DATAMATION®
1957 77 1977
May

Also: data base integrity, dp taxes, Bell's end run, IBM vs. AT&T, cross-compilers, message systems, data for rent, and the IBM 3033...

KENNEDY

SERIES 5300 DISK DRIVES

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Series 5300 drives are fixed media, high performance units utilizing advanced Winchester disk technology.

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SEE MODEL 5300 AT NCC—BOOTH 1785

KENNEDY · QUALITY · COUNT ON IT

When CMC delivers...
there's something for everybody.

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The Workhorse. Throughput advantages that beat price-comparable systems by miles. Ideal for small and medium data entry needs. With sophisticated communications to reach your local and long-distance locations. The CMC 3/5 KeyProcessing® System will surprise you...while it tirelessly ups efficiency and speeds your data to where it's needed.

The Supersystem. To be honest, we didn't name it that. A leading computer magazine did—on its cover. Totally modular, it brings powerful distributed data entry to medium- and large-scale operations. Up to 64 local and remote keystations...or just a few. With concurrent operations, multi-volume disk storage, report writing languages, and a file retrieval bonus that tops off the package. It's our CMC 1800 KeyProcessing® System. But when you order it, just ask for The Supersystem.

The DREAM Machine. When your dream is a distributed processing system that does it all concurrently—Data Retrieval, Entry And Management. Everything you need to put processing power at the source—where information originates. Order the XL40 Distributed KeyProcessing® System. You'll get a microprocessor-based system for growth and flexibility. Plus expandable disk storage. A multi-task operating system. And COBOL Shared Access Method (COSAM) information retrieval. A dream that's yours for the asking.

We were the trail blazers in shared-processor data entry—the company that set the standards for the industry. Now CMC is a division of Pertec Computer Corporation, with over $100 million in revenues and solid financial resources. And we're still setting the standards wherever we go.

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☐ CMC 1800 Supersystem
☐ XL40 DREAM Machine
☐ All three systems

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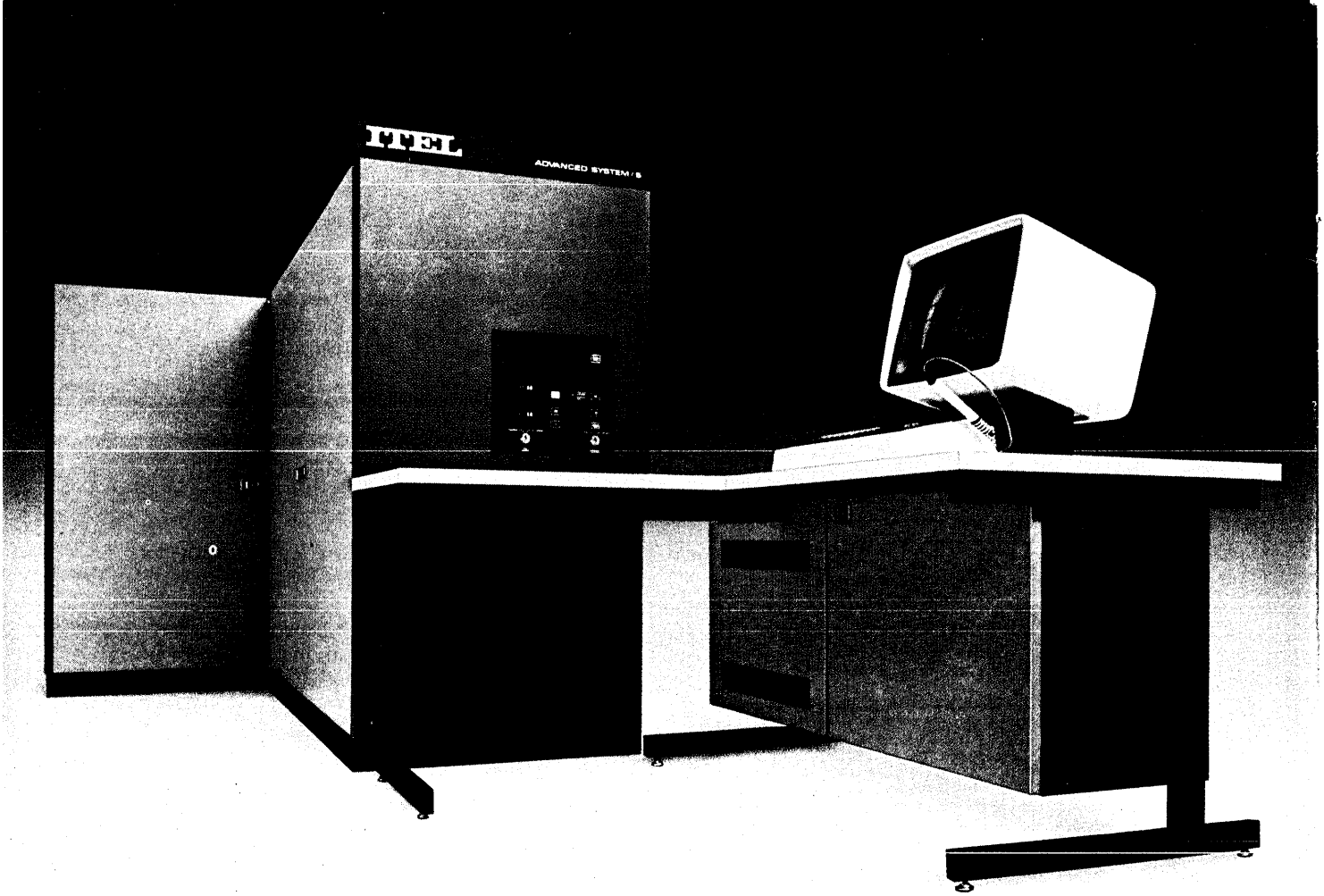
Clip coupon to your company letterhead and mail to CMC, P.O. Box 92300, Los Angeles, CA 90009.



ITEL'S ADVANCED SYSTEM.™ THE SENSIBLE ALTERNATIVE.

As a matter of fact, it's the only sensible alternative to the IBM-370. Because Itel's Advanced System not only gives you everything its IBM counterpart does (in some cases, even more), but gives it to you at enormous savings.

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San Francisco, California 94111
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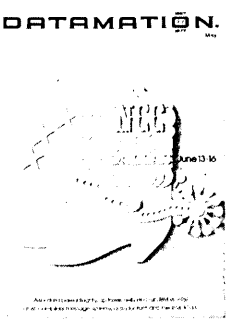
CIRCLE 55 ON READER CARD

DATAMATION®

1957 77 1977

VOLUME 23 NUMBER 5 This issue 135,970 MAY 1977

FEATURES



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MRI and SYSTEM 2000®

Your resourceful approach to Data Base Management.

Data is a resource—a resource which can provide a wealth of information for management as well as technical personnel—a resource which can aid and increase productivity throughout a company. MRI Systems Corporation is in the business of providing tools for tapping this resource through the facilities of effective data base management.

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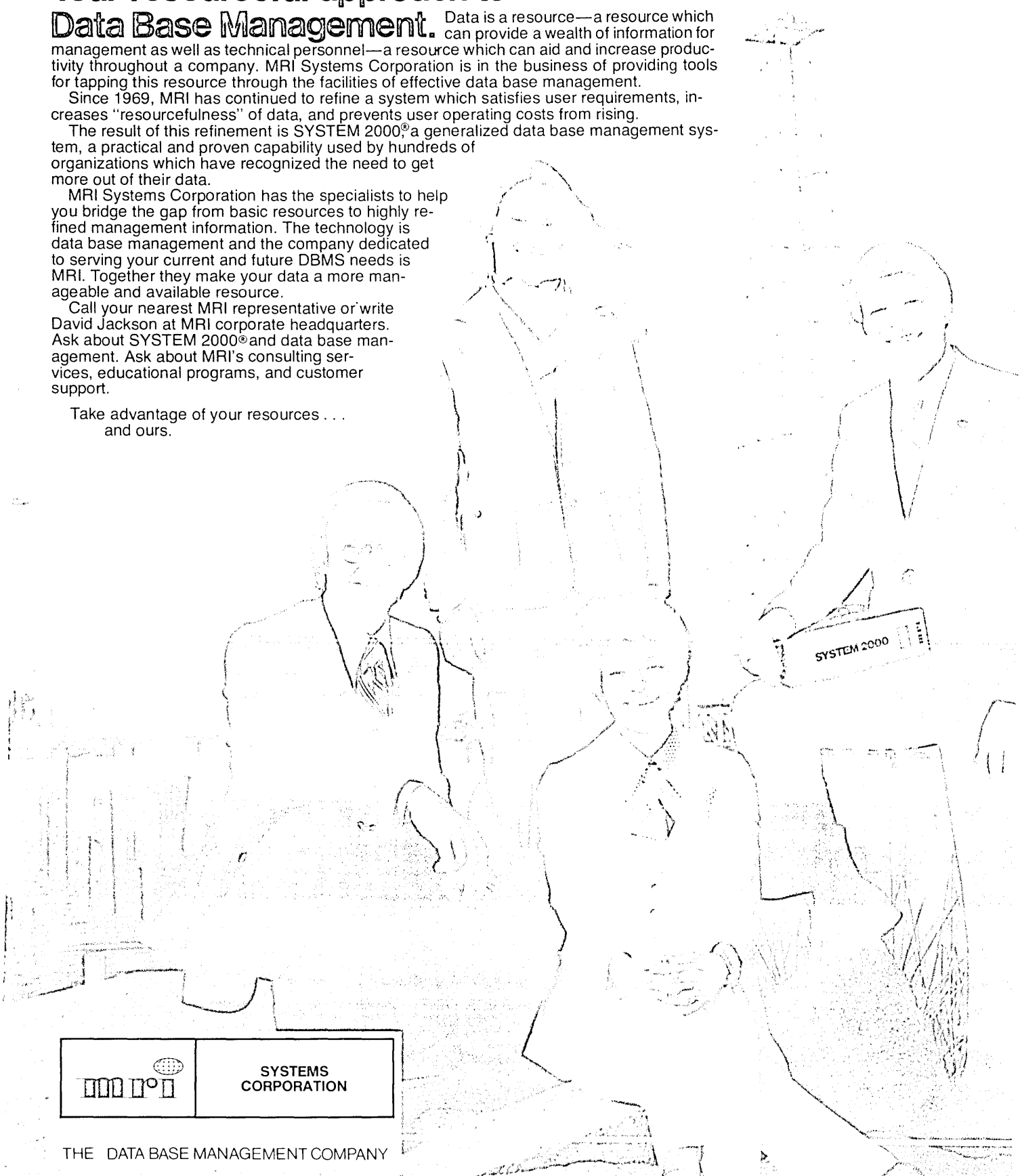
MRI Systems Corporation has the specialists to help you bridge the gap from basic resources to highly refined management information. The technology is data base management and the company dedicated to serving your current and future DBMS needs is MRI. Together they make your data a more manageable and available resource.

Call your nearest MRI representative or write David Jackson at MRI corporate headquarters. Ask about SYSTEM 2000® and data base management. Ask about MRI's consulting services, educational programs, and customer support.

Take advantage of your resources . . .
and ours.



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Multi-Tracking™ Is Jacquard's Foxy Way To Use Memory.

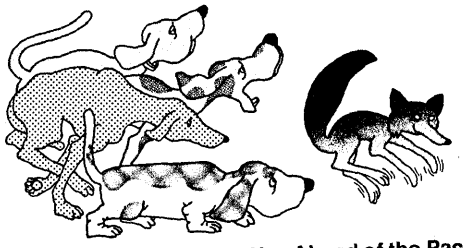
Jacquard's total systems manufacturing ability has allowed us to create made-for-each-other software/hardware that we call Multi-Tracking.

This combination of our powerful systems software and Videocomputer™ is designed so you can easily upgrade applications and plug in new stations, without adding costly memory. And unlike other stand-alone systems that are sized down versions of large business computers, our cost/power ratio and flexibility makes us the first true small business system.

Without Multi-Tracking a Small Business System Only Has a One Track Mind. The Videocomputer can be used for multiple applications and multiple tasks within those applications, simultaneously. And our unique systems software automatically generates re-entrant code, so that any number of users can access any program in memory.

Other systems offer re-entrant code as applications software. But you'll pay for redesigning it when you upgrade, because they don't have our total system power.

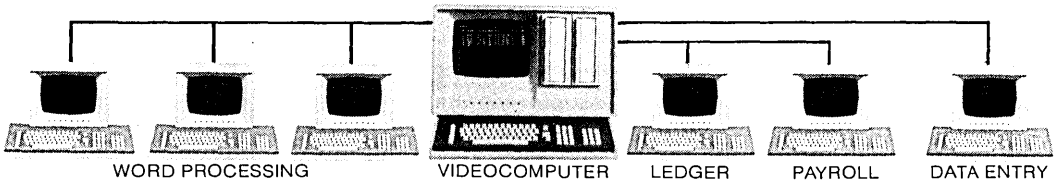
Hardware is only part of the story. Judging a small business system by its hardware alone is much like comparing the fox to the hound. Both are cousins and have the identical inventory of parts. But the fox has gained a superior reputation for keeping ahead of the pack. How? His programming is superior. So if you're joining the hunt, be careful! You could get badly bitten.



Re-entrant Code Keeps You Ahead of the Pack. Built into our systems software is a feature which automatically generates re-entrant code for any application package in memory.

DISTRIBUTOR INFORMATION AND DEMOS AT NCC BOOTH #1195 AND IWPA CONFERENCE BOOTHS #611-613

A typical small business system showing Jacquard's Multi-Tracking capabilities. Because the Jacquard system can keep track of its terminals, you have total flexibility in a multiple user/application configuration. Here you see six terminals sharing three applications concurrently, without additional copies of any program being added to memory.



Our time sharing and time slicing capabilities simulate full power/direct access to the computer. So each operator receives instantaneous answers, and throughput is enhanced.

That's how Jacquard's Multi-Tracking keeps you ahead of the one-track pack. Simply and economically.

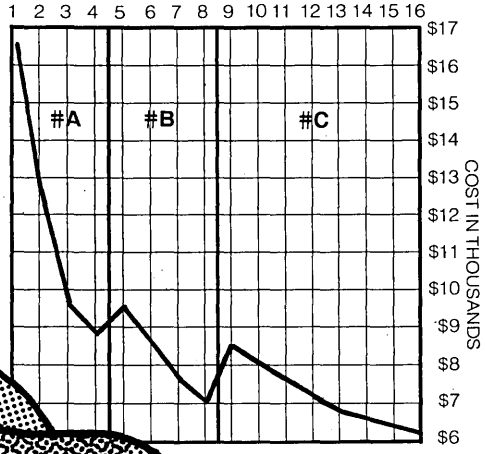
The Bigger You Get The Better We Look. In a multi-station situation the average cost per work station drops for either word or data processing configurations.

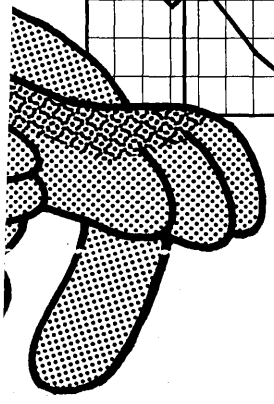
#A: Floppy disk systems with one printer and word processing software.

#B: 12 MB disk systems with 2 printers and word processing software.

#C: 24 MB disk systems, 2 high quality printers, one fast printer (rough drafts) and word processing software.

NUMBER OF J105 WORK STATIONS





Our Business Software Package Complements the System's Unique Design. Our integrated set of accounting programs include General Ledger, Accounts Receivable, Accounts Payable and Payroll. They are designed so that a multiple terminal installation can use information from different companies, different accounting periods and different applications concurrently.

The system's editing capabilities assure you of maximum data accuracy. The program's financial reports can be varied to content and format without the operator needing special technical abilities. And because the programs are interactive and conversational with step-by-step operating instructions, they are easy to use.

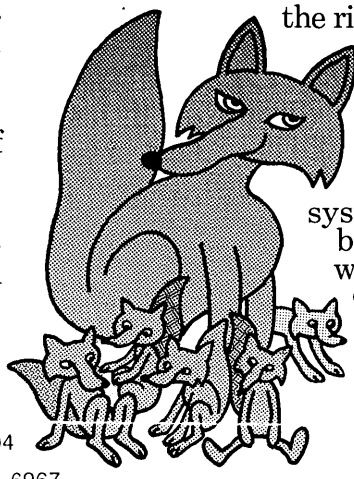
Word Processing. For the price of eight simple automatic typewriters, you can have our system with eight terminals. The word processing system allows users to draft, store, recall, modify, append, edit, format and print any type of business correspondence or documents from interoffice memos to high volume direct mail campaigns. You also can use it for complex tasks such as preparing address lists which can be sorted by up to 20 different criteria.

Outfoxing Costs. The Videocomputer is priced low enough to be used as an intelligent terminal. Yet it's powerful enough to be used in demanding distributed processing situations.

Another nice feature is that the system is a totally self-contained unit. You don't need additional office furniture.

SPECIFICATION CHART
J100 Processor: 16 bit word, up to 128 K bytes, DMA, Power Fail Auto Restart, Real Time Clock, 1920 ch CRT and Keyboard, built-in Floppy Disks.
Peripherals: Up to 30 satellite CRTs, 6-12 Megabyte Cartridge Disks and 80 Megabyte Drives, 800 and 1600 BPI Tape Drives, Multiple Printers: 30 cps to 900 lpm, Async/Bisync communications
All software supported, available now.

End Your Hunt. If you've been searching for a system to handle small business functions, word processing, distributed processing or data entry, write Jacquard for information or a demonstration. You're on the right track.



The system your business won't outgrow.

1639 11th Street Santa Monica, Ca. 90404
Phone (213) 393-9784 TWX (910) 343-6967

Jacquard Systems

Looking Back in DATAMATION.

On our 20th anniversary

"A 24-bit computer for only $27,400?"

From an ad from a then up-and-coming Dallas computer co., Scientific Control Corp., a Penn Central subsidiary.

May-June 1958

Companies: Philco Corp. and Leeds & Northrop Co. launched a shared cost program to develop a digital computer which L & N would incorporate in industrial control systems and Philco would offer on the open market.

Military Use: The first computer ever to operate in a U.S. naval shipyard was installed at Mare Island Naval Shipyard, Vallejo, Calif., to assist yard officials in nearly every phase of their complex, $80,000,000 per year operation.

Transistors: What was reported to be the smallest commercially produced transistor, the OC 57, came off production runs at the Zurich factory of Swiss Philips AG. It was the first transistor to be completely developed and produced in Switzerland, and was the work of engineer Franz Winiger. Its size—5/-32 in. in length and ⅛ in. in diameter.

New Systems: NCR introduced its National 304 Electronic Data Processing System which it described as the first wholly business-designed large scale system featuring all solid state circuitry. A minimum configuration of the system was priced at $800,000. Its features included: a "business command structure," allowing programmers to write instructions in simplified language; automatic checking throughout the entire system to ensure accurate transmissions; a universal converter permitting all input/output functions to be time-shared with the processor; high speed input and output units; full transistorization; plug-in card circuitry; high speed magnetic core memory; and printed circuitry.

Programmers: System Development Corp., Santa Monica, Calif., was reported to employ more programmers than any other firm in the country. The number—800.

Conferences: The 6th Annual Western Joint Computer Conference drew a record crowd of "close to 2,000" to Los Angeles in April. An increased emphasis on peripheral equipment was noted and deemed "a sign that the industry is maturing."

May 1967

Time-Sharing: General Electric removed its commercial time-sharing operation, said to be the most profitable in the business ($2 million and 400 customers in 18 months) out from under its Missiles and Space Div. to its Information Systems Div., leading key employees to migrate and one employee to comment, "GE has killed the golden goose in favor of chicken soup."

Management Information Systems: Writing on management information systems, Robert V. Head, then manager of information technology at Computer Sciences Corp. and now a dp consultant to the federal government, noted: "In seeking to chart a course of action, management men sometimes become understandably confused about just what their systems people are trying to do in the field of information technolgy."

R. HEAD

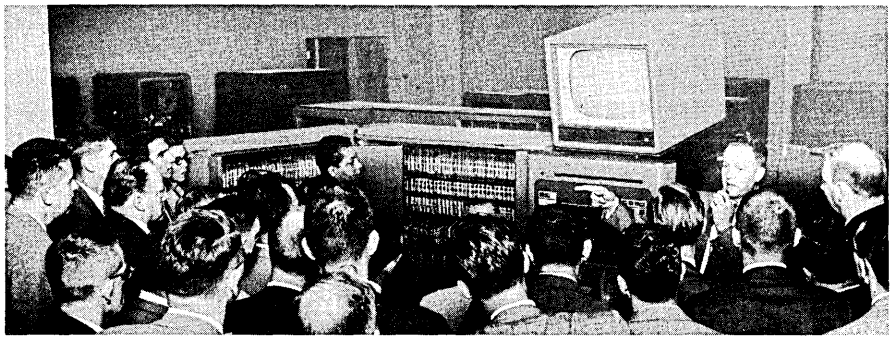
IBM: IBM stopped selling its 360/91 but said it would fill all contract orders and would install the first machine that summer. Order totals were not disclosed but at least 18 were indicated.

Show Business: Computers invaded show business with establishment by Computer Sciences Corp., El Segundo, Calif., of a subsidiary called Computicket which planned to provide an on-line seat reservation and ticket issuing system for sports and entertainment events.

Integrated Circuits: General Instrument Corp. began production of integrated circuits described as "the most complex ever produced commercially." The circuits were made with a process the company called MTO (Metal Thick Oxide Silicon) and were said to allow the construction of electronic systems using less than one-fiftieth the number of devices needed with (then) conventional microelectronic circuitry.

Computers and the FBI: Donald R. Roderick, special agent and program supervisor of the then-new National Crime Information Center (NCIC) told a Chicago symposium the FBI hoped to have terminals eventually in every state and in 25 major cities, and to have ties with other federal law enforcement agencies.

International: The French government seal finally was embossed on proposals for a Plan Calcul through which state aid was to be pumped into the computer industry over a five year period. Some $100 million was to go to Compagnie Internationale d'Informatique (CII) which merged the operations of three firms and was offering small to medium scale systems. ❋



A group of Western Joint Computer Conference attendees toured the Computing Center at Northrop Div. of Northrop Aircraft for a briefing on the new IBM 704.

Now! A Non-Impact 240 cps Printer

... and at the competitive price of $1595 (quantity 1)

Presenting the Series 200 from Scope Data, a CRT hard copy printer = and data communications terminal = that allows you to modernize your printer requirements.

Speed = up to 240 cps ...

Quiet = non-impact, low voltage electrosensitive imaging technology ...

Field-proven reliability = over 16 million hours of actual field operation to date ...

Serviceability = unique modular circuitry lowers repair time and maintenance costs ...

... and because of its attractive design and lightweight, compact construction, the near silent 200 printer is ideal for any office environment.

We also offer KSR Models for your input/output needs. Both our I/O and KSR models offer up to 1200 BAUD data transmission rates.

The Series 200 is plug-to-plug compatible with all popular CRTs such as those produced by ADDS, Burroughs, Beehive, Hazeltine and many others. Our one standard price provides you with your choice of serial, parallel or current loop interface as well as 64 characters of incoming data buffering.

OEM prices go below $1200 in large quantities. Lease terms and nationwide service available.

Investigate the revolutionary Series 200 from Scope Data = send today for our new brochure. Scope Data, Incorporated, 3728 Silver Star Road, Orlando, FL 32808, (305) 298-0500.

SCOPE DATA

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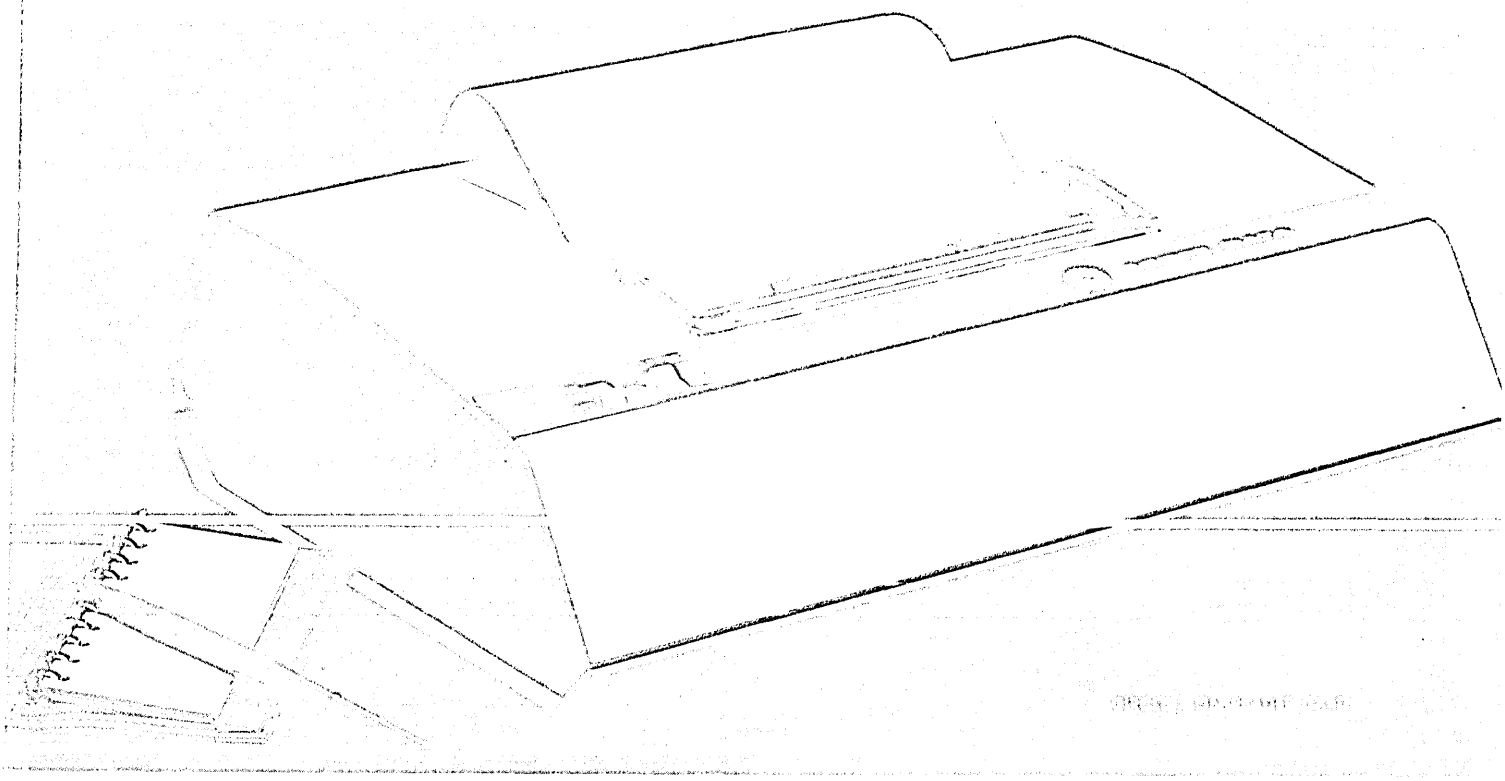
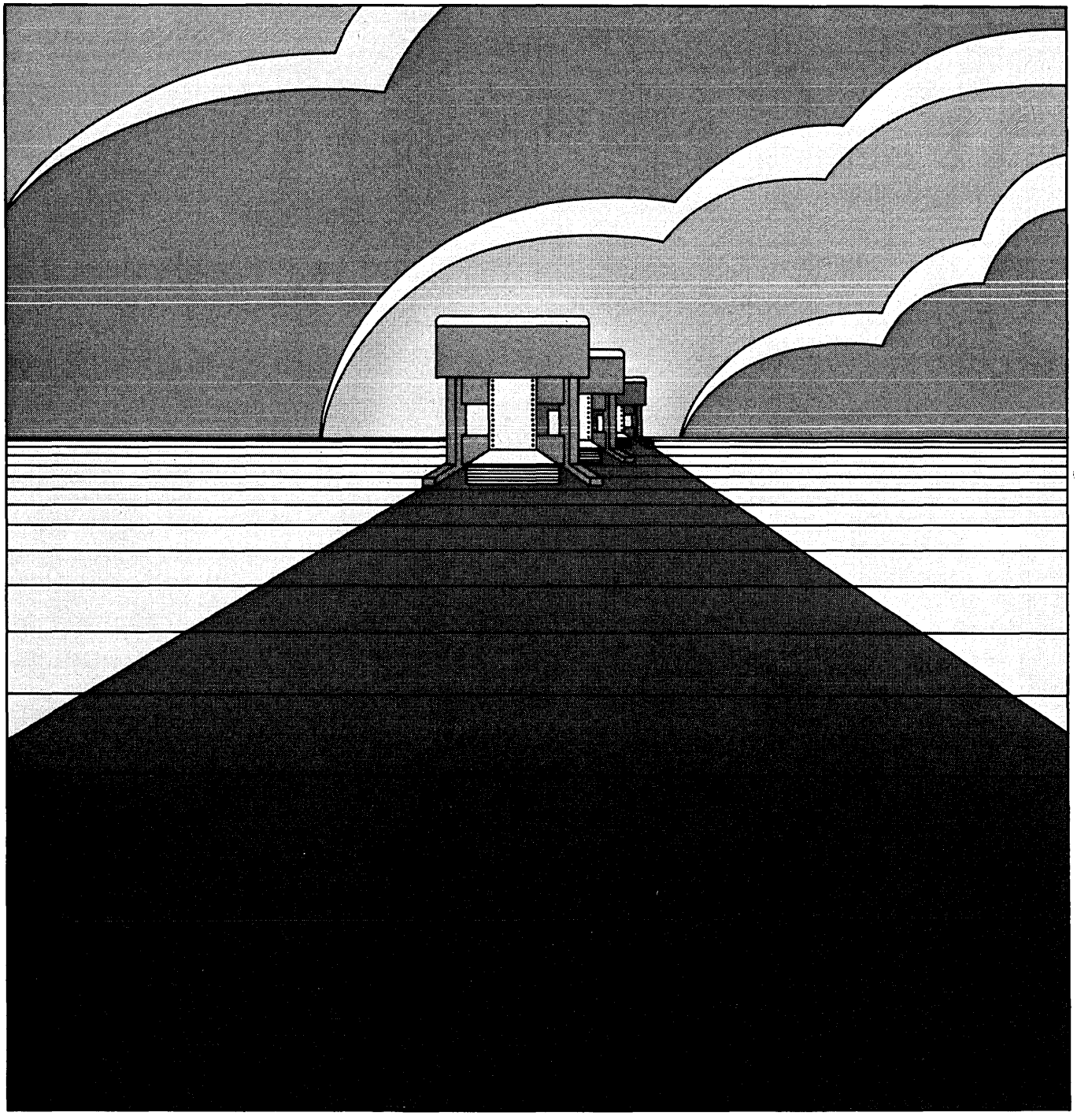


DATAPRODUCTS FOR A NEW ERA



SETS THE STAGE IN PRINTERS.

The date: June 13 to 16, 1977.
The place: the National Computer Conference.
The place to be at NCC: Booth #1273.
The Printer Company's booth.

When something new happens in printers, it happens at Dataproducts.

But don't take our word for it, come to booth #1273 and see for yourself.

This year, we will be announcing and exhibiting some exciting new printers at exciting prices.

They make use of the latest technologies to meet today's needs.

They are high-quality, high-dependability, low-cost machines.

And since they're from Dataproducts, you can be sure that they're reliable.

We have a complete line of commercial and military printers, from 300 LPM to 1500 LPM.

And we're expanding our line to meet the growing needs of OEMs and their customers.

Our printers are performing the world over in every type of application, from remote terminals and small business systems, to large general purpose computer systems.

To better serve our world-wide market, we have manufacturing facilities in the U. S. and in Europe.

A commitment to R&D, a determination to design and produce highest-quality printers, and a dedication to customer satisfaction, have helped make Dataproducts The Printer Company.

If you want to know what's new in printers, the place to be is booth #1273.

And if you can't make it to the show, call or write us.

We'll be more than happy to tell you how Dataproducts' New Era in Printers can expand your horizons.

Dataproducts

THE PRINTER COMPANY

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A Xerox expert can analyze your business objectives and needs because more than likely, he faced situations like yours in other businesses. He understands things like inventory levels, profit analysis, cash management, production scheduling, budgets and a lot more.

He can install any or all of our on-line integrated business applications. Like order processing, inventory management, financial reporting, MRP, labor efficiency, or job cost. And he'll work with you before, during and after installation, so nothing can come up that both of you won't be able to handle.

If you're interested in getting all the advantages of Data Processing without the capital investment or risks of buying your own computer, contact Bob Goodwin at (213) 390-3461, collect. Or write him at 5310 Beethoven Street, Los Angeles, California 90066. He'll arrange a free visit from our expert as soon as possible.

Because, once you get an expert from Xerox, it won't be long before you'll be sharing his expertise.

Xerox Computer Services

XEROX

YOU'VE GOT THE REMOTE, WE'VE GOT YOUR GRAPHICS.

Gould's new Remote Graphics Processor gives you the speed, image clarity, ease of operation and cost effective graphics of an electrostatic plotter.

The RGP interfaces to most remote job entry and remote batch terminals, or can be operated stand-alone through a modem. With appropriate Gould host computer software, the RGP processes highly encoded character data which can be transmitted by your mainframe's standard spooling software.

Gould software is available for IBM 360/370, Univac 1100 Series and Control Data 6000, 7000 or Cyber 70 Series.

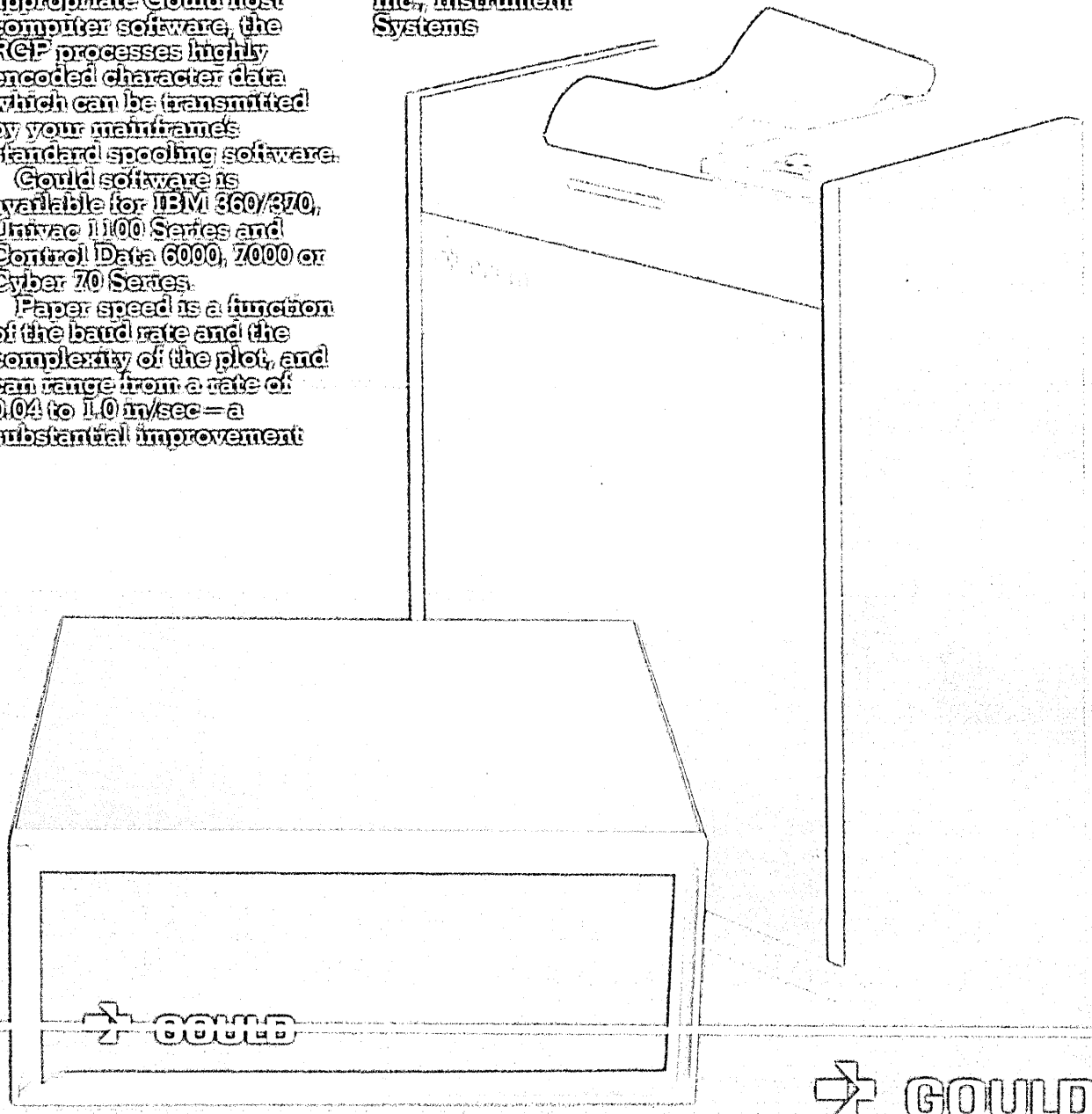
Paper speed is a function of the baud rate and the complexity of the plot, and can range from a rate of 0.04 to 1.0 m/sec — a substantial improvement over pen plotters.

If you're already into remote graphics, you owe it to yourself to examine the RGP's potential. And if you're not now involved in graphics, let's talk anyway. Because you might be soon.

For more information on Gould's remote graphic capability, contact Gould Inc., Instrument Systems Division, 3631 Perkins Avenue, Cleveland, Ohio 44114. Telephone (216) 361-3315.

Or Gould Advance, Raynham Rd., Bishop Stortford, Herts, Great Britain.

For brochure call toll-free (800) 325-6400 Ext. 77. In Missouri (800) 342-6600.



GOULD
The product development company

CIRCLE 30 ON READER CARD

Quick, which small computer has the fastest COBOL?

Wrong.

It's the Data General commercial ECLIPSE. By a wide margin. And you can quickly verify that fact by asking any other company to run benchmarks against our ECLIPSE COBOL. Then watch their expression.

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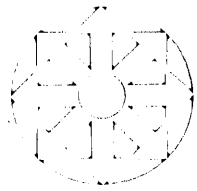


LOOK AHEAD

IF IT WORKED IN FLORIDA, WHY NOT NEW YORK?

Bob Sherin, president of Nova Computing, Miami, who single-handedly won a favorable decision in Florida on the subjectability of software to sales tax (March, p. 15) under the Administrative Procedures Act, believes the same methods can be applied elsewhere, and his next target is New York. David Campbell, chairman of the New York State Sales Tax Committee of the Assn. of Data Processing Service Organizations (ADAPSO), whose company, Computer Task Group Inc., is subject to a retroactive sales tax assessment by the state of New York (p. 155), has asked Sherin for a written report on the applicability of the APA to the New York situation.

Sherin feels it is "more applicable in New York than it was in Florida." He feels "New York wants us to participate in an administrative action." He was due to go to Albany in late April to meet with New York State tax people and he was looking for a New York company he could represent under the APA, an act which allows an individual to argue his own case at the administrative level in an Administrative Court. Sherin continues to believe the APA is "the only way to go" in fighting software taxes.

A MINI AT MICRO PRICES?

Computer Automation, Irvine, Calif., says it is "lowering the ceiling on microcomputers." The company next month, at the National Computer Conference in Dallas, will introduce a "new generation" minicomputer family. It said the family's highlight is the LSI 4/10, a full 16-bit minicomputer on a board priced at $645 for single units, with discounts available to volume purchasers. This, said CA president David Methvin, is "a full 16-bit minicomputer at microcomputer prices."

DICK WATSON HEIRS BATTLE OVER TAXES

On July 19, 1974, as Arthur K. Watson lay comatose with a fractured skull suffered in a fall down the stairs of his New Canaan, Conn., home the previous evening, his attorney George J. Gillespie III of Cravath, Swaine & Moore and Thomas J. Watson Jr., former IBM chairman, purchased $5 million worth of "flower bonds," securities issued by the Treasury Dept. which for complicated tax reasons are worth far more after the owner is dead that when he is alive. That purchase was followed by an additional $3 million bond acquisition made on July 22, four days before Arthur Watson died of his injuries at 55.

Ever since, the Treasury and Arthur Watson's heirs have been locked in a legal struggle with the Watsons maintaining that the full $8 million face value of the bonds should be credited to the deceased's estate taxes. Treasury, however, is arguing that since Watson was unconscious and close to death at the time the bonds were purchased for him, he wasn't really their owner. Rather, the purchase was a ploy to circumvent estate taxes--one that ultimately would cost the public several million dollars. Now the legal fight is reportedly about to come to resolution in the federal courts. If the case is dismissed, Treasury wins. If there's a rejudgment, the Watson heirs will save millions.

THE SCRAMBLE TO INTERFACE WITH X.25

The new rallying cry in the data communications world is X.25. Ever since it became a standard several months ago, this higher level communications protocol for linking computers and terminals to packet networks has drummed up support from the likes of IBM and ITT. Also backing the standard are a host of terminal and mini makers, which are scrambling to come out with X.25 interface gear. Raytheon, one of the latest companies to junp on the X.25 bandwagon, propitiously announced its X.25 wares at the Interface Data Communications show in Atlanta in March.

Hewlett-Packard as well as Prime Computer Inc. also are anxious to take the X.25 plunge, which sources predict will come sometime this year. Terminal manufacturer Incoterm climbed on board the X.25 bandwagon too. The move was prompted by a California bank which specified the interface standard in its contract with the company. Packet pushers see this as evidence of a growing trend among large users who want this type of data communications capability. (Recently, Chrysler and Xerox opted for systems with X.25 tie-ins.) But the real impetus behind the X.25 protocol

drive, speculates one source, comes from IBM. "IBM World Trade's announcement in March," he maintains, "accelerated the whole process. All of a sudden that made people stand up and take notice."

NCC CHAIRMAN NOW RUNS A COMPUTER STORE

Not only is she the first woman chairman of the National Computer Conference next month in Dallas (p. 180), but Dr. Portia Isaacson also is the first computer store operator to hold the title. Dr. Isaacson next June 1 will quit her post as assistant professor of mathematical sciences at the Univ. of Texas at Dallas to join her husband, David Wilson, in running Dallas' first computer store, The Micro Store, which sells hobby computers of six manufacturers, plus peripherals, books, and circuitry, and now is negotiating an international distribution network with South African and French sources.

The store, which she calls a supermarket, has been selling some 30 computers a month. It was formed a year ago next June 19 and for nearly nine months was Dallas' only computer store. Dr. Isaacson says startups today in that field aren't easy. "All of our revenues go back into the store, and we earn our income by consulting." They started with $60,000 of their savings, but today, Dr. Isaacson says, it would cost about $100,000 and banks aren't interested in lending money to stores where the margins allowed by vendors are a low 25% to 30%. Besides, you now must offer a lot of software development. Developing software is why Dr. Isaacson is devoting her full time to the store, whose staff of five mostly have MS' and Ph.D's.

FRANCE EYES ELECTRONIC MAIL ALTERNATIVES

The U. S. isn't the only country looking into electronic mail. France, which at long last has decided to beef up its telephone system, is also eyeing electronic mail alternatives. But unlike the U. S., France seems more than willing to put its money where its mouth is. A request for proposal (RFP) calling for 1.1 million electronic mail machines, valued at $500 million, was released by the French postal telephone and telegraph (PTT) authority in March.

Anxious to get the system pieced together, five of the bigger French electronic companies began scouring the U. S. last month, talking to facsimile, components, and modem outfits, as well as other likely equipment suppliers. Working on the first stage of this three phase, ten-year project, the technologically weak French are looking for technology to buy or license from U. S. firms to build prototype models. The Europeans apparently received a warm reception, which came as no surprise to one industry insider who believes the project will spawn a fresh and lucrative market in the U. S. for electronic mail terminals, as well as store and forward switches and memory buffering gear.

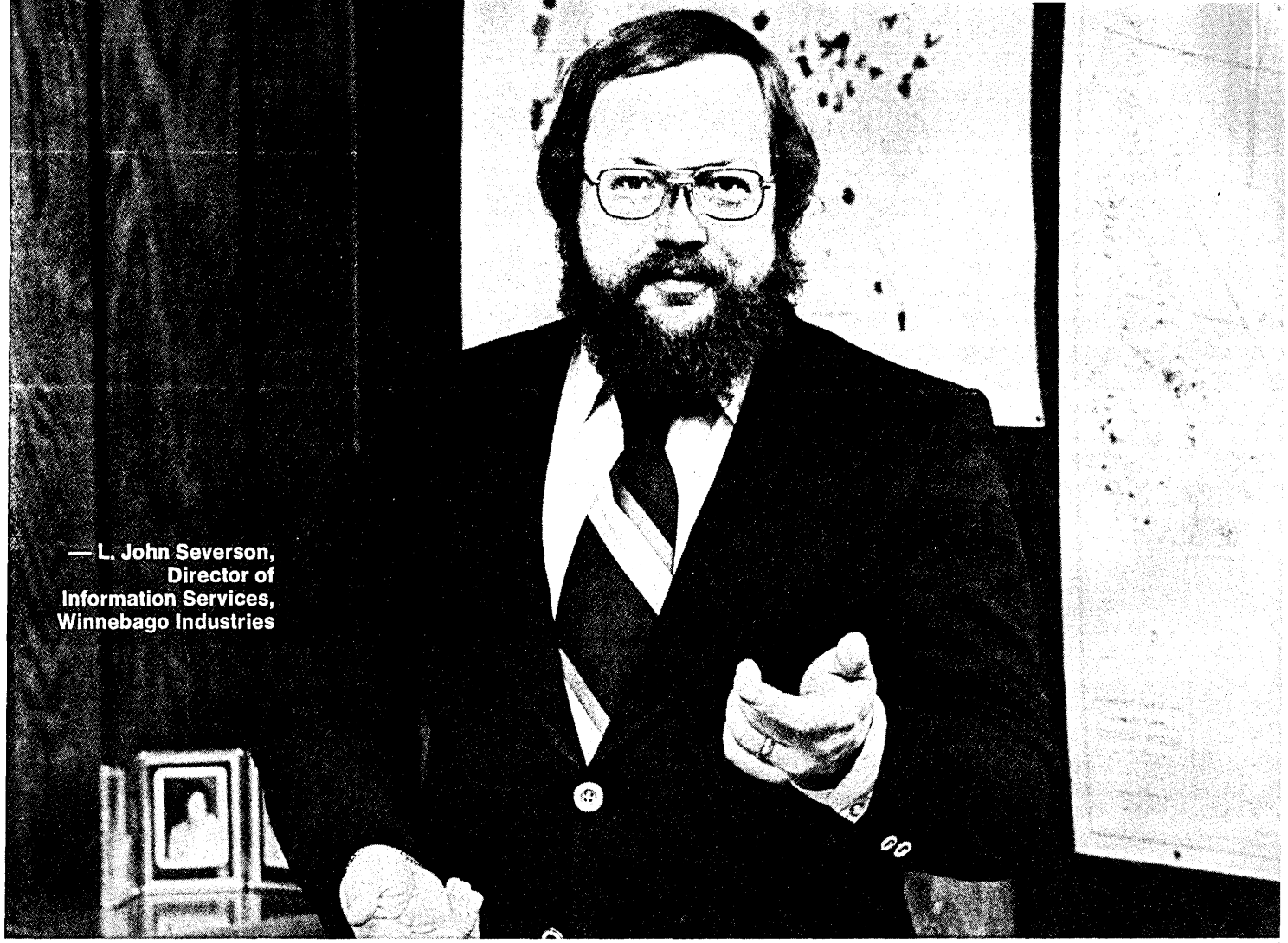
AFIPS TO CONSIDER A MONTHLY MAGAZINE

Publication of a monthly magazine, to be called Abacus, is under study at the American Federation of Information Processing Societies (AFIPS). A mockup of the magazine and the results of a $50,000 feasibility study on whether such a project would be a financial success is to be presented in mid-June to the board of AFIPS, a federation of 15 computer-related societies representing 120,000 persons.

The publication would be a voice for social and technical questions the huge computer federation feels it should address, but wouldn't be like computer industry trade magazines, a spokesman says. "We're thinking more of a magazine resembling the Scientific American," a monthly publication whose authors write on a variety of scientific subjects.

It's understood the idea faces tough opposition from some of the AFIPS constituent societies, such as the IEEE Computer Group, that also publish for their members. Although the publications are for the most part tiny and money losers, the societies guard them jealously. The Association for Computing Machinery (ACM), though, believes it's a good idea. "We're very supportive of the project, and you can quote me," says Dr. Herbert Grosch, president of ACM. In fact, says Grosch, if AFIPS doesn't go along with its Abacus, ACM will revive its proposed Journal for All Members, a general interest publication that would supplement the society's technical publications.

(Continued on page 266)



— L. John Severson,
Director of
Information Services,
Winnebago Industries

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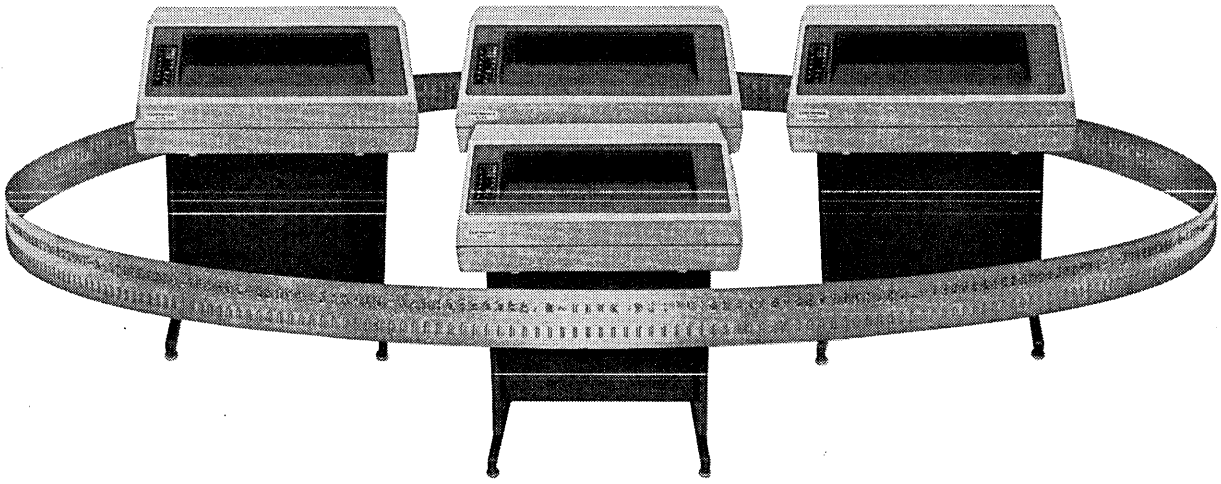

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letters

Jar · gon (jar'gən) n.

In "Six Future Strategies for IBM" (February, p. 63), Marvin Silverman states: "Developments such as their joint venture into Satellite Business Systems, Inc. seem to leverage these strategies, with ultimate success hinging on government regulatory agencies as well as computer technology." Leverage? I leverage, you leverage, he or she leverages, we all leverage together. It seems that DATAMATION likes to jargon its readers.

NEAL PARIS
Duke University
Durham, North Carolina

Source reference

In our article, "Our Changing Industry" (January), we neglected to reference Booz-Allen and Hamilton as the source of the conceptual sketch of the satellite communications-oriented information system of the future. I wish to rectify this error, and also thank Booz-Allen for sharing their perspective of the future.

E. W. PULLEN
Gnostic Concepts
Menlo Park, California

Not more but better

Programmers respond to the method selected for their evaluation. The use of LOC can only result in code which is complex, voluminous, redundant, thoughtless, and verbose. We do not need *more* code, we need *better* code. The choice of LOC, largely because the data is easy to collect and requires little intelligence to apply, is an abdication of responsibility by programming management, whose job it is to see that programmers are evaluated upon criteria such as:

- Was it ready on schedule?
- Did it work?
- Is it straightforward (i.e. can someone else read it?)
- Is it flexible? (or must it be totally rewritten to accommodate a minor change?)
- Is it easy to use?

It is true that these are more difficult questions than "How long is it?" but until more people start asking them, we will have to settle for OS/360-level quality. I, for one, think *that* is a rather dismal prospect.

D. F. STEVENS
Lawrence Berkeley Laboratory
Univ. of California
Berkeley, California

Flexibly compatible system

IPL's System/370-compatible computer referred to in your February issue (p. 142) has not yet been announced to the public by Control Data Corp. Thus I am not free to discuss its specifications. I would, however, like to point out one inaccuracy in your article.

You stated that the computer "will be cheaper, much easier to build, but much harder to change." One of my primary design goals was to make the machine very flexible and easy to change in order to keep up with possible IBM product enhancements and extensions to the 370 architecture. I achieved this by using a very simple and modular hardware design together with a writeable control storage loaded with a floppy disc. For example, should IBM in the future define some new 370 instructions, they could be incorporated in our machine simply by changing floppy discs.

For years I was a design engineer in IBM's large systems group, and I understand full well the evolutionary nature of the System/370.

S. J. IPPOLITO
President
IPL Systems, Inc.
Bedford, Massachusetts

Counting out lines of code

In "A Working Measure of Productivity" (February), Mr. Johnson makes valid points about the value of LOC (lines of code) counts in software development. However, I do not think that LOC ties in as closely with productivity as the article implies. Two points should be made. First, LOC is at best only vaguely a measure of productivity. If we view productivity as a ratio of the value of output to the cost of input, we see that increasing LOC rates can actually affect both the value and the costs in either direction, and that the ratio is extremely complex. Dr. Brooks' book *The Mythical Man-Month* is an important book precisely because he deals effectively with the complexity, even the contradictions, of the discipline.

The second point is that dwelling on LOC does not begin to address the problem of how productivity is to be increased. In other fields of endeavor, increased productivity has come about by the elimination of those processes which we are most likely to measure with a stopwatch. Significant progress has often followed a better understanding of broad objectives, and has often been implemented by finding ways to handle larger or more complex components. If this holds in software production, progress will most likely emanate from a conceptual level away from code production, and will result in making LOC an irrelevant parameter. Broader objectives begin to clarify when one describes the computing systems' universe in terms of formal languages and its procedures in terms of a structured language. I believe that the key to productivity lies at this level.

ORVILLE GOERING
Systems Consultant
Silver Spring, Maryland

Mr. Johnson responds: Mr. Goering raises two valid issues which deserve clarification. First, it is agreed that the "values" or "qualities" of a programming project are the ideal theoretical productivity measure. However, in practice, no known quantitative measure of value exists.

The ultimate value of a dp system is the resulting increase in corporate profit; but only in rare situations could the impact be isolated from other factors. Assuming the relationship to profits is infeasible, other metrics can be explored. Those commonly referenced are: 1) number of abends (reliability), 2) time required to mix (maintainability), 3) user benefits, 4) systems security, and 5) program changes required (design stability). Some combination of these factors results in a measure of value. Because value is subjective, it is not an appropriate base for project comparison.

Choosing to concentrate on the best quantitative available data (LOC) the article intentionally avoids the difficult task of defining value or quality.

The second point addressed, ignoring techniques to improve productivity, is also a valid observation. Increasing productivity is a combination of many factors such as organization, motivation, training, structured technology, etc. Granted, the issue is important, but it is outside the scope of the article. In summary, "A Working Measure of Productivity" had two main purposes: 1) to clarify the meaning of lines of code LOC, and 2) illustrate the value of using lines of code in project planning at a macro level.

Distributed system

In response to Harold Feinleib's letter (February, p. 11), I am afraid he has missed a major point of a distributed system. The technique by which a process, such as a financial planning package, is placed on a network to be executed by a remote node is only one of many of the characteristics of a distributed system. To design a distributed system with only this characteristic in mind would be disastrous, since it implies that all network processors are homogeneous.

A truly sophisticated (well designed?) distributed system should also allow the user to place data on the network for execution by a remote processor. This greatly enhances the capabilities of a distributed system, since the system can now be comprised of nonhomogeneous processor. The user may:

1) place data on the network to be executed by a remote processor;
2) place data on the network for output by a remote processor

letters

with an input/output device;
3) access a remote data base;
4) initiate program execution on a remote processor for data acquisition or process control.

With such a distributed system, Mr. Feinleib would be able to access his financial planning package and have the output routed to a suitable device (plotter). He may have to wait for the output to be mailed or delivered, but with a centralized system the same problems occur.

Mr. Feinleib's statement that ". . . the quality and diversity of the software that a given mini installation can maintain will always be a problem . . ." is archaic considering the sophistication of current minicomputer software. Perhaps the problem is the lack of user support in the mini shop since most mini installations are not blessed with the "user services" group characteristic in a mainframe shop. But this is a management decision and not a characteristic of minicomputers or distributed systems.

GERRY A. BROWN
Univ. of California
Santa Barbara, California

RAMIS experience

Having just completed the development of a RAMIS system to maintain federal offshore oil and gas lease bidding and production data, we were naturally interested in reading of Citibank's experience with RAMIS ("RAMIS at Citibank," December 1976). The simplicity of the report generator, as well as the system's plotting capabilities were the key factors which led us to choose RAMIS over MARK IV, which had been used in an earlier implementation of our BIDFILE system. However, while we agree with the concept of using "utility files" as a means of obtaining flexibility and modularity in a RAMIS system, our own experience with this feature of RAMIS uncovered some potential problems of which prospective users should be aware before committing themselves to a utility file approach.

In particular, linkage between a reporting file (RF) record and its associated data on a virtual or utility file (UF) is not established until a field on the virtual level of a RF record is referenced for the first time by a RAMIS report request. Unless pointer resolution is accomplished in an efficient manner, system performance can be severely degraded by haphazard, time-consuming pointer resolution. Fortunately, if the data in the reporting file and utility file is fairly static, the initial resolution of pointers, itself a costly operation, need only be performed once. However, since a virtual pointer will become unresolved following data management activity affecting either a reporting file record or its associated utility file record, a high level of activity in either file will begin to hamper system performance again unless the initial pointer resolution process is repeated.

Caution should be exercised, therefore, before one proceeds with a multiple (or even single) utility file approach in the design of a RAMIS data base system. If a high level of data management activity is anticipated in the system, it may be wise to avoid a proliferation of virtual files. Although some degree of flexibility and storage efficiency will be sacrificed, some potentially undesirable performance efficiency problems will be avoided.

THOMAS J. LOGAN
Computer Services Department
Standard Oil Company of California
San Francisco, California

Queue corrected

There appears to be an error on page 94 of "Just Enough Queueing Theory" (February). The denominator is expressed as:

$$1-\rho\left[\frac{\sum_{N=0}^{M-1}\frac{(M\rho)^N}{N!}}{\sum_{N=0}^{M-1}\frac{(M\rho)^N}{N!}}\right]$$

As you can see, for any value of N, the above expression has the value $1-\rho$. I believe the proper expression would be:

$$1-\rho\left[\frac{M-1\frac{(M\rho)^N}{N!}}{\mathbf{M}\ \frac{(M\rho)^N}{N!}}\right]$$

DOUGLAS B. SMITH
Columbia, South Carolina

Mr. Wiley replies: Mr. Smith is sharp-eyed, and did catch a typographical error in the published version.

Of ostriches and sand

I am tired of seeing DATAMATION editorials about government agencies and various bills before Congress. You are beginning to look like the *New York Times*.

It is time for your editor to learn something about data processing. I am sure that, like a good Californian, he spends most of his time running naked up and down some foggy beach. Surely, he could spare a few minutes to learn COBOL or FORTRAN, or find out what a disc drive looks like.

JOSEPH RIGO
SYSDOC, Inc.
New York, New York

When asked to comment, our editor expressed surprise that there were still some data processing professionals who did not understand the tremendous impact that the results of the antitrust cases and the Bell bill would have on their companies, their departments, and their careers. He then had to excuse himself. He said he had ten more miles to run that day as part of his training for the Santa Barbara to Newport Beach nude marathon and it was already getting kind of cold.

Criteria clarified

I am curious as to the definition of certain criteria used in "Comparing Architectures" (February, p. 48).

Program protection, extendibility of instruction set, and read only memory are unclear as "absolute," "initial screening" criteria. From what, and how, do you expect a "program" to be protected? How does "extendibility of instruction set" differ from "subsetability" (or does extendibility refer to unused instruction space)? Does "read only memory" mean that some portion of the instruction set must be microprogrammed or that the user would be able to plug in ROM's at will?

ROSS R. W. PARLETTE
United Technologies
Chemical Systems Division
Sunnyvale, California

Mr. Burr and Mr. Smith reply: These are the formal definitions used by the selection committee.

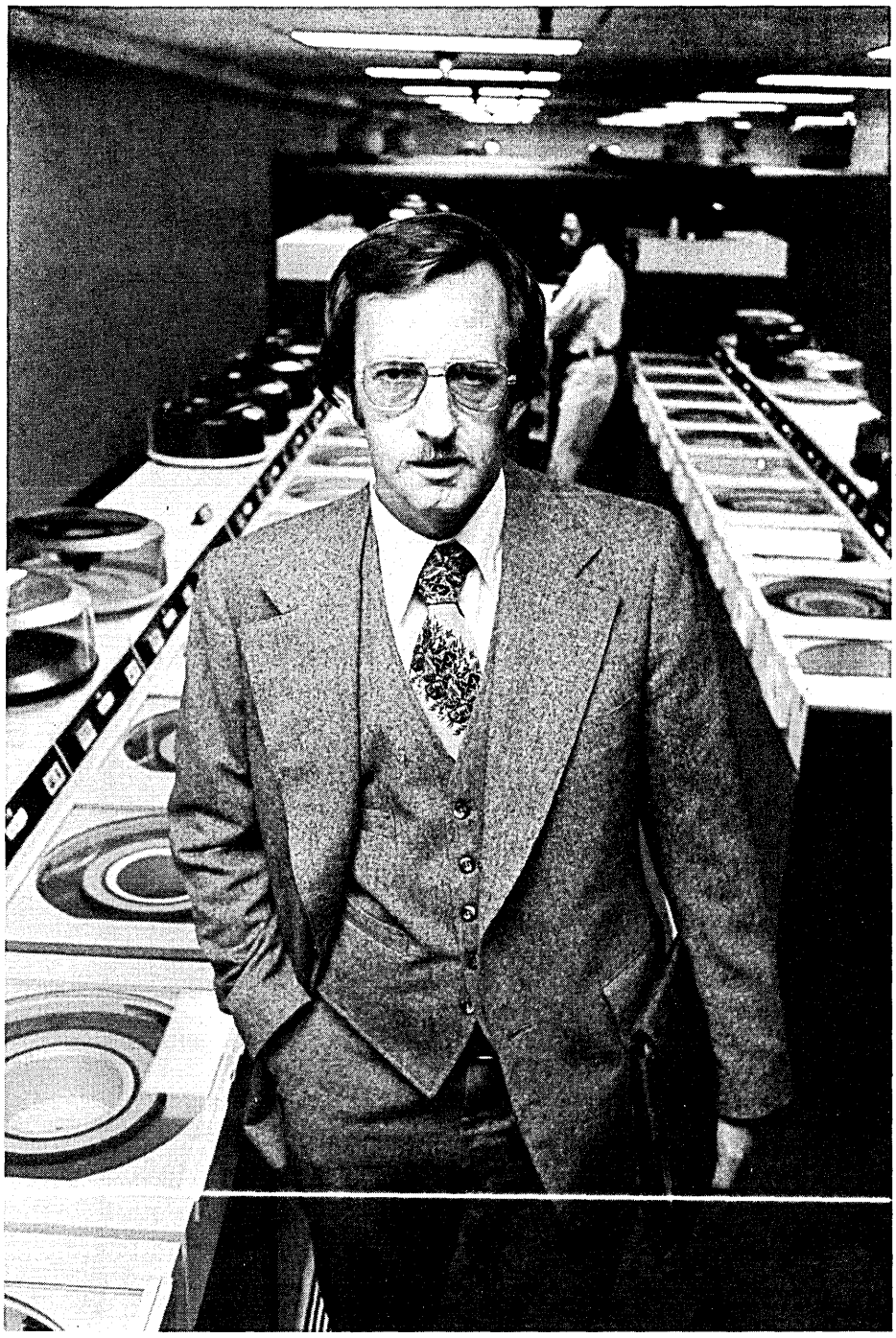
Protection: The architecture must have the capability to add new experimental (i.e. not fully debugged) programs that may include I/O without endangering reliable operation of existing programs. The intent of this criterion is to provide a mechanism in the hardware for aiding software development, and for preventing certain catastrophic software failures from occurring in the field. Architectures that use a privileged mode to protect vital registers and system resources generally meet this criterion.

Subsetability: At least the following components of an architecture must be able to be factored out of the full architecture: a) virtual to physical address translation mechanism, b) floating point instructions and registers (if separate from general purpose registers), c) decimal instruction set (if present in the full architecture), d) protection mechanism. Implementation of the architectures on small machines must not be required to include features of the architecture intended for use on larger, multiprogrammed, multiapplication configurations. Existence of such subsets did not have to be demonstrated in an operational implementation of the architecture. In order to retain program compatibility cross the implementations of the architecture, this criterion was extended to include the following requirement; the trap mechanism of the architecture must be defined such that instructions in the full architecture, but not implemented in the subset machine, trap on the subset machine, and that it be possible to write trap routines for the subset machine that allow it to inter-

(Continued on page 230)

"Raytheon has a $2½ billion reputation riding on my team."

Will Evans, Regional Manager



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And, as a regional manager, I have the authority to put all of these Raytheon resources to work for my customers.

Commitment. It's one reason RSC is the fastest growing independent service company in the country. For some of the other reasons, call me collect at my office in Alexandria, VA. My number is 703-836-0550. Or call Mike Salter, our Director of Commercial Marketing at 617-272-9300 ext. 358.

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High Operator Data Entry Accuracy	Protected fields	Yes	Yes	Yes	Yes	Yes
	Low-intensity fields	Yes	Yes	Partial	Partial	Partial
	Numeric only fields	Yes	Yes	No	No	No
	Inverse video fields	Yes	Yes	No	No	No
	Blink fields	Yes	Yes	No	Yes	Yes
	Line drawing capability	Yes	No	No	No	Yes
Simple, Fast Editing of Data	Insert/delete character	Yes	Yes	Partial[1]	Yes	Yes
	Insert/delete line	Yes	Yes	Partial[1]	Yes	Yes
Minimized Loading on Host Computer	Host programmable send keys: send all data, send only unprotected data, send only data modified by operator, send only a "request to send" header.	Yes	No	No	No	No
Simplified Programming	Ability of host CPU to read device status	Yes	No	No	No	No
	Ability of host CPU to read device mode key settings and communication option straps	Yes	No	No	No	No
	Program override on mode key settings	Yes	No	No	Yes	No
Simplified Program Debugging	Transparent mode permits all characters to be displayed	Yes	No	No	No	No
Cost Effectiveness	OEM price in quantities of 25*	$1496	$1670	$1795	$2395	$1995

*When unit includes editing capabilities, 24 x 80 display, numeric pad, and upper/lower case characters.

[1]No Key. Requires Two Key Code.

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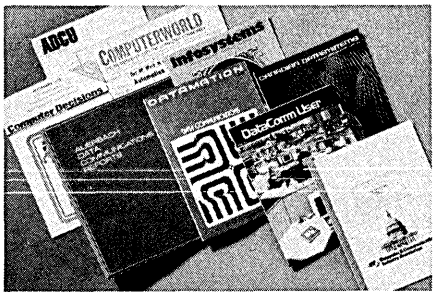
You came to DataComm 77 in record numbers—over 3000 strong! From all over the U.S. From Canada. From half-a-dozen foreign countries.

To each of you a sincere "thank you" from DataComm's Organizing Group: **the Association of Data Communications Users, the Computer and Communications Industry Association, Auerbach Publishers,** *Canadian Datasystems, Computer Decisions, Computerworld, Datamation, DataComm User* **and** *Infosystems.*

Thanks, too, to the companies who exhibited at DataComm 77, and for the opportunity you provided attendees to learn about the latest developments in datacomm products and services.

And a special vote of thanks to those who served as chairmen or panel members, and to the speakers, who devoted so much time and effort to making each session well worth attending. These professionals from government, business and industry, the field of education, and consulting organizations did much to sustain the high quality of DataComm throughout the three-day program—



DataComm Organizing Group

from the Keynote address by Congressman Lionel Van Deerlin (D-Calif.), Chairman of the House Subcommittee on Communications, to the last of over 50 sessions and workshops. Many of the speakers were called upon to repeat their sessions to accommodate the large number of interested attendees.

Total Industry Involvement

Datacomm users from both the governmental and private sectors, datacomm marketers, officials from Federal regulatory bodies (including FCC Commissioners), Administration spokesmen and Congressional representatives concerned with telecommunications—DataComm 77 drew participants from all segments of the datacomm community.

The Conference was particularly successful in achieving a major objective: bringing government officials and users together for the first time in large numbers for productive dialogue. Datacomm industry leaders and government representatives shared the podium in sessions featuring lively interchanges with users on such controversial issues as the CCRA legislation, the FCC's new Computer Inquiry, EFTS, security and privacy—all matters of crucial importance to data communications interests.

These Issues sessions were an important addition to the annual DataComm program which regularly includes datacomm basics, product workshops, industry applications and networking.

A Look Ahead

This successful effort at opening the lines of communication between legislative and regulatory bodies and users and vendors will be expanded even further in next year's DataComm program. For this reason, Washington, D.C. has already been selected as the site for DataComm 78 next February 21-23, and plans are well underway to make the 1978 program even more stimulating and informative for next year's participants.

Thanks again to all who helped make DataComm 77 such a resounding success. We'll be looking forward to meeting with you again next year in Washington—where the action is!

DataComm 78

DataComm 78
Annual Conference and Exposition
February 21-23, 1978
Sheraton Park Hotel
Washington, D.C.

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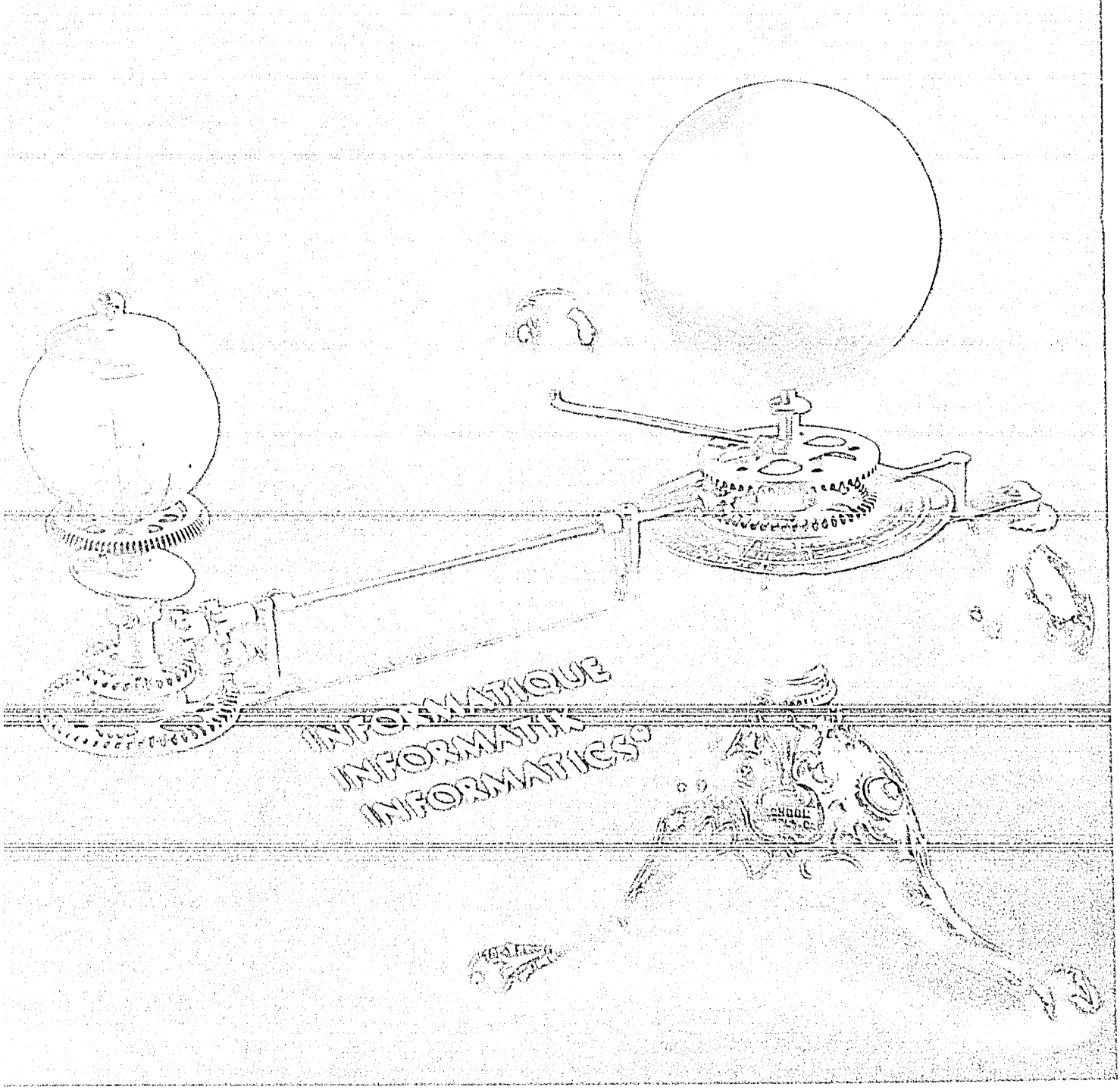

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people

Putting Sales Skills "Into a Box"

"Hot hardware and a handshake" no longer are the main ingredients in selling a computer, says Charles R. Cole, president of Tratec, which has been teaching selling skills to the computer industry and others for the past nine years.

"The computer salesman's prospect today is the president or the financial officer—the guy who considers other factors besides the bits and bytes which were sold five or six years ago to the edp manager; and the edp manager has moved up the ladder in the organization," Cole says. Among these other factors are the investment tax credit for new purchased equipment, the lower interest rates, and the influence of labor unions. "The computer is an investment today. It's no longer an appendage to your operation. Think of what happens when the computers go down? It may be more attractive to buy than rent today."

One of Tratec's courses addresses this phenomenon. It's called "Influencing Financial Decisions," a financial market training program that often leads to purchase of machines rather than lease. One Tratec customer is IBM, which last year recorded close to $6 billion in outright purchases, or 37% of revenues (vs. $2.8 billion or 30% in 1972). IBM first bought a Tratec selling course in 1974 for its Data Processing Div. and some 10,000 IBMers have taken it since. "We stressed basics in selling, a lot of blocking and tackling," Cole says. Since then more than 60 courses have been prepared for various divisions of the giant.

Almost 70% of Tratec's revenues of close to $4 million are from programs it sells to 16 computer companies, including IBM's Data Processing, Office Products, and General Systems divisions. But it also has sales skills programs for the capital equipment, communications, and banking industries. And one of its courses is on how to sell computers to banks. It has some 50 to 60 courses under development, and about 150 are in use at present by customers.

Tratec (for training technology) is one of hundreds of companies offering training for marketing people, "but we find that our major competitors are the customers themselves who do their training in house," says Cole. In its sales literature, the company says that "most companies do not possess the qualified people to develop instructionally designed programs whose results can be measured and that cause learning."

Tratec's big edge is that its courses consist of well thought-out training books that come with audio and video cassettes and slides can be taken in a day or two by persons who don't have to leave their offices.

The company's 20,000 sq. ft. headquarters in Los Angeles is staffed by some 85 persons, many of them with

CHARLES R. COLE
"A great opener and closer"

Ph.D.'s—or studying for Ph.D.'s—in a relatively new science called instructional technology. Development may take up 80% of a course which typically is prepared in 16 weeks. Tratec comes up with equations (some running up to 150 pages in a book) asking such questions as what is to be taught, who are the students, how are they to be taught. Then they interview sample students to see how the program will work. After this is done, they go into preparation of books, cassettes, films, etc. The company, in addition to customizing courses for specific customers, usually has about five proprietary courses a year made for general distribution.

Cole, 45, left Scientific Data Systems in 1968, where he had been v.p. of sales, to form Computer Resources (later to become Tratec), and traveled all over the U.S. and Europe conducting sales training courses. Tired of all the traveling, he decided that what salesmen needed was his expertise—and that of a former IBM sales manager and market training expert, George Caras, who also left SDS with Cole—but with the students doing all the work.

So he put his courses "into a box," shipping the sales material to the students instead of himself and his staff.

The company issued stock to the public in 1971, which Cole observes was a bad year for the computer industry but good for Tratec "because in bad times people were beginning to feel it was better to train persons on the job than to send them away for their training."

He's been in the computer business since 1954 when he came to California as an IBM customer engineer. Later he went to Bendix Corp. and Control Data as a salesman. A friend who worked with Cole at Control Data in the Midwest says Cole "was one of the best salesmen I ever knew. People like Charlie," and "Charlie was a great opener and a great closer."

Ron Posner, one of the founders of Tratec who left the company three years ago, agrees: "Charlie is a good, if flamboyant, salesman. A good motivator who today probably is a better manager than a salesman. A great opener and closer, yes; but I found myself doing most of the work in-between, such as writing proposals." Posner says he left the company because Cole was too conservative with his expansion program.

Cole runs a tight ship. His earnings have been growing at a 70% a year rate, of late, but he says this will be trimmed somewhat in the coming years as the company tries to finance its expansion out of earnings. It generates 20% pretax margins on revenues.

Cole, a one-time Methodist lay-preacher and an amateur actor, found it difficult at first to go outside his company for the talent he uses in the audio and video portions of his courses. But he does: "The same people who follow our courses also watch professionals performing on television at home. So why should we be in the home movie business?" Tratec's films won't win Academy awards, but the company's track record as one of the largest independents in the business shows that they meet the company's charter to "develop programs which improve corporate productivity."

More Than 100 Patents

Andrew Bobeck is as enthusiastic as a kid who's just gotten his first lab set. "Look through this microscope," he tells a visitor to the Bell Laboratories in Murray Hill, N.J., "and you'll get an idea of how bubble memories operate."

Bobeck, supervisor of Bell Labs' Device Design Group, probably knows as much about how bubble memories operate as anyone in the field. A holder of more than 100 memory and magnetic logic patents and a 1976 recipient

of the prestigious Valdemar Poulsen Gold Medal awarded by the Danish Academy of Technical Sciences, the 50-year-old electrical engineer is an internationally recognized pioneer in the development of magnetic bubble technology.

But now Bobeck's research has been shelved, temporarily at least. "I've been running back and forth between here and Reading, Pa., where Western Electric is putting a bubble product we developed into production," he explains, "And I've become very involved in the manufacturing role, which is new to me."

ANDREW BOBECK
Bubble project 13A

The bubble product is called the 13A announcement system. To be tested in an operating company environment, the 13A stores voice messages on separate printed circuit boards containing bubble packages, each of which has a storage capacity of 12 seconds of digitized speech. A single 13A machine can record and announce up to eight different messages while its predecessor could only handle one. And it represents the first application of bubble technology in a Bell product—an accomplishment of which Bobeck and the other members of the design group are understandably proud.

"It took a lot of foresight on the part of our upper management to stick by the technology," says Bobeck. "And now, if the 13A proves successful, it could lead to the introduction of bubble technology in a number of other areas."

Production of the 13A will also enable Bobeck, who, as a result of a wager with a co-worker, discovered magnetic garnet could be used as a bed for magnetic bubbles, to go back to what he enjoys best—research and development.

"Hopefully by July I'll be able to return to exploratory work and try to advance the technology another notch," he says, "but after you've been away for awhile, it's not always easy to return."

With Bell Labs since 1949, Bobeck wants to try to increase the packing density of memory units, and also is interested in doing research creating what he calls "structureless propagation," an environment in which bubbles could move within a structure made by nature instead of being guided by the etched-on patterns of garnet as they are today. If work in this area is successful, bubble memories probably could be manufactured far less expensively than they are today, and the bubbles themselves could be moved more easily than current technology permits.

The future of memory technology, as Bobeck sees it?

"Bubble chips with 10^8 bit capacity should be state of the art by 1985," he offers. "We need not wait that long for something useful to materialize, however, for single chip packages equivalent in capacity to the floppy disc should appear in 1977, and multichip packages of 10^7 bit or greater should be commonplace by 1979."

And when he is not experimenting with new bubble technology or meeting with Western Electric representatives about 13A production, Bobeck, married, with three children, relaxes in his Catham, N.J., home. "I like to work with my hands, doing woodwork or building models or golf clubs," Bobeck says. "I also bowl." But one senses the engineer is happiest in his crowded Murray Hill lab observing bubble patterns through his microscope.

"The Climate Has To Get Better..."

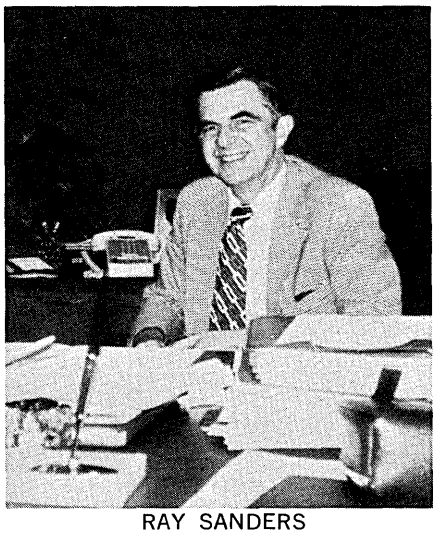
Southern Californians don't usually worry much about climate—the everyday sun and hospitable temperatures have always been taken for granted, at least until the last two years of drought. That's not the climate that concerns Ray Sanders, president of Computer Transmission Corp., better known as TRAN. It's the climate for starting small businesses in the United States that is one of his chief concerns.

"The more we go in the direction of squelching the entrepreneurial attitude in this country, the more we're embracing the attitude that is rampant in Europe—that the world owes me a living. The government is going to take care of me kind of thing. In the final analysis, it is absolutely dehumanizing. It's not success/failure kinds of things that are important, it's to have the chance to make it on your own. We're losing it in this country. It's a societal kind of thing; not one man or one administration can change things. There's got to be a better climate for people to come along and say, hey, I want to try it."

Started in 1969, TRAN has built an enviable reputation in the computer communications field, but that's not enough for Ray. "The primary goal is to make this a substantial organization in the digital network business. And bring some focus to the fact that this is really an organization that is opening up a third market. We've had computers, and we've had communications—modems, multiplexors, transmission facilities, and the like, and I like to think that we'll become one of the better organizations in the melding of communications and computing into networking."

When could we expect networks to move out of the nearly exclusive realm of banking and into other applications? "Tough question," says Ray. "One of the central issues is whether there will be a public data network. Right now it doesn't exist here, but other countries like Canada and France are trying to come up with such a thing. I think there's a public need for this kind of ubiquitous network. The alternative to the public network is the private network, and I see the possibility that there will be relatively sizable networks for private users that are shared. The problem holding this up is that nobody is saying here are the rules and here's what you'll have to live by for the next X years. The alternative is that we as a country won't make the progress in this field that others will make, and we'll become a second rate outfit in an area where we surpass the world in technology."

Curiously, Sanders doesn't see satellites playing the leading role in networking that many communications



RAY SANDERS
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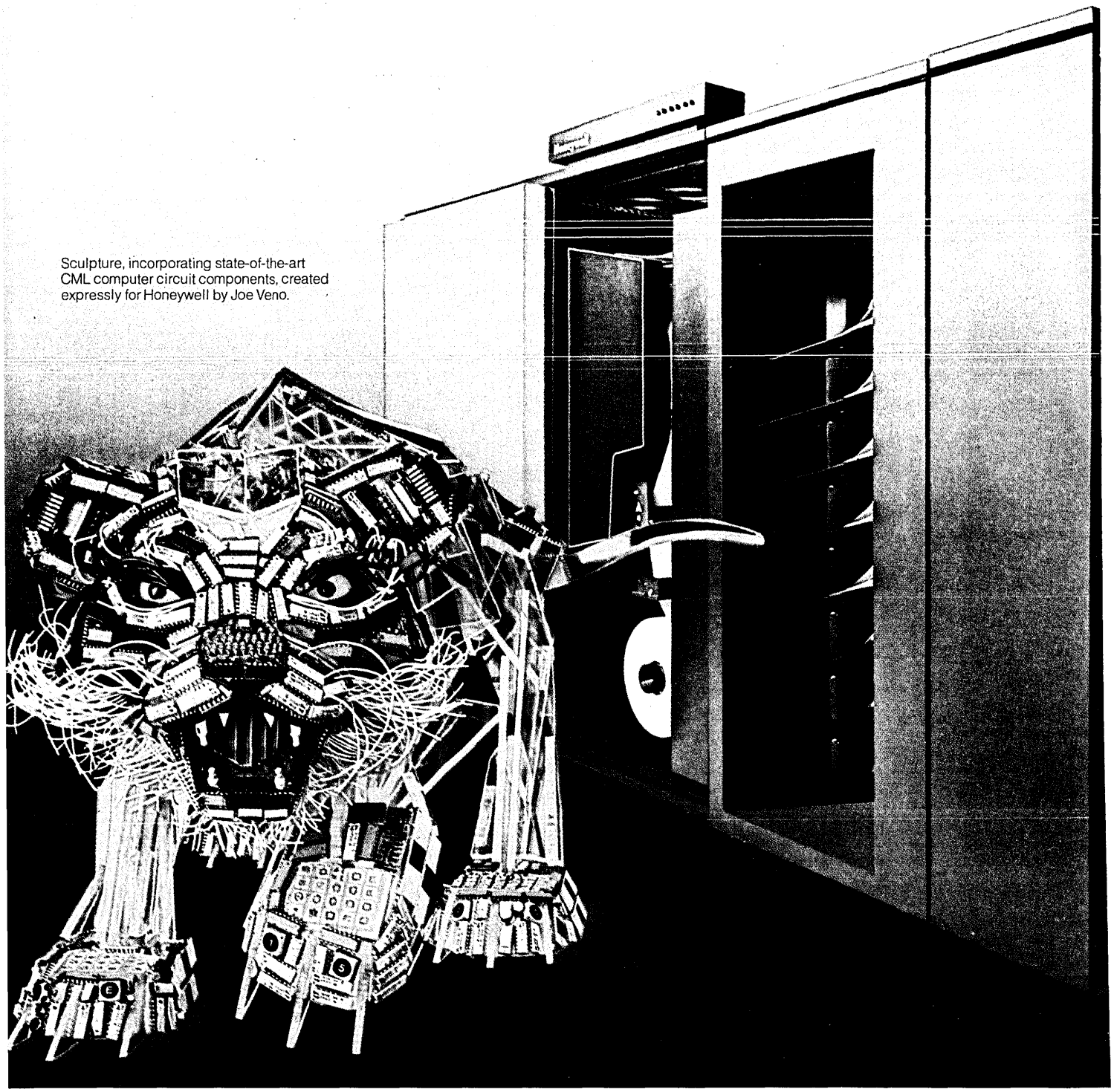

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experts predict. "There are two principal reasons. One is the delay problem, which is something we're stuck with, waiting for the signal to travel nearly 50,000 miles. And the second is cost. I would be willing to put up with the delay annoyance if it were saving me a lot of money, but I just don't see the savings in the satellite approach, compared with terrestrial transmission."

Sometimes the road has been difficult in bringing TRAN, a high-technology company, along without going public, but Sanders, an engineer by training, enjoys running his company. "The thing that has impressed me more than anything about running the company is that the free enterprise system really works. It is absolutely fascinating and unbelievable that you can start a company and do this entrepreneurial thing, and that it works. Until you actually take part in something like that, what you read about it in the textbooks doesn't mean an awful lot."

It is out of concern for our country's future that Sanders makes such dire observations about our economic system as this one: "It would be very much more difficult for any of the successful companies that started in the late '50s and early '60s to succeed today. There are rare exceptions, such as Cray and Amdahl, but by and large the large institutional investors, who are in control of the stock market, only seem to be interested in sure things any more. There seems to be a $200 million/year threshold before they get terribly interested in you. Think what our industry would be like today without the Digital Equipments and Data Generals of the world."

South Africa's Software Houses

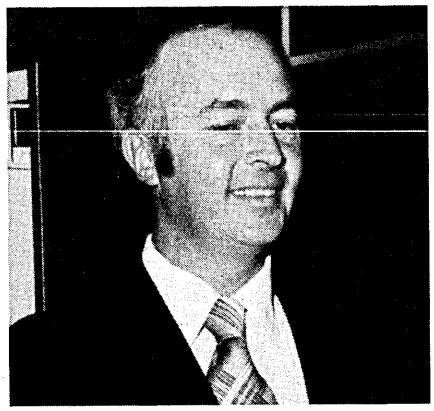
Lenn Israelstam, the head of a South African software house that is expanding into Israel, recently compared the state of programming talent in the two nations.

In Israel, knowledge of dp systems and data base technology is considerably higher. In South Africa there is too much turnover, and what an Israeli learns in six years takes double that in South Africa. Israelstam, president of Systems Programming, Ltd., of Sandton, a suburb of Johannesburg, explains: "Many people go into the Israeli Army's data processing unit for a five or six year period and undergo the army's tremendous training program. They are given an excellent education and experience with very large computer systems, and after six years come out of the Army with very solid training and experience."

In countries such as South Africa, Israelstam said, a person with six years of experience has had three or four jobs because the turnover is very high, like about 38% a year. It therefore would take a South African about 12 years to gain the same knowledge he would in Israel in six years, he said.

Israelstam's company has been in business eight years and has completed about 70 projects, mostly for the South African government. He was in the U.S. early this year preparing to market ADABAS, the data base management system, in Israel on behalf of Software Ag., Reston, Va. He's already installed three ADABAS systems in South Africa. But for Israel, he's hiring Israelis to do the job, not South Africans. The first installation was with the Israeli Ministry of Finance.

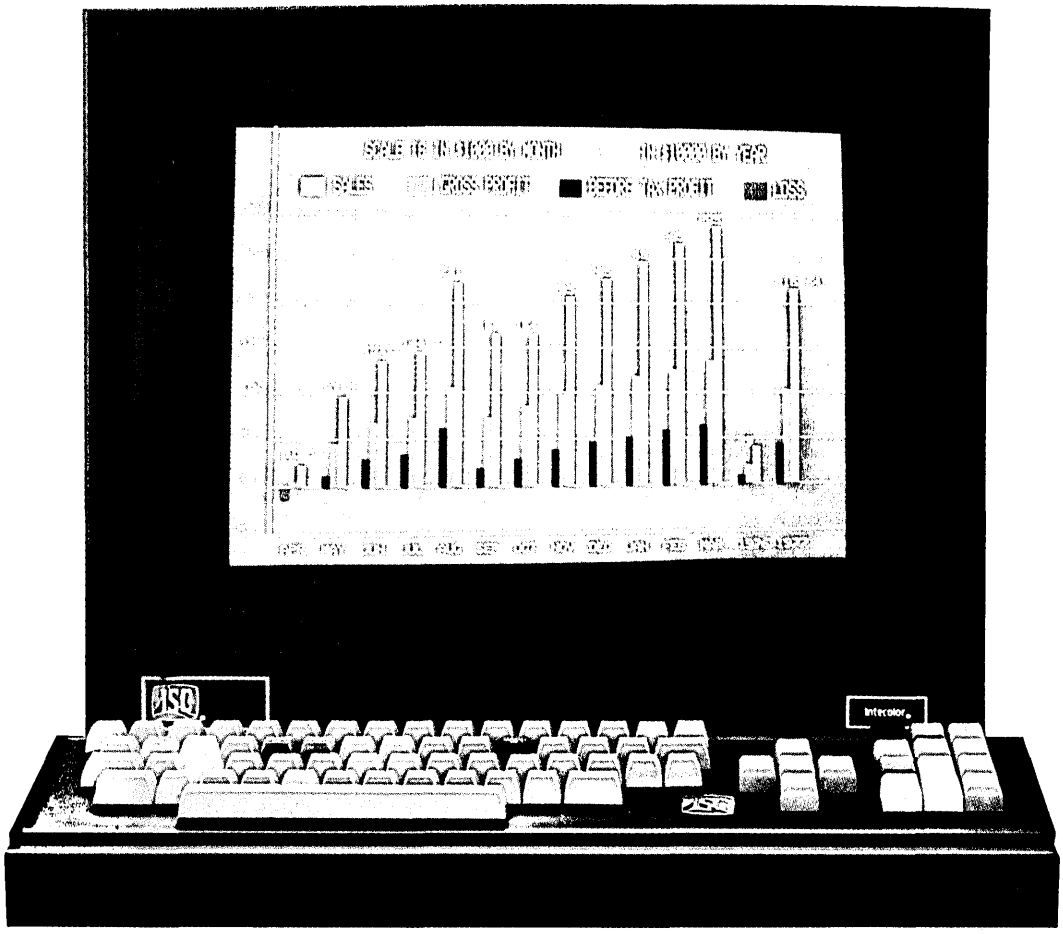
His company also has represented Applied Data Research (*Autoflow* and *Librarian*) for the past four and one-half years in South Africa, and has placed them in 50 installations, a big number in South Africa where there



LENN ISRAELSTAM
A problem of skilled people

are 110 IBM computers of the size to use those software products. More recently, the company reached an agreement with Informatics, of Los Angeles, to market that company's Mark IV. "We have one installation—a fairly large multiple configuration which has just about all the bells and whistles—for one of the largest corporations in South Africa."

Israelstam started as a programmer in 1958 with Hollerith Machines of Johannesburg, which later, through mergers, was to become part of International Computers, Ltd. Two years later he took a postgraduate course in computer sciences at Leeds Univ. in England, "one of the few universities in 1960 which offered computer sci-



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How their bones and muscles seem to creak as they struggle to get into shape for those double-header benchmark tests on steaming summer days.

Will SM1-5740, SM1-5734 and old SMO23 ever recover fully from all those heel spurs, shin splints and sore elbows?

Frankly, the prognosis is not good. *Because as of March 1, our SyncSort III-and-a-half became the most popular sort in North America!*

Here are the standings, as relayed to us by our scout in the Grapefruit League:

ANALYSIS OF SORTING MARKET*
OS & OS/VS
(U.S. and CANADA)

Rank	Sort	OS Users	OS/VS Users	Total Users	% of Market
1	SyncSort	455	742	1197	36.8
2	IBM SM1-5734	958	129	1087	33.4
3	IBM SM1-5740	NA	603	603	18.5
4	IBM SMO23	263	NA	263	8.1
5	Other	75	30	105	3.2
	Totals:	1751	1504	3255	100.0

(In addition, SyncSort has over 300 users overseas)

Are we proud that we're No. 1? Sure. Who else do you know who's taken 36.8% of *any* market away from the Computer Giant? (You can count the names on the finger of one finger!)

The main reason for SyncSort's primacy is simply performance. It does more sorting work at less cost in machine resources.

Matched against the "tottering threesome" it will give you savings on the following order:

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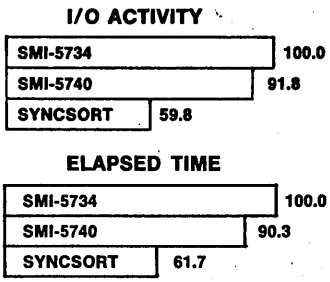
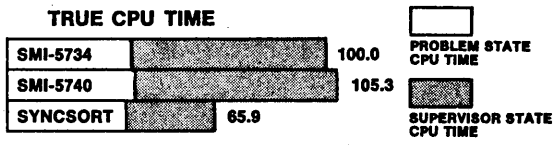
London: GEMINI Ltd.
Melbourne: Shell Oil Co. of Australia
Milan: SYNTTAX
Paris: CAP/SOGETI PRODUITS
Sao Paulo: Deltacom do Brasil
Stockholm: BRA
Tel Aviv: ADVANCED TECHNOLOGY, Ltd.
Vienna: Ratio





Of course, there is one danger to being No. 1. Those nifty little sorting techniques, on which you expended so much blood, sweat, toil and tears, have a way of showing up regularly in your competitor's sorts.

But we treat that as just another part of the game — like the spit ball. And we keep adding new techniques today to make sure that our competitors will have something to emulate in the years ahead.

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We don't know. But we will make one prediction, When he gets out there on the field in major-league sorting, with its flashing spikes, beanballs and salty language, he'll receive quite an education!

*Supporting data on request.

WHITLOW

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

ence courses." Israelstam adds: "It gave me a view of things about computers which I wasn't experiencing in my work."

Systems Programming Ltd. started with two employees and has since built to 50. In addition to marketing software products, it designs commercial application computer systems for the South African government and private businesses.

"We started to build quickly at first, and then more slowly when we realized that selection of people and the way we handle ourselves is the key to success in this business," Israelstam said. "We then expanded very slowly, probably not more in actual numbers than 10% to 15% a year."

"The problem we have in South Africa is that of skilled people, people with high level skills," he said. "We find that the kind of person you need to run a big project from start to finish is very scarce." Almost 30% of the company's staff has immigrated to South Africa, the largest number coming from England, the rest from Europe.

IBM and ICL are the two strongest mainframe companies in South Africa, accounting together for about 75% of the market, Israelstam estimates. Other mainframe companies include Univac, Control Data, NCR, and Burroughs. There are about 450 to 500 mainframe installations in South Africa and about 500 to 600 minicomputers. Installations are growing steadily at about 20% to 25% per year.

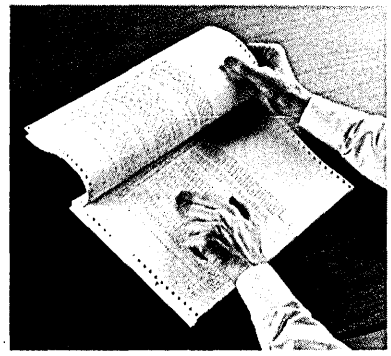
In an industry where software companies often have a very short lifespan "you make one or two mistakes and that's the end; the word gets out"—Israelstam attributes his firm's successful eight years to "realizing that there's one job, and if that's done really right, the rest comes a lot easier . . . and that job is the placement (hiring) of people."

"We take a good deal of care over placement of people, and I think we're pretty good at it," he explained. "It's the first thing you've got to do right, because if you do that wrong, nothing else is going to help."

"We also do not believe in a management hierarchy," Israelstam said. "We believe there is only one way a project can be managed, and that's from inside—the project manager is the guy who is first in and last out on a project." Before assigning a project manager, Israelstam says the company has to be pretty sure he's the right man for the job. "We won't grab business and then find the staff to do the job. We've got to have the staff first and then go out and get the business." ❋

Series/1 contin

Series/1 is a family of small, powerful computers that offers experienced data processing users the opportunity to develop computer solutions closely tailored to their specific needs at a reasonable cost.

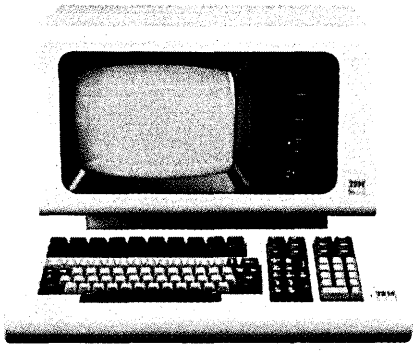


Series/1 can function in a distributed processing environment with an IBM host computer or as a stand-alone system. And because the system is modular, it can be assembled in an extensive array of configurations.

Now IBM introduces new Series/1 software and hardware that extends the range and flexibility of this extremely versatile family of computers.

New Software

The IBM Series/1 Realtime Programming System is a new, full function, disk-based operating system that includes multi-programming and multi-tasking capability for commercial, event-driven and scientific applications in either batch or realtime modes.



In addition, a Program Preparation Subsystem allows you to use the system for background batch applications or application development while you're running realtime jobs.

The system supports two high level languages for faster, more productive application development.

PL/I is a powerful flexible language that can be used for commercial, event-driven or scientific applications. And it takes fewer steps to write programs in PL/I, so you can get your applications up and running faster.

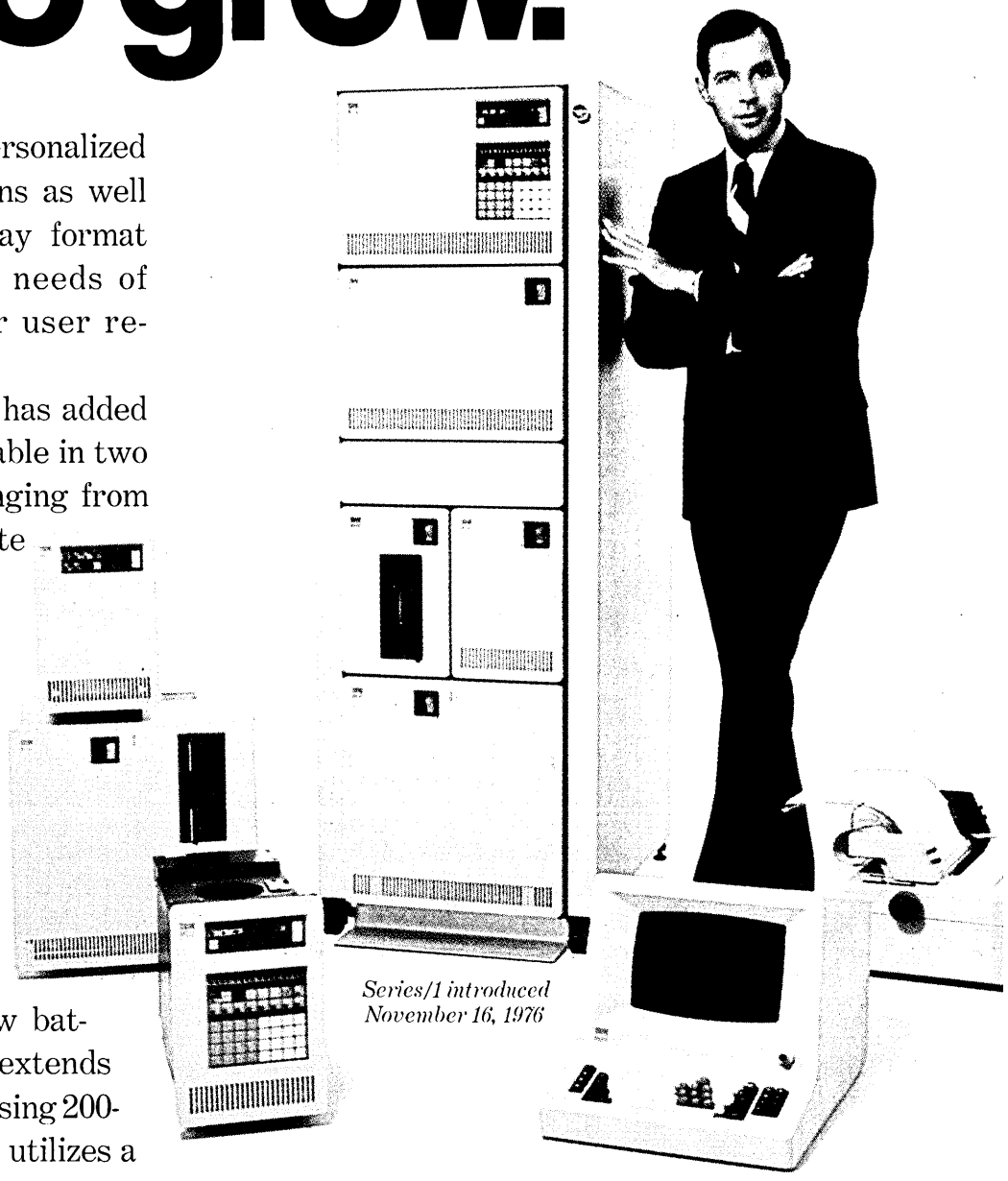
FORTRAN IV is a widely-used, mathematically-oriented language that has been extended to make it easier to use in developing and running realtime applications on Series/1.

Other additions to the Series/1 software package include the Mathematical and Functional Subroutine Library and various Control Program Support extensions.

New Hardware

Series/1 now includes a new custom display station that

ues to grow.



Series/1 introduced November 16, 1976

can be ordered with personalized key and display functions as well as a personalized display format designed to meet the needs of special applications or user requirements.

In addition, Series/1 has added a new line printer, available in two models, with speeds ranging from 80 to 414 lines per minute depending on the model and character set.

The system also features four new processor models utilizing 32K byte storage cards to provide lower cost memory and increase device attachment flexibility.

Finally, there's a new battery backup unit which extends coverage to processors using 200-235 volt power. This unit utilizes a common automobile battery (user supplied) to maintain data in memory, in case power is interrupted.

How to find out more

Now that there's more to Series/1, there's more reason than ever to find out how this versatile, modular family of small computers can help you become more productive.

Series/1. IBM quality with IBM maintenance available throughout the United States and Canada.

To find out more about Series/1, please contact your IBM marketing representative or write to IBM General Systems Division, P.O. Box 2068, Atlanta, Georgia 30301.

IBM®

We fly your freight to more places, more often.

Number One System

No other airline puts so large a system at your service. You get single-carrier responsibility to 113 cities. United connects with every U.S. airline and every international airline serving the U.S. And now our Small Package Dispatch service goes door-to-door between more than 3,800 communities.

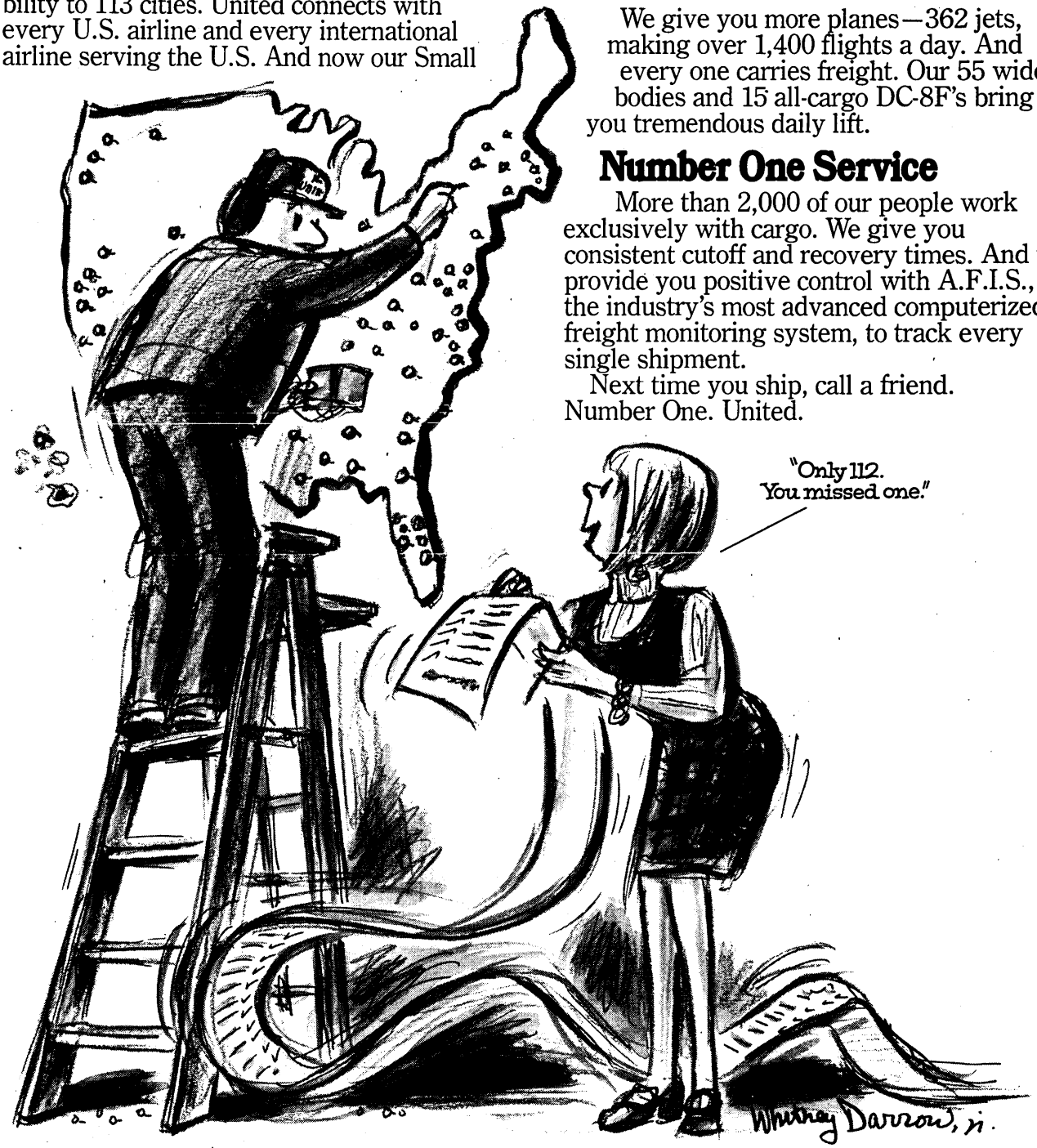
Number One Fleet

We give you more planes—362 jets, making over 1,400 flights a day. And every one carries freight. Our 55 wide-bodies and 15 all-cargo DC-8F's bring you tremendous daily lift.

Number One Service

More than 2,000 of our people work exclusively with cargo. We give you consistent cutoff and recovery times. And we provide you positive control with A.F.I.S., the industry's most advanced computerized freight monitoring system, to track every single shipment.

Next time you ship, call a friend. Number One. United.



See why United's No. 1 in the cargo sky.

UNITED AIRLINES CARGO

calendar

MAY

May 25-27, [illegible] Fla. Hosted by the Jacksonville Chapter of the [illegible], the conference theme was chosen because it addresses the data processing problem of keeping the user honestly informed. Many of the seminars will address this problem [illegible] [illegible] [illegible] Contact [illegible] Chapter, [illegible]

JUNE

June [illegible] [illegible] [illegible] ence proceedings which will be distributed to all registrants. [illegible]

[illegible] and their applications is sponsored by [illegible] the International Society for Mini and Microcomputers, with the support of [illegible]. The programs are expected to cover all aspects of mini and microcomputers including hardware technology, software, peripheral devices, networks, selection procedures and manufacturing [illegible]

June [illegible] will be one of the attractions of this second annual [illegible] Regional Computer Conference for [illegible] computing. The gathering will be a complete convention with workshops, manufacturers' exhibits, seminars, and technical sessions open to all attendees. Fee: $2, including seminars. Contact: Gary Coleman, Midwest Affiliation of Computer [illegible]

June 13-16, Dallas. This annual meeting of the computer community will feature over 100 program sessions, plus an exhibit program including displays by over 250 organizations with over 1,000 booths. Areas to be covered include a wide range of digital, analog, hybrid, and special purpose computer systems, data communications equipment, data conversion equipment, components, microcomputer systems, crt displays, tape and memory systems, and time-sharing systems, among others. [illegible] one level below the main [illegible] exhibit hall. The conference is sponsored by the American Federation of Information Processing Societies (AFIPS) and four of its member societies. Full conference registration is $60 in advance, $75 on-site, and includes the four day program, exhibits, and the con-

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CALENDAR

ference proceedings. Other fees are $25, program and exhibits, one day; $10, exhibits only, one day; $10, students, four days; and $25, exhibits only, four days. Contact: AFIPS, 210 Summit Ave., Montvale, N.J. 07645 (201) 391-9810.

14th Design Automation Conference, June 20-22, New Orleans. In the broadest sense, the design process includes everything from specifying the characteristics of a product to meet a marketing objective to enumerating the details of how it is to be manufactured and tested. Topics of interest at this conference include: techniques such as software aids, verification and simulation; implementation of data base design, interactive tools, and design languages; applications; and functions such as interconnection, partitioning, inspection, and testing. Contact: Judith Brinsfield, Bell Laboratories, Whippany Rd., Whippany, N.J. 07981 (201) 386-3169.

Third Microprocessor Conference, June 20-24, Ames, Iowa. A repeat of two earlier over-subscribed conferences, participation is limited. The conference will provide background and experience for designing microprocessor-based systems. One type of microprocessor will be used as a base throughout, though others will be discussed. The objective of the conference is for the student to learn both the specifics and general concepts of microprocessors. Fee: $345. Contact: Roger Camp, 332 Coover Hall, Iowa State Univ., Ames, Iowa 50011 (515) 294-2663.

International Word Processing Assn. Conference, June 21-23, Portland, Ore. This year's theme is "WP- Link in the Information Network Chain." Seminar sessions have been developed on two levels, basic WP/AS, and more advanced sessions covering information network systems. Scheduled sessions include telecommunications, word processing and the computer, distributed information networks, motivation, non-verbal communications, and word processing career opportunities. Also scheduled are special panels and workshops. Fee: $125, members; $150, non-members. Contact: International Word Processing Assn., Maryland Rd., Willow Grove, Pa. 19090 (215) 659-3220.

Conference on Computer System Productivity, June 27-29, Washington, D.C. Sponsored by the Capitol Area Chapter of the Society for Management Information Systems and Government Executive Magazine, the conference will bring together computer managers and leading systems professionals from industry and government to discuss managerial and technical aspects of improving computer systems performance. Scheduled sessions will cover trends in technology and software, performance measurement, management practices and planning and budgets. Contact: Institute for Professional Education, 1901 N. Fort Myer Dr., Arlington, Va. 22209 (703) 527-8700.

ON THE AGENDA

Insurance Accounting and Statistical Assn., June 5-8, Montreal, Canada. Contact: Walter Mason, Mutual Plaza, Durham, N.C. 27701. **International Magnetics Conference, June 6-9,** Los Angeles. Contact: Intermag, P.O. Box 82, Coopersburg, Penn. 18036. **Symposium on Health Computing Careers, June 12,** Dallas. Contact: Karen Duncan. (803) 792-3211. **Input/Output Systems Seminar, June 21-23,** New York City, (203) 323-3143.

The Computerless Terminal.

Bruning's fast, new microfiche retrieval/printer.

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

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

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

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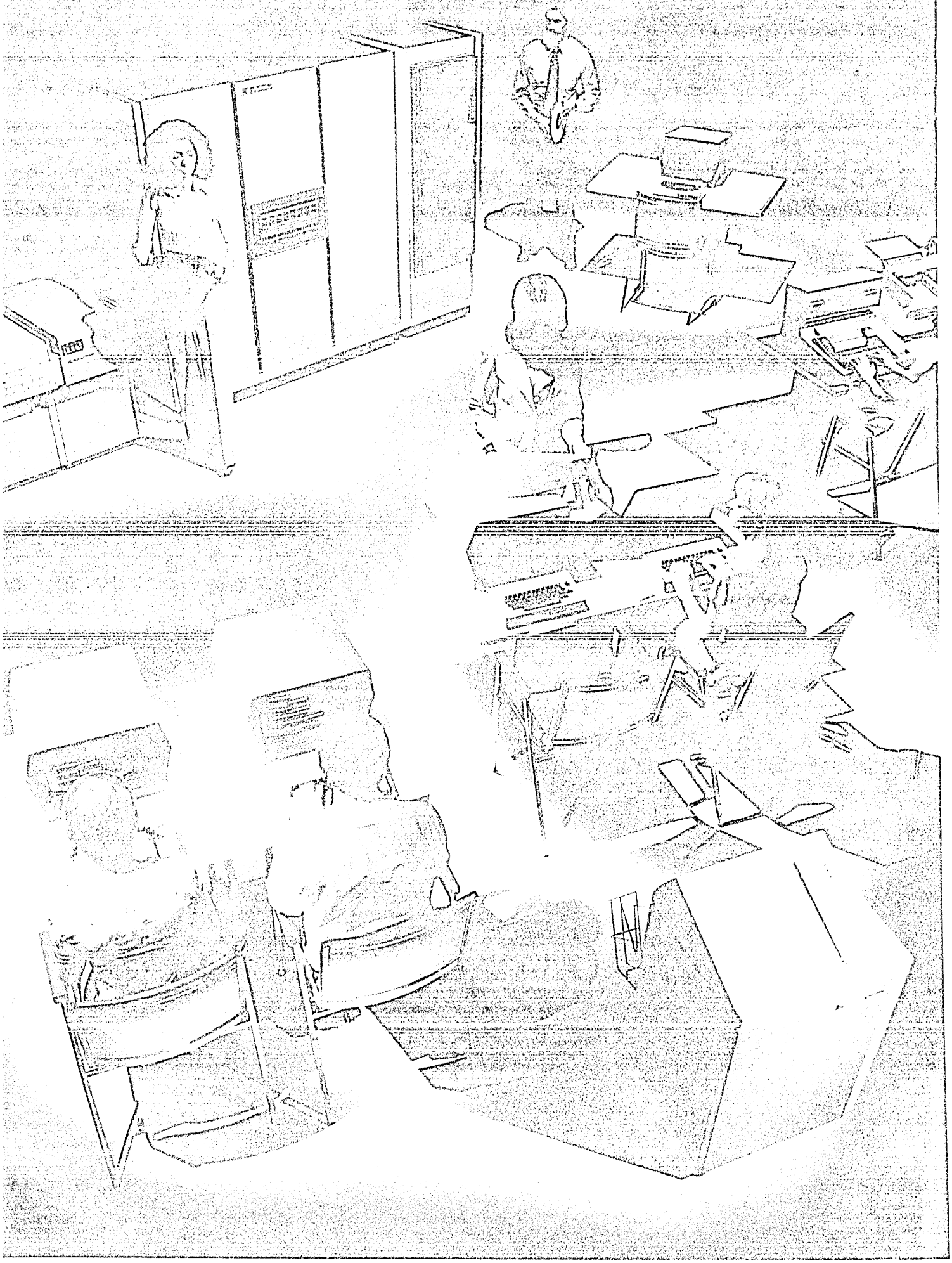


A lot of computers offer multi-level batch processing, or RJE, or realtime, or interactive timesharing.

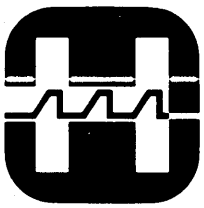
But only Harris offers all of it, concurrently.

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

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

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

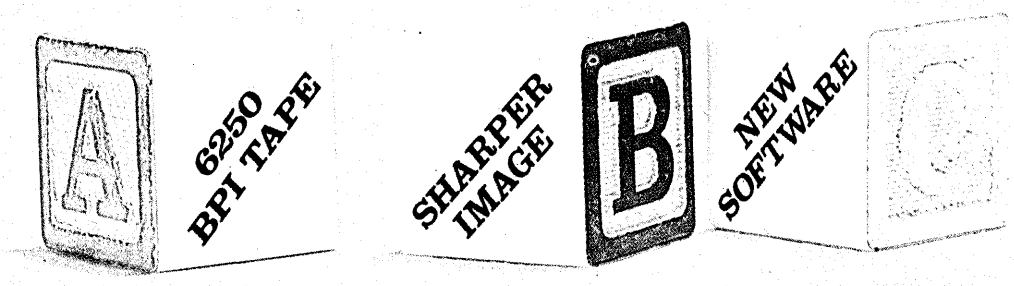
HARRIS



COMMUNICATIONS AND INFORMATION HANDLING

BELL & HOWELL'S COM PRODUCTS

Computer Output Microfilm as simple as . . .

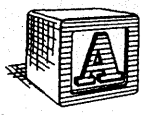


. . . and still expanding.

Last year we added a minicomputer-controlled preprocessor with versatile, easy-to-use software to our proven 3700 COM recorder. To the resulting 3800 COM System, it is possible to add up to 3 more COM recorders, a CRT terminal, fixed head disk, line printer or tape drives. All can be purchased as they are needed, and all can be field-installed.

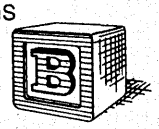
But that was last year.

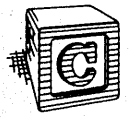
This year we're adding 3 more options to keep the 3800 the most versatile system around.



First, a 6250 bpi tape drive is added that keeps the 3800 up to date with most recent developments in the data processing industry. With this new tape drive option, your 3800 System directly processes magnetic tapes written on the newer computer systems. No need to waste valuable main frame computer time converting to lesser tape densities. You get the full benefit of 6250 bpi, including savings of computer time, tape volume, and handling costs.

Second, we've sharpened our image by making available a new stroke generator that forms characters by incremental line segments. This results in clearer, sharper images on the final microfilm. In addition, this high-resolution option enables us to offer a broadened range of standard and special characters in standard or italicized fonts in normal, double, or triple-sized characters. Existing 3700 or 3800 COM Systems can be easily and economically field-retrofitted for this option.

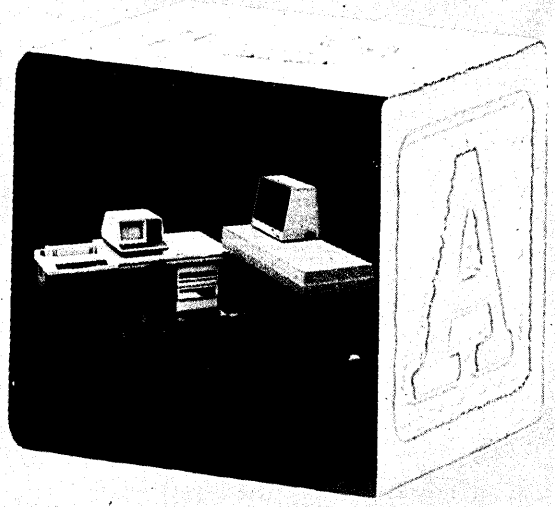




Finally, we've added many new tape input formats and COM features to our already extensive library of software modules, and more are continually being developed. With the new software, the 3800 System can now accept print tapes from virtually any computer system, while the added COM features provide operator convenience and increased system flexibility.

These are but three of the many reasons for choosing the Bell & Howell modular 3800 COM System. For a lot more reasons, call P. J. Flynn at (714) 752-1940 or write:
Bell & Howell COM Products Division,
1451 Quail Street, Newport Beach, CA. 92660

COM PRODUCTS DIVISION
BELL & HOWELL



BELL & HOWELL COM PRODUCTS. WHAT COMES NEXT? D E F

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source data

SOURCE DATA provides information on books, courses, references, reports, periodicals, and vendor publications.

books

Inside Information: Computers in Fiction

by Abbe Mowshowitz
Addison-Wesley Publishing
Reading, Mass. 01867
(1977)
345 pp $7.95

Mowshowitz' previous book, *The Conquest of Will*, is by far the best work on the social implications of computing. This new volume is an anthology of fiction, about computers, including 36 selections from novels, plays, poems, and short stories. The entries are divided into eight categories with headings such as "Broken Promises" and "Clockwork Society." Most of the pieces were written after 1950 by authors aware of the reality of the computer. A few are older, including one published in 1893 concerning a chess-playing automaton which kills its inventor when he checkmates it. Authors represented include Kurt Vonnegut, Jr., John Barth, Arthur C. Clarke, H. G. Wells, Isaac Asimov, Eugene Burdick, and Robert Sheckley.

Mowshowitz contributed a preface and brief introductions to each of the eight sections. In the preface he states his reason for compiling this anthology: in anticipating large and complex changes, "works of fiction are often as insightful as scientific studies." One hopes that mankind will learn from such insights how to mold the future to avoid the consequences that these authors describe. As Mowshowitz puts it, "The vision of man's future that emerges in the literature is not a comforting one. It is riddled with anxiety over the diminishing role of human beings in an increasingly technological world. The sense of malaise which permeates computer stories suggests an attitude of morbid fatalism . . . one finds a near-universal belief in the inevitability of continued development of ever-more-powerful machines. Contemporary fiction foresees the creation of intelligent computers which will rival, and perhaps replace, man as the dominant species on earth."

Inside Information will make a fine book of readings for courses in Computers and Society, or Technology and Society. For members of our profession with an appetite for science fiction, the book is a must. Those without such tastes, but who have intended to read books like Vonnegut's *Player Piano* and Burdick's *The 480*, will have a chance to sample these two works and a number of others. It will be time well spent.

—Paul Armer

Mr. Armer is a past-president of AFIPS and a Datamation Contributing Editor. He is presently a director of On-Line Business Systems, Inc., where he is involved in the marketing of Wylbur, a software package developed at Stanford Univ.

movies

"Demon Seed": Computers in the Flesh

Hollywood has now given us about half a dozen films in which computers played a prominent role. So far, mankind is losing the battle against malevolent mainframes—the score so far is total human subjugation and the loss

Technician probes the resources of Proteus IV, a supercomputer.

of a Minuteman missile site and its associated crew ("The Forbin Project"), and the killing of the better part of two spaceship crews ("Forbidden Planet" and "2001—A Space Odyssey"). Believable scenarios or dazzling special effects (for which "2001" won an Oscar) helped make these movies box office successes.

Here comparisons with classics like "2001" must end, for MGM's "Demon Seed" is something else, despite a first rate effort by Ms. Christie. Here's a quick quiz to help you decide whether to ante up the admission price. Do you think it will *ever* be possible for a computer to trap a housewife on a kitchen table and somehow make the floor hotter than a pancake griddle until she gives the computer what it wants? If that idea grabs you, go see the movie. If you think that's a little—or a lot—far-fetched, wait until you hear what the computer wants. After eyeing Julie Christie toweling off from a shower (it's tastefully done, especially for an "R" rated film) Proteus Four

Paralyzed with terror as a humanoid mechanical arm forces her to do a power hungry computer's bidding.

gets mad as hell and decides he isn't going to take this anymore. "Let me out of this box!" screams Proteus—one of the more memorable lines of the film. He'll do this by impregnating Ms. Christie against her will with a special sperm he's working on when he's not developing a cure for leukemia or communicating with cosmic intelligence, conveniently found in nearby Orion.

Computer buffs will delight in floppy discs installed in the kitchen and old SDS equipment in the house where most of the drama takes place, but it's unfortunately buried in a set surely resurrected from the Dr. Frankenstein film era. In fact, that's just one of the inconsistencies that pervade the film. The latest sports cars are shown, but the house and its sets are dated. Proteus is designed to be intelligent, but when the first signs of intelligence surface, Dr. Harris, its developer (and Julie Christie's husband), seems bewildered. And the primitive tools seen in the basement of the house look barely adequate to work on the doctor's sports car, let alone develop the types of "unusual" devices seen in operation around the household. These inconsistencies are seemingly aimed at keeping viewers alert.

One bright spot in the film is the use of some very impressive graphics, but here again it's overdone and used to get the film going again. Important note:

try to stay alert toward the end for Ms. Christie's explanation of the 28-day pregnancy to her husband when he returns from (babysitting?) the computer. That director Donald Cammell would have Ms. Christie relate this scene of obvious horror in a firelight and soft music atmosphere, and without any apparent emotion, shows the director must have been as anxious to get finished with the film as I was.

—Michael W. Cashman

reports & references

New Reports

A Survey of Minicomputer Vendor Policies details the support and service practices of 11 well-known minicomputer vendors, including Data General, DEC, General Automation, Hewlett-Packard, Honeywell, Interdata, IBM, Modular Computer Systems, Prime Computer, Texas Instruments, and Varian Data Machines. Areas for comparison include: hardware sales, installation, warranty, and maintenance; software maintenance, distribution, initial installation and education, and users groups. The survey is $89.

A 54-page report is designed to help users of one of the most popular small business computer systems evaluate their present system in terms of upgrading and comparability. The report separately covers the IBM System/3 family members 4, 6, 8, 10, 12, and 15, presenting for each comprehensive overviews, compatibility evaluations, competitive analyses, users' reactions, and full pricing information. Configuration guides diagram hardware and software and memory/main storage requirements for software support and peripheral options. The report is $15.

An 11-page portfolio, "*The Impact of Personal Privacy Requirements on Data Base Administration*," includes a review of current and proposed legislation regarding personal privacy of information, and summarizes the requirements of these regulations as they pertain to data base administration. A recommended course of action for developing a personal privacy impact plan is also included. The portfolio is free.

All of these reports and references are available from AUERBACH PUBLISHERS INC., 6560 N. Park Dr., Pennsauken, N.J. 08109.

Datapro Reports

Two new reports are now available from Datapro Research at $12 each.

All About Teleprinter Terminals presents the results of a user survey of more than 7,000 installed terminals. Detailed results of the survey show how more than 500 users rated the 7,250 terminals for ease of use, keyboard feel and usability, print quality, hardware reliability, maintenance service, and over-all satisfaction.

Reprinted from the March supplement to Datapro 70, the 43-page report also provides detailed specifications and prices for 152 teleprinter-style communications terminals from 57 vendors.

All About Modems is a 48-page report reprinted from the February supplement to Datapro 70. The report contains detailed specifications for more than 300 data communications modems from 43 vendors. Thirty-three pages of comparison charts describe the transmission characteristics, interface requirements, compatibility relationships, and other features of the modems studied. Also featured are the tabulated results of an extensive Datapro survey of user experience with a total of 16,500 installed modems, with user ratings of over 90 popular models. DATAPRO RESEARCH CORP., 1805 Underwood Blvd., Delran, N.J. 08075.

DBMS Report

This 352-page report details six major DBMS packages: ADABAS, IDMS, IMS/VS (DL/1), ROBOT, SYSTEM 2000, and TOTAL. *The Selection of Database Software* includes: a state of the art analysis of software technology, selection trends, guidelines, and case studies, selection criteria, and selection checklists summarizing features offered by each package. Price: $195. HAYDEN BOOK CO., INC., 50 Essex St., Rochelle Park, N.J. 07662.

Guide to Computer Books

More than 225 new books are listed in the tenth edition of the *Annual Bibliography of Computer-Oriented Books*. Except for a few classics, all books prior to 1971 have been deleted from this year's edition. Despite the deletions, there are still over 1,000 books from 210 publishers listed, with a 50% increase in listings on data communications. The bibliography has been divided into 55 categories, including a new category on program design, added this year, which includes 10 new books published in this category. Price: $4 ($5 if invoiced). COMPUTING NEWSLETTER, Box 7345, Colorado Springs, Co. 80933.

Software Directory

In the fall of 1976, a survey of computer service bureaus and software houses was conducted. The results are published in the *Directory of Financial Planning Software*. The directory includes software packages specifically developed for supporting budgeting, financial, and corporate planning applications. Comparison information for 26 software packages supplied by 17 vendors in the U.S. and Canada is included. Packages detailed are: ABC, AIDS, AUTOTAB II, BBL, CALLPLAN, CPMS, CUFFS, EXPRESS, FAL II, FCS, FINANCIAL ANALYSIS, FIPAC, FIPLAN, FLARES, FORESIGHT, FPS (CSC), FPS (DATALINE), GOFER, IFPS, MPS-F, OLSFMS, PLANCODE I and S, PROHPIT II, SIMPLAN, and TABOL. The directory summarizes and compares characteristics and facts for each package, such as: financial and mathematical functions; curve fitting; types of data files and data base management systems available for use with the system, reporting capabilities, limitations of the package, identification of other useful features of the language, such as sensitivity analysis, risk analysis, and backwards iteration; and names and mailing addresses of suppliers. Price: $25. DECISION SYSTEMS INC., 2323 Young St., Ste. 604, Toronto M4P 2C9, Canada.

Adapso Proceedings

The proceedings of the 45th Management Conference sponsored by the Association of Data Processing Service Organizations (ADAPSO) held in Toronto this past fall are now available. The conference included workshops and seminars covering topics such as minicomputer systems, mergers and acquisitions, sales training and motivation, software development, and data communications. Price: $10 for conference attendees; $50 for ADAPSO members who did not attend; and $100 for non-members who did not attend. ADAPSO, 210 Summit Ave., Montvale, N.J. 07645.

vendor literature

Filing Systems

The essentials in scientific filing from indexing to sorting, filing systems, file housing, fire protection, filing aids and controls, and retention are described in this 24 page, color brochure. "How to Unboggle Your Records and Retrieval System" covers the rules of filing, and illustrates the methods available, as well as detailing brochures available from the vendor. SPERRY UNIVAC, Office Products Div., Blue Bell, Penn.

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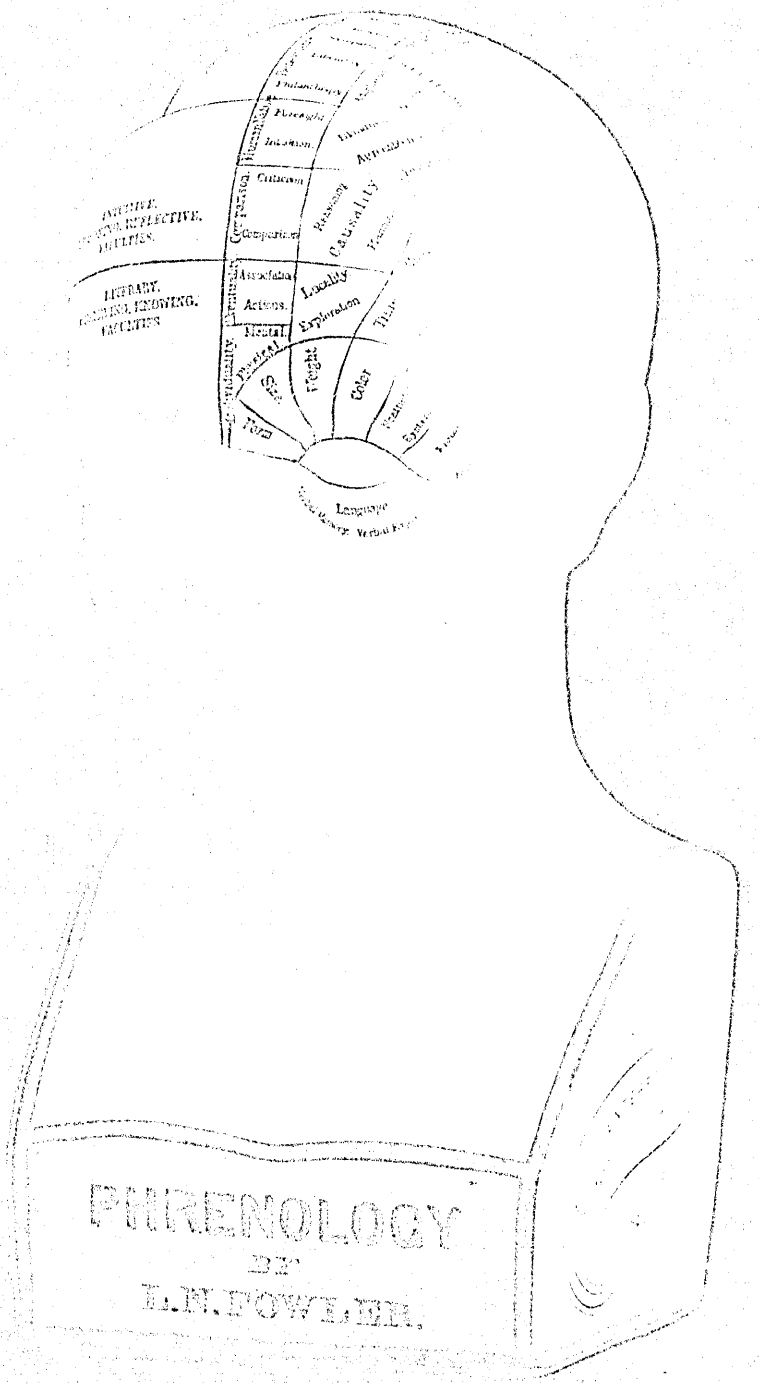
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BY
L.N.FOWLER.

Introducing the SEL 32/75 System.

The Computer with a Subconscious.

Your eyes blink 25 times a minute. You don't realize it because this routine, like thousands of other vital routines, is handled by your subconscious.

That's important, because this parallel processing frees the conscious part of your mind for critical decisions.

This is also a good description of how the new SEL Regional Processing Units operate within the SEL 32/75 System. Working independently, these RPU's contain sufficient control and buffer storage areas to process an I/O region and transfer the resultant data directly to main memory. Computer system throughput is further enhanced by High-Speed Floating Point Hardware, Writable Control Storage, and flexible interleaving.

The SEL Memory MAP efficiently manages up to 16 million bytes of main memory, with no instruction overhead.

Sounds like a big system, doesn't it? SYSTEMS can link 20 CPU's, with hundreds of Regional Processing Units, into one multiprocessor network.

You see, the well-established SEL 32 computers fit the term "minicomputer" in price alone. Based on true 32-bit architecture, all are fast, powerful machines using functional, proven software. SYSTEMS computers are proving their worth in big jobs like seismic exploration, power plant operations, aircraft simulation, and scientific computation.

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Oem Products
Products and services for the computer oem are presented in this 16 page, full color brochure, which also includes four processor product bulletins. The brochure includes specifications and features of the 16-bit Model 5/16, 6/16, and 8/16 processors, and the 32-bit Model 7/32 system. INTERDATA, INC., Oceanport, N.J.
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Accessories Catalog
A new, enlarged catalog of minicomputer accessories is now available from this vendor. The 40-page catalog offers products such as disc cartridges, magnetic tape, floppy discs, binders, connectors, racks, and cabinets for all makes of minicomputers, plus unique or hard-to-find items for end users and oem's. It also includes a number of suggestions for improving operational efficiency. MINICOMPUTER ACCESSORIES, Palo Alto, Calif.
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Remote Display System
The Model 82 Remote Display System from Data 100 is an on-line, interactive, visual display system compatible with IBM host systems using the IBM 3270 Information Display System communications protocol. It is capable of operating with other Data 100 products, and provides a multi-function capability. System operation, a typical configuration, the display station, system controller, and line printers are detailed in this six page brochure available from the vendor. DATA 100 CORP., Minnetonka, Minn.
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Network Enhancers
"We'll Get You Through" is the title of this new 20 page brochure describing the complete line of intelligent network processors, time division multiplexors, LSI modems, and other network enhancement products available from this vendor. The brochure includes a postage paid card for requesting more detailed information about any product. CODEX CORP., Newton, Mass.
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Printer Systems
A new 6-page brochure describes the full array of this vendor's line printers. Specifications are given for printers operating from 100 to 1200 lpm and include matrix, solid font, chain, and drum units. The brochure also includes the DAC M-Series card reader (300 to 1200 cpm) and DAC 100 to 1500 lpm interfaces. DIGITAL ASSOCIATES CORP., Stamford, Conn.
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Data Communications
Processors and data communications packaged systems are described in this 8-page brochure. Specifications for three packaged systems are included: CP Basic, a communications building system; CP-1 for remote job entry; and CP-2 for high throughput in a decentralized computer system. The brochure also lists configurations for systems used in data concentration, packet switching, distributed processing, and remote batch processing. INTERDATA, INC., Oceanport, N.J.
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Task/Master Approach
A new software approach using standard IBM System/360 or 370 hardware at each distributed site, and TASK/MASTER as the communications monitor in host and satellite locations, is described in this 12-page brochure. The vendor describes the aim of the approach as a consistent architecture throughout the network, avoiding the difficulties of using minicomputers as satellite processors. The brochure describes TASK/MASTER's distributed processing features, presents typical configurations, and illustrates the use of the system with a case study. TURNKEY SYSTEMS INC., Norwalk, Conn.
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AOS Brochure
This new 16-page brochure explains how minicomputers can perform real-time, time-sharing, and batch operations concurrently. The brochure describes the recently announced Advanced Operating System (AOS) for users of the Eclipse small computer. It explains AOS multiprogramming capability, heuristic resource scheduling, and memory and file management techniques. Also covered are languages, utilities, and other programmer and operator aids available with the system. DATA GENERAL CORP., Southboro, Mass.
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Programmable Plotter
Four color plotting is possible with this new X/Y plotter that changes pens automatically. The 9872 is a microprocessor-based A3 sized plotter which works with HP's 9825 and 9831 desktop computers. Its features include addressable moves as small as 0.25 mm, selectable pen speed, point digitizing, window plotting, five resident character sets, off-scale data handling, dashed line fonts, and axes generation. The system is described and illustrated in a new 8-page brochure. HEWLETT-PACKARD CO., Palo Alto, Calif.
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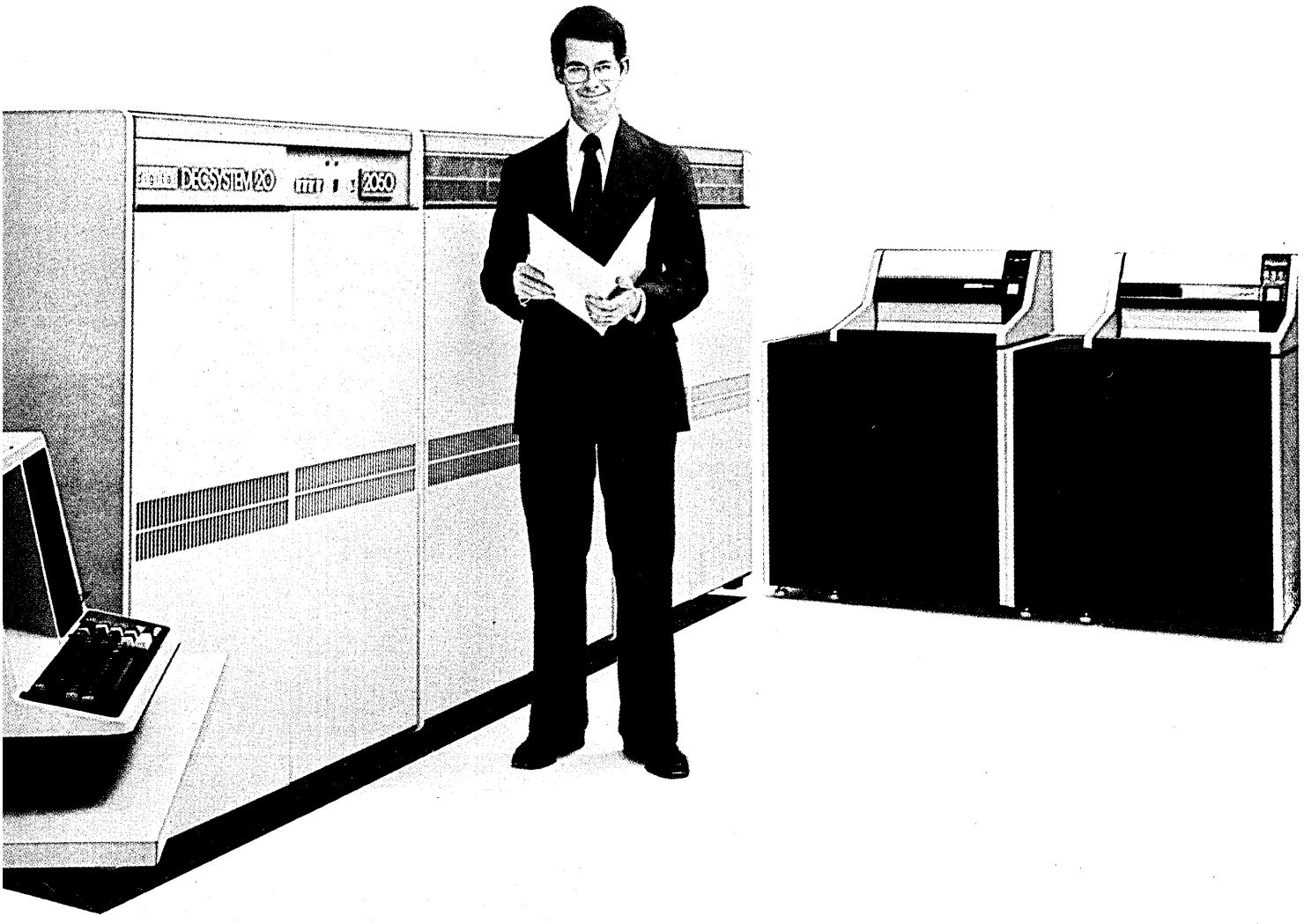

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Features will include articles covering a range of material from basic four-function, hand-held calculators through computers, practical applications of problem-solving skills through games and simulations, and concrete self-contained sections which can be directly copied for use in the classroom. Published seven times a year, the subscription rate is $12/year. DYMAX, P.O. Box 310, Menlo Park, Calif. 94025.

Data Communications Clippings

Concom Express is a new service offered to those interested in keeping up with the ever-changing field of data communications. Each week a Dallas data communications consulting firm will review those major national publications that regularly cover data communications. Some key data is recorded from each article and advertisement that relates to that field. The data is input to a computerized report generator which then produces a summary of the items by subject, such as EFTS, Display Terminals, or Regulatory News, and also by vendor. The publication carrying the item, as well as the page number, is included so that subscribers may easily locate any article of interest to them.

The report is generated and sent by first class mail each Friday. Subscription: $75/year. CONCOM, 8585 Stemmons Freeway, Ste. 828, Dallas, Texas 75247.

On-Line Journal

On-Line Review is a new international journal of on-line information systems beginning publication this spring. Regular features of the review include a news section with information on new data bases, new systems, equipment, search aids, and people. Feature articles will cover both general and expert levels, and for the first two issues include a review of on-line systems and services, and an editorial on on-line retrieval in Europe. A Search Corner will concentrate on search techniques showing actual worked examples, and an On-Line Update section will cover literature appearing elsewhere.

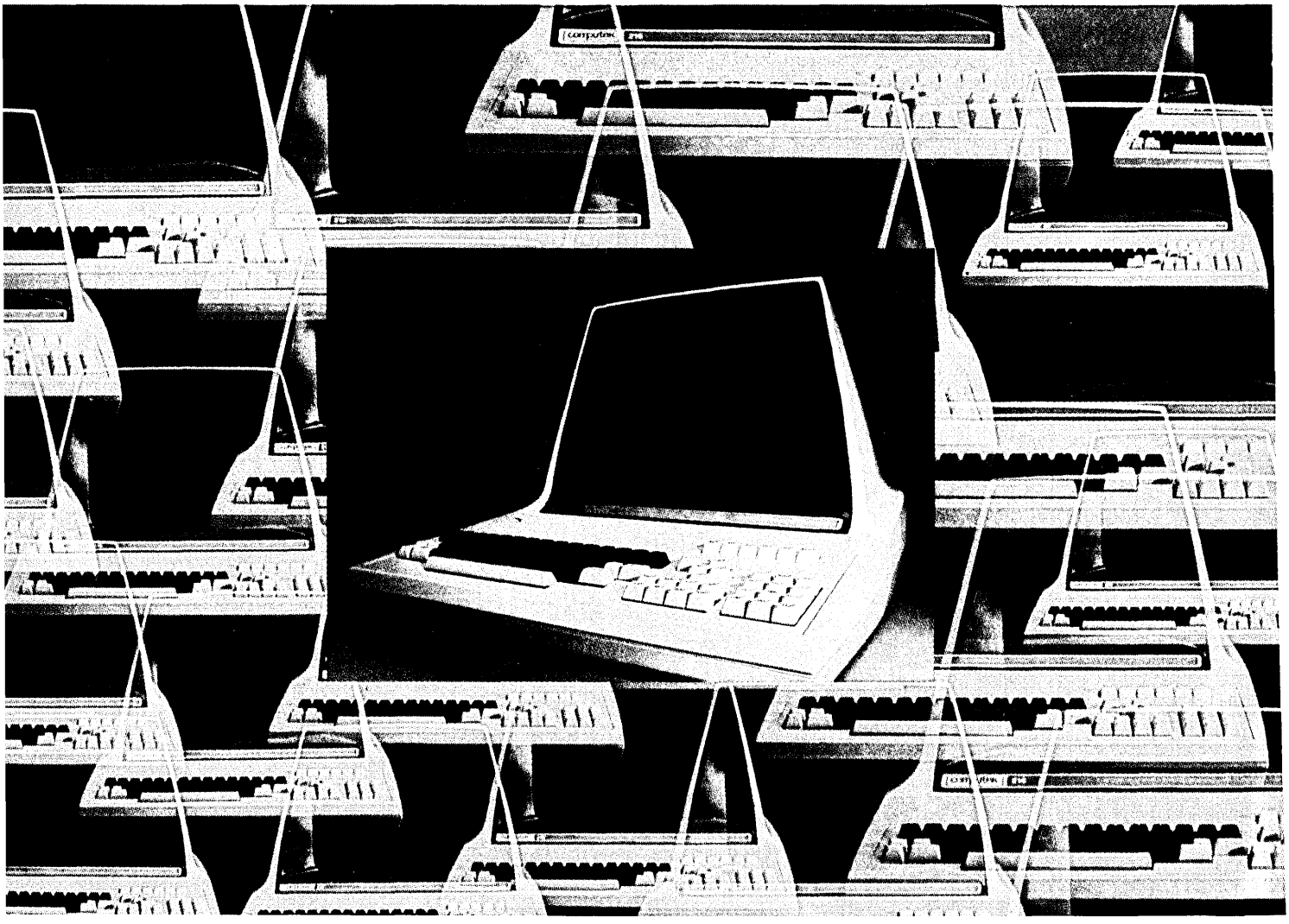
On-Line Review will be issued quarterly, and will be simultaneously available on microfiche. Subscription: $40, one year, institutional; $25, one year, personal. These fees do not cover microfiche edition. ON-LINE REVIEW, 200 W. 57th Street, New York, N.Y. 10019.

Negotiations Newsletter

CNReport begins publication this spring. Its aim, according to International Computer Negotiations (ICN), the publisher, is to provide computer users with the latest information on negotiation-related subjects, including pricing, discounts, concessions, negotiating strategy and tactics, what to look for in negotiating a third party lease, pitfalls of turnkey acquisitions, planning for negotiations, and modifications of the "standard agreement."

The report will also include a Readers' Column in which questions relating to computer negotiations will be answered by the editors.

CNReport will be published monthly in a professionals' edition at



$225/year. In addition to the newsletter, a monthly insert will be included which will consist of such things as: a substantive contract provision, a negotiations agenda, checklists for various types of acquisitions, and hardware bid forms. For those not desiring the inserts, a standard edition will be available for $125/year. Further information and a sample copy are available from INTERNATIONAL COMPUTER NEGOTIATIONS, P.O. Box 364, Winter Park, Fla. 32790.

courses

Free Take-Home Micro

Participants in this *Hands on Microprocessor Short Course* receive a microcomputer to use at the workshop and take home when they leave. The computer has a 6800, RAM, PIA (parallel I/O), ACIA (Serial I/O), and ROM with Fantom-II, and is fully expandable to 65K. The course will be given in Cleveland/Akron, May 24-26; Syracuse, N.Y., June 7-9; and Hackensack, N.J., June 21-23. Fee: $495. WINTEK CORP., 902 N. 9th St., Lafayette, Ind. 47904.

Communications M.B.A.

Degree candidates in the Telecommunications Management Program at Golden Gate Univ., San Francisco, may apply credit earned in the seminars towards an M.B.A. in Management. The program offers professional training in the cost-effective design, utilization, and management of currently available telecommunications capabilities (including voice and data communications), and is the first of its kind on the West Coast.

Initially, the program offers two graduate-level seminars: "Introduction to Telecommunications Management," an overview of the history and major aspects of domestic and international telecommunications; and "Managing Corporate Telecommunications," an advanced seminar in the cost-effective management of telecommunications technology. Further seminars are planned. Students may enroll on a degree or non-degree basis. DEAN OF ADMISSIONS, GOLDEN GATE UNIV., 536 Mission St., San Francisco, Calif. 94105.

The Reward of Virtue

Now that you remind me, yes,
Five years ago today.
We argued, and you spoke against
My brainchild, Project A.

Well you were right, and I was wrong
(I'd thought it quite ok)
And we wasted half a million
On that useless Project A.

Your brainchild, on the other hand
(We would have called it B),
I cancelled, taking up my stand
On corporate strategy.

Which does not risk that kind of thing;
One more black mark for me.
Another outfit's coining it
With something just like B.
And then we bid on contract C
You said it was a waste.

Two million dollars later
We repented of our haste.

That special language that I hoped
Would help us write our stuff
You told me (here I bowdlerize)
It was not good enough.

I'm sure it would have been just fine
But when the budgets shrink
The best of projects have to go;
One million down the sink.

You have so often turned out right
And I so often wrong,
I wish that I'd been sensible
And listened all along.

Too late, too late; the budget's cut,
Midst my mistakes I stay,
While you go on to better things,
And here's your layoff pay.

—David H. H. Diamond

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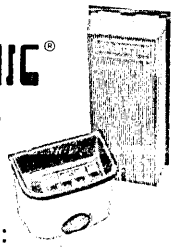

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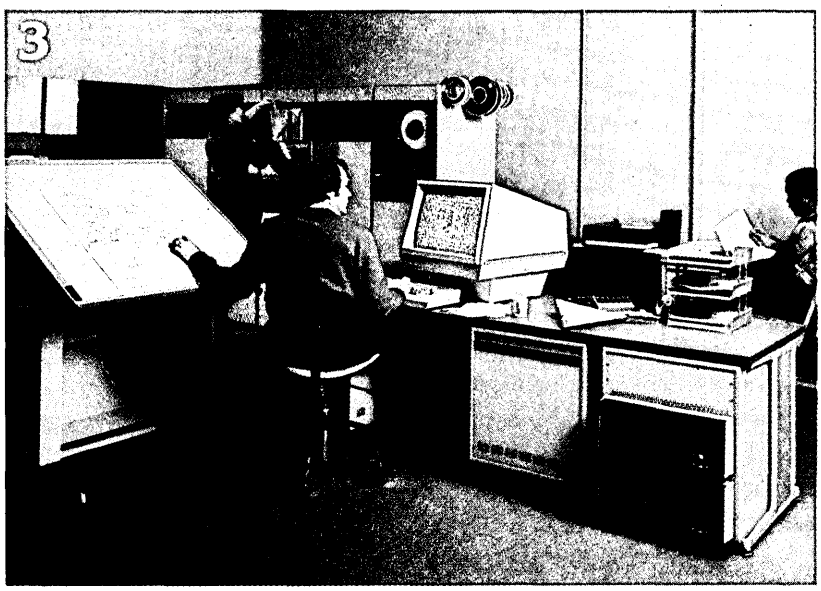

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2 High-resolution results from analytical instrumentation tests, as displayed on the 4012 Graphic Display Terminal, reduce research costs and eliminate the inaccuracy of manual analysis. The 4662 Interactive Digital Plotter produces camera-ready copies.

3 Combined storage and refresh graphics capabilities of the 4081 Interactive Graphics Terminal are saving aeronautics and aerospace engineers hundreds of manhours in relating the dynamics of flight to design methods and materials.

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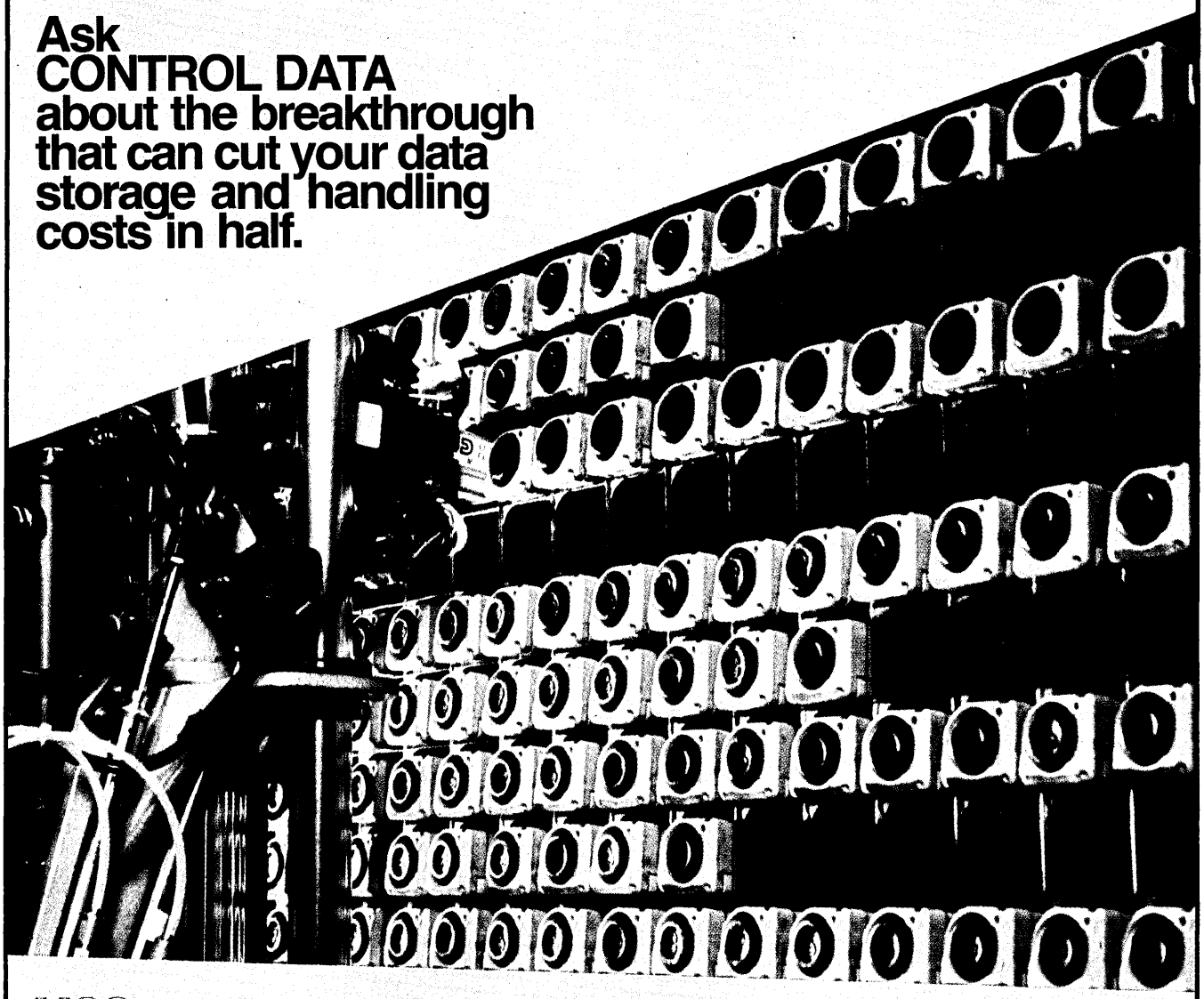

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CIRCLE 23 ON READER CARD

Editor's Readout

John L. Kirkley, Editor

Programmer Productivity

If you think coffee is too expensive nowadays, wait until you get the price tag for your next software project.

We're faced with an interesting situation: over the past twenty years hardware costs have been steadily dropping while software has suffered galloping inflation.

Back in the 1950s, according to an estimate by Barry Boehm (May 1973), the ratio of hardware to software costs was about four to one; by 1973 that ratio had reversed.

Today we have the intuitive feelings of legions of burned users whose request for systems resulted in jobs that took twice as long and cost three times as much as the original dp department estimate. We have generalities and vague approximations. But we do not have precise measurements. After all these years we cannot answer the question, "Software is too expensive relative to *what*?"

Muddying the waters is the problem of programmer productivity. In the SILT report *(Data Processing in 1980-1985)* the authors flatly state, "The fact that software is the product of a craft lies at the heart of most of the problems facing the data processing industry today."

One of the characteristics of a craft is the difficulty in measuring precisely how much time the act of creation will take, how much it will cost, and when it will be finished.

Structured programming, top-down design, HIPO, chief programming teams . . . all seek to make programming more productive, more of a discipline. But despite all the recent activity in software engineering, we still lack a precise measure of productivity.

Not that people aren't trying. In our February issue James Johnson describes how he uses lines of debugged, delivered code as a measure. But he recognizes the limitations of this approach. "By *default*," says Johnson, "it (lines of code) is the best data available."

In this year's spring issue of the *IBM Systems Journal*, a pair of statistically minded worthies, Walston and Felix, tackle the problem with graphs, tables, and charts. They have compiled a data base from 60 completed development projects and a productivity index based on 29 variables significantly related to productivity. All seems well until you realize that many of these variables, such as "customer interface complexity" and "personnel experience and qualifications," are highly subjective and open to widely differing interpretations. Using a net made of statistics, they are trying to capture the wind.

Others have suggested that we can quantify individual productivity by making the professional programmer accountable for his work. Like a master Japanese potter, each programmer would affix his chop to his finished creation; in the case of programming teams the chief programmer becomes the signatory. Records of test data should soon create relative rankings, pinpointing the competent producers and those that write code crawling with bugs.

Then there's the Fortune Cookie Solution: "It is easier to go around the stone wall than push it down" (Hong Kong Noodle Company, 1977). Liberally translated-get the programmer out of the loop.

In that same DATAMATION article, Boehm called for the 50% automation level . . . the date on which 50% of the programs can be implemented by the user in an hour or less, with no more than a day's training. Today there is some work involving automatic program generation but it's still in the formative stages. Logically the next step is to machine-store precise systems specifications, automatically generate code and test routines, and *voila*, with the exception of a few expert fine-tuners, you have done away with the applications programmers of the world.

It is our opinion that this halcyon state will be a long time coming.

To survive the difficult transition years ahead, we suggest you keep a copy of Fred Brook's splendid little book, *The Mythical Man-Month*, right next to your antacid tablets. Whereas the SILT report comments on what is and what is yet to come, Brooks offers practical suggestions. His pragmatism is conveyed in easy to read but masterful prose, embellished with illustrations that enlighten and amuse. Although over two years old, it's still the best guide to slogging through the quagmire of software development.

And in DATAMATION we'll continue to search out and publish articles that reflect current work on programmer productivity and software development.

Perhaps some day programming will no longer be the mysterious, arcane craft it now is, much like alchemy and horography. Like all passings, something will be lost, but certainly something will be gained. ❋

Integrity in Data Base Systems

by Robert M. Curtice

The time to decide how to control data base integrity and how to recover from processing errors is before any application program gets near the data.

The integrity aspects of data base systems are of some concern to all users and of major concern to many. By integrity we mean the ability of the system to maintain the values of data items as they were intentionally placed on the data base. Integrity mechanisms are invoked by data base management systems to prevent erroneous data values from replacing the intended data values. Similarly, at a lower level, operating systems also employ such mechanisms (such as read after write).

Integrity mechanisms do not prevent bad data from appearing on a data base if a user or user program intentionally put it there. Rather, they are concerned with data errors resulting from the environment, from the data base software itself, and from various system or program failures.

There are three objectives in detailing here the various causes of error and the integrity mechanisms used to overcome them. First, there is a general confusion over the classes of error, how the basic integrity mechanisms work, and the terminology involved.

Second, each of the many data base management systems in use today contains distinct integrity mechanisms; and prospective users need to identify and evaluate these in relation to their needs. While we do not provide a compendium of the features of all systems here, we will use existing systems as examples of the various methods and approaches in use.

Finally, in an operational environment, there are standards and procedures which need to be established no matter how automatic the integrity mechanisms of the data base software. We can provide a framework for those integrity standards, for diagnosing error conditions, and for developing guidelines for remedial action. Integrity mechanisms break down into two classes: those invoked in the normal mode of processing, and those which come into play during abnormal modes of processing. (See Fig. 1.)

Integrity in the normal mode

Modern data base management systems provide three classes of integrity mechanisms for the normal mode of operation. These mechanisms can be thought of as preventive measures: they prevent integrity errors from occurring during the normal running of application programs. Note that we do not include here provisions for preventing an application from intentionally introducing errors in the data base. An example of an intentional error would be a program which altered system control data (such as a pointer). Most data base systems do, in fact, protect against this kind of intentional error. (The programmer may not have made the error intentionally, but the program surely did!)

Processing intent. The first class of integrity protection deals with "processing intent." As one of its first communications with the data management supervisor, an application program declares its processing intent against each data base (usually as part of the OPEN command or equivalent). The most common processing intent modes and their meanings are given in Table 1.

The intent mode of a program identifies the allowable intent of other programs with which it can run concurrently, with respect to a data base. Thus, if EXCLUSIVE is specified, no other program which accesses the data base can run together with this one; if PROTECTED is specified, then retrieve-only (but not update) programs can run concurrently; and if SHARED is specified, any program can run concurrently.

Conversely, if program *A* intends to update the data base in shared mode, and another program *B* already has it opened in a protected mode, then program *A* must await the completion of program *B* (the data base supervisor initiates the wait).

How does processing intent act as an integrity mechanism? First, some programs require that the data base remain constant during its entire execution so that inconsistencies do not result. For example, consider a program which computes the percent of total U.S. population in each state, where there is one data base record for a state. If the population figures were being updated concurrently, some records would reflect the new data, some not; the percentages would be in error.

Conversely, some programs make wholesale changes to the data base, and it is preferable to have even retrieve-only programs await their completion.

Next, many system utility functions (such as reorganization or recovery) by their very nature demand exclusive or protected use.

Finally, intent is used in recovery

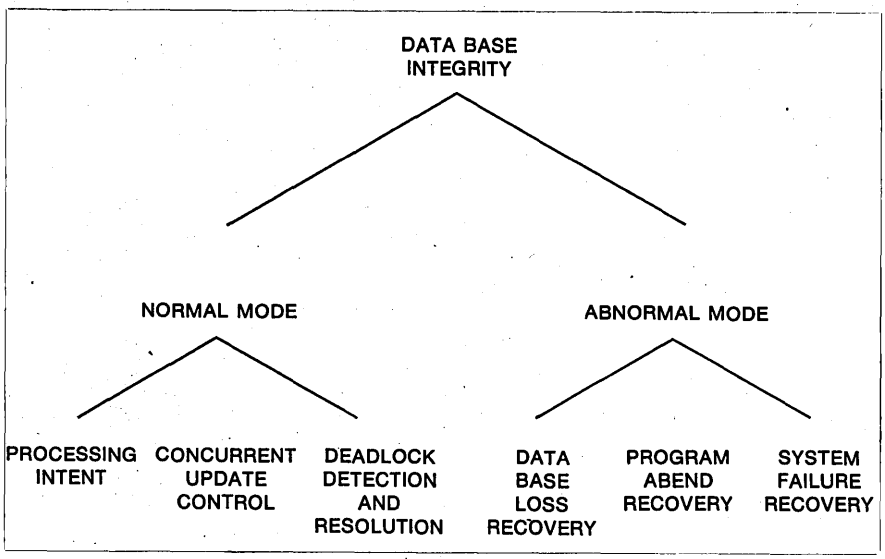

Fig. 1. Data base integrity, at least for this discussion, involves the ability of the system to maintain the values of data items as they were intended to be—where anything done by the user or user program is taken to be "intentional."

itself as will be described below.

Data base management systems distinguish themselves with respect to processing intent primarily by the level to which the intent may be specified. For example, in IMS/VS intent may be specified at the segment type level, in DATACOM/DB at the file level, and in IDMS at the area level. In general, the lower the specifiable level the better, since fewer intent conflicts will result, thereby allowing greater concurrent operation of programs while still achieving the purpose of the intent mode.

Consultant update control. The second class of normal mode integrity mechanism has to do with "concurrent update control." Here we are concerned with errors resulting from two or more programs updating the same piece of data "concurrently" (in shared intent mode). It is quickly described with the example in Table 2, which contains a sequence of events.

Clearly, the desired value after event 4 is 9 and not 6. The mechanism introduced to prevent this error is called lockout, and results in this case in the system prohibiting program B from reading the record in event 2.

Some data base management systems (such as ADABAS) require the program to issue an explicit instruction to read with intent to update, while others assume all reads may update (as TOTAL). Lockout of the record which was just read then occurs, until: (a) the update is issued, (b) the program issues an explicit unlock, (c) another record is read, (d) the program terminates or abends, or (e) a checkpoint is issued, all of which choices depend upon the particular system.

Note the distinction between intent and lockout: exclusive or protected intent locks a data base (or file or record *type*) for the duration of the program while lockout usually locks a record *occurrence* for the duration of the update only.

Notice too that for the concurrent-update integrity mechanisms to work properly, all update programs must use the same copy of the multi-user version of the data management supervisor. If each update program used its own copy of the system, then each could have the data base open for update, not be aware of the other's existence, and cause errors of the kind described above.

At least one system, TOTAL, protects against this by physically flagging a data base which is opened by one copy of the DBMS and prohibiting access by another copy. This problem also effectively prohibits shared access to a data base by two cpu's.

Deadlock detection and resolution. The third mechanism is referred to as "deadlock detection and resolution." Deadlock is a condition which occurs as a result of lockout; as such it is not strictly an integrity mechanism although it is normally considered one. Assume the following sequence of events:

1. Program *A* locks out record 1.
2. Program *B* locks out record 2.
3. Program *A* reads with intent to update record 2.
4. Program *B* reads with intent to update record 1.

The data management supervisor prevents program *A* from event 3 until record 2 is unlocked. But it also prevents program *B* from event 4 until record 1 is unlocked. Stalemate: neither program can proceed.

Again, data management systems vary in the way they detect and resolve deadlock. We have the following cases:

1. In some systems, such as IDMS, TOTAL, and MODEL 204, deadlock is not possible. This is because a given program can lock only one record at a time—hence the situation above cannot occur. So if a program needs to be sure that *more than one record* will not be altered by another program during a specific time (say the time to process a transaction), then it will have to use a protected processing intent.
2. In IMS/VS, deadlock is detected and one of the programs aborted, backed-out, and restarted. (See the next section for details.)
3. In ADABAS, if a program requests a locked record five times, the record is unlocked. Then, the new requesting program can gain control of the record and proceed. The programming implication is that once a program locks a record, it may attempt to update it only to find that it had lost control. The record must be reread and the update reprocessed.

PROCESSING INTENT OPTIONS

Intent	Intent mode		
	EXCLUSIVE	PROTECTED	SHARED
RETRIEVE-ONLY	No other program can run	Retrieve-only program can run	Any program can run
RETRIEVE AND UPDATE			

Table 1. "Intent" describes what a program will do to a data base. "Intent mode" describes what other concurrent programs will be allowed to do to that data base.

CONCURRENT UPDATE PROGRAM

Event	Program	Action	Result
1	A	Reads record	Record contains value = 2
2	B	Reads record	Record (still) contains value = 2
3	A	Adds 3 to value and writes record	Record contains value = 5
4	B	Adds 4 to value and writes record	Record contains value = 6

Table 2. Concurrent updating can easily cause errors. Here in event 4, program B is updating the value it read in event 2. The update which was supposed to take place in event 3 is simply lost, and a value of 6 is recorded when the value should be equal to 9.

Integrity in the abnormal mode

The abnormal mode of operation is concerned with preventing integrity errors when an abnormal event has occurred. Abnormal events of interest here are:

1. Loss of all or part of the physical data base (head crash, fire, etc.).
2. Abnormal termination of a program (abend).
3. Complete loss of the system (power failure, etc.).

The mechanisms which data base management systems use to *recover* from such an abnormal event depend on preventive measures which are in effect during normal processing. Three of the most significant measures are:

Backup Copy: A backup copy of the data base is created at regular processing intervals (typically one to several days). Almost all commercial packages provide a utility program for fast unloading of the data base to magnetic tape.

Logging: The process of logging (or journalizing as it is sometimes called) involves a duplicate recording of each data base transaction which modifies (adds to, revises, deletes from) the data base. It has two modes:

"Before" image logging: a copy is made of the information on the data base as it existed prior to the modification.

"After" image logging: a copy is made of the information on the data base as it exists after the modification.

Existing data base management systems differ widely in the features they

provide for logging. The following list includes some important distinctions among these:

- Options: Most systems now provide both "before" and "after" image logging. Sometimes logging may be optionally enabled by data base or file, sometimes by program.
- Media: Most systems log onto magnetic tape, but some intermediately log to disc (such as SYSTEM 2000).
- Dual Logging: IMS/VS, for example, permits two logs to operate simultaneously for added integrity and flexibility.
- User Logging: Many systems permit an application program to write messages directly onto the log file.
- Use as a Teleprocessing Log: Vendors which offer integrated data base/data communications systems (like DATACOM DB/DC) use a single log file for both data base and data communications logging. In addition to using fewer resources (one tape drive vs. two, for instance), this ability can have important advantages in recovery of an on-line system as discussed below.
- Blocking: The blocking of log records is a trade-off. It makes more efficient use of the logging medium, but should a failure occur, certain log records which were being built up into a block within a volatile memory will be lost. Subsequent recovery would have to begin from an earlier point in time.
- Physical vs. Logical: The more physical the logging, the closer the log record looks to the "before" or "after" image. The extreme case is when a snapshot of the entire data base block containing the modification is logged (as in IDMS). This results in a large log file but very quick recovery processing. Sometimes just the logical record is logged, requiring less space but some additional processing. Some systems log a processed form of the command which resulted in the modification (as does SYSTEM 2000).

Checkpoints: Application program checkpointing is a facility provided by many operating systems to enable long running jobs to be restarted at the last checkpoint, rather than at the beginning of the job, should a failure or abend occur. In a data base context it has several important implications:

- A data base checkpoint results in the flushing of all data base buffers. Modifications which a program made to records in the data base buffer may not be physically written at that time, a checkpoint will force the physical update.
- All locked records will be unlocked after a checkpoint.
- Data base position may be lost after a checkpoint.
- When a data base checkpoint is taken, the system records the checkpoint and associated data on the log file.
- When a program "signs-on" to the data base system (explicitly, or perhaps through an OPEN statement) it is automatically checkpointed; similarly during "sign-off." In this way, the log file contains an historical record of programs which were in process at any time, of the data bases or files they had open, and the intent of each program against each data base or file.

Now how are these mechanisms used during recovery from the various types of abnormal events?

Data base loss recovery. When all or part of the data base is lost due to a head crash, unreadable data, or other reasons, the data base or file lost is first loaded using the most recent backup copy. Most systems provide utilities to do this. Then, all log file records which represent "after" images of modifications made subsequent to the date of the backup copy are applied in a *restore* or *roll forward* operation, again using a utility program. This will bring the data base to the position it was at when the last log record was created.

Depending on when the loss of the data base was uncovered (prior to daily startup? during the middle of a batch run? during the middle of an on-line transaction posting session?) and on the extent of loss (entire data base vs. one block, for instance) a decision may be made to continue processing until an orderly shut down can be made, to stop processing and to roll back certain programs (see below) prior to restoring a portion of the data base, or to restore the data base only to a specific checkpoint and restart programs from that point.

These decisions are made by the data base administrator or his representative based on the conditions present at the time.

There is a trade-off between taking frequent backup copies of the data base and the time it takes to restore it. Note that in the process of applying "after" images, the same record may be "restored" several times—once for each modification made since the backup copy was taken. Since we are only interested in restoring the data base to its most recent condition, we could sort all of the log images for each record together and only keep the one corresponding to the most recent change. Such a "change accumulation" utility would minimize restore time. One is provided as part of IMS/VS.

Another important factor in the restore operation is that while one data base is being restored, other programs which depend on the log file may not be able to proceed even though they are not accessing the data base or file in question. Dual logging is advantageous in this case. SYSTEM 2000 creates a separate log for each data base (from the single intermediate disc log), so restoration can proceed independently up to a point.

Finally, some systems (including ADABAS) provide for restoration on a track basis if only one or a few tracks are lost.

Program Abend recovery. A program which has a retrieve-only intent, and abnormally terminates, is of little concern. But one which is updating a data base must be attended to, or the data base will remain in a quasi-updated condition. Several alternatives are possible:

1. The data base can be reloaded and restored to the point when

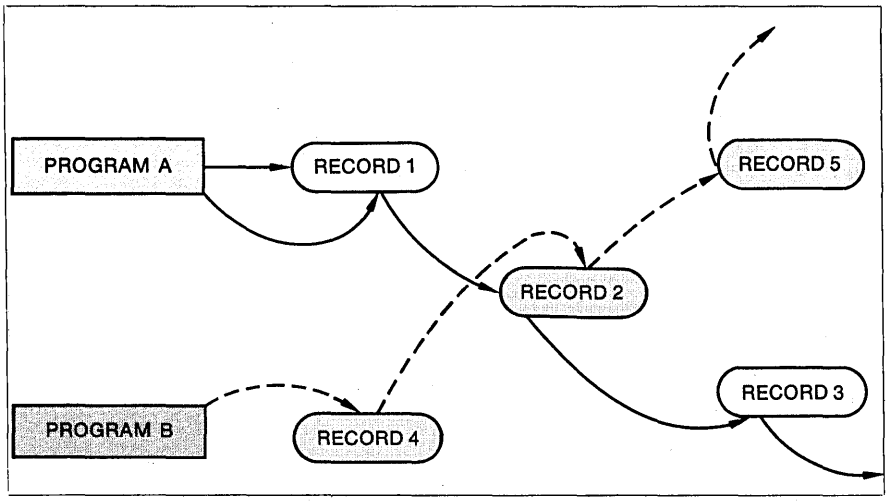

Fig. 2. When two programs are acting on the same data, and one abends, a rollback operation on the offending program will not ensure integrity. If program A abends after processing record 3, rolling back the records it has touched to their original values will accidentally undo the updating program B did on record 2.

the abending program began. The program can be rerun if the abend cause was transitory.

2. The restoration can be made to the point of the most recent checkpoint, and the program restarted, if checkpoints were provided and the cause is transitory.
3. The program's modifications to the data base can be undone through the *backout* or *rollback* operation. Here, the "before" images on the log file are applied so that each data base record is returned to the condition just prior to the modifications made by that program. This entails actually reading the log file backwards and applying the "before" images in the reverse sequence from which they were created. The rollback process can proceed all the way to the point when the program began (its sign-on record on the log file) or to the most recent checkpoint, again depending on the restartability of the program.

Most data base management systems provide utility programs to roll back the effects of a program, either entirely or to a specified checkpoint. Some systems (including IMS/VS and IDMS) provide an automatic rollback facility—when an abend is detected, the program is automatically rolled back without operator intervention.

Consider now the case in which two programs have a data base open with shared update intent, and one abends. A rollback operation on the offending program is insufficient to insure integrity. (See Fig. 2.) The sequence of events is such that program *A* first updates records 1, 2, and 3, and then some time later program *B* updates records 4, 2, and 5, in that sequence.

Now assume program *A* abends. If we roll back the modifications made on all records affected by program *A*, say to a checkpoint just prior to modifying record 1, then we will have undone the update of program *B* on record 2 as well!

This situation is handled differently in various systems. The main problem is to determine the effects of rolling back one program on another program which is also accessing the same data base. Note that even read-only programs can be affected—if, for example, some decision was reached by program *B* based on the content of record 2 after it was updated by program *A*, and a different decision would have been made prior to update (or after rollback).

With most systems, the solution is to identify which other programs had update intent concurrently, and perform a rollback on them as well. The log file provides the data about the programs involved, but the problem is to determine how far to roll back each one.

In the example, we first rolled back program *A* to its last checkpoint, say time *T1*. Now we must roll back program *B* at least as far as *T1*. However, we have to stop at a checkpoint, so we roll back program *B* to its most recent checkpoint just prior to *T1*. But this operation may undo some of the updates of program *A* prior to *T1!*

We can always examine the log file to determine if this is the case, or perhaps both programs must be restarted from the beginning. Nothing can be done automatically, and in systems with automatic rollback (such as IDMS), this facility can only be invoked when a program has protected intent against the data base.

Otherwise no automatic rollback can occur, and it is up to the operator or data administrator to analyze the situation and take appropriate action.

The somewhat unsatisfactory recovery mechanism described above can be overcome in two ways. In the first way, the system queues all modified records between checkpoints. IMS/VS is the only current system which uses this method (and IMS/DC must be in use). The queuing prevents program *B* from gaining access to records updated by program *A*, until program *A* terminates or issues a checkpoint.

If program *A* abends, then it can be rolled back (automatically) without undoing the affects of another program. The trade-off is in the overhead of queuing the modified records, and in forcing other programs to wait for the release of specific records.

The other method is to synchronize the checkpoints of the various programs, so that rollback can be done to a common point in time. This requires all programs with update intent to issue checkpoints at the same time. Again, there are several ways to do this.

ADABAS has a special facility to allow synchronized checkpoints. It entails one program issuing a call for a synchronized checkpoint, then when other programs issue normal calls to ADABAS, they receive a special return code indicating that a checkpoint is in process, and the program can take appropriate action to participate. This scheme, of course, has an effect on programming logic because the special return code must always be tested.

The other method to ensure synchronous checkpoints involves the use of a transaction processing monitor. Some general discussion of the on-line environment is appropriate before we describe how the teleprocessing monitor influences integrity. Everything discussed thus far applies to on-line as well as batch programs.

The important concept with regard to on-line programs is that for the most part, they are short-lived. This is because under transaction processing we consider each transaction processed to be a complete run of the program (module) which processed it. And each transaction is normally processed in one, or perhaps several, seconds (depending on complexity).

Since checkpoints are always taken at the start of each program, rollback of a program corresponds to rollback of one transaction. This simplifies things considerably. The monitor becomes responsible for "re-feeding" the proper transaction to a program which has been rolled back and restarted. An integrated DB/DC capability (such as TOTAL and ENVIRON/1 have) is advantageous to this. Now the teleprocessing monitor has to synchronize its transaction checkpoints with the data base checkpoints so that restart can be synchronized. Beyond this, the TP monitor can force a system-wide checkpoint by holding-up the processing of transactions until no activity is in process.

Depending on the duration of each transaction, and the frequency taken, system-wide checkpoints can have minimum impact on throughput and response time; they provide for a very clean restart point. INTERCOMM, for example, has this facility operating in conjunction with a number of data base management systems. So rollback of specified on-line programs to a common system-wide checkpoint will maintain the integrity of the data base. However, if one or more batch programs were involved, this solution is not available.

Finally, in environments which have only modest transaction processing activity (say no more than several per second, depending on equipment in use), it may be possible to operate each transaction processing program with protected update intent. This would relieve the checkpoint synchronization problem because each transaction would have protected use of the data base and could be rolled back independently. Remember that many of the data base systems in use are not fully multithread so that this restriction is unlikely to cause a bottleneck.

System failure recovery. A total system failure can be caused by a variety of familiar conditions. The important characteristic of a system failure, as opposed to a program abend for instance, is the loss of the operating system and main memory contents. Hence any knowledge about what was happening at the time of the failure must be based on external data from the log file, the data base itself, or the operator. Otherwise, a system failure can be regarded as an abend on all programs in process, plus the potential for a data loss if a hardware malfunction was involved. So recovery from a

system failure can be a tricky undertaking.

Successful data base recovery from a system failure currently depends on human diagnosis and action. The integrity mechanisms and tools already described, plus a few others, are available once the appropriate action steps are identified. The decision to roll back or roll forward is a particularly important one. In a batch environment, a roll forward may be more straight-forward, but in an on-line environment a rollback may be required due to the need to get back up and running quickly. Here, rollback of all update programs to the last system-wide checkpoint is an effective recovery strategy.

Either of these strategies, of course, involves the use of the log file. Note that the failure itself could have occurred right in the middle of writing a record to the log file as well as to the data base. So one of the first actions is to run a utility which examines the condition of the log file, reports on the programs which were in process at the time of failure, and places an end of file marker on the log file since none would have been written.

If in fact a log record was being written at the point of failure, it is lost. But this is not a problem since the log record is written prior to the data base update; thus the update would not have actually taken place yet.

On the other hand, suppose the failure occurred after the log record was written, but before the data base was updated. Again there is no problem since a rollback would merely replace the record with an identical "before" image; roll forward cannot get this far, since there is no checkpoint beyond the failure point at which to restart.

There is a problem, however, with the loss of log records which were being assembled in memory for a blocked log file. Unless these log records are forced to be written (even if it means some wasted space in the block) when a checkpoint or end of program is reached, then rollback may not work properly. In other words the data base might be updated, but the changes not reflected on the log. Restart, or complete rerunning of the program, may well process the same update twice.

Physical examination of the data base may be required to determine the synchronization of the data base and the log file prior to rollback. System-wide checkpoints, in particular, may flush the log buffer to work properly.

A similar problem can exist in an on-line environment when the data base has been "closed" by a transaction processing program, but a failure occurs while the program is still in process as far as the TP monitor is concerned (for example, the program may be formatting an output message to confirm that the update was completed). The update may not be backed out since the data base was closed, but the monitor may refeed the same transaction during its restart. Again, human intervention is called for.

Once the data bases have been recovered to a predetermined point at which processing may be begun or restarted, the data base supervisor can be loaded and applications processing can begin again. The point at which this can occur will vary by the particular system in use. Some systems, especially those which treat the data base as a single physical entity, require all recovery to be completed using separate utilities prior to commencing normal operation.

Others permit recovery of portions of the data base concurrently with normal processing of other portions. SYSTEM 2000, for example, incorporates the restore and roll forward functions directly into the data base supervisor and treats each data base as a separate entity; normal operations can proceed on one data base while restoration is proceeding on another.

Many systems provide for a "damage flag" to insure that adequate recovery has taken place. When a data base or file is opened with update intent, a flag is set on the data base itself. It is not turned off until normal termination of the program. If a failure occurs and the system is reinitialized, the flag is examined and if set, further access is denied until recovery is completed. Both SYSTEM 2000 and ADABAS can automatically roll back all update programs upon reinitialization of the system after failure.

Know the game's rules

It should be obvious from the above discussions that concern for data base integrity cannot be left until a failure or loss occurs. Advanced planning, testing, and the development of adequate standards and procedures are called for. These activities are all highly dependent on the integrity mechanisms incorporated in the data base management system and related software in use.

Each organization needs to study the integrity issue as it relates to its own environment and applications requirements, and to then establish appropriate standards and procedures. The following guidelines are offered as initial points for discussion in this process:

- Well documented procedures are needed for use by operations personnel in diagnosing and recovering from a loss or failure. In the absence of on-site data base administration personnel, operations must act on their behalf.
- As many realistic failure conditions as possible should be thought of in advance and the recovery mechanism tested (such as a failure during recovery).
- Do not update on-line where it is not necessary. Do not update on-line and batch concurrently if possible.
- Think through the processing intent mode requirements of each program carefully. Avoid shared update mode unless performance demands it. Guard against two copies of the data management supervisor updating the same data base.
- Consider the integrity related aspects of all applications programs. For example, in on-line programs, do not close the data base until the transaction is complete, and keep each transaction short if possible.
- Examine the performance implications of the integrity mechanisms in use. For example, in the protected mode the use of a conversational transaction may result in long wait lines for other transactions.
- Evaluate the need for backup copy frequency in relation to cost and time to recover. Large data bases may need to use a segmented copy strategy.
- Institute and enforce checkpoint standards, particularly for batch programs which may be run in conjunction with on-line activity. ❋

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Six Approaches to Distributed Data Bases

by G. A. Champine

The technology is here, and we know quite a bit about where to apply it.

During the past few years, the topic of distributed data base systems has received much attention, but very little information has been shared about actual implementation examples, or how these examples fit into the global picture.

The reason for the interest in distributed data base systems is because they provide a solution to some very real problems for the geographically distributed organization which needs to preserve a unified information-sharing and processing system. Then too, information processing and storage costs have been decreasing at twice the rate of decreases in data communication costs. Therefore, it is becoming increasingly attractive to substitute lower cost local processing and storage for (relatively) more expensive data communications. There are also advantages in system reliability and system performance for those applications where distributed data bases are appropriate.

The geographically distributed system user currently has two approaches available for implementing a unified data system.

1. The files can be centralized, with access by remote terminals. This approach provides for economy of scale and for easy central implementation and control. However, communication costs can be high and the system is quite vulnerable to a failure at the central site or in the communication system.

2. The system can be implemented with a number of (generally small) computers (nodes) at the various locations, each with its own mass storage and terminals. There may or may not be a central node. Applications software in the nodes can send data to, and receive data from, other nodes. With this approach, each node can access only local files, and the burden falls on the user to generate application software to do all manipulation of data at other nodes. The cost and effort to do this require a very high level of capability on the part of the users. However, there are benefits in failsoft operation, high transaction rates, and low communications cost.

A "typical" node does not exist because of the application-dependent nature of the configurations. However, a number of systems have been implemented with a (non-central) nodal configuration something like the following:

- Minicomputer with 64 to 128KB
- 10 to 20 crt terminals
- 10 to 20 MB mass storage
- 1 to 2 medium speed printers (100-300lpm)
- magnetic tape
- communications equipment (1200-2400bps)
- transaction/batch software

A number of the central nodes have consisted of medium to large scale conventional systems the size of a Univac 1100/20 or larger. However, the non-central nodes can range from small to large machines, depending on application requirements, as can the central node. Thus, it seems that the distributed systems will not obsolete either the medium or large scale systems, but instead will complement and extend their application.

Centralization vs. distribution

The following situations can be identified as typical candidate applications where a distributed data base would be more efficient than a centralized data base.

1. Large volumes of data are generated at many locations, and fast access is required. Some of the data, and summarizations of all of the data, are needed at a central site in a timely manner. An application example of this is a chain of retail stores requiring current status on operations.

2. A large amount of data is generated centrally, but fast access is required at remote locations. Either the central or remote site can update the information. An application example of this is the production scheduling of manufacturing plants. The production schedules are used by individual plants to produce parts explosions and net material requirements every day. Engineering changes can be made by each plant.

3. Remote locations generate large volumes of data for fast response to immediate inquiry. The vast majority of the inquiries are local, but fast response is needed infrequently from other locations. One example of this is a unified stock quotation system covering the five stock exchanges across the country; another example is interairline passenger reservation processing.

From a functional basis, each of these applications could be satisfied with either a centralized or distributed system. However, each of the two approaches has advantages and disadvantages.

In general, the advantage of a centralized approach are the disadvantages of a distributed approach and vice versa. They are, in broad form:

Centralized advantages/ distributed disadvantages

- operations economy
- hardware economy of scale
- unified control
- easy intrafile communication
- easy update/retrieval
- compatibility

Distributed advantages/ centralized disadvantages

- communication failsoft capability
- central site failsoft capability
- lower communications data rate and cost
- configuration flexibility
- high system performance (fast response and high transaction rate)
- modular implementation
- modular upgrade

The failsoft capability of distributed systems for communication or central node failure arises because files and records are normally distributed on the basis of record activity. The records that are most active for a given node

are generally stored at that node. If the central node becomes unavailable, the high activity records can still be processed. The performance requirement for the communication system may be reduced for the same reason.

At the same time, the benefits of economy of scale for large central systems have been weakened or negated by the advent of low cost small processors and memories, both main memory and mass storage. Also, there is a management trend to decentralize operations to obtain better control.

Often the application requirements are conflicting, but generally the distributed system approach would be selected if:

- Failsoft considerations are important.
- The data base can be distributed according to activity (partitioned or segmented).
- Performance requirements (transactions/second) are high.

Implementation alternatives

A generalized system diagram for a three level distributed data system is shown in Fig. 1. Each node in the system is assumed to have data storage, data processing, and data entry/retrieval capability in addition to data communication.

If the data base accessed by transactions can be segmented into local files in the same way as the nodes are geographically distributed (that is, they are congruent), then each data item is stored only once on its own system; all transactions and data are local, and each node is aware of its own files.

However, a different situation arises when transactions must reference data that cannot be local to one node; this situation may require distributed data. The following approaches to data distribution are available:

1. Store duplicate (replicated) copies of the total file at all locations, and propagate updates to all locations.

2. Store the records of the data base at the node that exhibits the highest activity for that record, and transfer transactions that cannot be handled locally to the appropriate node, either the central node or the node holding the record.

When access is made to data not held locally, the transaction is treated as an exception, and at least two options exist for its handling. The transaction can be forwarded to the next higher node where a master directory exists to forward the transaction to the proper location. Or, an updated copy of all data may exist at the next higher node so that the transaction can be handled there directly.

The task of selecting the best match between data base characteristics and distribution method requires extensive system analysis. However, on an intuitive basis, the best approach to distribution of small files is to simply replicate them and propagate updates to all nodes holding a copy (of course, appropriate synchronization methods must be used). If the file is large and has a small exception rate (say, 25%), the best approach would seem to be to store records at nodes by activity and propagate exceptions.

However, if the file size is large and the exception rate is high, it may be necessary to centralize the file. This can be summarized in the following table.

Exception rate	File size	Distribution method
—	small	replication
small	large	partition
high	large	centralize

A number of distributed data base systems have been implemented and are now operational. The following have been selected for discussion because each one represents a unique approach to implementation of distributed data base systems:

SITA	ARPANET
Celanese	Lowes, Inc.
Bank of America	Aeroquip

SITA

SITA (Société Internationale de Telecommunications Aéronautiques) provides a system for communication between airline data bases for the purpose of making passenger reservations on airplanes in Europe and Asia. Assume that a hypothetical Mr. Jones wants to make an airplane trip that requires travel on three different airlines, Northwest, Air France, and Lufthansa, and that he places his reservation with Northwest.

The Northwest reservation agent in

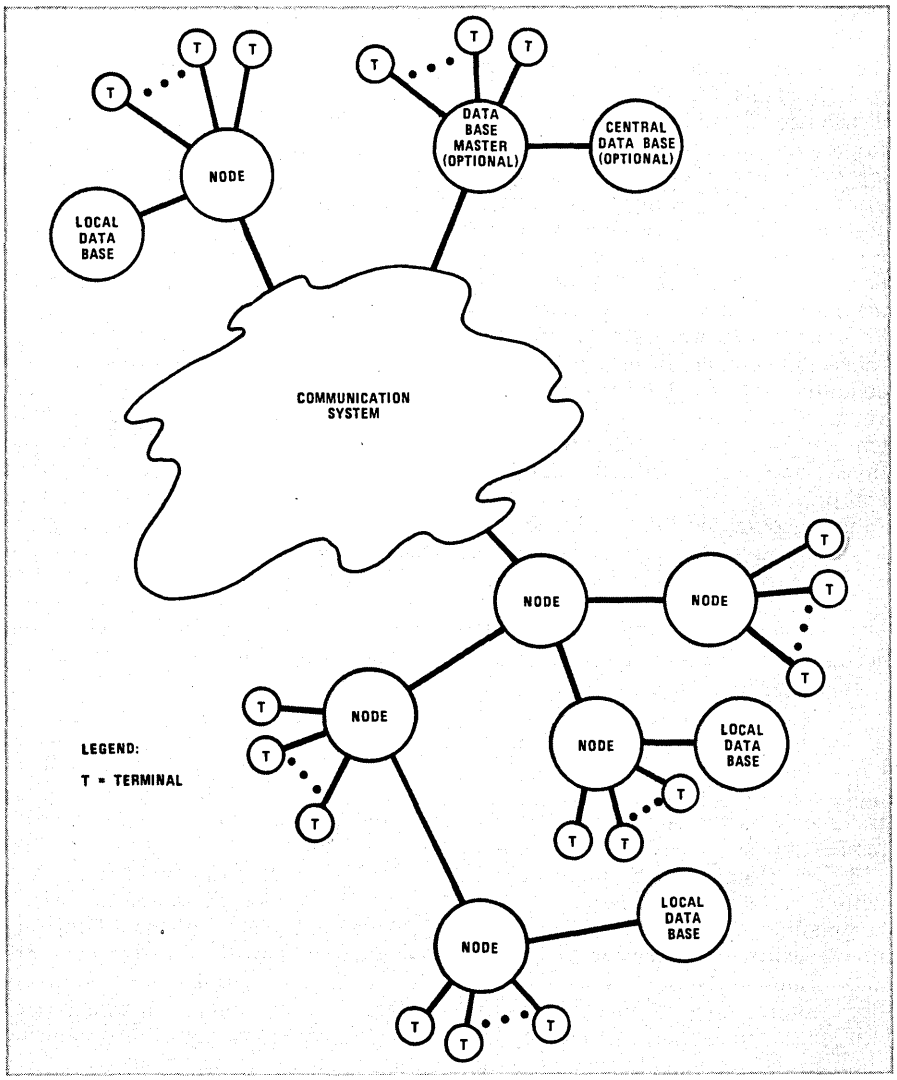

Fig. 1. The two basic approaches to distributing data bases are to replicate the entire data base at each node, which will obviously work best when the file sizes are small and communications costs are high, or to partition the data base, which works well when most transactions are to "local" large files. When most transactions are not to local files and file sizes are large, centralization of some form may still be the answer.

Minneapolis will check the (centralized) Northwest passenger data base for the appropriate flight to determine if space is available for the Northwest portion of the trip. Assuming it is, the agent will enter a transaction in the Northwest system to determine if space is available on Air France and Lufthansa. These data bases are not held by the Northwest system, so the inquiries (transactions) are forwarded to SITA for processing since Air France and Lufthansa are European airlines.

SITA determines the proper destinations for the inquiries and routes the transactions to the proper locations (Paris and Frankfort, respectively). The returning information also comes through SITA for routing back to Minneapolis.

The classification of this system is a virtual, partitioned data base system with the directory method of routing exception transactions. ARINC (Aeronautical Radio, Inc.) performs the same function for U.S. airlines that SITA performs for European/Asian airlines and in the same manner.

CELANESE

Celanese is a large U.S. textile manufacturer with a number of geographically distributed facilities with principal locations at Charlotte, S.C., and Shelby, N.C. Each location has its own computer which serves as a node in the system. An integrated data base is maintained jointly on these two nodes, as well as a number of other nodes in the system including laboratory quality control information, warehouse inventory control, and shipping information.

Each of the several nodes enters its own tranactions into the integrated data base. In addition to the usual transactions performed by the laboratories, orders (including revisions), customer information, and product descriptions are entered from multiple locations at Charlotte, while production, billing, and order shipment summary data is obtained. At Shelby, data is obtained from the production and warehouse nodes for purposes of routing products to storage space, for shipping, inventory control, production control, and for storage space control.

The method of data base distribution at Celanese is to maintain replicated files at both Charlotte and Shelby, with periodic updates of the data from both locations. In addition to the common data that is replicated, each location also has unique data.

BANK OF AMERICA

The Bank of America is a large financial institution headquartered in California, with over 1,000 branches and 11 million accounts. Data processing services are provided on a batch basis from centers in San Francisco and Los Angeles. In spite of the large amount of data on customer accounts held in the bank's (batch) data base, this data was not available to the tellers because of a lack of on-line access capability. The result was that in cash payout situations, such as check cashing and credit card cash advances, the tellers had no way to determine account status quickly.

Therefore, predetermined rules had to be established based on the amount of the transaction in an attempt to limit losses without invoking too many customer complaints about delays encountered while manually checking account status. Even so, check cashing loss often ran in excess of $3 million annually.

To improve this situation, an on-line teller information system was established with the goals of:

- a 33% reduction in check cashing losses
- a 40% reduction in interoffice phone expense
- a 16% reduction in office staff

A pilot system for 100 offices was successful in meeting these goals, and the system has now been expanded to 209 branches and 2,100 terminals on an operational basis. The distributed system is now approaching operational status.

The data base is partitioned between the two data centers, with exception transactions from one node forwarded to the other for processing. Each node is fully redundant so that processing can continue in spite of a hardware failure. The distributed data base approach is estimated to have a lower development cost by 40% than a centralized approach and is estimated to be some $4 million lower in yearly operating cost. The savings from this system are expected to exceed those operating costs by $3 million per year.

ARPANET

A software system entitled RSEXEC (Resource Sharing Executive System), has been developed by the Bolt, Beranek, and Newman Co. for use on the ARPANET to provide distributed resource sharing. A major characteristic of RSEXEC is a distributed file capability which spans host computers (nodes) and supports uniform file access and automatic maintenance of replicated files. RSEXEC is currently operational on ARPANET.

LOWES COMPANIES, INC.

Lowes Companies, Inc. is a chain of 140 retail lumber/hardware stores located in the southeastern United States. In the early 1970s, the decision was made to move to an on-line inventory control and customer invoicing system. A centralized system was first considered, with the data base located at the corporate headquarters and communication lines connecting it to terminals in all 140 stores.

This approach served the centralized operations well, such as central purchasing, warehousing, and distribution/billing to the stores. But it was not a good approach for the individual stores because the data base for each store was logically independent from all others, and large enough to benefit from economy of scale at the local level. For this and other reasons, including heavy communications cost, a distributed system was examined.

The approach finally implemented was to install a minicomputer with disc and up to 16 terminals at each store. Each store is connected to the (functionally distributed) central system by data communication lines, and inventory and sales summary information is transmitted to the central system automatically each night. The system also receives information from the central site each night, such as new price information.

System installation is now basically complete. Store personnel have immediate on-line access to inventory, pricing, and customer account information which yields a 30% increase in sales person efficiency. It also yielded intangible but definite improvements in control over credit sales, accounts receivable, and price accuracy which results in additional cost savings.

The Lowes system is, then, a partitioned data base with all files and transactions handled locally.

AEROQUIP CORPORATION

Aeroquip Corp., a subsidiary of Libby-Owens-Ford, is a manufacturer of fluid power components, including hoses, fittings, and couplings in many sizes. The company had been using an on-line query system locally at the corporate hedquarters for inventory control and order processing, and wished to extend the capability to a number of other manufacturing locations scattered from Georgia to Oregon. The objective was to provide on-line order processing, inventory control, credit checking, and shipping documents, to facilitate shipping most orders within 24 hours after receipt.

The classical centralized data base approach was examined first and found to be too expensive from a data communications standpoint.

The system ultimately selected uses intelligent terminals at each node, supported by a local data base on disc. These intelligent terminals are con-

nected by low performance communication lines to the central data base on a large scale mainframe, where a complete copy of the entire data base is maintained. Each node maintains a local subset of the master data base that is needed by that node.

In operation, the central site dials each node once every five minutes over a WATS line for transactions that cannot be handled locally. At night the central site dials each node in turn and obtains the accumulated transactions in compressed form and sends back updated records and output reports. The system became operational in 1973.

This approach, then, is a partitioned data base with exception transactions sent to the central node where they are handled by a complete copy of the file.

At least a partial proof

The above examples have been selected to illustrate some of the approaches to distributed data base systems. (See Table.)

It would appear that, at least in some instances, distributed data base systems have lived up to expectations. Although there is still a great deal to be learned about the proper design, implementation, and appropriate application of distributed data base systems, a basic technology and sphere of application does seem to exist.

It has been suggested by some that the advent of distributed data base systems will eliminate the need for large scale computers. The evidence does not seem to support this contention. Of the examples cited, SITA and ARPANET use large scale computers as nodes; Celanese and Aeroquip use both large and small computers as nodes; and Lowes and Bank of America use small computers as nodes. It seems more likely that, while small computers may replace large ones in some distributed data applications, they will complement them or fail to compete with them in others. Thus, we may well see a complete spectrum of alternative configurations in use as the technology matures, depending on the application. ❋

SITA	partitioned, exception transactions handled by directory at master node
Celanese	replicated files
Bank of America	partitioned, exception transactions sent to other nodes for processing (no master)
ARPANET	this network is accessed by such a diverse user community that all design approaches may be currently being used
Lowes	segmented, all files local
Aeroquip	partitioned, exception transactions handled by duplicate data at master node

Dr. Champine is senior staff consultant at Sperry Univac, where he is responsible for managing the advanced technology program, and for technology planning of future large scale commercial computer systems. In his 19 years with the company he has held several technical and managerial positions in software and systems design, the most recent of which was as director of advanced systems design for large scale systems.

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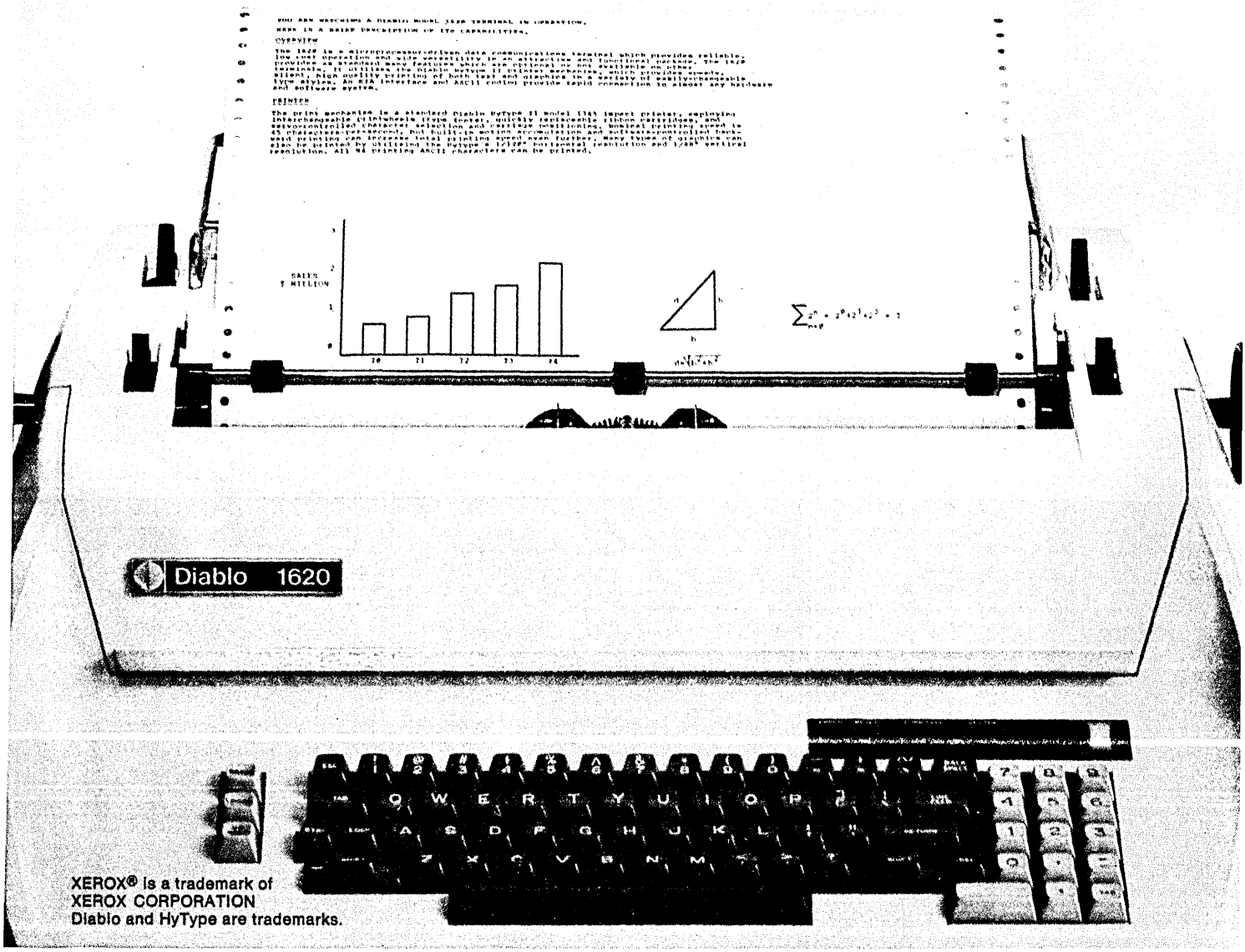

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The Many Faces of the DBA

by Edward K. Yasaki, Sr. Associate Editor

The higher the data base administrator's job is placed in the organization, the better it seems to work. But is it really more sales than technical?

At the Chase Manhattan Bank in New York City, the data base administration activities currently include the identification of data elements that are required for a specific project, separating them from data that has a corporate role. The company's data processing organization has been in the data base environment for less than two years.

"We don't have a corporate-level integrated data base," says Joseph Judenberg, Chase's manager of data technology management. "We have some data bases that are totally non-integrated, and we have one or two that are integrated by application. They're functional data bases," he explains. But Judenberg, with a clear view of his objectives, is working toward making integration at the higher level feasible. "We're not sure the corporation is moving toward integration," he says with a chuckle. "But we're building the technology and the environment to make it possible."

These early steps by the nation's third largest bank place it at least one giant step ahead of most dp organizations, some of which have yet to enter the data base environment. But even those that have taken that first step and have named someone to the position of data base administrator (dba) appear uncertain as to what should come next.

Gene Altshuler of Stanford Research Institute says people have come up to him at conferences where he has spoken on the data base technology. They introduce themselves as the dba for a company, then ask, "Now what do I do?"

SRI's Karl A. Drexhage, like Altshuler a senior member of the management systems consulting staff, tells of a dba with a year on the job who had been assigned to a department where he had little visibility. He was defining dictionaries and looking for tools. "That's the last thing he should have been doing," Drexhage says.

By no means is that the dilemma at Fairchild Camera and Instrument Corp., the large semiconductor and equipment maker in Mountain View, Calif. This company has had IBM's IMS up for about a year and admits to being in its infancy with the implementation of data bases. A few small applications programs have been completed, using non-integrated data bases, but Fairchild is now bringing up an order processing system with data bases integrated at the functional level. The company is looking for a dba.

Even those that have named someone as a data base administrator seem uncertain about what to do next.

"We've got a lot of sales work to do," says Sharon Bonner, Fairchild's manager of software and procedures. "We've got to sell upper management on the idea that data base is the way to go." It's an expensive proposition, she adds, "and the payoff is quite a ways down the road." But Bonner, who reports to the head of dp and has his full support, is still staffing up the db management group. "I'm looking for people who are not only technically capable but can also sell ideas, get along with people, and can look at the broad scope of things."

Standing in stark contrast to this is Standard Oil of Indiana's operations in Tulsa, Okla. This division of the Chicago-based concern has operations that range from finding oil and producing it to keeping track of the costs. The data bases there are integrated at the divisional level, not merely by functions, and managed by a staff of 10.

What does the title encompass?

Thus one finds that there are data base administrators and then there are data base administrators. The job title is almost as broad as "medical practitioner," which runs along a continuum encompassing everyone from a paramedic to a nurse, with their many specialties, to an intern and the numerous surgeons and physicians with their specialties.

The pay scale of a dba similarly varies. At the low end, it is said to be $25,000, plus or minus $2,000. In another instance it ranges from $26K to $32K; one respondent placed it from $20K to $40K, and at the lofty end it goes up to $50K. A management consulting firm is said to be staffing up to advise clients on the higher level of integration, offering from $50K to $60K for anyone fortunate enough to qualify.

Organizationally, too, one finds the dba or the head of data base administration reporting directly to the head of dp; sometimes on a par with the head of tech support and reporting to a manager or supervisor who is directly under the dp manager, and also sometimes reporting to someone who is two steps removed from the head of dp. "I would think," one dba said, "that the higher you can start it in any size company, the better off you're going to be."

It is the existence of these types of disparities that strikes anyone looking into the dba job title. Some members of data base administration groups are necessarily so immersed in the technical aspects of the activity that they fail

to take the larger corporate view of the role of data. Those who have risen above that have yet to sell their managements on what Drexhage calls a "planning view of data." And there are organizations that have allowed applications-level data bases to be developed without any coordination or central management.

Altshuler of SRI, in Menlo Park, Calif., views three potential conditions under which a company will consider installing a data base management system. "One is because they have a specific system that has a complex enough structure or a data base that's dynamic enough to require generalized techniques to manage it," he says. "So they bring it in for one system and one system only." At this point they will bring in one of the dbms software packages.

"The other is where they have a low level of integration requirement. In a bank it might be all loan systems; in a manufacturing environment it might be production control with bill of materials processing, inventories, plus orders. It's a low level of integration.

The final step, which is considered the ultimate and most desirable, is a corporate integration of data, so that one can support management information that cuts across functional operating lines. We haven't seen more than one or two that have attempted the corporate integration. A dba operating at a company at each of those three levels would be a different dba—different responsibilities, different authorities, a different type of person is really needed."

Not surprisingly, data base administrators tend to come to their jobs with backgrounds in programming, systems design, and project management. Many also have had experience in systems software. For example, Joe Judenberg of Chase Manhattan, as a project manager, implemented a project with a data base management system prior to being named that organization's dba. Arlene Johnson of Blue Cross of Northern California started as a FORTRAN programmer, acquiring experience also with PL/1 and IMS. She got into systems work with teleprocess-

> The job title is almost as broad as "medical practitioner."

HOW DBA'S SEE THEIR JOBS

At Standard Oil/Tulsa

Decentralized and with a heavily supported divisional operation is Standard Oil Co. of Indiana, whose Tulsa, Okla., operation has five 370/168s. Its first user-written application programs with data bases began in 1967, and IMS activities started in 1971. Data bases there span more than one department and multiple applications, thus are integrated at the subsidiary level.

"We do implement data; we don't implement applications," says db administration manager Richard D. Secrest. "Applications use the data we implement, but we have *a* maintenance system. Singular. It maintains all data bases. And we sort of divorce application logic."

Secrest has a BA, and an MS in math, has had an operations research and a systems engineering education, never quite completing his work on a PhD. He was first employed by IBM as a systems engineer, worked as a systems programmer for a number of aerospace firms, and joined the Tulsa operations of Standard Oil in 1970. There he has been involved with the analysis, design, and implementation of data bases, becoming the dba in '72 and recently receiving his new title.

The organization's forward thinking about data bases is shown by a user-driven information system study performed in 1965, which called for the integration of data bases across applications, a move curtailed because the technology of the time did not allow them to share it the way they wanted. In addition, the immediate need for applications by operating departments worked against integration at that time. Preventing them from further spreading the benefits of integration, Secrest says, is the multiple cpu problem. "If we could process everything on one cpu, we'd be pretty close to where we want to be."

RICHARD D. SECREST

Organizationally, Secrest is on a level with the manager of systems analysis and the manager of computer systems design and implementation. The three of them report to the manager of systems development who, in turn, reports to the manager of data processing. Below him, Secrest has a supervisor of data base analysis and supervisor of data base technology.

The latter is involved with the design and implementation of data bases, the analysis of logical data requirements, and with an optimal physical design to satisfy those logical data requirements. He also spends a lot of time on recovery and on shared data problems, a situation that results from their IMS files being shared by five cpu's when they were designed to be used by only one. So he has recovery, back-up, and startup problems, and must work with programmers so they will use mutually agreed upon call patterns.

The supervisor of db analysis has a staff of four, each responsible for a department, and is responsible for coordinating data requirements of all departments. He's at the front end of applications development. His effort also goes into getting file directories integrated with their dictionary system, trying to drive up the utilization of data by users.

"We're trying to get the data closer to the users," says Secrest, by having user languages such as ASI's INQUIRY and MARK IV that make it easier to get to the data. "The organization and structure of the data should lend itself to easier and better use of the data. That's the whole thrust behind our existence."

Secrest, himself, spends his time coordinating computer centers to retain standardization. He shares the task of reviewing and approving application proposals, and spends time with his users outside of dp, "trying to get them to think data instead of programs." He is also planning for the on-line environment, Tulsa's operation still being batch. ❋

ing monitors and the like, and after joining Blue Cross about six years ago did systems-level programming and got into hardware evaluation and networking. Her title now is supervisor of systems services, the position to which the db administration staff reports.

Fairchild Camera's Sharon Bonner

The fertile recruiting ground is in systems analysis.

was previously with Marathon Oil in Ohio in programming and programming management slots, both on the business and scientific side. She even served six months on a temporary assignment as head of computer operations. Says Richard D. Secrest of Standard Oil (Indiana) in Tulsa, "The fertile recruiting ground for us is in systems analysis, generally."

But Donna Sheppard Rund of Crown Zellerbach views the dba job as 60% nontechnical and 40% technical. "The 60% nontechnical has to do with understanding the business, understanding the direction of the long-range plans, and the modeling of data," she explains.

Acknowledging the need for the technical background, then, what should be the dba's strengths? The answer is quite clear. It is, essentially, the ability to sell, in a missionary way, the idea of treating data as a valuable corporate resource. Says Dick Secrest, "Communications, I think, is very key —both written and oral." And be a diplomat? He says he considers that a subset of communications.

Donna Rund says the process of educating people on this role of data in a corporation is easier at the upper management level because they understand the idea. Starting lower, with the people who may have had systems "blow up in their faces," won't work, she adds. "But starting at the top and having that attitude or viewpoint filter down to the people at the lower levels takes a long time."

Until then, there can be problems. Although people have been saying for some time that data should be treated as a corporate resource, Altshuler says, it is instead considered proprietary by users within a company. " 'It's mine,' they say. They put walls around it. And there are incompatibilities among them."

Arlene Johnson of Blue Cross agrees. Programmers and analysts, she says, are accustomed to considering an

At Crown Zellerbach

Donna L. Sheppard Rund joined Crown Zellerbach, the forest products and paper company based in San Francisco, Calif., in early 1975. She brought to the job her experience as a programmer and systems analyst, as well as a background in management science. She had headed the first data base project at Transamerica Corp., where she served as the dba, senior designer, and project leader. She subsequently joined Cincom Systems, vendors of the TOTAL data base management system.

With these technical and managerial qualifications, she came to Crown Z, a firm whose experience with IMS could not be considered one of your basic successes but which was nonetheless committed to do a large IMS application. Zellerbach Paper Co., a distribution arm that operated as an independent firm with its own accounting department and all other support functions, was to get its own corporate-level integrated db system. The $6-million system was to support the paper company's entire business, from order entry to invoicing, inventory management, purchase order receiving, and accounts receivable, but is now also getting into sales statistics and financial reporting.

Parallel testing of the system is underway, the first on-line terminals are scheduled for installation in August, and the implementation phase is to run through the end of next year.

Although originally hired as the dba, she has since risen to become the supervisor of systems support, which has the six-person db group involved with the physical aspects of db management, plus one person on the logical end doing the functional business specification requirement in the data base.

Rund also considers it fortunate that her first assignment was a "corporate-wide" db effort for the paper company. It required her to explain to that concern's management the benefits to them of integrating data bases at the higher level. It also gave her a chance to talk to her corporate management at

DONNA L. SHEPPARD RUND

a nontechnical level about the costs and benefits of db.

She thinks she'd still possibly be buried at the lower organizational level if she had allowed herself, as the leader of the db group, to become engrossed in the technical aspects of the job instead of being able to view the db effort from the broader corporate level. It helps, too, she adds, that the dp director, to whom she reports directly, also views the dp activity from a broader perspective.

"I'm eventually going to try to call it the Information Management Group —versus data base—mainly to get away from the purely technical way people look at it," Rund says, "plus the prejudice they have when someone says 'data base' which means someone's going to try to throw IMS down their throats. Because of previous experience that's not a very tasteful thing to them." But, she continues, it will take time to get there.

Presently, however, Rund has the necessary clout to do her job. The policy is that no one can design a data base without going through her staff and using her design methods. "We have the general policies and overall standards set that sort of give us our clubs when we need them," she says with a smile. In case of disagreement by others, "the general management support and understanding are there."

Her group has begun work on a system integrated at the corporate level, specifically in employee relations. It will initially implement the retirement plan, moving on to the government's ERISA requirements, labor relations, education/training, and payroll. For the Timber & Wood Products Div., it is also performing the division-wide information planning, looking to see whether a db system should be implemented and what activities stand to produce a high rate of return, versus those that don't justify the data base approach. Working at this level enables her to get the division management to look at its information requirements and to view the data base as an option that may or may not apply to its requirements. ❋

application as their own. And the files are their own. And the screens, formatted to their liking, are theirs. "The fact that they're now sharing these things and losing a certain amount of control over their applications—that's an uncomfortable situation," she adds. "People new to data processing are going to start with those concepts, and it's going to be easy for them to accept."

Take it out of dp?

Therefore people are saying there ought to be a data czar, a data administrator who has a corporate-wide view.

"But when the dba starts his function, he's dealing at a very technical level," Altshuler continues. "He's trying to find out where the data is, what it looks like, its characteristics and attributes. He's dealing at such a technical level that you can't make him, for example, a staff assistant to the president—much as a corporate comptroller would be, up at that level. So you put him under the director of data processing. And there he starts to get a view of the world that is filtered by his organizational placement. Yet what we really need is someone who rises above that."

If the dba is the corporate owner of data, he should be outside of data processing.

But the dba role continues to change and, hopefully, grow. "After the first year or two," says Altshuler, "when he finds out where all the data is and starts to go through the exercise of bringing in a specific data base management software system, then all of a sudden he's got to be a manager, no longer a technician, and he's the wrong man for the role. So it's an evolving position, both organizationally and functionally."

Among knowledgeable people, there is no agreement whether the dba should remain within the dp department or evolve to a staff-level position. Should the dba be out from under data processing? "Absolutely," says Judenberg. "If the dba is really recognized as the corporate owner of data, which is probably what it should be, then it should be outside of data processing."

Disagreeing with this position is Secrest. "I can't see taking data and information out from under the computer processes that generate them," he says. "I think both those functions need to report to the same person. There's data and there's processes that derive that information. And it looks like a chicken-and-egg thing, as far as I'm concerned.

What with the dba function still being relatively new, it is not surprising to find it operating within the dp department. But perhaps not for long. Jon Turner of Columbia Univ. says, "When the process of data base administration becomes a little bit more mature, I would expect to see them move out from under data processing and float to a level within the organization that allows them to resolve the type of conflict that they have to deal with." Turner, who is in the midst of making a survey of people performing the dba job, explains that it represents a conflict-resolution issue.

"It comes into being when there are multiple users for a single resource like a data base," he explains. "And so their primary function is one of resource allocation and conflict resolution. In order to do that, they have to be at an appropriately high level within an organization. Until a function becomes more mature and they move out of the initial startup relationship with data processing, you're not going to get it free-floating."

Another consideration in this argument is expressed by Rund. A programmer by background and a former technician in db management, she nonetheless has managed to avoid becoming too technically involved since joining Crown Zellerbach in early 1975. Her concern is that when the dba is buried within the larger dp department, an activity considered too technical to be fully grasped, the dba function will likewise suffer and be viewed by corporate management as just another technical role.

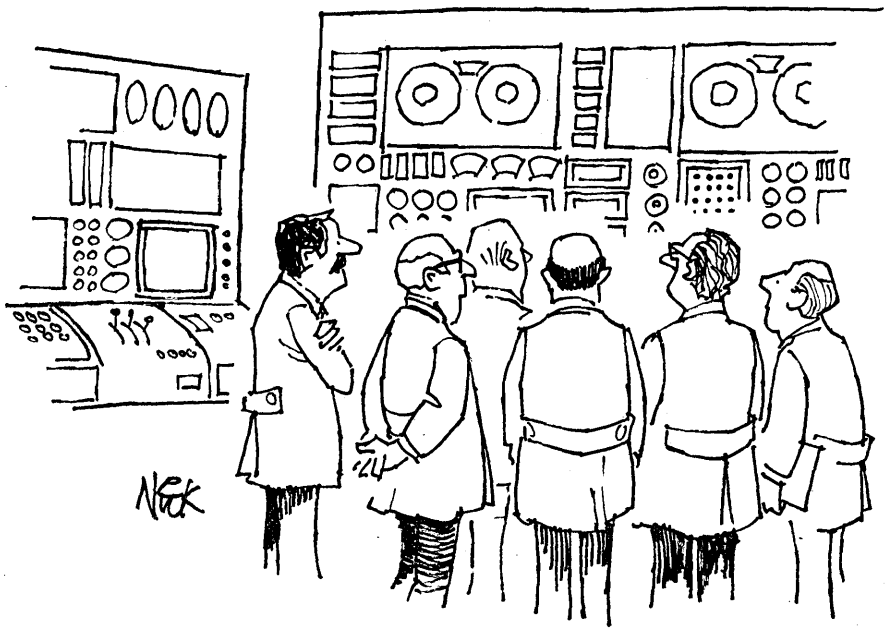
The job is not dissimilar from that of a comptroller.

"If we're successful," she says, the dba function will consist of two groups. One will be technical, concerned with the physical aspects of data base, and the other will have to do with the logical aspects, with business functional specifications. "And hopefully the information planning side will be entirely out of computer services and into more of a corporate staff position. Mainly because when you have it under computer services it looks like you're doing computer planning (what sort of machinery and people do I need?), versus corporate information planning, which is a different animal."

Rund, who may be better known from her speaking engagements and her writings as Donna Sheppard, also says she's been trying to get the thought across that the job is not dissimilar from that of a comptroller, "except that you're not controlling money but rather data or information. And I think in the long run, if we're successful, that's the direction we'll go. But I have no idea when it'll occur."

Can one person do it all?

An obvious question, then, is whether the same person would be capable of handling the dba function at all those various levels—from the technical to the managerial. Donna Rund feels the



"... and if any of you have a problem, please remember that my input keyboard is always open."

dba needs both the technical background and the broader view, and is not certain it can be done by one person. "I do think you need the two sides if you want to look at data base as a tool to do some corporate management of data. You have a person who has a global perspective, as well as a person who technically can implement and manage that. And if you find such a person, that's great. I find it very difficult."

Drexhage of SRI expresses a concern over this dichotomy in an eye-opening

Is the dba working at the technical level destined to stay there?

way. He thinks the dba working at the technical level is destined to stay there. "As soon as you suck a guy down in there," he says, "he's never going to bubble up and say, 'Hey, corporate people, it's important that we assess the corporate role of data.' He's never going to sell that pitch. It takes an awareness—slow to come, but it's coming—that the dp side is important to the running of the company; ergo we ought to look at data much like we look at money. A corporation puts a lot of effort into the short- and long-term planning for dollars, and it ought to put the same kind of effort into the short- and long-term planning for the use of data."

Jon Turner, who is director of advanced systems at the Center for Computing Activities at Columbia, provides a different slant on this. He sees the two roles as those of a generalist and a specialist. "I think in data processing you have a large predominance of specialists," he says. "The conversion of

The conversion of a specialist to a generalist is a very difficult one.

a specialist to a generalist is a very difficult one." People at the middle and top managerial posts in corporations are generalists, although they formerly had been specialists in law or accounting. So the dp specialist must be able to change his perspectives, right?

"That is not encouraged within a very technical discipline as computing or data processing," he explains, "because it has its own subculture, which perpetuates it. And one gets rewards based on technical skill, not on creating these communications and interdisciplinary skills. So there's a real problem. I'm not sure that people *can* not rise above that. But they *will* not begin to do so until we modify the incentive system so we make it attractive for them to do it." ❄

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CIRCLE 124 ON READER CARD

Bell's End Run

by John M. Eger, Contributing Editor

The Bell System wants to offer data processing services. The U.S. Government, in the form of the Federal Communications Commission, says "no." But Bell knows a way around the government; it's been that route before.

Congressman Lionel Van Deerlin, chairman of the House Subcommittee on Communications, boldly announced last year that the entire 1934 Communications Act needed an overhaul. He's certainly right. The Act attempts to regulate present telecommunications, satellites and all, using 1934 foresight. Written at a time when we had only telephone, telegraph, and radio-without-pictures, the Act established the then-cozy relationship between a regulated monopoly, the telephone company, and its regulator, the Federal Communications Commission.

The Act set up the FCC to regulate communications between states, while communications within the borders of each state were left to the state governments to regulate as they saw fit. This no longer makes sense in an age where time and distance are so compressed.

In the earlier days, government regulation of a monopoly, and regulation as a substitute for competition, were not a problem since both the industry and government were concerned with the same goal; universal plain-old-telephone service. But the computer/communications industry of today presents an entirely different situation. The once-cozy partners, FCC and Bell, have taken widely different stands, with the FCC favoring a wide open marketplace and Bell fighting to preserve and enlarge its monopoly.

Van Deerlin's announcement of a rewrite of the 1934 Act was most welcome—especially in light of Bell's recent pushing of the deceptively labeled Consumer Communications Reform Act (the so-called "Bell Bill"). And the announcement was paired with another welcome move, Congressman Timothy Wirth's and Senator Gary Hart's fostering of a Congressional resolution favoring competition in the communications industry.

> The Bell System is to the preservation of monopoly what Red Grange and Crazy Legs Hirsch were to football.

Trouble in Peoria and Split Lip

But beware! Many are too pleased with these new developments, and are getting comfortable; others have already grown weary of the fight. And while all eyes are on the House and Senate deliberations of a new (non-Bell) bill for an enlightened third century of America, or on the slower-grinding AT&T antitrust suit, or on the quixotic Federal Communications Commission exercise in semantics called the Computer Inquiry, there is trouble brewing—in Peoria, in Tuscaloosa, in Split Lip, and elsewhere.

For the Bell System is to the preservation of monopoly what Red Grange and Crazy Legs Hirsch were to football —masters at deception, deft and agile on the end run.

And an end run it is in the form of a service called TNS or Transaction Network Service—designed for the emerging electronic funds transfer and point-of-sale industries of the future, and for much more. It is being marketed by AT&T quietly, skillfully, almost by stealth; and while it is only tariffed in Minnesota, Washington, and filed for approval in Arkansas—three states in all—AT&T may well be laying the foundation for the next major court test, one in which they are the victor: call it *"Telerent Revisited."*

Do you remember the Telerent Leasing case? That's the one where the

North Carolina Public Service Commission tried to ignore the FCC's pro-competition move, after the FCC had ruled that non-AT&T terminals and other non-Bell equipment could be connected to the telephone network. North Carolina's Commission had passed its own ruling which said, in effect, that if the FCC wanted you to have non-Bell devices on the phone line, that was all right so long as you only used it for *inter*state service.

North Carolina's stand was nonsense of course, and could have led to having two telephones on every desk as was prevalent at the beginning of the century. So last December the Supreme Court decided in favor of Telerent and against North Carolina. For the manufacturers, suppliers, and users of competitive computer and business equipment, *Telerent* was a major victory. *Telerent Revisited* could be a major loss.

There is as yet no such case as *Telerent Revisited*. But, as one member of the National Commission on Electronic Funds Transfer surmised, if there is to be one, it's already been lost.

How? Well, Bell has recently been busy inventing and offering a product called the Transaction Terminal and this service we mentioned called Transaction Network Service. The names are trademarks for a collection of terminals, controllers, switches, and software—as well as communications protocols—which Bell pretends is only a telephone service for credit verification.

Actually, with TNS Bell is putting into place a whole network for credit verification, funds transfer, point-of-sale, and even electronic mail, the whole works for its business in the 1980s. Even the deceptively simple looking telephone in the mix is really an intelligent terminal of some power.

Bell will use the method which proved so successful in getting Dataspeed approved.

You can't get it between Minnesota and Washington or between New York and Illinois, of course, and you won't. Not yet anyway. Because TNS is purely an *intra*state service. Something called the McFadden Act restricts banks from having out of state branches, so Bell can innocently claim that in developing a branch banking system it needs only state authorization.

But TNS is certainly not intended to stay an intrastate offering. Bell will eventually try for an interstate tariff, but not now. A filing now would very likely be turned down. Instead, Bell will use another method, the one which proved so successful in getting the Dataspeed 40/4 approved.

They did it with Dataspeed

The Dataspeed 40/4, you'll recall, is a terminal processor with substantial data processing capabilities. When Bell first attempted to offer the device, that is requested a tariff for it, the FCC turned down the idea on the grounds that the Dataspeed was data processing equipment.

After losing that first round—and note the parallel with the *Telerent* case—Bell made an end run. It went directly to the states for *intra*state approval of the device, and was granted the approval practically without exception—this in a four to six week period.

Presented with this fait accompli, a de facto state standard, the FCC reversed its prohibition against Dataspeed.

The Transaction Network Service, while having many of the characteristics of the Dataspeed 40/4, is a much more pervasive entrant in the marketplace. It is precisely the right combination of hardware and software that lies at the heart of all future electronic funds transfer and point-of-sale developments, among others.

TNS in effect is AT&T's system network architecture, and if AT&T controls the EFT switch that inevitably ties the interstate knot, AT&T and AT&T alone will most decidedly control the terms and conditions, the formats and protocols for use or access to the AT&T network. From that position of strength there is no limit to the leverage AT&T will have, whether it be controlling the product design or the marketing strategy of their competitors, indeed determining whether and to what extent there will be any competitive entry at all.

Yes, TNS is the epitome of the evolution of data processing and communications. Under the rules—the 1956 Consent Decree (which effectively precludes AT&T from providing any service other than "regulated common carrier communications") and all—tariffs for it would probably be rejected out of hand. For although the FCC reversed itself on Dataspeed it did so with some conditions attached—and with a promise to review the distinction between data processing and data communications in the on-going study we refer to as the "Computer Inquiry." Would the FCC duck the TNS tariff and again defer to another proceeding? It's highly doubtful.

AT&T is fully aware of the FCC's dilemma, and so wisely has chosen not to push it. It has likewise chosen not to irritate the Justice Dept. into revisiting enforcement of the 1956 Consent Decree either.

But the Justice Dept. has a dilemma too. Like the FCC it can't tell the difference anymore between communications and data processing. Worse yet, as a matter of policy, Justice hasn't been asking for more than 10 year consent decrees and AT&T's is already 21 years old. And after all, Justice has an antitrust suit under way against Bell. What more could you ask?

State commissions aren't as suspicious

The state commissions don't have the expertise of the Justice Dept.—nor the responsibility. They don't have the expertise of the FCC either. Perhaps, to put it politely, it is *because* they are not as hostile or suspicious of Ma Bell as those scoundrels in Washington, D.C. are that we are seeing, and will see more, state action both within the state legislatures and at the public service commissions.

And so whether data processing or communications, common carrier or not, TNS tariffs—like Dataspeed 40/4 tariffs—are being filed even before FCC approval. State by state has accepted them as the process continues its normal, unobserved course.

Like the FCC, the Justice Dept. cannot tell the difference anymore between communications and data processing.

There is precedent, AT&T has argued, that "acceptance of regulatory jurisdiction by . . . a substantial majority of state authority satisfies the intent and literal language of . . . the decree." But it's a precedent they may not even need.

If in the weeks and months ahead AT&T should secure the acceptance from a majority of state regulatory bodies, how can the FCC deny interstate nationwide authority for the TNS service? Even if it should decide TNS is a data processing service? Even if whatever the service definition—either data processing or communications—it decides it shouldn't be regulated? It need not be regulated?

Too late? Perhaps, for at that juncture AT&T will already have pulled our EFT/POS future into the murky, stilted regulatory arena. The monolithic telephone industry moving slowly but inexorably into markets heretofore unregulated, but using pricing principles and cost allocation methods of the regulated monopoly, may have distorted forever the free marketplace by simply seeking state regulation and getting it without a whimper.

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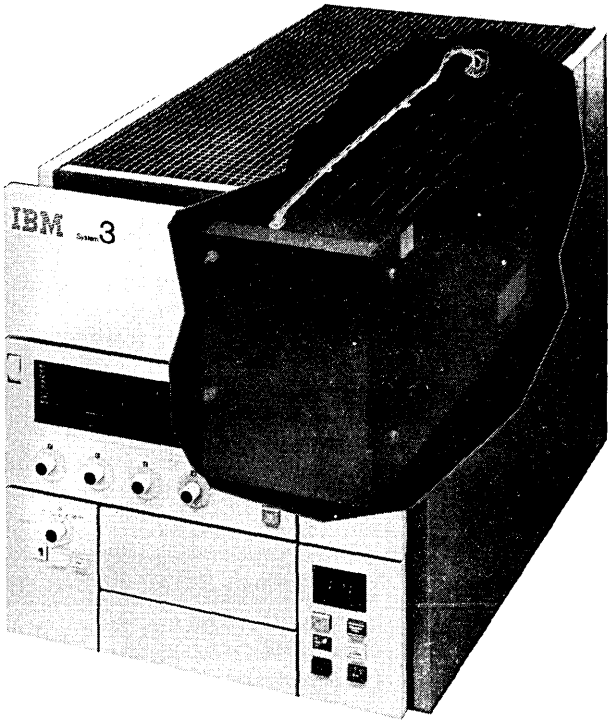

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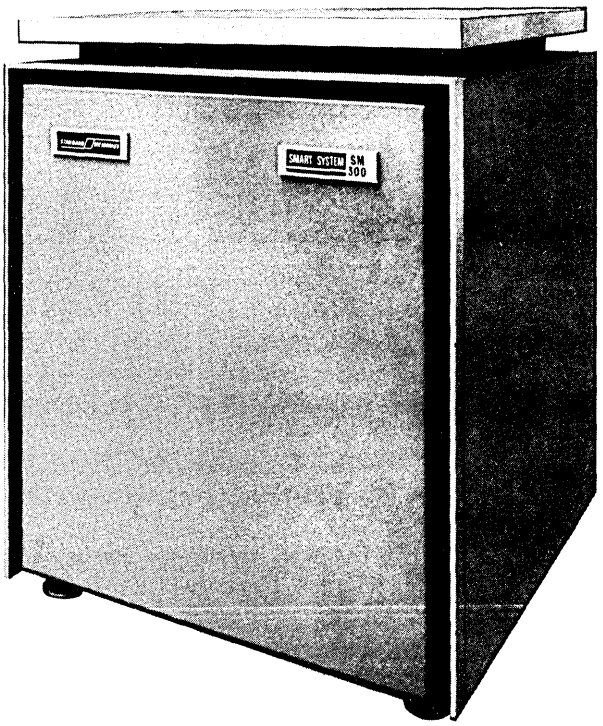

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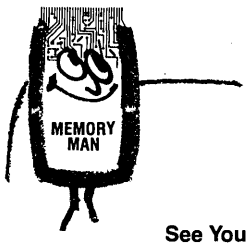

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END RUN

again? I don't know. I do know we must stop this trend. I do know we must find a way for both competition and monopoly to coexist. Regulatory instruments that insure against both predatory pricing by the monopoly and predatory entry by the competition into the monopoly's regulated business can and must be constructed. The traditional concepts of common carrier regulation and monopoly can and must be redefined—and narrowly. And a basic and assured commitment to the free market must be made by all of us.

But most of all we must recognize that Chairman Van Deerlin and his counterpart in the Senate, Chairman Hollings, need our help. We must speed up the process of enacting new legislation.

If we should fail and AT&T should go to court armed with authority to operate in 50 states but not FCC approval, then it is possible that the court's order shall read "The system is the solution."

But the system is not the solution. We need more competition, not less, and less regulation, not more. Most of all we need to inform everyone who will listen about what the real issue is in this battle we have called *"Telerent Revisited"*—a deregulated free marketplace, nothing more, and nothing less. ❁

Until last summer, Mr. Eger was the acting director of the Office of Telecommunications Policy, Executive Office of the President. While in that post he was also the chairman of the Interagency Council of Government Telecommunications Users, a member of the President's Ad Hoc Committee on Regulatory Reform, and the President's Cabinet-level Domestic Council Committee on Privacy.

Prior to acting as director of the OTP, he was legal assistant to the Federal Communications Commission Chairman, and prior to that special assistant and attorney advisor to the general counsel of the FCC.

He is presently counsel for Lamb, Eastman & Keats, Washington, D.C.

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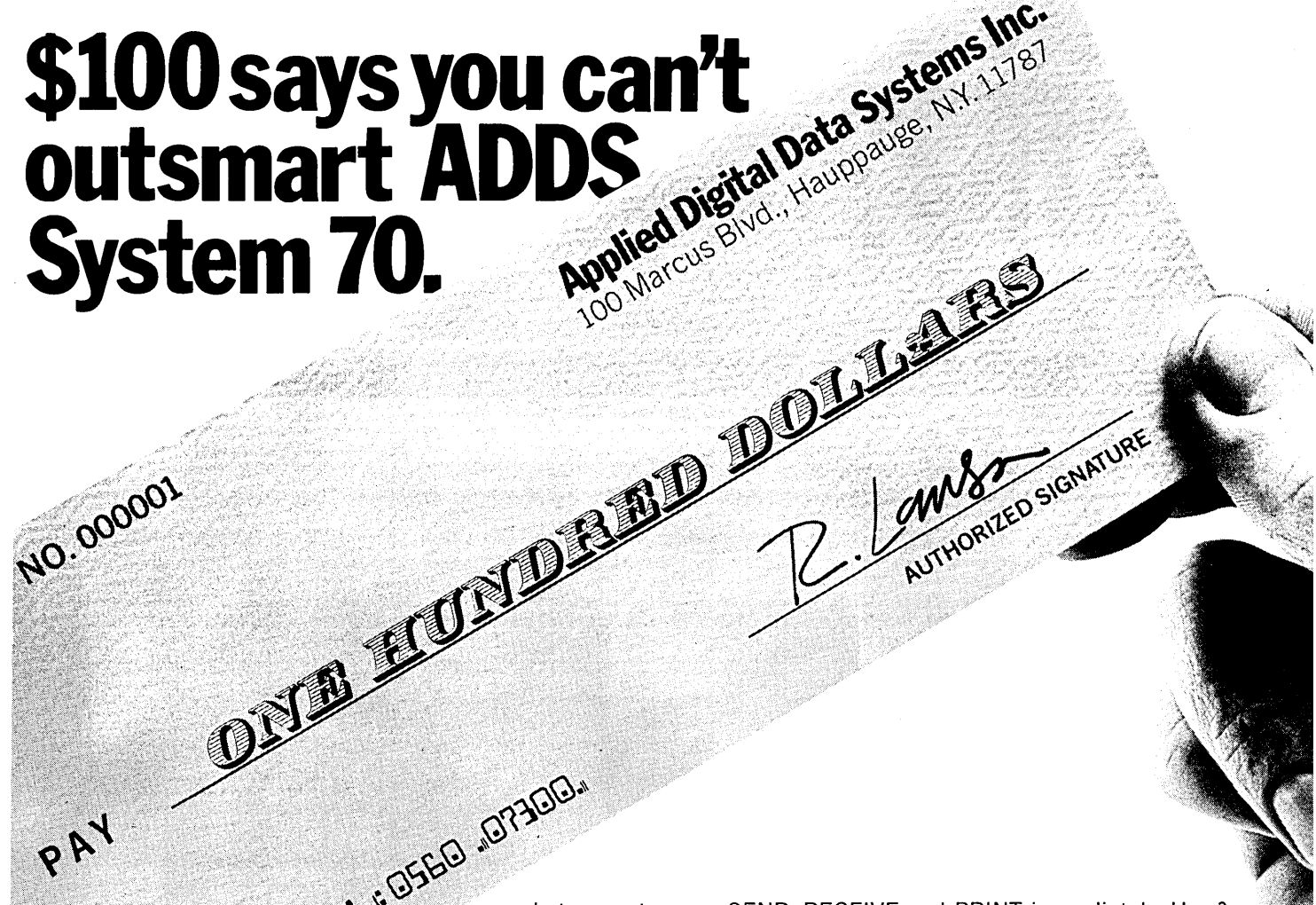

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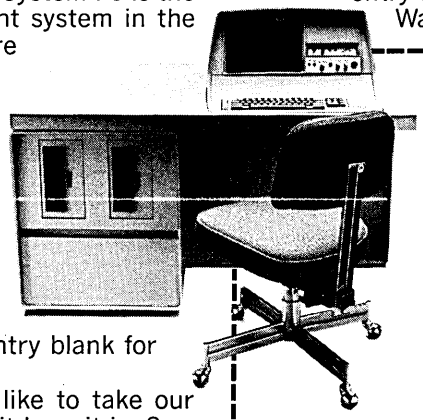

CIRCLE 11 ON READER CARD

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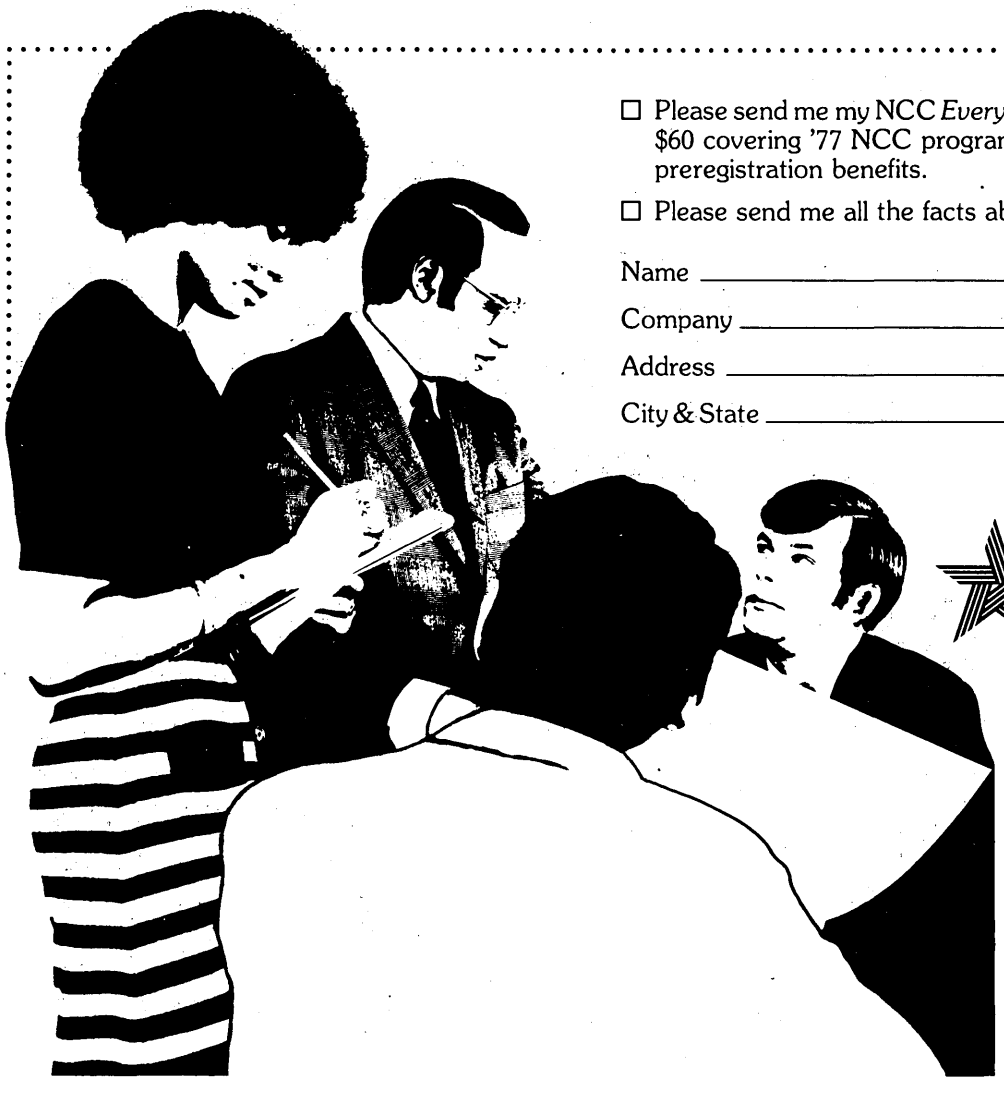

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CIRCLE 33 ON READER CARD

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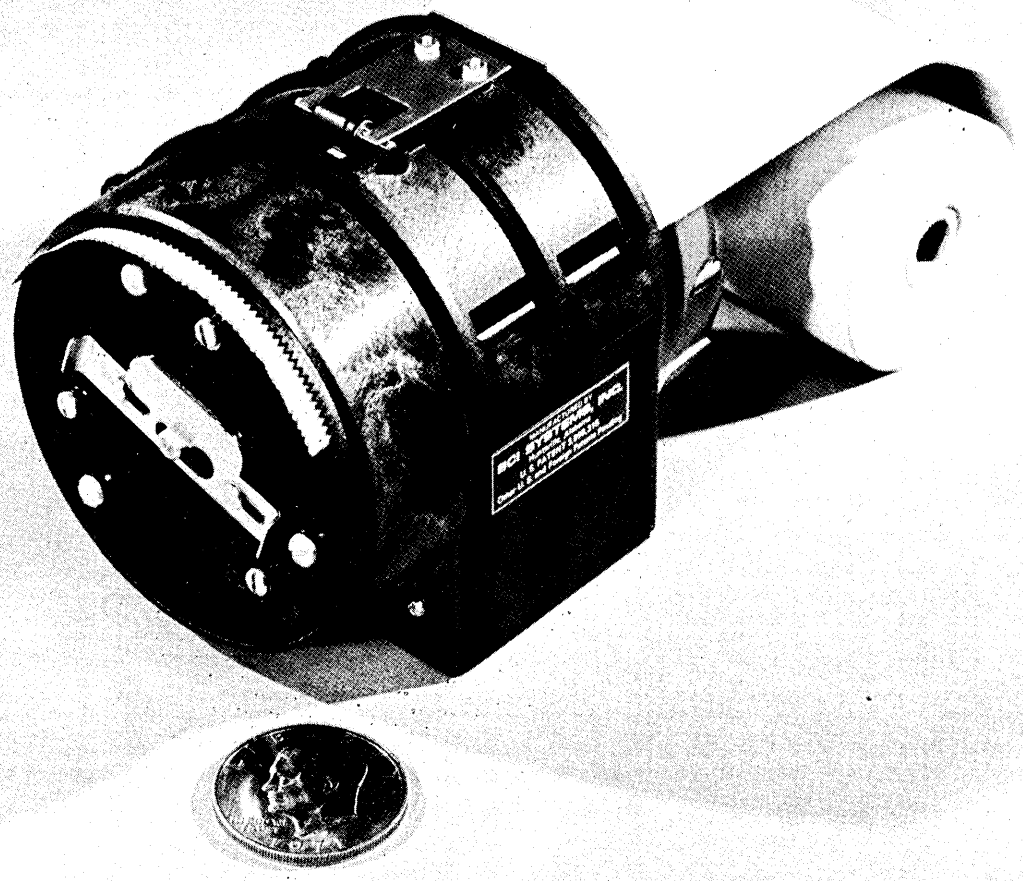

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IBM Versus Bell in Telecommunications

by Howard Anderson

Bell's battle plan is to have the entire telecommunications territory legally declared "off limits to all but communications carriers." IBM's counterattack is to become a carrier. Every user has a stake in the outcome.

It is commonly assumed that IBM is so vitally interested in communications because it wishes to protect its computer mainframe business and its memory business. Such is not really the case. IBM *needs* to get into new businesses.

To understand this, we must look at the various service and regulatory supervised markets and compare them against competitive equipment markets.

Go after the office

For IBM, the major market in the future will still be *the office*, its traditional market. The IBM Task Force, which is investigating exactly what IBM strategy should and must be, feels that the business in computing (cpu's and memory) is not particularly threatened by competition nor by developments in communications.

Instead, the problem with IBM's cpu and memory markets is that technology has been forcing down the costs and the prices—not that a formidable competitor is on the horizon, nor that ATT or Honeywell or Burroughs or Digital Equipment could supplant the IBM market share—just that it is severely impacted by IC technology.

In the past this mainframe and traditional memory market comprised some 70% of IBM's business. Next year it will comprise more like 30%; by 1985 it may account for no more than 10%.

I do not feel that the profit margins on the cpu's and memory will decrease, just that the dollar amount of gross sales and gross dollar margins will decrease. We need only look at the raft of price and cost reductions of memory over the past two years to say this will happen, and is already happening.

Bubble memory, charge coupled devices, and other technologies have driven down the cost of manufacturing and the price of the product as well. Memories are cheap now and they are going to be cheaper—will we see a 16K bit memory costing under $1?

The first part of our logic, then, is that cpu's and memory are an essentially safe market for IBM, but that they will contribute a decreasing percentage of gross sales and gross profits in spite of continuing to be highly profitable.

The biggest market for IBM will be the Office of the Future. But IBM's strength here must be protected because there are a number of factors which may inhibit and, to some extent, prohibit the development of this market as IBM would wish.

The first of these is regulation. Table 1 shows a double line between "Transmission" and "No Man's Land." Once you cross this line, once you send data or voice across the street, you are in a regulated business.

Between "The Office Market/The Computer Market" and "Transmission" is something we call "No Man's Land," and it is here that this battle of strategies will be fought, for this area represents some 70% to 75% of the entire data communications marketplace.

The big questions are obvious: who will own this No Man's Land? Will it be ATT and the common carriers, or will IBM and the competitive electron-

THE OFFICE	NO MAN'S LAND	TRANSMISSION	NO MAN'S LAND	THE OFFICE
telephone	PBX		PBX	telephone
typewriter	stored program PBX		stored program PBX	typewriter
dictating	"smart" switch	• • • • • • • • • •	"smart" switch	dictating
facsimile	controller		controller	facsimile
word processing	multiplexor		multiplexor	word processing
photocopy	rooftop antenna		rooftop antenna	photocopy
THE COMPUTER ROOM				**THE COMPUTER ROOM**
cpu				cpu
memory				memory

Table 1. IBM's traditional market has been in The Office and in The Computer Room, while ATT's has been in Transmission. The battle between the two will take place in none of these environments but in No Man's Land, and that's where 70% to 75% of the data communications marketplace is.

ics firms have part, or all of it?

The problem is larger than just data; obviously voice transmission comes in this area of black box hardware. In fact, any black box that takes a signal from a cpu or a piece of office equipment and sends it out into the Transmission system is in this area. Multiplexors, processors, PBX's, "smart" switches that digitize voice and data —they are all there.

Now, IBM doesn't want to be barred from entering this No Man's Land. And it is ATT's strategy to do just that, or at least use it as a bargaining chip for the bigger game.

IBM's first problem is that if even some of these No Man's Land functions are performed by a regulated utility, such as ATT, then, when those functions become important enough the utility can run back to its supervisor—the FCC, or the state public utility commissions—and claim it has been unfairly taken advantage of.

The second problem for IBM is that the definition of regulation is sufficiently vague that there is little policing by the regulators to keep what IBM believes to be unregulated businesses out of the hands of the utilities, once a tariff is granted.

IBM fears that once a "service" is tariffed, then that service (or product) falls under this umbrella and that in some time in the future, the utilities (ATT, Western Union, whoever) may go back to their regulators and rightly or wrongly claim that "the public interest is being hurt. This is a tariffed service and we are a natural monopoly. Please order this upstart firm (IBM?) to cease and desist."

This is true even if the "competitive" firm was offering the service at the same time, or even in some cases, before the "natural monopoly." The legalists call this the problem of "primary jurisdiction" and we will find this coming up again as we trace the strategies of both IBM and ATT.

It turns out to be in the best interests of ATT to have these No Man's Land services tariffed, and in the best interests of IBM not to have them tariffed. This is what the entire Datapeed 40-4 argument was about, and this is what future IBM/ATT conflicts will be about.

Once an area is tariffed, the common carriers can move into it and expand the definition of regulation. The "taint" of regulation is never removed. And, theoretically, once a service is tariffed, no one but utilities should be able to offer it.

To see how it works, one need only go back to 1966 and track Bunker Ramo's attempt to penetrate the SICOM stock reporting service offered by Western Union. Bunker Ramo had a system that went from the floor of the stock exchange, to the central office of a brokerage house, out to the branch office, and back again through this same trail. Western Union was able to block this because this was a "message switched" service that emanated and terminated in a "public place" (the stock exchange floor). By having a new kind of service tariffed, Western Union had usurped the business forever. Too bad, Bunker Ramo.

It is not in the best interests of the common carriers to have competition and regulation side by side for exactly the same services either, because this can give the regulators a "benchmark" which may not operate in their favor.

Examples of cases where this has happened involve Graphnet and Telenet (which set precedents for packet switching being different from regular carrier service) and now-defunct Datran (digital microwave). In the latter case ATT was very frightened that a comparable hardware system existed, and it couldn't let that system grow.

Okay. IBM worries that ATT begins to supply services which they feel go beyond ATT's charter, such services as supplying a "network processing service"—which is really just a store and forward message switch. IBM feels strongly that this is an area that has traditionally been a data processing and dp equipment market. IBM and the whole computer business have a legitimate worry when ATT talks about supplying a "dial-up service" like the voice-answerback service for reading bank balances to customers ATT is pushing in some states. In theory, ATT is just "delivering a message"; actually they are doing more.

These are some of the examples of why IBM has changed a basic tenet of its philosophy, which once was to stay out of regulated businesses.

Get into regulated businesses

The new philosophy at IBM is to get *into* this regulated business because:

1) IBM needs *total* systems control, and total end-to-end control, and could not get this without being in a regulated telecommunications business.

2) Total control means that IBM cannot run the risk of being forced out of a market by non-market derived means, such as regulation. Which means it must have a good strong voice in what is happening in regulation.

John Opel of IBM stated that: in order for IBM to plan its product line five to ten years in advance, it had to know what technology and what economic characteristics would influence the marketplace. Chief among them is the link, the regulated network. On this basis, IBM can justify their participation in Satellite Business Systems, the communications carrier.

The time has passed when a series of meetings with Bell Labs would suffice to let IBM plan its products and rely on an outside vendor (ATT) to establish and run this vital link, the long distance network and the local loops.

IBM needs the assurance that the products it is designing will have a network, a "highway," on which to operate optimally. Because of the pressures on ATT and because of the enormity of this link in IBM's Grand Design, there was really no other alternative than to build this link itself.

By building the link (SBS), IBM assured that it would: first, have a good handle on pricing; second, have a strong voice in regulation because it would be operating as a common carrier; and third, have a long-line facility over which it could operate and on which it could plan its technology.

In fact, SBS is not expected to be a large part of IBM's business and the firm has not counted on it to throw off great amounts of profit. The crucial point to remember is that SBS is *not* crucial to IBM's business. Nice? Yes. Necessary? Vital? Not Really. In fact, SBS is just one large bargaining chip.

Actually, by promulgating SBS, IBM has guaranteed itself not one but two of these "highways"—its own and ATT's.

And because of the political ramifications, ATT cannot let the technology lead shift in long lines from itself to another company, even one so vaunted as IBM.

It is just the kind of leverage that worked *against* Datran that will work *for* IBM. Datran underestimated the force and speed of ATT's response in the marketplace. IBM not only expects that kind of response, but wants it.

IBM realizes that its move into a digital system will force ATT to divert more of its resources to the rapid development of such a system. Since the efficacy of IBM's business is having a system (any system) up and running, it then becomes doubly protected (perhaps triply if another financial lemming insists on following).

Let's put some numbers to this to put it all into perspective. The data processing and the telephone industries split $60 billion in annual revenues each year. Both industries have been growing at about 13% per year, so their combined new business is well over $7 billion per year. IBM has about 50,000 computers in the field and places some 12,000 to 13,000 per year (U.S. only, minis not included). The overseas market is 7,000 to 8,000 cpu's and is growing faster than the U.S. market.

At stake now is the business communications market, most specifically that of major U.S. companies. This

market today, with the Fortune 1000 companies, is somewhere over $4 billion, and growing, including voice, data, facsimile, text, etc.

The private line business, from which Bell now derives some 4% of its revenue, equals $1.2 billion, and it is this portion which is most vulnerable to a digital system. Although the specialized common carriers (not including SBS, since that system is not yet up and running) do only $75 million, it is a very important part of this business communications for ATT because it is a high profit area and because the leading edge firms now experimenting with it could shift a good deal more business that way if they decided it was a good thing.

On top of that, the demise and the uncertainty surrounding Telpak, Bell's volume discount offering for big users, acts as another advantage to the specialized carriers. Those carriers are now in a position to raise rates, still undercut Bell, and make more profits.

Then too, the interconnect firms are fighting Bell for a PBX market worth $497 million each year, and have cut themselves in for some $125 million so far—albeit most of their PBX sales go to the non-Bell independent phone companies which account for some 20% of the phones in the U.S. On another front, the non-Western Electric suppliers have picked up $105 million of the $320 million "Key System" market (the market for the kinds of telephones that have lighted buttons.

We bring these points and numbers up because they are necessary to understand the rest of IBM's strategy and ATT's competitive response.

The logic so far: the declining prices and costs of cpu's and memories force IBM to go elsewhere for its future growth. Their most natural market is the Office of the Future, but ATT has begun to make regulatory inroads there. Since the line of demarcation between "Office" and "No Man's Land" is sufficiently vague, IBM fears it will be forced out of this market, that it needs the assurances of a digital highway in order to plan its products. For this and a variety of other reasons, IBM reverses its "stay out of regulation" dictum and gets in with SBS. However, the efficacy of SBS has importance to IBM, but is not crucial.

The battlefield between the two will be in No Man's Land because it is here that the products overlap. Both firms have products in the Office, although in the traditional sense IBM is stronger. As computers get smaller and smaller, the electronic companies begin to put intelligence into voice, data, encyrpting, and facsimile equipment—all of which begin to use the PBX, the multiplexor, and the communications controller which Bell has traditionally supplied—and this part of the business gets much more traffic.

Now, in which end of No Man's Land is the battle to be fought? ATT would prefer that it be fought in the office, holding the PBX, multiplexor, etc. markets for itself. IBM prefers to fight it on the other side of the double line: in "Transmission."

Bell's problem in accounting

The similarities between these two companies and their goals is startling; but so are the differences. IBM has extreme confidence in its own abilities in this market; it is currently spending $900 million on research and development versus some $600 million from ATT. However, IBM is much more accustomed to the vast technology turnover which this digital technology is bringing about. ATT still lives with its 40-year depreciation on electronic switches while IBM uses accelerated five-year depreciation, which means that it has effectively written off a computer (read: "switch") in two years. And IBM only capitalizes its actual costs, not its installation costs.

A 40-year life for a major switch may have made sense when technology stood still; it makes no sense in today's world. David Kraushaar, the FCC administrative law judge, put the matter in perspective when he said that it is not the question of who was at fault, ATT or the FCC; it is that somehow this system must be redressed.

It is ironic of course that the firm which invented the transistor (ATT) should be the firm with the most to lose because of its development. While I am certain that no one thought of taking the three inventors out and shooting them at the time, there are those now at ATT who might consider that the idea had its merits.

In fact, however, if ATT exploited even 50% of its technical advances, it would bankrupt the company. The problem is the unified and standard system of accounting which the common carriers must adhere to. Its effect, when it comes into focus with the real world, is to greatly overvalue the ATT plant and undervalue the IBM plant.

If IBM depreciates its computers over five years, that means that during the beginning years it has a tremendous amount of "depreciation expense" which it offsets against income. Although this is an "expense" item, it really provides cash flow—cash flow being the net profits plus the depreciation.

ATT's accounting is really its Achilles heel. Working from a standard system of accounts that is approaching 60 years old, it assumes a very long depreciation period (20 to 40 years). Then, because of the regulatory mess, ATT can earn only some 8% return on capital, even though it earns from 27% to 30% pretax on its revenues.

The problem is political. If ATT were allowed to accelerate its depreciation, it would have increased operating expenses (depreciation) expense and this would allow it to go before the regulators and seek unpopular rate increases.

So ATT must update its plant in measured steps. But technology does not move forward in measured steps; it leaps.

Then there's the fact that inflation can reduce the abilities to replace worn equipment with new equipment. While it is also true that interest rate expense can be passed on to telephone users, the "lag" time is such that the effect doesn't help the telephone industry until at least 18 months later, and the company usually has to swallow a portion of this cost itself.

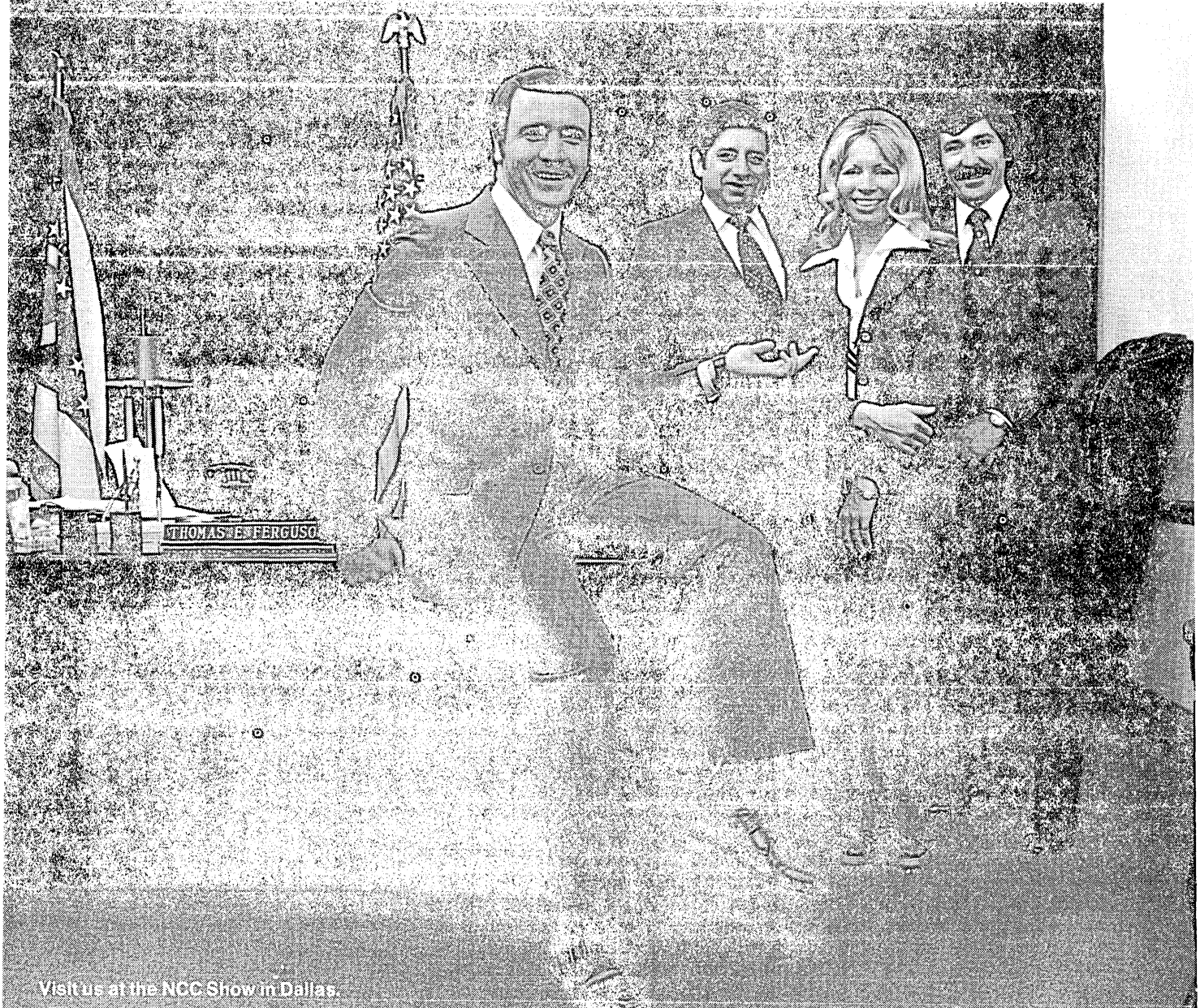
We could go on with this side of the discussion, but let us just say that IBM has nothing but pleasant surprises for itself with its ultra-conservative accounting system and ATT has a Pandora's Box which will now allow it to do and spend what it would have to in order to be competitive.

The effect is that IBM sees ATT as a company strong in technology but saddled with a good deal of junk which is not yet paid for. IBM sees that it can take advantage of its research while ATT cannot. It sees ATT's competitive response taking the form of the Consumer Communications Reform Act (HR12323, also known as the Bell Bill) to help maintain its monopoly position by law rather than through the marketplace, and so never face the prospect of writing off all that hardware.

Getting into Bell's goldmine

Even with its somewhat antiquated equipment, Bell has some real money-making departments. And these are very vulnerable to competition. The Long Lines department, the long distance facility, is 40% pure profit. Bell desperately needs something to throw off that kind of money if it has to continue to support all those money-losing local services. (Many people do not realize that even in populated areas residential phone service costs more to provide than ATT takes in on it. And even on a long distance call, most of the cost to the phone company is in the local switching, not in the use of lines.)

In effect, the long distance caller has been paying out of all proportion to the cost of providing service to him. Not only is there a tremendous investment in local switching equipment, driving up "local" costs, but the number of calls between major points is far greater so the economy of scale operates there. Finally, the state of the art, with microwave and multipath cables, makes it



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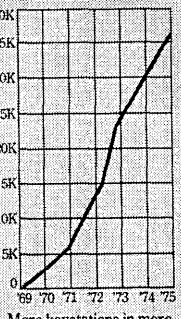

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IBM VS. BELL

easier to pump a lot of calls, say from Boston to Los Angeles, than to switch them locally from office to office.

Satellites, including IBM's, further complicate the problem. If charges for satellite transmission are set equal to charges for terrestrial circuits, then the satellite owners coin money by the bushel because their costs are far lower. However, if you allow them to make only the 8% to 10% return on investment allowed for the existing land-based telephone plant, then the satellite rates are so low as to capture the major market share.

In short, there's a total mismatch because the phone company has been using the return from long distance calling to subsidize local service, keeping those rates lower and winning political points.

Of course Bell can cut prices on long distance calls to compete with SBS and others, but then it must find another rich vein of ore somewhere. In the meantime, IBM is working to at least block Bell's entry into other mines.

As mentioned, the major IBM thrust is to capture an increasing part of the office market and to do it with its traditional mix of technology and marketing.

The entire body of terminals, for instance—including for the moment everything from the 200,000 PBX's in place to the 123,000 facsimile transceivers—is virtually obsolete, and no one knows that better than IBM. IBM's strategy of going after the replacement market with its new communications architecture, SNA, is similar to its strategy with SBS: to have a "leg up" on its competitors; to establish the standards by dint of its market share and its speed; to not have to reveal its strategy and specifications in advance; to not have to change its equipment half way through development because of industry association's standards; and, most importantly, to have knowledge of how its communications architecture matches its future network.

Naturally, this all fits into the Grand Design as outlined previously. IBM has always resented how its competitors were able to copy its terminals in the plug-to-plug compatible business. It hopes through SNA and SBS to far outreach its competition.

By announcing very loudly that SBS will be available to anyone, it both forces Burroughs and Honeywell to take notice, and forces ATT to hasten its development. But there are many who feel that ATT can't really respond, given its need for return on investment; this group feels that ATT is too locked into the existing costs for its existing network for it to be able to compete.

So there are the battlelines and strategies. The war must be fought in the No Man's Land *between* the user and his telephone line. ATT's strategy will be to have tariffs set wherever possible, staking out the territory as a "regulated" business and therefore a natural monopoly—ATT's. The Bell System may also move to modernize its accounting methods, and to compete more strongly in the long distance business. But these actions will fail it unless it is able to convince the government to give it full control over these new businesses through tariff setting.

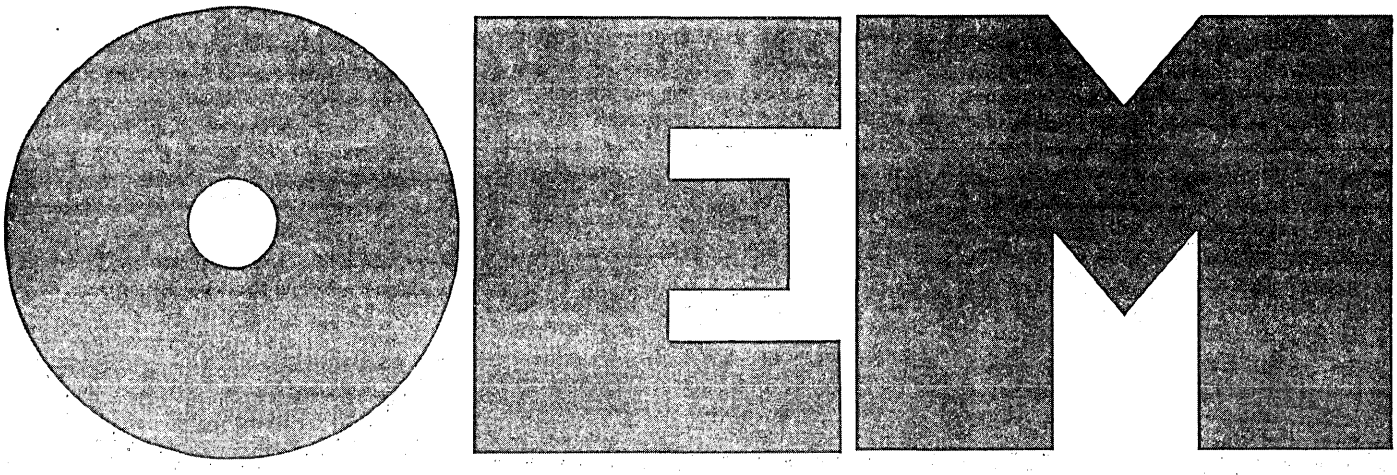
IBM sees all this, of course, and its moves will be to thwart some of the tariff-setting, and to get into the regulated carrier business itself.

IBM is well aware of what having a digital transmission facility means and right now is posing its product lines to take maximum advantage of it. Satellite Business Systems recognizes the necessity of having terminals and computer equipment to take advantage of its unique capabilities; it has the assurance that at least one major vendor will have offerings in the marketplace. Competitive vendors may wonder how they fit into this scenario. Pessimists are certain that there is no room for market entry. Optimists just aren't sure. Either way, its going to be very interesting.

At least given this scenario, it's a little easier to understand some of the present actions of the combatants in the courts, before the Federal Communications Commission, and before the state public utilities commissions. And such an understanding is vital for those of us who plan to be in this data processing/data communications/office automation business in the future. ✲

Mr. Anderson is president of the Yankee Group, a Cambridge, Mass., consulting and research firm. His own special expertise is in communications, a subject he has spoken on before the North American Telephone Assn., Interface '77, and the International Communications Assn. The Yankee Group has produced several reports on communications topics, including "IBM—The Grand Design," from which parts of this article were taken.

SIEMENS



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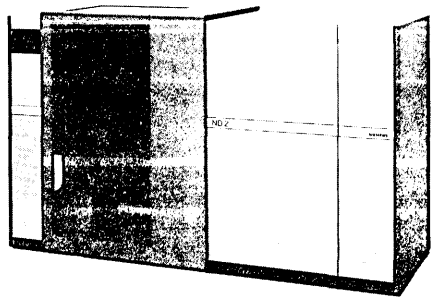

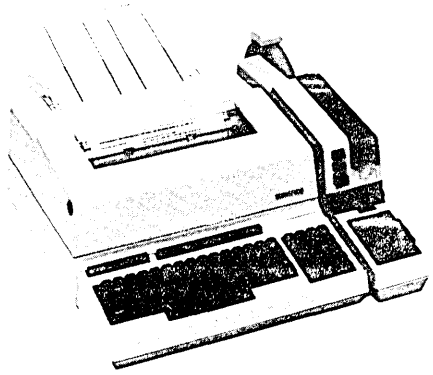

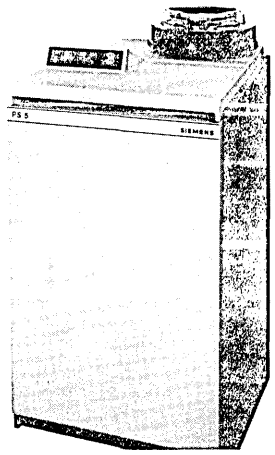

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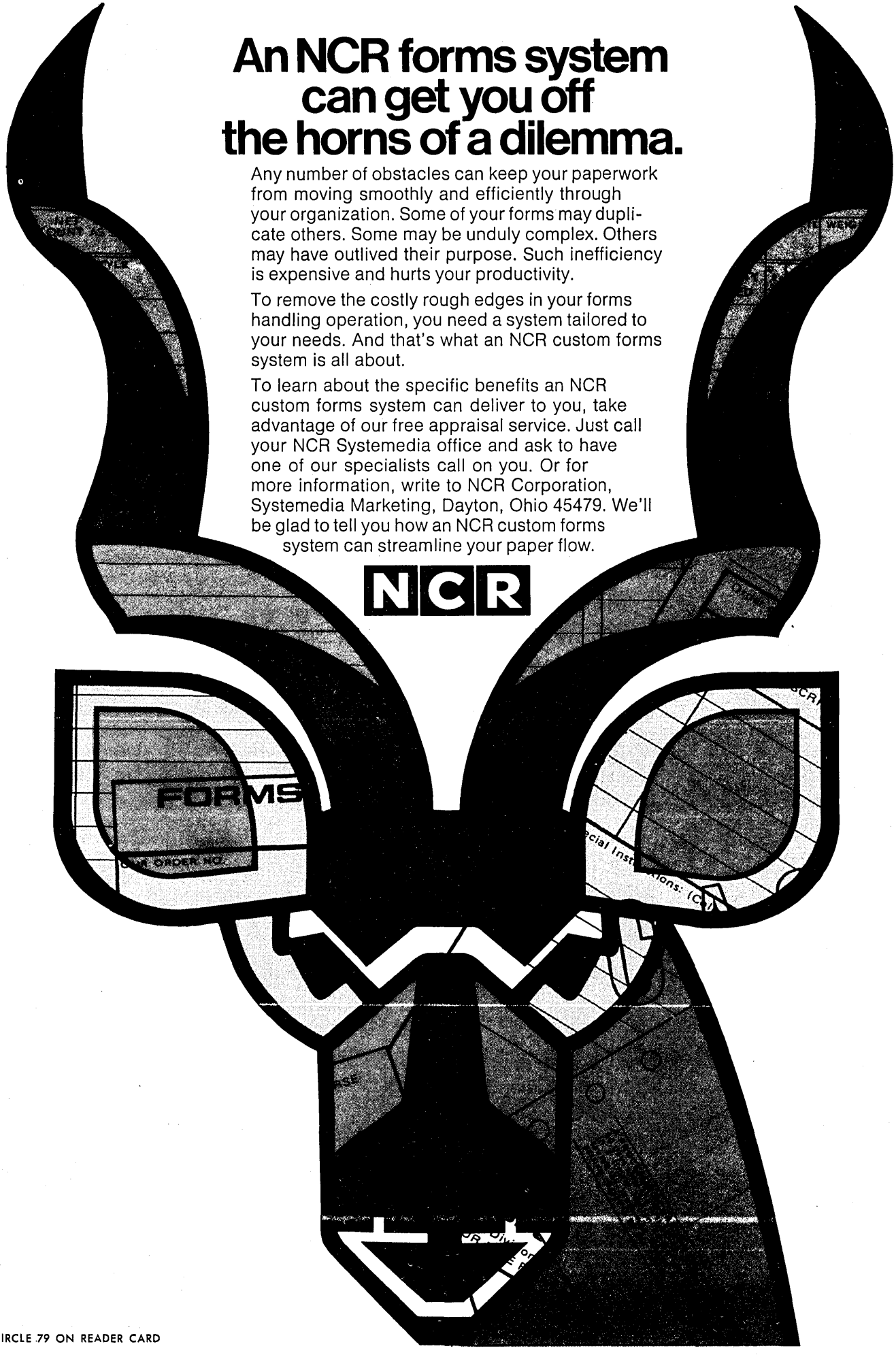

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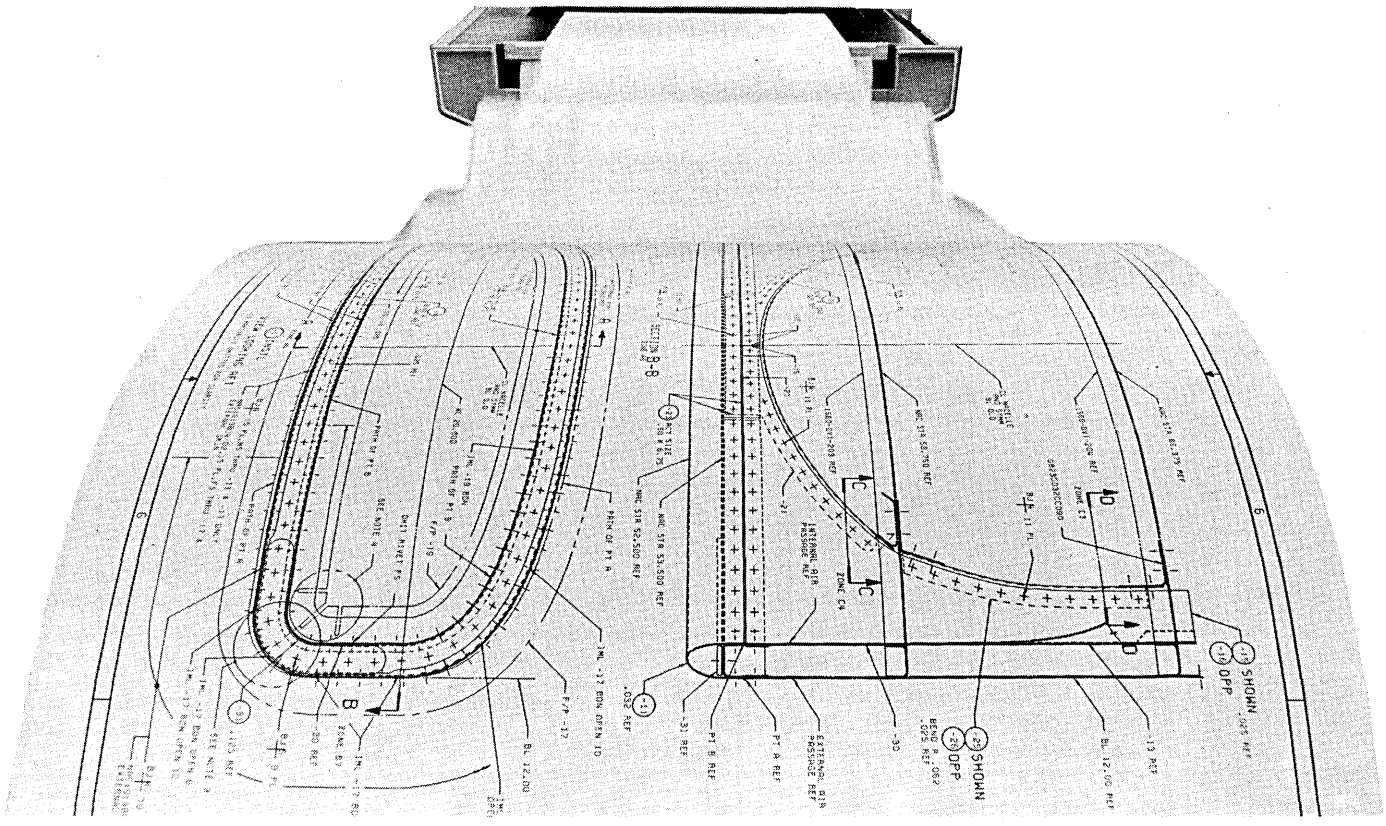

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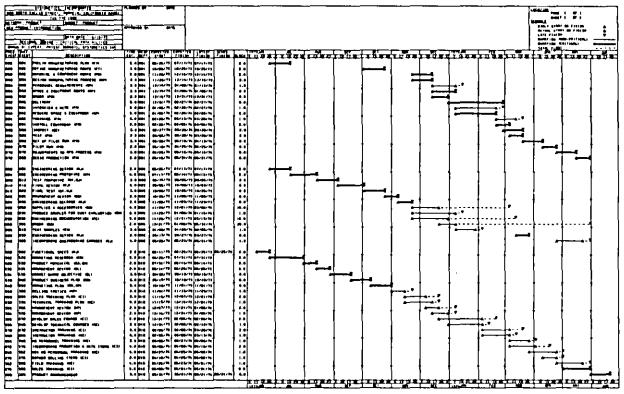
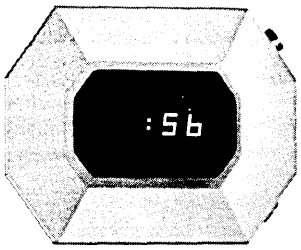
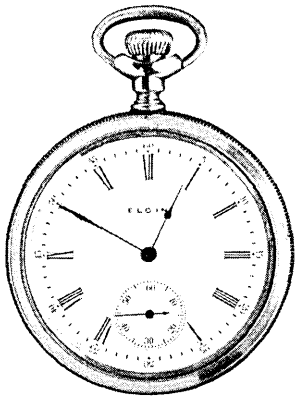
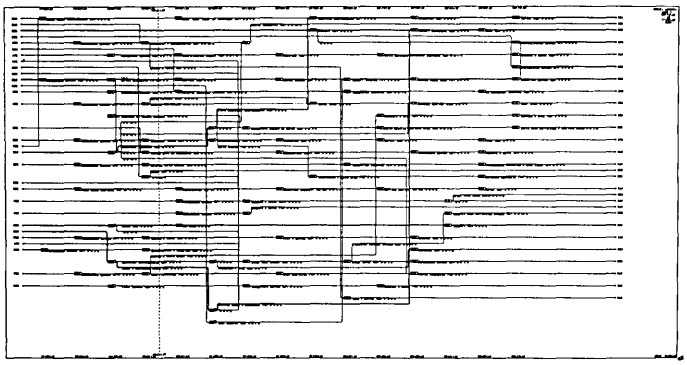
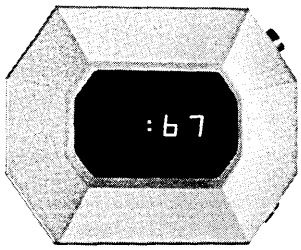
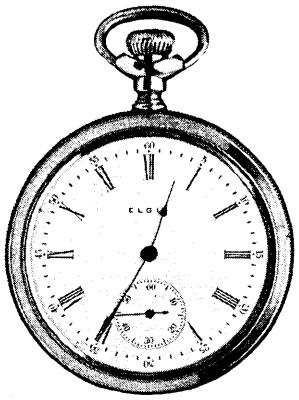
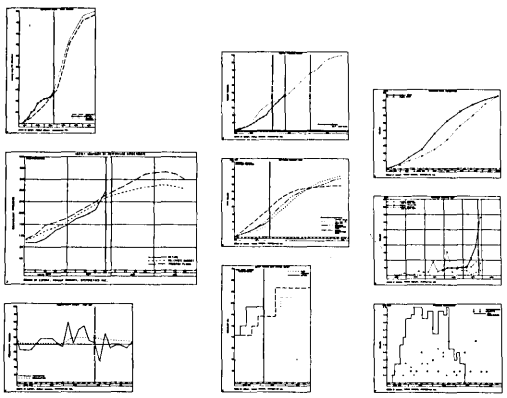
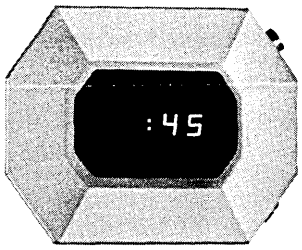
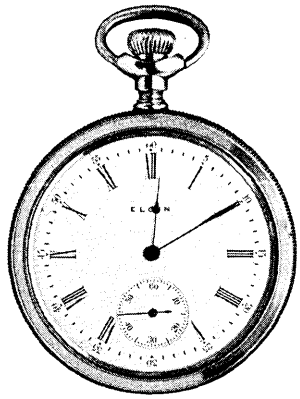
	Versatec Model 8136, operating off-line at half rated speed	**CalComp™** Model 1036
 Plot size: 56″ x 36″ 33,000 vectors CPU & I/O time for sort & rasterization: 9 seconds	 **56 seconds**	 **50 minutes**
 Plot size: 67″ x 36″ 16,000 vectors CPU & I/O time for sort & rasterization: 8 seconds	 **67 seconds**	 **35 minutes**
 Plot size: 45″ x 36″ 15,000 vectors CPU & I/O time for sort & rasterization: 6 seconds	 **45 seconds**	 **10 minutes**

Tests were performed with IBM 360/65 computer, OS/MVT operating system, EZPERT™ application software (Systonetics) and Versaplot™/Version 7 plotting software (Versatec). ™Trademarks: CalComp (California Computer Products), EZPERT (Systonetics), Versaplot (Versatec).

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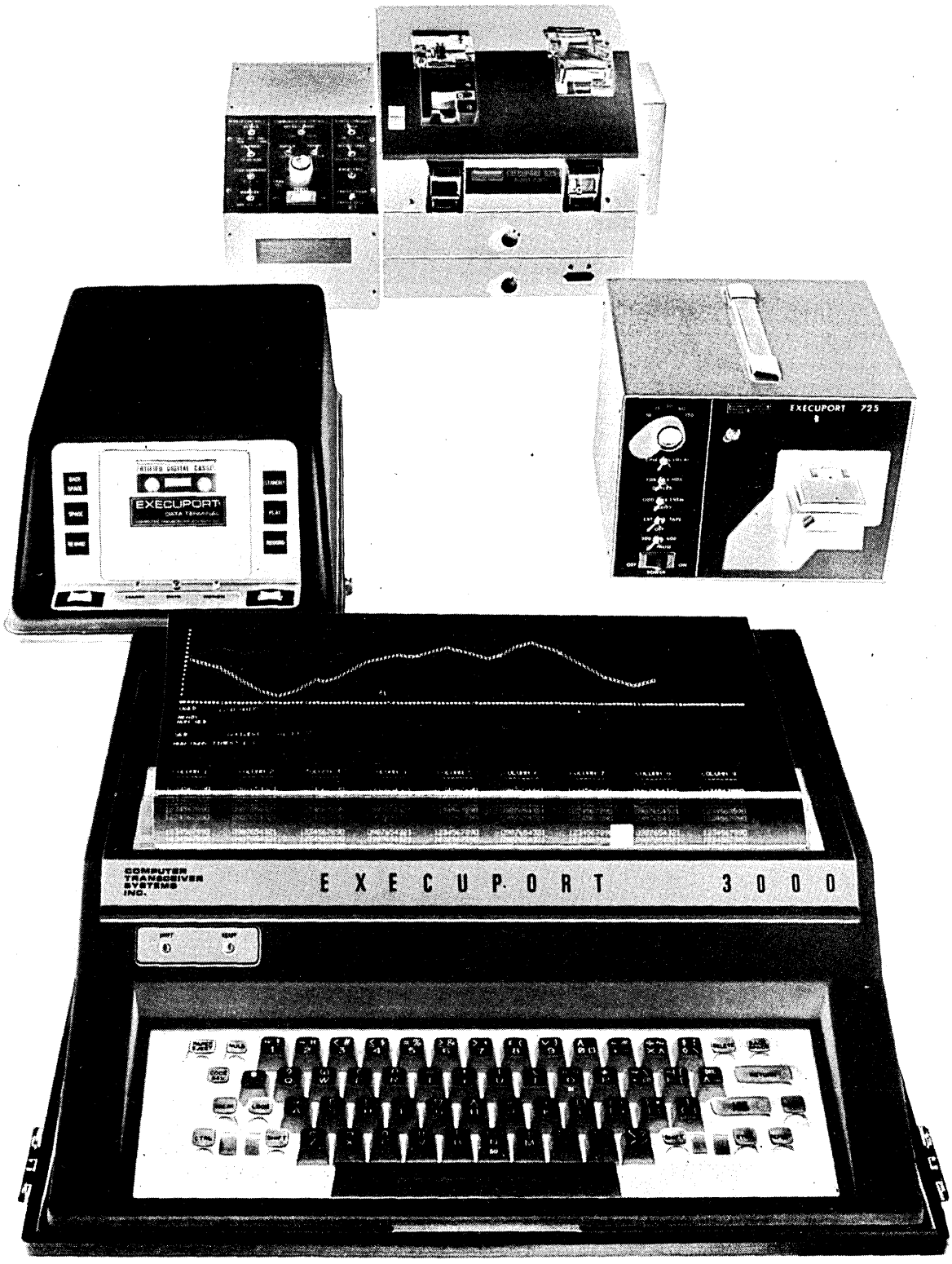

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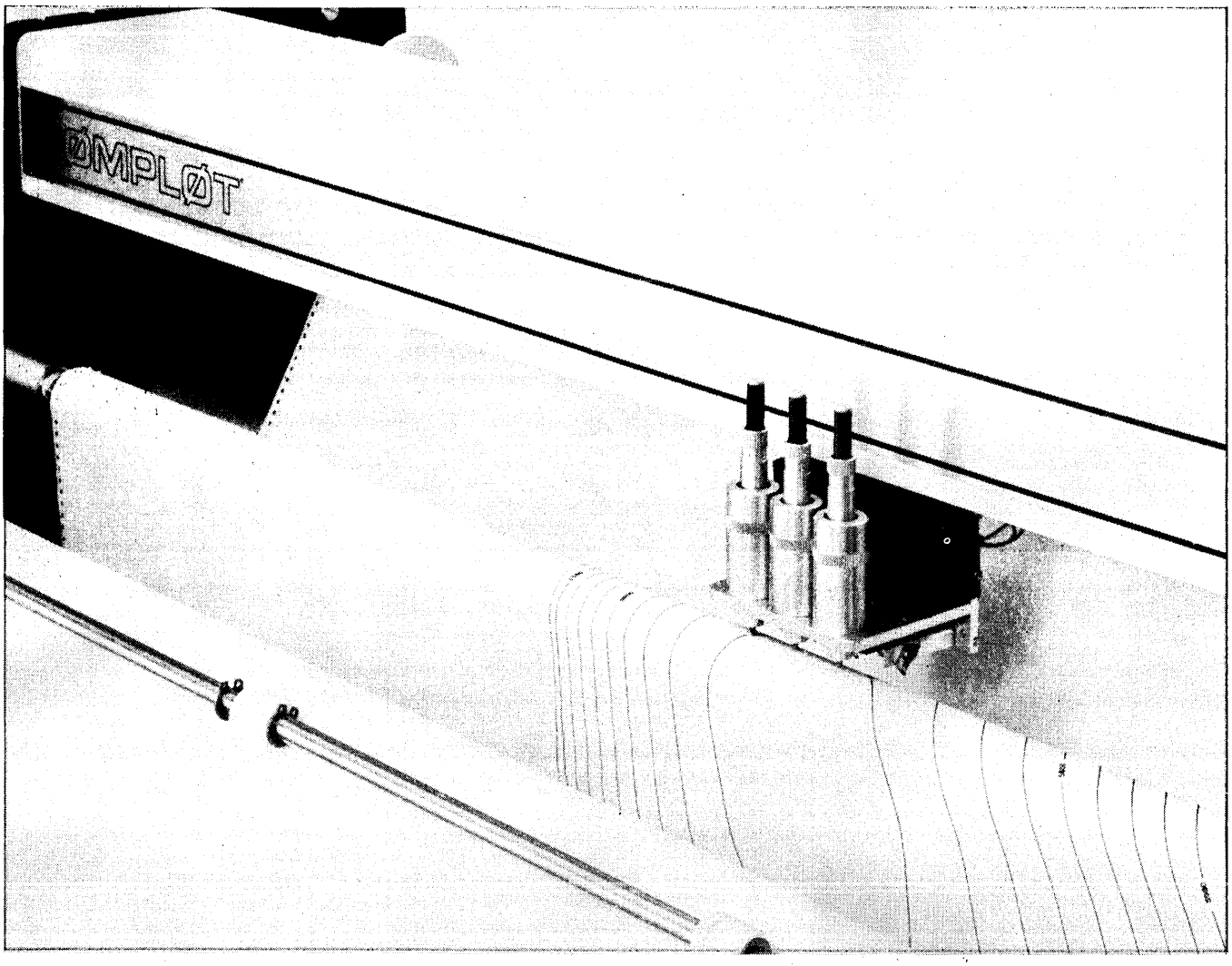

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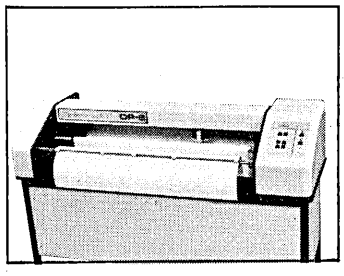

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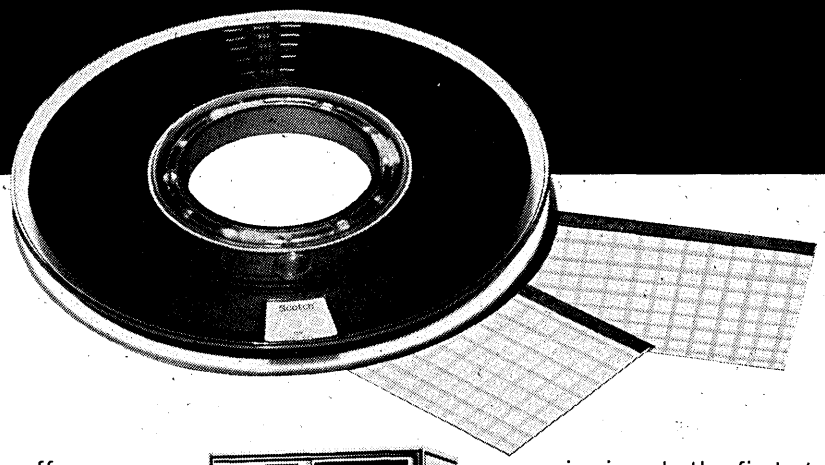

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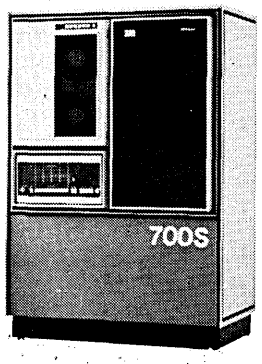

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The Future of Computer Communications

by Vinton G. Cerf and Alex Curran

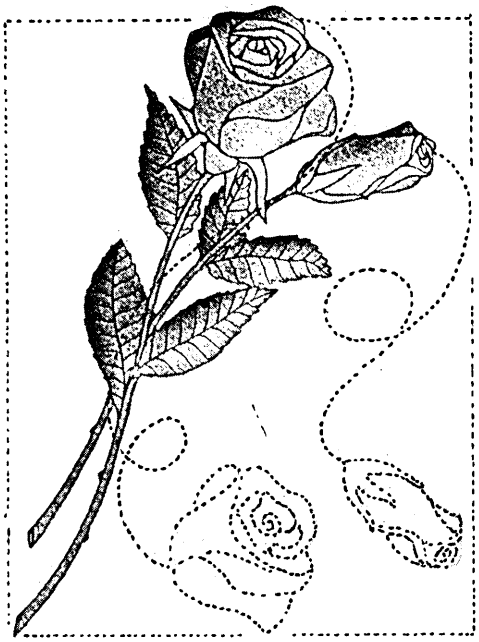
Some of the bloom is off the rose.

The information processing industry has grown at a phenomenal rate. Much of the impetus for continued growth is emerging from the distribution of computing functions via telecommunications networks. The observable trends of cost decrease per unit of computation and per unit of storage suggest that the era of rapid growth will continue.

We have tried to quantify that growth. To do so we have estimated the maximum traffic which would result from the nationwide use of point-of-sale terminals, electronic funds transfer systems, and electronic delivery of all first class mail. This process has allowed us to identify constraints to growth, to quantify the impact on telecommunications networks of the increased traffic, and to estimate the capital requirements for implementation.

These particular services were selected because they represent more than 90% of the total data traffic forecast by the Stanford Research Institute in a 1970 study of the demand for information transfer. Our estimates extend to the next decade; it is very difficult to estimate beyond that point. It is unlikely that our three services' choices will be universally available by 1986, hence shortfalls in size due to our exclusion of other services should be fully compensated by our assumption of near-universality of point-of-sale, electronic funds transfer, and electronic mail by 1986.

The results of the qualification surprised us. Intuitively we had expected much larger traffic figures than emerged. In an attempt to understand the difference, we examined qualitatively the recent history of some of the more imaginative service proposals. We found that the implementation of those suggestions has been much slower than had been forecast—it appears that some of the imaginative innovation has disappeared from the industry. It is our belief that more innovation should be encouraged to ensure that U.S. leadership in the information processing field is maintained. Encouragement can be given by careful relaxation of the regulatory climate.



This article has been adapted from a paper presented to the Federal Communications Commission as part of a planning conference held in conjunction with the American Federation of Information Processing Societies (AFIPS).

Size and cost comparisons

Although it is clearly possible that the data traffic may be carried all or partially on specialized networks, it is relevant to make size comparisons with the telephone network. That network is ubiquitous; its characteristics are well known and its capital and operating costs have been carefully documented. Thus it provides an accurate standard for comparison.

First we compared traffic. In 1975 the telephone network carried 250 billion calls within the U.S., a utilization that has been growing at an annual rate of 4% over the past two decades. A conservative estimate of the average call duration is three minutes; in a digital network the equivalent bandwidth is 64K bps per channel. Through encoding, that bandwidth could be reduced to, perhaps, 9.6K bps, which is also a more reasonable estimate of the data carrying capacity of an analog voice channel. Table 1 summarizes the relevant traffic statistics.

Next we compared the magnitude of capital investment. Since our intent has been merely to estimate total capital required, we have been content to use figures which are representative of the in-place cost of a telephone plant. For

the major elements we have used the following:

subscriber loop	$ 800
toll connecting trunk	$ 40 per channel mile
toll trunk	$ 20 per channel mile
48K bps trunk	equiv. to 12 voice chs.
voice channel bank	$ 400 per channel end
modems—low speed, part of terminal	$ 100
—medium speed	$ 500
—high speed voice	$ 1,500
—48K bps	$10,000
low speed data multiplexor	$ 200

Finally, to estimate the annual revenues of the telecommunication portion of the distributed computing services, we have used tariffs which approximate those currently existing in the telephone networks.

Electronic funds transfer systems (EFTS)

The basic purpose of EFTS is to reduce the high cost of paper handling in the billing and payments process. EFTS only partially accomplishes that purpose, for sales still will have to be recorded on paper, to accept checks at the local banks, and to distribute them to the appropriate payment bank. The flow of paper will only be staunched when point-of-sale (POS) systems are married to EFTS.

Nevertheless EFTS will reduce some of the handling problems in the banking system. Further, since the banks form a cohesive business group, it is clear that EFTS will be implemented before a ubiquitous POS network emerges. Therefore, in our view of the future, we have chosen first to implement an EFTS network, then to augment it with a POS network.

In our model, the nodes of an EFTS network comprise local banks, area clearing centers, the Federal Reserve Bank, and a proposed federal switching center. Fig. 1 shows the network in skeleton form.

The size of the completed network is determined by the following elements:

° in 1974 there were 15,000 banks including national banks, state commercial banks, trust companies, mutual and stock savings banks, private and industrial banks, and special institutions treated as banks by federal supervisory agencies. In some states the banks have branches. To account for these branches and for growth in the industry we have estimated that by 1986 there will be a grand total of 45,000 local banking offices, including branches.

° these local offices perform their clearing functions through 100 area clearing centers.

° checks which must be cleared to different areas are processed through the 36 Federal Reserve Banks.

° for conceptual convenience we have assumed that one of these Reserve Banks will serve as a final switching center for transactions between the Reserve Banks. In practice, high usage routes may be established directly between certain Reserve Banks (or at other levels of the hierarchical network). Such links will be implemented for operational economies when warranted. Their use will not drastically change the network costs.

The traffic flowing on this network essentially results from the check clearing function. In 1975 about 32 billion checks were processed. We can expect that number will increase to 34.2 billion in 1976, 48.2 billion in 1981, and 67.7 billion in 1986. Approximately 75% of these require bank clearance, each clearance generating a communication of about 1,000 bits. The current geographic distribution of checks suggests that the average transaction will involve 2.5 links in the network.

From these figures the total traffic flow on a complete EFTS network would be as shown in Table 2. In this table the reduction to "average bits per second" has been made assuming that four hours of each of the 250 banking days each year are allocated for clearing checks.

The average capacity of the network, even at 1986 traffic levels, equates to the distributed capacity of 23 T1 high speed digital carrier systems. Clearly the transmission requirements are modest when compared to the voice telephone network.

But it isn't only traffic which determines network cost. One must also examine the size and capacity requirements of the network links. In our network model the elements are:

° in the local hierarchy there are 45,000 links. On average, each will operate at approximately 300bps. Even after allowing a factor of 8 for peak demand, it is clear that nearly all banking offices can be served by one voice grade link. For most of the offices the link to the regional clearing center will consist of only two local links. For perhaps 20% of the offices the link also will contain a toll connecting link averaging, perhaps, 50 miles. Thus, the total capital required to implement this hierarchy of the EFTS communications network is about $\$135 \times 10^6$.

° the capacity of the links to the Federal Reserve Bank is more difficult to calculate since it is so dependent upon the geographic distribution of check cashing. As a reasonable guess, we can assume that 40% of all checks must be sent from the area clearing centers to the nearest Federal Reserve Bank, and that these banks perform clearing operations eight hours per working day. The required bandwidth is approximately 23K bps per link in 1976 growing to 47K bps in 1986. Thus until at least 1986 nothing more exotic than 48K bps circuits are required. The capital cost of these 100 links is about $\$15 \times 10^6$.

° finally, about 10% of all checks must be cleared between Federal Reserve Banks. The bandwidth required for each of the 35 links grows from 16K bps in 1976 to 33K bps in 1986. For this portion of the network the communications capital requirement is about $10 million.

° therefore, the total network facility capital cost is about $175 million. It would generate approximately $12 million annually in local revenues, and perhaps $30 million in intercity revenues, or a total of $42 million annually.

By comparison each banking outlet would require an average of four or five teller tereminals. Even in 1986 it is unlikely that the installed cost of these terminals will be less than $10,000 each. Thus for terminals alone the capital required is $450 million. The computing back-up and software may increase the total computational capital to $600 million.

		1976	1981	1986
	Calls per year ($\times 10^9$)	260	316	385
64K bps per ch.	Bits per year ($\times 10^{18}$)	5.99	7.28	8.87
	Bits per second (av) ($\times 10^{11}$)	1.90	2.31	2.81
9.6K bps per ch.	Bits per year (10^{17})	8.99	10.92	13.31
	Bits per second (av) ($\times 10^{10}$)	2.85	3.46	4.21

Table 1. Telephone traffic projections.

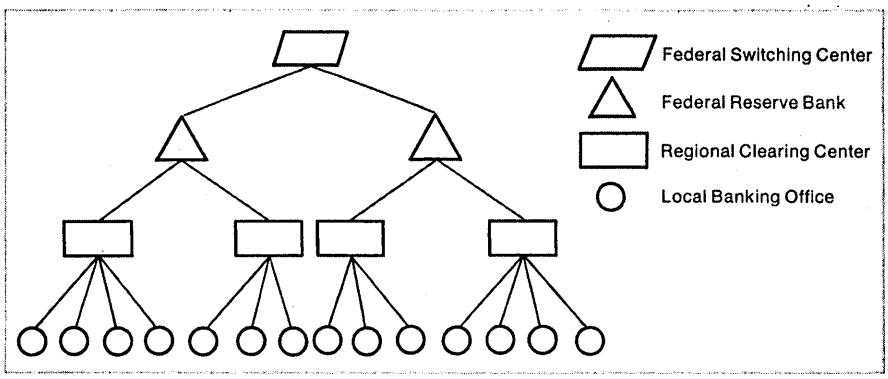


Figure 1. Conceptual model—EFTS network.

In summary, there are no major communication impediments to the installation of electronic funds transfer systems. Once the privacy and legal problems are resolved, the networks can be rapidly installed with existing technology. The capital requirements, based on 1986 size and traffic forecasts will be: $175 million for communications facilities; and $600 million for terminals and computing facilities.

This network would not eliminate the flood of checks but would improve the handling efficiency in the banking system. To eliminate the check writing aspect completely it will be necessary to add a point-of-sale facility to the banking network.

Point-of-sale systems

Much of the need for check writing could be eliminated if the signature authorization for funds transfer were replaced by credit card readers activated by consumer chosen passwords or numbers. A scheme of this sort is already used by some customers of Citibank who use the "magic middle" card to authorize transfers.

Again projecting our view to universality of service for measuring ultimate impact, we would expect that the number of transactions on a POS-EFTS network would be eight times those on an EFTS network alone. At 1986 levels, therefore, the total traffic flow on the network alone would be the distributed equivalent of 184 T1 systems. While this is a substantial amount of traffic, it is certainly not overwhelming when compared to the traffic handled on the voice network.

Telecommunications access to the retail outlet is not a major problem. A large store might contain 50 POS terminals. During the busy hour each terminal will serve about 20 customers, with each transaction generating about 1,000 bits. For such a large store, the peak capacity is only 300bps. It is hard to imagine a need for more than 2400 bps even for very large stores, and even if more than one message per transaction is needed. This is certainly within our technological capability today. The size and capital requirements of a combined POS and EFTS network will certainly be larger than that previously calculated. The network elements are:

- in 1972 there were 5.5 million retail and service businesses in the U.S. Some of these businesses had hundreds, a few even thousands, of locations. The vast majority, however, had one outlet only. With reasonable assurance, we can assume that even in 1986 there will be no more than 10 million links needed. If we make the most pessimistic assumption of no network switching, then the local network capital need is 18×10^9.

- the EFTS network will be of similar form to that previously described. However, the traffic capacity must be increased to cater to the larger number of transactions. As a reasonable estimate the required capital will be 300×10^6.

- the local network revenue, based on $30 per business loop per month, would amount to 7.2×10^9 annually for universal service. The EFTS network would generate perhaps 75×10^6 in annual telecommunications revenues.

The installed cost of POS terminals currently is in excess of $3500 each. Assuming a modest average of 2.2 terminals per retail outlet, the estimated capital cost for terminals only is 77×10^9, outweighing the communications cost by at least four to one.

What we have postulated is a universal POS-EFTS network linking all banks and all retail outlets by 1986. To achieve this it would be necessary to invest nearly $20 billion in telecommunications facilities and $80 billion in terminals and computing systems. The investments would generate annual telecommunications revenue of $5 billion, and annual computing revenue of perhaps $20 billion exclusive of the costs of computing hardware, software, and systems maintenance.

But that is too much to expect. Overall the average cost of processing is five cents per transaction. That figure is highly traffic dependent, however, being very low for large retail outlets, much higher for small stores. Clearly, then, universality of POS service cannot be achieved by 1986 unless much less costly techniques are found to cater to the multitude of small shops. As a more realistic estimate we would visualize one-third of all outlets subscribing to the service (i.e., about three million outlets in 1986). At that more reasonable level the telecommunications revenue would amount to about 3% of the AT&T revenues expected in 1986.

	1976	1981	1986
Checks processed ($\times 10^9$)	34.2	48.2	67.7
Bits per year ($\times 10^{12}$)	64.1	90.4	127.0
Avg. bits per second ($\times 10^6$)	17.9	25.1	35.3

Table 2. Traffic projections EFTS network.

Electronic mail

The third area in which computer communications could make a significant impact is the transfer of first class mail at speeds greatly exceeding those achieved by the U.S. Postal Service, and at service costs which by 1986 could be competitive with physical delivery. Our objectives here are to assess the potential impact of electronic mail on the demand for computer communications, and to explore the near term economic viability of electronic mail technology.

There are several technologies which can serve the electronic mail market. The most likely are facsimile, time shared message switching services, and standalone word processing equipment. Of these facsimile is the most versatile since it permits the transmission of a wide range of information formats without substantial data processing requirements. Facsimile, however, offers none of the flexibilities of computer based systems with respect to such features as message composition and editing, storage, automated retrieval, multiaddressing, and retrieval at the convenience of the recipient. Since the purpose of this article is to assess the maximum anticipated impact of computer communications, we have assumed that these advantages will prevail and that electronic mail will be computer based.

There are two classes of computer based systems. Standalone systems are based on sophisticated terminals which

contain word processing, message editing, and addressing capabilities. These terminals consume no bandwidth during message composition or reading time. By contrast, time-shared systems make use of less sophisticated, less expensive terminals, relying on the system computers for message processing services. Obviously these systems consume transmission bandwidth during message composition and reading.

Both types of systems will be required. Users who generate large volumes of traffic will find that the cost of the standalone terminals are fully justified by the savings in network costs. Those who generate smaller amounts of message traffic will prefer to pay higher usage charges to save the "initiation" charges associated with the more complex terminals.

It is interesting to note that the Arthur D. Little Corp. has recently developed a scenario which describes a pitched battle between the U.S. Postal Service and competing electronic mail carriers. The intent of the scenario is to urge action now to resolve the jurisdictional boundaries between the Postal Service and its potential competitors. One of the rivals is very close, for about 30% of the first class mail is concerned with the billing and payment system which will be incorporated in EFTS as it develops. For the remaining first class mail, the Arthur D. Little scenario suggests that electronic transfer will soon be economically attractive. Our study confirms that conclusion and indicates that electronic mail is suitable only under very special circumstances today. However, it would become economically and operationally attractive at least in a business environment if:

- the rental charges for terminals with some text formatting capability drops to $40 per month,
- time-sharing charges decrease to $0.15 per cpu second, and $2.00 per hour of connect time,
- intracorporate word processing, text filing systems based on centralized processing, and storage facilities become acceptable, and
- time-sharing services offer similar word processing, text filing services to smaller commercial enterprises on a pay-as-you-use basis.

It is quite unlikely that all four of these events will occur by the early 1980s, so it is reasonable to assess the communications impact of an electronic equivalent of today's U.S. Postal Service.

It is not easy to predict the bandwidth requirements of electronic mail. For the purposes of this study we have chosen to ignore the legal issues which will be hard to solve and which clearly will affect the acceptability of electronic delivery. There remains an interesting array of factors difficult to predict, but which will certainly affect the utilization of various telecommunications options.

A number of "near-mail" services exist today. ARPANET offers a message exchange facility for its users. TYMNET also offers a message service. Bolt, Beranek, and Newman has a public offering, via TELENET, of a message switching facility called HERMES. I.P. Sharp Associates offers a service called MAILBAG. Obviously it is a straight forward matter to build a time-sharing facility to exchange messages.

But the customers for all of these services are technically sophisticated time-sharing users. The command structures for the systems are too complex for casual users, and there is no standardization to allow for message exchange between systems. Thus our experience with systems today is an inadequate base on which to build predictions for the business community.

The business world is preparing to move into the word processing era, since it is the most promising technique for the improvement of productivity in the office environment. The interconnection of word processing systems will reduce the transfer delays for memoranda and other textual materials from days to seconds. The impact could produce a change as significant as the business speed-up caused by the widespread use of the telephone. If that happens, electronic mail could:

- replace a major part of the first class mail load,
- substitute for many of today's business telephone calls,
- compete with TELEX, TWX, and Mailgram,
- replace some of the interoffice memoranda.

It will be some time before we can make meaningful estimates of the effect of such systems.

However there is some help. In a Stanford Research Institute Report (March 1976), Raymond Panko estimated that by 1985 the business community within the U.S. will electronically exchange between 10 and 30 billion messages per year. By making some crude assumptions about message length (99% of 5 lines, 0.8% of 50 lines, and 0.2% of 100 lines of text), and by adopting the communication protocols of ARPANET we can calculate that the gross bandwidth required will be between eight and 24 x 10^{13} bits during 1985. Assuming that this traffic will be carried only during the business hours, we conclude that the peak gross bandwidth requirement is of the order of 1.5 x 10^{7} bps, roughly the capacity of ten T1 systems. Again we conclude that the transmission requirements are very small in comparison to the needs of the telephone network.

By 1986 electronic mail will be a reality only in the business market. By that time we would expect that today's 13 million businesses will have grown to about 16 million, not more than one-third of which will subscribe to the service. The major telecommunications cost will be in the distribution system which would connect those businesses to the appropriate switching centers. For those five million businesses the telecommunications capital requirement for loops and modems is about $6.5 billion, generating a telecommunication revenue of about $2.1 billion annually.

By 1986 suitable programmable terminals should cost about $1,000 yielding a capital requirement of about $5 billion. These terminals must be supported by time-sharing systems capable of serving two to three million active terminals. The current hardware cost per active user ranges from $1,000 to $3,000. Thus hardware and terminal capitalization could well total $10 billion. Maintenance costs will be about $1 billion annually. Software costs are much harder to predict, but almost certainly will be of the same magnitude as the mainframe costs. Thus we can expect the total computing and terminal capital to be about $13 billion. The annual revenue requirement including maintenance would be about $6.5 billion.

Again one is led to the conclusion that in both capital and revenue requirements the terminal and computing needs significantly outweigh the communications needs.

Other services

The results of our attempt to quantify the communications revolution have been disappointing so far. The summation of bits per year flowing through the network as a result of EFTS, POS, and electronic mail will not exceed 7 x 10^{14} bits per year in 1986, a very small percentage of the total traffic flux due to voice services. We have, therefore, examined briefly two additional service categories.

One of the more exciting possibilities is the availability of very high bandwidth digital transmission facilities developed over satellite channels accessed by low cost, on-site ground terminals. By making use of the multimegabit per second capability of these channels, systems designers can geographically distribute parts of a com-

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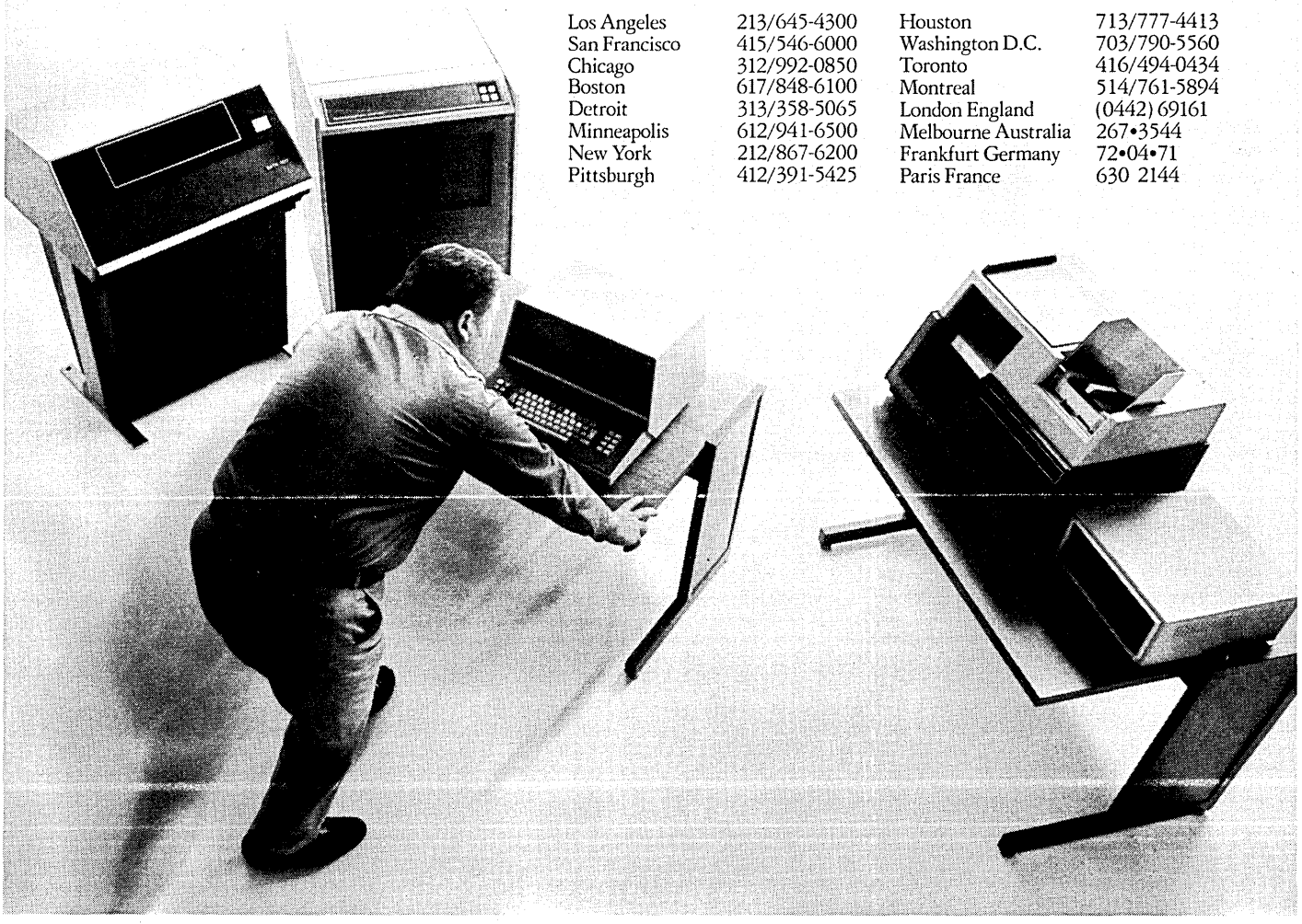

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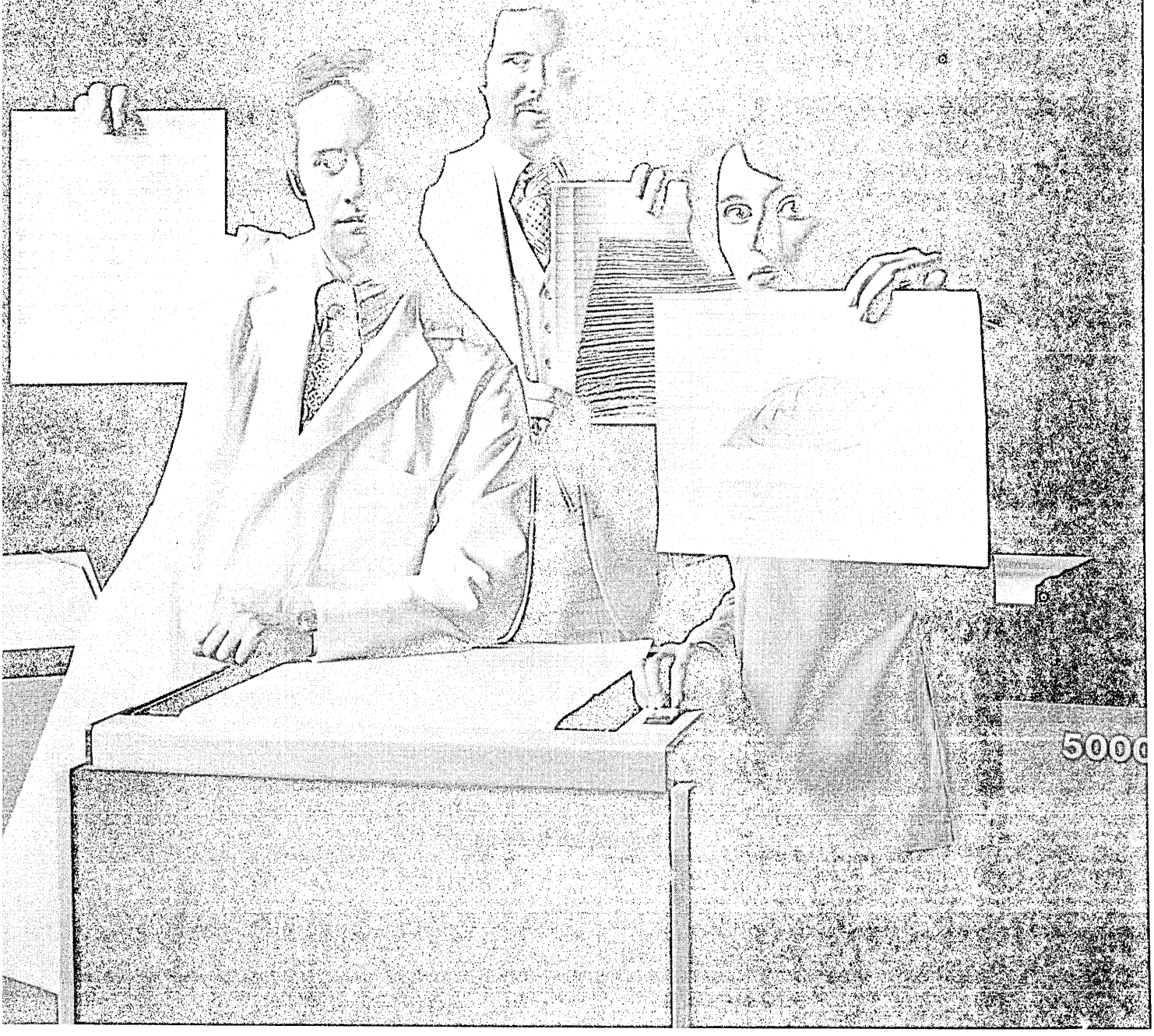

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puter system. For example, mass storage facilities could be housed in several different localities in the U.S., accessible by customers as back-up, tertiary storage in the memory hierarchy. Similarly, other novel services are visualized by the Satellite Business Systems Corp.

The key to this network is the reduction in cost of the ground stations. In the four to six GHz bands ground stations still cost in the order of $150,000. Some experimental stations have been built for operation in the 12 to 14 GHz band with a forecast cost of $10,000 to $15,000. We understand that the Satellite Business Systems Corp. contemplates a ground station cost of $50,000.

It is our view that at that price level the ground station can be "on-site" only to large commercial, government, or military users. For them the SBS system will provide a novel and powerful alternate to the intercity offerings of other common carriers. We have seen, however, that the major costs of telecommunications are in the distribution facilities—and here for most users the bandwidth requirements are modest. We can only conclude, therefore, that satellite systems will provide additional choices for intercity transmission of data communications by large users. They will not initially, at least, contribute to the widespread dissemination of distributed data services.

As for the revolution in home computing, we can see little evidence of the rapid development of services. We suspect that terminal costs must drop to under $200 to spawn a large residential demand.

Two thrusts are operating in this direction. One is the tv game market. Here Magnavox's Odyssey and Atari's Pong games have exploited the tv receiver as a display unit. Some early examples of keyboards with some programming capability and with a small amount of storage have been built, mainly by hobbyists. However there is no sign yet of an adequate terminal at a sufficiently low cost. When that appears a gap still will exist in the development and marketing of interesting services.

The second thrust is the use of microprocessors as "do-it-yourself" computers. Costs of processors and peripherals are still much too high for a mass market, but dedicated hobbyists have taken up the challenge of writing interesting and novel programs which are strictly for fun rather than cost reduction. Their efforts may pioneer the entertainment value for home computing.

In spite of these two thrusts we cannot visualize home computation services developing a traffic flow rivaling that generated by business systems by 1986.

Recapitulation

We started this survey with the intent of quantifying the maximum realizable impact of data communications during the next decade. To do this we examined S.R.I.'s list of 400 information transfer services and identified those which would account for the largest penetration of service by 1986. On the assumption that EFTS, POS, and electronic mail would become widespread at least in the business field, we then calculated traffic flows, network costs, terminal and computing costs, and expected revenues. The results are summarized in Table 3.

In arriving at these estimates we made very optimistic assumptions about the penetration of new data services. Even with this optimism some rather unexpected results emerged. In particular:

- the impact of data traffic on the common carrier networks appears less than we expected. Even with our optimistic assumptions, data transmission revenues will not exceed 7% of voice revenues ten years hence.

- the vast majority of new construction for data links will be in the local access area. It is here, primarily, that innovation will yield benefits in cost reduction.

- the capital requirements for terminals, computing hardware, and service software are very high. The accumulation of this capital could become a major constraint on implementation.

Observations and conclusions

Because these results were less optimistic than we had expected, we then reviewed the literature to determine if we had omitted major imminent developments. The review disclosed a rather bleak picture.

In 1970 S.R.I. published a report on information transfer which listed 400 services and which forecast a rapid transition to electronic distribution of these services. In 1972 the International Conference on Computer Communications (ICCC) held its first meeting in Washington. The bright mood of the Conference was caught by Carl Hammer who forecast that "during the 1970s the revenue from machines conversing will surpass that of people conversing." At that conference only August Ohlmer painted a restrained picture. He was classed as a reactionary. The 1972 Proceedings contain 22 papers which define new, innovative computer based services.

Since October 1972 there has been a rapid closing of horizons as people have come face-to-face with the realities of implementing distributed computing services. By 1974 the number of ICCC papers defining new service concepts had decreased to 12, and by 1976 only four papers described new services. Throughout that period no new service ideas emerged—but many disappeared from view. It seems that the realities of implementation have drastically curtailed the dreams of the innovators.

During that same period a number of data oriented networks have been constructed providing users with new and improved methods of transmission and switching at much lower cost, at least in the intercity links. In 1972 the major constraint on implementation appeared to be the lack of "good" data communication facilities. That constraint has clearly been eased, and yet new service ideas are becoming scarce.

In analyzing the results of the three ICCC's we are led to the following observations:

- there has clearly been a very gross underestimation of the difficulty of creating and maintaining large data bases.

- no significant progress has been made on the design and implementation of systems by which authors may offer and be paid a royalty for the use of information which they have prepared.

- computer assisted instruction is growing very slowly; again, the startup problems were grossly underestimated.

- some progress has been made in automating library service systems, however the manipulative protocols are too complex for nonlibrarians, so, except in rare instances, the systems are internal to the library.

- no home services have been devel-

	Maximum 1986 Expectation Levels					
	Communications Network			Terminals & Computing		
Service	Bits/Yr x 10^{14} Traffic	Capital $ x 10^9	Ann. Revenue $ x 10^6	Capital Terminals	$ x 10^9 Other	Ann. Rev. $ x 10^6
EFTS	1.27	.175	42	.45	.15	210
POS	3.39	6.1	2,400	23.0	10	12,000
Mail	2.0	6.5	2,100	5.0	8	4,900
New Data	6.7	12.7	4,500	28.5	18.2	17,000
Voice	13,310	177	64,000	—	—	

Table 3. Maximum 1986 data communications levels.

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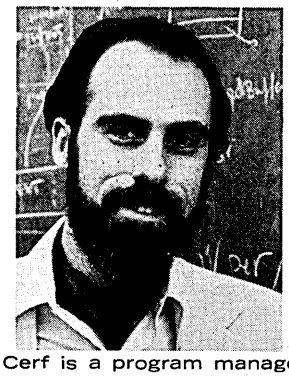
oped. The costs are clearly too high, except for dedicated hobbyists.

As we applied these observations to forecast computer communications growth patterns we concluded that the technology is being applied only in the business sphere, primarily to reduce the cost of existing functions. That process will continue, for it is fueled by cost reductions necessary to maintain business viability, and the extension of low cost data networks will be instigated by that cost reduction activity. No other widespread service will emerge until that extension occurs.

Again, this history of the ICCC tends to confirm our rather pessimistic forecast and our reliance on EFTS, POS, and mail services as the prime growth areas during the next decade. ❁



Mr. Cerf is a program manager at the Defense Advanced Research Projects Agency, Information Processing Techniques Office. From 1972 to 1976 he was an assistant professor of electrical engineering and computer sciences at Stanford Univ. Most of his research has been concerned with computer networking and communications protocols.

Mr. Curran is president of BNR, Inc., Bell Northern Research's newest research and development facility. Active for many years on the consultative committees of the International Telecommunications Union and the International Federation of Information Processing, he was chairman of the IFIP Technical Committee on Data Communications from 1972 to 1975.

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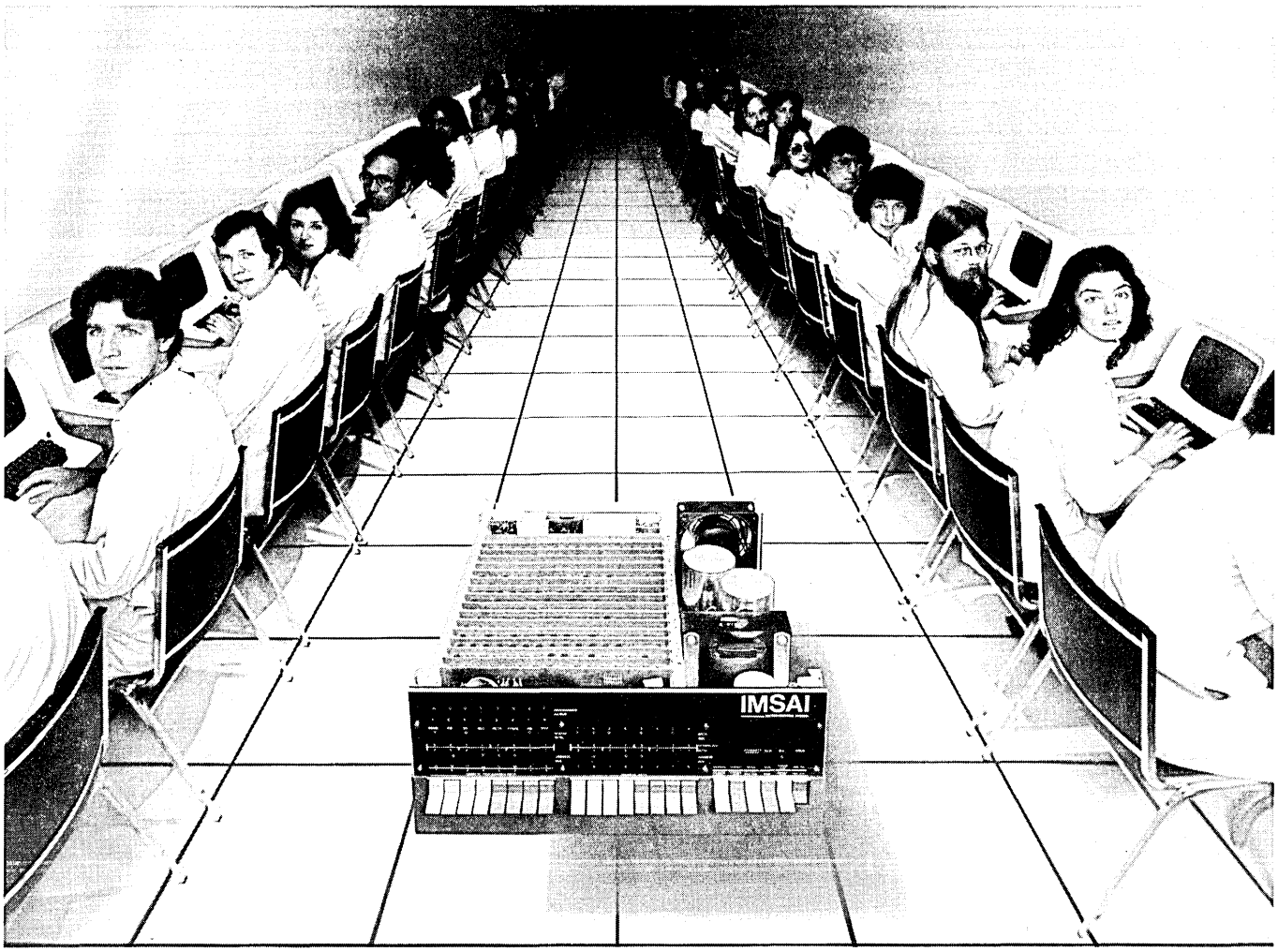

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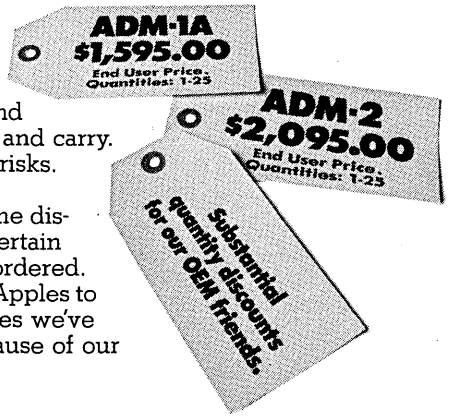

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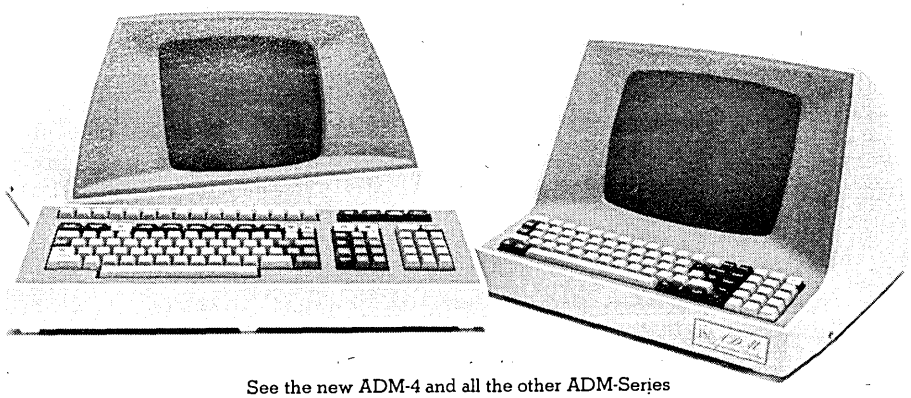

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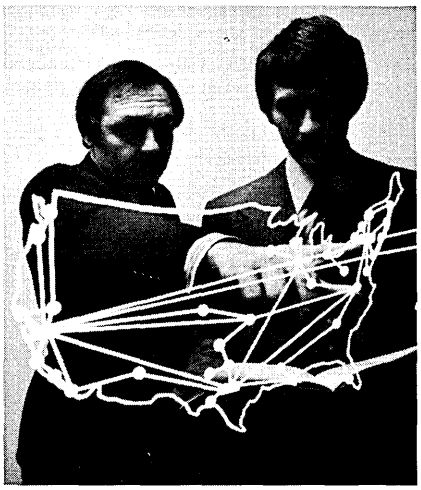

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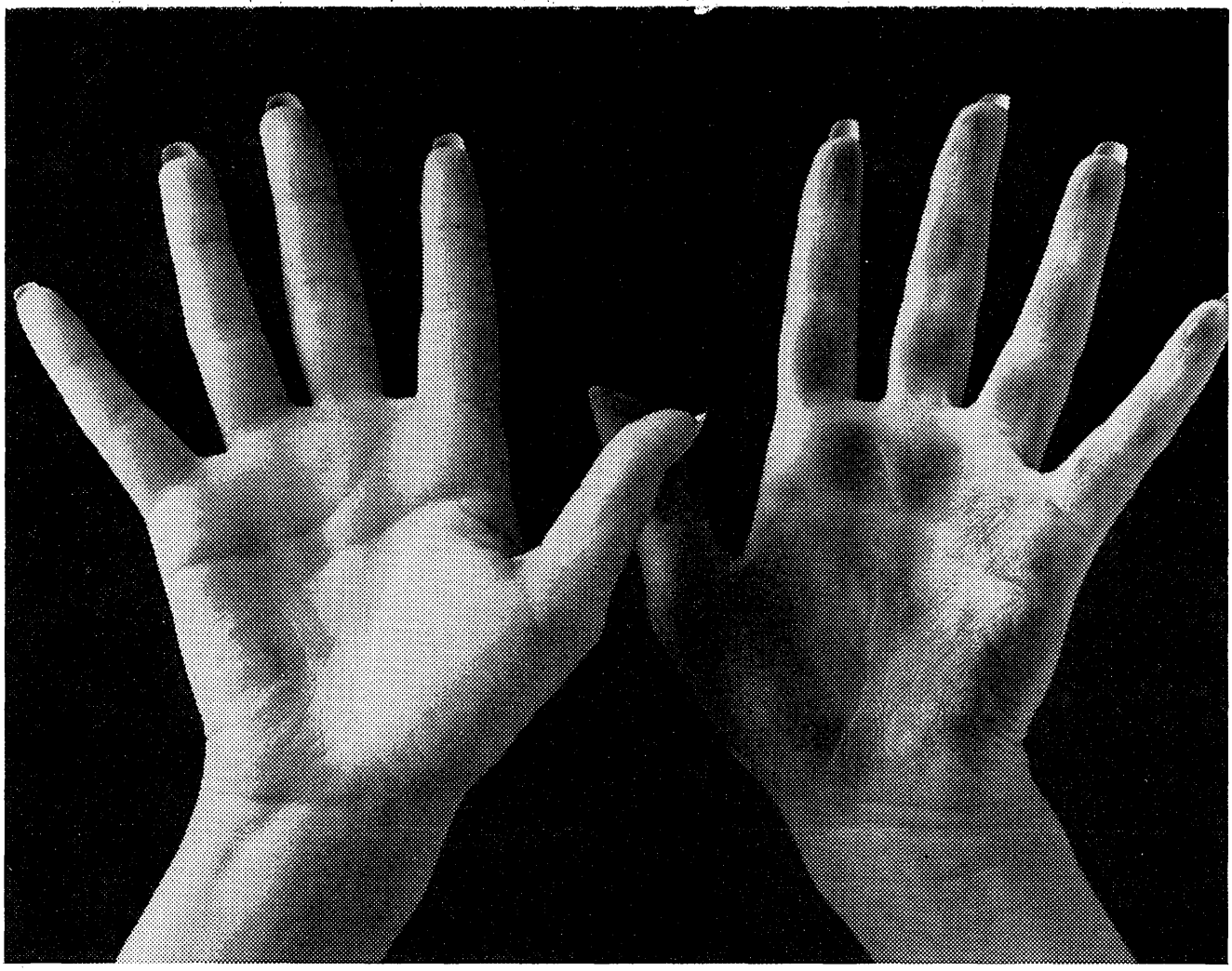

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Human Factors in Computer Message Systems

by Ronald P. Uhlig

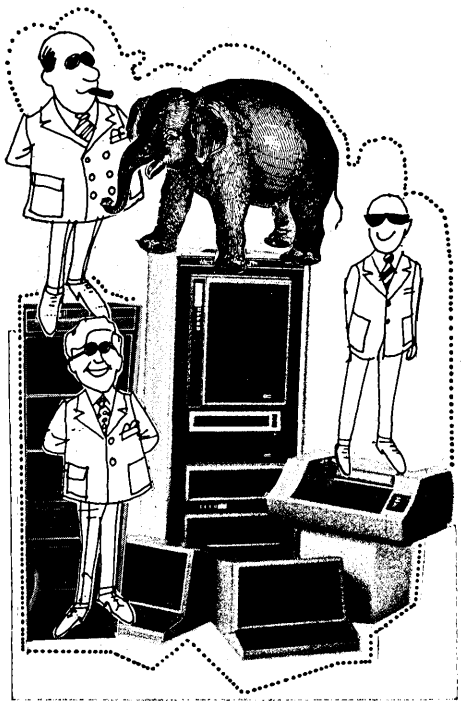
In many ways, message systems based on computer networks are more than the sum of their word processing, message switching, and data processing parts. In some ways, unhappily, they're not as good as what they replace.

During the next 50 years computer based message systems (CBMS's) will have as great an impact on the way business is done in our society as the impact that the telephone had on business practices during the last 100 years. This, at least is what our organization has come to believe after two and one-half years of experimenting with them.

In the spring of 1974 we became aware of this emerging technology and wanted to find out how well it would work for general use by managers and staff officers in our organization, the U.S. Army Materiel Development and Readiness Command (DARCOM, formerly the U.S. Army Materiel Command).

DARCOM is responsible for developing, purchasing, supplying, and maintaining the army's equipment. This is accomplished through a multi-$billion budget, with almost 100,000 people at over a 100 different geographic locations. Because of the nature of our responsibilities, we conduct business in much the same way as any large corporation, so we believe that what we've learned about message systems will be directly applicable to the commercial sector.

In its simplest form, a CBMS can be described as a "message data bank" system. The user types a message in at his terminal. He gives instructions to the computer to store the message and to notify the addressee or addressees the next time they connect to the computer. To use the system to receive a message, the user logs in the same way. In the system we are using today, he first receives a one line per message summary of new messages as shown in Fig. 1. He can ask for any or all of those messages to be printed. A typical message is shown in Fig. 2.



Data processors, administrators, and communications specialists react like the three blind men examining the elephant.

Extensions to this basic message sending concept have greatly expanded its utility. The first extension results from adding the capability to edit the text of a message as it is being typed in and after it has been typed. Word processing software has been developed to do this on the system we're using.

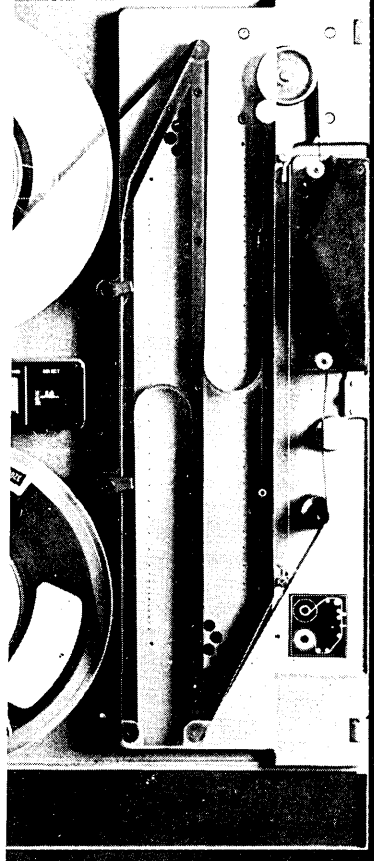
A second extension was the ability to deliver messages among many computers through a computer network.

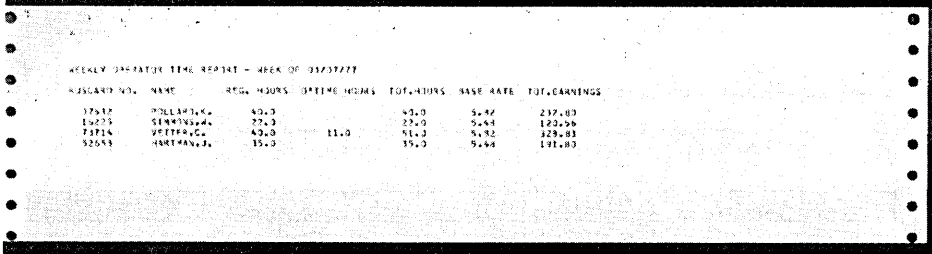
The third major extension results from an ability to store and retrieve received messages with a data base management system, using all the capabilities of computers for handling alphanumeric data. After reading the message, a recipient can choose to "throw it away," file it, forward it to someone else for information or action, annotate the message, or any of the other things we do now with information on paper.

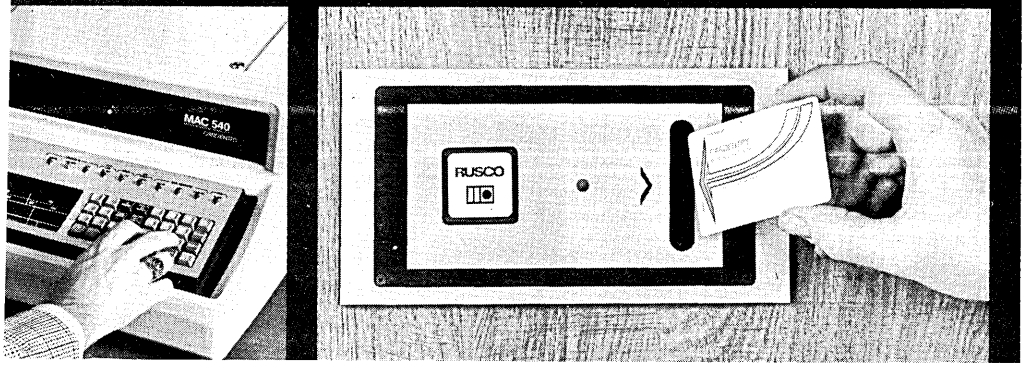
To comprehend the impact of the system, one should understand that it is used by an individual (or his secretary) in his own office, home, or motel room. Messages do not flow through human "middlemen" in communications centers or computer centers.

The bosses first

In the fall of 1974 seven dp-oriented managers began an experiment using a message system in Cupertino, Calif., which we accessed from Virginia, via the ARPANET. At first the CBMS was







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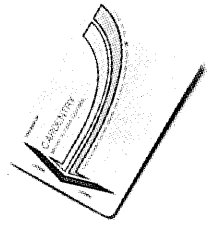

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CIRCLE 85 ON READER CARD

used primarily for informal communications—the kind normally accomplished by telephone conversations, handwritten notes, and impromptu meetings.

The equipment used was the OFFICE-1 facility of the Stanford Research Institute Augmentation Research Center, consisting of a Digital Equip. PDP-10 operating under the TENEX monitor. SRI has described this facility as an "experimental utility." SRI instructors provided a one day training session in basic message system use, plus the NLS system, developed by the Center, which has a powerful office support capability, with text editing, document handling, and many other facilities.

The next step was to train the secretaries of these managers. Some may argue that this should have been the first step, but actually, the enthusiasm of their bosses made it easier to tackle the reticence that the secretaries had in using a computer system for the first time.

Our original intent had been to confine the use of the CBMS to seven key individuals for at least one year. However, by spring of 1975 the advantages were so clear that a decision was made to extend the system to data processing managers at 20 more sites within DARCOM—primarily covering the eastern U.S. We felt that this group would be best able to cope with the available CBMS, which had been hastily programmed by dp professionals without much attention to the human interface.

With the additional users, we began to see impacts of this medium on communication in many directions.

To ensure that the people added from field activities had a commitment to using the system, they were required to provide their share of the cost out of their own budgets. Their training was provided on-site, with a normal session including the manager, his secretary, his top aides, and often someone from his technical staff.

The reaction from top management was *always* positive, and we began to receive many requests for demonstrations. With few exceptions, each demonstration led to a request to take part in the experiment. Twenty more sites were added in early 1976, extending the user community as far north as Alaska, as far south as the Panama Canal Zone, and to most regions of the U.S.

As of right now, we have about 100 log-in accounts in operation, being used by over 200 individuals, and we have extended our sources of computer service to include both the SRI OFFICE-1 facility, and the facilities of Bolt, Beranek, and Newman, Inc. in Cambridge, Massachusetts.

The reaction from top management was **always** positive.

```
NUM   CHARS     DATE      FROM      SUBJECT
186     468     3 JAN 77 LIEBERMAN LOGISTICS
185    1387     3 JAN 77 JACK ARNTSON MEMORANDUM FOR RECORD - MARDIS
184     344     3 JAN 77 MCCUTCHEN AT OFFICE-1 PDP-11 AT MERADCOM UP
183     423     3 Jan 77 DRCIN FREEDOM OF INFORMATION ACT (FOIA)
182     498     3 JAN 77 DRCGS INFORMATION BOOK FOR CG
181    1168     3 JAN 77 JGILBERT AT BBN-TENEXB DARCOM FIVE YEAR ADP PLAN
180     192     3 JAN 77 OPER ARCHIVE RETRIEVAL
179     709     3 JAN 77 SECC SECC DIRECTORY LIVES
178     928     3 JAN 77 DSMITH AT BBN-TENEXB GILBERT CALENDAR OF 7 JANUAR
177     287     3 JAN 77 AMC-SCI RE: (AMC-SCI) FILES
176     373     3 JAN 77 DRXIG-X FY 76 COMBINED GENERAL & PROCUREMENT INSP
175     403     3 JAN 77 DRCGS INFORMATION BOOK FOR CG
174     341     2 JAN 77 NMA AT OFFICE-1 RE: VISIT NEXT WEDNESDAY, JAN. 5
173     486     2 JAN 77 TO: LIEBERMAN RE: TRAVEL PLANS TO DARCOM - LOGIST
```

Fig. 1. To come up to speed on what's happened since he last logged off, the message system user is provided a list of one-liners describing his "mail."

Better communication

We have learned many valuable lessons from our two and one-half years of experimenting with CBMS.

There are many ways of categorizing our findings, and we have found no easy way to sort these findings into mutually exclusive categories. However, many of the impacts relate to the fact that the CBMS provides a kind of connectivity among individuals not available with any other existing media.

When we first began using the system the most striking lesson was that we began communicating with each other to a much greater degree than we had prior to use of the system. This was somewhat surprising, because we thought we had good communications already.

Use of a CBMS provides a way to interact among people on important issues, but frees these same people from having to carry out that interaction in real time. The most striking examples of the impacts of this benefit have been in communicating with people widely separated in time zones.

The ability to interact much more rapidly, in writing, than with any previous medium has generated many time savings within our organization. The head of one of our field activities estimates that he has reduced the turnaround time in getting decisions on urgent actions to a matter of 2 to 3 days. To get the same decision would have taken 1 to 2 weeks prior to the availability of the CBMS.

Another advantage is that the receiver of a message can control *when* he receives his communications. The recipient can choose when he wants to receive his communications, and can adjust the timing to when he is best able to cope with them.

Closely related to this is the ability to send a message whenever, and from wherever you want. Of course, the latter advantage is derived from the fact that telephones are widely available throughout the industrialized countries, and the fact that very lightweight portable computer terminals have become available. (We've been using Computer Transceiver Systems "Execuport," Texas Instruments 735s and 745s—the latter is the light one, and a Digilog System which we attach to a five-inch tv monitor.)

CBMS's information storage and retrieval capabilities made it possible to arrange the bits and pieces of information we all get into logical form, and made it easier for us to deal with each of them, making sure that none of them got lost.

We found a decrease in tension on the part of the managers using the system to be a real benefit. The poten-

tial to be "connected" to the office, no matter where you are, can take away the concern that something major may be happening which you need to know about.

Another advantage stems from the ease of sending multiple copies of a message where we might have made phone calls before. When we made the phone call, it was very tedious to contact several individuals to tell them the same thing. Also, on many occasions, only the caller and the person called know about the action, in any detail.

> We have observed a greatly improved "corporate awareness."

Better coordination

With the message system, it has become easier to attack problems which require action by several people and activities, and it is much easier to keep everybody informed from the beginning. The benefits are twofold. First, we have observed a greatly improved "corporate awareness" among the individuals involved. Second, we have observed a great improvement in the coordination process.

The ability to coordinate complex actions among many people, independent of geography, is a major advantage. With the CBMS it is possible to informally circulate copies of draft policy statements, among many persons who may be affected, in parallel, rather than serial, fashion. This can be done on a piece by piece basis as the document is being drafted, so that the whole document can be digested more easily by those affected. The ability to annotate a message makes it possible to "mark up" a document and to highlight those areas where the individuals or organizations affected would like to see changes made.

The coordination process often turns into a "conference" or a meeting. When multiple people are discussing the same subject, via messages, and all are sending copies of each message to each other, they are doing the kind of thing that the pioneering "computer conferencing" system users did. With our brand of CBMS, filing and retrieval mechanisms are used to organize all those "conference" messages into a coherent set of "proceedings," too.

Just as in the commercial world, travel money and time for committee meetings are often scarce in DARCOM. The CBMS has made it possible to form committees to bring together headquarters and field personnel for discussion of important issues, without having to bring the committee members together in the same geographic location. We have one committee, for example, which conducted all its business for its first three months of existence by sending messages back and forth among the committee members. Lest this be misunderstood, we also find a need to bring committee members together for face to face meetings. However, the CBMS discussion which precedes the face to face contact makes these meetings much more productive.

Each of the benefits discussed up to this point relates to the basic "connectivity" afforded by the CBMS. The network becomes a "place" in the thought processes of those attached to each other via the CBMS, and this makes it possible to bring people together who are separated by travel time or cost.

The great equalizer

We found an unexpected benefit in an area not related to connectivity. The system performed a substantial levelling of individuals at many rungs of the management hierarchy, which showed up in the form of some very candid statements. Most of our users understand that although our privacy protection mechanisms could be broken, they are sufficient for the users to be confident that their messages will not fall into the wrong hands.

> . . . a substantial leveling of individuals at many rungs of the management hierarchy . . .

Another element which contributes to generating candor is that the person sending the message can type in something which may be unpleasant to the intended recipient without fear of the recipient roaring back over the telephone or in a face to face conversation.

Another advantage, not peculiar to CBMS, is the disciplining of the management of an organization to increase the amount of handwritten versus verbal communication. The discipline of having to put your thoughts into writing before you communicate them to another person is invaluable.

But non-verbal clues are lost

Although there are overwhelming advantages to the use of CBMS, there are areas in which much research needs to be done, and where we have learned that we must exercise caution. Much of the needed research is really psychological, dealing with how human beings can and should interact with this medium.

Some of the problems with current CBMS stem from the rather narrow bandwidth of the system when viewed as a communications medium. Within DARCOM, virtually all use is via 300baud circuits. Even more important is the fact that the input is limited by the typing speed of the individual. Then too, as with any form of the written word, all the nuances of speech are lost, and the non-verbal cues given in face to face communication are lost.

Furthermore, ease of use of the system, and particularly the ease of interacting on a subject, can lull the user into thinking he is having more interaction than he really is. We have had some monumental misunderstandings arise when individuals tried to do everything via messages. The ease with which a reply can be sent is sometimes the opposite of what is needed. An individual may quickly read a message, and, because of his "personal mental

```
DATE:  3 JAN 1977 1301-EST
SUBJECT:  DARCOM FIVE YEAR ADP PLAN
FROM:  JGILBERT AT BBN-TENEXB
TO:  CALCOTE, CYRUS, DAMES AT OFFICE-1, JAMES, MCCUNE, SAUM, TECOM-HQ
CC:  DSMITH, LEISHER, ARNTSON, CIANFLONE, JGILBERT, UHLIG AT OFFICE-1,
AMC-SYS

SUSPENSE-DATE:  10 JAN 1977

HELLO,

THIS IS A REMINDER THAT THE PRINCIPAL TOPIC AT OUR 18-19 JAN MEETING
WILL BE OUR OBJECTIVES FOR THE CCSS FIVE YEAR ADP PLAN.  WE NEED TO
TALK ABOUT THE NUMBER OF TERMINALS WE WOULD ENVISION ULTIMATELY BEING
USED AND THE FREQUENCIES AND TYPES OF RUNS WE WILL BE MAKING.  YOU
MAY RECALL I TOSSED OUT A FEW IDEAS AT THE L.A. MEETING.  ALMSA IS
MAKING A PRESENTATION ON THEIR NEW SYSTEMS DEVELOPMENT PLANS FOR THE
NEXT TWO YEARS.  I THINK WE SHOULD ALSO IDENTIFY THOSE MAJOR SYSTEMS
THAT ARE NOT YET STANDARDIZED, BUT WHICH IMPACT MOST ON YOUR PERSONNEL
AND HARDWARE RESOURCES.  ANY DIALOGUE WE CAN HAVE AMONG OURSELVES BEFORE
THE FACT SHOULD EXPEDITE THE MEETING.

THANKS,

JOHN
```

Fig. 2. The system provides a date and time stamp automatically, as well as a list of others receiving the message. The suspense date field is a "reply by" request, and can be used in checking to see if all responses have been received.

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Please contact me for a demonstration____.

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Title_____
Company_____
Address_____
City_____
State_____ Zip_____

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*For 48K memory (16K user) integrated dual floppy disk and integrated thermal printer the price is just $8,950.

CIRCLE 84 ON READER CARD

filters," answer something quite different from what was asked. We have observed that this can escalate over the course of several exchanges of messages into something that would best be termed a "fight."

Resolution of the resulting problem can often only occur by picking up the telephone and calling the individual, or by meeting in a face to face conversation. There would be a real benefit in being able to associate the spoken word with the written word in a message in a computer.

Another area in which much needs to be learned is the proper etiquette for use of the system. Society has evolved an etiquette for talking over the telephone. We were taught the etiquette for writing letters in school. A different etiquette is associated with each different medium of communication, and one needs to evolve for this CBMS medium. For example, something which you intend as humor may not be taken that way unless you mark it.

The interface between the human being and the interactive software containing the message system is an area of intense development effort today. We believe that this area will continue to improve for some time. We found that most people were able to adapt to this interface much more rapidly than we thought they would, however, many people have a built in aversion to anything which is related to computers, and a very good interface is needed to make them feel comfortable.

Training is another area of concern. Although we found that most users could learn how to do the very basic things required to compose, send, and read messages within a few hours, most of these same users then quickly moved to a requirement for more advanced features, such as multiple indexing. In response to this need, a formal course in CBMS has been established in DARCOM to train key personnel.

Good user documentation is a requirement for any data processing system. It is even more important in an interactive computer based message system being used, on-line, by someone who not only doesn't know about computers but may not even want to. (And in fact we had to rewrite some of our documentation which had seemed perfectly clear to dp types.)

And "good" pressure evaporates

One other area in which we learned to proceed with caution was in the use of CBMS as a teleconferencing system. Several initial attempts to conduct a teleconference failed. They failed because we had selected subjects which weren't urgent enough to *demand* participation by the people taking part in the conference. The "pressure vessel" generated by assembling a group of busy people in a room, and telling them to stay there until they solve a problem, disappears in an on-line teleconference.

Top management must supply the motivation or be sufficiently enthusiastic about the topic chosen for the "teleconference" for it to work. They must supply the equivalent of the "pressure vessel" which makes the teleconference urgent enough to devote the time to participating in it.

The ability to choose not to participate is important to personal use of the system, but it points out that there are many kinds of communication which the CBMS does not replace. The manager who doesn't return his phone calls has a tendency to not answer his messages—although he does read them. CBMS's are not a panacea for all the communications problems of an organization.

> Something intended as humor may have to be marked as such.

Bigger than the sum of its parts

We are convinced that CBMS's represent an important new data processing tool, as well as an important communication tool. We believe that they are going to open the door to the kind of automated support that will bring a whole range of tools to the office of the future. To accelerate the process, we are investigating the possibility of implementing these message systems on minicomputers: to bring the costs down, allow greater distribution of the system, allow higher accessibility, and provide greater reliability.

At this point, the cost of using the system amounts to between one-fourth and one-third the cost of maintaining a clerk on the payroll. With good clerical support always in short supply, the system can often be justified on this basis alone. However, once a whole range of interactive tools becomes available in the office, the benefits substantially outweigh the cost.

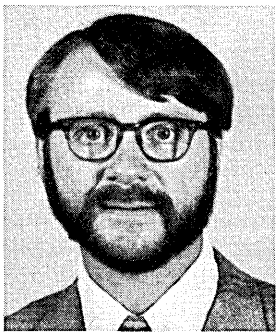
Reliability is important. Once an office begins to rely heavily on computer terminals, and its files are computer stored, that service and data must always be available. Similarly, accessibility is very important. The user in an office must not be blocked from getting at the service for any reason.

To focus on these problems, we are continuing our experiments, and will be collecting the kind of data on message traffic to enable us to accurately define the costs of the service and the benefits.

The biggest single lesson we have learned from our experimental use of CBMS is that this is a major new medium of human communication and interaction, with a very positive impact on the way we do business. It is not just a replacement for letters, phone calls, TWX's, Telex, and telegrams.

Because of the richness of capabilities of this new medium, it is easy to get lost in the details and not see the potential from a global perspective. Perhaps this is best illustrated by the ancient Arabian story of three blind men trying to describe an elephant by "feel." Today we have "data processors" patting the computer on the head and stating, "I perceive that a CBMS is just a data processing system." The administrator looks at text editing/word processing systems which are built into CBMS and says, "CBMS's are nothing more than word processing systems." Meanwhile, the communicator feels the wires which connect the terminals to the computers, and which interconnect the computers in a network, and concludes that this is "just a substitute for telegrams."

CBMS's are a new animal, one combining three technologies into something greater than the sum of its parts, and holding great promise for the future. Not all the problems are yet solved, but the necessary work is underway to turn computer based message systems into what may turn out to be one of the most important developments of the 20th Century. ❋

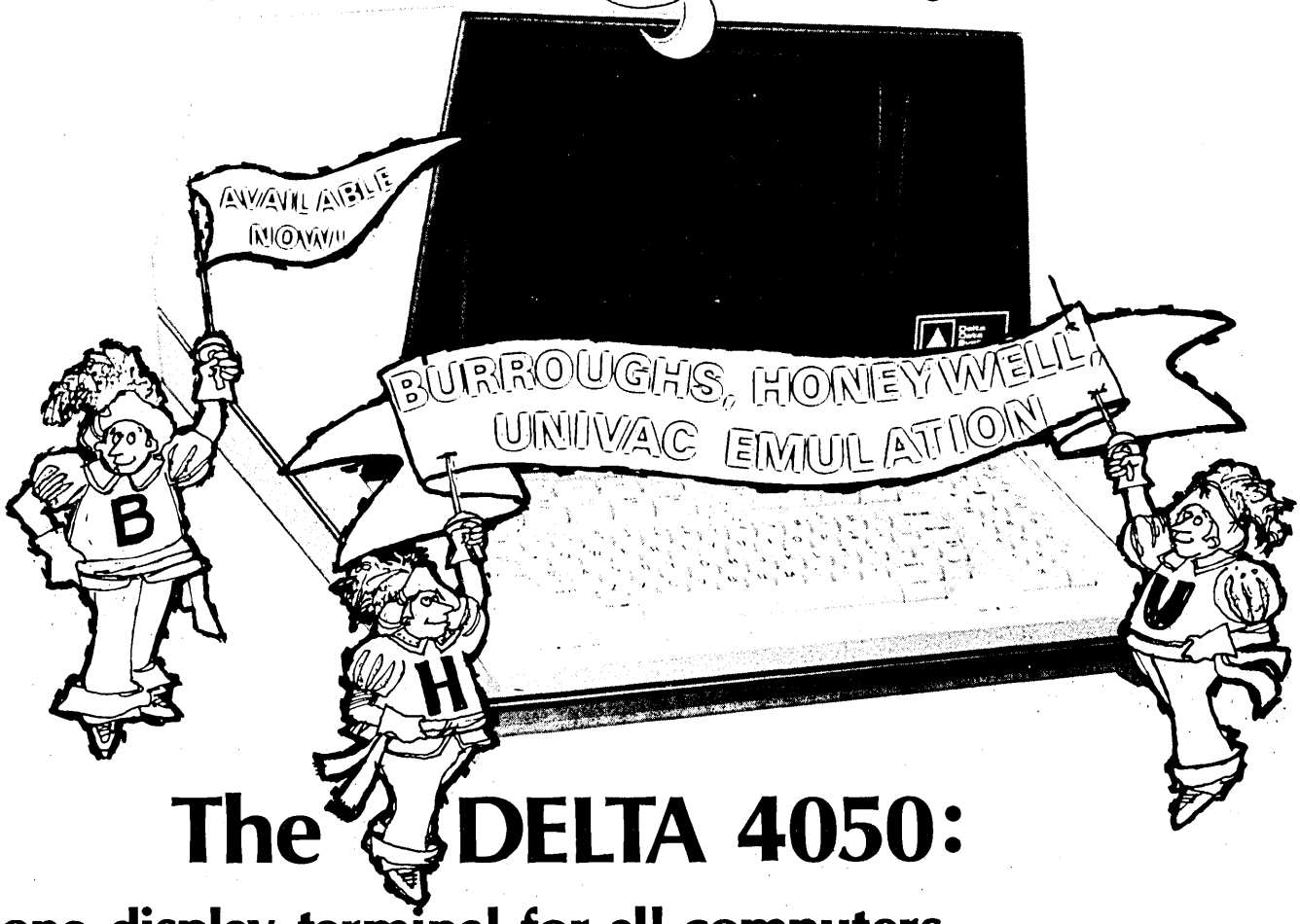


Dr. Uhlig is presently responsible for management policy governing the computers used to support the scientific and engineering community of the U.S. Army Materiel Development and Readiness Command (formerly the Army Materiel Command), within the Directorate for Management Information Systems.

For the past two years he has also had responsibility for the agency's program in interactive computer based office support systems, of which the computer based message system experiment mentioned in the text is a part.

He is a member of the U.S. Army Mathematics Steering Committee, too, and chairman of its Subcommittee on Numerical Analysis and Computers.

One for All & All for One



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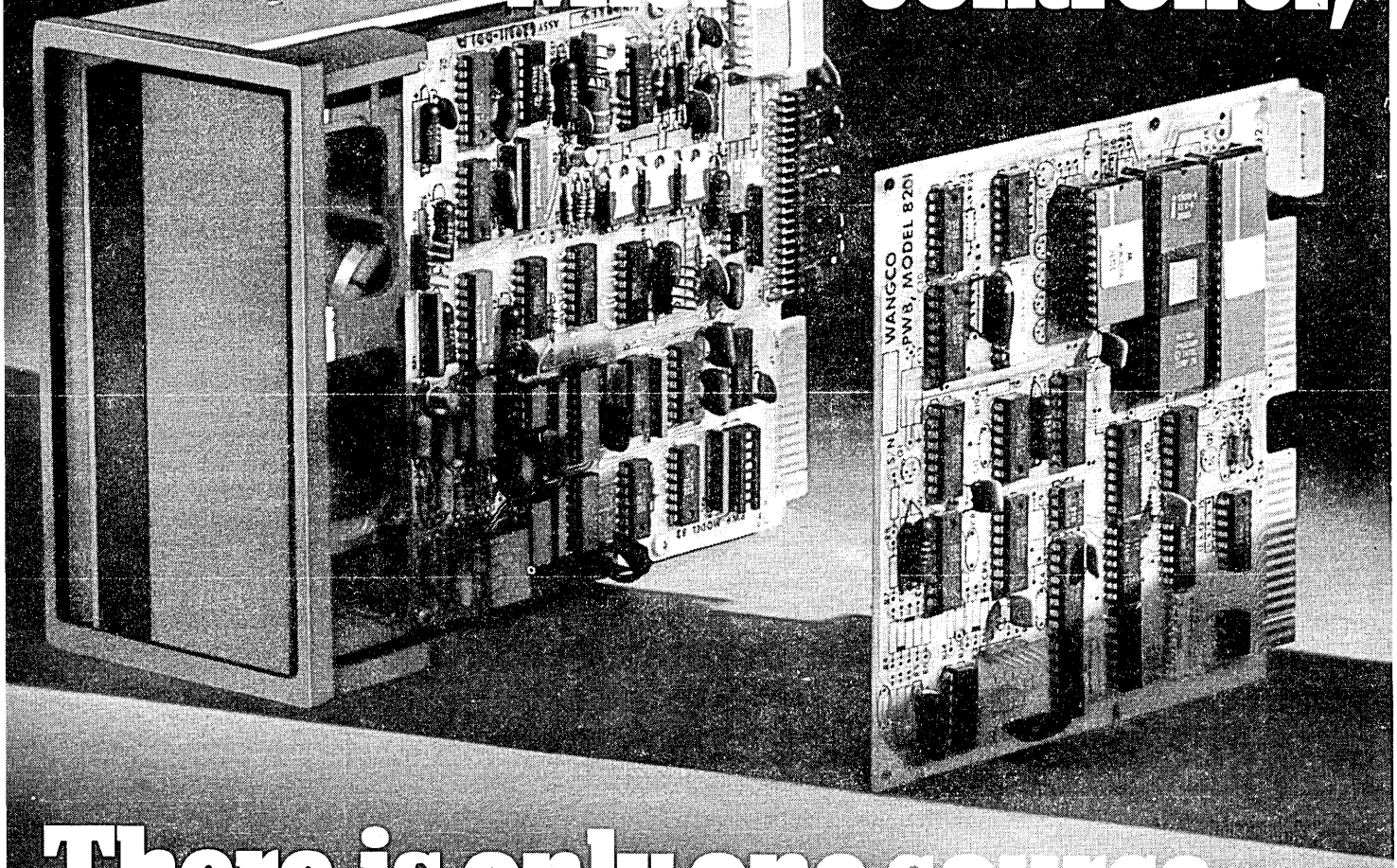

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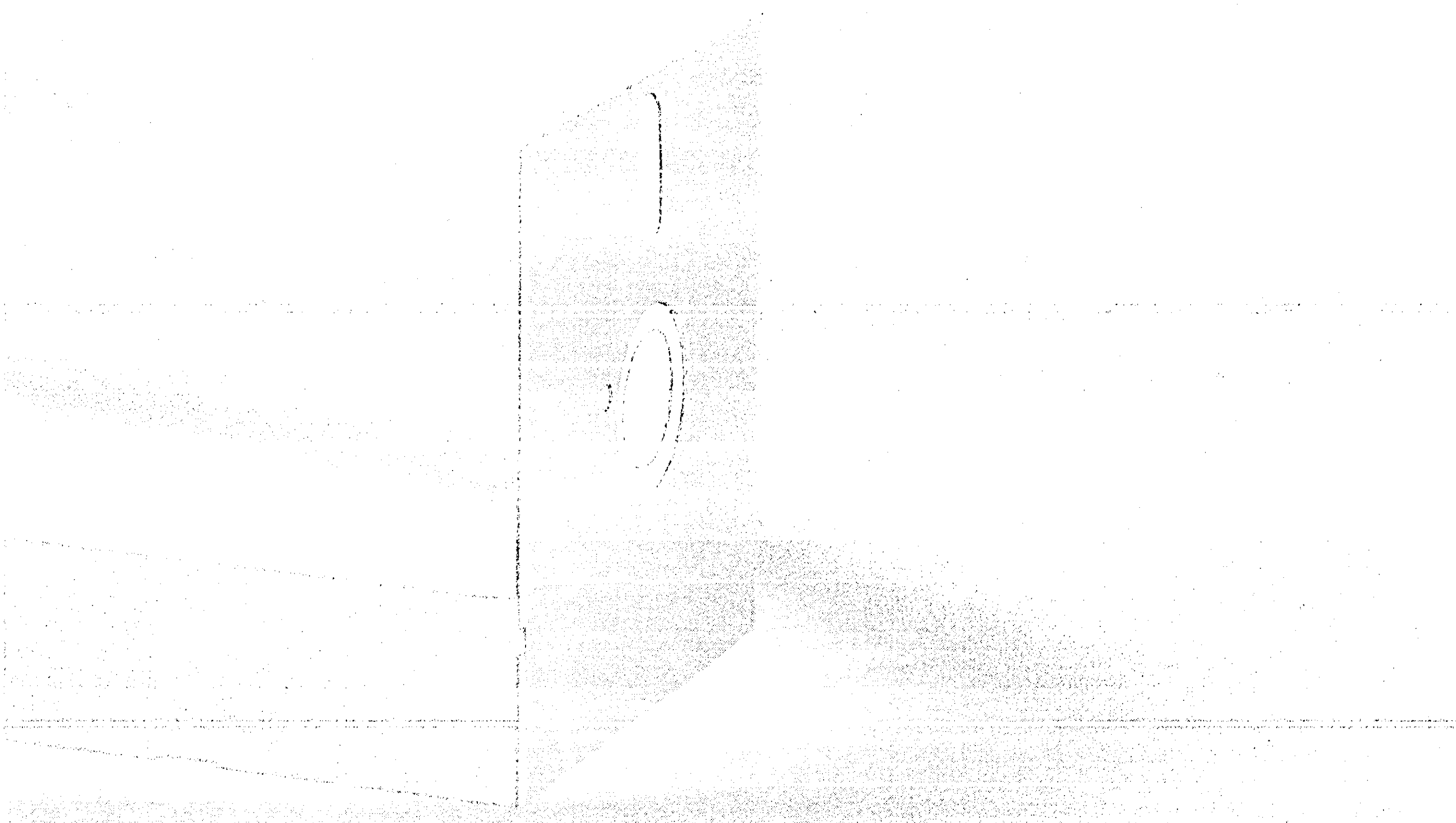
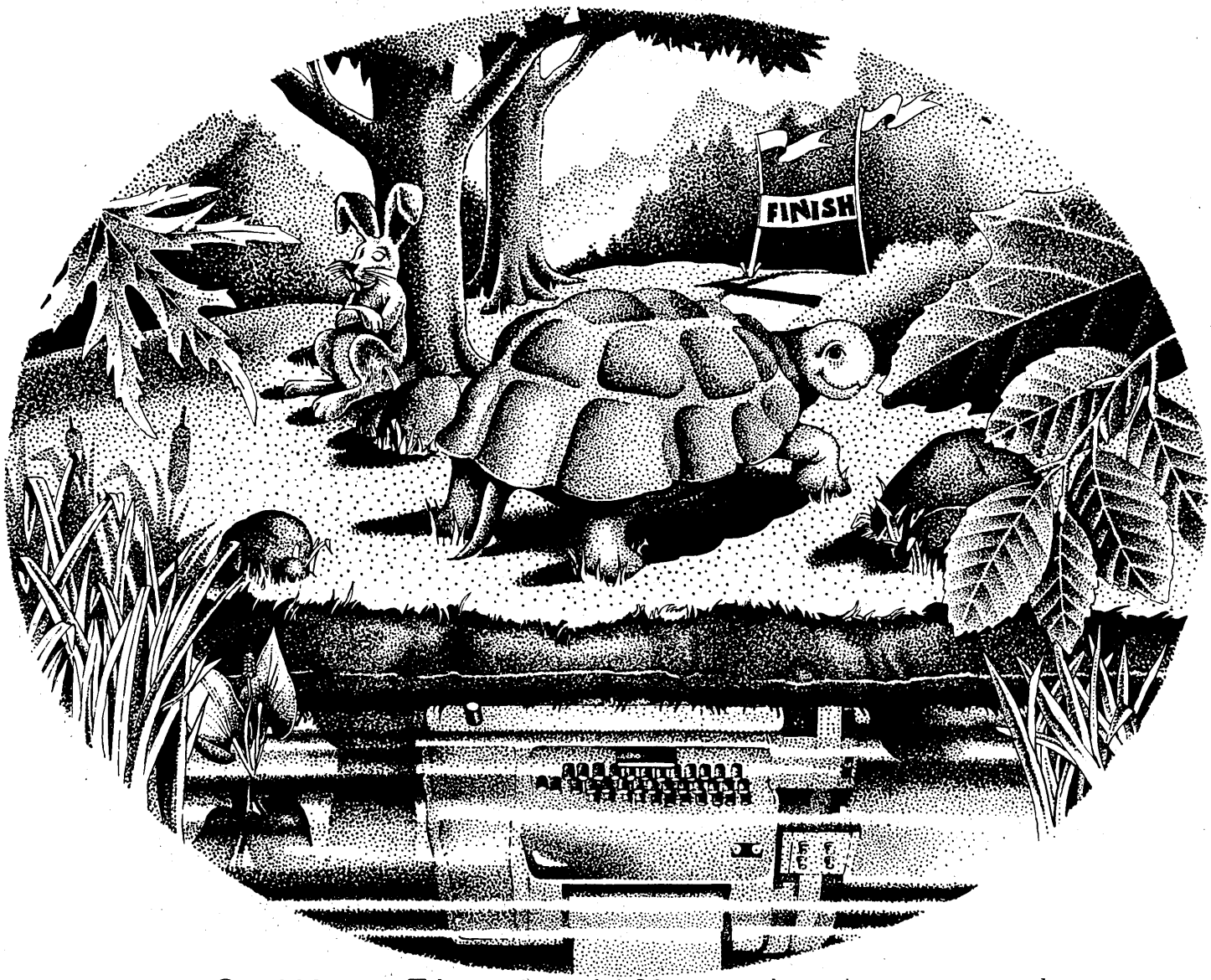


A FABLE FOR OUR TIMES: OR HOW A 100 WPM DATA TERMINAL CAN COME OUT AHEAD OF A 300 WPM UNIT.



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The Ultimate Personal Computer

by Lawrence R. Zeitlin

Forget learning the multiplication tables, compress college attendance into an afternoon, and master a new language in hours. Dick Tracy would have loved it.

For several weeks last winter, I conducted an informal survey among my colleagues and graduate students, posing the question:

"How would you make use of a small, portable computer, capable of storing and retrieving information, performing mathematical calculations, and making logical decisions?" About 15% of my respondents stated that they would use the computer's mathematical capability for assistance in job related calculations, statistics, engineering, etc. Another 5% proposed to use it in some non-job related fashion, including as a paper weight, to figure the odds at the racetrack, etc.

But the overwhelming majority, nearly 80% of those asked, would make primary use of the information storage function, largely as a memory aid. They would use it to store and recall names, addresses, phone numbers, and birthdays. They would load it with the factual content of course work or job related information, for retrieval as needed.

This last proposed use was expressed with great depth of feeling since the question was posed immediately prior to college examinations; a time in the life of any member of a college community in which information storage and subsequent retrieval becomes a matter of great import.

A matter of education

After reviewing the results of my informal survey, I began to wonder at the feasibility of this last use. Just how much information storage is required of a college student?

At a first approximation we may be able to estimate the information storage requirement by assuming that a college education represents the accumulated sum of all the assigned course reading over a period of four years.

Let us take Paul Samuelson's *Economics* as a representative textbook. It contains 800 pages, 40 lines per page, with 15 words or 80 character spaces per line, for a total of 480,000 words or 2,560,000 characters.

If the typical requirement is two such books per course per semester, a college education represents 64 books; a total of 3.1×10^7 words or 1.64×10^8 characters. Coded in 7-bit ASCII format, a college education therefore represents 1.15×10^9 bits of information.

Now the current state of the art in solid state computer memory permits an information packing density of 6 mils[3] per bit with integrated injection logic (I^2L). Neglecting packaging materials and leads, this comes to about 1.67×10^8 bits per cubic inch of active volume.

A college education therefore represents 6.88 cubic inches of state of the art storage, about the volume of a king size cigarette flip-top box.

A common concern in my survey was the manner in which communication with the hypothesized computer would be accomplished. Most such communication requires the learning of a mechanical skill, keyboard entry, and a special programming language. My respondents felt that the computer would be of limited usefulness unless they could communicate to the computer as they would to another person in a natural spoken language and receive a similar auditory response.

Let's look at the state of the art in this. Several years ago, IBM reported 92+% accuracy over a wide range of subjects with a phoneme decoder about the size of a shoe box for input. I suspect the size is smaller and the accuracy is higher today. Also, English-like query languages for data base access are in active development in software houses throughout the country.

For output, synthesizers have been around for some time and are in commercial use in stock quotation devices, calculators, and reading devices for the blind.

Suppose then we approach the input/output problem on a verbal level; the user speaks to the computer, perhaps in a restricted or formalized query language, and receives a synthesized speech response. No conceptual breakthroughs are required, merely miniaturization.

But, if we are going to communicate in the spoken word, why bother to encode all the characters of text? Why not code phonemes instead? This will cut the storage volume required by almost half.* Thus the information content of a college education could be stored in 3.7 cubic inches.

This volume is based on technology representing the current commercial state of the art. Within the last few months, a major semiconductor manu-

*Assuming 4 phonemes/word, the 3.1×10^7 words $= 1.24 \times 10^8$ phonemes. The (32) phonemes of English can be encoded by a 5-bit code. Thus the information content is 6.2×10^8 bits equivalent to 3.7 in[3].

facturer has started preproduction runs of magnetic bubble static memories with storage capabilities of over 92,000 bits per chip. This permits an increase in information storage density of 22.5 times over the (I^2L) or CMOS memories used for the previous calculations. These and other new nonvolatile memories use little or no power in the resting mode. If we take advantage of this newest technology, a college education can be reduced to 0.17 $inch^3$ or about 3 cubic centimeters.

As easy as pulling teeth

This size is small enough to be conveniently inplanted in the body, perhaps as a dental inlay or in the space made available by extracting a nonfunctional wisdom tooth.

I wouldn't want anyone to judge this argument on the inlay idea, but the mouth is, in fact, an almost ideal environment. We tolerate foreign bodies in the mouth quite well. Virtually everyone in the audience has a filling or an inlay, a false tooth, or a piece of bridgework. The mouth is temperature controlled and serves as an effective heat sink. This location for the computer facilitates input/output communication, a piezoelectric crystal picking up the vibrations of speech and responding via bone conduction to the ear.

Indeed the saliva could act as an electrolyte for a wet cell which generates the power for operation. The only unusual design requirements are that the device be waterproof, shockproof, and nontoxic.

Thus obtaining the information incidental to a college education could be achieved as easily as pulling teeth—and in the same professional office.

But, you may well ask, despite the fact that the student receives his diploma with his dental bill, is this really an education?

The answer is an unequivocal NO—and an unfortunate YES.

It is really no more of an education than handing a student an armful of textbooks and granting him his degree; but, the latter is a fair characterization of present educational practices, and the inlay wouldn't be much worse.

Education, as we conceive of it today, may be considered a communications channel which conveys information from the printed page to the gray matter of the brain. Since the communication channel has such a low data rate and the brain's retention process is so inefficient, a prodigious amount of time must be spent in information transfer. If we assume that a student spends 40 hours a week for 9 months of each academic year reading the 3.1×10^7 words representing a college education, he has a data input rate of approximately 58 bits/second.

Judging by the typical performance on examinations, only about 1/10 of this information is retained, resulting in an effective transmission rate of six bits/second from the printed page to the brain.

An oft-spoken criticism of contemporary education is that so much time is spent in the accumulation of information, that very little time is available to explore the use of that information. The direct implantation of *data* would solve that problem in a single stroke and could allow the educational process to direct itself to the integration and understanding of information rather than the accumulation of facts. In this respect the personal computer represents a potential technological breakthrough in education roughly on a par with the invention of moveable type.

No one reads the sky anymore

Aside from purely pedogogical considerations, the economic implications of a personal computer are staggering. As a simplified example, consider my son's grade school. Our local school district spends nearly $1,700/year/school child. Approximately 15% of the educational time is directed to instruction in basic mathematics, largely rote learning of arithmetic. By the time the child has completed the fifth grade, the school system, and we the taxpayers, have spent $1,275 to teach the child to add, subtract, multiply, and divide.

Now you and I know that we can buy the same skills conveniently packaged in the form of a pocket calculator at the local drug store for $9.98. Furthermore, the calculator never makes a mistake—but my son often does.

When I expressed my misgivings at a teacher's conference about spending so much valuable educational time and money on rote learning an easily mechanizable skill, I was greeted with expressions of shock and disbelief. "How can anyone," I was asked, "function in our society without a thorough mastery of arithmetic?"

Yet, when I asked the time everyone in the room looked at his or her watch. No one glanced out of the window to ascertain the position of the sun in the sky. Not so long ago, however, the ability to tell time by the position of the heavenly bodies was also one of the marks of an educated person. But since the personal timepiece evolved into a ubiquitous artifact, telling time by the sky has been deemed a skill appropriate only for Boy Scouts, along with finding north by the moss on the trees, and building a fire by rubbing two sticks together.

In due time, perhaps in the next year or two, Mickey Mouse on my son's wristwatch may learn to count on his fingers as well as tell time by moving his hands. So too, after a somewhat longer period, the personal computer may become a ubiquitious artifact, a part of the natural scheme of things.

The overall consequence of this eventuality may well be a change in our normal method of intellectual functioning. The most immediate is the one we have already discussed, providing the data bank of education at all levels of schooling—not the methodology mind you, but the data.

Instant retraining

Another, and perhaps equally important, consequence will be the possibility of instantly changing or updating learned bodies of occupationally relevant data.

It has been estimated that the half-life of a technology based job or education is about five years. That is, five years after learning a job or leaving school, half of what you have learned is obsolete. Retraining our adult work force has become an increasingly important problem. If present trends continue, a worker may well have to be retrained four to five times during his working life, with all of the lost time and emotional trauma that such drastic dislocation in life involves.

With the implantable computer it may ultimately be possible to change one's occupation with every visit to the dentist. Perhaps even do-it-yourself preprogrammed memories might be made available in such selected specialties as law and medicine as a substitute for postgraduate education.

Along a similar line, the courtroom lawyer might contain his law library in his molar, the tax accountant in his bicuspid. What a godsend for the doctoral student facing oral examinations!

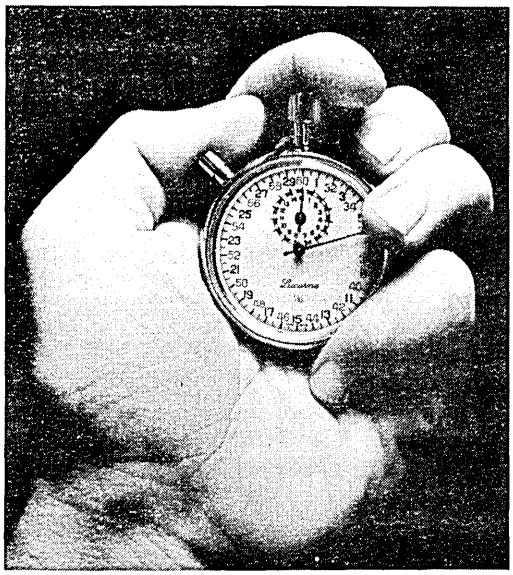
On a less esoteric level, the individual contemplating an overseas trip may eschew Berlitz for an implanted foreign language dictionary. Imagine the effect of acquiring 10,000 words of Chinese in a two hour layover in Hong Kong!

The social implications of the implanted computer are equally as profound. If costs can be kept reasonable, as they probably will be judging by the price/performance manufacturing learning curve of pocket calculators and digital watches, the computer might well serve as a social equalizer, divorcing access to data from income level. Note that human performance is still limited by intelligence and by the ability to use data itself.

When I first started this little paper, my tongue was firmly lodged in my cheek. But, come to think of it, everything I have suggested is either within the state of the art today or is likely to

RAMIS REPORT #3

How to evaluate the efficiency of a DBMS



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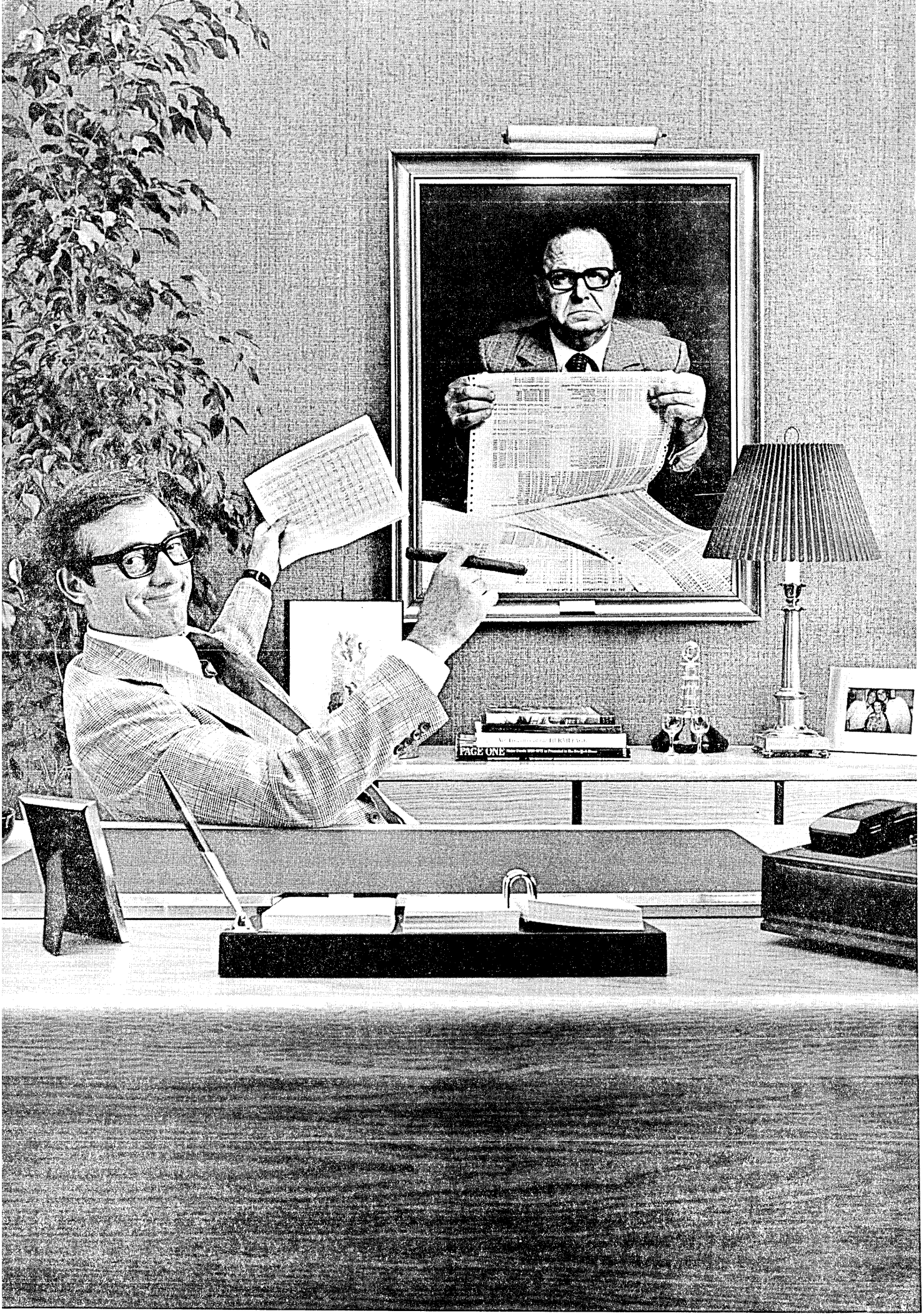
PAGE ONE

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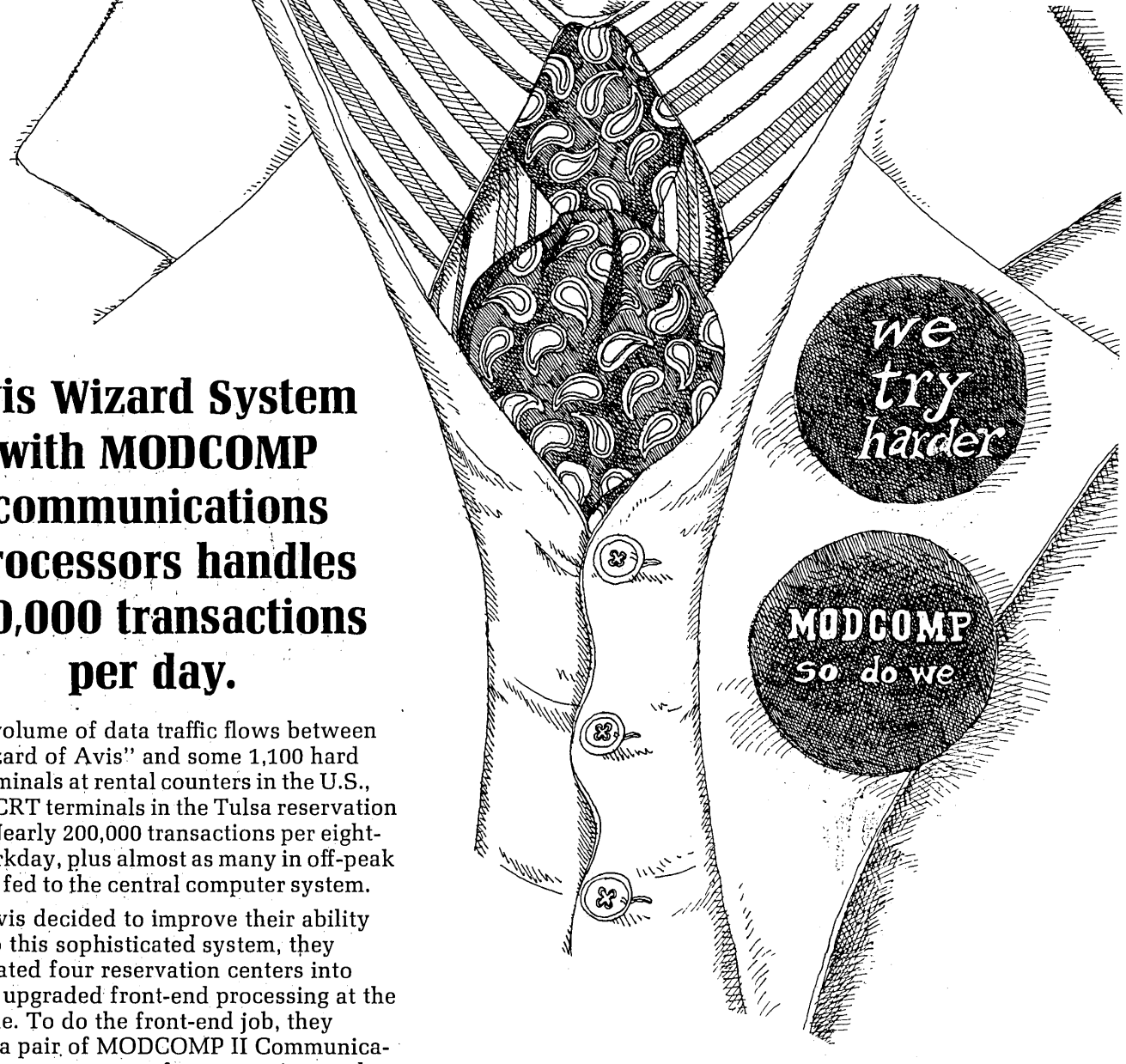
XEROX



Avis Wizard System with MODCOMP communications processors handles 200,000 transactions per day.

A huge volume of data traffic flows between the "Wizard of Avis" and some 1,100 hard copy terminals at rental counters in the U.S., and 175 CRT terminals in the Tulsa reservation center. Nearly 200,000 transactions per eight-hour workday, plus almost as many in off-peak time, are fed to the central computer system.

When Avis decided to improve their ability to talk to this sophisticated system, they consolidated four reservation centers into one, and upgraded front-end processing at the same time. To do the front-end job, they selected a pair of MODCOMP II Communications Processors — one for processing, and one for backup. Each has 128K bytes of four port memory, and its own fixed head disc for program loading which can be switched to either CPU.

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The entire system is supported by MODCOMP's MAXCOM Communications executive, to which Avis added software test features for message trace, I/O trace and program trace.

Cutover to the new system went off with minimum problems, thanks to the flexibility of the MODCOMP equipment. As for reliability, the MODCOMP equipment has been running with 99.7% uptime.

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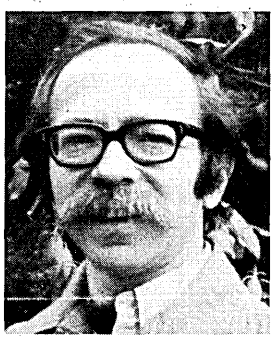
MODCOMP

The communications specialists.

be so before this decade is out. The technology is here and the economic impetus is positive. Indeed, the personal computer capability suggested is *not* the ultimate individual system but rather an interim step. The ultimate computer might well be the size of a grain of sand implanted in the brain at birth and as accessible to the brain as any other neuron.

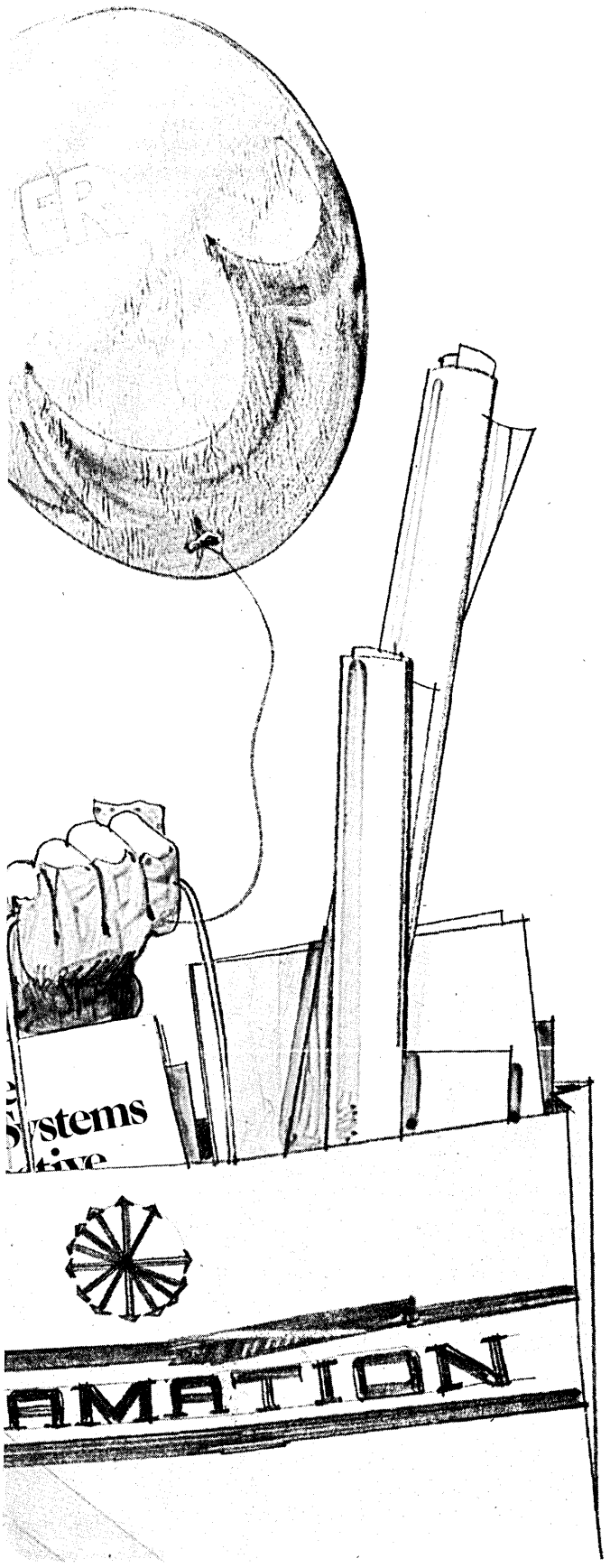
At the moment I would say that such a device was a practical impossibility. Not a conceptual impossibility, mind you, but a practical one. I would be willing to bet, however, that perhaps my child, or certainly my grandchild will be spared the difficulty of rote learning the data of a college education by a man-made, aptly named, wisdom tooth. Okay, if not a tooth, then a locket or a wrist computer.

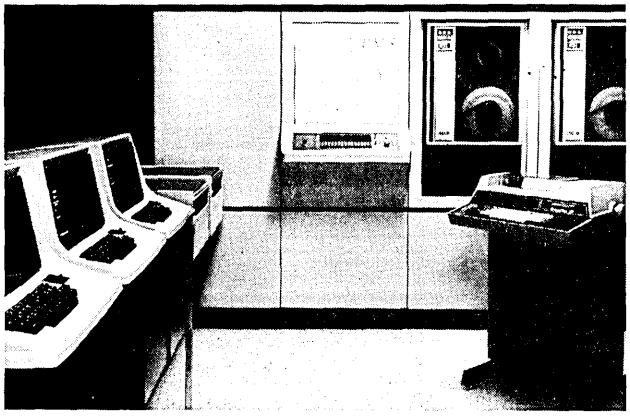
Now I'm not seriously recommending that IBM should try to corner the market on dental supplies or that Intel should apply for FDA approval of its memories, but rather that the data processing community should become aware of the long range implications of size and price reduction of computing machinery. We are in the earliest stages of a technological revolution which will force us to reevaluate that human attribute, the storage, manipulation, and recall of information, and in consequence, the utility of an educational process that provides that information in a most inefficient way. ❋



Dr. Zeitlin has been involved with computing machinery since he was awed and partly deafened by the Aiken Mark II at Harvard in the late '40s. Subsequent exposures were to the pin-programmed Burroughs 101, the Bendix G15, the IBM 1620, and a very forgettable group of analog machines, among others. He is now professor of Industrial and Organizational Psychology on the doctoral faculty of Baruch College of the City Univ. of New York, and is president of Lakeview Research, Inc., a consulting firm. His experience with computers of ever-decreasing size and cost provided the premise for this article.

To the VP of DP going to Big D for NCC:





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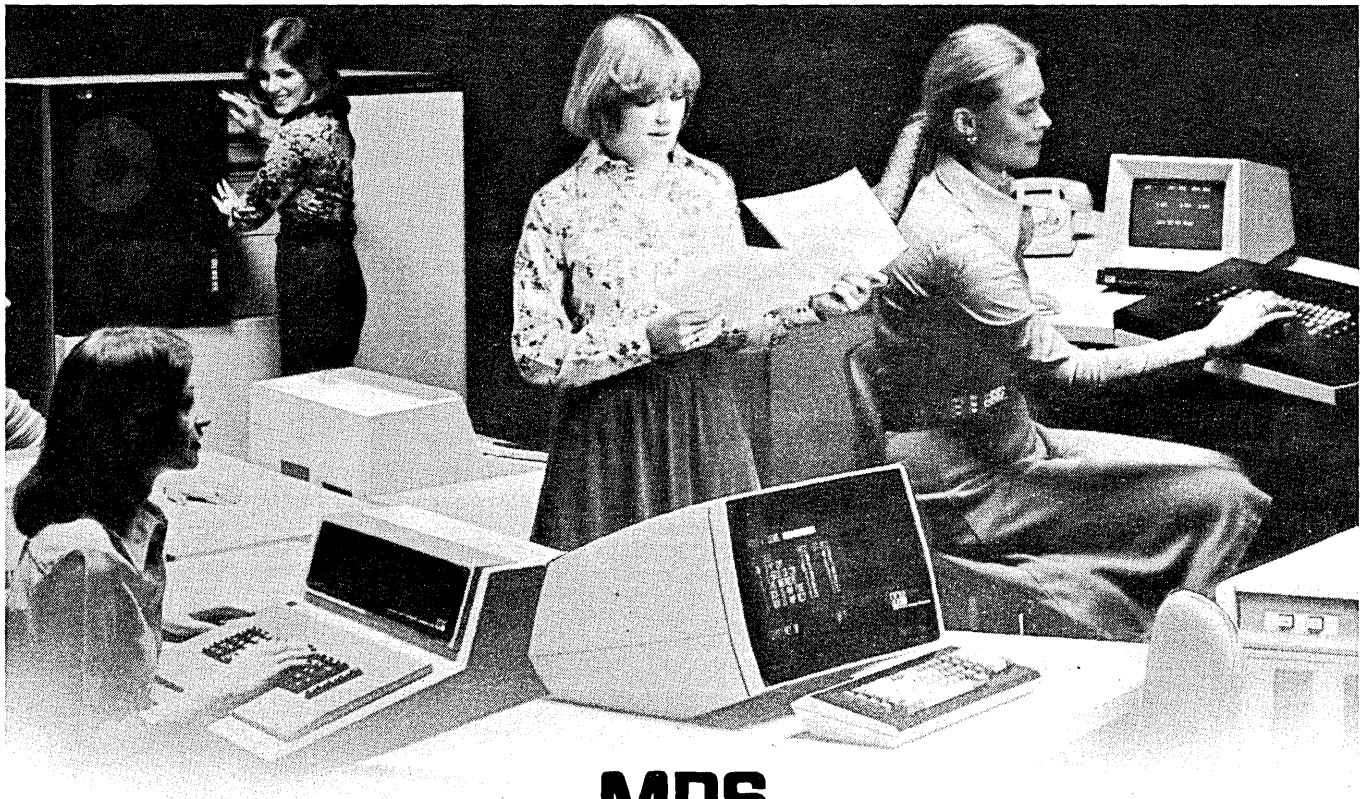

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A Time For Cross-Compilers

by Marcus L. Byruck

Adding another layer of software can cut costs, development time, and maintenance effort. How does "10,000 lines of code per man-year" sound?

Many companies are beginning to identify that their data processing needs can be divided into separate, independent functions which can be distributed to the responsible departments. Each of these functions can often be implemented as a separate application on a minicomputer. The different user departments and the mini itself may even be physically dispersed from the central site. Depending on the data required by the function, the mini may have access to a limited local data base only, or to a complete one which may be accessed by several applications.

Thus, the use of minicomputers (and even micros) in commercial or business data processing is increasing very rapidly, and the kinds of applications being implemented on them are becoming more and more diverse and sophisticated.

This leads to the minis and the systems software delivered with them becoming as complex and general purpose as larger machines. So, while the cost of the hardware is falling, the cost of programming the applications for these small machines is not only not falling, but is probably rising; programming is still highly complex and labor-intensive.

Mini-software, full-size costs

So, the way to get best value from development dollars is to focus on software, not hardware, in inverse proportion to hardware costs. The less costly the hardware, the more attention one must pay to the software. Cross-compilation proves to be a step in this direction.

It costs the same (or perhaps even more) to develop an application on a machine *costing* $50,000 as on one *renting* for $50,000/month. Yet users buying cheaper hardware are balking at paying the same software costs. What can be done? One thing is to stop spending our efforts optimizing hardware usage and focus on ways to minimize short and long term labor usage.

Application development involves several labor-intense activities, not just coding. Some are:

- specifying the problem
- designing the system
- programming and checkout
- programmer training
- internal documentation
- development management
- user training
- maintenance (bugs) and updates (changes)

Software engineers tell us that the majority of application software costs are spent in maintenance and updating. Regardless of how the system is developed, there will be errors, revealed by previously unencountered data conditions, and changes in specifications.

It costs the same (or perhaps even more) to develop an application on a machine **costing** $50,000 as one **renting** for $50,000/month.

Programs which are not easily changed or corrected are really costly. That is why most coding, even for minis, ought to be done in a higher level language. That is also why tools like special converters for assembly language to COBOL, or assembly to anything, are in demand as users discover the box they have been put in by the deferred hidden costs of maintenance.

Some may object that compilers in general, and COBOL in particular, do not lend themselves to highly optimal object code. But within reason, so what? Many applications on minis are I/O bound, and interactive programs are human bound. Given typical machine execution speeds, *decent* object code should be sufficient for most applications.

We no longer have to be slaves to an arbitrary machine efficiency god. It is usually not necessary or economical for a program on a mini to execute with "optimal" speed or in "minimum" space if this comes at a cost of programmers' time or causes project development delays. Programmers should concentrate on optimizing only critical modules, where the efficiency payoff is high.

Cross-compilers can give another degree of leverage to programming in a higher level language for a mini, by accelerating the development of that programming. Some explanation about them is in order to understand how they can do this.

Another layer of software, but

A cross-compiler is a compiler which executes on a host machine like an IBM 370, accepting programs written in a particular source language like COBOL. Unlike a normal compiler, however, the code it generates is designed to execute on a different machine (the target), which is usually a mini.

Various cross-compilers have been developed for internal use by different companies, mostly to handle special situations of equipment conversions. Some of these are commercially available as packages, including ones for FORTRAN and JOVIAL. The most common commercially available systems of this kind are cross-compilers from large scale IBM equipment to minis. The difference in scale between the host and target machines is what seems most important, though; recently several cross-compilers *from* minis (to micros) have been built.

The following are just a few of the kinds of applications executed on a mini that could benefit from using a cross-compiler on a larger machine. For the method to be of benefit, of course, the company must be undertaking enough development to warrant the initial cost of acquiring or developing the cross-compiler.

- Insurance company branch office claim processing. (The mini and terminals may be standalone or connected to a central site.)
- Bank branch office inquiry network.
- POS cash register control and backroom batch applications.
- Hotel reservation systems, standalone and networked.
- Batch applications dedicated to a particular function within a large company, such as credit rating, revolving credit, or trust accounting in a large bank.

One could develop the programs for these applications in the resident COBOL or other high level language, or even the assembler language of the

mini. However, many minis (especially those which are purchased primarily for their execution capability) don't have a resident compiler; and resident COBOL is rare. Or, the compiler may lack the required language features, may have unacceptable program size limitations (a limited number of data names in COBOL, for example), or may generate slow object code (as interpreters, by their nature, usually do).

Even when some high level language is available, it may not be the one for which a company has developed standards and application libraries.

Finally, even when a *good* compiler is available on the target mini, the time required to develop an application can be very much reduced by using a cross-compiler on a bigger machine.

Cross-compilers accelerate application development.

Say that you agree that COBOL, as a de facto business programming standard, is the way to go. The same COBOL-experienced staff you have always used then writes the new application you need in COBOL just as they would for the large scale machine, perhaps with some restrictions. But they are doing it for eventual use on the mini. All program development (editing, etc.) can be done on the large scale machine, with many programmers acting simultaneously on the same test data if desired. Then compilation can be done either on the host COBOL or the cross-compiler, to detect the initial syntax errors. The host machine can also be used for initial execution of the programs, depending on the application.

Thus the considerable power of the large scale cpu and its program development tools can be exploited wherever possible.

At some point, of course, the object programs produced by the cross-compiler must be tested in the application environment on the mini. By then, some debugging has already taken place, probably more than if a mini-resident compiler had been used.

Checkout will be similar for all program development methods. In this, the cross-compiler has little if any advantage except for speed of recompilation after finding errors and possibly also the ability to inject provisional debug code in the object program.

At this stage in program development, a mini is needed with one or more terminals to simulate the field situation. The development mini could be connected to the host machine so that it can be down-loaded with the results of a compilation, or a tape or disc can be used as the common medium. Similarly, in a network situation the machines on the network could, at appropriate times, be down-loaded from the host machine. Alternatively, more traditional methods of updating the mini could be used. These kinds of logistics depend on the particular connection and situation of the mini and host machine.

Watching one in action

Recent use of a cross-compiler by Micor Corp. illustrates some of the advantages of the concept. Micor is a wholly-owned subsidiary of Ramada Inns Inc., of Phoenix. The company supplies reservation services to hotel chains as well as standalone mini-based on-line systems for individual hotels, called Property Management Systems.

Micor began development of the PMS product in early 1975. This system allows a hotel to develop, update, and access customer and room information, such as rates, room availability, group bookings, special requests, etc. The information is stored on disc and the hotel's (non-technical) staff accesses it through crt terminals located at various points in the hotel. Each hotel may have from four to 30 terminals. Data is displayed or entered in fixed positions on a screen "menu."

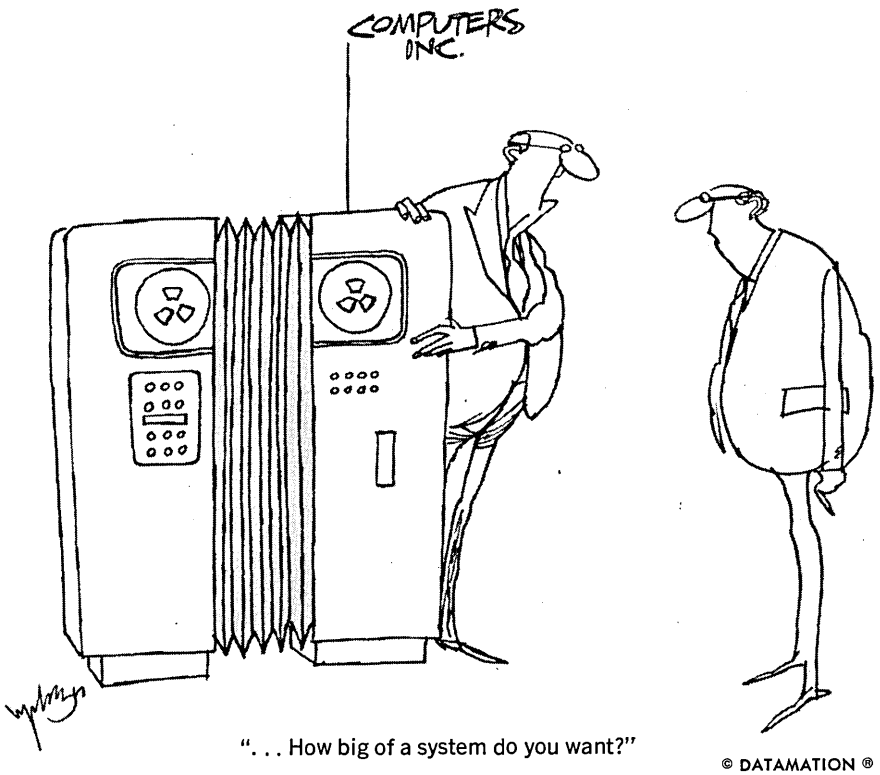
Micor already had available for its extended reservation system a large-scale DECsystem-1077. It chose the Texas Instruments 990 as the mini on which its Property Management System product would be based in each hotel. At that time, the 990 did not have a resident COBOL, but Micor did have a resident COBOL applications staff. Hence the decision to use a cross-compiler.

The system was divided into various main and subprograms, each performing a specific short-lived function. Many of these access the same data base, and each have data which is exclusively local to it. This was implemented relatively simply by organizing the system into COBOL programs and subprograms; and using the COBOL Data Division Linkage section. The application ultimately turned out to consist of about 300 programs (or subprograms), each between 200 to 800 lines of code, accessing a common set of files on disc.

The functions of these subprograms can be divided into rough categories as follows: about 50 report generation, 75 file update, 75 screen format (input, output, edit), 50 editors, 50 system-oriented (warm start, recovery, etc.), and three application supervisory programs.

The language available on the cross-compiler was approximately COBOL ANS level 2. It includes a library copy facility which takes advantage of the powerful DECsystem-10 library handling capabilities, a data linkage section, COBOL and non-COBOL subprograms, communications, a data type which represents a binary 16-bit word, generalized expressions, N-level subscripting, etc.

The cross-compiler issues clear English language diagnostics, and offers useful options such as a cross-reference list and object debugging code. The



"... How big of a system do you want?"

CROSS-COMPILERS

operating system allows the compiler itself to be time-shared by more than one user.

The TI 990 object code generated by the cross-compiler is reentrant (consisting of a changeable data segment and a fixed procedure segment). Wherever feasible, in-line code is generated; for some functions, (such as decimal arithmetic, editing, I/O interface), a run-time subroutine call is generated. The run-time package of subroutines is reentrant and requires about 3,000 (16-bit) words.

One year was required from project initiation time until a production system was ready for installation at a customer site. The application staff involved consisted of five COBOL programmers (none with specialized skills or minicomputer expertise), and one systems programmer. Micor did not maintain accurate machine usage statistics, but claim that each programmer was probably logged onto the system for about four hours per day on average.

> Fixes, changes, and even translation to Spanish have been handled without major problems.

As it happens, Micor built its own cross-compiler. Although this let them control the exact language implemented, it otherwise did not particularly affect the development of the application programs themselves. Different groups developed the cross-compiler, the application program set, and the TI 990 run-time subroutine support package, in parallel.

The DECsystem-10 operating system provides multi-user time-sharing access with spooled output and a high throughput rate. Each programmer had on-line access to the machine through crt's. The programmers achieved unusual productivity (more than 10,000 lines/man-year) through use of the 10 for all of the source program physical development work, as well as cross-compilation itself. They did all maintenance of files on the 10 using that system's editor, file copier, librarian, etc.

After each source update, they could, without changing machines, immediately do a recompile on the cross-compiler, and get printed or display output. In this way, they completely avoided the logistical problems of moving source files from machine to machine. They only moved to the TI 990 when a program was complete, cleanly compiled, and ready for testing. And the test 990 was physically connected to the 10 so that object programs could be transferred to it directly.

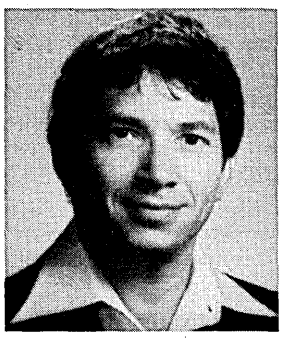
It pays off

Both the Micor management and the programming staff are convinced of the outstanding advantages of the cross-compiler approach. So far, they've handled error fixes, system specification changes, and even translation to Spanish, without major problems. The system is performing reliably and efficiently, and has been installed in several customer sites. Micor has already reaped the benefits of this approach, and is in the process of reaping more by developing new applications with the same cross-compiler.

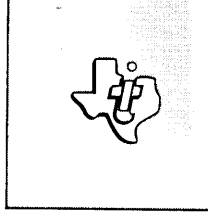
The kinds of software development costs being incurred by users of minis are just beginning to be noticed and not swept under the rug. They will become even more apparent as the applications age and maintenance costs begin to be felt. The advantages illustrated by the Micor experience make cross-compilation an increasingly important technique to consider in reducing these development and maintenance costs.

And the technique is not reserved for large users with big budgets, or even those with on-site cpu's. Cross-compilers are available as packages and on a service basis, so they can make good sense for the small user too.

Minis are used more and more by laymen in dedicated, specialized applications, so why should they be scaled-down general purpose machines? Why not single-purpose user oriented machines? And why not cross-compiling, cross-assembling, or cross-anything else? As companies like Micor are finding, for many applications it's the only sensible way to go. ❋



Mr. Byruck is the director of advanced systems at International Computer Technology (ICT) in San Francisco. For several years previously he was an independent consultant and before that worked at SRI, Informatics, CDC, and Honeywell. He has specialized in language processor designs, and most recently has concentrated on mini- and micro-based systems.



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Distributed Processing Systems

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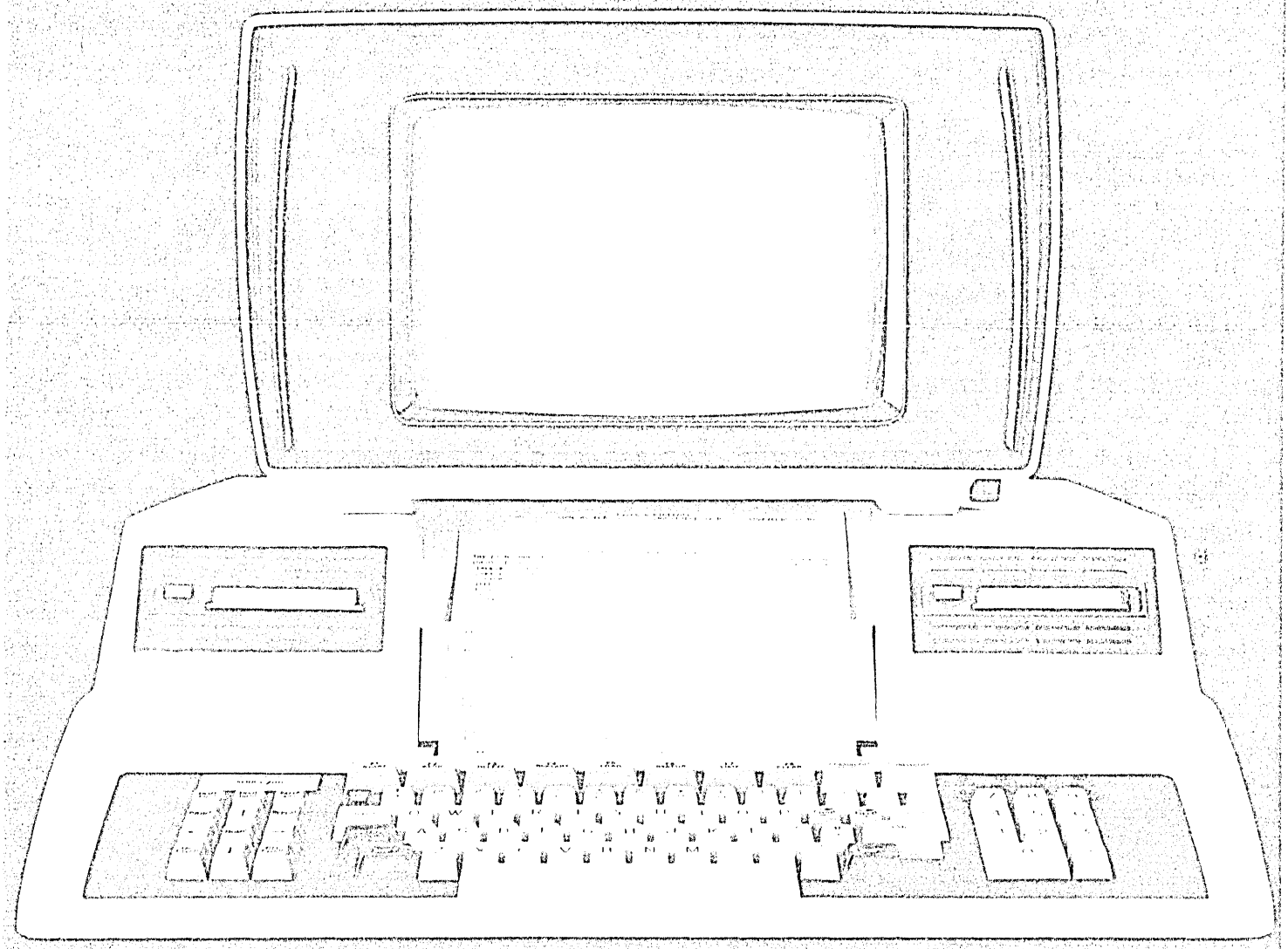

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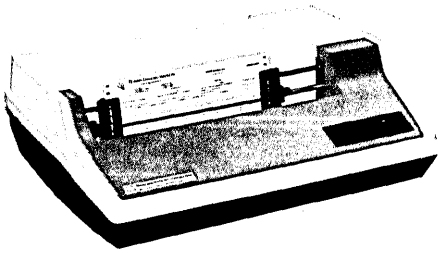
Totally integrated package.
The Model 770 terminal includes all the components of an entire system. It has features like dual mini-cartridge tapes, a 1920-character video display and up to 48K bytes of memory. And it's the first video display-based intelligent terminal on the market that offers a built-in 80-column printer.

For multi-copy and 132-column capability, TI's compact, microprocessor-based Model 810 impact printer is also available.



Model 810 Impact Printer

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Model 770 terminals are easy to program and operate with TPL 700, the flexible, powerful Terminal Programming Language. TPL 700 is a high-level business-oriented language that greatly simplifies forms generation and procedures for data entry and local processing. Programs can be developed interactively on the 770 without ever writing lines of code.

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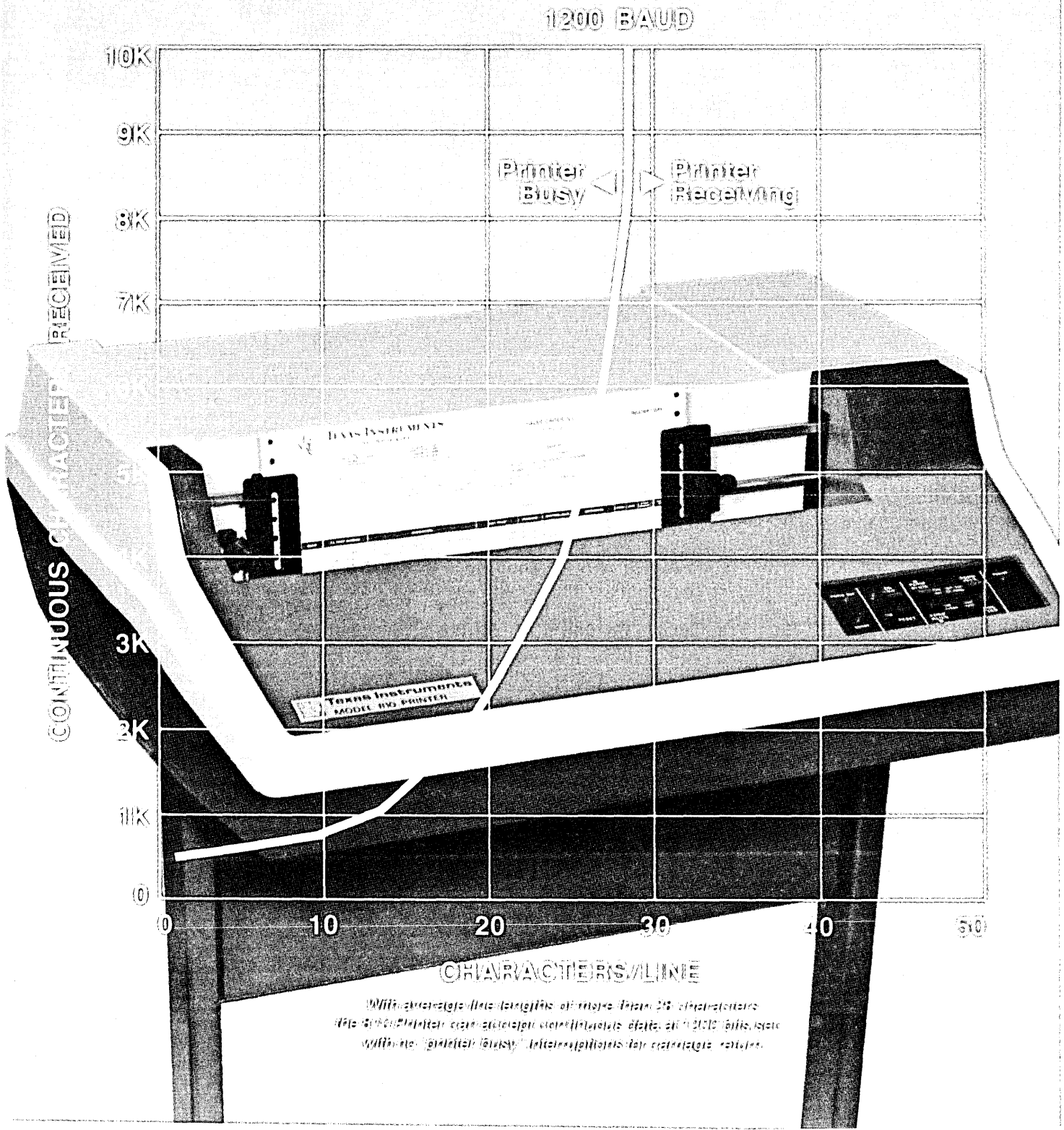
New from TI

Plot the performance of the Model 810 Printer against any other printer on the market.



And you'll find our impact is exceptional.

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Compare the new Model 810 Printer with any other printer you are using or considering. We believe you'll find that the 810's reliable, microprocessor-controlled printing results in the highest throughput per dollar and lowest cost of ownership.

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Plot our standard features.
The 810 printer has exceptional standard features too. Like bi-directional printing at 150 cps. No paper tape programming. Adjustable tractors for a variety of form widths. A 9 X 7 wire matrix character font for high-quality printing of an original and 5 copies. Bottom and rear paper loading. Speeds from 110 to 9600 baud. And 6 or 8 vertical lines per inch. Add to these the 810's tested reliability and the result is *performance.*

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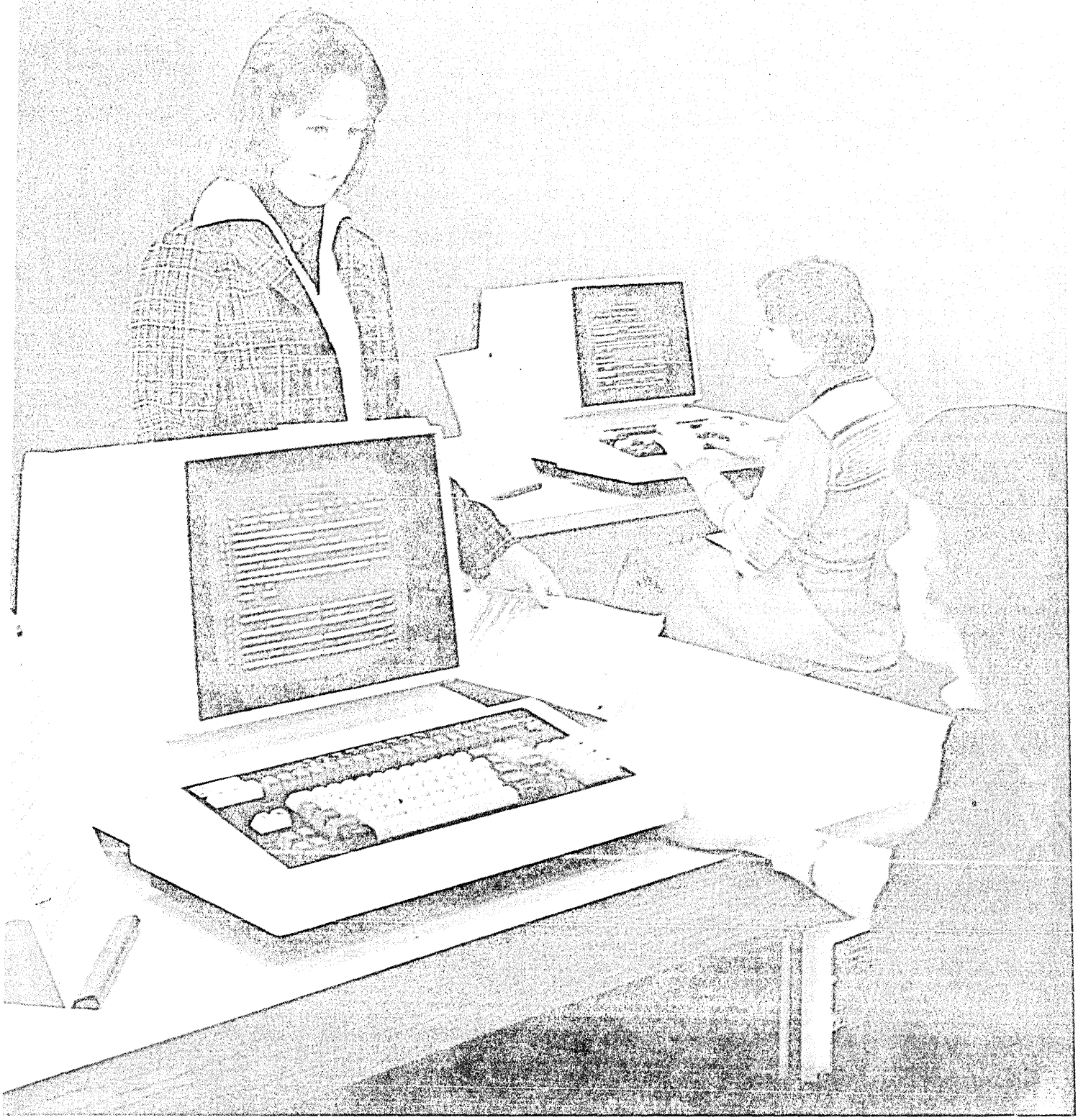
DXS Data Exchange System.



Think of it as the intelligent alternative.

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The DXS* Data Exchange System is a full-function distributed processing system that can significantly increase the productivity of your personnel, while taking the burden off your host computer. And it will do all this with less disruption and at less cost than competitive systems, like the 3790. Compare performance:

DXS	The Competition
Concurrent 3270, 3780 emulation.	Not available.
High-level languages: COBOL, TRANSACTION.	Not available.
Expandable to 256 terminals.	Expandable to 31 terminals.
Expandable to 400 Mb disc.	Expandable to 27.5 Mb disc.
Stand-alone batch processing, including compiles.	Not available.

Source: 1976 Auerbach Computer Technology Report

Placing the power of a distributed processing system into the hands of noncomputer-oriented personnel is what DXS is all about.

DXS increases the efficiency of your network by eliminating peak loading problems. You can access data from both the DXS and host in one transaction. And because DXS reduces host dependency, your remote users are assured access even when your host computer is unavailable.

DXS expands easily and inexpensively. For instance, to add terminals at a remote site, DXS requires only a simple controller unit costing less than $1,000. And the terminals can be located up to 10,000 feet away from either a DXS or remote controller unit — connected with low-cost standard twisted-pair wire.

And there's more. Like a wide range of peripherals, complete application program capabilities, and low-cost intelligent terminals. You even can use your existing 3270 application programs.

DXS. We think it's the intelligent alternative for performance and price. To find out for yourself, call Computer Marketing at (512) 258-5121, Ext. 2527, or fill out and mail this coupon.

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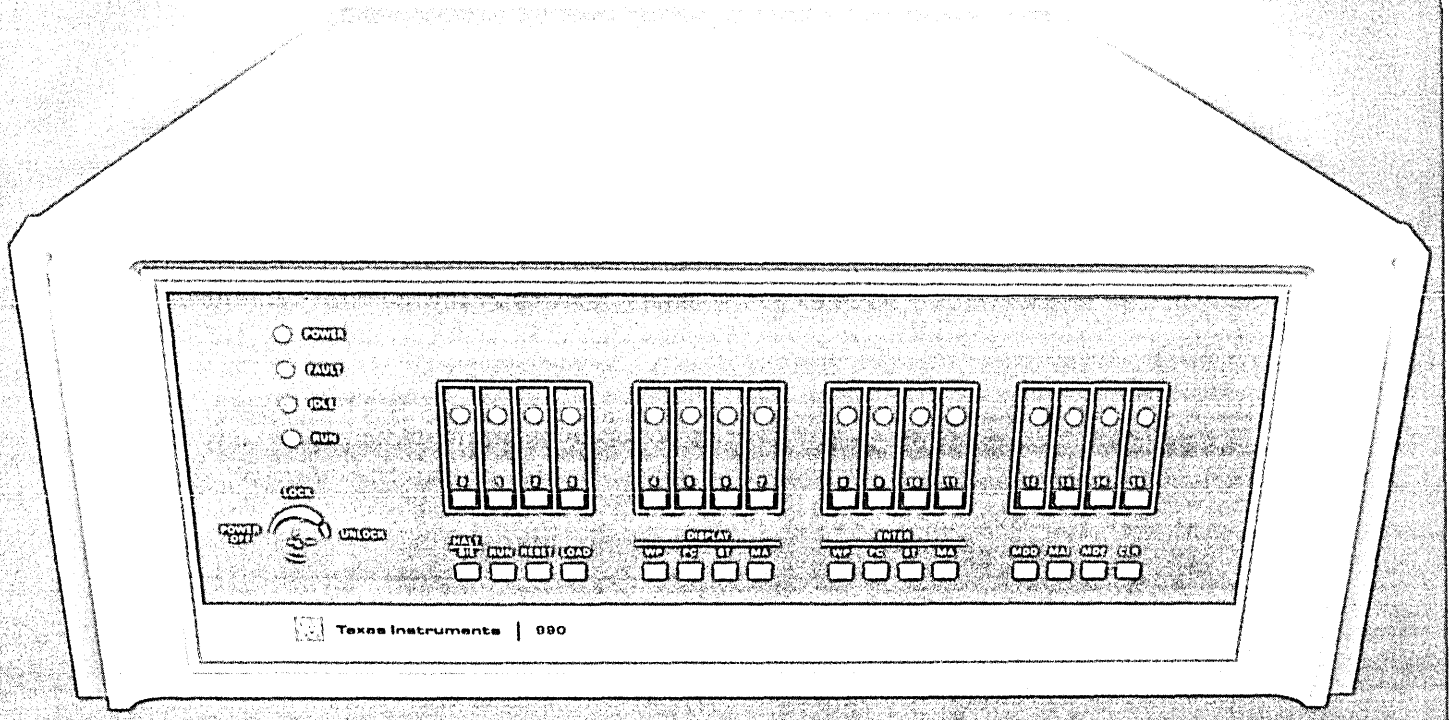
See Texas Instruments products at Computer Caravan and NCC.

990/10 OEM minicomputers.



Built, backed and priced to sharpen your competitive edge.

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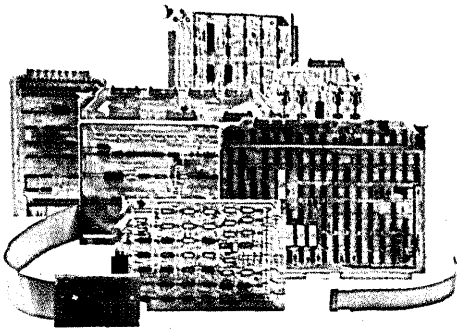
The 990/10 minicomputer from TI brings superior value to both you and your customers.

Starting with field-proven hardware, the 990/10 delivers the reliability you expect from TI. And all the off-the-shelf support you need for user applications. You get standard software languages, a broad choice of peripherals and nationwide service.

Built for more processing power.

The 990/10 is the most powerful member of the 990 computer family. Its architecture provides features that give you maximum processing power for your money. Like hardware multiply and divide. A 16-level hardware



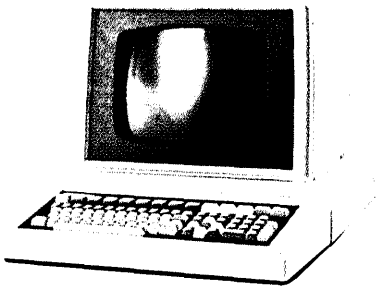
Peripheral Interface Modules

interrupt structure. 16 registers arranged in a workspace concept. I/O that's directly programmable through the Communications Register Unit (CRU) and autonomously through a high-speed data bus. And bit, byte and word addressing of memory.

Built for system flexibility.

In small or large configurations, the 990/10 design provides surprising flexibility for a small investment.

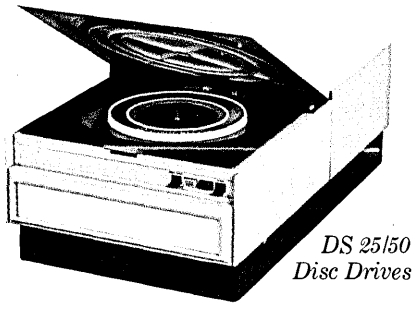
The CRU, with up to 4096 I/O lines, reduces interfacing costs by keeping controller complexity to a minimum. The TILINE* asynchronous high-



Model 913 Video Display Terminal

speed data bus can support both high- and low-speed devices and takes advantage of design simplicity for simultaneous data transfer between peripherals, the CPU and memory.

With the 990/10, you get a powerful instruction set with an extended operating feature that allows hardware to take over operations that software would normally execute. An optional mapping feature provides memory protection and memory expansion to 1 million words. And, optional error-correcting memory corrects single-bit errors for increased system reliability.



DS 25/50 Disc Drives

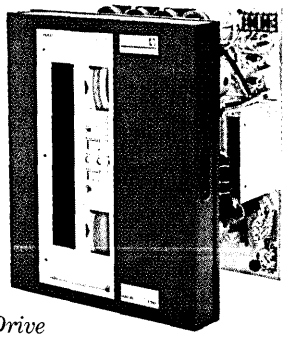
Full peripheral support.

As well as a range of standard peripherals, disc storage to 90 million 16-bit words and magnetic tape with 800 and 1600 bpi options are available for low-cost mass storage and back-up.

A choice of software.

With common higher level languages, FORTRAN IV, COBOL and Multiuser BASIC, plus the 990/10 assembly language, you have all the tools you need for an efficient application program.

Both the disc-based and memory resident operating systems give you modularity and flexibility for system generation to meet application de-



Model 979 Tape Drive

mands. We offer program development aids for creating and testing software, and communications software to support synchronous or asynchronous data transmission.

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Our responsibility to you doesn't end with the sale. We follow through with complete system training, plus a nationwide factory service network.

The TI 990/10 minicomputer. We build it, back it and price it the way you and your customers want it. You can start configuring a system now with our 990 Computer Systems Handbook on the upward-compatible family of the TMS 9900 microprocessor, 990/4 microcomputer and 990/10 minicomputer. For your free copy, send a letterhead request to Texas Instruments Incorporated, P.O. Box 1444, M/S 784, Houston, Texas 77001.

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Data Processing and Taxes

by Edith D. Myers, Associate Editor

Moves are afoot in several states to tax data processing users and vendors either through new rules or new interpretations of old laws. "It's a ripoff of the worst sort," says an ADAPSO official.

Taxes have been called one of the two most certain facts of life, but there's nothing certain about taxation within the data processing industry, particularly where software and services are concerned.

Tom Farewell of the Association of Data Processing Services Organizations (ADAPSO), which has been spearheading efforts to head off imposition of new taxes in several states, called current efforts by some states, "a ripoff of the worst sort."

"Sure the states need money," acknowledged Farewell, "but is needing money an excuse to rob a bank?"

Sure the states need money, but is needing money an excuse to rob a bank?

Some states are drafting regulations to deal with taxation of software, data processing services, and related services. Others are attempting to retroactively apply new interpretations of old rules.

Ronald Carpenter, of Intellidata Inc. (a Sunnyvale, Calif., data entry and contract programming services firm which has received a retroactive assessment from the state of California for $29,000), said that contending "the illegality of retroactivity" will be half of the case his company will make in fighting the assessment.

Tom Harincar, controller of Informatics, Inc., which has been assessed for retroactive sales taxes by the state of New York, said that state is telling vendors they can sue their customers for the back taxes and "the state will join you in court." Few vendors seem anxious to go back to their customers.

David Campbell, whose firm, Computer Task Group of Buffalo, has been assessed some quarter million dollars in retroactive taxes including penalties and interest, wonders, "how far back can they go . . . will the courts let them go back . . . and what about the interests and penalties?"

Bob Sherin, president of Nova Computing, Miami, won a precedent setting case in Florida (March, p. 15) in which software was deemed intangible and therefore not subject to sales tax. He is an active crusader for action in the dp industry against taxation. "It's a gathering storm," he said, "and everyone's sleeping. We have to take every avenue open to us and we have to act now."

"These things can sneak right past you," said Mike Zeidler, a Wisconsin computer consultant, of a clause in the current Wisconsin budget bill which would tax software and dp related services, including his. He contends passage of the bill with that clause could put him out of business.

Consider the case of Sandy Clericuzio. Sandy runs The Data Gap, a San Fernando, Calif., keypunching service she started in 1974. She has 25 employees, most of them part-time, and does $200,000 a year in business. Last August she was audited by California's State Board of Equalization and was assessed $17,000 in uncollected sales taxes dating back to when her company was formed.

Understandably, she doesn't want to go back to her customers to collect the tax, a tax she never knew she was expected to collect. "When I applied for my city business license, I asked what other agencies I should contact and the Board of Equalization was not on the list."

Sandy said the only reason she was audited was "because one of my customers was audited and they found some of my bills." She has approached a lawyer, but he wants $10,000 to help her fight the assessment, $5,000 of it up front.

Three ways to lose

There are three types of taxes to which data processing products are being subjected in varying degrees. They are personal property tax, sales tax, and use tax.

Operating systems are seen as part of the hardware, and thus subject to property tax.

Personal property tax is imposed by localities, usually counties, under enabling legislation passed by the states. Generally, tangible personal property and real property are subject to this tax, although in some cases intangible personal property is included. Hardware almost always is considered tangible and subject to the property tax. The status of operating systems software isn't as clear.

Some states, such as California, have considered the question and have classified this type of software as part of hardware and thus subject to property tax. Applications software is exempt from personal property tax in such states.

Sales tax is a tax administered by a state on the retail sale, and usually rental or lease, of tangible personal property within the state. The tax is

imposed on the retailer who ordinarily is permitted or directed by statute to pass it on to the consumer. The definition of retail sale normally excludes sale or lease either for resale, re-lease, or a combination of the two. The sales tax is measured by the gross receipts of the sale and the percentage varies from state to state.

The sale, lease, or rental of hardware is considered a sale, lease, or rental of tangible personal property in all states having a retail sales tax. At question in many states is whether or not application software, either packaged or custom, constitutes tangible personal property for purpose of sales taxation.

Retroactively assessed for more than $1 million by the state of New York, he doesn't even have an office there.

In addition to taxation of tangible personal property, many states also impose the sales tax on gross receipts derived from providing certain services. In some states this tax has been imposed on data processing services, including time-sharing.

Use tax is a tax which complements the retail sales tax and is found only in those states having a sales tax. This tax is levied on tangible personal property "used, stored, or consumed" in the state, where the sales tax imposed by that state has not been paid.

Applying them to software & services

Twenty-three states have, through statutes, rules, or interpretations, applied one or more of these three taxes to software and data processing services. There is wide variety in the reasoning behind this imposition and in the method of valuation employed.

New York state has been auditing software and service companies based on rules adopted last Sept. 1, which essentially were reinterpretations of 1965 tax law. ADAPSO's Tom Farewell believes the auditing is being done alphabetically.

Campbell of Computer Task Group and chairman of an ADAPSO subcommittee on taxation for the state of New York, said his firm's retroactive assessment goes back to 1966. "If you have been filing state sales tax returns they can only go back three years," he explained. "If you haven't been filing, and we haven't, they can go back 10 years or to when the company was started."

Harincar of Informatics said his firm's retroactive assessment only goes back to 1972 although the company has not been filing sales tax returns. He was at a loss to explain why it didn't go back farther, but said, "We don't want to know."

Don Sundeen, president of Applications Software Inc., Los Angeles, was retroactively assessed for more than $1 million by the state of New York. It's an assessment he's going to ignore. "We don't even have an office there (in New York State) and they went back to '65 or '66 when we didn't even exist."

Alan Rievman, v.p. of finance for National CSS, Inc., Norwalk, Conn., and chairman of ADAPSO's national taxation committee, said the committee's mode as concerns New York is a "wait mode"—waiting to see what they really want to tax.

The state of New York was to have come out with an explanatory booklet by the end of April. ADAPSO had some ideas as to what to expect, prior to publication.

As to proprietary software, it was expected the state would say the sale or license of proprietary software delivered on cards, tape, disc, or other machine-readable media is subject to tax as a sale of tangible personal property. It was expected no distinction would be made between applications and systems programs. The interpretation, it was anticipated, would be applicable to all sales of packaged software made after Aug. 1, 1965 (the effective date of the New York State Sales and Use Tax Law).

Software on cards is tangible (and taxable) personal property.

The extent to which sellers of software packages in the state of New York would be held liable for uncollected taxes would depend, in part, on whether they had filed sales and use tax returns, as Campbell indicated.

ADAPSO anticipated the state would say the charge for keypunching is subject to tax if the keypunching bureau purchases the cards, tape, disc, or other media on which the customer's data is transcribed. This, the state is expected to argue, would mean delivery of the media would constitute a sale of tangible personal property.

If the cards, tape, disc, or other media is supplied by the customer, the state is expected to contend, the keypunch bureau is deemed to be performing a service under another New York tax law which imposes a tax upon the sale of a service which produces, fabricates, processes, prints or imprints tangible personal property for a person who directly or indirectly furnishes the tangible personal property, not purchased by him for resale, upon which the services are performed. (Whew!)

Sounds like a tongue twister but it doesn't leave much loophole room.

New Jersey, said Rievman, "is more confused than New York and about three months behind New York." At least one company with computers in New Jersey has been assessed for its failure to collect sales taxes on time-sharing charges and the assessment goes back to July 1973.

Quiet in Jersey

Farewell of ADAPSO said since that one assessment "things have been quiet in New Jersey and we hope they'll stay that way for a long time." He pins high hopes on the fact that most state officials are up for reelection this year and "they have the problem of a new state personal income tax hovering over their heads. We don't look for a problem for data processing until after the November elections."

But ADAPSO does have a tax subcommittee in the Garden State. Its chairman is George Raymond of Automatic Business Centers, Maple Shade, N.J. He said the state has issued a number of quasi-official publications on the subject of the taxability of software and services which have had "inconsistencies."

Sandy Goldberg, an attorney with the New York City law firm of Roberts & Holland, retained by ADAPSO's national taxation committee and by the subcommittees in New York and New Jersey, said he has requested a meeting with New Jersey's director of taxation, Sidney Glazer, "to get some clarification."

California, says Farewell, "is reentering the limelight." The Golden State has been imposing sales and use tax on software and some services since 1972, but recently has been reinterpreting some sections of its Rule 1502 covering "Automatic Data Processing Services and Equipment," and has been issuing retroactive assessments.

Carpenter of Intellidata said his firm's retroactive assessment is based on section F-2 of 1502 which says, in part, ". . . tax applies to the sale of custom programs transferred to the customer in the form of punched cards, or in tape, disc, drum, or similar form, or in the form of typed or printed sheets to be used as input media in an optical character recognition system."

He contends the work his company did more properly comes under section G-6 of the rule which exempts provision of "technical help, analysts, and programmers, usually on an hourly basis."

Harincar of Informatics believes

TAXATION BY STATES

Explanation of Codes

Property Tax	Personal Property Tax, meaning the state has a tax on its books which could conceivably apply to the computer industry.
Sales Tax	Sales Tax, meaning the state has one on its books which conceivably could apply to the computer industry.
Use Tax	Use Tax which could be applied to the computer industry.
Applied	"Applied To Computer Industry," meaning the state, either within the statutes themselves or through rulings and/or interpretations, has specifically defined applicability of the taxes within the computer industry.
Decisions	Decisions rendered, meaning court and/or public agency decisions have been rendered in the state affecting taxability of computer industry products.
Pro	Favorable decisions for the industry.
Con	Unfavorable decisions.
Active	There is current activity within the state to either reinterpret old laws or to develop new ones.

State	Property Tax		Sales Tax		Use Tax		Decisions		Active
	On Books	Applied	On Books	Applied	On Books	Applied	Pro	Con	
Alabama	X		X		X		X		
Alaska									
Arizona	X		X		X				
Arkansas	X		X		X				
California	X	X	X	X	X	X			X
Colorado	X		X		X				
Connecticut	X		X	X	X	X			
Delaware*									
Dist. of Col.	X		X		X		X		
Florida	X		X	X	X		X		
Georgia	X		X		X				
Hawaii			X		X				
Idaho	X		X	X	X	X			
Illinois**	X		X		X				
Indiana	X		X	X	X	X			
Iowa	X		X		X				
Kansas	X		X		X				
Kentucky	X		X		X				
Louisiana	X		X	X	X				
Maine	X		X		X				
Maryland	X		X		X		X		
Massachusetts	X	X	X	X				X	
Michigan	X		X	X	X				
Minnesota	X		X	X			X		
Mississippi	X		X		X				
Missouri	X		X	X	X	X			
Montana	X								
Nebraska	X		X		X				
Nevada	X		X		X				
New Hampshire									
New Jersey	X		X		X				X
New Mexico***	X		X	X	X	X		X	
New York			X	X	X	X			X
N. Carolina	X		X	X	X	X			
N. Dakota	X		X	X	X	X			
Ohio	X		X	X	X	X	X	X	
Oklahoma	X		X	X	X	X			
Oregon	X								
Pennsylvania			X	X	X	X			
Rhode Island	X		X		X				
S. Carolina	X		X	X	X	X			
S. Dakota	X		X	X	X	X			X
Tennessee	X		X		X		X		
Texas	X		X	X	X	X			
Utah	X		X		X				
Vermont	X	X	X		X				
Virginia	X		X		X				
Washington	X		X	X	X				
W. Virginia	X		X	X	X	X			
Wisconsin	X		X	X	X	X		X	
Wyoming	X		X						

*Delaware, although it has no sales tax, does have a lease tax to be collected by the lessor from the lessee and could, subject to interpretation, be applied to software.

**In addition to property, sales and use taxes, Illinois has a Special Service Occupation Act to tax persons engaged in the business of making sales of services on "the cost price of all tangible property transferred . . . as an incident to a sale of service," which could, conceivably, be applied to software leases. The state also has a Messages Tax Act taxing receipts derived from "transmitting messages" within the state which could be applicable to time-sharing operations.

***New Mexico does not actually have a named sales tax but its Gross Receipts Tax amounts to the same thing.

Source: Adapso (data current to approximately mid-April 1977)

"we can live with the California regulations as long as they are applied uniformly. The current problem is they're not." He cited a recent decision in some California cases to tax remote data services if they incorporate licensed proprietary software.

Passing the tax to the user

Sundeen of Applications Software, while ignoring his New York assessment, is happily collecting sales tax in California. "We're selling a product." He feels some people who worry about the California taxes are "suffering from paranoia . . . looking at (their tax situation) through rose-colored glasses."

Even as the states differ in interpretations, companies differ in reaction and planned courses of action. Campbell's Computer Task Group, faced with its huge assessment, is going to fight it all the way up the court ladder. This would take the firm from a tax court hearing through the state court of appeals and the state Supreme Court.

Informatics has received a "determination letter" from the New York tax people which it plans to challenge on grounds that the state put out an "information letter" which specifically stated that programming services are exempt from sales tax, yet such services were deemed taxable in its determination letter.

Bob Brown, controller of Xerox Computer Services, said his company was worried about the situation in New York but, after studying the tax code, is "hanging our hat" on the fact that the information XCS provides is "useful only to our clients." XCS has not been audited in New York but, if Farewell is right and the state is auditing alphabetically, this could be explained. The company was audited by California in mid-1975 with no problem.

A use tax on royalties for software has become a problem for some California firms. Bruce Coleman, president of Boole & Babbage, Sunnyvale, Calif., software and performance measurement company, said his company has been audited for use tax due on royalties but little has happened beyond that. He's waiting for further word from the State Board of Equalization.

Ryan Schmellz, Remote Computing Corp., Palo Alto, Calif., faces a similar problem but more has happened. RCC has a number of agreements with owners/developers of software it offers via its time-sharing services. "We pay the owner a royalty as a function of our revenue. The state has decided that's a taxable activity. It's a use tax situation and the state has determined we're the ultimate user."

RCC has started passing on royalty taxes to some of its users. But, Schmellz pointed out, "Sometimes we enter into a minimum guarantee arrangement with the software owner. Then, if nobody uses the software we have no one to pass it (the tax) on to."

RCC has received a letter of determination from the State Board of Equalization on use tax owed on royalties and on sales tax owed on data preparation. Schmellz feels there is a legal basis for the sales tax on data preparation but not for the use tax on royalties. The company has prepared a petition for redetermination and has had one hearing with an Administrative Hearing Officer who is empowered to consider only factual arguments, not legal issues. The next step, Schmellz said, is a hearing before the Board of Equalization itself; then the matter could go up through the courts. It could take a long time.

. . . double taxation in some instances as in New York and New Jersey.

Carpenter of Intellidata said his firm has billed its customers for retroactive taxes it has been assessed but he doesn't expect anything to come of this. "We're not going to take anybody to court." Intellidata has had an informal hearing with a Board of Equalization representative and has received a letter of determination. The firm's attorney filed a petition for redetermination and Intellidata now is waiting for the next visit of a B of E official to nearby San Jose, Calif. A hearing in Sacramento could have been scheduled earlier "but all we could lose this way is a little bit of interest." If the next hearing doesn't satisfy Intellidata, Carpenter said the firm would pay the tax and sue for a refund in the state Supreme Court.

In the meantime, Intellidata is refusing to do keypunching as part of its services as that was the tie on which the state based its assessment. "The state said all of our programming services were taxable because we did keypunching for some customers and therefore were delivering programs in a tangible fashion."

ADAPSO, apparently, is the only trade organization fighting the software and services tax issue. In New York State, Campbell said his subcommittee has solicited and gained support from the Empire State Chamber of Commerce which "is taking the case of the consumer, our customers, to the state tax people."

A cause for concern on the part of ADAPSO tax attorney, Goldberg, is the possibility of double taxation in some instances, particularly as concerns New York and New Jersey. Where services are involved, New York is concerned as to where terminals are located. New Jersey, on the other hand, wants to tax all services based on computers located there.

Informatics' Harincar and Sherin of Nova Computing are concerned that states are more concerned with form than with substance. "It's not the nature of the product, but how it's delivered," said Sherin.

Then there is the problem of the time people have to spend fighting the tax battle.

Glen Jacobsen of Professional Data Processing, Madison, Wisc., who has been waging something of a lonely battle against the offensive clause in the Wisconsin budget bill, said the problem in his state is that "no one has the time to devote to this on a full time basis."

Harincar said he has been spending 60% of his time on the tax issue since January.

And in Florida, Sherin is planning to sue the state in Superior Court for $50,000 damages because of loss of business due to the year of time he spent preparing his case.

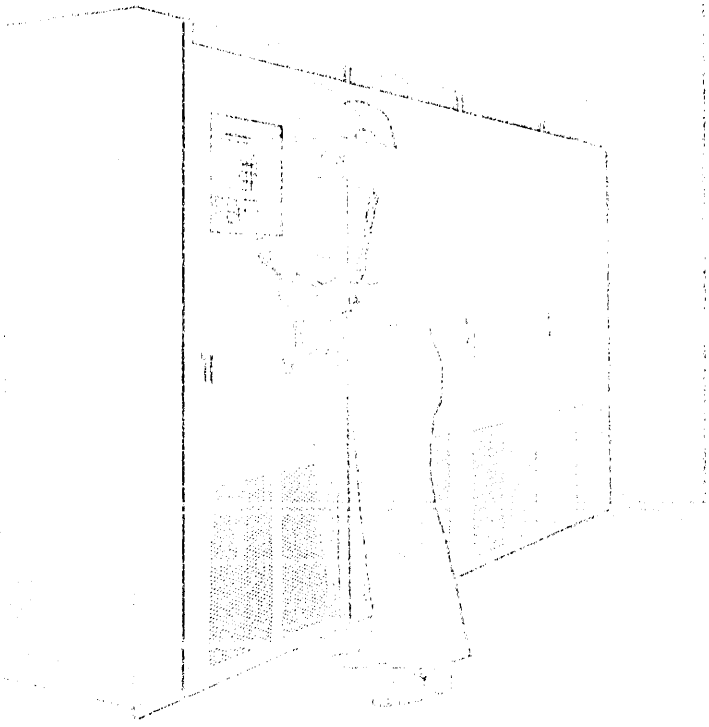
Conflicting decisions

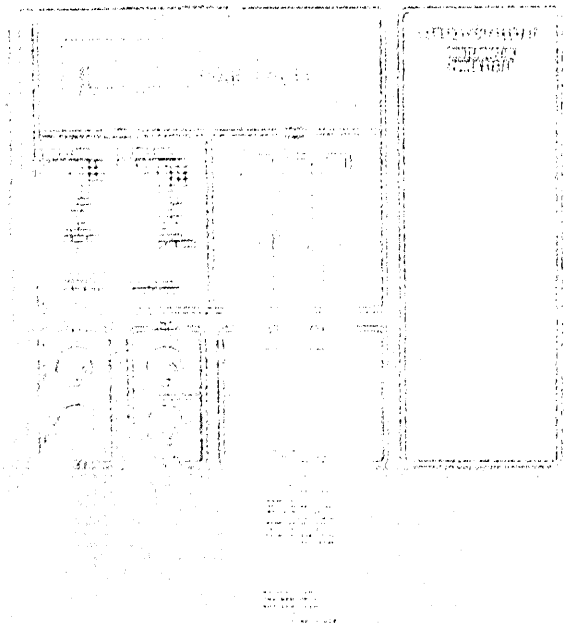
Court decisions in Florida, Tennessee, and Alabama have held that software is intangible and therefore not subject to sales tax. But in Tennessee, even though that state's Supreme Court had made such a ruling, the legislature passed a bill taxing the very software the court had decreed exempt. The bill was awaiting the signature of Gov. Ray Blanton when members of the industry got wind of it and began calling the governor's legislative aide, Nelson Biddle. Biddle told one he was unaware of the Supreme Court decision. As a result of the calls, the bill was returned to the House which deleted the offensive section. The Senate was directed to concur.

The legislature passed a bill taxing the very software the court had ruled exempt.

A court in Texas has ruled keypunching services exempt from sales tax while a court in Wisconsin has ruled such services are taxable. Conflicting decisions on the taxability of other data processing services have been handed down in different courts in Ohio.

Courts in the District of Columbia and Maryland have ruled that software is intangible and not subject to personal property tax, but both jurisdictions have different outlooks when it comes to sales tax.





DP AND TAXES

Hardware too has been the subject of litigation in the area of state sales, use, and property taxes. An Illinois court decided that even when a lease for hardware in Illinois is executed outside the state, the transaction is subject to Illinois use taxes. Hardware rented by a manufacturer to the federal government and used in California was held subject to California use taxes by a California court, because the manufacturer retained title. In another action in Vermont, a court held that when a manufacturer uses its own equipment for its own work, the use tax will be based on the retail price of the equipment, not the manufacturing cost.

A Massachusetts court exempted hardware owned by a time-sharing corporation from personal property tax because it is "machinery used by a manufacturing corporation." A similar decision was handed down by a court in Minnesota.

A New Mexico Bureau of Revenue ruling held that a corporation with headquarters in Michigan was subject to use tax on computers it was operating in a New Mexico branch office to instruct customers.

Waiting won't lead to winning

But the software and services area remains the stickiest. Farewell of ADAPSO calls it "an item of utmost priority." In addition to vagueness and

The software tax issue can be won.

wide variance in existing rulings, he notes, "if you get five different state auditors from the same state, you get five different interpretations."

Sherin of Nova Computing champions fighting the tax battle using the Administrative Procedures Act (APA) which permits a party to represent himself or to be represented by other competent parties or attorneys. His victory in Florida was under this act and, he said, "involved extensive pleadings, motions, discovery, argument, a trial transcript of 150 pages, and more than one thousand hours of my time."

Sherin believes the software tax issue can be won in all states as it was in Florida. To that end, he has offered his time, free of charge, to represent any party under the APA in any state.

"If we sit back and wait to be taxed, rather than by asserting our right to due process under the Administrative Procedures Act, and have a trial-like hearing on our factual situation, we are going to have a massive epic on our hands, not a small brush fire." ❋

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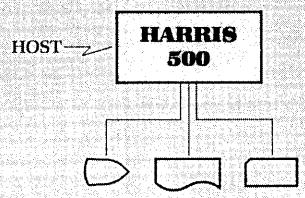
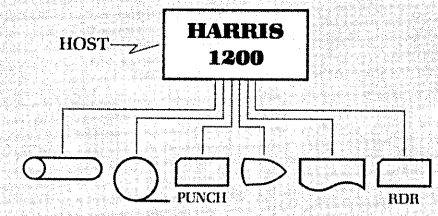
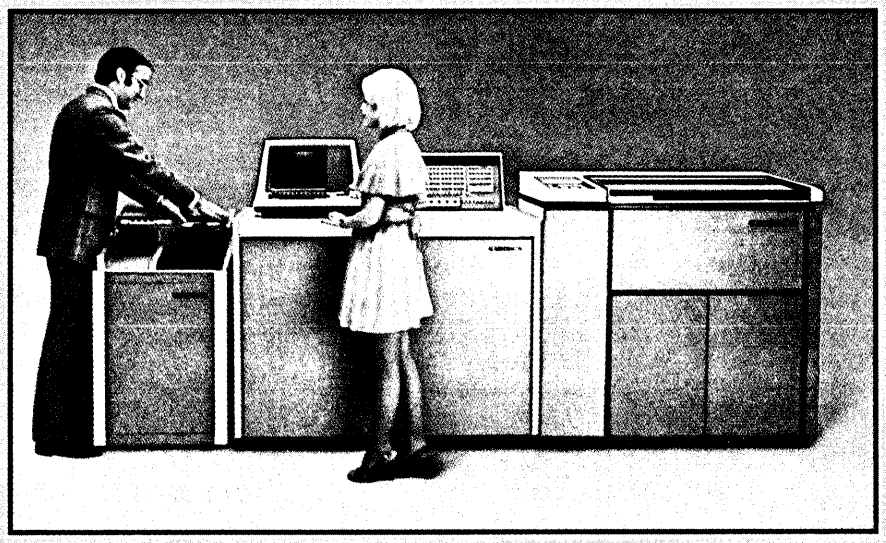


Expanded Harris 1200 Remote Batch Terminal supporting multiple peripherals into mainframes such as IBM, CDC, UNIVAC and Honeywell.





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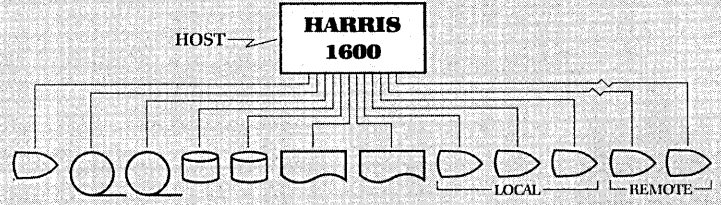

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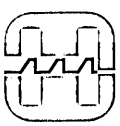

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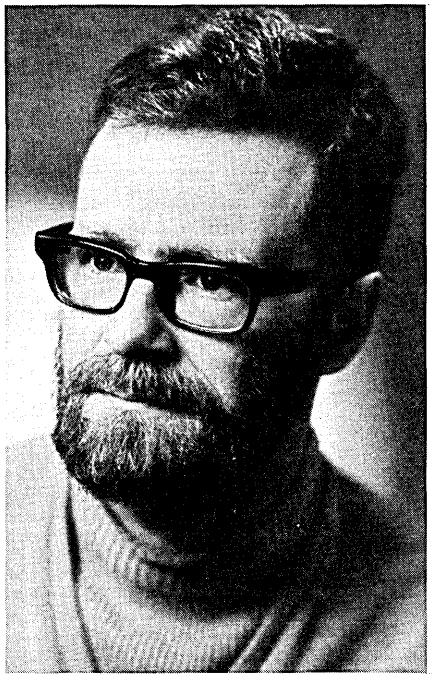
An Interview With Professor Dr. Edsger W. Dijkstra



by Michael W. Cashman, Technology Editor

A student of theoretical physics and teacher of mathematics at the Technological Univ. in Eindhoven, The Netherlands, Dr. Dijkstra is perhaps best known for his March 1968, "letter" to the *Communications of the ACM* explaining why the GO TO statement led to bad programming practices. His letter stimulated a discussion which has led to many of our current thoughts about good programming practice. He was the first to use the term "structured programming"—a phrase he has since abandoned because it has become so ambiguous.

Dr. Dijkstra is still actively concerned with improving programming practices and makes some dire predictions for those who do not mend their ways. A recipient of the 1972 ACM A.M. Turing Award and the 1974 AFIPS Harry Goode Memorial Award, he was interviewed at his home in Nuenen, The Netherlands.

Datamation: What is your opinion of what has happened since your letter warning about GO TO statements, and the rise of structured programming in general?

My letter was grossly misunderstood. If you read that letter carefully you can see that it's written under the assumption that everyone *knew* something was wrong with the GO TO statement. The only thing I did was to explain why. But apart from the uproar over my "letter"—which was submitted as an article—the transition from programming as a craft to programming as a scientific discipline was very clearly in the air at that time.

Do you think that we now have all the tools required to program effectively? Or are some additional breakthroughs needed?

It depends on what you mean by "needed." Personally I am convinced that the design of all *good* programs—that means demonstrably correct programs—will remain a very great challenge. I don't believe that programming, except for trivialities, will become easy. It might become possible!

In the mid-'50s I had been programming about four years or so and considered myself an experienced programmer. I tried to solve a rather simple problem: given in store an unordered permutation of the numbers from 1 through N, write a program that will put them into numeric order. I tried for two hours to do that problem in the '50s and I had to give up. A few years ago, while lecturing an introductory course for office programmers, I needed a simple example. Suddenly I remembered that old problem I got stuck on 16 years before. This time I solved it in about 20 minutes without pencil and paper. What is more, I didn't need more than 20 minutes to demonstrate the solution to a relatively inexperienced group of programmers.

One tends to remember one's failures, and I know how I got stuck in the '50s. I was a machine code programmer because there was nothing else but machine code. We created programs as long lists of instructions, some of which were jump instructions. We didn't have this syntactical grasp of what a repetition clause does for you. I wasn't even quite sure what a loop was. Of course I knew that, on account of jumping back, instructions could be executed many, many times, but the *idea* of a loop—what is its invariance dimension, for example? That whole grasp wasn't there.

Besides that, I was coding for a machine without index registers, which meant that one had to modify program instructions in store, which was routinely done. But if you are trained that way, there is no clear separation in one's mind between the program and the variables it operates on.

Here you have a very striking example of the amount of programming progress that has taken place over the last 20 years. And it is due to a combination of systemizing and simplification.

What is your opinion of the various languages we are using to perform our programming functions?

Well, I've made the public statement that if FORTRAN was regarded as an infantile disorder that PL/1 should probably be classified as a fatal disease. Real progress [in programming] will not be possible unless we have at our disposal languages whose syntax and semantics are sharply defined in a non-operational manner. The whole notion of program correctness only makes sense provided you have a postulated definition of what your programming language achieves for you *without* the details of how it does it.

That's true for the hardware design-

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ers, too. In 1953 I wrote a functional specification for a machine, and the second sentence of that document states explicitly that this document describes the machine completely as far as it is relevant for the user, and does not describe how it works. Only if you have this impenetrable interface are you in a position to decide whether a programmer has done his job, and whether the hardware engineers have done their job.

Apart from structured programming, what are your current interests?

That term has been used so much that I don't use it anymore. What is beginning to intrigue me very much is that I have discovered an omission, a gap, in all our scientific curricula. We don't teach students how to invent adequate notation. The mathematician is trained; he's used to a series of highly efficient, not misleading, well-established notational techniques. And as long as he's covering that subject matter, he's fine. But suddenly you ask the same man to consider completely different subject matter—strings or graphs or points in space, or combinations of these—you have to invent your own notation. And if you make the wrong choice, your formula gets twice as long. That means if you make the wrong choice five times, your formula gets thirty times as long and you just can't do it anymore.

It's very illuminating to think about the fact that some—at most four hundred years ago—professors at European universities would tell the brilliant students that if they were very diligent, it was not impossible to learn how to do long division."

Long division?

You see, the poor guys had to do it in Roman numerals. Now here you see in a nutshell what a difference there is in a good and a bad notation. A hard university subject can be brought to such manageable proportions that it can be taught in primary schools. You have exactly the same thing with Greek mathematics, which also used letters to denote digits, and therefore didn't have the notation necessary for the introduction of variables. Add the fact that they gave all their proofs not in a formalization, but in natural language, and you see that some of their proofs doubled, or tripled, and how certain parts of mathematics were a closed book to them.

All because the tools were wrong.

Yes.

And tools make the difference.

They make a tremendous difference. Because tools have such a profound influence on the thinking habits of the people who are trying to use them.

What is your opinion of the trend toward distributed processing?

I'm not surprised at all. A year ago I was at an IBM sponsored conference in Canada at which academic computer scientists and so-called "people from the real world" were brought together. It was obvious to me that the MBA's, the managers with Masters degrees in Business Administration, had painted themselves into a corner. I expect a number of companies—not so much the technical ones, but probably a number of purely financial ones such as insurance companies, to just collapse, crushed under the sheer weight of the unmasked complexity of their data processing systems.

There was one man there who described the troubles he was having with his centralized system, and then it transpired that the operation of his company was dependent on five million lines of COBOL programs. And that's going to collapse. In addition, the operational procedures for executing these programs get more and more complicated. My colleague C. A. R. Hoare from Delft Univ. made a very true statement:

"The unavoidable price we have to pay for reliability is simplicity. Regretfully, many computer manufacturers think this price too high to pay."

One of the things I have discovered —and it seems to be a fairly standard rule—is that if I write not just a program, but an essay, either formal or not, explaining why it is a correct program, invariably the essay is about 10 times as long as the raw code in which it culminates. Of course, the man who is responsible for a million lines of source code is absolutely frightened at the thought of maintaining 10 million lines of documentation.

However, I have a strong suspicion that the reason he has a million lines of source code is that he suspects that's about the maximum he thinks he can manage. And if he had to write and maintain the documentation for them, the final programs might well be (one tenth their current size). If it is a very large job, he would perhaps still have a million lines, only 100,000 of them program.

I realize that there's a standard [comment] made, that this is all very nice for lovely little programs, but can you do this on "real world" programs of 10,000, 100,000, or a million lines of code? I never received a convincing proof that programs have to be so long.

It is, I'm sorry to say, the age of difference in attitudes on the two sides of the Atlantic. I attended a conference in '62 attended by ordinary programmers, and those who had written compilers—and were regarded as demigods. It was striking to hear the Americans bragging to each other, one saying he had written compilers of 50,000 instructions. The next one answered up and boasted of 80,000 instruction compilers, and a third one, outdoing him by claiming 120,000 instruction compilers. Among us poor Europeans, it was the other way around, you see. One of my friends boasted that he had written an ALGOL 60 compiler in about 5,000 instructions, and I, outbidding him, claimed 2,600!

This has something to do with management tradition. As late as in September of 1975, R. W. Hamming of Bell labs gave a talk about programming at Newcastle, England, and used the number of lines of code produced as a measure of programming productivity. From the audience it was pointed out to him that you could, of course, count lines of code, but instead of talking about the number of lines of code produced, perhaps we had better talk about the number of lines of code *used!*

We've heard some interesting arguments in Europe that before an organization can successfully decentralize its data processing activities, it must have first centralized them completely. What is your opinion of that reasoning?

Sounds like a reasonable argument. The main problem will be one of education, for it's very nice to have little groups with manageable machines, but unless the people responsible for them have gone through a number of sobering experiences, they will again make a mess of it, and replay history on a smaller scale. What seems to be happening with microprogramming is the average people thinking about microprogrammed machines are remaking the programming mistakes of 20 years ago.

Finally, Dr. Dijkstra, What do you see as the ultimate potential of computers?

Automatic computers, by nature of their tremendous power, are fascinating pieces of equipment, not so much as tools as in their capacity of presenting a new intellectual challenge without precedent. And this new challenge can teach us so much more about what we can think. And how we ought to do so. ❋

Data for Rent

by Laton McCartney, Associate Editor

Their births in the mid-'60s went almost unnoticed, but shared data bases began to take off when technology—including mature data base management systems and packet switching—was ready for them.

"Back in the middle '60s I don't think anyone really anticipated the development of the on-line searching industry," says Dr. Lee G. Burchinal, director of the Div. of Science Information, National Science Foundation. "But now the field is very vigorous. It's come of age."

From its tenuous beginnings in the '60s when the National Science Foundation funded the automation of files and chemical abstracts for organizations like the American Institute of Physics, on-line searching, or information banks services, have burgeoned. Today hundreds of these services are available through a variety of suppliers, and growth of the industry seems still to be gaining impetus.

According to a recent report by Auerbach Publishers, Inc., information banks can be put into three categories:

- statistical information banks which are basically collections of numeric information updated at periodic intervals.
- bibliographic information banks that comprise text-based information including excerpted articles, books, and the like.
- computational information banks that provide computational facility and access to specialized raw data, thereby affording more readily usable search results.

The growth of all three segments as well as the industry in general is largely attributable to a number of key technological developments, the Auerbach report argues. Among them is the development of a large number of data base management systems.

Other factors cited in the growth of information bank services include the recent massive declassification of government technical documents, the increased use of computers in libraries, and the installation of data banks by nationwide time-sharing services.

Add, also, the increased availability of low cost computer terminals and communications facilities, principally the packet switched services being offered by Telenet and Tymshare. Telenet alone has some 65 or so information banks available through its network, and access charges are no longer prohibitively high, as they might have been several years ago.

For example, Bibloiographic Retrieval Services, Inc., which recently tied its Schenectady, New York, computer center onto the Telenet system, offers access to a variety of data bases including MEDLARS, a medical base compiled by the National Library of Medicine, as well as several engineering, agricultural, and business data bases, for as little as $9 per access coupled with communications charges that range from $3 to $6 an hour and data base royalties of $6 to $30 per use.

The "other" N.Y. Times project

Additionally, many of the information bank suppliers have apparently overcome the system and data base design and implementation problems that plagued them early in the game. A classic example of this is *The New York Times* Information Bank, which in the early stages of its development in the '60s turned to a now defunct company called Foto-Mem, Inc. to develop its retrieval system, which was then basically automating the newspaper's morgue. The Foto-Mem technology—an exotic optical storage system—turned out to be more science fiction than fact. Consequently, the *Times* turned to IBM, specifically the Federal Systems Div., for help.

Unfortunately for the *Times*, the IBM designed system didn't prove to be the answer either. "They touted us on top down structured programming," says Gordon H. Runner, a v.p. with The Information Bank. "But what they delivered was not what they promised."

When the FSD system proved unsatisfactory, the *Times* got rid of its IBM 370/148 and brought in a 360/67 and a DEC PDP-11/70. Further, Runner and his staff designed a system that was less ambitious than its predecessor but feasible and less costly. For example, the data capturing function was done on a standalone, off-line basis and separated from data retrieval, whereas with the FSD approach, data capturing had been run alongside information retrieval as an on-line subsystem.

"With the new approach we're not looking to bite off the state of the art," Runner explains. "We're trying to deliver a product."

The results? Runner claims the new system is performing as well as, and in many cases better than, projected. And though still not profitable, The Information Bank now has about 300 customers tied into its Parsippany, N.J., computer center.

Customers run the gauntlet from state and local governments to public libraries and big corporations like Mobil Oil and even, Runner hints, the C.I.A. And if the experience of J. Walter Thompson, the huge advertising agency is any indication, subscribers are generally well satisfied.

Thompson recently tied its New York City "war room" into the *Times* system and now uses it (coupled with the Predicasts Terminal System to which its Chicago information center subscribes) to help clients map out domestic and international marketing strategies. "It's proving a very valuable tool," notes Thompson's controller John J. Cox. "It covers many areas of general information that are pertinent to what we do, and using it in conjunction with the Predicasts data base, which is specifically business oriented, makes a good combination."

DATA FOR RENT

Where the time-sharers went

Aside from the *Times*, most of the other suppliers emerging as major forces in the industry are time-sharing and service companies. They include Boeing Computer Services, Systems Development Corp., General Electric, the Cyphernetics Div. of Automatic Data Processing, Lockheed, and National CSS

These suppliers often offer a variety of related data banks, most of which are geared for specialized markets. For example, National CSS sells three separate financial data bases: a record of the long term performance of hundreds of stocks, a base of stock and bond prices updated daily, and one used for broad-range economic modeling. Typically, says Michael J. Toomey, National CSS's manager of data management services, a user might access the stock performance base to obtain, say, a list of all the stocks on the New York Stock Exchange that have maintained price/earnings ratios of under seven thus far this year.

The economic data base user, on the other hand, may be interested in projecting how well his company is going to do vis-a-vis its competitors in penetrating a new market.

"However, in either case," explains Toomey," the customer is using our interactive processing and data base management capabilities. That means if he's doing economic modeling,he doesn't have to write out a program of his own because he can use ours."

Concurrent with the maturation of time-sharing suppliers has been the development of information bank service centers. Here, instead of having to tie into a supplier's data bank with his own terminal, the user can simply request specific data on a one shot basis. The centers, in turn, often utilize a number of suppliers and dozens of data bases.

New York's World Trade Information Center, as an example, taps a long list of data bases including Interfile, a pool of international business information it developed itself in conjunction with other trade centers around the world and stored on the G.E. time-sharing network.

"The system's capable of answering questions on virtually every phase of international business," explains the center's manager Gerald Lieberman. "Users may be concerned with where they can find a specific product, or they're looking for exporters or importers, or compiling trade statistics or tariff information.

A sample of the type of data bases accessible through the World Trade Center includes: INSPEC-ELEC/COMP an electrical engineering, computer science, and control engineering data base; CLAIMS/CHEM, a file of U.S. chemical and chemically related patents; and MIS, a marine data base that covers just about every facet of the shipping industry.

Some 6,000 customers used the World Trade Information Center information bank resources last year, Lieberman says, and the customer rate is climbing steadily this year.

The projections for growth look good all over the (sub)industry. Another who speaks optimistically on the subject is Dr. Carlos A. Cuadra, general manager of System Development Corp.'s Search Service Div. He says that the bibliographic part of the business alone grows by a factor of 10 every four years. He figures that between 1969 and 1973, the number of terminals used in the U.S. for bibliographic purposes grew from 50 to 500, and from 1973 to the present, from 500 to 5,000. He sees an expansion to 50,000 terminals internationally by 1981.

Still some drawbacks

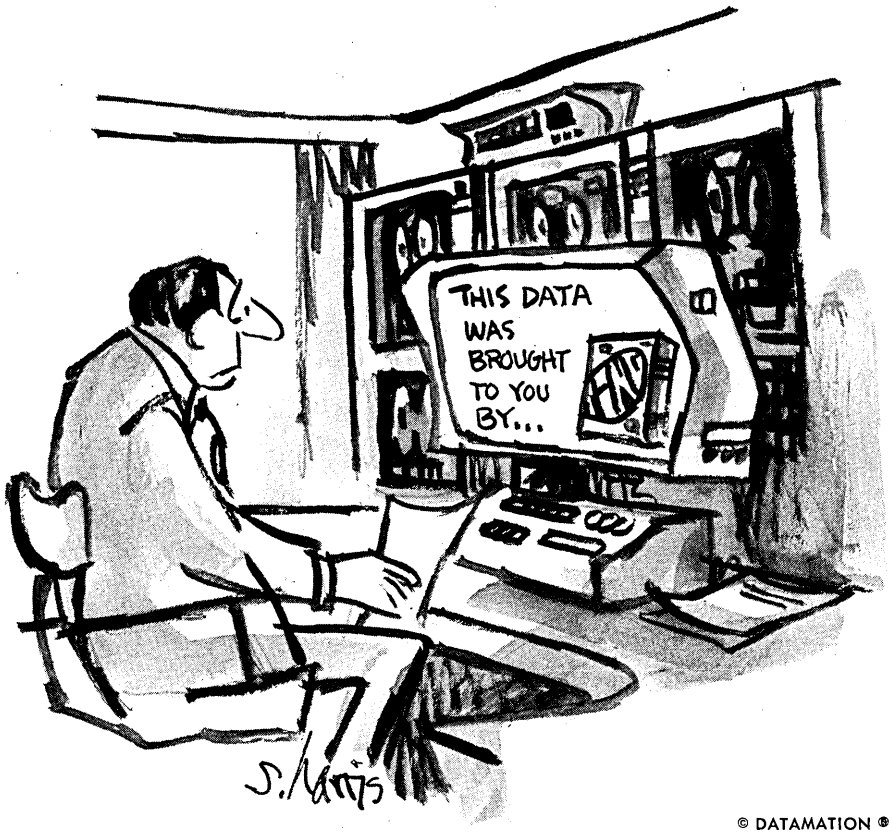
Yet as information banks gain wider acceptance, particularly as permanent adjuncts to the in-house information system, users shouldn't lose sight of the potential problems. As subscribers in the past have discovered, data bases are often incomplete. "This," the Auerbach report notes, "may necessitate additional data collection by you or your organization to make it pertinent for your use."

Moreover, despite lower communications and terminal charges, these services can still prove expensive and must be frequently used to justify their existence and ultimately pay for themselves. Further, many services are only compatible with certain kinds of terminals. The *Times* Information Bank, for example, uses the Harris 2000. To utilize several different services concurrently, then, as a number of users do, the subscriber needs to install and maintain separate sets of terminals, and sometimes modems—a costly restriction.

Finally, many so-called "computational information banks" offer similar, or sometimes the same, data bases. What distinguishes one from another is their data base management, a fact the user should keep in mind when evaluating these services. They are, in effect, only as good as their DBMS.

In many ways this "on-line search" industry looks a good deal like the whole computer business looked some 20 years ago. It's experiencing the same kind of very rapid growth, is stumbling over the same lack of standardization, and also has a similarly large number of vendors trying to establish themselves. We can expect that, also like the computer business, it will begin to see its price wars and shakeout among vendors.

It has another similarity too: it gives that same vague feeling that we are just beginning to appreciate how far it's going to go and how much it's going to affect us all. ❋



Hewlett-Packard

Computer Advances

Vol. 2 No. 1 May 1977

HP 2640

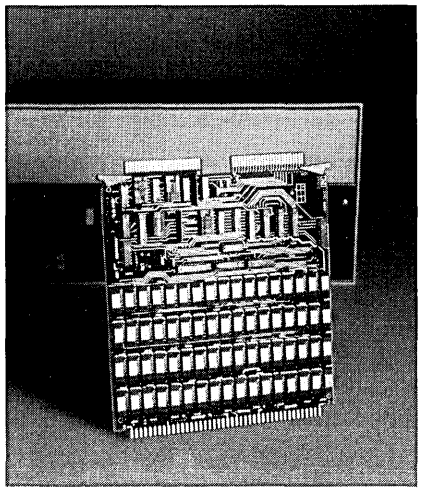
CMOS/SOS

(Advertisement)

You can't have a fast system without fast memories

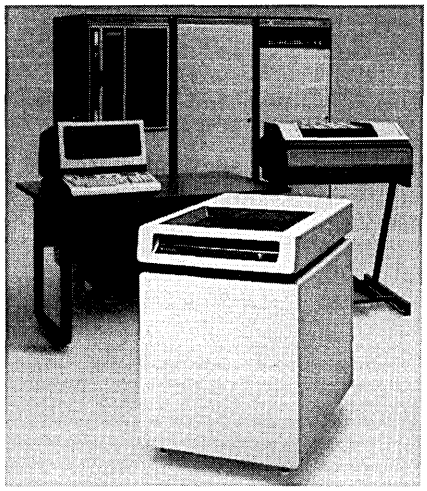
As data bases grow even larger, data processing systems are becoming more and more memory centered. System performance is becoming as much a function of memory speed as of processor speed.

Recognizing this fact, HP frequently offers improved memories to its end user and OEM customers. The new HP 21MX E-Series high-speed memory and the new HP 7920 disc are two such recent examples. Both of these products increase the performance of HP computer systems.



30% increase...

The addition of high-speed memory to the 21MX E-Series computer results in up to 30% overall system performance increase.



30% increase...

The addition of the high-speed HP 7920 disc to a 256k byte 3000 Series II results in a 20% improvement in system response time in interactive sessions and a 30% improvement in throughput.

Cache speed memories at semiconductor prices

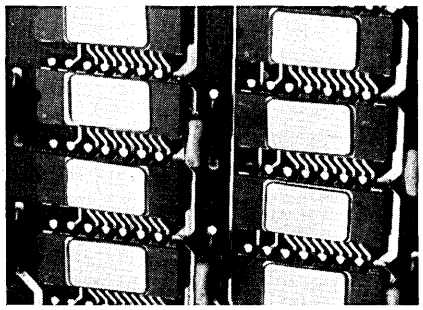
In the time it takes light to travel 100 meters, an HP 21MX E-Series with high-speed memory can retrieve information and be ready for another access. That's performance!

New 4K RAMs cycle fast

A major contribution to this speed is the use of new memory technology. The 16k word high-speed memory uses N-Channel MOS/RAM memory chips from a leader in semiconductor memory design and manufacture. The compact parts incorporate the latest process and design techniques to create chips that cycle in 320ns.

The second contribution to speed is the result of changing the structure of the controller and using new-technology parts. This combination almost eliminates overhead imposed by the controller. It performs its function in only 30ns. Cycle time of the system then is 350ns—almost that of the chips themselves.

◀ *Cover*
In a typical quarter of a second, the HP 7920 disc can complete three 256 track seeks and transfer a total of 129k bytes of data. The low profile heads fly 35 millionths of an inch above each closely spaced disc surface. This design results in a slim and compact disc that is easy to carry and store—a feature not to overlook as your data base grows and grows.



The latest technology semiconductor MOS/RAM memory chips have been densely packed on this new 16K words board, which measures only 22cm by 20cm. (Shown actual size.)

Reliability results from experience

The maintenance prices for HP's semiconductor memory reflect the reliability of the technology. $10* a month service charge per board is among the lowest in the industry.

Since the May 1974 announcement of 4k RAMs semiconductor, HP has shipped approximately two million memory chips in its 21MX Series and 3000

Continued on page 8

HP 7920-the disc that doesn't keep your CPU waiting

The new 50 megabyte (formatted) HP 7920 disc has some of the fastest access times in the minicomputer industry. (Seek times: Track to track— 5 ms, average 25 ms, and worst case—45 ms.)

In three minutes... An HP Service Engineer, with two screwdrivers can separate the disc into its basic service units.

Start-up, stop, and access are fast

We designed a light carriage/rail system for lower mass, and a linear voice coil motor with high force inputs. Low mass and high force allow higher accelerations, and therefore greater speed.

Speed in stopping and accurately positioning the head is equally important. High-speed feedback circuitry, which derives a signal directly from the surface of the disc, allow optimization of over-shoot and settling times.

By concentrating on these factors that affect seek time, plus choosing a healthy rotational speed of 3600 RPM, we gained impressive access times.

Reliability is designed in

Stored magnetic data is priceless. HP's discs are designed with that keenly in mind. The disc controller detects and corrects errors to a degree that is rare for discs in the 7920's price range.

The Error Correction Code hardware and algorithm are together capable of correcting one single-burst data error per sector, if the error is of length ≤ 32 bits. Every single-burst data error of length > 32 bits but ≤ 48 bits will be detected without being miscorrected. For burst-errors of > 48 bits, 99.999% are detected.

All disc drives are susceptible to environmentally caused errors. Airborne contaminants, for example, can cause head crashes and data loss. To prevent this, the standard dual filtration system of the HP 7920 contributes to reliability by removing 99% of particles 0.3 microns or larger.

Another environmental factor that can affect a disc's error rate is the condition of the power line. In the HP 7920, a brushless DC spindle motor isolates the rotation of the disc from incoming power line changes. This is especially important where power line regulations are relaxed or where the power source is uncertain, such as on board a ship or train.

In the event of a blackout or circuit break, an emergency head retract prevents head crashes. The disc heads are removed from the polished disc surfaces and placed in a rest position before the disc has lost appreciable speed.

Write data at 10° C, read at 40° C (or vice versa)

The HP 7920 tolerates a wide environmental range of operation. Error performance/interchangeability of HP 7920 disc packs is guaranteed over its entire temperature range. This applies not only on one drive, but also one to the other.

10,000 discs later...

HP has now manufactured over 10,000 drives of its own design. The new HP 7920 is the second in the family of controller compatible discs.

The HP 7920 costs $17,500* with a controller; add-on drives can be purchased for as little as $13,000* (Quantity discounts available.) **For further information on the new HP 7920 disc, check B on the reply card.**

*U.S. domestic price only

(Advertisement)

Ten years of innovations from HP

A major supplier of business computers recalls its first decade in industry, science, and education

One can only speculate on the future of computers. In less than three decades, they have had a profound impact on business, research, education, and manufacturing. Hewlett-Packard has contributed significantly to computer technology for over one-third of that time. As a glimpse at the following pages reveals, it is often easier to look ahead by simply reflecting on the past...

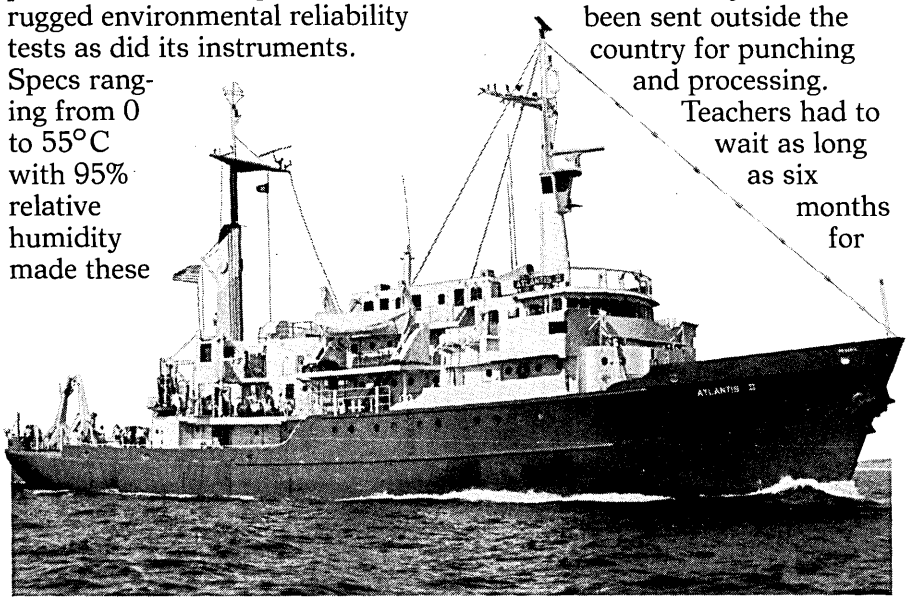
66

Several crew members on a fleet of research vessels off the Cape Cod coast have logged more sea time in the last decade than most oceanographers. They are HP 2116A minicomputers, still doing underwater research for Woods Hole Oceanographic Institute of Woods Hole, Mass.

HP insisted that its first computers, HP 2116As, pass the same rugged environmental reliability tests as did its instruments. Specs ranging from 0 to 55°C with 95% relative humidity made these **instrument-rated computers** "go anywhere, do anything" tools.

Woods Hole's HP 2116As have collected and analyzed data from unpredictable marine environments from the Labrador Current to the Black Sea.

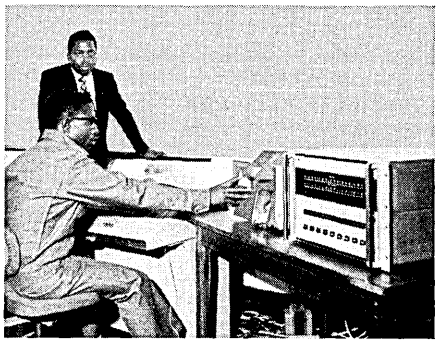
In one case, HP 2116As have acquired and processed seismic, magnetic, and gravity data used to study the earth's crust for evidence of continental drift and sea floor spreading.



68

The popular HP 2007 system introduced the minicomputer industry to the concept of **batch BASIC via mark sense cards** and an optical mark reader. In Malawi, Africa, at the Regional Test Centre, this system freed teachers' valuable time from exam processing.

Previously, data had been sent outside the country for punching and processing. Teachers had to wait as long as six months for



results which they now receive in less than a day.

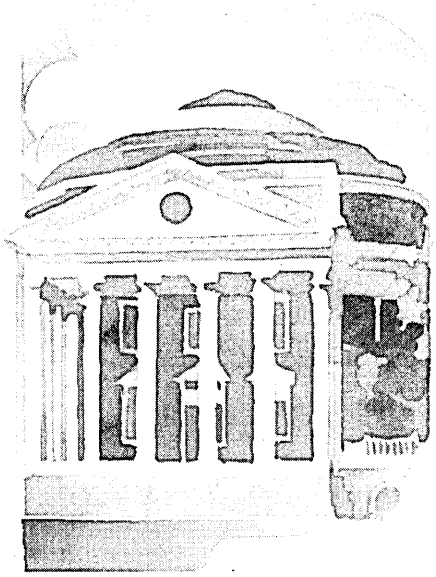
From the Regional Test Centre, the HP 2007 also traveled over 1,400 miles in a four-wheel-drive vehicle, a trip that included treacherous dirt roads and a harrowing ferry ride. Surviving the rigors of the trip, the HP 2007 was up and running one hour after reaching its first destination.

The African climate also put the computer to test under sweltering conditions. Specs quote temperature ranges of 10° to 40° C with 80% relative humidity. Malawi humidity exceeded 90% during half the year.

69

At a time when no other minicomputer manufacturer could offer a **timesharing system,** the University of Virginia's School of Engineering and Applied Sciences was operating an HP 2000A that supported up to 16 terminals in conversational BASIC.

The University was committed to the concept of in-house timesharing for instructional computing. This HP 2000A system was



more economical than conventional timesharing services.

That was nine years ago. Today, the University has expanded to three HP2000 systems and a total of 96 ports that provide students with timesharing access 24 hours a day, seven days a week.

71 The first minicomputers with **user-microprogrammable control,** HP 2100s have proven invaluable for Scan Optics Inc., East Hartford, Conn., in controlling high-speed, optical character recognition systems.

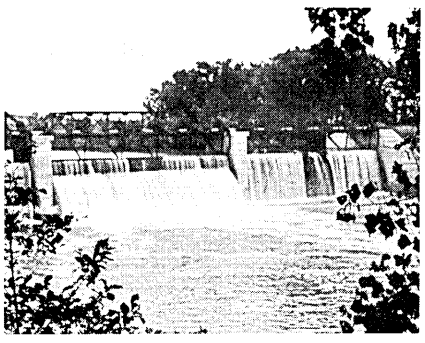
With 2100 microprogramming capability, Scan Optics could develop their own firmware, and thus tailor systems to specific requirements.

The ability to upgrade without major hardware or software changes more recently enabled Scan Optics to convert to newer, faster 21MX-based systems.

Mitsui Co., Japan's leading general trading firm, relies on one such computerized scanning system for improved communications among its 185 offices in 77 countries. With this system, messages sent all over the world can be processed at a rate of 60 pages a minute.

73 A forerunner in computer network development, HP's first **distributed system** consisted of a 9700 RTE-based central computer and multiple satellites that communicated with each other in both directions. Sharing peripherals in this network structure resulted in lower-cost remote computers. Faster response times and increased reliability are just two benefits of a network concept.

An early network customer was the Division of General Research in Denver, Colorado, part of the U.S. Bureau of Reclamation. They rely on an RTE-controlled distributed systems network, with seven satellites connected to a central, to perform hydroelectric testings on dams, canals, and spillways, as well as critical concrete testing.



73 When the clinical laboratory of a major hospital in Connecticut ordered the first HP 3000, it received several industry breakthroughs in a single system.

The Multiprogramming Executive operating system enabled the HP 3000 to perform **concurrent timesharing, batch, and real-time operations.** Stack architecture streamlined program execution. Virtual memory, the SPL programming language, and full ANSI COBOL were other notable HP 3000 firsts.

The HP 3000 is used to derive, store, and disperse findings from human fluid tests. This process begins when blood is taken from a patient. A mark sense card attached to the blood tube contains patient information and specific test requests—for example, check for glucose concentrations. This data is entered in the computer.

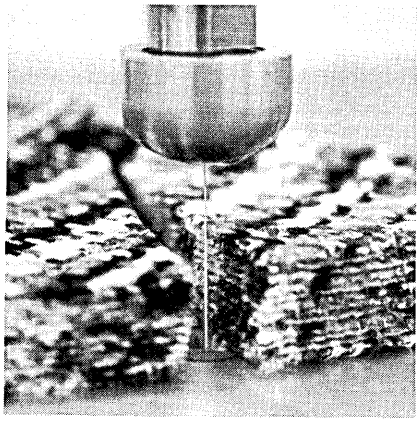
At lab test stations, heat and chemicals are added at various intervals. Light readings from the samples are converted by the HP 3000 to show the glucose concentration.

Besides lab research, the HP 3000 also sends billing data to a remote IBM central for processing.*

*This HP 3000 application was developed in conjunction with the Clinical Laboratories Department of the Yale-New Haven Hospital, New Haven, Conn.

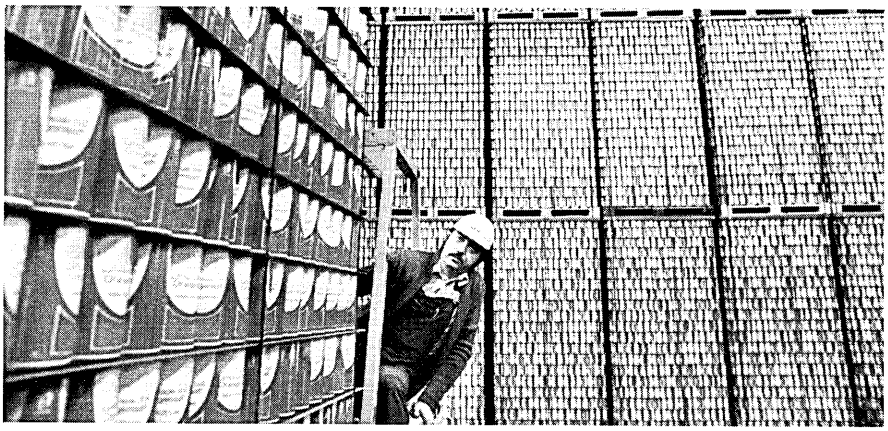
74 HP's use of state-of-the-art **semiconductor memory design** inaugurated a new generation of smaller, faster, more reliable, and less expensive small computers—the 21MX Series.

As HP computer products matured, Camsco Inc., of Richardson, Tex., took advantage of family compatibility and converted its 2100-based computerized graphics systems to these 21MXs.



One Camsco product is a numerically-controlled cutting system which uses a 60,000 psi jet of water as the cutting medium. The position of the cutting jet is controlled by the 21MX.

74 HP introduced IMAGE/3000, the first **data base management system** on a small computer. Schmalbach-Lubeca, a German-based member of the Continental Can group of companies, has



been using IMAGE to help ensure fast delivery of over 10,000 products to 2,500 customers. It has provided timely information about order processing, production inventory, and delivery.

The company has plans for nine more IMAGE/3000 systems at its various factories. These will interconnect to form one powerful distributed system for data base management.

75 By virtue of its **shirtpocket-size, 3M mini-cartridge,** HP's 2644A terminal was the first to offer internal mass storage. Management Systems Inc. of America, based in Atlanta, Ga., incorporated HP 2644s in its ACTION system—A Clinic Terminal Information On-Line Network.

ACTION improves the handling of patient account status, insurance files, appointment schedules, and hospital census records.

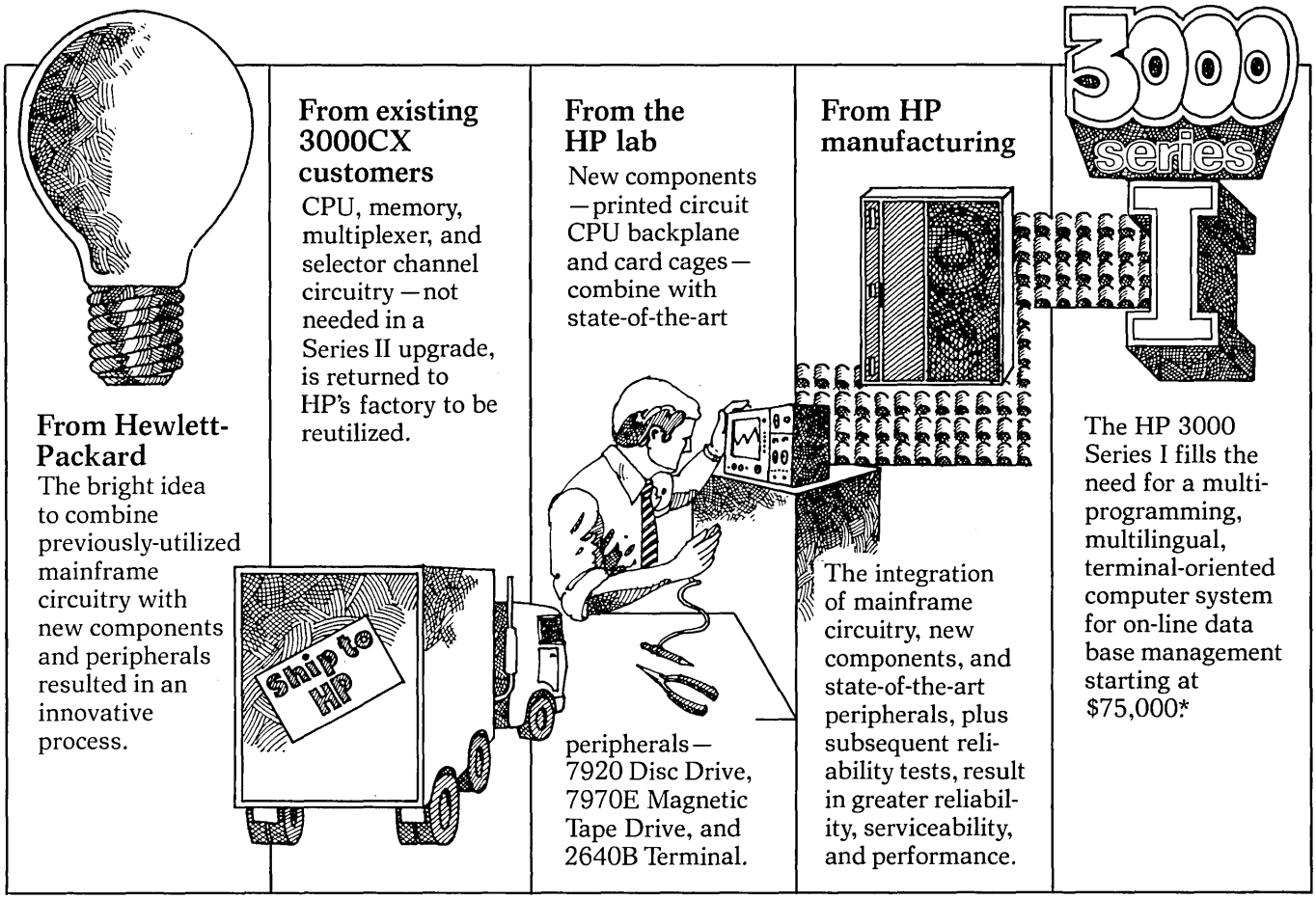
76 The power and elegance of APL became available for the first time on a small, general-purpose computer with HP's **APL\3000** and the 2641 APL terminal. As the test site of APL\3000, Yale University's Computer Science School has seen its APL students advance three times faster in programming skills and general understanding of EDP than those studying conventional programming languages.

An entire program for sorting a set of numbers, for example, can appear in this concise APL form:

X[⍋X]

Another HP language first was the FORTRAN II compiler on the HP 2116A minicomputer. Throughout the past decade, HP has pioneered these and other languages, keeping in mind that hardware technology cannot be successful by itself.

Evolution of a low cost computer



New technology has permitted the computer industry to average a 30% annual price drop. HP, recognizing the demand for 3000 system capabilities at a lower cost, developed an innovative method of transcending the cost/performance ratio.

The result: HP's 3000 Series I, a multiprogramming, multilingual, terminal-oriented computer system for general-purpose processing. With proven performance increases of 10-50% over earlier equivalently configured 3000CXs, the Series I starts at $75,000.*

The Series I offers standard Series II capabilities such as the state-of-the-art Multiprogramming Executive (MPE) operating system, IMAGE data base management system, and five languages: COBOL, RPG, BASIC, FORTRAN, AND SPL. Depending upon the application, the Series I supports up to 16 terminals. For applications requiring more terminals or greater throughput, it can be upgraded to a Series II without rewriting applications or retraining users.

What the HP 3000 Series I also offers is already-proven 3000CX mainframe circuitry integrated with new components and sophisticated peripherals for increased reliability, serviceability, and performance. The new performance level of the Series I should make it especially interesting to small and medium-sized businesses, educational institutions, divisions of large companies, and system houses.

Check C on your reply card for more descriptive information about the HP 3000 Series I computer systems.

*U.S. domestic price only; OEM discounts available; available in North America only.

New & Noteworthy

First details from Hewlett-Packard's CMOS/SOS lab are made public

Micro CPU chip (MC²) has approximately 10,000 transistors in a total area of 34 square millimeters.

The first accomplishments from Hewlett-Packard's three-year old CMOS/SOS laboratory in Cupertino, California were revealed in Philadelphia on February 17th in proceedings of the International Solid State Circuits Conference.

A technical paper entitled, "A CMOS/SOS 16-Bit Parallel Micro CPU" was presented, which described a microprocessor optimized for controller applications. The micro CPU chip combines low power consumption, high speed, high circuit density, and static operation. All these features are characteristics of the CMOS, silicon-on-sapphire process, and the combination offers advantages over other technologies. A year's worth of tests on some 20,000 parts have reinforced HP's confidence in the consistency of performance obtainable from the micro CPU chip and in the laboratory's ability to achieve required volume and economical yields. Figures given indicate that yields have been running between 12% and 24%.

HP invested in CMOS/SOS to gain system level performance advantages, which we are now achieving. Much effort has also been in testing for reliability. Current data based on significant quantities, show the reliability to be excellent. HP products benefiting from the process will be introduced this year.

An article on this high-speed, low-power, high-density chip appears in the April issue of the *Hewlett-Packard Journal.* **For your copy, check D on the reply card.**

Continued from page 2

Series II computers. All memory parts and boards undergo vigorous burn-in and diagnostic tests to discover and correct faults not discernable in other ways. Accumulated hours of testing before customer shipment ensure a highly reliable product at, and long after, delivery. Three million memory device hours of MTBF testing projects that reliability should be as good as our field-proven memory.

The new memory meets the same environmental specifications of the 21MX E-Series, i.e. 0-55°C, up to 95% humidity and tough shock and vibration. These are the only commercial 350ns semiconductor memories available with such stringent specifications.

Asynchronous memory enables speed gains

The 21MX E-Series has a fully asynchronous interface with memory. This innovation makes it possible for present and future E-Series users to take advantage of this new high-speed memory by simply plugging it in. Memory technology will continue to change at a rapid rate. HP users have the assurance that their computers will be able to take advantage of faster, larger, more reliable, and less expensive memories as they become available.

With a speed of 350 nanoseconds, the 21MX E-Series high-performance memory exceeds that of many cache memory schemes. Most of the throughput benefits of high speed cache systems can be realized without the associated cost. The new 16k word, high-speed memory sells for $2100.* The controller is priced at $600.* **Check A on the reply card for further details about HP's new memory.**

*U.S. domestic price only

Computer Advances, written to inform professionals of the latest technical contributions from Hewlett-Packard's engineering labs, appears regularly as a compilation of product and customer innovations.

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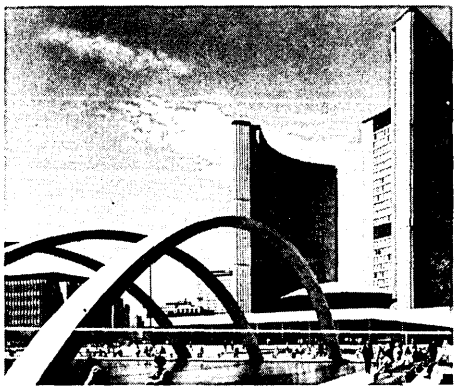

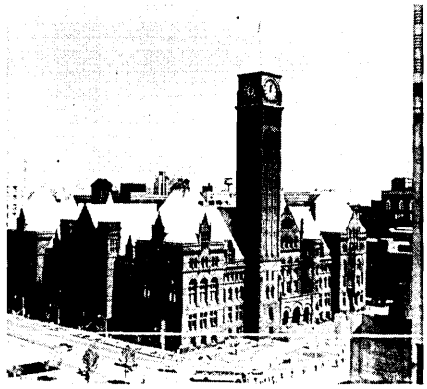

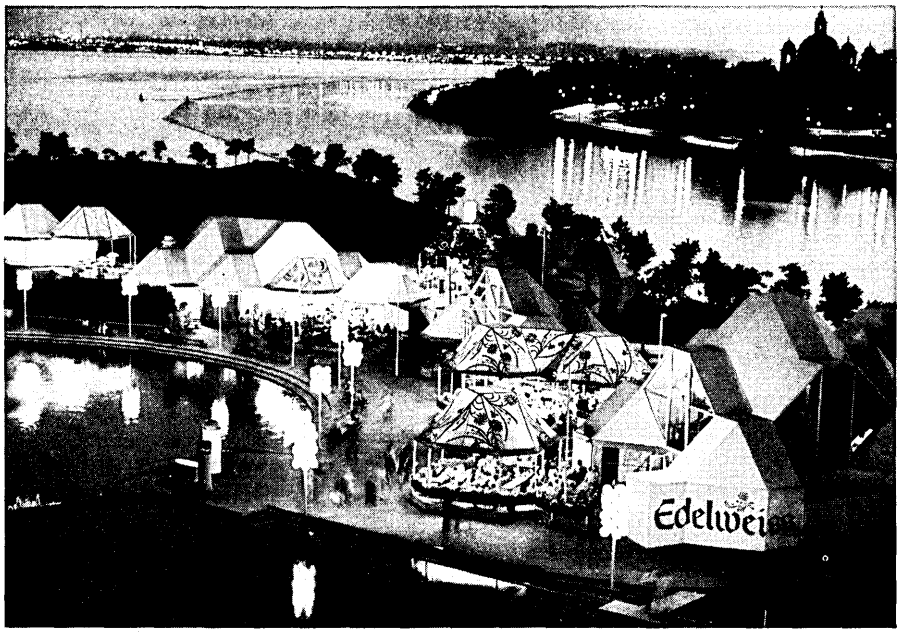

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Share a stimulating week with the world's best computer scientists.

Here is a unique chance to see and hear what's happening on the leading edge of the state of the art, and to do it in a location that combines the excitement of a big city with the atmosphere of a lakeside resort.

IFIP Congress 77 marks the first return to North America in more than 12 years for this triennial gathering of the foremost information scientists from around the world. The Congress offers a full week of stimulating information exchange with developers and users of the most advanced computer techniques from some 35 countries.

As an attendee or as an exhibitor, you can see or be seen in Toronto this summer, where you'll find charming medieval landmarks side by side with such avant-garde sights as the world's tallest free-standing structure and the world famous entertainment center, Ontario Place.

It's an ideal setting for this triennial meeting of information scientists, and you should plan now to be there.

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IFIP CONGRESS 77
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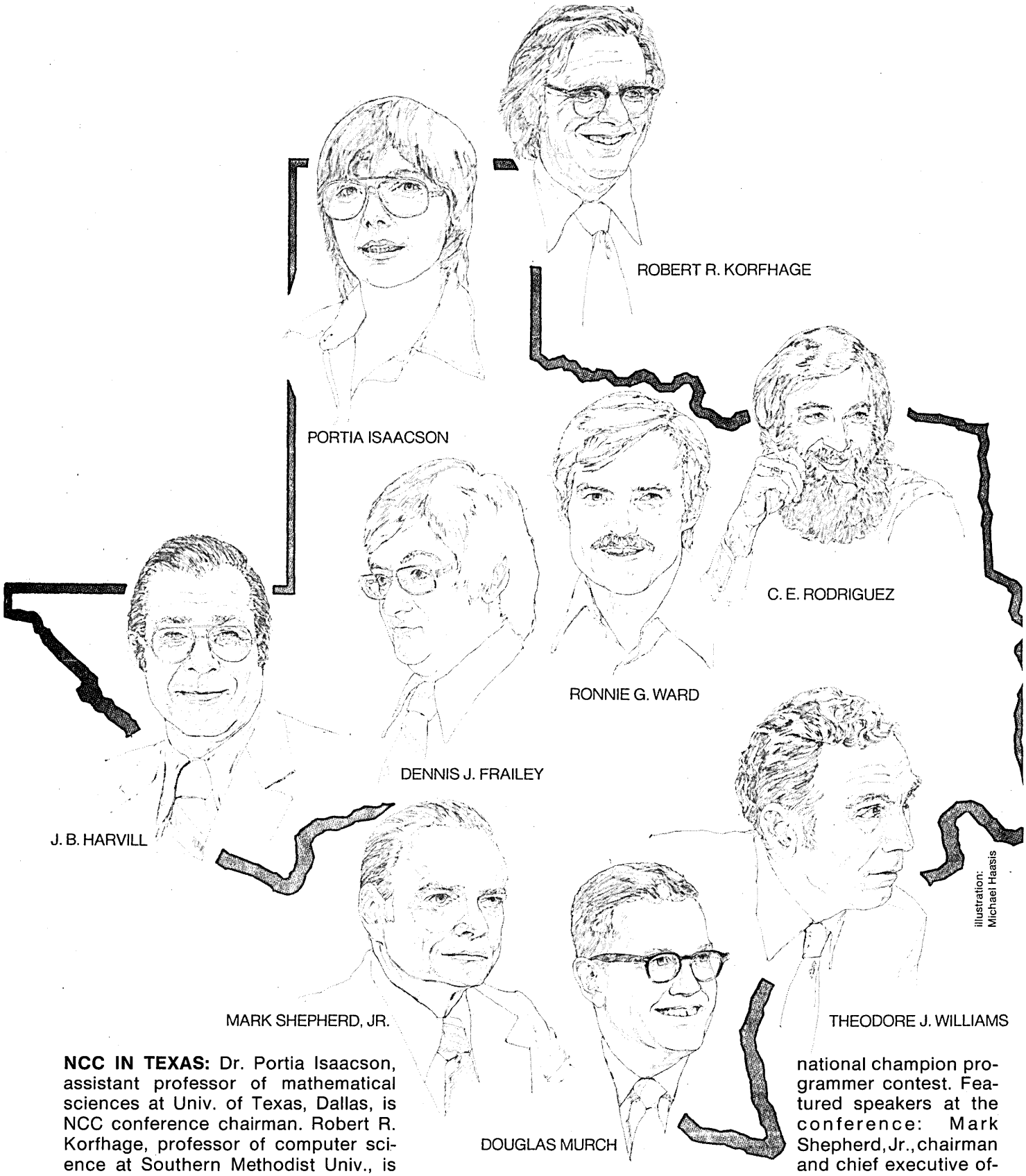


NCC IN TEXAS: Dr. Portia Isaacson, assistant professor of mathematical sciences at Univ. of Texas, Dallas, is NCC conference chairman. Robert R. Korfhage, professor of computer science at Southern Methodist Univ., is NCC program chairman. J. B. Harvill and Dr. Dennis J. Frailey of the Computer Science Dept. at Southern Methodist Univ. have organized Pioneer Day. Dr. Ronnie G. Ward, Univ. of Texas at Arlington, is director of NCC's Professional Seminars program and Dr. C. E. Rodriguez, East Texas State Univ., has organized NCC's national champion programmer contest. Featured speakers at the conference: Mark Shepherd, Jr., chairman and chief executive officer of Texas Instruments, Inc.; A. Douglas Murch, senior vice president of Prudential Insurance Company of America; and Dr. Theodore J. Williams, of Purdue who also is president of the American Federation of Information Processing Societies.

A Conference for Users

by Tom McCusker

Research will be aired as usual at the NCC. But the emphasis is on user interests—with management briefings, how-to subjects, and many panel discussions.

The National Computer Conference June 13-16 in Dallas demonstrates more than ever before an emphasis on user concerns and less on its traditional role as a forum for airing research projects in computer science.

"Traditionally, the NCC—and its predecessors, the Spring and Fall Joint Computer Conferences—were the big research conferences," says Dr. Portia Isaacson, NCC conference chairman. People came to the conferences to present papers on recent research in computer sciences. "Today, there are many smaller research-oriented conferences for them to do that. The NCC now is designed to be of more use to computer users."

This is not a new concept. It's been tried ever since the conference last was held in Texas—the Fall Joint Computer Conference in Houston in 1970—where sessions on the program covered "broad perspectives," sort of tutorials on trends in the computer business. And throughout the following years, there has been a smattering of "business-oriented" sessions aimed at users. But this year the effort has been concentrated.

Of the 89 sessions, 11 are billed as "management briefings" in which one or more speakers will discuss "how-to" subjects, and eight will relate to key management subjects. Another 19 are applications related. Forty-seven sessions—less than half of the program—are devoted to computer science and technology. And of the total of 89 sessions with more than 300 speakers, only about 130 papers are to be published in the NCC Proceedings.

Many are of the panel format. And for the first time, panel subjects were refereed for quality and timeliness, almost with the same intensity that technical papers were reviewed—each paper by up to four persons. Dr. Isaacson, who is assistant professor of mathematical sciences at the Univ. of Texas in Dallas, said one out of four papers offered for the technical sessions was accepted.

Late in April the NCC steering committee was planning to publish a "Guide to Panels" for distribution to NCC registrants. The guide of 100 to 150 pages would contain 500 word abstracts of what the panelists would discuss at the conference.

The DPMA arrives

Emphasis on management related subjects reflects the new presence of the Data Processing Management Assn. (DPMA). The DPMA became a member of the American Federation of Information Processing Societies (AFIPS), which sponsors the NCC, three years ago. It is a co-sponsor of the conference and show with AFIPS, the Association for Computing Machinery, the Computer Society of the Institute of Electrical and Electronics Engineers, and the Society for Computer Simulation. "It's the first year that anything significant has been done for them," says Dr. Isaacson, who expects a larger turnout of persons with management interests.

Also on the program is a series of eleven professional seminars, organized by Dr. Ronnie G. Ward of the computer science department at the Univ. of Texas in Arlington. The seminars are one-day mini-courses for which there is a fee of $30 that also entitles the attendee to four days at the exhibits. The seminars are on the following topics: **Tuesday, June 14:** Comparing Data Base Systems; Microprocessors . . . Origin and Outlook; Software Design Techniques; Introduction to Computer Networks. **Wednesday:** The Data Base Administrator; Introduction to Software Physics; Structured Design; EDP Professional Development. **Thursday:** Distributed Data Base Networks; Structured Information; and How to Develop a Long-Range Plan. AFIPS said the seminars will be kept small and registrations will be accepted on a first-come, first-served basis.

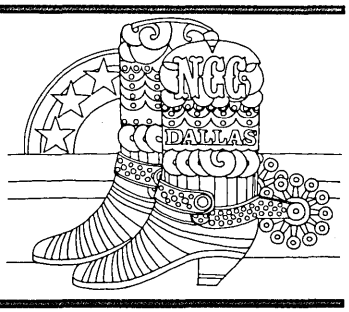
Attendance outlook is good

Registration for the full four days of the conference and exhibit is $75. Additional registrations include one-day program and exhibits at $25; four days of exhibits at $25; and one-day, exhibits only at $10. However, AFIPS has circulated more than 200,000 tickets to exhibitors who will distribute them free to their customers. AFIPS is forecasting an attendance of 25,000, which is 10,000 fewer than the 1976 NCC in New York City, but an AFIPS spokesman says the turnout is anybody's guess. He expects 27,000. He said it all depends on the kind of turnout from outside Texas. (At the FJCC in Houston seven years ago, half of the attendance was from out of state). Still, AFIPS said it had received 11,000 inquiries in mid-April from prospective attendees, which is five times the number of inquiries it had received last year right up to showtime. "It's a good economy for the computer business and that could turn things around," the spokesman said.

Good times for exhibits

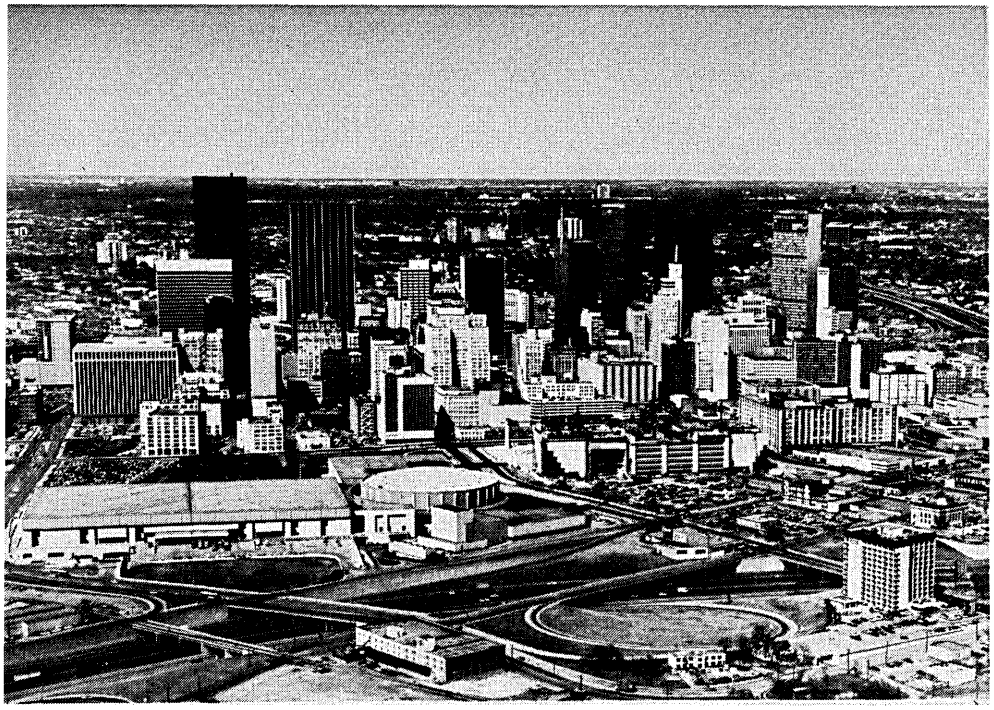
Signs of good economic times are in evidence at the accompanying exhibit which makes the NCC the largest computer trade show ever held. In late April, some 300 companies had reserved 1,143 exhibit booths at the huge Dallas Convention Center. That is compared with the 1969 Fall Joint Computer Conference in Las Vegas, where about 970 booths were crammed into two sites to set an exhibit record that lasted until this year's Dallas show.

A good economy could turn attendance forecasts around.



Personal computer show

Besides the NCC exhibit, an exhibit of personal computers (offered at half the price of an NCC exhibit) had attracted some 50 manufacturers and suppliers in mid-April, and Dr. Isaacson said this figure could soar to 100 companies by show time. Dr. Isaacson, herself a computer hobbyist (see May



Dallas skyline with Convention Center in foreground.

Conference Particulars

Dates: June 13–16
Place: Dallas Convention Center, Dallas.
Conference Program: Monday, 2 p.m.—5:15 p.m. Tuesday, Wednesday, and Thursday, 9 a.m.—5:15 p.m.
Exhibits: Monday 11 a.m.–7 p.m. Tuesday, Wednesday, and Thursday 10 a.m. to 6 p.m.
Fees: Conference, exhibits, and proceedings for four days: $75. Exhibits one day, $10. Exhibits and conference for one day, $25. Four days of exhibits, $25. Students, $10 for entire conference and exhibits.
Sponsor: American Federation of Information Processing Societies, 210 Summit Ave., Montvale, N. J. 07645. Telephone: 201-391-9810.
NCC Travel Service: For information on reduced rate travel to Dallas and other travel information: 800-556-6882. (In Rhode Island, call 401-943-5061).

1976, p. 13), said systems to be displayed will include hardware and software implementations, games, recreation, music, art, amateur radio, and scientific and general applications. Called the Personal Computing Fair, it will be housed in the convention center's North Hall, one level below the main exhibit hall, "but adjacent to an eating area and certain to attract a lot of traffic."

There is talk, too, of combining the Personal Computing Fair with meetings of special interest groups for a series of informal sessions on topics such as the building of computer kits, debugging software, use of assembly language, and software standards. There also are plans for a "National Club Congress," enabling representatives of clubs from throughout the nation to exchange ideas and discuss issues relating to their activities and programs. And there will be five formal sessions as part of the NCC program to discuss personal computing—its history and forseeable future; its hardware and software; personal systems; and trends in computer stores.

Champion programmer

The NCC also will honor the "1977 National Champion Programmer," from an entry list of 70 programmers who have been selected to participate in a programming contest that is another first at an NCC. Participants qualified by submitting a difficult program. During the contest, which runs throughout the conference and ends Thursday at noon, the contestants will participate tournament-style in three elimination rounds. They'll be asked to write a program, with the winner being the one who wrote it in minimum time; to modify existing programs; and to find errors in existing programs. The first prize is a Texas Instruments terminal from the company's Silent 700 series. The contest has been organized by Dr. C. E. Rodriguez of the computer science department at East Texas State Univ. in Commerce, Texas.

The speakers

The NCC keynoter is Mark Shepherd, Jr., chairman and chief executive officer of Texas Instruments, Inc., who will discuss the extension of distributed computing into new applications that weren't predictable when computers first were used extensively 25 years ago. His talk will be given on opening day, June 13. On Tuesday, Dr. Theodore J. Williams, the AFIPS president, will deliver a presidential address in which he will discuss the application of computers to industrial systems. Dr. Williams, a professor of engineering and director of the Purdue Laboratory for Applied Industrial Control, is a past president of the Instrument Society of America, one of the AFIPS societies. The third major address of the conference is to be made Wednesday by A. Douglas Murch, senior v.p. of the Prudential Insurance Company of America. Among Murch's posts with Prudential during a 25-year career, was executive director of electronic systems. As a senior v.p. for the past eight years, one of his responsibilities is the direction of the big insurance company's computer systems and services operation. He'll talk about the application of computers in the Prudential organization.

Steering committee of Texans

The National Computer Conference is run by a full-time staff at AFIPS headquarters in Montvale, N. J. But responsibility for the program—and such other innovations this year as the personal computing fair and programming contest—is in the hands of a 15-member steering committee made up mostly of Texans and headed by Dr. Isaacson. Robert Korfhage, professor of computer science at Southern Methodist Univ. in Dallas, is the program chairman. His credentials are extensive: a graduate from the Univ. of Michigan with a Ph.D. in mathematics; a professor at SMU for six years; 15 years of teaching at Purdue Univ., North Carolina State College, and the Univ. of Michigan; a Fulbright-Hays lecturer who taught at the Josef Stefan Institute in Ljubljana, Yugoslavia, and the Technische Hochshule in Vienna; elected outstanding professor at SMU's Institute of Technology in 1974.

In an interview in mid-April Korfhage, with all of the program's organizational work behind him, was trying to select the best paper to be presented at the NCC. "It's an impossible job," he said. "Every one seems to be the best."

All about data bases

Data base technology will be examined in 11 sessions to be held each day of the conference. In one, "Data Base Administration," on Monday, two authors tell of a survey they've

When the lines are down, does your 3270* get buried? Our Harris** 8180 doesn't.

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What's the solution? More mainframe? More lines?

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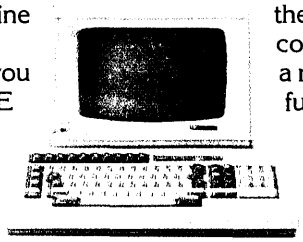

How come? Because the Harris 8180 can be configured to perform a number of special functions. Let's look at one of them: Queued Transaction Handling.

Queued Transaction Handling lets you store data at your 8180—whether the data are keyed by your operator and stored prior to transmission to your CPU, or received from your CPU and stored prior to local display or printing.

Result #1. Your Harris 8180 can take and store data from your operator, even when your CPU can't take it from your 8180. Then, when your 8180 can get thru, it can transmit the data without re-keying—and in a fraction of the time your operator took to key the data initially.

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made to identify the role of a Data Base Administrator (DBA) and what his challenges will be in the future as Data Base Management Systems become more complex. The authors, Jean-Paul De Blasis and Thomas H. Johnson, offer this definition of his function:

"The data base administrator is the individual providing the coordination, perspective, and administration of the data base by exercising specific responsibilities. His responsibilities should include the definition, organization, protection, efficiency and documentation of the data base. He should also be responsible for defining the rules by which data is to be accessed and stored."

Basing their findings on a study of more than 20 DBA groups in companies ranging in size from $3 billion down to $20 million in revenues and having data bases ranging from 100 billion characters to a few hundred thousand, the authors found that the largest DBA group had 14 persons; the smallest had one. The primary qualifications for such a person was that he possess very high technical skills and have a knowledge of the company. "Administrative skills were secondary qualifications to three-fourths of the DBA's," the authors say, because the administrative skills could be learned on the job.

Another observation: "The DBA is most frequently a senior analyst or group leader in applications or systems development organizations. In only two cases did the data base administrator report to the top level of systems management."

As for data base policy in a company, the authors felt the DBA people would serve only in an advisory capacity to the corporate information managers who would make the policy. "The DBA would be the most important implementer of the policy," the authors say, "but not the policy maker."

In another paper, Michael Ehrensberger, of Cincom Systems, Inc., discusses the role of Data Dictionary software, pointing out that "the computing industry is no longer preoccupied with computing; rather it is concerned with the management of a vital corporate resource—data."

The Data Dictionary, used to manage the data within the data processing department, is a new concept and like many new concepts, Ehrensberger notes, "should be used with enthusiasm but with a measure of discretion." He explains that the overhead in using it could be substantial if all access to data requires an additional access to the Data Dictionary. "As new technologies emerge, the overhead of accessing data will probably reduce to core-to-core transfers. At that point, the full concept of data base—data dictionary—can and will be a reality."

Relational systems

A handful of users are now using relational data base systems. Michael Stonebraker, of UC Berkeley, has organized a session entitled "User Experience with Relational Data Base Systems"—systems in which users retrieve data by specifying its properties instead of specifying which access paths are to be followed to find that data. Tymshare's Magnum and National CSS' Nomad are two relational systems often mentioned in that small circle of relational enthusiasts. But Stonebraker thinks true systems are those that support high level data manipulation languages. One of these, INGRES (for Interactive Graphic Relational System), which was developed by UC and runs on the PDP-11 Unix system, is being used in a production environment mostly by researchers, but two are licensed to commercial concerns.

In the session, Gerald Held, of Tandem Computers, Inc., Cupertino, Calif., will present a survey of current relational data base systems, and Nancy Goguen of Bell Laboratories, Murray Hill, N. J., and James Berkey, of Arthur Anderson Co., Houston, will describe their experiences with relational systems. Frank Manola, of the Naval Research Laboratory, Washington, D.C., is a member of the CODASYL data base task group which advocates network-oriented models with access paths linking one table in a data base to another. He'll be the fourth speaker and, Stonebraker says, "He'll be there to tell us we're all crazy."

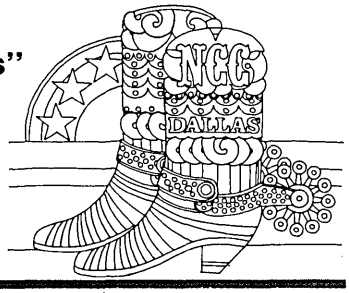
Computers of the future

Computer consultant Lowell Amdahl, of Los Angeles, foresees "drastic" changes in the way computers will be designed 5 to 10 years from now as new languages induce architectural changes. Amdahl is the chairman of a session Monday afternoon, "Toward the Computer of Tomorrow: A Multi-Faceted Challenge." The speakers include vendors such as Gordon Moore, Intel Corp.; Albert Hoagland, IBM, San Jose; Harlan Mills, IBM, Gaithersburg; Gene Amdahl, Sunnyvale, Calif.; and users such as Charles Vick of the Ballistic Missile Advanced Technology Center in Huntsville, Ala.; and Herbert Grosch, a Sunnyvale, Calif., consultant who also is president of the Association for Computing Machinery.

In the short time allotted for the session—an hour and a half—Amdahl doesn't expect a survey of what will be new, but rather a discussion of approaches to tomorrow's computers as explained from the position and backgrounds of the speakers. He believes that the judicious use of software and hardware in the future will lead to more effective load sharing in multiprocessing in a way that will bring about drastic changes in a new generation of computers.

That session is part of a four-day program of sessions exploring computer architecture. Topics range from microprocessor architecture and pattern recognition to consideration of distributed processing and fault-tolerant computing. One session, "Government Panel on Research in Computer Architecture," organized by Jimmie R. Suttle of the Army's Research Office, will bring together five government research people who will discuss the current state of research activity and will attempt to identify areas of research in computer architecture which are likely to have an impact in the future. As for the expected audience, Suttle says, "It should be made up of everybody who intends to get money from the government in the future. The session basically is a consolidation of what they (these agencies) have in mind in the way of new research."

"Computer medics" will be able to provide better patient care than doctors.



The computer-medic

Five sessions explore the use of computers in medicine. One, "The Coming Age of Computer Based Medical Consultation: Will it be Fair?" brings together six panelists who will explore such questions as: How should it be implemented? Who should pay for it and control it? What about quality and the rights of privacy? Dr. John Lackmann of the Univ. of Iowa says such questions have already been discussed intensely by some persons in the Family Practice Profession. Computer-based medical consultation is technically feasible today, he says, "It's all a matter of priorities." There's a lot of expertise; the technology is here and there are national networks "that can be accessed by anybody who wants to pay for them."

The panelists will represent the American Medical Assn., the American Board of Family Practice, the government, doctor training institutions, and the physician in family practice. They'll respond to these questions and, hopefully, to questions

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from the audience about patient concerns.

A highlight of the session is a talk by psychiatrist Jerrold Maxment, author of *The Post-Physician Era,* published in 1976. He'll defend his argument in the book that "computer-medics" will be able to provide better patient care than doctors, that doctors should be replaced, and that it is unethical to suggest otherwise.

Security what's the risk?

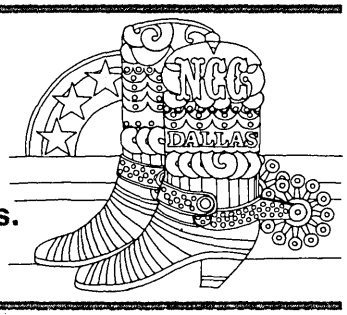
Although there is a need to study security risks in computer centers, no generally accepted risk assessment methodologies are now available. In a session on Monday, "Computer Security Risk Assessment," Robert Courtney of IBM Systems Research Institute offers some thoughts on the question. In risk assessment, Courtney says, "Consideration must be extended to all things which might result in undesired modification, destruction, or disclosure of data, or suspension of data processing services." This is opposed to the view that consideration should be given only to catastrophic events which would result in the complete loss of the data processing capability or to the view that only events ascribable to intentional misconduct need evaluation, he explains.

Risk management, he says, basically involves selecting such security measures, including insurance, as are appropriate to bringing the risk within tolerable limits at the lowest cost. The session is chaired by Rein Turn of TRW Systems, Inc., who also has co-authored a paper with Steve Glaseman and R. Stockton Gaines on "Problem Areas in Computer Security Risk Assessment." They will be joined by panelists from the Dept. of Agriculture and Stanford Research Institute in evaluating the effectiveness of risk methodologies that have been proposed, evaluate their effectiveness, and explore needed research and development.

Distributed or lost?

Does the proliferation of minicomputers within large organizations mean the corporation will begin to lose some of its information? Larry D. Woods, of the huge farm equipment manufacturer, Deere & Co., Moline, Ill., thinks that is a possibility and is taking steps to control the phenomenon. His session at the NCC, "The Management of Distributed Computing in Large Organizations," will attempt to point out "that distributed processing is not as simple as everybody is saying it is."

Distributed processing is not as simple as everybody says it is.



Woods says the actual distributing of information is a technical feat. "What is beyond our control is that many departments in a company are buying minicomputers on their own, without consulting with the central computer site, and that data which should belong to the corporation now belongs in a department." In addition, Woods says, "There's the question of duplication of effort." He says most departments or branches will buy turnkey systems in which the central site not only has no say in the hardware being acquired, but also no say in the operating system used.

At Deere, where Woods holds the relatively new title of "manager of distributed computing," the company already has some 150 minicomputers. Woods' group acts as an in-house consulting organization to departments that are planning to install their own minicomputers. It's a cooperative effort in which his group works with the branch or department from "day 1, directing their efforts in a way in which we can make data available for corporate use." The group provides software support for all the minicomputers and, while not touching applications software, it offers to generate operating systems and fixes on the operating system.

Woods hopes to get other speakers with similar problems in what he hopes will be a "realistic" session. "We won't have anyone there telling us how neat their distributed processing organization is," Woods says.

Other sessions

Some other noteworthy sessions at the conference:

Symbolic Evaluation: A new technique for studying the static and dynamic properties of computer programs. The chairman, Edward F. Miller, Jr., of Software Research Associates, San Francisco, says the technique enables one to learn about the properties of software programs that can't be learned in any other manner. Basically, he said, the session provides attendees the opportunity to "look into the researchers notebooks" for a view of what is coming in a few years.

Systems Strategic Planning—A View From the Top: Harvey L. Poppel, of Booz, Allen & Hamilton, the management consulting firm, will review a model for elevating information resource management into the board room, and tie it into the strategic planning process of top management. Poppel also will address the practical potential of rapidly blending data processing, word processing, and communications processing technologies, and how to plan, control, and organize these emerging opportunities.

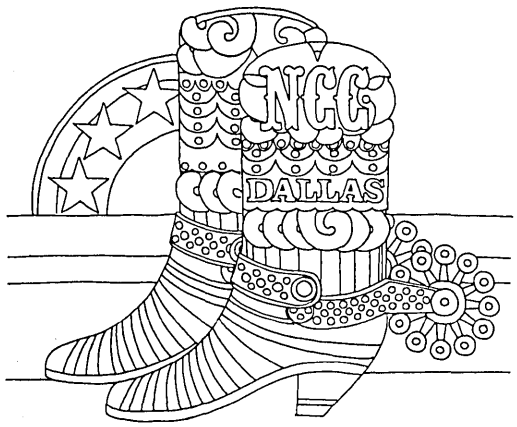
Computing at Los Alamos in the '40s and '50s: This will be the NCC's annual Pioneer Day observance, this time recognizing contributions by the computing group of the Los Alamos Scientific Laboratory in New Mexico. Beginning with the development and installation of MANIAC I in 1952, Los Alamos' computing group has worked at the forefront of new developments in computer technology and related mathematical computation, including the installation and testing of the CRAY I computer last year. Key members of the laboratory will assess contributions the group has made and discuss what is ahead.

Data Communications Policy And Its Impact on the Consumer: This session, organized by Robert Korfhage, the NCC program chairman, will be held to discuss the Consumer Communications Reform Act of 1977, generally known as the "Bell Bill." Korfhage said the idea for this session came from a debate in London last January on the performance of Europe's PTT's as providers of data communications.

How to Sell, Service, and Support Customer Needs with Small Business Computers: A session with five persons representing vendors, but not including IBM. It has been organized by Donald W. Fuller, president of Microdata Corp., Irvine, Calif. As manufacturers continue to expand their user base and sales, how are they doing with applications support?

National Commission on Electronic Funds Transfer Report: The session will be aimed at a recent report issued by the commission. It has been organized by William A. Fenwick, a Palo Alto attorney active in privacy issues. Speakers are James B. Rule, State Univ. of New York; John B. Benton, the commission's executive secretary; John M. Eger, a Washington lawyer and formerly of the Office of Telecommunications Policy; and Daniel McCracken, who has addressed groups on some issues relating to an eventual nationwide EFT system. ✲

Product Preview



Slip off yer boots, podnuh, and mosey down by the exhibitor corrals with the other folks. We reckon thar's a herd of new products in this territory. Here's a sampling.

Computers & Systems

BEEHIVE INTERNATIONAL
Salt Lake City, Utah **Booth 1265**

Small Business System
This terminal manufacturer has decided to invade the dynamic small business system market with BOSS (Beehive Office Supervisory System), which is based on the firm's B800 video computer system. BOSS features a Nova-compatible micro, which is user programmable, various peripherals, communication controllers, support software, and modular packaging. A 32K unit with floppy disc and 165 cps matrix printer is priced at $17,175 ($12,750 to systems houses). A second model with 32K of memory, 10 megabytes of cartridge disc storage, console desk, and 165 cps printer lists for $32,135 ($21,5000).
FOR DATA CIRCLE 358 ON READER CARD

DATAPOINT CORP.,
San Antonio, Texas **Booth 1005**

Distributed Processing
The company that could rightfully claim to have been the first to get into the distributed processing market is still developing products for that sector, and Dallas will witness the latest gear, a more powerful processor for the 6600 series. It features 120K bytes of user memory (in addition to system memory) and 600 nsec. cycle time performance. Capable of supporting up to 24 work stations, the new engine can perform in standalone or disbursed data processing installations. Users of the manufacturer's 1100, 2200, and 5500 series product lines will find that their software is compatible on the new 6600. With five megabytes of disc the price will be something under $35K.
FOR DATA CIRCLE 357 ON READER CARD

GENERAL AUTOMATION INC.
Anaheim, Calif. **Booth 1393**

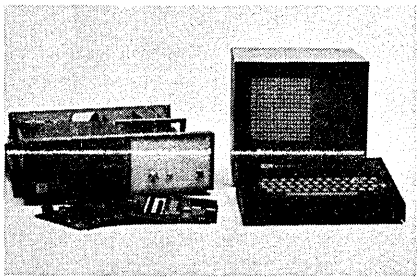
Minicomputer
The GA 16/550 is a minicomputer for multiprocessor applications, and this firm ought to know how, after installing a 56-processor system for the Bank of America. The 16/550 has a 550 nanosecond effective cycle time, multiprocessor shared memory, expandable to two million bytes, and a 32-bit memory and data bus. A typical configuration of the 16/550, with 256K bytes of semiconductor memory, 10 megabyte disc, 600 lpm printer, 400 cpm card reader, and one crt, sells for $73,000. First shipments are scheduled for August.
FOR DATA CIRCLE 360 ON READER CARD

IMSAI MANUFACTURING CORP.
San Leandro, Calif. **Booth 74, 98, 99**

Memory and Micros
A megabyte of memory for microcomputers and a single-board control-computer will star in this firm's booth. Sixteen of this firm's 64K byte memory boards controlled by an Intelligent Memory Manager (IMM) adds up to a full megabyte of memory for the firm's 8080 and other S-100 bus microcomputers. Memory is divided into 16K byte sections, any four of which may be active at a given time. The IMM provides read and write protection, control of up to one megabyte of memory, and interrupt processing functions. A 64K byte memory board sells for $3,899 assembled and $2,599 in kit form. The IMM ranges in price from $299 to $699, depending whether you buy it as a kit or assembled, with ROM or EROM. The 8048 control computer has an eight-bit cpu, 1K bytes of ROM or EROM program memory, 64 bytes of internal register memory and 27 I/O lines. The firm says it is suitable for controlling energy conservation systems, ham radios, light shows, and a number of other applications. Pricing for the 8048 starts at $249 in kit form; a five volt power supply sells for $99.
FOR DATA CIRCLE 339 ON READER CARD

WINTEK CORP.
Lafayette, Indiana **Booth 1023**

Microcomputer
Based on the 6800 microprocessor set, the System 68 can accept any of this firm's micro-modules with MPU, RAM, ROM, serial I/O, parallel I/O, and EROM programmer. It can handle 64K bytes



of memory and one or more floppy disc drives. The basic system includes a 1K byte ROM containing Fantom-II, a monitor/diagnostic program that allows the user to enter programs and data, single step through programs, and set break points. Other software includes an editor, an assembler, and BASIC. Prices start at $1,799 for a System 68 with one floppy disc drive. System 68 will be available at the end of June.
FOR DATA CIRCLE 329 ON READER CARD

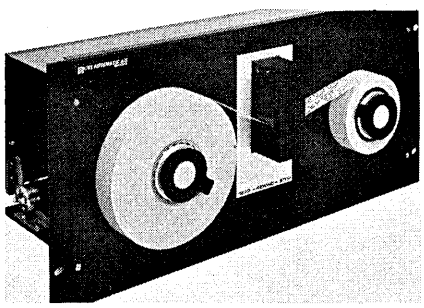
Peripheral Equipment

DATARAM CORP.
Cranbury, N.J. **Booth 1025, 1027, 1029**

Bulk Core
Nova and PDP-11 users can see a bulk core replacement for fixed head discs at this vendor's booth. Nova users can use the BC-301 system, which has a two microsecond access time and a four microsecond per word transfer speed. Each word is stored as 17 bits. The BC-301 is a Novadisc replacement. Users of PDP-11s can replace RC-11 and RF-11 fixed head disc systems with the BC-201. This unit has an access time of 750 nanoseconds and a transfer speed of 1.5 microseconds/word. The BC-201 uses 18 bits to store each word. Both bulk core systems have a maximum capacity of 1,024K words; memory increments come in 128K word boards. Both units sell for $9,700 for the first 128K words, additional 128K word increments go for $6,000.
FOR DATA CIRCLE 356 ON READER CARD

GNT AUTOMATIC, INC.
Waltham, Mass. **Booth 1176**

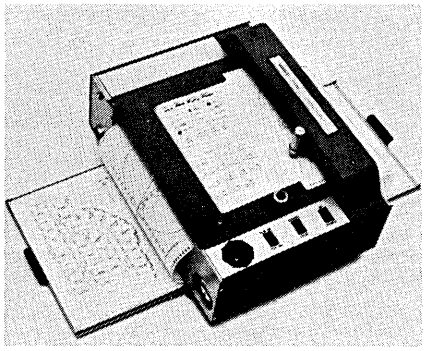
Paper Tape Reader
The model 27 paper tape reader station is a self-contained, 19-inch rack unit, using TTL logic. It is said to have a mean



time between errors of one billion characters. The model 27 offers bidirectional reading at speeds of up to 1,500 characters per second. The model 27 sells for $1,495.
FOR DATA CIRCLE 336 ON READER CARD

HOUSTON INSTRUMENT
Austin, Texas **Booth 1193**

Plotters
This firm will show its Complot DP-11 drum plotter and Complot DP-101 microprocessor-controlled flatbed plotter. The 12-inch wide DP-11 plots at 4.5



inches per second. It can be used for remote batch, time-share, on-line and off-line plotting. Pen and paper positioning is accomplished with a joy stick. The unit sells for $4,150. The 11 x 17-inch DP-101 operates at two inches per second. This vector plotter has hardware character generation, error detection/correction retransmission capability, and circle generation. It will adapt to any RS232C port. The DP-101 sells for $3,495. Both plotters will be available at the end of July, and oem discounts are available for both.
FOR DATA CIRCLE 363 ON READER CARD

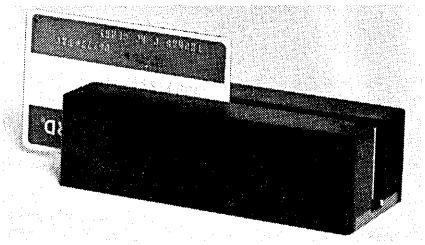
KENNEDY CO.
Altadena, Calif. **Booth 1785**

Disc Drive
A line of disc drives, the Series 5300, with capacities from 14 megabytes to 70 megabytes, will headline at this firm's

booth. These fixed-cartridge, moving head discs use a sealed enclosure which eliminates the need for expensive filters and blowers. Average head movement time is 45 msec., with a worst-case maximum of 80 msec. Rotational latency averages 10 msec. The unit can transfer data at one megabyte per second. Pricing for the Series 5300 ranges from $2,500 to $4,000 depending on capacity and quantity ordered. Delivery is 90 days A.R.O.
FOR DATA CIRCLE 353 ON READER CARD

MAG-TEK, INC.
Carson, Calif. **Booth 1719**

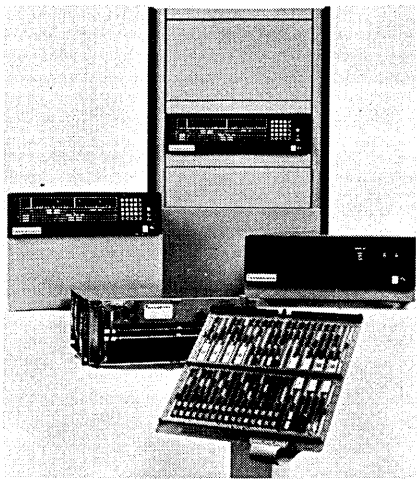
Mag Stripe Card Reader
The MT-210 magstripe card reader fits applications in point-of-sale, factory data collection, automatic gas dispensing, and access control systems. Five versions are offered, allowing the de-



signer to choose which track (or tracks) he wishes to read. Pricing starts at $140, with oem prices dropping as low as $38 per unit.
FOR DATA CIRCLE 367 ON READER CARD

PERKIN-ELMER DATA SYSTEMS
Oceanport, N.J. **Booth 1483**

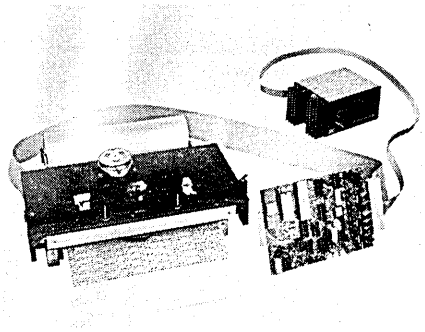
Peripherals and Computers
Perkin-Elmer will run a three-ring circus with its Interdata, Wangco, and Terminal Products divisions all showing products under the same tent. Interdata will bring its 5/16 computer-on-a-board



to the show; connected to the 5/16 will be a new floppy drive from Wangco. The 5/16 sells for $868 in quantities of 100; the one or two drive floppy, with a controller for one to four drives, sells for between $2,900 and $6,400, based on configuration. Terminal Products will provide the animal act, showing off its line of Foxes and Owls. The Owl-1200 is a 1,920 character-editing terminal selling for $1,496 in quantities of 25. The Fox-1100 is a black-on-white, 24 line by 80 character terminal selling for $971 in quantities of 25
FOR DATA CIRCLE 346 ON READER CARD

PRACTICAL AUTOMATION, INC.
Shelton, Conn. **Booth 1743, 1745**

Printer Controller
The UP7-1 and UP7-2 are microprocessor controllers for this firm's DMTP dot-



matrix impact printer series. Two modes of data input are available: six-bit parallel with strobe; and RS232C or Teletype current loop serial. Parallel input can come in at speeds of up to 16KHz serial data can come at speeds up to 1200 bps. The UP7-1 is for 20 to 40 column printers, the UP7-2 is for 60 to 132 column printers. They sell for $150 and $162, respectively. A power supply for both the printer and controller will also be shown in this firm's booth. The PS6-28 sells for $75. Delivery is 8 weeks A.R.O.

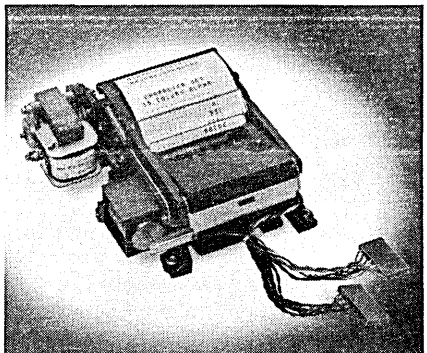
FOR DATA CIRCLE 362 ON READER CARD

SHELDON-SODECO

Elmsford, N.Y. **Booth 1128**

15-column Printer

The PR1500 series printers print up to three lines per second of numeric information, and half that rate for alphanumeric data, drawing from a 54 character



set. The impact units feature 500 msec startup time and subsequent line feed rates up to 10 lines per second. Multiple copies can be generated on standard paper. Prices drop to something under $100 in orders of 100.

FOR DATA CIRCLE 338 ON READER CARD

SWEDA INTERNATIONAL, OEM PRODUCTS

Pinebrook, N.J. **Booth 1000, 1002**

Paper Tape

This firm will be showing paper tape readers, punches, and combination reader/punches. Designed to sit between a terminal and its modem, the model 1560-S is a reader/punch with an RS232C interface. The punch operates at speeds of up to 60 cps; the reader can operate at switch-selectable speeds of 50, 75, 110, 134.5, 150, 300, 600, 1200, or 2400 bps, independent of the punch speed. Pricing on this firm's line ranges from $1,295 for the model 1060-P, a punch with parallel interface, up to $2,195 for the 1560-S. Oem discounts are available.

FOR DATA CIRCLE 328 ON READER CARD

Terminals

COMPUTER DEVICES INC.

Burlington, Mass. **Booth 1513, 1515, 1517**

ASR Terminal

With both a built-in, mini-cassette capable of storing 68,000 characters and an integral 8K byte random access memory, the Miniterm 1204 automatic send/receive terminal provides simultaneous transmit/receive capability; tape-to-memory, memory-to-tape, or either

tape- or memory-to-line transmission. The 20-pound terminal can operate at 110, 300, and 1200 bps transmission rates; its thermal, 5 x 7-dot matrix printer operates at 35 cps. An APL keyboard is available. The unit has an RS232 interface. You can lease the Miniterm 1204 ASR for $165/month on a one year lease, or you can buy it for $3,385.

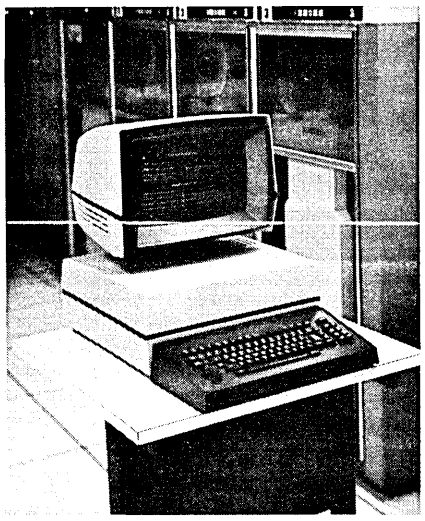
FOR DATA CIRCLE 325 ON READER CARD

INTERNATIONAL COMMUNICATIONS CORP.

Miami, Fla. **Booth 1360**

Terminal

Univac users rejoice! There's another alternative available in case you don't like the original manufacturer's Uniscope display. ICC has come out with a terminal that looks like the Teletype Dataspeed 40 but is set up for Univac protocol. It features fully buffered communications, full cursor controls, formatted data entry, protected fields, upper/lower case, dual intensity display, reverse video, diagnostics, etc. There are



editing functions such as character and line insert/delete, and 30 terminal commands for control. A choice of 12 or 24 lines of 80 ASCII dot matrix characters, displayed in 7 x 11-dot matrix fashion, is offered. You can get one as cheap as $4,550, but special features and protocol requirements can boost the price to $5,750 in small quantities.

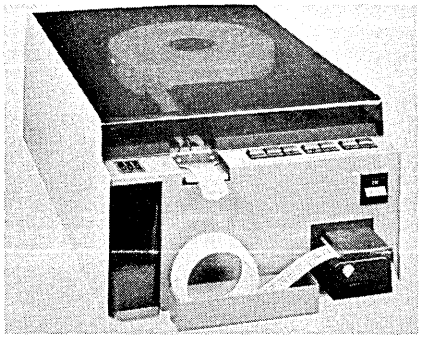
FOR DATA CIRCLE 351 ON READER CARD

DATA SPECIALTIES, INC.

Northbrook, Ill. **Booth 1525**

Terminal Peripheral

The SRP-300 is a combination tape reader/punch that attaches to terminals equipped with RS-232 interface jacks or current loop connectors. Full- and half-



duplex communications are standard; other built-in features include on-line/off-line operation, search/edit control, back space, tape feed, and selectable baud rates. It's priced at $2,095.

FOR DATA CIRCLE 341 ON READER CARD

QUESTRONICS, INC.

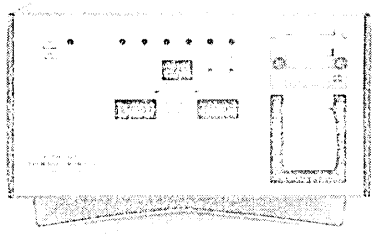
Salt Lake City, Utah **Booth 1645**

Terminal Monitor

The printing response time monitor model PRTM-102 maintains a printed

PRODUCT PREVIEW

record of the response time of interactive terminals, such as IBM's 3277 series. Response time information is printed, automatically or on command, on a



built-in twenty-column alphanumeric printer. Front panel switches allow the user to set a response time threshold which, when exceeded, causes printing of the transaction time and the time of day at which it occurred. This allows the user to correlate delays with other problems in the dp center, such as: shift changes, bad discs, and high channel activity. The PRTM-102 uses optical couplers positioned over the terminal's "input inhibit" cursor or light. In quantities of one to ten, the PRTM-102 sells for $5,700.

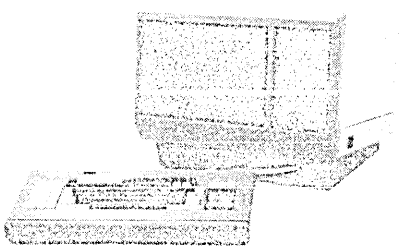
FOR DATA CIRCLE 361 ON READER CARD

TANDBERG DATA, INC.

San Diego, Calif. **Booth 1065**

Smart Terminal

The TDV 2114 is a display unit which may be used as a Teletype replacement, an intelligent terminal, or as a standalone processing system. It contains a microprocessor, which allows you to change operating modes by loading the appropriate program. Screen capacity is 2,000 characters; 25 lines by 80 characters. The character set consists of 95 characters, including upper and lower case. A 128 character set is optional. The TDV 2114 may be equipped with up to four 3M-type cartridge tape units and up to four floppy disc drives. One diskette or cartridge drive may be in-



tegrated in the TDV 2114 itself. The unit comes with a monitor program which is initiated when the power is turned on. A simple, two-character command loads TOS21, a more comprehensive operating system. Other programs available for use with the TOS21 monitor include utilities for handling files stored on tape or diskette; Intel 8080 assembler; a sequential text editor; and a cross-reference program. The TDV 2114 sells for $7,000. Delivery is 60 days A.R.O. beginning in the fourth quarter.

←CIRCLE 128 ON READER CARD

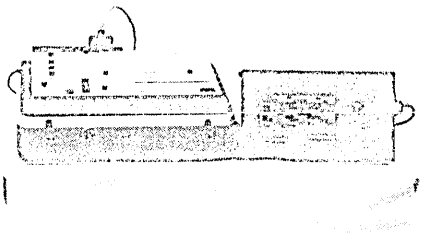
FOR DATA CIRCLE 333 ON READER CARD

ATLANTIC RESEARCH CORP.,

Alexandria, Va. **Booth 1067,1069**

Communications Testing

INTERVIEW is a programmable crt monitor for displaying data communication transmissions. It's intended for use with the manufacturer's companion product, INTERSHARE, with INTERVIEW providing the operator with a display of all data



traffic, or only traffic from a selected terminal or location. Visual observation of up to 1,024 characters in either text, hexadecimal, or octal format is provided at full- or half-duplex mode speeds ranging up to 56K bps. The unit is transparent to any data communication protocol and is just as happy analyzing SDLC and it is bisynch. It's priced at $3,150.

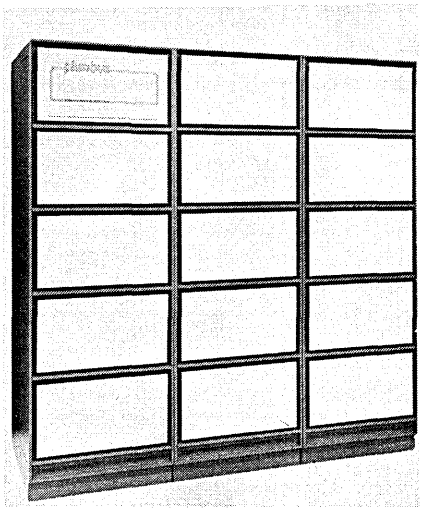
FOR DATA CIRCLE 348 ON READER CARD

BOLT BERANEK AND NEWMAN INC.

Cambridge, Mass. **Booth 1723**

Communications Processor

When the ARPAnet was first assembled, the designers needed a communications processor with several properties: high bandwidth, many terminal lines, and the ability to interface to a variety of mainframes. To fit this need, this firm developed the Terminal Interface Message Processor (TIP). Now there's a TIP for the general dp market. The Pluribus Multiprocessor uses a number of minicomputers, with both private and shared memory, to provide a reliable and adaptable TIP. Pluribus can interface to a number of mainframes. Currently



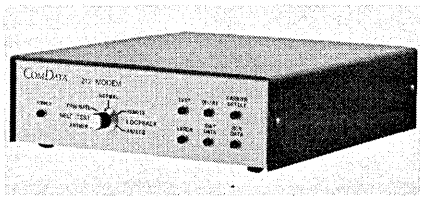
supported are DEC Systems 10 and 20 and PDP-11s; a 370 interface is being prepared. Mainframes can communicate between each other and their terminal network using the Pluribus. For $180,000 you can get the hardware and software to interface three mainframes to 100 terminals. Delivery is six months A.R.O.

FOR DATA 334 ON READER CARD

COMDATA CORP.
Skokie, Ill. Booth 1739,1741

Modem

The model 232-D2-43 is a 1200 baud modem on a pc card that mounts into the manufacturer's 330 "Basic Unit," and provides the capability of mixing



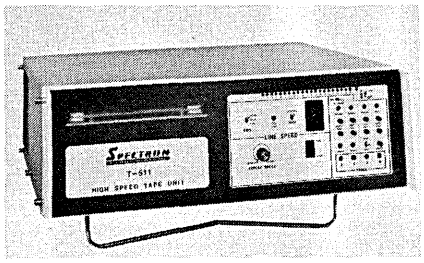
300 and 1200 baud ports in the same enclosure. The modem operates in full-duplex mode on four-wire lines, and half-duplex on two-wire set-ups. Each modem has an integral power supply, automatic answer, and display lamps showing four control and two data functions. The price is $225.

FOR DATA CIRCLE 369 ON READER CARD

SPECTRON CORP.
Mt. Laurel, N.J. Booth 20043, 2044

Communications Diagnostics

A high-speed portable tape unit that records all traffic on both sides of a data link for instant replay and analysis will



be shown in this firm's booth. The T-511 high-speed tape unit can store from 2.4 to 60 minutes of traffic (depending on transmission speed). Tapes produced at speeds below 44,000 bps can be replayed on the firm's model D-601 Datascope; tapes recorded at any speed may be replayed on the tape unit itself with a cable connection to any model Datascope. The T-511 is compatible with most forms of data transmission, whether synchronous or asynchronous, and uses a magnetic tape cartridge for recording both sides of the communication channel. Purchase price of the T-511 is $5,900. It is available 60 days A.R.O.

FOR DATA CIRCLE 332 ON READER CARD

TELCON INDUSTRIES INC.
Ft. Lauderdale, Fla. Booth 1883

Communications Computer

The Datamax 6 wears a lot of hats. It

Intel® delivers 370/158 and 370/168 memory that gets you where you're growing.

Growth. Your computer gives you insights that can help you chart the course. Choosing Intel memory gives you the flexibility to reach your goals.

When you first select 370/158 or 370/168, our in-7158 and in-7168 solid state memory systems stretch your computing dollar. Then, as you grow, adding Intel memory extends the useful life of your computer, efficiently and economically.

Turning to the industry's leading independent supplier of semiconductor memory makes sense when there's no room for compromise. Intel's proven performance offers bankable benefits you can't afford to pass up in this competitive world.

Each Intel memory system is self contained and is fully hardware and software compatible with the computer system it's designed to supplement. To help keep your computer working, our unique micro-computer-controlled maintenance program oversees all aspects of memory operation and implements comprehensive self diagnostics.

It all adds up to reliability and capital conserving expandability when you need it most. That's what hundreds of 370 users have come to expect from Intel. We deliver an extensive line of add-on memory for the 370 family. All designed to help you get where you're growing.

When you're planning a 370 installation, or expanding existing capabilities, that's the time to talk to your Intel system specialist. Phone us at 408/734-8102. Or send this ad with your card attached and we'll respond immediately. Intel Memory Systems, 1302 N. Mathilda Avenue, Sunnyvale, CA 94086.

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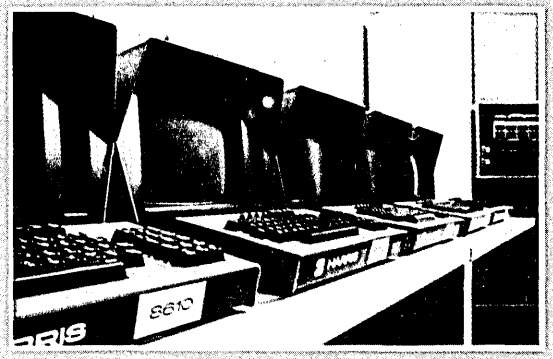
Data Entry

Remote Batch Processing

On-Line Interactive Processing



Stand-Alone Processing

Harris — A major new force in Distributed Processing.

Now there's a powerful new force in the fast-emerging distributed processing market. Harris supplies four capabilities that are basic to any total DDP system:

Remote Batch Processing with Harris entry-level, medium and high-function remote batch terminals;

Data Entry with Harris microprocessor-based CRT Key Entry Stations;

On-Line Interactive Processing with Harris intelligent, interactive CRT terminals;

Stand-Alone Processing with Harris computers providing concurrent timesharing, multibatch, and real-time processing.

Harris processing systems have the hardware and software to provide any of these capabilities separately or to support all of them concurrently.

Harris — A $600,000,000 high technology company now making a major thrust into the data processing market. Write for more information.

Harris Corporation, 55 Public Square, Cleveland, Ohio 44113

SEE US AT NCC — BOOTH 1333

HARRIS

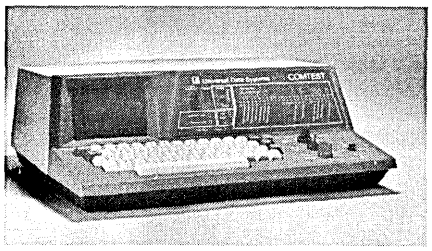
COMMUNICATIONS AND INFORMATION HANDLING

can serve as a time division multiplexor, communications concentrator, selector, buffer memory, or serve in any data communications conditioning role required by the user, we're told. Prices begin at $1,295. We'll all just have to wait until we get to Dallas to find out more about the Datamax.

FOR DATA CIRCLE 354 ON READER CARD

UNIVERSAL DATA SYSTEMS
Huntsville, Ala. **Booth 1601,1603**

Communications Testing
COMTEST is a data analyzer compact enough to fit under an airplane seat, yet capable of checking most problems that might occur with data communications systems. It identifies flawed characters with underlining, re-



verse imaging, or flashing. The microprocessor-based unit can be used on full- or half-duplex lines; it can even emulate the cpu of various terminal devices. A 16-line, 512 character crt display shows what's coming across the RS-232 interface. It's priced at $7,950.

FOR DATA CIRCLE 352 ON READER CARD

VADIC CORP.,
Mountain View, Calif. **Booth 1835,1837**

Modem
An historic occasion might well be the theme in this booth, for it's claimed that the VA317S is the first direct connect modem to be registered under the new FCC ruling that eliminates the requirement for the Data Access Arrangement (DAA) for Bell-compatible 103 or 113 modems. A resistor has been installed inside the VA317S to determine modem transmit level; adjustments are no longer needed at installation time. The 113B-compatible modem provides full-duplex transmission at data rates up to 300 baud over switched or leased two-wire telephone circuits. The VA317S is priced at $280/channel for 16 modems or $337.50 for two channels. Delivery is 30 days A.R.O.

FOR DATA CIRCLE 365 ON READER CARD

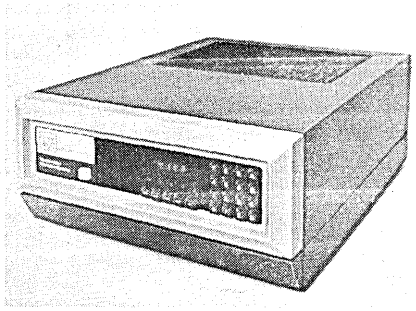
WAVETEK DATA COMMUNICATIONS
San Diego, Calif. **Booth 1253**

Communications Controller
The 1500 is a communications controller that features voice response, visual output, and Touch-Tone code input on the switched telephone network. It attaches to most computers via an ASCII RS232 asynchronous interface, with bi-synchronous communication planned. Communication speeds range from 110 to 300 baud. Up to 32 I/O lines can be accommodated. Communication to the host computer at speeds ranging from 1200 to 9600 baud is recommended. With 32 words of vocabulary, a basic unit is priced under $25K.

FOR DATA CIRCLE 368 ON READER CARD

WESTERN UNION INFORMATION SYSTEMS
Mahwah, N.J. **Booth 1166, 1168**

Multiplexor
The System 4100 is an intelligent time division multiplexor that can handle a wide range of synchronous and asynchronous data terminal equipment. Each 4100 can handle synchronous terminal lines with speeds up to 9600 baud and asynchronous lines with speeds up to 1200 baud. Up to 20 half- or full-duplex lines with various data rates can be combined. Control of the 4100 is under the responsibility of an 8-bit microprocessor with 16-bit address lines. The instruction repertoire includes 72 variable length mnemonics, seven addressing modes, a variable length stack memory, vectored restart, and maskable



interrupts. DMA, interrupt, and multiple processor capability are available. A 16-line system, including keypad and control panel, is priced at $5,930 in small quantities.

FOR DATA CIRCLE 335 ON READER CARD

Special-purpose Systems & Components

AMERICAN MICROSYSTEMS, INC.
Santa Clara, Calif. **Booth 1051, 1053**

Logic Analyzer
The MDC-140 is a computerized logic analyzer that's a handy aid in developing microcomputer applications on this vendor's equipment, but in addition, the 140 connects to other digital circuits through a set of probes. The 40-channel device can trace 1,024 program steps under software control. "Pages" of 16 lines are displayed on the 140's screen under user control: binary, ASCII, hex, symbolic lists, etc. The MDC-140 is priced something under $4K.

FOR DATA CIRCLE 350 ON READER CARD

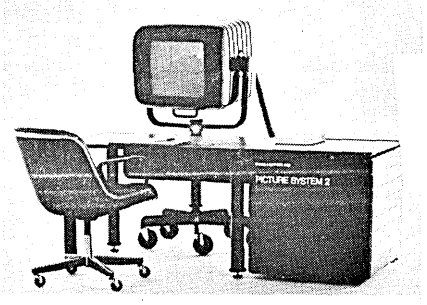
CALIFORNIA COMPUTER PRODUCTS, INC.
Anaheim, Calif. **Booth 1233**

Graphics and a Floppy
CalComp will show a graphics terminal, an on-line plotter controller, and a two-sided, double-density floppy disc drive. The Interactive Graphics Terminal (IGT) is a microprocessor-controlled terminal capable of graphic functions including pan, zoom, cursor tracking, and grid generation. It has a full ASCII keyboard and an RS232C interface. The IGT is priced at approximately $14,700, with first deliveries scheduled for September. The On-line Plotter Controller (OPC) is an intelligent interface, allowing specified CalComp plotters to be driven locally or remotely by a variety of computers and calculators. The OPC can accept data in serial RS232C format or IEEE 488 parallel format. Integral firmware can generate plotter commands for drawing lines and characters. The OPC sells for $3,500, with first deliveries in July. The 143M Floppy Disc Drive has an unformatted capacity of 12.8 megabits; a multifunction controller has been developed as a companion product. Single unit price for the 143M is $785, less applicable discounts, with delivery 90 days A.R.O. Controller price and delivery will depend on the specific minicomputer interface selected.

FOR DATA CIRCLE 343 ON READER CARD

EVANS & SUTHERLAND
Salt Lake City, Utah **Booth 1097**

Graphics System
The PICTURE SYSTEM 2 is one of the more powerful graphic systems around. It is capable of presenting dynamically moving pictures of two or three-dimensional objects. The hardware comprises a picture controller interface, picture



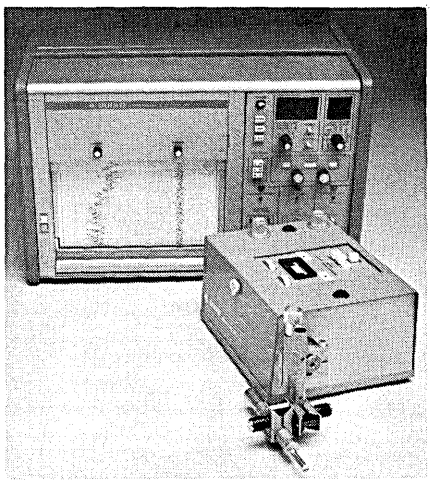
system data bus, picture processor, picture system memory, picture generator, picture display, and interactive devices. The controller is a mini, such as a PDP-11, but is capable of supporting multiple displays. A software graphics package is supplied with the system as a set of FORTRAN-callable routines that perform functions such as windowing, viewporting, rotation, translation, scaling, drawing, line texture selection, data positioning/detection, etc. Prices start at $65,500.

FOR DATA CIRCLE 359 ON READER CARD

GOULD INC., INSTRUMENT SYSTEMS DIV.
Cleveland, Ohio **Booth 1015**

Remote Graphics

This might just be an original idea. Gould has developed a remote graphics processor that decodes graphics information that can be coming over a communications line to an RJE or batch terminal. Appending the manufacturer's 5000 or 5005 printer/plotter to the terminal means that charts, graphs, and engineering drawings can be coming over the line at typical speeds of 9600 baud, or about one inch of electrostatic plotting/second. First terminals that will be supported come from Data 100, Harris,



Datapoint, and Sycor. The processor can also be used in standalone fashion direct to a mainframe through a modem. Pricing starts at $4,450.

FOR DATA CIRCLE 355 ON READER CARD

KEYTRONIC CORP.
Spokane, Wash. **Booth 1354, 1356**

OCR

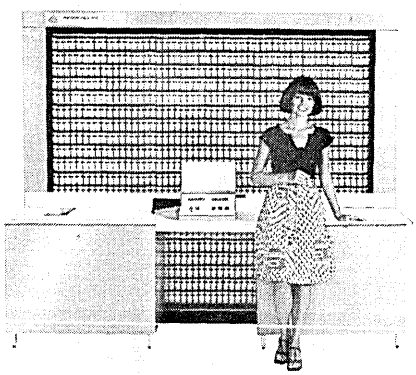
This firm will demonstrate its Datareader, an OCR document transport and reader. The Datareader reads one (or optionally, two) lines at a time, and handles forms from one inch tall by two and one-half inches long to six inches high and eight and three-quarters inches in length, making it suitable for scanning checks and other forms where the significant data are on one or two lines. The read-head is adjustable over the height of the document. Up to 3,900 documents per hour can be read. The Datareader will be demonstrated with the firm's M9 character recognition module. A basic one-font recognition system, including the Datareader and the M9, sells for between $18,000 and $23,000, with eight week delivery. Typically, fonts are priced at $1,500; OCR-A goes for about $4,500.

FOR DATA CIRCLE 326 ON READER CARD

INFODETICS CORP.
Anaheim, Calif. **Booth 1049**

Storage/retrieval

One of the more unusual products at this year's conference will be the 410/40, a closed loop document storage and retrieval system based on aperture cards or tab size microfiche cards. The advantages of such a system are that it can store very large quantities of written *and* pictorial information. Any microform in the system can be retrieved in a few seconds, it's claimed, and several users can be using the 410 simultaneously. Storage modules can contain from 200,000 to 11,200,000 documents (depending on reduction ratio and document size) on 3¼ x 7⅜-inch aperture cards or fiche. Cards can be selected in



groups and routed to a hard copy output station. The only unfortunate thing about the display will be that a mock-up will be shown; it takes too much time to set up the real thing, say the builders. The smallest capacity version is priced at $150K.

FOR DATA CIRCLE 366 ON READER CARD

LIPPS INC.
Santa Monica, Calif. **Booth 1668**

Magnetic Heads
This firm will be showing off a 20-track, one-half inch digital tape head. The firm says that the head can interface with most half-inch tape drive systems. In quantities of 100, this head sells for $300.

FOR DATA CIRCLE 331 ON READER CARD

MOTOROLA GOVERNMENT ELECTRONICS DIV.
Scottsdale, Arizona **Booth 1893**

Data Encription
Despite the mention of government in this vendor's name, these two data security modules are for commercial applications. The MGD6800DSM and MGD8080DSM (for Motorola 6800 and Intel 8080 microprocessors, respectively) use the new data encription standard approved by the National Bureau of Standards. These single-board modules permit microprocessors to transmit and receive secure data. In quantities of one to five, the MGD6800DSM sells for $475, the MGD8080DSM for $495. Both will be available in the third quarter.

FOR DATA CIRCLE 342 ON READER CARD

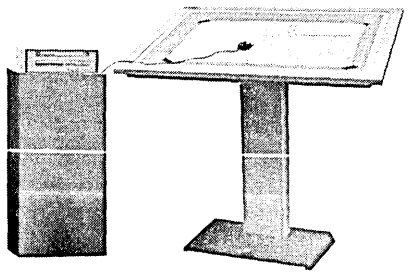
NORTRONICS CO., INC.
Minneapolis, Minn. **Booth 1266**

Magnetic Read/Write Head
The "Thrift" Head is designed for applications in electronic funds transfer, teller terminal, and constant cash terminals. It is said that the DURACORE magnetic alloy used in these two-track heads has a wear ratio ten times greater than conventional Hi-Mu 80 materials. In production quantities, the Thrift Head sells for $35; prototypes will be available in three months.

FOR DATA CIRCLE 345 ON READER CARD

SUMMAGRAPHICS CORP.
Fairfield, Conn. **Booth 1170**

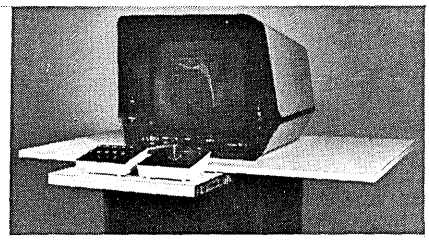
Data Tablet Digitizer
An Intel 8080 microprocessor-based digitizer designated the ID series will be announced. Incorporating intelligence into the digitizing process makes it possible to preprocess the digitizer's data, freeing the user from programming the computer. Current "board level" firmware includes relocateable origin, binary/bcd conversion, metric output, incremental operation, scaling, rotational correction, area calculation, distance measurement, and angle calculation. Several units may be displayed, with the largest one measuring 42 x 60-inches



and priced at approximately $6K.
FOR DATA CIRCLE 364 ON READER CARD

VECTOR GENERAL, INC.
Woodland Hills, Calif. Booth 1115

Graphics System
Any minicomputer equipped with fairly standard I/O specs can be equipped with the series 3300, a refresh graphics display. Two models are offered: the model 3301, which displays two-dimensional graphics and alphanumerics; and the 3302, which adds image transformation and rotation capabilities. The micro-

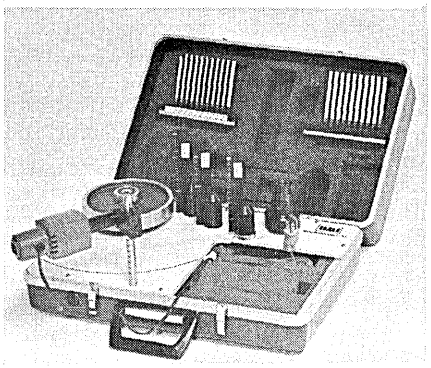


programmed units feature 2D digital transformations, variable speed vector and font generators, programmable graphic instructions, font transformations, optional refresh buffers, and subroutine stack capabilities. The high-speed unit can display 16,667 short vectors. Prices begin under $25K.
FOR DATA CIRCLE 340 ON READER CARD

Auxiliary Equipment

DATA MAINTENANCE, INC.
Rolling Hills Estates, Calif. Booth 1807

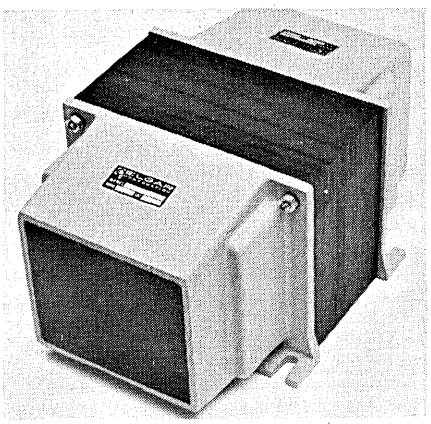
Disc Pack Inspector
The model 600 disc pack inspector provides radial and axial runout checks for all disc surfaces using a series of comb gauges. An illuminator and various mir-



ror towers allow for disc surface inspection. The model 600 inspects all standard IBM packs, Univac's 8416 and 8418, Burrough's B-206, CalComp's trident series, and CDC's 9762 data module in both packing densities. The model 600 sells for $2,350.
FOR DATA CIRCLE 327 ON READER CARD

ELGAR CORP.
San Diego, Calif. Booth 1008, 1010

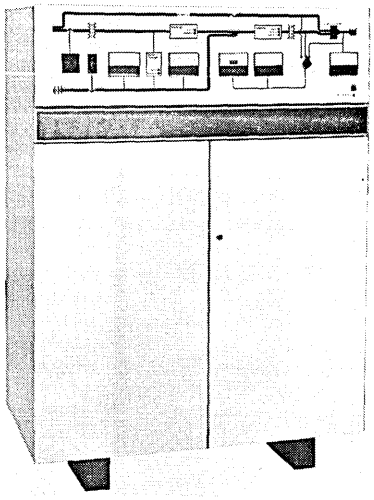
Isolation Transformers
Available in ratings from 1KVA, this firm's High Isolation Transformers (HIT) protect sensitive equipment from noisy power lines. The HIT's are said to reduce both common mode noise and transverse



mode transients caused by common mode noise by greater than 125db. All of the HIT's will be connectable for either 120VAC or 240VAC input or output, allowing them to be used as a combination stepdown transformer and noise isolation device. All models are rated for either 50Hz or 60Hz operation. The HIT's will be available from stock beginning July 1. Pricing starts at $290.
FOR DATA CIRCLE 330 ON READER CARD

TOPAZ ELECTRONICS
San Diego, Calif. **Booth 1177, 1179**

Uninterruptible Power Supply
The 81000 series of uninterruptible power systems has single-phase current outputs and are now available in 3, 5, 7.5, 10, and 15 KVA ratings. The developers claim they are especially applicable



to computer-based applications such as data acquisition, process control, communications, instrumentation, and security systems. Options include static transfer switch, audible alarm, and acknowledgement switch, etc. Prices for a basic 7.5 KVA system begin at $10,360 with delivery three to five weeks A.R.O.
FOR DATA CIRCLE 347 ON READER CARD

Software & Services

IMSL
Houston, Texas **Booth 1638**

Software
IMSL has seemingly saturated the mainframe market with its set of scientific and mathematical subroutines, and is now turning its attention to the mini marketplace. Now available for Data General's ECLIPSE series minis is a library of 178 FORTRAN subroutines. The library requires the use of DG's FORTRAN 5 compiler. The library is available for an annual license fee of $750 with an additional $470 for first time users.
FOR DATA CIRCLE 349 ON READER CARD

MRI SYSTEMS CORP.
Austin, Texas **Booth 1612, 1614**

Software
CONTROL 2000 is a data dictionary developed to operate with this developer's successful System 2000 data base management system. All the facilities traditionally associated with a data dictionary are said to be included, including the accumulation of information about data fields and records, schemas, reports, programs, and data base definitions. Standard reports pertaining to interrelationships of the various entities are provided, as well as "what if" modification impact reports. CONTROL 2000 is priced at $15K.
FOR DATA CIRCLE 337 ON READER CARD

TANDEM COMPUTERS, INC.
Cupertino, Calif. **Booth 1642, 1644**

Software
Tandem, the "failsafe" multiprocessor company, will demonstrate software packages called Envoy, Enscribe, and Entry. Envoy is a data communications manager providing high speed binary synchronous (56K bps) or asynchronous (19.2K bps) data transmission with an automatic calling facility. Envoy is included with the firm's Guardian operating system. Enscribe, a file and record management system, provides key-sequenced, relative, and entry-sequenced data access. It has a $4,000 license fee per customer, plus a charge of $1,000 per processor for microcode. The Entry screen formatter provides a method of creating and displaying user-defined forms on an interactive page-mode video terminal. It also provides validity and error checking. Entry has a $2,000 license fee.
FOR DATA CIRCLE 344 ON READER CARD

ADDED ATTRACTIONS . . .

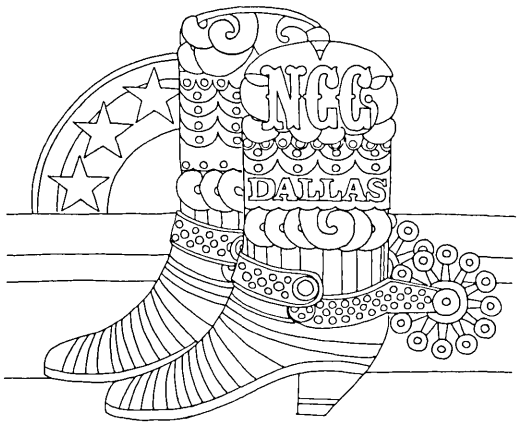
Computers & Systems

COMPUTER AUTOMATION, INC., Costa Mesa, Calif., booth 1465, will be making its biggest splash ever at a National Computer Conference. Featured will be the firm's well accepted SyFA distributed data processing system from the Commercial Systems Division; automatic test and simulation systems from the Industrial Products Division; and some as yet unannounced minicomputers slated for May 23 announcement . . . INFOREX, INC., Burlington, Mass., booth 1691, 1693, will be displaying the most significant product introduced in the company's history, the System 7000. Aimed at the distributed computing market, the 7000 allows users to perform data entry, data processing, file management, and data communications concurrently at all local or remote locations . . . MDB SYSTEMS, INC., Orange, Calif., booth 1081, will feature logic modules ranging from peripheral and communications controllers, memory modules, power supplies, to a backplane/cardguide assembly with expansions chassis—in short, everything needed to configure a DEC PDP-11 /03 equivalent system . . . WANG LABORATORIES, INC., Lowell, Mass., booth 2049, will be showing off recently announced additions to its stable of computing products. The PCS-II is a $6,200 system that includes a 1K crt screen, typewriter-like keyboard, processor and two memories, 8K of which are the user's. The WCS/25 is a 24K byte BASIC language-based system, while the WCS/40 is an extension of the forms processing market served by the WCS/25. It's intended to meet high volume requirements by providing more terminals for forms input, larger capacity disc storage, faster printers, and more processing capability . . .

Peripheral Equipment

DATAPRODUCTS CORP., Woodland Hills, Calif., booth 1273, will be announcing a slow speed line printer at the NCC. Few details have been released on the product, which apparently bears the name LP-1, but the designation could represent a whole new series from one of the leading printer manufacturers . . . MAXELL CORP. OF AMERICA, Moonachie, N.J., booth 1697, will proudly display its FD-3200S floppy disc medium. Designed for use on IBM 3740 or equivalent drives in data entry systems, it conforms to ISO, ECMA, ANSI, and IBM diskette standards . . . RAYMOND ENGINEERING INC., Middletown, Conn., booth 1820, 1822, will feature a tape drive for use with one-quarter inch cartridges. The 6413 Cartridge Raycorder is based on a design that has been sold for several years to the telecommunications industry. Several thousand such units are in use . . . SCI SYSTEMS, INC., will probably have one of the premier attractions of the show on display in booth 1172, 1174. It's an extremely fast nonimpact printer featured in our March issue (p. 238). The manufacturer may be ready to announce (or at least talk about) follow-on products that might include a 4,000 cps unit priced around $1K . . . SHUGART ASSOCIATES, booth 1085, the company founded by the designer of the original floppy disc while at IBM, will be announcing the SA805/851 double-sided, single/double density floppy disc drive. The double density capability, plus the increased storage capacity, raise prices approximately 25% across oem discount schedules . . . the Japanese will make their presence felt in Dallas (more than by buying up all the cowboy hats in the city). TOKYO JUKI INDUSTRIAL CO., LTD., through its Juki Machinery Corp of America post in Costa Mesa, Calif., booth 1086, will be showing an array of products. Perhaps of greatest interest to oem's will be the 5100 series drum line printer. Drawing from a character repertoire of 64 ASCII characters, the 5100 prints

at 350 lpm across 136-column lines. Paper tape handles format control (four or eight channels), and up to six copies can be produced. A toggle switch selects six or eight lines per inch character spacing. Hopefully, potential customers will be able to obtain an approximate price for the 5100—we couldn't. Also on display will be facsimile equipment . . .



Terminals

The APPLICATIONS GROUP DIV.of EPRAD, INC., Toledo, Ohio, booth 1759, will have one of the more interesting products at the show. The AG 60 is a full graphics and alphanumeric display terminal that uses plasma technology instead of conventional crt design to generate characters. The unit can be interfaced as a tty, or directly to Data General Nova 1200 series computers. Prices begin in the region of $5,550 . . . GENERAL ELECTRIC'S DATA COMMUNICATION PRODUCTS DEPT., Waynesboro, Va., booth 1585, will display its recently announced TermiNet Multi-Form Printer, and a magnetic tape-based terminal. The MFP can generate up to nine copies at 30 cps. Prices begin around $1,675 . . . MFE CORP., Salem, N.H., booth 1753, 1755, will announce that its model 5000 buffered data terminal now can be equipped with auto answer capability, a Bell 202-type modem controller, and 86/138 character block length selection at no extra cost. Announced about a year ago, the 5000 sells for just under $2K. One of the most interesting mobile data collection terminals announced recently will be displayed by MICON INDUSTRIES, Oakland, Calif., in booth 1352. Complete with ASCII keyboard, 32-character LED display, power supply, RS232 interface, and controlling microprocessor, and cassette storage, the Cassetterm is priced at $400 before oem discount schedules are applied. (The unit also is selling well to hobbyists.) . . . MI? CORP., Columbus, Ohio, booth 1583, will be showing its interactive printing terminal, the DESIGN 2400 KSR/T. The 1200 baud, switchable half- and full-duplex communications terminal features a programmable protocol interface board (it's an Intel 8080) which is user programmable to meet multiterminal demands. Priced at $4,440, the DESIGN 2400 KSR/T has been in the field about nine months . . . ONTEL CORP., Woodbury, N.Y., booth 1197, will be showing the OP-1, a user programmable display terminal that can have as much as 64K of memory. It operates standalone or downstream to any computer, say its builders. High level languages are available to aid in programming the OP-1. It's priced at $1,795 in orders of 100 . . . a National Computer Conference wouldn't be an NCC without TELETYPE CORP., Skokie, Ill., booth 1505. On display will be the model 43 teleprinter, a send/receive (KSR) matrix teleprinter. Featuring 10 or 30 cps operation, upper and lower case printing, and 132-column format, the 43 is compatible with Teletype model 33 machines . . . For VARDON & AS-

SOCIATES, Irving, Texas, booth 1251, it's just a short trip down the road to the NCC, and too tempting to pass up displaying its vs202 acoustic enclosure. Actually, the enclosure is marketed together with a complete terminal, which can be for TWX, DDD, or TELEX usage. The enclosures are said to decrease noise levels by approximately 50%

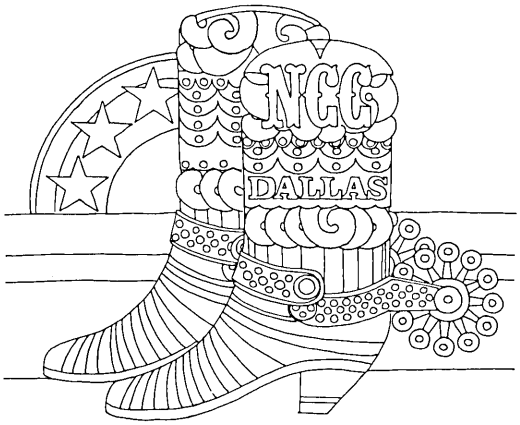
Communications

INTERNATIONAL COMPUTER PRODUCTS, INC., Dallas, Texas, booth 1511, will display what it calls a communications-oriented microcomputer, the TermiDisk, which we think is a misnomer. The device is actually a programmable floppy disc storage device for use with terminals. Memory for the TD-1 TermiDisk starts at 12K and can go to 64K bytes. Baud rates range up to 19,200, and the TD-1 can be used for unattended operation. More than one floppy can be appended to the system. Prices begin at $3,495 . . . NETWORK SYSTEMS CORP., Brooklyn Center, Minn., booth 1178, will show its HYPERchannel and HYPERbus high-speed local networking/information movement systems. The HYPERbus provides data transfer between devices separated up to 1000 feet at 50 megabits per second. HYPERchannel provides universal channel interconnect capability for host computers, storage subsystems, and I/O subsystems of most any manufacturer you can think of, we're told . . . PARADYNE CORP., Clearwater, Fla., booth 1616, 1618, will display its PIX-II, billed as a "virtual data link" that allows remote peripherals to communicate with 360/370 mainframes via SDLC protocol without the need for NCP or VTAM software. Also on display will be the MP-48, a microprocessor-based modem, and the SRM-192, an all LSI 9600 baud modem, will also be in the booth . . . T-BAR INC., Wilton, Conn., booth 1811,1813, 1815, will display peripheral switching equipment for IBM, Univac, NCR, and Burroughs mainframes. Additionally, switches for virtually every major minicomputer builder will be shown. The minicomputer switches are primarily used in distributed processing applications and in on-line inquiry/response systems . . .

Special-purpose Systems & Components

DATAROYAL, INC., Nashua, N.J., booth 1295, 1297 will be showing off its recently introduced IPS-7, an intelligent printing system. Its purpose in life is to take keyboard data input and generate materials handling labels in different sizes and formats . . . HENDRIX, Manchester, N.H., booth 1157, 1159, will be showing its TYPEREADER, an optical page reader designed to read data prepared on ordinary office typewriters. The TYPEREADER reads either OCR A or OCR B with accuracy better than one error in 20,000, it's claimed. It has a suggested end user price of $14,900 . . . INTERFACE MECHANISMS, INC., Mountlake Terrace, Wash., booth 1845, will show its model 9210 bar code reader that uses a word scanner. Any popular bar code can be read with the 9210; a light pen available for it can be used to scan characters bidirectionally at rates up to 50 ips. Variable length messages up to 64 characters can be accommodated . . . MOHAWK DATA SCIENCES CORP., Parsippany, N.J., booth 1460, is bringing the most significant products it has announced in several years to the NCC, the systems 21/20 and 21/40 (see March, p. 236). System 21/20 is programmed for data entry and validation under control of user-supplied formats and is expandable to four operator stations. The 21/40 is fully programmable by the user and can be adapted to a wide variety of distributed tasks, from extended data validation to full transaction proc-

essing . . . One of the application requirements that is allowing voice input technology to gain a foothold is mobility, especially for the user to use his/her hands. One of the leaders in the industry, THRESHOLD TECHNOLOGY INC., Delran, N.J., booth 1017, will show a wireless option for its systems that includes a miniature FM transmitter to broadcast the data to a companion receiver. Operating range can go up to 1,000 feet, depending on local conditions . . . VERSATEC, Santa Clara, Calif., booth 1165, will conduct a time and motion study at NCC. Known pen plotter times will be compared to the manufacturer's 36-inch wide electrostatic plotter and will lose by over two orders of magnitude, it's claimed . . .



Auxiliary Equipment

KEY TRONIC CORP., Spokane, Wash., booth 1354, 1356, will show its logic engine No. 1 series (LE 1 Series) MOS LSI keyboard that contains a 4,592 bit ROM for encoding up to 112 capacitive keyswitch closures into usable 10-bit codes. The use of N-MOS technology eliminates the need for 12 volt power necessary for most other keyboards . . . proving that the NCC has something for everybody, KNICKERBOCKER CASE CORP., Chicago, Ill., booth 1202, will display a line of computer service (field engineer) tool cases including printed circuit board cases . . . MAGNUSONIC DEVICES, INC., Hicksville, N.Y., booth 1725, will display 7- and 9-track IBM compatible tape heads, 2314-type disc heads, floppy disc heads, and read/write heads for cassette and cartridge devices . . . RANDOMEX, INC., Rancho Palos Verdes, Calif., booth 1805, will show the model 435 fully automatic disc pack cleaner for IBM 1316, 2316, 3336-1, 3336-11, Univac 8440, 8416, and 8418; Calcomp's Trident series, Burroughs B-206, and CDC's 1876/9877 or equivalent media. Users are invited to bring along "problem" packs for cleaning on the convention floor. All you have to do is convince the guards you're not up to something sneaky! It hasn't been decided how many uninterruptible power systems INTERNATIONAL POWER MACHINES CORP., Mesquite, Texas, booth 1626, 1628, will bring over to Dallas, but the vendor promises at least three, ranging in power from 15 KVA up to 375 KVA. Interested parties might be able to talk reps at the show into visiting the nearby manufacturing facilites . . .

Software & Services

This edition of the NCC seems a little thin in software and services turnout, but MANAGEMENT SCIENCE AMERICA, INC., Atlanta, Ga., will be there in booths 1071, 1073. MSA claims to be the largest independent supplier of financial software (especially payroll systems) in the U.S. with more than 2300 users. The MSA general ledger system will be shown, which already has more than 450 users. ✲

Dallas: Welcome to the Buffalo Hide Capitol

by Robert Alexander, Southwestern Correspondent

Greenville for swingers, the European Crossroads for shopping, the Olla Podrida for local arts, food from Creole to barbecue, rodeo, a Texas-style Disneyland, and a little piece dedicated to John F. Kennedy.

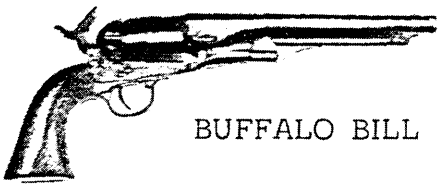
Dallas' neighbor, Fort Worth, bills itself as the city "where the West begins," causing numerous wags to remark that Dallas, some 30 miles closer to the Mississippi, is where the East peters out.

This doesn't mean that Big D is a false-front, hitching post town with no hint of a cosmopolitan air. In comparison with downtown Fort Worth, Dallas is Paris on the Trinity. However, when stacked up against New York or Chicago, it is sort of small towney—and we think you'll like it that way.

For instance, Dallas has no real problem with things like midnight muggings in the metropolitan area; not that you'll be wandering the downtown streets much after dark anyway. There's nothing to see except store fronts, and they will all be dark after 6 p.m. But, there *is* considerable action in other parts of the city.

We hasten to say you will not be disappointed in Dallas, whatever your tastes. Just be thankful the National Computer Conference wasn't slated here when there was no liquor by the drink, as late as about 1970, and you had to walk from club to club with your booze in a brown paper sack.

Many first time visitors remark that so much of Dallas seems "brand new,"

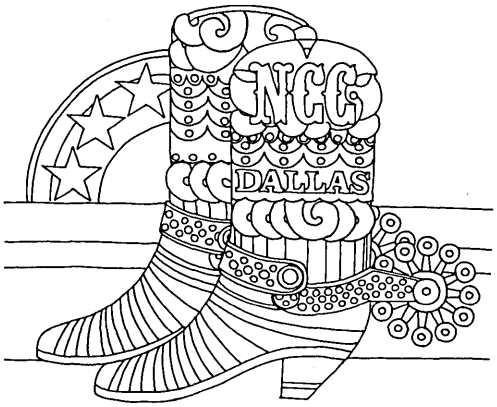


BUFFALO BILL

and it is. Whereas Boston and New York have been around for over 200 years, Dallas didn't have a log cabin to its name till 1841. John Neely Bryan built that one as his trading post headquarters and you can still see a replica of it across from the turreted 1890 Courthouse.

Dallas' first claim to fame came in the 1870s, when it was called "The Buffalo Hide Capital of the World." Some of those hide traders stuck around after the buffalo were killed off and Dallas is now quite a fashionable apparel center. Styles change!

The great percentage of downtown high-rise buildings weren't built until the 1960s and the Convention Center, where NCC sessions and exhibits will be located, has been open only a few



years. It can accommodate 28,000 persons and, in true Texas style, is five stories tall and covers an area larger than four football fields.

Incidentally, the NCC will pretty well have Dallas to itself that week in June. Except for local citizens, the only other group in town will be the Southwest Legal Foundation, which is having a two-day symposium on private investments abroad.

Bigger than Manhattan—the airport, that is

The Dallas/Fort Worth International Airport will be the first bit of Texas most of you see, and it needs a few words of explanation. As the pilot of the French Concorde said after he flew in for the grand opening several years ago: "Somebody sure sold them a bunch of concrete."

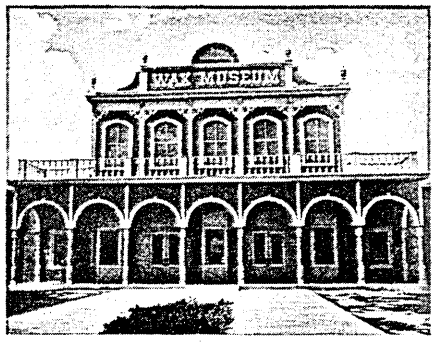
It is big. In fact, the land area of the airport is larger than Manhattan Island, but not nearly so crowded.

Now that it has been in operation for some time, those of us who use the airport regularly are convinced it is an efficiently designed place. However, it may confuse newcomers. All we can say is "Watch the signs, and take the south exit." That's the exit which takes you to downtown Dallas. The north exit takes you to Oklahoma.

The airport is served by Surtran, which stands for Surface Transportation, and includes both taxi and bus service to the city. There is also a cute little computer-operated system of driverless cars called Airtrans, which convey passengers to and from various sections of the sprawling airport, but you won't need to be involved in that operation.

Surtran buses leave the airport at regular intervals and will drop you at the downtown Union Terminal, a short ride from most hotels. The price from the airport to the downtown terminal is $3.00 (or $4 right to the hotel for most major hotels) and it takes about 45 minutes. A Surtran cab ride is closer to $14.00 and takes about 30 minutes—about a dollar per minute saved.

A word about cabs in downtown

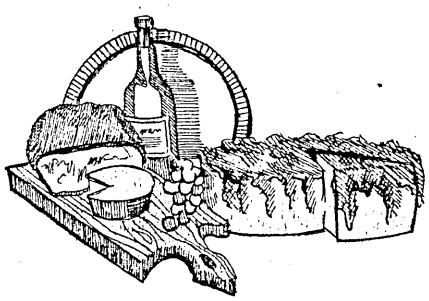


Dallas. The meter will read $.65 when you get in. That makes the first mile cost $1.25, with subsequent miles at $.60 per. There used to be some goofy law that insisted that you could get a cab only at designated cab stands. But,

that's changed, and you can now hail a downtown cab. You can get to even the most remote action centers for about $5.25.

Dallas after dark is, well, dark

We insisted that Dallas after dark is just that—dark. But there are a host of excellent restaurants and clubs located in the hotels, and those you can find with no problem. By the way, try to catch the bright young group of talent that makes up the supper show at Incredible Charlie's in the venerable Adolphus Hotel.



Restaurants run the gourmet gamut from barbecue to Creole and Greek to Korean. (If my 1950 experience with the 7th Infantry means anything, that Korean place may not be too crowded.)

The eating establishments are scattered all over town, but a visitor can catch most of them in either one of two spots: the Bachman Lake area, or Greenville Avenue's restaurant row.

The Bachman Lake location, which also features a unique shopping center called the European Crossroads, is about 10 or 15 minutes from downtown. Within a five-block area you'll find a dozen or more excellent establishments.

Greenville is more of a young swinger's locale, with numerous disco houses, singles' bars and some fine restaurants. It's also about a 15-minute cab ride from downtown.

Make sure that you taste some Texas barbecue for lunch before you leave Dallas. There are a raft of bbq joints and, although many are just holes in the walls, most are good.

Any members of the Chili Appreciation Society International will be overjoyed to hear that one of the founders of the society, *Dallas News* columnist Frank X. Tolbert, has opened Tolbert's Texas Chili Parlor and Museum of Chili Culture on Main Street, near the Kennedy Memorial Plaza downtown. Frank cautions friends to stop in after 1 p.m., saying: "It's just too damn crowded at noon."

A place for remembering

The Kennedy Memorial will, we are sure, be on many persons' list of things to see in Dallas. It is a landscaped block at Main and Commerce Streets; and a granite marker at Houston and Main designates where the President was slain during the 1963 motorcade. Nearby, at 501 Elm, is the John F. Kennedy Museum, a private establishment with a detailed model of the motorcade route, films, narrations, mementos, and research materials.

The original downtown store of Neiman-Marcus will be an attraction for many visitors. Neiman's is at Main and Ervay, but you may walk by without realizing it. The name of the store is traditionally understated on a 15-inch bronze plaque at the corner—although they could probably afford a much larger sign.

The Olla Podrida, a marketplace of arts, crafts, and collectibles will probably be on the tour list for shoppers, as well as the Quadrangle Shopping Center. If you've got the time, they are both worth seeing. Take money.

Unique in Dallas is an oil painting of the Miracle at Pentecost, which truly brings this Biblical happening to life. The painting is 20-feet high and 124-feet wide. It depicts more than 150 figures in life size. In a three-dimensional theatre setting, with a full symphony orchestra background, narration, and theatrical lighting, the painting transforms the viewer into the temple itself. For students of the Bible, it is a moving experience.

And for fun

Another "moving" experience for those who have never seen one is a rodeo. They go on each Friday and Saturday night in the town of Mesquite, about ten miles east of Dallas, in case you're coming in early or staying an extra day.

Football buffs who pine to see where NFL jocks put on their pads can tour Texas Stadium, home of the Dallas Cowboys. Guided tours are conducted daily and include visits to the super-elegant private Circle Suites where the more moneyed of Dallas sports fans watch the game from boxes furnished in a range from chromium modern to mid-Victorian. The Press Box is on the tour, along with the player dressing rooms, and you'll even get a chance to tear across the Tartan turf.

Six Flags Over Texas, a sort of junior Disneyland, is a fine spot for the young at heart to visit. It takes hours, but you can ride the Runaway Mine Train, the Log Ride, Big Bend, share adventures with pirates on Skull Island, and try the Texas Chute Out, a parachute-basket ride that drops you 17 stories. Six Flags is at Arlington, Texas, about 15 miles west of Dallas.

Chances are that few, if any, computer-oriented professionals will be interested, but we might mention that sightseers seeking what are called "topless joints" will find a plethora of them along Harry Hines Boulevard.

Yes, you'll enjoy your stay in Dallas, whatever your taste. Again, take money! ❋

Seven tough problems in "On and how Tandem's "NonStop"™

The Tough Ones.

1. System Down—Processor Failure.
2. System Down—Disc Failure.
3. System Down—Repairing Hardware.
4. System Down—Restoring Data Base.
5. System Down—Software Failure.
6. System Down—Changing to a Larger Processor.

Lots of things change when you go "on-line." Mostly for the better. That's why this is the most important trend in data processing today. But the one area which concerns management the most is "What happens when the computer goes down?" It's a good question, and until Tandem introduced "NonStop" processing last year the answers weren't pleasant. Service is interrupted; that's bad enough. But there is worse news still. At the instant of failure, a transaction in process could be lost (or duplicated), a record being updated could be destroyed, or a pointer changed incorrectly could cause the loss of untold records. In short, loss of service is the surface cost. Loss of data base integrity is an even greater problem. Tandem's NonStop System, hardware and software, is the first top-down, designed-in solution to both these problems. To make it even better, we've designed it so it's easy to program, easy to expand, and easily the most efficient transaction processing system around.

1. System Down—Processor Failure.
Every computer will fail sometime. The bigger they are, the more often they fail. Tandem has replaced bigness with a unique multiple processor architecture. Workloads are shared by the processors under control of Guardian, the only NonStop Multiple Processor Operating System available regardless of price class. When a component fails, Guardian automatically reassigns both processor and I/O resources to ensure that in-process tasks including file updates are completed correctly. You decide the priorities; Guardian does the work. And no interruption of your "on-line" workload occurs. Restart is virtually instantaneous.

2. System Down—Disc Failure.
When one of your disc storage devices fails in the middle of a file update, unknown damage to the record, to record pointers, or to indices can occur. Enscribe, Tandem's NonStop Data Base Record Manager, ensures that the damaged record is restored; and, with our optional Mirror Volume duplicate file technique, that operation is continued using the back-up file. The back-up files are created automatically and are used by Enscribe to improve system response time. When the down disc is repaired so are its files, automatically, by Enscribe. You decide which volumes to back up; Enscribe maintains them, and no interruption of service occurs.

3. System Down—Repairing Hardware.
With any system, a hardware failure must be repaired. But only with Tandem can the system keep operating, right through the failure and through the repair, too. Tandem's Customer Service Representative can remove and replace any failed module in your system without interrupting service. The operators at terminals and the programs in process are totally unaware of either the failure or the repair. And routine maintenance, too, is performed with the system fully operational. This is one more unusual feature of our system, but without it, no system can truly be called "NonStop."

4. System Down—Restoring Data Base.
When a hardware failure occurs during file update in any "on-line" system which is not NonStop, there is every reason to question the integrity of the data base. Integrity of the data base is crucial. For this reason, elaborate procedures to maintain restart points and backup files are required in almost all "on-line" systems. Not with Tandem. Using Guardian and Enscribe, the Tandem NonStop System ensures that all transactions are completed correctly even if a processor, I/O channel, disc controller or disc drive fails during that transaction. Equally important, the system downtime normally required for "restore" and "restart" operations is eliminated.

5. System Down—Software Failure.
System software crashes are an important source of downtime in ordinary on-line systems, but not in Tandem installations. Because all Tandem software is designed and tested to run in a multiple processor environment, it is also designed and tested for failure modes never considered in single processor systems software. Most important, the use of independent processors, each with its own memory, assures that a software failure in one processor cannot cause a failure in a second processor or contaminate the data or programs executing in that processor.

6. System Down—Changing to a Larger Processor.
On-line systems tend to grow, and as they grow they change. New applications, more stations, improved service; all of these result in a need for bigger, faster processors. With Tandem's NonStop System you can actually add processors, add memory, and add peripherals without any re-programming whatsoever. Using Guardian, Enscribe, and Envoy, Tandem's Data Communications method, all user programs and all files are geographically independent. They have to be for NonStop operation. You can also write your programs using a powerful high-level compiler for a multiple processor environment as easily as for a single processor.

7. System Up—Confidence Down.
When an "on-line" system is up, people come to rely on it. And because today's computers are reliable, people have come to rely on them quite heavily. Which makes it even worse when the system does go down, or the information it supplies is wrong. Confidence is severely damaged. And anyone who has tried manual back-up systems knows that they are not the answer. An automatic back-up, non-stop system is the answer. And Tandem has it.

Line" Data Base Systems System solves them.

Tandem offers a proven, field tested solution to the two principal questions everyone should ask about an "on-line" data base system: What level of service will it provide? What protection does it offer for my data base?

Someday all "on-line" systems will be NonStop. Tandem 16 Systems are NonStop today. And without price penalties. Not everyone needs an on-line, real-time, non-stop system, but for those who do there isn't another solution worth thinking about. Tandem Computers, Inc., 20605 Valley Green Drive, Cupertino, California 95014 or Tandem Computers GmBH, Bernerstrasse 50A, Frankfurt 56, West Germany.

Toll Free 800-538-9360 or 408-255-4800 in California.

Guardian

Multiple Processor Operating System

NonStop operation.

Automatic re-entrant, recursive and shareable code.

Virtual memory system.

Geographic independence of programs and peripherals.

Enscribe

Data Base Record Manager

Provides relative, entry-sequenced and key-sequenced files.

Each file may be up to four BILLION bytes.

Up to 255 alternate keys per file.

Optional mirror copy by disc volume.

Envoy

Data Communications Manager

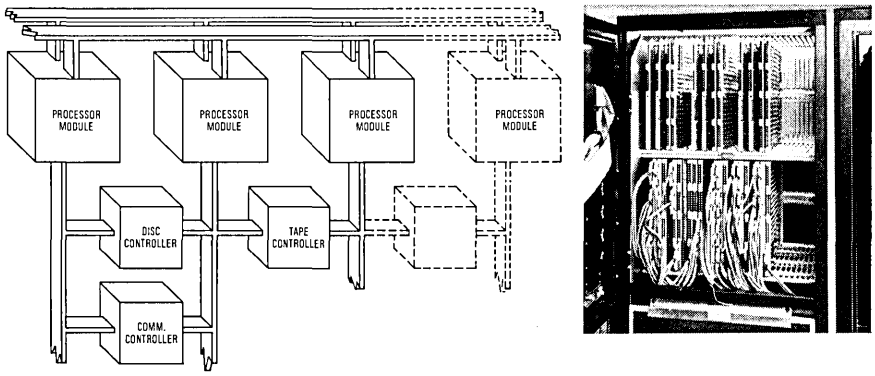
Communications with remote devices and/or processors.

Support of point-to-point, multi-drop, master and/or tributary.

All transfers via DMA.

Speeds up to 19.2Kb asynchronous and 56Kb synchronous.

Photo and schematic show three processor modules with space for fourth module, interconnected to disc controllers, tape controllers and communications controllers.



TANDEM

The Tandem 16 NonStop System is composed of multiple, independent processors with dual redundant communications paths. The unique interaction between Tandem hardware and software assures not only continuous operation, and the integrity of your data base, but also throughput unmatched by any other computing system of comparable cost.

WHY FENWAL IS THE FIRE PROTECTION COMPANY OTHER FIRE PROTECTION COMPANIES HATE.

Fenwal has always set the standards for Halon-based fire suppression systems.

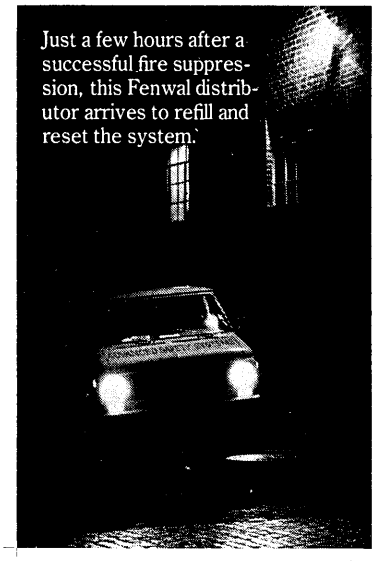
Trouble is, a lot of our competitors get a little frustrated trying to keep up with these standards.

WE'RE THE HALON EXPERTS

Fenwal pioneered the use of Halon 1301, the fast, clean, dry suppressant. Halon systems are our specialty. And we make it all—from sensors to control panels and agent storage containers.

CUSTOM DESIGN & INSTALLATION

Fenwal modular fire suppression systems are custom designed to meet specific hazards, room sizes, environments. To give the right concentration—in the right place—at the right time. And they're systems that can grow with you—inexpensively.



Just a few hours after a successful fire suppression, this Fenwal distributor arrives to refill and reset the system.

NO WAITING AROUND FOR SERVICE

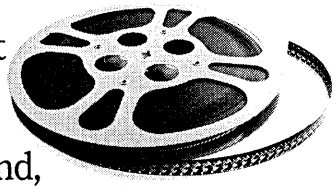
Fenwal's international team of distributors are constantly being trained and kept up-to-date. To provide the best pre- and post-installation service anywhere. And at any time. When you buy a Fenwal fire suppression system, you can be sure of the best follow-up service available.

Factory-trained distributors provide around-the-clock service just for you. With UL approved refilling facilities. With repair parts. And without a lot of waiting around.

BUT SOMEBODY LOVES US

Maybe setting these kinds of high standards hasn't made us very popular with some of our competitors. On the other hand, our customers seem to like us a lot. We install more Halon fire and explosion suppression systems than everyone else in the business. And we've got more satisfied customers.

So if you'd like to find out how to become one of them, send for our free film, "The Fireeaters". Or write for our free booklet on Fenwal's approach to fire suppression.



It's won us a lot of good friends.

Write Fenwal Incorporated, Ashland, MA 01721. A Division of Walter Kidde & Co., Inc. Our local full service distributors are listed in the yellow pages under "Fire Protection".

FENWAL®

Nobody in the world has more experience in fire and explosion protection systems.

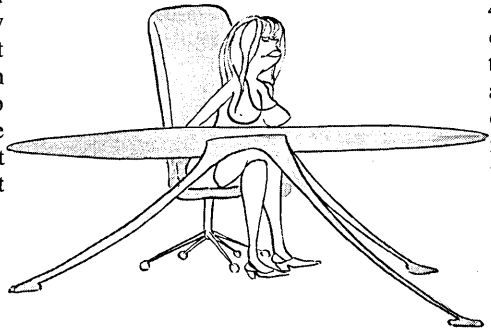
The Advanced Manager

by Gordon Watt

There are always gaps in all management texts. More often these gaps are sensed rather than observed. It should be the objective of an advanced management course to shed light on these areas and to fill them in. The following is an attempt to cover some of this missing material.

1. Don't tell others what you know! Spend a long time on any particular job and make sure no one knows *how* you do something or even *what* you do. Forget job manuals! Destroy any you see on sight! This will ensure that you can always do things your own way as nobody else will know how to do them anyway. It will also increase the firm's hesitancy to replace you as it would take them too long to figure out what you were doing.

4. Use raw fear. Very effective. Eat one employee live each morning. Listen to no suggestions. Brook no disagreement. This will ensure that your directives will never be disregarded nor questioned, as everyone will be too concerned about their own skin.

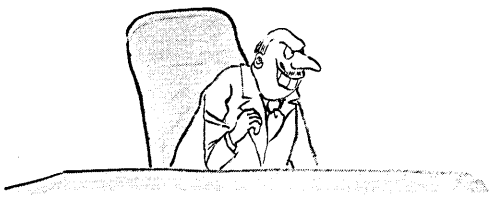


3. Be attractive to someone higher up the ladder than yourself—a simple ploy, yet effective. If this route is open to you, don't overlook it because it is obvious and basically simple. This is a very strong tactic and is as effective today as it was in Delilah's.

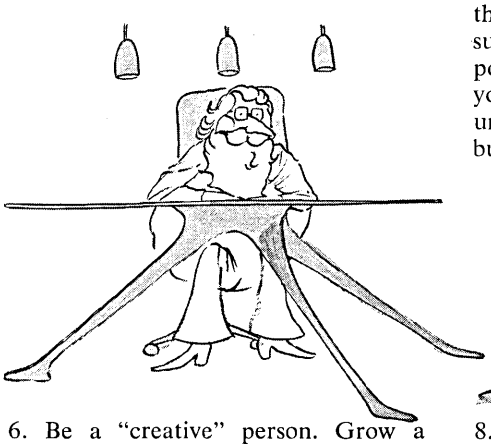
2. Hold meetings. It is always important to remember the conditioning of the masses. The masses are conditioned to view meetings and conferences as important and productive. More importantly, meetings are only held by *important* people. Ipso facto, if you hold meetings you are an important person. A skilled manager can stretch a discourse on the relative merits of square paper clips over an entire morning!

5. Be an authority on all the current management theories: Management By Objectives, Transactional Analysis, Herzberg hygienic theories. Always be the first to attend a management seminar. In this way you will always be able to say, "according to Drucker. . ." You fill in the blanks.

THE ADVANCED MANAGER



7. Be a womanizer. Probably one of the most intrinsically satisfying pursuits for men in management. Your position can only serve to strengthen your hand here. True, this approach is unlikely to advance your career at all, but while it lasts. . . .



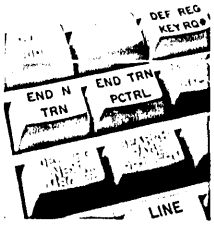
6. Be a "creative" person. Grow a beard. Become an expert in some more or less esoteric area such as human resources or public relations. Strive to create the impression that whatever you do is an art rather than a science. (Remember that this is basically only an illusion and do not fall into the pitfall of believing it yourself!)

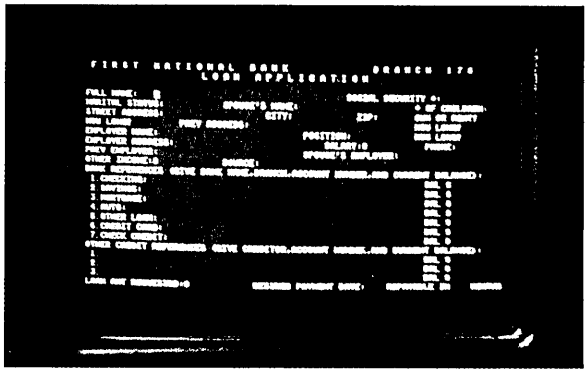
8. Play the office politician. This technique contains all these ingredients, and more: danger, excitement, scandal, revenge, and humor. But beyond this, it also offers excellent prospects for advancement. Learn to plant rumors. Stab someone in the back. Divide and conquer. Cultivate the right people.

9. Be indecisive. Spend the whole day pondering the alternatives at hand. Never give in to the impulse to make a decision. If you never make a decision, you can never be blamed for making an incorrect one! Sooner or later the normal course of events will force a decision on you. But statisticians tell us that a good executive need only be right slightly in excess of 50% of the time. And the laws of probability indicate that whatever course of action you take, you will be right in any case 50% of the time. Then too, it is a simple matter to blame any really unfortunate occurrences on someone else. ❋

Faster, more accurate data entry with powerful terminal software:

Data Entry Level II Software
for Incoterm Series 30 and Series 40
Intelligent Terminal Systems





IDES II.

IDES II is an advanced, application-oriented Level II Data Entry software package. It helps an Intelligent Terminal make maximum use of your data gathering network. Helps make your people more productive.

Now you can greatly streamline entry procedures; provide extensive editing and validation.

Operators key in only new data to the form and depend upon program control for instant data editing and interactive validation routines.

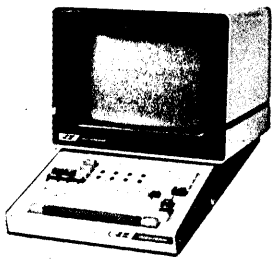
Arithmetic functions are supported, as are batch controls, page subtotals, form totals, batch balance checks, conditional branching forward or back throughout up to 255 form pages.

Operators can reference the central data bank during data entry; to see if an insurance policy is active or cancelled before processing a claim, or if a freight station is served before creating a waybill.

Entered data is stored locally, ready for a polled request from the computer or for later batch transmission. Your entire data entry staff can continue to process data even when the computer or communication lines are down.

If your business generates data at remote action centers, why not learn more about IDES II from INCOTERM? Write or call for complete details.

More power to your terminal.



INCOTERM® CORPORATION

65 Walnut Street, Wellesley Hills, Massachusetts 02181 Telephone: (617) 237-2100.
Sales and customer service offices in major cities throughout the United States and abroad.

Make your move to painlessly with Datapoint's

Getting computer power out where the action is can be a system jigsaw puzzle — you can't be sure what equipment will best match the needs of your various field facilities, and whether it will fit in with the rest of your network plans.

Relax. With Datapoint's complete and compatible family of dispersed processors and peripherals you can keep the field offices running smoothly and be assured that an upgrade or change won't entail complete software redesign. Nor will your network be a computer hodge-podge that requires constant tuning.

A compatible family

With Datapoint you can pick the amount of processing power needed for each site and then select the appropriate peripherals. For example, any Datapoint processor can use any Datapoint printer. And there's a wide range of memory storage units ranging from diskettes to mass storage disks. Product compatibility means that you can plug in a more powerful processor later and keep the same peripherals.

With compatible software

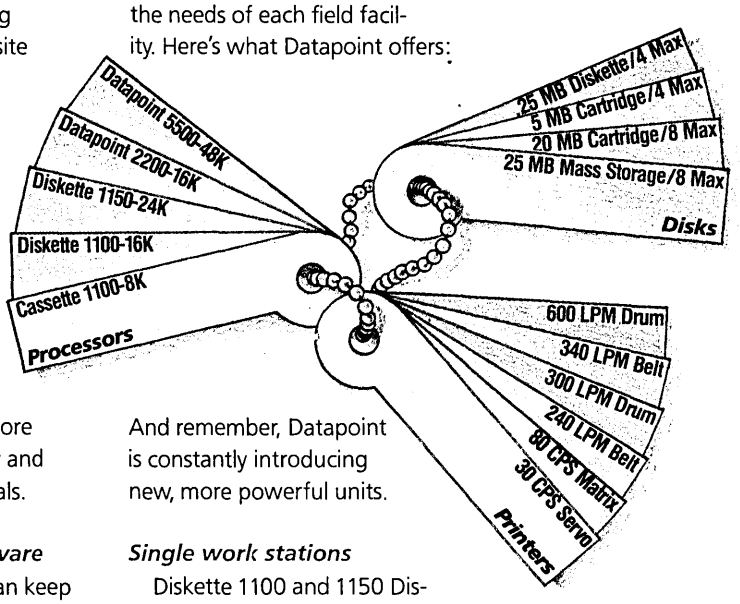
With Datapoint you can keep the software, too. For openers, the Disk Operating Systems are all upward compatible (utilities included). The DATABUS® program you wrote for the Diskette 1100 installed last year in a field office can be loaded into that office's multi-user DATASHARE® system and run — generally without changes. Your software investment remains secure.

Mainframe or not

If you have a mainframe, good; the field Datapoints will make it more productive than ever. If you don't have your own mainframe, then look into putting all the workload on your network of Datapoints. A lot of sophisticated users are doing just that.

Pick a system, any system

Network builders need to be able to specify the precise amount of computer power and peripheral capacity to match the needs of each field facility. Here's what Datapoint offers:



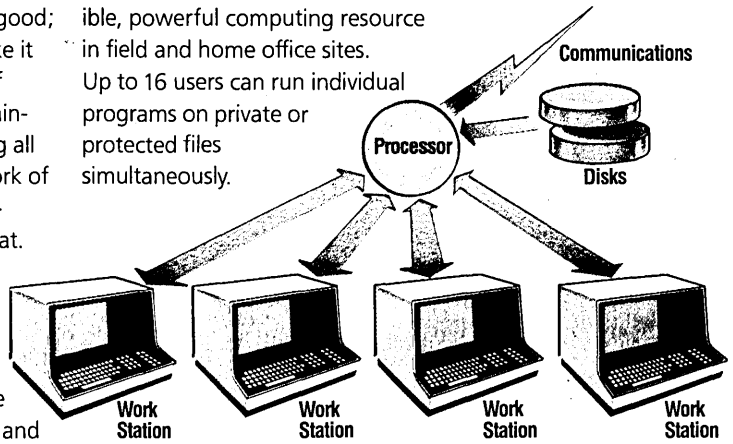
And remember, Datapoint is constantly introducing new, more powerful units.

Single work stations

Diskette 1100 and 1150 Dispersed Processors offer built-in keyboard, video displays, and diskette memories, and a choice of either 16K or 24K processors. You can enter data, check local data bases and communicate to a central computer concurrently, too, if you need that capability.

Multiple work stations

DATASHARE, Datapoint's Business Timesharing System, puts a flexible, powerful computing resource in field and home office sites. Up to 16 users can run individual programs on private or protected files simultaneously.



Check DATASHARE features

- ☑ True timesharing system
- ☑ High-level language
- ☑ Access to common files
- ☑ Easy communication,
  - batch or real time,
  - to mainframe
  - to other Datapoint systems

At last, a common-sense file structure

If, for example, you create a file with COBOL, update it with DATABUS, and send it to another site using any one of our communications packages, you'll never have to run conversions - because all of our file formats are the same.

Programmers can spend their valuable time working directly on applications rather than on complex file conversio or file allocation tables.

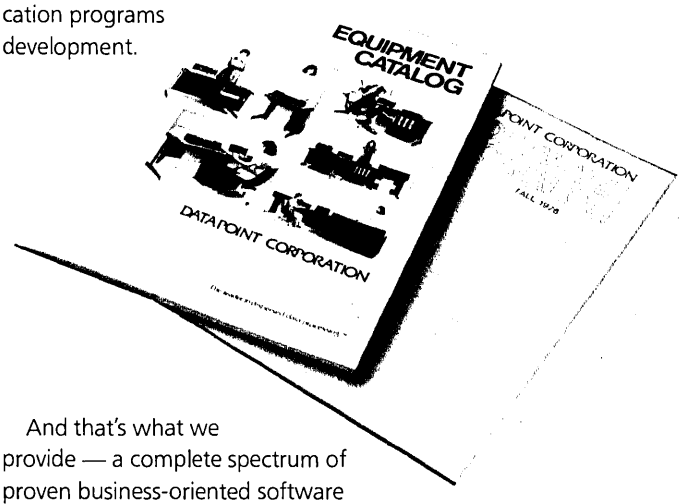
networking 'family' approach

Solid system software

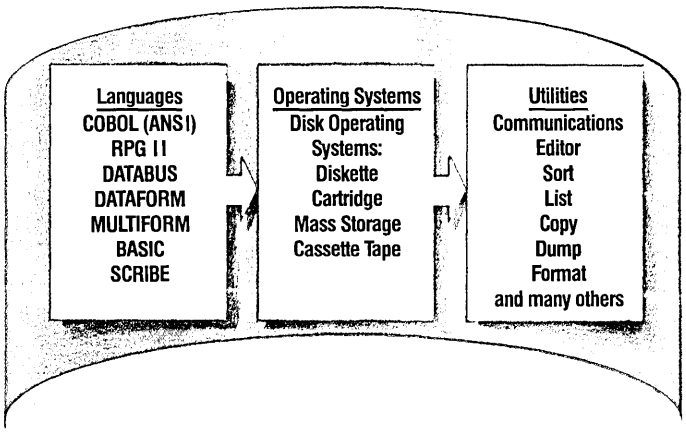
Don't underestimate the software capability you're going to need out in your field offices. The power contained in these Datapoint computers is considerable. Operating systems, utilities and high-level languages will be required to free up your time for vital application programs development.

Data processing power aplenty

Datapoint systems now supply the total computing power used by many companies so you've got plenty of power to draw on — whether you need to substantially off-load a mainframe or simply to get more tasks done within present formats.



And that's what we provide — a complete spectrum of proven business-oriented software to go along with our "Family" of dispersed processing equipment. (Details are available in our Software and Equipment Catalogs.)



Data entry; the starting point

Intelligent data entry can save time and money by getting "clean" information quickly into your network. Any Datapoint work station can be used for data entry using sophisticated packages such as DATAFORM® and MULTIFORM.™

Local data storage — take your choice

Depending on how much storage is needed and how fast you need to get to it, you may choose from a variety of media. Diskettes, cartridge disks or mass storage disks make selection easy. The disks can be used for local data storage or inexpensive local data bases.

Communications — the crucial link

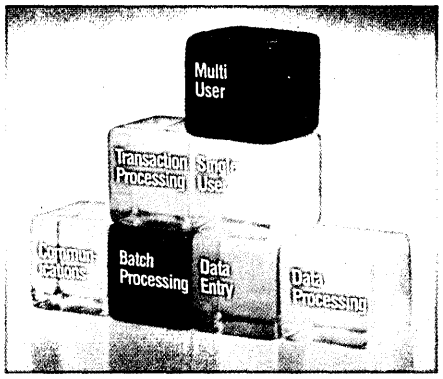
Your dispersed systems are only as effective as your communications capability. Datapoint offers a full complement of communications disciplines to meet your needs. Datapoint's DATAPOLL™ will collect batch data automatically from remotely located Datapoint processors (at night, when telephone rates are lowest). Or we'll put real-time telecommunications in your hands with MULTILINK,™ a sophisticated but user-oriented language designed to talk to almost any mainframe in existence. And with the DSNET™ extension of DATASHARE, you can utilize remote data bases as if they were right in the same room with you.

Use them separately. Use them all together. Use any combination that fits in with your plans. For even greater flexibility, Datapoint offers a host of emulation routines:

HASP	Burroughs TC 500
IBM 3780	Univac DCT 2000
IBM 2780	Teletype
IBM 2741	CDC 200 UT

Build the network you need

We provide the building blocks you need — more than any other supplier — to develop the network that's just right for your company now and that will accommodate future growth readily.



DATAPOINT CORPORATION

The leader in dispersed data processing™

How to find out more

To take a closer look at Datapoint networking capabilities, just clip the coupon and mail.

Datapoint Corporation
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9725 Datapoint Drive
San Antonio, Texas 78284

Send me:
- ☐ Equipment Catalog
- ☐ Software Catalog
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CIRCLE 36 ON READER CARD

Datapoint Corporation has sales and service offices in principal cities.

i&se*

maintains more computers now than when GE made computers.

The reason: I&SE now services computers of other makes. Moreover, I&SE is offering its worldwide computer service network to OEM's and computer manufacturers who need a ready-made service organization.

The advantage: I&SE experience. I&SE computer service engineers are systems oriented. They're experts at making your entire system work, including the computer.

For full information, phone I&SE's Manager-Computer Service, (602) 264-1751, or write General Electric Co., Section 950-17, Schenectady, New York 12345.

SERVICE ANYTIME... ANYWHERE

Who's maintaining your computer system?

*INSTALLATION AND SERVICE ENGINEERING DIVISION

GENERAL ELECTRIC

Overtime Pay for DP Employees?

by Sandra L. Green and Robert J. Greene

Systems analysts, no. Programmers sometimes, Others, probably.

In an attempt to treat dpers as professional personnel, many firms declare them exempt from overtime pay and put them on the "executive" payroll. These well-intentioned firms are overlooking one overriding fact, however, and some are having trouble with the Wage and Hour Div. of the Dept. of Labor because of their oversight. The problem is that the overtime pay exemption question is a legal one, and not within the realm of managerial prerogative.

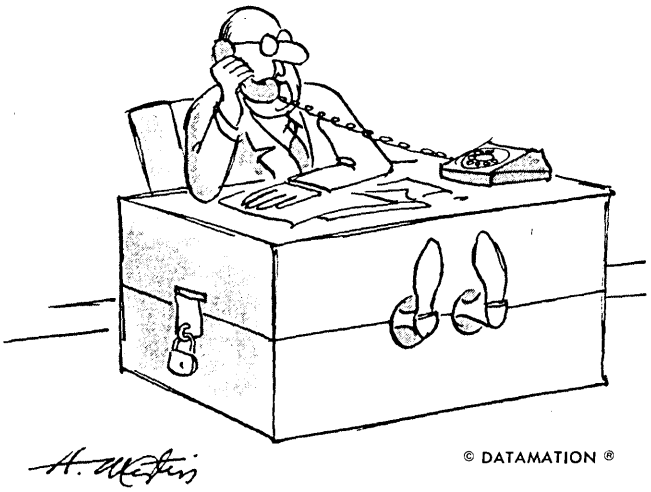
The data processing function, due to its rapid emergence and constant state of flux, poses some especially complex problems with respect to exempt/non-exempt classification of job positions. One such problem stems from the fact that dp employees are not, "under the law," always seen as professionals. This leads to confusion in whether they must be paid for overtime work.

A recent GTE case involving programmers recently publicized the possible legal entanglements involved in the issue. The findings of the court were that the question of whether a computer programmer is exercising discretion and independent judgment (two of the prerequisites for legally calling him a professional) depends on the facts in each particular case.

When he is analyzing a problem to be computerized, breaking it down so that exact and logical steps can be taken for its solution, then he is exercising discretion and independent judgment. When he determines exactly what information must be used to prepare necessary documents and ascertains the exact form in which the information is to be presented, then too he is exercising discretion and independent judgment. But when he is involved in a highly technical and mechanical operation such as the preparation of a flowchart or of instructions to the computer operator, or in the debugging of a program, then he is not.

At any rate, in the GTE case it was found that the company had failed to carry out its burden of proof requirement to establish that the programmers customarily and regularly exercised discretion and independent judgment.

In another recent case it was found that an individual employed by Automated Systems Company as a systems analyst to design and implement computer control systems was employed in a bonafide professional capacity. This was despite an earlier interpretation by the Administrator of the Wage and Hour Div. of the Dept. of Labor that there is too great a variation in standards and academic requirements to conclude that persons employed as computer programmers or systems analysts are part of a true profession.



"You think I **enjoy** working late, Alice? Well, you're wrong."

Must a firm put itself out on the proverbial "limb" each time it attempts to classify a data processing position? Not if it follows some basic job classification practices.

Understand the exemptions

First, understand the law. There are three basic groups which can be exempted under the Fair Labor Standards Act, the legislation which determines such things:

1. executive positions
2. administrative positions
3. professional positions.

A fourth group, not applicable to the data processing employee, is the outside salesman.

The *executive employee* must meet all of the following tests in order to be exempt from overtime pay:

1. His (or her) primary duty must be the management of an establishment or a recognized department.
2. He must direct the work of at least two full-time employees.
3. He must be able to hire and fire or recommend hiring and firing.
4. He must regularly exercise "discretionary power."
5. He must devote no more than 20% of the work week to non-exempt work (no more than 40% for an employee of a retail or service establishment), and his current salary must be at least $155.00 per week; *or* he must spend the majority of time (over 50%) on exempt work if his salary is in excess of $250.00 per week.

The *administrative employee* must meet all of the following tests:

1. His (or her) primary duty must be the responsibility for office or nonmanual work (white collar work) of substantial importance to management or the operation of the business.
2. He customarily and regularly must exercise discretion and independent judgment as distinguished from using skills and following procedures. He must have the power to make important decisions.
3. He must spend no more than 20% of the work week on non-exempt work (no more than 40% for an employee of a retail or service establishment), that is, work not closely related to his administrative duties, and must earn at least $155.00 per week in salary or fees; *or* must spend the majority of his time (over 50%) on exempt work if his salary is in excess of $250.00 per week.

The *professional employee,* to be considered exempt, must do all of the following:

1. Perform work which requires knowledge of an advanced type in a field of learning normally acquired by a prolonged course of specialized intellectual instruction and study, *or* do work that is original and creative in a

The information on prevailing practices included in this article is taken from "Prevailing Practice Among U.S. Firms: Fair Labor Standards Act Classification Practices and Extent of Unionization Among Data Processing Employees." That report is available directly from A. S. Hansen, Inc., 1080 Green Bay Road, Lake Bluff, IL 60044 ($10).

OVERTIME PAY

recognized field of artistic endeavor.

2. Consistently exercise discretion and judgment.

3. Do work that is mainly intellectual and varied as distinguished from routine or mechanical duties.

4. Spend no more than 20% of the work week on activities not closely related to the professional duties and earn at least $170.00 per week in salary and fees; *or* must spend the majority of his time (over 50%) on exempt work if his salary is in excess of $250.00 per week.

Establish a formal policy

Secondly, to comply with the Fair Labor Standards Act a firm should establish an administrative policy and the associated procedures to control the exempt/non-exempt classification of its positions. This classification process should include:

1. complete and accurate position descriptions which detail the assigned duties and responsibility level of each position

2. clearly defined and well-understood reporting structures and allocations of authority with respect to hiring, firing, salary adjustments, etc.

3. thorough review of all proposed exempt/non-exempt classifications by an attorney to insure the classifications are in keeping with the provisions of the Act.

And check prevailing practices

Finally, the firm should check itself against what others are doing. The following should prove helpful in that regard.

In a recent survey of prevailing practices, these dp positions were found to be commonly accepted as exempt:

Systems Analysts (all levels exempt, including trainee)
Application Programmers (all levels exempt except trainee)
Systems Programmers (all levels exempt, including trainee)
Computer Operations (only the manager is exempt)
Data Entry (only the manager is exempt)
Data Control (only the manager is exempt)

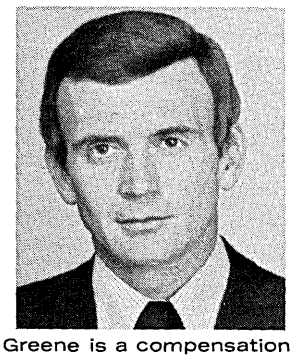
Just because these are the prevailing practices, however, does not make them correct. For example, well over half of the firms exempting Applications Programmers were found to be doing so using the *professional employee* exemption, which is highly questionable considering published Dept. of Labor opinions.

A large number of firms exempted entry level (trainee) Applications Programmers and Systems Programmers, too, which is also a highly questionable practice.

On top of that, less than 20% of the approximately 500 firms reporting indicated that they used legal counsel to verify their classification practices. This is risky because, again, the exemption question is a legal one.

It would seem to behoove any data processor who aspires to being considered "management" to remember that his employer does not have the luxury of making a determination about overtime pay—that much is constrained by legal rulings. And, practically speaking, it is rather disfunctional for an analyst or a programmer to decide whether to participate in the work of management on whether a 1938 law allows them to receive overtime. The world doesn't work that way. Neither does it work the way some managers think it does, and it's time for everyone concerned to learn the rules of the game. ❋

Ms. Green is currently a compensation survey coordinator for A. S. Hansen, Inc., publisher of the "Weber Salary Survey on Data Processing Positions in the United States." Her responsibilities include working with compensation consultants in the preparation of salary structures and doing research for compensation audits.



Mr. Greene is a compensation consultant with the Philip H. Weber Salary Administration Services of A. S. Hansen, Inc., and has frequently contributed articles on dp compensation to Datamation.

His previous experience includes having been a systems and programming manager at Motorola, and a systems and methods manager at Knight Electronics Div. of Allied Radio.

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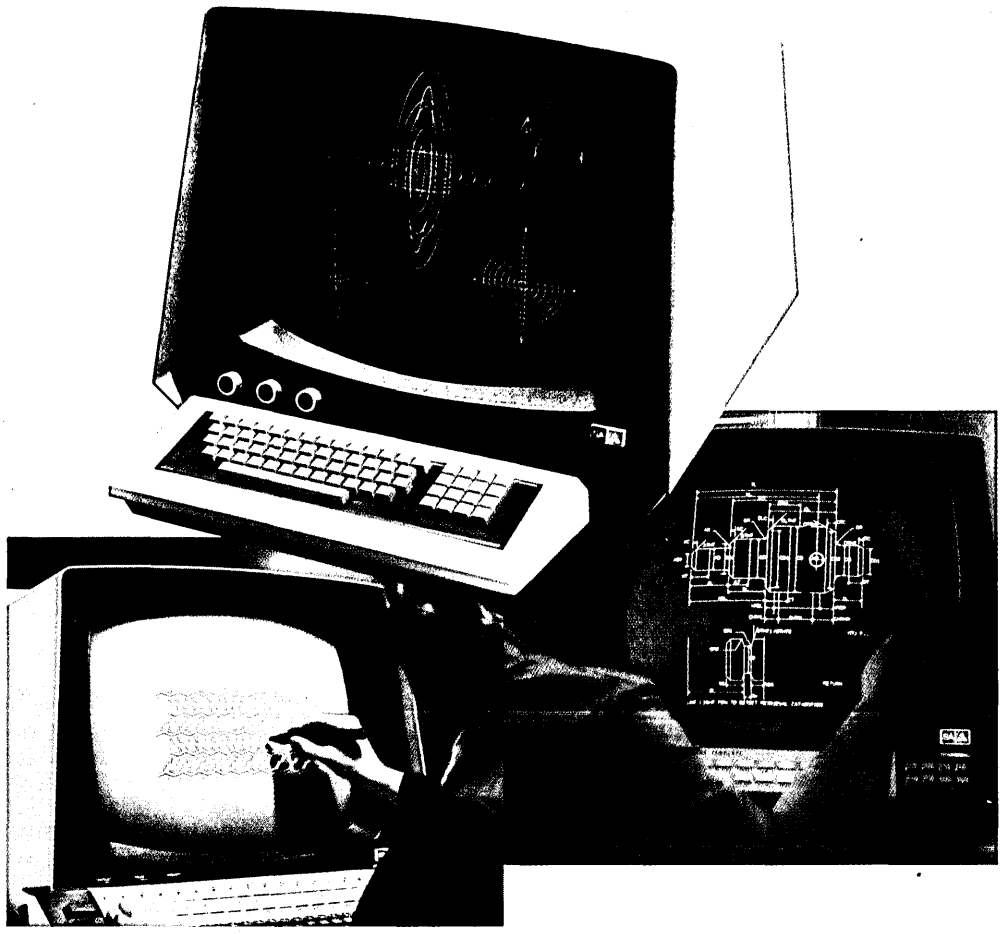

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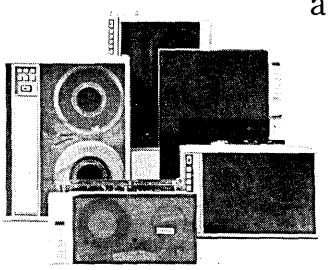

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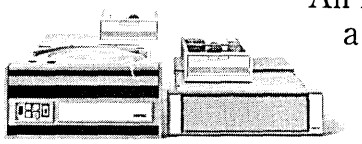

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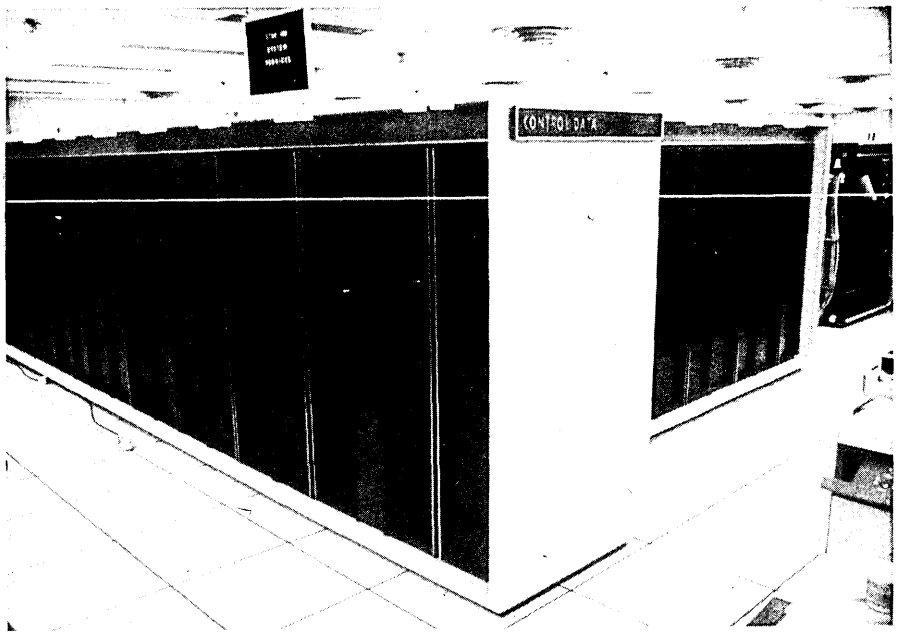


Supercomputer Development - The Pleasure and the Pain

by Neil R. Lincoln

"No man in his right mind, fully aware of what's going on in this place, would ever voluntarily associate himself with this project."

Surely in the vast armada of rules, groundrules, guidelines, and admonitions launched at burgeoning computer engineers there must be a place for the "theorems of supercomputer development" that have been derived from the industry's last twelve years' dalliance with innovative structures in its quest for high performance computation.

We all, inventors, manufacturers, users, programmers, and blue-sky theorists have passed through (some think "survived" is more appropriate terminology) a most interesting period of supercomputer experimentation. An experiment it has been despite all participants' claims that the real world of incredible computing was at hand; despite the fact that in 1964 none of the participants realized that they were challenging the frontiers of a barely conquered technology, little understood architecture, and immature software concepts. The "experiment" was initiated by visionary people who realized that the continued "brute force" improvements in computer performance were soon to be completely constrained simply by the finite velocity of the speed of light. The computing industry "survived" because for the past ten years radical, parallel computer architectures were not imperative to supply the insatiable demands of energy, weapons, weather, and flight research.

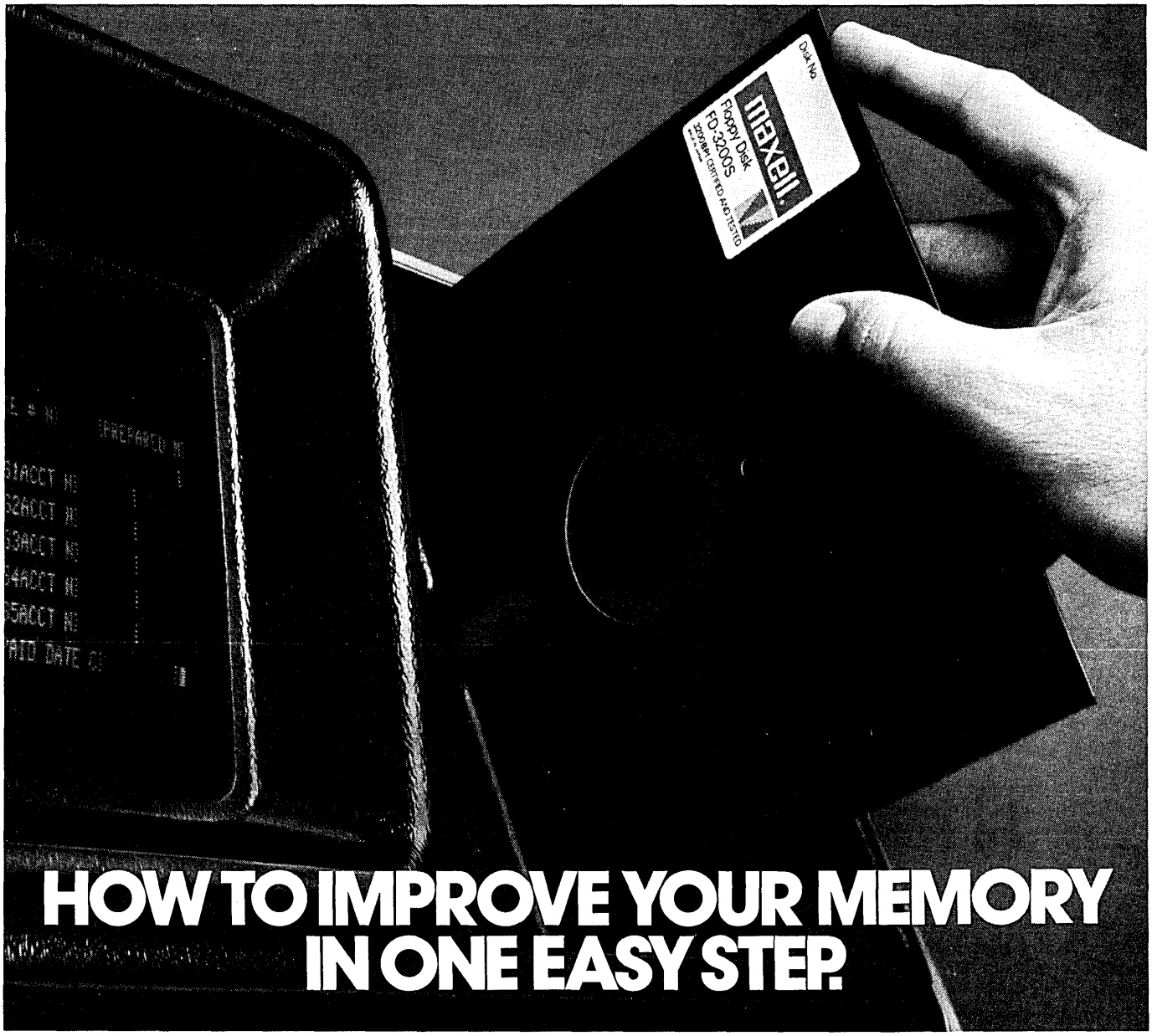
This is no longer the case. Supercomputer development cannot keep pace with even the minimal needs being placed by society, technology, and international need without the radical departures in organization that have been displayed in the ILLIAC, the ASC, the CDC STAR-100, the PEPE and STARAN computers, to name the most publicized examples.

In the beginning

In 1964 customers had just begun struggling with the architecture of the CDC 6600. Parallelism in the multiple add and multiply units and the peripheral processing units of the 6600 offered the potential for great gains in computer performance if only someone could figure out how to tap those resources effectively. In spite of the fact that the 6600 was barely in place, and compiler technology couldn't cope with even modest parallelism, several "dreamers," most notably at the Lawrence Livermore Laboratory, began to speak "in tongues" of the need for a hundredfold increase in computational horsepower by 1970. These dreamers were soon joined by a number of computer architects who scented in recently developed integrated circuit technology a real opportunity to exploit parallelism in a substantial way. From this confluence of need and engineering optimism sprang the several parallel experiments of that era.

The CDC STAR-100 development began with early parallel notions in 1964, was shipped in 1974, and just now in 1977 is beginning to realize its true potential as a high-performance, production computing machine. Out of this experience came a series of "one-liners"

Reprinted from the digest of CompCon77 Spring held this year in San Francisco. Mr. Lincoln works for Control Data Corp.



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known as the "STAR THEOREMS," which now hang over the desks of some prematurely grey engineers. Let's examine these theorems (discreetly restated for publication) in light of the pleasure and the pain of high risk development efforts and with an eye to where we have been, where we are, and where we are going in the "supercomputer" milieu.

I. "No man in his right mind, fully aware of what's going on in this place, would ever voluntarily associate himself with this project."

There is genuine excitement in the conception and specification of a "new thing," particularly a radical departure in computing architecture such as the ILLIAC IV or the CDC STAR-100. Beginning with a clean slate and given unlimited opportunity to innovate is most certainly pleasurable. It is pleasing to look back and see that some attempt was made to create a philosophical basis for these supercomputers. In the TI ASC the processing model chosen was FORTRAN, everyman's language, while for the CDC STAR-100 the model was Kenneth Iverson's APL, and for the ILLIAC IV it was two dimensional, matrix computation.

During the initial conception stage of these new computers there was no lack of volunteers. In the case of the CDC STAR, the decision to provide a macro-level hardware instruction set opened the door to many volunteered suggestions for hardware functions. Some suggestions, which were apparently consistent with the APL conceptual model, were immediately adopted and became part of the CDC STAR design specification regardless of the engineering realities of trying to implement such functions. The CDC 6600 computer, certainly one of the more complex computers manufactured in the 1960s, contained something like 40,000 "gates" in its CPU. The CDC STAR-100 was going to require about 400,000 "gates." Although the large majority of these gates were required by the parallel nature of the machine, a significant portion were needed to support operations that were created by "volunteer inventors."

It is obvious now that given the state of the computer "art" in 1964, it was truly impossible to extrapolate existing experience to predict schedules for a 400,000 gate machine structure. As the magnitude of the project became accurately perceived only after extensive detailed design had been completed, the enormity of effort required and the impossibility of schedules discouraged even the heartiest volunteers. Designing to meet functional, performance, and reliability requirements to a tight schedule for an assemblage ten times more complex than created in previous experience was not conducive to either physical or mental health.

Under such pressure it is not surprising that erroneous judgment was exercised often in trade-off decisions and in basic project management decisions. A "fundamental rule" that should be tatooed inside every designer's eyeballs is, "It's never too late to junk the whole thing and start all over." If the situation warrants, it should be added, this applies even the day before the computer is to be installed at a customer's site. Obviously an overworked and totally immersed design team is reluctant to follow the rule, but one of the best things that happened to the CDC STAR-100 was just such a "bite-the-bullet" decision in 1972. It took six years of detailed design, in other words, to finally determine the magnitude of the task at hand, and thus permit proper design and planning for a deliverable machine.

Status report

One asks, "Where are we now?" Each of the major architectural alternatives has been implemented. Each is being subjected to employment in a wide variety of computational environments. The architectural implications for algorithms, software, and the design and manufacture of large parallel machines is now presumably understood. Technology and project management techniques have matured so that we can now proceed at full steam into the future.

The future promises:

a. High speed LSI for less real estate, less signal transmission time, and the reliability necessary to build a multiplicity of computing elements.

b. Manufacturing and maintenance technology will be able to cope with 5,000,000 gate assemblages.

c. Parallel programming techniques will be taught at *basic* programming levels in colleges and technical schools. No more will frightened, intimidated professionals avoid dealing with parallel machines.

d. Highly parallel architectures will become evident at even the moderate performance computer levels for cost/performance reasons.

e. *No* single parallel architecture now known will become the predominant scheme for supercomputing in the next decade.

And people will start "volunteering" to work on such radical projects once again. . . .

II. "If the scope probe can be hung wrong, and if it's possible to therefore cause a catastrophic failure, it will happen."

a. Somehow test instruments, development, and logic packaging techniques lag sufficiently behind the architect's parallel brainstorms as to become a real limitation to system implementation. In its fourth year of checkout, the CDC STAR finally had multiple-trace scopes of sufficient bandwidth to substantially improve checkout efficiency.

b. Computers must be "checked out" and maintained by human beings with finite length arms and fingers and finite senses of humor. Maximum high performance must be traded off against the need for ready access to critical parts of a computer, or mayhaps the machine will never be made to run. The objective to allow every logic board on the CDC STAR-100 to be extended from the chassis for signal probing was difficult to meet without impacting margins or performance in some areas of the machine.

c. If a complex machine has 3,500 pluggable logic modules with about 100 pins each, someone is guaranteed to bend an inaccessible logic pin on a given day of checkout. Since logic design verification of the CDC STAR-100 was done entirely with the first delivered hardware, each check-out day saw the removal and reinsertion of hundreds of modules a day. A simple bent logic pin could cause more havoc than a number of logic design errors.

Today it's possible to examine our experience with large collections of logic modules and related checkout and maintenance: The important Mean Time To Repair quotient is directly dependent on the time required to detect an error, localize it, and repair the problem. We think we are much smarter now about human engineering to prevent the repair activity from creating another failure.

More components

In the future, high performance machines are going to contain even more componentry. While of admittedly higher reliability, the electronic elements will, because of their greater numbers, require a substantial frequency of access. Means must be built

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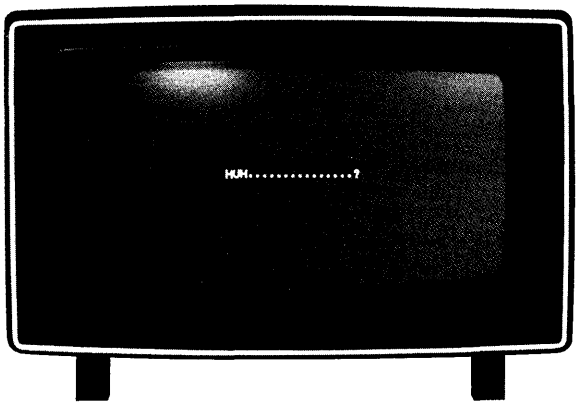

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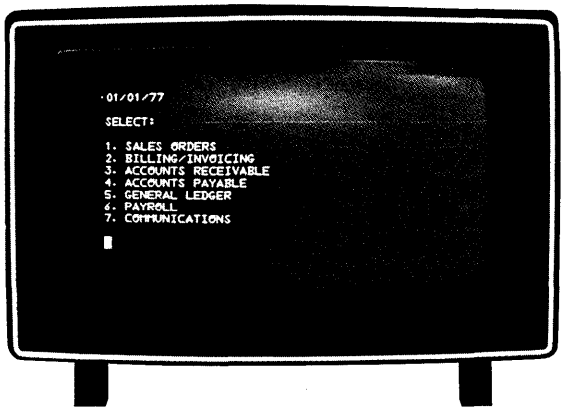

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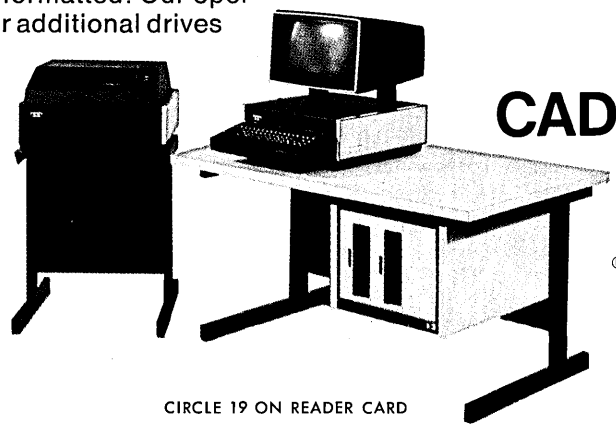

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in to ensure that human error doesn't destroy an otherwise pleasant operating day. Use of permanently wired-in maintenance logic, micro-code, and truly modularized logic is essential to reduce the need for direct human access to machine components. "Check-out" must be accomplished before hardware is constructed.

III. "There ain't nothing (not a single blessed thing) for free on this 'bloody' project."

Corollary: Don't be fooled into believing in magical solutions for insurmountable problems.

In the software area, the magical approach led many of us, this author included, to predict that FORTRAN compiler technology would permit the "parallelization" of almost all of almost any arbitrary FORTRAN program. This belief, without even the advice of a witch-doctor, was tendered widely and irrespective of the type of parallel architecture described. We also magically believed that the average programmer would quite rapidly learn "parallel" thinking techniques and become comfortable with the new architectures. This feeling made most parties underestimate the "labor intensive" nature of algorithm conversion for *any* of the parallel machines.

In the hardware area, four magical notions were cherished and crushed between 1965 and 1972:

a. The "hybrid" circuit technology initially adopted to meet performance goals would finally be made stable and reliable. This belief was held despite reasonable engineering analysis indicating that it was fundamentally unsound.

b. Once parallel hardware algorithms were designed and performance goals were met, secondary issues such as "interruptability" of a process would be automatically resolved. On the CDC STAR-100, with its virtual memory virtually guaranteeing interrupts in the middle of vector operations this was a dangerously naive assumption.

c. Design "kinks" could always be resolved through the diligent application of sufficient intelligence and massive quantities of man-hours. When a fundamental architectural or design concept was in error, and project pressures seemed to forbid "junking the whole thing," many good resources were frittered away chasing this elusive ghost of completion to no avail.

d. The truly last and final problem was found and about to be solved. In a complex as big and elaborate as ILLIAC or the CDC STAR there never will be a truly "last problem."

Today we have learned to deal with the yet unbroached problems in a given design. Few engineers still employed on these large projects will ever believe in any magical solution, no matter how plausible.

In the future we should see:

a. FORTRAN demi-compilers which analyze input source text and thereupon interact with the programmer to produce a "parallel" form of the program best suited for the "target" architecture

b. some real progress in specifying a machinable higher level language suited for general parallel processing independent of specific architectural features

c. diagnostics to reduce the probability of undiscovered design faults to near zero. This step has required the previous 12 years experience to help us understand parallel "failure modes."

d. A resident exorcist for each supercomputer project.

IV. "When the mess in front of you is obviously due to a software problem, it will eventually prove to be a hardware problem—and vice versa."

Bottom line

The implications for users and developers alike of the effects of parallelism in cpu structure don't begin to really make themselves felt until actual production work with usable answers is required from the high performance "experiment." It would help, of course, if the parallel architecture didn't possess a different number format and different arithmetic system (such as two's complement instead of one's complement), from computers then in place. The original departure to a parallel mechanism seemed so overwhelming, however, that the minor inclusion of a number system change from existing machines seemed insignificant. But, after the diagnostics have been run, the machine integrity is still not verified until comparative results have been obtained for programs run on existing (and therefore assumed to be reliable) computing systems.

A "production code" that performs trillions of calculations on a machine with 500,000 gates can produce a dilemma for the customer and the manufacturer of the supercomputer. Is there a software problem, an algorithm instability, or is some flip-flop misbehaving?

Machines and software in the future must be fault-detecting as well as fault-tolerant. This means that:

a. Hardware checking must be performed in all critical networks which can create undetectable result errors.

b. The parallel units should be interchangeable to permit verification of identical behavior of those components.

c. Software must be instrumented to detect possible errors to a higher degree than is presently done.

d. The hardware must possess sufficient surplus horsepower to permit a high degree of software instrumentation without loss of performance.

e. The hardware should provide "hooks" for the efficient instrumentation of software.

f. Software and hardware complexity should be reduced substantially while still maintaining performance goals, so that errors and their causes can be easily ascertained. (A glib necessity but seemingly impossible to achieve.)

V. "The design repair (fix) you are working on now will solve a problem completely unrelated to the one you started with."

During the early days of CDC STAR-100 check-out, it seemed to be a law of nature that an error detected by a diagnostic led to a lengthy signal tracing session in the course of which a design error was detected. After considerable labor in the detecting, redesigning, and rewiring of the erroneous logic, the diagnostic would be run and the original failure would still be there. The design had "gotten out of hand." That is, it was no longer possible for a single human being to comprehend completely the totality of a half million gates of complex logic. If we are to double or quadruple our processing speeds in the next decade with only a modest improvement in circuit speeds, then we must obviously double or quadruple our processing logic in some parallel manner. Even if a great deal of this logic is identical in organization, as in the case of multiple, identical arithmetic units, there seems to be more logical interrelationship than one single mind can cope with.

Obvious methods for improving this situation include extensive levels of documentation, cross references, and the like. The most appealing approach for the future, however, appears to be the use of computer simulation of the total logic design for design verification and subtle fault isolation. A system that could couple such a design tool to the maintenance process seems to be essential for future supercomputers. This tool could be used to determine whether a problem is related to software or to hardware, and where the problem lies in detail.

VI. "If the chief architect has to help install a design change, the project is at least another two months from completion."

This piece of serendipity relates to the fact that when the people charged with responsibility for the big picture get submerged in the panic of the moment, something of major consequence is bound to slip by unnoticed with disastrous consequences. Although this is a truism in any environment, the supercomputer experiments of the last twelve years have proven that an overview of the complete system must be carefully maintained at all times. One bad judgment about a small logic change in a single functional unit can be immediately magnified by the number of such units, 4, 64, or 256, at great cost. One mistake in analysis can lead to a fruitless search down 255 wrong paths.

VII. "The design repair (fix) you install today will return to haunt you in some other awful way."

This "theorem" arises for the same reasons as all previous theorems. The immensity of logic in supercomputers has defied most simple documentation and mental organization schemes for subduing it. Throughout the CDC STAR-100 project there existed no computer of sufficient power to provide the design automation and verification tools necessary to make the human job of comprehension easier.

There are now techniques for simulating the massive number of gates necessary for future machines. These methods will have to be extended to provide diagnostic support and maintenance aids for future machines.

As the hardware complexity increases so, too, does the software complexity. The basic software necessary to manage the super resource becomes entangled with requirements for time-sharing, dedicated computation, and high security processing. The software necessary to enable moderately competent programmers to efficiently use the parallel hardware also becomes incredibly complex. The result is a total system of hardware and software that is beyond real comprehension.

In the future, there must be a counterpart to the hardware simulation tools being developed which can be used for the software and total system interaction analysis. Without this simple beginning we may never be able to properly use the future supercomputers. Alas, I see no significant progress in this area.

VIII. "It is impossible to avoid being misquoted, misunderstood, or misused on this bloody project."

Why this plaint? At the beginning of each of the major experiments there was great need for clear interchange between hardware and software designers. To find oneself in 1971, after struggling to milk the last ounce of performance out of a particular machine feature, being told by the software "folk" that, "We can't find any use for that function," is not only unnerving, it is downright expensive. This also implies a major miscommunication occurred somewhere at an early stage of the project. Misunderstandings like this are not just due to the complexity of the hardware system, but arise mainly from the shift from serial to parallel computing approaches. Our noble experiments have yielded a wealth of information of how *not* to exploit parallelism, as well as what hardware features should be emphasized to maximize parallel processing.

It appears that the computing community has arrived at several viable alternatives to parallel processing. If these architectures can remain essentially unchanged while engineers exploit technology in implementing more parallel activities, computer and software architects alike should have a better common basis for communicating functional and performance needs. A departure orthogonal to current parallel schemes could well incur the same painful development experience.

And so what began in the mid-sixties —a development characterized by more guts than brains, more sweat than technology, and a simplistic view of the effort needed to design, manufacture, and program a high performance parallel computer—is moving toward another evolutionary stage.

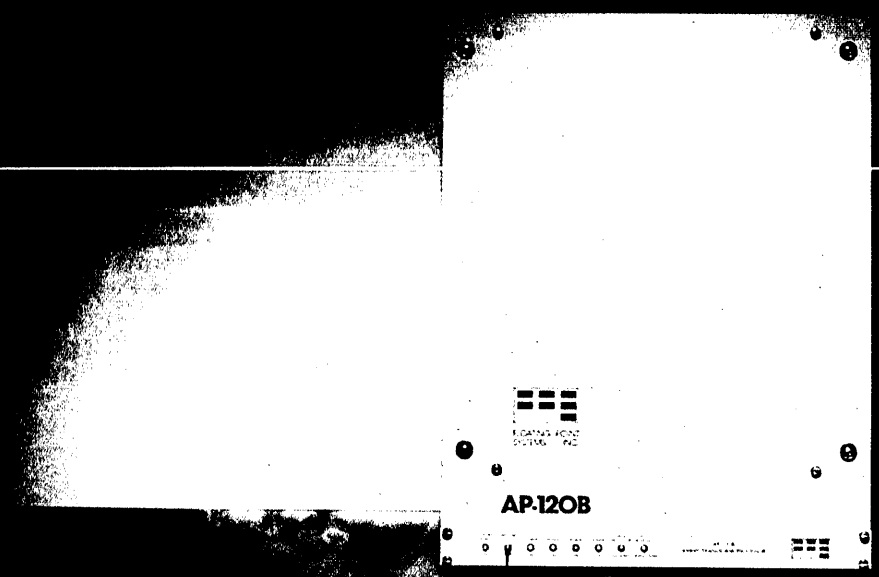
Hopefully. by learning from past mistakes, we'll stop floundering in a sea of parallel circuits and programs and achieve real production of these systems. A major hurdle is the fact that we still do not have some form of generalized theory of parallel computing and programming to keep us from continuing our ad hoc methods of adapting algorithms to CDC STAR and ILLIAC type machines.

But the need for supercomputers will continue and we're confident that some manufacturers will respond with liberal quantities of parallel hardware.

And of course, the need for supercomputer projects will also continue, and therefore the creation of a never-ending set of newly discovered "theorems."

Let's hope that they don't turn out to be the same set of theorems again. ❋

The age of array processing is here...



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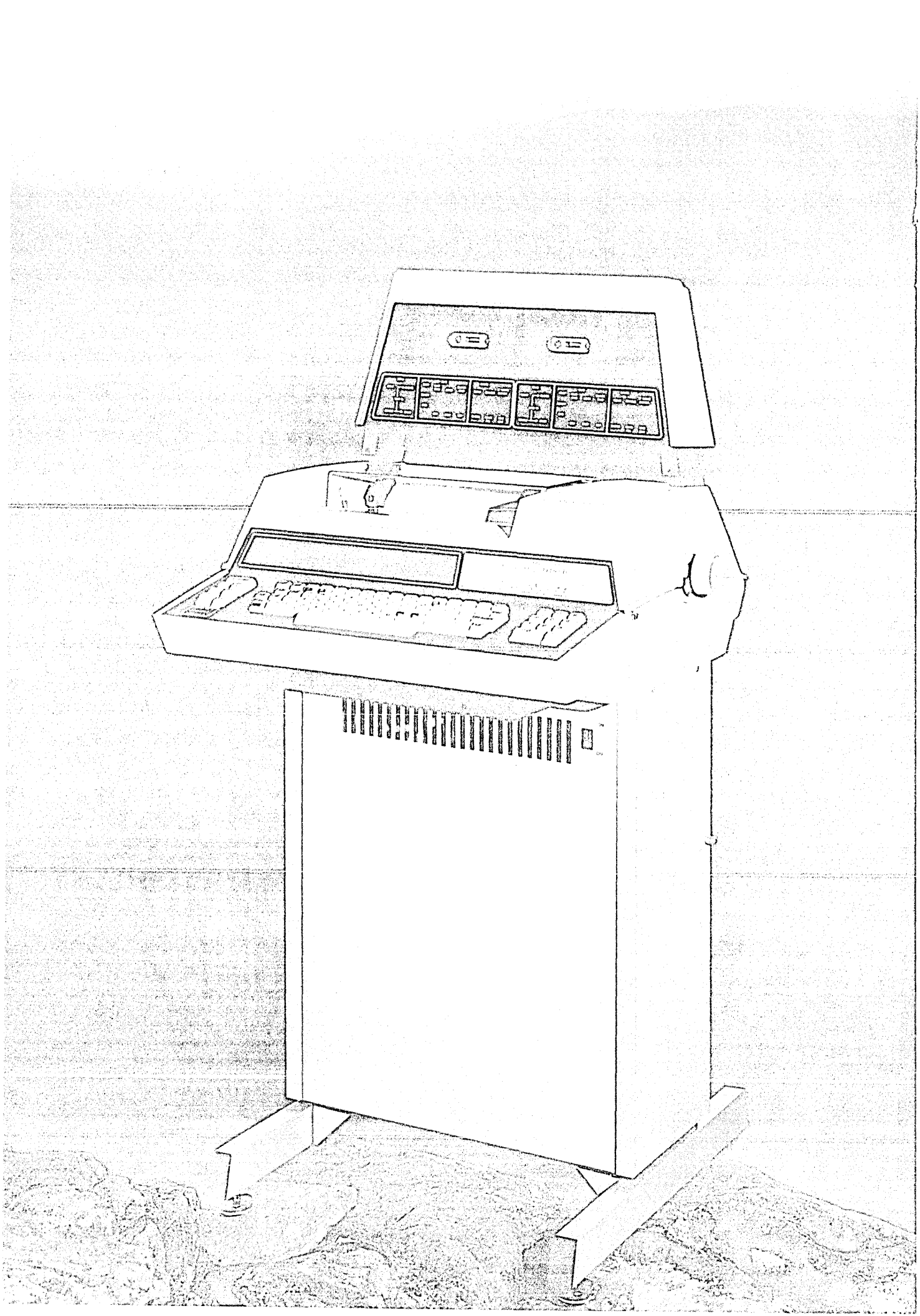

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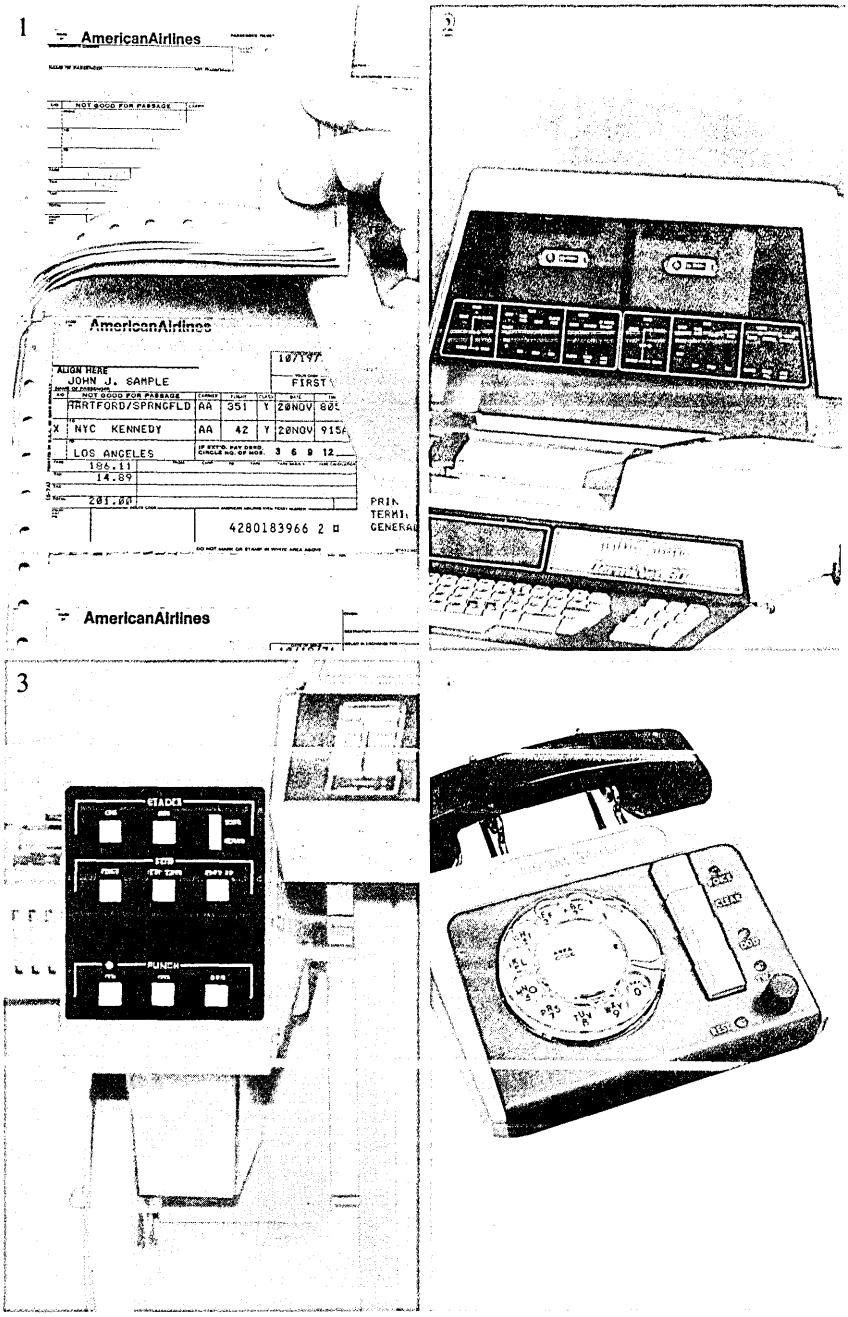


letters

(Continued from page 22)

pretively execute those instructions not implemented directly in hardware (or firmware) and then resume execution.

Extendibility: The architecture must have some method for adding instruction to the architecture consistent with existing formats. There must be at least one undefined code point in the existing op code space of the instruction formats.

Read only code: It must be possible to execute programs from read only storage. This criterion is intended to permit an added degree of reliability by permitting programs to be stored in a nonvolatile read only memory. (This does not imply that the hardware would necessarily permit users to plug in ROM's at will, nor does it require that the instruction set must be microprogrammed. It simply implies that nothing in the storage set itself precludes the use of read only memory or program storage.)

Sharing information

Regarding the reference to Mr. Silverman in the News In Perspective section (January, p. 150), I hasten to point out that the os Eastern Region Systems Group is not affiliated in any way with SHARE, Inc., although we have occasionally exchanged technical information.

JOHN P. HOGAN (MTR)
President
SHARE, Inc.
Chicago, Illinois

Queueing up

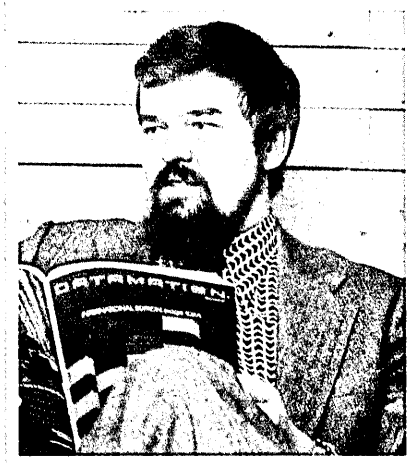
I believe Mr. Wiley made an error in his analysis of the five-line bank system ("Just Enough Queueing Theory," February). His solution would be valid only if we could not choose a line to wait in. Most of us would choose the shortest line. Then the average waiting time would be close to the average wait for the single-line, five-server system; and if we were allowed to hop to a shorter line, the average wait would be the same for both systems. The distribution of the delay times is different though; the standard deviation is less for the single-line, five-server system. Classical queueing theory cannot handle the five-line system Mr. Wiley described; one must resort to simulation techniques.

DAVID SLOWINSKI
Development Analyst
Cray Research, Inc.
Chippewa Falls, Wisconsin

Mr. Wiley's answer: Mr. Slowinski's criticism is of the original case in the example, not the revised case. The example is correct if random assignment to a line is assumed, such as might be found in a computer system. However, since people don't select lines randomly, Mr. Slowinski's objection appears valid.

WHEN ANGIE PANTAGES TALKS WITH MOGENS ROMER ABOUT COMPUTER NETWORKS IN DENMARK...

Angeline Pantages,
International Editor, DATAMATION



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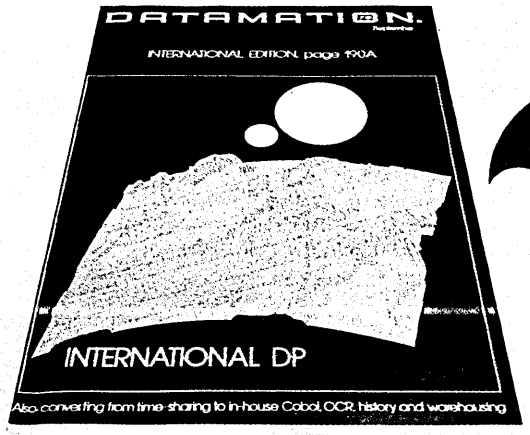

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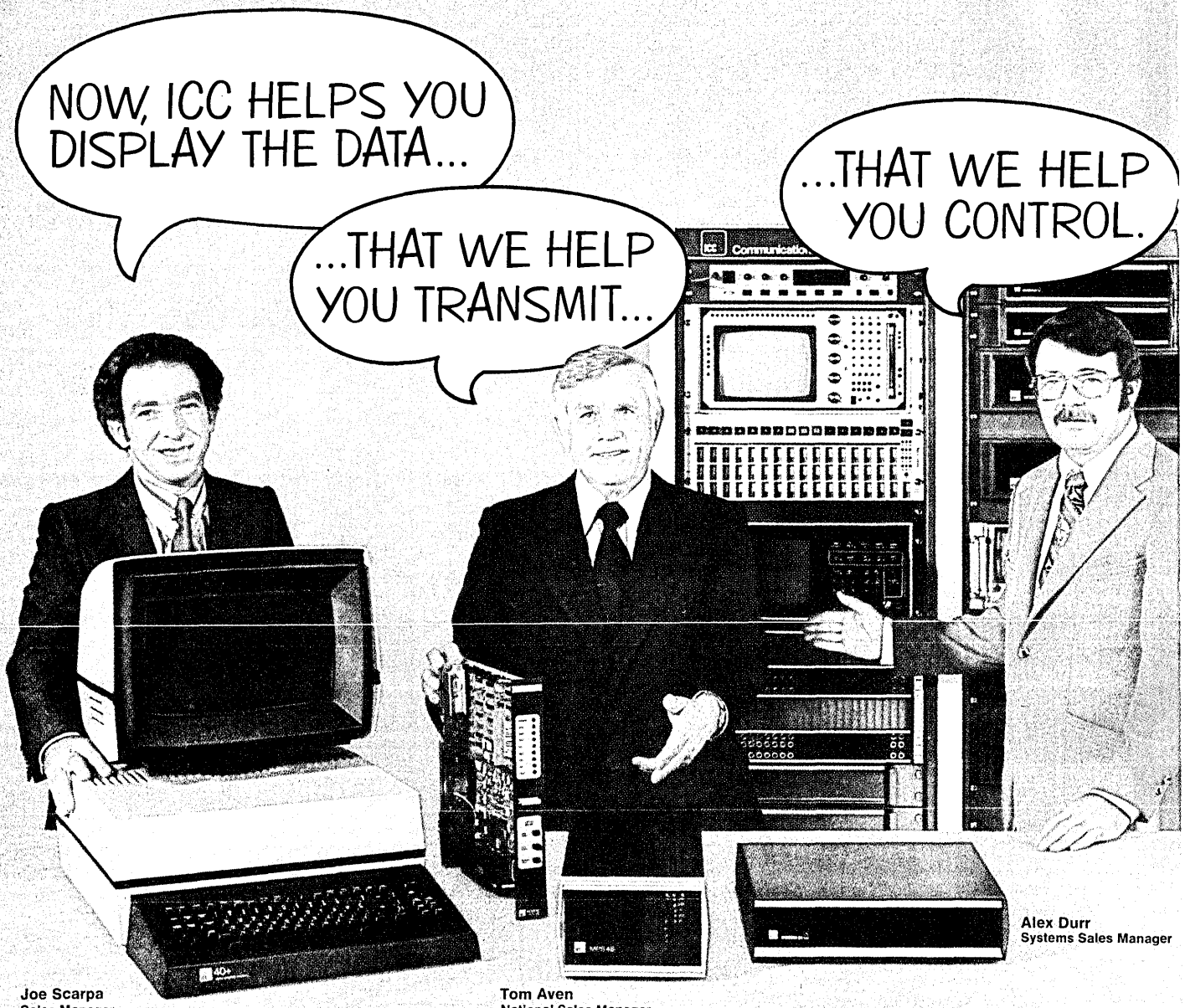

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CIRCLE 107 ON READER CARD

letters

Let me interrupt

We at Interdata are proud of being counted among the top three finalists in "Comparing Architectures" (February, p. 48). One 8/32 reference listed in the absolute criteria mentioned "possible problem with interrupts and traps," and another stated: "There was a nagging question about how well the state of the machine was preserved after interrupts." I would like to state most emphatically there is no uncertainty or question about the state of the machine after interrupts. The state after all interrupts is known, predictable, and consistent, although it may not be what the authors expected or desired.

In all but two instances, the location counter points to the instruction in progress when an interrupt occurs. In these two special instances, the location counter points to the instruction following the one being executed. The two interrupt exceptions occur following an arithmetic fault or a machine malfunction interrupt, which are often considered by system designers as unrecoverable.

Arithmetic fault interrupts are the result of: fixed point division by zero, fixed point quotient overflow, floating point division by zero, floating point overflow, or underflow. Machine malfunction interrupts can be any of the following: power restore, power failure, memory malfunction (parity error), or fullword data read/write on a halfword boundary.

These two exceptions cause the authors some concern because the 8/32 has three instruction lengths: halfword, 16-bits; fullword, 32-bits; one and one-half words, 48-bits.

The 8/32 does not indicate the length of the instruction in the program status word (PSW). This prevents an interrupt service routine from backing up to the precise instruction in progress when the interrupt occurred.

Interdata's experience indicates that recovery programs generally back up to a predetermined breakpoint. Backing up to the specific instruction may have some theoretical advantage for an esoteric application, but it provides little advantage in a practical COBOL or FORTRAN environment.

We hope this clarifies any uncertainty or ambiguity relative to the 8/32's machine state after an interrupt.

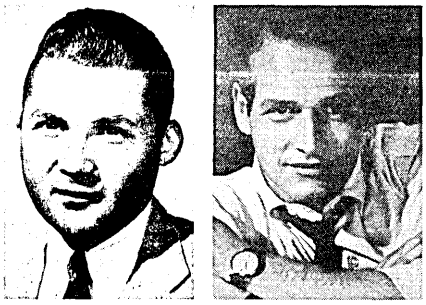
JEAN J. BARTIK
Model 8/32 Product Manager
Interdata
Oceanport, New Jersey

Mr. Burr and Mr. Smith respond: Thank you, Mr. Bartik, for the information. Had Interdata been able to supply this information to us last winter, spring, or summer, there would have been no "nagging uncertainty." Alas, although we first asked the question about traps and the incrementing of the location counter in February of 1976 while visiting the Interdata factory, and followed up on the point in two more visits and several phone conversations, it was July before we received a reply and that reply only covered the case of memory access controller interrupts. The processor Users' Manual, we might add, was entirely silent on the question. We made our final selection in August, hence the nagging uncertainty.

We are afraid, however, that this information, had we been able to get it, would have pushed the 8/32 into the "failed" category for the interrupts and traps criterion. We quite agree that the issue is of little practical significance for most FORTRAN or COBOL applications. The Army and Navy do, however, have their share of real time command and control applications where a very heavy emphasis is placed upon error recovery and continuity of systems operations, and it is not unheard of to look at instructions and operands after arithmetic or other traps, and try to apply some appropriate action. The authors have in the past coded such a trap handler for the 360 themselves. The selection committee was trying to select architecture for a very broad range of possible applications, and considering the great interest in error recovery in some military systems, this is a fair requirement for our purposes.

Photo sensitive

I was shocked to see in your March 1977 issue (p. 8) a flagrant breach of editorial license and historical etiquette in your use of an old and obviously modified photograph.



Then . . . and now

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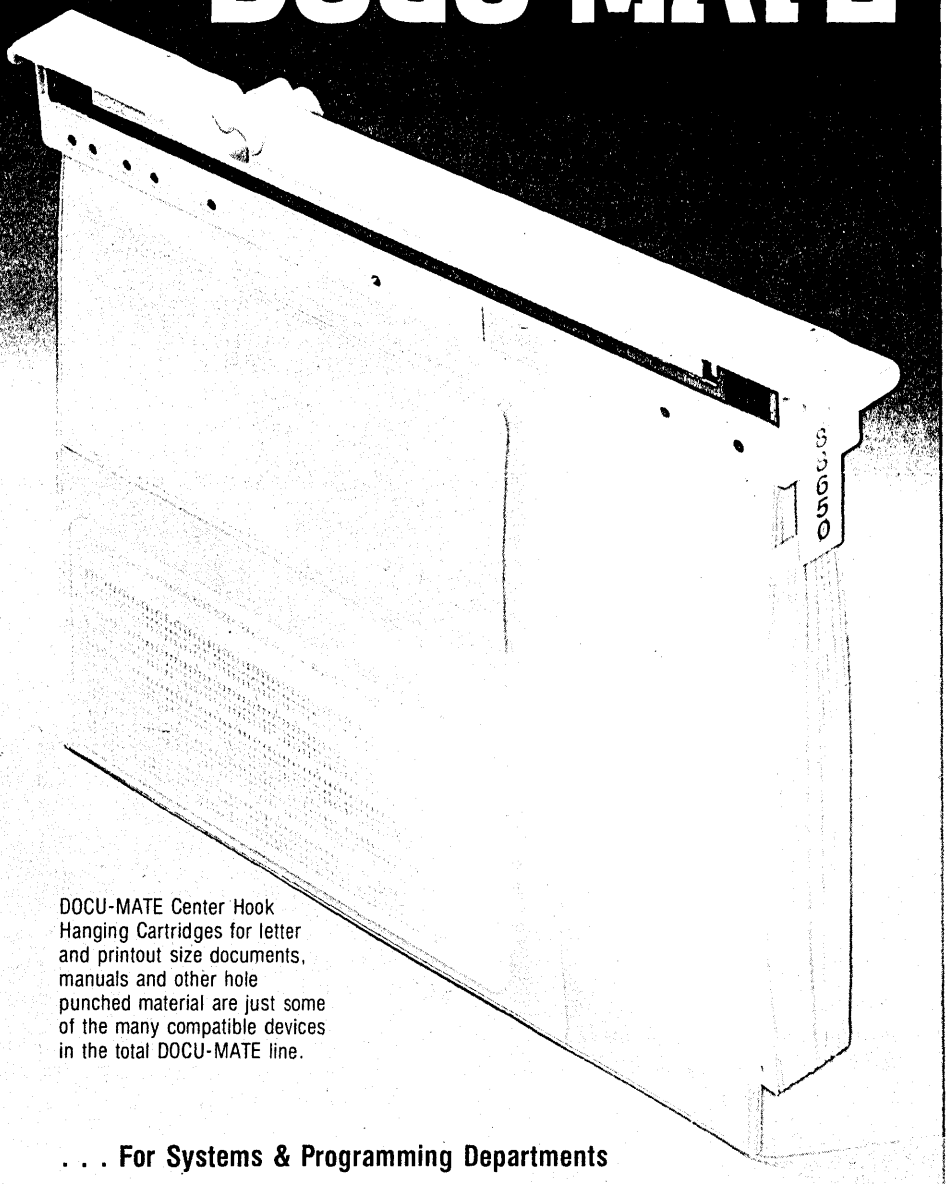

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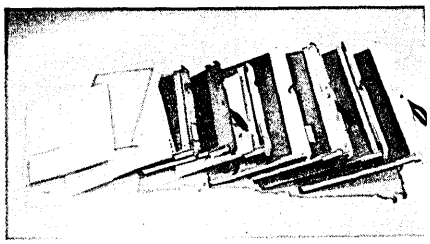

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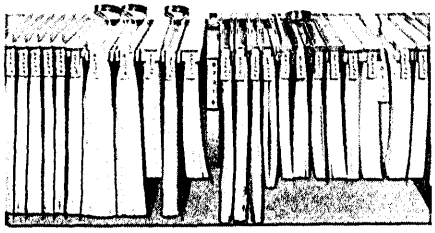

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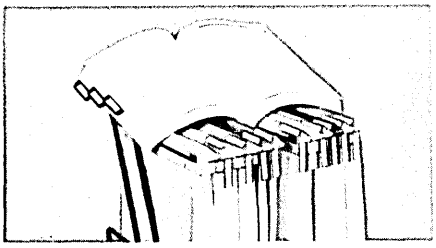

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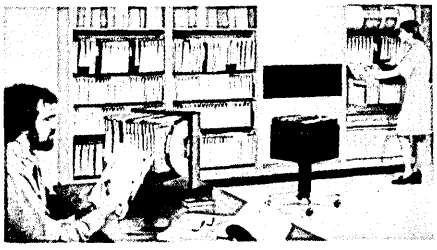

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CIRCLE 5 ON READER CARD

The IBM System/370 Model 3033

by Angeline Pantages and Michael W. Cashman, Associate Editors

Faster and less costly than a 168, with denser circuitry, and OS improvements stashed in optional firmware, much of the machine remains a mystery.

In an unparalleled performance, IBM drove the industry wild this spring with a series of announcements that wore out 500 Wall Street calculators. First, IBM jolted Amdahl and other mainframers with a new, mysteriously named, bargain-priced processor of uncertain technical merit—the 3033. Then it rammed its umbrella down onto the heads of nearly every competitor with a bewildering set of price cuts on cpu's, memory, and disc drives. It also served notice to the software industry that while it was finally unbundling system software, some of that "software" would reside undefined in firmware. It did all this in the midst of a booming year for System/370 orders.

In tandem, IBM's General Systems Div. added a Rabbit to its Volkswagen line, the System/34, and trimmed prices on memory and cpu's in many product lines. The division's Series/1 minicomputer was greatly enhanced through new program products including a priced operating system, and new hardware.

Much of this was good for users, even if many did not enjoy seeing the residual values of their purchased systems dip. But the general prognosis for the industry was menacing. Harry Edelson of Drexel Burnham voiced the common concern: "Wall Street portfolio managers are not taking this lightly. Investments are permanently leaving the computer stocks, and not one major computer stock is selling above 14 times earnings."

Even if one has little sympathy for the stock market, such an attitude could really squeeze out the innovators, the new companies, the companies with good products that need additional financing. Wall Street's vision is that competitors with very low profit margins—in memories, disc drives, mainframes, etc.—will be hard put to keep up with IBM. Frank Cary, IBM chairman, has been quoted as throwing down the gauntlet: "We will be competitive box for box." So the Street believes we haven't seen anything yet, and is spreading rumors that the 158 replacement, labeled "Project Scorpio," is due out soon, and replacements for terminals like the 3270 and 3600 financial terminal will likely come up later this year too.

Attacking the plug-compatibles

IBM watchers are convinced that the company is feeling so aggressive because of its legal victories, as in the CalComp case. One source tells us that Chet McLaughlin, the true legal brains behind IBM's antitrust fight, has been reassigned to become v.p. and general counsel of IBM in Europe. "That means two things. Since such assignments are three-year stints, IBM must be confident nothing will happen here until after that. And the European Economic Community's legal investigation of IBM in Europe must be heating up, so IBM is sending over the big gun."

The big bombshell in the announcements was obviously the 3033 processor, which analysts say will have sales of 1,000 to 2,000 units. It offers 1.6 to 1.8 times the power of the 168-3 and costs 40% less for an equivalent configuration. Users needed that bigger processor to go to, but few in the industry expected the price break. It does bring the system more in line with the 138 and 148 pricing, however.

The first reaction, as with the 138 and 148 pricing, was "2319" revisited. That is, these systems are considered by some to be more highly integrated, tuned up versions of their 370 predecessors, just as the 2319 was considered to be a repackaged version of the 2314 disc drive. The target is the same—the plug compatible manufacturers. Only the box has changed.

One long-time IBM observer allowed that IBM "is going to get the plug-compatible mainframe parasites out of its machine rooms just as it did the periph-

The System 370/3033 is delivered with the cpu, two consoles, a power/coolant distribution unit, and a minimum of 4MB of memory. Said to be 1.6 to 1.8 times as fast, internally, as a 370/168-3, it rents for about 40% less than its predecessor.

NET CHANGE IN SYSTEM/370 PROCESSOR PRICES SINCE 1971

Processor	Rental	Purchase
115	- 10%	- 31%
115-II	0%	- 30%
125	- 10%	- 31%
125-II	0%	- 30%
135	- 6%	- 6%
138	0%	0%
145	- 4%	- 4%
148	0%	0%
155	+ 10%	+ 10%
158	+ 8%	- 22%
165	+ 10%	+ 10%
168	+ 8%	- 22%

erals parasites," but he sees more meaning in the announcement. "The price cuts are deeper than any I've ever seen, and the name 3033 is no accident. IBM is telling industry that it is getting ready to depart from the 370 line. The 3033 may be just the first of a set of functional processors that will evolve into the fourth generation."

Competitors with venom in their hearts note that the 3033 is not the performer everyone expected (three times the power of the 168 was rumored) because "IBM was caught with its pants down after the failure of the Future System development. This was all they could come up with." Those wary of IBM's new pricing strategy think that a multiprocessor version could appear to fulfill that "three times the 168 prophecy," and with a very attractive price too.

The new pricing scheme will have a profound effect on the pricing and profit margins of the competitors. Amdahl, long awaiting the blow, announced immediately that it would meet the IBM challenge with a new 470 V/6-2 that undercuts the 3033; it also announced a more powerful system, the V/7 and simultaneously slipped under the 158 with a new V/5. Its profit margins would not be affected, it said. Analysts think that assertion means a change in charges by Amdahl's prime supplier of subsystems, Fujitsu.

Itel, whose AS/4 and and AS/5 are repeats of the 148 and 158 in performance, has not yet reconfigured its processor prices, although the memory increments will dip to $70,000 to $80,000 per megabyte to stay below IBM's $110,000. Richard Whitcomb of Itel's Computer Products Division noted that the firm will definitely come out with new leasing packages with purchase options. IBM did not lower the rental or lease prices of its big system, so Itel's leasing accountants will have room for creativity.

Cutting profits on hardware

Burroughs shot back at IBM with its own set of price cuts on the brand new 7800 system and the aging 7700. It also doubled basic main memory to three million bytes on the 7800 and wrapped 24-hour maintenance into the lease rate. The reductions vary on both purchase and rental, but a good comparison can be made with the dual processor 7821 with six megabytes and its standard 28 channels. This runs about $82,440 a month (after a reduction of over 25%), while a 3033 uniprocessor with 12 channels and six megabytes is $85,210. Strategy: equal price for greater performance.

Burroughs has the profit margin to cope with it. Despite corporate comments that the margins are dwindling, Edelson of Drexel Burnham tells us Burroughs' profits are still up around 17%, and that is far more than Sperry Univac (9%), Honeywell (7%), or NCR (8%) can currently claim.

Univac and Honeywell have systems competitive at the large-scale end but neither have announced price changes. The Univac 1100/80, more powerful than the 158, is also more expensive to purchase since the changes; it remains cheaper in rental. Honeywell's 66/85 pricing climbs past the 3033 to the new 168 purchase prices as memory increases to six and eight megabytes. In rental, however, its prices are below the 3033 and above the new 370/158 pricing.

While pricing comparisons are some measure, at times the comparisons are of apples and oranges, not only because of differences in architecture and attendant throughput, but also because of unbundling variations. For example, Burroughs does not yet charge for systems software, even compilers (actually interpreters), nor for any part of the MCP operating system. (The data management system is priced, however.) Honeywell has some compilers priced along with the data management system, but the GCOS operating system is still bundled.

But making more on software

IBM's unbundled software and service prices have clearly gone up in the last several years. Not only have program products for a fee increased in number and sometimes price, but also systems engineering services and maintenance of all forms have been hiked in 4%, 8% and 10% increments since 1973.

But the software pricing is the biggest noticeable change. The 3033 signals the unbundling of some operating system software on one hand, while on the other hand, firmware incorporating certain functions is rebundling other parts of it into the system. IBM announced an Extended Facility in hardwired/firmware logic that would permit the use of two System Extensions program products for MVS and VM systems, programs costing $1,250 and $1,200 a month respectively. (In order to achieve the promised improvement in performance provided by these products, 158 and 168 users would first have to pay one-time charges of $13,000 and $65,000 for the Extended Facility.)

Users expect this trend to unbundled pricing to continue and their bills for packages to be hiked yearly. Budget surveys are showing that the software share of total dp spending is moving rapidly to a level of about 5% of the rented hardware and software budget. Put another way, one giant company with six 168s says it is spending more than $500,000 a year on IBM packaged software. Another user said that most shops with one or two 168s are spending at least $100,000 yearly on these packages and expects that amount to increase three to five times in the next several years.

If IBM has 3,500 158 and 168 installations, it could be looking at future software revenues from these shops alone of more than a billion dollars per year. This might help make up for the majority of large systems that are purchased and not producing monthly revenue. Interesting to note is that IBM's Data Processing Div. lists hundreds of program products, field developed programs, and user developed programs.

Any 3033 buyer, therefore, must

NET CHANGE IN SYSTEM/370 MEMORY PRICES SINCE MAY 1976

System	Rental	Purchase
115	- 58%	- 58%
115-II	- 58%	- 58%
125	- 58%	- 58%
125-II	- 58%	- 58%
135	0%	- 35%
138	- 35%	- 35%
145	0%	- 35%
148	- 35%	- 35%
155	0%	0%
158	- 58%	- 58%
165	0%	0%
168	- 58%	- 58%

count on an additional chunk of funds for unbundled products, and must contend with quite a matrix of choices. But that still provides him with a better deal than before, for the time being. Those with 158s and 168s have many choices to make. Those who are lease-purchasing now have a greater percentage of the purchase price, accrued in options because of the price cuts. The purchase-to-lease ratio on those systems has actually dipped from 45:1 to less than 35:1—an all-time IBM low. Users also can add memory to overloaded systems at a better price. Since the first cuts in May 1976, the price per megabyte has dipped from $263,000 to $170,000 and now to $110,000. Generally, the memory factor reduces processor/memory configurations an additional 8% on average systems and up to 15% on very big memory systems. Also, 3330 disc drive prices have been sliced twice in the last few years—by 10% and recently by 15% in purchase price.

What will the others do?

This brings us back to the competition. Leasing companies, like Itel, which have not been putting their own funds into systems but have used financiers, have no risk position in their portfolios. These companies may pick up S370 systems from users with high accrued purchase option credits and place them on the market at prices that undercut the 3033. The undercutting will have to be drastic, though, just being 20% below the new 168 prices would obviously do no good. We have already heard of a well-endowed 168 going for $65,000/month on lease. Of course, the 3033 is a leasing candidate, attractively priced to be bought; but analysts think there will be more price/performance kickers announced for it, so buyers may wait awhile.

Memory makers and peripherals makers are struggling with the problem of what to do next. As noted, Itel's memory offerings, which come from AMS and National Semiconductor, will be reduced in price. Others will seek technological improvements rather than cut prices. And still others in all areas will try to think of another business to get into.

Software companies and the Itels and Amdahls face software problems and perhaps opportunities. Marvin Silverman of American Express feels that IBM, by functionally pricing systems software, opens up that market to competition, a market which was never fully available while systems software was bundled. Of course, as Mike Field of National CSS points out, "We need a definition of the interface to that firmware." National CSS markets a substitute for the time-sharing monitor TSO, called VP/CSS, and also develops much of its own software for its IBM and Amdahl systems. In the next year or so, a battle should shape up over IBM's willingness to part with the specifications for those firmware interfaces.

In the meantime, Japan Inc. looms in the background. Amdahl's partner, Fujitsu, has been developing its own equivalents for IBM operating systems. While some downplay the Japanese ability to develop such software, others feel that with Amdahl and some ex-IBM developers, Fujitsu at least has learned a great deal about it.

Overall, it appears that calculators in offices on Wall Street *and* in the offices of IBM's competitors *and* at user sites will be taking quite a hammering for some time to come.

COMPARING THE 3033 AND 168-3 PRICES

Processor	Rent	Lease	Purchase
3033	$ 77,430	$ 70,400	$3.38M
168-3	$129,904	$118,144	$4.30M

Prices figured with each system having 4MB, two consoles, 12 channels, high speed multiply, and Extended Facility.

The Technical Perspective

Most of us should have learned our lesson by now that IBM products aren't always what they seem to be on announcement day. The 2319 looked like a new disc storage device when it came out; only later did we learn that it was a repackaged 2314 with the integrated controller necessary to put some distance between IBM and the independent "parasites," directed verdicts, and comatose antitrust laws notwithstanding. And don't forget that until puberty, the original 370 line was a relatively uninteresting carry-over of 360 philosophies until virtual memory was "discovered."

It may be a bad mistake for anyone, competitor or user alike, to assume the 3033 is a souped up 370/168-3. Even though the system obviously fulfills the requirements of saturated 168-3 users, there's more to the announcement than meets the eye. For instance, Honeywell, in its recent 66/85 announcement, came about the closest yet of any manufacturer to introducing an intelligent file controller, with multiple access paths into a fast buffered memory from a mass storage system. Notice that IBM has left the disc controllers as separate boxes on the 3033, just as on the 168. IBM could go the same direction as Honeywell, however—as soon as all the ramifications can be worked out.

Also, the channel complement on the 3033 suggests that these channel units may be easily pluggable, perhaps even backed by imbedded I/O processors. Then too, the 2K-bit memory chips in the 3033 (which IBM claims to be using) make for relatively costly manufacturing compared to denser chips. Considering the availability quotes of "early next year," it's possible that no customer will ever really take delivery of a 2K-bit per chip memory in the 3033; chances are that IBM has something better (more competitive) in mind, say 8K chips? And lastly, the model numbers of the new machine, U4, U6, and U8 have always been used by the grey giant to designate uniprocessor models. It would seem that multiprocessors might not be far behind, depending on marketing requirements.

You can loosely couple a 3033 to any processor/operating system configuration that was allowed of 168-3s. Memory interleaving on the new processor is eight-way, for all memory complements (4, 6, or 8 MB).

The new denser cpu logic consists of 78 x 81-mil (.001 inch) chips, each containing the equivalent of 360 transistors. That is twice the 168-3's density, and helps to contribute to the 1.6 to 1.8 speed improvement ratio over the older cpu. But packaging is basically like the 168-3's, we're told.

Then there's the integrated channel, "a channel housed in the 3033 processor complex that operates synchronously with the processor." The processor is fast, at 58 nsec. (80 nsec. for the 168-3) and so are the channels. Standard ration is 12 channels, 10 of which are 1.5 MB block multiplexor channels, and the remaining two 40–75 KB selector channels. You can replace the first multiplexor channel in each group with a two-byte wide block multiplexor channel that operates at 3 MB rates. (This would be useful for supporting very fast peripherals or subsystems such as the 2305 drum, the 3838 array processor, or perhaps some devices now on the drawing boards.) If this still isn't enough channel power, there's an optional group consisting of either four block multiplexor channels or one byte multiplexor and three block multiplexors. Jumbo cpu's are getting to be like jumbo jets—they can get off the ground with anything you can stuff on them.

And all this power is available for less than the monthly rental of a 32K-word 7094 II (of perhaps the power of a 370/125) that was IBM's top-of-the-line 15 years ago. ✲

The Missing Link

The HP 3000 Series II closes the gap between the small business system and the big central computer.

Until recently, that gap was a real problem. For small to medium-sized companies the cost of a big computer was prohibitive. But there was a growing need for extensive batch processing and real-time information management.

Today, the HP 3000 Series II fills that need. A fast, powerful general purpose system, it can handle a wide variety of computing modes concurrently. Yet system prices start as low as $110,000 (U.S. domestic price).

A versatile operating system is the key.

Our Multiprogramming Executive allows the system's resources to be used concurrently. While batch jobs are running, several users can interact with the computer on a time-share basis via terminals (either hard-wired or over phone lines).

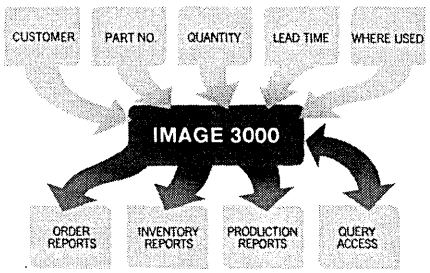
Operating speed is maximized with firmware-assisted software. And spooling, standard on all models, keeps the peripherals working at top speed.

Our system has virtual memory, giving you the flexibility to run large programs with a relatively small real memory. And with batch plus terminal capability, you can develop programs at a terminal using our interactive EDITOR—then run them unchanged in batch mode for production work.

The HP 3000 is fluent in COBOL, RPG, FORTRAN, BASIC, APL and SPL (our ALGOL-like Systems Programming Language). These are high-level languages, which the operating system treats alike. The same simple control language statements let you use any programming language.

Data Base Management: another "big computer" advantage.

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



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

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

IMAGE has proved to be such a useful DBM capability that it was named to the 1976 Datapro Software Honor Roll. This places it among the 38 top software products, and one of only three DBM packages, among 1447 rated by computer system users throughout the country.

The software was judged in six categories: ease of installation, throughput efficiency, vendor support, ease of use, documentation and overall satisfaction.

We've made our data management capability even more useful with the addition of KSAM (Keyed Sequential Access Method), giving you fast access to indexed sequential files.

Hardware advances add speed and reliability.

HP's "fault control memory" keeps the CPU running at full speed, even when a memory circuit has failed. Five error-correcting bits in every 21-bit word determine where a fault has occurred and the system compensates for it. A RAM automatically stores the information about the faulty chips. When our Customer Engineer arrives for regular maintenance, he calls up a status report and replaces any faulty circuits—even though everything has been running fine as far as you're concerned.

Fast (350 ns access) semiconductor memory is used, making the CPU easy to expand. In fact, you can go from 128K bytes of main-

frame memory to 512K bytes, depending on the system you choose. And disc capacity ranges from 15 to 400 megabytes.

At the heart of the CPU is a microprogrammed 32-bit ROM-based processor. It contains 209 firmware instructions that execute many system operations normally left to software. This microprogramming speeds up such recurring operations as moving character strings from one location to another, scanning strings for a particular character and environment switching. Processing interrupts and linked list searches are also implemented in microcode, relieving the operating software of considerable overhead burden.

With its power and versatility, the HP 3000 is a natural upgrade for companies outgrowing their small business computers. If you'd like to see it in action, call your nearest Hewlett-Packard office listed in the White Pages. Or write to Bill Krause, Hewlett-Packard, 11000 Wolfe Road, Cupertino CA 95014.

HEWLETT hp PACKARD

Handling big business problems on a small computer.

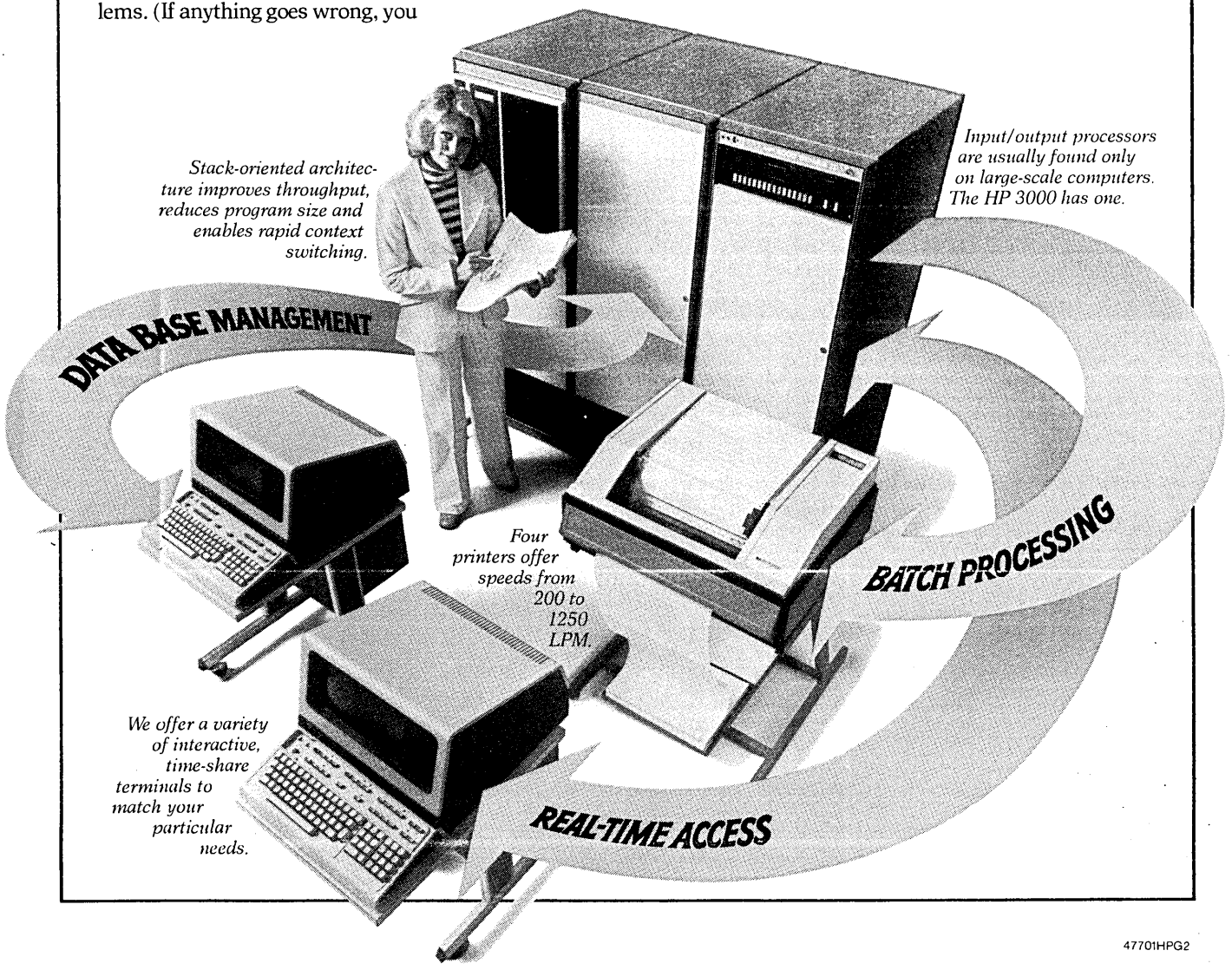
With a throughput two to six times greater than the original HP 3000, the Series II is designed to handle batch operations and multi-terminal on-line computation simultaneously.

All components of the system are supplied by Hewlett-Packard, which assures maximum compatibility and minimum service problems. (If anything goes wrong, you know precisely who to call!)

The smallest system, the Model 6, has a 128K main memory (expandable to 256K), plus a 50 megabyte moving-head disc, a 1600-bpi magnetic tape unit, an HP 2640B CRT terminal and a 16-port asynchronous terminal controller.

The Model 8 has all of this but starts at 320K bytes of main memory (expandable to 512K).

Any configuration can be enhanced with the addition of line printers, card readers and punches, terminals, discs, tapes and more main memory. Everything is planned to let your system grow with you.



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CIRCLE 41 ON READER CARD

Privacy/Security

Security: The Only Means to Privacy

Computer Security and Privacy Symposium Hears Speakers Talk of Future Legislation and Cost

Next month the Privacy Protection Study Commission created by the federal Privacy Act of 1974 will make public its final findings, conclusions, and recommendations.

The scheduled publication date is June 10. The data processing industry has been second guessing these recommendations since the commission was created in hopes of implementing policies that would make privacy legislation affecting the private sector unnecessary.

At a Computer Security and Privacy Symposium conducted last month in Phoenix, Joseph Horvath of Honeywell said his corporate computer group was looking to the June 10 publication for "guidelines" for their corporate privacy and security planning.

DR. ELDRED C. NELSON
". . . free to keep private affairs private"

Privacy and security continue to be linked, although to most they are two different things. One attendee of the Honeywell conference suggested that security was the only means to privacy . . . that privacy was the goal and security the way to reach it.

But, as was pointed out by one symposium speaker, Dr. Eldred C. Nelson of TRW Inc., there are contradictions. "Keeping secret the existence of a data base containing personal information helps insure its protection, its security," he said, "but privacy legislation says such data bases should not be kept secret, that their secrecy violates rights to privacy."

Nelson offered a definition of privacy: "Privacy is the right of an individual to be free in private affairs from surveillance and intrusion; to be free to keep private affairs private; and to be free from compulsion in action, thought, and experience."

JOHN MORGRIDGE
The public good vs. the public cost

To many of the symposium speakers, privacy and its assurance means trade-offs. To John Morgridge, v.p., Honeywell Information Systems, conference keynoter, it is a trade-off of "the public good versus the public cost."

Right to know and withhold

To Ronald Meyer, Phoenix attorney specializing in constitutional law, it is a trade-off between the "right to know and the right to withhold." Meyer believes the courts are taking a "trade-off balancing approach" which proposed legislation is ignoring.

Meyer feels a big question is, "How broad is the zone of privacy?" He feels recent lower court decisions which seem to have ruled that dissemination of personal information is "outside this zone" indicate that the Supreme Court, "when and if" it has to deal with the issues, will take the "balancing approach . . . the right to privacy balanced against a legitimate right to know." He cited a lower court case in which a court said a small town police department which had, during the Christmas shopping season, distributed a list of "active shoplifters" to local merchants, was within "the legitimate need to know" area of right, even though one person whose name was on the list was never convicted.

Jack L. Osborn, director of Information Privacy Research Center at Purdue Univ., said at the symposium that the private sector is making a mistake in stressing cost as a foremost factor in their objections to proposed privacy legislation. "Legislators are willing to consider cost," he said, "but not as a foremost factor."

Dr. Robert Goldstein, whose Honeywell-funded doctoral dissertation on "The Cost of Privacy" has stirred a small amount of controversy since its publication in 1975, took this point one step further: "Legislative decisions," he said, "are not going to be based on cost. But cost can be a factor in shaping legislation."

Dr. Goldstein based his doctoral dissertation on a model for assessing the cost of complying with privacy legislation, legislation which, at the time he did the work, didn't exist. He emphasized at the Phoenix symposium that his model was not expected to be used by companies to determine privacy compliance budgets, but rather was intended to influence legislators contemplating the framing of privacy laws.

"It was meant for comparative purposes," he said. "The comparisons were good, but the numbers it could generate in an actual run were not." Goldstein said he and "associates" were contacted by the National Bureau of Standards after the passage of the 1974 privacy act and asked to modify the model and run it through "several federal agencies." They did. Part of the contract called for delivery to NBS of a copy of the program which generated the model. NBS, Goldstein said, put the program on sale as a standard federal document "for a trivial amount of money." Many com-

panies acquired copies and ran the model as a budget assist, he said, some with bad results. "Some wrote papers saying the model was lousy and I wouldn't hear about it until I'd see the paper in the proceedings of some conference."

New cost model

Goldstein currently is working on a new privacy cost model "partly just out of desire to obsolete that old one." In mid-April he was expecting to "start testing shortly."

He said the new model "still won't be good enough to set a privacy compliance budget with, but it will compare alternative costs and be an aid to improving processing strategies. Comparisons," he said, "will be good, not the numbers." Goldstein's current project is funded by the Purdue center.

That some kind of privacy legislation affecting the private sector is coming was assumed by most of the symposium speakers. Attorney Meyer feared the legislators wouldn't take as "reasonable a view" as the courts.

Rep. Barry Goldwater, Jr., an author of the 1974 act and of the pending HB 1984 which, essentially, would impose the 1974 bill's particulars on the private sector, said he anticipates not an omnibus bill such as 1984 but amendments to existing legislation.

"Even though I introduced 1984," he said, "I hope it never becomes law. It would mean a nightmare in terms of costly administrative procedures."

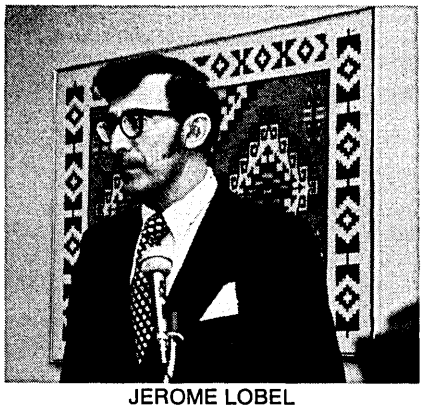
Jerome Lobel, manager, computer security and privacy for Honeywell Information Systems and organizer of the symposium, predicted that the Privacy Protection Study Commission will "take a selective position with regard to privacy legislation in the private sector." He cited testimony by Edward A. Robie, senior v.p. of The Equitable Life Assurance Society of the United States, during commission hearings: ". . . in an economy as diverse as ours, centralized regulation is extremely expensive and often of limited effectiveness. In addition, like many medical prescriptions for the ills of our bodies, regulatory prescriptions often have unforeseen and unattractive side effects. Where possible, it is preferable to rely on the incentive of the market system. It has been our view that recognition of the rights of employees as individuals, including their rights of privacy and access to information about them, is good business."

Goldstein said far-reaching privacy legislation could impact decisions on centralization versus distributed processing and could cause some small companies to decide not to manage personal data at all, but rather to go to a service bureau and let the bureau worry about compliance.

Voluntary compliance

Lobel said the Privacy Protection Commission's hearings "contained the very clear message from American businessmen, that they felt that they could more than adequately solve this problem (privacy protection) on a voluntary basis."

During the symposium he wondered if the same businessmen shouldn't be paying more attention than they are to the possibility of natural disasters. "Disaster recovery," he said, "is nothing magic. If there's any place in which the industry has been deficient, it's this



JEROME LOBEL
Businessmen could solve privacy protection problem voluntarily

area." He contended most companies tend to think only of total destruction and tend to put off disaster recovery planning for this reason. "A disaster can be a very small thing."

A symposium speaker on this subject, Jack Curry, manager of edp security for Seattle-First National Bank, agreed with him. His bank has a disaster recovery plan and it's modular "because you probably won't be dealing with a total disaster."

Curry calls his disaster recovery plan "a corporate insurance policy." It was developed in seven phases. Phase one involved establishment of applications priorities. To do this he developed a questionnaire for users which was hand-carried, and covered such questions as: what are the dependencies; are time-periods critical; can data be recovered; is manual processing possible; is data submitted remotely and, if so, where?

Curry said it took four to five man-months of effort just to establish the applications priorities.

Phase two involved personnel. "All employees have to know what they're going to do and how they're going to do it in case of a disaster." A disaster recovery manager should be appointed, he said. "Who does what and when is important, and the manager should have a back-up because he could be in the dp center when the bomb explodes."

Equipment was the concern of phase three of Curry's program. "What equipment is needed for high priority applications? Where can it be found? Can you distribute your work to other companies in a similar business environment?"

Document it

He emphasized that "a gentlemen's agreement—a 'you scratch my back, I'll scratch yours'" is not effective. "The agreement must be documented. Work with your vendor when possible."

Phases four through seven of Curry's development involved supplies, distribution, facilities, and miscellaneous. He said it took 140 to 150 man-weeks to complete the entire project, adding that it ended with a plan which must be updated semiannually.

An aspect of computer security that evoked considerable interest at the Honeywell symposium was the NBS encryption algorithm adopted last year (March 1976, p. 164). David J. Sykes of HIS told the group that devices to enable link encryption using the algorithm "will be announced shortly and will cost between $2,000 and $3,000, and will plug into terminals and network processors."

Hank Koehn, v.p., Security First National Bank, Los Angeles, said his bank, which is planning to put 512 branches on-line to the tune of some 5,000 terminals, is specifying that the NBS algorithm be built into any equipment it purchases.

Koehn talked to the group about EFTS security, stating that he prefers to think of EFTS as Electronic Financial Transaction Services rather than the usual Electronic Funds Transfer Services. "EFTS alone," he said, "will finally force business and industry to concern themselves with data security. A new delivery system poses new threats. High level creative fraud that will come with EFTS can only be solved by high level creative security."

That threats can come in a variety of forms was testified to by a number of speakers. Fred Tater, manager of scientific programming for Aeronutronic Ford, told of a terminated employee who destroyed a key file which had "cost me $15,000 to gin up."

Harley Robertson, corporate consultant, Gibralter Savings, wondered about customer engineers "walking off with your program."

The question of a universal identifier, particularly the social security question, was addressed. Goldstein said he has been rethinking this matter. In his model, he explained, "it always is assumed that we know who is asking and who is being asked about." Not to use a universal identifier, he said, is to assure privacy by making things more difficult. He would prefer to have an identifier to make privacy protection easier.

Lobel also noted that "the case for more liberal use of the Social Security number is extremely strong. As Charles

E. Brown, v.p. of employee relations for Honeywell, Inc., pointed out in Honeywell's written response to a request for its position on the privacy of its employee information said, 'in considering the use of the Social Security number, it should be recognized that we live in a more complex society than we did only a few years ago when there was no Social Security, no unemployment compensation, no tax withholding, only limited public welfare programs, few employer group life or medical and disability insurance plans, savings and investment plans, or retirement programs, and when proportionately much less reliance was placed on various forms of credit.' "

Because many people have the same name, said Lobel, "because names change with marriage and because it is far more difficult to mechanically or electronically search files by alphabetic means than by utilizing numbers, it has become necessary to establish numerical identification systems to manage large information files."

But numbers can create problems too. Koehn of Security Pacific told of a study done in a Florida retirement community on the PIN (personal identification number) popular with banks having automated teller terminals. In this community customers were allowed to choose their own PIN's and the number 060644 was much too popular—the date of D-Day.

—Edith Myers

Technology

How Bubbles Bounce

TI's Announcements Bring Bubbles out of the Laboratory

Two rapid-succession moves at Texas Instruments have finally brought bubble memories out of the lab and into the end user dp market.

On March 9, the firm's Semiconductor Div. in Dallas announced availability of its TBM0103, a $200 (single quantity prototype price), 92K-bit bubble memory chip in a 14-pin package roughly one inch square. Then, barely five weeks later, on April 15, its sister division in Houston, Digital Systems Div.(DSD), said it would use these chips in conjunction with its Silent 700 line of terminals to provide end users with a portable terminal with up to 80K bytes of nonvolatile storage (see Product Spotlight, p. 270).

With a cost per bit of slightly more than two-tenths of a cent, the TBM0103 doesn't immediately come into competition with other secondary storage devices, such as small discs. However, as production expertise brings increased yields, and economies of scale come into play, bubble prices will drop to the point where designers may opt for solid state bubble devices instead of using moving magnetic media.

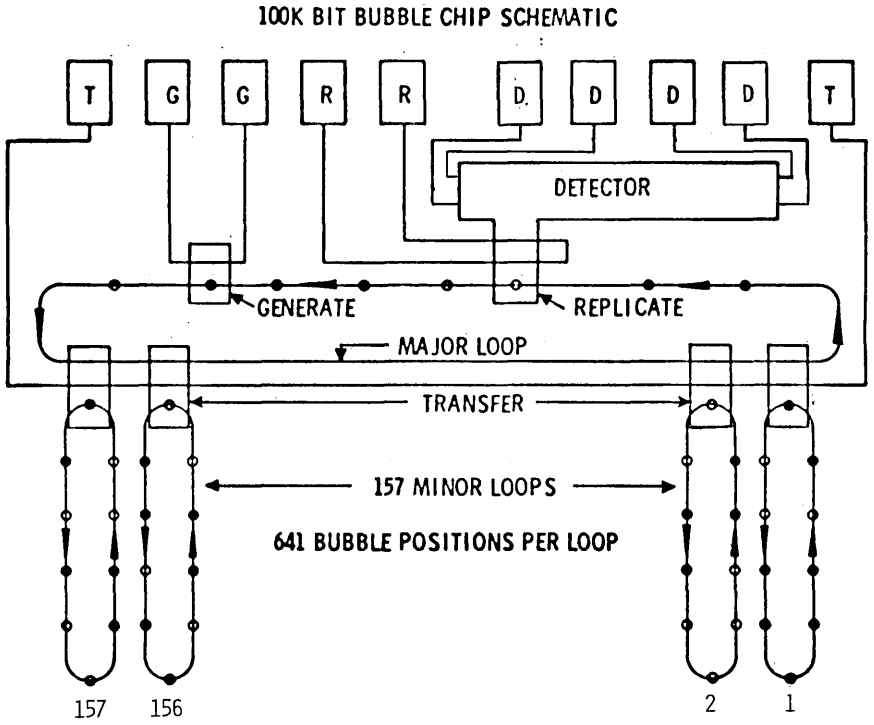
"We saw the effect of economies of scale when we started using 4K RAM's from Texas Instruments' Semiconductor Division," says Doss Dunlop, v.p. and manager of DSD. "We expect to see similar economies of scale come into play as our products use more and more bubble memory chips."

Aimed at new markets

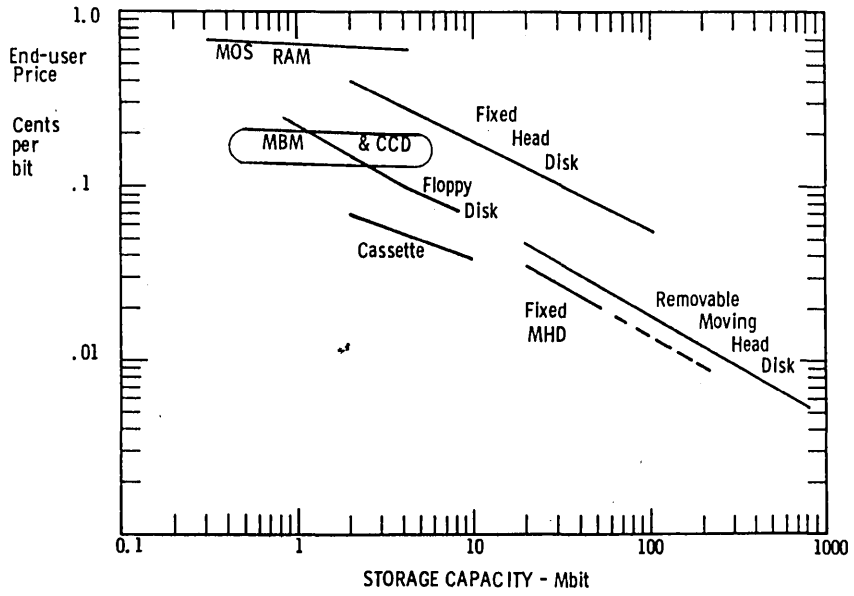
Replacing existing storage devices won't be the largest market for bubble devices, a TI spokesman from the Semiconductor division says. New markets, where a small amount of nonvolatile storage in a small package is required, have more potential sales.

A magnetic bubble is actually a cylindrical magnetic domain with its poles in the opposite direction of the polarity of the magnetic material in which it is imbedded. The memory device is put together in such a way that the bubble positions are uniformly spaced. The presence of a bubble signifies a binary "one," absence of a bubble means a binary "zero."

TI takes a garnet substrate and grows an epitaxial layer of magnetic garnet material on top of it. An epitaxial layer has the same crystal structure and orientation as the substrate. Andrew Bobeck (see People, p. 29) and a team of engineers at Bell Labs in New Jersey performed pioneering work with garnet-based bubble devices in the late '60s and early '70s; TI and Bell have a cross-licensing agreement. Bell has already put bubbles to work, but not in an end user dp application: the phone company is currently evaluating its 13A announcement system, which plays



MAJOR/MINOR loop chip organization. Boxes at top represent pins connecting the chip to the outside world. The replicator (upper right) can either deflect a bubble (destructive read) or copy the bubble (non-destructive read) and send it on to the detector. The generator (upper left) creates new bubbles as required for write operations.



END USER price per bit and storage capacity comparison for various technologies, including magnetic bubble (MBM) and charge coupled devices (CCD). Source: TI and 1976 vendor price lists.

back messages such as, "You have reached a non-working number," stored in a digitized format in bubble devices.

Another approach

Early on it was thought that bubbles could exist only in epitaxial films. Then in early 1973, scientists at IBM's research center in Yorktown Heights, New York, announced that they had observed magnetic bubbles in amorphous (non-crystalline) films of gadolinium-cobalt and gadolinium-iron. These films can be sputtered onto a substrate, a much easier task than growing a garnet crystal.

A TI spokesman explains that amorphous film research hasn't progressed to the point where it's viable outside of the lab. "Remember that garnet technology has several years' head start on amorphous research," commented an IBM spokesman.

TI's TBM0103 uses what is known as major/minor loop organization. The minor loops, 157 shift registers parallel to each other on the chip, contain the data. Another shift register, the major loop, is perpendicular to the minor loops. Read and write operations pass data through the major loop to or from the minor loops.

Each of the minor loops has room for 641 bubbles, giving the chip a potential capacity of 100,637 bits. However, to increase production yields, up to 13 minor loops may be defective, so each chip will have at least 144 good minor loops. Bad loops are identified during a testing phase, and a map of bad loops is loaded into the chip before it leaves the factory. With this map a microprocessor controller can format data going to or from the chip. In DSD's terminal this microprocessor also performs memory management and text editing functions.

Data transferred in "pages"

Data transfer occurs in blocks, or "pages." A page of data consists of one bit from each minor loop. A current is fed to the chip when a page of data is to be read. This causes the bit closest to the major loop in each minor loop to jump to the major loop. The page then shifts around the major loop, passing by a detector which sends out a current pulse each time a bubble passes. Since the data are moving around a closed loop, the chip's average access time, 4 milliseconds, is analogous to the rotational latency of a disc. Reading an entire 144-bit page of data takes 12.8 milliseconds.

Since the bubble chip works with current pulses, and logic circuits work with voltage levels, a set of interface chips must sit between the memory and logic circuits. Prototype memory boards for DSD's memory terminals have about a dozen integrated circuits to perform the interface function. TI's Semiconductor Division will have a custom MOS controller and a family of interface integrated circuits available soon, which will let DSD put four times the memory in the same surface area.

Permalloy defines loops

A series of *T* and *I* shaped permalloy patterns deposited on top of the garnet film define the major and minor loops. Two perpendicular coil windings create a rotating magnetic field when fed 100KHZ triangular wave-forms 90° out of phase. This rotating field causes the permalloy *T* and *I* bars to form electromagnets with rotating poles that suck the bubbles along their intended paths.

TI uses bubbles having five micron (millionths of a meter) diameters. The factor limiting bubble size is the width of the permalloy guides that can be deposited on top of the garnet film. With current manufacturing technology, the guides can be fabricated for bubbles with three micron diameters. Such a chip would have about twice the density of a chip using five micron bubbles. Smaller bubbles and denser chips will have to wait until new techniques, such as x-ray lithography or electron beam slice writing, become part of the standard manufacturing repertoire. Still, at least one TI engineer foresees an order of magnitude increase in packing density by 1980.

—Bill Musgrave

Services

Year of The Rabbit

XCS Extends Life of Sigma's With the HF 32

"It was the year we caught the rabbit," said Jim Campbell, president of Xerox Computer Services, of 1976.

It was the first full year in which the seven year old information services arm of Xerox Corp. was profitable. "Profitability," Campbell explained, "had been the elusive mechanical rabbit of dog races."

They like the rabbit so much they've named a device they developed to extend the life and capabilities of their Sigma computers after him. It's called the HF32. The HF is for Hasenpfeffer, a German word the XCS people define as rabbit trap although Webster defines it as rabbit stew.

Campbell described the HF 32 as a "symbiotic processor." When attached to a Sigma computer, "the two together are faster than either one alone " The device is based on an Intel microprocessor. XCS had its first production unit last January and now has three connected to one of its Sigma 9s. "We expect them to improve the performance of the 9 by a factor of two at night and 1.5 during the day. We're already close to our night time goal," said the XCS president in mid-April. He said the devices will extend the life of the Sigma equipment into 1980.

XCS started development of the HF 32 in the second quarter of 1975 in an effort to "generate more revenue per system." It uses "our own microcode and costs from $18,000 to $22,000 per unit to manufacture," Campbell said. The company intends to produce the units solely for its own use.

A terminal, too

Development of the HF 32 was headed up by Pete Hatfield, v. p., engineering services, who also directed development of XCS' 1340 terminal of which some 1500 currently are installed. The terminal is based on a HyType 1 electronic typewriter produced by another Xerox subsidiary, Diablo Systems Inc., Hayward, Calif. "Diablo manufactures the 1340 to our specifications," said Campbell.

XCS either sells or leases the 1340s to its information services customers and also leases and subleases terminals produced by other manufacturers, mainly crt's. The customer also can deal directly with the terminal manufacturer if he wishes. "We encourage this," Campbell said.

JIM CAMPBELL
His computer room is a lonely place

XCS has other plans for extending the life of its equipment and for adding to it. "We've made a large mainframe commitment for additional 7s and 9s," Campbell said, "and we're working on a method which will effectively turn the 7s into 9s."

The company plans to enhance the HF 32 so it can "help in the disc controller function and improve data base access efficiency." It also is looking at three kinds of memory to increase core capacity: Honeywell's recently announced MOS memory and memories available from Telefile and Ampex.

When XCS opened for business back in 1970, its founders stated they wanted to grow "slowly and surely." It did just that in its first five years but, in the last two, Campbell said, they've doubled their activity in terms of transactions handled.

People-less computing

And they've done this with fewer people than they had two years ago because of what Campbell calls "people-less computing." XCS' massive computer room is a lonely place with nobody there most of the time. "We've programmed our computers so customers on terminals say what they want directly to the machines and the machines queue up the work and schedule it. It's more reliable, smoother, and we have better productivity than with operators as intermediaries."

XCS started in business with one Sigma 7 in Marina del Rey, Calif. Today they have two large centers in Marina del Rey, and a smaller one in San Bernardino, Calif., and branch offices in eleven major cities. They have seven Sigma 9s and five Sigma 7s for a total of 12 mainframes and 15 branch computers, both Sigma 3s and Xerox 530s. "Our data base has more than quadrupled," Campbell said.

"We're right on target or better," he said, noting that the company has more than 500 customers and a terminal population of more than 100,000 in 33 states. The company has a communications network of approximately 90,000 miles of leased line, 40,000 of which are interstate. Campbell said they probably will add international communications lines in late 1979.

The company has widened the scope of its services in its seven years of existence from a start of utility billing for municipalities and interactive accounting to a range of packages for just about any kind of business in the $1 to $2 million annual business to $80 to $100 billion range.

Currently XCS' big thrust is in the manufacturing industries for which it has "a whole set of products. Nearly two-thirds of our business is with manufacturing, not only the accounting office but in operational capability planning, controlling production costs, and materials requirement planning," Campbell said. "We are concentrating our efforts on the manufacturing process—assembly and fabrication operation and master scheduling."

Big among cities

The company continues to provide information services to cities, and this accounts for some 24% of its business. It believes it is the largest firm providing services to cities in the U.S. Cities in the Los Angeles basin account for one-third of its total, Campbell said, "but Northern California is growing, and last year we began serving cities in the Midwest and East."

Some services XCS offers could be used by any kind of business. One such is "The Reporter," a term they have copyrighted and which covers a service which makes it possible for a customer to create his own reports from his data base instead of using XCS' standard reports. "We have tens of thousands out," said Campbell.

The firm last month introduced general time-sharing services in BASIC, COBOL, FORTRAN and APL although it is not after general time-sharing customers. "Our goal is to provide total service to our client base," Campbell said.

And one of the biggest clients in this base is Xerox Corp. itself. XCS services most of Xerox' small to medium sized manufacturing plants which Campbell likes because "they (corporate) help fund additional development efforts." Could be this means development of bigger and better rabbit traps.

— Edith Myers

Companies

Long Way Back to The Winner's Circle

A few years ago when business was really booming, Modular Computer Systems, Inc. launched an ad campaign with photographs depicting a racetrack scene in which the thoroughbreds, whipped on by their jockeys, made the turn into the final stretch.

Today, however, it seems that Modular, better known as MODCOMP, violated a cardinal rule of both horse racing and corporate management: Don't get off to too fast a start and burn yourself out before hitting pay dirt. "MODCOMP put a hyper focus on growth and dazzling Wall Street," a computer analyst with one of the country's largest brokerage houses observes. "And predictably it lost control."

MODCOMP was first hit with real problems in 1976 when, after registering sharp sales increases and profits every year since it started operating in 1972, the Ft. Lauderdale minicomputer manufacturer announced a $4.1 million loss on sales of $37 million, more than $1 million less than they'd been in 1975. Working capital was cut almost in half (down to $9.9 million from the '75 figure of $17.1 million), several hundred or more employees got their pink slips and the stock plummeted to a low of $2½.

What went wrong? A number of things. "They were building machines

before they had firm orders and they were counting billings as bookings," a former marketing executive with the firm explains. "There were no real controls."

As a consequence, the marketing source says, forecasted revenues didn't materialize, products were manufactured that couldn't be sold at adequate profit margins, and shipment volume dropped off markedly.

Too narrow for growth

And that was only part of the problem. With minis that were oriented principally toward the measurement and control markets as well as certain segments of the data communications area, the company's product line was limited. "They built a specific niche for themselves, and their software is very specialized," George D. Elling, a senior analyst with Martin Simpson & Co., Inc., says. "Consequently, their market base wasn't really broad enough to sustain the kind of growth they were hoping for."

KENNETH G. HARPLE
One man could no longer call all the big management shots

To help rectify this situation and diversify, MODCOMP acquired ECS Information Systems, Inc., a Lexington, Mass., business systems house in late February 1977. With its experience developing applications packages as well as "turnkey" systems for small and medium size business users, ECS would provide MODCOMP with a strong foothold in the business market, the company hoped.

And to put its own house in order, MODCOMP, under pressure from several banks to which it owed close to $11.5 million, began to disperse some of the power 48 year-old Kenneth G. Harple, president and chairman of the board, had held since founding the company. Harple's credibility had slipped in the investment community. "He kept telling us nothing bad could happen," one analyst recalls bitterly. "And then something bad happened."

Moreover, the problems that came to a head in 1976 made it manifestly clear that one man could no longer call all the major management shots, especially now that MODCOMP had grown into a relatively large company. Consequently, the corporate organization structure was broken into four separate profit and loss centers: measurement and control, oem, communications, and business systems. "We had a lot of talented managers who weren't really managing under the old systems," says Robert G. V. DiStefano, a MODCOMP v.p. who runs the oem group, an area from which the company derives roughly 30% of its business. "This new approach gives them a chance."

"It helps our customers as well," adds Harlan E. Dybdahl, manager of the communications group. "Now they know exactly where to go with their specific problems."

A v.p. with clout

In addition, MODCOMP brought in Alexander W. Giles, Jr. as v.p. for finance and administration and secretary/treasurer. The 42 year-old Giles and controller John Dooley, who had worked with Giles earlier at General Host Corp., were given broad authority to initiate stringent financial controls. "Right now Giles has a tremendous amount of clout," a former MODCOMP executive who is still close to the company says. "He's set up very conservative procedures whereby nothing can be built unless there's a firm order in. There's no more of this open-ended approach where somebody says, 'Here's a market . . . let's go after it,' without knowing exactly what the cost and profit are going to be."

Giles himself describes the new system this way: "We've instituted monthly financial reporting which the company had never done before. This is not only profit and loss reporting but a comprehensive management information system that allows us to get behind the numbers, and monitor and plan around the pressure points of the business.

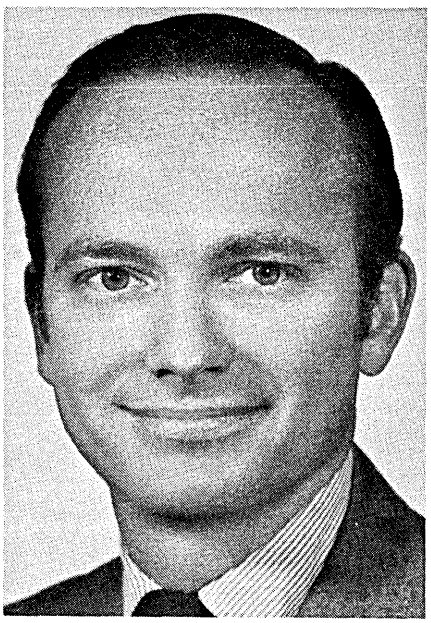
"We've also developed a real-time profit analysis system whereby every order that comes in is put through a series of checks to determine its profitability. The system itself will reject the order if it doesn't pass our criteria, though it can be overruled."

Other financial measures include extensive documentation, a continual monitoring of all accounts, and a redesigned cost accounting system. "These are things we should have been doing all along," Giles explains.

Software problems persist

The new controls and organizational structure should markedly strengthen MODCOMP, but the company still must overcome some major obstacles before it can really get back on the track. While its hardware is generally considered solid—big users like Union Carbide and Johnson Controls give it high marks, for example—users say serious software problems persist, at least with MODCOMP IV, its newest 32 bit processor, and MAXNET IV, a system oriented at the distributed processing area.

One of MODCOMP's largest customers explains why. "The software on the earlier products (MODCOMP III and MAXNET III is solid, but we've had all kinds of difficulties with MOD IV and MAX IV. Delivery is way behind, promises were made that were never kept, and they haven't met their specifications.



ALEXANDER W. GILES, JR.
Nothing can be built unless there's a firm order in

"For example, we've been waiting for over a year for a file manager to work in the distributed network environment, and finally MODCOMP is about to come out with what they call the Rev. C release to solve the problem. But thus far we haven't been really able to get their damn distributed processing system up and running.

"I'll say this, however, in their favor. Their software organization seems to be a hell of a lot better organized lately. Maybe that financial crisis they went through was the best thing that ever happened to them."

A laundry list of MODCOMP's other

principal worries would have to include its heavy dependence on a relatively small number of customers, as underscored in the firm's own 10-K report, the form it filed with the Securities and Exchange Commission recently. "The five largest customers . . . accounted for approximately 28% of its (MODCOMP's) revenues during the last fiscal year . . . No other customer accounted for more than three percent of sales," the report states. "The loss of any major customer by MODCOMP without offsetting orders from other sources would have an adverse effect on the business."

Moreover, an order with ITT Domestic Transmission Systems that MODCOMP has touted as being potentially worth $3.5 million is contingent on preliminary development and testing which is still in the works. Any commitment of $3.5 million is by no means firm, an ITT source says.

Further, two markets on which MODCOMP has recently turned its marketing guns—distributed processing and business systems—have softened significantly. "The distributed processing market may only grow about half as fast as the 40% annual rate people were projecting last year," a leading computer analyst says. "And sales momentum on business systems is dead in the water since IBM's System/34 announcement. It's the wrong time for someone like MODCOMP to come into the business."

The distributed processing market may only grow about half as fast as the 40% annual rate people were projecting last year.

Giles counters that although the MODCOMP business systems group only has three systems out in the field to date, two more are currently being shipped, there's a $1.2 million order in house and a big shipment that may run in excess of $5 million is scheduled for September. "We haven't seen any softening in relation to what we expected out of the market," he maintains.

Takeover fears

Perhaps the darkest cloud hanging over the firm's Ft. Lauderdale headquarters, however, is the possibility of a takeover such as Milgo, the Miami-based modem and communications equipment manufacturer recently experienced.

At a time when it was going through the worst of its financial problems last summer, MODCOMP was the subject of a number of takeover rumors that had everyone from T.R.W. to Data General ready to snap up control. A recent flurry of trading in MODCOMP stock has renewed those rumors, this time with Applied Digital Data Systems—the company that lost out in the Milgo takeover to Racal, a British electronic firm—as the suitor. "Even though it failed in the Milgo takeover bid, ADDS made about $30 million in the deal from the Milgo stock it held," a Florida financier says. "And they have to reinvest that money before the I.R.S. hits them with all kinds of taxes. MODCOMP seems a likely target for them."

Giles discounts the ADDS rumors. And MODCOMP seems determined to fight any takeover attempt if it comes. "There's no way in hell ADDS or anyone else is going to get control of this company," a MODCOMP director announced angrily after a recent board meeting.

"If management fought a tender offer," adds Giles, "it would be very difficult for someone to obtain the 80% of MODCOMP stock needed for consolidation."

What about the 51% needed for control? "It's possible someone could get it, but not without creating a lot of bad feeling here."

MODCOMP plans to go it alone, then, and the projected numbers, if they turn out to be correct, indicate the company's odds of making it have improved dramatically since last year. Giles is talking about a $12 million first quarter and total 1977 sales of about $50 million—enough to put MODCOMP back in the black, and perhaps once again in the winner's circle.

—Laton McCartney

"Sycor 350 terminals perform the edits and checks we used to do on-line. At a fraction of the time and cost."

Jack Robinson, Asst. VP
State Street Bank of Boston

State Street Bank & Trust Company of Boston is one of the largest custodian banks in America with over 125 portfolios totaling some $20 billion in assets. This includes serving as custodian bank for mutual funds whose assets represent 30% of the entire domestic mutual funds industry, as well as variable annuities, pension funds, and college endowments.

Each day, the custodian service department must report the net asset value of the mutual funds to the National Association of Securities Dealers for publication by the daily news media.

Getting this information out on time—and getting it out accurately—is vital. To do it,the bank depends on Sycor 350 terminals for processing over 500 daily portfolio and general ledger transactions.

Sycor picked for speed and economy.

"Our growth was placing heavy demands on both our on-line terminal network and keypunch facilities," notes Jack Robinson, assistant vice president. "Typewriter terminals were simply not fast enough to get the job done, and making improvements in the on-line program would have required a massive overhaul.

"The replacement of on-line terminals with Sycor 350 terminals took care of both problems. It also eliminated the need for nighttime keypunching which helped us save even more on operating costs."

The dual-flexible-disk Model 350 is microprocessor-controlled and has 16k bytes of memory.

Sycor terminals keep working when the CPU goes down.

"Every Sycor terminal has an independent microprocessor, so we have as many back-up systems as we do terminals," Robinson says. "If the mainframe goes down, we can still continue entering data.

"We currently receive 12,000 transactions per month by TWX, phone and mail. We enter the data on Sycor terminals and, at scheduled intervals, transmit it to our CPU. This gives us an on-line batch system that gets the job done economically and gets it done right. It's the best of both worlds."

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SYCOR

Harris: Growth by Acquisition

Remember the Harris-Intertype Corp., the Cleveland company that made sheet-fed offset presses? It's now the Harris Corp. and it's a big electronics concern with a major presence in the information handling field.

Harris took a $17 million write-off to sell its sheet-fed business two years ago, but at the same time it was well on its way to becoming a factor in the electronics business, having acquired a semiconductor firm, various satellite communications businesses, the minicomputer manufacturer, Datacraft, and the remote batch terminal business of University Computing—to name a few.

In its fiscal 1977 year, which ends June 30, commercial electronics products are expected to provide 50% of the company's sales of more than $600 million and provide 55% of its earnings.

It has done this by acquisitions. An example is its strongest electronics operation—the Harris Data Communications Div. in Dallas, which is expected to sell about $50 million this year, followed closely by the minicomputer operation in Florida with an estimated $48 million. It entered the market by buying the UCC Communications Systems, Inc., manufacturing subsidiary of UCC (before it became the Wyly Corp.) for $20 million. That was when UCC was looking for money to finance its recently aborted Datran, data transmission carrier business.

That gave Harris the COPE 1200 range of programmable remote batch terminals, communications controllers, IBM compatible teletyprewriters and a network of sales and service offices in the U.S. and Canada. Next the division extended its base by buying the M&M Computer Industries, Inc., subsidiary of Singer for $3 million, giving it that company's remote batch computer base.

Sanders was next

But its most important acquisition was that of Sanders Data Systems, made early this year for $15 million and the assumption of around $2 million in liabilities. "I've had my eye on that company for more than two years," says Jack C. Davis, the Harris division's 39-year-old v.p. and general manager.

Davis said the company's IBM 3270-like product was excellent, but its start-up costs were a drain on its parent, Sanders Associates. (It lost money every year, although its revenues were rising all the time—to about $28 million last year.) Besides the price—about one-half the book value of the Sanders division—Davis said two other good things about the acquisition are that it gave Harris a strong overseas base for the first time and it was in a growth market. Sanders, which is being operated now as the Nashua (N.H.) Operation, has some 500 customers worldwide and 100 sales and service persons in the U.K. and West Germany.

JACK C. DAVIS
An eye on Sanders for more than two years

And, says Davis, "we found that while the market for remote batch equipment was growing at a rate of 18% to 20%, the demand for on-line data entry—the product Sanders makes—was growing at a 40% rate."

"We practically had no reorganization to do," says Davis. "Sanders had hired Andrew Haladej a year earlier to rescue the operation and he did the obvious—chopped off 250 people from the staff," to about 700 today. Haladej now runs the Nashua operation for Harris. In Texas, meanwhile, Harris plans to sink $5 million to consolidate its operations, now scattered in six leased buildings, into a 250,000 sq. ft. plant on 25 acres the company has acquired.

The 1600 line

In early 1975, Harris Data Communications came out with a successor to the product it acquired. Called the COPE 1600, and now called the Harris 1600 line, it was a higher speed programmable processor that operated under a multitask operating system called COS. It had routines that eventually included emulators for the IBM, Control Data, Univac, Honeywell, and Burroughs mainframes, and provided in addition to remote batch, data collection, line concentration, and standalone processing.

That took the company into what is now called the distributed data processing business, "and we're making money at it," Davis said. The 1600 line is being added to continually, and next month at the National Computer Conference in Dallas it has more improvements to announce.

Included are an expanded memory that will allow a user with the 1600 to execute, for example, up to 10 interactive programs concurrently with remote batch jobs, or up to 15 interactive programs without remote batch.

A dual processor configuration—the Harris 1680—also is being shown for the first time at NCC. With such expanded concurrent processing capability, the 1680 might be configured to operate an RJE protocol, batch COBOL programs and 12 key stations executing independent interactive programs. Another typical 1680 configuration might feature the execution of two or three RJE protocols to similar or dissimilar mainframes, concurrent with 12 key stations executing local interactive programs.

Two software packages for its key-to-disc offerings also are being introduced. They are called Format/10 and Format/41 and require no knowledge of programming. They may execute concurrently with other key stations performing programmed applications.

"Distributed processing as I see it," Davis says, "must contain four ingredients: remote job entry or batch; data entry; inquire response and file update; and standalone processing. Harris offers all of this with its 1600."

And it doesn't have to "kill its young" to do it, says Davis of his favorite quote which means going to third parties for lease financing. Harris carries all of its own leases, which represents more than 85% of its volume to some 1,300 customers. That's the beauty of being part of a company with plenty of cash—$146 million in cash at the end of last year and $108 million in marketable securities. For the same reason, though, it hasn't given Harris Data Communications the visability it would have as a separate company. Harris Corp. is spread out, with this operation in Texas, others in Florida, headquarters in Cleveland, and assorted other divisions scattered throughout the eastern U.S.

"Our image isn't too well-known in the computer business," says Davis, a Mississippi born engineer who has held a number of engineering and managerial posts with the company since joining it 15 years ago. What is the image he'd like most to project?

"In our case, it is that we add thought to our products." The thought content, he says, is more important than the hardware.

—Tom McCusker

Still Looking for The Bottom Line

Any data processing shop that has thought about adding a mass storage system would have received some invaluable insight at a workshop last month on the subject. It was one of those cases where you just had to be there. Not that there were any hard and fast answers, if such things even exist in this industry.

But users of the Ampex Terabit Memory (TBM) being marketed by System Development Corp., Santa Monica, Calif., the Control Data 38500, and the IBM 3850, one per installation, were on hand to say what it's like. The workshop, sponsored by the IEEE Computer Society, drew about 150 persons to Palo Alto, Calif. They were told that mass storage, at least for the purposes of this gathering, meant a trillion bits or more. And although the speakers and discussion leaders concentrated on the magnetic storage of those bits, none got into the automated tape library; it remained for a participant in the audience to mention that at his Western Electric installation they had a Storage Technology Corp. Superdisk in combination with an automated tape library.

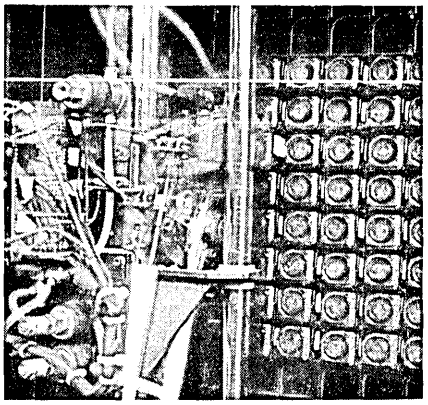
Luncheon speaker Erik Salbu, who was instrumental in the design of the Ampex TBM and is now president of Masstor Systems Corp., of Santa Clara, Calif., referred to mass storage systems (MSS) as a thing of the future, saying that five years from now they would be an integral part of dp systems. "I don't think we can consider mass storage a success today," he said. They're a limited success, and although 50 to 100 systems are now installed, they "haven't done much for us yet." Vendors of such systems, he added, will have to improve their cost and performance, and they will. At the same time, users will have to learn to live with memory hierarchies. He said users are finding it costs more than they had originally thought and that it takes more effort. They are also insecure with it, backing up everything on tape, but in time that won't be necessary.

As for cost-justifying an MS system, Salbu didn't think that would be necessary in a few years. Like tapes and discs today, the justification for mass store will be merely that it is "needed for our application." He foresees the mass storage concept migrating downwards, eventually reaching to the System/3-type user.

Low cost to upgrade

Ken Gootgeld of System Development Corp. acknowledged that one problem with MSS is the initial high cost. But the beauty of it is the low cost of upgrades in capacity and the relatively small amount of added space required. He said people looking at devices like the Superdisk to save the initial dollar investment are not good prospects for MSS, but warned they will pay more for incremental capacity increases and will need much more real estate.

The problems of disc and tape capacity, of floor space for the hardware, and



EACH CDC mass storage file uses programmed, automatic selector mechanism to pick and move small data cartridges to information transfer points. A one-way trip is completed on an average of two to three seconds.

of tape libraries that occupied more space than the machine room were raised by MSS users on the program. At the Southwestern Ohio Regional Computer Center, for example, about a

thousand reels of tape were being added annually to the inventory, in addition to one tape drive, one disc drive, and one operator each year. "We felt that there must be some better means of storing data," said Bill Meyer, the center's associate director, "especially since we had 2400-foot reels of tape and we were using maybe the first couple of feet of tape on each reel."

A four megabyte Amdahl 470V/6 recently was installed at the center, which now also has the CDC 38500 mass store. The Univ. of Cincinnati and Miami Univ. of Oxford, Ohio, are members of the center, which supports not only the research, instruction, and administrative dp for those two institutions with a combined enrollment of 50,000, but also a medical college, a 650-bed hospital, and various governmental agencies. All work comes in from RJE stations, and as many as 75 users simultaneously will be submitting batch jobs. The center had a tape inventory of some 10K reels.

In justifying the installation of an MSS, the center could see a cut in the purchase of tapes and the space to store them. It had 12 tape drives and two controllers and thought these could be decreased to six drives and one controller. And from 18 disc drives and three controllers, they're going to 15 drives. Along with this, of course, is a drop in the number of disc pack mounts and tape handling, and so it was felt they could go from 19 operators to 15, plus doing away with one person whose basic job was to log tapes as they were created and to scratch them as needed.

Throughput is a problem

But in addition to hardware, throughput was also a problem. Tapes require operator intervention, and the people at SWORCC found their jobs getting hung up by tape mounting problems. The same was true at the American Broadcasting Co., which was performing about 24,000 tape mounts a month, and many job reruns were being caused by incorrect tape mounts and tape errors. "We did an analysis of our reruns," said Donald Lassoff, ABC's director of technical services. "We found that of our 139 hours of reruns a month, 30% were caused by tape, and we were going to eliminate those."

ABC went to the IBM 3850 to support two 370/168-3s, a dp operation that has grown at an annual 20% to 25% clip over the last five years. This shop, too, is heavily into batch, supporting 11 RJE facilities around the country and running some 2,400 batch jobs a month. With the objective of cutting tape activity by 80%, ABC ordered the 3850 when it was announced. This month they are scheduled to be 70% converted to the MSS and become 100% converted in August.

"Conversion is not transparent if you're a heavy tape shop," warned Lassoff, who is also head of the MSS users' group within Guide, the IBM user group. But ABC took the opportunity to redo their documentation and update their JCL. They optimized blocking factors and increased their multiprogramming capability. And with the 3850 they can see reducing the number of disc spindles from 64 to 36, in addition to dropping down from 28 tape drives and four controllers to 10 drives and two controllers.

Almost converted

At the time of his presentation in March, ABC was 38% converted to MSS, had eliminated 5,000 tape mounts a month, four spindles of 3330s, and had returned 10 tape drives. They had retired 700 reels of tape, transferred three tape-handling employees, eliminated the creation of 1,900 tapes a month, experienced a 25% reduction in tape-caused reruns and a 100% improvement in RJE user satisfaction, Lassoff said. "I think the key is that we've not missed any production schedule due to an MSS problem since we've installed it."

It apparently would be a mistake to think that a mass storage system is justified on the basis of hardware replaced.

But it apparently would be a mistake to think that a mass storage system is justified primarily on the basis of hardware replaced. At ABC the dollar savings were significant because of the programmer productivity increase that results from their receiving faster turnaround time. Bernie O'Lear of the National Center for Atmospheric Research, which has had the Ampex TBM on-line to a CDC 7600 for a month and is about to get a Cray-1 mainframe, placed his emphasis on improved service to his RJE users, who don't have to wait for tape mounts. And Meyer of SWORCC said he didn't know the dollar savings they had achieved but knew they were getting more capacity. He said, however, that the hardware they had eliminated paid for the MSS.

Thus economic justification may play a secondary role in going to mass storage. "Most of us have found a bottom-line, immediate dollar benefit," said Lynn Shirley of Masstor Systems, which is a consulting and software firm. He said it is not merely a matter of trading dollars between disc drives and mass store or between tapes and MS. There often are users with applications that by themselves will justify having that amount of data on-line.

Expects drop in prices

Shirley, who thinks MSS will follow industry trends and begin to drop in price, mentioned the improved service being provided by a bank to its correspondent banks in the RJE mode. Those remote institutions transmit data at night, receiving their reports before the start of business the next day. But one correspondent bank performed its data entry earlier in the afternoon. Because the central dp facility did not have to schedule its tape runs, it processed the data submitted early through its MSS and returned its answers as much as 15 hours earlier than previously. And, as it turned out, the user found that this earlier response enabled him to do useful things not considered previously. It was a benefit not foreseen by either party.

In that context, it was also said by speakers that their users, in many instances, did not know their data had moved from tape drives to the mass store, that as far as they were concerned there had been no change at the central facility.

In a luncheon talk, Dr. George Michael of Lawrence Livermore Laboratory spoke of their need to store from a trillion to a thousand trillion bits for scientists who must simulate and model various processes. They save their data because it's cheaper to store it than to recompute it. But, he continued, with the advent of the microcomputer this is changing. Give the scientist his own personal computer, Michael averred, and the necessity to store a trillion bits can be eliminated. So the need for mass storage is becoming "muddled." Among other workshop participants, too, there was no unanimity in the sentiments toward MSS.

"I don't think it's an idea whose time has quite arrived," one said. Of IBM's and CDC's approach, Michael said, "I don't think either of them is any good." To which Lassoff of ABC replied, "I agree." But Lassoff explained that one cannot sit still and do nothing, waiting for the ultimate system, whatever that might be. Over the long haul, he added, MSS is more cost-effective than more discs or tape. A participant in the audience chimed in that he agreed, saying he had committed to the Amdahl computer a month before IBM announced the new large-scale 3033 mainframe. But he said it without rancor. Someone also asked whether a user was sufficiently committed to the current offerings to purchase an MSS. "Would I get ABC to purchase it?" Lassoff repeated. "Not on your life."

—Edward K. Yasaki

Pricing

Floppies Continue Their Price Dive

"This year Shugart may exceed IBM in unit shipments of floppy drives," says consultant Lee Walther who specializes in this market. He figures IBM will ship 74,000 of these drives in 1977, Shugart about 72,000. It's been that kind of corporate life for Shugart Associates, which dominates the floppy disc drive market.

The Sunnyvale, Calif., company was founded a year and a half after IBM shipped the first-ever floppy within the bowels of the 3830 controller for the 3330 disc file. It introduced its floppy drive in June of 1973, shipped its 10,000th drive two years later and the 60,000th at the end of last year. And just when it's about to overtake the leader, a new kid has moved into the block.

The long-discussed bubble memory is nearing commercialization, courtesy of Texas Instruments Inc., and people are speculating about its impact on the disc memory. On a price-per-bit basis, TI's bubbles this year are said to be approximating 42 millicents (.042 cents), dropping to 20 millicents by the end of next year. That pleases the folks at Shugart, who say their standard IBM-compatible floppy prices out at 10.9 millicents per bit. Their double-density floppy, of course, drops the per-bit price by half, to 5.45 millicents.

Last month Shugart announced the double-sided floppy, the SA850, which further decreases the price to 3 millicents per bit. What remains is for someone to come out with a double-track density version of the 850, cutting the per-bit price again by half. By 1979, they say at Shugart, the floppy disc drive will be down to about one millicent per bit, considerably below a projected "aggressive" price in the 1980s of 10 millicents for the TI bubbles.

Not all on-line

In addition, says marketing v.p. W. Ferrell Sanders, users of floppies want the removable medium. "They don't want all their storage on-line." He believes bubbles, with their faster access times, will impact head-per-track discs with the greatest severity. Shugart's director of product development, George H. Sollman, also exhibits little concern.

"What will happen," he says, "is that people will design small business systems or intelligent calculators with a bubble for system-resident memory. The bubbles, unfortunately, do not address the problem of I/O very well. So for input/output they would use the Minifloppy, and for systems-resident memory they would use the bubbles."

Walther, who follows the disc technologies, is no less bullish on the floppy. He says total shipments this year will approximate 280,000 and have a value of $868 million. Of that amount, shipments to oem's will come to 175,000 and have a value of $56.5 million. These figures, counting only spindles and without the control electronics, are based on an end-user price of $3,100 and an average

W. FERRELL SANDERS
Bubble memories don't frighten him

oem price of $350.

Walther, formerly with Quantum Science Corp., further sees the market in 1980 growing to unit shipments of 550,000, valued at $1.54 billion. Shipments to oem's are expected to be at the level of 250,000, valued at only $61.9 million: that's based on a unit price of $310, not much lower than today's volume-purchase prices.

Shugart, which Walther figures has about 40% to 45% of the oem market, was formed in February 1973. In its first fiscal year, ending April 1974, it had revenues of almost $1 million and "a substantial loss." But in the following fiscal years sales went to $2.5 million, $9 million, and about $17 million in the year ended last month. Projections are for revenues of $33 million in the current period. The growth has been so fast that the company has been unable to add to its payroll fast enough to keep pace with the orders. It is said to be shipping currently at the rate of $30 million a year with only 300 employees, or an average of $100K per employee. By the end of 1977, however, some 500 are expected to be on board. Even a new building into which the company moved in January has already been outgrown. The 60,000-square-foot facility is being supplemented by space rented nearby, and plans are to put up another 60K-foot building next door for occupancy in the fall.

Spread around

This growth, significantly, is not based on business from one or two major customers. No company accounts for more than 15% of Shugart's business, and 30% of the customers produce 70% of the volume. The major volume of their drives are going to small-business systems developers and to manufacturers of intelligent terminals. But the customer list also includes makers of medical and typesetting systems, minicomputer and peripherals manufacturers, and makers of microcomputers.

Companies such as Intel, Rockwell, Southwest Technical, and Byte Inc. have taken to Shugart's Minifloppy, which was introduced last September. The small disc, which has a capacity of 110K bytes and is a candidate for double-density and two-sided recording to achieve added capacity, is a hit with the personal computing market. "We wandered, stepped into, fell into that one with the Minifloppy," says Sollman. "According to my market projections, we should be shipping about 300 drives a month (to the hobbyist market) . . . Today they account for about 60% of our shipments (of Minifloppies)." And will that continue? "Well, we don't see any signs of it abating."

Shugart's early business plans reportedly called for a per-unit price of $750 for what was to be called the SA900 drive, introduced in June of that first year. As is typical in the industry, the price has been reduced over time and is now at about $350 for large-quantity orders. "And they're beginning to firm out at that point," says Sollman.

—E. K. Y.

Communications

Interface: Next a West Coast Show

The weather couldn't have been much worse—tornado and flash flood warnings amid an almost steady downpour of rain. But despite the dismal weather conditions and traffic snarls caused by the glut of NCAA basketball fans, the Interface '77 data communications conference held in Atlanta in late March was a success.

One measure of that success was attendance, which hit 6,500 by the end of the three-day show. Conference planners hadn't expected much more than 5,000. Held at the mammoth Georgia World Congress Center, the conference featured 70 sessions including seven technical workshops—all of which drew relatively heavy turnouts. Over on the exhibit floor, the 140 or so vendors seemed equally satisfied. The experience of one specialized carrier typified exhibitor reaction. "There's been a constant flow of people who are prospective customers," he said. "We're talking to the right people at the right level."

Generally, these "right people" turned out to be a mix of high level dp and data communications personnel. But the level of data communications expertise, according to show vendors, continued to be low.

NCR's 2,100 sq. ft. booth, carpeted in blazing red to match the sales forces' red sport coats and ties, was a clear standout as the show's biggest exhibit. An impressive multimedia slide show touted the company's line and attracted 400 people during the first two days of the conference. So claimed a company rep who demurely noted that NCR "just wanted to tell its story."

Another company, which also wanted to tell its story, was the inimitable AT&T. Turning on the charm, a Bell spokesman wrapped up his formal sales spiel which repeatedly plugged the company's controversial Dataspeed 40 terminal line, with a strong pitch for "the system is the solution." His approach was disarmingly direct: "Whatever your

140 EXHIBITORS were happy with turnout of some 6,500 to Interface '77, but some complained of too little time between conferences to view exhibits.

requirements, we have the solution," he boasted.

But rough, too

But one solution Bell couldn't come up with at the Interface show proved particularly troublesome. Despite the company's "good success" at the conference, one disgruntled AT&Ter complained that the program, especially the opening night keynote address, "was extremely one-sided." Anti-AT&T sentiments were also quite evident in the daily sessions.

Conference coordinator Robert Lively admitted that some of the session panels were "a little weighted" against AT&T. But the bulk of the criticism, he pointed out, was aimed at the Bell bill keynote which many claimed had been misrepresented as a debate. In reality, there was no actual debate since keynoters John M. Eger, the former outspoken head of the Office of Telecommunications Policy, and Rep. Timothy E. Wirth, were both united against AT&T. No Bell backers were represented.

This was a major oversight. Lively realizes this but insists that the conference staff tried to round up some AT&Ters and were turned down. "There was a great deal of turmoil," he acknowledged, "over who would participate (in the keynote)." And apparently this turmoil continued. The day after the keynote, conference coordinator Lively was "tackled by the Bell people in their booth" and the staff received an indignant call from AT&T headquarters in New York.

Plenty of play

But despite all this furor over the keynote, the Bell System did manage to get plenty of play in the sessions. In one of the more popular panels on Bell services, communications consultant Anthony T. Easton from International Communications Management traced AT&T's future moves. In the next three to five years Easton predicted Bell would: lower long distance charges for MPL (multischedule private line) service while steadily upping local loop charges; switch from unlimited use of local lines to metered services; and revise WATS service, shifting it to a three-zone service as opposed to the present five-zone. Citing future marketing maneuvers, Easton claimed the company would try to sell satellite service as a private line offering with demand access switching. He also sees Bell setting up its own switched data network as well as a private subsidiary to sell data terminals and other computer/communications gear.

While AT&T's future data communications plans are still uncertain, the one sure thing the company, along with its competitors, can count on is market growth. Lively thinks the heavy attendance (600 to 700) at the show's all day data communications school reflects this trend. "We are seeing," he pointed out, "an ever-growing mass of beginners, which is evidence of a growing marketplace."

To better serve this growing marketplace, Interface planners are sponsoring a three-day West Coast conference in Los Angeles in November. To differentiate it from the national show to be staged in Las Vegas next March, Interface officials are expanding the data communications theme to cover more computer topics as they relate to communications. Therefore, the sessions at the Los Angeles meeting will be aimed more at the system designer rather than at the end user.

The four-day national Interface show will take up the broader data communications subjects with more sessions and also will schedule more time between conference sessions for exhibit viewing. This should make the sales hungry exhibitors particularly happy since most of them felt the two and one-half hours for lunch breaks at the Atlanta show were insufficient. However, even with this limited time, most exhibitors seemed to be high on the conference. "We did terrifically," gushed one enthusiastic hardware vendor. "This show is definitely here to stay."

—L. F.

news in perspective

Plan to End Flat-Rate Private Line Tariffs Causes Sharp Discord

An effort by European PTT's to substitute volume-sensitive private line rates for present flat-rate charges seems likely to start a major battle at an international tariff meeting in Geneva, Switzerland, this month. There is some indication that U.S. international carriers are considering a similar substitution.

The new rates, discussed informally for years, were presented last year to SWIFT, the recently developed international bank transaction network. Essentially, SWIFT officials were told they would have to pay a basic monthly charge for each leased circuit plus an additional amount for each message. The latter item is what's causing the fuss. It will eliminate the user's opportunity to reduce his communication costs by installing higher-speed terminals, multiplexors, concentrators, and/or switches.

SWIFT officials have estimated that the new tariff will increase their communication costs two to four times between European banks, and ten-fold between Europe and North America.

A spokesman said member banks will begin paying the new rates "within the next few months," when the first link in the SWIFT network, connecting France and Belgium, is supposed to begin regular operation. Two connections will be provided to North America—one between Amsterdam and Montreal, the other between Amsterdam and the New York City area. They will start up next fall, according to present plans. The spokesman said the new tariff will remain in effect "at least until January 1978."

Italian proposal

The new tariff was developed by CEPT, the Conference of European Post and Telecommunications Administrations (PTT's). In February of this year, Italy—one of the chief architects of the new scheme—submitted a proposal to CCITT, whose members include all of the major telephone and telegraph carriers around the world. After pointing out the flat-rate private line rates "seem out of date now," partly because of "a proliferation of multiple use (i.e. shared) circuits and private line networks," the Italians said that "users (should be) discouraged from setting up private networks at random and . . . going in for multiple use. In the interests of (CCITT's members), therefore, and in order to safeguard their revenue, the point-to-point . . . circuit should be disciplined by taking into consideration the volume of information transmitted." The Italians went on to recommend a study of "the possibility of replacing the present traffic system for leased circuits with one governed basically by the amount of tariff exchanged by the user."

A few weeks ago, the U. S. delegation to the upcoming CCITT meeting in Geneva met in Washington for a preparatory discussion of the agenda. Regarding the Italian proposal, it was decided to go along with a study but to confine it to "new" metered private line services rather than existing flat-rated offerings. The U. S. goal, basically, is to get a commitment from CCITT that the latter tariffs will be retained even if the study reveals a need for expanding the use of volume-based rates.

Washington discussion

In the course of the discussion in Washington, some interesting points of view surfaced:

"If the FCC decided to institute sharing/resale of international circuits," said ITT assistant v.p. John O'Boyle, "you'd get a lot more support for the

Italian position." He added that "we need the (support of) partners on the other side." (The FCC is now considering the sharing/resale of international circuits. Last July, it issued an order sweeping away virtually all such restrictions on both domestic and international private lines. But subsequently, the order was modified: only domestic circuits will be subject to sharing/resale pending the outcome of a Commission inquiry regarding inclusion of international services).

Spokesman for AT&T, RCA, WUI, and ITT all insisted they have no "present" plans to institute volume-sensitive tariffs.

P. H. Sach, WUI's v.p. for tariffs, observed that a volume-sensitive tariff "could be beneficial to small users . . . if one extrapolates present volume-sensitive (international) rates, they are quite beneficial to small users." His basic point seemed to be that the Italian proposal shouldn't be rejected without at least exploring all of the implications.

A. E. Schwamberger, director of regulatory affairs for RCA, said "the vast majority" of European telecommunication administrations want to "attract" users to volume-sensitive tariffs. "There is no desire to do this by edict." He added that some adminstrations may be reluctant to go along with the Italian proposal because "there is a lot of competition for the business of the large data networks."

End of private lines

CBEMA (Computer and Business Equipment Manufacturers Assn.) considers the Italian proposal "the initial effort to force users away from transparent private line by making them so expensive as to practically foreclose their use," said Hank Greenberg, the association's director of telecommunications. For the small or medium volume user, Greenberg added, packet switched networks might be a cheaper alternative. However, for them as well as for customers with large transmission volumes, "the continued availability of transparent private lines at reasonable rates should . . . be an option."

The Office of Telecommunications Policy (OTP) is "concerned" about the extension of usage-sensitive pricing, "at least with respect to traditional private line services." By making the user's investment in multiplexing/switching equipment "uneconomic," volume-based rates could have "a seriously adverse impact." Also, the Italian proposal, by discouraging customers from setting up private networks at random and establishing multiple use schemes, is "flatly at odds with . . . the U. S. view." So said William Fishman, OTP's assistant director, in a letter circulated at the Washington meeting.

"Anything we can do to retain (flat-rate) leased channels will be done," said the FCC's E. S. Barbely, who heads the U. S. delegation. "We (intend to) convince the world that metered services are *new* offerings, not replacements for existing services." ✻

Memories

Morale Boost for EM&M Div.

"It's been like a shot in the arm," said Tony Coppola, director of marketing for Electronic Memories & Magnetics Corp.'s Computer Products Div., of EM&M's acquisition of Cambridge Memories Inc.'s add-on memory lease base.

EM&M has been managing the CMI base since last January. With this base, EM&M has the largest installed base of add-on memories in the world, with some 1,000 units world wide. "And the CMI base accounts for almost 50% of that," Coppola said.

"It's been a tremendous boost to our morale," he said. "It's made the corporation more aware of our potential." That awareness could account for the fact that the corporation is moving Coppola's division into three newly acquired buildings this month.

Coppola's enthusiastic for the future. "We will announce significant perform-

ance improvement for 145 add-ons in the very near future," he said. "We've received our first order for a 148 add-on (November 1976, p. 158) and are committed to delivery in July for the 148s. He's not concerned about IBM's 35% memory price cut. "We're stressing enhancements and viable alternatives. We'll be announcing enchancements for our 158 and 168 add-ons very shortly."

He said the expansion that has come to the Computer Products Div. with the acquisition of the CMI base has spread to other divisions of EM&M, specifically the Memory Products Div. which produces some of the CPD products and SEMI, a Phoenix EM&M subsidiary from which CPD purchases semiconductor products.

Acquired in December

EM&M effectively acquired the CMI installed lease base in December. It began contacting CMI customerF via letter in December. The letters explained the acquisition and introduced customers to the sales and service personnel in their area. Salesmen were sent copies of customer contracts and made personal calls to verify their introductions. If customers wanted upgrades they were immediately scheduled.

Coppola considers this the most "smooth takeover of an installed customer base ever. We started with just under 20 problem accounts and by the end of the first quarter we had only three and they're now solved." All were invoicing and procedural problems.

Since taking over the CMI base, EM&M has expanded its own operation including a three-fold expansion of its sales force. The Computer Products Div., since the take-over, has opened offices in Connecticut, Atlanta, and Washington, and has moved to larger facilities in Dallas. The division has added reconfiguration and upgrade facilities on both the East and West Coasts and has hired a number of former Cambridge employees.

For servicing, it has phased in Sorbus for the CMI base which previously had only Raytheon Service as a source.

Coppola says his division will "build as much product in 1977 as in 1976 and 1975 combined." He expects his division to double its revenue in '77 over '76 which could have a significant impact on the 20% increase in revenue predicted for EM&M as a whole by chairman and president, Trude Taylor.

One of the first things EM&M did when taking over the CMI base was to change the logos on all installed add-ons. "You never know when a dp manager is going to change jobs," Coppola explained, "and we wanted the manager always to know where to go for help, if needed."

Coppola's division also formed a new product planning group, dedicated to developing new products for both the EM&M bases. Also under consideration is development of add-ons for other than IBM computers. "Technically, we're there now. It's a question of market review."

The division also has started a quarterly newsletter for EM&M and Cambridge add-on users "mainly to let them know more about what the company is all about."

Coppola said the CMI base "produced a significant number of desires for enhancements which led CMI users to EM&M products, although EM&M still is able to supply Cambridge upgrades when adequate and/or desired."

He said the upgrade demand has been "greater than anticipated. Corporate loves us now."

Small Business Computers

IBM Small Systems Blossom with Spring

IBM's southern flank, the General Systems Div. in mid-April announced high-level languages for the six month-old Series/1, and a new top of the line small business system called the System/34.

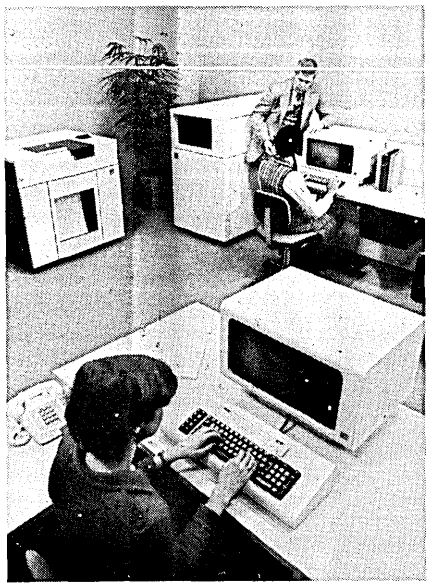
Stage for the announcement was GSD's new 375,000 sq. ft. headquarters in the hilly suburbs of Georgia's capitol, Atlanta. This building, designed by IBM architects, is heated principally by the computer equipment within it. It's estimated that the outside temperature would have to fall below 10° before other heat sources would have to be used. Power usage in the new headquarters showpiece is managed by an IBM System/7. More than 500 of these systems have been sold to customers to perform this same application, it was learned.

One would have thought that IBM would have announced FORTRAN and PL/1 at the Series/1 unveiling last November, considering the firm's characteristically long availability quotes. Such was not the case, however, and as a result, numerous little software firms have geared up to fill what they thought was a void. "We were anxious to get the assembly lines rolling to supply customers who needed the least support," explained Robert M. Umbreit, director of GSD Special Systems. Also announced

for the Series/1 was a real-time operating system, lower cost 32K byte memory cards, four new processor submodels, a line printer (the model 4973, rated at 414 lines per minute), and a new display station.

The System/34

While better Series/1 product definition was important, it played a supporting role to the System/34 announcement. Designed by the same team that did the relatively mundane System/32, the System/34 is a big step up in both features and performance. It should give fits to direct small business competitors such as Microdata (with its Reality system) and Basic/Four, and slam the door on any independent peripherals manufacturers (which some at IBM term "parasites"). For the processor, memory, fixed-disc storage, and floppy disc drive are all under the processor's hood. As a rule of thumb, IBM says the System/34 is roughly eight times the power of a System/32.



SYSTEM/34
Nearly everything's under the hood

Some more important and interesting features include a new display station (the 5251), one of which must be connected within 20 feet of the cpu to serve as system console. But up to seven other units can be used up to 5,000 feet (1,524 meters) away aimed at companies planning to distribute their computing chores. The new 5256 table-top printer (40, 80, or 120 cps bidirectionally) can be substituted for terminals, or used in conjunction with them up to a total mix number of eight. On the subject of RAS (reliability/availability/serviceability) any external device on the System/34 can be deallocated for servicing without taking the entire system down.

System/32 users can run their software on the System/34 with "minor"changes, but they'll have to run in single program mode, and that's not an efficient way to make use of the 34's multiprogramming capability.

Storage maximums are 64K bytes of main memory, 27.1 megabytes of disc storage supplied by two internal units and typically 9,472 128-character records of floppy disc. The drive supports both one- and two-sided floppies single- and dual-density. Both SDLC and bisynch communications features allow the System/34 to communicate with another /34, a 3741, 3747, 5231, System/3, System/32, System/7, 360, or 370. Customers can downline load the disc files in the /34, but that cannot be done when the system is unattended. System/34 RPG II is the main programming language, assembler is also available. The utilities program includes a data file utility, sort, source data entry utility, and work station utility.

A relatively large processor, with the maximum memory ration (64K), 27.1 megabytes of disc storage sells for $40,820 ($1,237/month on rental; $1,125/month on lease). Desktop printers sell for $5,200 to $6,250 ($176 to $217 monthly rental); a new line printer (model 5211) sells for $12,800 (160 lpm) or $15,600 ($458). Add $3,200 for display terminals, or $100/month rental. First deliveries are slated for January, 1978.

—M. W. C.

Government

Smithsonian Information Exchange Provides a Field Day for Critics

Back in the 1820s when James Smithson benevolently bequeathed his massive fortune to the United States of America, the foresighted philanthropist had lofty and honorable intentions in mind. And it was with these lofty and honorable intentions that the Smithsonian Institution was founded in Washington "for the increase and diffusion of knowledge among men."

Today, 141 years after its establishment, critics contend that the institution's operations – particularly its accounting and money-handling practices–are self-serving and questionable. The pot shots are aimed at the Smithsonian Science Information Exchange Inc., a computerized set-up which tracks on-going scientific research in both the federal and private sectors.

In operation since 1949, the information service (initially known as the Medical Science Information Exchange) began its automation drive in the early 1950s and has steadily upgraded its computer gear to wind up with the present configuration which consists of an IBM 370/135 with 12 on-line Bunker Ramo terminals. Peripherals include an IBM reader/punch, IBM and Mohawk printers, and CalComp discs and tape drives.

All this dp power is used to process information on approximately 100,000 research projects each year. This data, usually in the form of specially formatted mag tape, is turned over to the exchange by 1,300 government agencies and private organizations. The bulk of the data is derived from federal sources. The bulk of the users are federal. And the bulk of the revenues come from these federal users who must pay SSIE for the use of their own information. Therein lies the controversy. Or at least part of it, for there are other elements in SSIE's operation which are equally controversial.

Nonprofit and funded

Controversial and mysterious. One key point in trying to unravel the confusing threads of fact and fiction woven into this mystery centers around the group's seemingly disparate status as a private nonprofit corporation. But the kink is, unlike other private nonprofit corporations, SSIE receives direct federal funding from a line item in the Smithsonian's budget request to Congress.

Before its incorporation in 1971, SSIE functioned under the aegis of various federal agencies which used the then-free service to exchange information on their research programs. In the mid-60s the exchange was funded through the National Science Foundation which contracted with the Smithsonian to run the service. Then in 1970, funding responsibility was transferred from NSF to the Smithsonian, which ended up with the whole operation.

Touting its status as a private corporation, SSIE likes to point out that the "Smithsonian does not 'control' the exchange in the ordinary sense of the word." It has also maintained in a federal court document that "the federal government exercises no control whatsoever" over its activities. The real clincher, however, contained in the same court brief, shows SSIE claiming "it receives no direct federal funding."

For fiscal year 1978, the Smithsonian budget request carries a $2 million appropriation earmarked for SSIE. Obviously, the corporation overlooked this when making the court statement which was clearly false, as Smithsonian officials have since admitted to Congress. A closer look at the SSIE set-up turns up still other contradictions and inconsistencies.

Seeking non-federal users

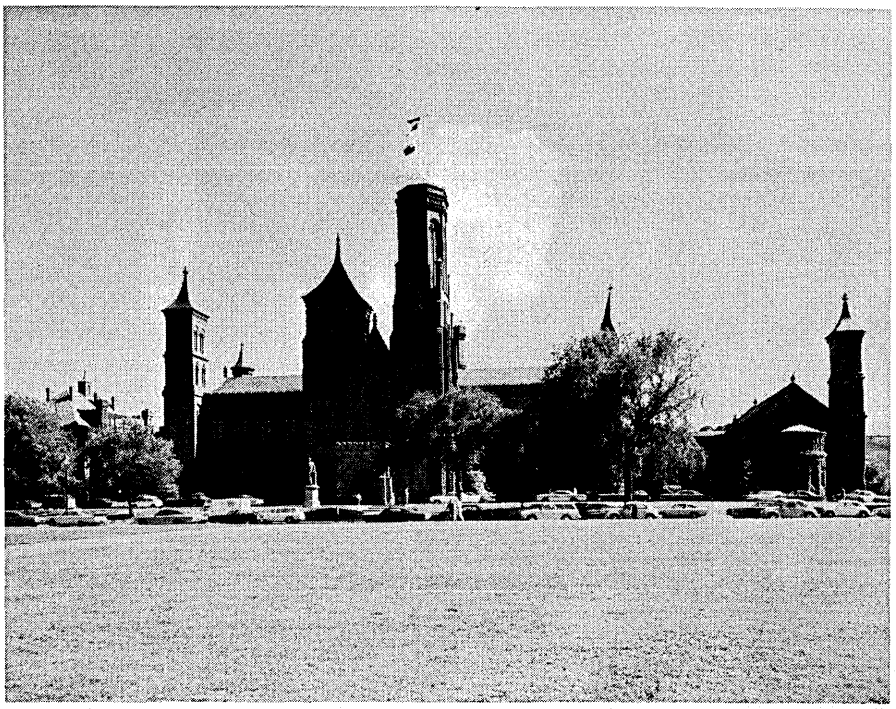
In order to fulfill its mission to better serve the scientific research community, SSIE has been striving to make its data base as complete and up-to-date as possible. Currently, agencies hand over their data on a voluntary basis. In the private sector, of course, there's no way to enforce mandatory submissions. And the private sector is apparently where SSIE is having its real problems.

SSIE president David F. Hersey admits the drive for users is never-ending. "We encourage users as avidly as we can and any way we can." The current campaign to drum up more non-federal clients has been underway for some time. "We're encouraging that market. We're pushing it," says Hersey. And they certainly are, and so far unsuccessfully, according to one SSIE source who contends that despite massive mailings and other marketing strategies, the exchange has not made a dent in the private sector market.

One way SSIE is hoping to rally these potential clients is through an on-line data base search service provided by System Development Corp. Upon incorporation, SSIE had this data base copyrighted and declared a "trade secret." So in the deal with SDC, SSIE turns over its proprietary data to the company which pays usage royalties back to the exchange. Despite overwhelming evidence that this service had initially not paid off, Hersey claims it's now "bringing in increased revenues."

Is it profitable?

The fact is that the organization, at least in the beginning, lost a considerable amount of money on the deal. And



SMITHSONIAN INSTITUTION

The Smithsonian Institution Building

an SSIE insider doubts whether it's profitable even today. "If it had worked like they told us it would," he reveals, "they would have been rolling in royalties. But SDC was a little bit smarter than they were in writing the contract and took its cost recovery off the top. As a result, SSIE didn't get any appreciable royalties for the first couple of years."

Reluctant to report these alleged losses, the exchange, according to the source, used a little "creative accounting" at the end of the second year "to show that they were just breaking even, but actually even at that point there was quite a bit of a loss involved." Indeed, financial documents bearing these contentions out show a first year loss (FY '75) of $25,569. But even that figure is questionable since the corporation itself had projected $59,500 in startup costs, plus a $20,000 yearly maintenance charge.

The reasons for SSIE wanting the SDC venture to pan out are obvious. "They want to convert it into a winning proposition," declares one candid observer, "because they have a lot at stake, including their egos." Other parties also have a lot at stake, namely the federal agencies which have been reluctant to go on-line through SDC or SSIE.

Agencies take the bite

SSIE's emphasis on exclusive commercial royalty schemes, such as the one with System Development, has bothered some of the SSIE staff as well as other government officials. It's especially irksome, they contend, since some of the losses from these operations are being written off against the income from in-house scientific staff efforts. They also allege that other losses from commercial non-federal project contracts are being recovered through the income from these federal contracts and exorbitant profit fees and overheads charged to the agencies.

SSIE's Hersey adamantly denies these allegations. The exchange is making money from the commercial deals, he contends, adding that "that's the whole purpose of user charges—to offset the federal appropriation." He also disavows any attempt by SSIE to juggle the books. His argument is as follows: "All the money is reported to Congress every year... We plow all the money back into the business. There isn't any money going into anybody's pocket... Our overhead rates are subject to audit every year by Peat, Marwick & Mitchell, and by Smithsonian auditors. So I'm sure if we were ripping off anybody or charging excess overhead, we'd be the first to hear about it."

To prove some of his points, Hersey repeatedly cites what he claims is a Congressional mandate to charge higher user fees to offset federal funding. (The two components in SSIE revenue are fed-

eral funds and user charges, initiated for non-federal users in December 1968 and for federal users in July 1969.) He also argues that this funding has decreased since the group's incorporation. According to SSIE estimates, the level of government-appropriated money used to run the exchange has dropped from 80% in FY '72 to 60% in FY '76. But one dubious critic close to the corporation notes that these percentages are deceptive since they don't include the sizable funding the corporation gets from the National Cancer Institute (NCI). Since this is an interagency transfer of funds, he argues, it should be considered as federal money, which would up Uncle Sam's stake to around 80%.

Not going smoothly

NCI is SSIE's biggest contract, earning the exchange $1.3 million over three years. For that $1.3 million, SSIE provides the institute with a Current Cancer Research Project Analysis Center (CCRESPAC). The operation is not going smoothly. At least that's what one disgruntled SSIE employee is maintaining. In an anonymous memo turned over to NCI and Congress, the staffer charges that SSIE "violated the spirit and letter of its contract" with NCI by "favoring for-profit commercial clients at the expense of federal agencies with critical missions."

To document his claims that the institute is "subsidizing the private sale" of its own data, he points to numerous NCI project records which were "fully indexed by the commercial side of the SSIE operation and given to System Development Corp. at no cost for their sale of on-line data base access, but which were never given to CCRESPAC to look at, or were first put on the SDC file." As of March 8, he notes, "there were 2,568 projects being withheld from CCRESPAC in favor of SDC."

If true, this is pretty damaging evidence against SSIE and its profit-driven motives. The GAO has also questioned the group's corporate method of operation. In a report released in late March, it recommended that SSIE be dissolved and folded into the "Smithsonian's regular organizational structure" so that Congress could keep better tabs on its activities. Congress, ostensibly the appropriations committees in the House and Senate, is also getting into the act, asking some pointed questions of their own about the exchange's operating and financial procedures.

Exchange executive Hersey insists the corporation has always been willing to tell all to its Congressional overseers. "Congress has never accused us," he declares, "of not telling them everything they wanted to know." On the GAO restructuring proposal, he comments: "So far, I haven't heard anything from GAO which would indicate the (plan's) advantage."

"Didn't change anything"

SSIE staunchly defends its corporate mode of operation. "Incorporating," according to Hersey, "didn't change anything. We've always been a non-federal organization since 1950. I don't see any difference between the NSF contract with the Smithsonian to operate the exchange and the fact that it's operated now by contract. Nothing has essentially changed."

Not true, protests a government source who claims that things have changed dramatically. "The exchange was originally set up," he explains, "as an interagency federal service. Any non-federal spin-off was considered a nice side effect, but it was a side effect to the predominantly federal purpose. But what the management developed it into was an operation designed to make as much money as possible, and any

federal involvement was nice but secondary."

One of the real bones of contention in the SSIE controversy is the copyrighted computerized data base. Hersey maintains that it's the SSIE-developed output from the data and not the data base itself that's "our property." If it wasn't copyrighted, he argues, then people could "make multiple copies" and put SSIE out of business. He says bluntly that the copyright is used "to preserve our ability to continue to increase user revenues."

Copyright critics claim this is just another tactic designed to rip off federal users. It's had to justify (the data base copyright)," points out one such critic, "when you consider it costs them nothing to get the data, they get an appropriation from Congress to use it, and they have sole source contracts (with the government) to sell it. To turn around and say that they have a 'proprietary trade secret' is a bit much."

The whole SSIE set-up "is a bit much" to understand, confides one puzzled scientist who believes Congress should take a closer look at the operation. If that probe ever takes place, he asserts, SSIE will be scrambling for justifications. "They'll be using every excuse they can think of," he predicts, "as a reason why they shouldn't be required to give up what is potentially a money-making operation. Anybody in the commercial world, given that much advantage, would be home free. And why they couldn't make it, I just don't understand."

–Linda Flato

SSIE

SMITHSONIAN SCIENCE INFORMATION EXCHANGE, INC.

News in Perspective
BENCHMARKS . . .

The First Quarter: It's been an excellent first quarter for the major mainframers, although financial analysts were somewhat disappointed with IBM's 5.3% increase in profits to $573 million from $544 million the year before. The analysts projected higher profits. The giant computer maker's gross revenues during the first quarter amounted to $4.09 billion, compared with $3.8 billion the year before. Chairman Frank T. Cary said that outright purchases of dp equipment were substantially lower than the record purchase volume in the final quarter of 1976, but somewhat higher than in the comparative first quarter of last year.

Honeywell's first quarter computer revenues increased 14.3% to $138.7 million, compared with $121.3 million, providing the company with total revenues of $662.8 million, against $534.2 million in the year previous. The company's income soared to $30.9 million, from $13.6 million in the year previous. **Burroughs** posted a first quarter profit of $28.4 million, an increase of 16.9% from the year earlier's profit of $24.3 million. Revenues were up 9.2% to $442.6 million, despite a five-week work stoppage at three Detriot area plants. **Control Data Corp.** computer business earnings more than tripled to $3.6 million from $827,000 in the first quarter and its revenues were $338.3 million, compared with $306.6 million a year ago. Its Commercial Credit operation suffered a 13% decline in earnings on revenues of $156.2 which showed no change from a year ago. **NCR Corp.** more than doubled its first quarter profit from a year ago, posting earnings of $16 million, compared with $7 million a year ago. (Last year a cumulative accounting change on prior years increased the net profit to $13 million). Revenues showed a 9% gain, rising from $471 million in the first quarter of last year to $515 million in 1977. The company attributed the brighter outlook to more favorable conditions in the U.S. and to an increase in productivity.

Acquisitions: Shareholders of Entrex Corp., the Burlington, Mass., data entry manufacturer, will vote this month to approve a merger of their company with Nixdorf Computer A.G., the West German manufacturer of small and medium size computers. Nixdorf is reported to have offered $25 million for the company which would become known as Entrex, Inc., a Nixdorf Computer Co. Nixdorf, which had 1976 worldwide revenues of about $290 million, operates a U.S. subsidiary in Chicago which eventually would be moved to Burlington. Entrex revenues last year were about $26 million. Nixdorf markets Entrex key-to-disc systems in Western Europe and is licensed to manufacture the product in West Germany. . . . **Interactive Data Corp.,** Waltham, Mass., the time-sharing firm, acquired Dynamics Associates, Inc., a Cambridge, Mass., software and consulting firm. . . . **TRW** agreed in principle to service point-of-sale terminal systems made by Pitney Bowes which withdrew from the business in 1972. . . . **Sperry Rand Corp.** in late April was negotiating to take over minicomputer maker Varian Data Machines, of Irvine, Calif., for a reported $20 million. One purpose of the move would be to obtain more products for its BC/7 small business computer sales force.

CalComp Changes: George Canova, president of California Computer Products, Inc., since last June, became the company's chairman also last month after a directors' meeting that ousted Lester L. Kilpatrick from the post. Although CalComp gave no reason for the change, sources close to the board said Mr. Kilpatrick was removed because the directors were unhappy with the company's erratic earnings records and wanted new management. Canova, who joined the company in 1968 and was executive v.p. from 1973 to 1976, also announced a realignment of the company's sales and marketing organization and the formation of two new divisions in an effort to "decentralize" its product operations. Kilpatrick, one of CalComp's largest individual shareholders, remains a director but won't have any role in managing the company. Associates said he may start a new company.

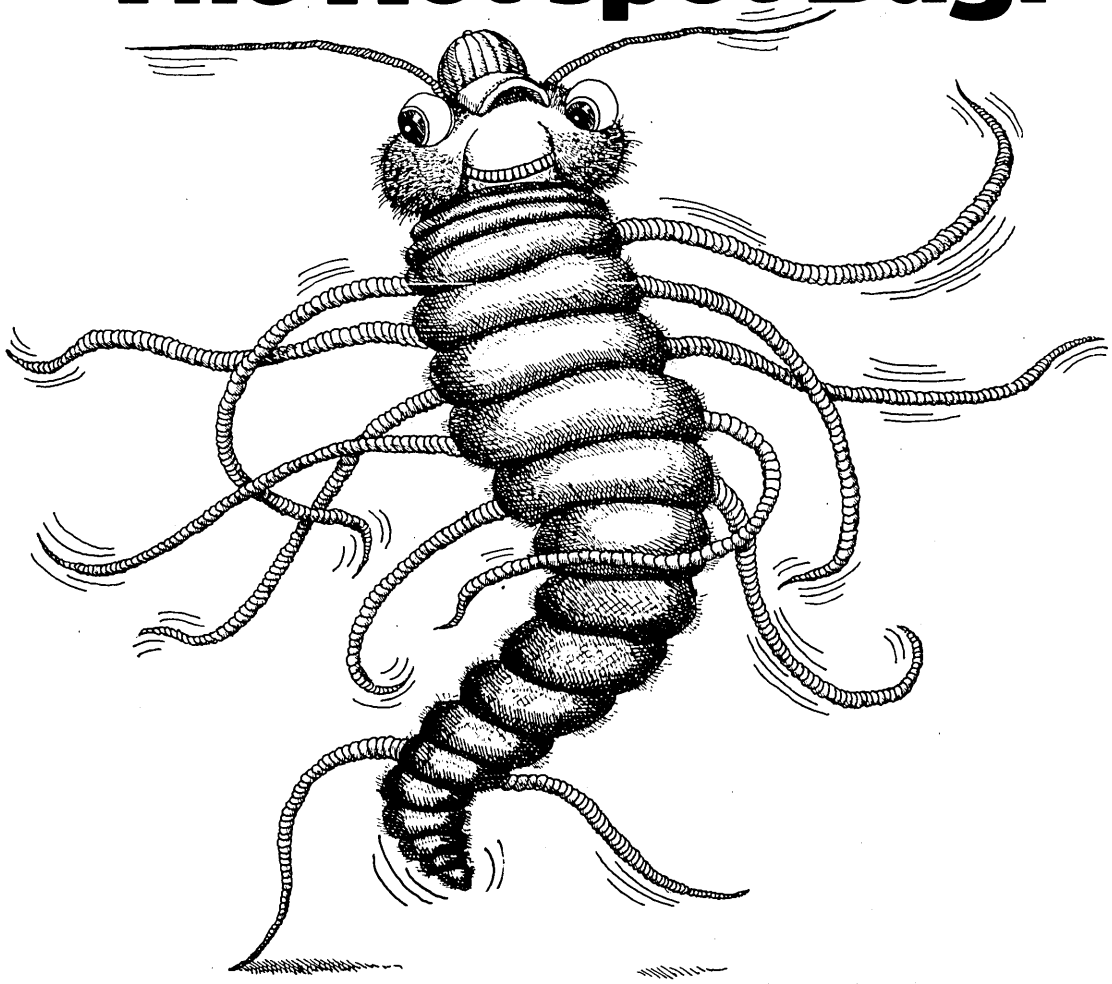
Super Computers: Cray Research of Minneapolis received orders for three supercomputers, worth $24 million, two from the Defense Dept. and one from the European Centre for Medium-Range Weather Forecasts. The company also will ship a Cray 1 to the National Center for Atmospheric Research, Boulder, Colo., in July. The lease on its first machine, installed at the Los Alamos Scientific Library, has been renewed. The system completed its six month evaluation last October and the machine there will be upgraded to a million words from half a million, and an automatic memory correction feature will be added. Mass storage also will be increased.

CDC's Cyber 176: Control Data formally announced its long-touted Cyber 176, described as one of the world's largest commercial computers. To be shipped first in the fourth quarter, the 176 will cost about $150,000 a month on a five-year lease. It becomes the top of the Cyber 170 line, first announced in 1974, and is about 18 times as powerful as the Cyber 171 which also was announced at the low end of the line. The 171, priced at $19,700 a month on a five-year lease, will first be shipped in July. The company sells the line mainly for engineering and scientific work in such industries as electric utilities, petroleum, large-scale construction, nuclear power, and aerospace. Shipments of other Cyber 170 products set a company record last year.

Computer for Trucking: Dr. George E. Mueller, chairman and president of System Development Corp., says most of today's computers can't do the work needed by the transportation industry. He said automated rating, for instance, is badly needed by the trucking industry but is impractical with today's computers, which he said are too structured and inflexible. In a talk in mid-April before the American Trucking Assn. in San Francisco, Dr. Mueller said his company analyzed the problem and found that "the most efficient data base management system today, operating on the computer that is the standard of the computer industry today, couldn't handle automatic rating at a price trucking companies could afford." He said new machines will require a brand new architecture and better mass storage and, once perfected, will be used efficiently in such other applications as electronic bill of lading and computerized communications between trucks and terminals.

Thinking Small: Ryal R. Poppa, the chairman and president of Pertec Computer Corp. was out last month drumming up interest in his company's latest moves into small business computer market. The company, which recently agreed to acquire MITS, Inc., makers of the Altair home computer, also operates ICOM, a manufacturer of microperipherals for microcomputer systems. Poppa said many people still think the small computer will have to continue daily communications with the corporate main computer to access the computing power resident in the central unit. "That's not the way it's going to happen," says Poppa, because it's too expensive that way. "If you look at the needs, and the equipment already available to satisfy those needs, it becomes clear that the large mainframe, when used as the only means of handling a company's total computer requirements, is inefficient and expensive. Instead, local computer needs will be handled at the local level by units matched to the load." *

The Hot Spot Bug.



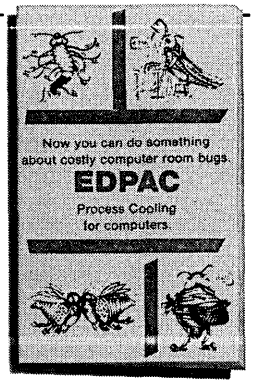
You can't afford to have this pest in your computer room.

If your present environmental system is not maintaining even temperatures throughout your computer room, chances are you've been plagued by the Hot Spot Bug. It's a very expensive little pest that reduces equipment life and can cause down time.

EDPAC Process Cooling Systems are specially designed to prevent such problems in computer rooms. They provide the proper modular control for the entire room. So you can rely on EDPAC to protect your computer as no regular air conditioning system can.

Before the Hot Spot Bug costs you a small fortune, find out what a big difference an EDPAC Process Cooling System can make — and find out today!

FREE BOOKLET. HOW TO GET THE BUGS OUT.



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EDPAC is a product of AC Manufacturing Company

LOOK AHEAD

(Continued from page 16)

A CHECK IS A CHECK IS AN IMAGE

In an end-around approach to Electronic Funds Transfer (EFT) and the paperless, checkless society, NCR Corp. and the Bank of America have embarked on a joint effort to develop an image processing system they call BANCR (for obvious reasons). The system will capture images of all cashed checks and store them electronically in machine processable form. All processing will be done on the electronic images instead of on the paper checks. The checks will stop traveling at the place of "document acceptance." Not entirely paperless but getting there.

MORALE SLIPPING AMONG SOME IBM WORKERS

Morale among IBM production line employees has slipped in the past year or so, conversations with a number of workers and first and second level supervisory personnel indicate. Chief gripes: the new stock purchase plan which is less flexible in its pricing structure than its predecessor; the phase out of many job functions as a result of the development of new technologies ("We're still employed but it's obvious we're becoming less and less necessary," one worker puts it.); a feeling that a lack of real dialogue between top management and line personnel exists and that the company is placing less emphasis on individual career path development than it did in the past. Perhaps to measure the extent of the discontent, IBM this year is inviting all employees to answer its annual opinion poll on how workers rate their managers, their jobs, etc. In the past these polls were given out strictly on a spot basis, IBMers say.

HUGE VA CONTRACT MAY BE SCUTTLED

IBM and Univac are off target--the $100 million Veterans Administration target system procurement, that is. Designed to overhaul and streamline the VA's compensation, pension, and education benefit delivery operation, the controversial system has been under Congressional attack ever since the pilot test was launced in Philadelphia during the summer of 1974.

The request for proposals on the full-blown target system was issued in January 1976. The system procurement at that time was valued at between $35 and $50 million. VA has since upped the price tag, but vendors aren't nibbling. The main reason, according to government and industry sources, is that the system as currently configured is not cost effective and privacy secure. Both IBM and Univac repeatedly protested the stringent terms and conditions of the deal to the VA and suggested possible changes. However, the agency refused to back down, which prompted the two mainframers to no-bid the troublesome contract, leaving Honeywell and Burroughs still in the running. But maybe not for long because the General Accounting Office may help scuttle the contract altogether when it comes out this month with two critical reports on the system.

CHEAPER SELF-SERVICE

NCR Corp., which has been peddling a self-service financial terminal for through the wall or off-site (like supermarkets) use called the 770 for a number of years, will introduce a less costly version called the 1770 at two major banking conventions in New Orleans this month, one for commercial bankers and the other for thrift institutions. The 1770 is designed for use in bank lobbies in single units or clusters. It will go into a pilot test in the Brenton Bank in Iowa in July.

RUMORS AND RAW RANDOM DATA

NCR Corp. is specifying what has got to be the most ambitious project for the financial community yet...UFS (Universal Financial System), and expects to present it to its financial users when they meet in San Francisco next fall. All that's clear now is that it's more of everything...more real-time, more control, more modular...One weekend last month all 450 seniors at Los Altos High School in Northern California received straight-A report cards in the mail, while all 350 seniors at Awalt High School in nearby Mountain View got Fs in every subject. Los Altos principal Robert Madgic said pranksters from Los Altos High somehow got access to the school district's computer report card forms, but he couldn't understand what happened next. One of the pranksters admitted to the Palo Alto Times, however, that some students have computer terminals in their homes.

Take an in-depth look at in-house timesharing:

You know the problems facing the data processing department:

Other departments in your company want faster response, broader capabilities, better service.

And your management wants you to hold down your operating costs.

You're probably looking hard for a solution. A closer look at in-house timesharing could give it to you.

Fast, long-lasting relief

Unlike upgrading a large central computer, expansion to an in-house timesharing system isn't a time-and-money-consuming ordeal.

And unlike buying outside computer time, you're not building in a monthly bill that inevitably keeps building up.

Adding an in-house timesharing capability is a shrewd way to add computer power. Because it won't add significantly to your operating costs; in fact, it can pay for itself by reducing current costs.

Especially if you add the system specifically built for timesharing: our BTI 4000.

A timesharer's timesharer

The BTI 4000 Interactive Timesharing System is made by us:

Basic Timesharing, Inc. We're the computer manufacturer with timeshare experience. Which has helped us produce a computer uniquely right for timesharing.

To help you do more—while helping your company spend less.

Easy to begin, room to grow

You can own your own BTI 4000 for as little as $35,950. For that you get a ready-to-go system with 10 megabytes of storage and 8 ports—just add terminals.

And start-up won't cause a departmental hang-up. The BTI 4000 can be installed and working for you in one working day.

Expanding to do even more work takes even less work. The BTI 4000 features modular construction, so system downtime for expansion is minutes, rather than days. You can add disk storage to 400 megabytes; increase user capacity to 32 ports; add peripherals like industry-compatible magnetic tape and a line printer.

Hard working, always working

The BTI 4000 is a true timesharing system. It allows doing any mix of tasks, all at the same time, all completely independent.

It also gives you continuous system availability, because software housekeeping can be performed while users are on-line.

There's also off-hours jobstream processing. So the BTI 4000 can be working for you, even when no one's around.

The BTI 4000 uses BASIC-X, an unusually powerful extension of the BASIC user language, enhanced for business programming.

What's more, the BTI 4000 offers heirarchal account organization and stringent security so that you can maintain total control over who's using it, and what they can do.

And it does all this without a full-time operator.

Inexpensive help

Used during typical office hours, the operating costs for a BTI 4000, including maintenance, are about $1 per terminal hour. And should you grow to 24 hour usage, your operating costs shrink to less than 10¢ per terminal hour.

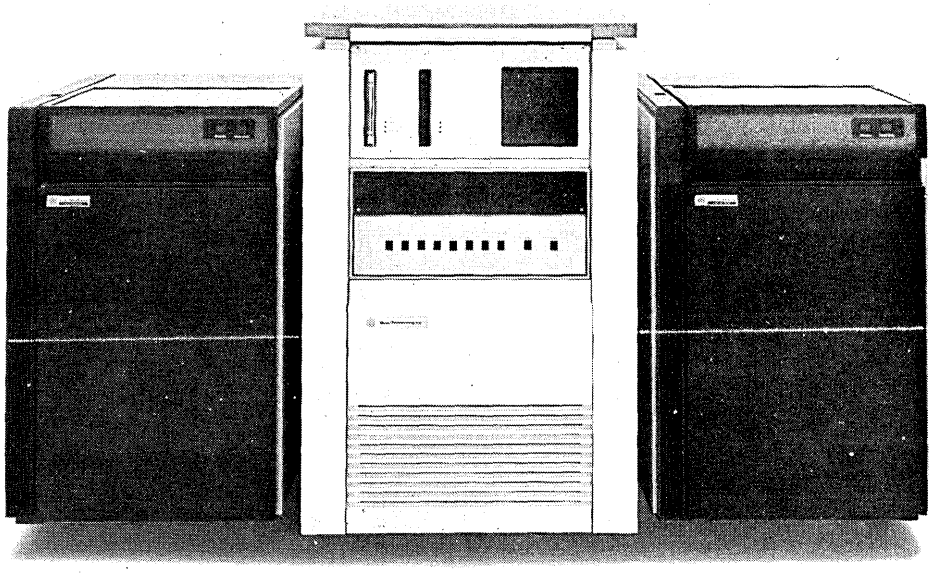
Around-the-clock help

We back our BTI 4000 with any-hour, anywhere, on-line support with dial-up access for problem diagnosis. Yet in a typical installation, our maintenance plan costs less than 1% of the system's purchase price per month.

Look to us

The BTI 4000. The interactive timesharing system that will help your data processing department do more, for less.

For more information, just look to the Basic Timesharing office nearest you.



The BTI 4000 Means Business.

Basic Timesharing Inc., Headquarters: 870 W. Maude Avenue, Sunnyvale, CA 94086. Sales Offices: East: Cherry Hill, NJ (609) 662-1122; Midwest: Minneapolis, MN (612) 854-1122, Chicago, IL (312) 298-1177; West: Sunnyvale, CA (408) 733-1122, Anaheim, CA (714) 533-7161

hardware

Off-line

The St. Louis Post Dispatch and the St. Louis Globe Democrat now share the first phase of what will be one of the largest electronic text processing systems in the newspaper industry. Their TEXT II system will consist of more than 200 terminals, nine computers, and 24 15-megabyte disc drives. The system, installed by System Development Corp., will provide business dp, advertising and editorial input and editing, and photo-composition.

A correcting Selectric typewriter that prints from right to left is available from IBM's office products division. Five type styles--two for Arabic and three for Hebrew--are offered. It works like a standard Selectric, but all the carrier functions, such as tab and backspace, are reversed.

If you've got hardware experience with IBM 1620s and 1622s, maybe you can help Lorenz Gerlach. He's trying to restore a system. He also needs a console typewriter. You can send him technical information at 24 East Pedregosa St., Santa Barbara, Calif. 93101.

First installations...Pacific Mutual Life Insurance has installed the first Itel AS/5...the first 370/148 has been installed at ITT Gifillan, an ITT subsidiary that manufactures radar systems.

Using computer output microfilm (COM) doesn't decrease the paper volume produced by the central computer, according to a report from International Data Corp. Both paper and COM file volume tend to increase at central sites. The impact printer will continue to be COM's biggest competitor for the next five years, the survey states.

Installation of five huge numerically controlled milling machines completes Lockheed Missile's $10 million, 43,000-square-foot facility for manufacturing heat shields for NASA's space shuttle. The heat shield, which will cover 70% of the shuttle's outer skin, is made up of thousands of silica tiles. The milling machines will shape the tiles so they fit the curvature of the shuttle's skin. Each tile is custom-made for a specific spot on the surface of the shuttle; a punched card that accompanies each tile identifies its intended location.

Daisywheel Printer

Using Diablo's Hytype II daisywheel print mechanism, the DTC-302/RO receive only printer can print from 10 to 45 cps.

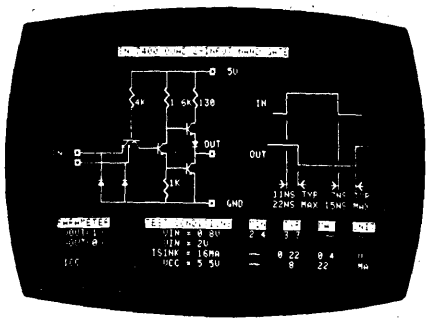
The complete electronics package and power supply are housed within the printer case. Both serial and parallel modes are supported. Plotting and pitch selection are standard. As options you can get different type fonts (over 20 to choose from), pin feed platens, forms tractors, a mobile pedestal, and a variety of ribbon cartridges including cloth, two-color, and film.

The DTC-302/RO sells for $2,980 with immediate delivery, DATA TERMINALS AND COMMUNICATIONS, Campbell, Calif.
FOR DATA CIRCLE 292 ON READER CARD

Color Graphics

A color graphics video generator that occupies two quad-size boards on a PDP-11's backplane provides standard ASCII alphanumerics, paint-up/paint-down bar graphics, reverse video, blink, and 128 microprogrammable special symbol graphics. Individual foreground/background selection in any one of eight colors may be made on a character-by-character basis.

The video generator, called the IDT-11, can display 24 lines of 64 or 80 characters. Each character is formed as a 5 x 7-dot matrix on a 7 x 10 field. Two more 64-character fonts for foreign alphabets or graphics may be stored within the video generator; additional fonts may be held in the PDP-11's memory.



Software supplied with the unit includes a FORTRAN-compatible package of driver subroutines for display control, interactive display development programs, and demonstration displays.

The IDT-11 costs $3,100 in unit quantity. In addition you'll need a color monitor with at least a 9.0 MHZ bandwidth, such as the one this firm sells for around $2,000 in unit quantities. Oem discounts are available. INDUSTRIAL DATA TERMINALS CORP., Columbus, Ohio.
FOR DATA CIRCLE 293 ON READER CARD

TWX/Telex to RS232

The 560 TWX/Telex control system provides electrical interface conversion between a computer's RS-232 interface and the TWX Access Arrangement (TAA) or Telex Line Adaptor (TLA) supplied by Western Union. A microprocessor handles the speed and code conversion necessary, converting 50 bps 5-level Baudot code into 110 bps 8-level ASCII.

As many as 12 TWX and/or Telex lines can be handled by one 560 system. Automatic answer is standard, automatic out-dial is optional.

Pricing starts at $3,300, with deliveries 45 days A.R.O. MICOM SYSTEMS, INC., Chatsworth, Calif.
FOR DATA CIRCLE 294 ON READER CARD

Private-line Modem

The SRM-192 provides synchronous data links over private paired wires at speeds up to 19,200 bps, and distances up to 18 miles.

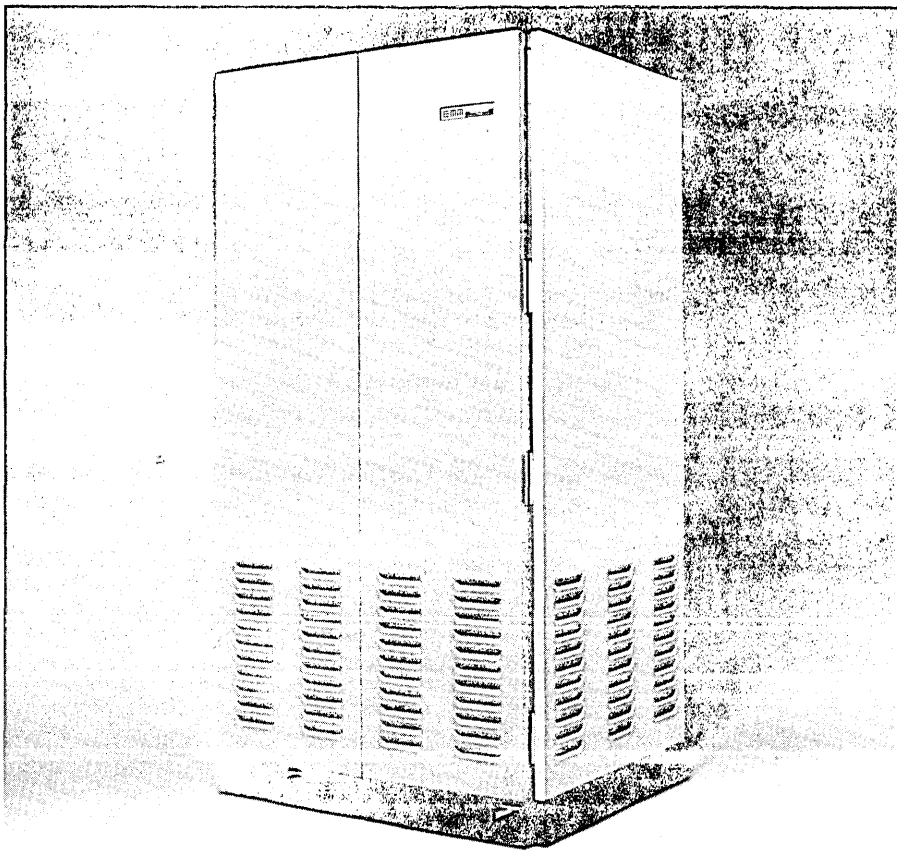
Designed to work on unloaded private cable systems or telephone company supplied local exchange loops using field equalizer controls, the SRM-192 accommodates half- and full-duplex as well as polled network operations. Data rates are strap-selectable at speeds of 1800, 2400, 4800, 7200, 9600, and 19,200 bps.

The SRM-192 sells for $900 in single unit quantities and leases for $25/month on a three-year lease or $30/month on a two-year lease. PARADYNE CORP., Largo, Florida.
FOR DATA CIRCLE 295 ON READER CARD

Line Surge Suppressor

This firm's line surge protector is said to protect computers and other electronic equipment from line surges. A surge suppressor absorbs transients that exceed the protection level, and a ferrite filter suppresses spikes and transients that fall below the level of the surge protector. The unit, which fits in the palm of the hand, plugs into a standard AC outlet and the equipment to be protected plugs into the unit. Models for 20 amp loads on 117 VAC circuits, two- and three-pin, are priced at $14.95 ($2 for shipping and handling on three pieces or less). Other ratings on special order. DYMA ENGINEERING, Taos, New Mexico.
FOR DATA CIRCLE 296 ON READER CARD

WE BUILD MORE INTO OUR ADD-ON MEMORIES SO YOU'LL GET MORE OUT OF THEM.



It's no accident that people get more out of our add-on memories than they can get out of competitive units. We've carefully designed them to be reliable to begin with. And to remain available long after others are unavailable.

We're well suited to do this because EMM is a complete systems company. We get involved in our products from the original design concepts through the installation. That's why we understand so well what a great add-on memory should be and how it should be made. And that's why we can assure you of always having the most memory available.

We begin with a very important basic ingredient. We are the only add-on memory manufacturer who designs their systems with total IBM compatible static RAM technology. This means that EMM add-ons will remain compatible with future IBM enhancements.

In addition, we designed our add-ons to be independently attached to your host computer. This enables EMM add-on memory to continue operating, even if the host memory fails.

Then, we built in a few more pleasant surprises. Such as the only single switch deferred maintenance in the industry. All it takes is a flick of the finger to automatically reconfigure any segment of EMM and IBM memory, keeping your equipment operative until the service man arrives. Just as important, this feature enables you to schedule routine maintenance when you want it, not just when you need it.

Another EMM exclusive is our Standby Memory© option. An increment of memory that stands by, ready to be activated in the event of trouble in the main storage. It enables you to continue operations as usual with your original memory capacity.

Even brownouts pose no problem for EMM add-ons. Our static RAM technology can take power decreases over 60% and keep on running. As you know, such is not the case with our more dynamic competitors.

We realize it isn't humanly possible to eliminate every potential add-on memory problem. But our total systems capability enables us to eliminate most of the more common ones. You get a lot more out of an EMM add-on because we build-in a lot more in the first place.

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hardware

Paper Tape Punch

For communications applications, the RQS 6120 perforator/spooler accepts data through its RS-232C interface at 1200 bps, punching at 120 cps. The data rate is selectable to 110, 134.5, 150, 300, or 1,050 bps, also. Characters may be 5, 6, 7, or 8 level; stop bit selection allows for 1, 1½, or 2 bits between characters. The spooler accepts spools up to 7½-inches in diameter. A fanfold version, the RQF 6120, is also offered. The RQS and RQF 6120s cost $3,150 in rack mount versions, $3,300 in table top versions. Oem discounts are available. Delivery is 60 days A.R.O. REMEX, Irvine, Calif.

FOR DATA CIRCLE 297 ON READER CARD

64K For Hobbyists

This 64K byte RAM board meets the S-100 computer interface specification used by many hobbyist computers, including Altair and IMSAI units. Cycle time is 500 nsec, with 400 nsec access time. All boards come fully assembled, tested, and burned in.

These boards have hardware provisions for "bank switching," which allows memory expansion beyond 64K bytes. Through a series of five or six microprocessor instructions, any of these memory boards on the same bus may be selected (or de-selected) for subsequent memory references.

A 64K board sells for $1,495, a 32K board is offered at $895, and a 48K board at $1,195. EXTENSYS CORP., Sunnyvale, Calif.

FOR DATA CIRCLE 298 ON READER CARD

Bar Code Printing

This hardware/software package allows IBM 360/370 users to print bar codes on low-cost printers, such as those manufactured by Printronix.

The printer controller is SYSGENed as a standard IBM printer MO3/2821. Through the software package, the user may select either a print or a graphics mode. In graphics mode, software can convert the computer's EBCDIC character records into bar codes. Codes currently supported are UPC, Plessy, and Monarch Code-a-Bar.

The controller and software package is priced at $7,500. Lease and third party maintenance is available; delivery is 60 days A.R.O. INFORMATION PRODUCTS SYSTEMS, INC., Houston, Texas.

FOR DATA CIRCLE 299 ON READER CARD

PDP-11/60 Minicomputer

The PDP-11/60 is a system integrated at the cabinet level for the laboratory, industrial, and educational markets. The cpu has an integral cache memory and a floating-point processor, and it's available integrated with two RK06 disc units (total capacity: 28 megabytes) and a hard copy terminal. Two low-profile cabinets contain the disc drives and cpu.

Pricing puts the 11/60 in the 11/40-11/45 neighborhood, while features such as the cache memory and main memory expansion to 512K bytes seem to place it between the 11/55 and the 11/70.

Memory, either semiconductor—MOS—or core, has a 532-nanosecond effective cycle time. The cache, 2K bytes of 170 nanosecond memory, is situated between the cpu and the bus

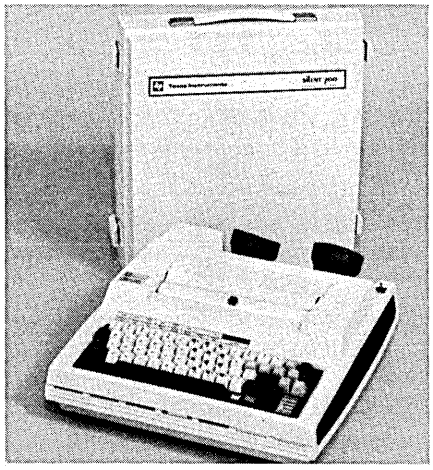
product spotlight

Terminal Has Bubble Memory

The Silent 765 Portable Memory Terminal marks the first time bubble memory has been put into the hands of dp end users.

The recipe goes something like this: take one of this firm's popular Silent 700 portable terminals, add 20K to 80K of non-volatile bubble memory, mix with a microprocessor, and bind the whole thing together with microcode for editing and ASR operation.

The unit looks pretty much like a



Silent 745 portable terminal with about an inch of cabinet space added at the base, but that inch makes the difference: the 765 can operate off-line in ASR mode for data entry, then you can use its editor to review and correct your input, and finally, when it all looks right, you pipe the data down the line to your computer.

Sales organizations and newspapers are two anticipated markets. A salesman on the road could enter his orders as he makes his calls, then at night edit and forward them to his company's computer. A reporter in the field could write his story on the terminal instead of a typewriter, then get to a telephone and send it to the paper's editing and photocomposing computer system.

The 765 has an integral acoustic coupler and RS232 interface while its sister, the 763, has tty and RS232 interfaces. Both have 30 cps thermal printers, and both are truly portable, weighing in at 17 pounds. Using an external modem and the RS232 interface, you can run the terminals at 1200 bps.

A dedicated microprocessor sitting with the bubble memory in the base of the unit provides memory management, editing functions, and ASR operation. Memory management is file-oriented; you can divide the memory into LINE or CONTINUOUS files with dimensions for characters per record and records per file to suit your application. The editor provides insertion and deletion of lines or characters, and one-to-one replacement of characters. In ASR mode you specify a playback file for prompts and a record file for responses, and the terminal automatically switches between the two. The microprocessor also gives you the ability to test the unit off-line, and you can change parity and the answer-back message as you see fit.

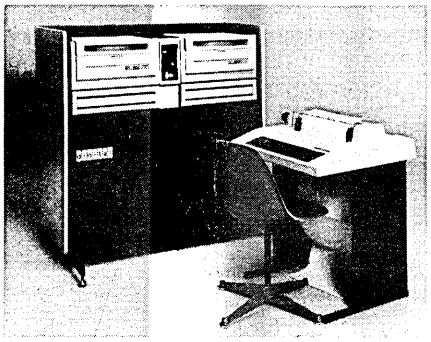
Deliveries are scheduled for the fourth quarter, but you can see the 765 at the NCC if you happen to be in Dallas next month. A 20K byte 765 will sell for $2,995; a 20K byte 763 for $2,695. Additional 20K byte memory increments sell for $500. Leases are available. TEXAS INSTRUMENTS INC., Houston, Texas.

FOR DATA CIRCLE 285 ON READER CARD ❋

so as not to tie up the bus when data is available from cache.

Several options can speed up the 11/60 for specific applications. A high-speed floating-point processor, known as the "hot processor," can be added to augment the integral floating-point processor. The hot processor can perform a 64-bit double precision multiply between registers in 3.74 microseconds, the firm states.

Optional user control store (UCS) permits tailoring the machine to specific applications at the microprogram level. Microprogramming allows for the implementation of functions ranging from special-purpose I/O operations to emulation of some mini and microcomputers. The extended control storage option allows UCS-developed functions to be placed into programmed read-only memories.



The optional diagnostic control store (DCS) module can test central processor modules in less than 30 seconds. DCS permits less computer-sophisticated personnel to replace malfunctioning cpu modules.

Several operating systems, including RSX-11M, IAS, and RT-11, are available for the 11/60. Language processors include BASIC and FORTRAN IV Plus.

End user prices for integrated PDP-11/60 systems range from $44,700 to $70,000. Single unit prices of cpu's for oem's start at $25,700. Deliveries are scheduled to begin in June. DIGITAL EQUIPMENT CORP., Maynard, Mass.
FOR DATA CIRCLE 300 ON READER CARD

120 cps Terminal

The long-awaited, 120 cps addition to the DECWriter line of terminals is here. DEC's Components Group says deliveries will begin this summer; the price-tag reads $2,270 in quantities of 100.

Known as the LS120 DECWriter III, the terminal uses many subassemblies from other DEC terminals, plus a microprocessor-based controller board. A 1K character buffer, EIA interface, an automatic "paper out" switch, last-character visibility, and a self-test capability are standard on the DECWriter III. Options include a forms handling package, a communications package, an APL alternate character set, a compressed font, and a 300 baud integral acoustic coupler. DIGITAL EQUIPMENT CORP., Components Group, Marlborough, Mass.
FOR DATA CIRCLE 288 ON READER CARD

Dual Sided Floppy

The SA850/851 double-sided, single/double density floppy disc drive can store 1,600K bytes unformatted or 1,200K bytes formatted, with a three millisecond track-to-track access time. With read/write heads on both sides of the diskette, the unit can sense if it has double-sided IBM diskette 2-type or single-sided diskette media. The new drive is plug-compatible with this firm's existing SA800/801 product line. Single quantity pricing is about $750. SHUGART ASSOCIATES, Sunnyvale, Calif.
FOR DATA CIRCLE 289 ON READER CARD

Bar Code Reader

Designed for plug compatibility with most crt's and other asynchronous terminals, this microprocessor-based bar code reader operates in tandem with any on-line RS-232C equipped terminal.

The model 9210 has external switches for selecting parity, half- or full-duplex operation, and data rates from 110 bps up to 9600 bps.

The reader comes with the firm's Ruby Wand light pen for hand scanning. Any popular bar code, such as

Code 39, 2 out of 5, and UPC can be read, according to the manufacturer. Labels may be bidirectionally scanned at speeds ranging from 3 to 50 ips. The unit can read messages up to 32 characters long (optionally, 64 characters).

Single quantity price for the model 9210 is $875. INTERFACE MECHANISMS, INC., Mountlake Terrace, Washington.
FOR DATA CIRCLE 290 ON READER CARD

125 ips Tape Drive

Oem's that need a 125 ips, 19-inch rack-mountable tape drive for their systems can use the Mod 14, which can read and write at 1,600 cpi in dual density PE format and 800 cpi in NRZI. Both formats can be implemented in the same unit, and embedded formatters are available.

The Mod 14 uses extra length vacuum columns. A capacitance element senses tape loop position, so there are no photocells, lamps, or moving parts within the tape buffer. The tape path has a 180° wrap around the capstan to prevent tape slippage.

All subassemblies of the drive are modular and accessible from the front of the unit for fast maintenance. The hard-coated read and record heads have a rated life in excess of 10,000 hours. The unit requires 10.5 amps of standard 115 VAC power; it can also run on 6.5 amps at 230 VAC. Up to four drives may be daisychained on a cable as long as 50 feet.

The drive has automatic tape threading accommodating IBM Easy Load I and II cartridges.

The mod 14 sells for $5,200 in oem quantities of 25 or more. Evaluation units will be available in the third quarter. WANGCO INC., Los Angeles, Calif.
FOR DATA CIRCLE 287 ON READER CARD

Perfect Binding

The Planax Databinder permits perfect binding of either burst or unburst continuous form printouts, as well as reports, correspondence, and booklets.

The unit uses a wire brush that rotates continuously while immersed in melted Planax adhesive. The material to be bound, up to 2⅜ inches thick and 17 inches long, passes over the rotating brush, the hot melt is applied, and the binding completed.

The Planax Databinder sells for $1,595. CUMMINS-ALLISON CORP., Glenview, Illinois.
FOR DATA CIRCLE 291 ON READER CARD

Intelligent Terminal

Available in standalone and clustered versions, the 216 family of intelligent terminals uses General Automation 16-bit microcomputers with up to 128K bytes of memory. A linked-list memory management system is implemented in hardware.

Communications interfaces for asynchronous, synchronous, BSC, and

SDLC are available, as are peripherals such as floppy discs, hard discs, mag tape, and line printers.

The 216 includes a disc-based program development system consisting of: assembler, editor, screen-oriented debugger, relocating loader, and screen-oriented utilities. A data entry system with forms creation, data collection, and file management is under development, as are text editing and text processing systems.

A 15-inch, non-glare, crt display can contain up to 1,920 characters in 24 lines of 80 characters. A 128-character full ASCII set is provided, and is expandable to 256 characters. A 7 x 9-dot matrix forms each character, which can be displayed with any combination of five attributes: bright, blink, underline, reverse video, and either blank or horizontal slash.

A series 216/10 standalone desktop system with 8K bytes of memory and an asynchronous communications interface sells for $3,750. A 216/30 remote cluster, which can have its stations up to 2,000 feet from the processor, sells for $11,475 with four display stations, 32K bytes of memory, and SDLC communications. Other configurations are available. Three- and five-year leases are offered. COMPUTEK INC., Burlington, Mass.

FOR DATA CIRCLE 308 ON READER CARD

Minicomputer

Midrange oem's and end users can get capabilities ranging from microprogramming to multiprogramming on the Eclipse S/130.

The S/130 has a second generation user-programmable control processor which allows users to speed up often-used functions in dedicated systems. For multifunction applications, the S/130 supports concurrent time-sharing, batch, and real-time operations using the Advanced Operating System (AOS). This Eclipse has the standard floating point and character handling instruction sets of the larger members of the family.

Memory, as much as 256K bytes, may be MOS, core, or mixed. Semiconductor memory modules are 64K bytes, with a cycle time of 500 nanoseconds. They have error correction and optional battery backup.

Available software includes AOS and the real-time operating system (RDOS). High-level languages include: FORTRAN IV, FORTRAN 5, single- and multi-user BASIC, and ALGOL. The vendor also offers utilities for remote job entry, sort/merge, and communications, and sensor access managers.

The system can support a number of the vendor's disc drives, ranging from 315K byte diskette drives to 190 megabyte disc files, as well as a family of

mag tape drives. Sensor I/O and communication subsystems are offered, as are printers and terminals.

An S/130 with 32K bytes of core memory, automatic program load, power fail/restart, and hardware multiply/divide sells for $11,000. A 64K byte MOS version, with error correcting and battery backup goes for $14,000. AOS, with both FORTRANS and BASIC, is another $7,800. Initial deliveries are scheduled to begin within 90 days, with volume deliveries slated for September. Oem arrangements are available. DATA GENERAL CORP., Southboro, Mass.
FOR DATA CIRCLE 286 ON READER CARD

Minicomputers

A desktop, minidiskette-based computer, the PCS II, and two larger computers, the WCS/25 and WCS/40, have joined the Wang Laboratories family of computers.

The PCS II is the second generation Wang personal computing system, and the first product offered with minidiskette storage, the firm says. Smaller than the widely used flexible diskette, each minidiskette stores more than 89,000 bytes.

Other hardware features of the self-contained, desktop PCS II include: a 1,024 character crt screen, a typewriter-like keyboard with separate numeric keypad and 32 special function keys for data entry and control, two memories: 8K bytes of user memory (expandable to 32K), and 42.5K bytes reserved for the operating system and BASIC language interpreter, and either one or two minidiskette drives. Options include ten printers with speeds ranging from 15 cps to 600 lpm, instrumentation interfaces, and a larger, 1,920 character display screen. Starting price for the PCS II is $6,200. Applications programs are available.
FOR DATA CIRCLE 301 ON READER CARD

The WCS/25 and WCS/40 are designed to break through the paperwork jam occurring daily in many office environments. A combination of hardware and software features let clerical work groups process forms; Wang also offers applications software. These multi-terminal systems can have IBM 3741-compatible diskette drives to store data for subsequent transmission to a central mainframe.

A basic WCS/25 system consists of a series 2200 processor with 24K bytes of user memory and 42.5K bytes of ROM for the operating system and BASIC interpreter; two diskette storage devices; a 120 cps printer; a model 2236 MXC microprocessor-based "mini front-end" controller; and three interactive terminals. Options include: a third 262K byte diskette drive, one additional interactive terminal, IBM 3740 diskette compatibility, additional printers, telecommunications controllers, and other peripherals and software packages available for the firm's earlier WCS/20. Pricing starts at $26,750.
FOR DATA CIRCLE 303 ON READER CARD

The WCS/40 tops off the Wang WCS product line. Its partitioned 2200 MVP processor allows multiple jobs to run concurrently. As many as eight interactive terminals can connect to the WCS/40.

Memory is divided into system (48K bytes) and user (up to 64K bytes) sections. Up to three floppy diskette drives and as much as 20 megabytes of fixed/removable disc storage may be connected to the system. As many as eight other peripherals, including printers, disc subsystems, and communications controllers (in addition to terminals), can be added to the WCS/40. Starting price for a WCS/40 system is $48,950.
FOR DATA CIRCLE 304 ON READER CARD

With the introduction of these computers came the announcement of software packages for forms manage-

ment, life insurance applications, patient billing, time and record keeping for service (lawyer/architect/consultant) firms, public accounting firms, mortgage management, and automobile financing. WANG LABORATORIES, INC., Lowell, Mass.

Power Distribution

Small dp installations with power requirements ranging from 5KVA to 45KVA, can use the PowerMite MK 1 to distribute power to their cpu's and peripherals. PowerMite taps into the building's electrical system through a junction box supplied with the unit; distribution lines from the unit run through shielded, flexible conduit, making it easier to install or move equipment.

A building-interface option offers protection in case of fire. A sensor on the room's sprinkler system can notify the PowerMite when the water goes on and the computer system can then be automatically powered-down, preventing the system from being shorted out by the water.

PowerMite can accept input voltages of 480, 460, 440, 240, 230, 220, or 208 V-ac. Ten three-phase lines or as many as 30 single-phase lines can be run from the unit. Combinations of single- and three-phase lines are also possible. Available output voltages are: 208 and 120 V, two or three wire and ground; and 208, 220, 230, 240 V, three or four wire, and ground.

The 25 x 30 x 30-inch unit sells for between $3,000 and $6,000, depending on ratings and options. COMPUTER POWER SYSTEMS CORP., Costa Mesa, Calif.

FOR DATA CIRCLE 306 ON READER CARD

32 Bit Computer

With as much as 16 megabytes of mapped main memory, the SEL 32/75 System tops off this firm's line of computers.

The 32/75 remains code-compatible with its predecessors. Operating systems include a program development system, and a real time monitor, RTM, with an optional time-sharing system, TSS. FORTRAN is supported and BASIC is on the way. Emulators for HASP work stations, 2780 terminals and 1130 computers are available, as is a process control package.

On the hardware side, the bus in this 32-bit machine can move more than 26 megabytes in a second. Word size is really 36 bits, 32 data-bits, and four parity bits. The interleaved and overlapped core memory runs at 600 or 900 nanoseconds; both types of memory may be in the same memory pool. The 600 nanosecond memory comes in 32K byte expansions, the 900 nanosecond in 64K byte expansions. Memory protection is standard.

The 32/75 has 163 instructions, including floating point as a standard. High-speed floating point is optional. Data in 1-, 8-, 16-, 32-, and 64-bit units may be operated on by the various instructions.

Regional Processing Units (RPU's) handle I/O. These RPU's may be user-programmed for other functions, such as fast Fourier transformations, the firm says. The RPU's execute their instructions in 150 nanoseconds. Each RPU can process 2.4 megabytes per second; each I/O controller has a maximum throughput of 1.2 megabytes per second.

In a complex processing environment, as many as 20 of these systems may share a common memory pool, the firm states. The firm's systems group provides support for this type of application.

Pricing for the 32/75 starts at $64,000. A full-blown system with one megabyte of main memory, 300 megabyte disc, mag tape, 1,000 cpm reader, 600 1pm printer, and operator communication device will sell for $220,000. The firm feels that the average system will sell for less than $125,000. Delivery is six months A.R.O. SYSTEMS ENGINEERING LABORATORIES, Ft. Lauderdale, Fla.

FOR DATA CIRCLE 305 ON READER CARD ✲

software & services

Updates

Students at Michigan State Univ., several colleges in the U.S., and a university in Germany are learning about environmental trade-offs through four "games" developed by two MSU professors. Students spend two to three hours, in 30 minute blocks, playing each game at computer terminals. Meeting government standards for water quality is simulated in WAQUAL, where the student may be cast as manager of a water plant, a government inspector, or the owner of a bathing beach. In DISPATCH, the student must find cost effective ways to distribute power from four generators to a typical Michigan community. POPDYN deals with the population dynamics of parasitic cereal leaf beetles. In FEEDLOT, the student simulates raising, then selling steers.

Jeanie, an electronic funds transfer system shared by four financial institutions in the Cincinnati area, became operational early last month. Customers may use any of the 20 IBM 3614 automatic tellers in the network to transact their banking business. A savings and loan customer can get cash from a bank's automatic teller; computers at a central site keep track of the cash flow between institutions and update customer accounts. The participating institutions are: The Fifth Third Bank, Provident Bank, Hunter Savings Assn., and Eagle Savings Assn.

Telenet and Teleinformatica de Mexico have started a computer communications service between the U.S. and Mexico. Both firms operate domestic packet switched networks providing communications at up to 1200 bps. It is claimed the interconnection will reduce typical communications charges between the two countries by 50%. Rates (in a tariff filed with the FCC) are $5.30 per kilopacket. Each kilopacket contains as many as 128,000 characters.

Altergo, the British software firm, has formed an American counterpart to market its Shadow II Teleprocessing monitor. Altergo Software Inc. will sell to non-IDMS users.

The APL Services Division of The Computer Company informs us that its ACTION/MAIL product (March, p. 248) "is not in any way designed to compete with either the phone company or the U.S. Mail."

Financial Planning Model

Due to the financial complexities facing its corporate planners, the financial team at American Optical Corp. developed a financial simulation model for use with IBM's Planning System Generator II/VS (PSG II/VS). The model is now available as the Economic Evaluation Model for PSG II/VS Installed User Program (IUP).

Users can evaluate the effects of various economic decisions, including: new investments in plant and equipment, potential new product lines, lease vs. purchase alternatives, and make vs. buy alternatives. A project income statement/cash flow report is produced for each alternative and set of assumptions.

The package consists of FORTRAN application programming (which uses PSG II/VS computational routines) plus PSG II/VS control statements and print specifications.

The configuration requirements to support this IUP are the same as those to support PSG II/VS (also required).

This IUP has a license fee of $275 per month; charges are waived after the first 12 consecutive monthly payments. INTERNATIONAL BUSINESS MACHINES CORP., White Plains, New York.
FOR DATA CIRCLE 309 ON READER CARD

Series/1 Software

When IBM announced its Series/1 minicomputer with minimal support software, it created another market for independent software houses. This software vendor has just entered that market with two packages: a BASIC interpreter and a set of structured programming macros.

The BASIC interpreter is the first in a series the vendor plans to release. It handles a limited subset of the BASIC language, making it suitable for writing demonstrations and simple applications. Statements supported are: LET, FOR-NEXT, IF, GOSUB, GOTO, RETURN, STOP, REM, PRINT, and INPUT. Five commands, the four arithmetic operators, six relational operators, and three predefined functions are included. As many as 286 single-precision integer values and one array may be used.

The next planned release in this series will be a multiuser BASIC with extensions for file handling and selected other functions. An extended commercial BASIC is expected later this year.

To use this interpreter on your Series/1, you need 16K bytes of memory, an operator station, and a diskette drive.

The structured programming macros give the assembler language programmer high-level control structures. The control structures are designed to be like the PASCAL programming language, and include: IF-THEN-ELSE, REPEAT-UNTIL, WHILE, FOR, SEARCH, and CASE. The manual describing the macros includes a section on structured programming techniques for assembler language.

Pricing for the initial release of Series/1 BASIC is $120 for a license fee on a per machine basis. This fee may be applied toward license fees for future releases. The structured programming macros and manual have a license fee of $75 per machine. GRAHAM COMPUTER ENTERPRISES, INC., Birmingham, Ala.
FOR DATA CIRCLE 312 ON READER CARD

Documentation Aid

Structured Charter keeps track of the many interrelationships between the small program modules that make up structured programs. Versions are available to document programs written in FORTRAN, COBOL, and PL/1.

Running on IBM 360 or 370 systems, the Structure Charter accepts source programs (which must be free of syntax errors) as input, and produces a tree-like chart depicting the interrelationships between modules. Additionally, a cross-reference and hierarchy list is provided for both the internal and external subroutines and external variables.

Each version of Structure Charter is licensed at $490 for the first year, and $290 for each subsequent year. PACER INDUSTRIES, Placentia, Calif.
FOR DATA CIRCLE 313 ON READER CARD.

Forms Analysis

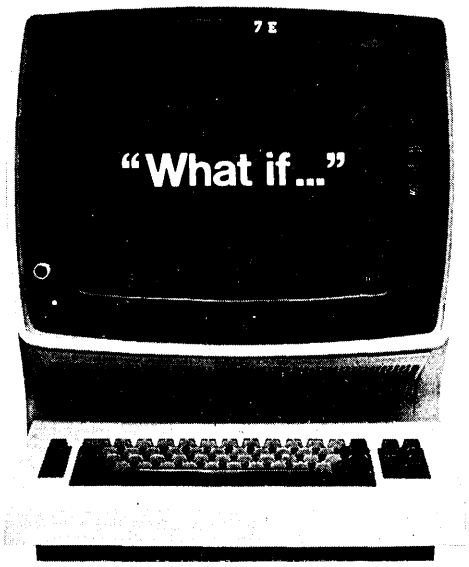
Larger business forms customers, doing in the neighborhood of $20,000 or more worth of business with this company each year, can make use of the firm's MAGIC (Media Analysis, Grouping, Inventory Control) service. The service is performed at no additional charge.

One part of the MAGIC service is an analysis of the customer's business forms requirements. This analysis seeks to identify areas of waste and duplication, and it includes suggestions for improved forms design and methods to help customers better control their business forms. Both computer-related forms and manual forms are included

asi/inquiry

The IMS DB/DC QUERY LANGUAGE

USED BY MORE IMS INSTALLATIONS THAN ANY COMPETING PRODUCT



ASI/INQUIRY is an IMS DB/DC query language that operates completely as an interactive Message Processing Program. The design of ASI/INQUIRY is such that the *structure of the data base is transparent to the user*. Moreover, one need not have familiarity with DL/1 segment logic or the complexities of multi-pathing. Extremely rapid response time is assured.

MAJOR HIGHLIGHTS

- ☐ End-user oriented
  - —Easy-to-use language
  - —Requires no knowledge of IMS
  - —Comprehensive diagnostic messages
- ☐ Rapid response time for even the most complex queries
- ☐ Dynamic priority scheduling to maximize system performance
- ☐ Availability of default as well as user-defined screen formatting

Recently delivered, Release 2 of ASI/INQUIRY contained a number of major enhancements, including:

- Development of a TSO-supported version
- Full support of IMS/VS secondary indexing
- Open-ended computational facilities
- Ability to SORT display output

In summary, ASI/INQUIRY represents the state-of-the-art product in an IMS DB/DC or TSO-supported IMS environment. It is the only system combining an easy to use language, complete user flexibility, and rapid response time in a single package. If you want to start answering "What if . . . . " immediately, call or write today for further information.

asi

The Software Manufacturer

Applications Software, Inc.
Corporate Offices
21515 Hawthorne Boulevard
Torrance, California 90503
(213) 542-4381

in this survey.

The service also provides a continuing inventory review of the customer's forms. One of the firm's Systemedia representatives takes a physical inventory of the customer's forms each month and submits the information to a regional systems center. At the center, a computer analysis is performed and an account database is maintained. This information is used to prepare a report showing the volume of forms used for the month and year-to-date, their cost analysis, the number of forms on hand, the number on order, and the number in storage.

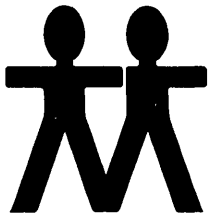
The MAGIC service provides the customer with information so he can group forms for more economical ordering patterns or more efficient use of press runs. NCR, Systemedia Marketing, Dayton, Ohio.

FOR DATA CIRCLE 314 ON READER CARD

software spotlight

Hire the Handicapped

Section 503 of the Rehabilitation Act of 1973 requires companies receiving $2,500 or more annually in federal contracts to seek out and find qualified handicapped individuals for employment. Handicapped Information Resource for Employment, HIRE, will help companies locate qualified handicapped individuals.



MAINSTREAM, INC.

The HIRE program is a joint venture by Mainstream, Inc., a non-profit organization which aids industry in its efforts to locate qualified handicapped Americans, and Information Science Inc. (InSci). The system will direct potential employers to agencies rather than individual job-seekers. This approach is preferred because of the overriding need for sensitivity and understanding in recruiting handicapped employees, which requires human rather than man/machine dialogues.

The program will begin in test mode in late June, with data initially confined to the New York City region. Expansion, first to 50 of the largest U.S. cities, then to the whole of the nation, is scheduled within 24 months. The service will have a nominal subscription fee, plus a charge for each transaction. Pricing has not been set. The initial budget of $137,000 for the 50-city program is coming from "enlightened corporations which understand just what has to be done and why," according to InSci president Dale H. Learn. MAINSTREAM, INC., Washington, D.C., and INFORMATION SCIENCE INC., Montvale, N.J.

FOR DATA CIRCLE 310 ON READER CARD

Data Management

Developed for scientists and engineers who must manage and analyze large quantities of data, CADMAT maintains databases of up to 32,750 observations (rows) on as many as 60 variables (columns). Usage of the system requires an understanding of Boolean algebra and set theory.

The CADMAT system is written in FORTRAN IV for the IBM FORTRAN (H) compiler. The program was developed at the NASA Lewis Research Center and

Maybe you need a new departure in control software.

Because we knew no single teleprocessing monitor could meet the needs of all 360/370 users, we developed three. And they're running at over 300 installations worldwide — everything from 24K DOS users with a few local terminals to large systems with hundreds of on-line terminals spread over thousands of miles. *One* of our teleprocessing monitors can help maximize the throughput and efficiency of your on-line applications.

MINICOMM is designed to get smaller DOS and DOS/VS users on-line fast. It supports application programs in Cobol, BAL, PL/1, and RPG, requires no hardware upgrades, and offers a whole list of features not available in other teleprocessing systems.

For DOS and DOS/VS users who want the ultimate in teleprocessing flexibility, there's BETACOMM — a fully queued, multi-threaded system that provides multitasking for application programs as well as the monitor. A comprehensive file handler allows all standard access modes, with support for popular data base systems. BAL, Cobol, and RPG II interfaces are available.

INTERCOMM, designed for OS and OS/VS users, is the most sophisticated teleprocessing system available anywhere. Its advanced features are far too numerous to list here, but include device-independent support of over 30 terminal types, comprehensive error recovery with integrated checkpoint, message, queue, file and data base recovery, restart, a large repertoire of pre-programmed utility functions, and a unique feature that provides program isolation. Over 150 INTERCOMM users attest to its superiority.

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runs under TSS/360; it can accommodate only one user at a time and is not suitable for situations requiring simultaneous multi-user access.

Data in CADMAT are stored either as four-byte floating point numbers or as four-byte "facts" (alphanumeric character strings). CADMAT is useful when the data is continually being accumulated, such as the results of a test program, and when the need for retrieval and analysis is on-going. The program has the ability to search on any or all of as many as 60 fields.

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In correspondence to the distributor, CADMAT should be referred to by its program number: LEW-12570/D. The program sells for $760; its documentation is $17. COMPUTER SOFTWARE MANAGEMENT AND INFORMATION CENTER, Univ. of Georgia, Athens, Georgia.

FOR DATA CIRCLE 315 ON READER CARD

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Companies with foreign manufacturing operations can use the SIMCOST II model and data base of future manufacturing costs to project the costs associated with the manufacture of electronic, electrical, and light mechanical products. The data base, covering Mexico, Brazil, and parts of Europe and Asia, will contain more than 20,000 individual economic forecasts through 1982.

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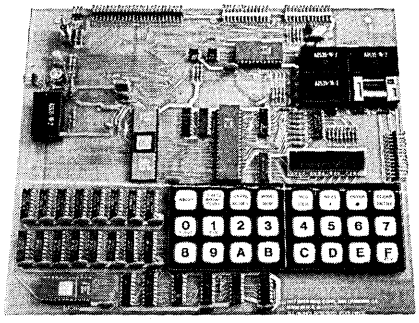

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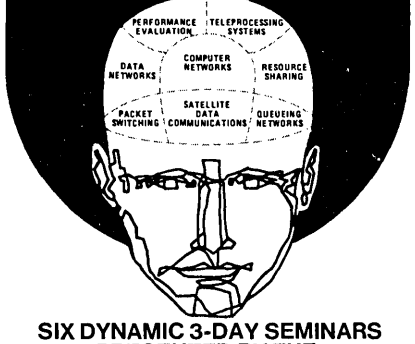

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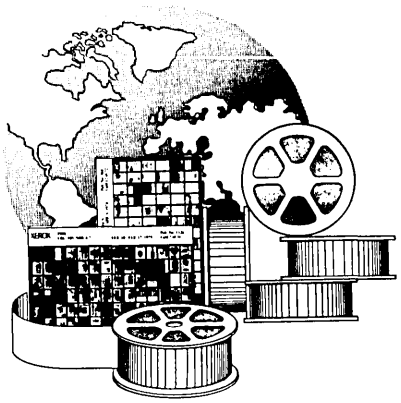

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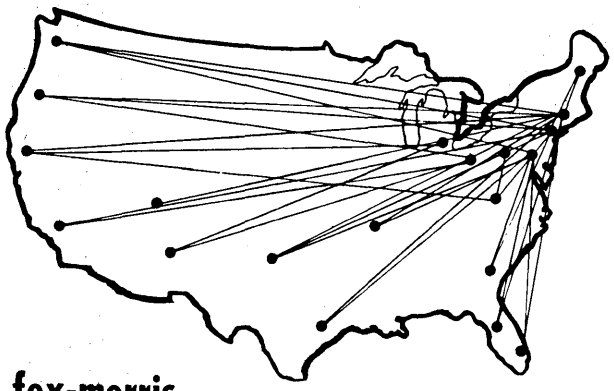

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What if COBOL Could...

A programmer's lot is not a happy one. When the Operations staff has a choice between running a test for the programmer or a couple of dozen calendars for the keypunch staff, the programmer knows which job will get priority. When he gets specs from the Systems people, the programmer instinctively knows what percentage will be contradictory, what percentage will be undecipherably ambiguous, and what percentage will be a flight of fancy on the part of the analyst. He also knows who will have to determine which is which, and who will suffer the consequences if he is unsuccessful.

It is a programmer's destiny to become proficient in JCL at approximately the same time as the manufacturer releases a new operating system (with new JCL). He knows, too, that the closer he gets to quitting time on Friday, the larger looms the prospect that a user will come to him requesting a change.

All these things would be bearable, however, if it were not for one recent development. Today, it seems, everybody should be writing "GO TO less" or "less GO TO" (depending on which guru you listen to) to become a more efficient programmer. Unfortunately, the programmer is restricted in many cases to using COBOL. Now COBOL is not a bad language, but it really is not designed to get maximum "GO TO less" or "less GO TO" efficiency out of a programmer. It is designed to produce programs that approximate the English language.

But all is not lost. Salvation (or a close facsimile) may be close at hand. Over the past few months, I have looked at COBOL from a programmer's point of view, with the idea of incorporating into the language definition the facilities that I think would make me a more efficient programmer. What follows, then, is a highly personalized "shopping list" that I would look for in the next COBOL standard.

1. Programs are written for one reason only: to process data. Unfortunately, COBOL is overly restrictive about the way the data may be defined. Take, for example, the OCCURS clause. Assume that a program is to be written to show the distribution of various temperatures recorded over a three-year period in Nome, Alaska. The simplest way to do this is to establish a table with each occurrence representing one degree of temperature. The first item in the table represents 1°, the second 2°, and so on. Thus, when a temperature of 19° is recorded, the program will add "1" to the counter in the 19th occurrence in the table.

Yesterday it was −7°.

That means that the program will have to be modified to calculate the subscript (or index) by adding an appropriate constant to the temperature to establish a relative position in the table. PL/1 has overcome this problem by allowing the programmer to declare the lower and upper bounds of the array. COBOL could improve on this by offering two constructs:

TABLE-ITEM OCCURS *n* TIMES FROM *p*
(where *p* is an integer)

and,

TABLE-ITEM OCCURS FROM *p* TO *q*
(where *p* and *q* are integers delimiting, respectively, the lower and upper bounds of the table).

Note the simplicity; note the elegance; note the programmer's Procedure Division coding that will be saved!

2. And, while we are on the subject of tables, COBOL really should remove the arcane restriction that a value cannot be given for an elementary item in an array. If the programmer does not want to initialize each item, so be it. But if he would like a particular field initialized (for each occurrence) with zeros, spaces, or a literal such as '@#$%¢&*()+', then COBOL should permit the programmer to do just that.

In fact, why stop there? Instead of making the contents of an uninitialized field unpredictable, let us have default values. If the PICTURE is numeric, then initialize with zeros; if alphanumeric, then start with spaces. One COBOL compiler already does this. BASIC compilers and interpreters always do this.

3. CALL, COMPUTE, READ, RECEIVE, STRING, and WRITE have one thing in common: they are imperative statements . . . except when they include the optional phrases SIZE ERROR, AT END, INVALID KEY, NO DATA, ON EXCEPTION, or ON OVERFLOW (as appropriate). This, in itself, is not serious. But when you consider these constructs within the syntax of the COBOL language, a continually nagging problem crops up. Consider the following coding:

```
IF condition
  COMPUTE A = X + Y + Z
  COMPUTE B = T + U - V
  COMPUTE C = A / B
  .
  .
  .
  (many, many statements).
```

The program will run smoothly until the inevitable occasion when B becomes a zero, and the program output is 128K of core dump. A possible fix would be the inclusion of an ON SIZE ERROR statement, but that would affect the logic flow. A second possibility would be an in-line test for zero and, if true, taking various corrective measures. But this would also mean that considerable coding would probably have to be duplicated to accomplish the results required from the testing of the original condition in the first line. A third possibility would be the use of a PERFORM statement to do an out-of-line computation using the ON SIZE ERROR option. This last possibility is a rather classic example of the cliche "using a sledgehammer to crack a nut." But fear not, there is a solution which, like a good martini, comes in two parts.

Instead of coding COMPUTE . . . ON SIZE ERROR . . . or READ . . . AT END . . ., amend the COBOL syntax to show that these phrases reflect conditions which may or may not occur. They should be tested with an IF. And that gives:

```
READ . . . IF AT END . . . ELSE . . .
COMPUTE . . . IF SIZE ERROR . . . ELSE . . .
```

with, of course, similar constructs for the other verbs thus affected. Dijkstra disciples will immediately recognize one of his acceptable structures.

But will it work? The answer is an unequivocal "Maybe." With the modified construct, our coding now looks like this:

```
IF condition
  COMPUTE A = X + Y + Z
  COMPUTE B = T + U - V
  COMPUTE C = A / B
  IF SIZE ERROR
    MOVE 0 TO C
  ELSE
    .
    .
    .
    (many, many statements).
```

Obviously, this is not the same as the original coding. And, just as the vermouth adds something extra to the gin, so does the second half of my hoped for change.

One of the premises for COBOL was the desire to develop a language that was an English notation in a narrative form. Since English has borrowed from other languages, let us borrow from another computer language: FORTRAN. COBOL can borrow a cup of CONTINUE and, when we are finished, we can return the cup to FORTRAN filled to the brim with PERFORM's. In COBOL we will define CONTINUE to mean a termination of a previously taken "conditional path" (following an IF, IF INVALID KEY, etc.) and for the program to CONTINUE as if the condition had not arisen. This gives us the following solution to our problem:

```
IF condition
  COMPUTE A =
  COMPUTE B =
  COMPUTE C =
  IF SIZE ERROR
    MOVE 0 TO C
    CONTINUE
  .
  .
  .
  (many, many statements).
```

We could even have:

```
  .
  .
  .
  IF SIZE ERROR
    MOVE 0 TO C
  ELSE
    ADD 1 TO C
    CONTINUE
  .
  .
  .
```

To put the concept into more easily understood terms, think of it like this: if you are thirsty make a martini, taste the martini, if it is too dry add some more vermouth, then, in both cases, continue by adding a twist of lemon.

4. In the July 1976 *Forum* (p. 156), John M. Triance noted that relics of antiquity (such as CONSTANT SECTION, SIZE, and—more recently—ALTER and 77s) are dropped from the COBOL language specification. I think it is about time we dropped another dinosaur: GO TO. Let us donate it to the Smithsonian Institute, subject to recall only when a user requests "just one *small* change to the on-line update program."

I can hear howls of protest from overworked, under-

staffed dp shops about all the programs that will have to be modified (or, Heaven forbid, rewritten), and I am sympathetic. So we will modify slightly Mr. Triance's second suggestion: GO TO comes out of the language specification; it stays in the compilers; and anyone who writes a new program which includes even one GO TO is subject to a suitable punishment such as being placed atop the SYSRES pack as it is being cycled up. But sooner or later, the GO TO will simply have to go.

5. Has anyone else noticed how PERFORM is very much like your doting mother? When you want to get everything in order, you code PERFORM INIT-RTN. When you need to collect various items, you code PERFORM ABC-RTN VARYING . . . But, like any other understanding mother, PERFORM does draw the line every so often. For example, right now Mother PERFORM insists that you code:

```
IF A = 1
  PERFORM RTN-1
ELSE
  IF A = 2
    PERFORM RTN-2
  ELSE
    etc.
```

Since we have just finished pensioning off our old work horse GO TO and his executive assistant GO TO . . . DEPENDING ON . . . , then we will have to ask Mother PERFORM whether PERFORM . . . DEPENDING ON . . . could be added to her repertoire. Since we have to worry about the two "it will never happen" conditions where the DEPENDING ON variable is zero or out of range, we could permit the optional syntax ELSE . . . as in:

```
PERFORM RTN-A RTN-B RTN-C . . . RTN-N
  DEPENDING ON A-VALUE
  ELSE
    DISPLAY "VALUE IS 0 OR GREATER THAN N"
    CONTINUE
```

Note that since the ELSE is the result of an implied IF, we can use the CONTINUE construct discussed earlier.

Since it is already possible to include all of the more complicated PERFORM formats in a simple IF statement, this request should not cause compiler writers too many nights of lost sleep. Who knows? Some bright young spark may have anticipated this request and already included it as a hidden, undocumented bonus. Give your compiler a whirl and find out. Maybe your Mother PERFORM can do more than you think.

6. Still, we really should not ask PERFORM to do everything for us. So, carrying the preceding analogy a bit farther, perhaps we could find another equally capable maid to help PERFORM. Like all good maids, she will come from somewhere foreign and will speak English with a slight accent. The perfect candidate is the DO . . . END construct from PL/1. Mind you, because of possible ambiguity, the "END" part of the instruction pair will have to go. But we can replace the END with DONE, giving us the general DO . . . DONE construct in the following formats:

```
DO n TIMES
•
•
(statements which may include "nested" DO's)
•
•
DONE
```

and

```
DO VARYING . . . UNTIL . . .
•
•
```

(statements which may include "nested" DO's)
•
•
DONE.

The purists will probably insist that COBOL must maintain its completely English format. Well, since American English borrows from English English when convenient (and vice versa, too), let us permit COBOL English to borrow from PL/1 English.

7. There was a muted, if persistent, series of complaints about the perfidy of the COBOL Language Committee when EXAMINE was replaced by INSPECT some years back. But regardless of which verb you prefer, why not enhance its capabilities by having an additional option along the lines of INSPECT . . . REVERSED so that the scan would begin with the right-most character and proceed leftward doing whatever was requested. Surely, it cannot be that difficult to implement this, and there have been a number of occasions when a construct such as this would have saved me from having to do an out-of-line routine simply to determine how many trailing spaces existed in a field.

8. I have a rather commonplace pocket calculator. By entering a number and pressing the square root key, I get (obviously) a square root. I can get a square root using BASIC. I cannot get a square root from COBOL without adding the coding to my program (not many sites have a program you can CALL which will return a square root). The same holds true for random numbers. These facilities are not included in a description of what COBOL can do. And that is a rather puzzling oversight. I do not wish to seem like I am suggesting that COBOL should provide the range of esoteric functions found in languages like APL. But I would gladly sacrifice the entire Report Writer Module just for the ability to access a random number in the same way that I can get the date or time.

9. Tantalizingly, the latest issue of the CODASYL *COBOL Journal of Development* hints at a possible shorthand in a new COBOL language definition. I would like, humbly, to offer my own meager suggestions.

For a start, let us not limit the shorthand to a list supplied by the language definition. Heaven only knows how many contentions there will be when old programs are recompiled and previously wonderful (that is, short) data-names are flagged with fatal diagnostics.

Please, please, dear COBOL people, allow the programmer to define the short forms he will be using. If we can have (and rarely use) such paragraphs as DATE-WRITTEN, DATE-COMPILED, INSTALLATION, and SECURITY, then it will probably not hurt to allow the programmer to have a paragraph (say, PROGRAM-ABREVS) for defining just what his short forms will be, what each will mean, and where they will be used. Then the compiler can build its own dictionary and replace as necessary.

Here is an example of what I would like to see:

```
PROGRAM-ABREVS.
  'O1' IS 'OVER-1000.'
  'A1' IS 'ADD 1 TO.'
  'W' IS 'WRITE PRINT-REC FROM DTL-AREA
    AFTER ADVANCING.'
  'P' IS 'PIC' IN DATA.
  'P' IS 'PERFORM' IN PROCEDURE.
```

In the Data Division, then, you will find:

```
05 O1          P S9(7) C-3 V Z.
```

which the compiler would treat as:

```
05 OVER-1000 PIC S9(7) COMP-3 VALUE ZERO.
```

In the Procedure Division:

```
IF FLD-A > 1000
  A1 O1
  CLR DTL-AREA
  P BUILD-DTL-AREA
  W 1 LINE
  A1 LINE-CNTR.
```

the forum

and the compiler listing would read:

```
IF FLD-A > 1000
  ADD 1 TO OVER-1000
  MOVE SPACES TO DTL-AREA
  PERFORM BUILD-DTL-AREA
  WRITE PRINT-REC FROM DTL-AREA AFTER ADVANCING
    1 LINE
  ADD 1 TO LINE-CNTR.
```

With a construct such as this you need only remember and use the short forms you want. Or you could establish a copybook to standardize the short forms your own particular site wants, and then copy this into program only if you want it.

And the implementation of short forms should not stop here. Let us also require that the compiler be responsible for prefixing section and paragraph names with a four-digit presentation sequence number so that program listings can be examined, and offending routines located, more easily. The list of possibilities is not endless, but these few ideas have barely explored the potential for this change.

10. Since my diatribes (read "constructive criticisms") are reaching double digits, I will ask for your indulgence for only one further tirade, then relinquish the floor.

Why not let the compiler be responsible for formatting a standardized output listing? Look at it this way: on each card (or card image) there are 80 columns; six of those are used for sequence numbers, one for comments/continuations, eight for deck identification, and the remaining 65 contain actual program coding (and the first four of these are used only for FD, 01, and the first four characters of paragraph/section names).

Now, consider the print line. If we eliminate the seven left-most columns and the eight right-most columns, we still have 117 columns to print 65 columns of card data. In other words, no matter what we do, 52 printer columns will be wasted because most compilers merely deign to produce 80/80 listings.

I am not going to go so far as to suggest that this is intolerable. But there is a standard for flowchart symbols (and a lot of programmers never use flowcharts) while there is no standard for program listings (and we all have to use the listing at one time or another). Please, somebody, develop a standard for compiler listings. It should not be that difficult.

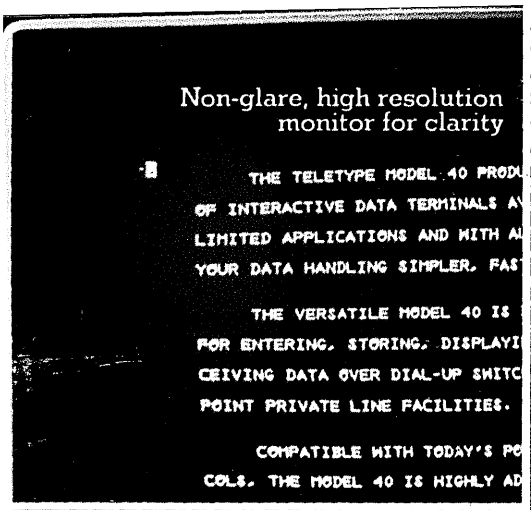
If you need any ideas just look at the average programmer's program: he aligns things like PIC and VALUE clauses; he indents several more spaces with each numerically higher level number (and returns as they get numerically smaller); and usually begins each new FD as well as the Working-Storage Section on a new page.

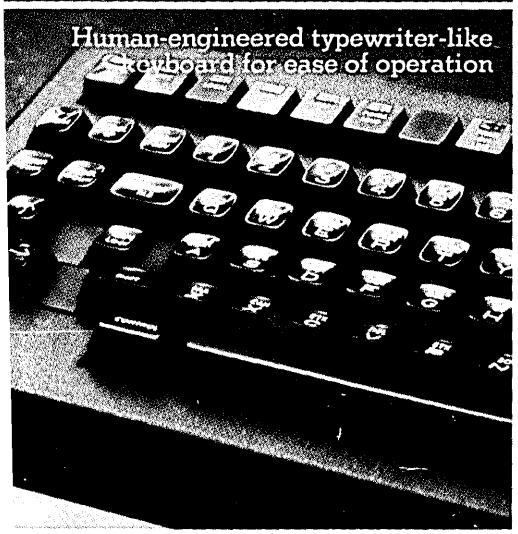
In the Procedure Division, an indent should follow an IF or ELSE. If there are multiple operands, an attempt should be made to align them, to spread the card image out by inserting spaces where necessary before and after such words as TO, OF, OR, and AND, and to go to a new page for each new section.

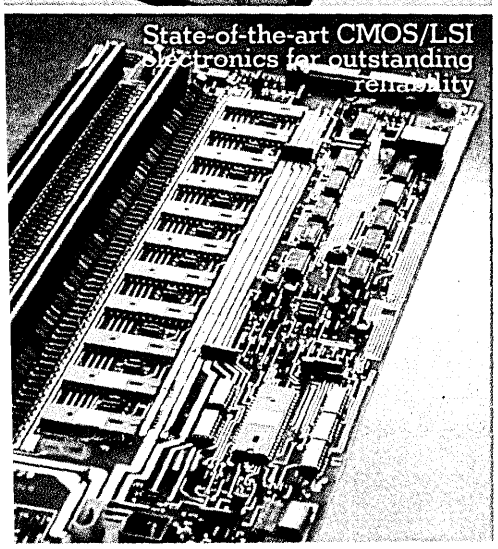
One manufacturer ran a series of ads with the catchline "What if . . ?" Well, I am not trying to suggest that if these changes are incorporated into the next standard that COBOL programmers will immediately start producing code that works correctly the first time. (I am not even going to say that *I* will be able to do that.) But, as the ad asked: What if . . . ?

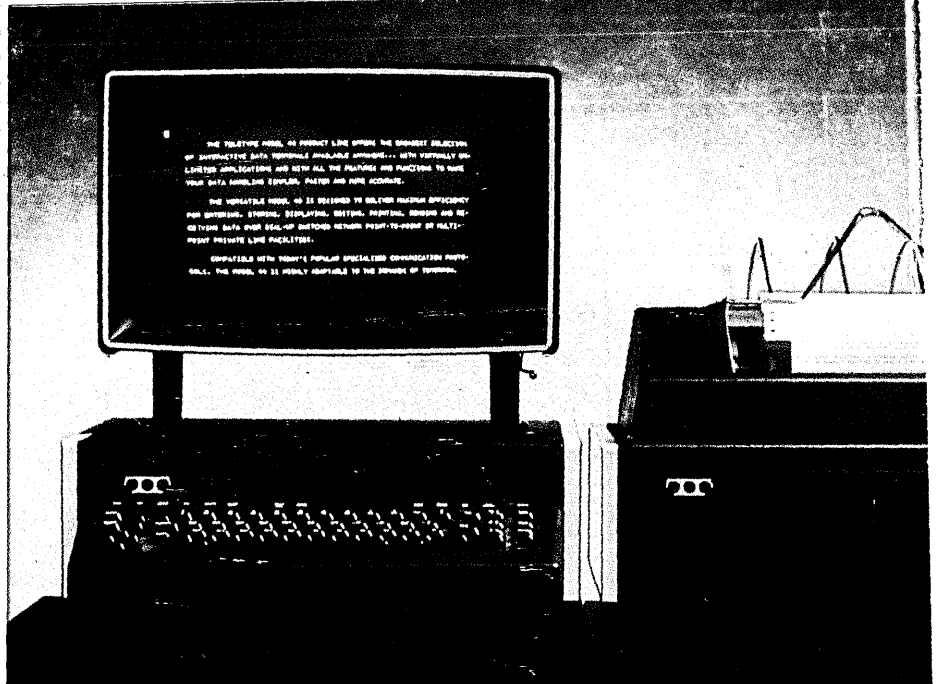
—John Beamish

Mr. Beamish has gained dp experience both in Canada and overseas. He is presently with Comserve, the Toronto-based consulting division of Multiple Access Computer Group.









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