EXTENDED CHARACTER SETS provide display of up to four 248-character sets which can be PROM resident or RAM loaded
- LARGE TEXT MEMORY from 6K up to 36K characters adds applications flexibility and terminal power to meet your needs

Put the power at your fingertips with a DELTA 7000 Series video display terminal. Zing us a line, or call for more information, literature or applications assistance.

Delta Data Systems Corporation

U.K. Subsidiary:
DELTA DATA SYSTEMS LTD.
Welwyn Garden (07073) 33833

Woodhaven Industrial Park
Cornwells Heights, PA 19020
(215) 639-9400

Service in over 150 locations in the U.S., and 14 European countries and Canada.

CIRCLE 60 ON READER CARD

You should have heard the things we said about you at our 10th birthday party.

You, our loyal customer, were the topic of discussion at Pansophic's recent birthday party, and with good reason.

Because without your support, we couldn't have grown from a small operation on Chicago's tough west side to one of the world's leading computer software companies in only ten short years.

Without your help we couldn't have introduced such revolutionary software systems as PANVALET, the program management and security system, EASYTRIEVE, the information retrieval and data management system, and PANEXEC, the security and control system for executable libraries.

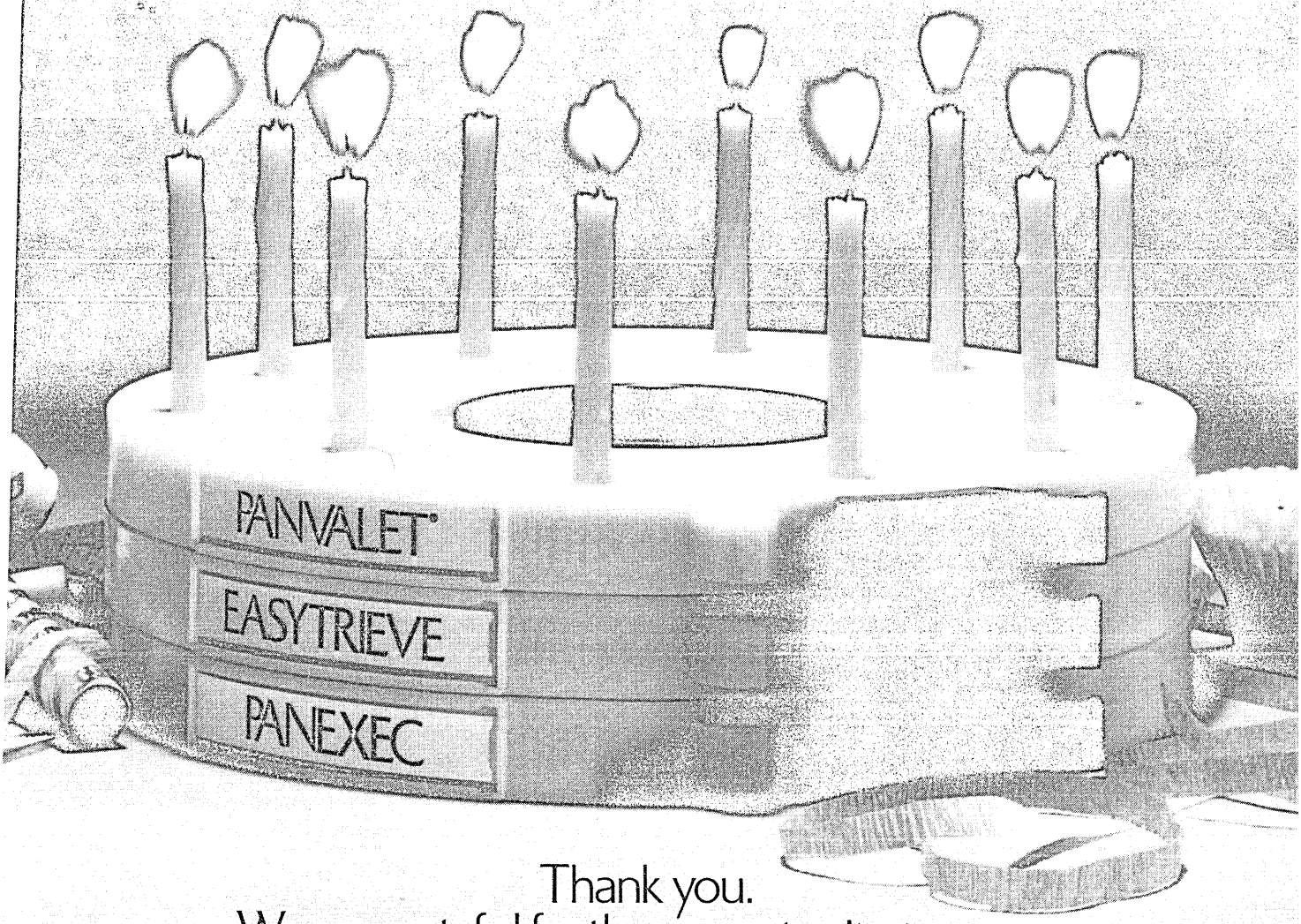
And thanks to you, over 5500 customers around the world now rely on Pansophic software.

Yes, we had a lot to say about you at our 10th birthday celebration.

And every word came straight from the heart.

PANSOPHIC

709 Enterprise Drive • Oak Brook, IL 60521
Corporate Headquarters 312-986-6000
European Headquarters 3408 4004, Telex: 844 47785



Thank you.
We are grateful for the opportunity to serve.

CIRCLE 88 ON READER CARD

timates fail—sometimes a project takes twenty times as many resources as planned—total projects still come in within 20% of estimate. Where some estimates are low, others are high. Our goal, however, is not to break even, but to diminish the variance in predicted-to-actual performance. Table 2 gives some sample estimates and their variances. There are other firms further along in the estimating process. One is Rohm and Haas, a chemical producer based in Philadelphia with more than six years experience in refining dp standards and procedures. Its work first came to my attention via the productivity group at GUIDE, the IBM user group. Erik F. Lukas, a standards specialist with Rohm and Haas, told me that 88% of the company's projects come within 20% of the estimate.

These examples are cited only to show what is possible. Estimates are related to both company and project. Each project must be evaluated according to its characteristics, and each installation can track its own data and *improve in relation to itself.* The appropriate image is a runner racing the clock. As long as his or her time improves, it doesn't matter what's being done in the Olympics. If a four-minute mile is not achievable, the five-minute mile may be. In our case, the prize is increased dp credibility and improved project development.

To summarize, an estimate must be made on a tangible and measurable project, and it must not be made too soon. Technical aspects such as size, technology, and structure must be considered. A history (data bank) must be built to track estimates relative to actual figures. These can be reviewed in order to learn from one's errors. Finally, each company and each project is different, so each should be measured against itself, rather than some abstract. As the company's data bank grows, estimates will grow more precise.

When it matters little whether estimates are on the high or low side, the key is that they move toward being more accurate. Using the estimating techniques outlined above does lead to a built-in learning process that improves accuracy, credibility and, ultimately, project selection by the firm based upon sound cost/benefit criteria. ✲

LAWRENCE H. COOKE, Jr.

Mr. Cooke is assistant vice president and manager of technical support for Midlantic National Bank, West Orange, N.J. He began his dp career in 1963 at IBM, directing the development of a compiler for the 7080. From there he went to Computer Applications, Inc. as a technical programmer and project manager. In 1969 he joined the Federal Reserve Bank of New York, where his projects included the design of an international balance of payments data base and the development of the Research Analysis Language (RAL) used by economists in the federal government, at the U.S. Treasury, and at the International Monetary Fund.

Building a computer facility is not a do-it-yourself project.

It's too important. And you have too much to do to coordinate the efforts of:

But we do it all the time. And in the last 10 years, we've planned or built facilities for more than 400 customers. Facilities for all sorts of computers.

We know computers. We know construction. We know how to create an environment for the efficient operation of a computer center. And we offer a full range of services, from consultation to the entire job.

We're international, too. With 11 offices in the United States and 15 in other countries, we're ready to serve customers around the world.

We'd like to show you what we can do for you. For more information on our full range of services, contact your nearest Control Data office or write to:

Facility Planning and Construction
Control Data Corporation
HQN11I, P.O. Box 0
Minneapolis, MN, 55440

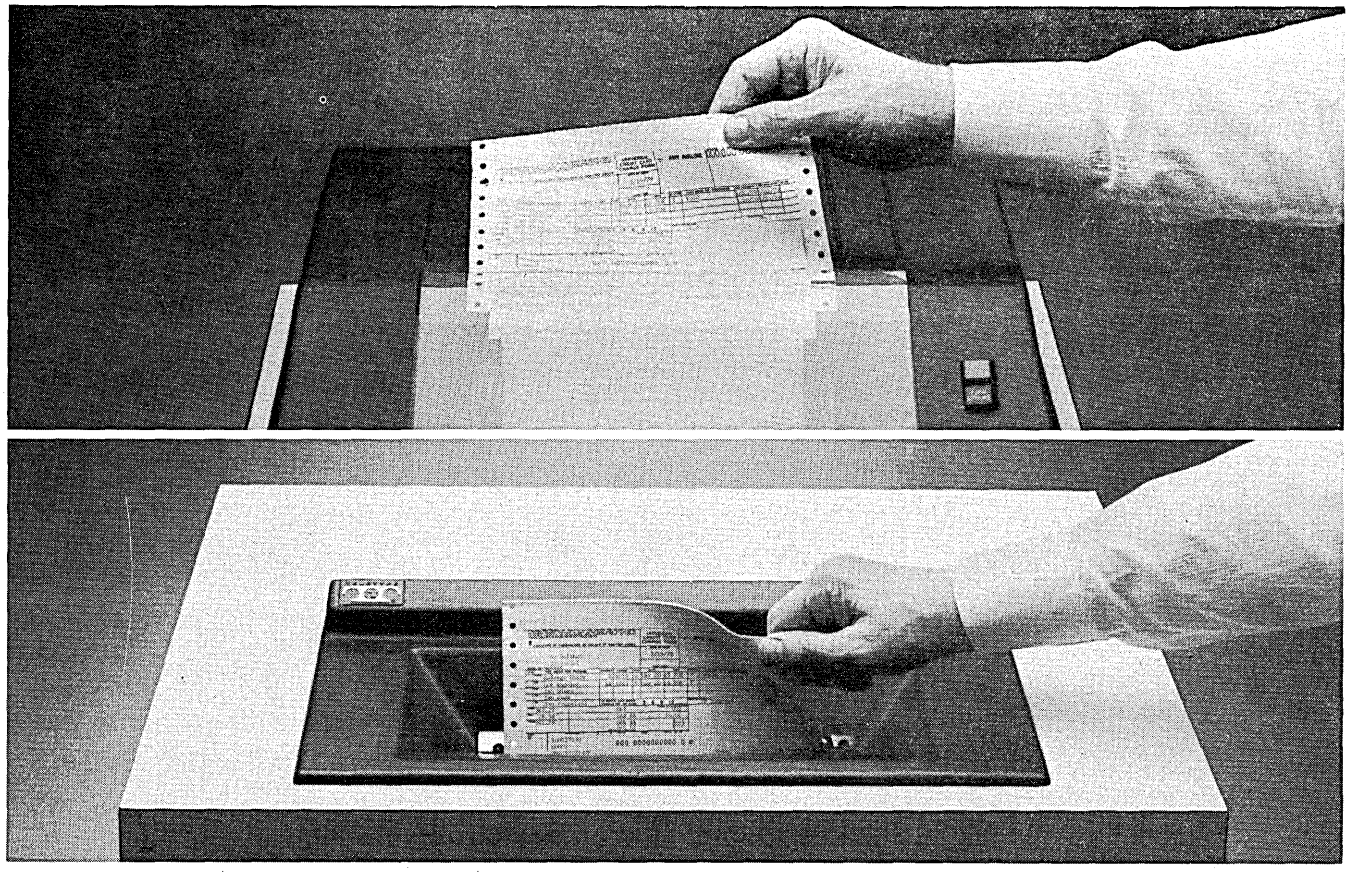
CONTROL DATA CORPORATION

More than a computer company

CIRCLE 73 ON READER CARD

WHY WOULD A COMPANY PAY GOOD MONEY FOR AN ENTIRE PAGE AND THEN LET PART OF IT GO TO WASTE?

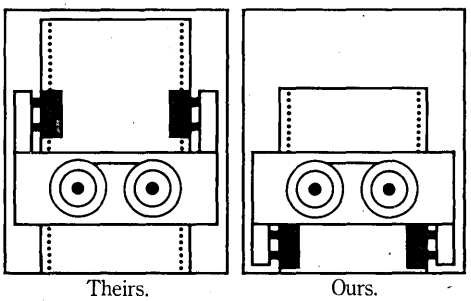
WE DON'T KNOW.



If your company doesn't use the Teletype* model 40 Forms Access printer for orders, labels, invoices, billings, tickets, or any "on demand" printing, then it's likely you're wasting paper.

And wasting paper is wasting money. Especially when you're printing those expensive multi-part forms.

But the model 40 has a unique paper feed mechanism, so it saves paper. And money.



Theirs. Ours.

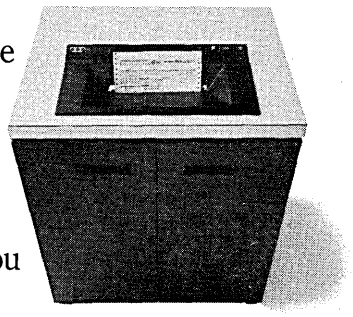
On conventional printers, the paper feed mechanism pulls the form through the printer from above. That means, to get at the form that's just been printed, you have to feed it out past the feed mechanism. And along with it comes the next form.

When you need the printed form right away, that can mean wasting every other form.

But the Teletype model 40 works differently. The paper feed mechanism is mounted below the printer, so the paper is pushed into the printer from below. You can print from the very top to the very bottom of the form, tear it off, and never waste or destroy the next form.

You can print anything from a single label to a multi-part invoice on the model 40, at 300 LPM. On forms ranging from 4¼″ to 9″ wide and from 2½″ to 22″ long. And the copy is always clean and sharp even on the last carbon.

Call Teletype Corporation for more information on the remarkable model 40 Forms Access printer. The sooner you stop wasting paper, the sooner you start saving money.



Teletype Corporation
5555 Touhy Avenue, Dept. 3185, Skokie, IL 60076
Tel. (312) 982-2000.

*Teletype is a trademark and service mark of the Teletype Corporation.

HARDWARE

OFF-LINE

"Any new (disk) drive development under 100MB which isn't already committed to 14-inch disks is almost sure to use the new 8-inch platter," according to a report entitled "A Preview of the 8-Inch Disk Drive Market." "Eight-inch rigid disk drives will capture 40% of the oem market for fixed-media drives under 30MB by 1981," predicts the $900 report prepared by Freeman Associates of Santa Barbara, California.

And speaking of developments in new disk technologies, Drexler Technology of Palo Alto, California, has received a patent for a method of detecting errors on optical disks prior to processing. "Error checking method and apparatus for digital data in optical recording systems," (U.S. Patent No. 4,145,758), describes the technique for finding errors on disks coated with a photographic-like emulsion. Drexler seeks to license the invention along with programs to supply prototype photoplate disks to firms wishing to produce large numbers of easily-duplicated read-only disks.

OCLC, Inc., the not-for-profit library service organization serving 1,750 libraries in 49 states, has let a $3-million contract to Ramtek for the development and manufacturing of 1,300 custom crt terminals. Two prototypes initially will be developed for testing. Production release is expected early next year, with production ranging to 75 units per month over a 24-month period.

Apple Computer and Bell & Howell Audio-Visual Products Division have entered into a joint agreement for Bell & Howell to market a specially-designed Apple-II microcomputer system. Initial efforts will concentrate on the educational market.

MULTIPLEXOR

The TC-3 concentrator combines the functions of an eight-line asynchronous interface and a statistical multiplexor. Designed for use with Digital Equipment's PDP-11, DECsystem 2020, and VAX-11/780 systems, the TC-3 plugs into the computer's Unibus. No software changes are required, as the TC-3 appears to be a DEC DZ-11A terminal interface. The TC-3 uses an SDLC-like protocol to provide error correction; data compression improves throughput. Communications between local and remote TC-3s can run at speeds ranging from 1200bps to 9600bps (synchronous or asynchronous). Interfacing conforms to RS232. A TC-3 concentrator sells for $5,500 and includes both local and remote units. An additional remote unit can be used to service another remote site, providing no more than eight lines are directed to the local unit. The extra remote unit sells for $2,750. COMDESIGN, INC., Goleta, Calif.

FOR DATA CIRCLE 351 ON READER CARD

MAINFRAMES

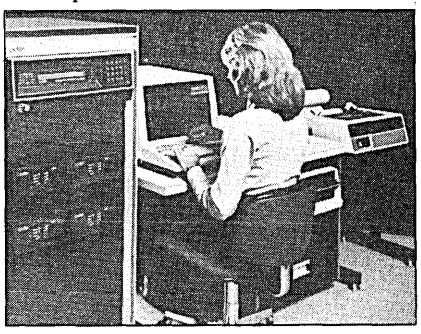
Four medium to large scale systems, bracketing IBM's two announced E-Series processors, have joined this vendor's Series 60 mainframes. The Level 64 DPS-320 is said to be roughtly equal in performance to IBM's 4331, and the Level 64 DPS-350 is said to have internal performance better than 70% above the DPS-320. Addressing the larger E-Series processor, the 4341, the vendor's Level 66 DPS-440 is said to have roughly 75% the 4341's performance, while the Level 66 DPS-520 is half again a DPS-440. These comparisons are based on benchmarks performed against existing IBM processors and adjusted by the performance factors IBM says apply to the E-Series. "Power modules" (a set of replacement pc boards) can increase the internal speed of a DPS-320 by up to 70%; a power module for the DPS-350 is said to yield a 25% performance improvement. Both of these Level 64 processors have basic memory sizes of 512KB, upgradable in 256KB increments to 1MB on the DPS-320 and 2MB on the DPS-350. Each quarter meg increment sells for $5,920. The two Level 64 machines include integral communications adaptors capable of supporting 14 lines, with up to 16 terminals or printers per line. A remote maintenance service capability, RMS/64, allows hardware and software maintenance from remote "tactical centers." A DPS-320 can be had for as little as $81,360, and a DPS-350 for as little as $155,232.

The Level 66 DPS-440 consists of cpu with one or two MB of memory, a system control unit, and an I/O multiplexor with 18 channel slots; the DPS-520 is similarly configured, but it can have up to 4MB of memory and a 27-slot I/O multiplexor. A basic DPS-440 central system sells for $198,338, and a basic DPS-520 goes for $371,316. HONEYWELL, INC., United States Information Systems Group, Waltham, Mass.

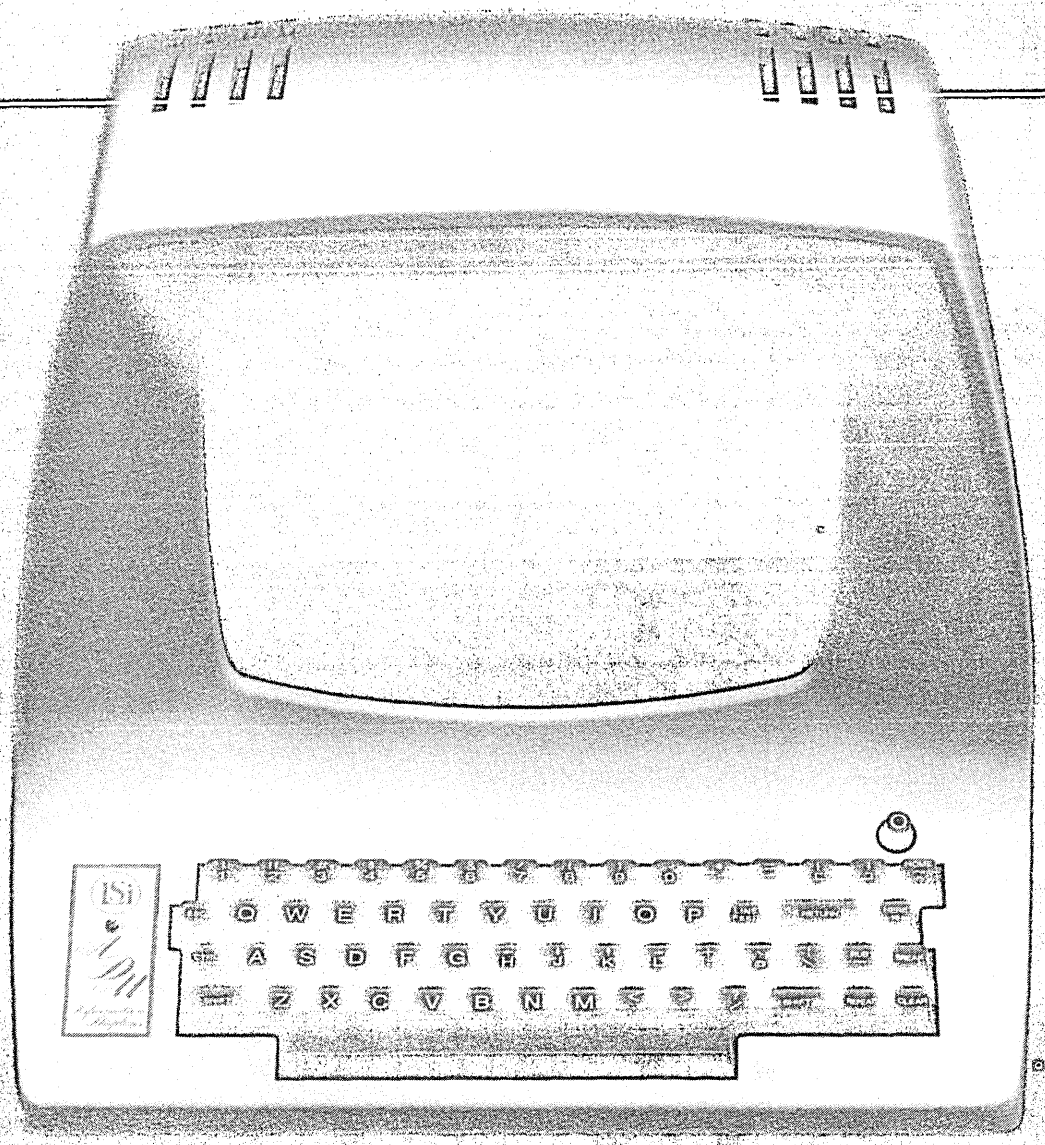
FOR DATA CIRCLE 352 ON READER CARD

NETWORK CONTROL SYSTEM

This vendor's Distributed Network Control System (DNCS) provides error messages to alert the user of network malfunctions, as well as providing diagnostic tools to locate failures. Reconfiguration commands allow service restoration through fall-back modes and standby equipment. DNCS supports up to 124 lines, with up to 64 devices on each line. The



vendor's MX 2400 series and LSI "Fast-Poll" series modems, with optional plug-in control card, are supported by the DNCS. The multiple microprocessor-based DNCS consists of a distributed network processor, an intelligent network crt terminal, printer, and floppy diskette storage for programs, network configuration and parameter data. To manage the network, the DNCS uses the independent secondary channel of master and remote



Dumbness is the sincerest form of flattery.

Why is everybody trying to look Dumb these days? It's in.

But four years ago, when we started building The Dumb Terminal® terminal, nobody thought such a basic device would ever amount to much.

Then we started selling our snappy, little terminals with 12-inch diagonal screens, full or half duplex operation at 11 selectable data rates, 1920 easy-to-read characters in 24 rows of 80 letters, typewriter-style keyboards with 59 entry keys, RS232C interface extension ports, direct cursor addressing and options galore for $895.

We shipped over 50,000 units.

Our competitors couldn't rush into the dumb market fast enough. They built just-as-dumb terminals with plenty of copy-cat features and options. But, they still couldn't duplicate the Dumb Terminal.

There's simply no short cut to four years of experience, extensive burn-in and the grueling quality control that separates every Dumb Terminal from the imitators.

In fact, our dependability is so respected in the computer industry, it's no wonder other terminals are trying so hard to look Dumb.

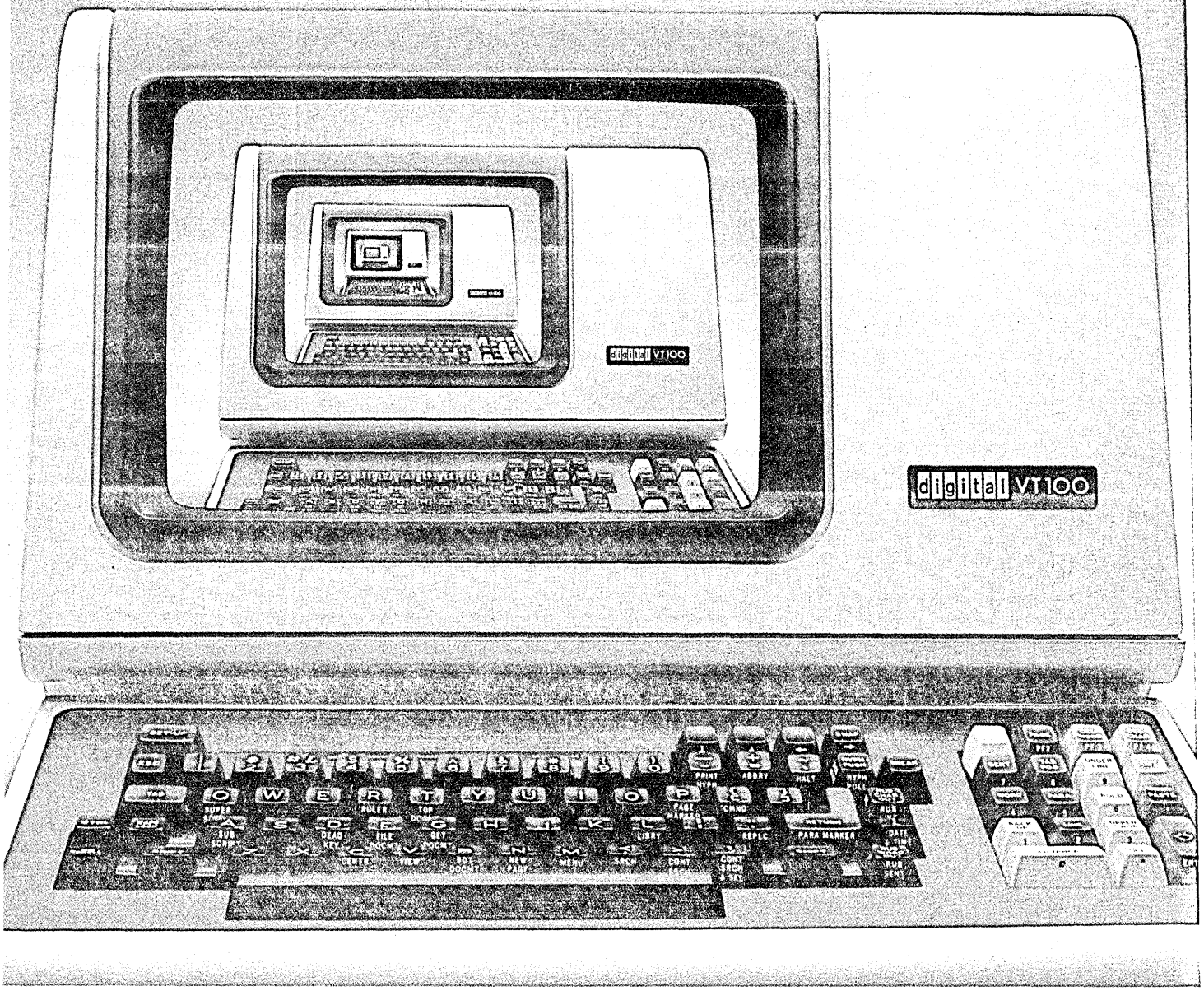
DUMB TERMINAL. SMART BUY.

LEAR SIEGLER, INC.
DATA PRODUCTS DIVISION

Lear Siegler, Inc./Data Products Division, 714 Brookhurst Street, Anaheim, CA 92803
(800) 854-3805. In California (714) 774-1010. TWX 910-591-1157. Telex 65-5444.

CIRCLE 36 ON READER CARD

Word processing. Don't just ask what it does. Ask how far it can take you.



Make sure the system you pick today can lead to what you'll need in ten years. And beyond.

With Digital's building-block approach, you can configure systems for the needs of specific work groups—and still get virtually unlimited options for expansion.

That's because every Digital system—from our basic word station up—features networking capability. Any terminal can talk with any other. Any system can talk with any other. This unique interconnectability gives you more freedom and flexibility than ever in your information processing plans.

And because every Digital system runs on the same simple-to-use, simple-to-learn software, you protect your investment in programming and operator training. No matter how large your system becomes.

Think of it as word processing you expand into. Not out of.

For a free booklet on how Digital word processing can help protect your future, clip your business card to this ad and send to Digital Equipment Corporation, Word Processing Computer Systems Group, MK1-1J14, Merrimack, NH 03054.

digital

A-6-9

modems. Operational control is handled from the crt through menu selection and prompting instructions. The network is constantly monitored, and error alarm messages are displayed at the crt. DNCS pricing starts at $29,200; lease prices start at $1,460, $975, and $860 per month for one-, two-, or three-year terms, respectively. Deliveries are slated for the third quarter. CODEX CORP., Mansfield, Mass.

FOR DATA CIRCLE 354 ON READER CARD

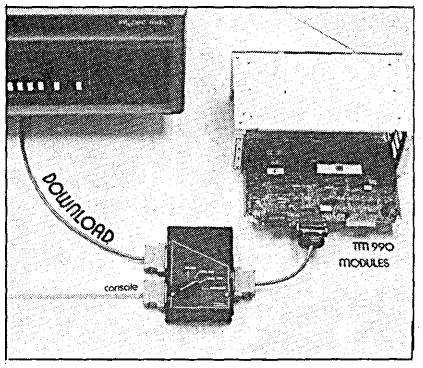
MICROCOMPUTER

The C8000 sports a 4MHz Z80 with 64KB of memory, a 12MB cartridge tape transport, and an 8-inch Winchester disk with 10MB capacity (for more on this disk, see June 1978, p. 254). Three RS232 I/O ports are standard, as is an 8-bit parallel interface. Users can run the OASIS operating system and program in BASIC (or make use of business application packages already developed for that operating system); optionally, the Univ. of California, San Diego Pascal system is available. Looking to the future, the vendor plans to offer a Z8000 cpu board; plans call for leaving the Z80 processor in place, and dedicating it to file processing. The 64KB C8000, with disk and tape, sells for $12,500. ONYX SYSTEMS, INC., Cupertino, Calif.

FOR DATA CIRCLE 353 ON READER CARD

DOWNLOADING ADAPTER

The developers of Pivot 9900 (software that allows TI 9900 program development on Intel microprocessor development systems; see November 1978, pp. 204, 205) have come up with a downloading adapt-



er. The adapter sits between the console and the Intellec console port, and provides four operating modes. It can operate in local mode (normal microprocessor development system operation), or local 990 mode, with the console operating the 990 module's monitor. Download mode allows moving object files from the Intel system to the 990, and an upload mode lets the user transfer memory contents from a 990 into the microprocessor development system. The adapter, with cables, sells for $260. PROCESSOR INNOVATIONS, Red Bank, N.J.

FOR DATA CIRCLE 355 ON READER CARD

HARDWARE SPOTLIGHT

ADD-IN COMPUTER

For applications that can be partitioned into autonomous, parallel processes, this vendor's slave computing architecture may prove attractive. Slave computing is implemented by adding from one to four Naked Mini 4/10S slave processors into an existing Naked Mini 4 or LSI 2 series computer. The 4/10S is essentially a Naked Mini 4/10 with 32KB of private memory and an instruction set expanded with stack-relative instructions, communications-oriented instructions, and slave control service instructions. The 4/10S can only operate when embedded in another machine—it is not a standalone mini. The slave processor(s) plug into the host's bus; either slave or host can generate an interrupt when it wants to communicate. Slaves can access up to 128KB of public system memory. Each 4/10S has four I/O ports, so peripherals, such as disks or terminals, can be serviced without interrupting the host. Software for slave processors can be developed on a Naked Mini 4, under OS4. An assembler, linker, and loader — available under OS4 — will han-

dle the 4/10S expanded instruction set. A single 4/10S sells for $1,990. COMPUTER AUTOMATION, INC., Naked Mini Div., Irvine, Calif.

FOR DATA CIRCLE 350 ON READER CARD

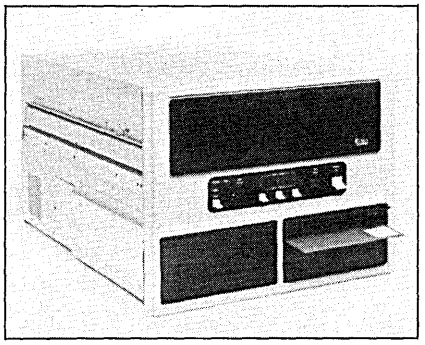
REAL WORLD INTERFACE

A data acquisition and process control device, the Real World Interface System, can be configured for a variety of applications by selecting appropriate plug-in modules. In its bare-bones form, the system consists of a cabinet, motherboard, power supply, and 8-bit parallel interface. At this stage the price tag reads $299 for those who don't mind assembling a kit ($360 assembled). To actually do something, you'll have to select some modules; the choices include A/D and D/A converters, current probe, AC or DC controllers, and a 32-channel low-power I/O board. Most of the modules have eight channels (the current probe has only four), although some have 16 or 32. Module pricing ranges from $65 (kit; $79.50 assembled) for the DC controller to $125 (kit; $150 assembled) for the AC controller. Along with the basic package, the vendor supplies diagnostics and usage examples in the form of 8080 source code and a Digital Group formatted tape. GENERAL COMPUTER TECHNOLOGY, Denver, Colo.

FOR DATA CIRCLE 357 ON READER CARD

DISK SYSTEM

"Data Warehouse" is an apt name for this combination Winchester and floppy disk system. On top, there's a 20MB Winchester disk, down below there's a pair of floppy drives, and tying the whole thing together there's an M6800-based controller and formatter. Systems integrators can hook up the computer of their choice through the Data Warehouse's 16-bit par-

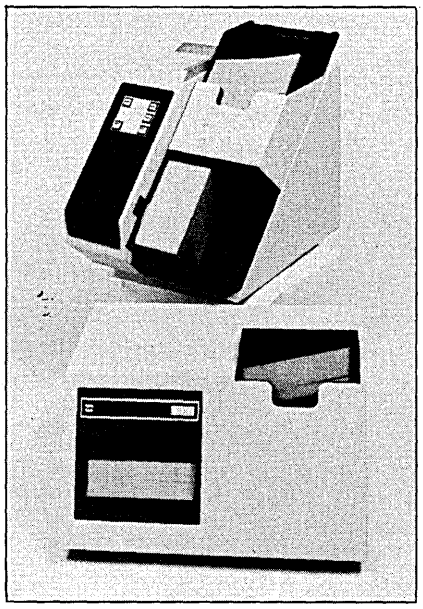


allel interface, or the vendor can supply interfaces for LSI-11S, PDP-11S, or S-100 bus systems. Data transfers are made via direct memory access. Microprocessor control allows the transfer of up to 64K words with a single command; it also allows packet chaining in noncontiguous memory, interrupt generation after every *n*th packet, and data copying between fixed and removable media without computer intervention. In lots of 100, the basic Data Warehouse, with single-density, single-sided diskette drives, sells for $6,592. REMEX DIV., Ex-Cell-O Corp., Irvine, Calif.

FOR DATA CIRCLE 356 ON READER CARD

CARD READERS

Designed for oems, the Models 300 and 800 card readers are said to have reduced parts counts and roughly 75% parts commonality between the models. Model 300 reads at a rate of 400cpm. Model 800 comes in two speeds — 600cpm and



1000cpm. Both can read mark-sense cards, 80-column cards, or both. Model 300 has a 500-card hopper, while model 800 comes standard with a 1,000-card hopper (a 1,500 card hopper is optionally available). Data output is character serial, bit parallel. In lots of 100, the model 300 sells for $1,657.50, and the model 800 is $2,112.50. Mark sense reading adds an additional 2%, and combination mark sense/punch card read capability adds 8%. The units are warranted for one year, and for orders of 100 or more, the vendor will paint the units in solid colors to match the customers needs. TRUE DATA CORP., Irvine, Calif.

FOR DATA CIRCLE 358 ON READER CARD

TRS-80 DISKETTE DRIVES

This vendor is offering TRS-80 users a choice between 40-track and 77-track minidiskette drives. Both sides of the 40-track diskettes can record data, while the 77-track drives use only one side. Using both sides of a 40-track diskette yields a storage capacity of nearly 205KB; the 77-track diskettes hold up to 197KB. The add-on diskette systems can be supplied with up to three drives. Also included with each system is a diskette containing patches to the TRS-80 operating system for supporting the diskette drives. To interface the drives to the TRS-80, users must have Radio Shack's TRS-80 Expansion Chassis. A single 40-track drive sells for $399, and a single 77-track drive goes for $675. Three drive configurations are $1,195 (40-track) and $2,025 (77-track). PERCOM DATA CO., Garland, Texas.

FOR DATA CIRCLE 359 ON READER CARD

DATA COLLECTION SYSTEM

System 15 includes processors and software to control data gathering terminals in a factory or plant environment. Potential users include remote sites of large industrial firms as well as smaller manufacturing companies. The modular system can be implemented in phases; as an example, the company suggests that an initial application of time and attendance reporting could later be expanded to include labor reporting, work in process, and other shop floor control functions. System 15 comprises three processor models, with memory sizes ranging from 64KB to 256KB; a disk controller and a variety of peripherals and terminals are offered as options. A basic 64KB System 15 includes a terminal adapter capable of supporting 10 terminals; a full-blown version can support up to 250 terminals. Terminals can be selected from three of the vendor's product lines: the model 102 attendance terminals, the 200 series of data-collection terminals, and model 122 remote printers. Expanded System 15s can support the vendor's top-of-the-line Modular Industrial Terminal (MIT) subsystems. System 15 can support up to 240MB of disk, and communications with a variety of mainframes. Software offerings include two data base management systems and an applications program generator, AIDE. System 15 purchase prices range from $28,000 to $67,000. NCR CORP., Data Pathing Div., Dayton, Ohio.

FOR DATA CIRCLE 361 ON READER CARD

PERSONAL COMPUTER PRINTER

If you're running an inexpensive computer, such as the TRS-80, the price of a printer may be inhibiting. While the Quick Printer II isn't the sort of printer you'd use to generate business correspondence, its price should make it attractive to many personal computer owners. And not just TRS-80 owners: the Quick Printer also has RS232 and 8-bit parallel interfaces. The printer uses 2-⅜-inch wide aluminum-coated paper. The unit prints upper- and lower-case ASCII characters, as well as double-size and double-spaced characters for special effects. Through software, the printer can be told to print 16 or 32 characters per line; the rated print speed is 64cps. Quick Printer II plugs directly into TRS-80s, or, with an optional cable, into the TRS-80 expansion chassis. Although designed for use with Level II TRS-80s, the other interfaces will allow its use with other microcomputers. The Quick Printer II sells for $219. RADIO SHACK, Fort Worth, Texas.

FOR DATA CIRCLE 362 ON READER CARD

PRINTER

The model 440 Paper Tiger is an upper- and lower-case ASCII impact printer. Capable of printing in 80- or 132-column formats, the tractor-fed printer has throughput rates ranging from 42 lpm to better than 300 lpm, depending on line length. Character size can be controlled

by software on a character by character basis. The paper tractors can be set for forms ranging from 1.75-inches to 9.5-inches wide, and the printers forms control can handle eight standard lengths. The 440 has both RS232 and Centronics-parallel interfaces; data rates are switch selectable from 110bps to 1200bps. A 2KB buffer and graphics package is optional. The basic Paper Tiger sells for $995. INTEGRAL DATA SYSTEMS, INC., Natick, Mass.

FOR DATA CIRCLE 360 ON READER CARD

TAPE TRANSPORT

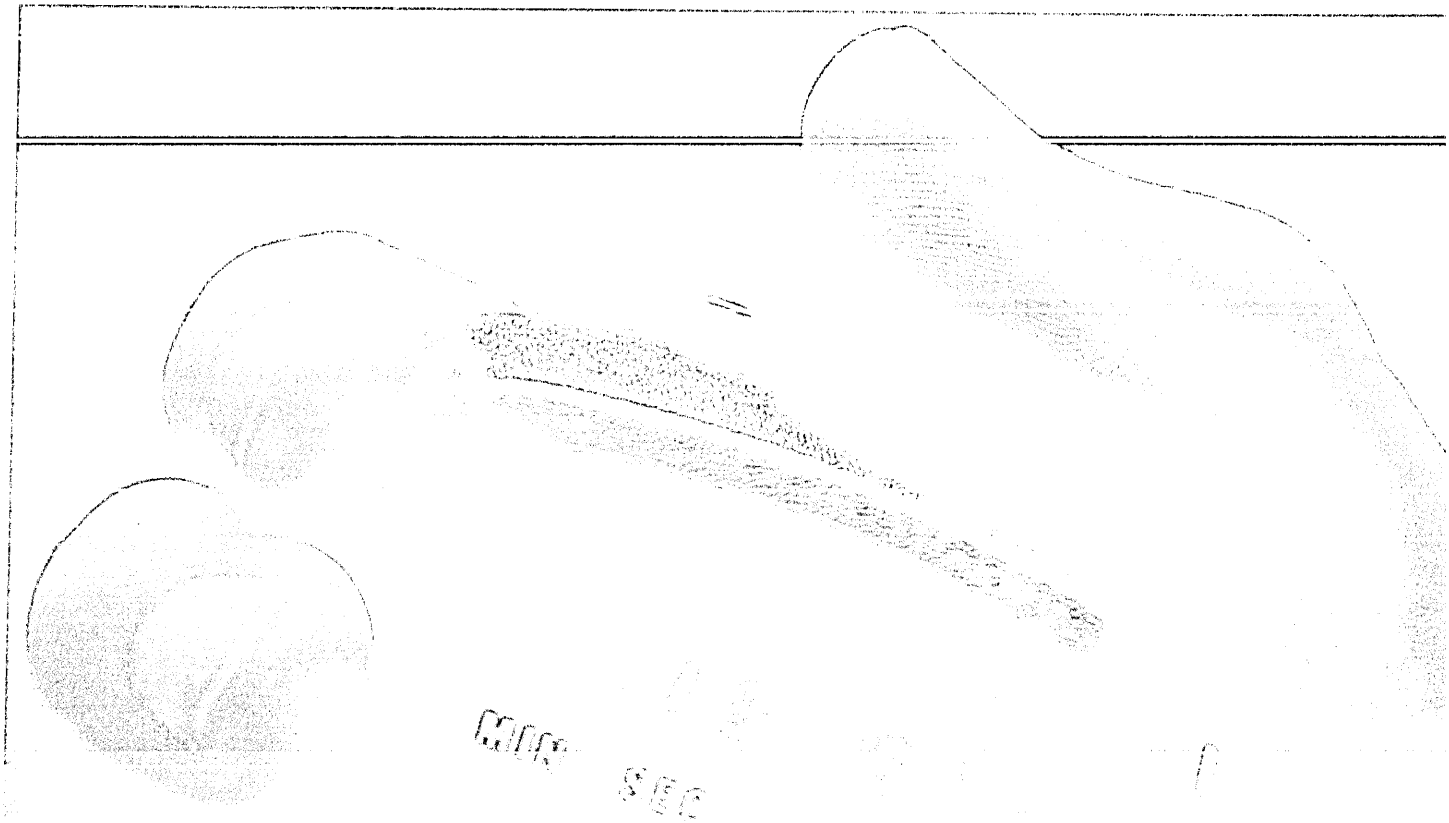
This vendor's Series 2000/9000 ½-inch magnetic tape systems work with Hewlett-Packard's smaller computers: 9800-

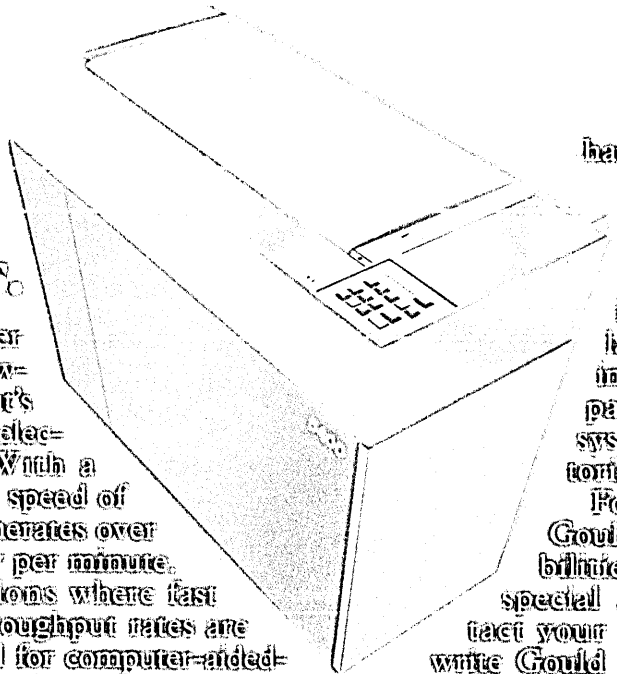
series desktop computers and the HP 250 and HP 300. An intelligent controller allows connection to the HP/IB bus; the controller handles formatting, and error detection and correction for up to four tape drives. The tape system can read and write seven- or nine-track tapes at densities of up to 1600bpi. A complete system, with tape transport, controller, formatter, and 54-inch rack enclosure sells for $9,875; compatible slave transports go for $5,350. DYLON CORP., San Diego, Calif.

FOR DATA CIRCLE 363 ON READER CARD

COMMUNICATIONS CONTROL

Primarily for medium to large scale communications users, and those with geographically far-flung systems, the Com-





An E-sized drawing in 13.5 seconds.

Gould's 54100 printer/plotter will produce an E-sized drawing in 13.5 seconds. That's faster than any competing electrostatic printer/plotter. With a paper width of 36" and a speed of 3.25"/second, the 54100 generates over 48 square feet of hardcopy per minute.

Designed for applications where fast turn-around and high throughput rates are important, the 54100 is ideal for computer-aided-design, seismic data plotting, and business graphic applications such as PERT/CPM, Gantt, and others.

Gould's patented integrative-pressure, closed loop forming system ensures high contrast dry hardcopy even at the maximum plotting speed of the 54100. Print resolution is 1000 dots per inch, horizontal and vertical. In addition, a staggered image head produces overlapping dots for high contrast images. A user-oriented control panel features a unique LED system for continuously monitoring paper supply.

For additional information on Gould 54100 printer/plotter capabilities, software, interfaces and special application packages, contact your Gould representative. Or write Gould Inc., Instruments Division, 3631 Perkins Avenue, Cleveland, Ohio 44114 ((216)) 361-3315. For brochure call toll free: ((800)) 325-6400, ext 77. In Missouri: ((800)) 342-6600.

GOULD

CIRCLE 9 ON READER CARD

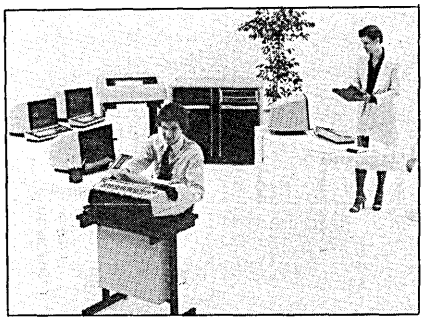
munications Intelligent Matrix Control (CIMC) allows switching of lines servicing communications and data processing equipment. With commands from the keyboard or preprogrammed computer software, the CIMC can switch the connections between data lines, modems, multiplexors, concentrators, and front-end processors anywhere in the distributed data communications system. The system operates with the vendor's existing line of switches when tele-control conversion devices have been added (these conversion devices can be added to switches already in the field). Of course, manual override is provided. A printer can be attached to the CIMC to log changed line interconnections and status. Depending on the number of switches involved and the number of locations, a CIMC will carry a price tag ranging from about $50,000 up to several hundred thousand dollars. T-BAR INC., Wilton, Conn.

FOR DATA CIRCLE 364 ON READER CARD

DISTRIBUTED PROCESSING

At the time of IBM's 8100 announcement, this vendor was said by many to be directly in the middle of the marketplace the Gray Giant hoped to capture. This vendor has countered with two machines offering 8100-like functional capabilities, yet retaining compatibility with the rest of the vendor's product line. Commenting on the IV/60 and IV/65, marketing vp John Clark said "We are *not* touting a plug-to-plug 8100 replacement . . . What we are offering is an alternative today . . ."

Positioned in the middle of the vendor's existing product line, the new processors sport 192KB of main memory, a "mid-range processor," and terminal support for 16 terminals on the IV/60 and 24 terminals on the IV/65. Memory, processor, and disk storage are packaged in a 40-inch high by 46-inch wide cabinet designed for an office environment. The systems run the vendor's Multifunction Executive (MFE/IV) and can support



standalone processing, data retrieval and update, COBOL processing, and communications between other machines from the vendor with IBM mainframes. A hardware communications controller, the 8450, designed specifically for HASP communications, also allows concurrent use of 2780/3780, SNA 3770, or 3270 applications while driving two line printers. The System IV/60 leases for $852 (one-year lease) and includes crt, 5MB of disk, communications capabilities, and software support. A similarly configured IV/65 goes for $1,062 per month on a one-year lease. The 8450 is $350 per month on a one-year lease. The 8450 becomes available this quarter; the two processors come up next quarter. FOUR-PHASE SYSTEMS, Cupertino, Calif.

FOR DATA CIRCLE 365 ON READER CARD

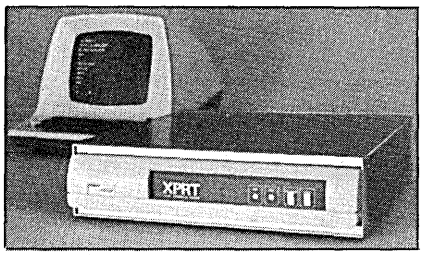
PLOTTER INTERFACE

This vendor's XY11 plotter interface allows PDP-11 minicomputers to control plotters from Zeta Research, Houston Instruments' DP series, CalComp 500 series, and others. The single printed circuit board controller is said to be plug compatible with the PDP-11, and software compatible with DEC software, including operating systems, drivers, and diagnostics. The interface sells for $1,250. MDB SYSTEMS, INC., Orange, Calif.

FOR DATA CIRCLE 366 ON READER CARD

X.25 TESTER

Intended for X.25 users and those developing X.25 hardware or software, the XPRT functions as a network terminal simulator, line monitor, and protocol vali-

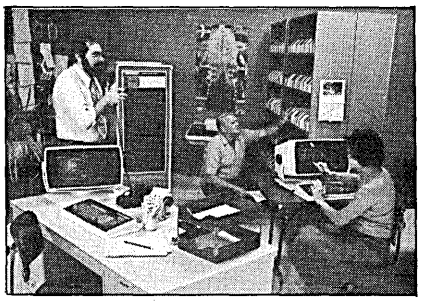


dater. The tabletop unit checks data terminal equipment and networks at each of the three X.25 defined levels: electrical, link control, and data packet. The microprocessor-based unit generates, displays, and validates X.25 traffic. In simulator mode, the XPRT can perform frame generation (user specified or automatic), frame display and validation, packet generation of major or minor errors, and error condition reporting; octal or hexadecimal notation may be selected by the user. Loopback testing and selective display of line traffic are available in line-monitor mode. XPRT sells for $15,000, and will become available in September. TRANS TELECOMMUNICATIONS CORP., Marina Del Rey, Calif.

FOR DATA CIRCLE 367 ON READER CARD

BUSINESS SYSTEMS

With the introduction of two microNova-based systems, this vendor has fleshed out the midrange of its two-year old CS family of interactive COBOL business systems. The two systems are intended for use in companies with up to 50 employees, or in larger company's distributed processing networks. The smaller CS/30 model C1 consists of a 64KB processor, one 10MB cartridge disk, a choice of printers (60cps to 300 lpm), a Dasher crt console, and



license for the Interactive COBOL software. The C1 can grow with the addition of a second 10MB disk, floppy drive, and IBM 2780/3780 compatible synchronous communications capabilities; it can be upgraded to the larger C3 model. With disk, crt, and 60cps printer, a model C1 sells for $21,090. The model C3 supports the standard and optional features of the C1, and with the addition of another 32KB of memory, it can handle three terminals. Configured with 96KB of memory, three crt's, 20MB of disk, 300 lpm printer, and 2780/3780 communications, the model C3 carries a $49,820 price tag. A smaller configuration with 80KB, 10MB of disk, 180cps printer, and two crt's, comes in at under $26,000.

The CS/30s (and the rest of the CS series) run the Interactive COBOL Operating System, ICOS, which has been enhanced with a fancier editor, a screen formatter which generates necessary coding for use with applications, and addition of the COMPUTE verb to the COBOL vocabulary. A Printer Access Scheduling System (said to be a "smart spooler"), an ISAM inquiry facility, and a "collapse" utility to condense ISAM index levels, are also included in ICOS revision 4.0. DATA GENERAL CORP., Westboro, Mass.

FOR DATA CIRCLE 368 ON READER CARD

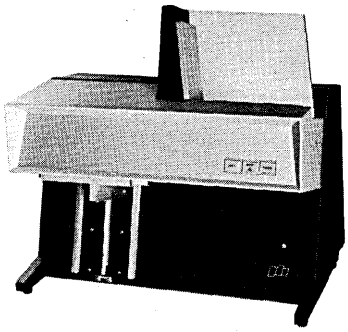
DATA ENCRYPTION

Moving sensitive data over low-speed circuits? The DSS 300 (110bps/300bps) and the DSS 1200 (110bps/300bps/1200bps) should provide some peace of mind to users fearing the unauthorized disclosure of their asynchronous traffic. Both units use the NBS Data Encryption Standard algorithm, and provide both encrypt and decrypt mode. The units interface to computers, peripherals, terminals, or modems through RS232 or current loop interfaces. The microprocessor-based units perform a self test as they are powered up. The DSS 300 sells for $1,250; the DSS 1200 sells for $1,450. DATA SECURITY SYSTEMS, Los Gatos, Calif. ✲

FOR DATA CIRCLE 369 ON READER CARD

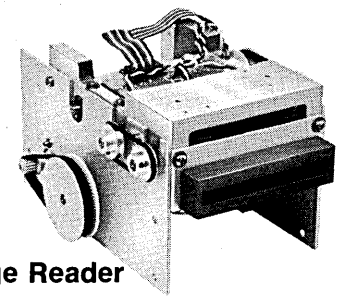
Peripheral Dynamics, Inc.

The first place to come for forms handling.



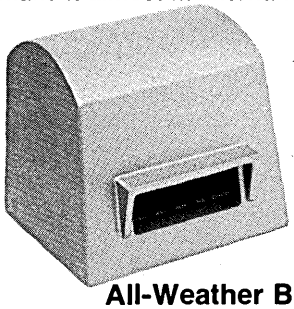
Quiet 600 CPM Card Reader

Model 6111 Automatic Card Reader — The new 600 CPM reader is dust-proof, dependable, and ultra quiet. The advanced designs of the 6111 make it almost maintenance free.



Card/Badge Reader

PDI's Card/Badge Reader can read both standard tab cards and Type 3 plastic badges on an intermixed basis. Unsurpassed in field performance, the Card/Badge Reader has become an integral part of factory data handling applications.

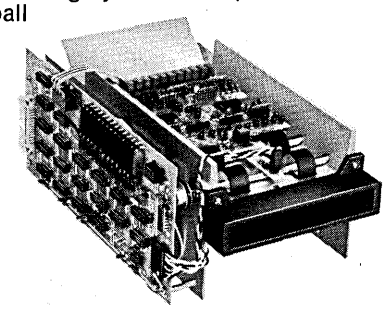


All-Weather Badge Reader

The All-Weather Badge Reader is at home in hazardous atmospheres and/or demanding environments. Tough and reliable, it meets the requirements of Class 1, Group D, of Underwriters Labs. The All-Weather Reader is intrinsically safe and completely weatherproof.

Broad Spectrum Read Head

The new Broad Spectrum Read Head can handle almost any mark sense challenge you come up with. It can read felt tip markers, ball point pens, pencils, and any other normally carried writing instrument.



Meet PDI's first place team (from left to right) — John Stowe, Ted Lyell, Charles Dobson, Pat Collins, and Tom Hill. They're available to answer questions, demonstrate equipment, and more importantly, talk intelligently with you about your specific card, badge, or forms reading needs.

Plan now to see our blue ribbon products...and judge for yourself.

PERIPHERAL DYNAMICS INC.
Sales & Marketing Offices • Whitpain Campus
1730 Walton Road • Blue Bell, PA 19422
Telephone (215) 277-8484 • TWX 510-660-8028

There is one place to get First Class hardware service.

Fortunately, it's in 160 different places.

The company: Sorbus Inc.

Named as the number one service organization, by manufacturers and end-users alike, in independent preference studies run by *Datamation*.* And cited for "Best Technology," "Best Price/Performance Ratio," "Best Service Organization," and as "Most Preferred to Do Business With," by readers of *Data Communications*.**

And you know where a lot of the votes came from? Places like Wilkes-Barre, and Waco, and Wausau. Places, maybe, like yours.

Places that wouldn't see a prompt First Class service call if it weren't for Sorbus.

Because that's how we got to be First. By making a point of being close to you. And being there on time. With the right parts. And the right tools.

In the hands of people who know how important up-time is to you.

It's a lot of work being Sorbus. But it sure beats being second.

Call or write today.

**Datamation* Reader Preference Studies, 1978, 1977, 1976, 1975
***Data Communications* Reader Preference Study, 1978

Sorbus

MAI

Sorbus Inc.
A Management Assistance Inc. Company
150 Allendale Road
King of Prussia, PA 19406 215-265-6700

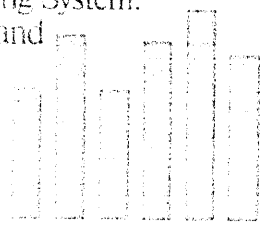
CIRCLE 48 ON READER CARD

XEROX OFFERS AN EASY WAY TO PRINT OUT PRINTOUTS.

Believe it or not, this is a computer printout. And, believe it or not, it took less than a second to make.

That's because Xerox created a totally new way of printing. The Xerox 9700 Electronic Printing System.

Electronic printing lets you design and change reports, letters or invoices quickly and easily.



Create visuals like symbols, charts, corporate logos and shadings.

Even bar charts.

The 9700 combines computers, which can store any number of different kinds of formats, with the advanced technologies of lasers and xerography. So you can electronically produce, sort and collate exactly what you want in a matter of seconds.

You can PICK THE typestyle AND SIZE YOU want.

There's no need to design, print and store preprinted forms. Which means you never have to go through the trouble of changing them. Or worry about bursting, decollating, reloading and retyping either.

And the 9700 delivers as many high quality copies as you need on executive size 8-1/2 x 11 paper at 2 pages per second.

For more information, write Xerox Business Systems, Dept. A1-10, 701 S. Aviation Blvd., El Segundo, CA 90245.

You'll find the 9700 is the newest way for you and your printouts to both come out looking better.

XEROX

SOFTWARE AND SERVICES

UPDATES

Time-sharing services using Control Data hardware charge less than services using DEC or IBM hardware, according to composite cost profiles developed by Real Decisions Corp. of Stamford, Conn. The report compared six DEC-based services, five IBM-based services, and four CDC-based services. Of 22 FORTRAN and BASIC benchmarks -- both I/O-intensive and computational -- the CDC services had the lowest charges in all but one run. Twelve I/O-intensive runs showed the DEC group 1½ times as expensive, and the IBM group came in three times as expensive. The overall comparison shows DEC and IBM services surveyed charged about 2½ times as much as the CDC-based services. The $695 report compared such vendors as Control Data, Computer Sciences, National CSS, Tymshare, GE Information Services, and the Service Bureau Co.

An improved method for Chinese-language telegraphy has been developed by an Australian firm, Information Electronics Ltd. On the sending end, the four-digit Chinese telegraph codes are entered using two-key encoding; at the receiving end, the translation from numeric code to ideogram is automated (using existing manual methods, both sender and receiver must manually convert to and from numeric codes). The telegraph terminals are equipped with video displays, so the message can be verified before transmission, and the received message can be dumped to a screen copier.

Hewlett-Packard's Desktop Computer Div. has established a BASIC Users' Club offering free program and information interchange, support for local area meetings, a software catalog, and a newsletter. Programs are provided on a three-for-one basis: for each program submitted to the library, the user is entitled to receive three programs in exchange.

PASCAL DBMS

The Realtime Databank Management (RDM) system, a data base management system for use with OMSI PASCAL on PDP-11's, is said to support relational data bases, distributed data bases, and keyed data bases (where reports remain the same, even though the data have moved). The Pascal-oriented system currently runs under RT11 and TSX (from S&N Computers of Nashville); RSX-11 and RSTS/E support are planned. A Forms-Input package, for use with RDM, is said to simplify data entry, and an optional report writer, the Interactive Report Generator, allows users to define custom reports. RDM is priced at $7,500, and the Forms-Input and Interactive Report Generator are each priced at $995. INTERACTIVE TECHNOLOGY INC., Portland, Oregon.

FOR DATA CIRCLE 335 ON READER CARD

ACCOUNTS PAYABLE

The On-Line Accounts Payable System (OLAPS) runs under DOS/VS/CICS on IBM 370 models 125 through 148; an OS version also is available. The package allows clerks to enter invoices, update and query data files, and generate reports, all from interactive terminals. To identify a vendor, the user need only provide the first 10 characters of the vendor's name, and the system will supply the complete vendor identification and provide prompts for further processing. The system supports on-line vendor file maintenance and inquiry, and an audit package that can generate voucher aprons and other printed reports for attachment to invoices. Standard reports available include open item lists, pay control lists, checks, check register, payment history, and daily control register. The DOS version of OLAPS is priced at $20,000. DECISION CONCEPTS INC., New York, N.Y.

FOR DATA CIRCLE 337 ON READER CARD

8086 FORTRAN-77

A cross-compiler that runs on PDP-11s and LSI-11s, and an 8086 runtime support library allow users to develop applications in FORTRAN-77. The compiler includes extensions for producing programs that will be loaded into ROM. Applications can occupy up to 1MB; any one program or subprogram unit can consist of up to 64KB of code and another 64KB of local data. The compiler supports arrays of up to 1MB, 32-bit arithmetic, local code optimization, ROM/RAM allocation control, in-line assembly language, and an ASSERT statement for debugging. The compiler generates assembly language, for subsequent input to the vendor's Microbench 8086 cross-assembler. Both the cross-compiler and cross-assembler are written in MACRO-11, and are said to run under all current DEC operating systems. Perpetual licenses for the FORTRAN-77 cross-compiler start at $3,750; Microbench 8086 licenses start at $1,695. VIRTUAL SYSTEMS, INC., Walnut Creek, Calif.

FOR DATA CIRCLE 338 ON READER CARD

COBOL COMMUNICATIONS

With its latest version of BLIS/COBOL this vendor has added a number of communications options and other enhancements. Written for Data General micros and minis (and, of course, compatible processors from other vendors), version 3.2 of the BLIS/COBOL multiuser operating system offers communications options to users wanting to link their minicomputer-based applications and data bases with host computer via concurrent transaction oriented communications. Communications protocols supported include Inter Branch (BLIS-to-BLIS), IBM bisync point-to-point, Burroughs TC500, and IBM 2780, 3780, and 3270 with options (such as switched or multipoint, with BLIS/COBOL either being polled or doing the polling). ASCII and EBCDIC data are supported, as are transparent and nontransparent modes.

Version 3.2 also has a new editor, support for hardware multiply/divide, and a utility for transfering files between sites via communication lines. The basic BLIS/COBOL version 3.2 software has an end-user price of $4,000. Communications options are priced at $1,000 per system for Inter Branch, and $2,000 for branch-to-host protocols. Oem discounts are available, and existing oem's can get the new version for a generation fee. INFORMATION PROCESSING INC., Winter Park, Fla.

FOR DATA CIRCLE 336 ON READER CARD

PAYROLL

A field developed program, the COBOL Payroll Management System, provides DOS/VS users with basic payroll functions and reporting capabilities. The FDP uses VSAM, and requires two additional IBM licensed programs: the DOS/VS COBOL compiler and library, and DOS/VS Sort Merge.

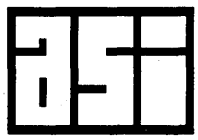
IMS and TOTAL USERS

YOUR DATA BASE & ASI-ST GO TOGETHER

More IMS and TOTAL installations have chosen the ASI-ST Data Management and Reporting System to implement data base applications than any other product. ASI-ST's dominance in data base environments is easily explained:

- Operates under all IBM 360/370 versions of DOS, DOS/VS, OS and OS/VS.
- Fully supports all TOTAL, IMS and DL/I features including TOTAL 8 and secondary indexing under IMS/VS.
- Permits creating and updating TOTAL and IMS data bases as well as retrieval.
- Allows concurrent processing of conventional data files with IMS or TOTAL data bases.
- Supported in both batch and on-line environments.

IMS users such as *American Airlines, Dow Chemical, TWA, American Can, The Hartford, Union Carbide;* and TOTAL users like *Combustion Engineering, Northwestern Mutual Life, Anheuser-Busch, Corning Glass Works, Eli Lilly* and *Holiday Inns* are a few who agree ASI-ST and data base belong together. In addition, ASI-ST provides an unequalled return on investment by maximizing the productivity of both man and machine. Since ASI-ST fully supports conventional data files as well as complex data bases, these benefits are not restricted to IMS and TOTAL users. To obtain more information contact:



The Software Manufacturer

APPLICATIONS SOFTWARE, INC.
Corporate Offices
21515 Hawthorne Boulevard
Torrance, California 90503
(213) 542-4381

CIRCLE 77 ON READER CARD

SOFTWARE AND SERVICES

The FDP takes care of check preparation and, through a series of modular subsystems, generation of a number of management reports. It includes facilities for file maintenance, time-card preparation, time and attendance reporting, payroll processing, check reconciliation, workmen's compensation reporting, and union reporting. The package can handle multiple companies (up to 99), with up to eight voluntary deductions per company, and six other pay categories: sick pay, vacation pay, meal allowances, bonuses, commissions, and tips. Pay frequency can be weekly, biweekly, monthly, or semimonthly. Federal and Illinois 1978 tax routines are included; tax tables are loaded at execution time, and users will need to perform some modifications for processing taxes in states other than Illinois. The system includes audit and control capabilities, such as audit listings of records processed, gross pay calculations, withholding, deductions, and employer contributions. Reports available from the system include payroll register, 941 federal quarterly reports, federal and state W-2s, and a union premium report. The COBOL Payroll Management System carries a monthly license fee of $425, which is waived after 12 months. INTERNATIONAL BUSINESS MACHINES CORP., White Plains, N.Y.

FOR DATA CIRCLE 339 ON READER CARD

JCL MANAGEMENT

Designed to help the DOS/VS POWER user manage his JCL, Job-Manager contains a procedure library (said to provide many OS-type JCL facilities). The package addresses the problems encountered during the organization, scheduling, and execution of jobs in a DOS environment. JCL procedures can be nested, allowing the user to modify a procedure and have the modification automatically included in all affected job streams. Parameters can be coded symbolically, and expanded conditionally based on expansion time variables. The library itself is self-condensing, and reporting facilities are provided. Procedure audit trails, simultaneous update from any partition, and selective backup and restore, can be invoked from a single statement. Job-Manager allows the user to dynamically control, at run time, the order of job step execution. The system also allows the user to restrict JCL input from specific logical devices to canned JCL procedures. This feature can be used to keep RJE submissions in batch, if desired. Job-Manager sells for $4,500, or it can be leased for $119 per month. Job-Manager requires no modification of IBM-supplied software. SOFTWARE RESEARCH CORP., Wellesley, Mass.

FOR DATA CIRCLE 341 ON READER CARD

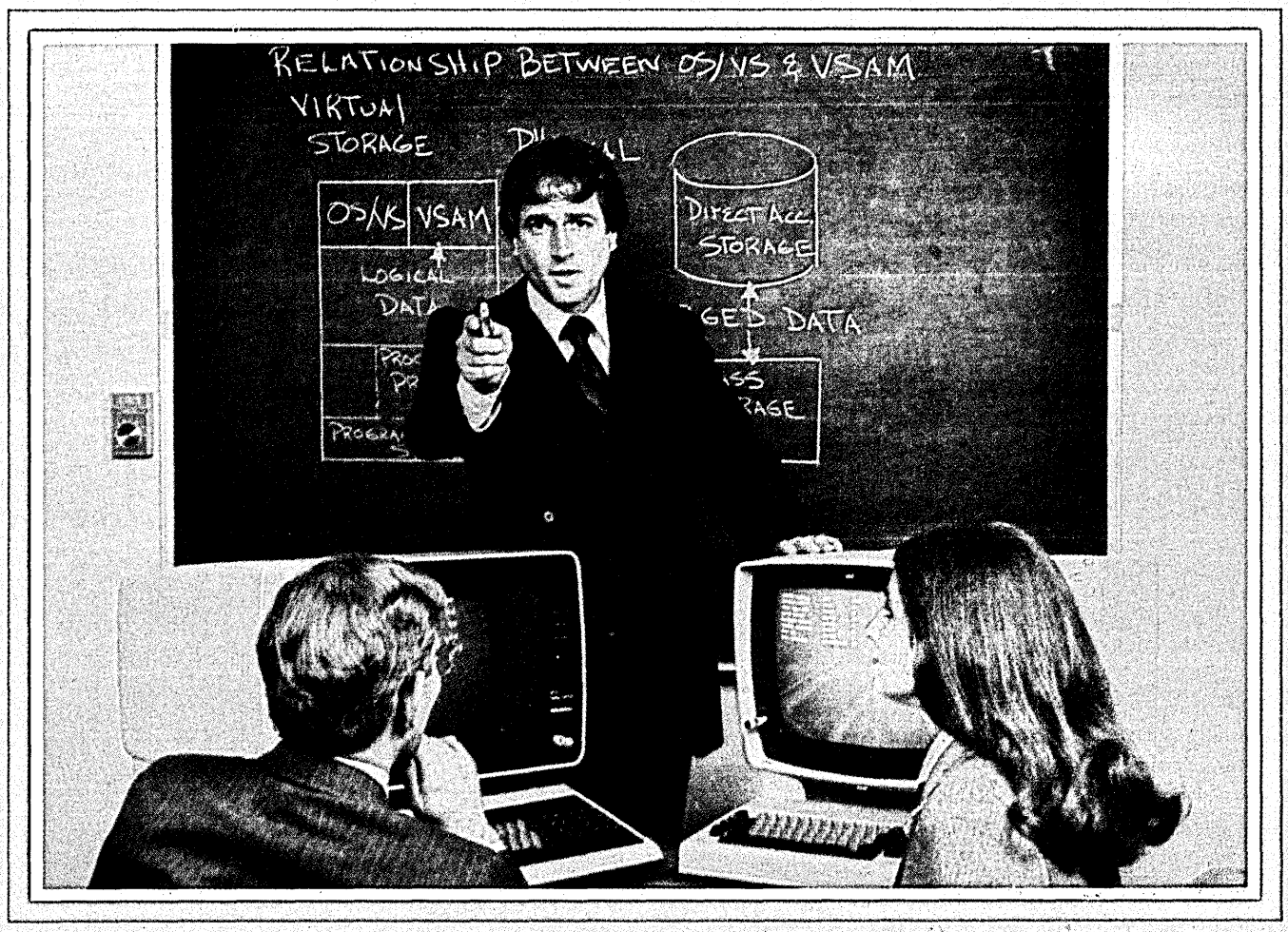
SOFTWARE SPOTLIGHT

MICRO CROSS-ASSEMBLER

Users of the 6800 microprocessor seeking a tool for moving on to the 6809 can use this vendor's cross-assembler and linkage editor. The two-pass assembler runs on 6800-based systems (versions available for iCOM, Percom, SWTPC, and other systems) and produces a listing, symbol table, cross-reference list, and relocatable object code. Known as XA6809, the assembler maintains upward compatibility with 6800 source code, in addition to supporting the 6809's additional instructions and addressing modes. XA6809 includes macro capability, and allows the nesting of macro calls. LINKEDT68 is a system utility that can load the relocatable object code generated by XA6809; it's a two-pass disk-to-disk program that lets users build output files without regard to the amount of RAM available at load time. XA6809 needs at least 16KB of memory; LINKEDT68 needs at least 24KB. XA6809 sells for $149.95, and LINKEDT is $49.95. HEMENWAY ASSOCIATES, INC., Boston, Mass.

FOR DATA CIRCLE 334 ON READER CARD

Consider Cincom



At last, Data Processing education courses that provide knowledge — not just notes.

Over the years, Cincom has become the recognized leader in DB/DC education. Why? Because we provide:

Technical Expertise Since the late 1960's we have consistently engineered major software advances in the data processing industry. TIS,® TOTAL® and ENVIRON/1.® Consequently, we became the logical choice for directing state-of-the-art education. Today, our curriculum offers a wide range of courses including VSAM, VTAM, Telecommunications Design, OS/JCL and many more.

Professional Instructors We employ full-time teaching professionals with solid field experience in a variety of installations around the world. These instructors receive continuous training on the latest industry developments. This up-to-the-minute education gives our instructors a decided advantage in providing effective classroom communication.

Lecture/Workshop Our unique lecture/workshop format has proven to be the most productive educational method to date. The comprehensive lectures are followed by workshops designed to reinforce the course material. The workshops guarantee that the student comes away with the knowledge—not just the notes.

Convenience and Availability Courses are available on a continuous basis at five regional centers around the country. Or they can be scheduled, by special arrangement, to be held at your corporate offices.

If you are interested in increasing your staff productivity, stretching your educational dollar, providing in-house education or enhancing your personal career potential, phone Frank Pollard today at (513)662-2300. Frank has all the courses you'll need to achieve your educational objectives.

U.S.A. 2300 Montana Avenue, Cincinnati, Ohio 45211
(513)662-2300.

Cincom Systems, Inc.®

The TOTAL Information Systems People.

CIRCLE 23 ON READER CARD

SOFTWARE AND SERVICES

PASCAL

Developed in cooperation with the Univ. of Washington, and intended for use in both instructional and industrial applications, this Pascal compiler for the VAX-11/780 is a reentrant, native-mode compiler that runs under the VAX/VMS operating system. The compiler takes advantage of the VAX machine's hardware floating point and character instructions, as well as the operating system's virtual memory capability. It provides a standard call interface to programs written in other VAX native languages, as well as access to all VAX/VMS system services. The compiler includes extensions — such as sequential files of fixed or variable record length, and a double precision real data type — as well as the ability to flag "nonstandard" source statements during compilation. DEC is a participant in the current ANSI Pascal standardization effort, and says it plans to keep the compiler compatible with the emerging standard. Nonprofit institutions can get a single-system binary license for the compiler for $2,500; others pay $5,000. DIGITAL EQUIPMENT CORP., Maynard, Mass.

FOR DATA CIRCLE 340 ON READER CARD

DATA SET OPTIMIZATION

OPTall analyzes program and data set activity, helping the management of an OS installation identify programs as candidates for optimization. The package also identifies tape data sets that might be better located on disk. The system provides a chronology of cpu use over a 10-minute time frame, and prepares detailed and summary analysis reports on the effect of each program's resource utilization. OPTall carries a $4,000 price tag. A & F SERVICES, Indianapolis, Ind.

FOR DATA CIRCLE 342 ON READER CARD

TRS-80 PACKAGES

This vendor has come up with half-a-dozen financial packages and five statistical packages for Radio Shack's TRS-80 personal computer. Finance Pack-1 consists of three programs to compute bond interest, effective interest, and interest rates on installment accounts. This package sells for $12.95. Finance Pack-3 computes mortgage amortization, analyzes and compares mortgages, and computes present and future values; it sells for $9.95. Finance Pack-5 ($12.95) analyzes stock purchases. Finance Pack-7 calculates the effects of bond switching on a portfolio; a second module calculates stock value for capital investment based on dividends. Finance Packs-9 and 10, each priced at $22, are menu-driven. The first calculates compound interest, annuities, loan balances, mortgage payments, and more. The second covers mortgage amortization schedules, depreciation, retail markup, etc.

Statistics Pack-1 consists of a linear regression module and a correlation module. Statistics Pack-2 calculates Chi-Square values and degree of freedom. Given a distribution, Statistics Pack-3 generates a listing of Z-score equivalents (sorted in ascending order), as well as sum of squares, variance, median, standard deviation, and skewness. The package also contains a routine for printing horizontal histograms. These three packages each carry $12.95 price tags. Statistics Packs-4 and 5 are priced at $12 each. Given two sets of unpaired data, Pack-4 computes Chi-Square, slope for linear regression, mean, variance, standard deviation, and T-Ratio. Pack-5 calculates multiple linear regression, and F ratio for Youden square design, as well as providing variance tables for Greco-Latin square analysis. NATIONAL SOFTWARE MARKETING INC., Hollywood, Fla.

FOR DATA CIRCLE 343 ON READER CARD

SYSTEM/34 UTILITY

$SPOOL provides access to the uniquely-organized #SPOOL file on System/34s. The utility copies selected reports from the #SPOOL file to another disk file for

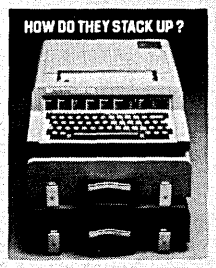
Once Lockheed got their hands on the portable Miniterm, they took off with over a hundred.

Lockheed Aircraft Service Company's JETPLAN®, a new computerized flight planning service, provides corporate, airline and U.S. Armed Forces pilots with the data they need to get from one spot on the globe to another. And do it using the least amount of time and fuel. Over 200 subscribers now use CDI Miniterm® 1203 portable terminals to communicate with Lockheed's large, dynamic database.

The pilot ordinarily uses his Miniterm at an airport telephone, just before flight time. That way he gets the most efficient and up-to-the-minute plan, factoring in the weather, loads and the performance of his particular plane. "Because the Miniterm is lightweight, durable and no bigger than a briefcase, it usually travels in the cockpit."

Miniterms are also being used in another Lockheed computer service, the DIALOG® Information Retrieval Service. This service provides access to the largest and most comprehensive collection of databases in the world, containing information on over 25 million published references. Miniterms give field researchers, engineers, scientists, librarians and others on-the-spot access to this up-to-the-minute information via telephone anywhere in the world.

Lockheed thinks Miniterms are the way to make time fly. So do over a hundred other Fortune 500 companies. Find out how other units stack up to the Miniterm series in terms of ruggedness, reliability and features. Send for our free comparison brochure. Computer Devices, Inc., 25 North Avenue, Burlington, MA 01803, Tel: (617) 273-1550.
Or call (800) 225-1230 toll-free.



Miniterm is a registered trademark of Computer Devices, Inc.
JETPLAN and DIALOG are registered trademarks of Lockheed Corporation.

We Travel in the Best Companies.

COMPUTER DEVICES INC.

CIRCLE 24 ON READER CARD

transfer to diskette or processing by other programs. Reports can be selected based on any of five criteria: spool id, procedure, user, forms, or printer. Output formats can be selected from three choices: 3741 data stream format, compressed print image format, or expanded print image. Print image formats can be adapted to COM processing or transmission to other cpu's or printers. $SPOOL carries a one-time license fee ranging from $750 to $1,100, depending on features desired. ZINK & KATICH DATA PROCESSING, INC., Lansing, Ill.

FOR DATA CIRCLE 344 ON READER CARD

OPERATIONS SCHEDULING

The Data Center Scheduler (DCS) provides a tool for the scheduling, forecasting, and documentation of the computer center and related work centers (i.e., I/O control, data entry, etc.). The system can handle multiple cpu's, and it provides 18 scheduling methods for automatically selecting jobs from the schedule file. Eight reports are available to the user, including a daily job schedule (all jobs, steps, work centers, and processing time for the period of the schedule), a daily work center schedule (sequenced by due in or due out time), and output processing labels (a set of gummed labels specifying output processing and destination for output produced during the schedule period). Written in COBOL, DCS runs under OS or DOS. The DOS version is priced at $6,000; the OS version is $8,000. Maintenance and enhancements are priced at 12% of purchase per year. SOFTWARE MODULE MARKETING, INC., Sacramento, Calif.

FOR DATA CIRCLE 345 ON READER CARD

DATA ENTRY/INQUIRY

The I-8150 Data Entry/Inquiry Station capability allows this vendor's entry-level I-8150 processor to support three workstations, instead of the previous one. The software allows several users to enter data and inquiries at the same time. The software also supports multiple workstations using any of the vendor's application packages. The package runs under the Interactive Direct Processing System operating software and the I-8150 COBOL interpreter. It can be had for a one-time license fee of $800, or for a monthly charge of $23. NCR CORP., Dayton, Ohio.

FOR DATA CIRCLE 346 ON READER CARD

3270 EMULATOR

Written for Data General minicomputers running under the Advanced Operating System (AOS), GT-70/AOS provides 3270-emulation; a single-keystroke command lets the user enter the 3270 communications system from the native operating system. Local applications processing and development can run concurrently with the GT-70/AOS software. The system is said to support any mix of up to 64 terminal devices, including local and remote displays operating at speeds ranging from 300bps to 19.2Kbps, and printers running from 30cps to 1,200 lpm. The GT-70/AOS package is priced at $4,000. GAMMA TECHNOLOGY, INC., Palo Alto, Calif.

FOR DATA CIRCLE 347 ON READER CARD

SERIES/1 ENHANCEMENTS

COBOL and a multiterminal manager for transaction-oriented applications have been added to enhance IBM's Event Driven Executive (EDX) for the Series/1 minicomputer. EDX COBOL comprises two licensed programs: a compiler (with resident library for compiling applications), and a transient library for use during program execution. Available next month, the packages are priced at $62 per month and $5 per month, respectively, or one-time charges of $3,700 and $300. The Multiple Terminal Manager (MTM) allows use of predefined screen formats with the user's application programs. MTM will become available in October for a monthly fee of $13 or a one-time charge of $780. INTERNATIONAL BUSINESS MACHINES CORP., General Systems Div., Atlanta, Ga.

FOR DATA CIRCLE 348 ON READER CARD

FASTER MACROASSEMBLER

Version 3.0 of this vendor's MCS-48 family macroassembler is said to be 100% faster than the previous version. Most of the improvement is in the macroprocessing part of the assembler; the nonmacro part is said to have a 10% to 15% improvement over version 2.0. The assembler allows users of Intellec microcomputer development systems to write code for all of the microcomputers in the MCS-48 family, including the 8048, 8049, 8041, 8748, 8035, 8021, and 8022. The assembler needs at least 32KB of RAM; 48KB is required for using the macro facility. Existing macroassembler users get the new version at no additional charge; new users can buy the software for $850. INTEL CORP., Microcomputer Systems Div., Santa Clara, Calif. *

FOR DATA CIRCLE 349 ON READER CARD

SCIENCE/SCOPE

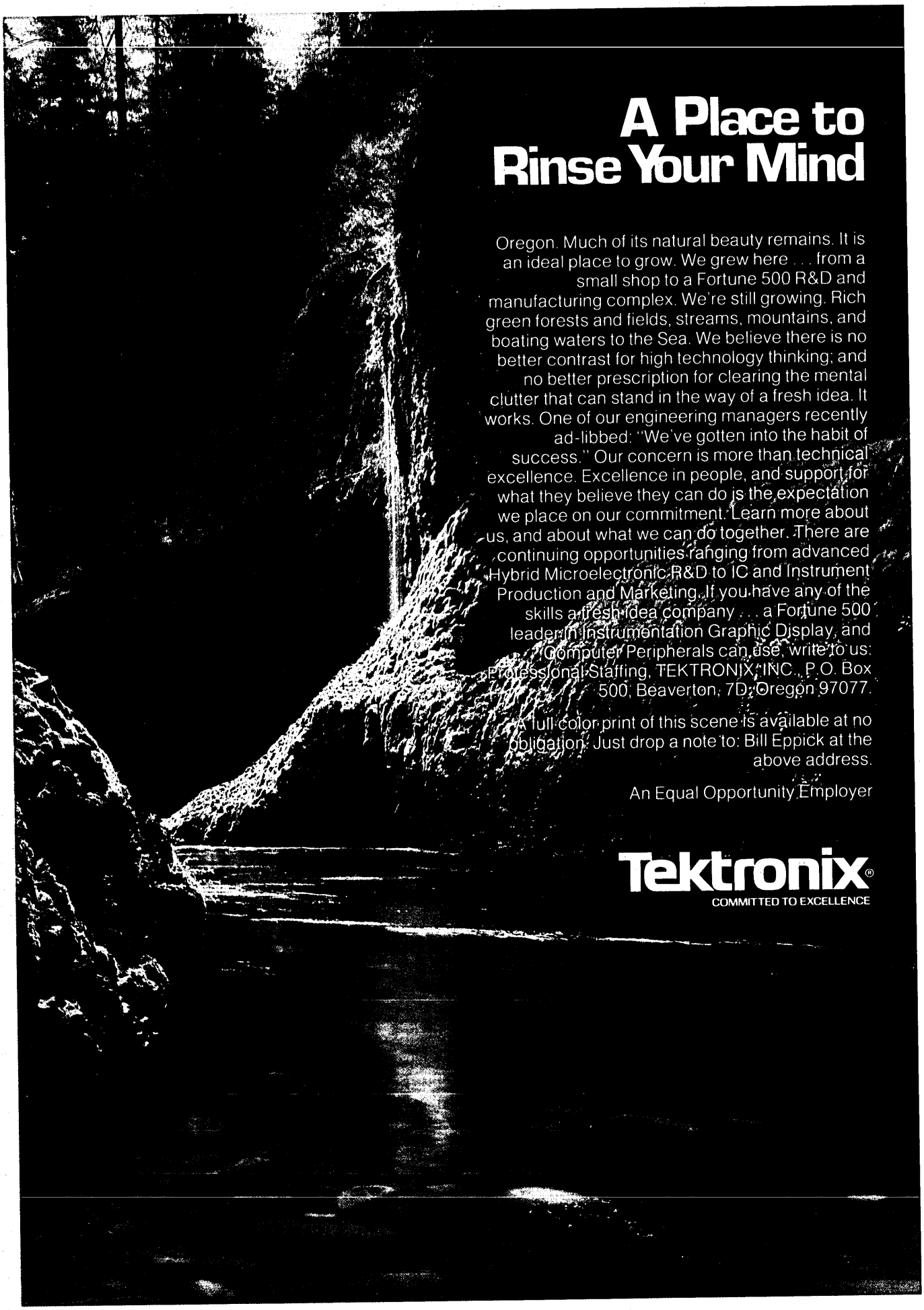
A ducted-rocket tactical missile with a new propulsion system obtains from the air nearly all the oxygen it needs for combustion. By not having to carry a full supply of oxidizer, it promises to go faster and farther than contemporary counterparts for the same weight and volume. The missile could be adapted for air-to-air, air-to-ground, or ground-to-air missions. Its distinguishing characteristics are a fuel-rich, solid-propellant motor and two intake ducts that feed air into the combustion chamber. Hughes is designing a prototype missile for validation flight tests under a U.S. Air Force contract.

Highly complex microcircuitry soon may be mass produced with a technique being pioneered at Hughes. The approach, called ion beam lithography, has been used to make very large-scale integrated circuits (VLSI's) having circuit lines as narrow as 0.1 micrometer, about 4 millionths of an inch. These minute dimensions have been possible only by tedious, painstaking methods that use an electron beam to draw circuitry on a wafer. Ion beam lithography, however, is faster and less costly because it uses a collimated beam of protons to "photograph" circuit patterns from a mask onto a whole chip.

A communications terminal almost one-third the size and less than half the weight of the three pieces of equipment it replaces serves a key role in an advanced military network. The Hughes Improved Terminal (HIT) combines a transmitter-receiver, signal processor, and computer into one unit that's more reliable and less costly to build than the separate units. HIT is designed to let all four military services exchange data instantaneously and securely via the Joint Tactical Information Distribution System. The terminal can transmit coded digital data over a single channel in preassigned time slots of several milliseconds. It can receive all information sent by other units or simply select what it wants.

Hughes Ground Systems Group is seeking electronics engineers for research, design, development, and production of surface-based and undersea systems. The systems and equipment include modern phased-array radars; advanced digital communications; microwave systems; computer systems; liquid crystal, CRT, TV-type displays; advanced signal and data processing equipment; A/D and D/A converters; and sonar arrays and processing equipment. If you have experience in any of these areas, send your resume to Hughes Aircraft Company, Ground Systems Group, Professional Employment, Dept. SE, 1907 W. Malvern, Fullerton, CA 92634.

Infrared heat "maps" now can locate problems in complex electronic equipment quickly and without damaging expensive printed boards. The Hughes Infrared Fault Isolation Test System (IRFITS) is a new non-contact, non-destructive testing method that discovers shorts and open circuits in printed boards faster and safer than ever before. It does this by mapping heat released from the surface of an object. Any variation in the heat pattern that would indicate trouble is displayed on a screen. Previously, it was necessary to chip away coatings, with the risk of possibly damaging intricate circuitry to probe for trouble spots.



A Place to Rinse Your Mind

Oregon. Much of its natural beauty remains. It is an ideal place to grow. We grew here . . . from a small shop to a Fortune 500 R&D and manufacturing complex. We're still growing. Rich green forests and fields, streams, mountains, and boating waters to the Sea. We believe there is no better contrast for high technology thinking; and no better prescription for clearing the mental clutter that can stand in the way of a fresh idea. It works. One of our engineering managers recently ad-libbed: "We've gotten into the habit of success." Our concern is more than technical excellence. Excellence in people, and support for what they believe they can do is the expectation we place on our commitment. Learn more about us, and about what we can do together. There are continuing opportunities ranging from advanced Hybrid Microelectronic R&D to IC and Instrument Production and Marketing. If you have any of the skills a fresh idea company . . . a Fortune 500 leader in Instrumentation Graphic Display, and Computer Peripherals can use, write to us: Professional Staffing, TEKTRONIX, INC., P.O. Box 500, Beaverton, 7D, Oregon 97077.

A full color print of this scene is available at no obligation. Just drop a note to: Bill Eppick at the above address.

An Equal Opportunity Employer

Tektronix®
COMMITTED TO EXCELLENCE

CIRCLE 195 ON READER CARD

JUNE, 1979 □ VOLUME 8/NUMBER 2
DATAMATION

INTERNATIONAL

THEY COULD IF THEY WOULD

Will Britain's new Conservative Government strangle, mangle, or embrace the National Enterprise Board? The first installment of this tale of suspense unfolds in this issue.

Supplied with the pros and cons of the dilemma—should the party of private enterprise support a government-funded holding company—we have carefully placed them on our Libra scales. After deliberation, we can only cautiously say that the obliteration of the NEB and its developments in microelectronics, software, and office automation could—not would, mind you, could—mean return to the "Three N" program that has typified most British computing in the past: No investment. No business innovation. No guts.

The NEB effort to bring Britain into the "microage," as Ralph Emmett puts it, is just getting started and should be given a chance. So many projects in Europe have died for lack of funding and patience. The dream of J. J. Servan-Schreiber for an EEC program in technology has never been fulfilled because the EEC only makes plans; it doesn't implement them.

The NEB activity has been a refreshing change. It has picked markets of the future, industries which would help develop other industries. It has come up with adequate and immediate funding. And it has thrown American industry into a bit of chaos by dashing in to steal away semiconductor talent, buy up software companies, and push the revolutionary viewdata concept. Britain has seemed an exciting place to be lately.

Those in favor of killing NEB often point to American successes under a system of free enterprise. Let us dust off some old truths about this.

1. The U.S. government has funded much development of computing and semiconductor technology. It hasn't had to subsidize companies because it is such an enormous customer and has had very generous budgets for grants in the sciences. Most nations do not enjoy this scale of investment.

2. The American financial community has also funded the industry, *but it is fickle.* In the late 1960s, financiers threw fortunes into worthless companies located in garages and attics; a few years later these were the same investors who, claiming new wisdom, spurned Amdahl Corp. and data communications upstart Datran. Amdahl was driven to Japan for support. Datran fell to the wolves.

3. Free market forces do not always work for the national interest. In computing, these forces have in fact led to fast technological and price breakthroughs, making it one of the few deflationary industries in the world. But the U.S. automobile industry found out how to produce cars travelling more than 10 miles on a gallon of gas *only when there was a crisis*; now the mileage claims go up with the price of the gas.

4. Government-funded projects can work. The NASA space program, starting from Sputnik's challenge, reached the moon in ten years. The technological fallout for private industry has been staggering. Only the soothsayers can guess what might have happened with a NASA for energy.

NEB is not NASA in structure, but it is dealing with some very advanced technological, social, and economic goals that need intelligent strategizing and management to reach.

The NEB funding has been necessary because private British investors have been lacking in imagination and understanding of computing. Even if private industry is now willing to take over the funding, that is not enough initially. Because British financiers think software stocks are "sexy" today does not mean they will still be there in six months. When a company needs a second or third investment to help its cash flow or survive a down period, what does it do when its funding bank is pouring available cash into buying ailing American banks . . . or its angel is an insurance company losing money on the residuals of old IBM computers?

The NEB could be a fine experiment. The Tories could lend their business expertise to make sure its enterprises are well run and do not become tools for full employment at the cost of viability. They could also plan the moment of return of each enterprise to private hands. The Labour party members could make sure that new enterprises to create new employment are encouraged and that the population will be trained for these new industries. They could.

—Angeline Pantages

IN THIS SUPPLEMENT

The British government-funded programs for dp and microelectronics face an uncertain future as the Tories take over (p.194-B). But the fact remains that the U.K. lags in application of the microchips, dangerously so, say studies (p.194-F) . . . Competitive reaction to the IBM 4300 is almost complete, as European mainframers (p.194-H) and Japan's companies (p. 194-R) have unveiled new models, many being repriced versions of not-so-new gear . . . The U.S. embargoes on certain dp sales to South Africa have spurred local development there and caused foreign vendors to shore up their local image through education investment, partnerships, and new buildings (p.194-T) . . . "Office of the Future" was this year's Hanover Fair theme (p.194-DD) . . . More new groups are cropping up to harmonize data protection laws (p.194-GG) . . . Look Ahead features IBM Series/1 problems in Europe (p.194-II) . . . Product Progress spotlights new small business and word processing systems at the Hanover Fair (p.194-NN).

The British government-funded push into microelectronics, office automation, and software export could be stalled by the party of private enterprise.

BRITAIN'S FATE IN TORY HANDS

by Ralph Emmett, European Editor

For a Europe suddenly swept along in a make-or-break attempt to get into microelectronics, the British election of a new Government on May 3 is extremely significant.

So far only Britain of the leading European nations has announced government-funded plans to design and manufacture advanced semiconductor (VLSI) chips, tackling U.S. and Japanese competition head on. And with the prospect of using its indigenous microelectronics capability in support, so far only Britain has put up the funds to create software and office automation consortia to tackle world markets, including the rich American market.

The problem is that all of these initiatives came from the now ousted Labour Government and its brainchild, the National Enterprise Board (NEB). The stated platform of new Prime Minister Margaret Thatcher and her Conservative Government is to return as much British industry as possible into private hands.

The new Government's handling of the NEB and the plans evolved by Chairman Sir Leslie Murphy and his advisors may well determine whether Britain sustains its first real effort to create a cohesive strategy for entering the "microage." The Europeans, who have seen many government computer strategies come and go, have an added interest in seeing the NEB carry out its plans. It represents a new kind of structure and, if successful, a model for state intervention in advanced industrial development.

Reflecting its traditional ideals, the Conservative (Tory) party argues (as it did all during its campaign) that Britain's microelectronics effort does not have to be run by the state to be successful. The unions and the Labour party maintain that without state intervention and strategy guidelines, personified by the NEB, the free market forces will cause widescale job losses. The Tory counter to that is that unless free market forces determine the shape of the microelectronics industry, the extra wealth needed to create jobs will not be produced.

But a wide range of options exist between these philosophies, and there are men and women in both parties that favor constructive compromise.

According to Sir Leslie Murphy, the NEB does not sit on the left with Labour as the Tories claim, but as a "bridge" between the two extremes. Or as he puts it, between the public and private sectors. His position is uncomfortable because the NEB can alternately be identified with both.

The last Government made the NEB act as a holding company for its shares in manufacturing industry and for nationalized or state ownership—a very left concept to which the Tory Government is fundamentally opposed. But Sir Leslie, as an ex-merchant banker, has been given the task of chasing new export opportunities, particularly in high technology areas, in the best Tory capitalist style.

The latter role is the one that Sir Leslie relishes and considers more appropriate to his idea of what the NEB should be doing. In recent months, he has increasingly maneuvered to place his venture in the good graces of the Tories and make it less easy to pull apart.

Behind these moves is his conviction that the NEB's "bridging" role puts it in a unique position to lend as a merchant bank, "but with an overall strategy." He says the NEB can take a longer view than the private sector banker can, and because of its state connection, stay with a company while it is making losses.

Murphy points out that when the

NEB took over the near-bankrupt computing and electronics concern, Ferranti, he was criticized for wasting public funds. "But we turned a $12 million investment into a current $90 million book value on the company."

This year Ferranti is expected to sell $14 million worth of integrated circuits from its British plant and another $10 million through its newly acquired U.S. subsidiary, Interdesign. Though these figures are small potatoes compared to Texas Instruments' $660 million in component sales last year (some 15% of the world market), they are enough to make Ferranti the largest U.K.-owned semiconductor company and certainly the most profitable.

But the ideal right of the Tory party, in the person of its chief spokesman, Sir Keith Joseph, favors selling off all the NEB's holdings in manufacturing industries to the private sector; this includes its shares in ICL and Ferranti, which together are worth about $140 million.

Joseph admits that under the last Government British industry lost much of its traditional ability to take risks and innovate. Therefore, he says, the NEB "umbrella" will be necessary until the economy recovers its confidence. But once a company has been returned to profitability, he adds, it should be offered back to the private sector.

But Murphy, in his long talks with Tory chiefs, has urged them to consider the need for a cohesive strategy and not just investment in the microelectronics industry.

Much criticism of the NEB's minority holdings in ICL and five software and systems companies (CAP, SPL, Systime, Systems Designers, and Logica) has centered around the shares being non-strategic. But Murphy counters by saying that without these holdings none of the senior managers in these companies would talk to the NEB. Without this rapport, he adds, no overall strategy can be conceived, let alone implemented.

TELEMATIQUE STRATEGY IS KEY

Murphy has reminded the Tories that there are two keys to the current microelectronics marketplace. First, it is international in character. And second, it is characterized by a convergence of many disciplines within computing and telecommunications—what the French describe as "telematique."

Because of this, a cohesive telematique strategy to support a diversity of investment is essential, he argues. At the heart of telematique is the ubiquitous silicon chip. This was one of the key factors behind the founding of INMOS. Also at the heart of telematique is software, and this lies behind the software consortium, INSAC, and the NEB's minority holdings. Then beckoning as one of the key target areas for software and chip application is the office; hence Murphy's decision to launch NEXOS, the NEB's new office automation consortium.

Another strand of the Murphy weave has just been revealed to impress the Tory big business sense. A new $25 million joint company has been formed to develop, make, and sell computer peripherals; in this the NEB subsidiary Data Recording Instruments (DRI) will join forces with the U.S. Control Data Corp.

The NEB has already plowed $10 million into DRI in exchange for a 63% controlling interest, and it is now injecting a further $16 million so that DRI can take a 76% interest in the new joint venture.

Sir Keith Joseph has often defended his party's desire to sell off NEB holdings by asserting that once state funding in the computer industry was withdrawn there would be plenty of private investors waiting to step in.

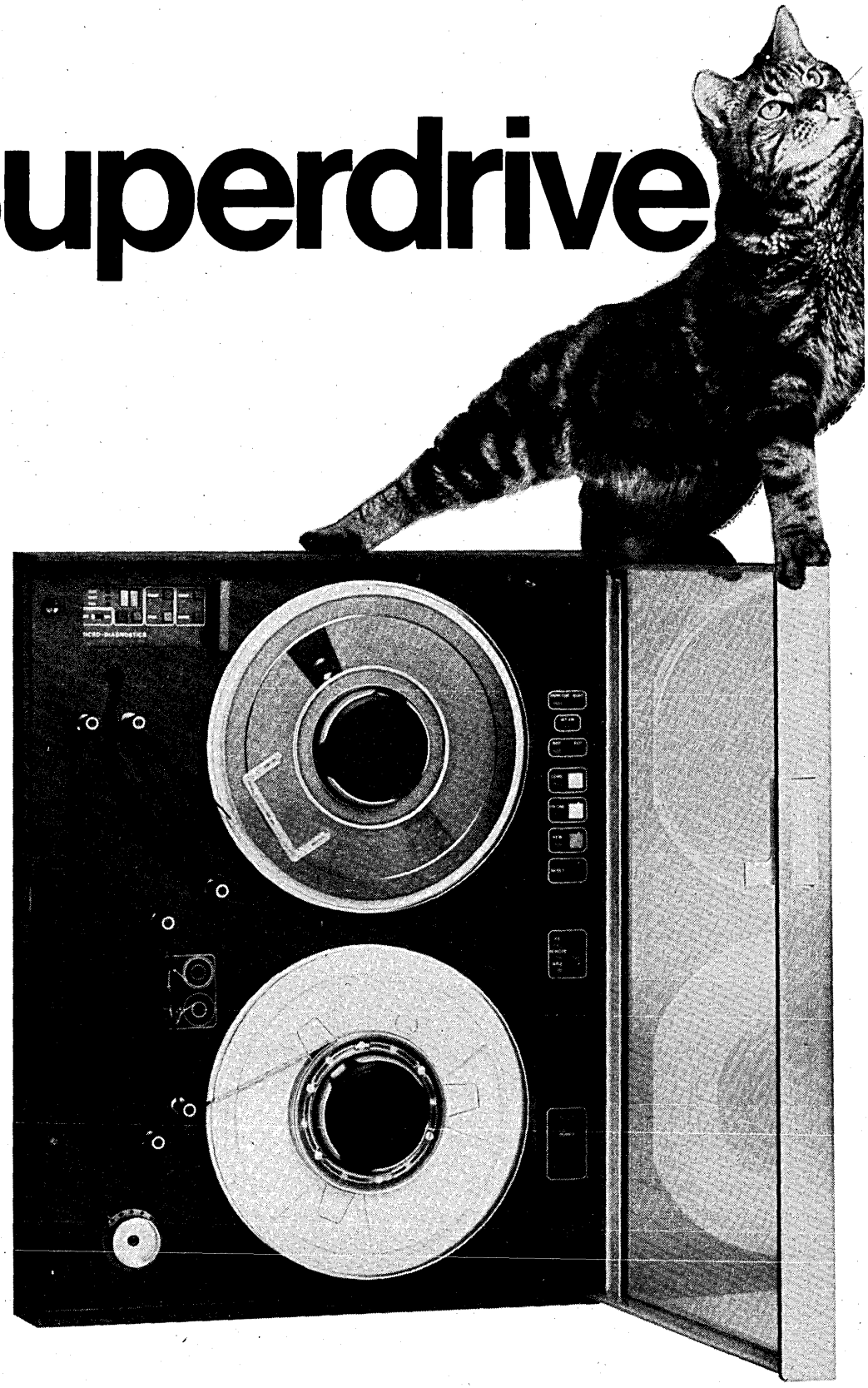
"This may be true now in some areas, software and microelectronics for example, but it wasn't the case even as little as one year ago," says John Pearce, managing director of the NEB's INSAC software company. Several of the software concerns that Pearce took minority shares in to form INSAC had desperately tried to raise venture capital in the private sector. "But they could not have cared less," said SPL International boss, Peter Adams. Adams says today he is literally swamped with offers for all or part of his company.

Most stockbrokers will now concede that British software companies are gilt-edged investments. But the situation regarding other sectors of the information technology industry, even microchip companies, is still uncertain.

Murphy has already pumped some $50 million into INMOS to get it to the prototype stage. Its U.S. Colorado Springs development center will release

The smiling eyes of Sir Leslie Murphy show a long history of good humor. But he will be in serious negotiation to save the NEB and the British microelectronics plan.

Superdrive



is here!

The EMI 8800, first of an all-new range of formatted digital tape transports is certainly putting the cat among the pigeons.

Here, suddenly, a generation ahead of the competition, is SUPERDRIVE, intelligent, flexible, reliable and demonstrably more cost effective. For the OEM it offers better margins. For the end-user, more flexibility and performance for the money.

With the help of powerful microprocessor control, the EMI 8800 has inbuilt intelligence to care for your tapes and meet your most exacting needs right now.

Consider these features. Robust geared arm retract mechanism and unique hub design simplify loading and ensure correctly seated reels. Capacitive arm position transducers, outdating optical sensors, set new standards of reliability. Direct drive motors. Microprocessor controlled inbuilt stroboscope, universal for all speeds, is completely independent of fluorescent lights or any other external source. The EMI 8800 is easiest to use and leaves nothing to chance.

Superdrive offers dual NRZ/PE, 7 or 9 track, with synchronous speeds up to 45ips using up to 10½" reels and is completely industry compatible.

Front accessible diagnostics allow rapid fault isolation through the interactive error code displays. Compare the true off-line test capability, power and programme-selectable versatility of the EMI microdiagnostics with anything else on offer. Add to this the minimum downtime benefits made possible by completely modular construction including the power supply!

The versatile EMI integral formatter solves interface, space and cost problems. Up to eight EMI 8800 drives can be operated in any combination of speeds and densities.

A range of interfaces is available for most popular minicomputers. EMI 8800 offers true systems capability and tested reliability at very competitive prices.

The EMI 8800 is the only tape drive in its class designed, developed and manufactured in Europe and backed by strategically located services throughout the world.

Find out more about EMI 8800–you'll be glad you heard about Superdrive in time!

EMI Technology

SE Labs (EMI) Ltd., Data Products Division,
Spur Road, Feltham, Middlesex TW14 0TD, England.
Telephone: 01-890 1477 Telex: 23995.

A member of the EMI group.
International leaders in music, electronics and leisure.

CIRCLE 249 ON READER CARD

its first prototype chips in the autumn. Another $50 million of taxpayers' money will follow if the company starts to be successful.

Many Tories have complained that INMOS will be manufacturing 64K RAM devices when they are out of date, and that is an unacceptable risk of taxpayers' money. But many sources close to Murphy and INMOS say that the company's real intention has not yet been revealed, namely to build micros for what could be massive and captive markets that could be European controlled. One example would be linked viewdata networks; the chips would be used to build special purpose terminals for home and industry links to this data base/data processing net.

Murphy reportedly told the Tories that the NEB's continuing connection with the state, even at arms length, could ensure a fruitful cooperation with the European communications authorities (which of course are Government departments) and their viewdata networks.

Traditional Tory elements have urged the new Government to promote private companies, like British GEC in its joint semiconductor venture with U.S. Fairchild, rather than back INMOS with state funds. But one embarrassment for the Tories is that when GEC/Fairchild was forming its venture, it went to the NEB for $14 million support.

This suggests that the Tories may need the NEB to bring life to the investment picture for a good while longer. This would give Sir Leslie's new creations the chance to develop a track record—and become an integral part of any new microelectronics strategy.

INSAC TRACK RECORD

The INSAC grouping has already demonstrated the value of a state link by working with the Post Office agency to market viewdata products and services in the U.S. U.S. carrier, GTE, is now negotiating to buy the British viewdata system and market data bases via a packet switched network. At writing, the Federal Communications Commission had approved GTE's proposed purchase of the source of that packet net, Telenet, but with tough conditions; if GTE accepts them and all goes well, the viewdata deal should go through this summer.

BRITAIN LAGS IN MICROELECTRONICS APPLICATION

Why is Britain now pushing so hard for a leading role in the manufacture and application of microelectronics? The answer lies in a series of studies conducted by the Labour Government in the last few years.

The most devastating revelation came in a recent study by the Department of Industry (DOI). According to its interpretation of figures on implementation of microelectronics in various nations, the U.K. is lagging sadly behind other advanced nations. The DOI concluded that some British industries could face obsolescence unless they seek out and apply the silicon chip, and its economies, in more products.

According to Industry Minister Alan Williams, the British could lose out on a fair share of an enormous market: about 2,500 products now incorporating some form of microelectronics together represent a world market of $160 billion. And in five years, he estimates, the market of chip-carrying products could rise to a staggering $380 billion.

Just how far behind are the British? Williams said that in the U.S. at least 24% of all industrial components used in manufacturing feature microelectronic parts of one kind or another. Trailing some way behind is Japan, with 15%, and West Germany, with 14%. The average for Western Europe, he says, is about 13%. But Britain itself falls below the average: 11.5%, less than half the U.S. figure.

Adding fuel to this fire have been two studies conducted by Britain's leading consultancy, PA Consultants, which suggest that British management is unaware of the potential benefits of applying semiconductor chips. In its government-funded studies, PA polled the top 1,000 companies in the country and found that 53% of them had never applied microelectronics and many have no plans to do so. Only 10% to 15% of the U.K.'s big companies had experience in microelectronics application.

Why is Britain so pessimistic about this situation? Chips allow a manufacturer to produce products that do more for the consumer at less cost; without them the British product is not competitive. The most publicized example of this is the decline of the traditional wrist watch market in the face of inexpensive digital watches with multiple functions. The traditional all-mechanical typewriter is bound to be another victim, replaced by machines with high electronic content and word processing functions supplied by the chip.

The Government also stressed in its reports that other countries more aware and prepared than Britain are now implanting microelectronics into the production process as well as the product itself. The manufacturing costs of commodities produced by mechanically and electromechanically operated equipment will ultimately be far greater than for products cranked out in a microprocessor-controlled machine tool environment. Not only is the new production technology becoming cheaper to buy and maintain, but also it affords greater productivity.

Thinking of microelectronics-based products for the office, the factory, the home, for business communications—it is not difficult to fathom where the multibillion dollar markets will come from.

The Labour Government was also intrigued by what such widespread automation over the next ten years could do to jobs. According to another study it conducted: "The real employment gains will go to those countries that can translate microelectronic innovations into new, attractive, inexpensive products for mass consumption."

The price of failure to create jobs through new applications and remain competitive has also been stated plainly —though by a series of seemingly arbitrary figures from the tops of people's heads, as on mass unemployment. Britain's current jobless count, 1.3 million, is a good bit lower than its other big European neighbors. But managers and unions alike are now talking glibly of over four million out of work by the mid-1980s; in the current frenzied climate everyone seems keen to hazard a guess at the figure.

Some detailed studies have been done. One of the first is by the Association of Professional, Executive, Clerical and Computer Staff (APEX), which predicts that electronic equipment could put an end to 250,000 office jobs by 1983. Similar private studies by the German mainframer, Siemens, suggest that a similar number of West German typists and secretaries could lose their jobs during this timeframe because of the advent of word processors and related office automation kit.

One recent private study of the

Murphy characterizes the NEB as the best of both party philosophies—"a merchant bank with a cohesive strategy."

After a long uphill struggle, INSAC is expected to supplement its GTE deal with the announcement of a U.S. acquisition before mid-summer. Since its foundation in 1977, John Pearce has only revealed one project for INSAC members, a software development contract for U.S. peripherals concern, Calcomp, that will be undertaken by SPL.

But Pearce has stressed that the momentum is now finally there, and is believed to have been negotiating with the banking community and other private investors to buy INSAC away if his project is scrapped by the Tories.

But INSAC is the only NEB enterprise with any kind of track record. The INMOS venture, as noted, is proceeding satisfactorily in the U.S. and has captured 15 of the best semiconductor talent from other U.S. firms. It also had a wildly enthusiastic response to 50 job openings at its Bristol, U.K. technology center: 1,000 applied.

The NEXOS office automation consortium is just beginning to staff up. It is headed by ex-IBM marketing director for the U.K., Muir Moffat, and features Logica's knowhow in wordprocessing system manufacturing.

If NEB keeps attracting the best talent in these areas and gets them working together fruitfully, then Murphy will have one more solid reason why the Tories should not decimate the organization.

Of all the options open to the Tories, apart from outright decimation, Sir Leslie Murphy most fears a freeze on the NEB funds over the next nine to 12 months, and then a ruthless pruning of its merchant banking role. The Board currently has a $500 million a year budget; plans by the last Government now waiting approval in parliament would guarantee the NEB a massive $6 billion borrowing ceiling, which in three to four years would rise to $9 billion.

Together, INMOS, INSAC, and NEXOS have had funding in excess of $250 million announced for them. Could a Tory freeze and review damage their prospects? A freeze on funds would initially have little impact on INSAC's new found momentum in the U.S. Pearce is known by sources to have $18 million legally committed now, with the promise of at least another $30 million to come. Like the directors of INMOS and NEXOS, Pearce said he fears Government inactivity while things are reviewed. He stressed that the new Government has some crucial decisions to take, and in the fast changing world of microelectronics they have to be taken speedily.

The likely outcome of Tory deliberations is that the NEB will be kept but under more stringent controls. Most experts feel that the Tories have been impressed enough by some of Sir Leslie's arguments that the obligatory "heads must roll" precedent may be waived, and Sir Leslie will be able to keep both his head and the NEB. But in order to keep face with its traditional ideals, the NEB's holdings in manufacturing industry, such as ICL and Ferranti, are expected to be ruthlessly sold off; holdings in nationalized industries would meet the same fate once the companies were viable and could be returned to the private sector.

Another option is that the NEB could be modified along the lines of a joint venture corporation financed by both the state and private industry. This would operate the high technology holdings, and presumably maintain some semblance of a strategy to augment its banking role.

Perhaps the best protection that Murphy and the NEB have against a carve-up at Tory hands, is one eternal tub-bashing ideal that the party has nurtured over all others: Without the promotion of entrepreneurial and risk investment, Britain is doomed to stagnation.

Perhaps if the Tories now put their support where their mouth traditionally is, Sir Leslie and a lightly disguised NEB might get the chance to prove the ideal is not all just hollow words. *

British stock exchange predicted that at least one-third of the present 15,000 stockbrokerage jobs would be eliminated in the near future by utilizing a fully electronic dealing system. The National Union of Bank Employees (NUBE) has also predicted wide scale unemployment in its ranks because of automated cash points and other computerized interventions.

The director of research for the Association of Scientific, Technical and Managerial Staff (ASTMS), Barry Sherman, said this month that it could be 30 years before the creation of jobs through the microelectronics revolution would outpace the loss of jobs.

According to U.S. consultancy, A. D. Little, as many as one million new jobs *net* could be created in the U.S., West Germany, France, and the U.K. by 1987 because of the growth of microelectronics. Some 60% of these would be in the U.S., says the consultancy (which spent $2 million and three years examining the question).

Jerry Wasserman, the ADL study group leader, says that although some industries will decline, the fast growth of newer sectors would provide that net increase.

Wasserman's figure is based on the creation of new wealth in four target industries: consumer, business communications, industrial and automotive products. He said that in these four sectors microelectronics would create between $30 billion and $35 billion of extra wealth by 1987 (at 1977 prices). But because overall productivity would increase only very slowly to some $40,000 per man by 1987, some 800,000 people would be required to produce the extra wealth the study predicts. And the effect on subsidiary industries would realize at least another 200,000 extra jobs, said Wasserman.

If the figures given earlier are true, Britain's decision-taking managers have an "awareness" problem. To counter this the Labour Government stepped in with a $110 million "industrial indoctrination" program on microelectronics, and some $30 million of this has already been spent on seminars and workshops. The Government also drummed up all the media activity it could get to counter what it described as "lethargy."

The Labour Government's ace was played last year with the creation by the National Enterprise Board of its INMOS subsidiary for advanced chip design and manufacture. It promised that it would plow a further $1 billion into the microelectronics industry if given another five years in office. That, of course, was not given.

The inevitable atmosphere of mild hysteria generated within government and industry has made it difficult for many companies to step back and take a cool look at the real benefits that semiconductor chips could bring to their businesses. The good result of this chip fervor is that British industry has been forced into self-examination. The questions now are whether the Conservatives will maintain the last Government's momentum and what strategy (if any) they will evolve to reach the promised land of new industry and jobs. *

UNDER THE 4300 UMBRELLA: EUROPE

Marching to IBM's tune, all European mainframers have repriced, reconfigured, and relabelled systems to compete with IBM's aggressive 4300.

by Fred Lamond
Contributing Editor

With European industry in a hubbub over the dramatic pricing changes IBM has wrought through its new 4300 series and System/38, most of the competing computer manufacturers timed their countermoves for maximum exposure—just before or at the colossal Hanover Fair in West Germany.

Burroughs and NCR had announced their new models in North America in late February and March, but held their European unveilings until a week before Hanover in April.

Honeywell Information Systems Inc. (HIS) and Cii Honeywell Bull (CiiHB) announced their Series 60 Level 64/DPS and 66/DPS-05 models worldwide on March 31.

ICL and Siemens timed the announcements of their new systems for the Fair's opening day. (In ICL's case, that announcement was for the West German market only, although other markets including the U.K. should have received the word by now.) Only Sperry Univac held off, reportedly planning to make its announcement at the National Computer Conference in the U.S.

All the new models announced to compete against the IBM 4300 and System/38 products use 16K bit memory chips. They are less highly integrated and thus more costly to produce than IBM's 64K chips, but they are faster according to currently published specifications. (Siemens alone is the only non-IBM firm to be using the 64K chip, for the larger 7.770 and 7.780.)

Within the constraints of this more proven 16K technology, Burroughs has produced new processor designs which significantly differ from those they replace. This is also true of Siemens, although its new models are actually a repricing and relabelling of products announced last year and not yet delivered.

The new HIS, CiiHB, NCR, and ICL processor models, on the other hand, are all versions of previously available processors. They differ only in faster clock settings and larger main memory capacities based on the 16K chip.

No mainframer with whom we talked admitted concern about being able to produce these models profitably at the new, lower price levels. Dr. Anton Peisl, president of the Siemens Data and Information Systems Group, publicly stated at a press conference at Hanover Fair: "The only factor that could upset our profit and loss projection would be a renewed weakening of the dollar exchange rate against the deutsche mark." In other words, at current exchange rates and the prices that flow from these, Siemens feels it can produce and sell its new System 7.500 profitably.

Dr. Peisl also pointed out that his EDP Division's profitability last year—the first in its history—was not a flash in the pan, but part of a continuing trend.

Despite any perpetuation of older processor designs and cpu circuit technology, all the rival manufacturers have matched IBM's System/38 and 4300 series in the performance: cost ratio of their hardware prices, with a parallel unbundling of their systems software.

NCR has even improved on IBM by cutting the prices of its new V 85x5M models as much below IBM's new 4300 hardware price levels, as its older V 8500 model prices were previously below the IBM System/370. The other manufacturers have been generally content to match IBM's performance: cost ratios.

DOWNWARD MIGRATION PROBLEM

The major question in this heated price: performance competition is how do the mainframers force rental customers to upgrade their systems enough to prevent a revenue loss? Certainly, the user can now trade old systems for new models with better performance for the same price, or with equal performance at less cost.

This is a particularly acute question in France and W. Germany, where tax laws encourage computer users to rent or lease their equipment, rather than purchase. While third-party leasing companies offer an alternative to IBM's own leases, other mainframers handle their own financial arrangements. In Siemen's case for instance, about 95% of its West German users are renting their systems from Siemens.

The revenue problem is a much greater one for non-IBM companies because of the nature of their customer base. Most users have opted for Honeywell, ICL, Siemens, Burroughs, etc., because the cost of hardware for their bread-and-butter accounting applications has been about 25% less at equal performance. They, therefore, are economy-minded and watch for opportunities to cut their rental costs further.

IBM customers tend to choose IBM because of its better support services and more comprehensive library of applications packages. They are by na-

30,000 excellent reasons for Honeywell Information Systems Italia to put its range of Matrix Serial Printers on the OEM Market.

Today 30,000 of these printers - over 10.000 units in the last six months - have been built by H.I.S.I. and shipped to users in the USA, Europe, and the rest of the world.

These printers are 100% designed and manufactured in Italy as a true family using modular design concepts and common components.

For the OEM market, this family of printers assures a high level of adaptability and reliability. The range of models satisfies a wide variety of applications: System Consoles, Output Printers, Teleprinters, Teminals, Hard-Copy, etc. with printing speed from 30 CPS (monodirectional) to 160 CPS (bidirectional in optimized mode).

A versatile range of options allows personalization of each model according to the needs of the application, giving the best cost/perfor mance ratio.

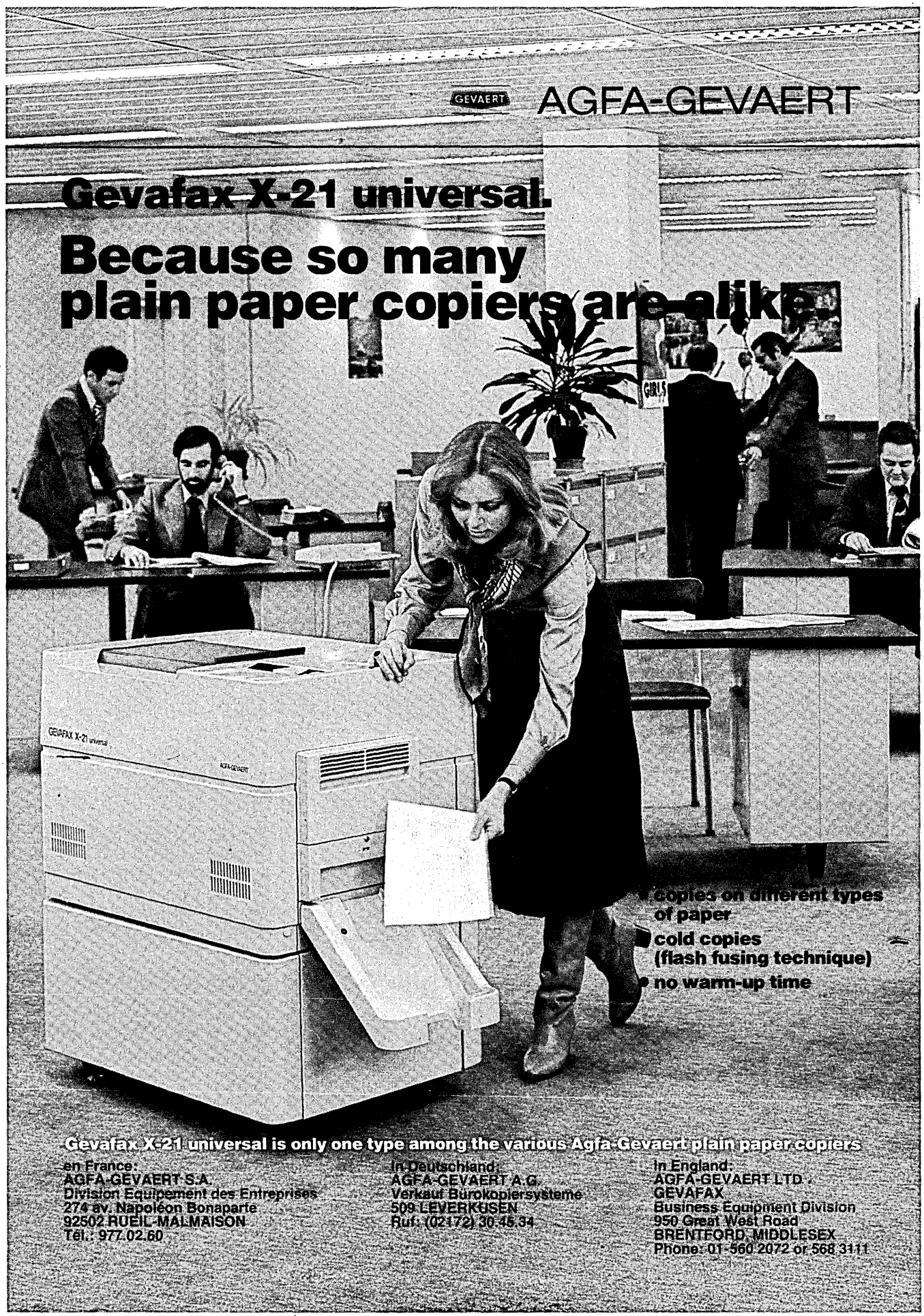
A range of printers designed and manufactured in Italy with fully modular design giving flexibility and reliability already proved by worldwide acceptance.

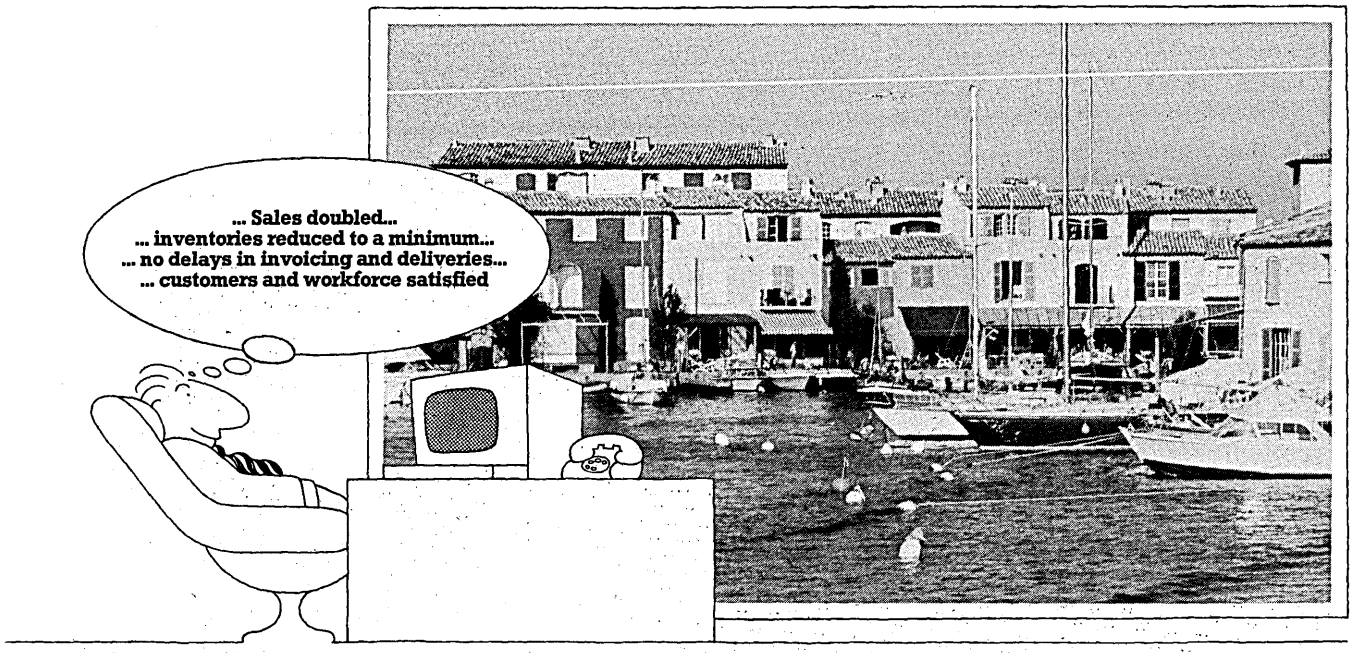
Honeywell

Honeywell Information Systems Italia

For worldwide countries with the exception of: USA, Canada, Australia, Brazil, Yugoslavia please contact:
H.I.S.I. OEM Sales - Via Vida 11, Milano (Italy) - Telex Milano 311308 HISI - Tel. 2841910-2826351

CIRCLE 253 ON READER CARD





Sems: computer systems that meet your real requirements

Sems "set fair" management with "SIS" Interactive edp Systems

Nowadays, a dialogue capability is one of the key factors in the efficiency of organisations, as most decisions involve interaction between an increasing number of parameters. Thus the new Sems Interactive Systems (SIS) have been designed as a data processing aid to such dialogue and to operations in general.

A typical application: the Daniel Alary boatyard:

This is a small organisation, employing 33 people at Port-Grimaud on the French Riviera. The company is concerned with hiring, selling, repairing and caretaking boats and selling accessories in a self-service chandler's shop.

The objective was to improve invoicing and control of a an inventory comprising 8,000 items, to avoid giving credit to unsatisfactory customers, to eliminate labelling errors and items going out of stock, and to improve delivery times.

Sems Interactive Systems (SIS) provided an EDP solution to this problem which was easily and rapidly installed by a handful of engineers, without disturbing the day-to-day operation of the organisation. Invoicing and real time control of orders were the first applications to be fully implemented.

A painless changeover from manual operation to EDP-based techniques was made possible by the use of a model from the SIS-L range, offering the following advantages:

- ease of installation;
- adaptability to existing working methods;
- facility for interrogating system by more than one person simultaneously;
- elimination of data capture and transcription errors;
- direct dialogue.

Nowadays:

- invoices are printed out on the evening of the final day of the month;
- the shop's sales figure has doubled without increasing its costs;
- administrative work concerned with the personnel is significantly reduced and more enjoyable.

The situation described here is merely one of many. We could just as well have described a family firm near Lyons, a medium-sized company in the North, or a research laboratory in the East or the West of France.

Whatever your business, consult us. Interactive EDP starts right there!

Sems is one of the world's foremost manufacturers of minicomputers, and a subsidiary of THOMSON-CSF. Sems Interactive Systems (SIS) are designed for:
• company management
• computer services bureaux and systems designers.

SIS offers the following advantages:

- Consistent hardware + software + services packages which are of modular design for easy expansion. The concepts of quality and continuing service replace considerations of the specific performance capabilities of this or that type of computer;
- buying in and operating costs reduced compared with those for conventional EDP solutions;
- machines designed and built for fast installation and easy, effective maintenance;
- prices ranging from 100,000 to 500,000 francs;
- economic leasing arrangements available through CILOMI, another THOMSON-CSF subsidiary;
- delivery time currently around 3 months;

SIS comprises 4 product ranges:

- SIS-L: "Language-oriented" management information systems for easy, fast implementation of simple applications;
- SIS-T: "data base" oriented management information systems (Tribu data base) for applications with multiple interrelationship characteristics;
- SIS-M: "transaction-based" management information systems (Mutex software), for special applications (on a made-to-measure basis);
- SIS-S: designed to meet the needs of research laboratories and design offices.

and 5 levels (100 to 500):
from single-station systems to multi-station, multi-language systems, with local and remote batch processing capability.

sems

THOMSON-CSF

36-38, rue de la Princesse - 78430 Louveciennes - tél.: 958.39.50 - télex: 695272

4 agences parisiennes / 10 agences en province: Bordeaux, Grenoble, Lille, Lyon, Marseille, Nancy, Rennes, Rouen, Toulouse et Tours
10 subsidiaries in: Germany, Benelux, Switzerland, Great Britain, Hungary, Yugoslavia, Spain, Algeria, Syria, U.S.A.

CIRCLE 261 ON READER CARD

SIEMENS

The new Computer System 7·500

"New can-do"

New can-do for business as usual

Accounting, invoicing, inventory control, production scheduling-whatever it is, if it's in your day's work, the Siemens System 7·500 computers will handle it faster, more efficiently, economically.

The dialog-oriented 7·500 system puts computer power where you want it: in your computer center, and at the work station and finger tips of every data user in your organization.

Add Siemens TRANSDATA® tele-processing, and you can stretch your computer power from end to end of your organization, placing it at the disposal of staff at any location or work center. With the universal data base and data communication system, all authorized personnel will have access to up-to-the-minute data.

New can-do for new applications

Besides doing your humdrum jobs, the 7·500s have plenty of power for imaginative applications.

For instance, graphic data processing. Now, your engineers can do their designing at the video terminal. Their drawings are produced instantly on the screen, together with computations of time and effect on materials.

Or, computer-aided planning and forecasting. Software is available to help dp laymen in any operational or administrative sector to build up, break down, and see through complex event structures. Simply by "interviewing" the computer.

The 7·500 series

The 7·500 family includes the 7·521 and 7·531 office computers – the mighty compacts – and our new model 7·541, for computer centers.

Thanks to their compact construction, the upward-compatible 7·500s combine big performance and capability with large savings in space and cost. All carry a price tag that's calculated to impress capital goods investors with an eye on the bottom line.

If you'd like to learn more about our 7·500s, write for details to Siemens AG, ZVW 104-D101/Postfach 103, 8000 Munich 1, Federal Republic of Germany.

D 15/7910.101

Count on the Siemens Data People

TABLE 1. NEW COMPETITORS FOR THE IBM SYSTEM/38 and 4300 SERIES

MANUFACTURER	IBM	BURROUGHS	CiiHB & HIS	ICL	NCR	SIEMENS
EQUIVALENT MODELS AT COMPARABLE PRICES	S/38	B 1855	62/35	2905	I-8430	7.521
	4331	B 2930	64/DPS-2	—	V-8555 M	7.531
	—	—	64/DPS-4	2950/10	V-8565 M	—
	—	—	64/DPS-6	2956/10	V-8575 M	—
	4341	B 3950	66/DPS-05	—	V-8585 M	7.541

Signs: _____ Compatibility break on upgrading. Rewriting of source programs or file recreation required.
--------- Recompilation required on upgrading.
| Field-upgrading possible from the smaller models to the larger models.

ture more expansion- than economy-minded and, thus, more easily persuaded to upgrade to systems both more powerful and more costly.

(Even for IBM, however, there is a period of transition. That is why IBM Germany's 1978 turnover dropped by .6% below 1977, even though shipment volumes had increased. This was caused by IBM's big price cuts in German rentals and purchases in order to bring them to international levels at current exchange rates.)

The tactic adopted by most of the general purpose mainframe manufacturers is to offer their existing users better deliveries—and in some cases, field upgrading of their existing systems —if they accept greater cpu power and more main memory at the same price.

IBM has its own strategy for preventing downward or sideways price migration. When Data Processing Div. (DPD) announced the 4300 series at the end of January, it also announced that deliveries up to the middle of 1980 would be limited to certain standard configurations of both processor models. This was done to optimize production to meet the expected rush of orders.

IBM has not given full details about these standard configurations, but the standard 4331 configurations appear to be limited to integrated I/O adapters and the peripherals that these can control. (Exclude the large capacity 3370 disks, which will not become available on 4331 systems until the second half of 1980.)

On 4331 configurations restricted to integrated adapters, all input must be via distributed 3276 display terminals, and all printed output via 400 lpm or 650 lpm line printers. Such configurations will be ideal for new satellite sites required by a large 370 or 303X system user, or for a user upgrading from a System/3 or 34 or similar system.

The small to medium range IBM 360 or 370 user (370/115 to 135) is an unlikely customer for these "standard configurations." He would have to throw out all his peripherals except 3340 disks. And he would have to convert all his input to on-line keyboard entry or 3741 diskettes.

Block or byte multiplexer channels are needed if this user wants to retain peripherals like card readers, 1200 lpm printers, 2314 or 2319 disk drives, or 3420 tape drives. Are they included in the standard 4331 configuration? The public hasn't been informed. If not, the user must wait until at least late 1980 to get a 4331 processor that's usable.

This is a convenient strategy for IBM, since rental customers of the 370/115 to 135 range must either go on paying the high 370 price, purchase the equipment (prices were cut last fall), or bite the bullet on peripherals.

The 4341 is another matter for these users, being complete with those multiplexer channels, and, from IBM's standpoint, a more lucrative upgrade. Users who placed orders this March have a chance for early 1980 deliveries.

TABLE 2. PRICE EQUIVALENTS IN CiiHB/HIS AND IBM LINES

NEW IBM	OLD IBM	NEW CiiHB/HIS MODELS Model	Main Memory (bytes)	OLD CiiHB/HIS MODELS Model	Main Memory (bytes)
System 34	—	61/DPS[2]	64K-96K+24K-56K	61/40[1]	32K-96K
		----------		61/60 II[1]	32K-96K+16K
System 34	—	61/15[3]	256K	62/10	176K-192K
_____	System 3/8	62/25[3]	384K-512K	62/20	80K-192K
System 38	System 3/12	62/35[3]	512K-1M	62/40	80K-256K
	System 3/15	—	—	62/50	96K-384K
_____	_____	—	—	62/60	96K-512K

4331	370/115	64/DPS-2	512K-1M	64/20	64K-512K
—	370/115-2	—	—	64/30	64K-512K
—	370/125-0	64/DPS-4	768K-2M	64/40	96K-512K
—	370/125-2	64/DPS-6	768K-2M	64/50	96K-768K
4341	370/138	—	—	64/60	192K-768K

4341		66/DPS-05	1M-4M	66/05	384K-2M

[1] Not offered by HIS in UK and Ireland.
[2] Not offered by HIS in UK and Ireland, nor announced by HIS Italia in Italy, Yugoslavia, Turkey and Israel.
[3] Not announced at the time of writing by Cii Honeywell Bull and its Continental European subsidiaries.
---------- Source program recompilation required on upgrading.
_____ Program alteration and/or file recreation required on upgrading.

If the customer can buy equal performance for less now, how does the mainframer force him to upgrade? All have a strategy.

The 4341, however, has its own strategy for discouraging 370/145 and 148 users from making a price downgrade. Many users have 2MB configurations that are more expensive than the 4MB 4341, but this 4341 model won't see light of day until after August 1980. Further, MVS operating system support is not available; the OS/VS 1 on the 4341 does not support the new 3880 DASD controller or the big 3770 disk drives. So for these needs, it's on to the 303X systems.

How do the rest compare in strategies and systems? Our discussion is limited to European companies, as NCR, Burroughs and HIS products have been covered in DATAMATION.

CiiHB UPGRADES COST 0

Cii Honeywell Bull and its part owner Honeywell Information Systems are using a somewhat different strategy to control customers. Earlier this year they announced new models in levels 61, 62, and 64. The new 61 models were made more competitive with the IBM System/34, while the 62 models were aimed at larger System/34 configurations and the System/38. The new Level 64 products attack the 4300 line.

The old 62 and 64 models can all be field-upgraded to the new DPS systems (for Distributed Processing System) at their levels. The only difference between old and new is price, larger main memory capacities based on new 16K chips, and faster cpu clock settings. (Systems software improvements were made across the board, such as multiaccess time-sharing facilities for the 64.)

The tactic CiiHB/HIS are using to retain revenues is to offer very fast field upgrades at no cost to rental customers and "moderate" costs to purchase customers. (The upgrading is beginning now, three months after the spring announcement.) The catch is that the rental or lease customers must agree to renew their contracts at the same rates as before, meaning taking on bigger systems. Users that prefer to keep the same performance and hence pay less, will have to queue up to obtain the new models. That may take nine to twelve months.

In either case, these users fare better in delivery, since most IBM customers for the System/38 and 4300 are facing 12 to 24 month waits.

To see how the field-upgrading looks—and the competitiveness with IBM products—see table 2. This shows *price, not performance* comparisons between old and new systems in the CiiHB and IBM lines. Entry level prices to both Level 62 and 64 are the same as before, but because of the greater memory capacities and performance the following happens. The entry level 62/15 costs as much as the 62/10, but offers the same throughput as the 62/40; the entry level 64/DPS-2 costs the same as the 64/20, but offers the same cpu throughput as the 64/40 and 512KB more memory.

The largest models of each level cost less than the old systems at the top of each line. That is, a 62/35 costs less than the 62/60, but offers a one megabyte system at little or no cost to users of the 62/40, 50, and 60; these models had 256KB to 512KB maximums.

The 64/DPS-4 and 6, with up to 2MB of memory, can be obtained—again at little or no cost—by 64/50 and 60 users, who had only 768KB maximums available.

This is the kind of field upgrading that CiiHB/HIS had in mind when it offered such fast installation of the additional facilities. While these users should be quite happy with these opportunities, how does this cost: performance structure appeal to IBM System/3 and 370 users? The delivery times overall, as noted, are better than IBM's for the System/34, 38, and 4331. And one can see on the table that CiiHB/HIS have taken care of price: performance competition.

The Level 62 continues to offer System/3 users more source program compatibility than either System/38 or the 4331. And by going to Level 62, such IBM users would have a smooth up-

TABLE 3. NEW ICL PROCESSORS

MODEL	2905	2950/10	2956/10
SYSTEM ARCHITECTURE	Distributed	Distributed	Distributed
ORDER CODE PROCESSOR (OCP)			
No. per system	1	1 or 2	1 or 2
Architecture	Pipeline	Pipeline	Pipeline
Buffer memory (cache) capacity	1KB	1KB	1KB
STORE CONTROL UNIT (SCU)			
No. per system	1	1 or 2	1 or 2
Combined capacity:			
8-bit bytes	512K-1M	512K-2M	512K-2M
24-bit DME words	96K-224K	96K-224K	96K-224K
Throughput SCU (bytes/second)	10M	10M	10M
I/O DEVICE CONTROL UNIT (DCU)			
No. per system	1	1 or 2	2 or 3
Throughput per DCU (bytes/sec)	2M	2M	2M
Control unit positions per DCU:			
Disk controller	1	1	1
Other local devices	15	15	15
Commun. lines (local and remote)	16	16	16
EXCHANGEABLE DISK DRIVES			
No. per DCU	2-8	2-8	2-8
No. per system	8 max.	16 max.	24 max.
Capacity (bytes) per exchangeable drive	80M, 100M, or 200M	80M, 100M, or 200M	80M, 100M, or 200M
TERMINALS			
Max. no. per commun. lines	24	24	24
Max. no. of commun. lines/DCU	16	16	16
OPERATING SYSTEMS			
512K-1MB systems	DME-2	DME-2 or 3	DME-2 or 3
IM-2MB systems	—	VME/K	VME/K

Mit PIX Remote Computing Facility
hat bei uns die Zukunft schon begonnen.

TP-Netzwerke der Zukunft, mit PIX heute bereits realisierbar

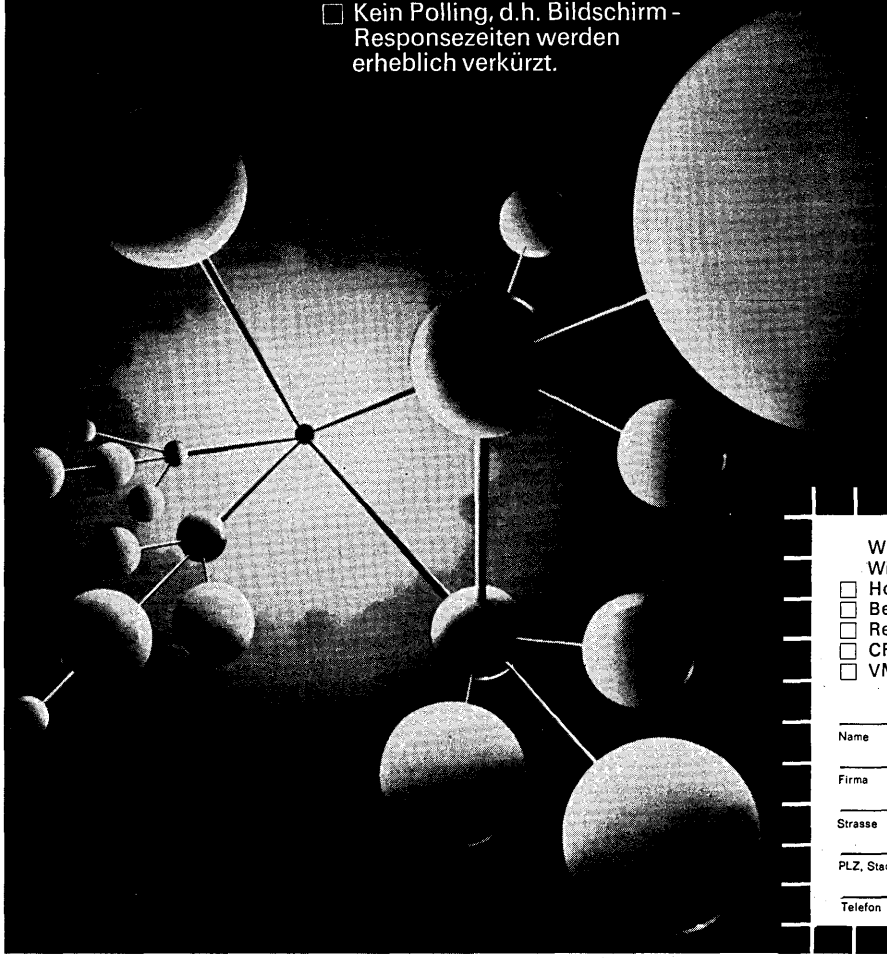
PIX Remote Computing Facility ist ein völlig neues Konzept für Benutzer von IBM 360/370/303X oder kompatiblen Zentraleinheiten.
PIX erlaubt Ihnen die Konzipierung eines Hochleistungs-TP-Netzwerkes ohne Front-End-Prozessor und TP-Software.
PIX ermöglicht die Verbindung von Remote Terminals zur IBM Zentraleinheit im "Local Mode."
Resultat: Verbesserter Durchsatz der Verarbeitungs-Programme.
PIX-Netzwerke sind einfacher zu konzipieren und kosteneffektiver als alle zur Zeit auf dem Markt befindlichen DFV-Systeme, und –

- ☐ PIX unterstützt Batch RJE, interaktive Bildschirme und Dateneingabe gleichzeitig über eine einzige Leitung unter Local-Software-Steuerung.
- ☐ Kein Polling, d.h. Bildschirm-Responsezeiten werden erheblich verkürzt.
- ☐ Voll-Duplex-SDLC-Übertragungsprotokoll mit umfangreicher Datenkomprimierung.
  Fazit: Größerer Datendurchsatz und bessere Leitungsausnutzung.

PIX bietet eine neue Philosophie im Aufbau von TP-Netzwerken.
Wenn Sie mehr über PIX Remote Computing Facility erfahren möchten, senden sie uns bitte den Copoun zu oder rufen Sie uns an.

EMI Technology

EMI Technology GmbH
Maarweg 141 · 5000 Köln 41 (Braunsfeld)
Telefon: (0221) 49 10 78/79



Wir bitten um weitere Informationen
Wir interessieren uns kurzfristig für:

- ☐ Hochgeschwindigkeits RJE
- ☐ Bessere Responsezeiten für Bildschirme
- ☐ Reduzierung von Übertragungsleitungen
- ☐ CPU – CPU Verbindung
- ☐ VM/370 Hochleistung

Name

Firma

Strasse

PLZ, Stadt Land

Telefon

CIRCLE 250 ON READER CARD

Plug-In-Intelligence Printing System.

Just plug new PROM chips into the standard, cost-effective Facit 4530 Matrix Printer and it gradually extends its functional intelligence. From the basic general report printer to a variable-size character printer, a bar-code printer, a label printer or, with the addition of a keyboard, a complete data entry work-station. ☐ The powerful microcomputer architecture allows the Facit 4530 Intelligent Printing System to be configured for practically any 160 character per second application ☐ Parallel or serial RO and KSR models are all easily re-configurable to changes in your firmware as requirements change, or as new applications develop ☐ The systems you work and plan on today will change. The Plug-In-Intelligence Facit 4530 will follow your requirements.

FACIT DATA PRODUCTS

FACIT DATA PRODUCTS. S-105 45 STOCKHOLM, SWEDEN. PHONE: (08) 738 60 00. TELEX: 11600 ELHEAD S.

CIRCLE 252 ON READER CARD

Offering one operating system for the new 7.500, and another for the existing 7.700 base could make Siemens vulnerable to defections.

ward compatible path to larger systems at Levels 64 and 66.

The Level 64 has been strengthened with the additional time-sharing software, which makes its systems software facilities fully equivalent to the giant Level 66 line, at least for single processor configurations. But HIS sources in the U.K. hold out more promise for stealing ICL and NCR customers than IBM users with the Level 64. This is because of the availability of source program conversion aids for shifting from ICL PLAN and NCR NEAT-3 to Level 64 COBOL.

ICL unveiled three new processor models at the Hanover Fair, all versions of the 2950 and 2956 announced some time ago. The 2950/10 and 2956/10 present a change only in this respect: faster cpu clock settings, more efficient microprograms, and more efficient systems software greatly improve the throughput. They offer essentially the same memory, I/O handling, and prices. With the improvements, they are faster than the 4331, but still more expensive.

Existing rental users of the 2950 and 2956 can have their processors field-upgraded at little or no charge, but again, only if they maintain the current rental commitment.

The 2905, the third model, is a 2950 microprogrammed to run only under the DME-2 instruction set and operating system. (This insures full compatibility with the 2903 and 2904 small business systems.) Its facilities thus cut down, the 2905 is much cheaper and is pegged at the IBM System/38.

Like the 38, the 2905 has an applications-independent data base system —IDMS. Unlike the 38's incompatibility with smaller IBM systems, the 2905 offers all the software running on the smaller 2903 and 2904, and can control almost all the same peripherals. Thus, 2903 and 2904 users can just exchange processors to get the added power. At writing, the industry was awaiting ICL's direct attack on the IBM 4341.

TABLE 4. SIEMENS SYSTEM 7.500

MODEL	7.521	7.531	7.541
SYSTEM ARCHITECTURE	Distributed	Distributed	Integrated
CENTRAL PROCESSOR	Integrated	Integrated	Pipeline
High speed cache memory	8KB	8KB	16KB
Cycle time (nanoseconds)	200ns/4 bytes	200ns/4 bytes	200ns/8bytes
MAIN MEMORY			
Capacity (bytes)	512K-1M	512K-1.5M	2M-4M
Access time (nanoseconds)	560ns/8 bytes	560ns/8 bytes	560ns/8 bytes
INPUT/OUTPUT SYSTEMS			
Integrated disk adapters	1	1	—
Integrated display adapters	1 optional	1	—
Integrated comm. adapters	1 optional	1 optional	—
Byte multiplexer channels	1	1	1
Block multiplexer channels	—	—	2-5
DISK STORAGE			
No. of drives/system	2-4	2-6	2-32/controller
Capacity (bytes) per:			
Exchangeable diskpack drive	63M, 126M	63M, 126M, 300M	63M, 126M, 300M
Fixed disk system	420M	420M	420M
System	1,680M	2,520M	13,000M/controller
TERMINALS			
Local	4-16	4-16	Unlimited
Remote	3 lines	3 lines	Unlimited
OPERATING SYSTEMS	BS 2000	BS 2000	BS 2000

SIEMENS RELABELS REPRICES

Siemens is not yet tired of new announcements, (or in this case, reannouncements) having announced a record number in the last year. In April, it transformed the 7.708 and 7.718 announced last year—not yet delivered— into the 7.521 and 7.531. The reason: to make them more price competitive against the IBM System/38 and 4331 models. The hardware prices did indeed come down, but both systems and applications software are completely unbundled for the first time.

Following IBM architecture closely, as is Siemen's practice, these two models are like the System/38 and 4331; they are designed primarily for interactive data entry and transaction file processing, and both disk drives and terminals are connected to integrated adapters on an autonomous I/O processor. The differences are in the offering of exchangeable, as well as fixed, disk drives and the inclusion of a byte-multiplexer channel as a standard rather than optional feature.

A new medium-size processor, the 7.541, was also announced. Competing head-on with the 4341, it is as channel-oriented as the IBM product, with the same memory range and number of block and byte multiplexer channels.

Where Siemens differs from all competitors is the way it prevents its existing base from downgrading in price. The only operating system it supports on all three models is the virtual memory BS 2000. Most of its customers for the 7.700 and System/4004 line use the incompatible BS 1000. Conversion for them would be expensive, offsetting any savings gained by going to the cheaper 7.500 line. Furthermore, the 7.700 and 4004 are largely bundled with the software, another cost consideration.

Thus, Siemens is shoving current users up the 7.700 ladder, hoping that if they do buy the 7.500 it will be to develop new applications under BS 2000. It is a dangerous strategy. The BS 1000's Job Control Language is extremely close to IBM's DOS and DOS/VS JCL. While this helped Siemens capture some IBM sites, it could also help IBM attack the Siemens base. Siemens is doubtlessly relying on IBM's long delivery delays for the 4300 to discourage such defection.

When those IBM delays finally shorten next year or 1981, Siemens could then announce BS 1000 support . . . if customer goodwill has not run out before then. *

Japanese mainframers imitate IBM market approach, but add an all-important Kanji capability for end user.

UNDER THE 4300 UMBRELLA: JAPAN

by Tomio Uchida, Japan Correspondent

"A great deal of change has been made in hardware and software. So too will be the change made in use of our computers." This headline in IBM Japan's full-page advertisement in newspapers on March 15, 1979, announcing the debut of the 4300 processors in the Japanese market, had quite an effective impact. The message underlined the new price:performance and application of the new processors and how they represent change in IBM's methods of doing business.

The Japanese manufacturers' reactions were incredibly prompt. In fact, two of them, because of the long period of rumors and leaks on the 4300 in Japan and elsewhere, beat IBM to the punch by announcing their products in February. The users themselves reacted in a "not-to-miss-the-bus" manner that led to a rush of orders for the new offerings of IBM and its Japanese competitors.

Nippon Electric Co. (NEC), Mitsubishi, and Fujitsu all have announced their new models. NEC announced the ACOS System 250 model 60 on February 6. Mitsubishi came out with its Melcom-Cosmo 700 III and 700S models on February 14. April 11, Fujitsu unveiled its new FACOM M-130F, 140F, 150F, and 160F. Hitachi alone has not announced its answer (as of mid-May), although upgraded models of the Hitac M150, 160 II, and L340 are due out soon.

Interestingly, all the new medium-scale machines announced by the Japanese companies have one feature in common with IBM: a design concept for distributed processing which will be fully implemented in the 1980s.

So, the "catch phrases" used in the new processor announcements were almost identical, saying "they are oriented to use by end users in distributed processing applications" and focusing on the emerging breed of on-line users —the market falling between the on-line bankers' consortium and broad-based small business computer users.

In line with that approach, Fujitsu claims that its "F" models are designed to achieve: (1) higher price:performance ratios supported by 64K bit LSI technology; (2) use by untrained personnel; (3) development of an optimal (flexible) communications network by use of an on-line software package; and (4) processing of Japanese Kanji data with a hardware/software system called "Japanese processing extended feature (JEF)"

Likewise, Mitsubishi introduced models 700 III and 700S as machines with the following advantages claimed for dp users: (1) greater ease in terminal-to-host conversational processing on a time-sharing basis; (2) distributed processing that will be achieved by linkage of MNA (Mitsubishi-developed shared network architecture) to IBM's SNA; (3) use of bus-structure multiprocessors, which Mitsubishi claims is a first on a medium-scale machine; and (4) Japanese Kanji processing to be achieved either on a batch, time-sharing, or workstation basis with a full assortment of Kanji I/O units.

NEC, unlike Fujitsu and Mitsubishi, regards itself as IBM's "non-plug-compatible" competitor. Because of this, it was able to react most quickly to IBM's 4300 announcement and has already won 100 orders for its ACOS 250 by the end of March. The machine's principal design philosophy is also to provide the medium-scale computer users with the convenience of distributed processing in a conversational mode from a multiple number (up to 64) of display stations.

PRICE AND SHIPMENT CRITICAL

"This should be the beginning of a close match between IBM and Japanese computer makers in the battle of the 1980s," says an official of MITI, "As expected, IBM's 4300 announcement is certainly a threat to the Japanese corps, but I don't expect to see them knocked down in the first round in the ring. They are about to keep up their challenge against the threat."

What are the major elements of threat to the Japanese competitors?

Price and delivery are more critical than performance capability, from a strategic viewpoint. In mid-February, IBM Japan announced a series of price reductions for IBM 370 series (maximum 20% on purchase price) and smaller machines. At this point, the price cuts were a prelude to IBM Japan's forthcoming announcement of 4300 series, and understandably they wanted to sell more of its existing models at lowered prices before any substantial replacements took place.

Some industry sources indicate that this is not the end of the story. Some Japanese computer suppliers are concerned that IBM Japan might possibly take to "discount" selling as part of its marketing strategy not only for previous models and small machines but also for new medium and large capacity systems.

One Japanese vendor doubts IBM will resort to such a tactic, but believes IBM will make pricing policy changes over time because "competition in the 1980s will be further intensified and may result in narrowing IBM's shares of the computer market in Japan and elsewhere."

On a monthly rental basis, this is how the price ranges roughly compare:

IBM 4331 standard configuration:
yen 1.6 million (yen = $.0047)
IBM 4341 standard configuration:
yen 6.4 million
NEC ACOS 250 model 60:
yen .7 to 3 million
Mitsubishi Melcom-Cosmo 700 III:
yen 4 to 15 million
Mitsubishi Melcom-Cosmo 700S:
yen 2.5 to 7 million
Fujitsu 130F, 140F, 150F, 160F:
yen 1 million, 1.5 million,
yen 3.5 million, 4.5 million
(minimum) respectively

The quick 4331 delivery will have a serious impact on Japanese competition. IBM Japan's announcement of the scheduled deliveries of the 4331 standard configuration to begin in June, with the first 4341 to be delivered in second quarter 1980.

Unlike the past, IBM's technology was a highlight in this announcement. A major reason that the 4300 series created excitement among both the Japanese

MEMOREX

MEMOREX

IBM users

choice

Memorex believes in freedom of choice in a competitive market.

As Europe's largest independent supplier of computer peripheral equipment, Memorex offers the IBM user a genuine alternative source.

Our wide range of disc-drives, tape-drives, printers, communications equipment, is designed to give you the power for your money.

And as the alternative supplier we aim to offer better ... better service, better technical support, plus a whole-hearted ... getting the best out of your existing investment in software and ...

Put Memorex peripherals alongside your IBM mainframe and you get the best of two of the world's great names in information handling. Memorex and IBM.

Memorex. Excellence in peripherals, communications equipment, computer and consumer media. 50 offices serving Europe.

MEMOREX

CIRCLE 248 ON READER CARD

computer makers and users is the use of 64K bit dynamic RAM in their memories, along with 704-gate TTL logic in the cpu logic, 1400-gate bipolar LSIs in the disk controllers, and an advanced packaging technology.

NEC, Mitsubishi, and Fujitsu have already announced that they will start shipping new computer models incorporating 64K bit LSIs by the end of 1979 or early in 1980. Being major semiconductor device producers, all of these Japanese computer makers claim that they are equipped to make the LSI chips and are ready to load them in their new machines. The fact remains, however, that they have yet to solve the question whether one 64K chip would have an advantage over four 16K chips in terms of cost effectiveness. It is estimated that one 16K chip costs yen 1,500, while one 64K chip costs nearly yen 20,000. This implies that the single 64K chip is over three times more expensive than four of the 16K chips—not a plus for production costs.

Where, then, are these Japanese computer vendors able to become more competitive to IBM, in other than pricing, shipment and technology? The answer would be in their ability to immediately respond to end user needs in their varying applications.

Mitsubishi and Fujitsu, in this respect, are better equipped than IBM and other Japanese computer vendors, since their machines are endowed with Kanji processing power both in hardware and software. This is a capability with which some of the small business computers are well equipped. Considering the near-term market in Japan—in which small and medium scale business organizations with fewer trained programmers and operators will become the mainstay—medium scale computers with a Kanji processing capability are a "must." IBM is, however, known to be developing some Kanji capabilities for its systems as well.

Two Japanese companies are also endeavoring to establish remote customer support systems (Mitsubishi's "Merit" and Fujitsu's "Mart"), similar to IBM Japan's "software support center." The concept seems to facilitate efficiency in service to customers, but some critical view still prevails that it may take time to win the users' confidence on this service. Some feel their software costs will actually increase and others fear unmanned service might be inferior to the service done by customer engineers. *

SOUTH AFRICA ON UPSWING DESPITE EMBARGOES

While worries about U.S. embargoes persist, foreign vendors solidify commitments and local firms increase.

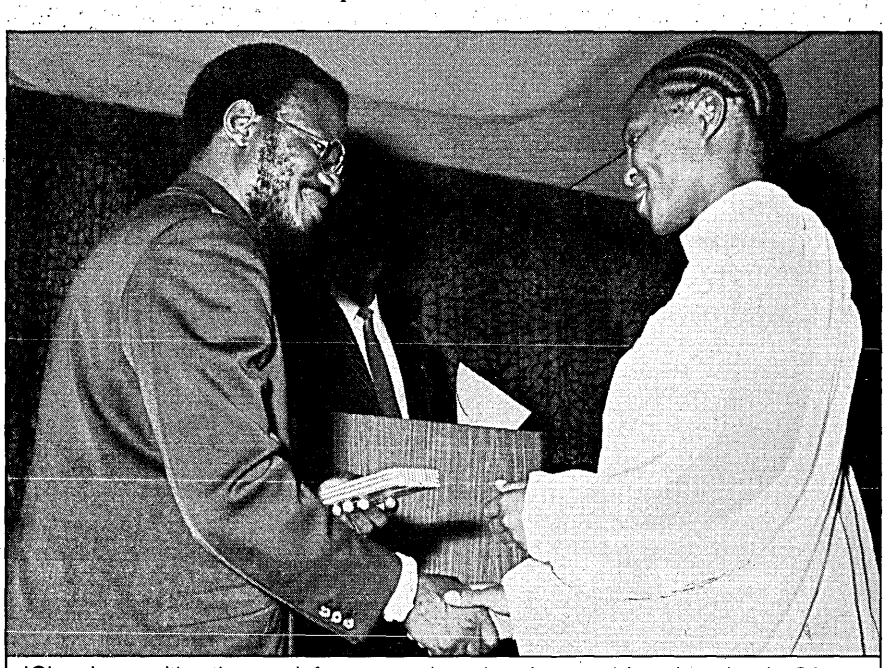
by Gail Purvis

In 1977 and 1978, when the United States announced embargoes on computer sales to selected South African government agencies, the fears and rumors spread like wildfire. IBM would pull out, Control Data would pull out, they said. Computer users feared what would happen to them if the U.S. restriction was expanded to include other government agencies and private industry.

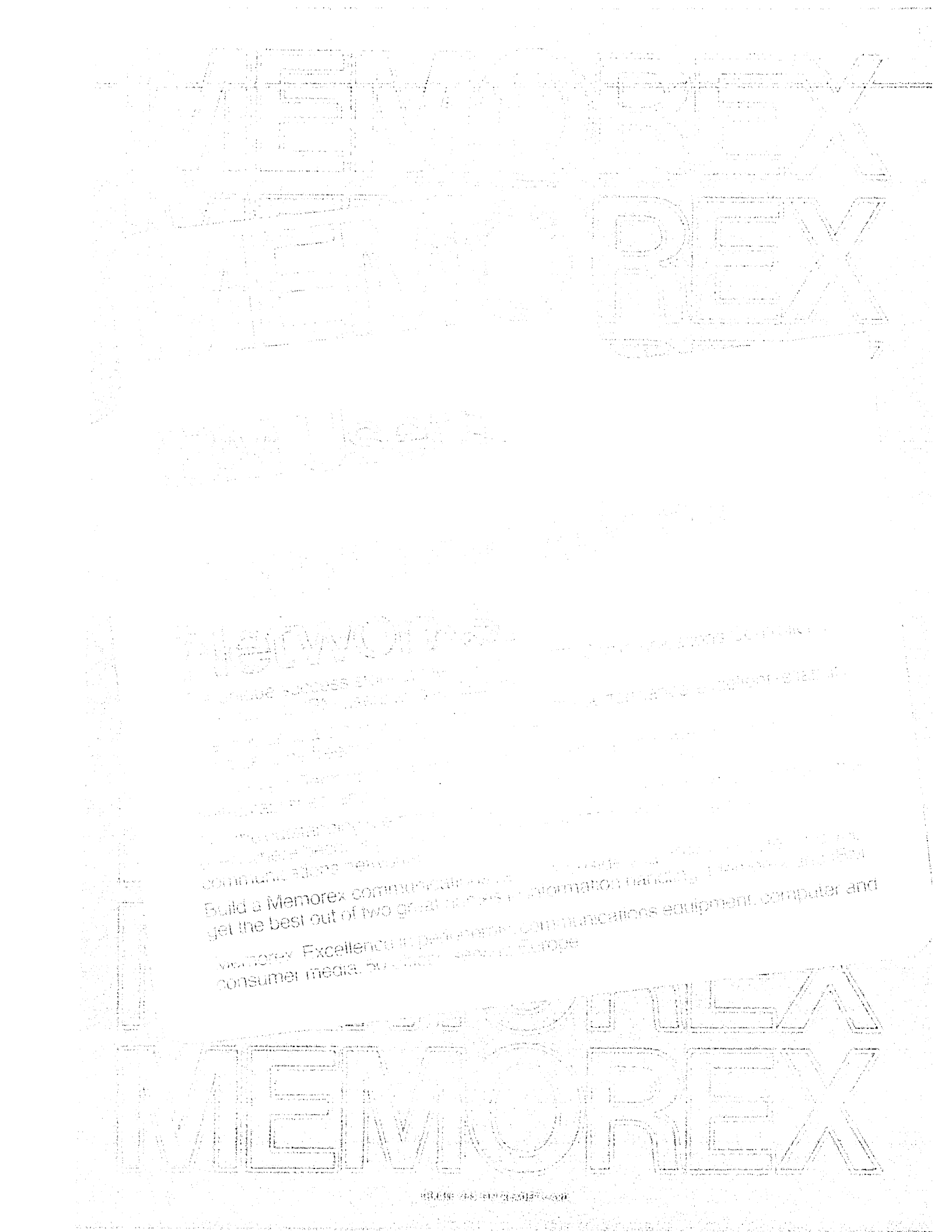
Companies like the British ICL stepped into the breach, capturing orders from the military and police. But British parliamentarians began arguing about their own version of a boycott, and the South Africans realized how vulnerable their dependence on the rest of the world for the critical data processing resource made them. The government hastily set about to devise a national policy that would strengthen local manufacture.

But so far, very few foreign companies have left South Africa for political reasons. No new embargoes have been placed. The government has not devised a national policy . . . yet. And contrary to world press accusations, the computer stockpiling that was expected has not occurred. In fact, South Africa, in common with the U.S. and Europe, has a gross overcapacity of computer power.

What has happened is that many of the foreign mainframe vendors have worked to confirm their South African involvement. When Control Data's chief, William Norris, publicly stated that CDC would not increase its funds to



ICL, along with other mainframe vendors, has invested in education in SA. Since January 1978, it has graduated 100 programmers, and one of them, Delisile Majola, (right) is being congratulated by Gatsha Bethlezi at the most recent graduation ceremony.


MEMOREX
Build a Memorex
get the best out of two
Memorex Excellence
consumer media.
MEMOREX

its CDC subsidiary, the nation thought this was a prelude to a withdrawal. But then the firm announced a long-term R10 million education investment ($11.8 million) which would bring its PLATO system into operation in the country, beginning this month.

That was just one of several education investments. IBM is projected to pour R3 million over the next three years in education. ICL is also spending money on a Black development program. Last year, with an R300,000 investment, the British firm graduated 30 students as programmer analysts.

Another proof of commitment has been through establishing bigger and better offices. ICL, Sperry Univac, NCR and Burroughs are all moving to new headquarters or expanding facilities.

The South African market has also seen new American entrants. Itel has recently teamed up with computer supplier Perseus (which holds the agency for Data General and several companies in the peripheral field) to market Itel processors and other products. Significantly, a great deal of emphasis is placed on the fact that Itel's large range cpus are made by Hitachi in Japan.

In one rare instance, criticism of South Africa forced an American supplier to abandon its wholly owned subsidiary: Wang. However, the Wang machine itself is still alive and happily selling in the Republic via a local company, General Business Systems. "We feel that we now have a truly South African image," says managing director Martin Hammerschmit. "Far from hurting us, I feel the withdrawal has probably strengthened us in the marketplace."

Establishing a local image may be at the root of Sperry Univac's planning. It has been searching for a local partner for three years, and now is believed to be teaming up with South African conglomerate Barlow Rand. Current rumors add the name of Computer Sciences (an Anglo-American subsidiary, not the U.S. company) to the partnership, reportedly to undertake marketing. Computer Sciences uses Univac equipment and will continue to hold the local franchise for Varian, now a Univac-owned company, for the next 18 months. (Univac can tender the Varian mini in large network configurations, however.)

LOCAL IMAGE COUNTS

Foreign companies need to strengthen their local image for a number of reasons. One is the persisting fear that the U.S. embargo will be extended further. (It now covers the military, police, the Uranium Enrichment Corporation, the Atomic Energy Board, and Bantu Affairs.) Whether spoken or not, this consideration always has some effect on the buying decisions of South African computer users in the public *and* private sector. In a few instances, it has definitely turned companies away from American vendors. These users have to be sure that their supplier will be there in the long term, so local partnerships and manufacturing help.

Another related reason for strengthening "local image" is the widely held belief that the government will either protect locally manufactured products through tariff protection, or more likely, through preferential treatment for the local in large government-controlled tenders. Reportedly, the

Some government protectionism for the locals and rationalization of the glut of mini suppliers is expected.

South African government is very gradually evolving a plan to create a few large and self-sufficient local manufacturers in the small systems market, particularly minicomputers. For practical as well as political reasons it would like to see the plethora of small systems manufacturers and agencies—sixteen firms peddle commercial minis—rationalized into a few strong local companies.

In the last few years local minicomputer, terminal, and software companies have indeed been increasing in number.

In specialized applications, local firms have been established for some time. Probably the first South African machine emerged from a local company known as SA Technical Industries Pty (SATI). SATI produced the ISIS and Osiris computers for the photospectrometry market. Five years ago SATI was acquired by Siemens, which modified the designs to incorporate Siemens' developments and expanded the product into process control.

Now it looks as though Siemens will also begin local manufacture/assembly of terminals, since it recently was awarded the Electricity Supply Commission tender for R1.6 million in terminals ranging from dumb to intelligent clusters and word processing units.

The first commercial move came five years ago when a local team working for Computer Sciences in South Africa approached parent Anglo-American for funds to develop a computer. Refused, the team modified the Compter Advances naked mini and produced Syfa. Computer Advances was sufficiently impressed to buy the machine and the people involved and began marketing Syfa in the States and Europe. The prize order was a 50-system network for Firemans Fund American Insurance Co.

Although Computer Sciences SA rejected Syfa, it has developed the SAM (South African Machine) terminal based on the Z80 micro. (SAM is a 2.5K to 64K bytes display terminal programmed to handle any known protocol. An option is a voice synthesizer.) Computer Sciences is aiming at 85% local content, importing only the cathode ray tube, chips, and specialized components.

Another local in this market is Messina Electronics. Four years ago it produced its micro-based (Motorola) computer, Commander, and has sold about R2 million worth for straightforward commercial uses, data capture applications, and industrial process con-

South African Computer Market

While it is believed that there are some 49 computer suppliers in SA, best known are the seven large mainframe suppliers—IBM, ICL, Burroughs, NCR, Sperry Univac, Control Data, and Siemens. About 16 commercial mini suppliers populate that market and a host of operators are in the process control field.

Market share by value of the big seven is: IBM 32% (turnover guessed at R80 million); ICL 30% (turnover R73 million and revenue up 51%); Control Data 2% (two year end orders from Barclays and Standard Bank for a national network of R4 million and again from Barclays for a regional in-house network will boost CDC up to 3% or 4%); NCR 14%; Burroughs 17%; Sperry Univac 4%; and Siemens 1%. Back in 1973 the shares ran at 56%, 25%, 4%, 4%, 6%, and 2% respectively.

In the mini market, according to a private survey by consultant Fine & Associates, there is an installed base of R180 million growing at 30% annually. Three best sellers are Datapoint (handled by Computer Sciences SA, which has a R14 million turnover including bureau activity); Data General, handled by Perseus Computing & Automation with a R7 million turnover; and Wang (turnover about R3 million). Following are IBM, Burroughs, NCR, Nixdorf and Philips SA. Of the 16 mini suppliers eleven are American, the rest scattered among SA, German, British (U.K. Systime expected any day now) Italian, and Swiss firms.

According to a Department of Statistics survey, there were 1,270 computers in South Africa by June 1977, with large systems increasing by 20% and small systems by 40%. It's reckoned that total hardware sales in 1978 were around R140 million, with bureaus and services notching up around R80 million.

(Above) Jack Clarke, IBM's chief, keeps a low profile, but his firm still maintains the lead in the SA market.

(Above right) John Starkey, ICL SA's managing director, was awarded the British CBE for services to British commercial interests in South Africa: he hiked revenues from £12 million to £40 million in six years. The Singer buy and the U.S. embargo helped.

(Right) Wilfred Wentges is chief executive of Siemens SA, which withdrew from the market a few years ago and has now returned.

The new Racal-Milgo MPS family of 9600 and 4800 bit/s modems equalize faster than any other. Using powerful, purpose-built microprocessors, they equalize automatically, adaptively, *totally*—in as little as 30 milliseconds. That's the fastest available anywhere, and over eight times as fast as the CCITT 253-millisecond V29 standard. Which means you get really fast polling—the fastest in the world.

With versions compatible with the V29 recommendation, or with existing multi-mode modems, they are farther ahead in technology, in facilities, in versatility.

And that's only the start.

System flexibility is total. These modems can be configured to suit the precise requirements of *your* system.

- **dynamic port allocation ('dyna-port'), automatically switching unused capacity to upgrade a priority link;**
- **modem sharing, permitting any one of up to four terminals use of a single port;**
- **multi-port operation—with or without the modem sharing facility;**
- **single port operation.**

A system flexibility which underlines our practical approach to network management—alsoldemonstrated by the comprehensive diagnostics we've built in. Like dynamic evaluation of line equalization efficiency.

Add high reliability—which means you won't often need to take advantage of the easy-to-service modular construction—and you have winners all along the line.

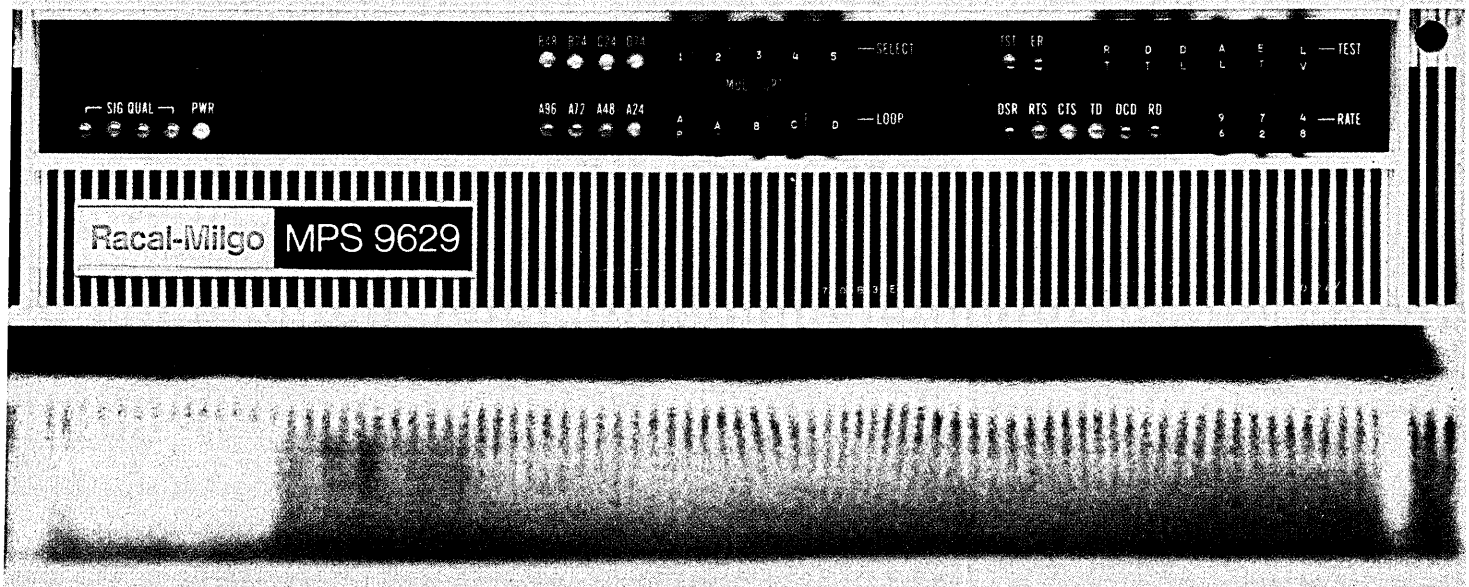
All backed, of course, by Racal-Milgo's renowned world-wide systems engineering and service capability.

And there's still more...

Post the coupon now and we'll send you all the facts.

Racal-Milgo Limited, Bennet Road, Reading, Berkshire RG2 0SS, England. Telephone: Reading (0734) 85282 Telex: 847667

Our new MPS modems are so fast that in the time you've taken to read this your central computer could have interrogated over 100 remote sites.



Please tell me how the new MPS family of modems will give me a better system.

Name _____

Position _____

Organisation _____

Address _____

_____

Telephone _____

Racal-Milgo Limited, Bennet Road, Reading, Berkshire, RG2 0SS, England.

DI

CIRCLE 259 ON READER CARD

Racal-Milgo On line around the world RACAL

People count.

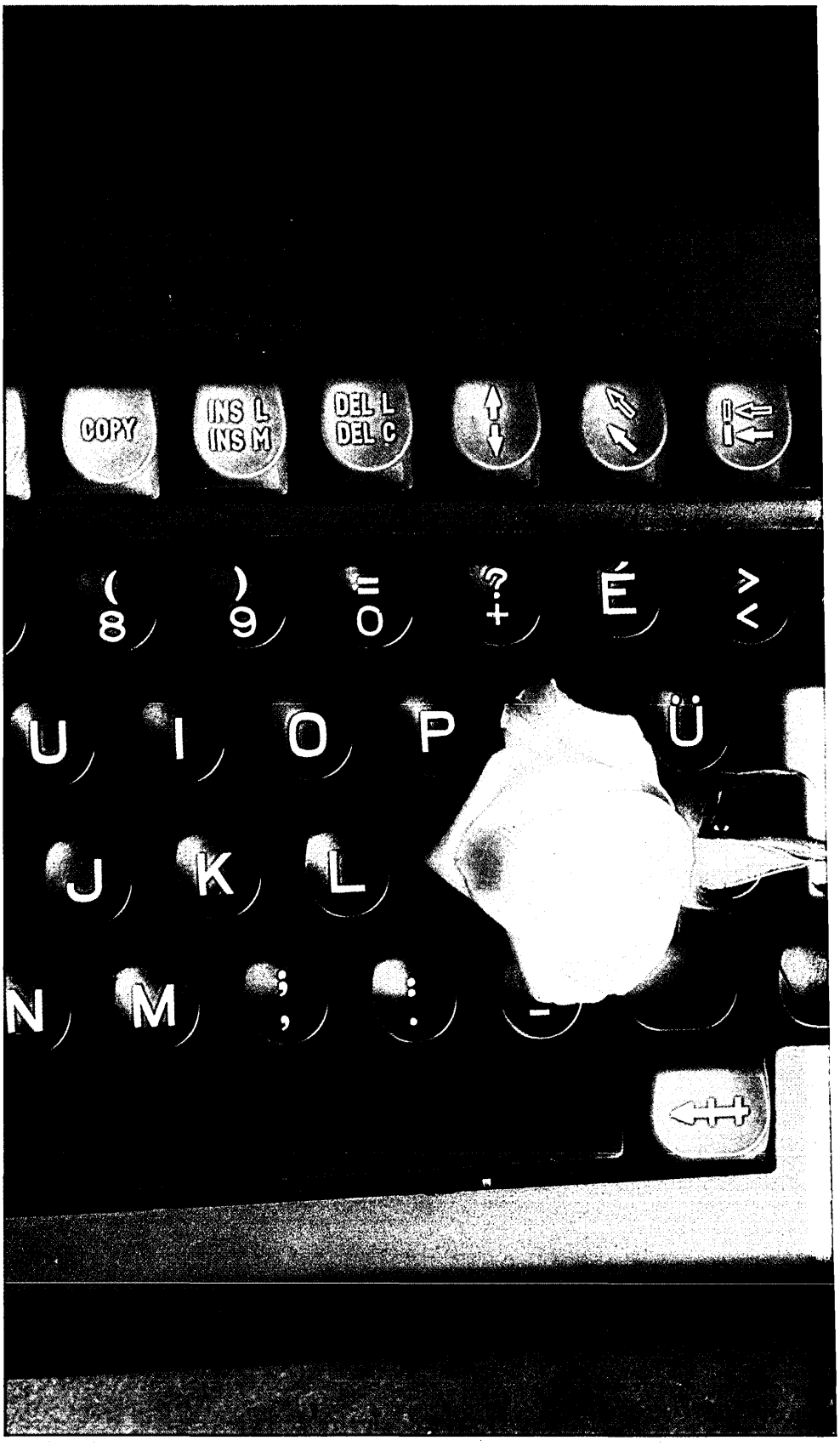
Nowadays, performance is a word that applies as much to people as to machines. Finding the right combination is the key to success.

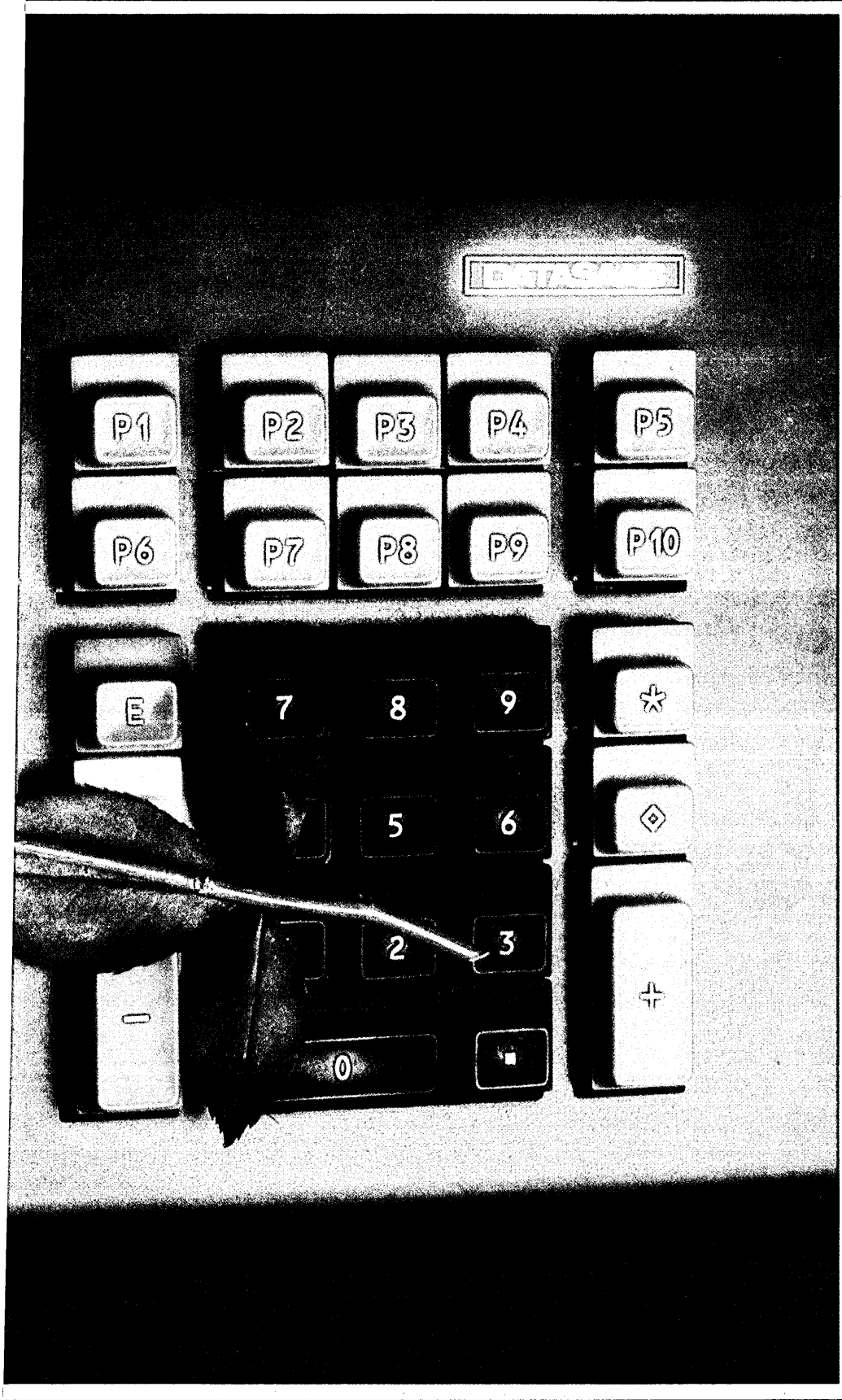
Take the keyboard you see here. It is one of the modules in Datasaab's wide range of minicomputer systems. Important because it constitutes the user's point of contact with the computer.

A lot of research has been done to make this keyboard exactly right for the job it has to do. And exactly right for the people who have to use it.

Combine your staff with a Datasaab system. And watch performance rise.

There's a Datasaab representative in your country. Give him a call!





On Jan 1st 1978 a new company came into existence following the merger of Stansaab AB and the Datasaab Division of Saab-Scania AB.

The new company, trading under the name Datasaab AB, represents a further consolidation of Swedish data processing technology and experience.

DATASAAB

CIRCLE 248 ON READER CARD

THE MOST USEFUL V.29 MODEM IN THE WORLD

DELIVERY IN 29 DAYS

THE CODEX 9600 bps CCITT V.29 COMPATIBLE LSI MODEM

	Countries	Homologation
	*Australia	PTT Supplied
	Belgium	RN 1/6783
	Denmark	2T 3997
	Finland	PTT Supplied
	France	77-038D
	W.Germany	A53-8 034/147a83
	Holland	770884/TG1
	*Hong Kong	0072/KWV/TTI/RC
	Italy	SIP 14049.1
	*Japan	NTT Approved
	Norway	PTT Supplied
	Sweden	PTT Supplied
	Switzerland	33-046b77
	U.K.	TH/L/1532

Pike others

The Codex V.29 modem has been sold and delivered to more countries than all other V.29 modems combined!

Here are the reasons why.

First, reliability. The low operating power of 20 watts means an MTBF of over 20,000 hours.

Then there's the remarkable fact that it operates at four speeds: 9600, 7200, 4800, and 2400 bps. It also offers multipoint operation. Plus the V.29's display directly shows modem speed, operating mode and multiplexer port speed. The space requirement is only: 13.4 cm high (5-1/4 inches), 21.6 cm wide (8-1/2 inches), and 45.7 cm deep (18 inches).

And it's compatible with the Codex "C" Series modems, and LSI Series modems.

Options available with the V.29 are:

- Secondary Channel (75 bps)
- Codex Circuit Quality Monitoring
- Eye Pattern Generator
- Alternate Voice/Data
- Buffered Data Multiplexer with Individual Channel Remote Loopback and Individual Channel Control Signals
- Remote Loopback
- Elastic Store Buffer
- Rack Mount

And not to be forgotten is the availability of local sales and service.

Is there any reason why you're not benefiting from the world's most useful V.29 modem?

Call or write Codex at the address listed below or your local distributor for a Codex catalog and LSI 96/V.29 data sheet.

*NEW

We'll get you through

Codex Corporation, 20 Cabot Boulevard, Mansfield, Mass. 02048 • Tel: (617) 364-2000 • Telex: 92-2443
Codex Corp., 2-8-2 Okubo, Yotsuya, Shinjuku-ku, Tokyo 160, Japan • (03) 355-0432 • Telex: 2324076
Codex Europe, S.A. (Codex Benelux), rue B-1160 Brussels, Belgium • Tel: (02) 762.23.51 • Telex: 26542

1979 is the year for advanced communications-based developments in South Africa.

trol requirements.

An early starter in the locally developed and assembled terminal market is Anker Data Systems (the original subsidiary of the European concern which went independent locally when ADS collapsed in Europe). It has largely concentrated on intelligent cash registers and point of sale units and received a big boost in the cash register market last year because SA adopted a general sales tax.

Others in the terminal field include Datakor, Unicom, and Saco Systems. Unicom, which handles the Reality computer, has sold nearly R1 million of its locally made badge reader terminals used for time and attendance applications. Saco Systems, which handles American Ontel intelligent terminals, has sold about R340,000 of its Sabr (South African Badge Reader) into the gold, platinum, and coal mining industry. Saco in fact, typifies some of the very bright, albeit small companies in South Africa. It holds the Ontel agency and last year won a large Australian contract for a computerized cinema and theater ticket reservation terminal system—the U.S.-originated Computicket system of Computer Sciences—which enjoys considerable success in the Johannesburg region.

SOFTWARE INDEPENDENCE NEEDED

Local software products and services have become a must in the current political climate. A recent entrant is Pretoria-based software house, Log-On, which probably ranks about third in the local market with a R750,000 turnover. Formerly the staff were IBMers working on a defense contract. The individuals split into a separate company, bid against IBM for that contract, and copped the order. From there it has diversified considerably into the commercial market.

Saco Systems, the terminal company, is also a good programming house. It developed the Sacbol language which has been accepted in the U.S. as OP/L, and was given the contract for design modifications on the new terminal range of a large U.S. manufacturer.

The two most successful export items to date are thought to be Q Pack (a payroll and salary application package that has gone to the U.S., Australia, and the U.K.) and Perseus' Nova compiler, which has also enjoyed considerable overseas use.

In the service bureau market, ICL dominates and its market share was further boosted by last year's acquisition of the R1.5 million Integrand Computer Service. After ICL the line up is Computer Sciences, Leo Computer Bureau, Commercial and Industrial Computer Services, and Management Computer Services. This group is grossing a respectable R25 million of the total R80 million market.

Bureaus, of course, are delighted by the idea of embargoed computer equipment, forgetting perhaps, that they are one of the major capital equipment consumers. The Computer and Services Bureaux Association (Cosba) members have in some instances been vociferous recently about the immense overcapacity and underutilization of computers locally. "Government," says one, "should ban computer imports for three years."

SA USERS HOT ON COMMS

If there is overcapacity, the order books show that the South Africans do not intend to stop buying systems. In fact, 1979 is the year for some very advanced communications-based developments. The South African Post Office now has its Saponet network running, giving computer users better public facilities for on-line applications.

Barclays and Standard Bank, using Control Data equipment, are developing their own Banknet, which should be running in 1980. (As with all national communications authorities, the SA Post Office does not want to permit private data networks now that it has its own running, but the banks successfully argued they had special requirements, particularly for data security.)

Another grandiose scheme is the Human Resources Information System being developed by Anglo American. This R4 million project went live early this year in a few of the company's mining locations. According to an Anglo spokesman, "Phase one covers all the basic administration functions for the Black labour force while a data base for all employees' work locations, training, shifts worked, etc. is slowly being loaded. After the manpower phase, planning and labor control subsystems are on the schedule."

Railways is also expected to issue some major tenders this year to upgrade its big IBM installation and improve its communications network.

One interesting development in South African computing is the increasing ability to link up to overseas installations. It looms as an intriguing way around any kind of embargo, and a means to save huge capital investment sums.

Fluor Corp., which is doing the project management of the South African coal-to-oil plant SASOL II, is transmitting data by satellite to its U.S. center. Fairly recently, Dresser Industries linked a Data 100 terminal to its parent company's computer center in Pennsylvania, giving the terminal the power of four IBM 370s and an IBM 3031.

At least a handful of South African concerns, including Anglo, Witts and Potchefstroom Universities, and some medical research bodies are all accessing data banks in the U.S. for literature searches.

As one can see, the South African computer developments have not slowed—either among users or vendors, local or foreign.

The concern is there. Companies like Perseus are laying in a supply of spares for the American equipment they handle, and the Itels emphasize connections with non-U.S. suppliers. Computer users are insisting on contractual guarantees of long term support. Visiting American speakers, like James Martin and John Diebold, do not receive the warm standing-room-only crowds they used to. And the government has not forgotten that it needs a computer policy that will diminish its vulnerability to embargoes.

But the South African computer market should still grow by 15% in 1979. *

GAIL PURVIS

Ms. Purvis, a leading South African journalist in computing, has recently founded a new dp/electronic weekly, Computronics, in Johannesburg.

"OFFICE OF THE FUTURE" AVAILABLE. . .IN PIECES

Few exhibitors at Hanover Fair demonstrated a grand plan for the automated office—premature, they said.

by Fred Lamond, Contributing Editor

"The Office of the Future" was the theme of this year's West German extravaganza, the CeBIT Hanover Fair, held April 18 to 28. It was replete with a small historical exhibition of typical office environments spanning the years from 1910 to the present, from manual typewriters and pencils to word processing systems and small business computers.

Only two companies actually mounted exhibits of their idea of the future office, Siemens and Triumph-Adler, while the rest simply showed in unconnected fashion the elements available today. This relative lack of response to the theme, many asserted, was realistic. The equipment available on the market in 1979 will not become typical of the average office until the late 1980s, if then, said one executive, because of conservatism among small and medium size businesses. Further, some thought that showing a very futuristic picture would be counterproductive, scaring off businessmen wary of technology that they do not wholly understand.

But Triumph-Adler, for one, was there to show its progressiveness, buoyed by Volkswagen's injection of new capital and acquisition of 55% majority shareholding. (Litton Industries, which had held as much as 99% of this firm has dropped its holdings to 19%; German instrumentation manufacturer Diehl has 25%; and the rest is scattered among small shareholders.)

The star exhibit in Triumph-Adler's version of the office of the future was the TA Minicomm, a modular assembly of desktop devices for top level managers. Displayed side by side were a radio receiver (for listening to the latest stock prices, or other news of interest), a dictation unit, a lamp with adjustable arm and angle, an electronic calculator with enough memory to store 100 most frequently used telephone numbers, a digital clock, and a two-way VHF radio receiver/transmitter.

The TA Minicomm is hardly representative of West German ingenuity, however. Just like Triumph-Adler's whole range of pocket and desktop calculators, it has been manufactured in and imported from Japan. As a Litton Industries subsidiary for the last 10 years, Triumph-Adler has a typical multinational attitude to the products it offers on the market.

The exhibit of the 1910 version of the office was a colorful departure from the plastic displays of new gear that jammed three buildings at CeBIT Hanover.

Other new products Triumph displayed included a 3M facsimile terminal offered as the TA 6432, and its new TA 1630, a business minicomputer engineered around a Texas Instruments TI 990 minicomputer.

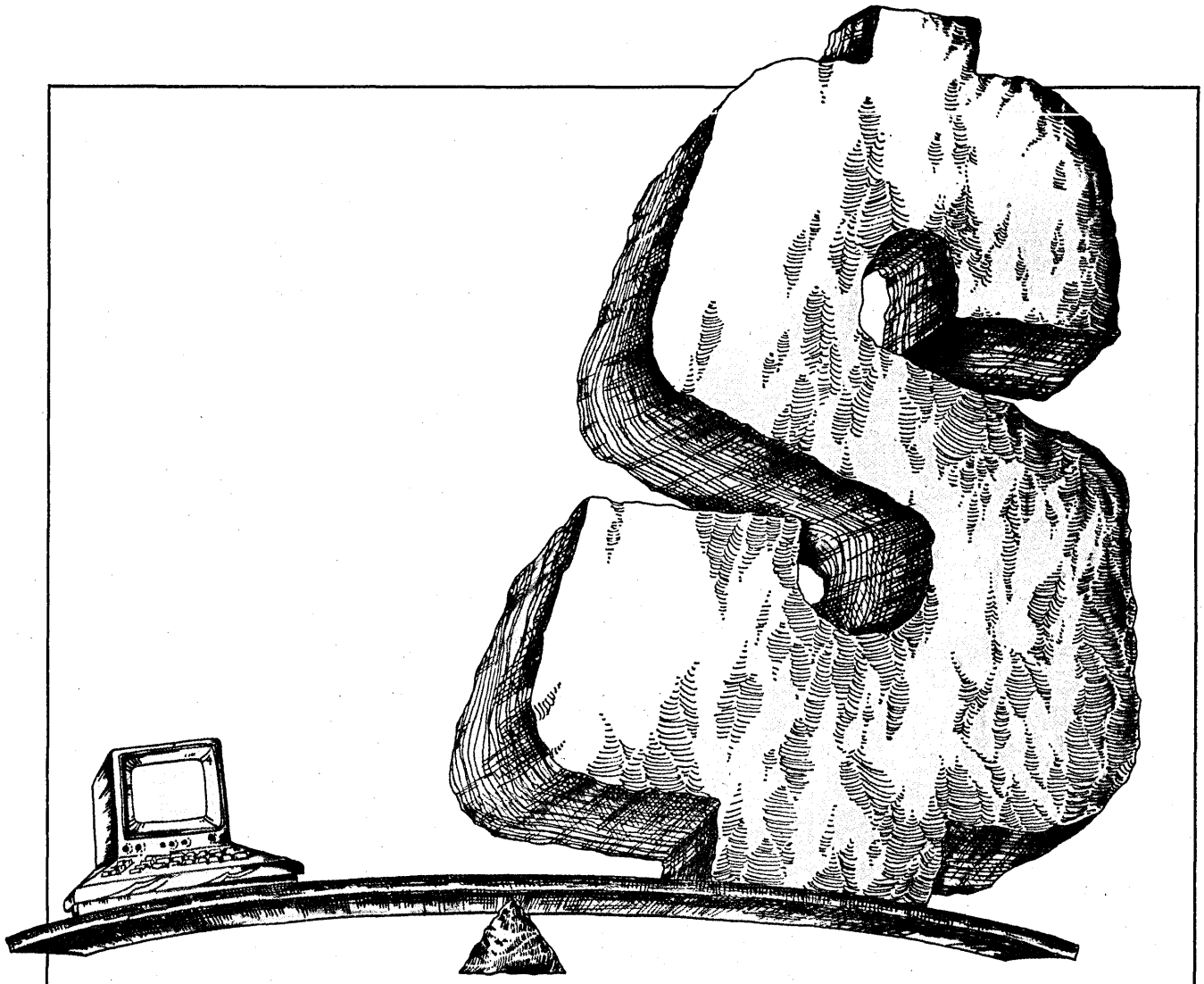
Among those that did not try to show a grand design for the office was the company most widely believed to have the master plan for supplying all components—IBM. The giant got its message of preparedness across merely by grouping all the products of its three divisions —Office Products, General Systems, and Data Processing—on the huge stand in the middle of the main hall. Name your interest, it was there: dictation equipment, ordinary electric typewriters, simple single station or complex multistation word processing systems, photocopying equipment, business minicomputers, general purpose systems, high speed printing devices, special purpose terminals, or telephone PABX system. In the case of word processing systems and computers, the three divisions showed their rivalry by displaying competing products.

The IBM stand was also the first opportunity for most Europeans to see in the metal the plethora of new systems announced in the last six months: the 8100 information system, 3730 document processing system, System/38, 4331 processing system, 3520 graphic display system, 1750 PABX. They were all there.

Few exhibitions were as comprehensive as IBM's. But all the leading companies there showed expansion beyond their traditional markets by offering cheaper, more expandable systems of the same type, or by diversifying into new product areas. As a result, the boundaries differentiating telecommunications equipment, office equipment, small business computers, and general purpose systems manufacturers are becoming increasingly blurred; their product lines are converging.

The three main areas of convergence are facsimile transmission terminals, multistation disk processing business computers, and word processing systems.

Following CCITT's definition of three

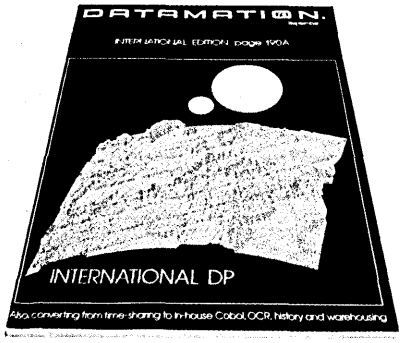


AS COMPUTERS GET SMALLER THE MARKET GETS BIGGER.

Remember yesterday's huge centralized computers? Because of their high price, users were forced to put all their eggs in one basket. An industry pioneer once said that a business that did all its work on a huge centralized computer was like a business where the president opened every piece of mail that came to the company.

Today's huge computers are sharing the limelight with the smaller ones. It makes sense.

Because as computers and their prices have gotten smaller, they've found their way into remote places and are doing jobs unheard of a generation ago. Jobs in medicine, education, transportation, communications, banking, insurance ... they're even sneaking into the home.



So this remarkable industry just keeps growing ... from sales of $2.5 million in 1957 to $25 billion in 1977 with another $25 billion overseas. With no end in sight. EDP professionals are the people who have made it all happen ... the designers who have made the huge computers small and the users who have made the small computer market huge. And DATAMATION magazine has been there all the time, keeping pace with the pace setters ... now 124,000 of them spread around the world making the fastest growing market in the world grow even faster.

TECHNICAL PUBLISHING COMPANY
A Dun & Bradstreet Company
35 Mason St., Greenwich, Conn. 06830
(203) 661-5400

DATAMATION®
magazine

the best magnetically coated media

From the introduction of our Type I Computer Tape in 1967, to our premium Quadronix Tape, to our revolutionary new G-Tape in 1975, Wabash has been manufacturing the world's finest magnetic media. Now Wabash has a new success story...our high performance flexible disks, designed for the needs of today's computers.

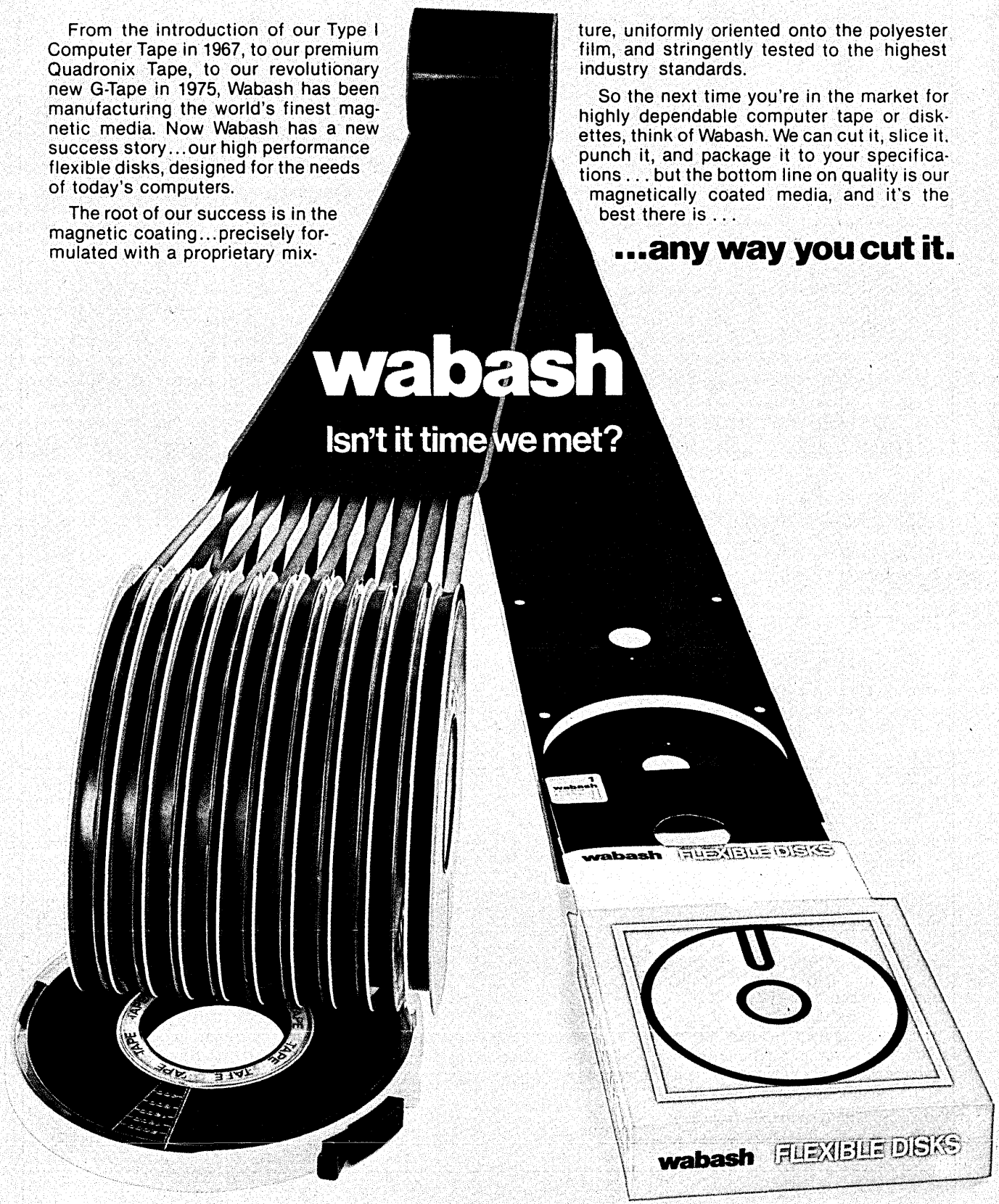
The root of our success is in the magnetic coating...precisely formulated with a proprietary mixture, uniformly oriented onto the polyester film, and stringently tested to the highest industry standards.

So the next time you're in the market for highly dependable computer tape or diskettes, think of Wabash. We can cut it, slice it, punch it, and package it to your specifications . . . but the bottom line on quality is our magnetically coated media, and it's the best there is . . .

...any way you cut it.

wabash

Isn't it time we met?



United States Wabash Tape Corporation, 2700 Des Plaines Ave., Des Plaines, Ill. 60018, Tel. (800) 323-9868 Telex 9106511800
Canada Wabash Tape Canada Ltd. 3135 Universal Drive, Mississauga, Ontario, Canada L4X2E6 Tel. (416) 625-9533 Telex 06961345
Europe Wabash Tape (U.K.) Ltd., Crown Rd., Cold Norton, Chelmsford, Essex, England CM36JF Tel. (STD062185) 8181 Telex 995455

CIRCLE 263 ON READER CARD

interface standards for facsimile terminals, the West German Federal Post Office is now actively promoting this, and was offering terminals on its own stand. Given its relatively liberal attachments policy (except for modems), its cue has given encouragement to the leading telecommunications and office equipment manufacturers. Firms like Siemens, Olympia, and Triumph-Adler offered new facsimile terminals on their stands.

The West German market for multidisplay, disk processing small business computers has hitherto been characterized by the battle between IBM's System/34 and Nixdorf's 8870 and by the scramble of fast-growing smaller firms like Computer-Technik Müller and David Datentechnik Computer. But this year, German companies from opposite ends of the computer market joined the fray.

Siemens, which had previously specialized in larger general purpose machines, showed its new 6.000 series, announced last October. Olivetti and Triumph-Adler, which had concentrated on single-station office computers, showed their new entries: Olivetti's was the 1900, actually the Microdata Express system, and Triumph Adler had its new TA 1630.

The traditional small business computer manufacturers, in turn, are diversifying increasingly into word processing, despite the relatively disappointing sales in this market so far. Annual sales of word processing workstations have barely exceeded 4,000, against a market potential of around 10,000 per year estimated by the West German federal government.

Manufacturers attribute market resistance to the complexities of the operating procedures of earlier models. They think the latest models, designed to be as simple as possible to operate, will solve that problem. Nixdorf, in particular, hopes its new U.S.-designed 8840 multistation word processing system will be much more successful than the German-designed 8815 single-station system first shown at Hanover three years ago.

Most of the other new word processing models unveiled at this year's Hanover Fair were also multistation systems, offered mainly by traditional computer system manufacturers as a specialized development of earlier computers or intelligent terminals. These included IBM Data Processing Division's 3730, CTM's 70/Text system, DDC's word processing system, and ICL's 7700 Information Processing Terminal, the British mainframer's first venture into the word processing field.

The ICL 7700 breaks new ground in several respects. It is one of the only devices to show any convergence between previously specialized applications at the device level. Thus, while the ICL 7700 can be used as a stand-alone word processing system, it comes into its own mainly as a multipurpose device; it is usable at different times for both word and file processing.

Apart from ICL 7700, only DDC was offering this type of dual-purpose business computer and word processing system. CTM, IBM, Olympia, Philips, and the Triumph-Adler group were offering word processing systems with a computing option; but this is good just for calculating extensions and totals when typing an invoice or order acknowledgement, and probably inadequate for fully fledged commercial file processing.

Outside the word processing field, applications convergence at the device level was still non-existent. Amid the proliferating facsimile terminals on so many stands, we were unable to locate one device combining facsimile terminal and office photocopier capabilities.

The new generation of stored program controlled telephone PABX's implements advanced telephone switching functions (abbreviated dialling codes, camp on, three-way conferencing, etc.), but little else. Even IBM's 3750 PABX has been primarily used only for telephone PABX functions in West Germany. According to an industry observer, about 100 3750 PABX systems have been installed in West Germany, but no more than four use its facilities for data collection or security checks and environmental control.

It seems that in West Germany, as in the U.S., everyone is *talking* about the totally automated office of the future . . . and that's all. *

DATA LAW

NEW DATA PROTECTORS APPEAR

Dissatisfied with current harmonization efforts, new groups attack transborder issue.

Just about everybody in Europe seems to be getting in on the data protection act. Seven European nations now have their laws governing data processing systems handling name-linked data. The Council of Europe, after some delays, is nearing completion of its draft convention to harmonize data protection policies in its 21 member nations. The Organization for Economic Cooperation and Development is close to a final draft of its "guidelines governing the protection of privacy in relation to transborder flows of personal data."

But several other groups, dissatisfied with the voluntary or "abstract" nature of these multi-nation efforts, are taking up the harmonization banner. The European Parliament has drafted a resolution calling for several EEC actions. The heads of existing national data inspection boards have formed their own club to resolve transborder data flow issues. And even the lawyers have their own development: the Union International des Avocats has framed a rival convention, approved at a meeting in March.

The efforts of the European Parliament could be the most significant. This body, representing some 200 million citizens of the nine EEC member countries, is shortly to receive at least a national power boost through direct elections. This could lend more importance to the recent passage of a resolution drawn up by the parliament's legal affairs committee.

The resolution calls for each member nation to set up a data control body modelled on the Swedish Data Inspection Board. According to the draft resolution, the body "shall publish the names of registered data banks in their appropriate form, inform citizens of their rights to the protection of personal data and assist them in exercising their rights."

Further, the EEC itself is called upon to form a data protection body to handle personal data export. "The authorization of the data protection body of the European Community will be required for the export of data from the territory of member states," says the newly forged resolution.

The parliament's legal affairs committee is effectively expressing dissatisfaction with the guidelines and conventions underway, feeling they will be inadequate because they are voluntary or are not binding. When it comes to transborder data flows, the committee members felt there should be no special arrangements between countries regarding the movement of personal data. The European Community's own data protection body would control all data export from member territories.

What is especially interesting in the new resolution is that the group has based its conclusions not only on the protection of private life but on a variety of other factors. These include: the problems of physical security of computer systems; the increasing influence of multinational companies and the risk this entails for the availability of economic data; the fact that scientific research increasingly depends on data transmission; the freedom of and access to information which is a topic of growing importance to European countries;

EMI puts it on the line

The name EMI is synonymous with the development and supply of high quality data communications equipment.

EMI can now offer from stock the MP4827 a synchronous transmission modem to full V27 bis /ter specification. In addition to the basic CCITT requirements, this modem offers state-of-the-art technology and sophisticated self-test facilities.

The MP4827 is microprocessor based and provides 4,800 bps full duplex operation. It is highly reliable and adjusts automatically to transmission line impairments.

With all these advantages, the MP4827 is available now from EMI, an established European supplier at competitive prices.

For more information on the MP4827 and other EMI modems contact the address below or fill in the reader reply card.

EMI EMI Technology

SE Labs (EMI) Ltd. Data Communications Division,
Spur Road, Feltham, Middlesex, England. Tel: (01) 890-1477 Telex: 23995

A member of the EMI group. International leaders in music, electronics and leisure.

CIRCLE 251 ON READER CARD

and also the economic impact of microprocessors.

What exactly will happen to the resolution now that it has been adopted is far from clear. The European Parliament is so far restricted to an advisory role. Its recommendations have to receive the blessing of the EEC member countries' foreign ministers before becoming a binding directive. The issue was due for debate at writing.

(Also interesting in the European Parliament is that the Social Democrats have latched onto the data protection issue as a fertile source of political capital. At an April meeting, they decided that individual rights were not really protected in international data processing, and came up with their own campaign).

The new "club" of data inspection boards should have considerable influence as well. Their first meeting in Bonn this spring was attended by leaders of these bodies: Gerhard Stadler of Austria, Louis Joinet and Jacques Thyraud of France, Jan Freese of Sweden, Jorgen Paulsen of Denmark, and Prof. Hans Peter Bull of West Germany. This group agreed to work together to resolve transborder data flow issues. As a first step, all will send their decisions in this area to Prof. Bull in Bonn, where the decisions will be translated and disseminated to members.

Meanwhile, tiny Luxembourg has passed its own data protection law. According to some sources, the law was rushed through parliament to counter Luxembourg's somewhat negative image as being an overtolerant haven for company operations. The law makes no pretense about privacy, as one expert close to the framing of the law pointed out. This is only one aspect of the data protection problem as perceived in Europe.

Both Luxembourg and Austria, which also recently adopted a data protection law, have included clauses to protect data held on legal entities such as corporations. This may force other bodies to disclose information held on suppliers, competitors, or customers to interested parties. The advent of the legal person inclusion seems to be on the increase. Large companies have not so far been too worried by similar provisions in countries such as Norway and Denmark because of other aspects of the law or the difficulties the authorities have in administering the law. But the two newcomers may make life tougher, says one industry source.

. . . And the proliferation of "harmonization" efforts among European and international bodies may lead to a need to harmonize the harmonizers. *

–Andrew Lloyd

LOOK AHEAD INTERNATIONAL

SERIES/1 ISN'T NUMBER 1

IBM and its Series/1 are due for a roasting at COMMON Europe this October, we hear. Many of the 200 members in this small system user group think that IBM's minicomputer is well on the way to becoming a marketing disaster and "one of the best things to happen to DEC."

IBM should be prepared for the onslaught since it had to fend off gripes at the COMMON meeting in Philadelphia this spring.

The Europeans—about 60 of the 200 are "interested" in the issue—are most annoyed by IBM's attitude toward mini buyers, whom it treats like big machine clients, they say. "Minicomputer users are a different species and should be treated as such. We want the kind of thing DEC offers, namely quick delivery, the speedy production of add-ons, and a feel for the end of each financial year in Europe," said one.

Some users aren't happy with the operating system, RPS. "Easy to crash" and "useless" for multiprogramming applications, said one. Another said the RPS net throughput is identical to that on MTX, used on the defunct 1800. "And the Series/1 cpu is three times faster, the disks are up to 20 times faster than the 1800!"

The list of gripes goes on: lack of peripherals, scarcity of software—from either IBM or the independents. At the U.S. Common meeting, IBM's concern was apparent, since it brought its 25-man RPS design team to defend its efforts. The Europeans, smaller in number, aren't expecting the designers at their October meeting, "just a few men well versed in what to say." (IBM, not used to such failure, may be wiser than that.)

HAIL FELLOWS AND FAREWELL

Ex-ICL boss Geoff Cross, helping GEC buy up the bits and pieces that will evolve into its "office of the future" entry, is rumored after an ICL adviser—Phil Fellows. Fellows, who has been a Vickers dp chief and most recently finished an electronic mail system there, has been consulting to both ICL and the Department of Industry on office automation and electronic mail. Cross presumably wants Fellows, an American, for the newly acquired A. B. Dick in the U.S.

Current ICL leader, Chris Wilson, is putting a premium on office, retail, and distributed processing developments; and that, we hear, is what put a strain on his relationship with R&D director, Ed Mack. Mack, who just left ICL, reportedly was losing some of his mainframe development budget to these activities, and even his latest efforts, software architecture to link ICL (Singer) terminals to the 2980, wasn't quite Wilson's cup of tea. Wilson is increasingly interested in terminal nets without major mainframe dependence.

ST. GOBAIN GOES SHOPPING

France has a newcomer to high technology electronics. After its deal with National Semiconductor, St. Gobain now wants to buy a share of Cii Honeywell Bull. The multibillion franc glass and construction conglomerate got the idea from the French state itself.

Possible ways to make the buy are: a takeover of CGE's share in Machines Bull (which owns 53% of CiiHB); a capital increase in Machines Bull; or a takeover of some of Honeywell's 47% share in CiiHB. So far, CGE says no thanks, and CiiHB says it would love the money.

Observers aren't sure if St. Gobain is just making a gesture to satisfy the government or if the government is plotting with the conglomerate to gain an increased say in CiiHB's industrial strategy.

PRODUCT PROGRESS

DP/WORD PROCESSOR

The ICL 7700 Information Processing System launched at the Hanover Fair, is the first shared processor multistation system designed in Europe that is specifically tailored for both word processing and host computer file transaction processing. When connected on-line to a host computer, it can also be used for intra-company "electronic mailbox" systems, for which ICL is offering the requisite software.

ICL 7700 hardware is almost identical with that of its 7501/14 intelligent display and data entry terminal system launched last October. Two 2K character display stations with detachable keyboards (which may be up to 1 km cable length apart from each other) share a common 40KB 7501 processor and two 512KB dual floppy disk drives located in the pedestal of one of the workstations. They also share a common output printer. The only difference between the 7700 and the 7501/15 is that on the 7700 the shared printer is a 45 cps daisy wheel printer, instead of the 60 cps chain printer used on the 7501 and 7502 terminal systems.

The Wordskil software package loaded into the 7700's shared processor allows the system to be used for normal word processing tasks in local mode, and on-line to a host ICL 1900 or 2900 series mainframe. Texts may be entered on local screens or floppy disk storage, retrieved, amended, corrected and printed out automatically.

When connected on-line to a host computer supporting the Wordskil Manager software package, the 7700 can do a great deal more than just word processing. Its two workstations can also be used for all the normal commercial data entry, mainframe file interrogation, and transaction processing tasks for which the 7501 and 7502 intelligent terminals can be used. In any company departments, the same 7700 workstations on a secretary's desk can thus alternate between being used for preparing correspondence, and for entering ad hoc inquiries to the system's files. Wordskil Manager also includes the optional Electronic Mailbox software module.

Wordskil Manager currently runs on ICL 1900 series mainframes under GEORGE 2 and Communications Manager, on ICL 2903, 2904 and 2905 systems under MTS 2, and on 2950, 2956 and 2960 systems under DME-2, DME-3 or DME+. When enough experience with it has been gained at those sites, it will also be developed for large 2900 series systems running under VME/K and/or VME/B. ICL, London, U.K.

CIRCLE 281 ON READER CARD

TABLE 1. WORD PROCESSING SYSTEMS ANNOUNCED AT HANOVER FAIR

MANUFACTURER MODEL	ICL 7700	CTM 70/TEXT	DDS BITSY	NIXDORF 8840
WORKSTATIONS				
No. per system	2	1	1-6	2-4
Display screen cap. (chars.)	2,000	1,920	1,920	1,920
PRINTERS				
No. per system	1	1	1-6	2-4
Printing mechanism	Daisywheel	Daisywheel	Daisywheel	Daisywheel
Printing speed (chars/sec)	45	45	45	40
Print positions per line	132	132	132 or 158	132 or 158
Exchangeable character set	Yes	Yes	Yes	Yes
SHARED BACKING STORAGE				
On-line capacity (chars.)	1 M	160K	160K, 660K or 5 M	2.5M + 512K
Mini-diskette drives	—	2	2, or	—
Standard floppy disk drives	4	—	2, or	2 +
Cartridge disk drive	—	—	1 fixed + 1 exchang.	1 fixed

OTHER WORD PROCESSING SYSTEMS

Other new word processing systems exhibited at the Hanover Fair are all key-display-oriented systems, with 1,920 character screen sizes, detachable keyboards, and 40 to 45 cps daisywheel printers. (See table 1.) They differ from each other only in the size of their backing storage, the number of work stations that share this, and in the availability of a communications option.

The CTM 70/Text is a version of CTM's Intel 8085-based intelligent workstation. It is a single station system, available with or without printer. Workstations without printer are used as freestanding support stations in offices where more than one is required. They pass their corrected texts on minidiskettes off-line to the master workstation for printing.

The CTM 70/Text system with printer costs DM 22,900 in West Germany, and without printer, DM 15,400. The local computer facility costs a further DM 6,000. COMPUTER-TECHNIK MULLER GMBH, Konstanz, W. Germany.

CIRCLE 282 ON READER CARD

* * *

DDS BITSY is initially also a single-station work processing system, available in three models based on storage variations. These include two 80KB minidiskette drives, two normal 330KB floppy disk drives, or a 2.5MB fixed + 2.5MB exchangeable cartridge disk drive. From the end of 1979 or early 1980, it will also be possible to connect up to five additional workstations to the shared processor. Each station will have its own control microprocessor, and may be optionally equipped with its own diskette drives, but it will be able to share access to the main workstation's backing disk storage.

Diehl Data Systems (DDS), is a Triumph-Adler subsidiary, so BITSY will also be marketed by Triumph-Adler. DDS DIEHL DATA SYSTEMS, TRIUMPH-ADLER GROUP, Nürnberg, W. Germany.

CIRCLE 283 ON READER CARD

SMALL BUSINESS COMPUTERS

Small business computers broadly competitive with the IBM System/34 continue to be one of the most buoyant sections of the market. In addition to the Siemens 6.000 series and SEMS SIS series, (DATAMATION International, March 1979, p. 226–JJ), we identified at least five new systems at the Hanover Fair. Their specifications are in table 2.

The Mael 5300 is the new entry-level small business computer of Mael Computer (new name for the former Insel Data Systems, but still owned and run by Massimo Rinaldi). It will gradually replace the Mael 2000, which continues to be sold only while existing stocks last. Mael 2000 was introduced just three years ago and used the Fairchild F8 microprocessor, for which the company has received little support from Fairchild since then. The new Mael 5300 uses the General Automation 16/110 instead, and is thus fully compatible with the larger Mael 5500 (based on the GA 16/440) introduced last year. MAEL COMPUTERS SPA, Rome, Italy.

CIRCLE 284 ON READER CARD

* * *

The Nixdorf 8870/30 is fully compatible for the 8870/1 interactive business com-

ATHANA
MAGNETIC MEDIA

"COMMITMENT"

A line of quality products becomes superior only when totally supported by a team of dedicated people. The ATHANA line of magnetic media products is superior because they meet this **commitment** to complete and continuing service.

Our high engineering and production standards form only the beginning of the ATHANA **commitment** to excellence demanded of each ATHANA product. This *superior* product line is complimented by a complete organization of sales service people, technical administrators, and expediting/shipping personnel who are totally **committed** to customer satisfaction. This team of dedicated people make our claim of superiority a continuing reality.

ATHANA manufactures and supplies products primarily to companies that re-sell them as part of their total business. We provide our magnetic media products to computer assemblers and/or manufacturers for inclusion within a total system package which is then sold to their end-user customer. Our complete line of products is also sold to the end-user under ATHANA label through an international network of qualified professional distributor organizations.

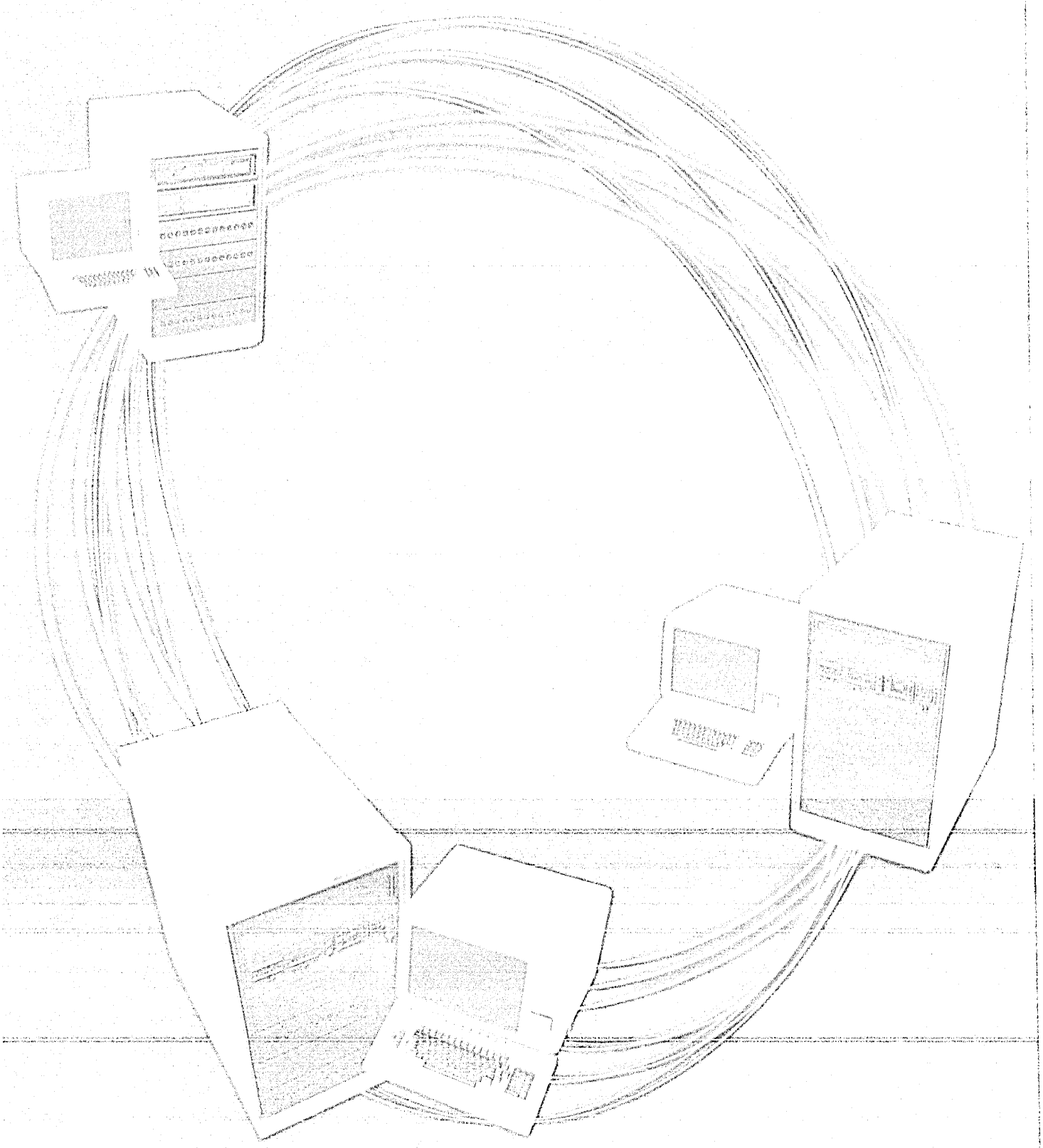
Manufacturing and marketing products in this way has advantages and disadvantages. It is obvious when a company elects to sell to the sellers, the superiority of its products as well as the level of **commitment** the company has made to service, is under constant and critical evaluation. We believe the unprecendented growth of our company is directly attributable to our track record in meeting the ATHANA **commitment** to total customer satisfaction.

We welcome your comments, inquiry, and evaluation.

ATHANA

Post Office Box 3696
Torrance, California 90510
(213) 775-3741 □ Telex 69-1502

CIRCLE 246 ON READER CARD



NORD-100

-the future concept in data processing

NORD-100 is the new generation of small and medium-sized computer systems – from Norsk Data. Flexible, easy to use and well proven software makes the NORD-100 system well suited to a wide spectrum of applications such as commercial data processing, research and education, datanetworks and data communication, process control, text processing and many more.
The NORD-100 system range offers single CPU models from N.kr. 100.000 to N.kr. 1,5 mill. with compatibility and upgrading possibilities from the smallest to the largest models. In addition a wide range of multi-CPU systems is available.

The NORD-100 system family is fully compatibel with its predecessor NORD-10/S, but based on totally new state-of-the-are hardware technology. The CPU speed has been increased significantly, the memory may be extended up to 32 megabytes and the disk storage up to 2300 megabytes. Up to 64 terminals directly connected.

The NORD-100 systems include a comprehensive range of software:

- SINTRAN III/VS operating system with simultanous real-time, time sharing and batch execution
- FORTRAN, COBOL, BASIC, RPG II, PASCAL and SIMULA programming languages
- A well proven Database Management System, a Transaction Processing System and a Screen Formatting System for online commercial applications
- Network software for connecting NORD computers together and batch and online emulators for communication with most mainframe computers
- Text and telex processing systems

We would like to tell you more about your possibilities with the NORD-100 system. Call us or send the coupon.

Please forward more information about NORD computers.
☐ For technical applications. ☐ For commercial work.

Name/Position: .....

Organisation/Telephone: .....

Address: .....

Norsk Data

Jerikoveien 20
Postboks 4, Lindeberg gård, Oslo 10
Tel.: (02) 39 16 01/39 17 01
Tlx.: 18661 nd n

NORWAY
Bergen:
Lægdesvingen 41–43
5030 Landås
Tel.: (05) 29 64 50

Stavanger:
Oalsgaten 11
4300 Sandnes

Tromsø:
Industribygget Tomasjord
Postboks 5173
9021 Tromsdalen
Tel.: (083) 30 790

DENMARK
Copenhagen:
Norsk Data ApS
Øverødvej 5
2840 Holte
Tel.: (02) 42 50 55

SWEDEN
Stockholm:
ND Norsk Data AB
Kanalvägen 3, Box 2031
194 02 Upplands Väsby
Tel.: (0760) 86 050
Tlx.: 13528 nordata s

Gothenburg:
Klangfärgsgatan 11, Box 9052
421 09 Västra Frölunda
Tel.: (031) 29 93 50

GERMANY
Wiesbaden:
Norsk Data Deutschland GmbH
Abraham-Lincoln-Str. 30
6200 Wiesbaden
Tel.: (06121) 764-1
Tlx.: 4186370 noda d

USA
Boston:
Norsk Data N.A., Inc.
65, William Street
Wellesley
MASS. 02181
Tel.: (0617) 237.7945
Tlx.: 23-0921740 norsk well

ENGLAND
London:
Richard Norton (NORD) Ltd.
NORD House
17 Balfe Street, King's Cross
London N1 9EB
Tel.: (01) 278 55 01
Tlx.: 299537 norton g

FRANCE
Ferney-Voltaire:
Norsk Data France
"Le Brévent"
Avenue du Jura
01210 Ferney-Voltaire
Tel.: (050) 40 85 76
Tlx.: 385653 nordata fernv

Paris:
120 Bureaux de la Colline
92213 Saint Cloud Cedex
Tel.: (01) 602 33 66
Tlx.: 201108 nd paris

puter introduced in 1975. It is designed for fully interactive programming in Business BASIC and transaction processing under the COMET package.

The alternative Nixdorf 8870/8 is both an upgrade and replacement for the 8870/2, 4, and 6. Like them it is designed mainly for batch processing of data previously entered via display stations. Using COBOL and RPG II, the system can therefore take over programs originally written in these languages for a larger mainframe. NIXDORF COMPUTER AG, Paderborn, W. Germany.

CIRCLE 285 ON READER CARD

* * *

The Olivetti 1900 is Olivetti's label for the American Microdata Express, which it is introducing to the European market as its first multistation business computer. The system is notable for the larger number of stations that it can control (6 to 30) and the large choice of screen sizes offered for these. Unlike its competitors it does not yet offer data communications links to a larger mainframe. ING C. OLIVETTI SPA, Ivrea, Italy

CIRCLE 286 ON READER CARD

* * *

The Triumph-Adler TA 1630 is also Triumph-Adler's first venture into multistation disk processing. Curiously enough, it does not use the German-designed CTM 70 business computer, which it is entitled to market since it acquired Diehl Data Systems last year. It is based on the same Texas TI 990 processor used by German rival, Kienzle. An interesting peripheral available on this system is a highspeed 4000 cps output printer that uses special paper. TRIUMPH-ADLER, Nürnberg, W. Germany.

CIRCLE 287 ON READER CARD

TELEPHONE MONITORING

Based on a Digital Equipment PDP-11/34 minicomputer, the TMS-11 (telephone monitoring system) monitors and analyzes faults and alarms occurring within large telephone exchanges; fault data also can be sent to the TMS-11 from remote telephone equipment. The modular system, and its variety of options, are said to be easily tailored to meet specific users' requirements. The systems can be networked, with a central system receiving alarm messages from up to four remote TMS-11s. Alarm messages are displayed on a crt terminal, and must be acknowledged by an operator. A mimic display board of up to 1,000 indicators can be supported; each indicator is controlled by a logical equation relating the indicator to the state of up to 125 alarm points.

The basic system consists of a processor with 128KB of memory, 5MB of fixed disk, 2.5MB of removable disk, a crt, and a teleprinter. Basic software consists of an alarm point scanning module, alarm message read module, alarm handler module, alarm logging module, and operating system and utilities. The system can grow with communications interfaces, display board, additional crts, line printer, and an additional 128KB of memory. Additional software supports the display board; other modules allow archiving alarms (and listing historical alarm data), as well as listing the alarms causing a given indicator to come on. A version of the system has been up and running at the Provincial Services Coordination Center of the British Columbia Telephone Company, in Vancouver, Canada for the past eight months. XOREN COMPUTING LTD., London, U.K.

CIRCLE 288 ON READER CARD

TABLE 2. SMALL BUSINESS COMPUTERS ANNOUNCED AT HANOVER FAIR

MANUFACTURER	MAEL COMPUTERS	NIXDORF		OLIVETTI	TRIUMPH-ADLER
MODEL	MAEL 5300	8870/3	8870/8	1900	TA 1630
CENTRAL PROCESSOR	GA 16/110	Own	Own	Microdata	Texas TI 990
Main memory capacity (bytes)	64K-128K	128K	128K-328K	256 K	128K-512K
DISK SYSTEMS					
Capacity (bytes)	2.6M-25M	26M-264M	26M-480M	10M-300M	32M-128M
Exchangeable diskette drives	2-4 × 1.3M	1 × 240K	1 × 240K	2-4 × 1M	—
Fixed or exchangeable disk drives	2 × 10 M	13M, 26M or 66 M	13M, 26M or 66M	10M, 25M, 75M	16M, 48M or 80M
MAGNETIC TAPE DRIVES	1 (optional)	1 (optional)	1-4	1-8	—
WORKSTATIONS					
No. per system	1-3	8-16	4-19	6-30	1-8
Display screen capacity (chars.)	1920	1920	960 or 1920	260, 480 or 1920	2000
Keyboard	Movable	Movable	Movable	Movable	Movable
Connection to central system	Local or remote	Local	Local or remote	Local up to 2000 m.	Local or remote
PRINTERS					
No. per system	1-4	1-17	1-20	1-30	1-9
Speed	120 or 180 cps or 200 lpm	45 or 100 cps 300 or 600 lpm	150 cps 300 or 600 lpm	90, 200, or 300 cps	50 cps, 4000 cps 250 lpm
DATA COMMUNICATIONS					
IBM 2780/3780 BSC	Yes	Yes	Yes	No	Yes
IBM 360/20 RJE emulator	Yes	Yes	Yes	No	No
Univac 1004	No	No	No	No	?
PROGRAMMING LANGUAGES	COBOL, RPG II, BASIC, FORTRAN IV.	Business BASIC COMET package	COBOL, RPG II DEGAS, SORBAS	COBOL, PL/1 Business BASIC	COBOL, RPG II, BASIC, FORTRAN, STEUBIH package

COLOR DISPLAYS

The MP.1000 multiscreen color display system uses a microprocessor-based controller that can support as many as four black-and-white or color workstations. Each workstation includes a television monitor, alphanumeric and function keyboard, and a joystick or trackball. The control unit also can support a teleprinter, line printer, up to six floppy disk units, plotter, and video hard copy device. Communications can run at up to 9600bps (asynchronous) or 19.2Kbps (synchronous); options include a parallel interface and a special asynchronous interface capable of transmission rates of up to 72Kbps. The control unit's program (as opposed to refresh) memory can expand to 16KB of PROM and 48KB of RAM.

Each display screen has a format of 48 lines of 960 characters; the preprogrammed characer set includes 64 characters and 128 symbols. Eight colors can be displayed with a variety of attributes: steady or blinking, normal or reverse video, and with colored backgrounds. CIT ALCATEL, Paris, France.

CIRCLE 289 ON READER CARD

DATAMATION
INTERNATIONAL
JUNE 1979 Vol. 8 No. 2

Editor Angeline Pantages

European Editor Ralph Emmett

Contributing Editors Fred Lamond, Bill Musgrave, Andrew Lloyd, Tomio Uchida

Editorial Advisers Philip Dorn, Flemming J. Jensen, David Hebditch, Russell Pipe

Production Helen Bogie

EDITORIAL OFFICE: 35 Mason St., Greenwich, Ct. 06830 USA; 20 Leamington Road, Southend-on-sea, Essex, SS1 2SN, U.K.

CIRCULATION: J. B. Tratsart, Ltd. 154 A Greenford Rd. Harrow, Middlesex, HA 13QT, England.

ADVERTISING SALES: Intergroup Communications, Inc., 31 Lyncroft Ave., Pinner Middlesex HA5 1JU, England.

PEOPLE

ORGANIZING A NEW CONFERENCE

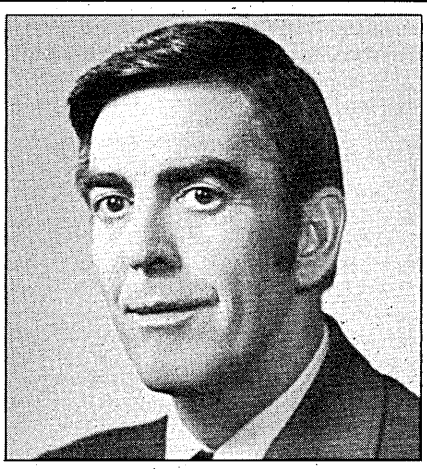
Floyd Harris received an interesting telephone call early this winter from the people at AFIPS: Would he like to organize the very first Office Automation Conference, which would be AFIPS' first move in seven years to expand its conference activities beyond the annual National Computer Conference?

Harris, who is vice president of data processing at Life Insurance Co. of Georgia in Atlanta, where the conference will be held next March 3-5, didn't hesitate. He said yes. "I was very positive because I feel a need for this type of conference," Harris, 51, said in a recent interview.

Since then, he's been meeting with office automation experts to try to find out what the business is all about and what issues would interest whoever would attend such a conference. It will be a unique conference. "No other one addresses all the different aspects of office automation," he said.

A recently convened round table of users, manufacturers, industry observers and educators who know about the subject brought forth five categories the conference will address: data processing, word processing, communications, reprographics, and records management. The audience, the experts said, will be top and middle management, actual users of automation equipment, technicians and inventors, manufacturers, and educators. Although many sessions will address futuristic topics, Harris says that doesn't mean the office of the future is very far off. "One of our members at the round table put it succinctly: "The office of tomorrow *is* tomorrow."

But who is to be in charge of that office is uncertain. Will it be the company's information manager? Or some form of office administrator? Will dp have a voice in it? "There was no consensus at the round table," says Harris who thinks that the "people problem" should be most topical among the sessions for the conference. He's named word processing guru Amy Wohl of McGraw Hill's Datapro Research Co. as the program chairman.



FLOYD O. HARRIS—Who will run the office of tomorrow?

Harris is not a newcomer to organizing conferences. In his 27 years with Life Insurance Co. of Georgia, he's been a member of the company staff that set up conferences for insurance people and four years ago was general chairman of Info Expo '75, held in Atlanta by the Data Processing Management Assn. (DPMA). He's also been a board member of NCC. His title at the Office Automation Conference will be conference chairman.

Harris joined the insurance company after graduating from Emory Univ. and worked in the systems department, later moving to the "IBM accounting department," as it then was known. Eventually he became the head of dp for Life Insurance Co., which last year reported assets of $761 million. Although it has been a long-time user of IBM equipment, and IBM is the largest tenant in its Atlanta headquarters building, some time ago the company replaced an IBM 370/155 system with two Itel AS-5 systems," because we didn't want to put all of our eggs in the one basket."

The 130-person data processing operation also includes a service bureau, Computer Customer Services, that does work for about 75 customers, including ticket processing for several major professional athletic teams and processing of scouting reports for the Atlanta Falcons and Philadelphia Eagles professional football teams. But despite such extensive computer activity, the company doesn't have anything yet that approaches office automation.

"That is one reason I'm sold on the conference," says Harris. "There's a massive educational job to be done for the business community on the one hand, and an organizational structure to be developed for office automation on the other." He hopes this activity will enable the growth of a company's automated systems to be orderly, effective, and as economical as possible.

So far, business seems to be listening: a turnout of 8,000 to 10,000 is expected at the conference and 108 booths of an exhibit of some 480 booths already had been sold late in April.

CONCERNED WITH USERS

"We're getting into an over-capacity problem."

David L. Holzman was talking about computers, word processing, and telecommunications. Trained in sociology and psychology, Holzman has spent 11 years concerned with users and their needs with General Electric, IBM, Xerox and, most recently, The Rand Corp. Today he is a Manhattan Beach, Calif.-based consultant in the same area. His clients include Bell Northern Research (BNR), a research and development facility of Northern Telecom Inc.; Lexitron Corp., a Chatsworth, Calif., word processing systems manufacturer; Xerox, and Rand.

He feels computer manufacturers are too "technology driven" to consider user needs as computers, word processing, and telecommunications merge. "Consider satellites. Scale increases enormously. We can transmit so much data but where does it come from? Where does it go?" He feels manufacturers will shy away from considering user needs because "they would have to eat two or three years growth."

If any companies can and will do it he feels it most likely will be the telephone companies or new companies entering the market. "Telephone companies are more user oriented. Telecommunications managers, while not as technically skilled as data processing managers, are more interested in keeping the user happy."

Holzman said Satellite Business Systems "is clearly pushing teleconferencing and there is not justification for it." And of word processing he said, "wherever word processing goes in, there is a tremendous increase in the number of

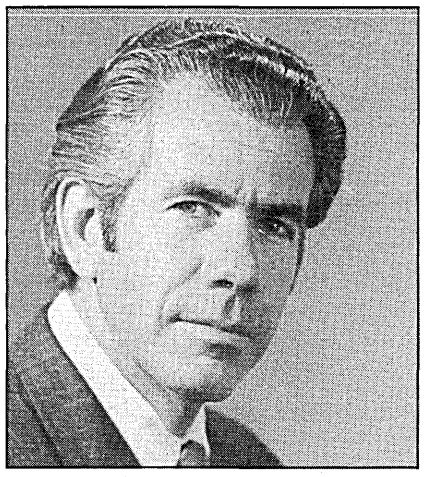
memos generated."

He feels users are going to have to pinpoint their needs themselves. "But there is a problem. Most users are hesitant. They can't articulate. Often they don't know what they need."

Early in his career, Holzman developed a technique for helping users define their information processing needs. "First I would educate the user on information processing; next came a decision analysis process considering all alternatives." He used this technique for some 150 users while with Xerox Corp. as manager of strategic market research and forecasting. "The users loved it. In some cases they would postpone new equipment decisions until they had cleaned up their own houses. In about half the cases they found an immediate need for new equipment."

But Xerox decided it "didn't want to do that any more." He left them in 1977 to join Rand as a senior information scientist. He feels Xerox subsequently come around to his way of thinking, citing a statement made by Chairman C. Peter McColough in early 1978, in the 1977 annual report: "We are accustomed to earning leadership by best anticipating change for our customers and ourselves."

He feels a similar change of heart took place following his departure from IBM. He worked with users while with IBM and, in the mid '60s "I found a significant minority had been oversold. Many had too much capacity. I told management and was disbelieved. In 1970 I told them it would take three years for many users to digest what they had. In 1974, Cary (Frank T. Cary, IBM chairman) admitted it."



DAVID L. HOLZMAN — "An overcapacity problem."

Holzman received an undergraduate degree in psychology from California State Univ., San Diego. He did graduate work in sociology at NYU. "I didn't get a PhD but I did all the work."

He began his career with General Electric in public policies analysis. While with GE he prepared Congressional testimony on computers and automation and their impact on employment for the chairman of the board. "We forecast they would not cause unemployment." The testimony, he said, caught the attention of IBM which thought, "we ought to be doing that kind of thing." IBM hired him in 1959. One of his first tasks was working with Columbia Univ. on "the first definitive study of the impact of automation."

While with IBM, he worked with the Data Processing Div., Office Products Div., and the Advanced Development Div. Of OPD, he said, "They were more concerned with and sensitive to users (than DPD)." While with Advanced Development, "I looked at new business opportunities like Electronic Funds Transfer (EFT), medical applications, and computers in the home. They would say no where risk was involved. A few low profile attempts failed and an analysis of those failures showed one common thread, overestimation of market acceptance."

Currently, Holzman is preparing a new methodology for analyzing user needs, focusing on the combination of computers, word processing, and telecommunications.

CDC COMPUTER SPECIALISTS

MOVE YOUR CAREER TO BOEING.

If you've been working in the computer field for a while now, it's probably a good time to start thinking about your next career move.

Which also makes it a good time to think about Boeing.

Boeing Computer Services provides computer timesharing, custom programming, consulting, training and data base services to over 2,000 clients. Including government, private industry, commercial aircraft and aerospace.

Right now we're looking for good people with CDC NOS or KRONOS experience to support our BCS Mainstream-EKS timesharing program. This program is a nation-wide timesharing service which provides large scale scientific and engineering data processing via multiple CDC Cyber 175 mainframes.

Those who join us will find plenty of challenge and growth.

Plus an opportunity to enjoy the clean air, spectacular scenery and relaxed lifestyle of Seattle and the Pacific Northwest.

If this sounds like the move you've been waiting for, send your résumé to The Boeing Company, P.O. Box 3707-JWA, Seattle, WA 98124.

An equal opportunity employer.

WE HAVE THE FOLLOWING OPENINGS FOR PEOPLE WITH CDC NOS OR KRONOS EXPERIENCE:

- ☐ Project Managers
- ☐ Marketing Support Specialists
- ☐ Consultants
- ☐ Performance Analysts
- ☐ Configuration Control Analysts
- ☐ Operating Systems Programmer/Analysts
- ☐ Systems Analysts

BCS BOEING COMPUTER SERVICES COMPANY

A Division of The Boeing Company

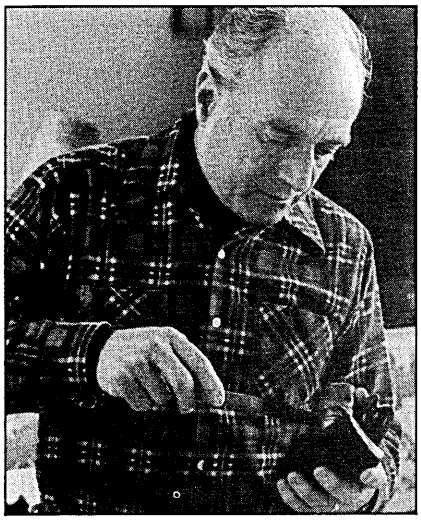
CIRCLE 177 ON READER CARD

PEOPLE

COMPUTER USE IN SCULPTING

Ray Jacobson is a sculptor at Carleton College in Northfield, Minn. His use of computer graphics began not as an end in itself but occurred to him in the process of one of his projects.

The project began as an experiment with the creation of bronze sculpture. The bronze sculpture forms were originally made in wax. "I wanted to work with wax in an indirect way," explains Jacobson, "giving its nature a chance to act."



RAY JACOBSON — "... alleviating fear and suspicion."

Jacobson has always been fascinated by natural phenomena, particularly the forces behind the changing forms around us—the action, for example, of wind and water on rock. "My interest in the energies involved in change pulls upon me to somehow deal with these phenomena in my work," he says. "Art enables me to become a participant."

His method of participating in the wax's nature began with an erosion-like process of melting. He broke the wax into small chunks and immersed them in molten wax of the same variety, kept at a constant temperature. Intermittently he would take the pieces out of the melted wax and examine them for workable shapes. Promising pieces were given direction by carving and then returned to the hot solution for continued erosive action. Persistent use of this working method—a deliberate exposure of guided, carved forms to random and chance alterations by erosive action—ultimately produced a small number of successful forms

Software Engineers

At Codex, the work is challenging because we are the leaders in high speed/high performance data communications products and systems. If the challenge of working for a leader reflects your goals, look us up.

Opportunities exist for Software Engineers to work with advanced microprocessor architecture and applications for data communications products. You'll be developing operating systems and applications software in a multi-microprocessor based real-time environment. Programming experience on minicomputer/microprocessor systems will open up opportunities to advance to senior level positions.

If you're qualified, don't hesitate to send us your resume, including salary history, in confidence, to: Art Bullung, Codex Corporation, 20 Cabot Boulevard, Mansfield, MA 02048.

codex corporation

A Subsidiary of MOTOROLA INC.

An Equal Opportunity Employer M/F

CIRCLE 175 ON READER CARD

Software/Hardware Professionals

New England/East Coast/ Nationwide

Norton, Kleven and Co., Inc., has a variety of positions available in Programming, Compiler Development, Language Design, Hardware/Firmware Design, for professionals well versed in their field and are with some of the top companies in the Industry. If your experience covers one or more of the following areas at the state-of-the-art level, contact us: Software Design and Development; Computer Sciences; Assembly or Higher Level Language Programming; Data Base Design; Compilers, and/or Operating Systems Design; Digital Logic Design; Interface Design; Microprocessor Utilization; Computer Architecture.

We've been providing confidential and industry-knowledgeable placement for, software/hardware professionals since 1969. We can also provide you with free resume preparation and career path counseling. Client companies assume all fees.

nkc Norton, Kleven and Co., Inc.
INDUSTRIAL RELATIONS MANAGEMENT CONSULTANTS

Three Fletcher Avenue, Lexington, Massachusetts 02173
Telephone (617) 861-1020
Member Massachusetts Professional Placement Consultants
Representing Equal Opportunity Employers M/F

CIRCLE 185 ON READER CARD

Even Webster's Knows About QUEST

QUEST (kwest). v. 1. To make a search; to go on a quest.

QUEST SYSTEMS, INC. n. 1. A corporation founded in 1968. 2. The largest professional recruitment firm in the U.S. functioning solely in the computer sciences; its client companies pay all employment fees, interviewing and relocation expenses. Quest is known for its deep personal commitment to relate to each candidate as an individual with individual goals. 3. Its professional staff averages over 6 years of experience in EDP recruiting (additionally, staff members have direct hands-on experience in programming, systems, hardware sales, etc.) 4. Quest is presently searching for programmers and analysts (commercial, scientific, systems software) for over 3,500 client companies in the U.S. *Quest has openings in over 700 U.S. towns and cities.* 5. Methodology — see Questsystem.

QUESTSYSTEM (kwest sis'tem). n. 1. Discussing with an individual what he would like to be doing in light of what he has been doing. 2. Analyzing the realities of his objectives as they relate to the current job marketplace. 3. Contacting client companies and other Quest staff personnel to identify positions of possible interest. 4. Introducing the job candidate to his prospective employers by providing complete details to each about the other, ensuring the efficacious use of everyone's time. 5. Arranging interviews. 6. If employment offers are extended, Quest assists in evaluating the responsibilities, compensation and opportunities (and relates those to the initially stated objectives). The Questsystem has been working for thousands of professionals at no expense, whatsoever. Ask your friends of their past dealings with Quest. Then, put the Questsystem to work for you. For additional information on this subject, please inquire directly to Quest Systems, Inc. (All inquiries/resumes received will be responded to immediately and in confidence.)

Q

Call Toll Free
(800) 821-7700, Ext. 114

QUEST SYSTEMS INC®
6400 Goldsboro Road
Washington, D. C. 20034 (301) 229-4200
Baltimore: (301) 788-3500 • Philadelphia: (215) 265-8100

CIRCLE 186 ON READER CARD

COMPUTER AIDED DESIGN/ COMPUTER AIDED MANUFACTURING

Sandia Laboratories is a prime contractor to the Department of Energy and is located in beautiful Albuquerque, New Mexico. Our mission is one of weapons and energy research and development.

We have an opening for a talented professional to advance state-of-the-art in computer aided manufacturing. A computer network is being implemented where graphics are used as a tool for design, analysis and manufacturing. The position includes responsibilities for evaluation and selection of computer hardware, software design, programming, testing and evaluation of commercially supplied software. Prefer experience with graphics, mini-computer system architecture (PDP-11, VAX), micro-processors (LSI-LL), APT part programming and NC postprocessors.

Candidates should have Masters Degree in computer science, or mechanical engineering, or manufacturing engineering.

Qualified candidates are requested to send resumes to:

J.D. Wheeler
Recruiting Coordinator
Staff Recruiting & Employment Division 3531
Sandia Laboratories
Albuquerque, New Mexico 87185

Sandia Laboratories

An Equal Opportunity Employer--Male/Female

CIRCLE 188 ON READER CARD

which were used to make the bronze sculptures; the majority of forms could not be resolved and eventually became part of the melted wax.

Looking at sculpture entails reading shape and the space around the shape. Walking around a sculpture to see it from different angles presents the viewer, in effect, with multiple silhouettes. Jacobson perceived that he could provide the computer with basic information taken from a systemized recording of the sculpture's configuration and then program the computer to generate for extensive exploration a family of hybrid images—bronze sculpture silhouettes articulated by the language of a Tektronix plotter. One of the anticipated transformations was the computer's rendering the sculptures to a two-dimensional format.

To produce the "two-dimensional sculptures," the artist spent a lot of time at the crt with a student who operated the computer. Coding had been done from a grid Jacobson made onto which the simplified drawings of the bronzes had been transferred, and a program had been written to manipulate the images in various ways, such as stretching them, expanding them, juxtaposing images, or radiating lines from a given point. At least 200 of the resulting images were abandoned, but 100 cohesive shapes were saved.

Jacobson was able to easily apply the flat shapes to his understanding of sculpture by reading them as three dimensional, the way the viewer of a sculpture reads multiple silhouettes. "Figure and ground became mixable," Jacobson explains. "The computer produced images I would never have arrived at by direct drawing."

What Jacobson learned from the variations on his original bronze forms he describes as the enlargement of his sculptural vocabulary. "The sculptor works with a given language," the artist explains. Mass, planes, shapes, volume, edges, shadow, and reflected light are some of the elements of this language. The computer-generated images allowed Jacobson to envision these elements in new ways, increasing his sculptural fluency. "What I do in the future will be influenced by this project," he says. Though the experiment has been shelved while Jacobson works on a commissioned sculpture, he plans to continue the computer project by making more sculptures as offsprings of the new images.

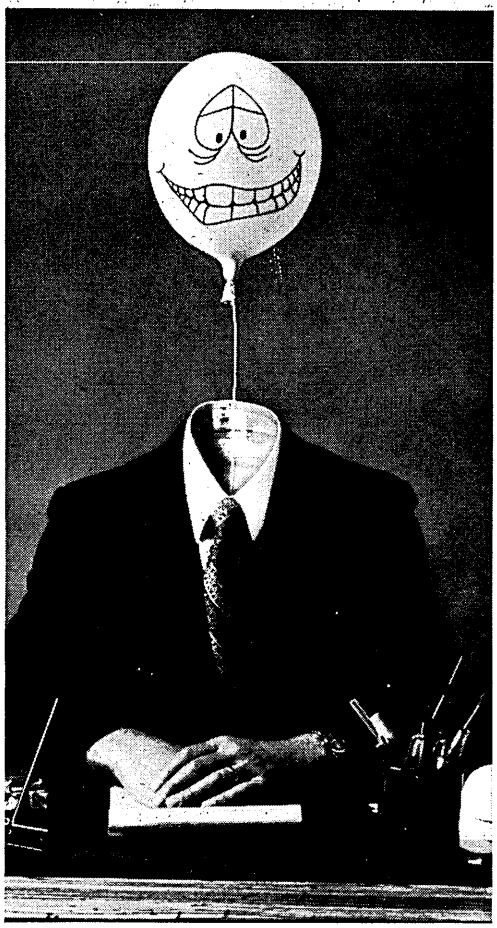
The six bronzes and their corresponding computer-generated images, as well as the coding grid and some printout of the computer program, were exhibited at the college. The audience response was lively, Jacobson remembers. "They seemed to think it was a revelation that an artist could use a computer in an authentic and legitimate way. The scientists were the most intrigued," he recalls, "because of the project's roots in their area."

"Since the computer is a part of daily life, whether I want it to be or not," says the artist, "I wanted to have a one-to-one relationship with it. It was a gesture of alleviating fear and suspicion. I felt I wanted to include it."

Just as he has applied an awareness of technology to his pursuit of art, Jacobson's approach to art has been applied to his use of technology. As he said of the process by which his art is a visual response to his environment, "By communicating with our environment, we become more responsive and build a better base of understanding."

AT NEW DESKS

WILLIAM C. KLINK joined Scan-Data Corp., Norristown, Pa., as president and chief operating officer ... FRANK X. FLEMING was appointed vice president, sales for Microdata International Corp. ... Control Data Corp. promoted ROBERT W. DUNCAN to executive vice president, edp systems, in its computer group ... WILLIAM C. GROVER was named vice president, Sperry Univac Minicomputer Operations ... C. MICHAEL DISHMAN was appointed vice president of marketing for the Infonet Div. of Computer Sciences Corp. ✱



EDP SPECIALISTS
career search opportunities
$18,000-$50,000

DIRECTOR MIS, $30,000-$35,000. Northeast machine div of "Fortune 500" corp seeks exp'd manager from mfg environment. Will coordinate multi-divisional information planning. State-of-Art on-line large IBM mainframe B/G. Degree preferred. Refer AT.

EDP PROFESSIONALS, $14,000-$35,000. Rapidly expanding Atlanta based co seeks professionals in software development, systems mgmt, time sharing & consulting. Client is committed to training for individualized career paths. Outstanding benefits. Desirable Atlanta suburbs. Refer RS.

2-MGR. SYSTEMS PROGRAMMING, $30,000. Major multi-national "Fortune 500" client seeks individual w/CICS, DL1, COBOL exp to direct sys programmers, hardware & software evaluation & the installation & maintenance of installed program products in a mfg environment. Excellent growth & promotional opptys. Refer RD.

SYSTEMS & PROGRAMMING MGR. to $30,000. Leading Carolina based financial organization seeks S & P mgr w/solid IBM, OS/COBOL exp. IMS bkgd preferred. Full benefits. Refer JS.

DATA BASE ADMINISTRATOR, $25,000-$30,000. Major Mid-Atl division headquarters of "Fortune 500" corp seeks individual for planning, development & utilization of Data Base function. Career advancement w/state-of-the-art shop. Refer RN.

PROGRAMMER ANALYST to $23,000. Major corp in Southern Virginia seeks exp'd analysts w/RPGII, COBOL. Modern shop, close to beach, Chesapeake. Refer DM.

CONTACT OUR NEAREST OFFICE ABOUT THESE AND OTHER FEE-PAID OPPORTUNITIES.
OUR UNIQUE, COMPANY-OWNED OFFICE SYSTEM ASSURES PERSONAL, CONFIDENTIAL SERVICE.

PHILADELPHIA, PA 19102—S. Burns, 1500 Chestnut St., 215/561-6300
ATLANTA, GA 30346—R. Spang, 47 Perimeter Center, 404/393-0933
BALTIMORE, MD 21204—R. Nelson, 409 Washington Ave., 301/296-4500
CHARLOTTE, NC 28202—J. Schwab, 1742 Southern Nat'l Ctr., 704/375-0600
CLEVELAND, OH 44131—A. Thomas, 5755 Granger Road, 216/749-6030
FORT LEE, NJ 07024—R. Mansfield, 2125 Center Avenue, 201/947-6920
McLEAN, VA 22101—D. Miller, 7921 Jones Branch Drive, 703/790-1335
NEW YORK, NY 10036—W. McNichols, 1211 Ave. of the Americas, 212/840-6930
PITTSBURGH, PA 15222—J. Beck, 4 Gateway Center, 412/232-0410
PRINCETON, NJ 08540—R. Davis, 3490 U.S. Rte. 1, 609/452-8135
WILMINGTON, DE 19810—L. Benson, 3411 Silverside Rd., 302/478-5150
HOUSTON, TX 77056—G. Lehman, 2801 South Post Oak, 713/877-1600

FOX-MORRIS
personnel consultants

CIRCLE 192 ON READER CARD

High Blood Pressure?

Only your doctor can tell. Like more than 10 million other Americans, you could have high blood pressure and not know it until it leads to stroke, heart or kidney failure. It has no special symptoms and often gives no warning. But your doctor can detect high blood pressure (he may call it hypertension) and usually control it. So see your doctor... and follow his orders.

Give Heart Fund
American Heart Association

Contributed by the Publisher

DATA PROCESSING PROFESSIONALS
take your career to the limits...

...and to Orange County, with fast-track Carter Hawley Hale, the high visibility organization that operates such pace-setting retail concerns as Neiman-Marcus, Bergdorf Goodman and The Broadway.

Our continuing success has created phenomenal growth and expansion, and has prompted relocation plans to beautiful new offices in Orange County. Join us as we move ahead, and get with one of the most active and innovative Data Processing teams in any industry. Opportunities include:

★ PROJECT MANAGERS
★ SR. PROGRAMMER ANALYSTS & PROGRAMMER ANALYSTS
★ SR. SYSTEMS PROGRAMMERS
★ SOFTWARE INTERNATIONAL OR MSA PROGRAMMER ANALYSTS
★ SR. SYSTEMS ANALYST

Intermediate positions require 1-2 years experience, and Senior assignments require from 3-6 years related background in programming and systems analysis. COBOL, JCL, CICS, IMS and SOFTWARE INTERNATIONAL exposure applicable to many positions.

If your professional credentials and personal motivations complement one of these careers, and you are interested in an Orange County location, we invite you to send resume and salary details. We feel that the compensation and benefits offered will more than meet your expectations. Address responses to:

Pam Tanabe

Carter Hawley Hale Stores, Inc.

Information Systems Division
700 S. Flower, Suite 250
Los Angeles, CA 90017

Equal Opportunity Employer M/F

CIRCLE 178 ON READER CARD

MAKE $1,000 MORE A MONTH AFTER TAXES.

THE ENERGY CRUNCH—IT'S CREATING NEW DEMANDS FOR PROCESS COMPUTER ENGINEERS.
READ HOW YOU CAN CAPITALIZE ON IT NOW.

We are the principal oil company developing the energy resources of Saudi Arabia.

A big job to say the least. So it stands to reason we need lots of talented people like you. And we need you now.

40% more money.

With us you can make up to 40% more money. For example, if you are making $30,000 a year(before taxes)in the U.S.,you can make another $12,000 (tax-protected) in Saudi Arabia. Let's compare what you're making with what you could be making.

Annual U.S. Base Salary	U.S. Net After Taxes*	Saudi Arabia Net After Taxes*
$25,000	$20,377	$30,385†
$30,000	$24,169	$36,169†
$35,000	$27,805	$40,801†

*Based on approximate assumptions of married person filing joint return, with three exemptions. Calculations observe 1977 Federal income tax laws using a 20% deduction.

†Includes base salary and expatriate premium.

World's biggest projects.

You will be pioneering some of the world's biggest projects, so you are bound to get professional experience you could not get anyplace else.

Responsibilities and promotions are available sooner in Saudi Arabia because there are more opportunities.

40-day paid vacation.

At Aramco,you get 40 days'paid vacation every 12½ months, plus an average of 12 paid holidays every year.

That is plenty of time to see Europe, Africa or the Far East. You can do it economically, too, because we pay transportation and travel expenses for your entire family to the States and back. Every year.

Process Computer Engineers.

You will be responsible for minicomputer software design. It will be your job to insure the reliability of operational system processes, with emphasis placed on gas plant operations.

You need a B.S. degree in math or computer science, and a minimum of 5 years' programming experience. Minicomputer assembler language is desired. Non-degreed individuals will be considered, if experience and partial degree requirements are met.

Call us toll free.

If you would like to know more about what we can offer you, call George Williams toll free at 1-800-231-7577, ext. 4113. In Texas, call collect 0-713-651-4113.

If you prefer, send your resume in confidence to Dept. DM0600-79A, 1100 Milam Building, Houston, Texas 77002. No obligation, of course.

ARAMCO
SERVICES COMPANY

CIRCLE 176 ON READER CARD

The Fringe Called Freedom To Move... And Still Keep Your Job.

DASD®

With DASD, home is where your heart is—in any one of 17 major cities throughout the U.S. Plus, we'll give you:

- Variety...of computers, languages, applications
- Challenge...and the chance to be recognized for your unique contribution
- Potential...to move up in a fast growing company
- Training...constant updating in computer technology advances
- Great Benefits...higher than average salary, paid overtime, paid holidays and vacations, comprehensive health and dental care, life and disability insurance, managerial profit sharing programs.

Immediate Openings Nationwide For Programmer/ Analysts With 3 or More Years Experience
DASD Corporation • Corporate Services Center
Dept. DM21 • 9045 North Deerwood Drive
Milwaukee, WI 53223 • (414) 355-3405
17 Offices Nationwide • An Equal Opportunity Employer

CIRCLE 180 ON READER CARD

THE WORLD HEALTH ORGANIZATION

invites applications for the post of Management Officer (Chief, Administrative Management Services) at Headquarters, Geneva.

The incumbent will assist WHO programmes in applying sound administrative and management techniques in planning, organizing, directing, controlling and evaluating their activities; will advise generally on managerial and administrative matters and assist in the development and implementation of the WHO Information Systems Programme.

Applicants should have a university degree, preferably at postgraduate level in either economics, business or public administration, public or company accountancy, management science, information science or computer science. Practical experience in public, business or industrial administration, with considerable responsible experience in the specialized field of the management consultancy type is required and an excellent knowledge of English or French with a working knowledge of the other language.

Applications, quoting reference VN/ISP P78/66 should be addressed to:

World Health Organization
Personnel
CH - 1211 Genève 27

Only candidates under serious consideration will be contacted.

CIRCLE 191 ON READER CARD

PROGRAMMERS
SYSTEMS ENGINEERS
SOFTWARE ENGINEERS
DIGITAL ENGINEERS

OWN A COMPUTER... FREE!

If you are now looking for a new challenging job, or if you think that you will be doing so in the next twelve months, we have an exciting offer - the chance to have your own computer - free!

FLW Assoc., Inc. represents a major Fortune 500 internationally known and respected firm that is currently developing an advanced state-of-the-art network involving highly sophisticated processing techniques and capabilities. Our innovative technology, combined with progressive management provide challenge and growth not easily found.

To encourage good response to our recruitment effort, FLW Assoc., Inc. will give free of charge a computer as described below to any applicant who is hired through FLW Assoc., Inc. in the next twelve months as a result of responding to this ad. You must respond by July 14th by sending your resume (handwritten OK) along with the attached coupon completed or a photocopy of the coupon. Of course, total confidence will be maintained.

FLW Assoc., Inc. will provide **only** the system described in this paragraph with delivery being made within sixty days after beginning new employment through FLW Assoc., Inc. The computer we offer is a major manufactured 8 Bit Processor that includes: CPU/keyboard with 4K RAM using Level I Basic, video monitor, power supply, cassette recorder, manual, and a game cassette.

NOTE: This system is expandable (not included) to 48K RAM with Level II Basic with printers, floppy disk, driver, and many software packages available for you to purchase easily at hundreds of outlets throughout the U.S.!

JUNIOR • MIDLEVEL

SENIOR • MANAGEMENT

Salary $18,000 - 45,000

You should have experience or exposure to some of the following areas:

Mini Computers
Programming
Software Design
Real Time
Systems Design
Systems Analysis
Large-Scale R/T Systems
Hardware Design
Fortran
Assembly
Test
Integration
RTOS
RDOS
Digital Systems
INFOS
Distributed Processing
Signal Processing
Intelligence Systems
Logic
Analog Systems
Architecture
Microprocessors
Firmware
LSI
SIGINT
ELINT
COMINT
EW
JOVIAL

FLW INC.

RESPOND NOW!
Please complete coupon and send it with your resume to:
FLW ASSOC., INC.
4753 West Braddock Road, Suite 101
Alexandria, Virginia 22311
(Please respond by mail only)

Equal Opportunity Employer.

Name: _____

Address: _____

Home Phone: _____

Office Phone: _____

AVAILABILITY Now☐ 3-6 Months☐ 6-12 Months☐

Current $ _____ Clearance _____

D 679

The Marketplace...

ADVERTISERS' INDEX

SOFTWARE SERVICES

MIL-STD-1552 PACKAGE PROVISIONING SYSTEM

Designed to provide your engineering and logistics people with the latest in automation. System accepts Bill of Material structured data and generates an exploded provisioning file ready to meet any service implementation of MIL-STD-1552. Here are some of the cost-effective features:

- BILL OF MATERIAL COMPILER - Automatic Explosion.
- QTY COMPUTATIONS - Automatic per family tree.
- FIRST APPEARANCE STANDARDIZATION- Automatic.
- DIDS SCREENING AND RESULTS - Automatic.
- NHA COMPUTATION- Automatic.
- EDITS FOR CONSTANTS/EXCEPTIONS - Automatic.
- ANSI Y32.16 EXTENDED REF. DES - Automatic.
- SEQUENCE NUMBER REASSIGNMENT - Automatic.
- ALL PTD DOCUMENTS FROM ONE DATA BASE.
- VENDOR SPEC CONTROL, MIL STANDARDS INTERFACE.
- IPB AND RPSTL PARTS BOOK INTERFACE.
- CONFIGURATION MANAGEMENT OUTPUTS - Automatic.
- LSAR/MIL-STD-1388 INTERFACE.

Immediate installation for most third generation systems. Demonstration without obligation. Use the logistics software that has been used by computer manufacturers for over 8 years.

SDDC
28 W. Baltimore Ave., Media, Pa. 19063
(215) 565-5660

CIRCLE 214 ON READER CARD

Consider Cincom For

- Data Base Management Systems
- On-Line Control Systems
- Query and Retrieval Systems.
- Application Software Packages
- Total Information Systems™ TIS™

Cincom Systems, Inc.
2300 Montana Avenue
Cincinnati, Ohio 45211
513 662-2300

CIRCLE 215 ON READER CARD

BUSINESS SOFTWARE

If you need business reports with fancy frills you have the wrong company. We don't put these in our software or our ads. Both cost ***YOU*** money.

But if you need solid, down-to-earth software for your North Star, IMSAI, Dynabyte, Vector MZ or other low cost data processing system written in CBASIC or Microsoft BASIC including GL, AR, AP, Inventory, Payroll, Mailing List and Fixed Asset Acct. plus the printing of many Federal Tax Forms then you ***DO*** have the right company.

Give us a try—we know you'll be glad you did.

We honor BankAmericard, Visa and Mastercharge

Aaron Associates Inc.
102 Avenida de la Estrella, Suite 208
San Clemente, CA 92672
(714) 492-7633

CIRCLE 216 ON READER CARD

Dataware Software Translators

RPG to COBOL

Converts RPG and RPG II programs to the industry standard ANS COBOL (DOS or OS). The translator achieves an extremely high percentage of automatic conversion (approaching 100%) of the source code.

RPG to PL/1

Converts RPG and RPG II programs to an optimized PL/1 (DOS or OS). The translator achieves an extremely high percentage of automatic conversion (approaching 100%) of the source code.

For more information on these and our other translators, write or call today.

Dataware, Inc.
2565 Elmwood Avenue
Buffalo, New York 14217
Phone: (716) 876-8722

CIRCLE 217 ON READER CARD

AUTOCODER/SPS to COBOL

Dataware's software translator automatically converts a high percentage of SPS/1400 Autocoder source code to ANS COBOL (DOS or OS).

The Translator converts from:

- **IBM 1401**
- **IBM 1401 SPS**

} can be mixed in a single source program.

- **IBM 1440**
- **IBM 1410**
- **IBM 7010**

For more information on this translator, please write or call today.

Dataware, Inc.
2565 Elmwood Avenue
Buffalo, New York 14217
Phone: (716) 876-8722

CIRCLE 218 ON READER CARD

PL/1 TO COBOL

Dataware's Software Translator automatically converts from IBM PL/1 to ANS COBOL (DOS or OS). The Translator is capable of handling IBM OS or DOS (48 or 60 character set) source programs as input.

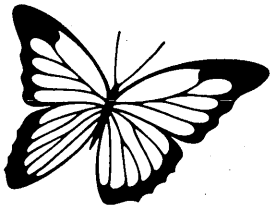
For more information on this translator or the others listed below, please write or call today.

- **EASYCODER/TRAN to COBOL**
- **BAL/ALC to COBOL**
- **AUTOCODER (7070) to COBOL**
- **COBOL to COBOL**

Dataware, Inc.
2565 Elmwood Avenue
Buffalo, New York 14217
Phone: (716) 876-8722

CIRCLE 219 ON READER CARD

NEW LIFE FOR *1401* PROGRAMS



CS-TRAN converts your 1401 *object* programs to COBOL for the mainframe or mini of your choice.

CS-TRAN is the *only* translator that accepts your object programs, patches and all, yet allows you to include actual COBOL paragraph names and record definitions.

If you'd like more details about new life for your 1401 programs just call or write Russ Sandberg.

C·S Computer Systems Inc.
90 John Street, New York, NY 10038 • 212-349-3535

CIRCLE 220 ON READER CARD

SUPER RT-11 SOFTWARE

- Low-cost WORD PROCESSING software
- Data Entry and RJE custom systems
- COMMUNICATIONS - Bisync and Timesharing for DEC LSI-11 and PDT series
- EZEDIT - advanced screen editor
- EZMAIL - direct mailing label system
- DEC RT-11 Starter Kit and special update service

All our products are guaranteed and reasonably priced. Do something for yourself and your company call us at (714) 549-4832.

Unique Automation Products
17922 Sky Park Circle - Suite L
Irvine, California 92714
(formerly Computer Solutions)

"making good things happen thru imagination and craftsmanship"

CIRCLE 221 ON READER CARD

Business Application Packages

in DIBOL,® COBOL, and BASIC for DEC,® Data General and Wang

•Order Entry with Inventory Control
•Accounts Receivable with Sales Analysis
•Accounts Payable •Payroll
•General Ledger

Multiple use licenses available for OEM'S and Software Houses. Inquire for more information.

Mini-Computer Business Applications, Inc.
4929 Wilshire Blvd., 9th Floor, Dept. DMO
Los Angeles, CA 90010 (213) 936-7131

DIBOL® and DEC® are registered trademarks of Digital Equipment Corp.

CIRCLE 222 ON READER CARD

PDP®-11 Users

TSX™ (Time Sharing Expanded) transforms RT-11 into a full multi-terminal, multi-programming operating system.

DBL (Data Business Language) is a DIBOL®-11 compatible compiler for RT-11 and TSX.

RTSORT is a super fast sort for RT-11 and TSX.

For more information contact:

Mini-Computer Business Applications, Inc.
4929 Wilshire Blvd., 9th Floor, Dept. DMO
Los Angeles, CA 90010 (213) 936-7131

PDP® and DIBOL® are registered trademarks of Digital Equipment Corp.

CIRCLE 223 ON READER CARD

FOR SALE

NCR CENTURY 101

48K MEMORY

657 DISK

1200 LPM PRINTER

UNDER CONTINUOUS NCR MAINTENANCE

FOR INFORMATION AND AVAILABILITY

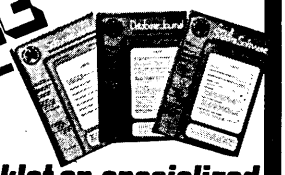
CALL

ARLINGTON HOSPITAL
Arlington Virginia

(703) 558-6253

CIRCLE 227 ON READER CARD

FREE



Data booklet on specialized software information systems covering:

****GENERAL SOFTWARE***
****DATABASE SOFTWARE***
****MICRO & MINI SOFTWARE***

A.P. Publications Ltd
322 ST. JOHN STREET · LONDON, E.C.1

CIRCLE 224 ON READER CARD

FREE CATALOG

For a free government catalog listing more than 200 helpful booklets, write:
Consumer Information Center, Dept. A, Pueblo, Colorado 81009.

• TERMINALS •

DEC • CENTRONICS

LA180	LA36	6300	703	779
LA120	VT100	6600	761	781
LA34	VT52	702		

LEAR SIEGLER • T.I.

ADM31	ADM2	810	763
ADM3A	BALLISTIC	743	765
ADM42		745	

PRINTRONIX P300 P600 P150

SALE, LEASE OR RENTAL, MAINTENANCE ALSO
Also couplers, modems, supplies and accessories—

Data Equipment Group
ICE Incorporated
772 N. Church Road
Elmhurst, IL 60126

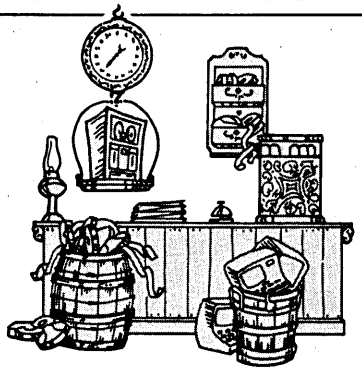
EAST 617/449-2237
MIDWEST 312/279-1960
WEST 714/956-1121

THE LAST WORD IN PRICE . . .

CALL ICE

CIRCLE 228 ON READER CARD

MOVE THE GOODS.



USE THE DATAMATION MARKETPLACE ADVERTISING SECTION
CALL FRANCIE: (203) 661-5400

CIRCLE 225 ON READER CARD

BUY, SELL, LEASE

Mr. DEC

Number One Since 1968

WE CAN SUPPLY ANY DEC ITEM FROM 1965 TO 1979.

TRY US!
617-261-1100

AMERICAN USED COMPUTER
P O BOX 68, BOSTON, MA 02215

CIRCLE 226 ON READER CARD

DP MARKETPLACE

RS 232 AND MORE FOR LESS:

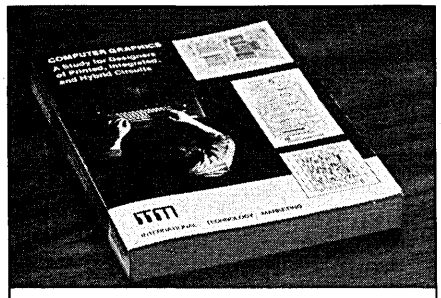
Up to 35% off on competitor's prices of high quality cables: EIA RS 232C Data Cables for as little as $10.40 per pair of connectors. 32¢ per foot of cable. EIA RS 232 low capacitance data cables for as little as $12 per pair of connectors and 58¢ per foot of cable.

THE ONLY CONNECTION YOU'LL EVER NEED!
Hot Line 1-800-243-5066

CRAIG DATA CABLE

BOX 5192, WESTPORT, CT 06880 — TEL. 203-226-8389
SATISFACTION GUARANTEED.

CIRCLE 229 ON READER CARD



COMPUTER GRAPHICS: *A Study for Designers of Printed, Integrated and Hybrid Circuits.* Comprehensive 460-page study of interactive systems, hardware, services. Documents CAD trends ranging from automated placement and routing of PCBs and hybrid circuits to IC design systems. Analyses of design, design requirements, systems, products, cost effectiveness, system selection. Authoritative, used by companies in U.S. and overseas. For descriptive brochure, call (617) 237-2089 or write

INTERNATIONAL TECHNOLOGY MARKETING
120 Cedar St.
Wellesley Hills, MA 02181.

CIRCLE 230 ON READER CARD

DEC WRITERS

LA34
LA36 LA120
VT100 TELETYPE 43 DIABLO 1620-3

90-DAY LEASES!
1-DAY SHIPMENT
CALL 617-261-2700

AMERICAN TERMINAL LEASING
P.O. BOX 68, KENMORE STATION, BOSTON, MASS. 02215

CIRCLE 231 ON READER CARD

COMPUTER INDUSTRY LEADERSHIP OPPORTUNITIES

If you are an outstandingly successful computer industry professional, we're interested in you! ADP is the world's leading independent computer services corporation. As the Network Services Division of ADP, we provide information management systems for Fortune 1000 corporations and major financial and governmental institutions. Our 70 offices world wide and over 200 computers are linked together in a communications network which serves our clients. We also offer the ADP/Onsite Service, an industry breakthrough which provides, at the client's site, remote computing for large users of timesharing and for distributed processing networks.

We are currently looking for persons throughout the United States who can provide leadership in the following positions:

- Marketing Manager
- Account Representative
- Marketing Representative
- Technical Consultant

If you are challenged by these opportunities, please send your resume in confidence or call:

Carl H. Sandberg
Manager of Manpower Development

ADP™ Network Services, Inc.
180 Jackson Plaza
Ann Arbor, Michigan 48106
(313) 769-6800 ext. 659

An Equal Opportunity Employer M/F

CIRCLE 235 ON READER CARD

BROKER IN

DEC SYSTEMS & COMPONENTS

C.D. SMITH & ASSOCIATES, INC.
730 N. Post Oak Road, #301
Houston, TX 77024
713-686-9405

CIRCLE 232 ON READER CARD

RS232C COMPUTER COMPATIBLE PAPER TAPE TRANSMITTER/MODEL 612

Stops and starts on character at all speeds, uses manual control or X-on, X-off 90-260 volt, 50-60 Hz power, 50-9600 baud, up to 150 char/sec synchronous or asynchronous; gated internal or external clock, RS 232C current loop or parallel output, reads 5-8 level tape, 7-11 frames per character, even or odd parity. Desk top or rack mount.

ADDMASTER CORPORATION
416 Junipero Serra Drive
San Gabriel, CA 91776
(213) 285-1121 Telex 674770
Addmaster SGAB

CIRCLE 233 ON READER CARD

PROGRAMMERS ENGINEERS

with systems programming/software dev exp IBM/OS, CDC, Univac systems or minicomputer assembly language sought by quality energy, mfg, systems & consulting cos. Software, hardware & real time applications opptys. $19-32,000 SW,SE,W, MW & NE. Other clients seek business applications analysts & programmers with financial, mfg, or energy co applications exp Cobol, PLI, RPG, assembly $18-29,000 SW & SE.

Confidential contacts controlled by you. Resume to J.L. Gresham, BChE, MBA will contact you at home first. Est. 1966, member AIChE. Fees paid. (713) 782-9701.

Systemation Consultants, Inc.
employment service

P.O. Box 42172 **Houston, Texas 77042**

CIRCLE 236 ON READER CARD

DATAMATION® *magazine*

"1979 MAINFRAME USER SURVEY" AVAILABLE NOW.

The 4th annual comprehensive analysis of EDP users' present equipment status, buying plans and attitudes toward the market has just been completed. This up-to-date report is essential data for industry analysts, planning and marketing executives as well as computer users.

This 300 page report is $790. plus postage and handling. $750. postage paid, if payment is enclosed with the order. Multiple copy prices available on request.

For complete information and/or a complimentary Profile of Survey Respondents call Dorothy Chamberlin, (203) 661-0055.

TECHNICAL PUBLISHING COMPANY
A Dun & Bradstreet Company
35 Mason St., Greenwich, CT 06830

CIRCLE 234 ON READER CARD

JOB MARKETPLACE

WORLD-WIDE MULTILATERAL DEVELOPMENT ORGANIZATION BASED IN NEW YORK

seeks, for IBM 3032/OS/MVS TSO Environment

SENIOR EDP SPECIALIST

Wide knowledge of current hardware/software
management information systems
data base administration
minicomputers

PROJECT LEADERS/SYSTEMS ANALYSTS/PROGRAMMERS

At several levels of seniority
Background in COBOL, PLI, Mark IV, Inquire, TSO
Experience in accounting/financial applications
and proprietary software

Annual salaries and allowances from $20,000 to $50,000;
Initial contract duration 6 to 11 months;
Duty station New York;

Send resume to:

P.O. Box No. 3404
Grand Central Station
New York, N.Y. 10017

Ph.D. COMPUTER SCIENTIST

Applications are invited for the position of manager of the computer science section of the biostatistics department. Responsibilities include guidance and supervision of programmers engaged in data base management on minicomputers and large multiprocessors, statistical computing, and computer graphics. The department is involved in a comprehensive program of consulting and collaboration with biomedical investigators; research and teaching. Position carries faculty appointment at Cornell University Graduate School of Medical Sciences.

Send résume and salary requirements to Dr. Valerie Miké, Biostatistics Laboratory,

MEMORIAL SLOAN-KETTERING CANCER CENTER
1275 York Avenue
New York, New York 10021
An Equal Opportunity Employer

CIRCLE 237 ON READER CARD

PROGRAMMER/ ANALYST

BS in Computer Science or equivalent experience necessary. Full knowledge of Fortran required. Experience with DEC-PDP-11 computers & interactive graphics applications preferred. Send resume and salary requirements to:

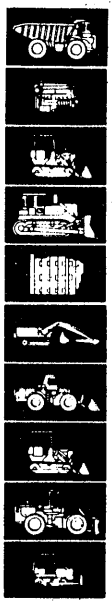
MARY T. DIXON

INSTITUTE FOR CANCER RESEARCH
7701 BURHOLME AVENUE
Philadelphia, Pa. 19111

Equal Opportunity/ Affirmative Action Employer

CIRCLE 238 ON READER CARD

CATERPILLAR



Recognized leader in the manufacture of earth moving equipment-corporate headquaters located in Peoria-needs personnel with a history of achievement to work in a service bureau environment, handling varied applications for independent dealers.

SYSTEMS ANALYST

3 or more years using ANS COBOL and at least 2 years systems design experience on business applications using IBM or DEC PDP-11 computers. Bachelor degree in computer science, business administration, mathematics or science desirable.

COMPUTER SYSTEMS ENGINEER

3 or more years experience in trouble shooting computer operating software and hardware on DEC PDP 11/34's, 11/60's, and 11/70's. Bachelor degree in computer science, electrical engineering, mathematics or business administration desirable. 40-50% travel required from Peoria, Illinois base.

We offer competitive compensation and fringe benefits. Send resume in confidence to: Patricia F. Lee, Corporate Employment Representative, CATERPILLAR TRACTOR CO., 100 N.E. Adams St., Peoria, IL 61629

An Equal Opportunity Employer

CIRCLE 239 ON READER CARD

NATIONWIDE CAREER OPPORTUNITIES CALL TOLL FREE 800-426-0342

A position that meets your objectives.....location, advancement, more money, new experience, increased responsibility, growth potential, challenges, etc. Our client companies need EDP professionals at all levels.

SALARIES RANGE FROM $18,000 - $45,000

HARDWARE/SOFTWARE ANALYSTS	PROJECT MANAGERS/LEADERS
SENIOR SYSTEMS ANALYSTS	PROGRAMMER/ANALYSTS
APPLICATION PROGRAMMERS	SCIENTIFIC PROGRAMMERS
T.P. SPECIALISTS	E.D.P. AUDITORS
MINI PROGRAMMERS	SYSTEMS PROGRAMMERS

No fees or contracts. Our client companies pay all expenses. The above represents a sample of the hundreds of jobs available nationally. For more information:

Call Bill Isgrig toll free at 800-426-0342 or send resume to him at:

PARKER PAGE ASSOCIATES
P.O. BOX 12308
Seattle, WA 98111

Offices in Atlanta, Portland and Audubon, NJ.

CIRCLE 240 ON READER CARD

ADVERTISING OFFICES

Sales Manager
John M. Gleason
Greenwich, CT 06830
35 Mason St. (203) 661-5400
Telex 996343

Eastern District Managers
A. Treat Walker,
Warren A. Tibbetts:
Greenwich, CT 06830
35 Mason St. (203) 661-5400
Telex 996343

New England District Manager
Warren A. Tibbetts:
Manchester, NH 03104
112 W. Haven Rd.
(603) 625-9498

Midwest District Manager
William J. McGuire
Chicago, IL 60611
444 No. Michigan Ave.
(312) 644-3970

Western District Managers
Alan Bolté, Jr.:
Los Angeles, CA 90035
1801 S. La Cienega Blvd.
(213) 559-5111

James E. Filiatrault:
Mountain View, CA 94043
2680 Bayshore Frontage Rd.
Suite 401
(415) 965-8222

U.K., Scandinavia, Benelux
Intergroup Communications, Inc.
Wallace K. Ponder, European Director
Paul D. Dimmock, Regional Manager
31 Lyncroft Avenue
Pinner, Middx, HA5 1JU
England
Tel: (01) 868 9289
Cables: PACOM, Pinner

Germany, Austria, Eastern Europe
Fritz Taeuber
Soltauer Strasse 85
D-314 Lueneburg
Germany
Tel: (0 4131) 4 38 49

France, Switzerland, Italy, Spain
Gerard Lasfargues
32 rue Desbordes Valmore
750 16 Paris
France
Tel: (1) 288 90 22

Japan
Shigeru Kobayashi
Japan Advertising Communications, Inc.
New Grinza Building
3-13 Ginza 7-chrome
Chuo-ku, Tokyo 104, Japan
Tel: (03) 571-8748

NATIONAL COMPUTER CONFERENCE

PRESENTS

JUST WHAT THE DOCTOR ORDERED!

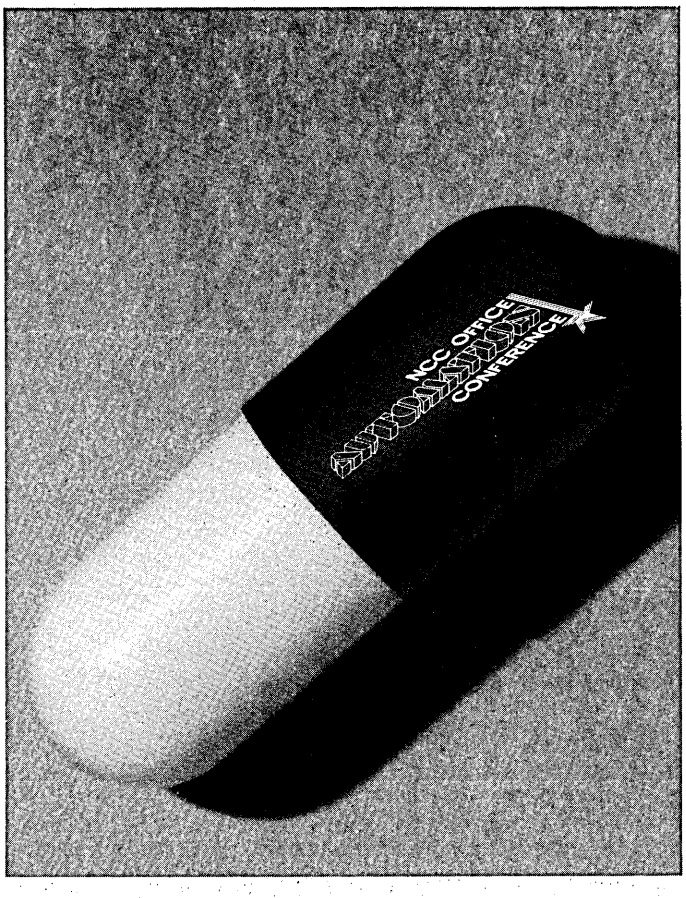
For the company whose office systems are stunted by too much paperwork, swollen files and the fever of catch-up overtime, the new NCC Office Automation Conference offers

grow power in a capsule

OAC is a first-class, full-blown dose of the NCC way to successful growth for automated office systems. An exciting new annual conference with exhibit showcase specifically formulated to provide the healthful effects of education and direction to the business community, today and beyond.

All self-contained in the Georgia World Congress Center, in Atlanta. Be there March 3-5, 1980, for the sweetest medicine ever prescribed.

Fill out the coupon for more information.



℞ NCC OFFICE AUTOMATION CONFERENCE
210 SUMMIT AVE.
MONTVALE, N.J. 07645

Please send me information on the following:

☐ My company is interested in exhibiting at OAC
☐ I am interested in attendance information
☐ I am interested in participating as a speaker or panelist

Name _____

Address _____

_____

Telephone _____

D

NCC OFFICE AUTOMATION CONFERENCE

American Federation of Information Processing Societies • 210 Summit Ave., Montvale, N.J. 07645 Tel.: (201) 391-9810

SOURCE DATA

BOOKS

TOWARD A POST-INDUSTRIAL PSYCHOLOGY: EMERGING PERSPECTIVES ON TECHNOLOGY, WORK, EDUCATION, AND LEISURE

by Don Mankin

Among its more cynical practioners, industrial and organizational psychology is irreverantly known as "cow psychology." The term refers to the basic assumption underlying industrial psychology in general and its human relations school in particular: that contented workers, like the bovine, will produce more.

Don Mankin's earnest, thoughtful, and far-ranging book is a courageous attempt to reject such self-serving cynicism. It is courageous because the book is likely to be both praised and damned for precisely the wrong reasons.

What Mankin attempts to do is easily enough described. He briefly traces the history of industrial psychology, its traditional use by managers as a testing technique, and examines its strengths and weaknesses as a device for placing potential employees or weeding out undesirables.

If Mankin had stopped here, he would have given us yet another very conventional, very safe introduction to industrial and organizational psychology. But Mankin does not stop here and because he does not, we have a much more important book. What Mankin proposes is to create a "post-industrial psychology" to better meet the needs of a "post-industrial society." What he asks for is nothing less than a radical transformation of the focus, function, and form of industrial psychology. The focus would no longer be testing for skills and/or attitudes, but discovering and encouraging "potential." Its function would be to facilitate the design of work and workplace to meet social needs, not just the personnel and productivity needs of a particular enterprise. And industrial psychologists would work with—rather than work on—the people they counsel.

A superficial reading of *Toward a Post-Industrial Psychology* would reveal little that it wholly original. Much of its inspiration even seems to come from one of the favorite gurus of the human relations school, Abraham Maslow. This superficial resemblance is exactly what will get Mankin in trouble. *Toward a Post-Industrial Psychology* will be rejected by the hard-boiled types (the ones wearing little lapel buttons that proclaim "Theory X") who view "self-actualization" as a wishy-washy substitute for sound production engineering and close employee supervision.

The human relations types, on the other hand (whose buttons proclaim "Theory Y"), will embrace Mankin's proposals. They will sense that Mankin, like themselves, has hit upon the manipulative possibilities inherent in "self-actualization," "job enrichment," and assorted other forms of subtle employee control.

The production busters and the self-actualizers will both be off the mark. Although Mankin fully appreciates the pressures for increased productivity and the desirability of contented workers, he is not proposing yet another managerial "style" based on the theories of humanistic manipulation proffered by Maslow, Herzberg, et al. He is suggesting something very different: that industrial psychology be used to change the work to suit the worker, not the other way around.

In short, Mankin is contrasting what industrial psychology is today—narrow, manipulative, restrictive—with what it could be—indeed, according to Mankin, has to be—enlarging, liberative, and supportive.

After having said all these nice things about *Toward a Post-Industrial Psychology*, I am afraid that in the end I have to express strong disagreement with Mankin. It is not that I am siding with either the Theory X or Theory Y types. And I can only praise Mankin's attempt to break out of the limitations of conventional industrial psychology. No theory of industrial psychology or of anything else can remain useful if it doesn't constantly compare what is with what might be—nor, for that matter, can a society, organization, or individual.

My objection to Mankin's attempt to redirect industrial psychology is not

that it goes too far, but that it doesn't go far enough. It is precisely where the book seems about to go beyond the conventions and constraints of traditional industrial psychology that Mankin stops, pulls back, and ultimately retreats into the same morass from which he is trying to escape.

Two observations will illustrate my point.

1. Industrial psychology, even the most sophisticated, ultimately rests on a crucial assumption: that the way individuals behave—and by extension, the way families, firms, and even societies also behave—can be traced back to feelings they have or have failed to overcome. In simple-minded psychology textbooks, the assumption is often expressed as, "Want to change a person's (firm's, society's) behavior? Change his/its attitudes!"

Anyone who has attended management seminars or taken a Dale Carnegie course will instantly recognize in this the deep faith most of us have in the curative powers of moral uplift. We are a nation of dogged self-improvers and right-thinkers. If we can only develop "the" right attitude, everything will be all right.

Mankin never questions this most basic assumption of industrial psychology, even as he challenges its traditional applications. Perhaps it is just as well, since, like all articles of faith, you either believe it or you don't. Still, the serious reader will wonder why Mankin, in his radical reassessment of industrial psychology, did not take his investigation to its logical starting point.

2. On the other hand, Mankin does pursue another theme which is less a matter of faith than of fact and thus of empirical examination. Unfortunately, upon examination it turns out to be the undoing of much of Mankin's argument. I am referring to the very notion that we live in something called a post-industrial society.

Mankin has accepted the claim made by a number of well-known pundits that we live in a post-industrial society because few of us work in factories or foundries and a lot of us work in fast-food stores, offices, and software shops. Because we produce Big Macs and memos and operating systems rather than cars or castings, we have also produced, or so the claim goes, new ways of relating to each other. For Mankin and others, our new "service" society means new needs and goals as well. It is only a short step to conclude that we need, therefore, a new and more appropriate psychology to define and shape those new needs and goals. Hence, a "post-industrial psychology."

But anyone who has worked in a fast-food emporium—or in an increasing number of "well-organized" programming shops, for that matter—knows how misleading such a picture is. The Bureau of the Census may label Ronald MacDonald a service worker, but the fact is that Ronald toils in a tightly organized self-contained hamburger factory. The same is just as true for other so-called service workers. What is the real purpose of developing the office of the future except to make it look like the factory of the past? What is the difference, from the perspective of either manager or worker, between processing words and processing steel?

The lesson has not been lost, furthermore, on the more enthusiastic promotors of "structured" and "egoless" programming. They haven't started calling it "software production" for nothing.

In short, what counts is not the product, which varies, but the nature of the production system. In fast-food restaurants, insurance offices, banks, even schools and software shops, the work has been, in a word, *industrialized*. It doesn't matter if we turn out software modules or students instead of sewing machines. We are *producing*, service worker or no, and the way we produce looks a lot like the way we have always produced. As the man said, reports of the death of industrial society have been greatly exaggerated.

Read the book anyway. It raises a lot of questions, covers a lot of ground, and provokes thought. It is also a reasonable survey of recent industrial psychology and it has a wonderful bibliography. John Wiley & Sons (1978, 212 pp., $8.95, softcover.)

—Philip Kraft

Mr. Kraft is Associate Professor of Sociology at the State Univ. of New York at Binghamton and the author of *Programmers and Managers: the Routinization of Computer Programming in the United States* (Springer Verlag-New York).

REPORTS AND REFERENCES

4300 VERSUS 303X

Shortly after IBM's E-Series announcement, Computer Intelligence Corp. surveyed the status of 118 303X systems on order—nearly 20% have been canceled or deferred, and another 30% are in doubt. Of the shaky orders, nearly two-thirds were attributed to the 4300 announcement; of the five remaining reasons cited, only "not specified" scored above 10%. The attitudes of these large systems customers are explored in a 41-page report: "Impact of IBM 4300 Announcement on Large Scale Systems Market." The report addresses price/performance trends, the 303X backlog, possible IBM reactions, and the impact on leasing companies, pcm's, other mainframers, add-on memory makers, and plug compatible peripherals vendors. The report sells for $1,000 ($200 for each additional copy to the same address). Computer Intelligence Corp., 3344 N. Torrey Pines Court, La Jolla, CA 92037 (714) 455-6420.

NASIS REPORT

The ninth annual report of the National Association for State Information Systems is now available, a bargain at $20.

Findings of the report are presented in two ways, both very nicely thought out.

Four appendices detail the information systems of state agencies—excluding higher education. This information is broken down into executive, legislative, and judicial branches for the first time in this year's report. NASIS prime contacts, in a fifth appendix, are also broken down into branches.

The first appendix lists applications comparatively by state, then describes each state agency's use of each application, including date of completion or last major revision of the system, primary language, monitor type, cpu, core size, storage medium, mode of operation and inquiry capability. Appendix B gives systems configurations for each state agency, and includes cost figures. Appendix C details communications and data entry equipment by state agency, and Appendix D covers off-line peripheral equipment.

Twenty-five tables are also used to convey responses about subjects like personnel, funding, and security. Each table or group of tables is preceded by a summarizing paragraph, revealing trends, pointing out other relevant sections of the report, etc.

Increased training efforts, for example, have continued this year, the study notes, speculating that changes toward distributed processing may well account for increased training efforts for both the states' data entry and operations personnel. "The concern expressed in last year's report over the drop in the percentage of user staff taking part in training programs," the report continues, "has been dispelled by this year's response, which indicates that this group again makes up more than one-third of all participants."

Formal state plans and standards are increasing. Most states without such plans fall into either the category of "smaller states with a high degree of centralization," or "states operating on a decentralized basis where it is probable that individual departments have developed their own long-range plans."

With regard to intergovernmental relationships, an increase is seen in state-local liaison, but almost completely in an advisory capacity. An interesting state-federal development is that there has been a 55% increase in state systems and applications developed with federal funding (either full or partial). The majority of these applications are in the area of health and welfare; it is interesting to correlate this information, the report notes, with the table on consultant use—"it seems an inescapable conclusion that much of the increase in consultant use if for federally

[illegible] Yourself [illegible] Choice Choose TEAC.

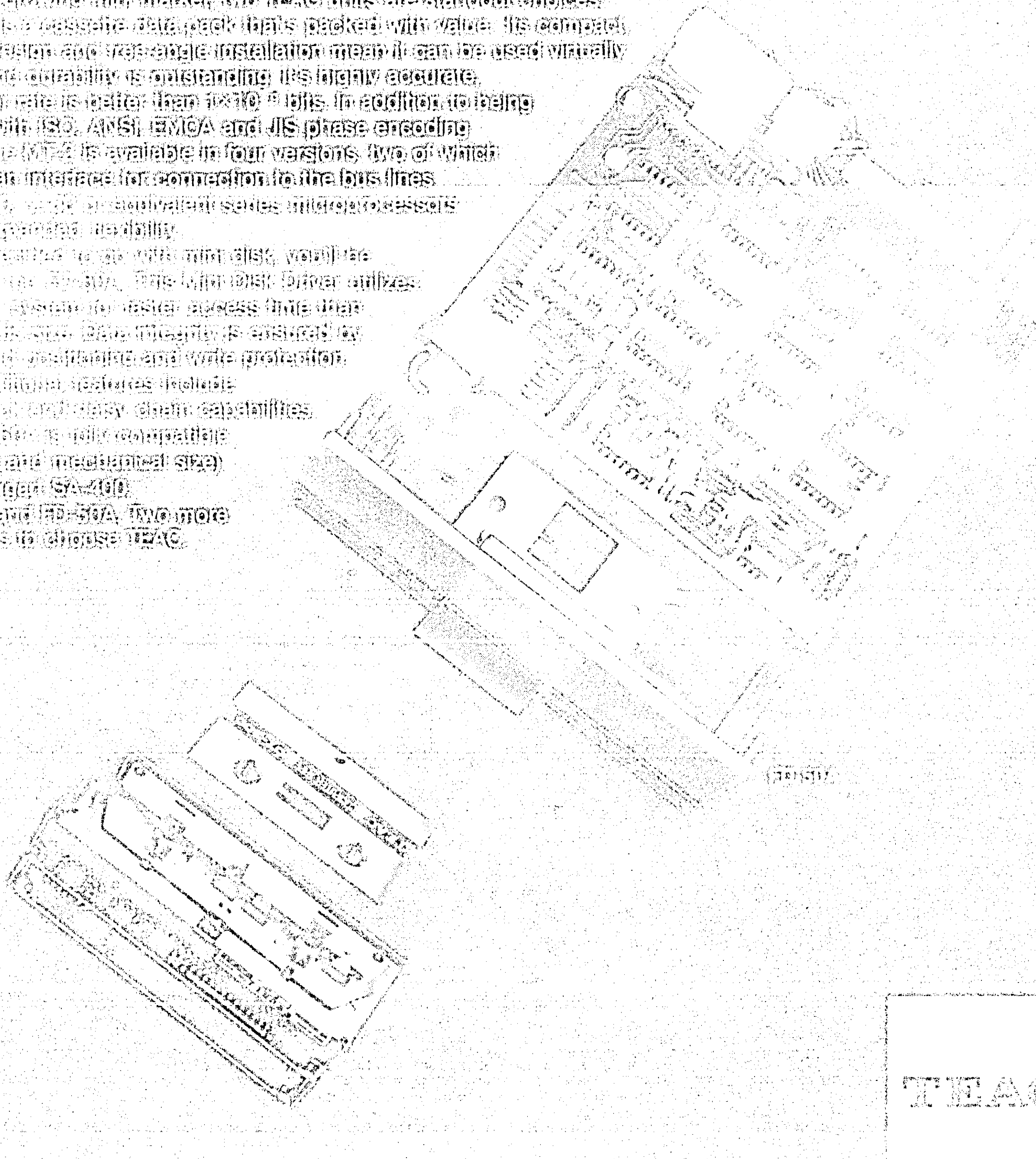
Whatever your data storage needs, large or small, there's a TEAC that's right for the job.

In the fast-growing mini market, two TEAC units are standout choices.

The MT-2 is a cassette data pack that's packed with value. Its compact, lightweight design and [illegible]-angle installation mean it can be used virtually anywhere, and durability is outstanding. It's highly accurate, [illegible] error rate is better than 1×10[illegible] bits. In addition to being compatible with ISO, ANSI, EMCA and JIS phase encoding standards, the MT-2 is available in four versions, two of which incorporate an interface for connection to the bus lines [illegible] equivalent series microprocessors [illegible] reliability.

[illegible] mini disk, you'll [illegible] Mini Disk Driver utilizes [illegible] faster access time than [illegible] Data integrity is ensured by [illegible] and write protection [illegible] Additional features include [illegible] capabilities, [illegible] compatible ([illegible] and mechanical size) with the Shugart SA400.

The MT-2 and FD-50A. Two more good reasons to choose TEAC.


FD-50A

MT-2

TEAC

TEAC CORPORATION [illegible]

CIRCLE 160 ON READER CARD

SOURCE DATA

funded projects."

Another interesting finding: "The use of software packages continues to be a desirable effort insofar as managing state data processing installations is concerned ... While there was no significant change in the numbers of packages used for any one purpose, many states reported changing software packages used for a specific purpose, indicating a continuous upgrading of capabilities."

Another potentially interesting subject is covered in the final table, which shows transfers of systems and programs from one state to another.

The report, as mentioned, sells for $20. Contact Mrs. Judie Parish, Administrative Assistant, National Association for State Information Systems, P.O. Box 11910, Iron Works Pike, Lexington, KY 40578.

INTERNATIONAL DATA BASE DIRECTORY

A 130-page softcover book listing every data base reported as available to the public, regardless of geographic origin, also lists all reported European operations and all reported non-European operations networked in Europe. The data bases come from Eusidic's European Scientific Information Referral working-group. $25. Learned Information Ltd., Besselsleigh Road, Abingdon, Oxford, OX13 6EF England.

IN-PLANT PRINTING

Frost and Sullivan has issued a report entitled "The In-plant Printing Market in the European Economic Community." Coverage includes analysis of the structure of the in-plant printing market, the market value of printing equipment purchases by in-plant printers, major manufacturers, technology, market structure, and a forecast of the demand for in-plant printing equipment between now and 1987. The report is #E262 and sells for $850.

Also from Frost & Sullivan is "Electronic Games Market in Europe," which predicts a $300 million market by the mid-1980s. Because of increasingly high manufacturing costs in Europe, the report says, it is expected that future main suppliers of tv games will be the Far East and the U.S. The report sells for $800. Frost & Sullivan, 106 Fulton St., New York, NY 10038 (212) 233-1080.

SEMICONDUCTOR INDUSTRY IN JAPAN

A new report on the Japanese semiconductor industry is available from IDC. The report was written by the consulting group of Bank of America Asia Ltd. in Hong Kong, which has offered to do more joint research ventures with IDC, such as annual updates on the Japanese semiconductor industry.

The present report begins with an economic overview of Japan, and covers the semiconductor market for consumer electronics, computers, communications, test and measurement equipment, calculators, cameras, automotives, office equipment, industrial robots, and other products. Supply and demand, major Japanese suppliers, and new product development and quality considerations also are covered. The 217-page report is said to include data on unit production. $475. International Data Corp., Attn: Sandra Steere, 214 Third Ave., Waltham, MA 02154 (617) 890-3700.

VENDOR LITERATURE

INDUSTRY INSECT

This is an exerpt from *The Book of Telecommunications Records*, available (free) from Telecom Systems Group Inc.,

The PADMOLIK ARMY ANT was unknown until about a decade ago. This insect primarily attacks international carriers. RCA and WUI were hit with an infestation in the early and mid 1970's.

The PADMOLIK ARMY ANT usually builds its nest and lays its eggs in the carriers marketing department. Later when the colony matures it attacks the carriers' leases and destroys them.

Carriers have experimented with a number of different insecticides, but this insect seems to be resistant to them. The PADMOLIK ARMY ANT is thought to be cyclical. It has not been seen the last two seasons and is thought to be in the dormant phase.

181 Upper Mountain Ave., Montclair, NJ 07042 (201) 783-5568.

FOR COPY CIRCLE 370 ON READER CARD

ENCRYPTION

Secure communications, be it analog or digital voice, synchronous or asynchronous data, facsimile, or Telex, are examined in this 12-page, illustrated booklet. The company describes itself, from its founding, through its cryptographic expertise, and on to its products. Laid out in a functional manner, the brochure covers voice security offerings for point-to-point voice and radio communications. Electronic message security is similarly examined. Of course, data communications security gets its due. In conclusion, the brochure discusses the firm's warrant and maintenance, as well as the installation of its product offerings. DATOTEK, INC., Dallas, Texas.

FOR COPY CIRCLE 371 ON READER CARD

DOCUMENT PRINTER

An illustrated six-page brochure presents the features and specifications of this ven-

COMPUTER SALES AND SYSTEMS PROFESSIONALS

ANNOUNCING THE NEW FORCE IN DISTRIBUTED DATA PROCESSING

SYCOR AND DATA 100 BECOME NORTHERN TELECOM SYSTEMS CORPORATION

We've combined the knowledge, products and marketing expertise of three outstanding companies to bring you unprecedented flexibility in distributed data processing. The combined resources of Sycor, Data 100 and Northern Telecom give us an unbeatable combination of hardware and software expertise that can put you in front of any competitor. To reach our new potential, we seek outstanding DDP professionals in most major cities, including Atlanta, Pittsburgh, Detroit, New York, Denver, Chicago and San Francisco.

SALES REPRESENTATIVES

You should have a minimum of 3 years' experience successfully selling terminals, peripherals or small systems, with a proven track record of sales over quota and a demonstrated general knowledge of DP applications, including communications. Your responsibilities will focus on the development of territorial sales for a complete line of computer products and the support of existing customers.

SYSTEMS ENGINEERS

COBOL or Assembler programming experience is essential; communications with bi-sync and on-line background would be helpful. The ideal candidate will have 5-6 years' experience or the equivalent BS degree and a background in Micro-Mini systems, programmable terminals or systems support. Any exposure to data entry applications and marketing customer support would be an asset.

We can provide complete product training, and we offer excellent compensation and advancement potential. For immediate consideration, please call:

Len Thielk...TOLL FREE,1-800-521-1532
IN MICHIGAN, (313) 973-4156

Northern Telecom Systems Corporation
100 Phoenix Drive • Dept. DM
Ann Arbor, Michigan 48104

An equal opportunity employer

SOURCE DATA

dor's CP210 Document/Passbook Printer. The folder lists applications and discusses the printer's document versatility. Printing characteristics and specifications are provided. OKIDATA CORP., Mt. Laurel, N.J.

FOR COPY CIRCLE 372 ON READER CARD

CURSOR POSITIONER

A 12-page catalog describes this vendor's Trackball offerings used by human operators to perform positioning and contouring on interactive displays such as, but not limited to, computer peripherals. Technical and application information make up nearly half of the brochure, with the remainder of the catalog devoted to data on specific standard items and options. Fourteen Trackballs are described. MEASUREMENT SYSTEMS, INC., Norwalk, Conn.

FOR COPY CIRCLE 373 ON READER CARD

MACHINE CONTROL

A six-page brochure describes this vendor's line of 2001 commercial/industrial punched paper tape readers. In addition to explaining why "punched paper tape is ideal for machine controls," the brochure discusses present day applications, product definitions, and sales support throughout the world. EECO, Santa Ana, Calif.

FOR COPY CIRCLE 374 ON READER CARD

WORD PROCESSING

An illustrated, 84-page catalog describes this vendor's offerings for word and data processing users. "Guide to Word Processing Accessories and Supplies, 1979 Edition" includes nearly 1,300 listings of crt workstations, diskette storage systems, ribbons, print wheels, thimbles, and other items. AMERICAN WORD PROCESSING CO., Tarzana, Calif.

FOR COPY CIRCLE 377 ON READER CARD

POWER PLANT SIMULATION

This manufacturer of analog and hybrid computers has prepared a four-color brochure addressing power plant simulation. The rationale for simulators is discussed in terms of profit/process optimization, reduced capital investment, more efficient training, improved operator proficiency, maximizing safety/minimizing risk, and environmental factors. Modeling techniques and hardware are discussed. Actual users, both of coal-fired plants and nuclear reactors are profiled. Although Three Mile Island is not mentioned in the booklet, a "hybrid approach to the solution of the momentum, energy, and continuity equations used in the thermodynamic equilibrium nodal analysis of a Loss of Coolant Accident," is said to be available from the vendor. ELECTRONIC ASSOCIATES, INC., West Long Branch, N. J. ✱

FOR COPY CIRCLE 378 ON READER CARD

Discover the Dynamic History of Computing

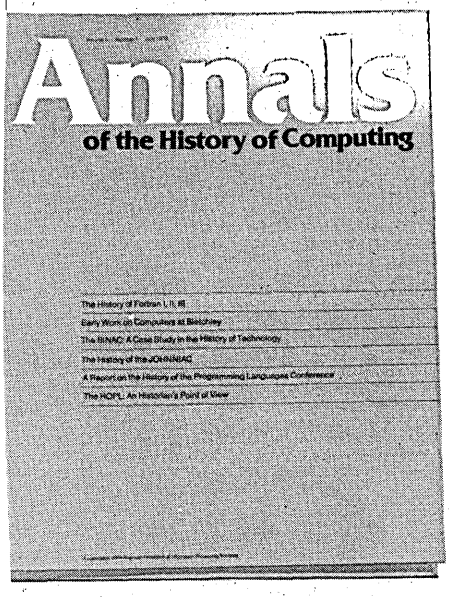
You are invited to discover the dynamic history of computing through the pages of an important new quarterly publication – the *Annals of the History of Computing*. The *Annals*, to be published by AFIPS Press beginning this July, will explore the evolution of computing with emphasis on contributions from individuals who participated in, or witnessed, the events and decisions which have shaped our computing environment.

By acting now you can become a charter subscriber to the *Annals*. This unique periodical will bring to life the developments and activities which have led to today's incredible rate of change in computer technology. And it's more than just history– you'll see how the activities of your colleagues and their predecessors have affected your life as well as the work of other individuals and institutions around the world.

Every three months, the *Annals* will bring you important articles by computer scientists, practitioners, users, engineers, and historians. Each issue will provide a lively forum for the presentation of the history of computing – one which invites commentary, dialogue, and debate. Each will be produced under the direction of an Editorial Board composed of distinguished computer professionals and historians drawn from the United States and other nations. Heading the Board as editor-in-chief is Bernard A. Galler of the University of Michigan.

In addition to formal articles, the *Annals* will feature descriptions of current historical projects, reports of significant successes and failures in the computing field, commentaries on collections of private correspondence, discussion of the impact of societal factors on the development of computing, annotated bibliographies, anecdotes and personal recollections, and responses from readers.

You can play an important role in preserving the heritage of the computing field by subscribing to the *Annals*, submitting articles or material, and by offering your comments and suggestions. To become a charter subscriber, complete and mail the coupon below. By acting now you'll receive the first four quarterly issues of the *Annals*. Subscriptions for members of the AFIPS Constituent Societies are only $15; individual non-members may subscribe for $20. The *Annals* also may be ordered on microfilm or microfiche.



ADVERTISERS' INDEX

Tbar® discovers Your Missing Link! Fast!

all new

The T-Bar TD-12 Digital Data Link Tester is the way to test all the links in your system ...terminals...modems...lines...front ends... even if made by different vendors or using a variety of protocols

- ☐ Troubleshoot your Data Communications Network
- ☐ Isolate Equipment Failures
- ☐ Diagnose Software
- ☐ Diagnose Operator Data Entry and Format Problems

TD-12 is EASY TO USE — because it has...

- ☐ Keyboard Programming plus Prestored Parameters
- ☐ Simple Instructions
- ☐ Prompting Displays
- ☐ No Switches to Set

TD-12 is VERSATILE — it can be used as a...

- ☐ Monitor
- ☐ System Emulator
- ☐ Bit Error Rate Tester (BERT)
- ☐ Time and Clock Measurement Device
- ☐ Network Efficiency Measuring Device

TD-12 DIAGNOSES FASTER — because it offers...

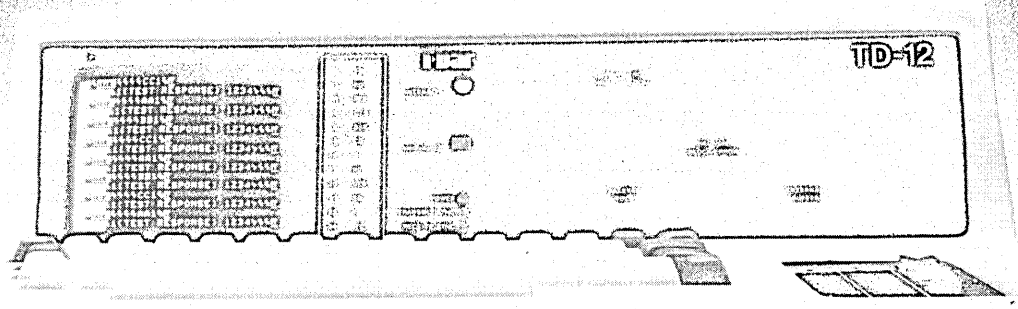
- ☐ Selective Storage and Less Time to Retrieve
- ☐ Easily Interpreted Displays
- ☐ Display of Pertinent Data Only
- ☐ Test Results Displayed

...all this with a minimum of technician training

Tbar® INCORPORATED

DATA COMMUNICATIONS SWITCHING DIVISION
141 Danbury Road. Wilton, CT 06897.
Telephone: 203/762-8351. TWX: 710/479-3216.

CIRCLE 59 ON READER CARD



ADVERTISERS' INDEX

†European Insert Advertisers

CSC

The slower you read this, the faster you'll get the message.

We've attempted to compress a very big growth picture into relatively few words.

Your reward for ploughing through this material may be a whole new awareness of the caliber of programs, hence opportunities, that await you at this unique Division of Computer Sciences Corporation.

So, we invite you to read it slowly...and contact us quickly.

COMMUNICATION SYSTEMS

Every dimension of challenge and opportunity is represented here, hardware as well as software, and systems work in its broadest definition. Even our smallest communication systems programs are larger than most...and our largest actually encompasses advanced versions of AUTODIN, DSCS, AUTOVON, and others...as subsystems!

Consequently, we need people to dig into the analytical side of creating new generation systems, predicting what will happen when new types of communication gear (digital) replace current (analog) equipment on a phased basis...where and how they will interface successfully ...how to transition from one generation to another...how to analyze major system interoperability...identifying potential problems in hardware and creating avenues of solution...developing and implementing ongoing systems support programs...system control, performance assessment and monitoring.

So whether you're a communications system generalist, or a specialist; whether you're the dean of digital techniques, or have just had a smattering of switching, voice processing, multiplexing, synchronization, etc., be sure to contact us.

SATELLITE COMMUNICATION SYSTEMS

One of our operations is deeply involved in digital systems so sophisticated, it is expected to take up to ten years of technology advancement to make them a reality.

The current tasks call for moderate to heavily experienced individuals (5 to 10 years) who are U.S. Citizens and whose backgrounds can withstand a rigorous security check.

Specific areas of experience should focus on one or more of the following:

• Digital Communications • Systems and Subsystems Design Analysis • Realtime Systems Software Architecture • Analog Communications Engineering • Planning, Logistics, Facilities Monitoring, Test, Check Out.

In the software area, the people we seek should have enough experience to do independent software design, test and documentation reviews, to participate in proposal evaluations, and to prepare purchase descriptions for software systems involving large, complex operations on both large and small computers.

ENERGY MANAGEMENT AND CONTROL SYSTEMS

CSC has emerged as a leader in advanced energy management and control systems, and as a result of major contract awards, there are many exciting openings now available in programming, engineering, and system checkout.

Software project engineers are needed to help produce functional designs for new software and modifications of existing packages; to monitor the development of design and implementation of control system software; to participate in and direct system data base and graphics development; to provide technical software liaison with customer; to support in-house and field checkout and acceptance of total system.

Programmers/analysts with 2-4 years experience in realtime minicomputer applications, and with HP RTE-III experience will find excellent advancement waiting for them in this group.

Hardware project engineers will also find plenty to challenge and reward them here. You should have a BS in engineering or ample practical experience involving projects relating to instrumentation systems, realtime data gathering systems, or HVAC systems.

OTHER SELECTED IMMEDIATE OPPORTUNITIES

Communications Engineers

— to support design of a communications network including selection of modems, determining the mix of terminals and communications circuits, and deriving communications requirements as a result of the overall system requirements analysis. Some knowledge of modem design and polling applications is preferable.

Functional Designer/Programmers

— to participate in and possibly also lead a design/development team in the functional definition, detail design and eventual development of software applications for a large Management Information System. Will prefer COBOL programming (experience with data base related systems).

Data Base Management

Immediate openings include at least one group leader and several moderate level individuals with a capability for defining data base schema for the MANAGE DBMS system, preparing data base design documents indicating the interrelationships of various record types, files and elements of a data base of national proportions. Experience with the MANAGE data base operating system preferred, as would be experience with large data base systems.

A SPECIAL NOTE TO PROGRAMMER/ANALYSTS

If you find your experience area in this list, you can surely find yourself a better opportunity with CSC on one or more of the projects outlined above, or others not listed because of space limitations:

H6000 – H716, 516 – WWDMS (MDQS) – IDS, ISP – GCOS – GMAP – FORTRAN – COBOL – WWMCCS **MINICOMPUTERS** – Interdata 7/32 – HP MINIS – PDP 11 – UNIX-"C" language – RSX 11D – Assembly Language – FORTRAN IV-**COMPUTER NETWORKS** – ARPANET – Protocol Design – Terminal Interface **360/370** – COBOL – OS/VS/MVS – TSO – IMS – JCL-**SYSTEM 2000** – OS/VS – COBOL – PLI – ALADIN – DBMS

For more information about these, and other related openings, please forward your resume immediately to Director of Professional Staffing, M/C 218 (AD).

WE AGGRESSIVELY SUPPORT EQUAL OPPORTUNITY AND AFFIRMATIVE ACTION

COMPUTER SCIENCES CORPORATION

SYSTEMS DIVISION
6565 Arlington Boulevard Falls Church, VA 22046
Major Offices and Facilities Throughout the World.

CIRCLE 179 ON READER CARD

Readers' Forum is designed for an exchange of ideas and experiences. Your contributions are invited.

READERS' FORUM

VORTICAL MANAGEMENT

"Vortical (vôr' tĭ kăl), adj. Of, pertaining to, or like a vortex or vortexes; whirling..." Webster's New Collegiate Dictionary, copyright 1961.

Mankind's greatest invention is neither fire nor the wheel. Mankind's greatest invention is management. It is management that permits groups of men to do things that no single reasonable and prudent man would attempt. It is management that made possible the pyramids, the leaning tower of Pisa, the Nixon Administration, the F-111, and the Edsel. Without management, the world, as we know it, could not exist.

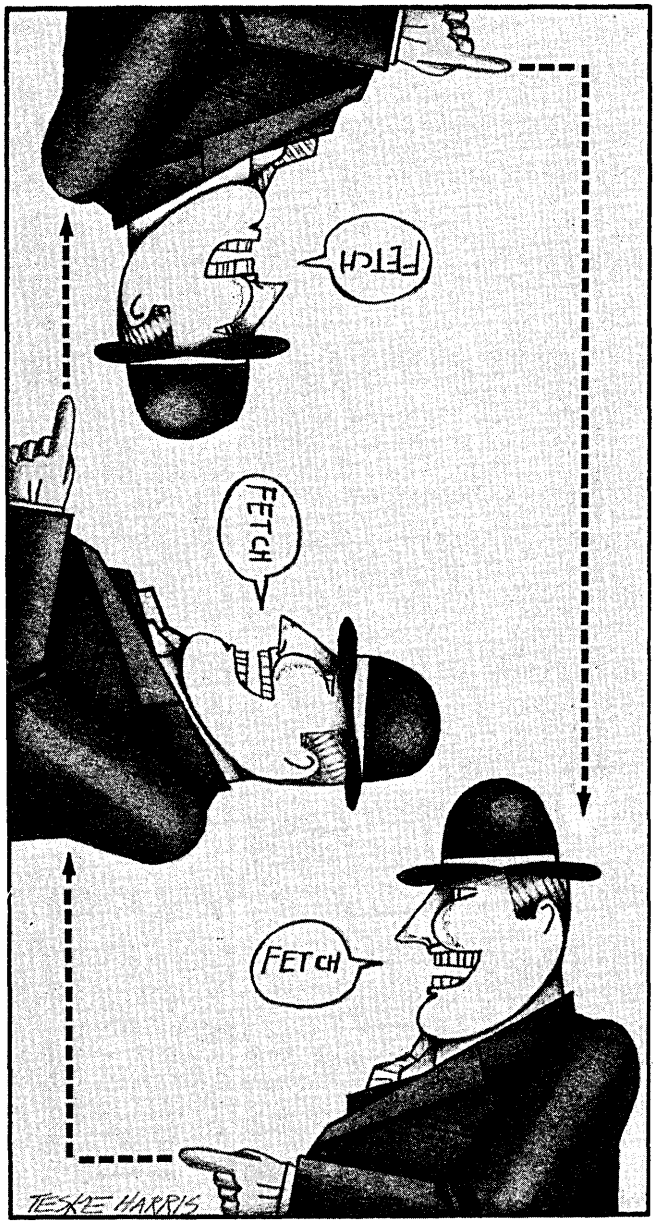
The original and best known form of management is vertical management. In classical vertical management, one man at the top directs a group of subordinates. These subordinates may do the work or may manage other subordinates who may, in turn, be either workers or managers of yet other lower levels. This structure may proceed through many levels of subordination.

Vertical management has been tremendously successful. This is due to the fact that it goes so far toward satisfying the two universal human goals:

1. Each individual wants as much authority as possible.
2. Each individual wants as little responsibility as possible.

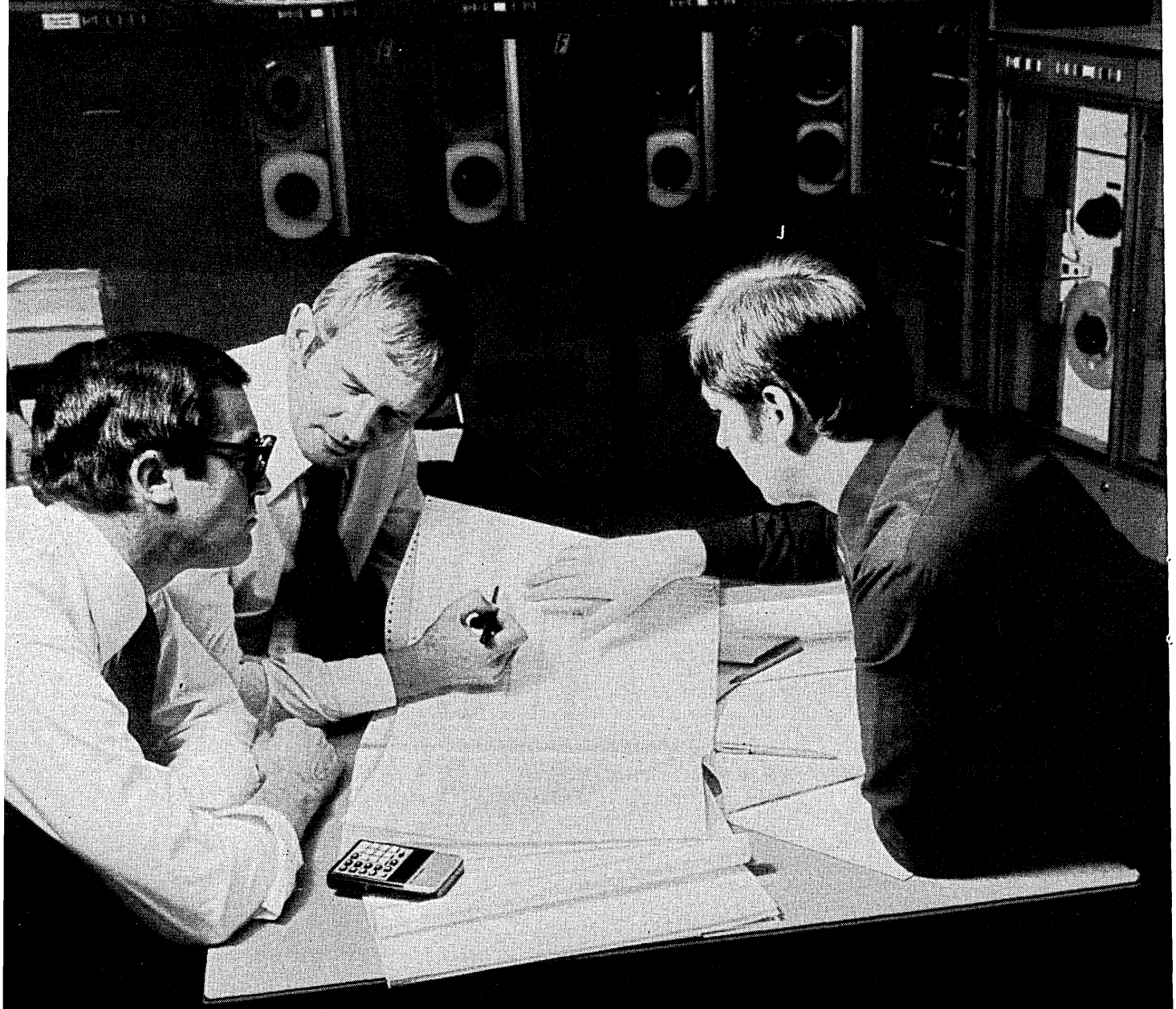
In classical vertical management, authority is concentrated at the top, while responsibility, despite what you may have been taught in school, resides at the bottom. Thus, those at the top have achieved the most enviable of human positions—maximum authority with minimum responsibility. Meanwhile, those at the bottom are enjoying the reverse. However, since there are (usually) many at the bottom, responsibility is parceled out in bearable lots. Further, each man knows that as time progresses and he rises, his authority will increase and his responsibility will decrease. Thus, hope and aspiration keep him going.

Vertical management *was* management—the only kind of management—for millennia. It was less than two centuries ago that the French dictator Napoleon invented the first change to vertical management since its original conception. In a burst of genius, Napolean realized that the restraint of classical vertical management—that the sum of the authority at the top equals the sum of the responsibility at the bottom—is not inherent to all management schema. Napoleon realized that it was possible to add individuals outside of the main line of vertical command, and that these people could have effective authority over portions of the main vertical management structure. Since their instructions would inevitably conflict with one another, as well as with those from the top of the vertical structure, the total of responsibility at the bottom was not increased. Napoleon had invented the Staff Organization—a structure wherein the sum of the authority exceeds the sum of the responsibility.



Only an exceptional mind could have conceived this idea. Some idea of the extent of Napoleon's genius can be realized when it is recognized that Napoleon managed to hold his own against the combined armies of Europe for many years despite the use of a staff organization.

One manufacturer cannot provide all your data systems needs. Cable and Wireless can.



Software, hardware, systems, networks.

Planning, design, installation, management, operations, training.

All are aspects of the Cable & Wireless total capability in data handling and communications. A capability no single manufacturer can match.

Completely independent of any manufacturer, we have the widest possible choice from the world's leading suppliers. We are constantly evaluating new equipment to assess performance, reliability and value for money. Which means we can give unbiased advice, and supply the best package – possibly from several different manufacturers – to suit your specific requirements.

Add to this over a century of experience in world-wide telecommunications, and an up-to-the-minute expertise in the supply of data communications networks for airlines, banks, shipping, oil and other multi-national companies, and you have the reason why Cable & Wireless can provide *all* your data systems needs.

Cable & Wireless

helps the world communicate

Cable & Wireless Limited, Mercury House, Theobalds Road, London WC1X 8RX. Telephone: 01-242 4433. Telex: 23181.

CIRCLE 21 ON READER CARD

The staff organization has slowly replaced the vertical organization in practically all areas of human endeavor. It has become increasingly complex as men strive to increase the ratio of authority to responsibility by appending more responsibility-free staff to the organization. Organization charts have gone from the neat pyramids of 1800 A.D. to complex foldouts—no deeper than those of 1800—but 50, 100 or more boxes wide near the top level.

The next major breakthrough in management was achieved in the 1960s. Some unknown and unsung genius realized that the authority/responsibility ratio could be increased by decreasing the sum of responsibility just as effectively as it could by increasing the sum of authority. This approach was formalized in the matrix organization. In a properly run matrix organization, responsibility is decreased by obscuring the lines of command sufficiently that it is never quite clear who is responsible for what. Perhaps we give too much credit to the inventor of matrix management. Possibly he or she was merely trying to append even more authority than was possible in a staff organization (an unnecessary effort—there is no limit to the number of people with authority in a staff organization). Whatever the reason, the result worked superbly.

This brings us to vortex management. Vortex management is a logical extension of matrix management wherein lines of authority—already obfuscated in matrix management—are completely eliminated. Thus, everybody has authority, nobody has responsibility, and the authority/responsibility ratio goes to infinity. The term vortex refers to the typical swirling motion that affects the vortically managed organization. This same phenomenon seems to affect all dynamic, amorphous media. It may be clearly observed, for example, in water going down a drain.

The vortical organization has many benefits. It maximizes individual authority and eliminates individual responsibility. Ulcers and psychiatric problems are rare in true vortical organizations. The vortex organization is constantly in motion, thus producing a feeling of accomplishment in the workers. However, although it is dynamic, the motion is rotary—circular. Thus there is no output from a true vortex organization. In a world plagued by pollution, overproduction, and underemployment, vortex management is the perfect management approach. Human needs are met, and no troublesome or dangerous products are produced.

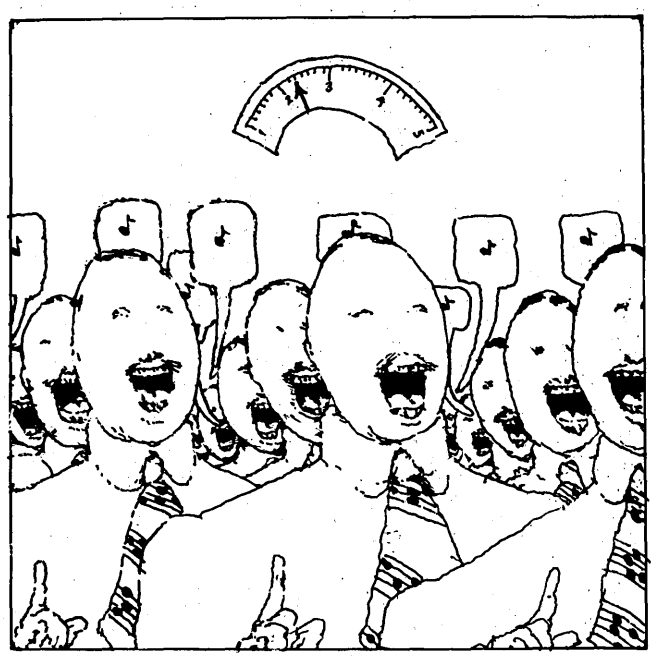
Moreover, there is no danger, as there might be with other management forms, that the vortical organization might get out of hand and inadvertantly produce something. The lines of command necessary for production simply do not exist.

Many areas of government have, or are approaching, a true vortical structure. The advance of vortical management in the private sector is, predictably slower—doubtless due to vestiges of 19th century, free-market competition remaining in that area. Nevertheless, it is the author's conviction that vortex management will be *the* management approach for the 21st century.

—Donald Kenny

COMPUTING A CAPPELLA

There is presently much interest in measuring programmer performance and productivity. The impetus comes from the rising cost of computing personnel compared to the falling cost of computing hardware. We believe a key ingredient in programmer productivity is morale. In fact, all computing people, whether student or teacher, whether amateur or professional, whether programmer, analyst, consultant or manager, are faced with a need to maintain an optimistic outlook despite repeated program



failures and schedule disruptions. We have found that a very valuable way to boost morale and build confidence is by singing. This is not a new concept—think of sea chantys used when bending to the oar—but how can it be applied to computing?

Different aged cohorts tend to be drawn to different genres of music and we would agree with the maxim *de gustibus non est disputandum*—there is no disputing about tastes. For

FORUM

younger programmers, the richest contemporary sources are pop and rock music constantly broadcast on both AM and FM. It is easy to draw on the subliminal knowledge of popular songs ("Top Forty" hits or "24K Gold" in the *patois* of the dispensers of this music), the melodies and lyrics of which become locked in the neural patterns of the brain. Middle and senior programmers and managers who are somewhat older may be better acquainted with the pop tunes from the 1940s and 1950s. In all cases, it is a simple and enjoyable step to provide computing-oriented lyrics.

(For ease of reference, most of the following examples are discussed in terms of the singer best known for popularizing the song, rather than the songwriter. Proper attention must be paid, of course, to the copyright owner of the original music. New lyrics can be copyrighted in their own right, but to use existing melodies, permission must be sought.)

Certain types of popular music are easier to adapt than others. Particularly suitable are songs from the earlier years of rock when tunes were simple and highly repetitive so that a message can be reinforced. Thus, Del Shannon's plaintive "Searching" can be rendered as the universally applicable "Debugging":

Debugging, I'm always debugging,
Hoping, some day I'll write,
A program, a program that works for me . . .

The Beach Boy's "Shutdown," describing a drag race, can be applied to such computer testing situations as "Benchmark":

It happened on the disks where I/O is fast,
Two megabyte machines running at full
blast . . .
Gotta' be cool now, tape mount here I come . . .

To inspire systems programmers, Jim Croce's "Time in a Bottle," about the elusiveness of time, could be rendered as "JCL in a Proclib" to describe an equally elusive entity. And what computer user could deny feeling a throb of pride when Paul Anka's "Having My Baby" is crooned as "Printing My Core Dump":

But it's printing my core dump,
What a lovely way of using up printer-time . . .

For generating general enthusiasm, it is hard to beat the Buddy Holly version of "Oh Boy":

All of my programs, all of my coding,
You'll sure like what you'll be seeing,
Oh, boy, Oh, boy . . .

There are also tunes that have stood the test of time somewhat longer. In these days of recycled paper, Bing Crosby's "White Christmas" might inspire "White Paper":

I'm dreaming of some white paper,
Just like the stock I used to use,
Where the perforations tay-er,
And wood chips are not there . . .

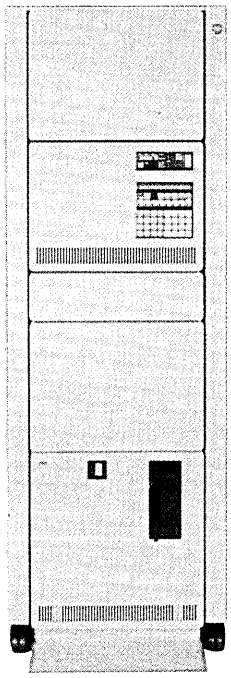
We could go on and on, but much of the interest in this technique is in locally developed "solutions" rather than external "software."

At present there is no statistical evidence to support our subjective observations about the effectiveness of such songs. However, we are conducting a factorial experiment with complete randomization to study all the relevant independent factors affecting programmer attitude: age of listener, salary of listener, decibel level of the music, size of the room in which the music is heard, number of times per day the music is played, genre of the music, quality of audio equipment used (including electronic synthesis), weather, time of day, season of the year, and state of the national economy. Of course all interactions as well as main effects will be studied for significance. It may take a decade to conduct the experiment, to await the arrival and departure of enough employees to achieve a satisfactorily large sample, but we hope to report the results in this same forum when the analysis is complete.

—James W. Cerny and Roscoe Gort

NO WAITING...

FOR DATUM'S SERIES/1 MAGNETIC TAPE SYSTEM



At Datum, we've been delivering Magnetic Tape Systems to IBM Series/1 users for more than one and one half years.

When you buy a Datum system you get more than just equipment. You get the bonus of Datum's committment to the Series/1. A controller, a Universal User's Adapter, support for all three software operating systems, Control Program Support (CPS), Realtime Programming System (RPS) and Event Driver Executive (EDX). And a proven magnetic tape drive (7 or 9 track, 200 NRZ through 1600 bpi P.E., 12.5 through 125 ips). Up to four drives can be interfaced to each system. And the security of knowing the whole Datum organization is behind you.

Ongoing Datum maintenance is available under the Datum maintenance agreement at a fixed monthly charge.

For more information about the Datum committment to your Series/1; call your local Datum office or write Datum, Inc., 1363 S. State College Blvd., Anaheim, California 92806 Telephone (714) 533-6333.

DIY TIMESHARE DELIVERY
IBM SOFTWARE COMPATIBLE

datum inc

CORPORATE HEADQUARTERS 1363 S. State College Blvd., Anaheim, CA 92806, Tel: 714/533-6333, TWX: 910/592-1289, Telex 68-5579 • **EUROPEAN HEADQUARTERS, DATUM (ELECTRONICS) LTD.,** DATUM House, Harlington, Middlesex, England, Tel: 01-897-0456, Telex: 935-398 • **DATUM SALES OFFICES,** CANADA, Willowdale, Ontario, Tel: 416/491-6960, Telex: 06-966857 EOR TOR: MOUNTAIN STATES, Denver Colorado 80232, Tel: 303/693-3414; EAST COAST, Mountainside, New Jersey 07092, Tel: 201/654-5590; MIDWEST, Des Plaines, Illinois 60018, Tel: 312/296-1064; SAN JOSE, San Jose, CA 95117, Tel: 408-249-5370; NEW ENGLAND, Framingham, MA 01701, Tel: 617/872-6911.

PPD 104

CIRCLE 2 ON READER CARD

A NEW PRODUCT. A NEW DIRECTION. A NEW COMMITMENT.

With each advancement of computer communications technology, a Teletype* product has been there to meet the need.

Today, the latest Teletype product to follow in this tradition of quality, performance, dependability and price is the new 4540 Series of data terminals.

Not merely a new product, the 4540 Series represents a new direction for Teletype Corporation. A change from a philosophy of product orientation to one focusing on user-applications.

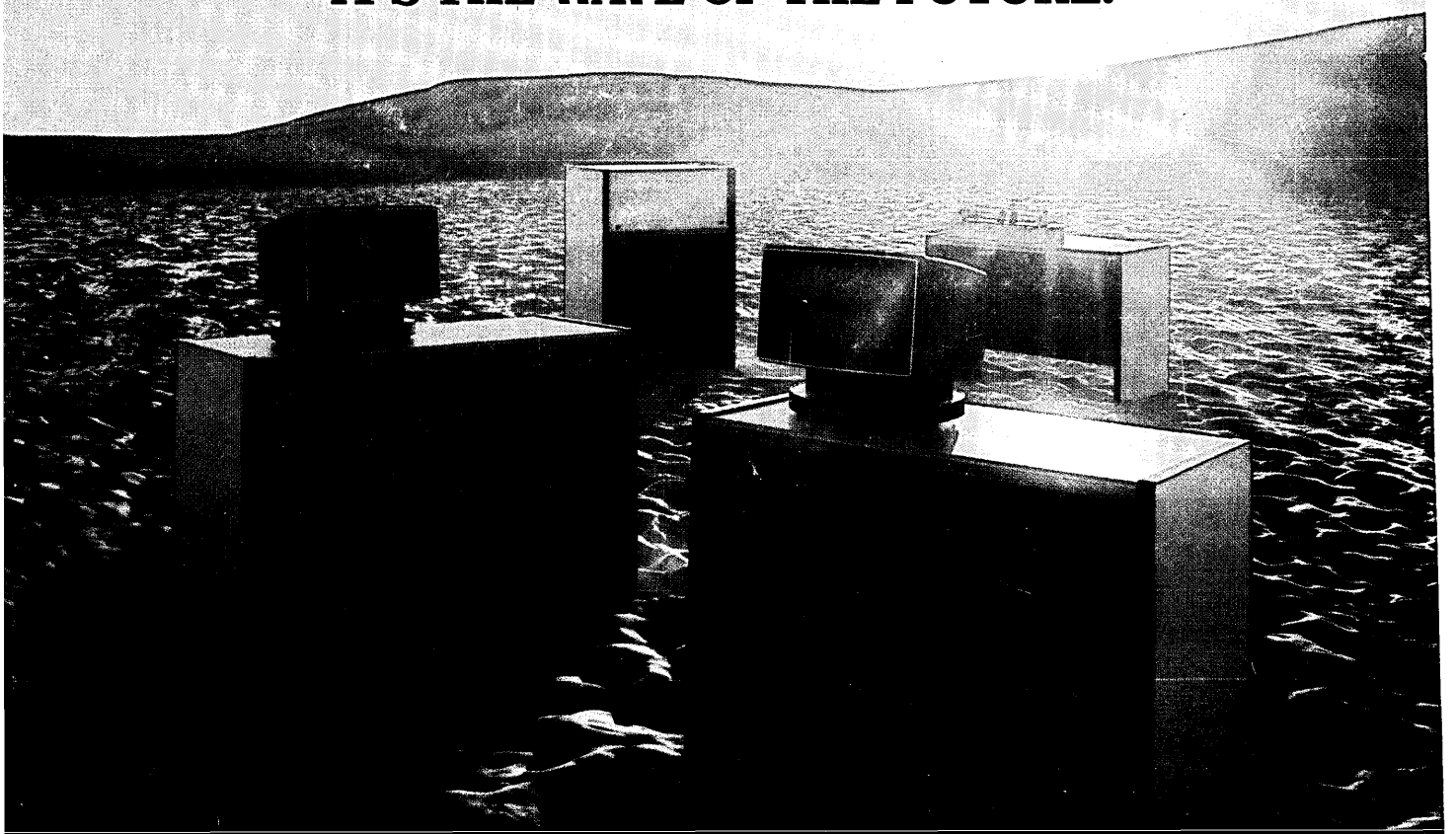
The 4540 Series also represents a new commitment. A commitment to provide a wide range of system solutions to meet user needs in computer-based systems. A commitment to customers before, during and after the sale.

The new 4540 is a keyboard-display based interactive series of synchronous terminals designed for inquiry/response, data entry and data retrieval. Operating at speeds ranging from 2400 to 9600 bps, it utilizes keyboard, display, character printer and line printer modules, as well as a controller with a simplified sub-set of software modules.

Since it truly is the state of the art in data terminals, the 4540 Series is available in several configurations compatible with the most popular standard host protocols for communications control. Initially, single-display and clustered configurations will be available, with the clustered version able to accommodate a maximum of 32 devices—including up to 8 printers. All 4540's can be coupled to multi-point or point-to-point private line facilities.

The new Teletype 4540 Series is the wave of the future. For the needs of today. Not only does it deliver the highest standards of quality and performance in the most common computer-based applications, it delivers these standards with true economy.

THE TELETYPE 4540 SERIES. IT'S THE WAVE OF THE FUTURE.



Teletype Corporation, 5555 Touhy Avenue, Dept. 3185, Skokie, IL 60076. Tel. (312) 982 2000.
*Teletype is a trademark and service mark of the Teletype Corporation.

CIRCLE 3 ON READER CARD