DATAMATION 79®
DECEMBER/3.00 U.S.A.

THE MATRIX ORGANIZATION

SOFTWARE PACKAGE EVALUATIONS

TOP WORLD DP MARKETS SBS, ACS RETRENCH

KENNEDY

SERIES 5300 DISK DRIVES

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

Available in one, two, or three platter versions, the unformatted data capacity can be as high as 70M bytes—all in 7" of rack space.

Track density of 300 Tpi is made possible by prewritten servo tracks utilizing one disk surface, thus assuring accurate head alignment under all circumstances. High data density results from use of advanced media and write compensated MFM recording.

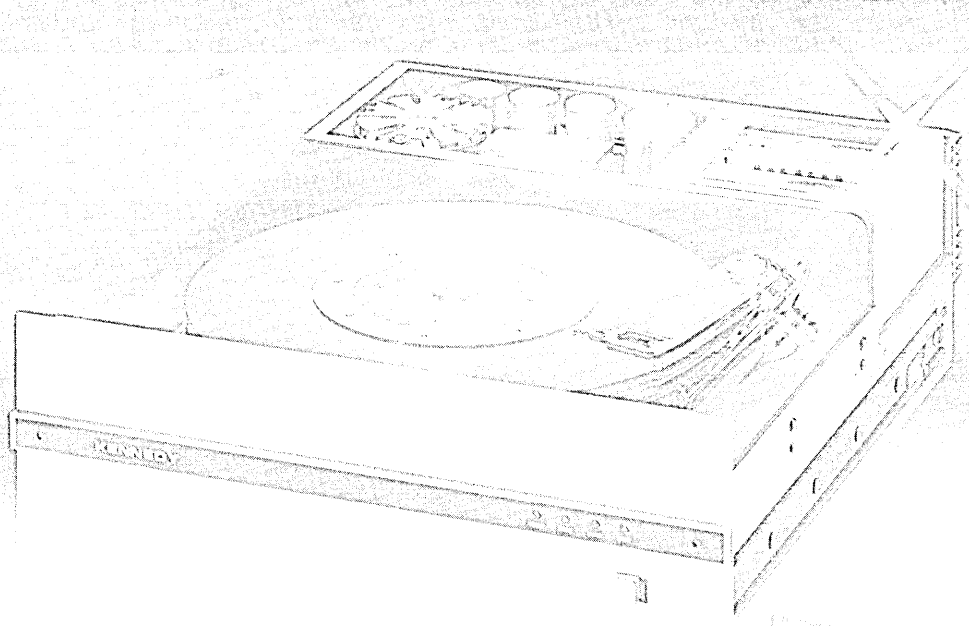
Maximum seek time is 70 msec, rotational speed, 3000 rpm, and data rate — 1.0 MB/sec.

The tightly sealed disk compartment allows Series 5300 drives to be used in environments unsuitable for conventional drives.

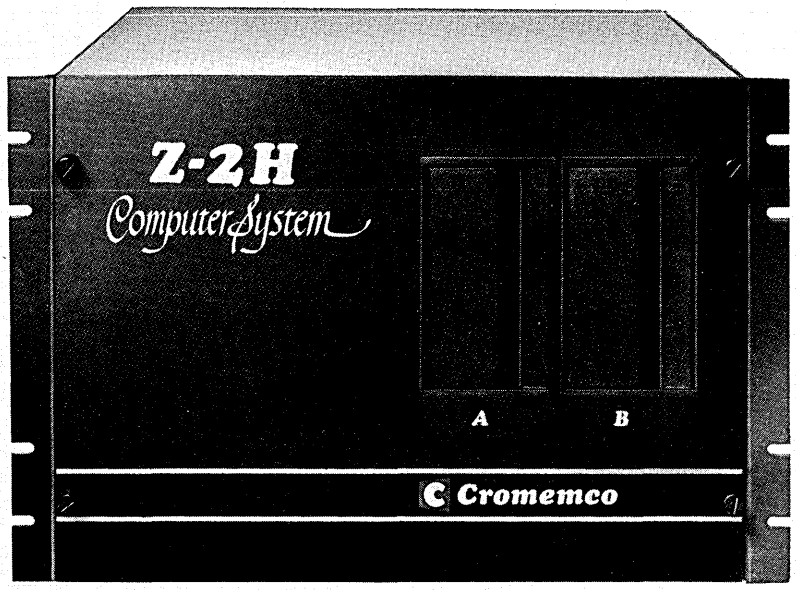
Other Series 5300 features include: NRZ–MFM data encode/decode circuits, daisy chaining of up to 4 drives, address mark detection, built-in power supply, small, easily replaced circuit cards and a standard interface.

Series 5300 is sophisticated in concept, yet like all Kennedy products, is simple in design for greater reliability, improved performance and lower cost.

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



CIRCLE 1 ON READER CARD



Low-cost hard disk computers are here

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

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

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

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

EXPANDABILITY

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

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

BROADEST SOFTWARE SUPPORT

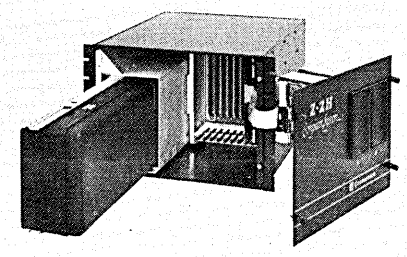
With the Z-2H you also get the broadest software support in the microcomputer field. Software Cromemco is known for. Software like this:

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

with more coming all the time.

SMALL, RUGGED, RELIABLE

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



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

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

CALL NOW

With its high performance and low price you KNOW this new Z-2H is going to be a smash. Look into it right now. Contact your Cromemco computer store and get our sales literature. Find out when you can see it. Many dealers will be showing the Z-2H soon—and you'll want to be there when they do.

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

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Tomorrow's computers now
CIRCLE 5 ON READER CARD

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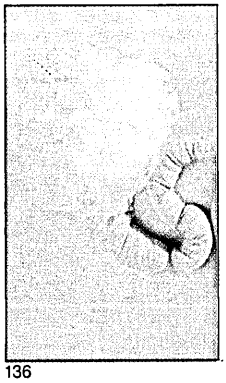
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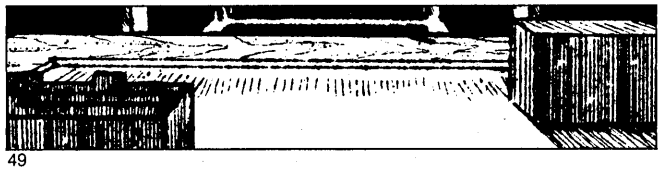
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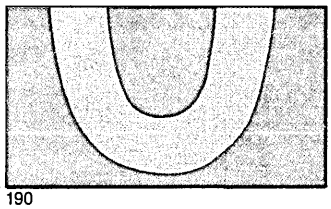
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COVER
An organization must be broken up into manageable parts before it can be understood. Cover photograph by James Joern ©1979.

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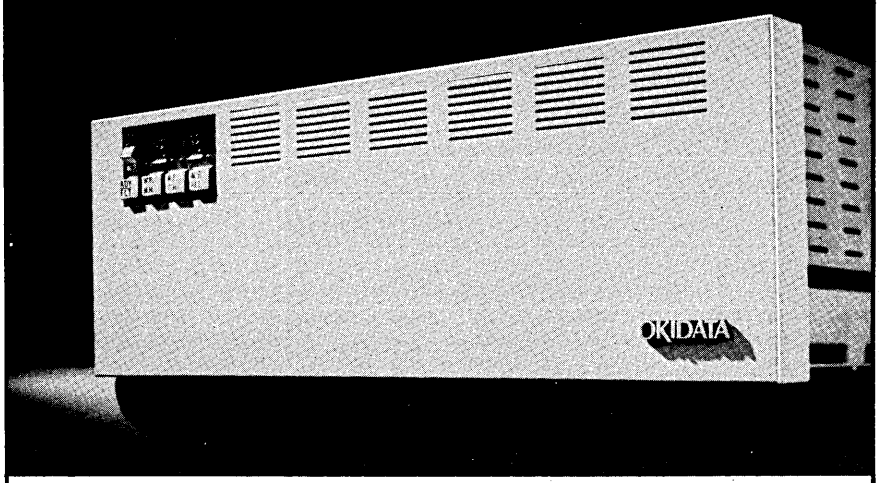
Data General and DEC Systems Live Longer



With Okidata Disc Drives

Data General and DEC users have a big investment in software. Okidata 3300 Series disc drives protect and extend that investment by growing with system requirements—all the way to 80 megabytes.

Six 3300 models, from 13 to 80 megabytes, all use the same set of systems programs and all fit in the same 7″ of rack space, including the power supply—Twenty-five percent more capacity than IBM's Piccolo in half the space. Plus—up to 2.4 megabytes of fast access fixed head storage in the same 7″ package.

Okidata disc drives live longer, with a field proven reliability record approaching that of their all solid state host processors. Winchester heads and discs and Okidata's unique low mass rotary positioner are protected from the environment and the operator by the finest air filtration system in the industry.

You've probably read about Okidata "bumping out" those big name disc suppliers. The reason is, when you compare reliability, performance, price, OEM support and ease of growth, Okidata disc drives live longer.

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Mount Laurel, New Jersey 08054
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CIRCLE 6 ON READER CARD

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Today. Tomorrow. Data base management with SYSTEM 2000 makes it possible for you to do more without spending more. We call it centsible—so do our customers.

For example, Texas State Comptroller Bob Bullock's office is using SYSTEM 2000 to assist in recovering hundreds of thousands of dollars in delinquent taxes. (They very cleverly tied together their tax administration and statewide accounting systems with a SYSTEM 2000 data base.)

Some forward-thinking people at a leading manufacturer of nuclear pumps used SYSTEM 2000 to attack problems in inventory, purchasing, and quality control. As a result, they helped management increase the company's return on investment by increasing the turn on inventory. They solved in six weeks the purchasing problem that the company had been trying to solve with traditional methods for two years. They implemented a very thorough quality control program and a lot of other outstanding, cost-effective applications to make the company more efficient. More importantly, SYSTEM 2000 gave them the ability to expand these applications into their worldwide operations with only a very small increase in staff at the central site. And as for those central site staff members, their productivity—when compared to traditional methods—increased three to four fold! That's centsible.

There's still more. NASA is saving time and money in their space shuttle program by having SYSTEM 2000 handle tedious projects such as inventory control, problem reporting, documentation control, and other tasks which previously were labor intensive, cumbersome and inefficient.

Seven years ago, Ford Motor Company's Ford Parts and Service Division installed SYSTEM 2000 to track packaging specs and bill of materials information for over 200,000 different types of parts. (These parts are stored in the Ford Parts Redistribution Center which has over 3,000,000 sq. ft. of warehouse space and in 21 Ford Parts Distribution Centers which have 6,100,000 sq. ft. and are strategically located throughout the United States.) Imagine how incredibly costly and inefficient this would have been under the old paper file method!

These are just a few of our centsible customers. We'd like to tell you about the others and what SYSTEM 2000 can do for you. Just send in the coupon—we'll be right back with a penny for our thoughts.

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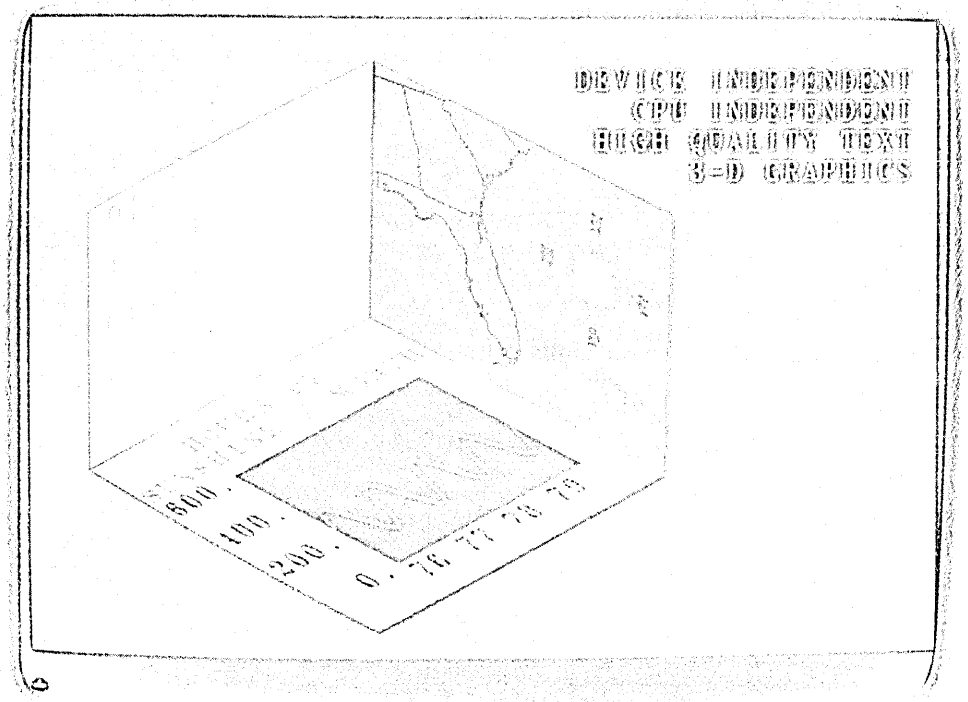
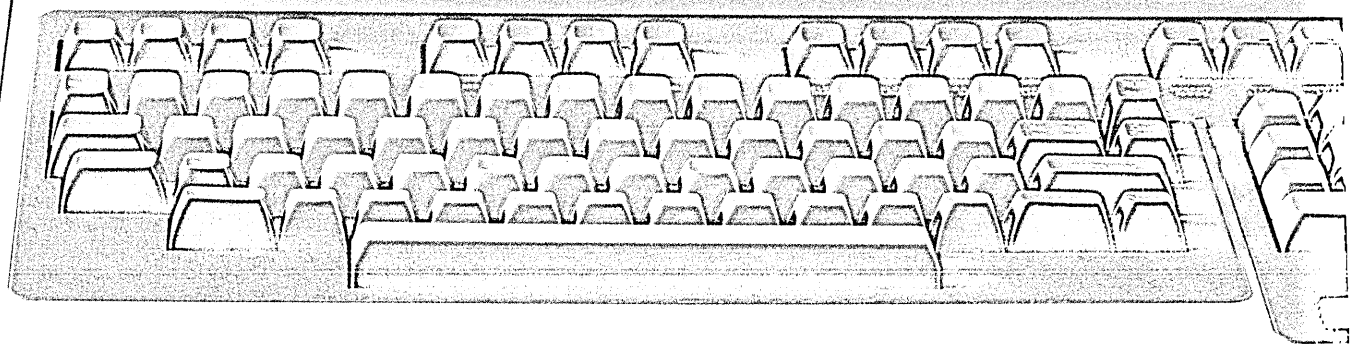
CIRCLE 7 ON READER CARD

From the Graphics Leader





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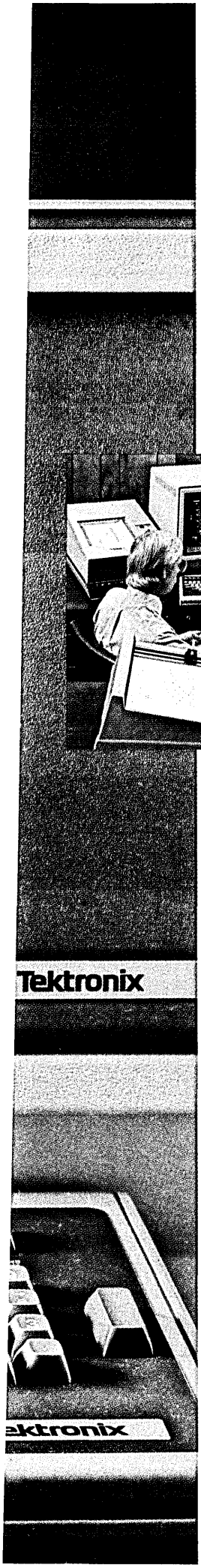

Tektronix 4027. Color computer graphics has never been so easy.

Graphic results can be reproduced in gray scale on our video copier or plotted in color on our digital plotters.

Our 4027 color graphics terminal incorporates sharp detail, powerful firmware functions and software support that sets the industry standard.

It's a combination of high performance and flexibility that could come only from Tektronix.

Display any 8 colors from a palette of 64, with precise control over hue, lightness and saturation. Firmware capabilities include concave and convex polygon fill; 120 user definable patterns; virtual bit mapping for unique scrolling of color displays and full-screen crosshair cursor that returns color information as well as x-y coordinates back to the host.

Our PLOT 10 software provides the tools for both graphing and graphics applications.

Our PLOT 10 Interactive Graphics Library contains the building blocks for basic, two-dimensional graphics, plus 3-D, high-quality text and color commands. It provides device and CPU independence: move from color raster displays to monochrome, DVST or pen plotters, without modifying code. Order the modules you need now, link up new capability in the future.

Written in ANSI FORTRAN IV, IGL is designed to keep pace with advancing computer power.

For quick turnaround from concept to finished graph, PLOT 10 Easy Graphing is the answer.

A few conversational, English-like commands produce full-color line graphs, bar charts, log and pie charts, quickly reproducible on our 4660 Series plotters.

4027 options include up to 192K of graphics memory, and a variety of peripheral interfaces from hard copy to video output.

Find out more about how the graphics leader makes color graphics easy. Call, toll free, 1-800-547-1512 (in Oregon, call 644-9051 collect), or contact your local Tektronix office.

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CIRCLE 9 ON READER CARD

LOOKING BACK

NOVEMBER/DECEMBER 1959

Fiber optics may still be in its adolescence, but the technology was born at least 20 years ago, as shown in our 1959 article on the subject. Several circumstances were cited in which fiber optics was of greater value than ordinary photographic techniques in recording data: (1) when very little light is available—which often happens when high speeds are used—(2) when there is a great amount to be recorded, and costs would drop as volume increased, and (3) when compact configuration is important, i.e., common photography methods usually mean much empty space is never utilized.

There was no commercial production of fiber opticals at the time, although limited quantities of experimental fiber optics materials were available from American Optical Co. for users interested in researching the area for possible development. Even with the great interest in this technique, however, the fiber optics field in data recording has still not been explored to its full potential.

At the same time, companies in computer-related industries were virtually combing the country to recruit qualified personnel. GE, IBM, NCR, Litton Industries, Chrysler, Ford, Raytheon, Lockheed, IT&T, and Sperry Rand, among others, placed classified ads seeking dp analysts, programmers, digital computer R&D teams, inertial guidance experts, engineers in numerous catagories, logical designers, specialists in transistor circuits, magnetics, electron and physical optics, etc. Much of the work was of a military nature, as indicated in one ad by Raytheon for its Missile Systems Div. and another by GE for its Heavy Military Electronics Dept. One company, now defunct, placed an ad stating, "Wanted: War Game Players" in a search for mathematicians, statisticians, programmers, and operations research analysts. The ad continues, "Very large-scale air-battle digital computer simulations are now going on at ——" Research on sensitivity of certain model computers to input changes was the bottom line on its requirements. IBM ran a full-pager that read, "You can become an IBM Applied Scientist, if:. . ." and went on to discuss educational and practical experience backgrounds necessary to join its ranks in the dp division.

DECEMBER 1969

And now, excerpts from a poem in computerese by Edmund Conti, which appeared in the December 1969 issue:

The Song of I/O-What-The

. . . From the wells of honey (Waltham)
From the IB empty spaces
From the land of Univacuums
From the land of controlled data
From the burrows of Paoli
Where the coder, called programmer,
Feeds among the reeds (and writeouts)
I repeat them as I heard them
Memories from Glitchee-Kludgee
Father of all new computers
Also grand and great-grandfather
(Depending on their generations). . .

. . . Glitchee-Kludgee, not realizing
That his thoughts are being printed
In the subroutine of someone
(Probably a sub-programmer)
Said programmer can't debug them
Sends them in to Datamation
Thus deports our I/O-what-the
Not to mention Glitchee-Kludgee
In the back of Datamation
Back among the tempting want ads
With the agencies employing
With the agencies imploring
Back with advertisers' index
And the bore-um of the Forum.

Ask me once more what the point is
Ask me once more if you care to
Even if you couldn't care less
I should tell you: I should tell you. ✻

NEC Spinwriters. Tailored printers.

Printers for every job. Terminals for every line.

NEC Spinwriter™ character printers and terminals can be configured in as many varieties as there are jobs to do.

They start as basic 55-cps printer mechanisms for some OEM buyers who want to add their own value. Then they grow and change to fit your precise letter-quality output needs.

Each of our 10 models is surrounded with features and options that make customizing easy.

Eight industry-standard interfaces, serial and parallel, let you add Spinwriter printers quickly to your current system. Ten form-feed options—most operator changeable—provide unparalleled document handling flexibility. Dozens of 10 or 12 pitch and Proportional Space thimbles—with up to 128 characters—solve your technical and language output requirements.

That's not all. Spinwriter printers and terminals lead the industry in reliability, with a more than 2000-hour MTBF. And in serviceability, with a 30-minute MTTR.

When you want hard-working printers that are tailored to your individual needs, call the NEC Spinwriter regional representative nearest you. He'll assure a perfect fit.

NEC. Going after the perfect printer.

NEC

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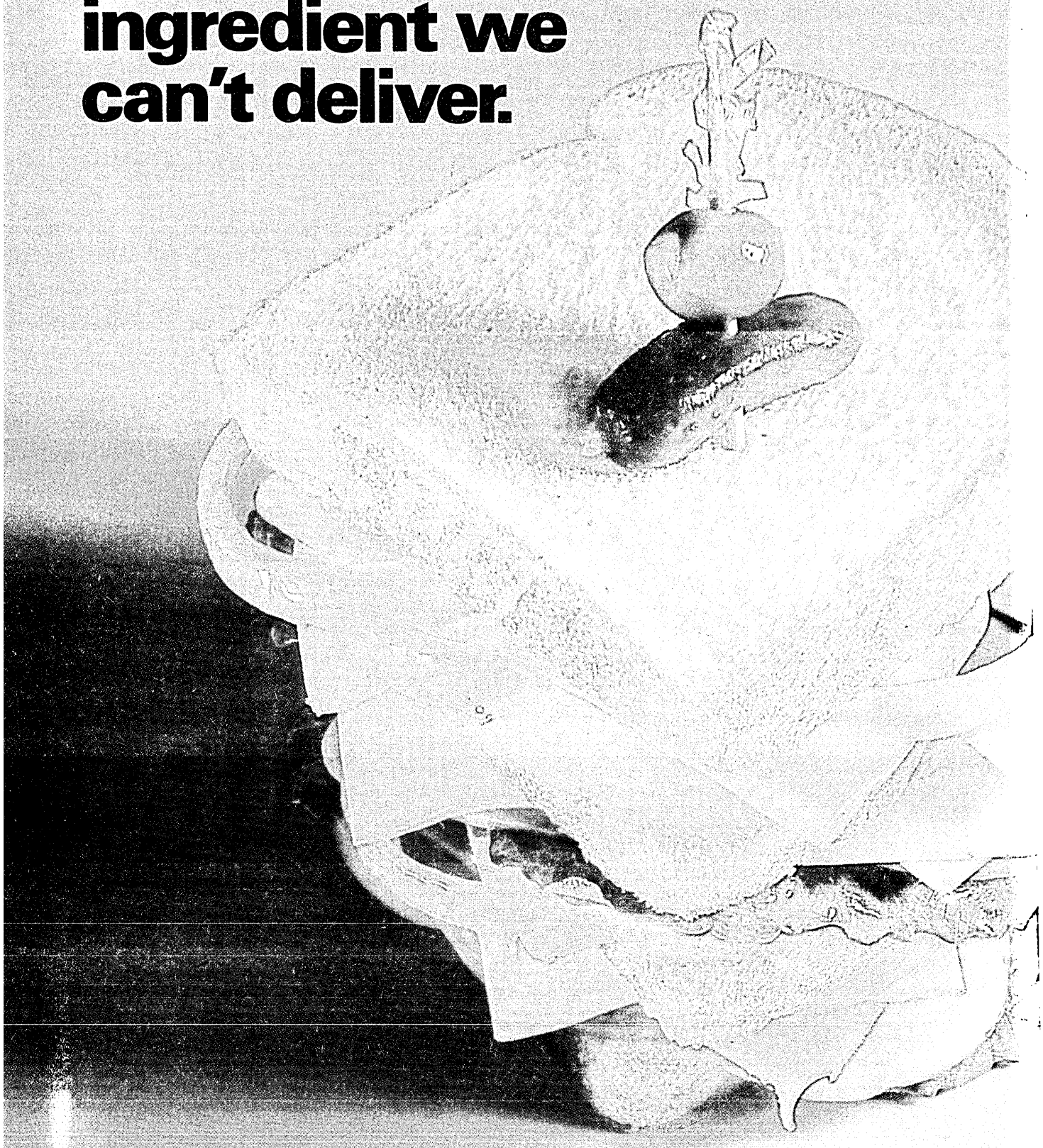
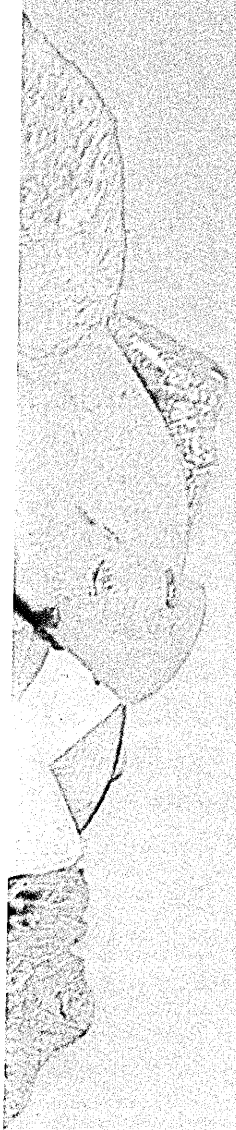
Western Region: 8939 S. Sepulveda Blvd., Los Angeles, CA 90045, (213) 670-734
Southern Region: 2965 Flowers Rd., South, Atlanta, GA 30341, (404) 458-701

CIRCLE 10 ON READER CARD

Remote processing from Northern Telecom: there's not a single ingredient we can't deliver.





DDP. Data Entry. Remote Job Entry. On-Line. For every remote processing function, there's a state-of-the-art solution from Northern Telecom Systems Corporation.

DDP

We make DDP systems that grow to fit each of the different sizes you're going to be. Systems that add new capabilities for each new task—without adding idle capacity.

Data Entry

Northern Telecom builds both source Data Entry and volume Data Entry equipment. All with concurrent communications.

Because, if you don't have concurrent communications, your high-speed Data Entry system could spend a lot of time standing still.

Remote Job Entry

Our basic, low-cost Remote Job Entry system is a best seller. But we also deliver large-scale RJE equipment to handle massive throughput and all kinds of sophisticated needs.

On-Line

On-Line hardware from Northern Telecom is plug-compatible with IBM 3270 s. But what makes our system unique is the Sprinter™ printer. It makes a hard copy that's easy to read. It switches in minutes from continuous-roll paper to cut forms. And it adjusts with push buttons where others use wrenches.

Why our bigger choice makes us a better buy.

It's hard to keep all the components in your system working together when service people from each supplier work alone.

When you deal with Northern Telecom, one service team can take responsibility for every part of your remote processing operation. More than 1200 Northern Telecom field engineers are ready to go to work for you today.

And because Northern Telecom can meet all your remote processing needs, we can often meet them for less.

But the best reason to talk to us today—is tomorrow.

Northern Telecom is combining data processing expertise with telecommunications expertise—a mix no other company can match.

Today, it means better access to all the processing power you pay for. Tomorrow, it means a smoother transition to the single system that will meet all your processing and communications needs.

Talk to Northern Telecom Systems Corporation. Where computers and communications meet.

For the office nearest you, call our Marketing Services Department at 1-800-328-6760. In Minnesota call (612) 932-8202.
Or write Northern Telecom Systems Corporation, Box 1222, Minneapolis, MN 55440

Northern Telecom Systems Corporation

CIRCLE 14 ON READER CARD

HP presents a compute
Start today.

At Hewlett-Packard, we've participated in the growth of networking for distributed systems right from the start. So we've had time to iron out a lot of the problems that go with it.

One problem was how to implement a distributed network today without limiting the growth needs of your company tomorrow. The answer: HP's Distributed Systems/1000—an advanced, real-time interactive communications package that you can install today without worrying about what changes the future may bring. DS/1000 gives you full system-to-system communications with the design flexibility to preserve your software investment, as well as accommodate the rapid advancements in computer technologies.

Rings, strings, stars: you name it.

No matter what configuration you need, HP's "layered" software approach lets you structure your network in a way that makes sense for your applications. You can arrange HP 1000 systems in star, ring, or string configurations—or any combination of them. Information passes from one system to another through intervening network nodes on an automatic "store-and-forward" basis without special instructions in your application software. And because you can access any system by simply specifying its node number, you can use the network just as easily from a remote terminal as from a local station.

With DS/1000, you can link workstations within a department as well as connect several departments on the factory floor (incoming inspection, final test, and quality control, for example). Or, you can link local manufacturing divisions to a host IBM mainframe or HP 3000 business system in your corporate EDP center. You can even create a nationwide network to coordinate geographically dispersed information.

All together. Now.

HP has a full range of real-time compatible hardware for implementing distributed computer networks—from terminals and interconnection hardware to sophisticated technical computers. A powerful data base management package with remote

22903HPDS25

network for manufacturers.

Expand tomorrow.

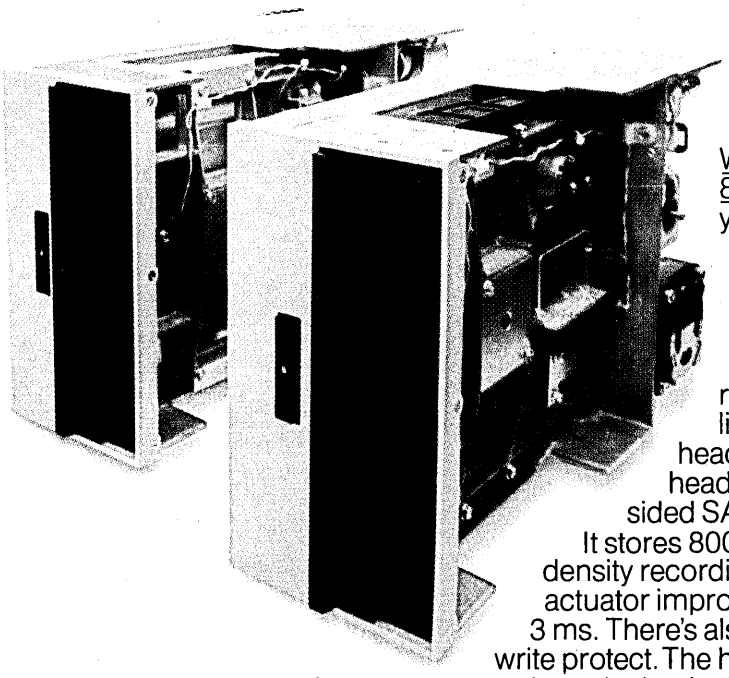
access capabilities will put the information you need right at your fingertips. And the modular software design will assure your orderly growth by allowing you to add to, or reconfigure, your DS/1000 network without affecting your existing programs.

Our long experience as a supplier of distributed systems means that HP's advanced technology is available now. Since 1973, HP computers have been installed in distributed networks around the world, all backed by extensive support systems.

If you'd like to know more about the HP 1000 computer system in distributed networking applications, call your nearest HP office listed in the White Pages and ask for a hands-on demonstration. Or for more information, write Hewlett-Packard, Attn: Roger Ueltzen, Dept. 454, 11000 Wolfe Road, Cupertino, CA 95014.

HEWLETT PACKARD

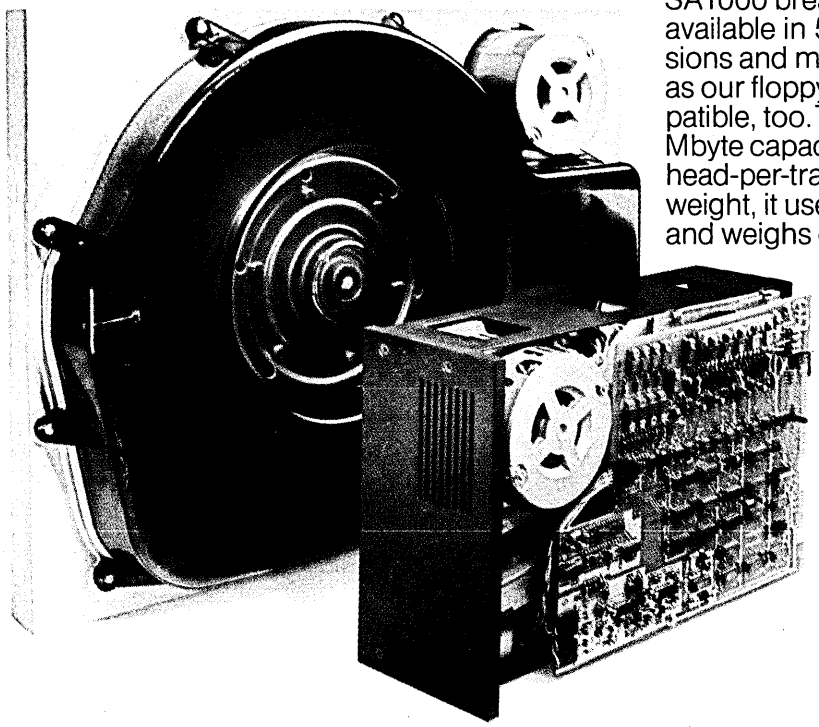
CIRCLE 15 ON READER CARD

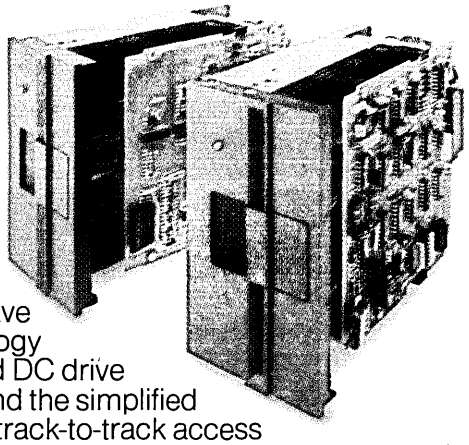


Want 400-1600 Kbytes? Choose our SA801/851 series. With the SA801 8-inch floppy, you have a choice of 400 or 800 Kbytes in single or double density, on the same drive for the same price. More than 400,000 of these standard-setting drives have been specified by OEM's around the world. They know that they can count on Shugart's proprietary read/write head technology to deliver media life of over 3.5 million passes per track, and head life of more than 15,000 hours. That's headstrong performance. And the double-sided SA851 drive gives you even more capacity. It stores 800 to 1600 Kbytes using single or double density recording. The 851's proprietary Fasflex™ band actuator improves track-to-track access time to a fast 3 ms. There's also a programmable door lock and write protect. The headstrong SA801/851. Solid performers from the leader in floppy technology.

The head Choose your

Moving up to 5-29 Mbytes? Check Shugart's SA1000 and SA4000 fixed disk drives with the lowest cost per Mbyte in their capacity range. The new 8-inch SA1000 breaks the $1,000 price barrier and is available in 5 and 10 Mbyte versions. Its dimensions and mounting holes are exactly the same as our floppy drives, and it's electrically compatible, too. The SA4000 offers 14.5 and 29 Mbyte capacity with an optional 144 Kbytes of head-per-track storage. Compact and lightweight, it uses only 5¼ inches of panel space and weighs only 35 pounds. All Shugart fixed disk drives use proven Winchester head and media technology to ensure better data integrity and longer trouble-free life. And system integration is easy because both the SA1000 and SA4000 can share a power supply with your floppy drives. Shugart fixed disk drives. The head of the family in capacity and cost/performance.

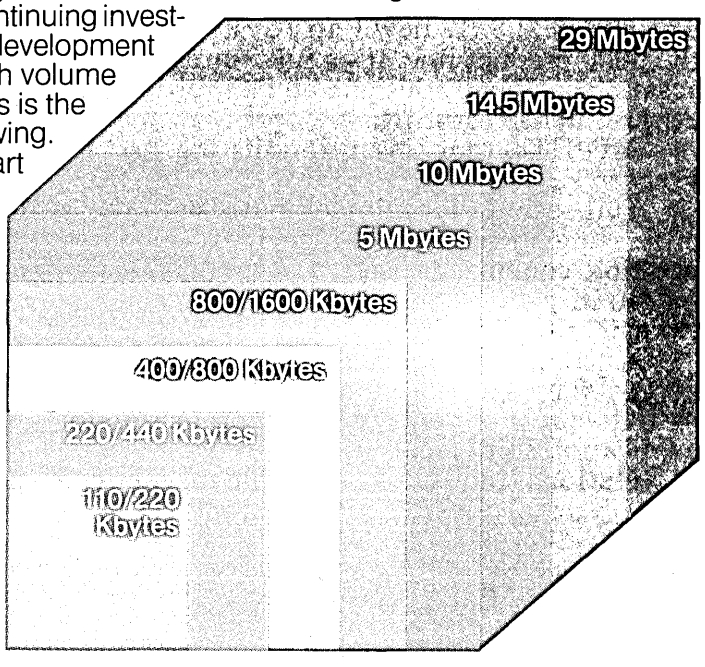




Need 110-440 Kbytes? The famous Minifloppy™ is the right choice. The Minifloppy stores from 110 to 440 Kbytes in a package about half the size of a standard floppy. We invented the Minifloppy family just two years ago and there are already well over 150,000 installed world wide. Compact size, reliability, and lowest cost per function are the reasons. Minifloppy drives have the same headstrong read/write head technology as their big brothers. The servo-controlled DC drive motor eliminates AC power requirements and the simplified actuator with direct drive spiral cam gives you track-to-track access as fast as 25 ms. The little drives offer the lowest heat dissipation of any floppy drive and feature positive media insertion, write protect, and activity light. Minifloppy. The original, and still the most popular 5¼-inch floppy drive in the world.

strong family. capacity.

The Shugart Family. Headstrong and proud of it. We're headstrong about our commitment to our customers. This means supplying you with a family of highly reliable, low cost disk drives in the quantities you need. And it means providing you with the best technical support and documentation in the industry. But it goes deeper. Like maintaining in-house control over the design and manufacture of 100% of our floppy read/write heads. And the continuing investment of financial and human resources in the development of new products and the most modern high volume manufacturing facilities in the business. This is the commitment that keeps our family growing. Headstrong? You bet. And proud of it. Shugart Associates Headquarters: 435 Oakmead Parkway, Sunnyvale, California 94086 (408) 733-0100; West Coast Sales/Service: (408) 737-9241; Midwest Sales/Service: (612) 574-9750; East Coast Sales/Service: (617) 893-0560; Europe Sales/Service: Paris (1) 686-00-85; Munich (089) 176006; Shugart products are also available off the shelf from local Hamilton Avnet outlets.



Shugart®

The Headstrong Company

CIRCLE 16 ON READER CARD

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

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

MULTUS multi-user timesharing executive.

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

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

4 user ports; expandable to 32 ports.

6400 bpi cartridge magnetic tape.

Unique proprietary account protection for application software.

Optional industry-compatible magnetic tape; line printers to 900 lpm.

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

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

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

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

BTI COMPUTER SYSTEMS

* Single quantity; attractive quantity discounts for the OEM.

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

CIRCLE 17 ON READER CARD

LOOK AHEAD

IN AND OUT OF RENTALS

In September, Digital Equipment Corp.'s president Ken Olsen sparked hopeful oem speculation about DEC beginning system rentals when he told NY security analysts that "for a specific product, it might be just the right thing to do." Unofficial DEC comments suggested Olsen was referring only to word processing--where competitors claim DEC already has offered rental terms in unusual cases--and Olsen himself tried to dismiss the rental rumors at the Oct. 30 annual meeting as little more than a passing fancy, far from a market offering.

WANG'S CHALLENGE TO TI, DATAPOINT

Wang Laboratories said it will offer new low end additions to its 2200 product line to challenge Texas Instruments and Datapoint in the small general business system and distributed processing market. The Wang system, priced between $12,000 and $15,000, will be of a design similar to the Wang MVP and fully compatible with existing 2200 systems. To be introduced in March, the little 2200 will have dual double density disks and Winchester drives.

WHAT'S NEXT FROM DATAPOINT?

A graphics capability for its electronic message system (EMS) is in the works at Datapoint Corp., which announced the EMS last month (page 76) with a text-only application. As announced, the system interfaces with the San Antonio company's attached resource computer system, its long distance control system or can be used on a standalone basis to transmit messages for printout anywhere a terminal is located. The next step will involve transmitting multiple copies of messages simply by inputting a visual image or a sheet of paper and ordering the number of copies that should go to a recipient. Then the specified number of copies would be printed at the destinations.

DRAWING A BEAD ON AT&T

Continuing delays plaguing AT&T in its development of the advanced communications service (ACS) has not gone unnoticed at GTE. Just like Avis, the No. 2 phone company seems determined to try harder when it comes to bringing value added network services to users. Having acquired Telenet Communications Corp. earlier this year, GTE also owns the U.S. rights to the British Viewdata type of service. And now Telenet has purchased Cambridge Telecommunications Corp., a pioneer in packet network software and intelligent processors that allow incompatible IBM terminals to operate on X.25 networks such as Telenet.

While ACS is stalled, GTE will encourage Telenet to introduce electronic mail and other advanced features. Innovative marketing experts have been working at Telenet to develop such services on a top priority basis. Customers who sign up for these services would be firmly entrenched and have to think hard before switching to ACS when it finally gets going, according to the GTE game plan.

LOOK AHEAD

...AND THERE IS MORE

Industry experts believe Viewdata type services may only be cost effective in the business sector and not the home. Thus a packet network like Telenet geared to business would make an ideal delivery system for such data base services. GTE is configuring a new operation to spearhead the introduction of advanced value added services. One of the pioneers in packet networks, David Horton, now director of computer communications development at Hawaiian Telephone Co., a GTE affiliate, reportedly will soon accept a post at GTE headquarters at Stamford, Conn. With Horton playing a key role, General Telephone is determined to get a jump on ACS and maybe also Satellite Business Systems and Xerox's XTEN. Having an operational packet net in place, is more than all other value added carriers, except Tymnet, have been able to put together. GTE with its widespread organization and resources would like to corner the market before the others can react.

THE MANY USES OF THE 4331

The capabilities of the 4331 have been highly touted by both IBM and its first users. Its price/performance is considered to have boded ill for many a PCM. But what about terminal manufacturers? Informatics, the software company, was a first taker for the 4331 in its Washington office. "And we can get as many as we want," said executive vice president Frank Wagner. What are they using it for? "As a super-intelligent terminal for a customer who wanted to cut the wire to his hated central dp site."

"WHERE WOULD WE BUILD IT?"

Data General says its 32-bit "Eagle" system, expected by some to be introduced this month, has been delayed by DG's internal squeeze on manufacturing capacity. "Where would we build it?" asked DG exec Bradley Stroup, noting DG's struggle to meet Nova 4 demand and to keep their delivery edge over Digital Equipment Corp.

RUMORS AND RAW RANDOM DATA

IBM's marketing expertise is hard to top. A Los Angeles salesman for the Armonk giant, who peddles automated teller machines (ATM) to southland banks, dressed his eight-year-old daughter up as a walking ATM on trick-or-treat night and sent her to his big bank customers. Except where one normally would deposit cash in most ATM's, this one admonished: "Deposit candy." Reports are she got a lot of both. And maybe some goodwill for IBM... The so-called office of the future has gotten official recognition from the Assn. for Computing Machinery (ACM). ACM has formed a new special interest group -- SIGOA (for Office Automation) -- or, as some wags put it, Sig--Olay.

RICHARD O. BAILY

Veteran comupter industry executive Richard O. Baily, the president and CEO of Lexitron, died Nov. 9 in Los Angeles after a short illness. Mr. Baily, 55, joined Burroughs Corp. in 1947 and left the company in 1971 to become president of Singer's Friden Business Machines Division. He became president of Lexitron, a word processing manufacturer, in 1976.

A Major Enhancement

Release 8 Is The New MARK IV.

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

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

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

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

Enhancement By Committee.

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

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

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

Enhanced Throughput.

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

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

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

Enhanced Data Display.

Graphics is another new feature of Release 8.

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

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

Enhanced On-Line Support.

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

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

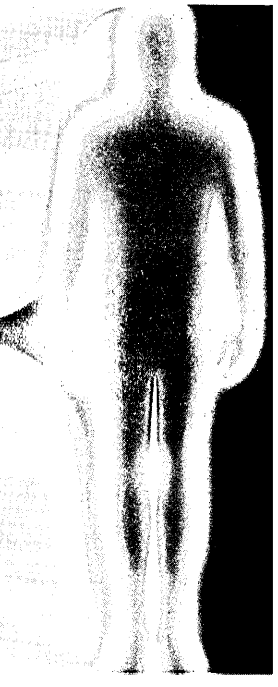
OS, OS/VS, DOS, DOS/VS, IMS/DC, CICS, INTERCOMM, TSO, and CMS—among others.

Enhancement Of The Mind.

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

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

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



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

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

informatics inc®

The Information Management Company

D 1279

Name

Title

Company

Address

City State Zip

REMOTE PROCESSING SERVICES SECTION

CIRCLE 18 ON READER CARD

Corporate Directors.

The DS990 Models 20 and 30. TI's most powerful business systems yet.

If you've been looking for a large minicomputer system for a wide assortment of demanding business data processing loads, look at TI's DS990 Models 20 and 30.

They're equipped with the business software you need—COBOL, Sort/Merge, a Data Base Management System with query and report features, and TI's unique, time-saving screen formatting language, TIFORM. Other powerful business software languages, like RPG II, BASIC, Pascal and FORTRAN, are also available as well as IBM-compatible communications. And all are enhanced by the proven DX10 Operating System.

The new, high-performance 990/12 CPU provides the throughput you need. In many applications, the Models 20 and 30 can handle 20 or more different jobs at speeds up to three times faster than the proven mid-range members of the DS990 computer family. And the compatibility of the DS990 computer family enables you to upgrade your existing hardware and software to the more powerful Models 20 and 30 easily, at minimal expense.

For more information, call 800-257-7850.
(In N.J. call 1-800-322-8650)

When it comes to dependable commercial computing worldwide, look to Texas Instruments, the company that has been appointed the official computer and calculator supplier of the 1980 Olympic Winter Games.

TEXAS INSTRUMENTS
INCORPORATED

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TEXAS INSTRUMENTS

We put computing within everyone's reach.

CIRCLE 19 ON READER CARD

OUR RCX70 SOFTWARE CAN GET YOU INTO TRUE DDP WITHOUT SPARKING A COMPUTER FAMILY FEUD.

Now, with RCX70, our new 3270 emulation software, and an ECLIPSE® Data System, you can add local data processing power and still remain on speaking terms with your mainframe. That means you can begin communicating with your IBM 370 in 3277 emulation mode right away.

In addition, you have all the capabilities of an ECLIPSE Data System to develop and run independent applications. You can also use RCX70 to include host data base access. And you get the availability of Data General's powerful Advanced Operating System (AOS), languages and utilities.

Now, it's easy to expand your 3270 installation and give your operating managers something that's more useful – true distributed processing.

Introduce your family to RCX70. They'll never know the difference, but you sure will. Let us tell you more. Mail the coupon.

CIRCLE 20 ON READER CARD

Data General Corporation, Westboro, MA 01581, (617) 366-8911. Data General (Canada) Ltd., Ontario, Canada. Data General Europe, 61 rue de Courcelles, Paris, France, 766.51.78. Data General Australia, (03) 89-0633. ECLIPSE is a registered trademark of Data General.

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Data General

Mail to: Data General, Westboro, MA 01581. I don't need a family feud on my hands. Send me complete information on: ☐ Data General RCX70 emulation software ☐ Data General ECLIPSE Data Systems.

Name

Title

Company

Address

City

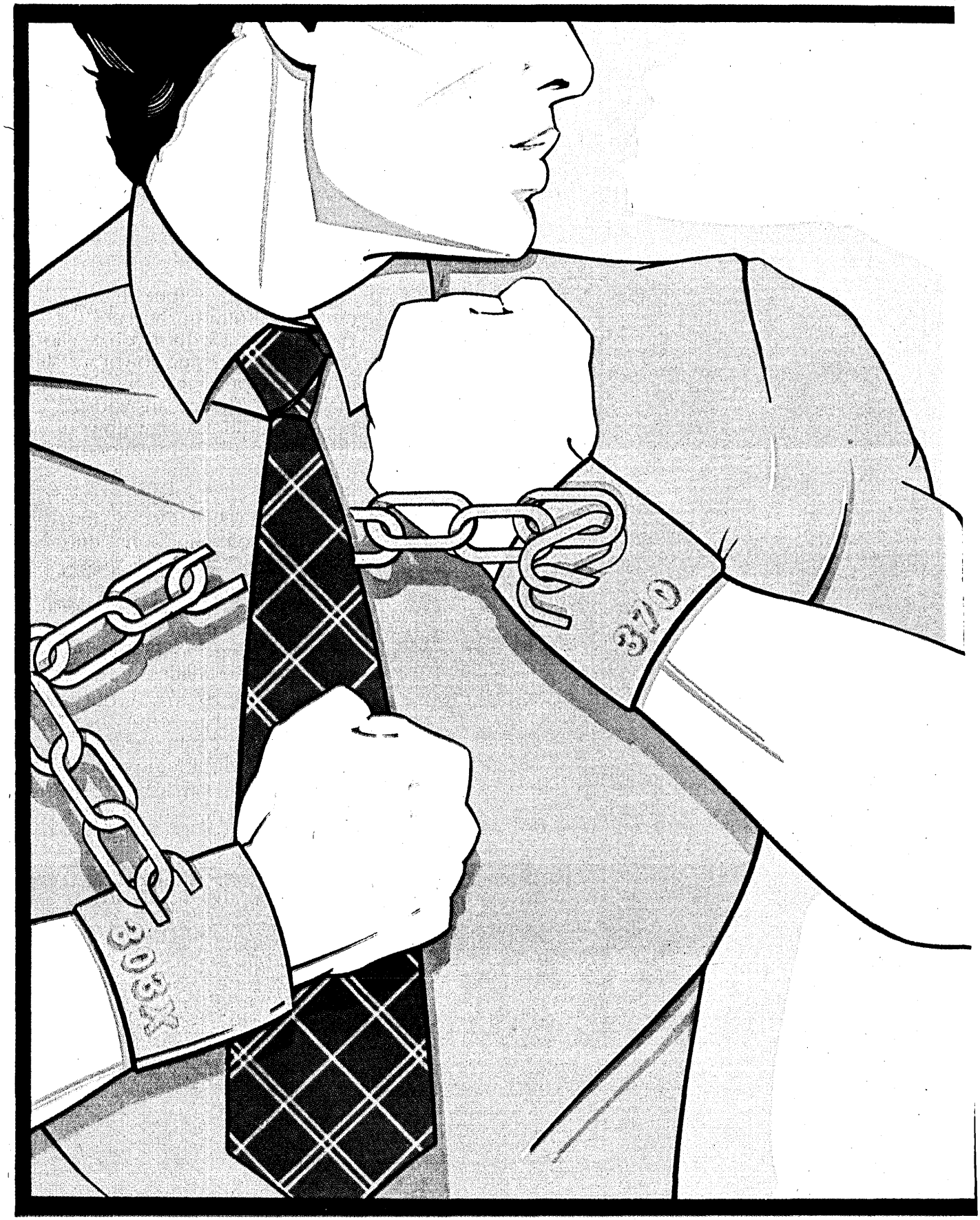
State

Tel.

Zip

The Computer of the U.S. Olympic Sports Medicine Committee

D12º



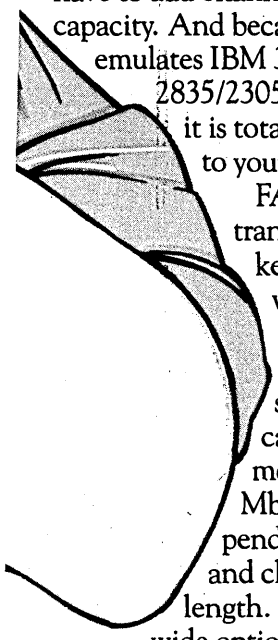
CPU Unchained

Intel introduces FAST-3805, the Semiconductor Disk that unleashes the full paging power of IBM CPUs.

Until now, the weakest link in IBM 370 and 303X systems has been the slow response of electro-mechanical disk drives. Today Intel delivers FAST-3805, the solid-state paging device with access speeds ten times faster than even the best performing disk.

Free I/O bound systems

Now you don't have to upgrade CPUs or main memory to increase throughput in I/O bound systems. By removing the virtual paging bottleneck, FAST-3805 can triple, even quadruple, disk traffic on your present system. You won't even have to add channel or controller capacity. And because FAST-3805 emulates IBM 3830/3350 and 2835/2305 disk subsystems, it is totally transparent to your CPU.



FAST-3805's transfer rates help keep your CPU working at full speed, too. With our standard single-byte wide capacity, you'll move 1.5-2.0 Mbytes/second, depending on the CPU and channel cable length. Our two-byte wide option will double capacity to 3.0-4.0 Mbytes/second. And since FAST-3805 can be optionally attached to as many as four channels, you can achieve optimum transfer rates to 16 Mbytes/second. Choose an overall storage capacity between 12-72 Mbytes.

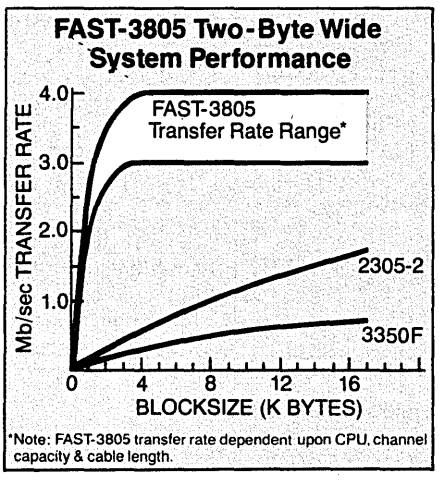
How we made it FAST

FAST means Fast Access Storage Technology—a virtual paging technique based in high speed MOS technology. Primary component in FAST-3805 is a high density, low power 16K dynamic RAM with access times far faster than disk technologies.

Dynamic RAMs have seen over a decade of service in computer memory. RAM is the primary component in the main memories of every major computer manufacturer, including IBM. Today the world's leading manufacturer of semiconductor memory applies this proven technology to high speed virtual paging.

Reliability through "self-healing"

Beyond the inherent reliability of solid state circuitry over electro-mechanical devices, FAST-3805 gives you unparalleled lines of defense against uncorrectable errors —all on-board. Double-bit error checking and correction (ECC) provides "self-healing" capabilities equal to those specified in the military's highest reliability systems. Additionally, a powerful iSBC 86™ single board computer performs continuous sweeping error detection and relocation of data to spare storage, if necessary. The entire FAST-3805 system is supported by motor generator sets to ensure data integrity in case of power fluctuations.



PERFORMANCE COMPARISON

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

Increase throughput today

We're delivering FAST-3805 now. For more information on how it can increase virtual paging throughput in your system, contact Intel Commercial Systems, P.O. Box 35900, Phoenix, Arizona 85069. Or call (800) 528-0590.

intel® delivers.

CIRCLE 21 ON READER CARD

CALENDAR

Sixth Semiannual ATE Seminar/Exhibit, January 8-10, Pasadena, Calif.

Features a comprehensive program of workshops, technical papers, and courses. Contact Sheila Goggin, ATE, 1050 Commonwealth Ave., Boston, MA 02215, (617) 232-5470.

TV-MEX, January 15-17, Birmingham, England.

The TV-Microelectronics and Microprocessing Exhibit is Europe's only trade exhibition devoted to all aspects of microelectronics and microprocessing for home, business, and education. Contact Jane Buchanan, 11 Manchester Sq., London, W1M 5AB, 01-486-1951.

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

The national business communication conference and exposition. Contact William Leitch, Conference Company, 60 Austin St., Newton, MA 02160, (617) 964-4550.

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

Scientists and engineers from government, military, and industry will attend to probe new technology and developments in electronics and aerospace. Contact Richard L. Harmon, (714) 557-4700.

Data '80, February 12-14, Toronto.

The program will feature panel sessions, audiovisual presentations, workshops, and technical sessions related to the field of data communications. Contact Laurie Whitsed, 2 Bloor St. West, Suite 2504, Toronto, Ontario M4W 3E2, (416) 967-6200.

The European Information and Management Exhibition and Conference, February 18-21, London.

The major European forum for all managers and equipment suppliers. Contact Linwood Williams, Expoconsul, 420 Lexington Ave., New York, NY 10017, (212) 953-1190.

NEPCON West '80, February 26-28, Anaheim, Calif.

This will be the largest conference program in its history, consisting of 63 technical sessions, numerous workshops, professional advancement courses, and open forums. Contact Industrial and Scientific Conference Management, Inc., 222 West Adams St., Chicago, IL 60606, (312) 263-4866.

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

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

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

Contact Mitch Zolliker, IBM Research, San Jose, CA 95121, (408) 256-7582.

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

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

Fifth West Coast Computer Faire, March 14-16, San Francisco.

Will focus on inexpensive computer power for home, business, and industry. Contact Computer Faire, 333 Swett Rd., Woodside, CA 94062, (415) 851-7075.

The Middle East Business Equipment Show, March 16-20, Bahrain.

First international event of this kind held in the Persian Gulf. Will contain a comprehensive and modern range of products and services from the entire spectrum of the business equipment industry. Contact Stephen Powell, Arabian Exhibition Manager, 11 Manchester Square, London, W1M 5AB, 01-486-1951.

Viewdata '80, March 26-28, London.

The first world conference and exhibition on computerized tv-based information, education, and entertainment. Contact TMAC, 680 Beach St., Suite 428, San Francisco, CA 94109, (800) 227-3477; in California, (415) 474-3000.

Peripherals '80, April 16-17, London.

An exhibition for purchasers of computer equipment. Contact Lliffe Promotions Ltd., Dorset House, Stamford St., London SE1 9LU, 01-261-8437/8.

Tenth Conference on Computer Audit, Control, and Security, April 28-May 2, San Francisco.

Jointly sponsored by IIA and ATC. Contact John Sheehan, Manager of Public Relations, the Institute of Internal Auditors, Inc., 249 Maitland Ave., Altomonte Springs, FL 32701, (305) 830-7600.

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

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

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

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

NCC, May 19-22, Anaheim, Calif.

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

CECON, May 20-22, Cleveland.

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

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

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

The Microcomputers you should take seriously.

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

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

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

Three processors today, more tomorrow.

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

Systems Software for three processors.

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

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

Applications Software for Small Business Users.

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

OS-DMS, the software star.

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

The "GT" option yields sub-microsecond microcomputing.

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

Mini-system Expansion Ability.

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

Networking and Distributed Processing

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

Prices you have to take seriously.

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

The Challenger III Series from Ohio Scientific.

C3-B

C3-S1

C3-OEM

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Consider PROMIS Lab at the University of Vermont. They selected our V77 Series minis and terminals from Megadata Corporation, a terminal manufacturer located in Bohemia, New York, for a broad range of medical applications.

Their unique Problem-Oriented Medical Information System helps them solve a lot of problems that plague medical care.

The PROMIS Lab computers aren't used just by data processing people. They're used by doctors, nurses, radiologists, pharmacists, and even patients.

All paper records in one ward have been replaced by electronic records to organize medical information; reduce dependence on human memory; and provide feedback for everyday medical problems. Simply stated, the entire system is designed with the patient's health care in mind.

Our minis make it easier for the busy medical staff to interface with the computer system. Cost effectively, efficiently, and with real-time speed.

The fact is, we cured PROMIS Lab's problems quickly and easily.

But hardware is just the beginning.

Our network data base management system lets you integrate data into one or more logical structures for quick random access.

PRONTO, our mini distributed data processing program, boosts the efficiency of your mainframe. By taking care of all your remote computer needs. And freeing your host to do the work it does best.

And, when it comes to languages, we speak yours. Whether it's English, FORTRAN, COBOL, or RPG II.

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

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

In Canada, write Headquarters, Mini-Computer Operations, 55 City Centre Drive, Mississauga, Ontario, L5B 1M4.

Even if you don't have a medical application, we think you'll like our prescription.

SPERRY UNIVAC

SPERRY UNIVAC IS A DIVISION OF SPERRY RAND CORPORATION

DOS TO OS. WITHOUT UCC-2, IT'S A LONG, HARD JOURNEY.

If your objective is to convert programs, then it is a long, hard journey indeed. It will usually take the average DOS shop from 18 to 24 months to laboriously—and expensively—convert its two thousand programs to OS.

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

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

Call us about UCC-2 at 1-800-527-5012 (in Texas, call 214-353-7312) or circle 150

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

A Tape Management System that protects data from loss or destruction (UCC-1). Circle 151

A Disk Management System that can save the cost of new disk drives (UCC-3). Circle 152

A PDS Space Management System that eliminates PDS compression (UCC-6). Circle 153

A Production Control System that makes scheduling systems obsolete (UCC-7). Circle 154

A Data Dictionary/Manager that really gets IMS under control (UCC-10). Circle 155

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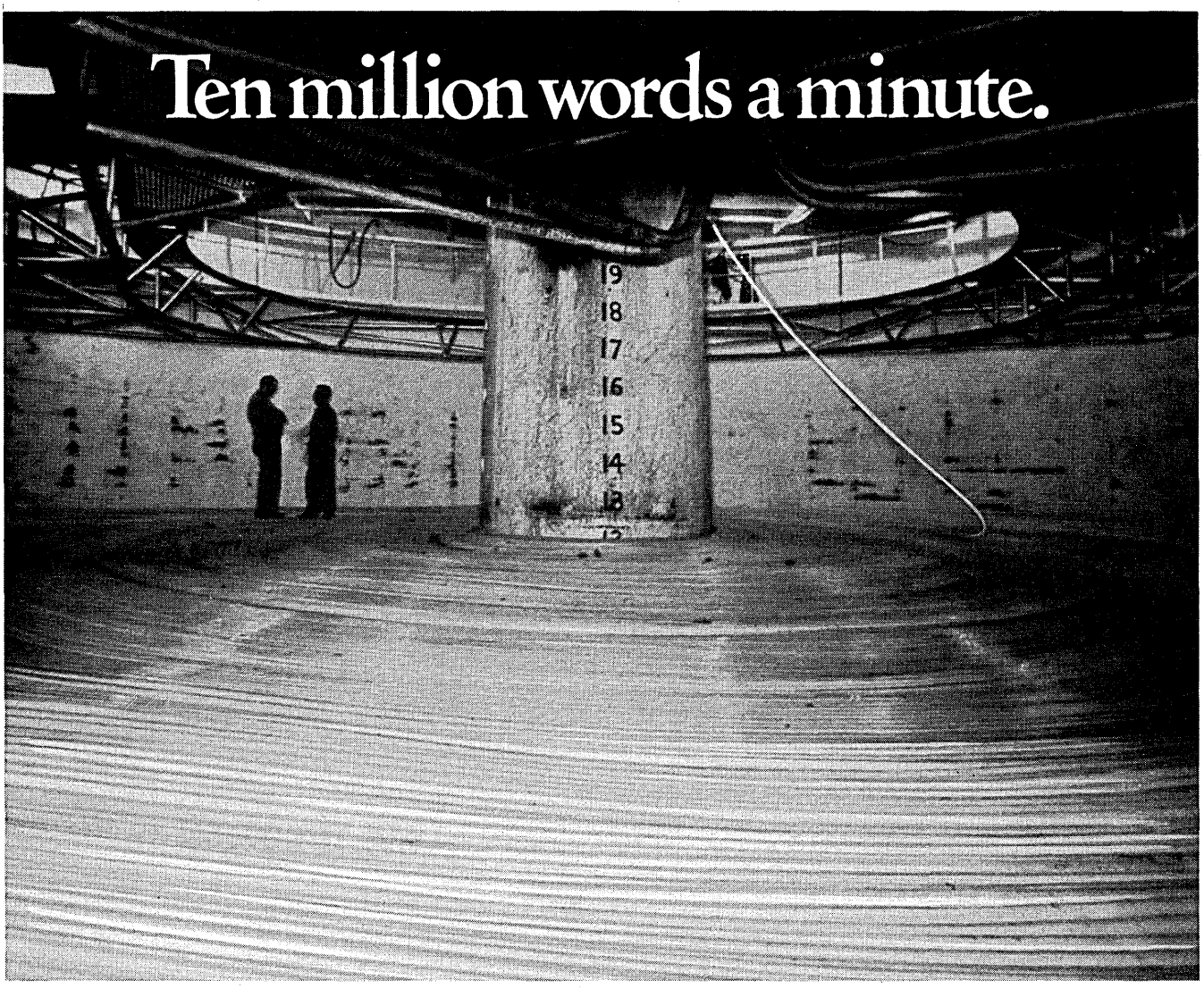

When we pioneered the global telegraph cable business over a century ago it would have taken two years non-stop to transmit ten million words.

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We've laid enough telephone cables to encircle the globe for the second time. And our fleet is responsible for looking after over half the world's total capacity.

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CIRCLE 25 ON READER CARD

Now you can see how every terminal on every line in your telecommunications system is performing...right now.

Now you can know about poor response time, line problems and other operational problems anywhere in your TP network...the moment they occur.

Now you can have real-time performance information on your network operation.

NET/ALERT™

The TP performance spotlight™

BECAUSE YOU SHOULDN'T LEARN ABOUT YOUR TP NETWORK PROBLEMS FROM YOUR USERS

Now, at last, operations managers, data communications managers, and other DP management can get a good look at their on-line telecommunications system — every line, every terminal — and see how well it's performing at that very moment.

Now, you can know about poor response time, line problems, and other operational problems the moment they occur, so that by the time your users tell you what's wrong, you can tell them what's being done to make it right.

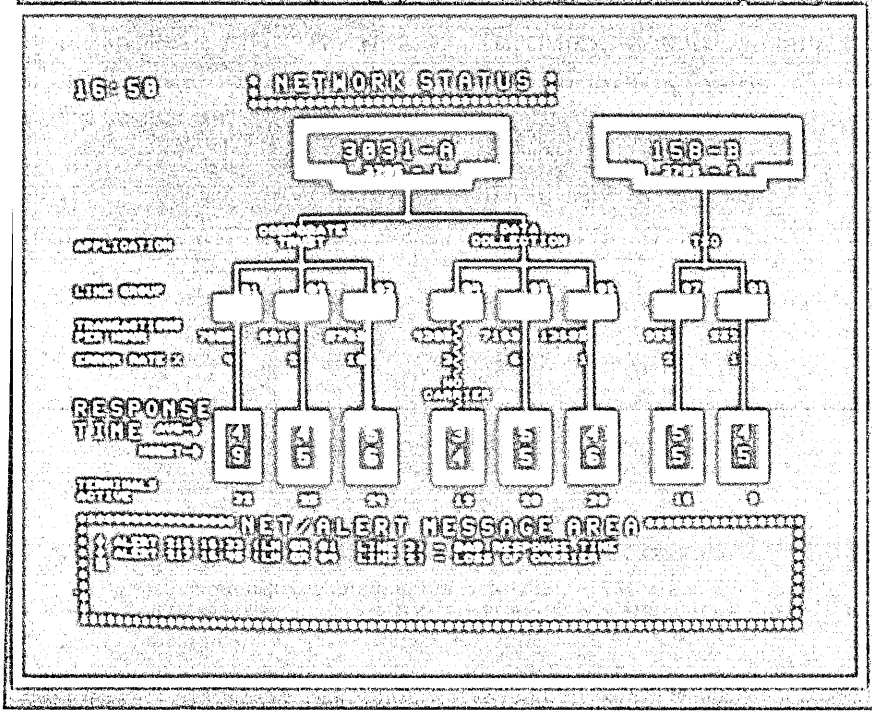
Now, it's all possible with NET/ALERT, the TP performance spotlight, a new, innovative microprocessor-based operational aid that lets you see what you've been missing in your TP network.

Now, with NET/ALERT, a color graphics CRT opens a spectacular window to your network — providing status information, audible and visible trouble alerts, and diagnostic messages to show you at a glance how your TP system is performing...or why it's not. And to help you quickly identify and correct any problems. Add to that a series of management reports that helps you measure and improve system performance, and plan network development, and NET/ALERT becomes a new dimension in your operations. Providing better information for operations managers; better service for users.

Now, like never before, it's all possible...because NET/ALERT makes it possible.

From AVANT-GARDE Computing, Inc. The company that puts advanced technology in its place: yours.

Unretouched photograph of actual NET/ALERT screen.



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Patent Pending

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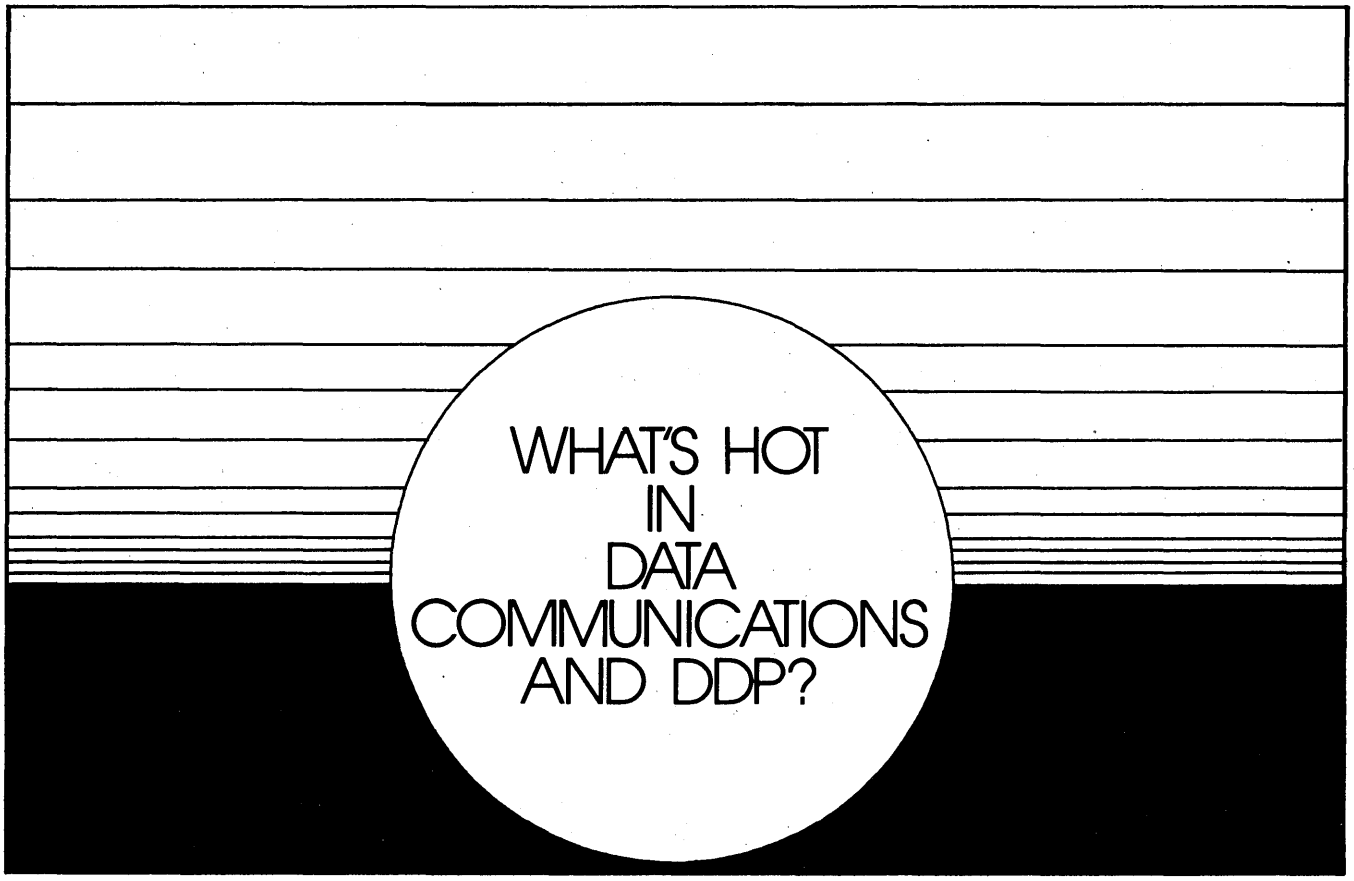

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HOT NEWS The INTERFACE '80 comprehensive Conference brings you the information you need to stay ahead. Four full days of information-packed sessions will examine all aspects of datacomm, ddp and networking. The goal: to provide cost-effective solutions to *your* problems.

Among the 68 sessions are topics such as Hardware Advances • Network Productivity • Distributed Data Processing: Accommodating the End User • Net Control • DDP Application Case Studies • Toward the Transparent Interface • Simplifying Datacomm Software • The All-Digital Dimension • and Datacomm School: The Fundamentals.

HOT PRODUCTS The INTERFACE Exhibit Floor grows hotter every year. This year an estimated 250 companies will occupy more than 200,000 square feet, to display virtually every product and service you may be looking for:

Mini- and Micro-based Systems • Distributed Data Processing Systems, Subsystems and Peripherals • Modems • Multiplexers • Concentrators • Front-End Processors • Terminals • Interface Devices • Switching Equipment • Word Processing Systems • Tech Control and Test Equipment • Data Base Management and Teleprocessing Software • Network and Value Added Services • and More!

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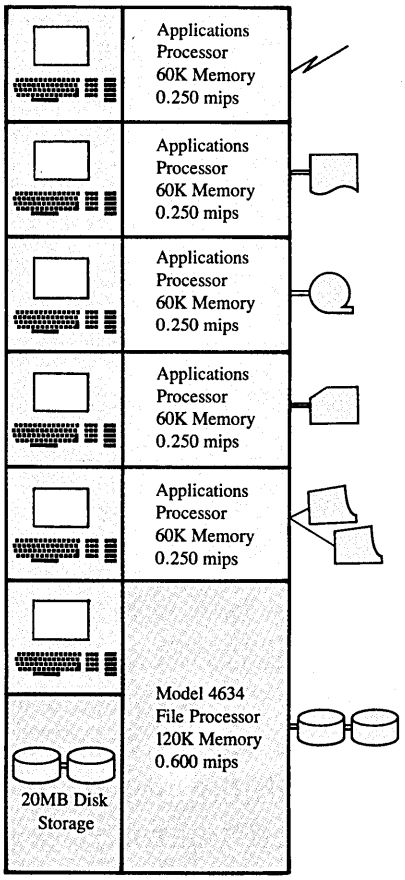
Datapoint will lease you this 420K Computer System for $1,950* a month and ship it in about 12 weeks.

ARCPAC™ gives you mainframe power without mainframe headaches, and costs only $2.21* per user per hour.



ARCPAC. 420K memory, 20MB disk memory illustrated here. Each applications processor is multilanguage, multifunction.

Now you can get business computing power with multilanguage and telecommunications capabilities. With easy growth, at reasonable prices, Datapoint has the system for you. We call it the Attached Resource Computer™ system, or ARC™ for short. The major components are proven Datapoint hardware. That's why we can ship you an ARCPAC in about three months with all necessary processors, disks, connecting cables and system software. All at a new, low, packaged price.

The bigger it gets, the better

ARCPAC is a multilanguage, multifunction, multiterminal system for both batch and transaction processing. Any processing work station runs COBOL, RPGPLUS, BASICPLUS, DATASHARE® and all Utilities.

The system can grow as your needs increase—simply, easily, in incremental steps, at affordable costs, and without reprogramming. Unlike most large systems, it actually gets better as it grows.

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

No systemwide failures

Because of its architecture, if part of the system goes off-line, you're still in business. Other parts of the system can simply take over for the off-line processor, or a replacement processor can be quickly plugged into the system. Either way, the system keeps right on working.

The ARCPAC Package

ARCPAC is designed to make it easy for you to get into attached processing. The package comes in two versions: with 20MB of disk storage or, for a little higher price, 120MB. Both packages include five 60K applications processors and one 120K file processor, plus all connecting cables, system software, and languages, at the low package prices.

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

The two-year lease rate is $1,950 per month for the basic ARCPAC with 20MB of disk storage. One- and three-year leases are also available. Maintenance is currently $552 per month extra.

Nationwide customer service

Datapoint has 665 Customer Service Representatives stationed in 138 local service offices around the country. Customers call one toll-free number, 24 hours a day, seven days a week, when they need service, and are usually in contact with a service rep in less than an hour.

The Datapoint approach

Datapoint out-thinks its competition to help you out-think yours. ARCPAC is just one of the ways. Datapoint made dispersed data processing feasible and is building now toward the integrated electronic office of the future. Whether you need a hundred small systems for your branch offices or a major computing facility for corporate headquarters, Datapoint has an answer.

For more information on ARCPAC, simply send in the coupon.

*Based on the monthly two-year lease rate with five users and an average of 176 working hours per user per month. Does not include maintenance.

DATAPOINT CORPORATION

TO: Marketing Communications Department (M62)
Datapoint Corporation
9725 Datapoint Drive
San Antonio, Texas 78284
(512) 699-7151

Please send the information indicated below.
☐ ARC system information ☐ ARCPAC
☐ Product family brochure ☐ Annual report

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Company

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Can you imagine if everyone tried to communicate at once?

We can.

We're Telcon Industries. We've been solving the problems of format and protocol conversions worldwide for ten years.

We can solve your communications problem with a complete turnkey system of format and protocol conversion hardware and software on a lease or purchase basis. No matter what data communications task you have, rely on Telcon for the most efficient, economical system deliverable today and ready for tomorrow.

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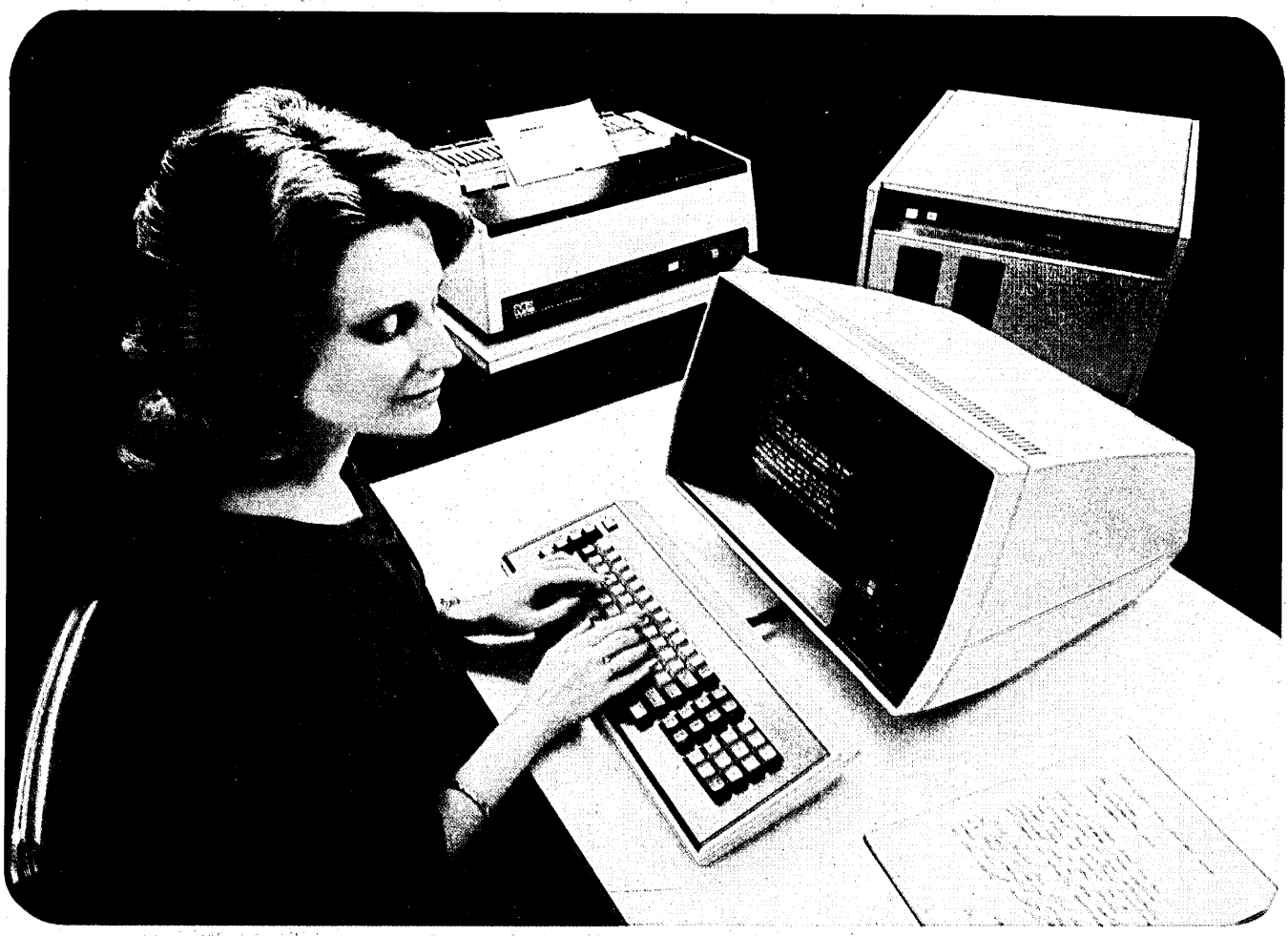
CIRCLE 29 ON READER CARD



Process data...Process words

You can do both with Mohawk Data Sciences Series 21 distributed information systems. That's why they're among the fastest-selling in the industry. Smart buyers all over the world realize that many of the features of the office of tomorrow are here today...with Series 21 systems.

For distributed processing, Series 21 systems offer a basketful of features. They're easy to install and simple to operate. They have big clear screens and touch-typing keyboards. And they handle almost any remote site application...order entry, invoicing, inventory control, plant scheduling, payroll preparation, labor distribution, personnel records...the list is endless.

Plus full word processing capability. With Series 21 systems, you get all the up-to-the-minute features needed to electronically create and edit your business documents—letters, reports, proposals, manuscripts. Repetitive typing is eliminated. Error correction is fast and simple. And, of course, you get picture-perfect printing of finished texts.

Learn more about the double-duty Series 21 systems from MDS...the company that sells and services its systems in 50 countries throughout the world. Fill out and mail coupon today.

PLEASE FORWARD MORE INFORMATION ON THE MDS SERIES 21 AND WORD PROCESSING

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CIRCLE 30 ON READER CARD

DIVIDEND

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Call (201) 568-9700.

DOS sorting just got better.

Years ago, when we were young and poor, we developed a very costly habit.

We decided that if we were going to compete successfully with the Colossus of Armonk in sort programs, life was not going to be a rose garden. Just developing a better sort on a *one-time* basis wasn't going to be good enough. We'd have to keep improving that product *ad infinitum*.

That's what we've done—again—with SyncSort DOS. Release 1.2 was the best DOS sort ever conceived. It grew to over 500 users in no time at all.

But 1.3 pushes the frontiers of DOS sorting out a little farther. It not only gives better performance in DOS/VS and DOS/VSE, it provides some new features that save an awful lot of programmer time and effort.

PERFORMANCE DIVIDENDS. 1.3 continues our old tradition of more sorting for fewer resources. If you compare the new release with any of IBM's DOS sorts, you'll see resource savings that look like this:

- **20-45% in Elapsed Time;**
- **10-50% in Overhead CPU Time;**
- **20-40% in Total CPU Time;**
- **20-50% in Disk Space Utilization;**
- **40-60% in SIOs.**

PROGRAMMER DIVIDENDS. 1.3 introduces a number of new features designed to reduce the effort that goes into applications programming:

- A new facility that prints sort output with page and column titles. When used with other features like INCLUDE/OMIT, SUM and OUTREC, this one can often eliminate a lot of time-consuming coding, compiling and debugging.
- COPY—copies one file onto another while bypassing the sorting process. A powerful file-edit utility when used with the three features above.

SYSTEMS DIVIDENDS. The new release is smart enough to sense your overall system requirements and then make adjustments to keep sorts from interfering with non-sorts.

- Storage Auto Option—a new concept that manages your system's real storage in accordance with your overall system priorities.
- PARM-EXIT—dynamically modifies sort parameters.
- Interfaces with many disk-space managers.

But the best way to find out what SyncSort can do is simply to try it. Benchmark it against your present sort on identical files and make your own judgement.

If we can help, give us a call. We're bound to be in the office. Working on the next SyncSort dividend!

OVERSEAS REPRESENTATIVES—
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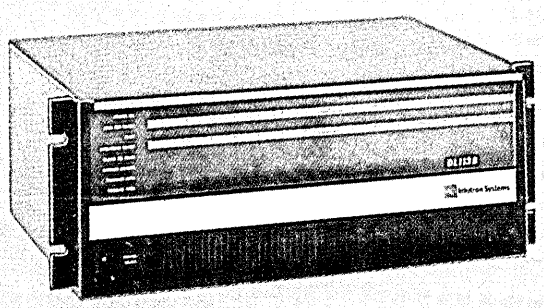
CIRCLE 31 ON READER CARD

Your System Deserves The Best . . .

Modems



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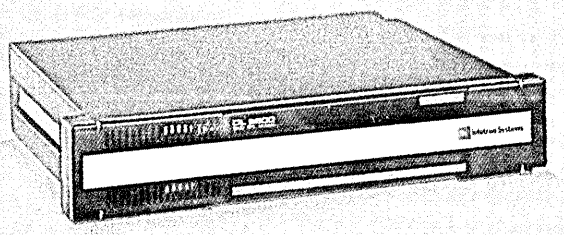
300 bps Direct Connect Modem

- Bell 113B compatible
- Sixteen modems in only 7″ of rack
- Full diagnostics



DL 9600
4800/9600 bps Modem

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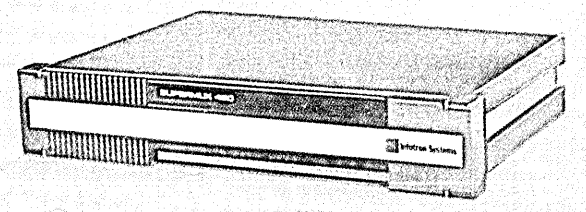
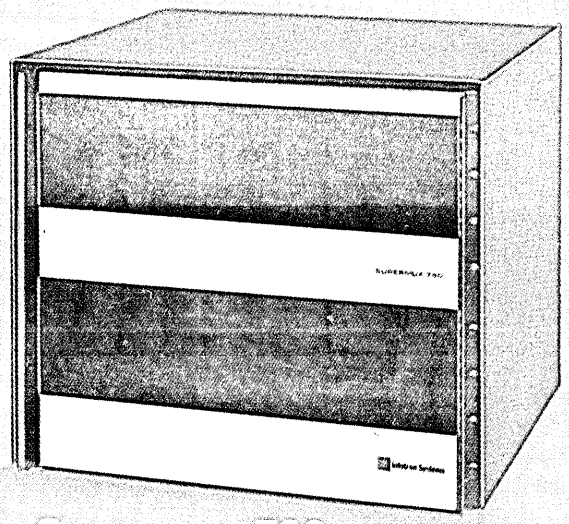
- Line degradation indicator
- Analog and digital loopbacks

Multiplexers



Supermux 480
Statistical Multiplexer

- Error-free transmission
- Up to eight channels at 9600 bps each
- Automatic baud rate detection



Supermux 780
Statistical Multiplexer

- Up to 128 channels
- Mixed synchronous and asynchronous inputs
- Data compression

And the Most Reliable

Ask any Infotron user. Read the independent surveys. When it comes to data communications, Infotron is the best. Call 800-257-8352 for a catalog. Free call. Free catalog.

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Infotron Systems

First in Performance and Reliability

CIRCLE 32 ON READER CARD

ADVANTAGE: CENTRONICS

the top-seeded 700 Series

. . . is a team of dot matrix printers that's hard to beat! Each of our twelve models meets a specific application and price/performance need . . . and every one is built and backed by the world leader in printers. With Centronics, you always have the advantage.

ADVANTAGE: SELECTION The 700 Series covers every inch of the court. We offer speeds from 50 to 180 cps—with throughput up to 400 lpm, a wide variety of forms handling capabilities, a choice of uni- or bi-directional operation, and a choice of 80 to 132 column formats. And we're still growing, with three new models just added and more on the way!

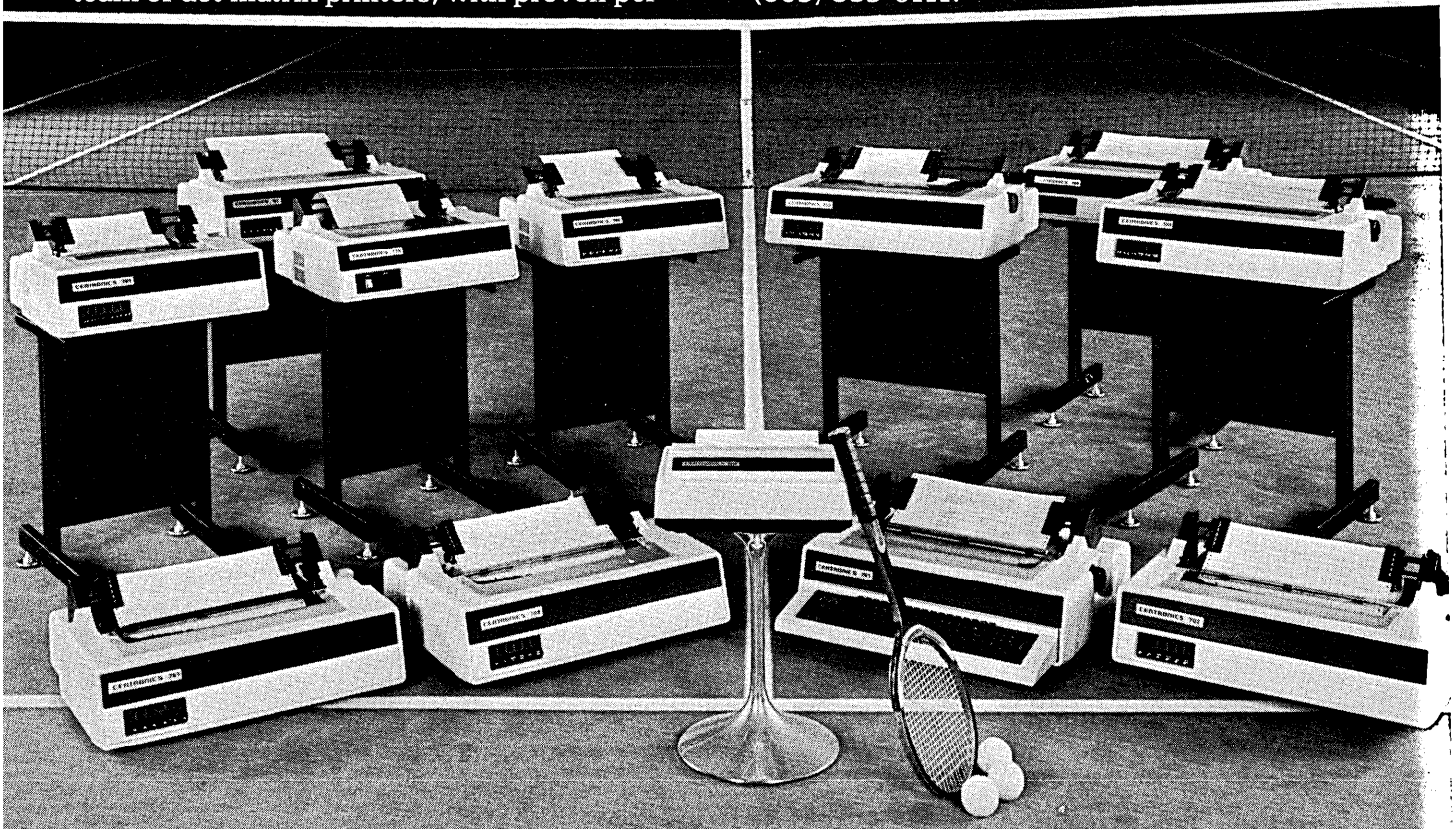
ADVANTAGE: FLEXIBILITY The 700 Series' wide selection gives you the flexibility to move into new applications and emerging market areas. Wherever your business takes you, you'll always have the advantages of the leader.

ADVANTAGE: APPLICATIONS The 700 Series is already the industry's most successful team of dot matrix printers, with proven performance for all applications: microcomputer, minicomputer, small business, terminal, text preparation, data communications, and data processing systems.

ADVANTAGE: COST OF OWNERSHIP Even though they perform like superstars, our team doesn't make big-money demands. They're highly reliable in any environment. And they're ready for any tour, with the largest worldwide service organization of any printer company backing them up.

ADVANTAGE: LEADERSHIP Each member of our 700 Series team shares the Centronics tradition of leadership. We pioneered dot matrix printing, and have been ranked #1 ever since. No other company can match our strong serve in selection, performance, and value. Plus, because of our high-volume manufacturing capability, we won't fault on your delivery.

For more information on products or employment opportunities, call or write today: Centronics Data Computer Corporation, Hudson, New Hampshire 03051, (603) 883-0111.



CENTRONICS® PRINTERS
...the advantage

CIRCLE 33 ON READER CARD

LETTERS

RACER'S EDGE

Re: "From Nags to Riches" (Sept., p. 207): The system not merely purportedly overcomes the traditional 17% edge at the California racetracks, but gives the player a 28% advantage on selected win wagers. Wow! I must say the supporting statistics from 102 races at Hollywood Park do look impressive.

Alas, if such an edge is true, player feedback (not to mention action by the track handicappers who weight the horses) will soon kill it off. . . and much more quickly than happened with blackjack in the Nevada casinos.

In 1960, I was the first computing professional, using a venerable IBM 650, to analyze the game with a stratified sampling model and correct sampling without replacement. My result: the single deck game played according to Las Vegas Strip rules and with correct basic strategy was dead even. Hence, use of card counting to improve one's odds led definitely to a positive expectation. Wide circulation of these facts led to various countermeasures by the casinos, such as the introduction of four-deck shoes (inherently less favorable than one deck). Adroit players who maintain a low profile can still win persistently even on four decks, but the feedback has made it a much tougher act.

Those wishing to exploit the bonanza at the tracks before it disappears should pay heed to this advice. To maximize the rate of win (with virtually zero risk of ultimate wipeout), use the optimal betting principle. Betting the right fraction of current bankroll is the key. Using round numbers to simplify an example, 36% winners yielding a 26% return would on average correspond to payoff odds of 2.5:1 on win. Solve for X in .36(X) – .64(1) = .26 to get that. The proper fraction of bankroll to bet is .26/2.5 = .104 or about 10%. In 100 wagers, the expected factor of multiplication of bankroll is

$$(1 + .26)^{36} (1 - .104)^{64} = 3.6$$

Professor Thorp (University of California at Irvine) has further refined the concept, with published research in the journals. And more to the point, he has used it very successfully in multimillion dollar investments in stock/warrant and stock/option hedging!

ALLAN N. WILSON
La Jolla, California

Although Mr. Barber presented an interesting and excellent evaluation of the Racetrack Computer distributed by the Starshine Group of Santa Barbara, he appears to have made a misstatement concerning the algorithm used by the device.

The Starshine Group is now selling a supposedly improved Racetrack Computer II which requires only slightly different data than the model examined by Mr. Barber. As with the original model, the new unit requires four pieces of data. The fact that the device needs the first piece of data (the median speed rating of the past three races) to be entered twice is an indication that the unit is not a special purpose device.

After manipulating the numbers from two problems entered into the device at a local calculator shop, I managed to uncover the amazingly simple algorithm. The method requires not "three additions, one subtraction, a square, and a divide function" as Mr. Barber states; rather, it requires only one each of the four basic functions (divide, multiply, subtract, and add, in that order.)

While the device used by Mr. Barber is a prior model, everything he stated in his article, together with the fact that the new model requires essentially the same data, seems to indicate that the hardware and algorithm are the same.

Although the algorithm may be used on virtually any calculator with the same number of keystrokes as the Racetrack Computer, the Starshine Group should be complimented for their ability to develop such a surprisingly simple system with the excellent predictive capabilities outlined in Mr. Barber's article.

DAVID GUIDO
Data Processing Manager
Larry's Food Products, Inc.
Gardena, California

PERSONALITY PLUS

Re: "Time to Retire the Telephone?" (Aug., p. 185): Our world is rapidly becoming reduced to binary exchanges between data processing managers with all hope of human personality being lost in the transmissions . . . I disagree with the desire to eliminate all extraneous personal conversation that prefaces and suffixes an exchange of necessary information. Are we all going to reduce ourselves to faceless robots?

Part of my job is to read out of the voices coming through my telephone whether or not the caller is someone I want to hire, terminate, cultivate, or placate. By intense listening I can detect whether my requests will be followed, at least heard and understood, or dropped by the wayside. How does Mr. Marill know if his automated action advisories are received, much less correctly understood? Printed words mean different things to different people. A flavorless, impersonal paper message is all too often totally misinterpreted—*what* you say is not as important as *how* you say it.

If I could afford it, I'd have the Bell System's long-awaited videophone on my desk. I need to see the expression on my caller's face to fully understand how well received my message is. I know a prominent manager who has 8 × 10 photos of all his field personnel pasted on the wall opposite his desk. When he calls any one of them he can look at the appropriate photo and associate a personality with the voice he is hearing. Electronic mail, which Mr. Marill suggests we use, would reduce each of us to a totally impersonal page of print.

Is time so terribly important that we have to do business in an atmosphere empty of all human feeling? Okay, then let's program the computers to compare notes, make their own decisions, and go to staff meetings in our places. I'll use a video cassette for all my presentations, have a tape recorder take notes, a voice response unit answer my questions, and a facsimile machine transmit the action items back to the plant computer for processing. But don't look for me—I'll be at the zoo, listening to what may be the last converational exchanges ever to be heard on earth.

JERROLD ASHER
National Sales Manager
Bishop Graphics, Inc.
Westlake Village, California

CORRECTION

Re: "Estimating Software Costs" (Oct., p. 171): Those who actually worked out the equations may have been disgruntled at the results. The equation describing the relationship between number of source statements and the effort, development time, and state of technology applied to the project should have read

$$S_s = C_k K^{1/3} t_d^{4/3}$$

(the final superscript was left out).

*

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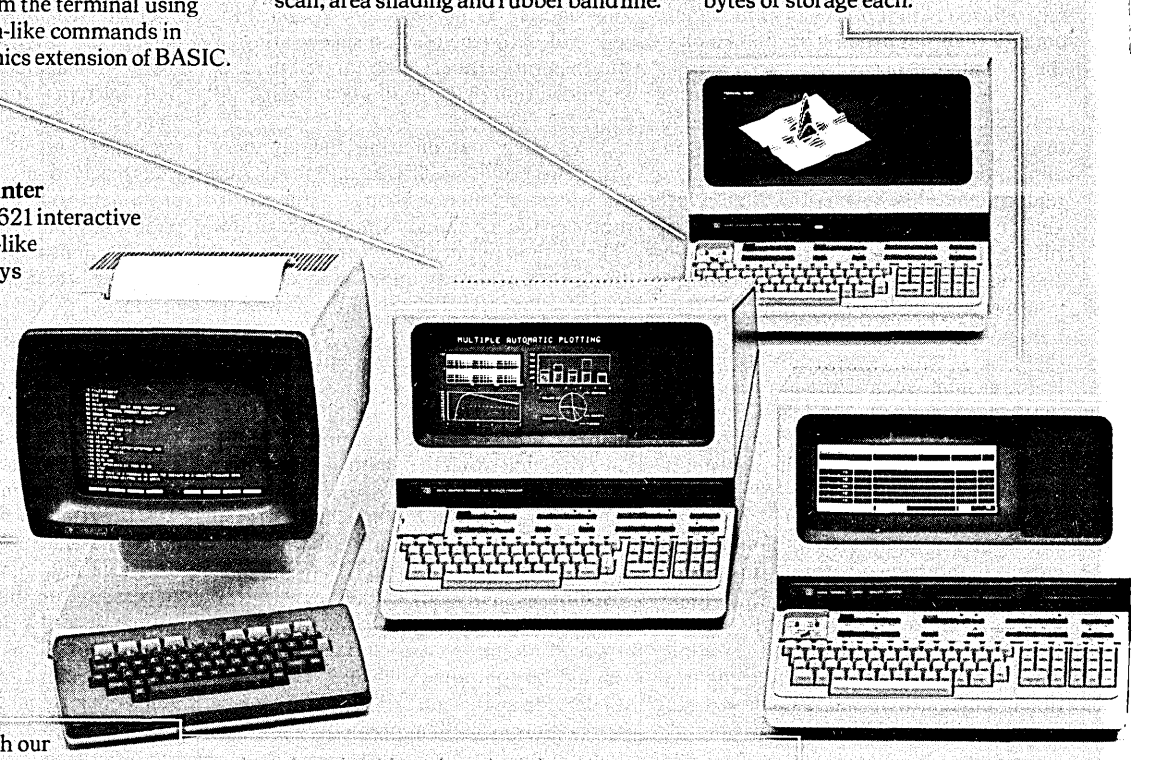

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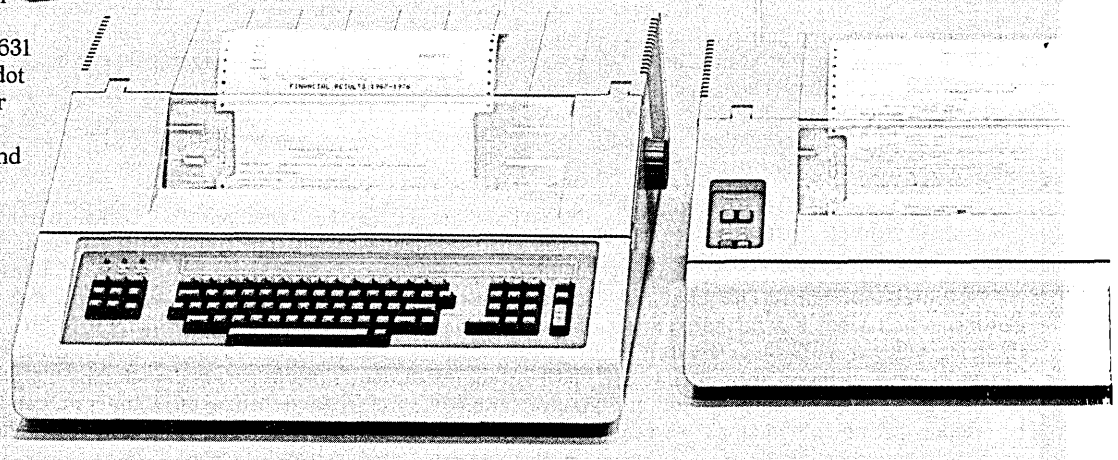

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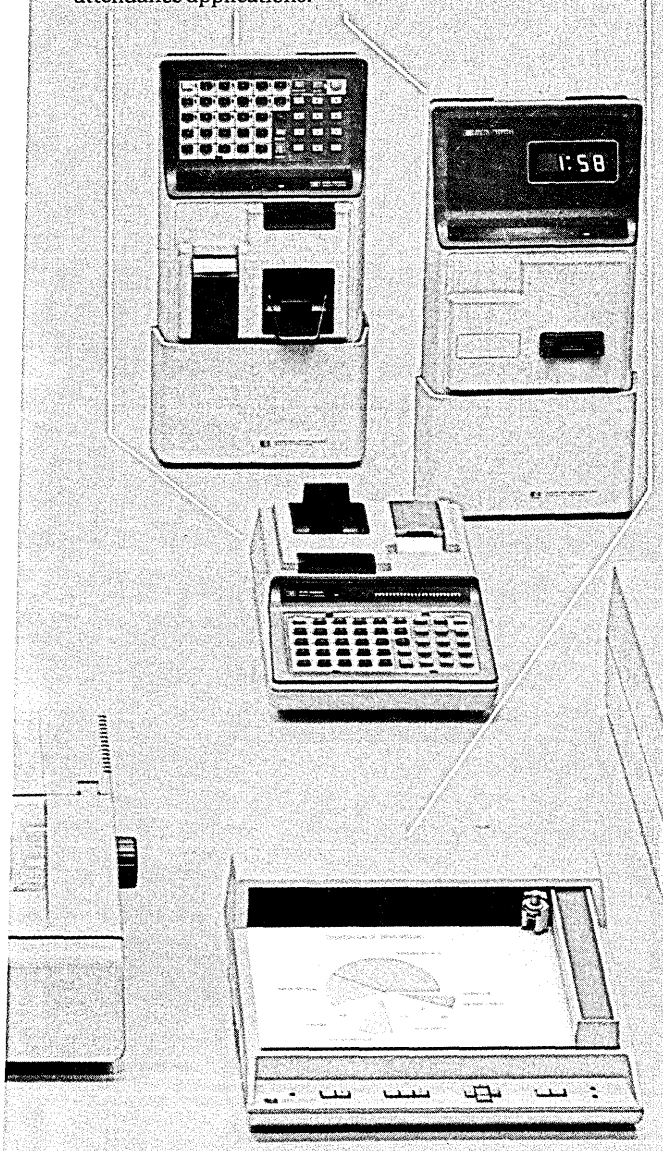
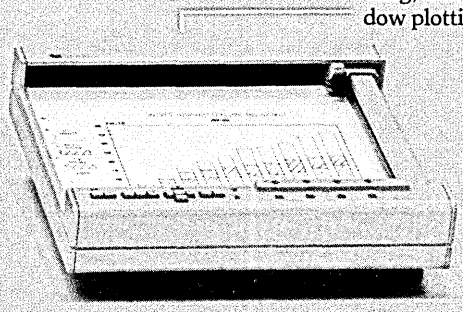
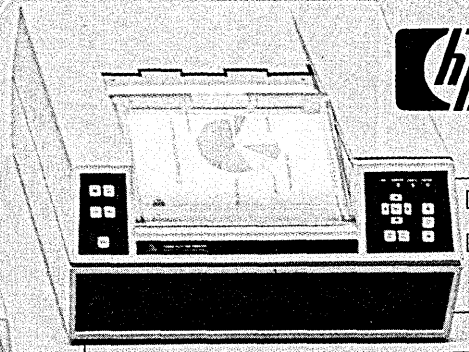
The microprocessor-based HP 9872A plotter produces high-quality, multicolored graphic plots on charts up to 280x432 mm. It has five built-in character sets, with labeling, point digitizing, character sizing and window plotting capabilities.







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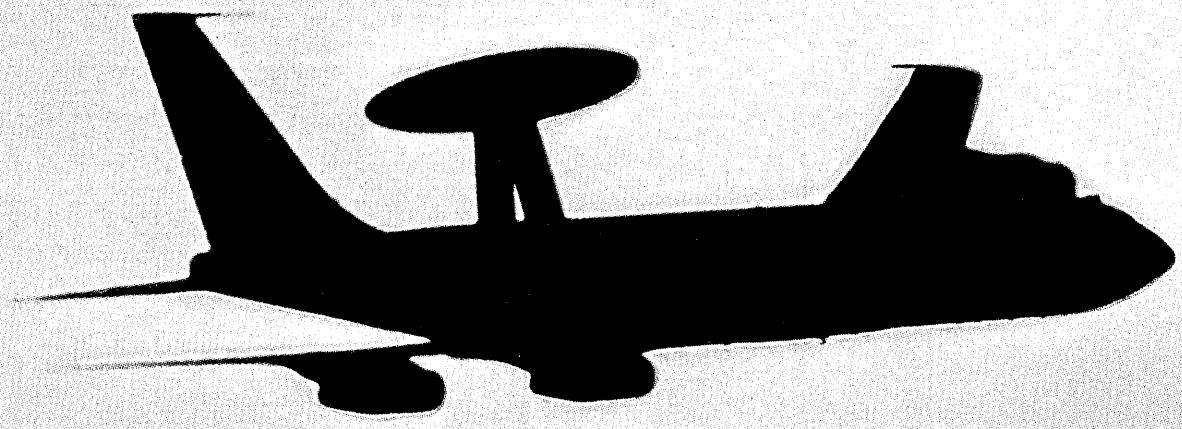

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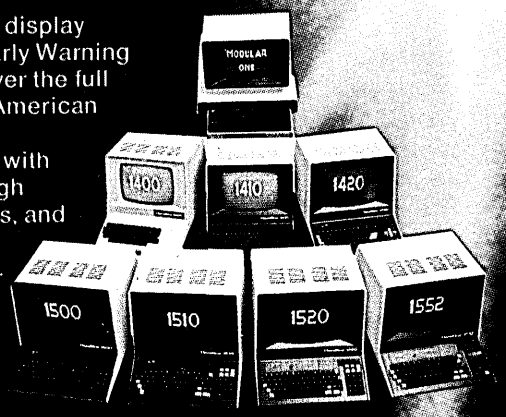

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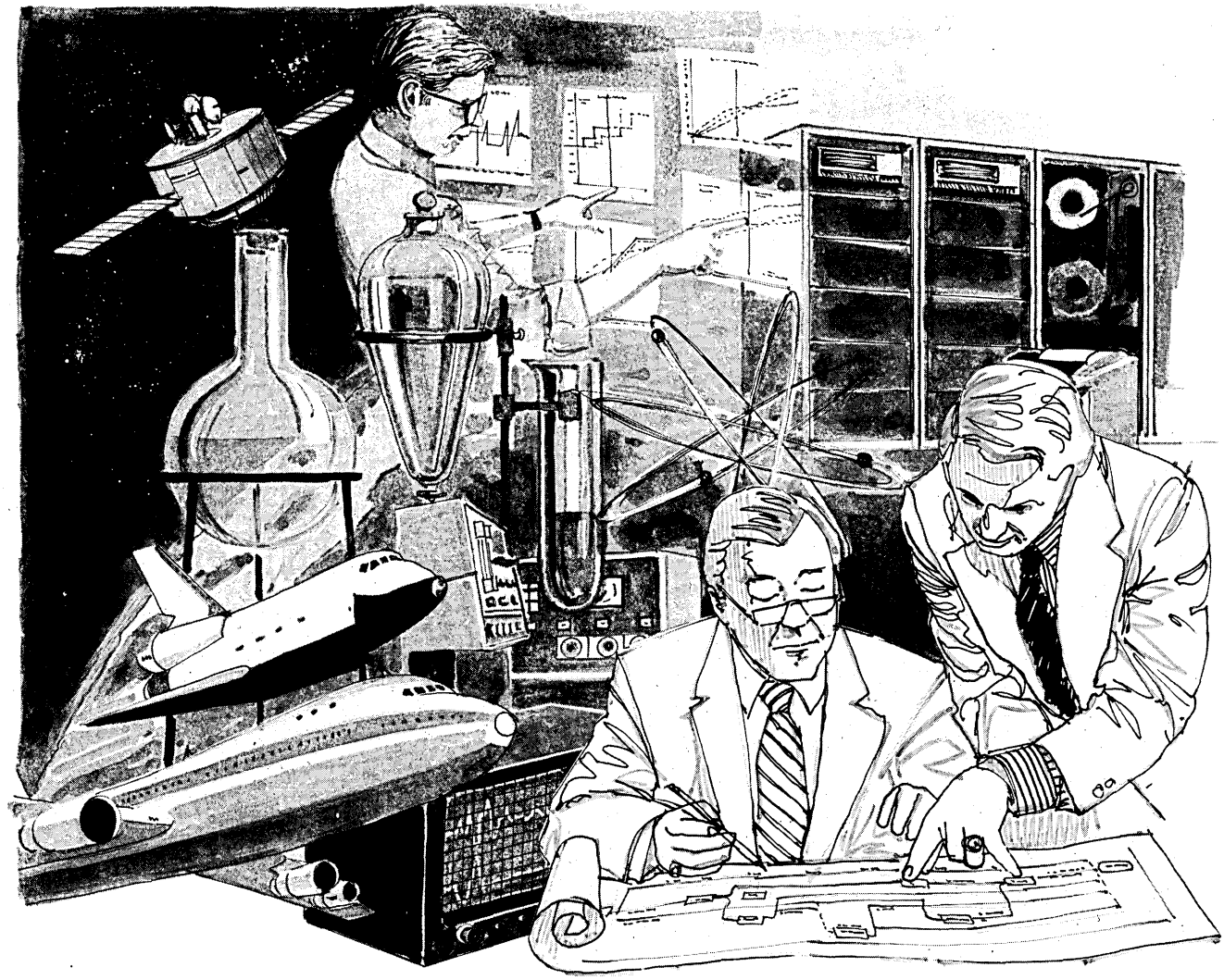

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CIRCLE 38 ON READER CARD

DP Dialogue

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

Containerized freight is transferred from a Burlington Northern Air Freight truck to a jet aircraft. The company speeds administrative messages with its IBM computer network.

Communication Gets FERST Priority at Burlington Northern

"Three programmers implemented our nationwide online message-switching system in 3 months, using FERST/VS," says Timothy L. Cherney, director of data processing for Burlington Northern Air Freight, Inc.

The Freight and Equipment Reporting System for Transportation/Virtual Storage (FERST/VS) is an IBM program product. To support its air freight operations, the Burlington Northern, Inc. subsidiary adopted one module of FERST/VS, called Message Switching, installing it in an IBM System/370 Model 148.

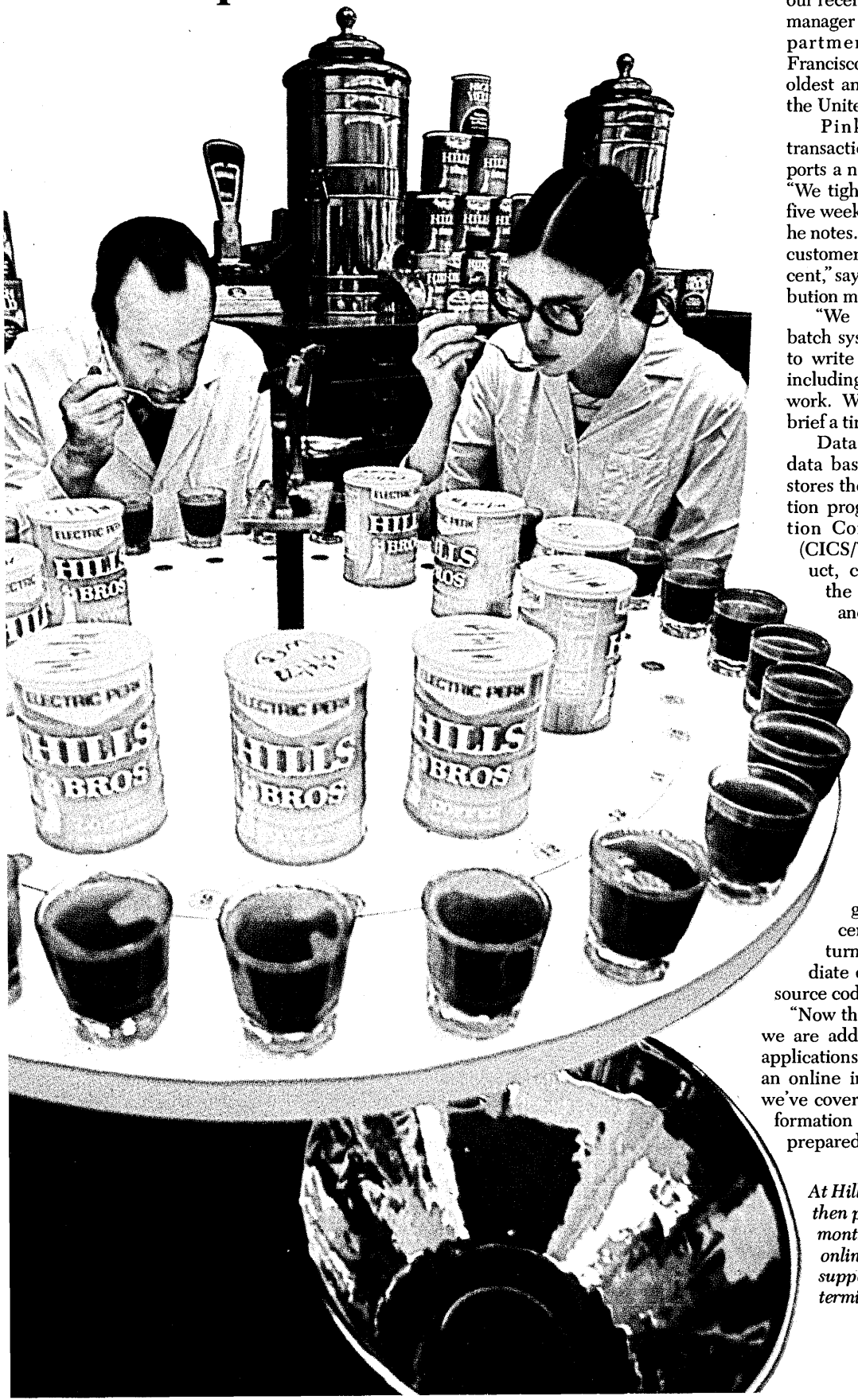
To speed shipments to customers, the Newport Beach, California-based company transmits a steady stream of administrative information around the world among its 86 offices. Today, the computer serves as a switch through which all this traffic flows. It queues the messages, stores them, and then forwards each as the destination terminal becomes available.

When an inquiry is not immediately resolved, the system automatically keeps track of it and periodically transmits reminders to the responsible station. A copy of each message is retained in memory and can be recalled at any time within 120 hours, or all traffic for that five-day interval can be reproduced. And, Cherney says, there has been a significant gain in speed of communication because of the computer's fast transmission rates and the efficiency of SDLC.

"The tracing function," Cherney adds, "which allows an operator at a terminal to ask the system for the present location of any shipment, was developed during our first year. By the time the system is two years old we will have total airbill entry, dramatically reducing the amount of paper required to move freight."

Burlington Northern's worldwide network was built using IBM's System Network Architecture (SNA). "With SNA," Cherney points out, "we are able to put the most appropriate device at each location without incurring additional line costs or rewriting our software. SNA gives us the flexibility to respond rapidly to technological advancements that fit the business needs of our company."

Coffee to Go: Customer Order System Starts up Fast



Four programmer-analysts created the online customer order processing system at Hills Bros. Coffee, Incorporated, in 15 months from the inception of the project to startup of the system nationally.

"It permitted us to cut the time between receipt of an order and mailing the invoice by 14 days, taking $3 million out of our receivables float," says Frank Pinkela, manager of the Information Systems Department for Hills Bros. The San Francisco-based company is one of the oldest and largest purveyors of coffee in the United States.

Pinkela is describing a new transaction-oriented system which supports a nationwide network of terminals. "We tightened inventory from a four or five week supply down to 3½ to 4 weeks," he notes. "At the same time we raised the customer service level from 96 to 99 percent," says Allen Weitzel, corporate distribution manager.

"We previously had a card-oriented batch system," adds Pinkela. "So we had to write online programs from scratch, including support for our terminal network. We could not have done it in so brief a time without DL/1 and CICS."

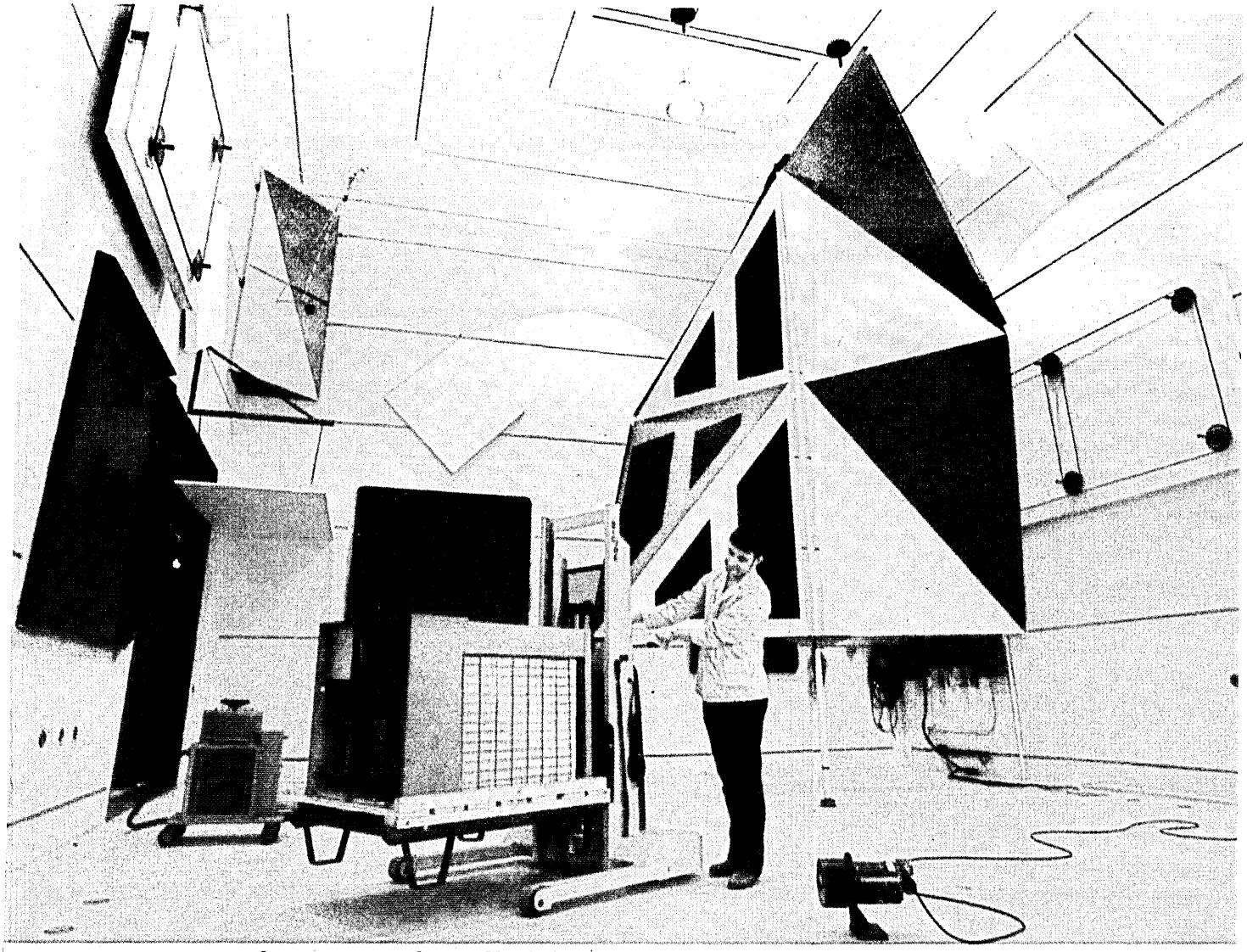
Data Language/1 (DL/1) is an IBM data base manager that organizes and stores the data for any number of application programs. The Customer Information Control System/Virtual Storage (CICS/VS), also an IBM program product, complements DL/1 by handling the details of transaction processing and terminal support.

Programmers at Hills Bros. worked at IBM 3277 Visual Display Stations to develop the system, using Source Program Maintenance Online (SPMOL). This IBM program product provides for writing and editing of a program directly at a terminal, and submitting it to the batch stream for compilation and execution.

"SPMOL increased our programmer productivity by 50 percent," Pinkela says. "They get faster turnaround on compilations, immediate diagnostics, and management of source code for test and production.

"Now that the system is up and running, we are adding to the data base for future applications such as a forecasting model and an online inquiry capability. In two years we've covered a lot of ground; today the information systems function at Hills Bros. is prepared to grow as the business grows."

At Hills Bros., experts sample coffee, then proportion the blend. In 15 months, the company implemented an online order-processing system supporting a nationwide network of terminals.



A Trane Company technician measures the sound level of a central air-conditioning system. For order entry and other applications, Trane's nationwide data network supports several types of terminal under SNA. As little as one day is required to add a new site to the network.

SNA Helps Trane Keep Its COOL

"We have 180 IBM 3767 Communication Terminals across the country for online order entry. Using SNA, we were able to put another 100 devices of different types on the same network, for other applications: remote job entry terminals, visual display stations, and the like."

Gordon Searle is describing the use of Systems Network Architecture (SNA) as the basis for the Computerized Order On Line (COOL) system at The Trane Company. Searle is director of corporate data processing for Trane, a major manufacturer of central air-conditioning systems.

"Today a customer order is accepted and forwarded to manufacturing or shipping in minutes, not days or weeks. As a result, we're retaining business we would have lost – particularly for service parts."

An order for the Commercial Division, keyed into any terminal in the network, is processed on an IBM System/370 Model 168 at company headquarters in La Crosse, Wisconsin. Under SNA with the Advanced Communication Function (ACF), an order for a home air-conditioning system, entered at the same terminal, is automatically routed to a Model 158 at Trane's Residential Division plant in Clarksville, Tennessee.

A new location can be added to the network in one day, Searle points out, describing SNA as a vehicle for delivering data processing services promptly as Trane acquires other companies or opens new branch offices. At the same time, the network of terminals has absorbed the administrative message traffic that used to travel over a separate system of teletypewriters.

"Some of our most useful applications have become much more widely available in the company, now that any terminal in the system can access any application under SNA," he notes. "At the same time, we are projecting a direct saving of $150,000 a year in hardware and communication charges, by eliminating several single-purpose networks we were operating.

"And SNA has saved us money during implementation. Among other benefits, it relieves the programmers of many of the communications concerns that complicate an online development. Phase one of the project was completed on time and within budget."

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

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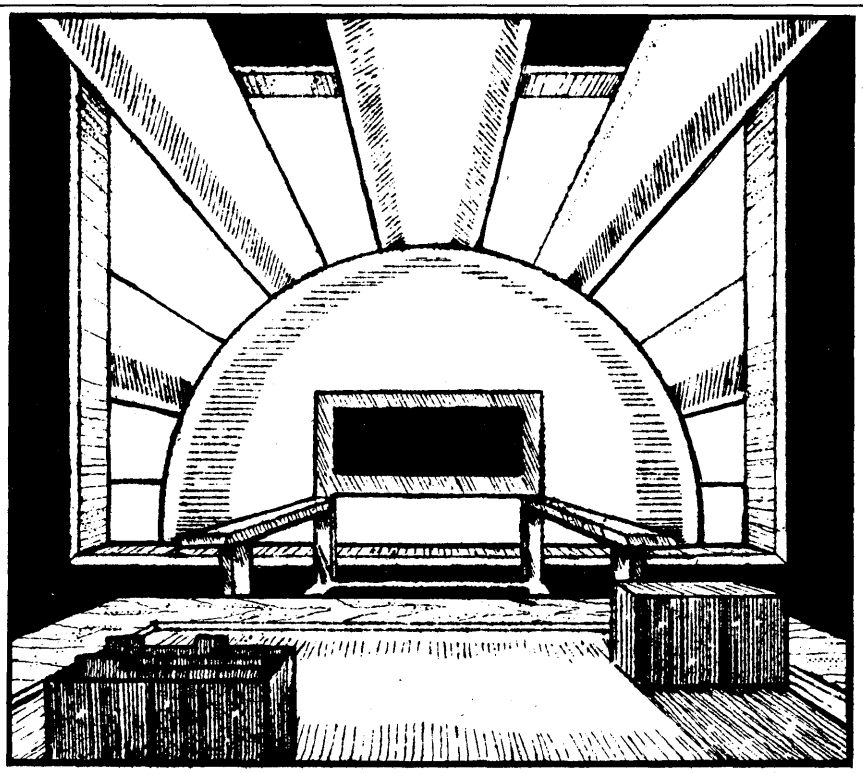
CIRCLE 39 ON READER CARD

JOHN L. KIRKLEY, EDITOR

EDITOR'S READOUT

IN AND OUT THE WINDOW



Confusion. That's the word we'd choose to characterize the computer industry in 1979.

Although many things contributed to the muddle, one series of events stands out. With the announcement of the 4300, IBM triggered a chain reaction that created both opportunity and disaster. At the same time they opened a window that could bring one of their most feared competitors into the U.S. marketplace.

It all began last January, when, after much rumor and speculation, the E Series, or 4300, was announced. Price/performance levels were stunning, far better than anyone had anticipated.

Gritting their teeth, IBM's competitors came up with a flurry of new announcements, and watched their profit margins plummet.

Itel, already faltering, was cut off neatly at the knees. The leasing industry suffered a bloodbath. Residual values on 370s nose-dived, and the redoubtable Lloyds of London, who had made the costly mistake of insuring a number of leasing companies, learned what it means to get into the same ring with the Gray Giant and lose.

Even IBM was caught in the backwash of its own announcement. Users, reasoning that the high-end H Series, reportedly due next year, would offer the same attractive price/performance as the 4300, began leasing instead of buying, or substituting used mainframes for new ones. IBM's cash flow faltered. Sales of the 8100 and the 303X slowed.

Uncertain as to how the 4300, 8100, and S/38 fit into their capacity planning strategies, users flocked to the order queues, knowing they could cancel later. The order picture became inflated and confused, muddying the waters for IBM and its competitors as well.

A window has been opened. With the users confused, with the competition in disarray, with IBM's new low-end machines yet to be delivered and its high-end machine yet to be announced, there is an opportunity for those ready to seize it.

IBM has its domestic competitors fairly well under control. But the invasions from overseas are becoming more frequent and more effective. And to the east, Japan is massing its forces once more.

Three Japanese firms are positioned to move into the window. Fujitsu recently concluded a joint venture agreement with TRW; Japanese executives are touring TRW facilities to see how the two might work together. Hitachi, left dangling after Itel's demise, has the machines if not the marketing. Nippon Electric (NEC) is already here with components and small business machines; their ACOS series of general purpose mainframes, not presently marketed here, is available. So, at the very least, we have three strong Japanese companies that could join the other foreign and domestic companies in taking advantage of the present window.

But although the window is open, our guess is that the Japanese won't climb through. Judging by past performance, they will take a careful look around before moving into a new market.

They do not yet have the maintenance capability to support a major sales thrust in this country. The language difference mitigates against them as does the lack of good software, especially applications software, which must reflect the idiosyncracies of U.S. business, a world and a culture apart from Japanese corporate practices.

But these are not insurmountable problems. A joint venture such as the one between Fujitsu and TRW can take the sting out of maintenance and marketing. And because the Japanese user demands extraordinary amounts of reliability, the hardware is of the highest quality, a technological edge that could make a significant difference in future American markets.

Japan may not be coming in the window in 1980. But IBM and the other American computer companies must be fully aware that they will be tromping in the door by 1985. ✲

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CIRCLE 40 ON READER CARD

NEWS IN PERSPECTIVE

OF BELLS AND HORSES

ADAPSO raced into the '80s amid silver dollars and worries about Ma Bell.

"I fear Bell to no end, much more than IBM."

This statement was made during a question and answer session at the Association for Data Processing Service Organizations' (ADAPSO) 51st Management Conference in late October in Colorado Springs. Topic of the session was the impact of recent IBM announcements or as one speaker, David E. Gold, Saratoga, Calif. consultant, paraphrased it, "Ode to Itel."

ADAPSO's concern with AT&T came up in other sessions. During a business meeting, Bruce Coleman of Informatics, the association's vice president for software issues, noted that ADAPSO had filed a protest with the Justice Dept. asking it to move against Western Electric Co.'s sale of computer software packages, contending that it is "in blatant violation" of the AT&T/Justice Dept. 1956 consent decree, which limits Bell to the provision of communications-related products and services.

And the first question asked of an ADAPSO conference key speaker, Archie McGill, AT&T's vice president, business marketing, posed by ADAPSO president John Imlay, was: "Do you intend to be the world's largest producer of software?"

McGill's answer, as were many of his remarks that day, was designed to reassure. "We do not intend to sell packages. We will make systems program sales only where they support sales of our services."

He allowed as how "we are advertising and selling standalone program systems and this is dominated by the sale of Unix." Unix is a time-sharing operating system for Digital Equipment Corp. PDP-11s which was developed at Bell Laboratories in the early '70s. Bell originally gave the system away but demand forced the company to charge for it.

"We could not withdraw unilaterally," said McGill. But, he added, "this (sale of software) is not our game. We're not interested. We don't want to be there and we're not adding products. If I have any control, we will not." This earned him a round of applause.

McGill said AT&T was having "serious programming problems" internally and didn't need the extra problems of developing software for sale. He could have been referring to programming problems which have set back the phone company's ambitious Advanced Communications System (ACS). AT&T has withdrawn its application to the FCC to operate the service which once was to have started last October.

ARCHIE MC GILL — "We do not intend to sell packages."

McGill predicted for his ADAPSO audience that software "will become the backbone of the communications process by the mid '80s. We need you to explore the marketplace. We are unable to do it ourselves."

He said customer expenditures on communications, which were $200 billion in 1978, will reach $500 billion per year by the late '80s.

Theme of the conference was "Racing Into the '80s" and ADAPSO had its own racehorse, Cricket, ever present on the grounds of Colorado Springs' plush Broadmoor Hotel. The crystal-balling was generally optimistic.

"Software will become the backbone of the communications process in the '80s."

This was true even in the session on the impact of the IBM announcements. Gold, noting that "there are no problems in life, only opportunities," said IBM is "just as locked into 370 compatibility as anyone else," and that others, particularly the plug-compatible manufacturers, can offer better solutions and better delivery schedules and "there's no reason you can't have plug-compatible software."

Gold said he doesn't think the so-called H-Series will be announced until 1981 and that its price performance improvement won't be nearly as dramatic as that of the 4300. He sees it as two or three

times the price performance of the 303X family. His rationale for saying '81 instead of the more oft-quoted early '80 timeframe: "There's no reason to eat your own children."

The most comprehensive picture of the '80s drawn at the ADAPSO conference was by Richard W. Anderson, general manager, Data Systems Div., Hewlett-Packard. "Computers in the '80s," said Anderson, "are going to be dominated by a dramatic larger scale movement toward distributed processing and distributed networks." He used water supply as an analogy. Once, he said, everyone went to a central well for water. Now we're used to having the water supply at our disposal at home.

He predicted that distributed systems will dominate systems technology and systems considerations and that public packet switching will come into its own.

He looks for a single chip processor, "a true microcomputer as opposed to microprocessors which take multiple chips," to show up in the early '80s.

"Charge coupled devices won't make it. They'll lose out to bubbles in the early '80s.

He sees LSI and VLSI continuing to bring down the costs of minis and micros but "not forever. It will not get to zero. The thrust will shift to more performance, usability or friendliness." By the mid-'80s, he predicted, "minis will achieve the performance of today's mainframes at today's mini prices."

Anderson doesn't believe charge coupled devices (CCD's) are going to make it. "They'll lose out to bubbles in the early '80s." He foresees two million transistors per LSI chip by the end of the decade.

And as for programming, "We'll no longer be programming to try to conserve memory." He feels there will be more stress on computer vendors for paramaterization of software, for software to be used for applications generation. He also looks for "a fairly extensive appearance of computer software in public

SERVICES FIRMS GROW; MINIS/MICROS PART OF IT

The year 1978 was a good one for the computer services industry in the U.S. and 1979 looks just as good.

These conclusions can be culled from the 13th Annual Survey of The Computer Services Industry produced for the Association of Data Processing Services Organizations (ADAPSO) by Input, Palo Alto, Calif.

The survey shows available U.S. computer services revenues in 1978 to have been approximately $7.5 billion. It estimates revenue growth for 1978 versus 1977 at 19%, the same growth rate achieved in 1977 over 1976. However, it indicates 22 major publicly owned computer services companies surveyed actually achieved a 26% growth increase.

Input's forecast of continued computer services industry growth is for an average rate of 16% through 1983. Applying this rate, the study says revenues in 1983 should reach $15.8 billion.

Respondents to the 1979 survey expect to install mini/micro computers at customer sites at an increasing rate, the Input study reports. "The rate of installation will increase by 129% in 1979 over 1978, compared to an 85% increase expected by 1978 respondents in the same time period."

The study showed that computer services companies are marketing mini/micro computers in two ways: as part of an integrated offering including extensive software, a communications network and access to the vendor's computers, and as basically standalone systems, often including applications software.

Input reported that impact of mini/micro computers being marketed by hardware manufacturers is being felt most severely by small processing services vendors. It predicts, "The impact will continue as the monthly cost of hardware drops to less than $500 per month. General business applications are more vulnerable than industry specialized applications. On average, services vendors feel that 25% of their business is vulnerable to replacement by mini/micro computers."

Software products companies, the report says, largely see mini/micro computers as an area of opportunity for applications and systems software.

Input estimates that "the current heavy activity" in the industry (it said 100 acquisitions will take place in 1979) will increase rather than decline. "Forty-four percent of respondents to the 1979 survey expected to have acquisitions as part of their 1980 plan, up from 32% who had them as part of their 1979 plan."

The research firm said it believes companies acquired in the computer services industry between now and 1983 will total approximately 700 and will be equivalent to $3.5 billion in revenue at their points of acquisition.

The company said acquisition activity is experiencing strong growth because it offers the acquiring company "a reduced failure rate compared to starting up a new activity from ground zero; an immediate addition of competent staff and expertise; immediate broadening of product offerings; accelerated corporate growth; and expanded geographic coverage."

The ADAPSO sponsored study showed that overseas revenues for service companies were the fastest growing category. It said "processing services dominated revenues and professional services dominated Canadian revenue growth. European revenues were particularly important to software product companies, accounting for more than 10% of 1978 respondent revenues after a 1977–78 growth of 61%."

In its breakdown of the kinds of companies surveyed for ADAPSO, Input characterized "processing services companies" as making up 74% of its 1979 respondent total. It defined these companies as "companies whose revenues were derived primarily from remote computing, batch, and facilities management services."

The study said acquisitions were "extremely important to the 1977–78 growth" of these companies, "with 20% of the incremental growth being due each to 1977 acquisitions and 1978 acquisitions."

It noted that the "dominant type of service is general business, those processing services for applications which are common to users across industry categories."

Companies whose revenues were derived primarily from the sale of software products, Input said, made up 5% of the total revenues of all companies responding to its survey.

Sale of software products by these firms, the study showed, were characterized by a concentration of 64% of sales in three industry sectors: discrete manufacturing, banking and finance and insurance.

Companies whose revenues were derived primarily from the sale of professional services had revenues representing 22% of total reported for respondents to the survey. "Inflation," the 1979 ADAPSO study said, "is felt to have the greatest impact on the computer services companies."

In the processing services category, the Input survey had 101 responses with 22 in the over $25 million class, seven in the $10 to $25 million category, 30 doing from $2 million to $10 million and 42 under $2 million. In software products there were seven over $10 million, seven in the $2 million to $10 million bracket and eleven under $2 million. For professional services the totals were 10 over $10 million, eight from $2 million to $10 million and 13 under $2 million. **—E.M.**

RICHARD ANDERSON — "The end of the '80s will see several computers in every home."

JOHN ROACH — "I don't know why I'm here."

libraries."

Anderson said the end of the '80s will see "several computers in every home. First they'll show up in appliances, then in environmental controls and finally as broadly used personal computation tools."

He told his computer services companies audience that "your challenge will be to adapt to the rapid change in the environment that is going to exist so that your added value can closely parallel new system and hardware development. In that respect you can bring real computer utility to the end customers in a way that is efficient."

William Sweet of Zilog, Inc., Cupertino, Calif., had a similar message to offer in a session on "Microcomputer Directions." At this point, he said, "we're pretty blind on applications. All we're going to do in Silicon Valley is make the bricks. You make the mortar."

John Roach, executive vice-president of Radio Shack, told the ADAPSO conferees that "innovative service organizations will use micros to their advantage."

Roach began his presentation by saying, "I don't know what I'm doing here," and ended it by saying, "I still don't know what I'm doing here." In between he told his audience that Radio Shack is the 47th largest computer producer and that it will continue to develop new products, "new computers to address specific market segments." He said he believes a true "home appliance computer" will evolve during the '80s.

In response to a question, Roach said Radio Shack generates some of its own software and buys some outside. "Our posture as to protection of software is to forget it. You can't do what can't be done."

Which isn't exactly the ADAPSO line. The association currently is involved in studying ways in which software products can be protected.

It also is taking a harder look at international business. A session at the Colorado Springs conference to determine the need for an international relations committee was well attended by conferees who seemed mainly to want how-to-do-it information. Jack Lotz, CARS, Inc., Birmingham, Ala. computer-based automotive service firm, wondered

"We shipped some product and probably broke a half dozen international laws in the process, but we got our money."

about "vendor relations internationally. We buy Data General equipment," he said, "but we wonder about buying DG in the U.S. and shipping it to Australia. We're afraid we won't get maintenance in Australia if we don't buy in Australia and pay 30% more than we would in the States."

Another attendee told of an ad his firm had run which elicited inquiries from outside the U.S. "We didn't know how to handle them. We shipped some product and probably broke a half dozen international laws in the process, but we got our money."

All attendees seemed to view ADAPSO as a potential international information clearing house.

Whatever it is, ADAPSO is growing. It was announced at the conference "there are 75 new members here today." The event drew 370 executives from more than 250 companies.

And it was indeed a race into the '80s. Outgoing president John Imlay, chairman of Management Science America, Atlanta, said it took him "two weeks of negotiating with the attorney general of Colorado" but he managed to run six pseudo horse races with the participants named suspiciously like members of the ADAPSO staff and board. But, in accordance with Imlay's agreement with the Colorado lawyer, only silver dollars were accepted as bets. Each conferee received ten of these with a registration package.

How many returned home with more than 10, probably only Cricket knows.

—Edith Myers

PRICING

SHORTAGE OF CHIPS

As a result, equipment makers will be hard put to keep from increasing prices.

A serious shortage of semiconductor components, especially advanced products like the 16K RAM memory chip and logic circuits called low-power Schottky TTL's, has hit computer and peripherals manufacturers. And it now appears possible that equipment makers will be hard put to keep from increasing their prices.

In the past, due largely to advances in the semiconductor technology, manufacturers have managed to increase computer performance by an average of 20% to 30% a year, or to drop their prices by that much while maintaining the same performance. As Richard W. Anderson of Hewlett-Packard Co. says, computer equipment prices have been "going against the grain of inflation" and this has made it possible for vendors to take the computer technology to a much larger base of users.

"That may be harder to achieve now in the coming year," says the general manager of HP's Data Systems Div.

Ramtek Corp., the Santa Clara, Calif., computer display manufacturer, delayed in filling orders for the model 9400 graphics system that was introduced last March because of the components shortage. In the past, according to a spokeswoman, they were able to go out to a so-called spot market, pay a little more, and get the necessary circuits. But there no longer is a spot market—"not unless you want to pay 10 times as much."

All this is occurring at a time when industry shipments of IC's is up about 40% over last year, and that's about as fast as the industry can build up its capacity, explains Terry Jones, vice president for marketing at Advanced Micro Devices Inc. "The demand is much higher than anybody expected."

In the last recessionary period, during the oil crisis of 1974, semiconductor companies rushed to reduce inventories and cut back their productive capacity. But they found that when demand for IC's reappeared, it did so with such an intensity that the industry could not fill the supply pipeline fast enough. Companies that had curtailed capital expenditures the most were the ones that lost market share to those that hadn't retrenched as much.

Thus, despite all the talk this year about an impending recession, which continues to appear to IC makers to be just around the corner, expansion at a deliberate and often uneasy pace is the name of the game. No one wants to expand too fast, but then neither does anyone want to be caught again facing a booming market without the ability to ship enough products.

There is no longer a spot market, unless you want to pay 10 times as much.

Just recently, for example, National Semiconductor Corp. announced plans for a new wafer fabrication plant in Vancouver, Wash., a 200,000-square-foot facility to be operational by 1981 and to employ some 2,000 people by 1984. The company, which employs more than 33,000 people worldwide, has wafer fabrication facilities in Utah, Connecticut, California, and in Scotland.

But only a few manufacturers seem to be experiencing any shipment delays stemming from the shortage of critical IC's. A spokesman for Storage Technology Corp., the tape and disk drive manufacturer, says they're experiencing no problems. The same applies to Hewlett-Packard, although everyone admits they're having to work harder in production scheduling, parts procurement, inventory control, and in projecting lead times.

A spokesman for HP says they're having to go to other semiconductor suppliers and having to qualify new suppliers, which increases costs somewhat. "We are buying in whatever quantity we can from whatever sources we can get, which means we're not getting the quantity discounts we're accustomed to getting." Suppliers are not increasing prices, it is being said, although there is a little of that going on. Prices of the very fastest memory chips, the premium parts, are going up, contrary to the pattern of the past.

"We're not really being held up in shipments because of shortages," says Tom Whitney, executive vice president for engineering at Apple Computer Inc., the personal computer maker. But it's had to make some selective substitutions of parts. And in the past, says Whitney, Apple paid more for certain parts. "In other words, there are parts around if you're willing to pay the price for them," he adds. In some cases they are parts being resold by an equipment manufacturer who found he had more than he needed and is making a few dollars by unloading them now.

A number of factors are contributing to the components shortage. Terry Jones of AMD explains that computer and peripherals makers have been approximately doubling their consumption of RAM's each year. This is said to reflect partly the fact that users have found that with lower prices for memory it's cheaper to write more inefficient code that occupies more memory space. And during this time, the per-bit prices of RAM's have been dropping at the traditional 30%-per-year rate.

This consumption pattern, contributing to the enormous demand for memory chips, is being aided and abetted by new consumer products that also require RAM chips—computer games for the home, arcade games, and the personal computer. "They're a new industry that never consumed any semiconductors a few years ago," Jones explains.

"Apple Computer," he adds, "is going to consume more 16K RAM's next year than Intel produced last year." It is a statement not refuted by Apple's Tom Whitney, although Intel Corp. is the world's largest maker of semiconductor memory chips. "So that's playing hell with the supply and demand situation," continues Jones. There are just a lot of new users in the marketplace.

At the same time, of course, semiconductor makers are looking at the huge automotive industry, which has begun to apply microcomputers to the engine control function in expensive models. But in 1981, because of the fuel consumption and pollution emission requirements of the federal government, even average-price cars are expected to be using micros to control certain engine operations. And that's another industry that will consume gobs of IC's, primarily microprocessors.

Indeed, the market for microprocessors by 1983, a mere 10 years after it became a commercial product, will exceed 100 million units, according to the research firm of Creative Strategies International. From its initial use in calculators, the microprocessor has found wide application in industrial, commercial, and consumer markets.

CSI says that between now and 1983 the terminals and peripherals business will account for the largest increase in microprocessor sales volume, growing at a compound annual rate of 23%. The consumer product segment will gobble up micros at a 22% compound annual growth rate, and the automotive industry at a 34% annual rate.

This surge in demand for IC's confronts an industry that finds it takes about two years to get a new factory into production, double what it had been only a few years ago. It costs more to build the plant, much more to equip it, and is expensive and time-consuming to train the staff to run it. And to top it off, the semiconductor industry historically has not been able to generate sufficient cash to allow expansion at the rate required by market demand for its products. The business is becoming more capital-intensive. And this is leading to the adoption by the industry of a new pricing philosophy.

Securities analyst Benjamin M. Rosen, a close observer of the semiconductor industry, makes note of the new pricing tack being taken by the leader, Texas Instruments. Instead of regularly lowering its prices by an average of 40% a year, come hell or high water, TI is said to be pricing with an eye to the supply and demand situation. And if this is the new pricing policy at the world's largest semiconductor company, can other IC makers be far behind?

Writing in his Morgan Stanley *Electronics Letter*, Rosen observes that in these times of need, a user of these IC chips is less concerned with its price than with its availability. "A production line halted for want of a 14¢ gate is far more costly to an equipment manufacturer than is any 3¢ price increase in that gate."

And TI's return to traditional supply/demand economics, he adds, should be welcome news to its competitors. "Industry profitability will be enhanced somewhat, a not unwelcome development for an industry that historically has rewarded its customers far more than it has itself."

—**Edward K. Yasaki**

COMMUNICATIONS

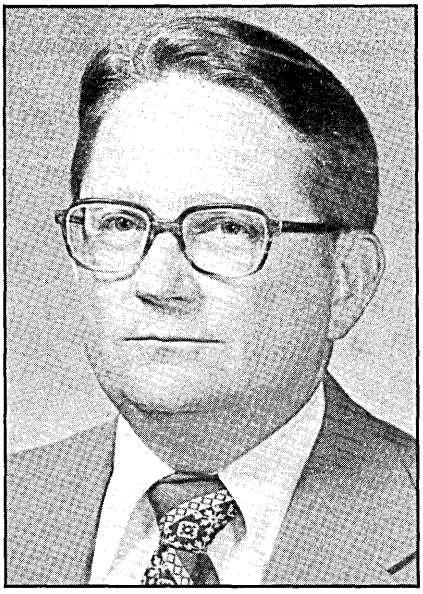
PROMISES WEREN'T FEASIBLE

SBS and AT&T explain delays in network offerings but say the outlook is good.

As the decade rapidly draws to a close, the network services promised for the 1980s seem more and more to be falling prey to implementation problems of the 1970s.

The two networks that probably have more visibility than other contenders are the satellite service to be inaugurated by Satellite Business Systems and the Advanced Communications Service of AT&T.

HALL OF SBS—He'll compete first on a pure voice basis.



SMITH OF AT&T—A greater delay than anticipated.

It now seems clear that both services have dropped back from their initial projections to more manageable abbreviated versions. Just how serious these retrenched positions are will be debated by industry experts during the coming months. But recent statements made by key SBS and AT&T officials, together with views from knowledgeable outside sources, indicate that both network providers promised more than it will be feasible to deliver in the early 1980s.

SBS has clearly been the more tight-lipped of the network purveyors. In the past the fledgling satellite service company has made few statements that were not couched in vague generalities.

But things are changing at SBS. And the architect of that change is Robert C. Hall, the new president and chief executive officer. The 47-year-old Hall comes to SBS from his previous post as executive vice president at the New York Stock Exchange. As a dper who formerly headed up the Securities Industry Automation Corp. (SIAC) which handles the dp and communications for Wall Street, and an executive at Control Data Corp., Hall knows the importance of playing it straight with potential customers.

Hall admitted in an interview, that some of the services that SBS has been aiming at users do not yet have an acceptable market. The four key elements in the SBS service, as Hall sees them, are voice, data, teleconferencing, and bulk document distribution. All of these have been pitched to key *Fortune* 500 prospects as part of an integrated service offering.

While his company still believes in the integrated service concept as an ultimate implementation goal, Hall revealed, "we will be out competing on a pure voice basis in a highly competitive industry." Using a voice network to establish an operational base with SBS, customers would then see the other key elements as lower cost add-ons that can be integrated as needed, he said.

Will the image of a voice carrier invoke a reaction from Bell? Hall nods and says a competitive response is expected from the phone company but SBS is confident it can provide equal features at lower cost. Hall speaks of a 10% to 20% savings in both the voice and data areas compared to competing services.

While Hall places data in second place after voice, he said some users would turn up their SBS service with data-only applications. Further down on the priority list are teleconferencing and bulk document distribution, although Hall said a few potential customers are looking at these as the primary application.

Some of the services that SBS has been aiming at users do not yet have an acceptable market.

For a company like SBS that has emphasized a total spectrum of service since its inception, the admission that selected service offerings will attract the first users is more realistic than radical.

Hall said the SBS timetable is still fixed at early 1981 to begin service. The first satellite is now scheduled for launch in October 1980. Originally set for last July, part of this delay was caused by setbacks in the Space Shuttle and SBS will now use the more expensive Delta launch vehicle, he said.

While stressing that SBS is not "trying to be secretive," Hall said 10 to 12 earth stations would be installed in 1980. These earth stations will service the first three networks that will be established in early 1981 when SBS becomes operational. The early customers will be made known in 1980.

Just how far along is SBS toward operating its system? Significant testing has been done at 4gHz and 6gHz, but questions still remain to be answered about satellite transmissions at 12gHz and 14gHz, he said.

"We need to demonstrate the error quality rate at the higher frequencies where attenuation from heavy rain is a potential problem," he said. SBS plans to conduct operational tests next year on one of Canada's Anik satellites which operates at the higher frequencies.

Hall said much of the testing that remains to be done is simply "to get the bugs out" but, he admitted, "We are not all the way home yet on this."

While SBS has no plans for resale or sharing of its facilities, some expanded capabilities are being explored. Since many large SBS users will also be multinational network operators, a gateway interface to overseas networks seems likely. Hall said the X.75 gateway standard would probably form the basis for such interconnections but no final decision has been made. For backup, some terrestrial links will be necessary, especially for voice users. And voice interfaces will be provided with the established telephone network wherever SBS users need such service—even though SBS will provide total end-to-end digitized voice facilities.

While some of these plans may seem different for SBS, Hall said he was still confident that his firm had a "unique and exciting service." Citing some of the different ways in which SBS will handle information, the SBS chief talked about the time division multiplexing combined with demand assignment. He also mentioned the satellite communications controller and the way in which software would be handled as important parts of the SBS service.

And how much will it all cost? Hall smiled and said, "We will file our rates after mid-year 1980." For a company that has already spent more than $500 million put up by three partners—IBM, Aetna, and Comsat General—it did not seem like much. But it was probably more than had been said by any SBS spokesmen since the company was founded.

While SBS was opening the door a crack, AT&T seemed intent on slamming the ACS door shut. What seemed at first like a fatalistic admission of defeat, was characterized more as an unavoidable delay by William Smith, director of interpremises development at AT&T. In a

classic statement that sounded like something out of a State Dept. briefing, Smith said, "It's not that we decided to delay; rather we discovered that we have to have a greater delay than we had anticipated."

While SBS was opening the door a crack, AT&T seemed intent on slamming the ACS door shut.

But Smith said ACS development was continuing at Bell Labs, primarily in software. The ACS plan had called for "purchased hardware" and extensive use of it, Smith said, and he confirmed that AT&T had originally chosen the Digital Equipment Corp. PDP-11 processors for the network service.

Although he said "we reserve the right to change our mind," Smith indicated many of the considerations that led to DEC in the first place "are still there." Asked if the reported ACS hardware upgrade meant DEC VAX machines would be used, the ACS spokesman said VAX would be a likely choice at this point.

And what about reports that AT&T wanted the Bell-developed Unix operating system for ACS. Would Unix run on VAX processors? Smith said, "VAX supports Unix. And Unix is one of the active software candidates. But if VAX is a final (hardware) candidate, then VMS (virtual memory system) will also have to be considered."

Asked if DEC was working on ACS software, Smith said, "I don't know of any software development that DEC is doing specifically for ACS." He added that DEC had been very cooperative in "helping us run Unix on DEC equipment."

Despite Smith's statement, industry sources said DEC had attached high priority status to upgrades of its DECnet architecture—especially in the development of an X.25 capability for DECnet. An X.25 support feature for DECnet would be potentially important if AT&T follows through with its plans to make ACS an X.25 network, these sources said.

Although Smith would not speculate on how long the ACS delay would be, he did comment on what the first service offering would include. "I would expect a message capability to be one of the early features," he said.

A message service would be one of the more clearly defined communications services based on past regulatory history. But the addition of editing support to the message service could lead to a return to the type of discussions that took place with the Dataspeed 40 terminal, he said. The addition of enhanced message preparation features would eventually lead to a crossing of the boundary between communications and dp service although no one can define exactly where that boundary is, he said.

During the period of delay, AT&T will continue to study the needs of potential users, but it will not discuss price, performance, or availability. Such research should not be classified as ACS marketing efforts, Smith implied.

Newer implementations of ACS hardware and software make sense, Smith said. But how long it will take to put those implementations in place was the key question. Outside sources said a delay of at least 12 to 18 months seemed inevitable.

—**Ronald A. Frank**

OFFICE AUTOMATION

DATAPOINT IN THE OFFICE

Enhancements to its ARC system will take the delays out of office procedures.

As its salesmen clamored two years ago for larger machines to match the offerings of competitors, Datapoint Corp.'s product planners had other thoughts.

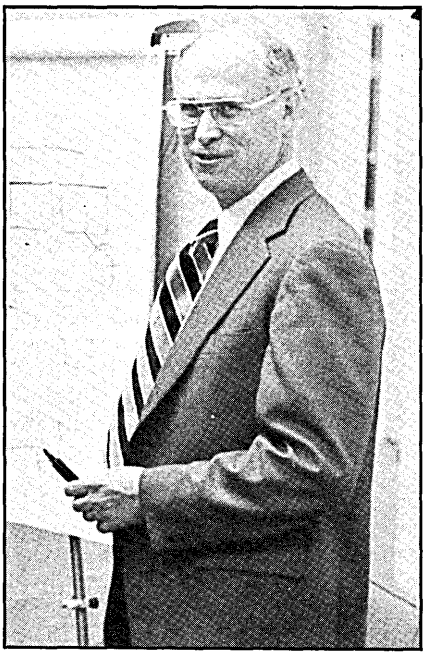
Why not stay with the same size of computers, but give them the ability to be hooked up into networks where users shared a common data base and could build these networks as large as they needed to? And also allow the networks to communicate with IBM mainframes?

That was the thinking that lead to what the 10-year-old San Antonio computer company called attached resource computers (or ARC) systems. And ARC systems have had a major role in more than doubling the company's revenues in two years—from about $100 million in 1977 to $232 million in the last fiscal year, ended July 31. Datapoint moved up in that time to the prestigious top 1,000 industrial companies and its number of employees passed the 5,000 mark (compared with 1,000 employees five years ago).

The attached resource computer idea represented a marketing coup as well as a technical one. Although Datapoint had to modify its operating system software to fit the ARC environment, it is transparent to users and allows them to add only the exact amount of processing and storage capacity that is needed. According to the company, any of its more than 12,000 installations could convert existing equipment to an ARC system simply by adding ARC communications components that are relatively inexpensive.

Therefore, Datapoint, whose lease revenues last year of $88.7 million accounted for more than half of all revenues, doesn't have to face the problem of obsoleting its lease base with new equipment; it merely offers new hardware and software enhancements to what already is being used.

"I'm absolutely amazed," says Victor D. Poor, a senior vice president in charge of the company's research and development, "that in the two years we've had ARC on the market, we have yet to have a competitor come out and say, 'Look, we've got the same thing or even better.' " He adds: "Maybe the competition doesn't recognize the market as we see it. Or maybe we're wrong. I don't know."

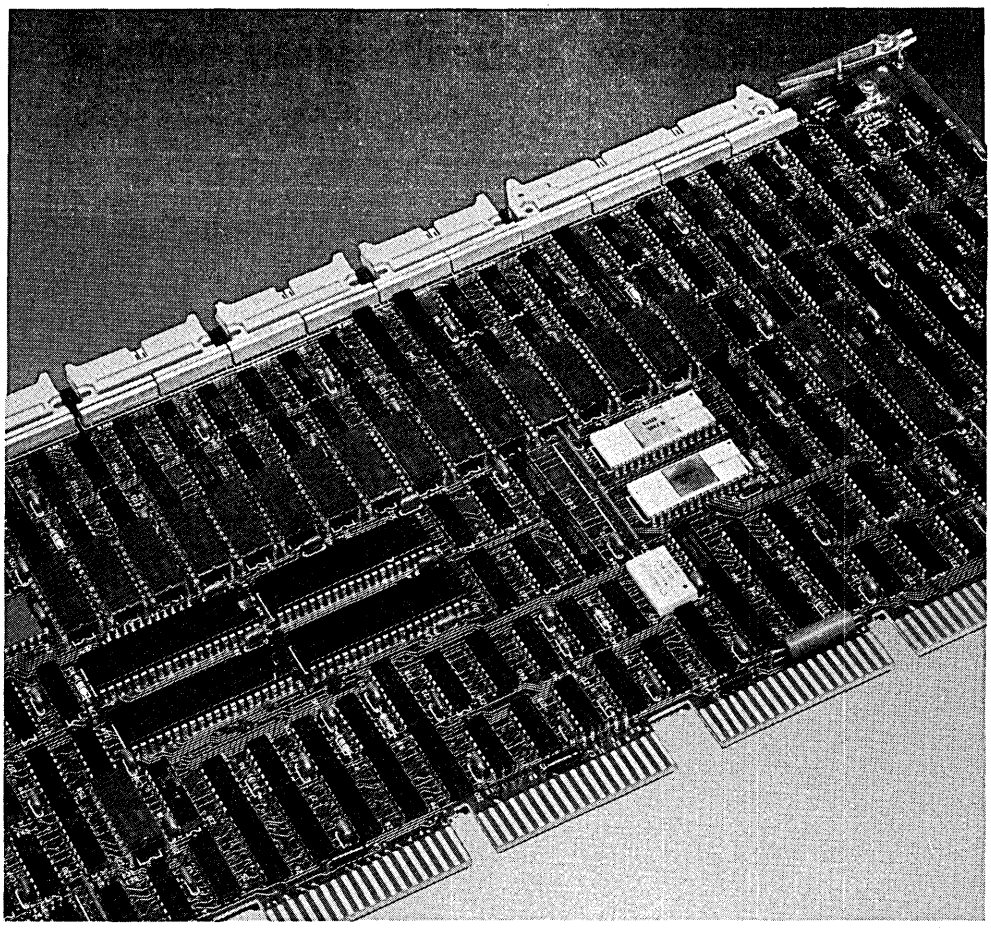


VICTOR D. POOR—Taking the delays out of office communications.

It's improbable that Poor is wrong. Even though he admits that ARC right now "is still very primitive," it's become the heart of the company's very successful product line. Last month at Datapoint's annual meeting, stockholders were given a glimpse of future products the company will add to the ARC system for the so-called office of the future or, as the company's president Harold O'Kelley likes to call it, "the integrated electronic office."

Dispersed processing is in the offices where people are trying to make money.

"Dispersed (distributed) data processing is not in chemical plants or in controllers' offices, it's in offices where people are trying to make money," says Gerry Cullen, vice president of product marketing in the company's data processing division. "If we can show (offices) how to



ONE-BOARD PDP-11 SMD CONTROLLER SOFTWARE COMPATIBLE...A FIRST!

Dataram's S33 interfaces Digital Equipment Corporation's (DEC®'s) PDP-11 series to a wide selection of SMD (storage module drive) and Winchester type disk drives. The S33 emulates DEC's RM02 and is fully software compatible with RM02 diagnostics and RM02-supporting operating systems. Up to four drives per S33 controller, almost 300 MB of disk storage. The microprocessor-based S33 controller has 2 KB of data buffering, multiple sector transfers, and built-in self-test capability. And media compatibility with DEC's RM02 drive. All this and amazingly packaged on one DEC hex board...the only controller to make this claim!

One-board means you need only one hex SPC slot. One-board means easy insertion and optimum air flow.

One-board with its attendant features of minimized interconnections and low component count means lower power, complete accessibility, higher reliability...and best of all, lower cost.

If you're interested in one of our one-board S33 controllers, or a whole bunch of them, we'd like to hear from you. If you operate in the LSI-11® world, still contact us. Our LSI-11 cousin of the S33 is on the way.

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

CIRCLE 45 ON READER CARD

make money, our business should grow. The direction we're taking is the integrated electronic office."

The heart of a "future office" product line is a word processing product, which Datapoint will be offering along with a new line of printers, hard disks, and electronic message service, improved communications devices for its ARC system and an innovative way, called Associative Index Method (or AIM), to keep track of where everything is.

Poor says the electronic message service is the most interesting of Datapoint's new offerings from an economic point of view because, in effect, it doesn't cost anything to operate. It's an extension of Infoswitch, a long distance control system the company introduced two years ago to control the telephone expenditures of companies with monthly telephone bills of $5,000 or more.

Infoswitch is used, along with the cost accounting features, to control intolerably long queuing delays that result when more than 60% of a company's telephone capacity is in use. That leaves 40% of capacity idle and EMS would use that 40% for data communications functions.

"So, except in the situation where the user is demanding instant response, which primarily is in an interactive environment, the incremental cost of EMS as far as external communications is concerned, is zero," says Poor. That means the company can offer EMS at no increase in cost over what's already being paid for telephone service.

"It makes the competitive data services that are coming on the market a little less interesting," Poor says, "because when you have to compete with zero cost, it's pretty tough to operate."

The EMS offering, coupled with the company's word processing systems, would enable every internal or external piece of correspondence to be stored digitally within a company and the EMS software would be used to ensure that such things as memos on price changes would be directed electronically to those who need the information, and in the right form. (Does the recipient have a terminal or should the message be typed out on a printer and then mailed if he doesn't?)

Also, using the associative index method (AIM)—which is a searching algorithm for which the company won't apply for a patent because it's so innovative—an office worker can search for documents that have been created at some point in the system and get them back in a few seconds without giving a thought to the procedure.

That means that every electronic message will be filed and indexed. "There will be a copy of it somewhere," explains Poor. "If it goes to archives, that'll be known too. But probably a year's worth of documents will stay in the system. It's up to the user to determine how much he wants to spend for storage."

And the AIM system can be adapted to search the existing files of new customers who "very simply" take data from a raw source and put it into the Datapoint document structure and do AIM indexes on the data. "There are some rough guidelines you have to follow," says Poor, "but they are nowhere near as rigorous as a typical data base management system."

Tying all of these offerings together is a new rooftop infrared communications link between processors in Datapoint's ARC system. The company already has one in place in San Antonio where Datapoint is one of the largest users of ARC with more than 100 processors linked to a common data base and to 29 buildings it occupies in the city. Up to now, the company linked the ARC system by underground cable but, says Cullen, "We had to practically go to the Pope to get permission to cut up the street and lay those cables." So the company developed the wideband interbuilding link using infrared, or what it calls "light link."

It was developed around laser diodes—spontaneous emissions that, unlike coherent light, are not subject to federal regulations, a problem Datapoint didn't

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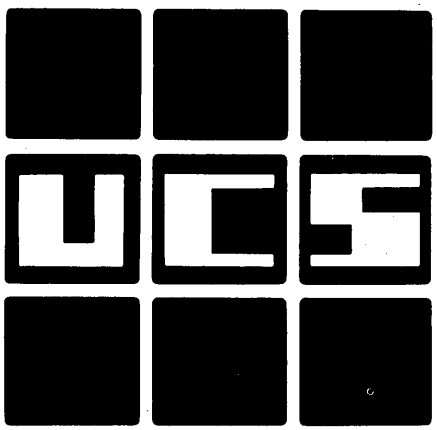

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Accounts Payable & Purchase Order
This module generates a full series of distribution, disbursement, and cash requirement reports, standard cost variance reports, automatic calculation of discount and due date reports to control the payable process. A flexible report writer is also available. In addition, the Purchase Order module provides a full range of tracking, matching and reporting capabilities.

Accounts Receivable & Sales Analysis
The Accounts Receivable module helps reduce costs while maximizing profits. It allows you to determine more profitable marketing plans through expedient reporting on your product mix, by controlling collections, by optimizing cash flow, and by properly reporting sales statistics.

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This module is designed to help you take advantage of the latest tax legislation. It features full transfer capabilities, investment tax credit and recapture, and many depreciation methods. In addition, the system has both an optional Asset Depreciation Range module and a flexible report writer.

FORESI

Financial Modeling
FORESIGHT asks the question, "What if . . .?," in such areas as strategic planning, cash requirement planning, capi-

feel its customers should have to face. In fact, Poor says that the use of noncoherent lines, which require larger collectors and lenses than would laser technology, improved the reliability of the system because the cone of light that passed between the transmitter and receiver was several inches in diameter, compared to the very tiny light beam of a laser. As a result, the scintillation in the atmosphere was averaged out and the amount of distortion that appeared at the receiver was a lot less than through a laser.

In clear air, the light link can transmit data up to 40 miles, but initially the company is recommending it for distances of two miles because 85% of Datapoint's customers have only a two mile requirement.

"And within two miles, you can build a pretty damned reliable infrared link that approaches microwave reliability," Poor says.

Productivity in the office, Poor says, always has been related to the speed of communications. And productivity could be a lot higher than it is today. "The amount of time you spend trying to establish contact with someone, getting a ruling or a reading or an answer to something, has a lot to do with how fast or how slow decisions get made."

He thinks that the system Datapoint is evolving eventually will be able to take the intrinsic delays out of office communications. "Then the delays will be entirely that of the decision-making process itself—how long somebody wants to think about something before they answer it or react to it. But the system is no longer responsible for them."

Adds Poor: "It's Datapoint's long range goal to automate everything that can be automated in a typical business office."

The company seems to be well on its way toward that goal.

—Tom McCusker

MAINFRAMERS

FIRE SALE OR WHAT?

Is IBM getting ready for H-Series announcement?

Somewhere within IBM's facilities there must be a door marked "Other." Behind this door is a closet full of unmatched shoes, for, as veteran IBM-watchers know, everyone always seems to be waiting for the other wing-tip to drop.

Last Nov. 1, IBM again whetted the appetites of the apprehensive: it announced the 3033N, a stripped-down 3033 with less performance (less cache) and a lower price than existing 3033s. At the same time, the firm cut purchase prices roughly 20% on the 3031 and 3032, and about 15% on the extant 3033s. Memory prices also felt the knife, pared from $75,000 to $50,000 per megabyte. System/370 prices were cut by roughly a third, as were those on two communications controllers (3704 and 3705 II).

But mainframe lease rates remain the same.

Many speculate that this latest move serves to announce a fire sale on large mainframes before the debut of a more powerful, more attractive series.

The announcement will stimulate purchases, according to many watchers including Robert Fertig, president of the technology analysis group at Advanced Computer Techniques Corp. (ACT). For existing lease customers, the combination of investment tax credit, purchase credits accrued, and need make purchasing attractive. Coupled with the traditionally long time between the announcement of a major new series and the time customers finally get delivery, many users may find themselves without any choice.

IBM should benefit from increased sales. Increased leasing, spurred by the uncertainty implicit in the E-Series announcement earlier this year, have slowed

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CIRCLE 46 ON READER CARD

the company's revenue growth. A good increase in sales in the fourth quarter will help improve year-end results.

"A fire sale typically precedes a big announcement," noted one observer. The long-rumored H-Series is expected to be just such a big announcement. Frederick G. Withington, computer industry analyst at Arthur D. Little, expects an evolutionary introduction of bits and pieces spread over the 1980 to 1982 time frame. He feels it won't be a single big bang, but rather the staged introduction of various functional units that all work together.

ACT's Fertig expects the tip of the H-Series iceberg to bear a machine two to three times the power of a 3033 come the summer of next year, with deliveries yet another year off. ACT, which will publish its H-Series forecast this month, predicts the second H-Series machine will be a less powerful model impacting the 3033s; the firm expects an announcement in the last quarter of next year, with deliveries coming as late as 1982.

The announcement of the 3033N didn't seem to catch the industry by surprise. Quotes for used 303X machines, gathered Oct. 31 by the New York-based *Computer and Communications Buyer* newsletter, had the 3031 and 3033 wholesaling at approximately 60% of IBM list and retailing at 80%. But the 3032 came in at 60% wholesale and 70% retail.

Amdahl Corp. seemed ready for the announcement: four days after the IBM announcement, it announced a new machine, the 470V/7B, and price reductions on existing processors and memory. The V/7B is said to have 60% to 65% the performance of a V/7. In its minimum configuration with 4MB and eight channels, the V/7B sells for $1,450,000. Memory prices dropped from $70,000 per megabyte to $50,000.

IBM specs its 3033N at 1.3 to 1.8 times the performance of a 3032. Offered in either four or eight megabyte versions, the 3033N sells for $1,800,000 (4MB, six channels) or $2,365,000 (8MB, 12 channels); both prices include 3036 console and 3037 power/cooling units. Four-year lease rates are $55,000 per month and $75,690 per month respectively. Deliveries are to begin next quarter.

—Bill Musgrave

COMPANIES

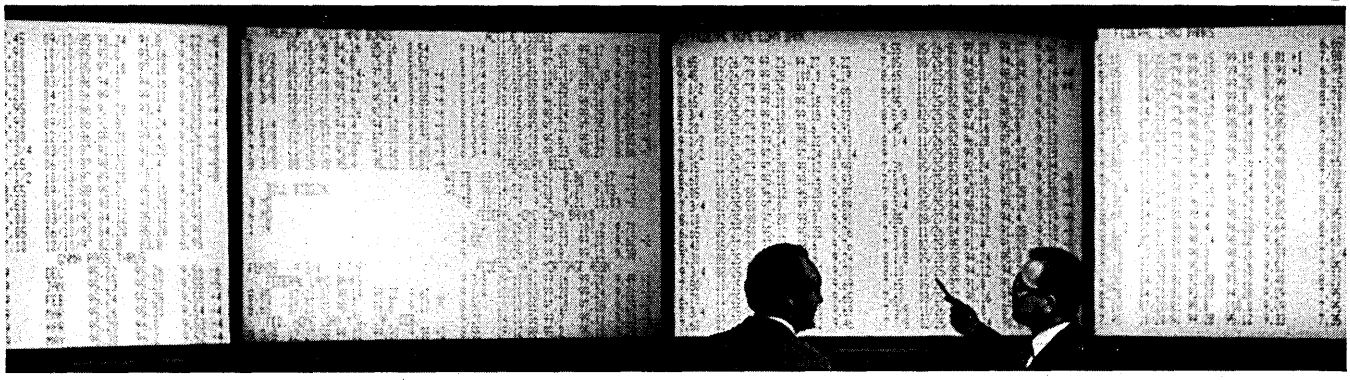
STABILITY IS THE THING

Microdata chairman sees his company's acquisition by McDonnell Douglas as a chance to plan without worry.

"We now have the financial stability to make longer term plans," said Don Fuller, chairman and chief executive officer of Microdata Corp., Irvine, Calif. small business systems producer, of his firm's acquisition by McDonnell Douglas Corp. (November, p. 76).

Fuller said Microdata has been experiencing a "51% compounded growth rate over the last five years," and allowed as how it would be hard to sustain that rate but he believes "McDonnell Douglas bought a growth company with a strong management team, a core company under whose umbrella they could bring in other compatible acquisitions."

When the last of Microdata's untendered stock is purchased by McDonnell Douglas (approximately 7% of 1,630,707 shares outstanding) at $32 per share, the St. Louis-based conglomerate, will have paid some $73 million for the



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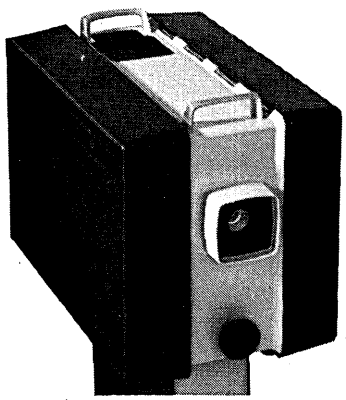

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CIRCLE 47 ON READER CARD

You got the

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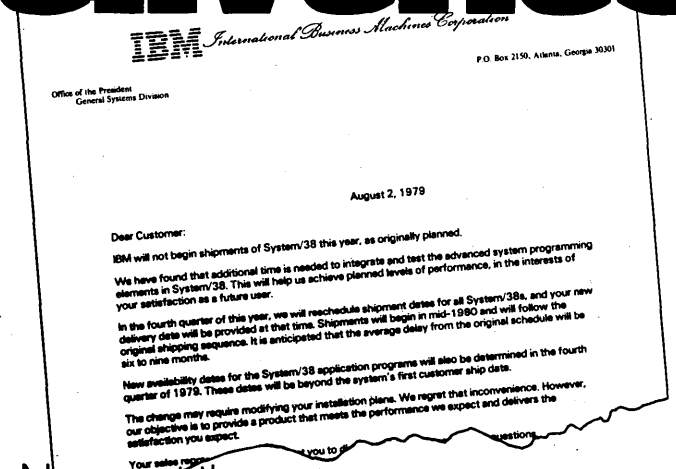

IBM International Business Machines Corporation

P.O. Box 2150, Atlanta, Georgia 30301

Office of the President
General Systems Division

August 2, 1979

Dear Customer:

IBM will not begin shipments of System/38 this year, as originally planned.

We have found that additional time is needed to integrate and test the advanced system programming elements in System/38. This will help us achieve planned levels of performance, in the interests of your satisfaction as a future user.

In the fourth quarter of this year, we will reschedule shipment dates for all System/38s, and your new delivery date will be provided at that time. Shipments will begin in mid-1980 and will follow the original shipping sequence. It is anticipated that the average delay from the original schedule will be six to nine months.

New availability dates for the System/38 application programs will also be determined in the fourth quarter of 1979. These dates will be beyond the system's first customer ship date.

The change may require modifying your installation plans. We regret that inconvenience. However, our objective is to provide a product that meets the performance we expect and delivers the satisfaction you expect.

Your sales rep... you to d... questions.

Now get the

good news from Wang.

The bad news.

Take a good look at that letter. IBM told thousands of would-be System 38 owners that they were just going to have to wait until next year...at the earliest. That leaves thousands of businesses with outmoded, overcrowded systems. But IBM says these people are just going to have to make do until a System 38 becomes available.

The good news.

Wang's VS virtual storage computer is available *NOW*. Not a year from now. So you can start solving today's problems today. And with Wang's field-proven RPG II conversion programs you won't sacrifice the programs you've spent years perfecting.

The VS accepts your present RPG programs like a System 3. Along with COBOL and BASIC. Yet it delivers the interactivity, ease-of-use and programmer productivity no other system can match...including the System 38.

But Wang's VS is more than just an alternative to a System 38. It's better. The VS grows incrementally as your needs grow. Without swapping out peripherals or rewriting programs. In fact, by the time System 38's start arriving, you could have grown all the way up to a VS 100 supporting up to 128 users with two megabytes main memory, 4.6 billion bytes storage, and a full complement of communications, peripherals, Data Base Management software...even word processing. Not even their 4341 can match that.

Perhaps the best news of all, you can buy a Wang VS today for less than a System 38 will cost you next year.

Want more good news?

Just fill out the coupon and mail it to Wang Laboratories, Inc., One Industrial Ave., Lowell, MA 01851, (617) 851-4111, and we'll send you the full story on Wang's VS. It may be the best news to come across your desk in some time.

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WANG

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Orange County company.

Fuller, together with members of his family, was the largest among some 2,200 shareholders. He estimated his share holdings at about 100,000.

He said Microdata will be run as an autonomous operation reporting to a board of directors consisting of himself, Don Graham, Microdata president, and four people from McDonnell Douglas: John McDonnell; Bill Orthwein, president of McDonnell Douglas Automation Co. (MCAUTO); Jerry Brown, treasurer of McDonnell Douglas; and Leo Merrowitz, vice president, McDonnell Douglas for corporate development.

Fuller said the acquisition would not change Microdata's direction but will "allow us to plan ahead without worrying about unexpected economic bubbles changing our plans." He believes most minicomputer companies of Microdata's size will have to merge if they want to grow. "There's no other way to get capital."

He feels there will be a "slow but inevitable meshing" of Microdata's operation with those of MCAUTO (a services operation), consistent with a trend among services companies to combine their offerings with on-site hardware offerings.

"It won't happen right away because most of MCAUTO's customer base is made up of large companies who need to be served by large machines." He said MCAUTO is big in health services and sees that area as a prospect for Microdata's Reality small business systems.

He doesn't see Microdata getting into the microprocessor-based small business systems field. "Those are going to have to be sold on a retail basis. All systems under $30,000 are eventually going to have to be sold retail."

Fuller doesn't want to get Microdata in the retail business. He hopes to keep their system at the $30,000 range and "move price performance down a lot."

He said Microdata will continue to sell Reality systems through a dealer network now made up of 22, although he admits the company has had problems in this area. "They (the dealers) are chronically undercapitalized." He said Microdata was forced to take over a New Jersey dealership and turn it into a direct sales office because "they owed us more than $3 million what with accounts payable and a $500,000 note and there was no way they could pay it back."

"All systems under $30,000 are eventually going to have to be sold retail."

—E.M.

Put a supercharger on your terminals.

Introducing the AJ 460 Micro Diskette System. It can give your printer terminals a real boost.

Not only in timesharing, data entry, and communications, but also in a variety of off-line uses such as text editing, letter writing, forms preparation, and data search/sort.

The AJ 460 has many outstanding features—including 204K-byte capacity on each floppy diskette. But one feature in particular—split-speed transmission—is exceptional.

It gives you separate and independent ports for connecting a terminal and a modem. Each port has switch-selectable data rates up to 9600 bps, full duplex.

You can always transmit and receive at the maximum speed of your modem, regardless of the speed of your terminal.

On-line, you can reduce line charges and computer connect time. And off-line, you can have a reliable data storage device with random access and editing capability.

Call your nearest AJ office for details. Or write Anderson Jacobson, Inc., 521 Charcot Avenue, San Jose, California 95131, (408) 263-8520. Also available through AJ subsidiaries in Ottawa, Ontario, Canada; Paris, France; Shepperton, Middlesex, UK; and distributors throughout Europe.

ANDERSON JACOBSON

CIRCLE 49 ON READER CARD

CAN'T TAKE MOHAMMED

For Control Data shareholders who can't attend annual meetings, the company takes meetings to them.

Many large companies move their annual shareholders meetings around the country to reach shareholders in different regions.

Control Data Corp. doesn't. Its annual meetings are always held in Minneapolis. It reaches shareholders in other regions in another way, a way which many CDC shareholders think is better.

Control Data holds regional shareholder meetings and they're not just meetings. Each one begins with a reception which includes cocktails, hors d'oeuvres, displays of Control Data equipment and strategically placed tv sets showing slide presentations about the company.

Then comes a sit-down dinner. At one in Los Angeles this featured a strolling violinist, playing requests. The piece de resistance, after dinner, is a presentation by a locally based member of the CDC board of directors and Benjamin Kilgore, vice president of investor relations.

Last come the questions. Not everyone stays for this part but there are

EXPLANATION FOR SHAREHOLDERS—Benjamin Kilgore, vice president of investor relations (left) explains Control Data's Plato education system to shareholders Nannette Jacobson and Bob J. Reyer during a shareholders meeting at the Hyatt Regency, Los Angeles.

always questions.

Seven regional shareholders meetings have been held this year, in Miami, Baltimore, Washington, D.C., Pittsburgh, Lima, O., San Diego and Los Angeles.

The director who participated in the Los Angeles meeting was Joseph Walsh, executive vice president of Rohr Industries.

Questions in Los Angeles ran the gamut, from the age of CDC president William Norris (answer, 67) to the effects of IBM's 4300 announcement on the company. Kilgore's answer to the latter was: "There have been some effects on selected parts of our product line, but by and large, none."

One shareholder complained about the lack of photographs in the annual report and was thanked for his input.

Everyone left if not happy, at least well fed. **—E.M.**

MICROCOMPUTERS

DINOSAUR COULD WINK AT YOU

Cal Poly students put finishing touches to microcomputer-based Rose Parade float.

If you join the 125 million viewers for the 1980 Tournament of Roses Parade on New Year's Day, take a close look at the float from the Cal Poly universities of Pomona and San Luis Obispo, Calif.

Against a prehistoric volcano background, you'll see a 30 foot dinosaur, five cavemen and numerous other figures all operating under microcomputer control. The cavemen play musical instruments while the dinosaur taps its foot, moves its head and wags its tail in tempo. A butterfly flaps its wings, birds open their beaks and a baby dino emerges periodically from its shell.

The Cal Poly float, one of the most highly animated in the parade, was designed, constructed and financed by the Cal Poly students, supported by equipment donations from corporations in the U.S.

Beneath the flowering exterior resides a sophisticated control system with operators' panels that strongly resemble a "Star Wars" creation. The microcomputer is a Rockwell System 65 with 256K bytes of memory. For system design and development, the cpu is supported by a M-200 matrix printer donated by Dataproducts Corp. and dual 96K byte floppy disks from Pertec. During the parade, the animation programs reside in programmable read-only memory and also in bubble memory.

The float is huge—55 feet long, 16 feet high, 18 feet wide and weighs 19 tons. Structural elements range from 10-inch "I" beams to 0.25-inch rods for the fig-

Put an end to *power-related* computer problems

New ISOREG™ Computer Power Module isolates computer from voltage spikes, regulates voltages, and provides energy for riding through very brief power outages.

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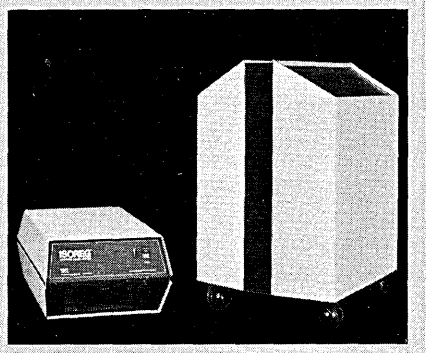
You can ensure *clean, stable* power for your computer with an ISOREG™ Computer Power Module. In a *single device,* ISOREG™ combines the benefits of super-isolation transformers and static voltage regulators.

ISOREG™ keeps voltages within ±½% even when line voltages deviate from nominal by +15% to −25%. If the line voltage shoots to 200% of nominal, the output voltage rises only 2% above normal. Even a 1000 Volt spike is filtered so that it is not even perceived by the computer.

The ISOREG™ Module provides reserve energy to ride through a fractional cycle power outage without a complete voltage collapse.

ISOREG™ Modules are rated from 250 VA to 25 kVA single phase, and 7.5 kVA to 75 kVA three-phase. Input and output voltage levels are selectable for 60 Hz or 50 Hz power systems in use around the world. Some ISOREG™ models can serve as step-down transformers as well.



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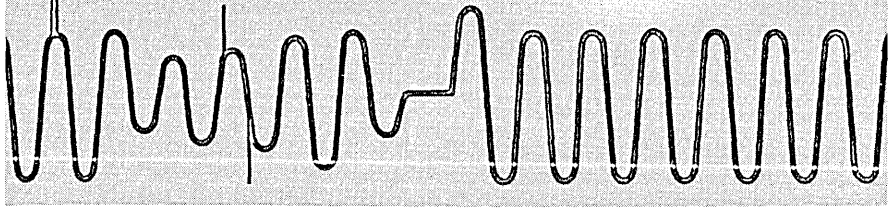
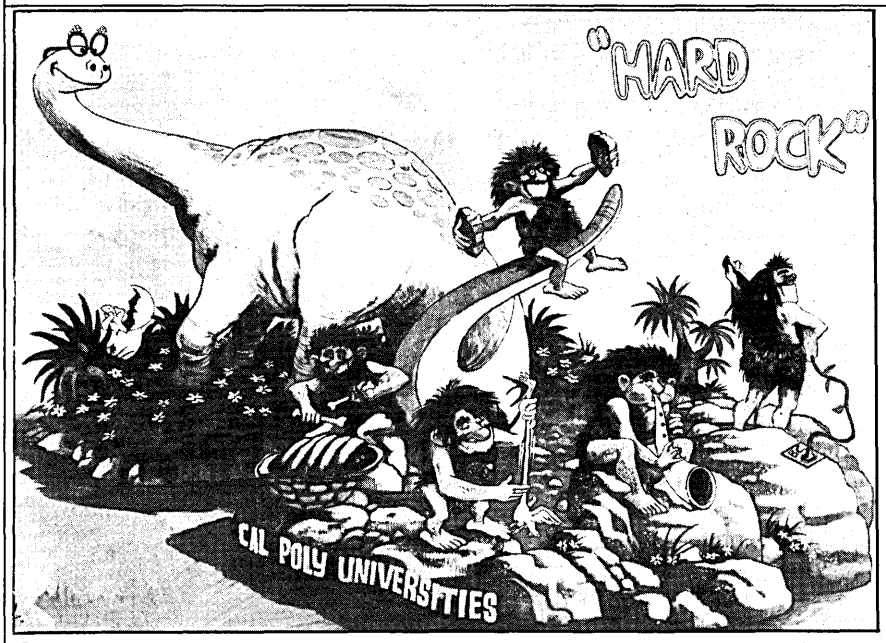


CIRCLE 50 ON READER CARD



CAL POLY Rose Parade float, as depicted in this artist's rendering, is 55 feet long, 18 feet wide and 16 feet high. It weighs 19 tons.

ures. Nearly 250,000 flowers are needed to decorate it.

Sixteen large hydraulic cylinders and 10 small electric motors provide the animation, all under microcomputer control. A Ford industrial engine, connected to dual hydraulic pumps and a generator, supplies motive and animation power.

Cal Poly universities have won awards in every one of the 31 years they've entered the Rose Parade, with major "Banner Awards" in 12 out of the last 14 years. "We highlight animals because the children relate to them" says Dale Wong, the Rose Parade float electronics chairman who's a graduate student at Cal Poly Pomona. "The parade is dedicated to children so we make our float as large as possible so it can be seen from a distance. We also implement highly-sophisticated animation routines to attract their attention. Not only are the cavemen and dinosaurs highly articulated but there also are various other animals that move, and, of course, the volcano smokes."

Applications programming for the Cal Poly float starts in June, using assembly and BASIC, and is completed in October when the programs are debugged on the System 65 in the Cal Poly Float Laboratory. The Dataproducts printer supplies alphanumeric listings as well as providing graphic output. The M-200 is a 340cps dot-matrix printer with graphics capability.

"The graphical printouts allow analysis of animation movements," notes Wong. "For example, the dinosaur's head is moving in several planes so we have to simulate the animation step by step. All of the major figures are under closed-servo control so we must examine movement rate and limit functions to produce life-like actions. Any music is generated on board the float so all figure movements must be coordinated for proper

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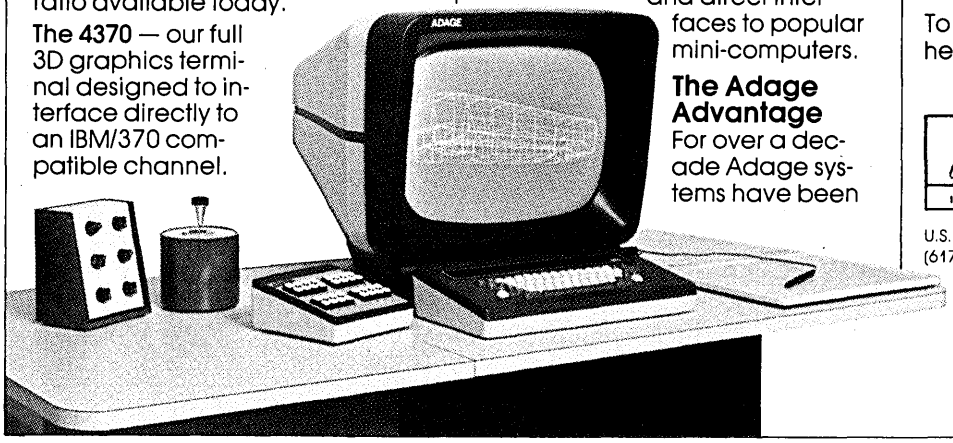

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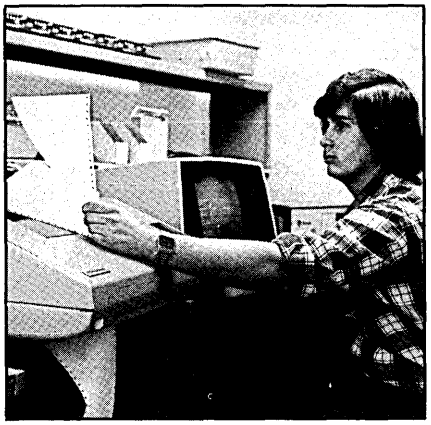
syncopation.

"We then plot the movements and place them on cards so we can riffle through them and see the action," he continued. "The programs are large, requiring about 36K words of RAM and 32K words of PROM. During program debugging, the system defaults to the printer when errors occur and it lists them and their location."

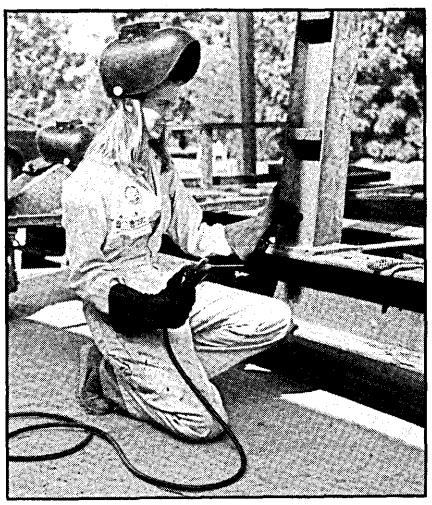
When school reconvenes in the fall, actual float construction begins and continues through the Christmas holidays. As the float takes shape, the computer system is installed along with six control panels designed and built by the student committees. The panels give the status of microcomputer systems, visual verification of controlled animation actions, analog indication of major figure movements as well as operation of hydraulic and electrical power systems.

Microcomputer is the Rockwell System 65 with 256K bytes of memory.

During an extensive checkout procedure, each subroutine is loaded from diskette, verified visually from figure actions and printed or plotted on the M-200.



DALE WONG examines animation program listing for float, using a microcomputer, a printer and dual floppy disks.



CAL POLY rose float committee secretary Shirley Beard examines weld on 19-ton basic structure of float.

Upon checkout completion, the routines are installed in bubble memory, RAM or PROM. The animation programs may run either from bubble memory or PROM's for redundancy. "We don't want to take a chance on failure during the judging and parade," Wong says. "There is also manual backup operation."

During the final stages, the float is covered by spraying on a plastic latex material which is painted to match the flower colors. "The flowers are picked from Dec. 23 through Dec. 26 and attached with high nutrient glue," explains Wong. "With some watering, the flowers will stay fresh for up to two weeks."

"We plan to have a flower in the dinosaur's mouth so he can present it to the judges."

Late on New Year's Eve the float is moved to the parade line-up area—where a final checkout is made and the printer and floppy drive are removed to protect

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them from vibration damage. A final judging takes place in the early morning hours of Jan. 1. "We plan to have a flower in the dinosaur's mouth so he can present it to the judges when they come by," Wong smiles.

During the parade, five students operate the float—a driver, an assistant driver, the computer operator, the electronic systems operator and one observer. The other Cal Poly students who have been working on the float join about three million others along the Colorado Blvd. parade route.

So on New Year's Day watch for the Cal Poly float. The dinosaur may wink at you as he goes by.

—T.M.

PERIPHERALS

ACQUIRED BUT NOT INVISIBLE

Under Xerox, Century Data Systems regained its original name, new employees and new products.

Century Data Systems was launched as a company in 1968 in Anaheim, Calif.

It put California Computer Products Corp. into the IBM plug-compatible tape and disk memories market when it was acquired by CalComp in 1973 (August, p. 56). Now it's part of Xerox Corp.

And as such it has been growing. What Xerox bought from CalComp in late 1978 was its Oem Products Div. which the copier giant promptly renamed Century Data Systems. The acquired CalComp Div. had 750 people. Xerox's Century Data Systems has more than 1,000.

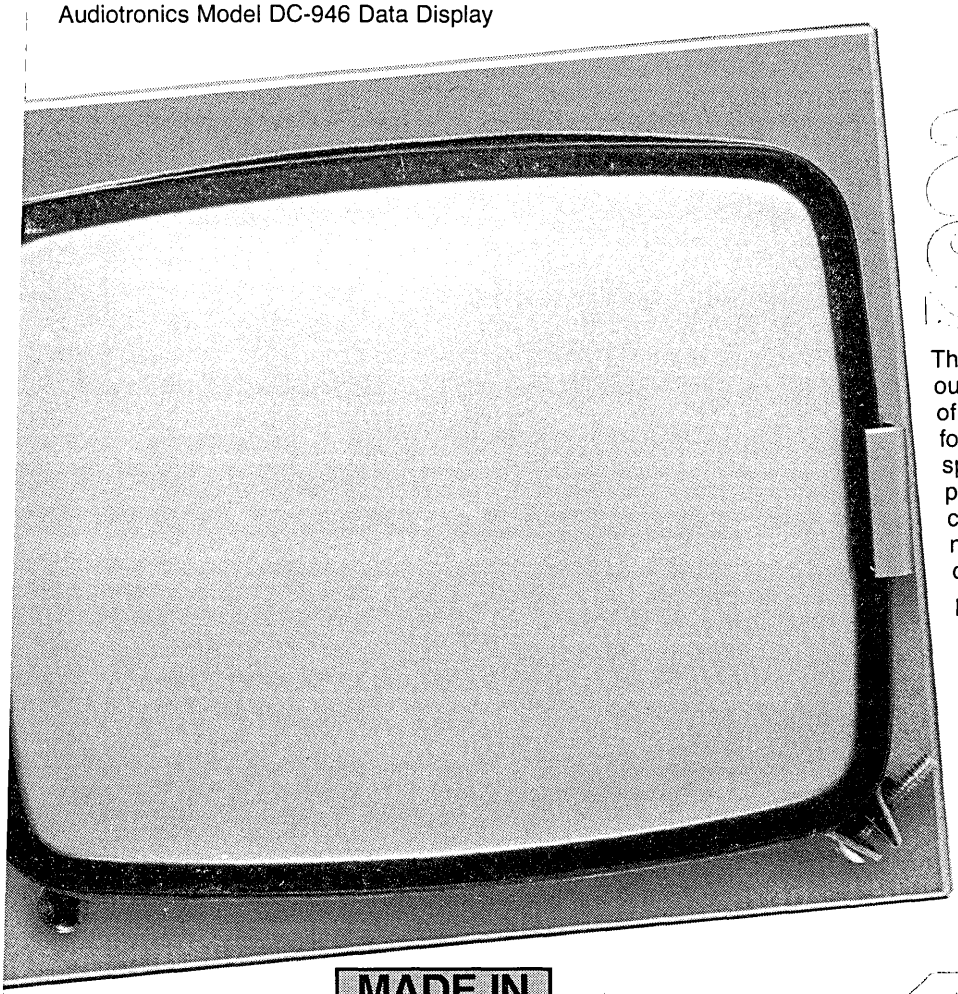
It has introduced four new products with more on the drawing boards and is particularly happy with reception of its Intelligent Marksman disk subsystem which it says is based on the company's Marksman disk drive and a storage system interface. The company claims it "makes it easy to put Winchester technology on-line, easily and fast."

And the Century operation has taken on new responsibilities as a result of the Xerox acquisition which has put it firmly in the Xerox family. Last month Xerox announced it had transferred marketing responsibility for disk memory products manufactured in northern California by its Diablo Systems, Inc., from Diablo to Century.

John V. Titsworth, Xerox corporate group vice president and president of the Information Products Group, said the transfer "will give both Diablo and Century Data Systems customers a single source for disk products that meet their full range of requirements, from small business systems up to large information processing systems. The change also will allow Diablo, which introduced the daisywheel printer, to concentrate on development of printing products."

Jim Conway, who became Century Data Systems president in late summer, said the combination was a natural

Audiotronics Model DC-946 Data Display



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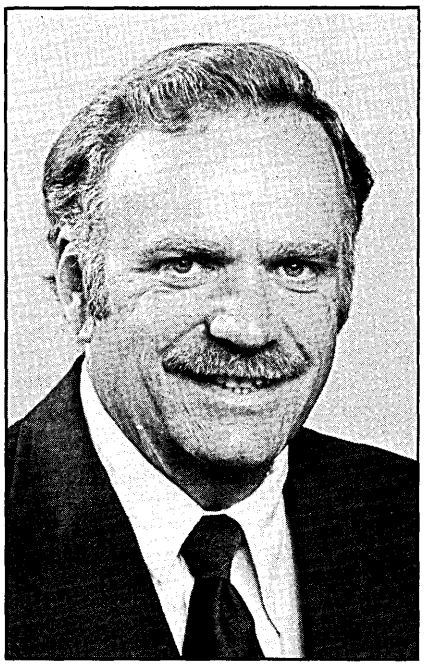
one. "We're calling on the same customers. We'll be taking over sales, service and marketing for their (Diablo's) disk drive operation and will be coordinating forecasting volumes." He said a natural upward evolution for users of Diablo disk products would be to Century products.

Xerox said the combined product line now offered by Century Data will provide disk storage capacities from 2.5 million to more than 600 million bytes of information and includes fixed disk drives, drives for cartridge disks and multiple disk packs which are removable, and combination units.

Conway, who joined Century as president to replace James Y. Payton who had been vice president and general manager of the operation when it was a CalComp division, is a longtime Xerox employee and has himself experienced being acquired. He joined Scientific Data Systems in 1965 and was acquired with it by Xerox in 1969. His most recent job at Xerox was vice president, development, Xerox Business Systems.

Before joining SDS, Conway was with General Precision's Librascope unit in the systems area and with Bunker Ramo. He feels an asset he brings to Century Data is "I've been on the other side of the table. I know how to give a hard time in the oem buying business (Century is in the oem selling business)." He believes he brings to the business "a systems approach which is what the user needs."



JIM CONWAY—He knows what it's like to be acquired.

His and his co-workers' belief in the Intelligent Marksman were echoed by at least two users last month.

The drive plus interface was introduced by Century last June. "Data integrity in the new disk subsystem," its announcement read, "is assured by utilizing Winchester style heads and media, a sealed contamination controlled disk chamber and CRC error control on all data. The storage system interface is a straightforward byte parallel, TTL connection that significantly reduces the cost of the cpu interface adapter."

Bob Reese, Intelligent Business Machines, a Fresno, Calif. oem customer of Century, has had evaluation units for from four to six weeks. He said they were able to get the units on-line and running smoothly within a couple of weeks. "I expected more than that. I think when you take delivery of raw hardware and get it running right in less than a month, it's great. And we didn't give this a major priority so it could have taken less time."

Ken Allen, president of Micro V, an Irvine, Calif., small business systems firm, said getting the Intelligent Marksman units his firm is using up and going "took very little effort," and was accomplished "in a day or so." His firm took delivery of its first unit last spring and "we've had no disk transfer error yet."

Allen's decision to go with the Intelligent Marksman may bode well for the

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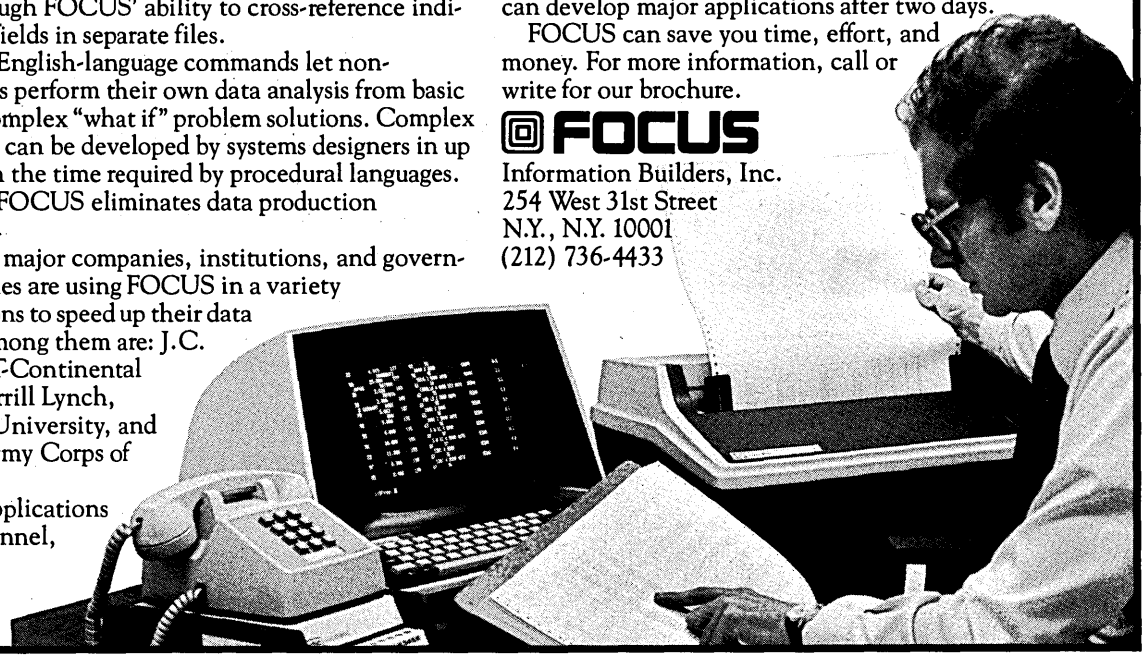

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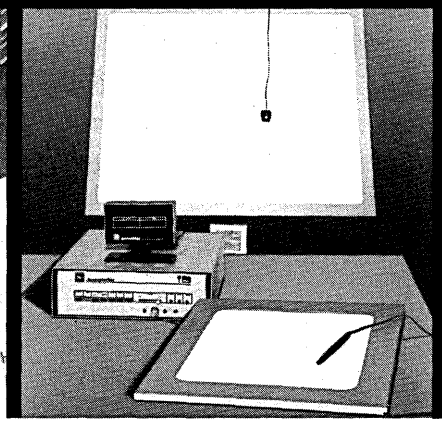

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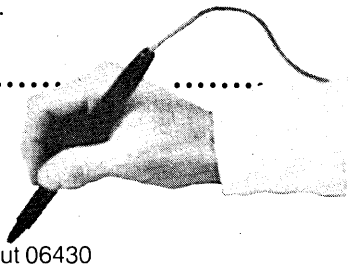

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Xerox acquisition of Century Data. He said he liked the hardware compared to alternative decisions but a factor in going with it was "the Xerox name."

But then he isn't buying general purpose computers. —Edith Myers

VOICE RECOGNITION

EARS FOR THE OEM MARKET

Interstate Electronics introduces low cost voice recognition module; others see voice response as a here and now technology.

"We're putting ears on computers," proclaimed Interstate Electronics Corp. last month in announcing an oem plug-in voice recognition module it plans to sell for less than $1,500 in oem quantities.

They're not the only ones trying to do this. The field is crowding and the vendors are all striving for things like speaker independence, greater vocabulary recognition, continuous speech and lower cost.

Interstate may have come through with the lowest cost to date. The company said in mid-November it would be filling oem orders "in 60 days" for its single-board voice recognition module.

It described the device as a microprocessor-based module for adding voice input technology to intelligent terminals, small business systems, machine controllers and other computer products.

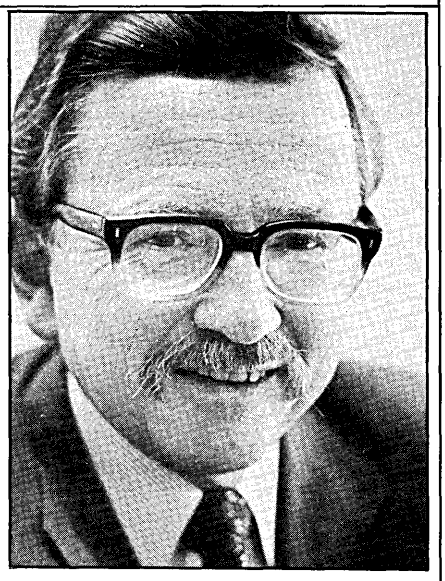
All the logic and input-output interfacing necessary to convert the spoken words into computer codes are contained on a single circuit board, the company said.

It is a discrete word, speaker dependent device which provides accuracies of better than 99% "regardless of dialect, accent or language." Its communications protocol is compatible with high-level software languages including FORTRAN, BASIC and Pascal.

Supporting the module, which it calls VRM (voice recognition module), Interstate introduced an emulator package which, it said, provides a designer with a valuable tool for software development and vocabulary recognition.

The VRM is not Interstate's first voice recognition product. The company in April 1978 introduced a voice operated intelligent terminal.

Interstate got into voice data entry when it hired a speech recognition research group from McDonnell Douglas and combined it with a product developed by and acquired from a small Reston, Va., firm, Scope Inc.



GEORGE GLASER—Some day, speech understanding.

At the Los Angeles introduction, Don Kirsch, Interstate's vice president of marketing, said market expectations are

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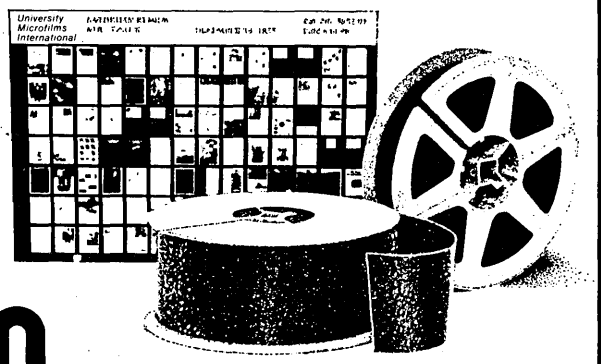

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unmeasurable "because there are so many applications that are not obvious right now."

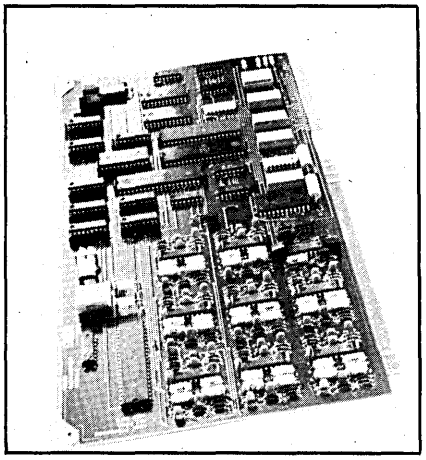
At a November meeting of the Los Angeles chapter of the Association for Computing Machinery (ACM), George Glaser, president of Centigram Corp., Sunnyvale, Calif., producer of a microprocessor-based voice recognition system called MIKE, talked about applications both existing and potential.

"There are so many applications that are not obvious right now."

He listed applications in office automation; banking for funds transfer, pay by phone and credit authorization; manufacturing for quality control, process control and numerically controlled machine tools; warehousing/distribution in order entry, inventory control, shipping/receiving and package sorting; and medical in clinical labs.

A bit down the road, because "costs are too high as yet," Glaser sees applications for consumers in toys, automotive equipment, environmental controls, entertainment supplies and dialless telephones.

At the Interstate introduction, a company spokesman responding to a question on consumer applications noted that Interstate's demonstrations were conducted using an Apple computer. "Computers like the Apple and Radio Shack's TRS-80 are being sold to consumers. If they want to buy our oem board and use it in applications, well . . ."



"EARS" FOR LESS THAN $1,500—Interstate's plug-in oem voice recognizer.

For the short term future in voice recognition Glaser looks for larger vocabularies and input via telephone. For the long term he sees speaker independence becoming more general along with ability to recognize continuous speech and, some 20 years away, speech understanding including grammar and syntax.

Recognition of continuous speech is coming.

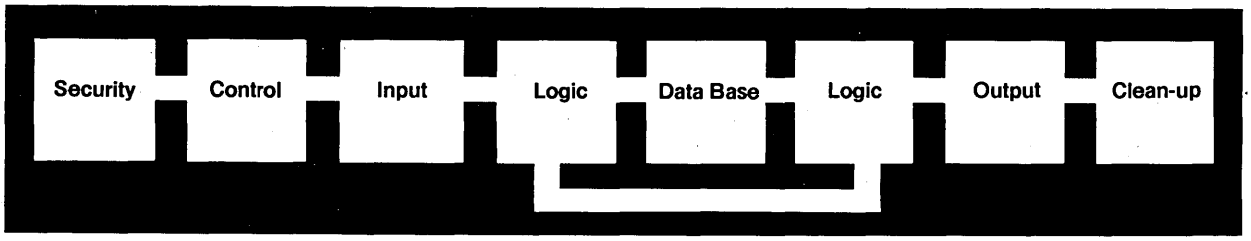
Glaser said pauses between words required today is typically 10 seconds. He said much work is being done in laboratories but the only commercial device he's seen that can recognize continuous speech is a device made by Nippon Electric.

Kirsch of Interstate noted that Japan has been a receptive market for voice recognition systems because of their large alphabet which makes necessary cumbersome keyboards.

Interstate opened its Los Angeles introduction of its VRM with a recording of the theme from Star Wars. Its intent; to show that while many see the notion of people talking to computers as futuristic, Interstate likes to think it's for here and now.

And so do others—companies like Glaser's Centigram, Logicon of Hawthorne, Calif.; Threshold Technology, Delran, N.J.; Exxon's Dialog Systems, Inc., Belmont, Mass. and, of course, Nippon Electric. —Edith Myers

Break It Down to See How It Stacks Up



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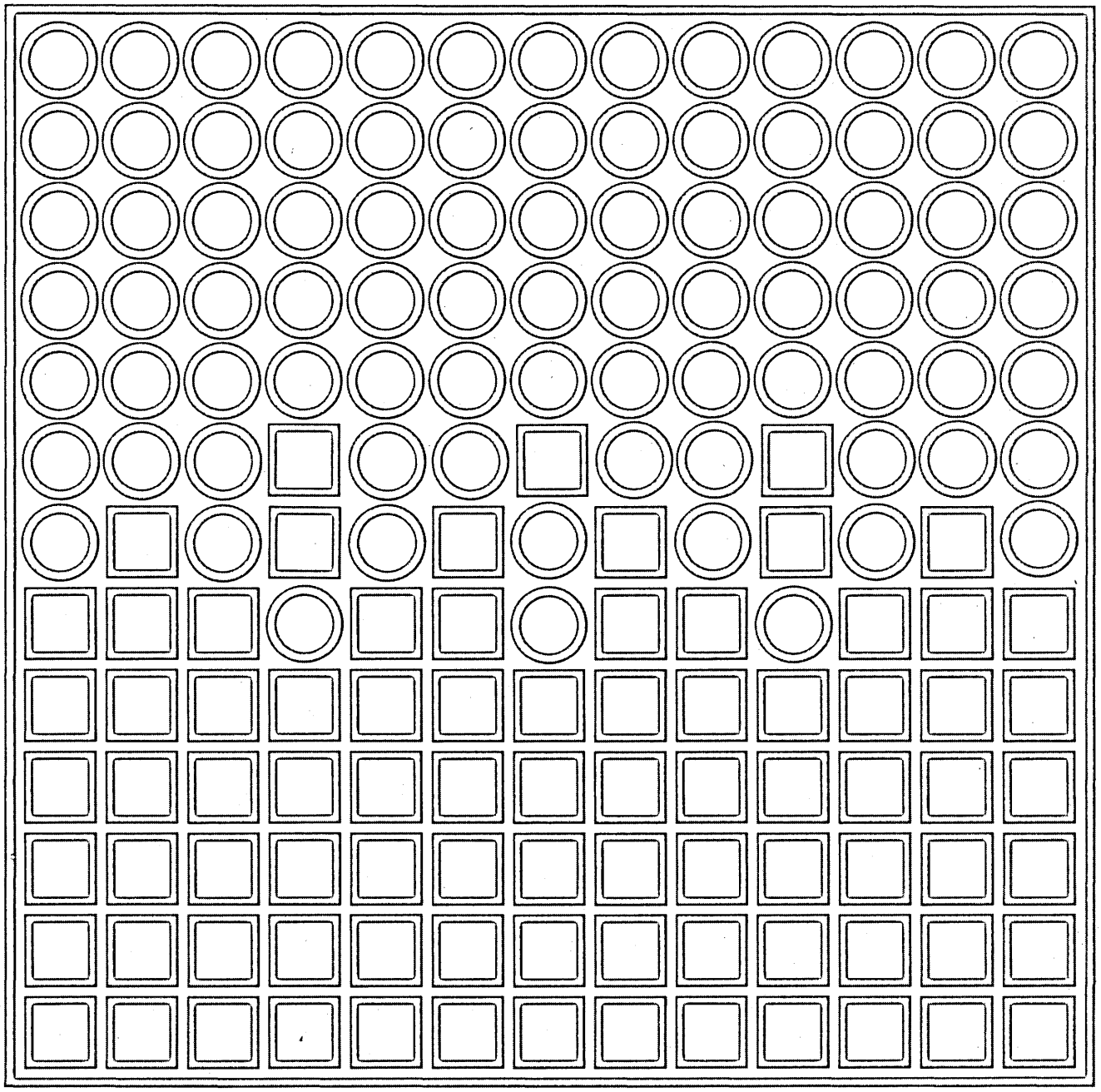

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CIRCLE 60 ON READER CARD

MEETINGS

FEDERAL DP ROLE RAPPED

But 8,500 who turned out for federal dp conference packed the sessions anyway.

Federal data processing officials were chastised for the way they practice data processing in conference sessions at the second Federal Computer Conference this fall in Washington. But the 8,500 who attended were warmly courted on the exhibit floor.

The turnout demonstrated a strong vote of confidence for a show whose debut last year attracted a bigger-than-expected crowd of 6,000.

"The few of us who travel to such events as the National Computer Conference each year do so with full knowledge that much of the expense is out-of-pocket," commented one government attendee. "Not only is this show affordable for all of us, but also every single session is specifically geared to our needs. Let's hope it's here to stay."

Vendors have that same hope. More than 100 exhibitors were on hand to display their wares, and there was seldom a minute when the exhibit aisles were empty. What's more, session rooms were packed, as federal dpers filed in to hear some 90 speakers espouse the ills of federal dp activities and to offer some possible remedies in "Preparing for the 1980s," the theme of the three-day conference.

The tone of the conference was set by Pete Jensen, who was responsible for producing the final report of the President's Reorganization Project on Federal EDP. He said, "Over 100 federal agencies that have been audited by General Accounting Office are said to be 'mismanaging' their computers."

Jensen added, though, that, "There are some instances of effective dp use in the government, but they are the exception rather than the rule."

The system makes it difficult for the government to keep pace with rapidly improving technology.

"It's no secret that, over the past 15 years, the federal government has fallen behind the private sector in the effective use of information processing," added John F. Akers, vice president and group executive of IBM's Data Processing Marketing Group. In a keynote luncheon address, Akers said one area that is particularly problem-proned is the process of acquisition.

The IBM executive said there are three main problems with the federal acquisition system. First, even with the need for public accountability, decision-making within today's system is often diffuse and imprecise. "There are too many control and review points," he contended. That system alone, Akers claimed, makes it difficult for the government to keep pace with rapidly improving technology.

The second drawback to the acquisition process, Akers said, is that the "focus on acquisition cost tends to result in the government requesting, and industry providing, the lowest common denominator solution, rather than the optimum solution." He urged federal dpers to evaluate total life cycle costs and benefits rather than mere acquisition cost-savings over the short-term.

As the third woe in the process Akers cited certain constraints imposed on the government that the private sector is not bound by, among them the continual effort to reduce the federal deficit, stringent laws and regulations governing such areas as privacy and security, and a commitment to promoting competition in

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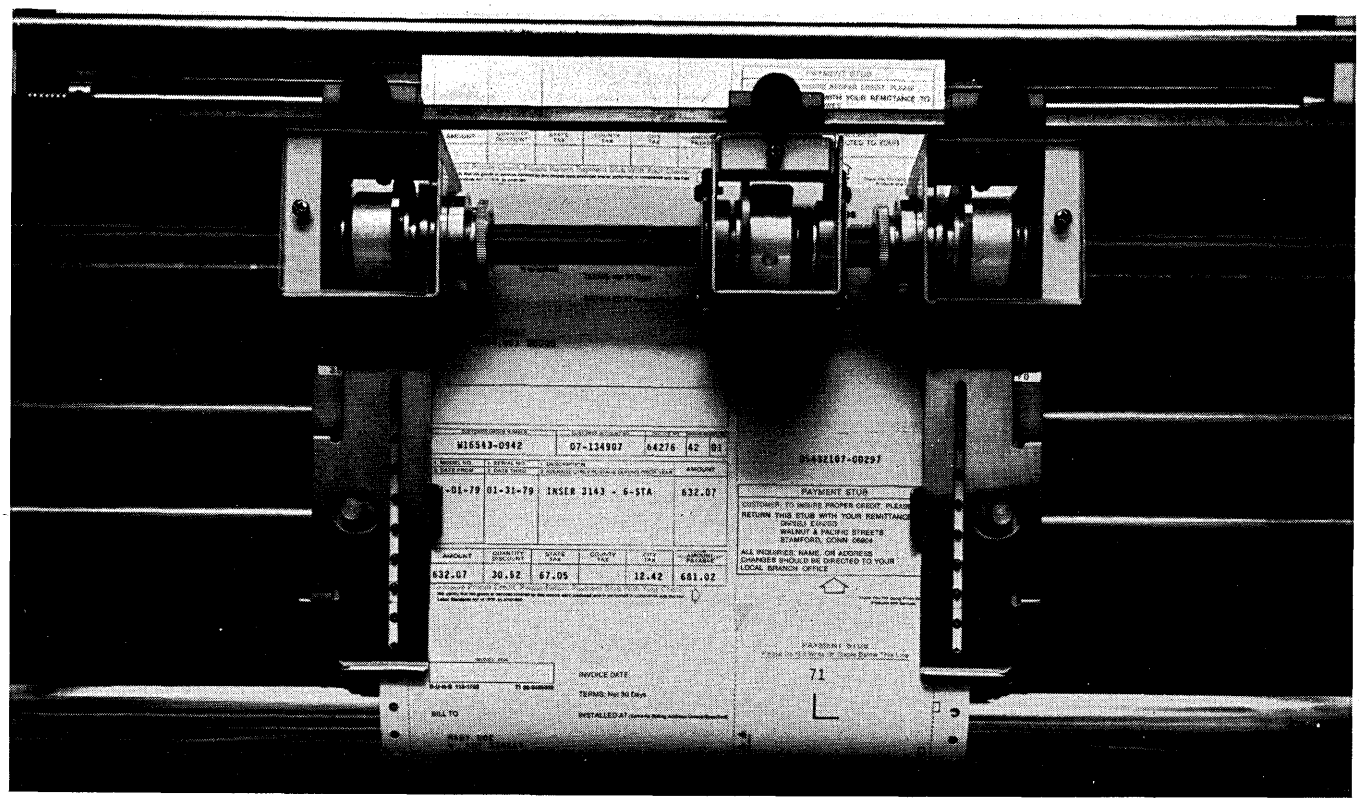

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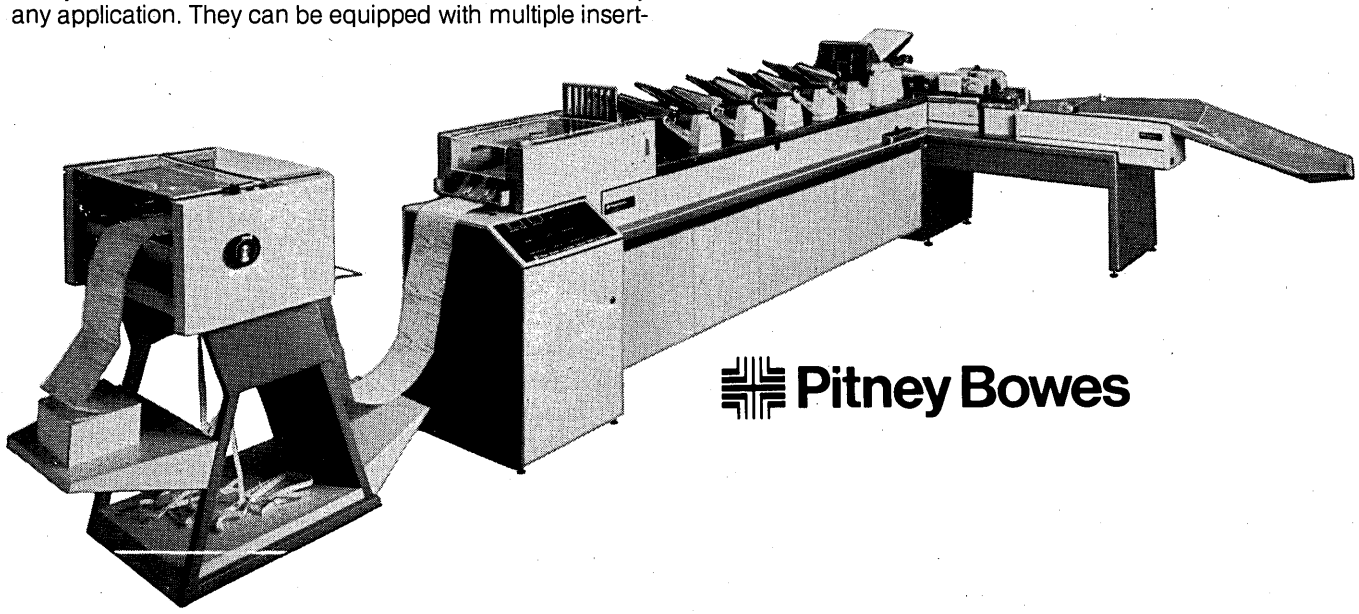

Pitney Bowes

FEDERAL COMPUTER CONFERENCE drew 8,500 in Washington to view products of 100 exhibitors and hear 90 speakers.

the acquisition process.

Despite the constraints and compromises inherent in the federal dp environment, Akers said, the simple truth remains: "The government must be able to take timely advantage of the best industry has to offer. And that's just not happening often enough."

Another speaker from the private sector, this one a user rather than a vendor, pointed out that there are no models in private industry that could serve as a roadmap for federal dpers. In a session on organizational structures, John L. Jones, vice president of management information services at Southern Railway Co., stated, "Every organization is unique; as for the federal government, there is no other organization that even closely resembles it." Because there are "no pat solutions, even in one company," Jones contended, computer technology must be embraced on a trial-and-error basis. The major hindrance in federal dp use, he added, is the government's fear of trying.

Another reason the government cannot simulate successful dp operations in the private sector, Jones said, is its competition mandate. "Once we (at Southern Railway) decided on Data General as a supplier of minicomputers, I decided any mini was great as long as it was from Data General," he explained. "In the government, such a practice is a 'no-no' known as 'sole-sourcing.' Unlike you, I'm not measured on how fair and honest I am (to the suppliers), but on how effective I am."

"Perhaps the biggest problem in the government," Jones ventured, "is the fact that top-level officials do not look at the computer as a tool they use or need." Without high-level understanding and support of the dp missions, the government cannot hope to improve its computer use in the '80s, he added. "If the government doesn't take positive actions toward that end now," he warned, "it will lose total control."

"Unlike you, I'm not measured on how fair and honest I am, but on how effective I am."

In an issues and answers session, John LeGates, president of Harvard's Center for Information Policy Research, told federal employees that the very issues our country considers most critical today can be alleviated if the government gets its act together on managing information technology. "It is possible for data processing to substitute for some of our natural resources, such as capital goods and energy," LeGates claimed. "If we better manage our natural resources with the use of dp tools, we may need to build fewer new plants and buildings, we may need less raw energy, we may become a self-sufficient society."

The Harvard man added that stepped up use of information technology will not put people out of jobs. "Our experience shows that the more dp is used, the more people are needed to manage it." While the government still has a long way to go in better managing its technological resources, LeGates reminded federal dpers, "Without information, all is chaos. And with increased use of dp, our information can be better managed."

The challenge to the federal dp community was well summed up by Jack Biddle, president of the Computer & Communications Industry Association: "You people have a great awareness of the issues; you have the intelligence to sort out the options and arrive at reasonable decisions on what should be done. But you don't make your views known." According to Biddle, that deficiency results in decision-making by fiat.

To illustrate, the CCIA president pointed to the nine-year-old debate over adoption of a federal I/O channel level interface standard. "The federal government is ambiguous about standards. The mainframers say a bundled system is the solution, and they are now in litigation to abolish the FIPS (Federal Information Processing Standards) program altogether. And still, the user community hasn't been heard from," Biddle blasted.

Calling on federal users to become more assertive, more vocal, Biddle added, "Whatever your opinion, it's a useless opinion if it's not heard."

—Becky Barna

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BENCHMARKS

CUTBACK AT NORTHERN TELECOM: Northern Telecom Systems Corp. terminated 60 people at its Business Communications group following the shift of that group's end-user PBX activities from Northern Telecom, Inc., Nashville, Tenn. to its Systems Corp. subsidiary in Minneapolis, made up of former Data 100 and Sycor personnel. As part of the reorganization, the company is moving the operations of Northern Telecom Systems Corp. to Dallas. The cutback reportedly was prompted by a soft profit picture for end-user PBX operators.

ITEL LOSSES: Itel Corp. last month was predicting third quarter losses of $175 million and was looking for a buyer for its plug-compatible computer business in South America, Japan, and Australia, something National Semiconductor reportedly did not want. When National took over the bulk of Itel's plug-compatible operation, Itel said it would continue the South America-Japan-Australia business, but now the firm said it is "talking to anyone interested in buying the rest of the computer business." The firm said its third quarter losses will include asset write-downs and loss reserves of about $150 million. The company lost $60.2 million in this year's second quarter.

IT'S TRIUMPH FOR PERTEC: Pertec Computer Corp. has agreed to be acquired by Triumph-Adler, West German computer and office machine manufacturer partially owned by Volkswagen. Ryal Poppa, Pertec president, said his company's management considered the Triumph-Adler offer, valued at some $117 million, "more favorable to the company and its stockholders than the previously announced agreement with North American Philips Corp. (September, p. 116). Philips had agreed to acquire 45% of Pertec's common stock for about $56.1 million. Triumph-Adler has agreed to pay $16.50 for each outstanding share of PCC common in an acquisition which will be accomplished through a cash tender offer by a U.S. subsidiary of Triumph-Adler, to be followed by a cash merger. The merger is expected to be completed in January.

REJECTIONS BY MEMOREX: Memorex Corp. last month had rejected merger proposals from both Amdahl Corp. (September, p. 86) and Storage Technology Corp. but had resumed negotiation with Amdahl with Memorex working for a better offer from the PCM manufacturer. Amdahl had proposed an exchange of 1.2 shares of its stock for each share of Memorex. That proposed deal was valued at $234 million. Storage Technology said it would make no further offers to Memorex. STC had first proposed an exchange of 1.6 shares of STC for each Memorex share, then came up to 1.75 shares, the latest offer rejected by Memorex.

TANDY AND DATAPOINT: Tandy Corp., Fort Worth, Texas, and Datapoint Corp., San Antonio, have agreed in principle to form a joint venture firm to manufacture 8 and 5¼ in. floppy disks. Tandy's Radio Shack Div. uses 5¼ in. floppies for its TRS-80 personal computer and 8 in. drives for its TRS-80 Model II small business computer. Current floppy sources for Radio Shack are Shugart Associates, Control Data and Tandon Magnetics. Datapoint, which uses 8 in. floppies on its dispersed processing and small business systems, has been manufacturing its own under license to Shugart. Location of the joint venture facility is undetermined but it has been decided it will be in Texas.

HARRIS ACQUISITION: Harris Corp., Melbourne, Fla., has agreed to acquire Farinon Corp., San Mateo producer of telecommunications installation and transmission equipment, in a stock exchange valued at $125 million. Under a preliminary agreement, Harris would issue eight-tenths of a share for each of the five million Farinon shares outstanding. Farinon's major product lines involve microwave radios and multiplexors but the firm also has competed against Harris in the receive-only earth station marketplace.

FOUR FROM SANDERS: Four representatives of Sanders Associates have taken seats as directors of California Computer Products, Inc. (CalComp) despite legal efforts of former CalComp president Lester Kilpatrick to stop them. Kilpatrick filed suit in Los Angeles Superior Court last Oct. 19 to stop the naming of the new directors and to enjoin the issuance to Sanders of 500,000 shares of CalComp preferred stock. The court denied Kilpatrick's suit on Oct. 30. Nov. 1, CalComp said it, with Sanders, had signed a definitive merger agreement and that Sanders had purchased the newly issued stock for $6,350,000 in cash and the cancellation of a $7,650,000 subordinated note sold by CalComp to Sanders earlier this year. CalComp directors who resigned Nov. 10 were Walter F. Bauer, president, Informatics, Inc.; Dr. George W. Brown, a university professor; Richard V. King, president of Delfi American Corp., and James W. Lewis, vice president, Paine, Weber, Jackson & Curtis, Inc. Remaining are George M. Canova, CalComp president; Harry G. Bowles, retired senior vice president, who also is a Sanders director; Albert G. Handschumacher, chairman emeritus, Aeronca, Inc.; Stuart A. Krieger, business consultant and Kilpatrick. From Sanders have come Jack L. Bowers, Sanders president; Henry F. Argento, a Sanders director and Sanders vice presidents Joel Kosheff and Albert B. Wight.

INTERFACE STANDARDS OPPOSED: Honeywell, Control Data, Burroughs and Sperry Univac filed simultaneous motions asking a federal court for a summary judgment to block implementation of federal I/O interface standards which they describe as arbitrary and capricious. The companies charge that the standards, if incorporated into the Federal Property Management Regulations, would cost the industry millions of dollars in both hardware and software modifications. If not blocked by a court order, the standards were to go into effect Dec. 13.

MICROS DOCUMENTARY: A documentary television special report on the use of microcomputers for elementary classroom instruction will be broadcast over the PBS network Jan. 6 at 6 p.m. Titled "Don't Bother Me, I'm Learning," the broadcast documents the growth of microcomputer use in schools and demonstrates from a child's perspective the far-reaching implications this has on society. It includes interviews with teachers, parents, consultants, university experts and computer research spokesmen. Major funding for the broadcast was provided by the Bell & Howell Corp. Local PBS affiliate listings can be checked for exact times.

SOFTWARE FOR SMALL BUSINESS: "The independent packaged software market for small business computers, running at a $241 million-a-year level currently, will increase to $700 million in 1988," said the New York market research firm, Frost & Sullivan, Inc. In a market report, "The U.S. Software Package Market Outlook in Small Business Computers," the company says software "is becoming the most essential part of a small business computer system and the only way to differentiate among similar hardware." It projects that more than one million software packages will be sold over the next ten years and that unit sales will increase from 60,000 packages this year to 65,000 in 1980 and 185,000 in 1988. ✲

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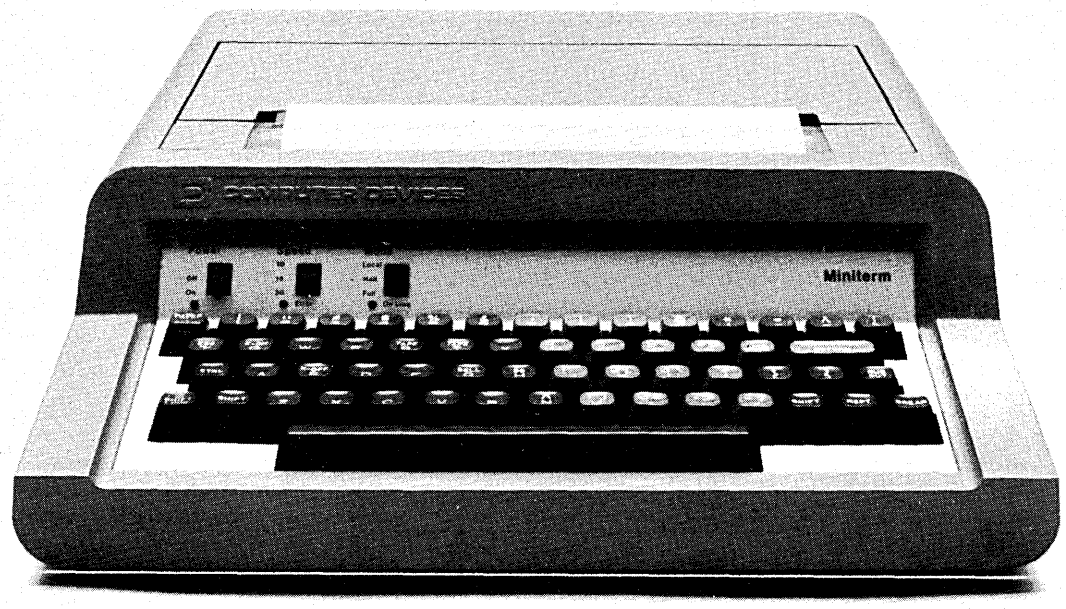

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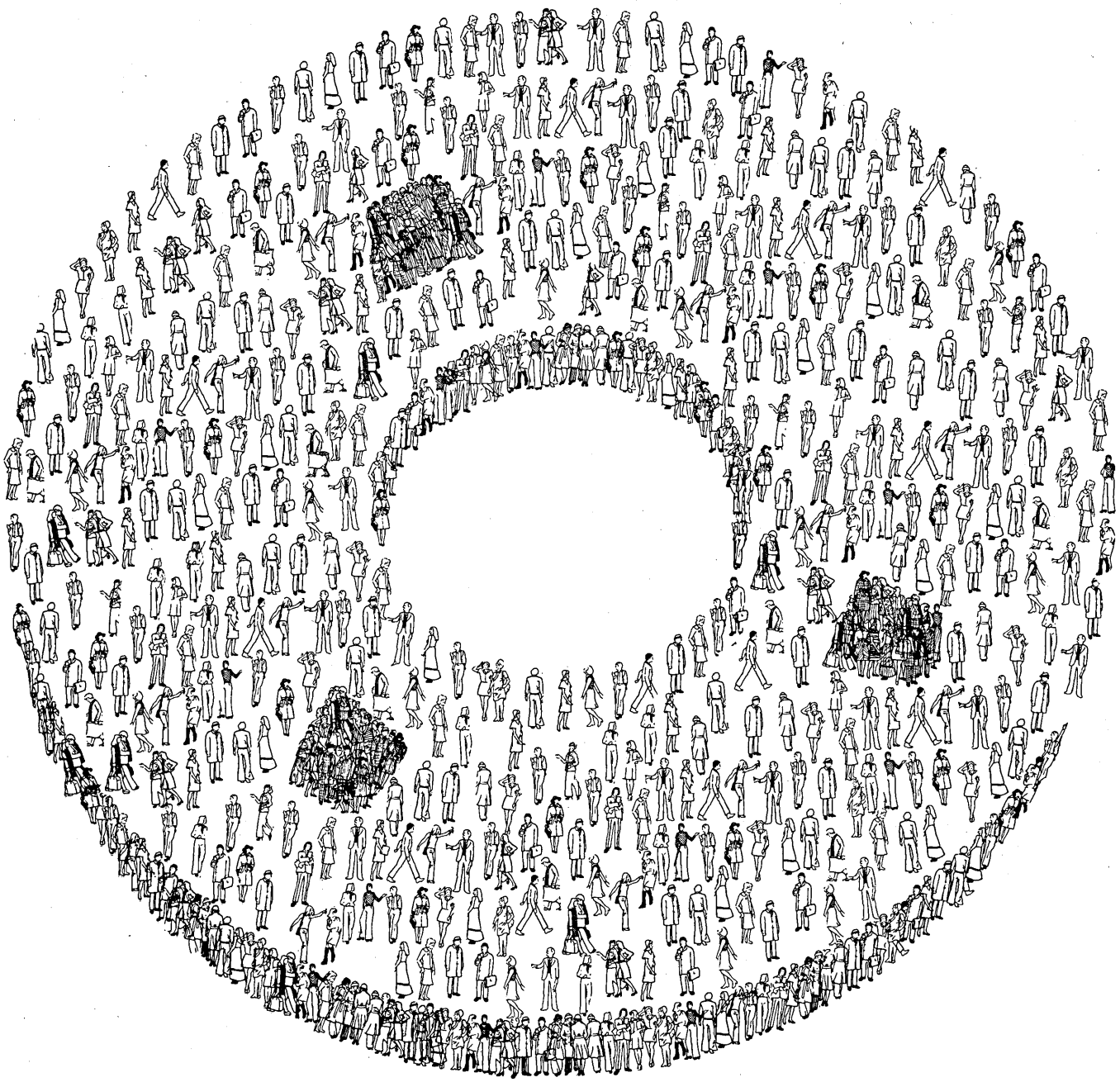

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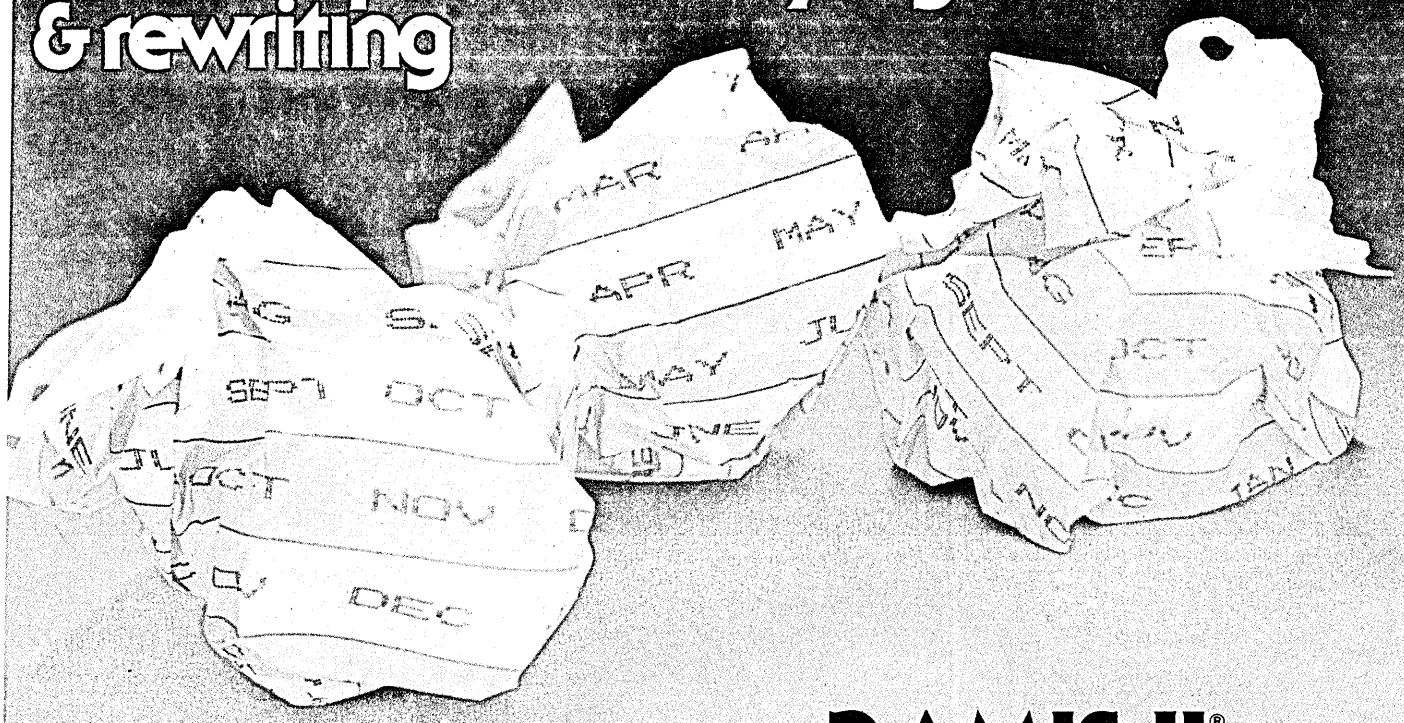

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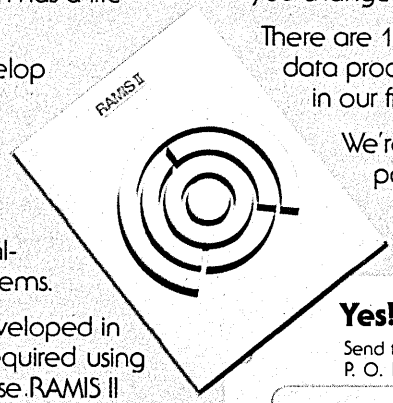

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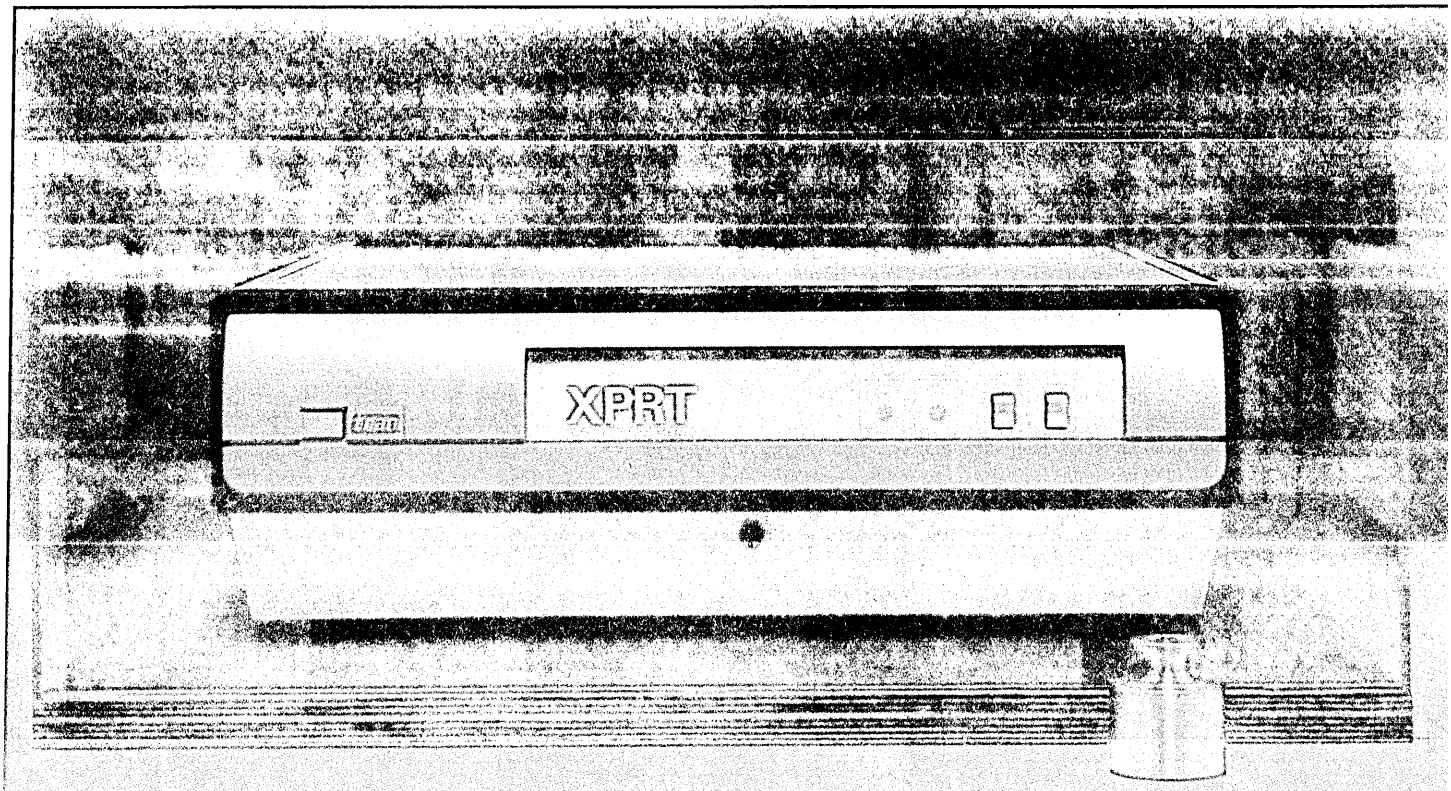

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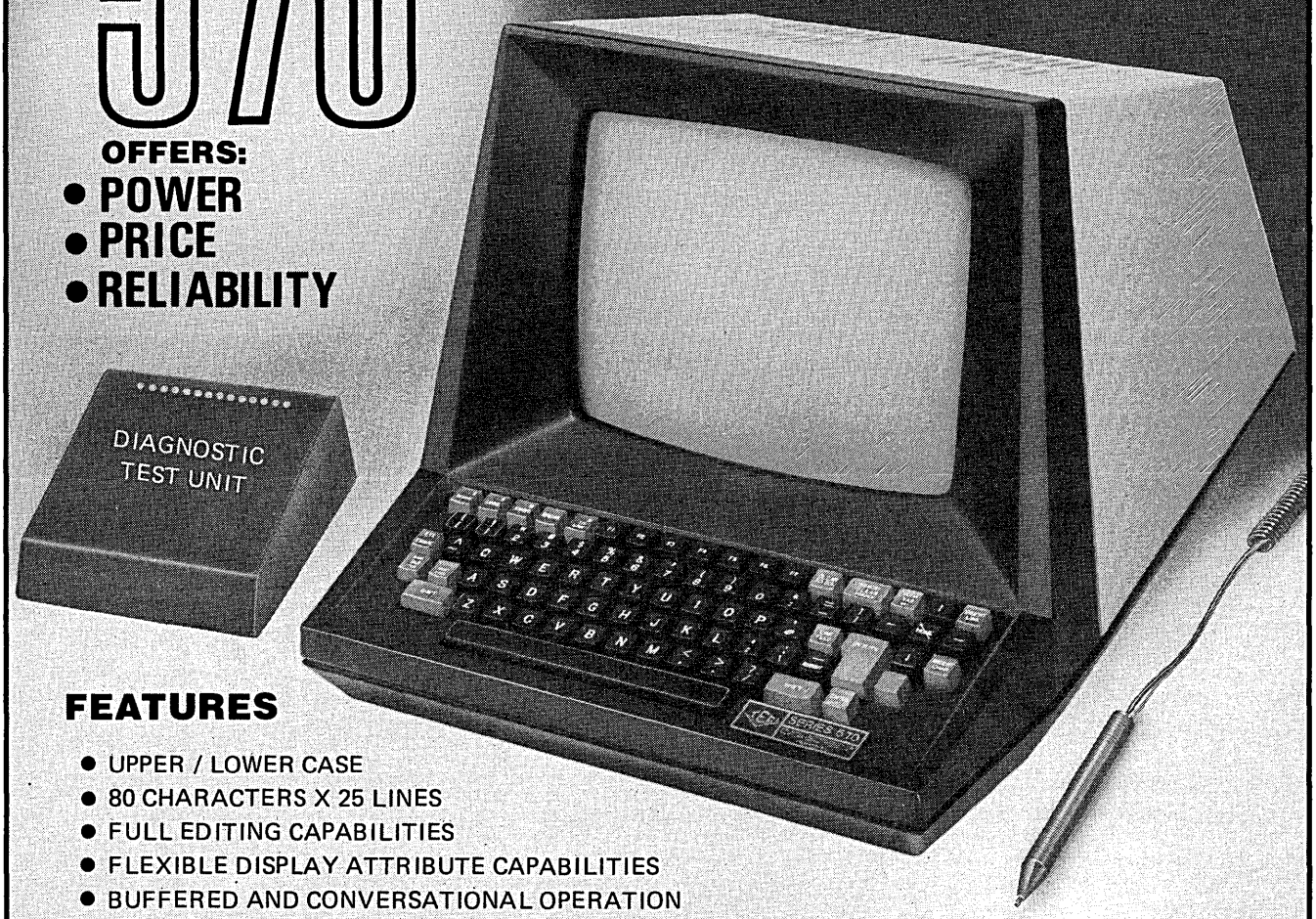

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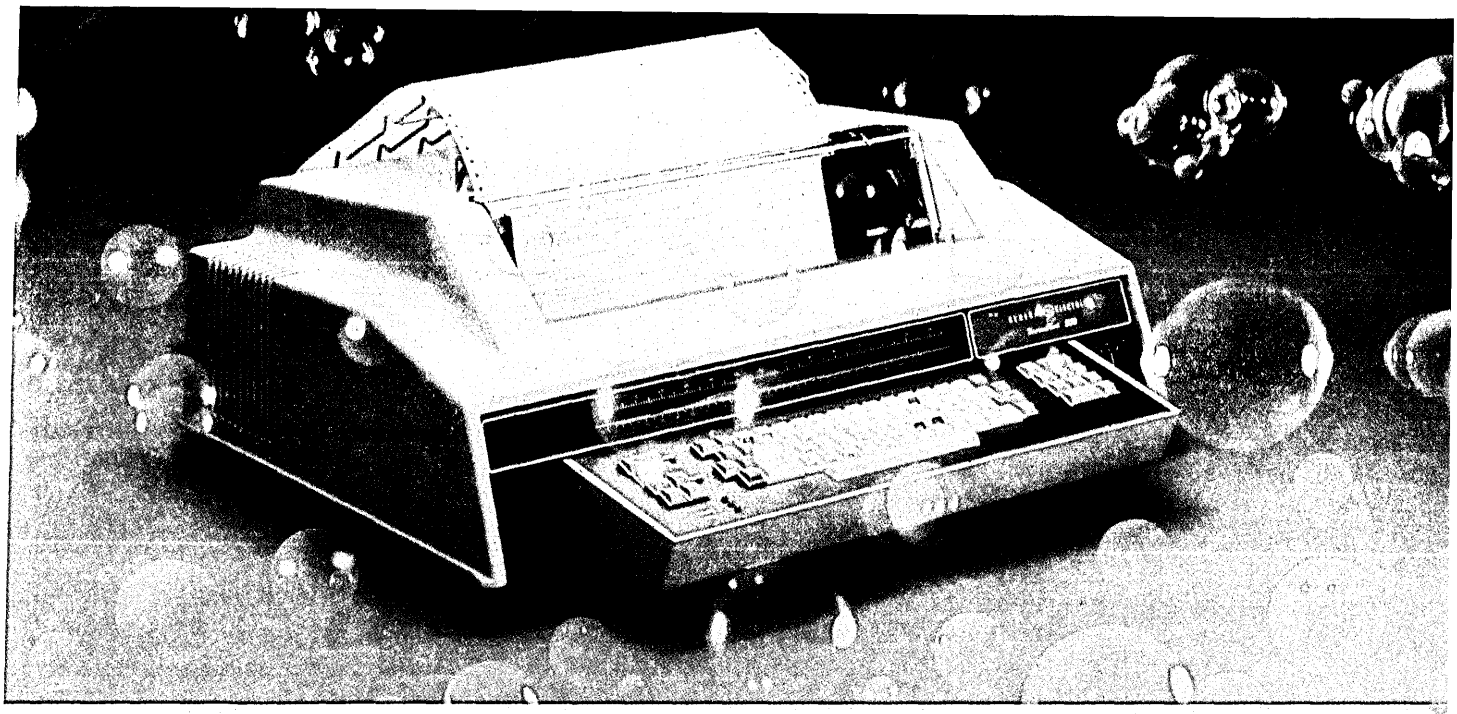

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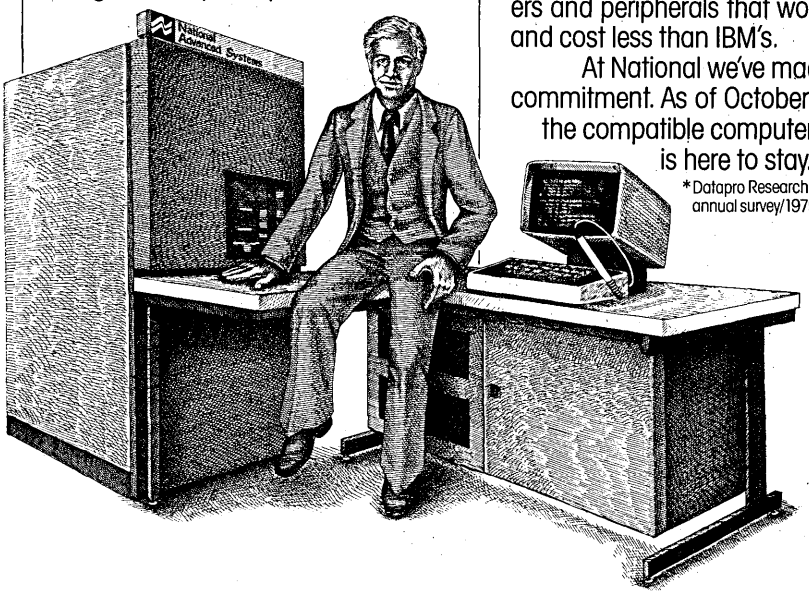

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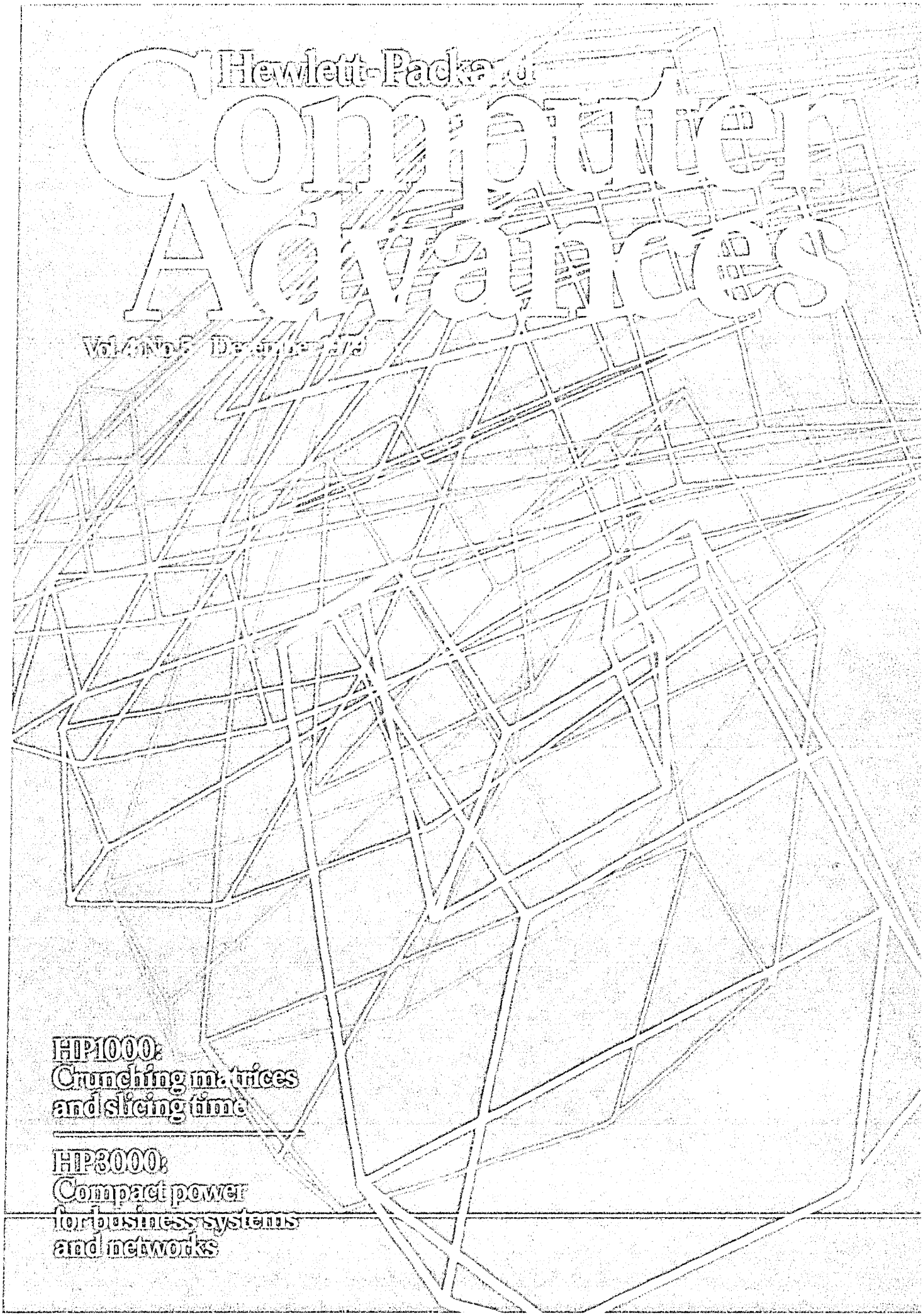
CIRCLE 72 ON READER CARD

Hewlett-Packard

Computer Advances

Volume 5 Number 12



HP1000:
Crunching matrices
and slicing time

HP3000:
Compact power
for business systems
and networks

The matrix machine

The Vector Instruction Set (VIS) gives the HP1000 F-Series computer a capability unique in the minicomputer industry: efficient and fast operation on matrices of data in a 16-bit computer.

VIS, a set of microcoded CPU instructions, fits the F-Series for applications that require manipulation of large, multi-dimensional arrays of data such as statistical analysis, 3D graphics rotation, structural analysis, image processing, and electronic circuit simulation. Such applications frequently require that a company purchase time on a mainframe, or buy a large computer, even when most of its applications do not justify such an expense.

With VIS, the HP1000 Model 45 becomes the Matrix Machine, the optimized system for scientific and engineering computation. This F-Series model comes with the RTE-IVB real-time executive operating system, which can manage up to 2 million bytes of main memory. The base system includes the 2648A graphics terminal, GRAPHICS/1000 software package, and the high-performance HP7906 20-megabyte disc drive.

- The HP1000 F-Series with VIS will provide the fastest minicomputer solution to many matrix operations.
- It can avoid the "overkill" of buying an expensive computer for a few speed-critical operations.
- And it provides room for expansion by speeding up present operations and freeing the CPU for other jobs.

Vector arithmetic

VIS expands the computational power of the F-Series processor by speeding matrix computations.

In most small computers, matrix operations are executed in FORTRAN DO loops, in which a single pair of numbers is brought from memory and combined according to the specific instruction, then the next pair brought, etc. The overhead associated with these fetch operations eats up CPU time.

VIS acts directly on whole groups of numbers, called vectors, improving execution speed by an order of magnitude.

The basic element of a vector, called a scalar, has a single distinct value. A vector is a set of scalars that share some common attribute; they may be X-axis coordinates, for example, in a 3D graphics problem.

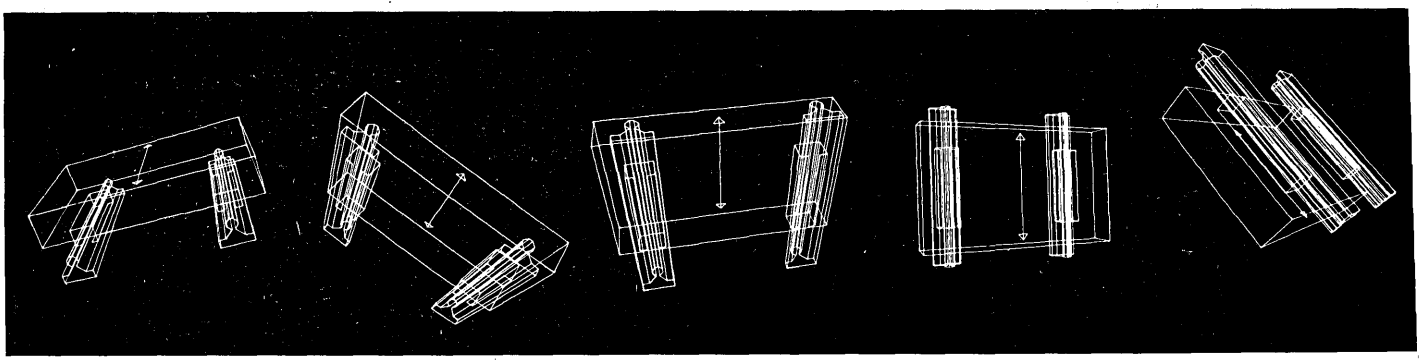
Pipelined processing

The F-Series computer performs vector arithmetic; that is, a single VIS instruction tells the CPU that the operation is to be performed on all scalars in a given vector.

With such an instruction, the CPU can pipeline the HP1000 floating point processor so as to achieve parallel processing of several elements in the vector. While the floating point processor is operating on two scalars, the CPU fetches the next pair from memory. Without VIS, the CPU would have to return to the DO loop for a new instruction each time it completed an operation, and then go search for the next pair of scalars.

Managing DO loops and chasing scalars can account for 90 percent

◀ **Cover (and below)**
Rotating in accordance with calculations supplied by the Vector Instruction Set, the image of an object can be viewed from any angle on a Hewlett-Packard 2647A graphics terminal. These images and the one on the cover were generated by a matrix rotation program running on an HP1000 F-Series computer with micro-coded instructions for performing vector arithmetic.



of matrix computation time. Here's an example:

Rotating an image

A 3D image may be rotated a specified amount by multiplying its present XYZ coordinate matrix by a rotation matrix. In FORTRAN, this operation must be carried out by multiplying each element in each rotation matrix column by each element in each coordinate matrix row. It takes nine multiplications and nine additions to establish a single point.

The FORTRAN instructions for rotating a 1000-point image look like this:

```
DO 10 I=1, 3
DO 10 J=1, 1000
  B(I,J)=0.0
DO 10 L=1,3
10 B(I,J)=B(I,J)+R(I,L)*A(L,J)
```

The execution time is 920 msec.

With VIS, the HP1000 can simplify the operation. Instead of a series of separate multiplications, VIS multiplies each rotational coordinate by an entire column of the coordinate matrix. The instructions look like this:

```
DO 10 I=1,3
CALL VSMY (R(I,1), A(1,1),3,
  B(I,1),3,N
CALL VPIV(R(I,2),A(2,1),3
  B(I,1),3,B(I,1),3,N
10 CALL VPIV(I,3),A(3,1),3,
     B(I,1),3,B(I,1),3,N
```

The execution time using VIS is 90 msec.

Mainframe capability

Working with large matrices efficiently requires fast access to large blocks of data, larger than normally available in 16 bit computers. A 400 x 400 matrix of floating point numbers, for example, requires a single block of 640,000 bytes of main memory.

The HP1000 computer systems have a unique feature called Extended Memory Area (EMA), that allows single blocks of data (matrices) as large as almost two million bytes to be specified without the need for special segmentation schemes. For a look at how EMA operates, see page 5.

Since vectors are arranged in memory in an orderly manner, the Vector Instruction Set can provide high speed access to matrices in the Extended Memory Area. The combination of VIS and EMA makes for a powerful matrix processing machine.

The chart on this page shows that the HP1000 F-Series with VIS can invert a 400 x 400 matrix of floating point numbers in 11 1/2 minutes. That's mainframe performance—at a fraction of the cost. The HP1000 F-Series is priced as low as $13,750.

To learn more about matrix operations on the HP1000 F-Series, check A on the reply card.

32-BIT PERFORMANCE IN A 16-BIT MACHINE

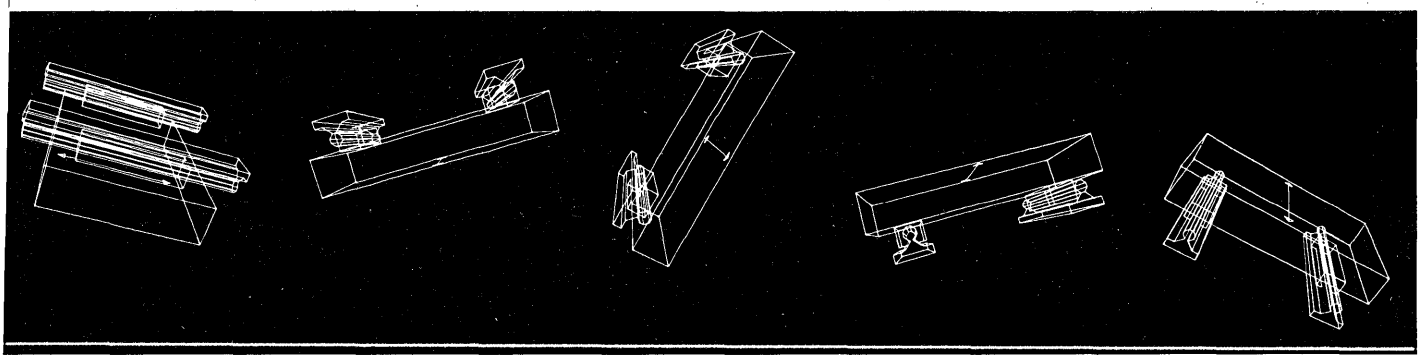
Very large matrices will normally overflow the addressing capabilities of a computer that uses a 16-bit word, so that the machine either cannot perform the application or has to resort to disc memory, drastically slowing the performance.

The HP1000 with EMA and VIS overcomes this limitation on small machines at a fraction of the cost of a large mainframe. We ran a matrix comparison test between the 16-bit HP1000 F-Series computer with VIS and one of the fastest 32-bit computers on the market. Here are the results:

MATRIX INVERSION

Matrix Size	F +VIS	32-bit computer
50x50	1.8 sec	1.5 sec
100x100	12.3 sec	11.7 sec
200x200*	105.0 sec	92.0 sec
400x400*	690.0 sec	720.0 sec

*EMA used



Session Monitor slices time

The Session Monitor for the HP1000 computer series, part of the RTE-IVB operating system, allocates and protects system resources when the computer is accessed by many users for both real-time and session activity.

Functionally, the monitor is a layer of software above the operating system. Following criteria set by the system manager, the monitor:

- Controls and coordinates access to work-station instruments and system peripherals such as discs and line printers:
- Assigns CPU time according to predetermined program priorities.

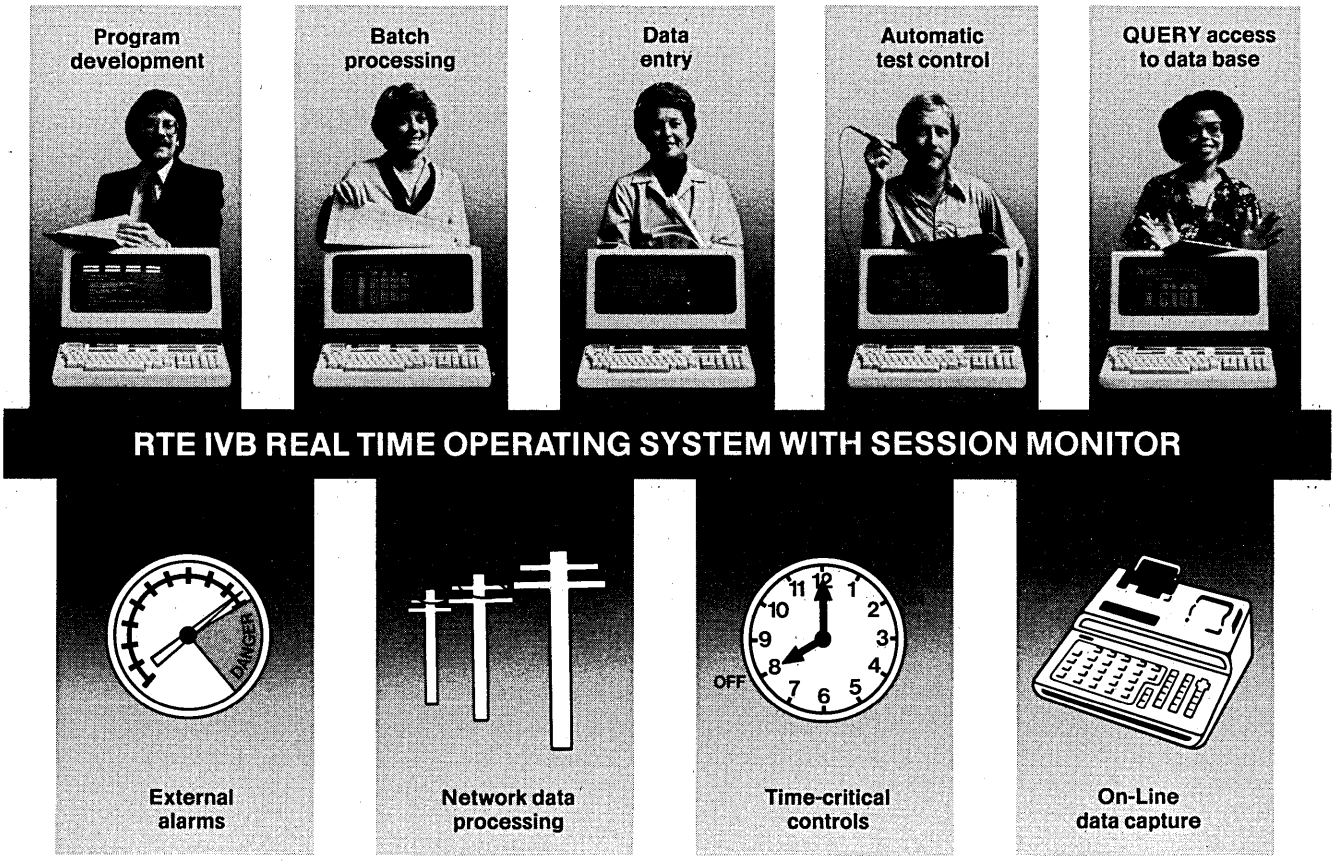
Time for everything

With the Session Monitor, the HP1000 can support program development, data entry, data base query and similar jobs that are not time-critical, and at the same time be used to monitor real-time processes and respond to them.

Session Monitor allocates CPU time to different classes of users according to a priority schedule set up by the system manager. Session activities, which are not time-critical, can be carried out concurrently with real-time data capture and control functions, with no danger that the background sessions will interfere with time-critical functions. Session monitor is now included in RTE-IVB software package for the HP1000 computers.

Every 10-millisecond clock tick, and on device interrupts, the monitor scans the program list to make sure that the highest priority program is running. Real-time activities, such as data capture, time-critical controls, or external alarms, are handled by an absolute priority. The tasks are carried out to completion unless preempted by an activity with an even higher priority.

Session activities are time-sliced; they are placed in a queue that is logically circular, with one queue for each priority level. The "fence" between real-time and ses-



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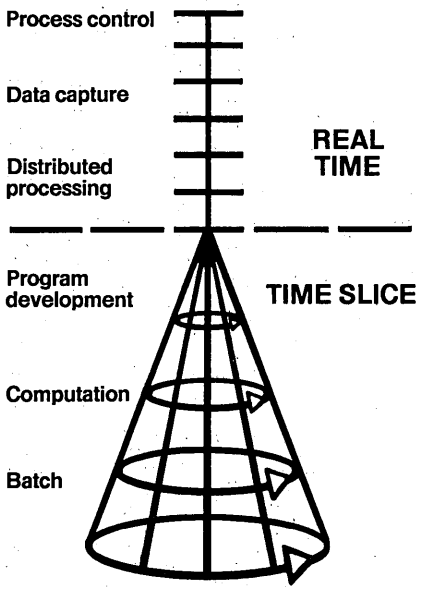


This diagram shows how Session Monitor slices time both vertically and horizontally. Above a "fence" level selected by the system manager, programs execute strictly according to priority. Below the fence, programs share time as it becomes available. If six programs with equal priority are running, they each get a sixth of the CPU time alloted to that level.

sion activities is set by the system manager.

Schematically, the time-sliced layers resemble an inverted cone. The lower a program's priority, the lower its representation on the cone. Since the cone widens toward its base, low-priority programs get longer time slices when they are allocated CPU time. The slope of the cone's edge may be varied by the system manager.

Low overhead

By pre-setting priority levels, the system manager can load-balance the system without incurring the CPU overhead that accompanies heuristic algorithms. The RTE-IVB operating system explicitly recognizes that the user knows more about system workload than a sophisticated algorithm can.

User devices are assigned according to a list attached to the log-on IC. The system keeps track of what instruments are being monitored at which stations, and keeps records of connect time and CPU time for each user. I/O and data storage devices may be designated by the system manager for particular users or groups of users, protecting files against unauthorized or accidental alteration by other users.

Tailor-made terminals

The monitor tailors an individual terminal to the needs of the person using it. A technician, for instance, may need no more than the ability to load data. A supervisor needs access to certain files to compile reports. A programmer can store new programs without worrying about their being changed or lost. The system manager can access the whole system and change it as needed.

RTE-IVB also provides spooling capability so that users can have access to peripheral devices, such as printers, without having to wait for the printing to be finished before continuing with other work.

In this way, the system ensures that the full capability of the HP1000 will be optimally distributed for the individual user's job mix.

Check B for literature on HP's RTE-IVB Session Monitor.

EMA:

Virtual memory in the central processor

Through the use of the Extended Memory Area (EMA), the RTE-IVB operating system can put the entire two million-byte physical memory of the HP1000's central processing unit, less only space for the operating system and the user code, at the service of a single program.

EMA looks to the user very much like disc storage. Its data is not directly addressable, but must first be brought into the 32K-byte logical address space of the program. To do this, part of the EMA is used for a Memory Window Segment (MSEG) to map the location of desired data.

EMA is user-transparent, and is called through simple FORTRAN statements.

When an element located in EMA is called by a program, the segment containing the element is mapped into the logical address space. Because this mapping requires no disc swaps, EMA provides fast retrieval of random access data.

With a Vector Instruction Set (see pp. 2-3), the retrieval of elements of arrays and matrices can be faster, since a single mapping locates all desired data.

EMA can be made to run faster for specific applications by writing memory management routines. Many separate operations may be performed on the same EMA when a segmented program is used. One segment can read in data, a second can process it, and a third can store the result. Actual execution speeds depend on how much memory management the user wants to do.

HP 3000 Series 30: Compact computer power

Hewlett-Packard's proprietary silicon-on-sapphire technology has made it possible to introduce a new compact computer system that makes the HP3000 the right business computer family for an even wider range of users and applications.

The newest member of the family is the HP3000 Series 30, an SOS-based processor that performs all the functions of the larger Series 33 and Series III systems, including concurrent transaction processing, batch processing, data communications and program development. It's packaged in a small cabinet measuring only 24" by 36" by 18," accompanied by a separately packaged system/maintenance console and a system disc. Yet it costs under $50,000.

SOS: An HP innovation

HP alone among computer manufacturers has developed SOS to the point where it can be used in commercially available products. For the user, SOS technology translates into small size, low power requirements, and high reliability in a general purpose machine.

The central processor unit (CPU) is designed around three SOS microprocessor chips containing the equivalent of 20,000 MOSFET transistors on one square inch of circuitry. Since devices on an SOS chip are dielectrically isolated, parasitic capacitance is dramatically reduced; the devices may be driven at relatively high speed—typically 2 nanosecond gate delays—on low power.

Putting most of the processor logic on three chips means that fewer integrated circuit packages and fewer printed circuit boards are required for the system. Reducing the number of components directly improves system reliability.

Easy to install

Because of modest power requirements, the Series 30 does not require the classic raised-floor air-conditioned data center. When configured with the standard 20-megabyte disc drive, the Series 30 produces about 4,650 BTUs per hour—about the same amount of heat as a medium-sized copying machine.

I/O flexibility

SOS technology is also implemented in the input/output (I/O) circuitry of the Series 30, allowing for broad expansion of peripherals from a single card cage. Up to 32 asynchronous terminals may be attached, with four magnetic tape drives, eight disc drives (with a maximum of 960 megabytes disc storage), two line printers, and one flexible disc drive.

The Series 30 can now be networked with other members of the HP3000 family through HP's Distributed Systems Network (HP-DSN) architecture. With two communication lines, the Series 30 can configure 24 terminals, 4 magnetic tape drives, 8 disc drives, 2 line printers and 1 flexible disc.

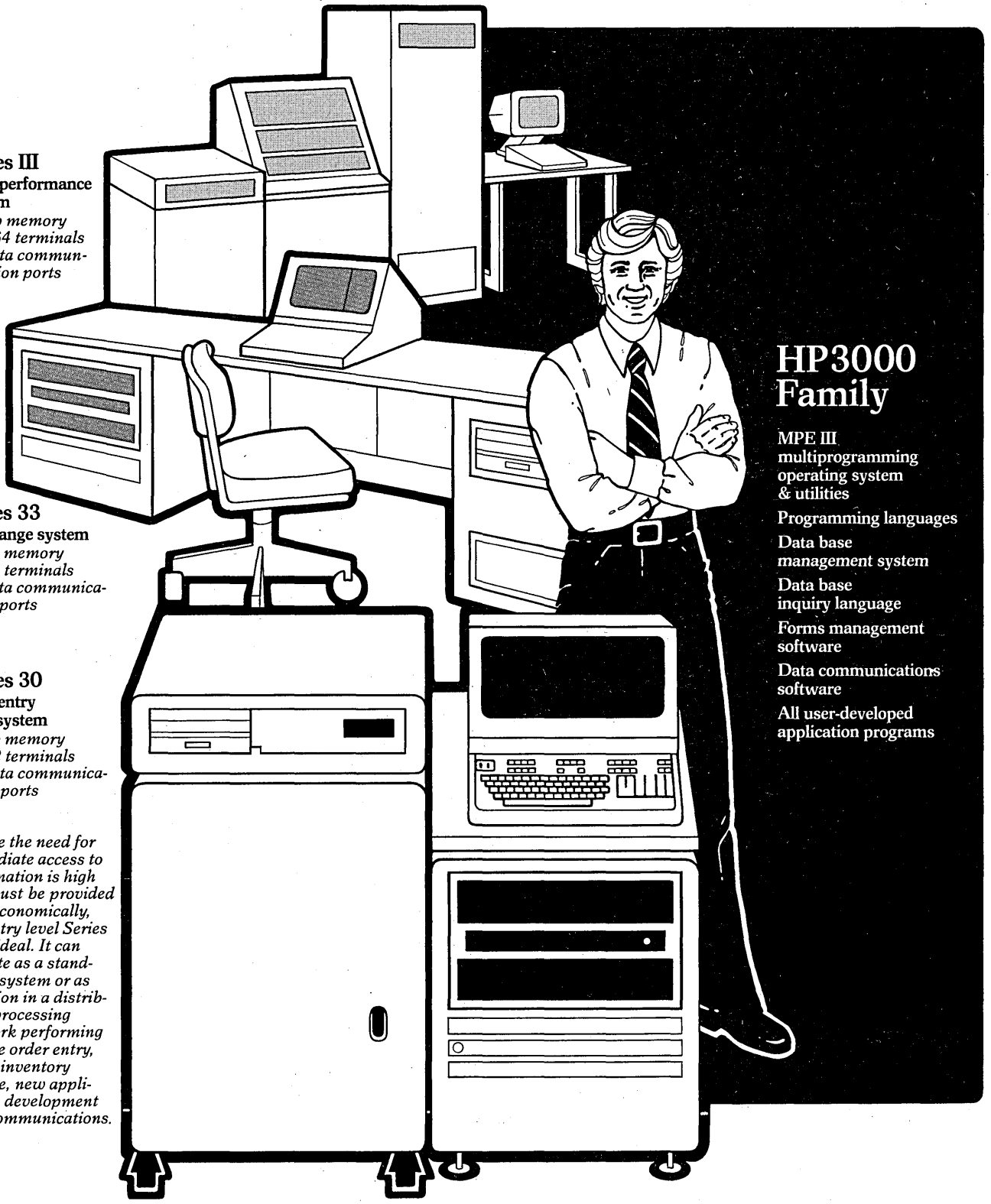
"Hard" and "Soft" MPE

The Series 30 processor maintains compatibility with the proven HP3000 MPE III (Multiprogramming Executive) operating system. Modular design of MPE means that only instructions that are hardware dependent ("hard" MPE, such as Input/Output and clock instructions) need differ on HP3000s that employ different I/O architectures and execution cycle times. The rest of MPE ("soft" MPE) is exactly common code on all of today's HP3000 systems. This allows common higher-level software: language compilers for COBOL, FORTRAN, RPG, SPL, and BASIC; applications tools for data base management (IMAGE/3000); English-like inquiry facility (QUERY/3000); and CRT-based forms management (HP VIEW/3000). Applications developed on any of today's HP3000s can be executed on any other family member without recompiling or relinking.

Thus, the Series 30 provides the business user with a general purpose machine having the same capabilities as the other members of the HP3000 family—the key differences between systems being price* and performance. This computer power can be put where the work is done: as terminals located throughout an organization linked to one computer, or as several computers located throughout the world and connected in a distributed network.

For the HP3000 Family story, **check C on the reply card.**

*Minimum configurations for HP3000 Series 30, 33 and III begin at $49,750, $58,500 and $105,000, U.S. list, respectively.



Series III
High performance system
- *2Mb memory*
- *16-64 terminals*
- *9 data communication ports*

Series 33
Mid-range system
- *1Mb memory*
- *8-32 terminals*
- *7 data communication ports*

Series 30
New entry level system
- *1Mb memory*
- *4-32 terminals*
- *2 data communication ports*

Where the need for immediate access to information is high but must be provided very economically, the entry level Series 30 is ideal. It can operate as a stand-alone system or as a station in a distributed processing network performing on-line order entry, batch inventory update, new application development and communications.

HP3000 Family

MPE III multiprogramming operating system & utilities

Programming languages

Data base management system

Data base inquiry language

Forms management software

Data communications software

All user-developed application programs

The INP: Housekeeper for busy CPUs

One of our newest SOS products is a front-end Intelligent Network Processor (INP) tailored for communications. Most of the data communications protocol handling is carried out by the INP; thus this load is removed from the CPU.

A data network manager wants programmers or analysts to be able to access remote data quickly, without degrading terminal response time for the rest of the on-line users. INP helps attain this goal by directing the flow of data.

Software off-loaded

The heart of the INP is a silicon-on-sapphire microprocessor, which generates BISYNC protocols from operating system software down-loaded from the CPU when the communications line is opened. The protocols are stored in the INP's own 32K bytes of fast RAM, which is also used for data buffering. This memory, with automatic error detection, is made up of the same chips used in the HP3000's main memory.

Faster response time

When operating, the INP will interrupt the CPU only to report when a block of data has been transferred or received. The chart on this page shows how the INP can reduce CPU overhead; on a system that is heavily CPU-bound, this will result in faster response times at the terminal.

Other factors—I/O activity, amount of memory, number of users, and especially the nature of the particular application—will also affect response time. However, our tests show that on a system with a load of 30 sessions, the INP can reduce the effect of DS/3000 lines on response time by 80 percent.

The INP will also improve the throughput of low-priority background batch jobs.

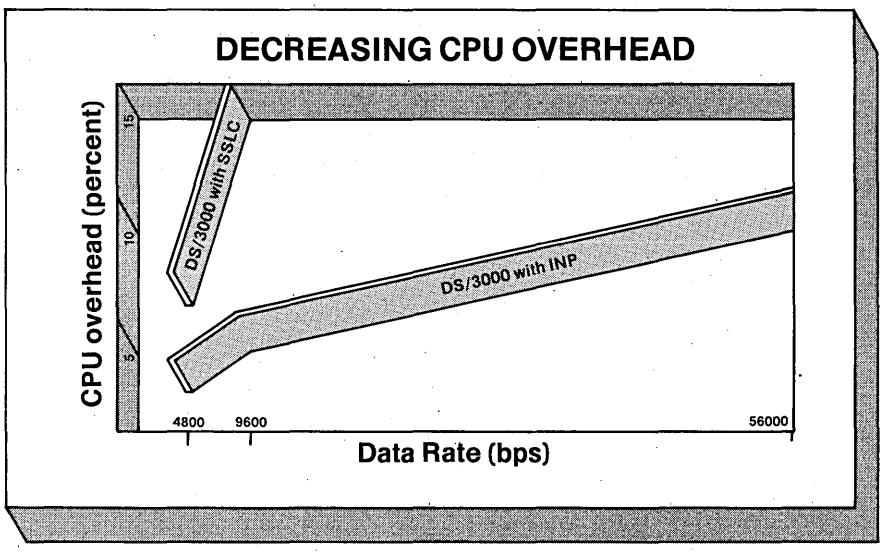
The fact that the protocol driver software is down-loaded from the CPU means that different communications protocols and subsystems may be accommodated in the future without adding new hardware.

The INP will support data transfer rates to 19,200 bits per second using modems, or up to 56,000 bits/second hardwired or with a CCITT V.35 standard interface. In general, maximum data rates depend on the communications subsystem used and the hardware to which the INP is linked.

INP is the preferred data interface for new users of the HP3000 computers. It may be a cost-effective replacement for the present HP SSLC (Synchronous Single Line Controller) on existing systems that are CPU-bound.

Check D on the reply card for further details on the Intelligent Network Processor.

INP outperforms the synchronous single line controller (SSLC) on Distributed Systems 3000, the link to other HP systems.



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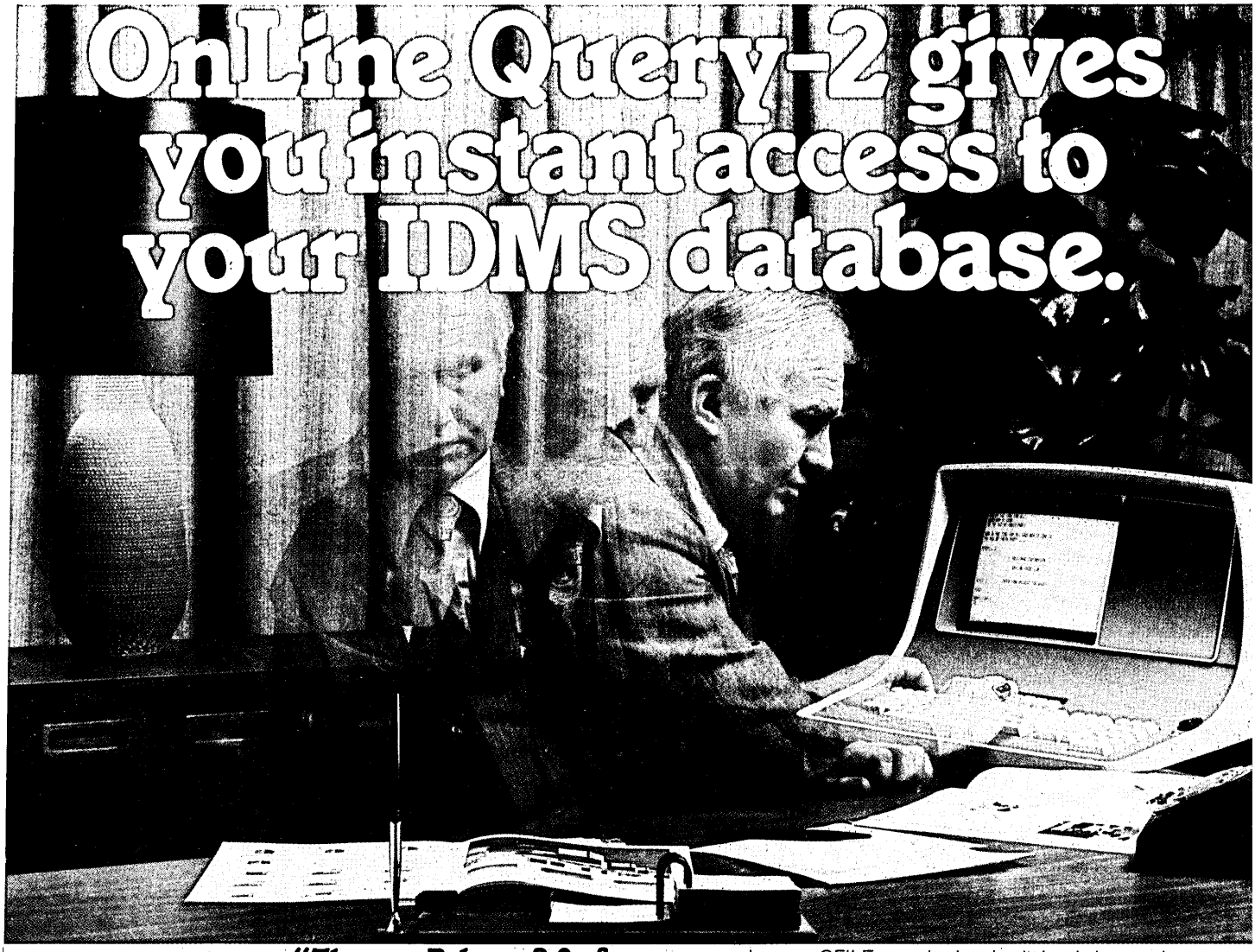
OnLine Query-2 gives you instant access to your IDMS database.



"The new Release 2.0 of our OnLine Query system is a major advance. Fully integrated with IDMS, it needs no application programming and produces immediately after installation. Easy to use, it has a powerful set of English commands to give both management and user departments on-line access to selected information via interactive terminals."

—James M. Hudson, Project Leader, OnLine Query.

By installing OnLine Query-2 in the IDMS environment, reports that normally take two months can be done directly by user departments in less than an hour.

Programmers can test suspect records on-line, cutting bug finding and bug-killing to minutes, rather than hours. New features for release 2.0 include:

Multiple Record Retrieval, where a single GET command lets users retrieve multiple records of a specified type in one operation, with the user receiving only the data in which he is interested.

QFILE Storage, where special programs may be constructed and stored in the data dictionary for reuse by programmers or end-users. QFILEs can be invoked simply by naming them and giving execution time values.

DBKEYLIST Command. Used with the FIND command to access records specified by different selection criteria, it then stores a database key for each record accessed. Successive FIND commands with different selection criteria can be applied to those records accessed in the DBKEYLIST to sift out the desired record for a given report—which means you create the report file only once.

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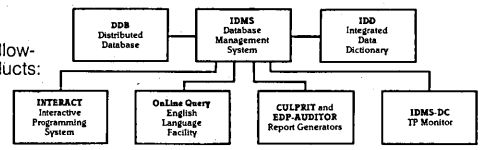

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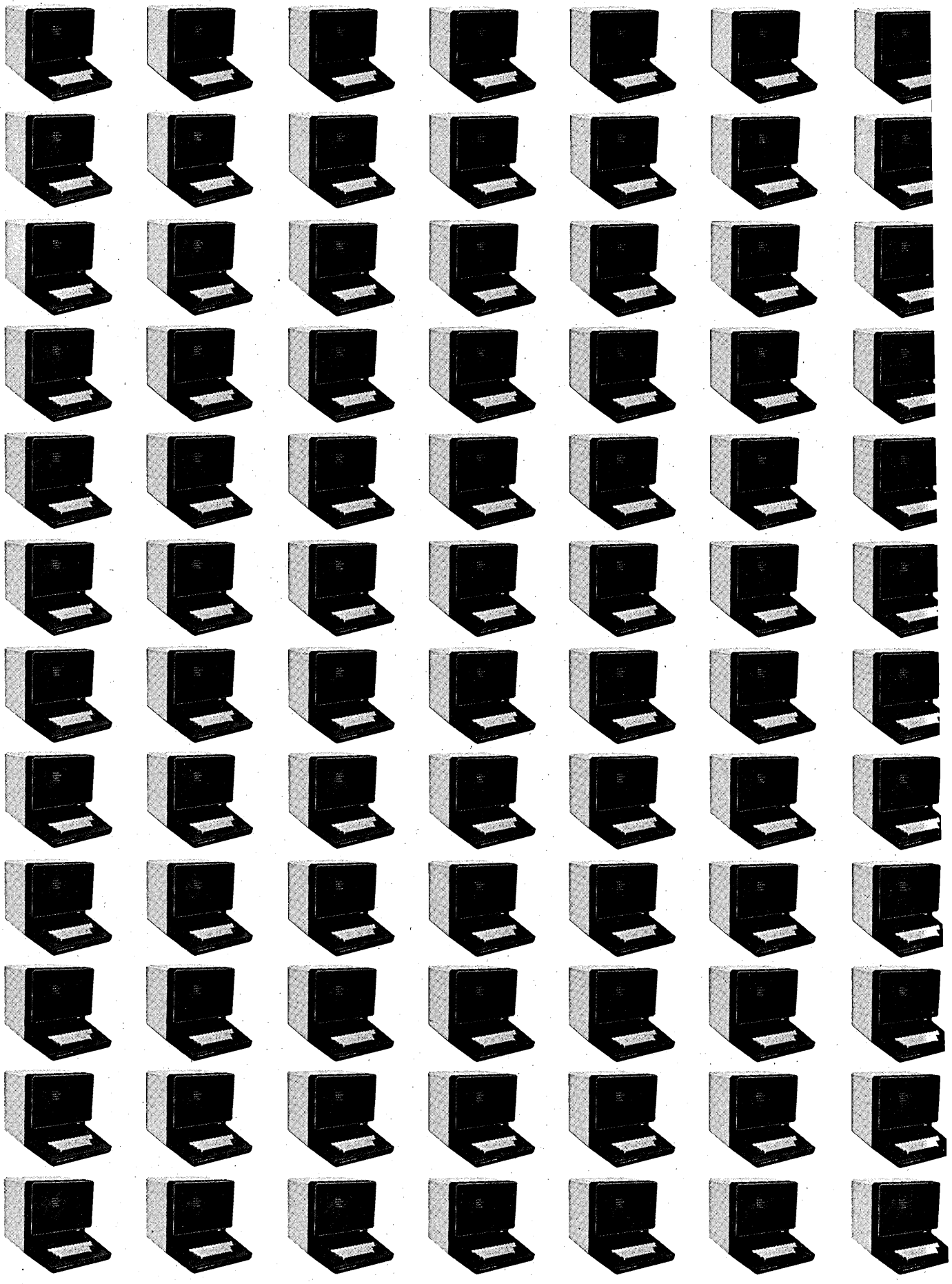

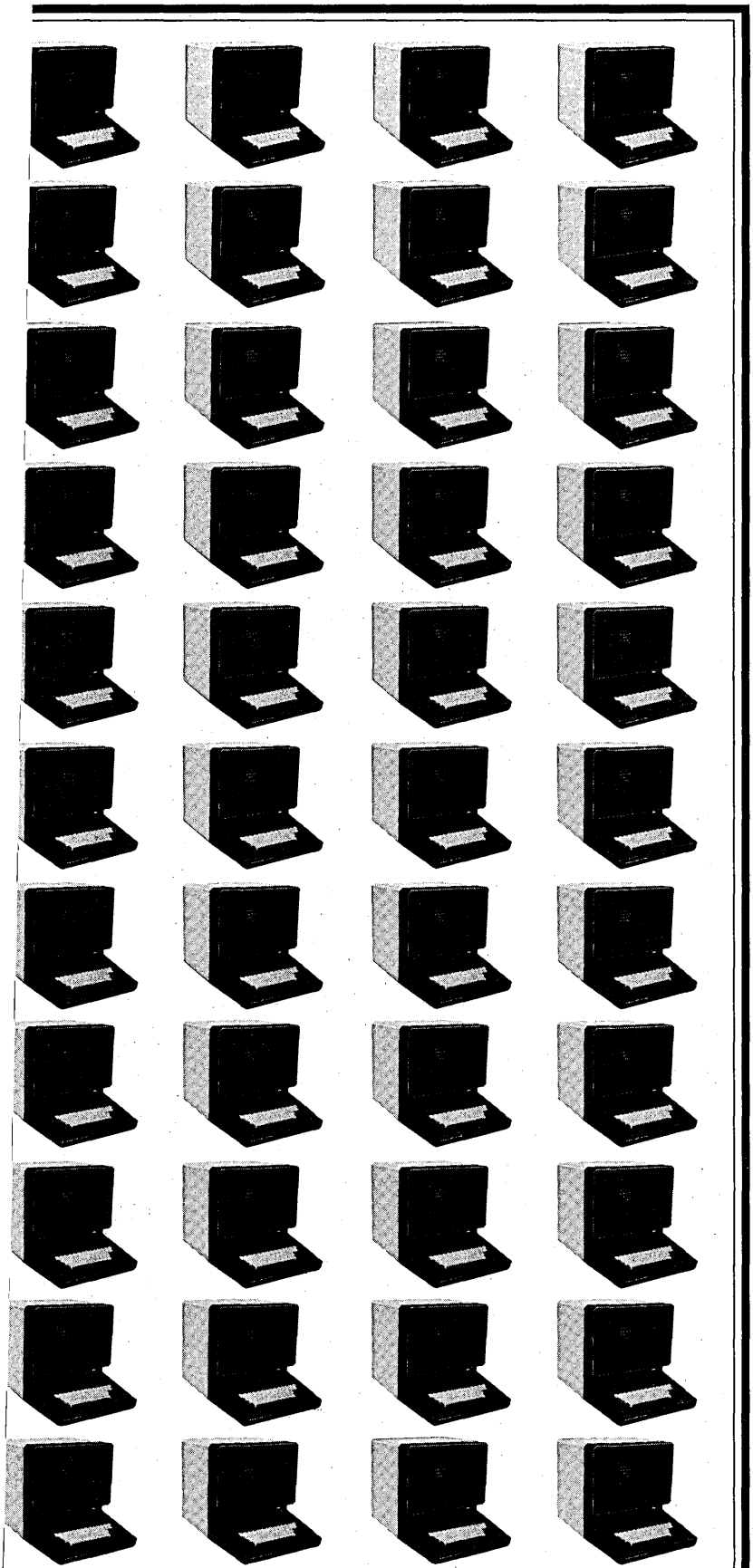

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You can build an ultra-high-performance, 128-terminal system on Perkin-Elmer's powerful new 32-bit Model 3220. That's 128 good reasons right there.

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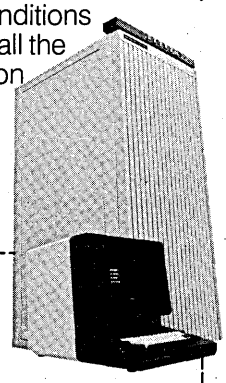
The Perkin-Elmer Model 3220 is a supermini with built-in growth. Its memory can expand to meet the broadest system requirements. What's more, the low starting price of $33,500 (U.S. only) is subject to OEM terms and conditions unmatched in the industry. Get all the reasons for building a transaction processing system with the 3220 and RELIANCE.



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Digital introduces DEC Datasystem 540.

A powerful new business computer running the industry's most highly developed distributed processing software.

Our DEC Datasystem 540 brings a new level of power to mid-range distributed processing systems.

Built around our hot new PDP-11/44 processor, the D540 gives you an extra large memory (a million bytes) to support more terminals. Handle more processing more efficiently. And give you plenty of room to expand your application.

It also offers a Commercial Instruction Set and a new enhanced COBOL compiler that deliver powerful performance for your business programs.

And to make sure you get all the benefits of this increased capability, we've also increased the uptime with plenty of reliability features. Like a microprocessor-controlled ASCII console. Plus facilities for optional remote diagnosis for 24-hour-a-day, 7-day-a-week service with an average response time of less than 15 minutes.

But what really sets the DEC Datasystem 540 apart from ordinary computers is the distributed processing software that comes with it:

Digital's proven CTS-500 operating system.

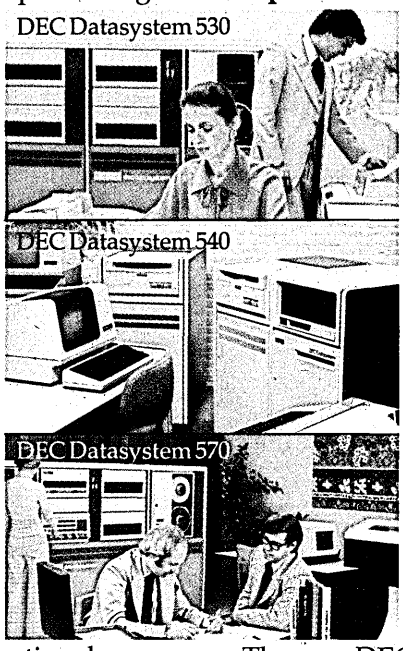
And now we're introducing major new enhancements to CTS-500. Combined with the performance improvements of the D540, it means you get response times 50% better than with comparable systems.

You also get superior interconnect capabilities. Because with CTS-500, the DEC Datasystem 540 can emulate the popular IBM protocols, plus others as well.

In addition, CTS-500 is designed to be easy to use for a wide variety of jobs. For transaction processing, batch processing, word processing, and program development. All at the same time.

But the DEC Datasystem 540 is more than an exceptionally powerful mid-range business computer.

It's part of the broadest range of COBOL-compatible interactive systems.



The DEC Datasystem 500 family now offers the widest choice of COBOL-compatible systems in the industry. From the economical D530, through the D540, all the way to the high-end D570.

So you can put the right computer in every location without ever losing your original software investment. Or restructuring your distributed processing strategy.

And the D530 and D570 systems also offer the latest version of CTS-500. So you get faster response times and unequalled communications across the whole DEC Datasystem 500 family.

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But it keeps some very impressive company as well.

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Software managers who succeed in establishing effective organizations will enjoy development rates 1,200% better than managers who fail.

ORGANIZING FOR SUCCESSFUL SOFTWARE DEVELOPMENT

by Edmund B. Daly

Software development requires competent technologists, competent managers and an effective organization structure. The synergistic effect of these three elements differentiates successful development organizations from those forced to operate in a chaotic environment. A good organization structure is meaningless without a well-defined design methodology and without effective management practices. The organization structure brings together technologists and management, but the structure must work within the culture of the organization.

An organization can be described by the way it handles information flow, or by its hierarchical structure—the way it looks on an organization chart. In either case, one must first consider an organization as a group of managers and technologists and then attempt to decompose these personnel in a manner best fitting the projects to be developed. *Organization structures must be dynamic and must be modified to accommodate the project (or work activity) environment.*

An interesting analogy can be established between concepts employed in organizational decomposition and concepts employed in software decomposition. In fact, if one employs the same decomposition rules for both the job to be performed and the people who are to perform the job, a very effective organizational decomposition can be achieved. The common decomposition rules are:

Software: Each software segment should be small so that it can be easily understood (20 source lines).
Organization: Each software team should be small so that it can be effectively controlled (Chief Programmer Group).

Software: Each software segment should be loosely coupled from other software segments.
Organization: Each software team should be assigned a unit of work which allows for minimal coupling among software teams.

Software: Each software segment should enjoy high cohesion (performs one function).
Organization: Each software team should be assigned a work unit that is highly cohesive. (One team should not design diagnostic software and supporting software, such as compilers.)

Software: The scope of effect of a software segment should be a subset of scope of control.
Organization: Software teams should be grouped together (reporting to one manager) in such a manner so that the decisions made within the manager group have minimal effect on the work of other managerial groups.

Software: As software is decomposed into a hierarchy of segments, higher level segments perform decision-making and lower level segments do the actual work.
Organization: In an organization structure the managerial hierarchy performs decision-making (more abstract and longer range decisions at higher levels of management) and the lower organization levels perform the actual work.

Software: Pathological connections should be avoided, or if not, at least fully documented. A pathological connection is a communication link not following the hierarchical software structure.

Organization: Pathological connections should be avoided among programmers in an organizational structure.

Fig. 1 illustrates the similarity between a software hierarchy and an organizational hierarchy when one applies the same rules to the decomposition of both work and people. This hierarchy is a basic entity in GTE's software development methodology.

The correlation depicted in Fig. 1 shows that interfaces between modules within a subprogram are controlled by the chief programmer, who is assigned the responsibility for developing one or more subprograms. Interfaces between subprograms within a class are controlled by the first line manager (or an appointee), who is responsible for the development of a software class. Note that in a matrix organization structure (which will be described in detail later), the technical coordination among subprograms will be performed by the project manager.

Let us assume the new development organization is required to develop two projects: Project A and Project B. Each project has three major functions to perform: real-time software development (operating systems), support software development (compilers), and hardware development (computers).

Fig. 2 shows six separate organizational entities, one entity for each technology for each project. The lower levels of the hierarchies shown in Fig. 1 can be viewed as existing within each box in Fig. 2. Now the manner in which we combine these separate organizations will give us a project organization structure (Fig. 3), a functional organization structure (Fig. 4), or a matrix organization structure (Fig. 5).

FACTORS IN SELECTING STRUCTURES

A combination of both matrix and project structures (where small project teams are created within the environment of a larger matrix superstructure) is the most advanta-

The matrix organization has the capability of exhibiting concern both for people and for projects.

geous for organizations responsible for developing both large and small projects. In most practical situations, the organizational structure selected is dependent on the following factors:

1. *Size of each software development.* Number of programmers/ engineers whose output must be combined to make up one working system.

2. *Number of projects.* Few larger projects (above 30 people) or many small projects (under 10 people).

3. *Scope of development.* Types of work activity being performed at any one time. Are all programmers involved in active development? Are some involved in planning for new projects, some involved in new design, and some involved in software maintenance?

4. *Environment.* A laboratory organization structure must recognize and be able to cope with the corporate culture and structure in which it exists. There is no such entity as a "project organization" in a development environment when the project organization controls only 30% of the resources needed to complete the project and the external environment is functionally structured and controls the remaining 70%.

5. *Physical limitations.* Is the project being developed in one location or in many locations, possibly in different countries?

6. *Organizational culture.* What style of manager exists within the organization? And more importantly, what organization structure does the organization's chief officer feel comfortable with?

Project Organization. This structure can be most effectively employed when an organization has many small projects to develop and when each project is developed at one location. The project structure requires that at least 70% of the resources needed to bring a project to completion is under the direct control of one line manager. This one person performs both the functions of project manager (technical) and line manager (administrative).

The advantages of the project organization are:

- Project and administrative decisions are made at the lowest possible organizational level thus allowing quicker decisions and better project control.
- Since full authority for the project is under the control of one person, interfaces are minimized and project responsibility is strictly defined (in case something goes wrong).
- This structure tends to mold system generalists and management personnel who are not assigned to functional specialties.
- Motivation is high during the active development period—programmers tend to identify with the project.

The disadvantages are:

- Projects must be kept small.
- Higher level management often loses track of project progress since their immediate involvement is not required.
- Economics of scale for critical resources can not be achieved. It is difficult to assign one "compiler" expert to three different projects. At least the project structure does not help cope with this problem.
- Training is costly since experts in all phases of development are required on each project. As an example, if one system software load must be generated for a given project, a member of the project organization must be trained in the techniques of generating a load. He may only utilize this training for a few weeks.
- Movement of programmers, especially good ones, from one project to another is difficult.
- Attrition is low during the active project development but often becomes excessive when the project is completed. Either programmers feel a loss of identity or alternative positions on other projects are not attractive.
- Probably the most serious flaw in this structure is that it inhibits both commonality among projects and generation of good software development standards and methodologies.

Functional Organization. This, the oldest form of organizational structure, is seldom used in medium to large development organizations. The concepts associated with a functional organizational structure are important only in so far as they serve as a base behind the more complex matrix structure. The basic problem is that all decisions that cross functional boundaries are made by one individual—the administrative and technical head of the functional organization. Very few managers are able to deal effectively with this much authority and often bottlenecks result, such as schedule slippages, project overruns, and poor quality. Also, the superhuman manager on top of the functional organization often gets bogged down in today's problems, leaving the organization's future to chance.

The advantages of a functional organization are:

- For a strong manager (hopefully free from megalomania) this organization sets a stage for very tight, centralized control.
- Since all the people associated with one specialty are centralized under a functional manager (e.g., one functional manager controls all real-time software development for all projects), commonality among projects can be effectively controlled. Also, selected personnel can be set aside to establish standards and advanced development methodologies, and ensure that industry-wide technological advancements are effectively included in the functional manager's internal operation.
- People establish affinity to a profession or to an organization rather than to a project, thus eliminating the attrition many development organizations face when the project technologists are assigned to nears completion.
- Adapts effectively to the long-range aspects—acquiring advanced technologies, and training and retaining personnel. This structure is capable of concentrating on the individual rather than the project.

The disadvantages of this form of organization are:

- Resolution of interface problems are made by one manager for all projects.
- Limits the creation of system generalists since all technologists are assigned to one functional specialization.
- Exhibits poor project control in terms of meeting development costs, schedules, and quality.

Matrix Organization. The project structure and the functional structure attempt to optimize one organizational constraint. Project structures tend to force an organization to concentrate on *short-term project goals* such as schedule, cost, and project quality. Functional structures tend to force concentration on *long-term goals* such as commonality among projects, technological advancement, improved standards of operation, and critical skills economics of scale.

The matrix operation is a complex organizational structure that attempts to optimize two or more organizational constraints simultaneously. Some matrix structures have been grown in an attempt to optimize multiple organizational constraints. Dow Corning, for example, has instituted a four-dimensional structure aimed at simultaneously optimizing project, function, territory, and strategy. Simple matrix structures are two-dimensional (Fig. 6). Here we see a structure that attempts the advantages of the two simpler structures, project and functional. The project side of the matrix concentrates on short term project objectives. The functional side of the matrix concentrates on longer term organizational objectives.

Probably the major disadvantage

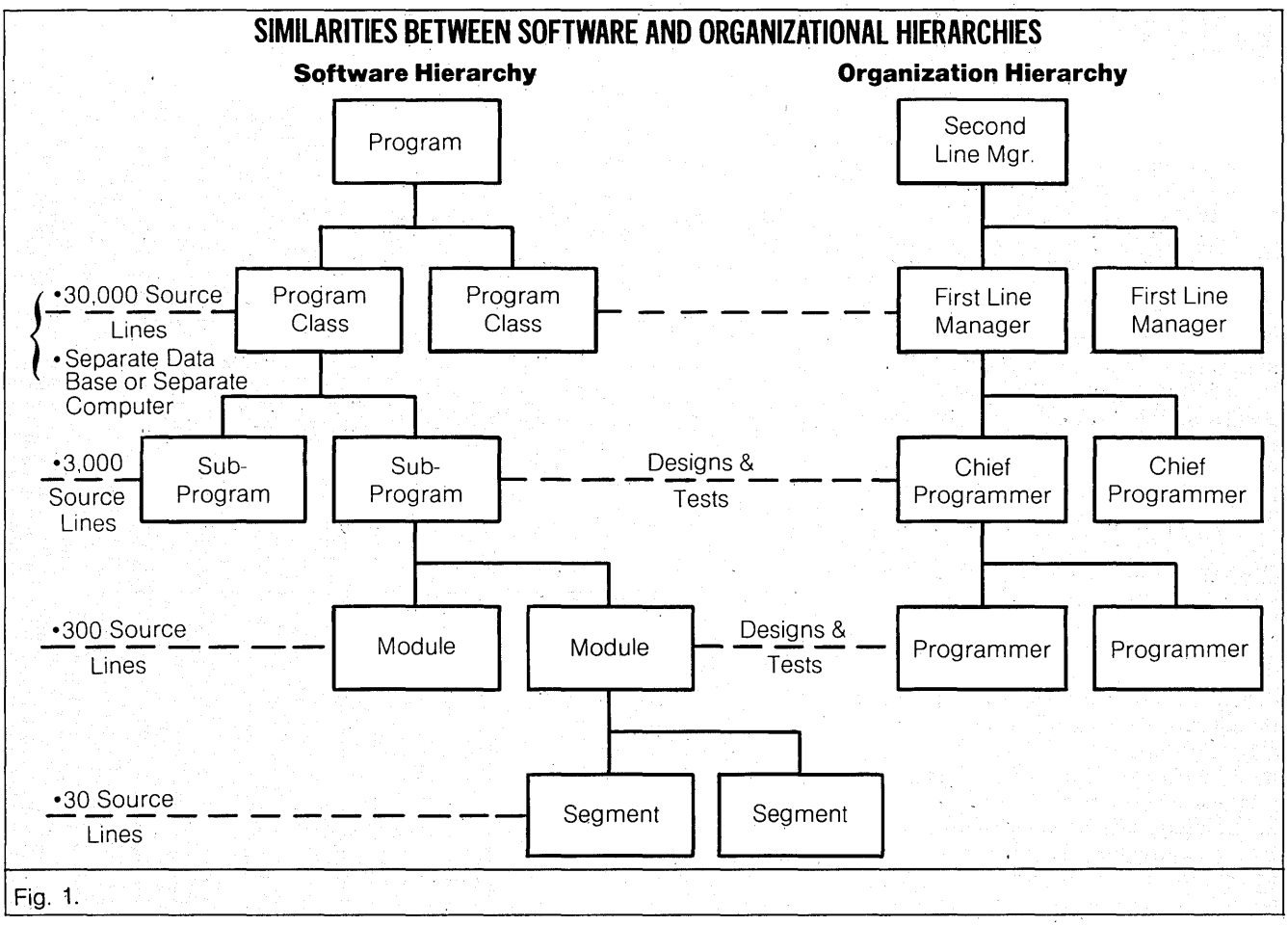

Fig. 1.

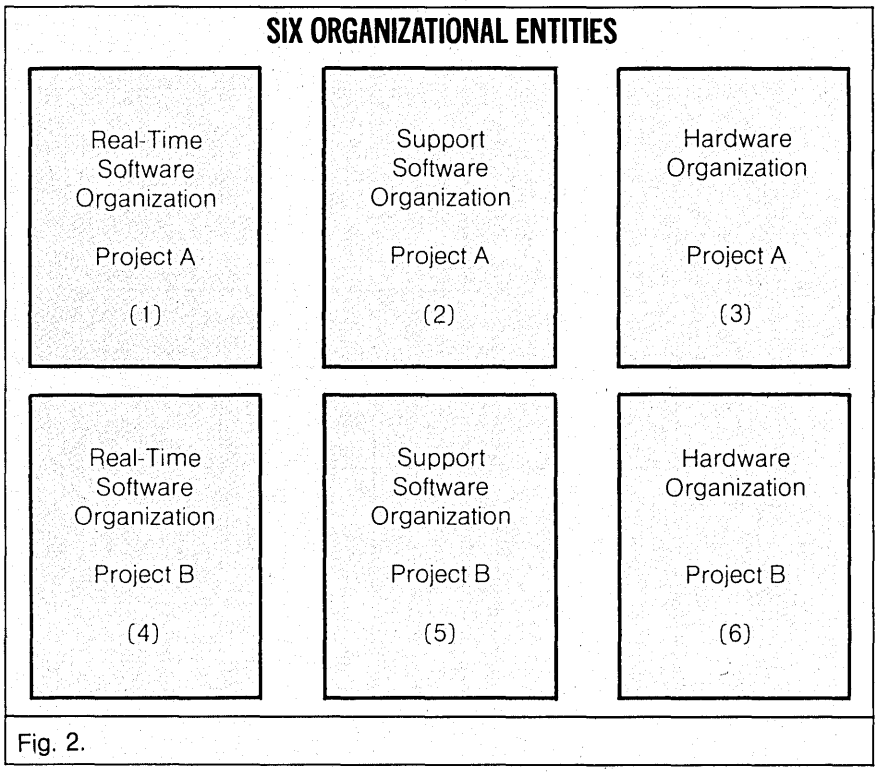

Fig. 2.

Fig. 1 shows that there is a similarity between the software and organization hierarchies when the same rules are applied to the decomposition of work and people. The lower levels of the hierarchies in Fig. 1 can be viewed as existing within each box in Fig. 2.

to a matrix operation is that there is no single person responsible for the success of each project; the responsibility is truly shared between the functional line managers and the project managers. In the matrix philosophy, the functional manager decides *how* to do the job. He supplies all resources for development to take place. The project manager decides *what* to do. He controls the dollars. Dollars are allocated to the functional manager as part of a contractual agreement to perform work.

I have found that not all managers can work effectively in a matrix organization; many managers do not like the division of project responsibility. Unlike project organizations, the matrix does not have, and cannot tolerate, either a bureaucratic manager (must follow the rules) nor an autocratic manager (must

do it my way).

In the face of conflict, the method of management operation in a matrix structure is for the project side and functional side to:

- Trust each other.
- Put all the facts on the table.
- Agree to a resolution. If this cannot be accomplished, both sides should compromise. As a last resort (admitting defeat) the problem should be brought to the "boss" who presides over both sides.

An often discussed disadvantage of the matrix is that it is a "two-boss system," meaning that a certain number of people in the organization have two bosses. However, I believe that if authority is properly defined and projects properly planned, the "two-boss" problem can be beneficial rather than detrimental.

MATRIX PROJECT PLANNING

If a development group decides to implement a matrix organization, top management must first define, in detail, the responsibility and authority of both the functional and project sides of the matrix. This is often done. What is overlooked in many situations is projects must be planned differently in a matrix environment. The matrix is a very powerful structure. Unlike either a project or functional structure, the matrix has an inherent capability to properly control "single project" development taking place in diversely located facilities or multiple companies. In a matrix environment, all work is effectively subcontracted rather then passed down through multiple levels of management.

For software design to take place properly within a matrix structure, one must ensure that project planning allows for subcontracting. To ensure this, the project group (usually expanded by temporary assignment of funtional chief programmers and group leaders) will decompose the total project (using work breakdown structure techniques if necessary) into small subprojects. In software, a small project would be one subprogram (3,000 source lines). Each subproject is then fully defined by the project group prior to subcontracting. The resulting package is called a "cost account," and it is this package which will be subcontracted to the functional software development line organization.

Sitting on the functional side of the fence, the functional manager sees his responsibility as one of developing many small projects (cost accounts). The functional software group will be contracting for these cost accounts with many different project groups. The important con-

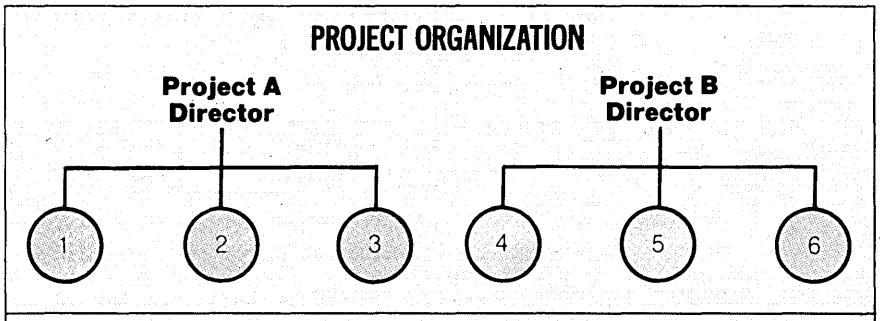

Fig. 3.

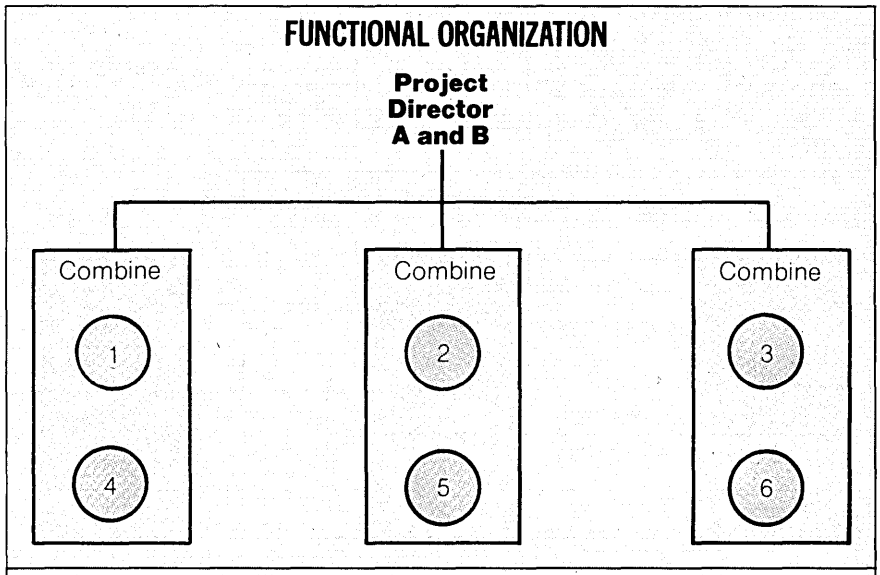

Fig. 4.

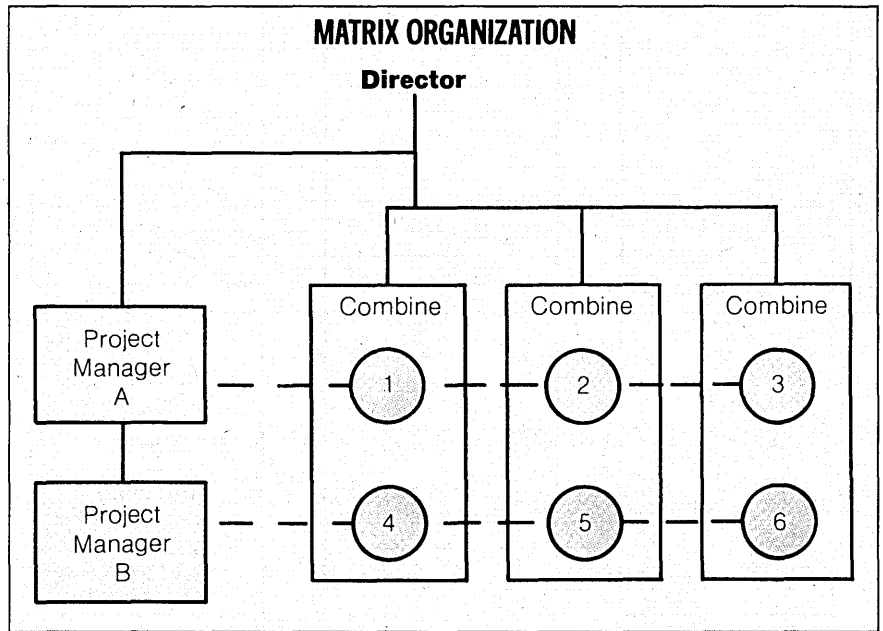

Fig. 5.

Too little attention has been given to the effects an organization has on software development rates.

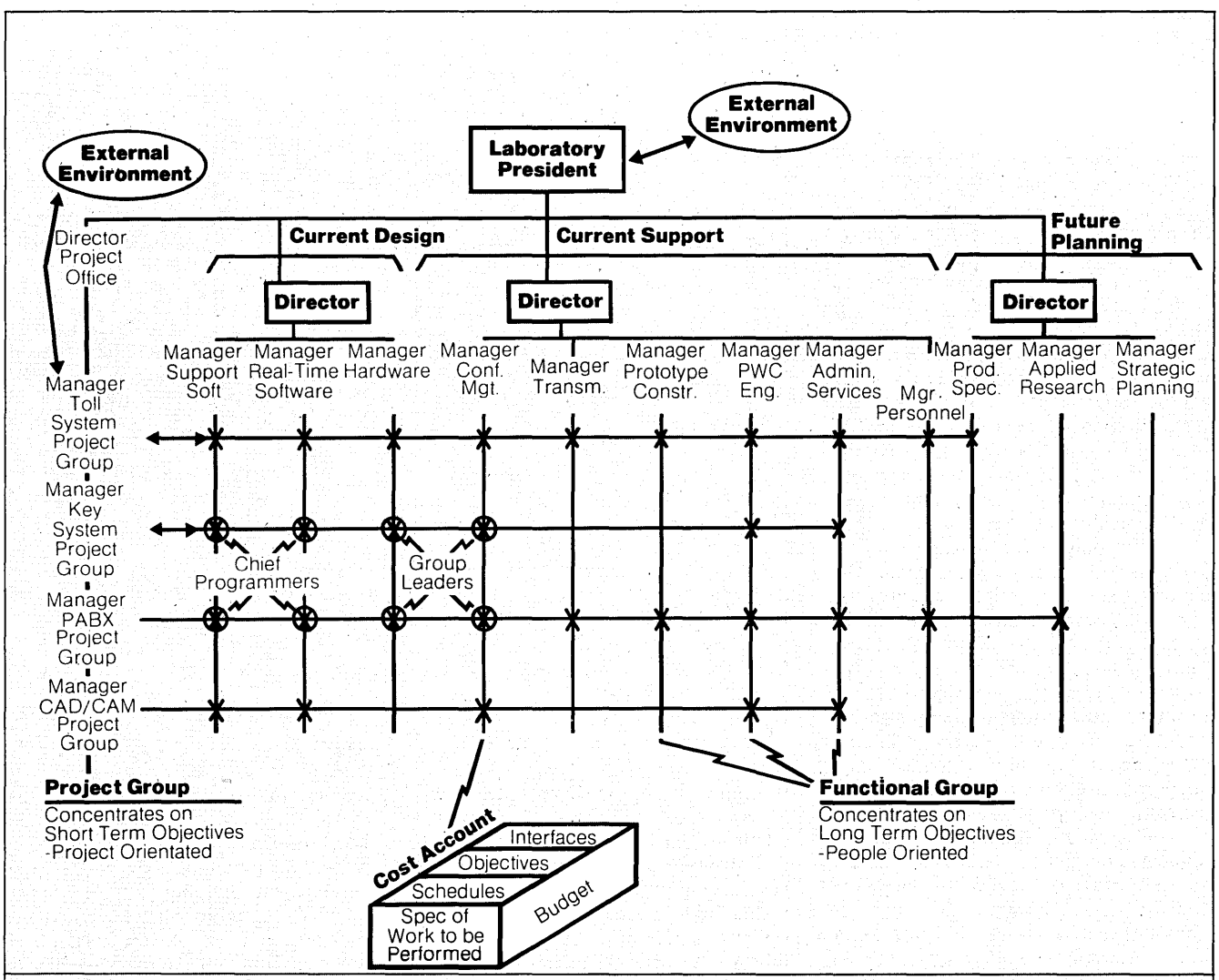

Fig. 6.

cept is that each cost account must be fully defined by the responsible project group prior to subcontracting so that it looks like an independent small project to the functional line group and so that the interfaces between these cost accounts can be monitored and controlled by the project group as active development takes place.

The major advantages of the matrix organization structure are:

- The matrix structure enjoys the intrinsic capability to optimize two or more organizational objectives simultaneously: project, functional, geographical strategic objectives.
- The functional dimension of the matrix structure allows for project commonality, advancement in technology and standards, sharing of critical resources among projects. Simultaneously, the project dimension allows for string schedule, quality and cost control.
- The matrix structure enables technologists to be matured in either a technological speciality via the functional dimension or as system generalists via the project dimension.
- Due to the power of the matrix structure, it allows for effective coordination and control of large software development performed in diversely located organizations.

Disadvantages are:

- The matrix is a complex structure and as such requires mature management capable of working without excessive autocratic or bureaucratic tendencies. For this reason, matrix organizations must be introduced gradually rather than installed.
- Functional and project authority is divided in the matrix structure. This requires that approximately 15% of the development staff (the chief programmers) must work for two bosses. Often this two boss system imposes conflicting demands on Chief Programmers.
- A matrix structure requires more formal project planning and control techniques than does a project structure. This is due to the "subcontracting" philosophy utilized in matrix organizations.
- Small developments and some medium-sized developments cannot be effectively managed utilizing the matrix due to overhead costs and division of responsibility. Thus, in most development environments utilizing the matrix, a Project organization philosophy should be employed as a substructure. As a general rule, those projects requiring less than 10 programmers should not be placed into a matrix unless there is excessive commonality with other projects being

Software management's objective: an environment in which high quality software can be developed with minimal resources.

developed or maintained within the organization.

The Management Grid. A popular tool for measuring management style is based on a concept developed by R. R. Blake and J. S. Mouton. This tool is referred to as the management grid. The grid, shown in Fig. 7, represents a two-dimensional analysis of managerial behavior: concern for production and concern for people. A manager who demonstrates extensive concern for people will score high on the vertical axis. A manager who demonstrates extensive concern for production will score high on the horizontal scale. An ideal manager will exhibit behavior characteristics which place him high on both scales, thereby approaching 9.9 on the managerial grid. I have found that the management grid applies to management styles exhibited by organizations as well as by individual managers.

By applying the management grid to organization theory we can see that the characteristics of a project structure tend to force the management style exhibited by the total organization into the lower right-hand quadrant of the grid since this structure stresses project objectives. On the other hand, a functional organization structure tends to force the exhibited management style into the top left-hand quadrant since this structure stresses people rather than projects.

The matrix organization, properly implemented, can now be shown to have a very powerful advantage over either of the two simpler structures (project or functional) since it has the capability of exhibiting concern for people via its functional dimension and concern for projects via its project dimension.

It is extremely rare to find an organization where all the managers fall in the 9.9 quadrant of the management grid. It is, however, easier to find managers who exhibit personality characteristics which place them in the 1.9 quadrant. It is also not too difficult to find managers who fall within the 9.1 quadrant.

By placing the 9.1 type managers in the project side of the matrix structure and the 1.9 type managers in the functional side, a synergistic effect occurs whereby the organization, as a whole, can be seen as exhibiting 9.9 quadrant management.

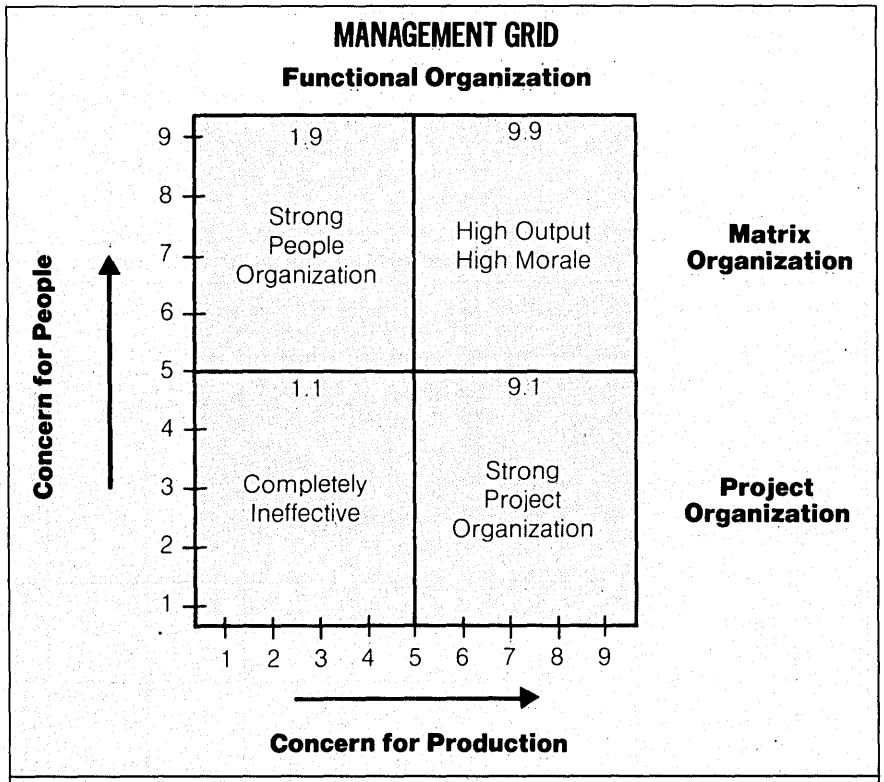

Fig. 7.

ORGANIZATION AND SOFTWARE PRODUCTIVITY

We have looked at various heuristics that can be used to decompose a software organization into manageable parts, and have shown that these parts can then be put together in one of three basic structures: functional, project or matrix. Now let us analyze a third facet, organizational efficiency. Organizational efficiency is the intrinsic ability of an organization to generate quality software in minimal time with minimal resources. Once the efficiency of an organization has been determined, we can begin to solve a problem that plagues all software management: how to accurately estimate software development effort.

Software development rates are normally measured in "executable source lines generated per programmer hour." The major factors which influence software development rates are the complexity of the software being designed (see Table 1 for a condensed complexity model which has been shown to be effective for our developments); the capability of the programming staff hired to perform the development; the activities required to generate and support commercial software (Table 2); and the efficiency of the organization within which the development is performed.

Experience we have gained in GTE has indicated that the effort required to develop a commerical software package (measured in executable source lines developed per hour) can vary by 6 to 1 depending on the software complexity (see Table 1); by 2 to 1 depending on programmer capability (this ratio is lower than that experienced by other organizations, because all programmers must follow a well-defined methodology for software development and, more importantly, the talented programmers have been assigned the more complex software tasks); by 12 to 1 depending on the management and technological methodologies utilized within the organization structure.

Although a significant amount of literature is available describing software complexity models and the effect of programmer capability on software productivity, too little attention has been given to the effects that an organization (along with its engrained methodologies) has on software development rates.

Organizations affect software productivity in three ways: first, the structure used to organize programmers; second, the systems used to plan and control the software development; and third, the management/technical methodologies employed.

Organizations manage these factors with different levels of effectiveness. The most effective organizations can develop high quality commercial software at rates approaching 12 to 1 better than organizations that do not contain the necessary talent to properly manage software development activities.

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Based on this dichotomy of management styles, we can segregate software development organizations into one of three categories: dated software organizations, modern software organizations, and state-of-art software organizations.

Dated Software Organization. We have found that development groups using dated organizational techniques have a low software productivity rate. These organizations do not employ composite design techniques nor do they follow a rigid methodology for software implementation. If documentation standards exist at all, they are poor, not formally defined, and poorly planned. Attrition is usually high and the feeling of software professionalism is not a significant aspect of the programming environment. The first four systems in Table 3 illustrate development rates of systems utilizing these concepts.

Modern Software Organization. As a software development organization matures, it establishes stricter controls over the development process. These organizations have enjoyed an improvement in software development rates of 300% over organizations using ineffective techniques for the same type of software listed above. System E in Table 3 illustrates the development rate of a large software system utilizing these more advanced design and management techniques.

Some of the techniques employed by these more efficient organizations:

1. Organizational structures are optimized around the projects being developed. Project structure and matrix structure are both used.

2. Organization hierarchy includes both chief programmers and feature chiefs, as well as a thoroughly documented and enforced design methodology.

3. Standard techniques are employed for decomposing software into functional entities. Techniques employed are transaction analysis, transform analysis, pseudo code, Jackson technique.

4. Strict software documentation standards are established and rigorously enforced. These standards are established to meet the following objectives: documentation is completely computer generated; documentation is a direct output of the design process and is the entity which undergoes design and code reviews; documentation defines software function, inputs and outputs; documentation is structured and accompanied by a hierarchy chart.

COMPLEXITY MODEL

Raw Software Design Hours (RDH) equals the product of (E) which represents organizational efficiency; (B) which represents program specific variables and (N) which represents number of executable instructions.
Thus RDH = E • B • N
The complexity model is employed to estimate the variable (B) where B is the product of B_1 times B_2 .... B_9.

B_1 =	.8	If the project development is aided by a set of interactive support tools. Else B_1 = 1.0.
B_2 =	.95	If the program is developed by one programmer.
=	1.15	If the program is developed by more than 15 programmers.
B_3 =	1.0	If the number of independent module inputs and output items is less than five.
=	1.1	If greater than five.
=	1.2	If greater than 10.
B_4 =	1.25	If this module has been specified as real-time critical.
B_5 =	1.5	If the module contains a very complex algorithm or has a significant hardware interface.
=	1.0	If the module is purely data manipulative.
B_6 =	1.2	If the module algorithm is not similar to previous work.
=	1.0	If the algorithm is similar.
B_7 =	1.5	If the module is modified from an existing module and only new or changed instructions are included in the instruction count.
=	1.0	Is a new module.
B_8 =	1.25	If the module has been specified as memory size critical.
B_9 =	1.1	If batch is employed and turnaround is greater than four hours.

Table 1.

SUPPORT REQUIREMENTS

S = Raw Software Design Hours (RDH)* / Total development hours up to one year after turnover to customer**

Based on 3,000,000 Hours of Historical Statistics

Software Design Hours —Project Size—	Value of "S"	Type of Design
400,000 Hours	1.9	New design—no existing base
100,000 Hours	2.0	
20,000 Hours	1.7	
200,000 Hours	2.1	Modified design using existing base
20,000 Hours	2.2	
50,000 Hours	1.5	Design maintenance after first year
10,000 Hours	1.9	

*Includes only software design hours required to decompose predefined subprograms into modules and segments, code, unit test, string test, integration test and all design documentation.
**Includes configuration management, supervision, laboratory support, evaluation, general project support, field support and design maintenance to one year after turnover to customer plus software design hours and planning hours leading to high level design.

Table 2.

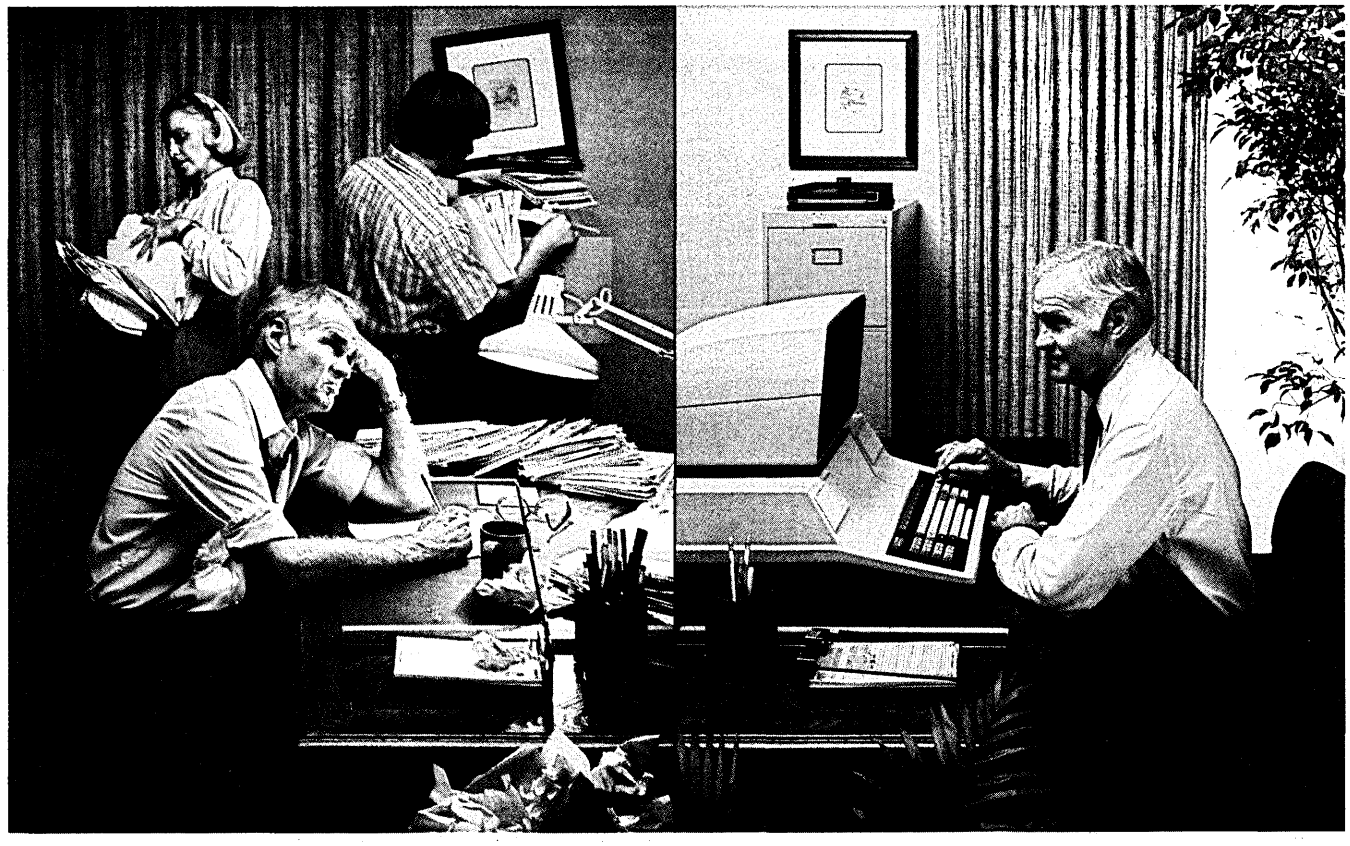
DEVELOPMENT STATISTICS

System	Commercially Available to Customer	Size of Program (New Instructions)	Development Rate Instructions Per Hour
A	1972	160,000	.33*
B	1973	117,000	.43
C	1974	111,000	.53*
D	1977	220,000	.52*
E	1979	131,000	1.2 *

*Executable object

Table 3.

Problem Solved.



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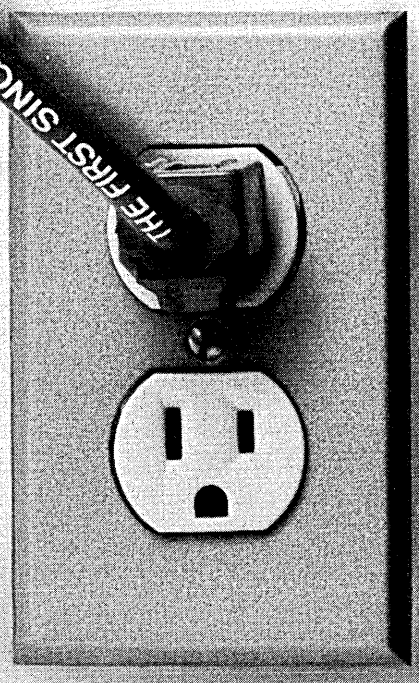

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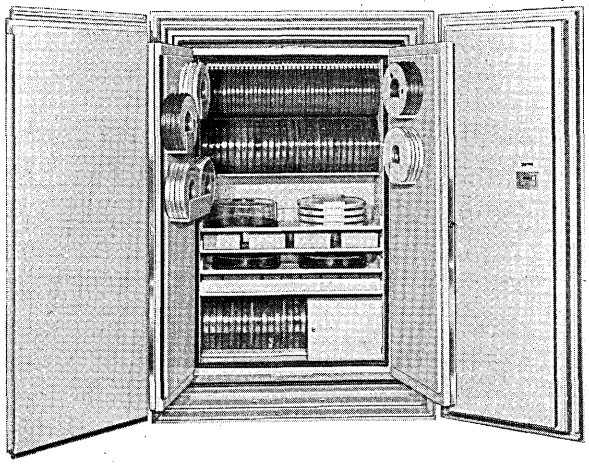

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5. Design walkthroughs are held at each level of software decomposition. Preestablished review formats are employed with standard reports generated. Reviews are formally scheduled to ensure programmer time is made available. Only commercial documentation is reviewed at these meetings. Adherence to design standards, documentation standards, and quality, inter cost account interfaces are ensured by these reviews.

6. Walkthroughs are conducted for each feature prior to system testing. During feature review the customer's requirement specification is validated against evaluation test plans and the software functional designs.

7. Structured code is employed, embodied within a medium high level compiler such as PASCAL. Code reviews and code walkthroughs are conducted following a predefined process. The chief programmer and at least one peer programmer read each module of code.

8. Strong management planning and control systems are employed. These systems help plan and control software quality, time, and cost. An ideal system combines PERT networks and the concepts of C/SCSC (a cost/schedule control system developed by the U. S. Department of Defense).

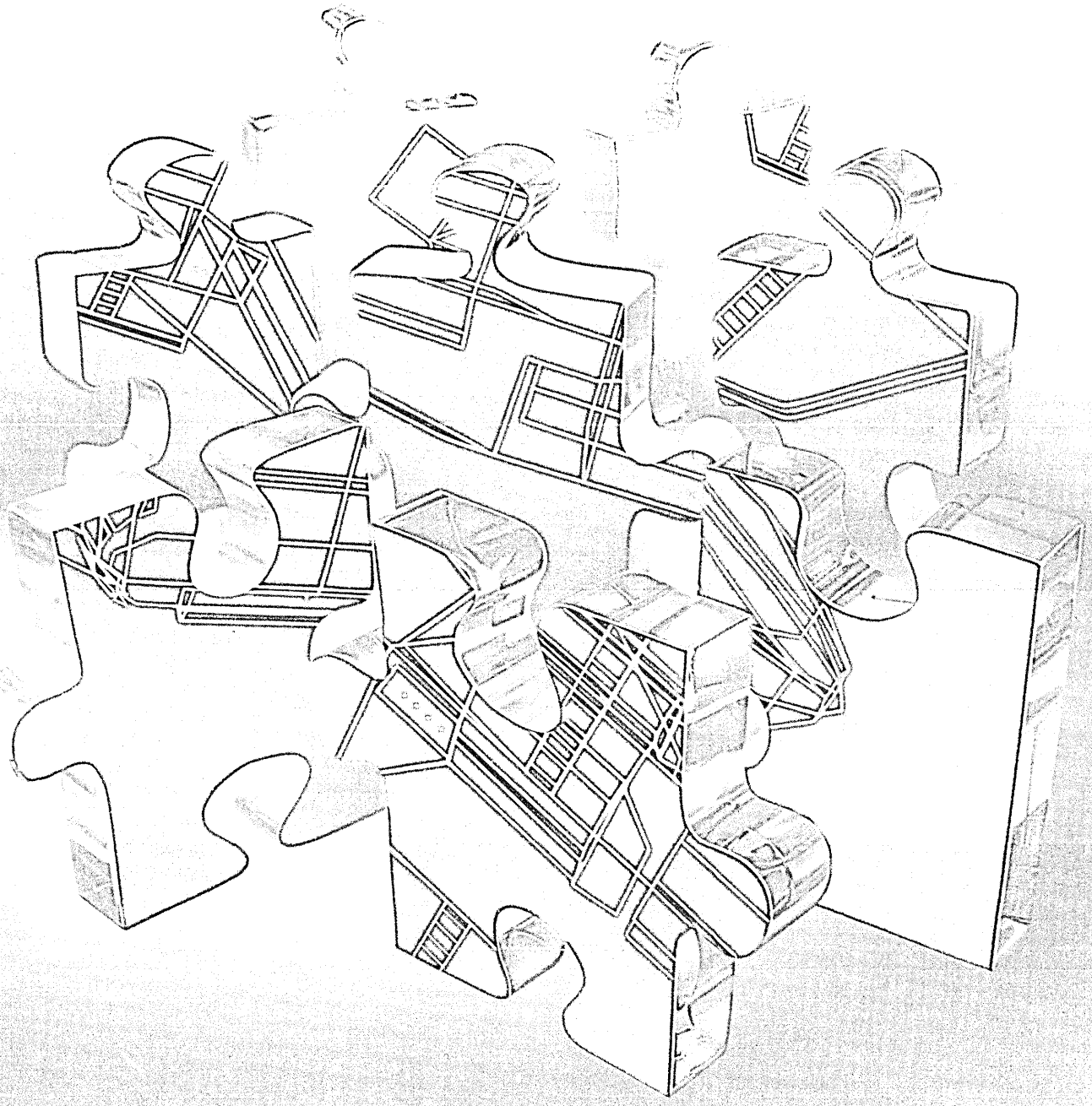
9. All major software interfaces and data structures are defined before detail design begins. Data structures and software interfaces form a contract which is monitored and controlled throughout design and testing.

10. Management attempts to hire and retain the correct mix of software personnel: 30% with more than six years' experience, 40% with between three and six years' experience, and 30% with college degrees and less than three years' experience.

State-of-Art Software Organization. Organizations which are at the state of art in software development should enjoy productivity of from 200% to 400% over modern software organizations. The higher percentage prevails in larger, very complex software developments. These organizations employ all the techniques described above and in addition utilize advanced concepts of a "software factory." This concept is a consolidated set of powerful development tools which allow software managers and programmers to perform the innovative aspects of software development and automate most of the more rudimentary tasks. Projects which have used this consolidated set of supporting tools have experienced significant improvement in developing rates.

The types of tools which have been shown to be most promising in improving development efficiency are described below:

1. A program which accepts rough software documentation as input and performs the following four processes: checks that all data variables have been defined and inserts a definition of



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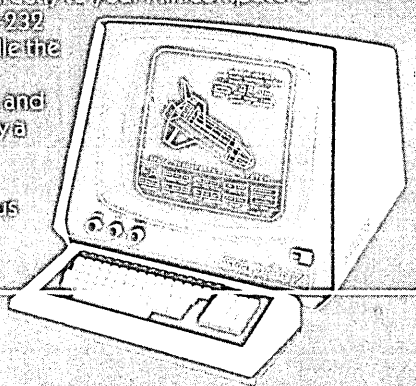

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each data element into the software documentation package; formats documentation according to predefined standards; generates data base maps and flow charts from data declarations and structured code; generates hierarchy chart from raw software documentation.

2. A requirement language processor and a design language processor. These processors allow the support system to understand constraints in both the system requirements documentation and the commercial software design documentation. This process allows for cross-correlation between the system specification and the design documentation and also allows for check of completeness.

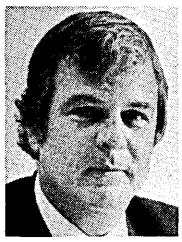
3. A software library concept which allows for effective storage and subsequent retrieval of functional software modules. This process allows for extensive reuse of software modules both within a given development as well as allowing for the reuse of functional modules among different developments.

4. Utilization of an ultrahigh-level programming language. This language allows for automatic code generation from a source language that describes operational processes.

5. Other less important tools, which include a design integrity analyzer, a software interface processor, a functional test plan generator, and various configuration control, design maintenance, and project management processors.

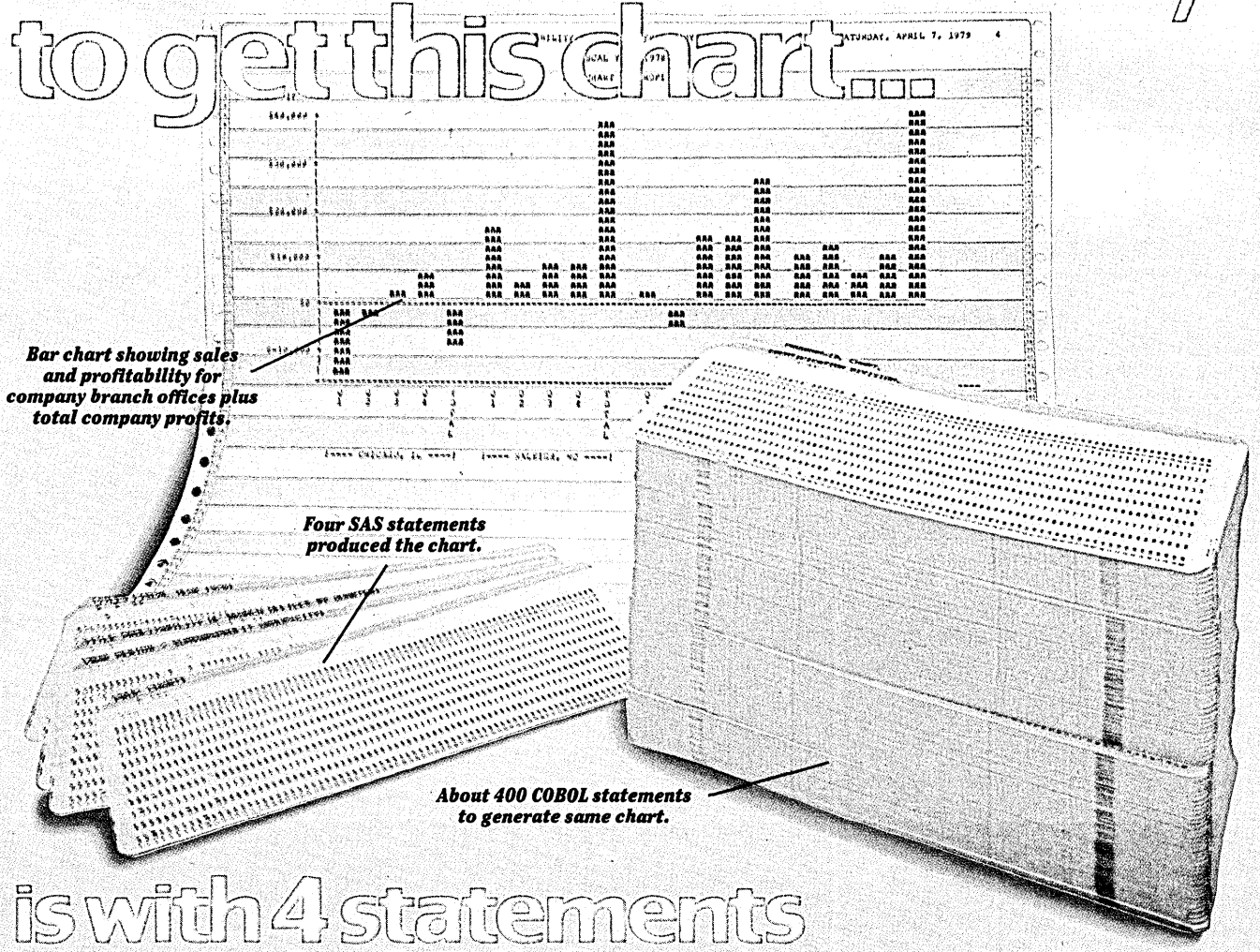
The objective of software management is to establish an environment in which high quality software can be developed using minimal resources. To achieve this objective, we must not only consider the organizational structure but also the control systems and management/technical methodologies employed within the organizational structure. Those software managers who suceed in establishing an effective organization will enjoy software development rates 1,200% better than those managers who fail. ✲

EDMUND B. DALY



Mr. Daly was recently appointed executive director-electronic switching of GTE Automatic Electric Laboratories, where during the past 10 years he has held the positions of assistant to the executive director, director-Advanced Development Laboratory, and director-EAX Operations Laboratory. He holds a BSEE and MSEE from the University of Illinois, Urbana, and a BA and MBA from the University of Chicago.

The most efficient way to get this chart...



is with 4 statements instead of 400.

SAS is a powerful software system that can increase your productivity. In the programming task shown here, 4 SAS statements produced the same chart as 400 COBOL statements. That's a typical example of how SAS can help you produce results faster.

But there's more. SAS can increase productivity two ways.

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

With SAS handling all that, programmers are free to use SAS a second way – as a higher-level programming language. Unlike most other software systems, SAS is not limited to prewritten routines. A programmer can use SAS to eliminate the tedious steps in a complex task.

However it's used, SAS increases productivity because SAS saves time. With SAS you'll be telling the computer what you want instead of how to do what you want.

Running interactively under TSO and in batch, SAS is now increasing productivity at more than 1,000 OS, OS/VS, *and CMS* sites. And users at those sites have put SAS on the Datapro Honor Roll for the third consecutive year.

There's another nice thing about SAS. The cost. You can add SAS to your dp staff for about 1/4 the cost of a new person. And after the first year it's even less than that.

To find out more, just write or call. It could be the beginning of a very productive relationship.

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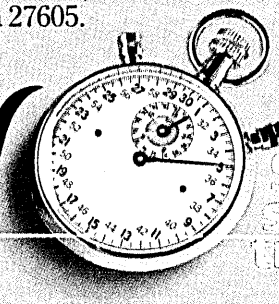
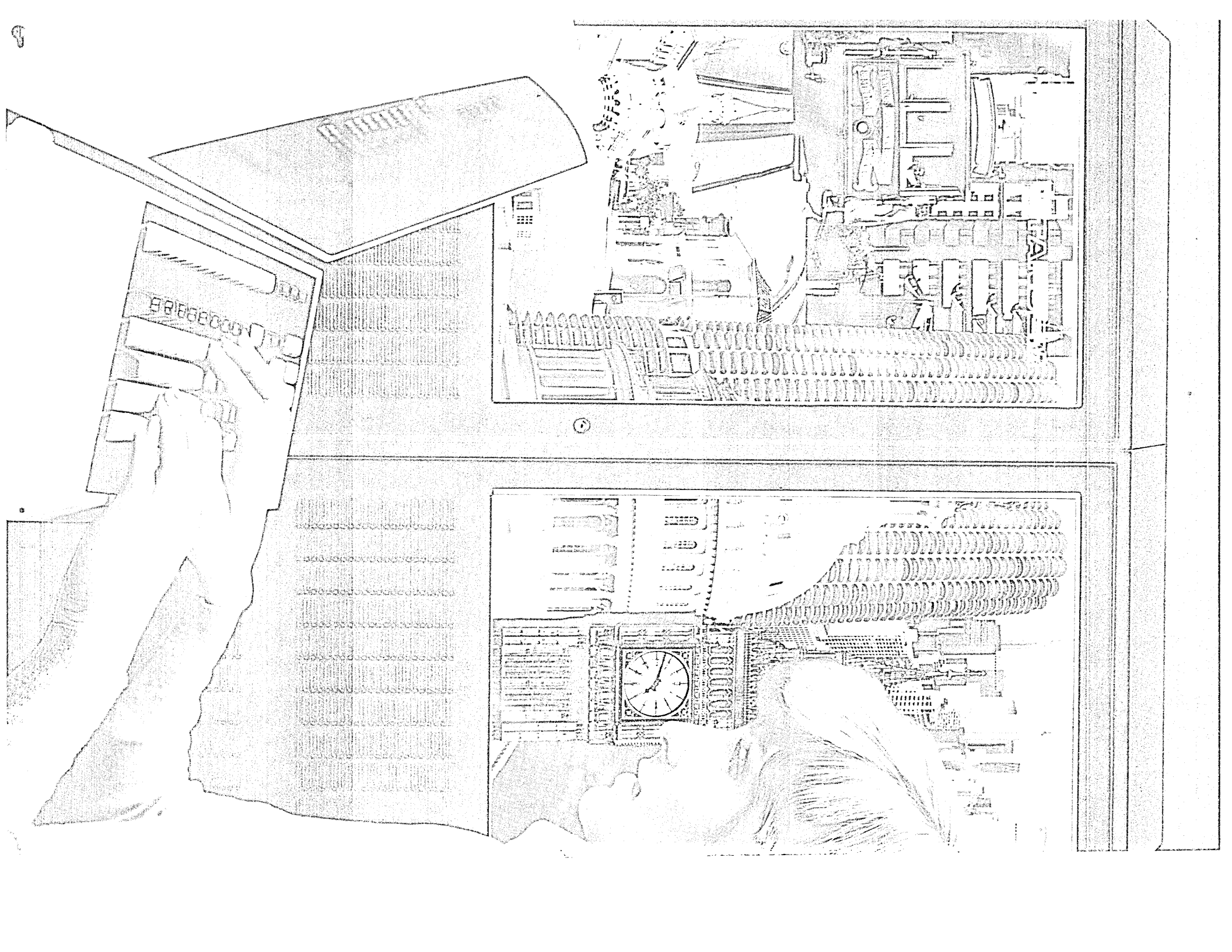
919/834-4381.

SAS



SAS saves time.

CIRCLE 81 ON READER CARD



GUARDIAN/EXPAND
The Tandem NonStop™ Network Operating System

The differences are enormous. The system is entirely transparent.

It began with the Tandem NonStop System. First of its kind. The one multiple processor system in the world capable of continuous operation—even during the failure of a processor I/O channel, disc controller or disc. Without loss or duplication of any transaction, even those in process. And with maximum protection for the data base—at a level unprecedented in the industry. Plus phenomenal flexibility: expandable in low cost increments from a basic two processor system all the way to sixteen processors with the ability to support thousands of terminals per system. File capacity of up to four billion bytes per file, and no limit on the number of files. Extraordinary it is, all by itself, and now as many as 255 Tandem NonStop Systems can be economically interconnected in a powerful, complete and amazingly simplified network. Read on.

Announcing the 4000 processor network.

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

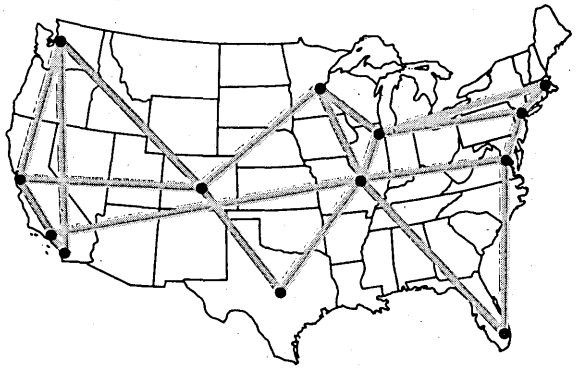
It looks exactly as if all messages were being transmitted only next door. And X25 protocol is available as well.

Introducing the distributed/ centralized data base.

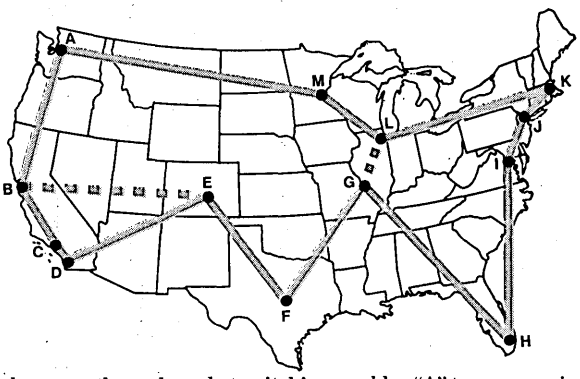
Totally transparent. With a split of geography completely invisible to the user. Not the separate interconnected data bases found in other networks but a unified data base completely and transparently accessible throughout the network. No user, and no application program, has or requires any awareness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

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

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



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



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

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

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

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

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

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

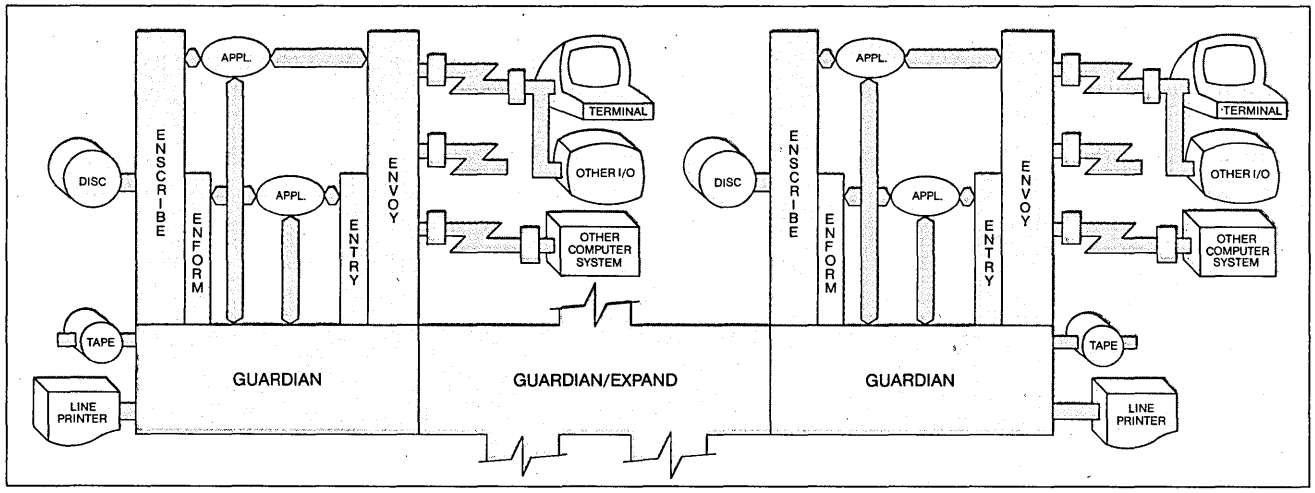
Comprehensive software—transparent and segmented.

Under the overall supervision of GUARDIAN/EXPAND, the Network Operating System, each individual system maintains its own Guardian Operating System plus all of the multiple processor and control communications systems and a host of applications languages including industry standard ANSI '78 FORTRAN and ANSI '74 COBOL. With T/TAL, EDITOR, SORT/MERGE, DEBUG, TGAL, ENFORM Query/Report Writer, and complete remote diagnostic capabilities, the software package of the Tandem NonStop Operating Network is truly impressive. Best of all, it never requires one iota of modification as systems, nodes and the entire network expand and are modified to suit changing requirements. And any Tandem GUARDIAN/EXPAND node can communicate with IBM or any other mainframe using industry standard protocols. We've made it possible and practical to go from any industry standard system to a low cost, comprehensive and flexible network without sacrificing your original installation.

If you're from Missouri, too.

Call or write for complete information about the Tandem NonStop Operating Network. We'll be happy to demonstrate both how and why this system will cost you less to begin with, less to expand, and less to operate than any other network on the market today. And most likely for years to come.

Tandem Computers, Inc.
19333 Vallco Parkway, Cupertino, CA 95014.
Toll Free 800-538-9360 or (408) 996-6000 in California.



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TANDEM

Global computer and office equipment trade grew 11% in 1977.

THE WORLD'S TOP 50 COMPUTER IMPORT MARKETS

by Bohdan O. Szuprowicz

The preliminary international trade statistics released by the United Nations in September 1979 provide comparative trade data for 113 countries. These statistics, compiled for specific commodities, are useful in assessing the size and growth of import markets.

Computers, peripherals, spare parts, and office equipment are accounted for under the Standard International Trade Code (SITC) 714. Under this code, about 85% of all equipment traded consists of computers, dp equipment, and parts, but does not include any software.

Although dp hardware production is one of the largest industries in the world, international trade in computer and office equipment is not one of the largest commodity groups traded in world markets. In 1977, total computer and office equipment trade was almost $11.6 billion, or 1.4% of the total trade in all commodites. This ranks computers and office equipment 16th in volume, comparable to paper and paper products, and only slightly larger than television, radio, and phonographs.

Interestingly, telecommunications (SITC 724) equipment trade is about 50% larger than that in computers and office equipment. Japan and West Germany are already larger exporters of telecommunications apparatus than the U.S.; Japan exports almost three times more telecommunications equipment than the U.S.

However, in the export of computers and office equipment the U.S. remains in the lead at 31.2%, followed by West Germany and Japan with 15.6% and 9.7%, respectively.

The top five countries exporting computer and office equipment command a collective market share of 74.5%. The top 10 exporting countries supply 93.3%.

Because the contribution of computer hardware exports to balance of payments is relatively small compared with trade in other commodities, governments are tempted to use such trade for political purposes. While individual manufacturers are frustrated by such attitudes, when they object vociferously about government-imposed export controls, they become even more valuable as "bargaining chips" to the politicians. Export licenses for advanced (or even state-of-the-art) computer systems are often a political pawn in the hands of government negotiators.

Western Europe continues to be the largest trading area in the world and is a net importer of computers and office equipment. While much of Western Europe's trade is strictly regional (and a certain portion that consists of shipments across countries), the region still imports over $1 billion more than it exports. Nevertheless, total Western European exports are now almost $6 billion, $2 billion more than the exports of the U.S. and Canada. However, much European trade consists of dp hardware manufactured by subsidiaries of American companies such as IBM and DEC.

Whereas imports in Europe increased by 17.7% in 1977, it is not the fastest growth area. Once again, that honor belongs to the 20 Arab countries in Africa and the Middle East which, as a group, have an imports growth of almost 26%.

Among the top 50 importing countries, four were over $1 billion markets in 1977; new to the group is the United Kingdom. The U.K. is also one of the four $1 billion-plus exporters (U.S., Japan, West Germany). France, which reached $995.8 million in 1977, is almost certainly a $1 billion exporter by now.

The fifth largest import market in 1977 was Canada, with imports at $669.5 in 1977. Canada is also the eighth largest exporter, with about $400 million shipped outside its borders in 1977. A large importer of Canadian-built equipment is the U.S., in many cases, buying from subsidiaries of American dp manufacturers.

The significant change in the top 10 importing countries was the dropout of the U.S.S.R., which showed a drastic decline as an import market for computers and office equipment in 1977, ending in 18th place among such countries as Brazil and Norway.

In market size among the fastest growing importing countries, Ireland leads with '77 imports of $156.8 million, an increase of 66% over '76. Since becoming a member of the Common Market, Ireland is a preferred assembly location for American, Japanese, and European manufacturers, who take advantage of Ireland's low labor costs and its proximity to the huge Western European markets. Ireland's exports were $213 million in 1977; it is one of the few countries in the world showing a surplus, far ahead of such traditional "off-shore" suppliers as Brazil, Singapore, Mexico, South Korea, or Hong Kong.

Among the Arab States, Saudi Arabia is the leader; Saudi imports grew 51.2% in 1977. Because the Saudi economy has a limited capacity to absorb high technology products without simultaneous training, installation, and operational assistance, these are additional dp markets; purveyors of software, services and supplies are needed to get dp projects installed and operating until Saudi personnel are trained to take over.

Following Saudi Arabia, the largest dp import markets in the Arab world are Algeria, Kuwait, Egypt, Iraq, and Morocco. Lebanon, if political stability continues for the next few years, will probably outpace most Arab states as a large importer of dp products because of its extensive banking and trading industries. In addition, Lebanon's longer range potential is enhanced by its high literacy rate; it is in a position to absorb high technology faster than many of its neighbors.

Four countries import considerably more than they export, resulting in an unfavorable balance of trade in the SITC 714 category. Traditionally, such countries are prime prospects for development of domestic dp manufacturing in an attempt to correct trade imbalances. Leading among these countries is Australia which imported $282 million of computer and office equipment products in 1977, an import-to-export ratio of 14:1.

The dramatic collapse of the import markets in the Soviet Bloc countries was perhaps the greatest surprise in 1977 because many Western manufacturers had high hopes for selling plug-compatible peripherals for use with COMECON-designed RIAD computer systems (designed around IBM/360 and 370 operating software). However, there is some question whether the decline of the Soviet Bloc computer trade has been as large as the United Nations trade statistics lead us to believe.

One reason for this is that Soviet Bloc countries are increasingly reluctant to provide commodity trade statistics pertaining to import and export of engineering products at detailed product levels. For 1977, Bulgaria, East Germany, Hungary, Poland, and Rumania did not provide full SITC 714 code statistics. East Germany withheld its export trade data at this level for the first time in 1977, and because its trade in computers and office equipment is the largest in the Soviet Bloc, this would immediately influence trade statistics of other COMECON countries who import 90% of East German exports in this category.

An analysis of Soviet trade statistics shows the Soviet Union imported $240 million of SITC 714 products in 1977, twice the amount reported by the U.N. statistics.

There are also differences in valuation of imports and exports that are troublesome to the compilers of comparative international trade statistics. In the case of the Soviet Union, for example, U.N. statistics based on U.S. Customs export data indicate $5.9 million of equipment left the U.S. in 1977 destined for the Soviet Union. For the same year, Soviet statistics published in Moscow indicate dp equipment imports from the U.S. valued at over $11 million. Soviet valuation, customs duties, and freight charges create differences, but if the discrepancies are unreasonably large, there is always the suspicion that Soviet imports reflect equipment shipments that may have been originally exported from the U.S. to other destinations in order to obtain export licenses, and later illegally diverted to the Soviet Union or some Eastern European countries for which export licenses could not be issued. Withholding trade statistics by COMECON countries would help in preventing the discovery of such trade inconsistencies.

There could be several reasons for the decline of Soviet Bloc imports markets, but the most plausible are an increasing shortage of hard currencies, a growing indebtedness to the West, and the development of significant domestic dp hardware manufacturing capabilities within each COMECON country (including Cuba's minicomputer production).

SIGNIFICANCE OF COMPUTERS AMONG OTHER COMMODITIES

Rank		Imports in millions of $U.S.	Percent of world total
	World Total	781,898	100.0
1	Fuels	170,590	22.0
2	Agricultural products	104,314	13.0
3	Motor vehicles & parts	68,856	9.0
4	Raw materials	58,638	7.5
5	Chemicals	53,633	6.8
6	Industrial machinery	42,296	5.4
7	Electrical machinery	34,917	4.5
8	Iron and steel	26,122	3.3
9	Textile fabric and yarn	22,284	2.8
10	Clothing	20,241	2.6
11	Nonferrous metals	19,727	2.5
12	Telecommunications	18,604	2.4
13	Scientific instruments	14,506	1.8
14	Metal manufacturers	14,009	1.7
15	Paper	12,214	1.5
16	Computers & office eqpt.	11,683	1.4
17	Tv, radios, phonographs	11,330	1.4
18	Diamonds	9,333	1.2
19	Aircraft	6,883	0.9
20	Agricultural machines	5,920	0.7

Sources: National Foreign Assessment Center, August 1979; United Nations International Trade Statistics, September 1979.

Table 1.

REGIONAL TRENDS IN COMPUTER IMPORTS 1976-77 (in millions of $U.S.)

Region	Total Imports in 1977	Total Imports in 1976	Percent change 1976-1977
World Total	11,683.9	10,520.8	+ 11.0
Western Europe	7,019.5	5,989.8	+ 17.2
North America	2,041.2	1,790.4	+ 14.0
Asia (including Far East)	882.2	768.7	+ 14.7
Latin America	566.9	520.8	+ 8.8
Soviet Bloc	389.5	775.7	− 49.8
Oceania	330.8	279.2	+ 18.5
Africa	263.6	235.0	+ 12.0
Middle East	189.9	161.5	+ 17.6
Arab States only *	169.4	134.5	+ 25.9

Source: Compiled by 21st Century Research from international trade statistics preliminarily published by the United Nations in September 1979 for Standard International Trade Category (SITC)714, which includes computers and office machinery.

*Arab States are a grouping of 20 Arab countries located in Africa or the Middle East. The totals for Africa and Middle East also include their constituent Arab countries in these statistics. These figures are developed for comparative purposes by region and do not add up to the world total as some duplication and overlap will occur.

Table 2.

TOP 50 COMPUTER AND OFFICE EQUIPMENT IMPORT MARKETS

Country	Rank	1977 Imports	Rank	1976 Imports	Percent change 1976-1977	Percent change 1975-1976
World Total		11,683.9		10,520.8	+ 11.0	+ 10.95
West Germany	1	1,382.9	3	1,171.9	+ 18.0	+ 8.3
United States	2	1,369.8	2	1,181.1	+ 15.9	+ 26.7
France	3	1,335.4	1	1,199.7	+ 11.3	+ 17.1
United Kingdom	4	1,159.8	4	977.9	+ 18.6	+ 18.1
Canada	5	669.5	5	607.1	+ 10.2	+ 19.8
Italy	6	620.0	6	579.5	+ 8.7	+ 13.2
Japan	7	499.6	7	432.8	+ 15.4	+ 6.2
Netherlands	8	483.3	8	410.4	+ 17.8	+ 15.2
Belgium/Luxembourg	9	341.7	10	263.6	+ 29.6	+ 14.3
Sweden	10	302.7	11	262.8	+ 15.2	+ 23.6
Australia	11	281.7	13	231.5	+ 21.7	+ 4.8
Spain	12	273.9	12	253.9	+ 7.8	+ 5.9
Switzerland	13	261.4	14	224.8	+ 16.3	+ 16.3
Denmark	14	173.6	19	129.3	+ 32.3	+ 8.6
Austria	15	169.0	17	140.5	+ 20.3	+ 18.4
Ireland	16	156.8	23	94.4	+ 66.1	+ 103.4
Brazil	17	135.2	18	134.0	+ 0.9	− 31.4
Soviet Union	18	115.6	9	315.7	− 63.4	+ 10.7
Norway	19	114.3	25	82.4	+ 38.7	+ 21.0
South Africa	20	113.0	21	104.5	+ 8.1	− 17.3
Hong Kong	21	111.4	22	100.7	+ 10.6	+ 31.5
Mexico	22	106.8	15	146.5	− 27.1	− 4.7
Venezuela	23	89.3	27	69.4	+ 28.6	+ 15.7
Finland	24	88.6	24	84.4	+ 4.9	− 1.1
Czechoslovakia	25	82.7	20	126.6	− 34.7	− 30.7
Argentina	26	81.0	36	39.1	+ 107.1	− 12.9
Yugoslavia	27	76.2	28	46.9	+ 62.5	− 14.6
South Korea	28	64.6	29	45.7	+ 41.3	+ 55.4
Poland	29	53.0	16	140.7	− 62.3	+ 9.2
Singapore	30	49.9	35	40.0	+ 24.7	− 8.5
East Germany	31	49.1	32	42.8	+ 14.7	− 21.8
Hungary	32	48.9	29	78.0	− 37.3	− 12.1
Iran	33	44.2	30	45.6	− 3.0	− 29.6
New Zealand	34	42.2	33	42.5	− 0.7	− 12.6
Israel	35	41.6	34	42.3	− 1.6	+ 2.4
Saudi Arabia	36	39.0	39	25.8	+ 51.2	+ 56.4
Portugal	37	35.9	40	25.2	+ 42.5	+ 8.2
Nigeria	38	34.6	41	24.9	+ 38.9	+ 37.6
Philippines	39	30.2	37	30.7	− 1.6	+ 15.4
Bulgaria	40	23.4	31	44.1	− 46.9	− 13.2
Panama (inc. Canal Zone)	41	22.4	43	17.6	+ 27.3	+ 74.0
Algeria	42	21.0	42	19.5	+ 7.7	+ 31.8
Greece	43	20.7	46	16.8	+ 23.2	+ 14.3
Malaysia	44	19.9	48	14.6	+ 36.3	− 22.3
Chile	45	19.5	40(1975)	11.8	+ 65.3	NA
Colombia	46	18.0	44	16.8	+ 71.4	+ 2.4
Romania	47	16.5	38	27.6	− 40.2	− 21.1
Kuwait	48	16.1	—	9.9	+ 62.6	NA
Egypt	49	15.7	50	12.8	+ 22.6	+ 31.1
Iraq	50	14.7	—	9.3	+ 58.1	NA

Table 3.

FASTEST GROWING IMPORT MARKETS IN 1977

Rank	Rank among top 50	Country	Percent growth 1976-1977	Market size millions of $ U.S.
1	71	Lebanon	158.8	4.4
2	26	Argentina	107.1	81.0
3	46	Colombia	71.4	18.0
4	16	Ireland	66.1	156.8
5	45	Chile	65.3	19.5
6	48	Kuwait	62.6	16.1
7	27	Yugoslavia	62.5	72.6
8	50	Iraq	58.1	14.7
9	36	Saudi Arabia	51.2	39.0
10	59	El Salvador	48.3	8.9

Table 4.

There is little question that since the early 1970s, when COMECON RIAD unified computer hardware, considerable progress has been made in the development of domestic production. (During the summer of 1979, the RIAD 2 series of computers, reportedly compatible with the IBM/370, was introduced to COMECON end users).

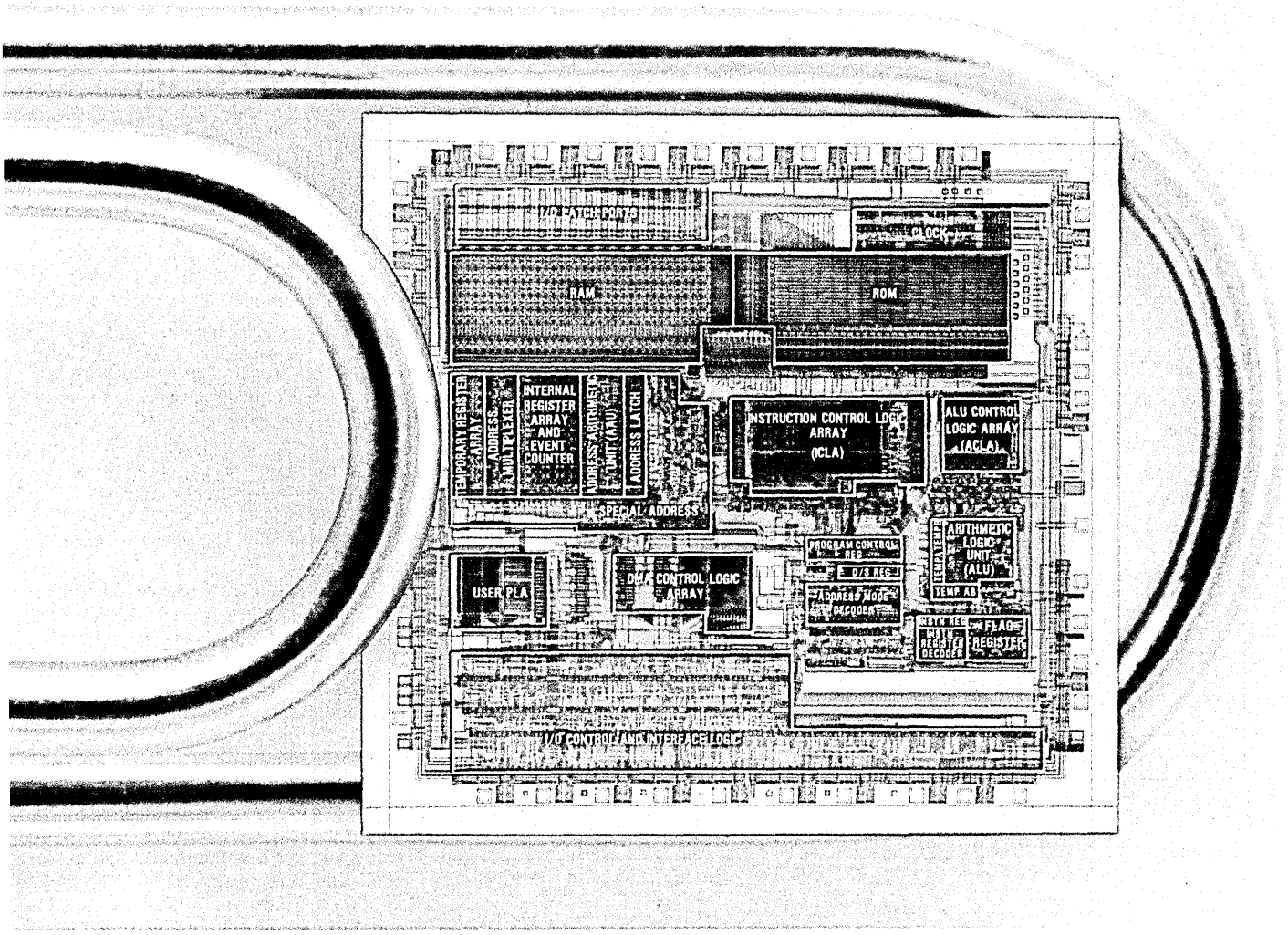
The magnitude of COMECON's dp manufacturing capabilities was outlined in August 1979 by the Central Intelligence Agency in its annual volume on basic international statistics. According to the CIA report, the Soviet Union's production of computers and peripherals reached 3.3 billion rubles in 1978 ($4.8 billion).

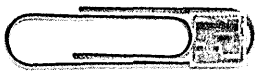
The CIA report also indicates that East German dp production was on the order of $700 million, while Poland and Hungary manufactured about $500 million and $121 million, respectively. Not counting Bulgaria, Rumania, and Cuba, which all manufacture computers, minicomputers, or peripherals, this suggests an output of dp equipment and peripherals valued at about $6 billion or 40% the size of dp shipments in the U.S. in 1978. Asia, Japan, China, and India are the three countries withh their own domestic computer hardware manufacturing industries, but only Japan is a factor in international trade. The second largest end user in the world, Japan is the seventh largest import market, and the third largest exporter. However, unlike the U.S., Japan's exports include a large proportion of office equipment products rather than computers.

Although progressive liberalization of the Japanese import markets has been widely publicized, the sluggish growth of Japanese import markets in recent years suggests that trade restrictions continue to have a decisive effect in protecting the Japanese dp markets for domestic manufacturers. The Japanese hardware production level by 1978 was estimated to have reached about $3 billion. This means that the U.S.S.R. is already a larger dp manufacturer than Japan. The reason for this is the huge military market which both the Soviets and the U.S. prefer to supply from domestic production. ✲

Mr. Szuprowicz is president of 21st Century Research, an international market research firm specializing in strategic materials and high technology trade. His past experience includes engineering and management posts at Boeing, General Dynamics, IBM, CEIR-Control Data, and High Technology West.

The one-chip computer: offspring of the transistor





The MAC-4 one-chip computer, developed for a variety of telecommunications applications, is compared to a standard-sized paper clip. The chip's numerous functional areas are labeled.

One of the transistor's latest descendants is the Bell System's 30,000-element MAC-4 "computer-on-a-chip." It's another in a long line of microelectronic developments that have come from Bell Laboratories.

The MAC-4 is so efficient that a program written on it takes 25 percent less storage space than that required by most other microcomputers. Its assembler language, C, also developed at Bell Labs, has features that make MAC-4 easier to program, debug and maintain. And the MAC-4 can handle anything from nibbles to bytes to words with its 4-, 8-, 12-, and 16-bit operations capacity.

Like other one-chip computers, the MAC-4 has sufficient memory to support its varied tasks—3000 nibbles of read-only memory and 200 nibbles of random access memory coupled to 34 input/output ports.

Fabricated with the latest CMOS technology, the MAC-4 needs little power. Thus it is well matched to a variety of telecommunications applications.

It started with the transistor

MAC-4 is just one current example of the many microelectronic devices to come from Bell Labs since we started the solid-state revolution with the invention of the transistor in 1947.

Over the past three decades, our advances in materials, processing, and devices have been vital to solid-state technology. These include:

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Today and tomorrow

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For further information, or to inquire about employment opportunities, write: Bell Laboratories, Room 3C-303, 600 Mountain Avenue, Murray Hill, N.J. 07974.

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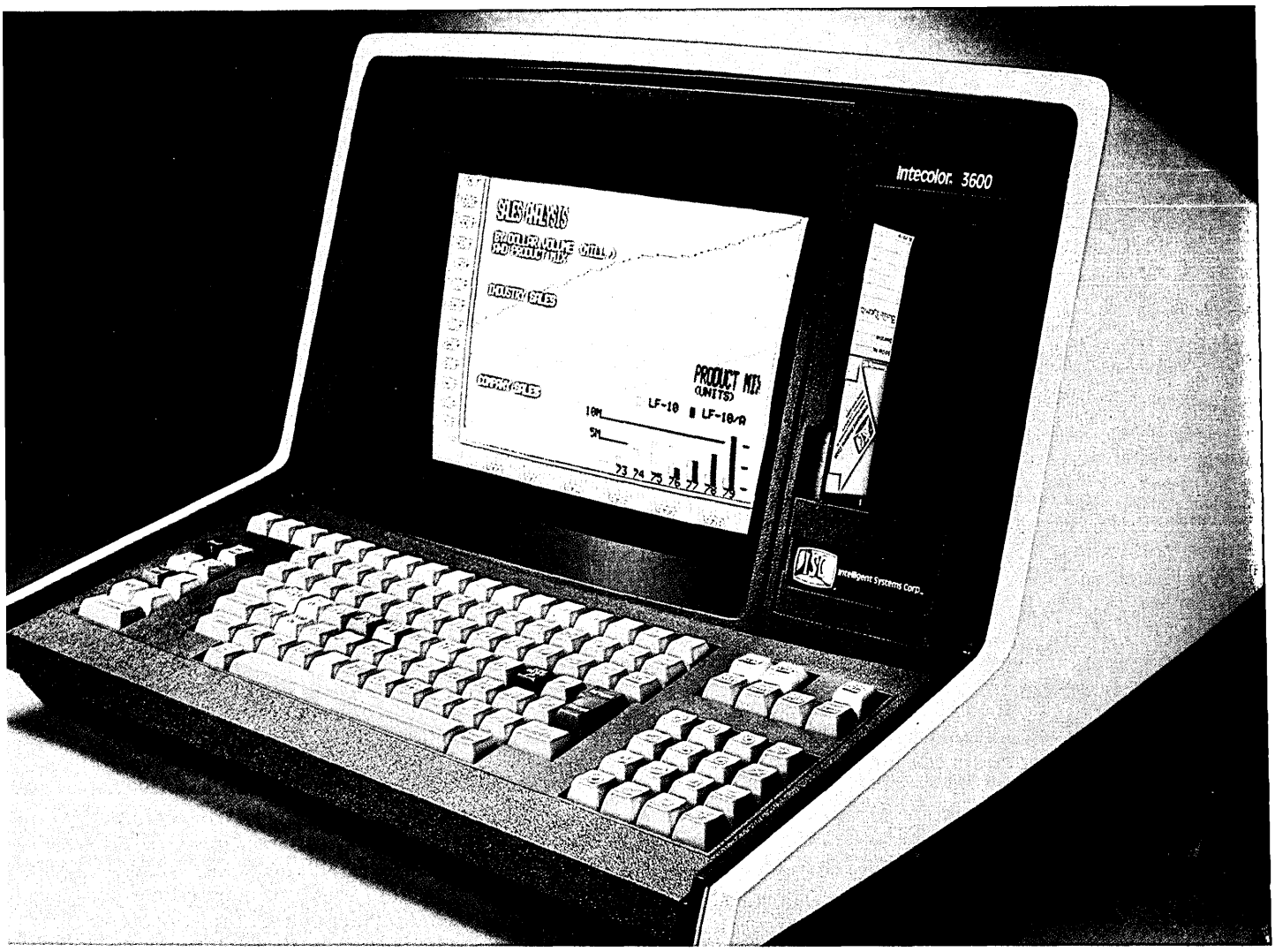
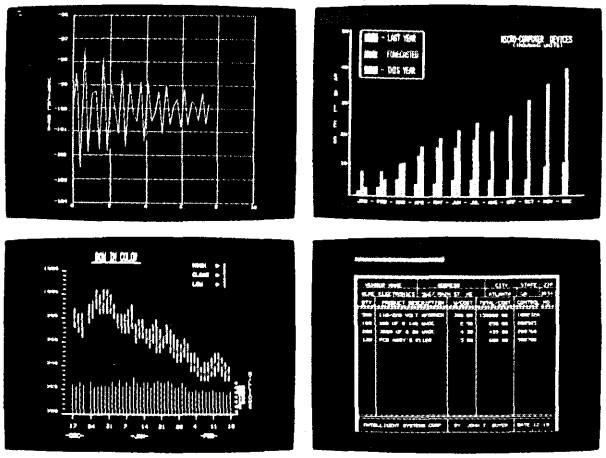
From Science: Service



Color communicates better. That's why the future belongs to Intecolor desktop computers.



In the past, almost any desktop computer would do. But as applications become increasingly complex, you need a desktop that actually improves the flow of information—Intecolor. Every Intecolor desktop features a color graphics display to make data more manageable and easier to understand. The cost? Surprisingly low—the Intecolor 3621 shown above costs just $3300* for a single unit. This includes BASIC, FORTRAN IV, mini-disk drive and 32K of user RAM. Only from ISC, the world's largest supplier of color terminals. Put an Intecolor desktop computer to work for you—contact your ISC sales rep today.

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CIRCLE 86 ON READER CARD

The environment, development process, people, and dp shop management all determine the productivity of an organization.

THE PRODUCTIVITY GAP

by Robert L. Patrick

"By Invitation Only"—that's how the 150 representatives of IBM's larger customers came to attend the Applications Development Symposium held Oct. 15–17, in Monterey, Calif. They were joined by about 50 IBMers, in an event IBM cosponsored with SHARE and GUIDE.

The 20 papers ran the gamut from the prosaic through state-of-the-art practical situations to the fringe of emerging research. Unfortunately, the sequence of presentations was confusing and the quality of the papers was spotty. In an attempt to spare the reader some of the sorting and cataloging the attendees had to do, a pause for an organizing principle is now in order.

There are four parts to the productivity problem. The parts are so fundamental they dictate the solution. First comes the environment. The physical facilities provided for your development people, the policies that guide your salary administration (overtime, bonus, compensatory time, or other incentives), and the basic value system of the organization control the relative values of people and machines (current expense versus capital outlay) in your organization. Every organization is different. The differences in these environments are significant since they determine how you motivate your staff and how they are rewarded for positive attitudes.

The second facet of the productivity problem is the process itself. Most shops have some formal developmental system that breaks up activities into phases. However, here shops start to differ greatly. Some plan and track development activities carefully and have rigorous milestones and lists of deliverable items which must be present for the phase to exist. Other shops have processes which are much less well structured. The process discipline and the developmental standards also change from shop to shop depending on the management goals and how tight a ship you run. Into this milieu we inject programming languages, support systems, special methodologies like structured programming, and a variety of tools and techniques designed to make specific activities within the process more efficient.

The third constituent is the people. How you select them, the education you insist upon, the entry level skills you demand, the refresher training and skills enhancement you provide, and the attitude you tolerate all form the whole being that carries out your development activities. The employees' home life can interfere with his productivity if he allows it to get out of kilter.

PRODUCTIVITY FACETS IGNORED

Finally the management of the dp shop has a direct effect on productivity of a development team. How many administrative distractions impact the developers? Do their previous systems, now in production, compete for their time, effort, and mental faculties? Are they given work assignments so they grow and learn and are prepared for new responsibilities? How are project planning, estimating, tracking, reviewing, and inspecting conducted?

All four of these facets interplay in a complex manner to determine the productivity of your development shop.

Although the symposium was billed as a comprehensive look at the state of the art, the environmental facets were not mentioned at all. The people problems were only alluded to, and only one or two speakers even mentioned the oft-quoted numbers—that the difference in productivity between a clod and a top-notch programmer can be as much as 10 to 1 on almost any scale you wish to measure by.

Also, as you might expect, a great number of the papers concentrated on the process. Half of these presented new tools for improving the efficiency of specific developmental activities, e.g., a paper on the use of a program specification language to improve requirements analysis; and another paper which described an experimental programmer's workbench that allowed data to be gathered, stored, and organized during the design process so it could be easily transformed into a data dictionary load to improve the programming process.

The other half of the process papers tried to change the process itself. There was the usual cry for getting the users involved so we could off-load some of the more mundane design responsibilities on the user, but these were complemented by calls for user-friendly specification systems so the users could be prompted to tell what they knew and help when they could.

And then there were several papers that tried to meet the productivity problem head-on through direct management action. These tried to innovate within the corporate environment by establishing measures for productivity, installing tools and techniques to support those measures, and then managing the data processing center to achieve these stated short-term goals.

The cocktail party discussions recognized that the size of the installation, the size and complexity of the systems being developed, and the pace of development within the shop acted as modifiers to the environment. Big jobs naturally suffered from more overhead and needed more support tools just to put them within the grasp of the typical development team.

Undercurrents running through the sessions and the informal conversations were concerns over the shortage of people, a scarcity of good people, the distraction caused by the constant flow of new products from the vendors (amplified by the vendors' software changes), and the squeeze caused by the growing backlog of old code that demands ongoing maintenance and attention to run productively. The audience didn't wince when one speaker noted that it was not unusual for a mature programming shop to expend 60% to 80% of its current labor force in changing and maintaining old code

While we made good progress in the past, we still have a problem: the demand is outstripping the supply.

while only 10% to 15% of the workers were building new systems. With the growth of the shops and the legacy of old code, it will take years for process changes to be assimilated in some of the larger shops (even when an integrated set of tools and techniques becomes available).

Several of the outstanding papers dealt with real-world situations. T. A. DiMartino, who works for the State of Connecticut, reported on a success story involving the use of the standard IBM DMS/VS (Development Management System, a fill-in-the-blanks programming technique for use with a class of on-line data base systems) to set up a Medicaid accounting and expense approval system. Evidently his application fit the DMS/VS design point exactly, because he took a crew of five young programmers and in less than a year designed, implemented, and put into production a major social service data base system. Furthermore, he had some estimates on what it would have taken to program the system using routine techniques running in CICS, and he beat those estimates by 5 to 1.

F. A. Comper of the Bank of Montreal characterized his environment as follows: 1,240 branches, 4,400 terminals on a network, and a sustained on-line load of 75 transactions a second. The bank has 2,500 changes outstanding at any one time, and they manage the 20,000 source modules in their production library with a formal change management procedure backed by airtight software library controls. Several years ago they launched a study and concluded they had to get rid of their assembly code and their personalized programming techniques. They went for a package of modern techniques that included structured design, PL/1, and walkthroughs. They completely renovated the programming environment and now have increased the statements per day per programmer by 43%. Comper hastened to add that he had installed quality controls at the same time so the increased productivity was matched by quality improvements.

A. J. Albrecht of IBM, White Plains, also reported success in improving the productivity of 450 contract programmers. He has a well-defined development process that all projects must follow rigorously, gets good labor distribution information as his people work, and collects all of this into a data base that he uses for estimating. He has prepared an estimating algorithm that seems to fit his work in his environment, and now he can track the estimates he starts with and the performance he achieves. He has been at this long enough that he can compare programmer productivity improvements over time for three separate programming languages: COBOL, PL/1, and DMS/VS. The results are impressive; he apparently has set up a management system that allows him to know what he gets whenever he innovates.

STAMPING OUT WASTE

R. G. Lanergan of Raytheon did a study and found that many projects wasted many labor hours redoing modules of code that had been done before. He got $250,000 out of his management and assigned six top-notch people to stamp out that waste. They conceived and built up a support system that encourages the use of reusable modules of code. He now has a library of subroutines, similar to the mathematical libraries long used by scientific installations, which contains the commonly called business programming functions (edit input statements, prepare report, update a record, etc.). Some of these are complete modules ready to be called and inserted in compiled code, whereas others are logical skeletons that require some coding by the user.

So far that's not a breakthrough, but he went on to produce a library support system that describes and indexes these modules so programmers can easily find out if what they need is already available, and a set of software that maintains an audit trail of which modules were used by whom and in what programs, so corrections and improvements can be properly promulgated throughout the production libraries. In five major applications consisting of over 250 programs, he has realized more than 60% reusable code. This means a substantial saving in time, development cost, and errors avoided.

W. E. Winters or AT&T Long Lines started back in 1973 to attack the analysis problem. He found that the Problem Statement Language (PSL, University of Michigan, Teichroew, et al) showed promise in improving the quality of his systems analysis, which then made programming and documentation easier. He evaluated PSL on a pilot project, sold it for prototype use, and now six long years later has it installed in several locations for use by the 300 people he has trained. He is proud to report that 87 of their current development efforts have now voluntarily chosen to use PSL. They found to date that PSL does not have a deleterious effect on the analysis step, and has a positive benefit on programming and maintenance.

J. B. Menard of Exxon followed with a similar success story on the use of Michael Jackson's technique for data-driven design. She and her colleagues evaluated it, extended it, built the necessary support software, and now have it installed in several of Exxon's worldwide locations to enhance development productivity. Both Winters and Menard reported on future plans that include extensions to these automated techniques to further improve the productivity of the development process.

In addition to those success stories dealing with improvements in the process, three papers concentrated on the management of development. T. C. Jones of IBM, San Jose, continued his string of excellent analyses of the programming process; in this case he addressed programming productivity and identified the factors that affect productivity while classifying the techniques to improve productivity. J. R. Ehrman of Stanford gave us a very lucid presentation of the complexity we have added to the programming process through the use of incompatible and illogical languages throughout the programming process itself. He identified 12 languages (enough for the tower of Babel) that a programmer needs to know to get an algorithm coded, compiled, tested, and documented. W. R. Bradshaw, of IBM-Corporate, enumerated a series of indirect productivity measures that have been designed by his staff function to cause the managers of IBM's internal data processing shops to keep the user's productivity foremost in their minds while controlling the proliferation of underutilized equipment.

As the seminar closed, it was pretty clear that some individual tools were available from IBM and other vendors and that some packages existed, but we had nothing that looked like an integrated set of tools and techniques to support the development process.

About the time we were feeling pretty glum because we had only pinpoint solutions to a broad-based pervasive problem, one of the audience tried to end the conference on a positive note by getting us to look back at all the progress we had made in the last 20 years. While we made good progress in the past, we still have a problem: the demand is outstripping the supply. With the price of hardware continuing to go down and the price of personnel continuing to go up, the pressure is building. We had better do some sincere work on the productivity problem because it is going to persist for a long while. ✻

Mr. Patrick has been an independent computer consultant for 20 years and has served on the DATAMATION editorial board for the same period.

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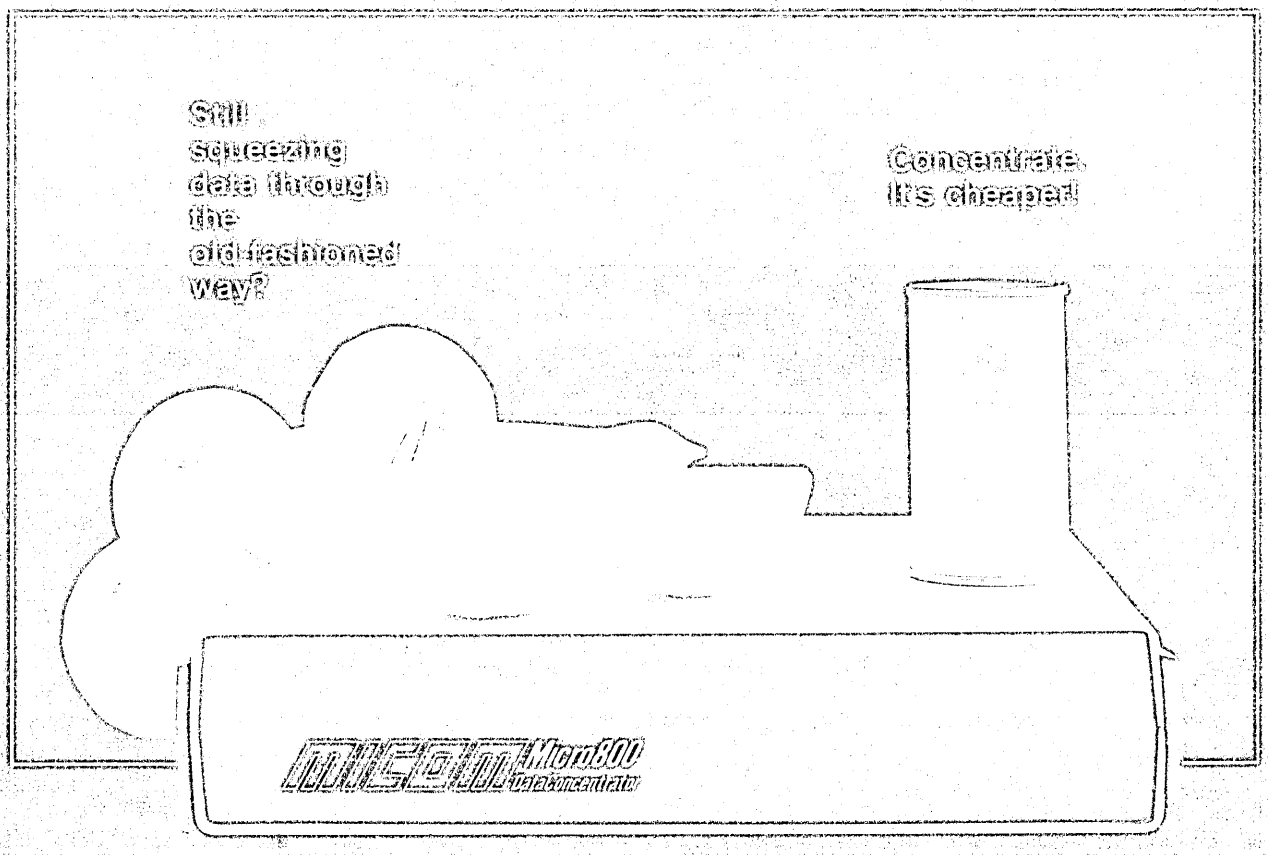

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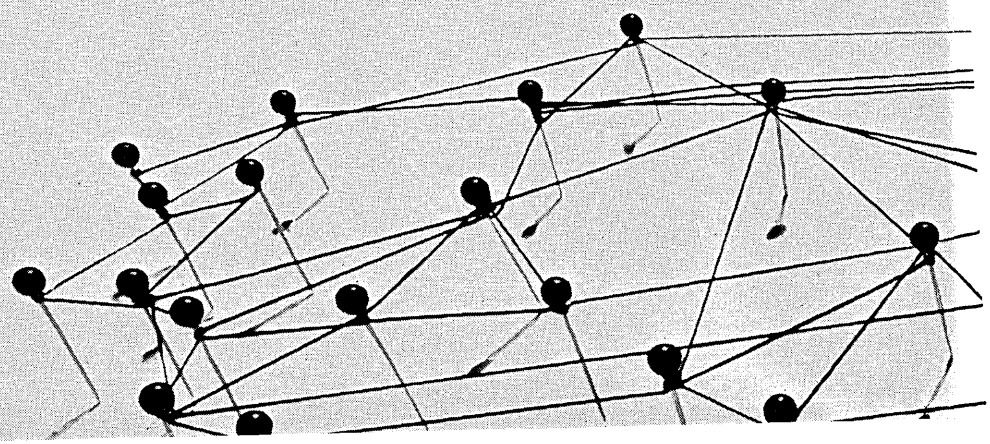

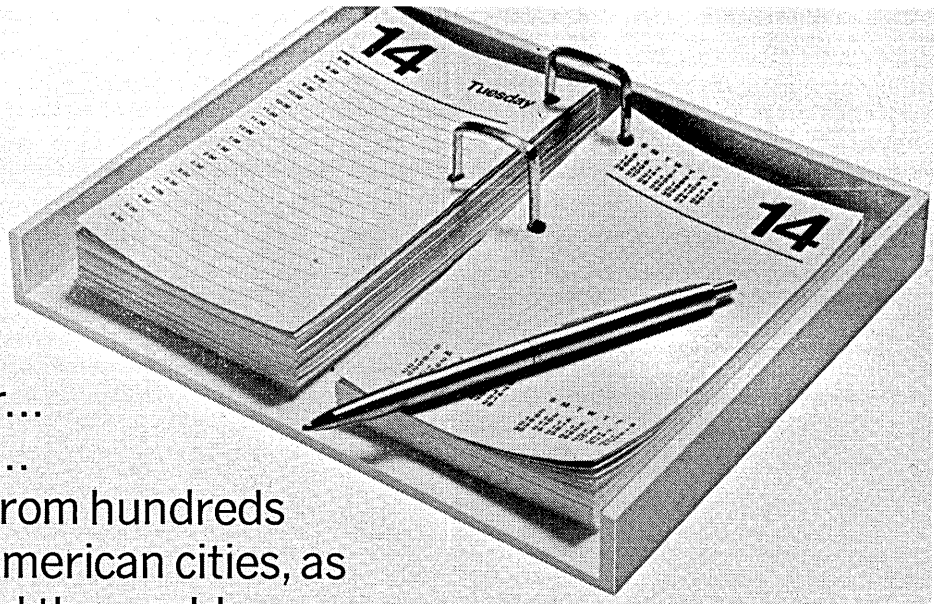

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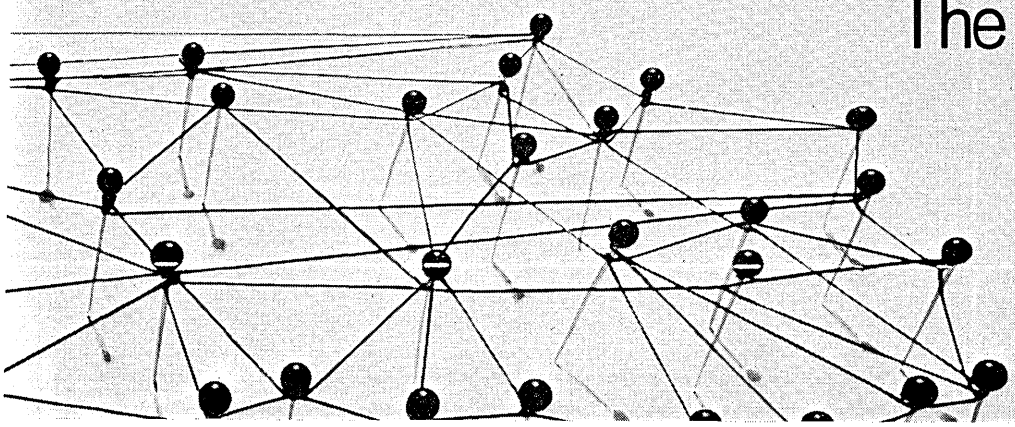

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The data network

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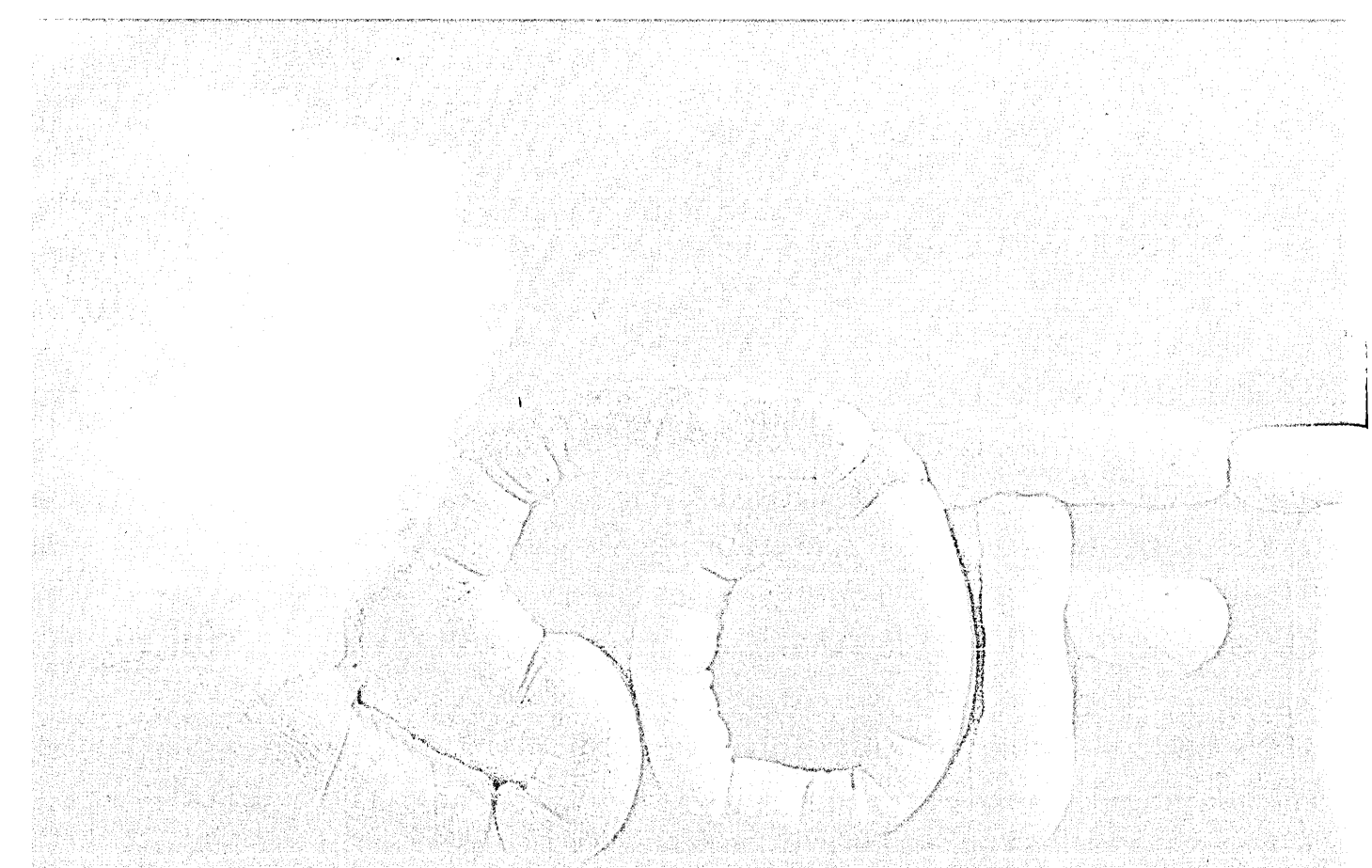


THE SOFTWARE SCENE: 1979

SOFTWARE PACKAGES: BEST BUY TODAY

by Martin A. Goetz

The software products industry is approaching $2 billion in annual revenues, and software product growth has been predicted to be 27% per year for the next five years. A variety of competitive software packages are available to users, and, as the DATAMATION/DATAPRO survey shows, there is overall user satisfaction with the packages rated.

Competition in the software industry has improved the general quality, the specific features, and the price of software products. Today, with the increasing cost of custom programming and the corresponding shortage of qualified programmers, the software package is a bargain. A user can buy a package that has been fully tested and is operational, and he can also receive full maintenance against errors. Also the user can begin using the package in a few days, and, additionally receives enhancements over the years.

Software packages have brought psychological as well as productivity benefits to the user. Studies show programmers are more productive and morale is higher when state-of-the-art software

packages are introduced in a company.

Finally, many software packages increase both the effective throughput of the computer and the reliability of operational user programs. Today's packages have undergone years of testing, and the code, although perhaps not bug-free, represents the most stable software available. Also, since software packages are built in a competitive environment, they tend to be more efficient than custom programs.

PACKAGES IN THE THOUSANDS

At last count, software packages numbered in the thousands. There is no doubt the catalyst for this rapid growth has been the promulgation of software unbundling since 1970. While unbundling did increase the opportunity for software product success, there are still thousands of unsuccessful—or marginally profitable—software packages that have been built both by hardware manufacturers and by independent software suppliers. On the average, the actual chance for success of a package is only 1 in 10. Because of this, many questions continue to linger regarding the elements of a successful software product.

The answer to these questions depends largely on the size of the software company, its history, its user base, and its management people. A user in the marketplace would be wise to consider several technical factors that are keys to a successful package.

Advanced technology. Today's users are knowledgeable enough to objectively compare competitive products. Successfull packages are usually the most technically advanced. The day of buying pig-in-a-poke software is gone forever.

Ongoing enhancements. Users' requirements and operating environments are rapidly changing. Products that are continuously enhanced are viable to the user for many years, and help the software company stay ahead of competition.

Expertise. Most successful software products have been built by companies with personnel who have strong, concentrated experiences in the specific subjects addressed by each product.

Good engineering disciplines. In an environment where most products are targeted for long lives, a soundly designed and constructed product will help to ensure success.

Ease of use. In a world where programming management faces training problems, shortage of personnel, and inexperienced users, "easy to use" should be one of the primary technical goals for any product.

The last few years have dramatically demonstrated the benefits of successful software products in both the systems and applications categories. Successful systems software has significantly improved the productivity and discipline of program development while simultaneously reducing the costs of getting applications operational. Applications software has reduced the total number of applications companies must develop from scratch. The cost benefits are obvious.

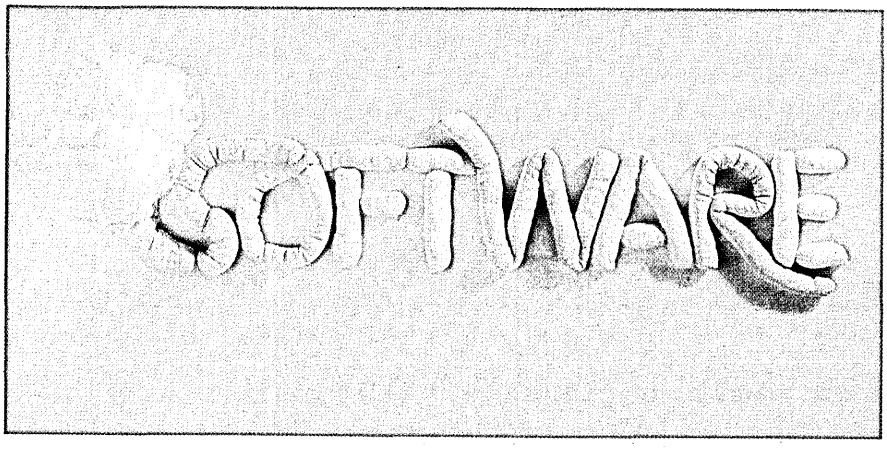
As these benefits continue to accrue to the users of packages, off-the-shelf software will become as commonplace as off-the-shelf hardware. ✻

Martin A. Goetz is senior vice president of Applied Data Research, Inc., Princeton, N.J. He was recently appointed contributing editor for DATAMATION.

More than 5,000 users of proprietary software packages rated 335 products in this year's survey.

THE SOFTWARE SCENE

USERS' RATINGS OF SOFTWARE PACKAGES



by Elizabeth F. Severino
Editorial Director,
Datapro Research Corp.

This is the fifth annual Datapro/DATAMATION survey of proprietary software users. As in the past, the survey was based on questionnaires mailed to approximately 35,000 DATAMATION readers identified from the subscriber list as the dp manager or "leading dp person" at an installation.

As the survey has grown in popularity, criticism from software industry associations has been increasingly directed at its methods and the validity of the resulting ratings. Datapro and DATAMATION acknowledge that the survey does not employ statistical sampling methods. Due to small sample sizes, individual ratings may lack the statistical validity to aid a user in making a buying decision and may further have categorized a product in a level that a larger statistical sampling may have otherwise categorized. Datapro and DATAMATION are taking steps to improve the sampling techniques which will be used in future surveys.

The aims of the 1979 survey are to poll the largest number of software users and then report their attitudes towards packages implemented at their facilities. No attempt is made to contact a statistical sampling of all the users of all the software packages marketed. Results are reported in an easy-to-understand manner for the general reader, making no attempt to interpret the data. The survey serves to report on user comments, not to determine the value or worth of each package. Results should not be regarded as complete criteria for the selection of a software package or vendor. Hopefully, the survey will be useful as a guide to a number of packages that could be considered for closer scrutiny and evaluation by more rigorous techniques.

Each questionnaire allowed the user to rate up to three different packages. However, the recipient was encouraged to reproduce the form as many times as necessary in order to rate the program products employed or evaluated. Also, a second copy of the form was enclosed in the set as a pass-along copy for a user department within the installation.

Each recipient was requested to rate any software package that was installed, that was acquired but no longer in use, or that was rejected after thorough testing.

Seven rating categories were specified on the questionnaire: overall satisfaction, job throughput/efficiency, ease of installation, ease of use, documentation, vendor technical support, and training (if applicable). Overall satisfaction is the only category reported in this article. All ratings forwarded for a particular package were then collected, verified, recorded, and averaged using a weighting scale of from 1.0 to 4.0 (poor to excellent).

This year we have used the following categories of reporting user ratings: 1.5-2.0 = Fair (F); 2.1-2.4 = Good (G); 2.5-3.4 = Excellent (E); 3.5-4.0 = Honor Roll (HR) or Honorable Mention (HM).

The criteria employed by Datapro for inclusion in the Software Honor Roll were:(1) a package must be rated by no fewer than 10 individual users; (2) the package must receive a weighted average rating of 3.5 or better in the overall satisfaction category; and (3) the package must also receive a weighted average rating of 2.8 or better in all other categories except training (eliminated because there are program products being implemented on a self-taught basis with no formal training procedures.)

Those packages that met the Honor Roll rating criteria of 3.5 or better in the overall satisfaction category and 2.8 or better in all other categories but received ratings from only five to nine users were listed as Honorable Mention.

Datapro processed responses from 5,683 users, a return of over 15% from the DATAMATION mailings. The responses involved 8,861 ratings on 2,141 individual software packages.

The list that follows summarizes the survey results on the 335 proprietary software packages rated by five or more users.

The information in this report can be informative if used with discretion and with the understanding there are many factors involved in selecting the right software package to meet a particular need. There are also many software packages that do not appear in the survey that may possibly warrant evaluation. The results of this survey should be considered as one step in a meaningful evaluation cycle.

1979 HONOR ROLL

(Listed Alphabetically by Number of Years Appearing)

SEVENTH YEAR

ALLTAX
Management Science America, Inc.

DISK UTILITY SYSTEM
Westinghouse Electric Corp.

EPAT
SDI

THE LIBRARIAN
Applied Data Research, Inc.

PANVALET
Pansophic Systems, Inc.

SIXTH YEAR

EASYTRIEVE
Pansophic Systems, Inc.

FDR/COMPAKTOR
Innovation Data Processing, Inc.

QUICKJOB
Systems Support Software, Inc.

SYNCSORT
Whitlow Computer Systems

FIFTH YEAR

DYL-260
Dylakor Software Systems, Inc.

1130/FORTRAN
DNA Systems, Inc.

RPG-II (360/370)
IBM Corp., DPD

WEST I
Westinghouse Electric Corp.

FOURTH YEAR

CA-SORT
Computer Associates, Inc.

IDMS
Cullinane Corp.

SAS
SAS Institute, Inc.

SLICK
NCI

1130/SORT
DNA Systems, Inc.

THIRD YEAR

ADABAS
Software ag of N.A., Inc.

EDOS,EDOS/VS
The Computer Software Co.

FLEE/FLIM
Goal Systems Corp.

IMAGE/3000
Hewlett-Packard Co.

ROSCOE
Applied Data Research, Inc.

RPG-II (S/3)
IBM Corp., GSD

SOFTWARE 1040
SAB, Inc.

SECOND YEAR

BEM
Sperry Univac

DOCS
CFS, Inc.

FAQS
Goal Systems Corp.

SHADOW-II
Altergo Software, Inc.

SORT (S/3)
IBM Corp., GSD

TLMS
Capex Corp.

FIRST YEAR

BOOST
Macro-4, Inc.

CP/M
Digital Research

DISK SPACE MANAGER
Westinghouse Electric Corp.

DYNAM/T
Computer Associates, Inc.

FTL
Goal Systems Corp.

LOGOUT
Macro-4, Inc.

ON-LINE SOURCE LIBRARY MAINTENANCE FACILITY
IBM Corp., GSD

O.W.L
NCI

RPG-II (S/34)
IBM Corp., GSD

SCEPTER
Westinghouse Electric Corp.

SPACE/MANAGER
Altergo Software, Inc.

SRI/EDIT
Systems Research, Inc.

VOLLIE
Applied Data Research, Inc.

1979 HONORABLE MENTION

ACCOUNTS PAYABLE
Bancroft Computer Services

AUTOFLOW II
Applied Data Research, Inc.

COMMERCIAL LOAN
Florida Software Services

DOS/RS
Dearborn Computer Co. (now marketed by The Computer Software Co.)

DOSSIER
Computer Concepts, Inc.

FATS/FATAR
Innovation Data Processing

FINANCIAL MANAGEMENT SYSTEM
Florida Software Services

FORESIGHT
United Computing Systems

INTEREST
On-Line Software Int'l

MINICOMM
Informatics, Inc. (now marketed by SDA Products, Inc.)

MPE-II
Hewlett-Packard Co.

ON-LINE FILE DISPLAY
IBM Corp., GSD

PASCAL-1
Oregon Minicomputer Software, Inc.

PAYROLL
Information Associates, Inc.

PLAN 1040
SAB, Inc.

QUOTA-II
Altergo Software, Inc.

RELO PLUS
Universal Software, Inc.

SCREEN DEVELOPMENT SYSTEM
Systems Unique

SCRIPT
University of Waterloo

SPSS
(CDC version) Northwestern Univ.

WATFIV
University of Waterloo

USERS' RATINGS

Categories: 1.5 – 2.0 = Fair (F); 2.1 – 2.4 = Good (G); 2.5 – 3.4 = Excellent (E); 3.5 – 4.0 = Honor Roll (HR) or Honorable Mention (HM).

Allinson-Ross Corp.
TIP/30
Offers interactive transaction processing for Univac users.
Users reporting 5
Overall satisfaction E
CIRCLE 400 ON READER CARD

Altergo Software Inc.
QUOTA-II
Source program maintenance support system.
Users reporting 5
Overall satisfaction HM
CIRCLE 401 ON READER CARD

SHADOW-II
A general purpose teleprocessing monitor.
Users reporting 21
Overall satisfaction HR
CIRCLE 402 ON READER CARD

SPACE/MANAGER
A DOS/VS disk space management program.
Users reporting 16
Overall satisfaction HR
CIRCLE 403 ON READER CARD

American Valuation Consultants, Inc.
BIT-FACS
Total fixed assets management system.
Users reporting 11
Overall satisfaction E
CIRCLE 404 ON READER CARD

Applied Data Research, Inc.
AUTOFLOW II
A system and program development tool for documentation.
Users reporting 6
Overall satisfaction HM
CIRCLE 405 ON READER CARD

DATACOM
A telecommunications processor for IBM 360/370 and compatibles.
Users reporting 9

USER RATINGS

Overall satisfaction E
CIRCLE 406 ON READER CARD

DATACOM/DB
Database management system for IBM 360/370 and compatibles.
Users reporting 18
Overall satisfaction E
CIRCLE 407 ON READER CARD

THE LIBRARIAN
A source program management system; can do batch and on-line retrieval.
Users reporting 131
Overall satisfaction HR
CIRCLE 408 ON READER CARD

LOOK
A performance measurement tool.
Users reporting 10
Overall satisfaction E
CIRCLE 409 ON READER CARD

ROSCOE
Remote job entry system for OS and OS/VS operating systems.
Users reporting 30
Overall satisfaction HR
CIRCLE 410 ON READER CARD

VOLLIE
On-line program development tool offering extended source maintenance.
Users reporting 14
Overall satisfaction HR
CIRCLE 411 ON READER CARD

A.R.A.P. (Aeronautical Research Associates of Princeton, Inc.)

DRS
Self-contained data management system with DBMS capabilities.
Users reporting 5
Overall satisfaction E
CIRCLE 412 ON READER CARD

Argonaut Information Systems, Inc.

PAYROLL
Generalized payroll system.
Users reporting 11
Overall satisfaction E
CIRCLE 413 ON READER CARD

Aries Information Systems, Inc.

PERPAS/POBAS
A personnel/payroll, budget and accounting system.
Users reporting 8
Overall satisfaction E
CIRCLE 414 ON READER CARD

Arthur Anderson and Company

MAC-PAC
A comprehensive manufacturing planning and control system.
Users reporting 10
Overall satisfaction E
CIRCLE 415 ON READER CARD

Ask Computer Services, Inc.

MANMAN
Manufacturing management on-line system for use with HP 1000s.
Users reporting 8
Overall satisfaction E
CIRCLE 416 ON READER CARD

Atlantic Software, Inc.

PC/70
Automated project planning and resource measurement system.
Users reporting 19
Overall satisfaction E
CIRCLE 417 ON READER CARD

Bancroft Computer Systems, Inc.

ACCOUNTS PAYABLE
A multicompany accounts payable system for use with IBM S/3.
Users reporting 6
Overall satisfaction HM
CIRCLE 418 ON READER CARD

ACCOUNTS RECEIVABLE
General-purpose, multicompany accounts receivable system for IBMs S/3.
Users reporting 5
Overall satisfaction E
CIRCLE 419 ON READER CARD

Boole & Babbage, Inc.

RESOLVE
On-line system performance and job monitoring package for 360/370s and compatibles.
Users reporting 13
Overall satisfaction E
CIRCLE 420 ON READER CARD

SECURE
An OS and OS/VS security system that guards against illegal access to data.
Users reporting 7
Overall satisfaction E
CIRCLE 421 ON READER CARD

Burroughs Corp.

ACCOUNTS PAYABLE
Accounts payable system for most Burroughs small- to large-scale computers.
Users reporting 6
Overall satisfaction G
CIRCLE 422 ON READER CARD

BHAS II
Hospital administration system for use on B 80 through B 4800 series.
Users reporting 8
Overall satisfaction G
CIRCLE 423 ON READER CARD

CANDE
Command and edit message control system for Burroughs' large-scale computers.
Users reporting 20
Overall satisfaction E
CIRCLE 424 ON READER CARD

COBOL
Standard Burroughs COBOL compiler.
Users reporting 18
Overall satisfaction E
CIRCLE 425 ON READER CARD

DMS-II
Burroughs' full-blown data base management system.
Users reporting 34
Overall satisfaction E
CIRCLE 426 ON READER CARD

FORTE II
Disk file management system for Burroughs B 1700 and up.
Users reporting 15
Overall satisfaction E
CIRCLE 427 ON READER CARD

GEMCOS
Generalized message control system for the Burroughs B 1800 series.
Users reporting 9
Overall satisfaction E
CIRCLE 428 ON READER CARD

GENERAL LEDGER
Generalized general ledger accounting system.
Users reporting 10
Overall satisfaction E
CIRCLE 429 ON READER CARD

MCP
Operating system for Burroughs computers.
Users reporting 6
Overall satisfaction E
CIRCLE 430 ON READER CARD

NDL
Network definition language for use on most B series computers.
Users reporting 45
Overall satisfaction E
CIRCLE 431 ON READER CARD

ODESY
On-line data entry system for Burroughs' B 1800 series.
Users reporting 12
Overall satisfaction E
CIRCLE 432 ON READER CARD

PAYROLL
A generalized payroll system for use on most Burroughs computers.
Users reporting 15
Overall satisfaction E
CIRCLE 433 ON READER CARD

PCS-II
A production control system; runs on most Burroughs computers.
Users reporting 14
Overall satisfaction E
CIRCLE 434 ON READER CARD

REPORTER
COBOL source code report preparation system for most Burroughs computers.
Users reporting 20
Overall satisfaction E
CIRCLE 435 ON READER CARD

RPG
Standard RPG compiler for most Burroughs computers.
Users reporting 8
Overall satisfaction E
CIRCLE 436 ON READER CARD

TEXT/EDITOR
Text editing facility for remote programming for B 1700 and up.
Users reporting 15
Overall satisfaction E
CIRCLE 437 ON READER CARD

THRIFT
Series of thrift industry programs including time deposits, loans, etc.
Users reporting 11
Overall satisfaction E
CIRCLE 438 ON READER CARD

Business EDP Services, Inc.

PRO
Generalized storage and retrieval system; used with Burroughs' 2500 and up.
Users reporting 5
Overall satisfaction E
CIRCLE 439 ON READER CARD

CACI

SIMSCRIPT II.5
Computer program modeling and simulation language.
Users reporting 6
Overall satisfaction E
CIRCLE 440 ON READER CARD

California Computer Products, Inc.

GRAPHIC SOFTWARE
Library of plotting subroutines; used with host computers and CalComp plotters.
Users reporting 5
Overall satisfaction E
CIRCLE 441 ON READER CARD

Cambridge Systems Group, Inc.

ACF_2
MVS data access control and security system used on IBM S/370s and compatibles.
Users reporting 5
Overall satisfaction E
CIRCLE 442 ON READER CARD

ASM_2
Automated disk space management system for use with OS or OS/VS systems.
Users reporting 7
Overall satisfaction E
CIRCLE 443 ON READER CARD

Candle Corp.

OMEGAMON
IBM 3270-oriented display monitoring system used with IBM MVS operating systems.
Users reporting 6
Overall satisfaction E
CIRCLE 444 ON READER CARD

Capex Corp.

OPTIMIZER III
Optimizes object code of IBM 360/370 ANSI COBOL programs under OS and OS/VS systems.
Users reporting 36
Overall satisfaction E
CIRCLE 445 ON READER CARD

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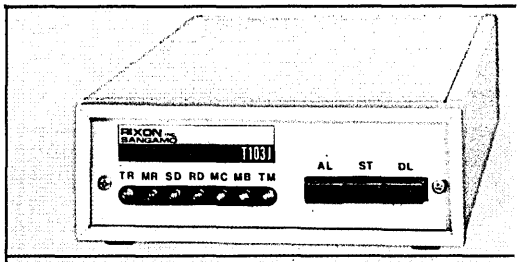

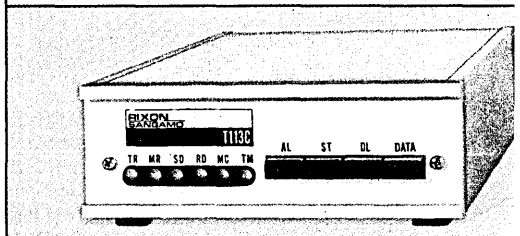

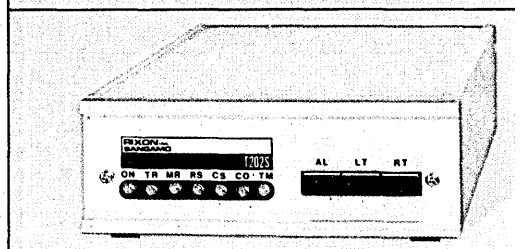

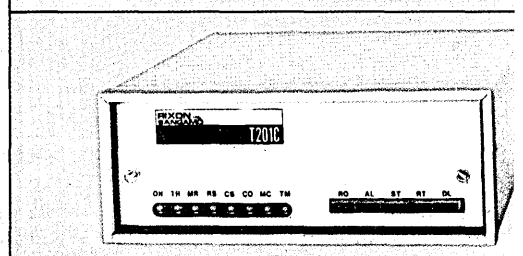

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CIRCLE 89 ON READER CARD

USER RATINGS

PLAN IV/PLAN IV MVS
A planning and performance control system.
Users reporting 11
Overall satisfaction E
CIRCLE 446 ON READER CARD

TLMS
Tape library management system for IBM 360/370 and compatible systems.
Users reporting 12
Overall satisfaction HR
CIRCLE 447 ON READER CARD

CFS, Inc.

DOCS
A display operator console support program.
Users reporting 19
Overall satisfaction HR
CIRCLE 448 ON READER CARD

Cincom Systems, Inc.

ENVIRON/1
General purpose data communications monitor.
Users reporting 19
Overall satisfaction E
CIRCLE 449 ON READER CARD

TOTAL
Generalized data base management system for use on a variety of systems.
Users reporting 122
Overall satisfaction E
CIRCLE 450 ON READER CARD

Computer Associates, Inc.

CA-SORT
Replacement sort/merge facility for OS or DOS environments.
Users reporting 122
Overall satisfaction HR
CIRCLE 451 ON READER CARD

DYNAM/D
A DOS and DOS/VS disk space and catalog management system.
Users reporting 38
Overall satisfaction E
CIRCLE 452 ON READER CARD

DYNAM/T
A DOS and DOS/VS tape library maintenance system.
Users reporting 39
Overall satisfaction HR
CIRCLE 453 ON READER CARD

JASPER +
Job accounting and performance analysis for IBM 360/370 DOS, OS and VS systems.
Users reporting 12
Overall satisfaction E
CIRCLE 454 ON READER CARD

Computer Concepts, Inc.

DOSSIER
A DOS and DOS/VS documentation and standards tool.
Users reporting 8
Overall satisfaction HM
CIRCLE 455 ON READER CARD

The Computer Software Co.

EDOS, EDOS/VS
Replacement for DOS and DOS/VS operating systems.
Users reporting 43
Overall satisfaction HR
CIRCLE 456 ON READER CARD

Comserve Corp.

AMAPS-MPS
Master production schedule development system for use with IBM 360/370s and HP 3000s.
Users reporting 5
Overall satisfaction E
CIRCLE 457 ON READER CARD

Cullinane Corp.

CARS/3
IBM System/3 auditing and information retrieval system.
Users reporting 7
Overall satisfaction E
CIRCLE 458 ON READER CARD

CULPRIT
Output processor and report creation system for IBM 360/370s and compatibles.
Users reporting 13
Overall satisfaction E
CIRCLE 459 ON READER CARD

IDMS
Data base management system for IBM 360/370 and compatible OS and OS/VS modes.
Users reporting 46
Overall satisfaction HR
CIRCLE 460 ON READER CARD

INTERACT
Text editing and documentation preparation system for OS or OS/VS modes.
Users reporting 8
Overall satisfaction E
CIRCLE 461 ON READER CARD

Cyborg Systems, Inc.

PAYROLL
General payroll and personnel system for systems supporting ANSI COBOL.
Users reporting 6
Overall satisfaction E
CIRCLE 462 ON READER CARD

Data Design Associates, Inc.

FIXED ASSETS
Specialized accounting system for IBM 360/370 and Burroughs B 1700 and up.
Users reporting 7
Overall satisfaction E
CIRCLE 463 ON READER CARD

Data General Corp.

AOS
Operating system for Data General Eclipse Series minicomputers.
Users reporting 9
Overall satisfaction E
CIRCLE 464 ON READER CARD

COBOL
Standard Data General COBOL compiler.
Users reporting 8
Overall satisfaction E
CIRCLE 465 ON READER CARD

FORTRAN
Standard Data General FORTRAN compiler.
Users reporting 8
Overall satisfaction E
CIRCLE 466 ON READER CARD

IDEA
Interactive data entry and access system for the Data General Eclipse Series.
Users reporting 6
Overall satisfaction E
CIRCLE 467 ON READER CARD

INFOS
File access method for the Data General Eclipse Series.
Users reporting 9
Overall satisfaction E
CIRCLE 468 ON READER CARD

RDOS
Real-time disk operating system for Nova and Eclipse minicomputers.
Users reporting 8
Overall satisfaction E
CIRCLE 469 ON READER CARD

SORT/MERGE
Standard sort/merge program for use on Nova and Eclipse minicomputers.
Users reporting 6
Overall satisfaction E
CIRCLE 470 ON READER CARD

Data Processing Design, Inc.

SAVER
Direct replacement for the standard PDP-11 RSTS/E BACKUP utility program.
Users reporting 6
Overall satisfaction E
CIRCLE 471 ON READER CARD

WORD-11
Multiterminal word processing system for use with the DEC PDP-11/34-70.
Users reporting 7
Overall satisfaction E
CIRCLE 472 ON READER CARD

Dearborn Computer Co.

DOS/RS (now marketed by the Computer Software Co.)
A replacement operating system for IBM DOS users.
Users reporting 9
Overall satisfaction HM
CIRCLE 473 ON READER CARD

Digital Equipment Corp. (DEC)

BASIC
Various versions to complement DEC operating systems.
Users reporting 16
Overall satisfaction E
CIRCLE 474 ON READER CARD

COBOL
Several versions to complement DEC operating systems.
Users reporting 11
Overall satisfaction E
CIRCLE 475 ON READER CARD

DATATRIEVE
Interactive query and report system mainly for use with PDP-11 series.
Users reporting 11
Overall satisfaction E
CIRCLE 476 ON READER CARD

DBMS-10/20
Data base management systems to support DEC System-10 and System-20s using the TOPS operating systems.
Users reporting 5
Overall satisfaction E
CIRCLE 477 ON READER CARD

DECNET
A series of communication tools for use with the PDP-11.
Users reporting 9
Overall satisfaction E
CIRCLE 478 ON READER CARD

FORTRAN
Available in various versions to support DEC computers.
Users reporting 36
Overall satisfaction E
CIRCLE 479 ON READER CARD

IAS
Multifunction, multilingual operating system for the PDP-11.
Users reporting 7
Overall satisfaction E
CIRCLE 480 ON READER CARD

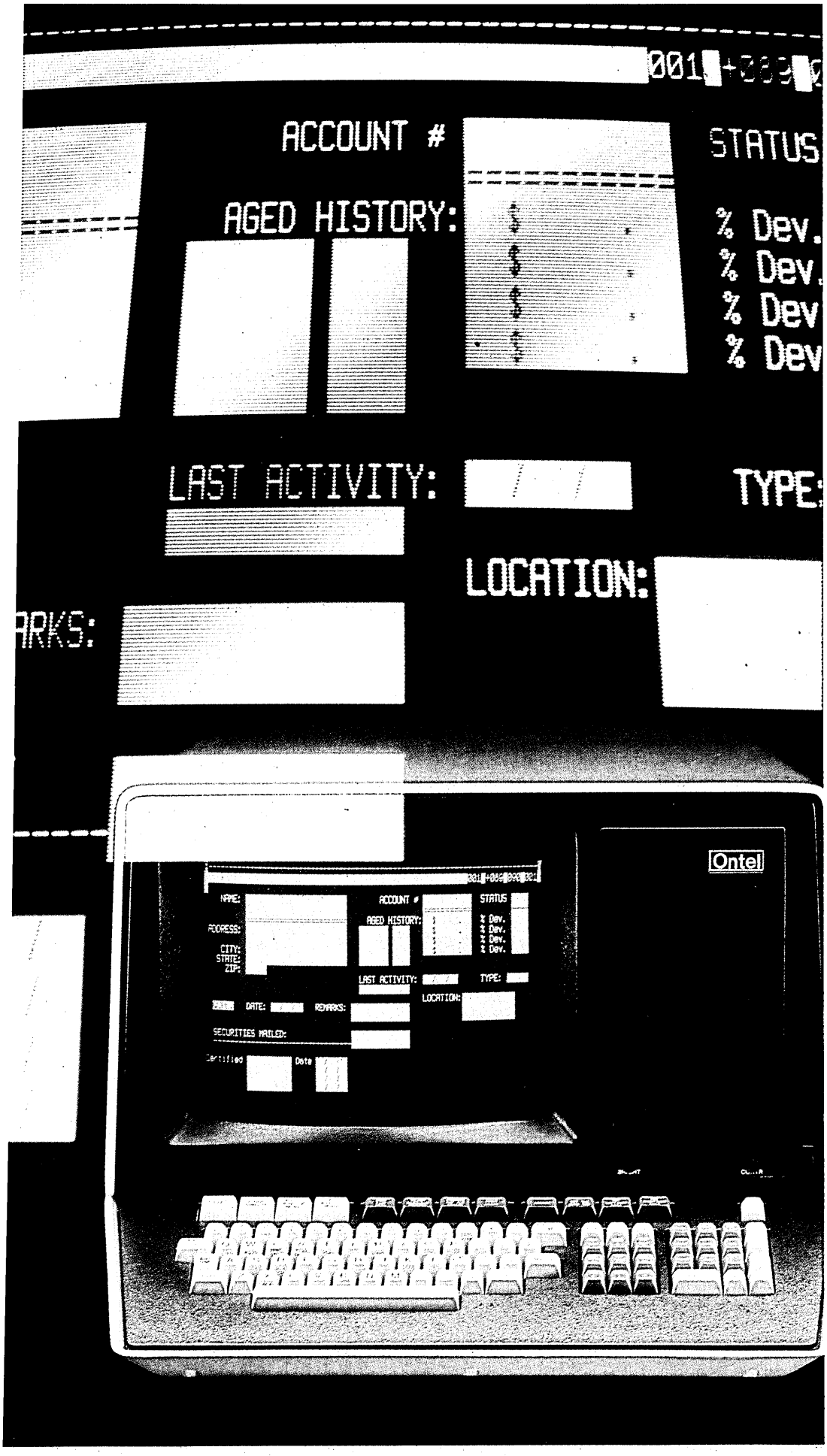
OS/8
Tape or disk operating system for batch or interactive PDP-8 systems.
Users reporting 5
Overall satisfaction E
CIRCLE 481 ON READER CARD

RJ2780 (Emulator)
DEC users can communicate directly with systems supporting the IBM 2780 remote terminal.
Users reporting 6
Overall satisfaction E
CIRCLE 482 ON READER CARD

RJE-HASP
Allows DEC systems to appear to the host computer as a HASP remote terminal.
Users reporting 5
Overall satisfaction E
CIRCLE 483 ON READER CARD

RMS-11
File management system for PDP-11s under the RSTS/E operating system.
Users reporting 9
Overall satisfaction E
CIRCLE 484 ON READER CARD

RSTS/E
Resource-sharing/time-sharing operating system for the PDP-11.
Users reporting 26
Overall satisfaction E
CIRCLE 485 ON READER CARD



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CIRCLE 90 ON READER CARD

USER RATINGS

RSX-11M
Subset of the larger RSX-11D advanced operating system for PDP-11s.
Users reporting 28
Overall satisfaction E
CIRCLE 486 ON READER CARD

RT-11
Foreground/background real-time disk operating system for the PDP-11.
Users reporting 23
Overall satisfaction E
CIRCLE 487 ON READER CARD

SORT
Standard sort for use with most DEC operating systems.
Users reporting 13
Overall satisfaction E
CIRCLE 488 ON READER CARD

TOPS-20
Operating system for the DEC System-20 mainframe.
Users reporting 5
Overall satisfaction E
CIRCLE 489 ON READER CARD

WISE
A data management tool primarily intended for college administration.
Users reporting 9
Overall satisfaction E
CIRCLE 490 ON READER CARD

Digital Research

CP/M
Disk-based operating system for most 8080, 8085 and Z-80-type microcomputers.
Users reporting 13
Overall satisfaction HR
CIRCLE 491 ON READER CARD

DNA Systems, Inc.

1130/FORTRAN
For IBM 1130 and compatible systems.
Users reporting 16
Overall satisfaction HR
CIRCLE 492 ON READER CARD

1130/SORT
Generalized sort program for IBM 1130 and compatible systems.
Users reporting 11
Overall satisfaction HR
CIRCLE 493 ON READER CARD

TSO
Time-sharing operating system for IBM 1130 and compatible systems.
Users reporting 11
Overall satisfaction E
CIRCLE 494 ON READER CARD

XBASE
Disk access enhancement for IBM 1130 and compatible computers.
Users reporting 5
Overall satisfaction E
CIRCLE 496 ON READER CARD

Duquesne Systems, Inc.

QCM
Independent, interrelated programs designed to measure and report computer utilization.
Users reporting 5
Overall satisfaction E
CIRCLE 497 ON READER CARD

Dylakor Software Systems, Inc.

DYL-250
File maintenance and label printing utility for IBM 360/370 and compatibles.
Users reporting 14
Overall satisfaction E
CIRCLE 498 ON READER CARD

DYL-260
Data management and report writing system for IBM 360/370.
Users reporting 67
Overall satisfaction HR
CIRCLE 499 ON READER CARD

Execucom Systems Corp.

IFPS
Interactive financial planning and simulation system.
Users reporting 6
Overall satisfaction E
CIRCLE 500 ON READER CARD

Florida Software Services, Inc.

CERTIFICATE OF DEPOSIT
General-purpose system for IBM 360/370, Burroughs and Honeywell systems.
Users reporting 9
Overall satisfaction E
CIRCLE 501 ON READER CARD

COMMERCIAL LOAN SYSTEM
Generalized system for IBM 360/370, Burroughs and Honeywell computers.
Users reporting 8
Overall satisfaction HM
CIRCLE 502 ON READER CARD

DEMAND DEPOSIT ACCOUNTING
General purpose system for IBM 360/370, Burroughs and Honeywell computers.
Users reporting 14
Overall satisfaction E
CIRCLE 503 ON READER CARD

FINANCIAL MANAGEMENT SYSTEM
Generalized financial management reporting system.
Users reporting 6
Overall satisfaction HM
CIRCLE 504 ON READER CARD

INSTALLMENT LOAN
General purpose loan system for IBM 360/370, Burroughs, and Honeywell computers.
Users reporting 7
Overall satisfaction E
CIRCLE 505 ON READER CARD

MORTGAGE LOAN
Generalized mortgage loan system for IBM 360/370, Burroughs, and Honeywell computers.
Users reporting 11
Overall satisfaction E
CIRCLE 506 ON READER CARD

Forth, Inc.

MICROFORTH
Microprocessor programming language for most 8080, 6800, Z-80 and 8086s.
Users reporting 5
Overall satisfaction E
CIRCLE 507 ON READER CARD

Four-Phase Systems, Inc.

DATA IV
Multistation key-to-disk data preparation system with remote batch capability.
Users reporting 5
Overall satisfaction E
CIRCLE 508 ON READER CARD

GBA International (now part of Mathematica Products Group)

GBASWIFT (now MPGSWIFT)
Data communications monitor for IBM 360/370 DOS and DOS/VS systems.
Users reporting 14
Overall satisfaction E
CIRCLE 509 ON READER CARD

Goal Systems Corp.

FAQS
Partition balancer and DASD I/O scheduling aid for DOS/VS systems.
Users reporting 20
Overall satisfaction HR
CIRCLE 510 ON READER CARD

FLEE/FLIM
Replacement linkage editor and MAINT utility for IBM 370 DOS/VS systems.
Users reporting 47
Overall satisfaction HR
CIRCLE 511 ON READER CARD

FTL
Fast transient loader that allocates transients in memory of DOS/VS systems.
Users reporting 13
Overall satisfaction HR
CIRCLE 512 ON READER CARD

HBO & Co.

MEDPRO
In-patient/out-patient, emergency room admittance and billing system.
Users reporting 6
Overall satisfaction E
CIRCLE 513 ON READER CARD

Henco, Inc.

INFO
Interactive data management system.
Users reporting 7
Overall satisfaction E
CIRCLE 514 ON READER CARD

Hewlett-Packard Co.

COBOL
Standard COBOL compiler for HP 3000 series minicomputers.
Users reporting 6
Overall satisfaction E
CIRCLE 515 ON READER CARD

DEL/3000
Data entry language processor for use with the HP 3000 series minicomputers.
Users reporting 6
Overall satisfaction E
CIRCLE 516 ON READER CARD

IMAGE/1000
Data base management system for the HP 1000 series computers.
Users reporting 10
Overall satisfaction E
CIRCLE 517 ON READER CARD

IMAGE/3000
Data base management system for the HP 3000 series computers.
Users reporting 49
Overall satisfaction HR
CIRCLE 518 ON READER CARD

MPE-II
Multiprogramming operating system for the HP 3000 series computers.
Users reporting 5
Overall satisfaction HM
CIRCLE 519 ON READER CARD

RTE-III
Real-time executive operating system for the HP 1000 and 2100 series computers.
Users reporting 8
Overall satisfaction E
CIRCLE 520 ON READER CARD

VIEW/3000
Data entry format development system for use with the HP 3000 computer.
Users reporting 7
Overall satisfaction E
CIRCLE 521 ON READER CARD

Honeywell Information Systems, Inc.

ACCOUNTS PAYABLE
Accounts payable system for Honeywell Series 60, 600, 6000 and Level 6 computers.
Users reporting 14
Overall satisfaction G
CIRCLE 522 ON READER CARD

ACCOUNTS RECEIVABLE
General accounts receivable system for Honeywell Series 60, 600, 6000 and Level 6 computers.
Users reporting 13
Overall satisfaction G
CIRCLE 523 ON READER CARD

COBOL
Standard COBOL compiler for most medium- to large-scale Honeywell computers.
Users reporting 16
Overall satisfaction E
CIRCLE 524 ON READER CARD

DM-IV
Total management information

Raytheon's PTS/1200 MARK·I & II

The distributed processing machines.

Distributed processing means different things to different people.

To Raytheon, it means delivering the maximum number of capabilities within a user's data communications network at the lowest possible cost.

That was one criterion for designing our PTS/1200 MARK I and MARK II distributed processing systems. Judge for yourself if the capabilities of the MARK I and MARK II meet the standard we set:

Multiple emulation capabilities. The system can operate immediately in most existing networks. MARK I and II support 3270 interactive (dumb and intelligent), 2780 and 3780 batch, HASP remote job entry, and a variety of non-IBM protocols, with SDLC batch/interactive in the future. Concurrent interactive and batch operation is supported on some models.

Intelligent controllers. You can program as little or as much power as you want into your system. PTS/1200 systems offer up to 128K-byte controllers capable of managing up to 20 peripheral devices.

Terminal power. Multiple screen sizes, up to 24 terminals per controller, a variety of keyboard options, programmable function keys, and numerous operator prompting aids are available with every terminal.

Rapid applications expansion. Every MARK I and II comes with a feature we call intelligent 3270-type operation. It lets your 3270-type applications add local format storage, local printing, direct data base access and updating, and either batch or transaction operations. The MARK I or II applications program decides when to go to the host, so your operators never have to get involved.

Data base storage, for local applications processing. PTS/1200s are expandable from 10MB to 252MB of disk storage, with powerful memory management software techniques that assure efficient data base operations.

Network enhancement. A distributed processing system with truly enhanced capabilities should allow you to do more with your network than simply transfer data. PTS/1200 systems let you add teleprinters to your terminal lines, or run batch and interactive jobs concurrently, or perform remote program development in any host CPU language, or debug, load and operate downline multipoint lines.

Not bad features for a system that is priced starting at $850 a month, including maintenance, for a four-terminal, 10MB disk, 165 CPS printer configuration.

When we decided to call MARK I and II "The Distributed Processing Machines," we wanted to be sure they were worthy of what you want in a modern terminal-based product.

Raytheon terminals. 60,000 now, and growing fast.

Tell me more about Raytheon's MARK I and MARK II distributed processing systems.

My current network consists of: _____ terminals using _____ protocol linked to _____ host mainframe.

Name: _____

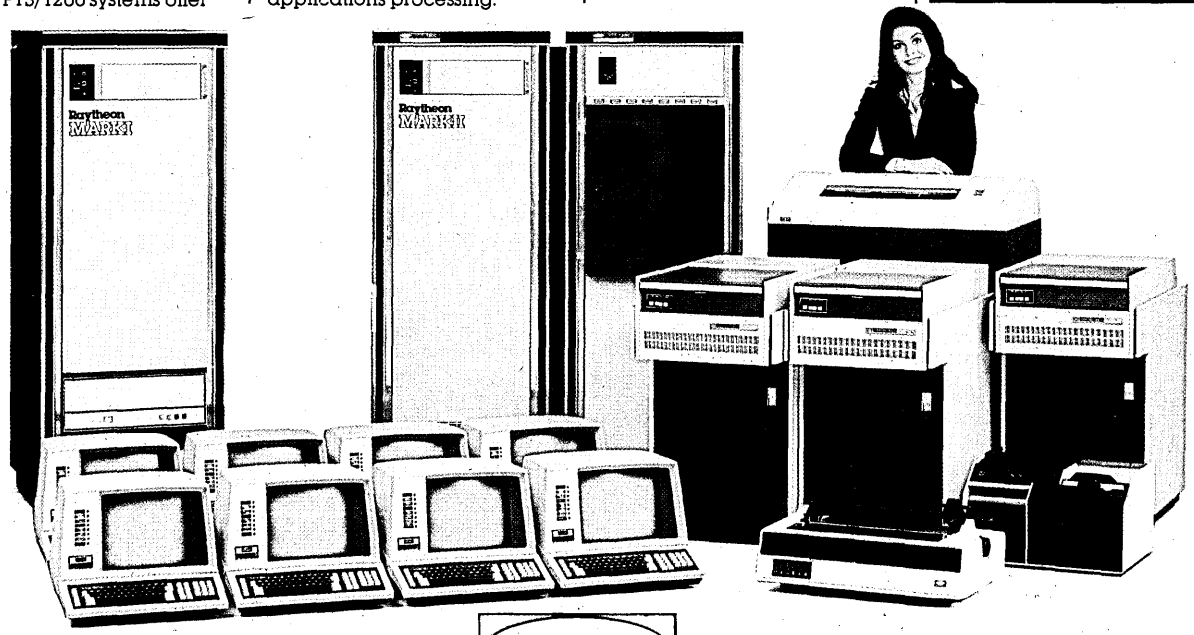
Title: _____

Company: _____

Street: _____

City: _____

State: _____ Zip: _____



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USER RATINGS

and data base management system.
Users reporting 6
Overall satisfaction E
CIRCLE 525 ON READER CARD

GCOS
Generalized operating system for all Honeywell computers.
Users reporting 10
Overall satisfaction E
CIRCLE 526 ON READER CARD

GENERAL LEDGER
Standard general ledger system for Honeywell Series 60, 600, 6000 and Level 6.
Users reporting 13
Overall satisfaction E
CIRCLE 527 ON READER CARD

INVENTORY MANAGEMENT SYSTEM (IMS)
An inventory management system for most medium- to large-scale Honeywell computers.
Users reporting 24
Overall satisfaction E
CIRCLE 528 ON READER CARD

MDQS
A self-contained management data query system for Series 60, Levels 66 and 68 computers.
Users reporting 7
Overall satisfaction G
CIRCLE 529 ON READER CARD

PAYROLL
For Honeywell Series 60, 600, 6000 and Level 6 computers.
Users reporting 12
Overall satisfaction E
CIRCLE 530 ON READER CARD

PSC
Production scheduling and control system for most medium- to large-scale Honeywell computers.
Users reporting 6
Overall satisfaction E
CIRCLE 531 ON READER CARD

SCRIBE
School attendance and grade reporting system.
Users reporting 7
Overall satisfaction E
CIRCLE 532 ON READER CARD

SORT/MERGE
Standard sort/merge package for Honeywell computers.
Users reporting 7
Overall satisfaction E
CIRCLE 533 ON READER CARD

TDS
A high-volume, transaction-driven processing system.
Users reporting 12
Overall satisfaction E
CIRCLE 534 ON READER CARD

TRANSACTION PROCESSING SYSTEM (TPS)
Level 66 system which controls the loading and execution of application programs.
Users reporting 6
Overall satisfaction G
CIRCLE 535 ON READER CARD

UTILITIES
Standard series of utility programs for use with Honeywell computers.
Users reporting 5
Overall satisfaction E
CIRCLE 536 ON READER CARD

IBM Corp. DPD

ACF/VTAM
Multiprocessor virtual telecommunications access method.
Users reporting 9
Overall satisfaction E
CIRCLE 537 ON READER CARD

ADVANCED PROGRAMMING FUNCTIONS
A series of IBM/370 DOS/VS programming enhancement features.
Users reporting 9
Overall satisfaction E
CIRCLE 538 ON READER CARD

ALPHA SEARCH INQUIRY SYSTEM
A CICS phonetic search and retrieval system for IBM 360/370 DOS/VS and OS/VS systems.
Users reporting 6
Overall satisfaction E
CIRCLE 539 ON READER CARD

APL
Standard APL language processor for IBM 360/370 computers.
Users reporting 17
Overall satisfaction E
CIRCLE 540 ON READER CARD

ATMD
Word processing system for OS/VS and DOS/VS systems with CICS capabilities.
Users reporting 10
Overall satisfaction E
CIRCLE 541 ON READER CARD

BACIS
Generalized budget accounting information system for use with IBM 360/370 computers.
Users reporting 5
Overall satisfaction E
CIRCLE 542 ON READER CARD

CAPOSS
Capacity planning and operations sequencing system for 360/370 systems.
Users reporting 5
Overall satisfaction E
CIRCLE 543 ON READER CARD

CICS
Data communications monitor.
Users reporting 241
Overall satisfaction E
CIRCLE 544 ON READER CARD

CFO II
Insurance contract maintenance system for IBM 360/370 DOS or OS systems.
Users reporting 6
Overall satisfaction E
CIRCLE 545 ON READER CARD

COBOL (360/370)
Versions for DOS, OS and VS systems on 360/370 computers.
Users reporting 123
Overall satisfaction E
CIRCLE 546 ON READER CARD

COMPUTER ASSISTED TRAINING
A self-teaching, computer-aided instruction course for 360/370 computers.
Users reporting 5
Overall satisfaction E
CIRCLE 547 ON READER CARD

COPICS
A total system of packages serving the production and manufacturing industry.
Users reporting 5
Overall satisfaction E
CIRCLE 548 ON READER CARD

DBOMP (360/370)
Data base organization and maintenance processor utility for IBM 360/370.
Users reporting 30
Overall satisfaction E
CIRCLE 549 ON READER CARD

DITTO (360/370)
File copy/file management utility for IBM 360/370.
Users reporting 25
Overall satisfaction E
CIRCLE 550 ON READER CARD

DL/1 DOS/VS
Data base management system for IBM DOS/VS users.
Users reporting 39
Overall satisfaction E
CIRCLE 551 ON READER CARD

DL/1-ENTRY
Data base management system for entry-level DOS users.
Users reporting 8
Overall satisfaction F
CIRCLE 552 ON READER CARD

DMS (360/370)
IBM 3270 display management system for use with IBM 360/370.
Users reporting 35
Overall satisfaction E
CIRCLE 553 ON READER CARD

EPIC SYSTEMS
A series of program products for schools.
Users reporting 17
Overall satisfaction E
CIRCLE 554 ON READER CARD

ETSS-II
DOS/VS entry time-sharing system for IBM 370 users.
Users reporting 34
Overall satisfaction E
CIRCLE 555 ON READER CARD

FORTRAN (360/370)
Versions for IBM 360/370 DOS, OS, and their VS counterpart systems.
Users reporting 24
Overall satisfaction E
CIRCLE 556 ON READER CARD

GPSS-V
Broad-range, general-purpose simulation system; for use with 360/370 systems.
Users reporting 5
Overall satisfaction E
CIRCLE 557 ON READER CARD

HEALTH CARE SYSTEM (HCS)
A specialized hospital-oriented accounting system for DOS/VS installations.
Users reporting 6
Overall satisfaction G
CIRCLE 558 ON READER CARD

IMS
Data base management system for OS and OS/VS systems.
Users reporting 49
Overall satisfaction E
CIRCLE 559 ON READER CARD

MTCS
Minimum teleprocessing communications systems for use with IBM 360/370.
Users reporting 5
Overall satisfaction E
CIRCLE 560 ON READER CARD

PANEL
A documentation tool that aids in the development of line art applications.
Users reporting 7
Overall satisfaction E
CIRCLE 561 ON READER CARD

PERFORMANCE ANALYZER
General system performance analysis and reporting package for 360/370s.
Users reporting 5
Overall satisfaction E
CIRCLE 562 ON READER CARD

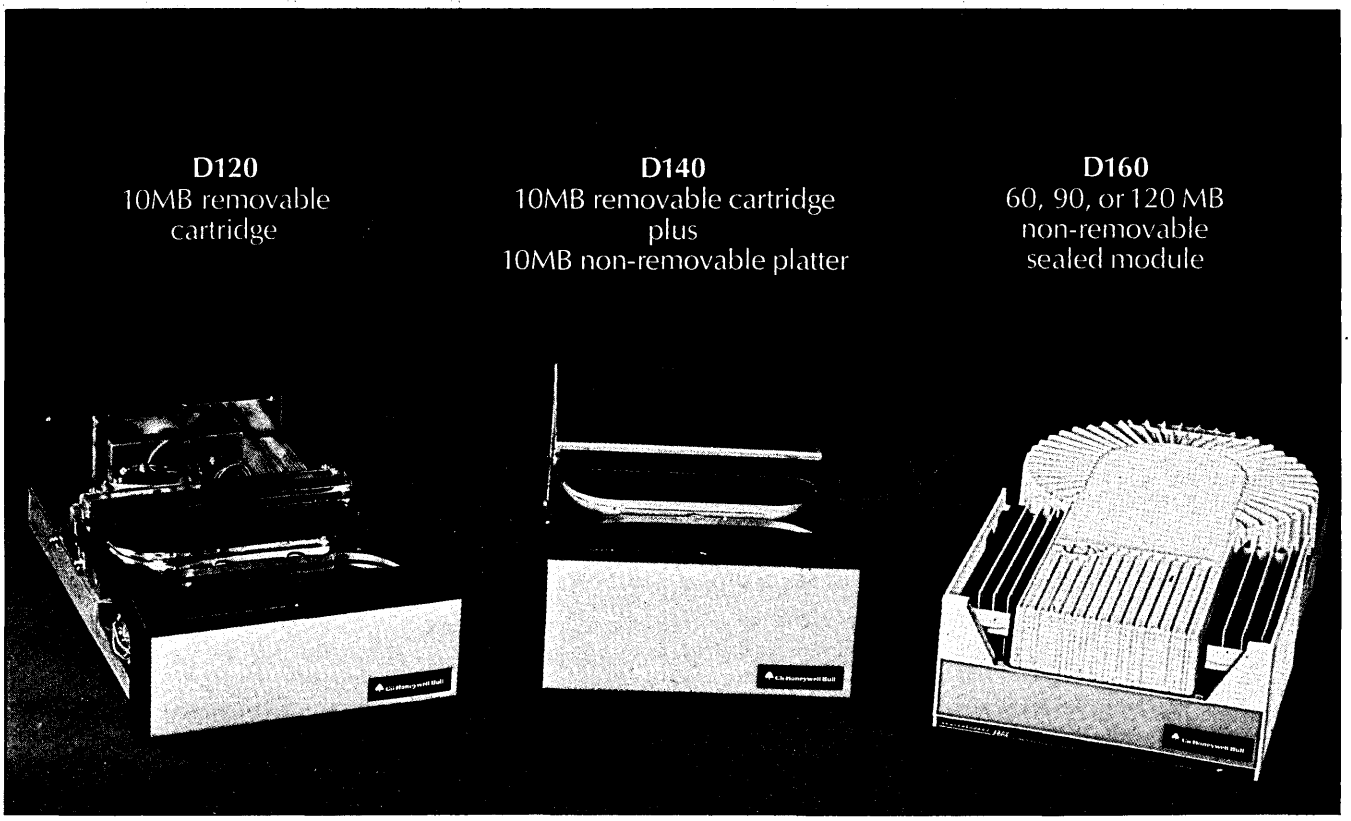
PLANCODE
System for building business planning models on VS systems.
Users reporting 6
Overall satisfaction E
CIRCLE 563 ON READER CARD

PL/1 OPTIMIZER
Automatic optimizing compiler for 360/370 computers.
Users reporting 30
Overall satisfaction E
CIRCLE 564 ON READER CARD

RMF
Resource measurement facility for logging and recording system activity data.
Users reporting 8
Overall satisfaction E
CIRCLE 565 ON READER CARD

RPG II (360/370)
Versions for DOS, OS and their VS counterpart systems.

Pack 10 to 120 megabytes in a unit one-third the size of conventional disk drives.



For OEMs and system builders, the D100 family of compact disk drives offers a surprising list of advantages. Two new models, D140 and D160 add capacity and flexibility to the proven performance of the D120. The D140 includes a 10MB fixed platter in addition to the 10MB removable cartridge as used with the D120. The D160 uses a sealed (non-removable) module which includes low pressure heads and carriage.

Small Size: Occupying approximately one-third the volume of conventional drives, models D120 and D160 measure 5.6″ × 12.2″ × 21.8″. Model D140 is slightly taller at 6.7″.

Innovative Cartridge: Both D120 and D140 models use a flat, thin (11″ square by .9″) self-ventilated cartridge weighing only 2.8 pounds.

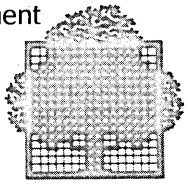
Common Interface: The same controller handles D120, D140, D160, or any combination of the three models. One or more D160's in conjunction with a D120 provide a fixed data base with a high-throughput-10MB load-dump yielding twice the operating flexibility at half the size of conventional single-spindle drives.

High Density/Speed: Up to 7300 BPI, 600 TPI; 920 kilobytes/sec transfer rate.

Accuracy: Data-imbedded servo-tracking techniques assure accurate head positioning and full cartridge interchangeability.

Low Power Consumption: From 100 to 130 watts depending on model.

Reliability: Simplified mechanisms rule out any need for preventive maintenance. The spindle-mounted dc motor is brushless. There are no belts or pulleys, no blower, no transducer, no thermal compensation device. And no head alignment is required. MTBF is 5000 hours for models D120 and D140, 8000 hours for the D160.



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D

USER RATINGS

Users reporting 43
Overall satisfaction HR
CIRCLE 566 ON READER CARD

SALEM
The Salem School student record system.
Users reporting 17
Overall satisfaction E
CIRCLE 567 ON READER CARD

SORT (360/370)
Disk-based sort for DOS, OS and their VS counterpart systems.
Users reporting 99
Overall satisfaction E
CIRCLE 568 ON READER CARD

SPF (Structured Programming Facility)
A programming development tool supporting a VS2 TSO user.
Users reporting 14
Overall satisfaction E
CIRCLE 569 ON READER CARD

SPM-360/370 (Source Program Maintenance)
Source program maintenance for COBOL programs.
Users reporting 37
Overall satisfaction E
CIRCLE 570 ON READER CARD

STAIRS
Document storage and retrieval system; versions for OS and OS/VS environments.
Users reporting 5
Overall satisfaction E
CIRCLE 571 ON READER CARD

TSO
Time-sharing option for use with IBM OS and OS/VS operating systems.
Users reporting 12
Overall satisfaction E
CIRCLE 572 ON READER CARD

VIDEO/370
Crt-oriented on-line data entry system for IBM 370.
Users reporting 7
Overall satisfaction E
CIRCLE 573 ON READER CARD

IBM Corp., GSD

ACCOUNTS PAYABLE (S/3)
Standard accounts payable system for IBM S/3.
Users reporting 19
Overall satisfaction E
CIRCLE 574 ON READER CARD

BOMP (S/3)
Bill of material processor for the S/3.
Users reporting 55
Overall satisfaction E
CIRCLE 575 ON READER CARD

CAFRS
Client accounting and financial reporting system for use with S/3 and S/34 computers.
Users reporting 9
Overall satisfaction E
CIRCLE 576 ON READER CARD

COBOL (S/3)
Supports IBM S/3 computers.
Users reporting 8
Overall satisfaction E
CIRCLE 577 ON READER CARD

COBOL (1130)
Subset version for IBM 1130 computer.
Users reporting 10
Overall satisfaction E
CIRCLE 578 ON READER CARD

DATA BASE TECHNIQUES (S/3)
Provides performance reports with cross-referenced information for analysis.
Users reporting 32
Overall satisfaction E
CIRCLE 579 ON READER CARD

DMAS-II
S/34 distributor management accounting system.
Users reporting 7
Overall satisfaction E
CIRCLE 580 ON READER CARD

FIXED ASSETS (S/3)
Generalized package for use with S/3 computers.
Users reporting 13
Overall satisfaction E
CIRCLE 581 ON READER CARD

GENERAL LEDGER (S/3)
Generalized version to run on the S/3.
Users reporting 14
Overall satisfaction E
CIRCLE 582 ON READER CARD

GENERAL LEDGER (S/32)
Version to run on the S/32.
Users reporting 5
Overall satisfaction E
CIRCLE 583 ON READER CARD

HFMS
Hospital financial management system for IBM S/32.
Users reporting 8
Overall satisfaction E
CIRCLE 584 ON READER CARD

IPICS
Initial production inventory control system for the S/3.
Users reporting 49
Overall satisfaction E
CIRCLE 585 ON READER CARD

IRP
Inventory and requirements planning for IBM S/3.
Users reporting 10
Overall satisfaction E
CIRCLE 586 ON READER CARD

JAS/3
Critical path method project planning and supervising for disk IBM S/3.
Users reporting 5
Overall satisfaction E
CIRCLE 587 ON READER CARD

MAPICS
Material and production inventory control system for the IBM S/34.
Users reporting 42
Overall satisfaction E
CIRCLE 588 ON READER CARD

MMAS BUSINESS APPLICATIONS
General manufacturing management accounting routines for IBM's S/32 and 34.
Users reporting 10
Overall satisfaction E
CIRCLE 589 ON READER CARD

ON-LINE FILE DISPLAY
Interactive, on-line query and display system for S/3 data files.
Users reporting 7
Overall satisfaction HM
CIRCLE 590 ON READER CARD

ON-LINE SCREEN DESIGN FACILITY
IBM 3270 screen development and documentation aid for S/3 computers.
Users reporting 19
Overall satisfaction E
CIRCLE 591 ON READER CARD

ON-LINE SOURCE LIBRARY MAINTENANCE FACILITY
Library maintenance routine for use on the IBM S/3 computer.
Users reporting 40
Overall satisfaction HR
CIRCLE 592 ON READER CARD

PAYROLL (S/3)
A version of the generalized payroll system to run on the S/3.
Users reporting 31
Overall satisfaction E
CIRCLE 593 ON READER CARD

PAYROLL (S/32)
A version to run on the S/32.
Users reporting 6
Overall satisfaction E
CIRCLE 594 ON READER CARD

RPG II (S/3)
Standard RPG compiler for the IBM S/3.
Users reporting 39
Overall satisfaction HR
CIRCLE 595 ON READER CARD

RPG II (S/32)
Version of the standard RPG compiler for the S/32.
Users reporting 6
Overall satisfaction E
CIRCLE 596 ON READER CARD

RPG II (S/34)
An S/34 version of the standard RPG compiler.
Users reporting 17
Overall satisfaction HR
CIRCLE 597 ON READER CARD

SORT (S/3)
Small sort (disk or card versions) for IBM S/3.
Users reporting 38
Overall satisfaction HR
CIRCLE 598 ON READER CARD

SSP (S/34)
System support program control system for S/34.
Users reporting 10
Overall satisfaction E
CIRCLE 599 ON READER CARD

UTILITIES (S/3)
Not further qualified by survey respondents.
Users reporting 24
Overall satisfaction E
CIRCLE 600 ON READER CARD

UTILITIES (S/32)
Not further qualified by survey respondents.
Users reporting 5
Overall satisfaction E
CIRCLE 601 ON READER CARD

UTILITIES (S/34)
Not further qualified by survey respondents.
Users reporting 13
Overall satisfaction E
CIRCLE 602 ON READER CARD

IMSL, Inc.

IMSL LIBRARIES
Math and statistical subroutines.
Users reporting 19
Overall satisfaction E
CIRCLE 603 ON READER CARD

Infodata Systems, Inc.

INQUIRE
Fully integrated data base management system for IBM OS and OS/VS environments.
Users reporting 10
Overall satisfaction E
CIRCLE 604 ON READER CARD

Infonational

ACCOUNTS PAYABLE
Multidivision, multicompany accounts payable system; for use on IBM 360/370, Burroughs, Univac, Honeywell, and most other comparable computers.
Users reporting 10
Overall satisfaction E
CIRCLE 605 ON READER CARD

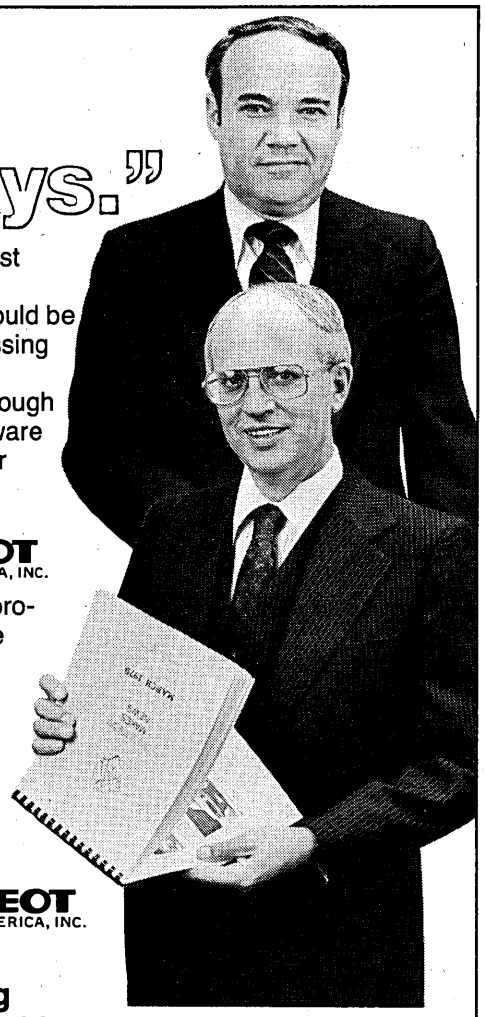
GENERAL LEDGER
Generalized package written in ANSI COBOL for most mainframes.
Users reporting 15
Overall satisfaction E
CIRCLE 606 ON READER CARD

Informatics Inc.

ACCOUNTING IV
Multicompany general ledger/financial reporting system for use on IBM 360/370, Honeywell, Univac, and Burroughs computers.
Users reporting 18
Overall satisfaction E
CIRCLE 607 ON READER CARD

INTERCOMM (now marketed by SDA Products)
Data communications monitor for IBM OS and OS/VS systems.
Users reporting 14
Overall satisfaction E
CIRCLE 608 ON READER CARD

"Up and running at Peugeot in sixty days."



"Peugeot, producing 2.5 million vehicles a year, is now the third largest automobile maker in the world. Domestically, Peugeot needed a comprehensive data base-oriented financial reporting system that could be implemented quickly, with the least amount of impact on data processing and accounting staffs and resources.

"We did not want to 're-invent the wheel', and after a thorough review, we selected Software International's Accounts Payable software package to start. We planned to follow that with their General Ledger a year later, but since Payables went in smoothly in only 60 days, we installed the Ledger six months ahead of schedule.

James F. Miller *Assistant to the President*

PEUGEOT MOTORS OF AMERICA, INC.

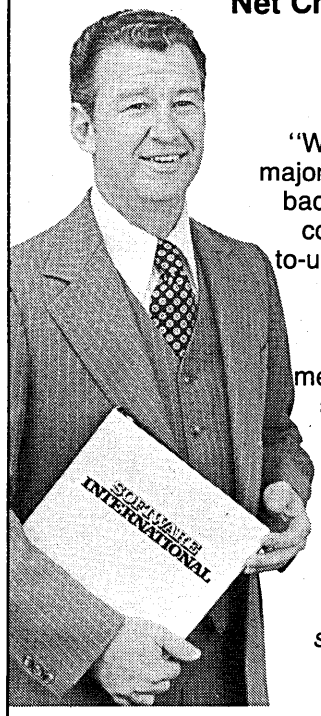
"There was no need for either accounting or data processing to compromise with either system. Prior to choosing Software International, we surveyed their customers and our 'Big 8' auditors, and were well-satisfied with reliability, field support and system performance.

"Preparing for anticipated growth in the U.S. market, Peugeot recently completely reorganized its field operations. Changing from seven regions to three zones meant realigning our reporting system to the new organization. Within 24 hours, the General Ledger provided us with necessary management reports without skipping a beat."

Bernard F. Steiner *Treasurer*

PEUGEOT MOTORS OF AMERICA, INC.

General Ledger and Financial Reporting
Fixed Asset Accounting • Accounts Receivable
Accounts Payable • Payroll/Personnel
Net Change Manufacturing Resource Planning



More than software . . . results.

"We believe, and more than 1500 major corporations around the world back us up, that we offer the most cost-effective, reliable and easy-to-use-financial and manufacturing control systems available.

"But it takes more than great systems for successful implementation. Software International supports all of its products with a world-wide network of local offices staffed with professionals whose wide range of experience covers both data processing and business. Users benefit from this expertise with *training, technical support, comprehensive documentation, maintenance* and *regular enhancements.*

Chet Domoracki
Vice President, Small Business System Division
Software International Corporation

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LARGE COMPUTER SYSTEMS — for users of IBM, BURROUGHS, DEC, HONEYWELL, UNIVAC and ICL computers.

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- ☐ Payroll/Personnel
- ☐ Accounts Payable
- ☐ Accounts Receivable
- ☐ Fixed Asset Accounting

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

SMALL COMPUTER SYSTEMS — for users of System/3 and other IBM, Burroughs, Univac 9030, Honeywell 62, HP 3000, Wang Interdata and most popular business minicomputers.
- ☐ General Ledger
- ☐ Payroll/Personnel
- ☐ Accounts Payable
- ☐ Accounts Receivable
- ☐ Fixed Asset Accounting

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USER RATINGS

MARK IV
Data management system for any IBM 360/370 with optional interfaces.
Users reporting 91
Overall satisfaction E
CIRCLE 609 ON READER CARD

MINICOMM (now marketed by SDA Products)
Communications monitor for smaller DOS or DOS/VS installations.
Users reporting 6
Overall satisfaction HM
CIRCLE 610 ON READER CARD

SCORE (now marketed by SDA Products)
Multipurpose COBOL program generator for most mainframes.
Users reporting 5
Overall satisfaction G
CIRCLE 611 ON READER CARD

Information Associates, Inc.

PAYROLL
Specialized institution payroll/personnel system; for use with DOS, OS and VS counterpart systems.
Users reporting 5
Overall satisfaction HM
CIRCLE 612 ON READER CARD

Information Builders, Inc.

FOCUS
Comprehensive report preparation and information analysis system; runs in OS/VS environments on 370 computers.
Users reporting 7
Overall satisfaction E
CIRCLE 613 ON READER CARD

Information Processing, Inc.

BLIS/COBOL
Multiuser operating system and COBOL compiler for Data General and like minis.
Users reporting 6
Overall satisfaction E
CIRCLE 614 ON READER CARD

Information Sciences, Inc. (InSci)

HUMAN RESOURCE SYSTEM
Payroll/personnel/human resource system for IBM 360/370 computers.
Users reporting 5
Overall satisfaction E
CIRCLE 615 ON READER CARD

Innovation Data Processing, Inc.

FATS/FATAR
Tape surface verification and copy program for use on IBM 360/370 systems.
Users reporting 7
Overall satisfaction HM
CIRCLE 616 ON READER CARD

FDR (Fast/Dump/Restore)
Disk-to-tape dump/restore utility for OS or OS/VS systems.
Users reporting 73
Overall satisfaction HR
CIRCLE 617 ON READER CARD

Insurance Systems of America, Inc.

STOCKS AND BONDS SYSTEM
Stocks and bonds portfolio system for IBM 360/370, Univac and Honeywell systems.
Users reporting 12
Overall satisfaction E
CIRCLE 618 ON READER CARD

Integrated Software Systems Corp.

DISSPLA
A package of FORTRAN graphic subroutines for use on IBM 360/370 and compatibles.
Users reporting 7
Overall satisfaction E
CIRCLE 619 ON READER CARD

International Systems, Inc.

PAC II
Planning and management control system for IBM, Burroughs, and Univac computers.
Users reporting 8
Overall satisfaction E
CIRCLE 620 ON READER CARD

Jason Data Services

SPRINT
Spooling supplement to DOS and DOS/VS system environments.
Users reporting 11
Overall satisfaction E
CIRCLE 621 ON READER CARD

Johnson Systems, Inc.

JOB ACCOUNTING (OS)
Job accounting and resource measurement for use with IBM OS or OS/VS systems.
Users reporting 18
Overall satisfaction E
CIRCLE 622 ON READER CARD

JOB ACCOUNTING (DOS)
Job accounting and resource measurement for IBM DOS or DOS/VS systems.
Users reporting 40
Overall satisfaction E
CIRCLE 623 ON READER CARD

Macro 4, Inc.

BOOST
Partition activity monitor for DOS/VS installations.
Users reporting 17
Overall satisfaction HR
CIRCLE 624 ON READER CARD

LOGOUT
DOS and DOS/VS console message analysis system.
Users reporting 20
Overall satisfaction HR
CIRCLE 625 ON READER CARD

Management and Computer Services, Inc.

DATAMACS
Creates test files for COBOL programs on 360/370 systems.
Users reporting 6
Overall satisfaction E
CIRCLE 626 ON READER CARD

Management Science America, Inc. (MSA)

ACCOUNTS PAYABLE
In ANSI COBOL for use on various mainframes.
Users reporting 14
Overall satisfaction G
CIRCLE 627 ON READER CARD

ACCOUNTS RECEIVABLE
Generalized system for most mainframes.
Users reporting 12
Overall satisfaction G
CIRCLE 628 ON READER CARD

ALLTAX
COBOL subroutine for performing tax calculations.
Users reporting 30
Overall satisfaction HR
CIRCLE 629 ON READER CARD

FICS
Data base-oriented financial control and reporting system for banks; runs on IBM 360/370, Burroughs, and Honeywell COBOL systems.
Users reporting 9
Overall satisfaction E
CIRCLE 630 ON READER CARD

FIXED ASSETS
Specialized fixed asset accounting system for most mainframes.
Users reporting 8
Overall satisfaction E
CIRCLE 631 ON READER CARD

GENERAL LEDGER
In ANSI COBOL for use on most mainframes.
Users reporting 34
Overall satisfaction E
CIRCLE 632 ON READER CARD

INVENTORY CONTROL
Inventory control and purchasing system for use on certain COBOL systems.
Users reporting 7
Overall satisfaction G
CIRCLE 633 ON READER CARD

PAYROLL/PERSONNEL
For any IBM 360/370 or Burroughs 3500 or larger system.
Users reporting 78
Overall satisfaction E
CIRCLE 634 ON READER CARD

Mathematica Products Group, Inc.

RAMIS II
Data management information and retrieval system with many data base management system features.
Users reporting 15
Overall satisfaction E
CIRCLE 635 ON READER CARD

MCBA (Mini-Computer Business Applications, Inc.)

DEC BUSINESS APPLICATIONS
A package of accounting routines for a variety of DEC computers.
Users reporting 13
Overall satisfaction E
CIRCLE 636 ON READER CARD

PAYROLL
Generalized payroll package for use with DEC and Data General minicomputers.
Users reporting 6
Overall satisfaction E
CIRCLE 637 ON READER CARD

McCormack and Dodge Corp.

ACCOUNTS PAYABLE
For use in most business-oriented establishments; runs on IBM 360/370, Burroughs, and Honeywell computers.
Users reporting 17
Overall satisfaction E
CIRCLE 638 ON READER CARD

FIXED ASSETS
Specialized accounting system for IBM 360/370, Burroughs, and Honeywell computers.
Users reporting 21
Overall satisfaction E
CIRCLE 639 ON READER CARD

GENERAL LEDGER
General ledger system for IBM, Honeywell, and Burroughs computers.
Users reporting 10
Overall satisfaction E
CIRCLE 640 ON READER CARD

Microsoft, Inc.

BASIC
Standard BASIC compiler for use with 8080 or Z-80 microprocessor.
Users reporting 6
Overall satisfaction E
CIRCLE 300 ON READER CARD

MRI

SYSTEM 2000
Data base management system for IBM 360/370 and compatibles, Univac, and CDC computers.
Users reporting 30
Overall satisfaction E
CIRCLE 301 ON READER CARD

MSP, Inc.

DATAMANAGER
Data dictionary system for DBMS or standard file organizations.
Users reporting 5
Overall satisfaction E
CIRCLE 302 ON READER CARD

NCI

DISK-O-TEK
Disk file organization and maintenance utility, runs with IBM DOS or DOS/VS systems.
Users reporting 9
Overall satisfaction E
CIRCLE 303 ON READER CARD

DR. D
Multifunction DOS and DOS/VS

A message from John R. Bennett, President, Applied Data Research, to firms considering DB/DC systems.

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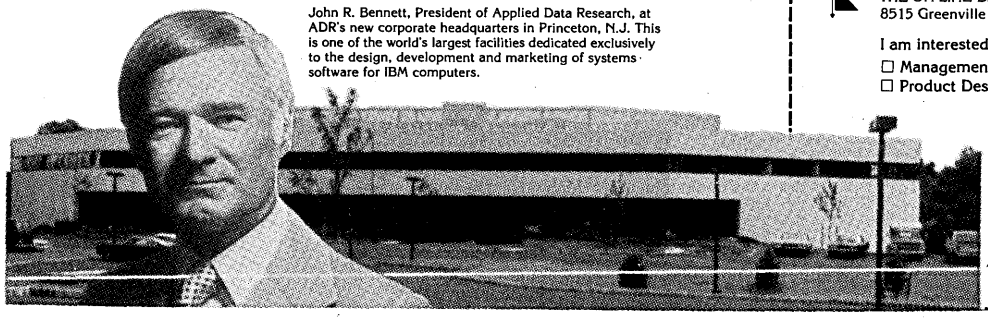

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disk dump and restore utility.
Users reporting 7
Overall satisfaction E
CIRCLE 304 ON READER CARD

O.W.L.
DOS/VS on-line programming development tool.
Users reporting 18
Overall satisfaction HR
CIRCLE 305 ON READER CARD

SLICK
Source program librarian for DOS, OS and VS operating systems.
Users reporting 43
Overall satisfaction HR
CIRCLE 306 ON READER CARD

NCR Corp.
ACCOUNTS PAYABLE
Generalized accounts payable system for most NCR computers.
Users reporting 17
Overall satisfaction E
CIRCLE 307 ON READER CARD

ACCOUNTS RECEIVABLE
Generalized system for use on most NCR computers.
Users reporting 9
Overall satisfaction E
CIRCLE 308 ON READER CARD

CIF
Central information file system for banks; runs on most NCR computers.
Users reporting 16
Overall satisfaction E
CIRCLE 309 ON READER CARD

COBOL
Standard COBOL compiler for most NCR medium- to large-scale computers.
Users reporting 7
Overall satisfaction E
CIRCLE 310 ON READER CARD

GENERAL LEDGER
A generalized system for use with most NCR mainframes.
Users reporting 17
Overall satisfaction E
CIRCLE 311 ON READER CARD

I.G.A.S.
Interactive general accounting system for small to medium NCR systems.
Users reporting 6
Overall satisfaction F
CIRCLE 312 ON READER CARD

PAYROLL
Payroll personnel system for most medium to large NCR systems.
Users reporting 43
Overall satisfaction E
CIRCLE 313 ON READER CARD

SPIRIT
Sales processing real-time inventory technique for NCR 8000 Series.
Users reporting 9
Overall satisfaction G
CIRCLE 314 ON READER CARD

Nichols and Co., Inc.
N 5500
Project planning and control system written in ANSI COBOL.
Users reporting 5
Overall satisfaction G
CIRCLE 315 ON READER CARD

Oregon Minicomputer Software, Inc.
PASCAL-1
PASCAL compiler for the Digital Equipment Corp. (DEC) PDP-11 systems.
Users reporting 6
Overall satisfaction HM
CIRCLE 316 ON READER CARD

SORT
Sort/merge package for use on DEC PDP-11 computers running under RSTS/E.
Users reporting 9
Overall satisfaction E
CIRCLE 317 ON READER CARD

On-Line Software International
INTERTEST
Interactive CICS testing program for any version of CICS.
Users reporting 9
Overall satisfaction HM
CIRCLE 318 ON READER CARD

Optipro, Inc.
EXTRACTO
Data management information and retrieval system.
Users reporting 6
Overall satisfaction E
CIRCLE 319 ON READER CARD

Oxford Software Corp.
DFAST & DFAST/VS (now marketed only by Tower Systems)
A version of this DOS and DOS/VS disk space management package offered by this vendor.
Users reporting 5
Overall satisfaction E
CIRCLE 320 ON READER CARD

TFAST & TFAST/VS (now marketed only by Tower Systems)
A version of this DOS and DOS/VS tape management system marketed by this vendor.
Users reporting 5
Overall satisfaction E
CIRCLE 321 ON READER CARD

UFO
CICS application development system for use with DOS/VS or OS/VS systems.
Users reporting 5
Overall satisfaction E
CIRCLE 322 ON READER CARD

Pace Applied Technology, Inc.
KOMAND
An OS and OS/VS job accounting and utilization reporting system.
Users reporting 8
Overall satisfaction E
CIRCLE 323 ON READER CARD

Pansophic Systems, Inc.
EASYTRIEVE
Information retrieval and reporting system for IBM 360/370 systems.
Users reporting 107
Overall satisfaction HR
CIRCLE 324 ON READER CARD

PANEXEC
Program security and library maintenance system.
Users reporting 5
Overall satisfaction G
CIRCLE 325 ON READER CARD

PANVALET
Program library maintenance system for any DOS, OS, or VS environment.
Users reporting 171
Overall satisfaction HR
CIRCLE 326 ON READER CARD

Pennsylvania State Univ.
MINITAB
Statistical analysis program for educational institutions.
Users reporting 9
Overall satisfaction E
CIRCLE 327 ON READER CARD

The Poise Company, Inc.
POISE
Data management system for use on DEC PDP-11 minicomputers with RSTS/E.
Users reporting 14
Overall satisfaction E
CIRCLE 328 ON READER CARD

Price Waterhouse and Co.
AFRS
Advanced financial reporting system with planning and budgeting capabilities.
Users reporting 5
Overall satisfaction E
CIRCLE 329 ON READER CARD

Prime Computer, Inc.
PRIMOS
Disk operating system for Prime minicomputers.
Users reporting 5
Overall satisfaction E
CIRCLE 330 ON READER CARD

Program Products, Inc.
DATA ANALYZER
Information retrieval and reporting system for any IBM 360/370.
Users reporting 11
Overall satisfaction E
CIRCLE 331 ON READER CARD

SAB, Inc.
PLAN 1040
Tax planning package for use in accounting firms.
Users reporting 8
Overall satisfaction HM
CIRCLE 332 ON READER CARD

SOFTWARE 1040
For preparation of personal income tax Form 1040.
Users reporting 41
Overall satisfaction HR
CIRCLE 333 ON READER CARD

SAS Institute, Inc.
SAS
Statistical analysis system with generalized data management capabilities.
Users reporting 45
Overall satisfaction HR
CIRCLE 334 ON READER CARD

SDI
EPAT
Keeps track of physical tape volumes on IBM DOS and DOS/VS systems.
Users reporting 51
Overall satisfaction HR
CIRCLE 335 ON READER CARD

GRASP
Spooling enhancement to IBM DOS or DOS/VS operating systems.
Users reporting 27
Overall satisfaction E
CIRCLE 336 ON READER CARD

Seibels, Bruce & Co.
PMS
Property and liability insurance system; runs on any IBM DOS or DOS/VS system.
Users reporting 5
Overall satisfaction E
CIRCLE 337 ON READER CARD

Software ag of North America, Inc.
ADABAS
Data base management system for IBM 360/370 and other comparable mainframes.
Users reporting 26
Overall satisfaction HR
CIRCLE 338 ON READER CARD

COM-PLETE
A general-purpose data communications monitor that interfaces with ADABAS and other DBMSs.
Users reporting 9
Overall satisfaction E
CIRCLE 339 ON READER CARD

Software House
SYSTEM 1022
End-user-oriented data base management system for DEC system-10 and 20.
Users reporting 10
Overall satisfaction E
CIRCLE 340 ON READER CARD

Software International Corp.
ACCOUNTS PAYABLE
General-purpose accounts payable system.
Users reporting 23
Overall satisfaction E
CIRCLE 341 ON READER CARD

GENERAL LEDGER
In ANSI COBOL to run on most mainframes and minis.
Users reporting 117
Overall satisfaction E
CIRCLE 342 ON READER CARD

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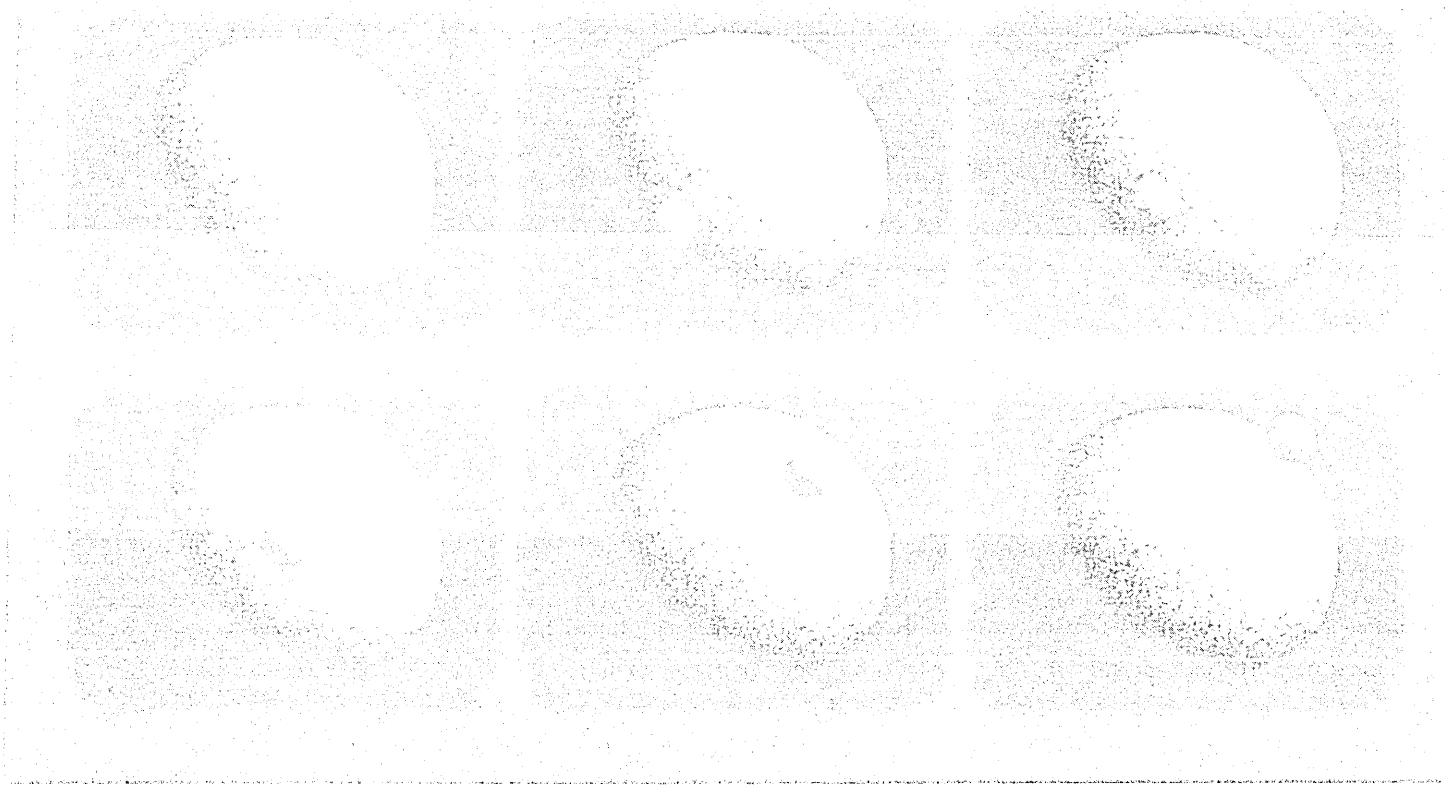

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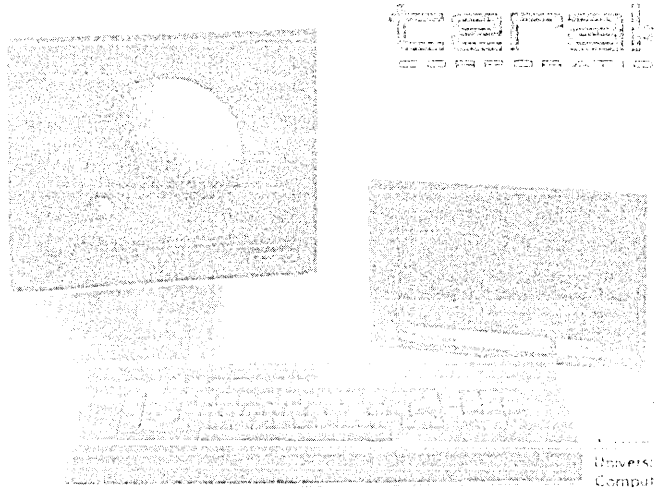

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USER RATINGS

DOS/MVT
Replacement operating system for IBM DOS users.
Users reporting 10
Overall satisfaction E
CIRCLE 344 ON READER CARD

Sperry Univac
BEM
A basic editor monitor for interactive programming under the OS/3 operating system.
Users reporting 35
Overall satisfaction HR
CIRCLE 345 ON READER CARD

GENERAL LEDGER
Generalized system for use with most Univac computers.
Users reporting 6
Overall satisfaction E
CIRCLE 346 ON READER CARD

ICS/90
Data collection system for use on Series 90.
Users reporting 8
Overall satisfaction G
CIRCLE 347 ON READER CARD

PAYROLL
General purpose payroll/personnel system for use on most Univac mainframes.
Users reporting 6
Overall satisfaction E
CIRCLE 348 ON READER CARD

UNIS
A bill of material, inventory control, planning, and scheduling system for the Univac Series 90.
Users reporting 21
Overall satisfaction E
CIRCLE 349 ON READER CARD

SPSS, Inc.
SPSS
For statistical work in the social sciences.
Users reporting 46
Overall satisfaction E
CIRCLE 350 ON READER CARD

SPSS/Carleton College
SPSS/(PDP-11)
A PDP-11 version of the SPSS package available through this conversion point.
Users reporting 9
Overall satisfaction G
CIRCLE 351 ON READER CARD

SPSS/McMaster Univ.
SPSS (HP 3000)
An HP 3000 version of the original SPSS package available through this conversion point.
Users reporting 5
Overall satisfaction E
CIRCLE 352 ON READER CARD

SPSS/Northwestern Univ.
SPSS (CDC)
A CDC 6000 version of SPSS available through this conversion site.
Users reporting 9
Overall satisfaction HM
CIRCLE 353 ON READER CARD

SPSS/University of Kansas
SPSS (HONEYWELL)
Honeywell SPSS package available through this conversion site.
Users reporting 5
Overall satisfaction E
CIRCLE 354 ON READER CARD

SPSS/University of Pittsburgh
SPSS (DEC-20)
DEC's SPSS version available from this conversion point.
Users reporting 6
Overall satisfaction E
CIRCLE 355 ON READER CARD

Stockholder Systems, Inc.
PEP
Paperless entry processing for automatic payment through ACH for IBM 360/370 and Burroughs computers.
Users reporting 11
Overall satisfaction E
CIRCLE 356 ON READER CARD

Systems Research Inc.
SRI/EDIT
On-line programming text editor and file maintenance system.
Users reporting 11
Overall satisfaction HR
CIRCLE 357 ON READER CARD

Systems Support Software, Inc.
QUIKJOB
File management and reporting system for any IBM 360/370.
Users reporting 39
Overall satisfaction HR
CIRCLE 358 ON READER CARD

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SCREEN DEVELOPMENT SYSTEM (SDMPS)
Screen development and message processing system for Univac 90/30 series.
Users reporting 5
Overall satisfaction HM
CIRCLE 359 ON READER CARD

Systonetics, Inc.
EZPERT
Project management network and chart generator.
Users reporting 5
Overall satisfaction E
CIRCLE 360 ON READER CARD

TCC, Inc.
LIFE/70
Life insurance company management information system.
Users reporting 8
Overall satisfaction E
CIRCLE 361 ON READER CARD

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PLOT-10
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Users reporting 12
Overall satisfaction E
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USER RATINGS

Texas Instruments, Inc.
DX-10
Executive monitoring system for the TI 990/10.
Users reporting 6
Overall satisfaction E
CIRCLE 363 ON READER CARD

Time Share Corp.
GIS (GUIDANCE INFORMATION SYSTEM)
School curriculum guidance system; runs on HP minis.
Users reporting 9
Overall satisfaction E
CIRCLE 364 ON READER CARD

Tomark, Inc.
ABEND-AID
Abnormal termination error diagnostic tool for IBM OS and OS/VS systems.
Users reporting 13
Overall satisfaction E
CIRCLE 365 ON READER CARD

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TOSC-IV
An on-line, real-time tape library management system.
Users reporting 5
Overall satisfaction E
CIRCLE 366 ON READER CARD

Tower Systems
DFAST & DFAST/VS
Allows DOS and DOS/VS users to automatically allocate and share disk space.
Users reporting 24
Overall satisfaction E
CIRCLE 367 ON READER CARD

TFAST & TFAST/VS
A tape management system for DOS and DOS/VS installations.
Users reporting 13
Overall satisfaction E
CIRCLE 368 ON READER CARD

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TASK/MASTER
Data communications monitor for DOS, OS, or VS-like operating systems.
Users reporting 20
Overall satisfaction E
CIRCLE 369 ON READER CARD

United Computing Systems, Inc.
FORESIGHT
Financial planning package written in FORTRAN.
Users reporting 7
Overall satisfaction HM
CIRCLE 370 ON READER CARD

Universal Software, Inc.
ADAS
Disk space allocation system for IBM DOS and DOS/VS systems.
Users reporting 13
Overall satisfaction E
CIRCLE 371 ON READER CARD

DOS/ASAP
DOS and DOS/VS spooling enhancement package for IBM 360/370s.
Users reporting 23
Overall satisfaction E
CIRCLE 372 ON READER CARD

RELO-PLUS
A library relocation enhancement for users of the IBM DOS operating system.
Users reporting 5
Overall satisfaction HM
CIRCLE 495 ON READER CARD

University of California at Los Angeles
BMDP-77
Statistical computing for medical and other applications.
Users reporting 19
Overall satisfaction E
CIRCLE 373 ON READER CARD

University of California at San Diego
PASCAL
A PASCAL compiler for the DEC PDP-11 minicomputer family.
Users reporting 9
Overall satisfaction E
CIRCLE 374 ON READER CARD

University Computing Co. (UCC)
FCS (Financial Control System)
Financial information storage and retrieval system.
Users reporting 24
Overall satisfaction E
CIRCLE 375 ON READER CARD

SUPER MICR
A series of complete check processing systems for the IBM 360/370.
Users reporting 6
Overall satisfaction E
CIRCLE 376 ON READER CARD

UCC-1 (or TMS)
Tape management for OS or OS/VS systems.
Users reporting 36
Overall satisfaction E
CIRCLE 377 ON READER CARD

UCC-2 (or DUO)
Aid for conversion from DOS or DOS/VS to OS or OS/VS on IBM 360/370s and compatibles.
Users reporting 17
Overall satisfaction E
CIRCLE 378 ON READER CARD

UCC-10
Data dictionary manager and control statement generator.
Users reporting 6
Overall satisfaction E
CIRCLE 379 ON READER CARD

UCC-15
Job recovery management system.
Users reporting 8
Overall satisfaction E
CIRCLE 380 ON READER CARD

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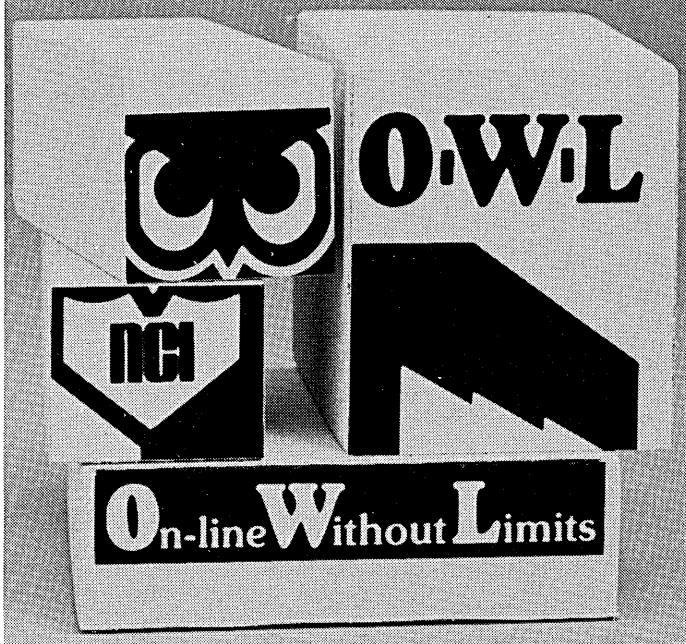

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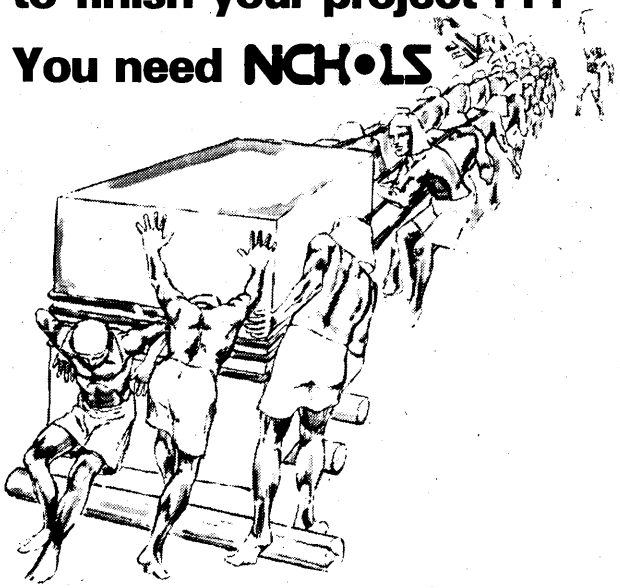

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Overall satisfaction HM
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Fast, in-memory COBOL compiler for IBM 360/370.
Users reporting 9
Overall satisfaction E
CIRCLE 382 ON READER CARD

WATFIV
Fast, in-memory FORTRAN compiler for IBM 360/370.
Users reporting 8
Overall satisfaction HM
CIRCLE 388 ON READER CARD

Value Computing, Inc.
COMPUT-A-CHARGE
Job accounting and billing, written in ANSI COBOL.
Users reporting 15
Overall satisfaction E
CIRCLE 389 ON READER CARD

VALU-LIB
Tape library management system written in ANSI COBOL.
Users reporting 5
Overall satisfaction E
CIRCLE 390 ON READER CARD

Wang Laboratories, Inc.
PAYROLL SYSTEMS
General payroll systems for IBM, Honeywell, and Wang computers.
Users reporting 17
Overall satisfaction E
CIRCLE 391 ON READER CARD

Weiland Computer Group, Inc.
DEMAND DEPOSIT SYSTEM
Performs demand deposit, credit reserve, and commercial account analysis.
Users reporting 10
Overall satisfaction E
CIRCLE 392 ON READER CARD

Western Electric Co., Inc.
UNIX
Multiuser time-sharing system for DEC PDP-11 and VAX-11 systems.
Users reporting 12
Overall satisfaction E
CIRCLE 393 ON READER CARD

Westinghouse Electric Corp.
DISK SPACE MANAGER
IBM DOS/VS disk space management system.
Users reporting 16
Overall satisfaction HR
CIRCLE 394 ON READER CARD

DISK UTILITY SYSTEM
Disk-to-tape, etc. utility for use with IBM DOS and DOS/VS systems.
Users reporting 104
Overall satisfaction HR
CIRCLE 395 ON READER CARD

JOB MONITOR
Job measurement and accounting system for DOS or DOS/VS modes.
Users reporting 9
Overall satisfaction E
CIRCLE 396 ON READER CARD

SCEPTER
On-line source statement library maintenance system.
Users reporting 11
Overall satisfaction HR
CIRCLE 397 ON READER CARD

WESTI
Teleprocessing interface system for small to medium DOS or DOS/VS mainframes.
Users reporting 38
Overall satisfaction HR
CIRCLE 398 ON READER CARD

Whitlow Computer Systems
SYNCSORT
DOS, DOS/VS, OS, or OS/VS disk and tape sorting program replacement.
Users reporting 167
Overall satisfaction HR
CIRCLE 399 ON READER CARD

Detailed results of the survey described in this article are contained in "User Ratings of Proprietary Software," a DATAPRO 70 report available for $15 from Datapro Research Corp., 1805 Underwood Blvd., Delran, NJ 08075, (609) 764-0100.

VENDOR INDEX

To obtain additional information about the software packages rated in the preceding listing, please contact the vendor directly at the address listed below, or circle the appropriate number on the reader service card.

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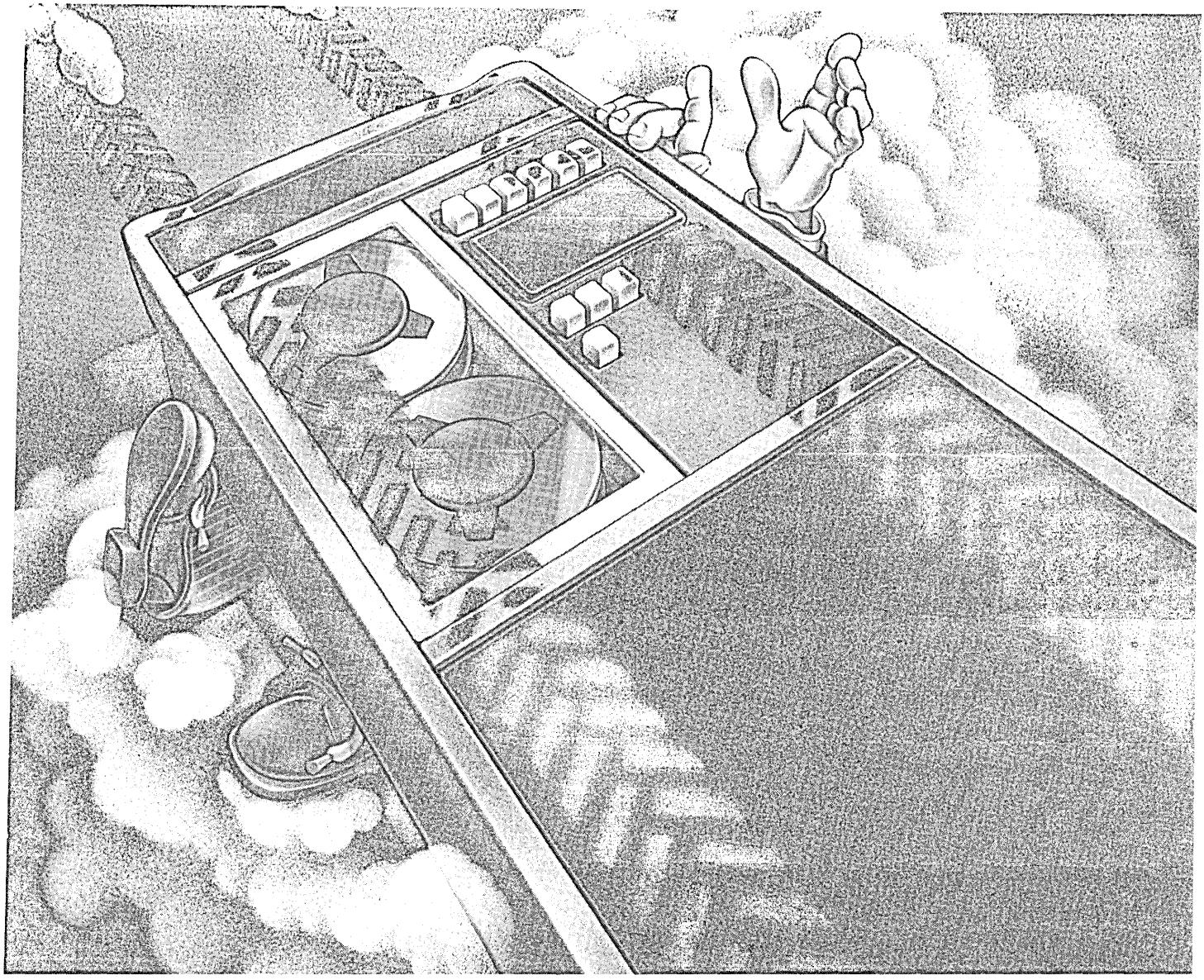
P.O. Box 185, Station A
Rexdale, Ontario M9W 5L1
(416) 746-3388

Altergo Software Inc.
Four Faneuil Hall
Boston, MA 02109
(617) 227-5100



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Boole & Babbage, Inc.
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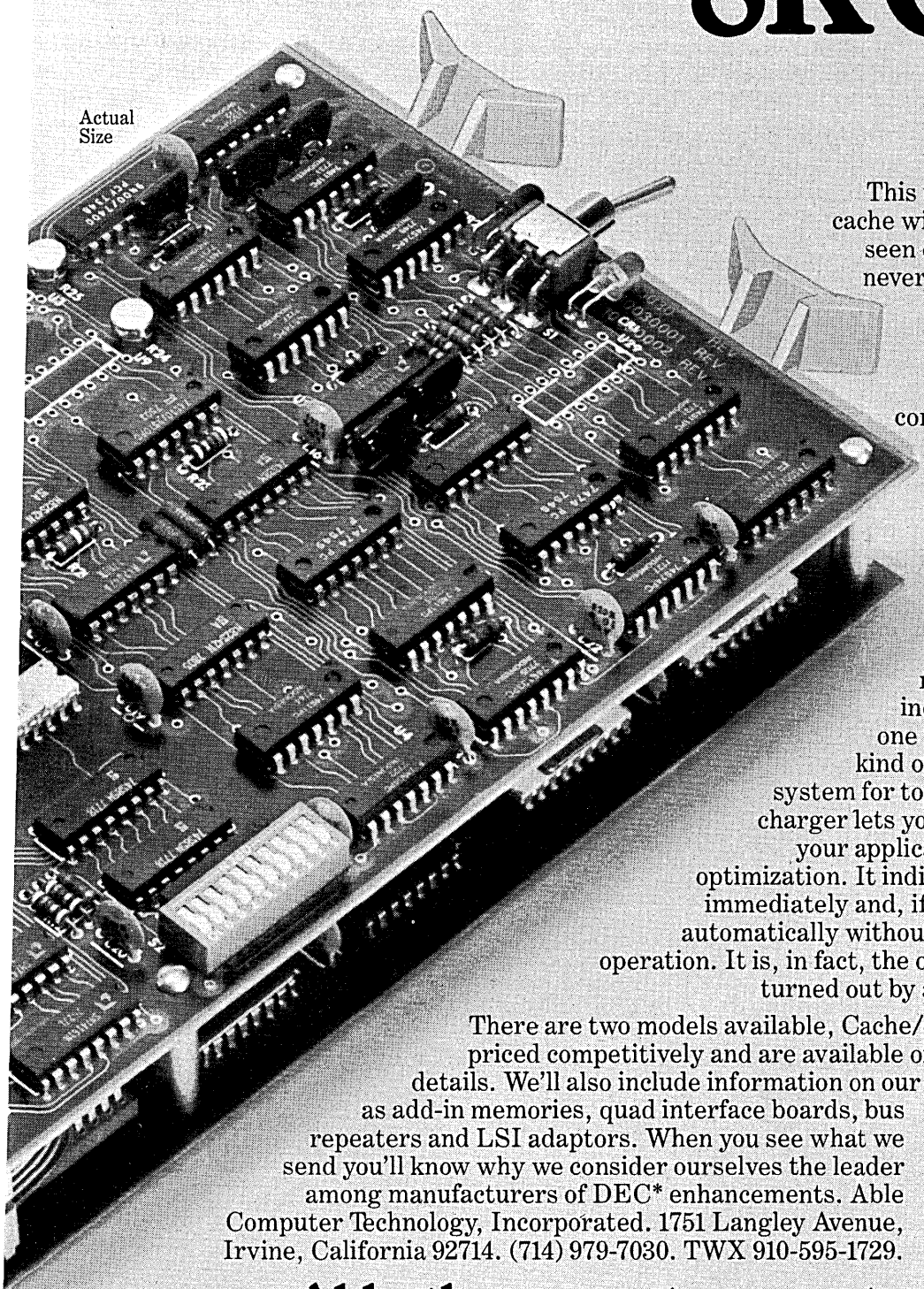
Actual Size



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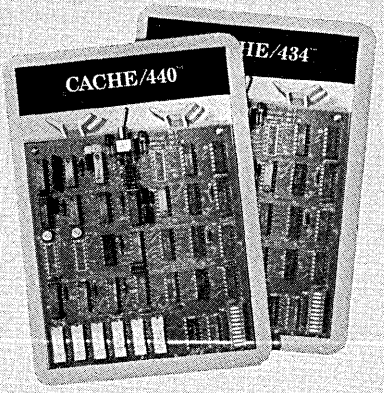

Able, the computer experts

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INTERNATIONAL DATA SCIENCES, INC.

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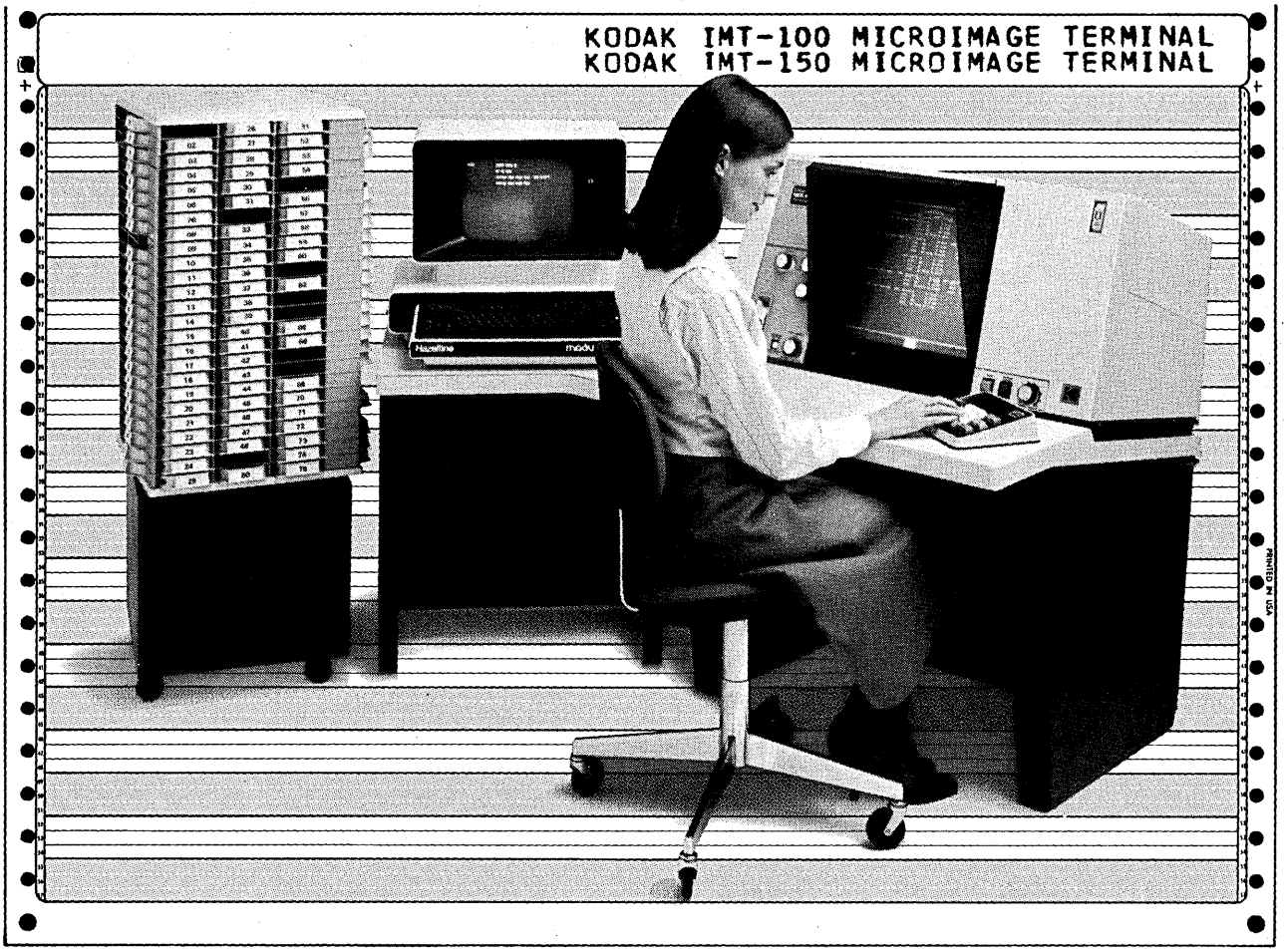
A few lines on increasing the productivity of your computer.



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

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

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

☐ Please have a Kodak representative contact me.

Name

Title

Company

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Prime Computer, Inc.
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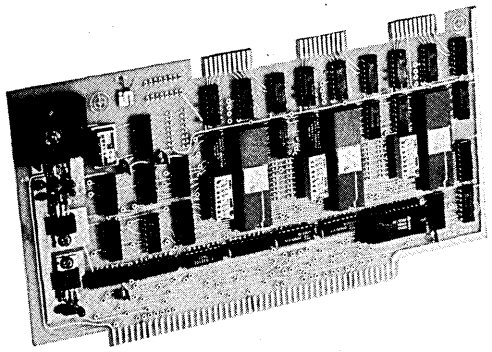

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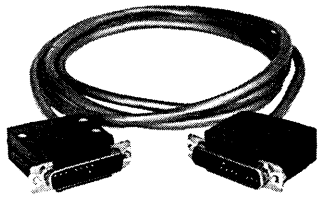

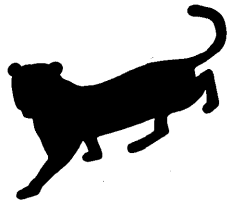

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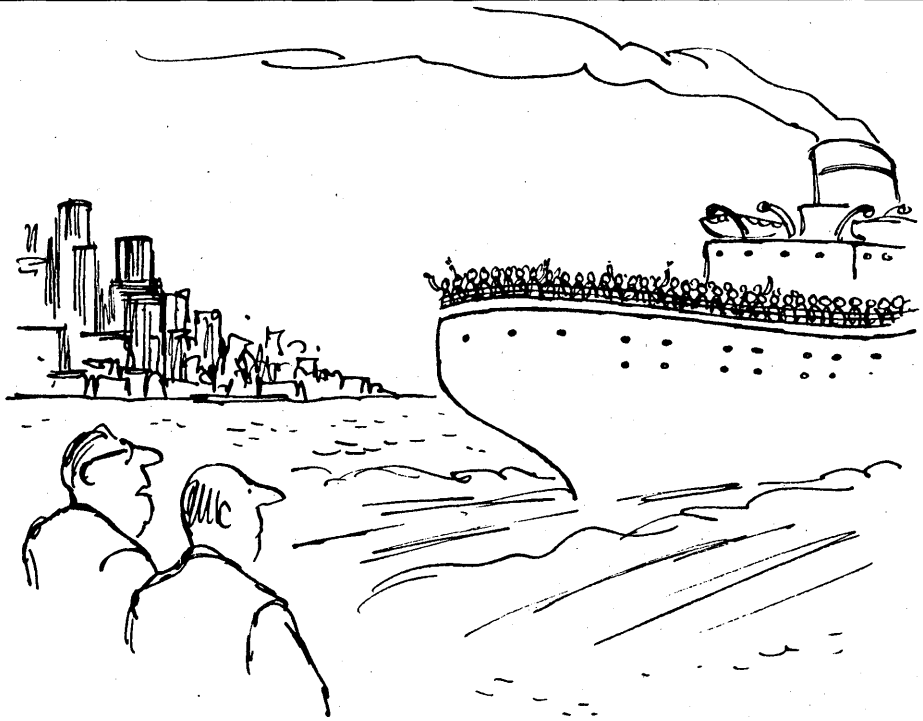

Well, we warned them what would happen if they didn't shape up."

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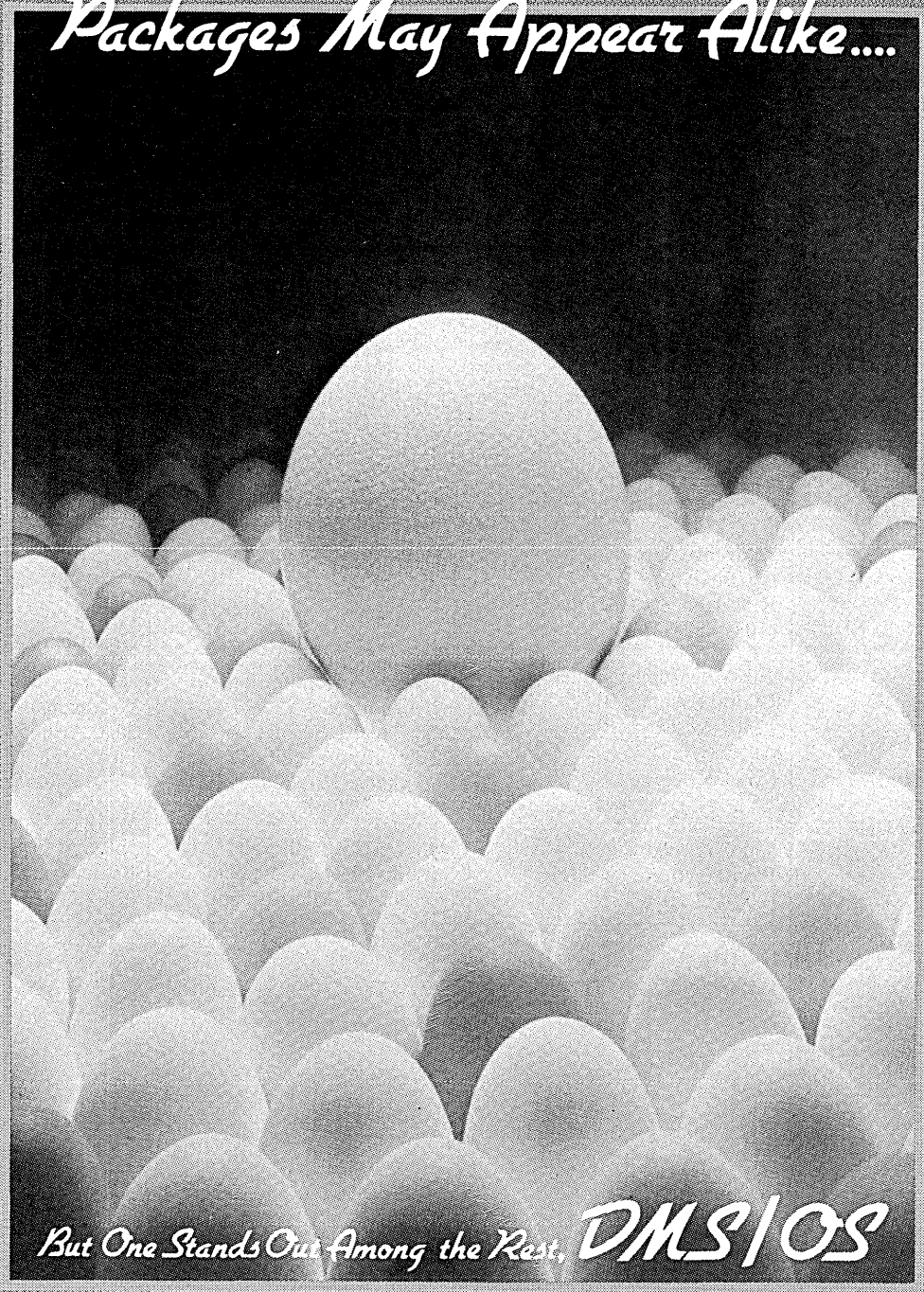

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CIRCLE 110 ON READER CARD

Critical systems can be processed during crises without a duplicate dp configuration.

VM: A BASIC INGREDIENT IN EMERGENCY PLANNING

by Matthew Murphy

Much of the logistical nightmare associated with contingency planning can be alleviated by incorporating the virtual machine (VM) as a basic ingredient in a backup plan. With VM it is possible to assure processing of critical systems in emergency situations without a duplicate configuration.

Contingency planning has become more important in light of the numerous crises that could interfere with operations of a data center. Not only are we exposed to fire, floods, and vandalism, but a new list of energy-related disasters appears on the horizon. We are now forced to deal with fuel shortages of both oil and natural gas. Electrical brownouts and blackouts could occur if electrical production is dependent on fossil fuels. Another danger not given much consideration before now is the prospect of forced or voluntary evacuations of data centers in the vicinity of nuclear plants.

The majority of the host control programs now in use are dependent on an explicit hardware configuration. The difficulty experienced by the dp community in finding any configuration, much less a number of candidates, closely resembling the one for which their host control program was generated defeats many a contingency plan before it gets off the ground. Also, most major host control systems (MVS, VS1, DOS/VS, etc.) are intrinsically connected to real peripheral devices (hardwired addresses and device characteristics). This severely limits the number of places to take one's production applications in case of an emergency. It also increases the workload associated with rebuilding a data center.

The limitations that hardware and software requirements placed on contingency planning in the past can be overcome by the implementation of a VM system. With respect to software, all of the following host system programs can run under control of VM: DOS, OS/MFT, OS/MVT, DOS/VS, OS/VS2, SVS, MVS, and a lower level VM system itself.

In each instance where one of the above operating systems is run under the control of VM, no modifications to this now pseudo-host system are necessary, nor do any of these pseudo-host systems operate as if they were not the controlling operating system. Essentially, the host operating systems can be expected to run under the control of a VM system without further modification. This means that if you have any of the above host systems currently defined and in operation it can be run wherever VM can be run. It would, of course, be a pseudo-host system in that case. More importantly, the system would be fully functional in every respect save one: performance.

The ability to achieve functional equivalence in a VM environment for all host systems extends to the subsystems of the host systems and thus applies to all application systems programming. This is especially true for batch systems, and with some hardware constraints (usually missing with respect to batch systems), applies to on-line applications as well.

VM can be generated from scratch in a matter of hours on any cpu that can be used for virtual storage systems, so a variety of cpus can accommodate VM (and therefore all other host systems as pseudo systems)—most of the mainframes manufactured by IBM as well as a considerable number of the plug compatible mainframes.

VM as a host control program has been with us for many years now, and has had significant success in the area of testing new applications and new systems. It is widely used in the educational community because of its versatility.

It is the versatility and flexibility of this host control program that has led us to take a good look at it within the context of contingency planning.

Our data center supports a critical IMS batch application with a 3MB working set. Our host control program is MVS release 3.7H and the version of IMS we now use is release 1.1.4. We have an IBM 370/158 model I with 3MB of storage, 3350 and 3330-I disks, and 3420 tape drives with the dual density feature giving us 1600 and 6400 bpi. We were able to run a text version of this configuration and the IMS application at a separate data center with the following configuration: an IBM 370/148 model I with 2MB of storage, 3330 model IIs, and 3420 tape drives similar to ours.

The two sites were obviously quite dissimilar with regard to physical characteristics; in fact, the addressing schemes were also quite different. In spite of this, we were able to bring up our MVS system and run our critical batch IMS application under VM on the backup 370/148 within an acceptable set of performance criteria and with a minimal amount of effort. The success of this test run should show that this critical application system can be processed under VM in a myriad of data centers nationwide.

Using VM, emergency applications can run concurrently with the regular programs of the backup site.

SMILE—IT'S A FREE PROGRAM

There is another aspect of this approach that should really make you smile. VM is available in most cases as a free host control program. There is, however, some cost involved in training your staff to use VM. This is an important factor, because the more familiar staff members are with VM and its abilities, the easier it is for them to implement a VM system and integrate it with your contingency plan.

Our installation happened to have two individuals trained in VM who had previously worked in environments where VM was the production system. Having moved our data center from New York City to Roanoke, Va., and also having converted from SVS to MVS, we had to revamp our contingency plan operations. In New York we had relied on a considerable number of data centers where we could process critical applications in cases of emergency, but in Roanoke we were much more restricted in the number of backup sites available. The concept of using VM as an integral part of our contingency plan was thus born out of necessity.

One of the major drawbacks of using a production environment in another data center as a backup site is having to wait for time to be available. Using VM is a big improvement since the programs of the backup site and of the corporation that needs emergency processing can run concurrently, thus minimizing the impact on the data center. Different machines will perform with different degrees of efficiency, depending generally on the amount of storage attached. For planning purposes, the memory size presents no configuration problems but is directly related to the performance levels achieved. Only the following device dependencies must be considered when migrating an operational host system to VM:

The off-site location requires only a tape or disk with characteristics similar to the present system. The nice thing about this is that only one device with these characteristics is required. This is basically the only requirement for backing up a batch operation (or an on-line application for which you are able to process the critical portion in batch mode). Those configurations for which on-line applications are necessary require a considerable amount of further planning; however, VM could still be feasible in many instances.

The benefits of VM can best be seen by what the migration does *not* require.

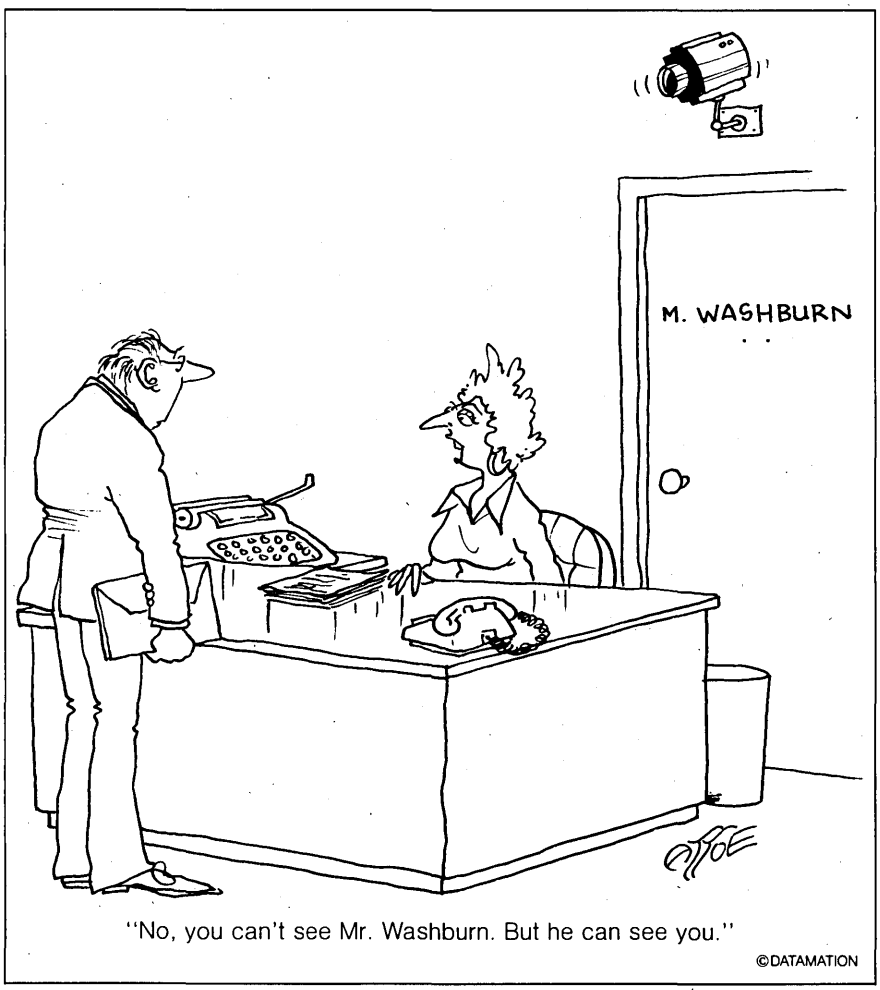
A host control program is typically generated for a specific set of addresses for disk and tape devices. The system generation is also specifically linked to those device characteristics. The hardwired address and characteristics after a system generation thus become a requirement for the initial program load of that particular host control program. Running under VM, however, this requirement no longer exists. Hardwired addresses and channels can be logically changed by VM to the requirements of the pseudo-host system. If a bank of 3350s are defined to the pseudo-host as addresses 250 through 25F, they can be any set of real addresses when that pseudo-host control program is run under the control of VM. VM can "ATTACH" (a VM command) a real device, such as hardwired "480," as device 250 to that pseudo-host system. At the same time, VM can ATTACHreal device "620" as device 251.

Even disks with unlike characteristics are easily handled—3330-Is can be restored to 3330-IIs (this wastes space, but is operational). As far as hardware is concerned, converting 3350 devices from or to emulation mode is a minor five-minute change. The logical configuration necessary for the mode desired can then be handled by the VMsystem.

Console configurations can also be logically changed to allow any consoles that are pseudo-host system defined (and some that are not) to become the primary console.

Even tape devices present no problem to the VM system with respect to their hardwired channel and device addresses. Again, the logical addressing scheme is the one of importance to the person seeking a backup site, and VM can logically change the hardwired channel and device addresses to the addresses required by a particular generated host control program. Once again, the ATTACH command can be used to reconfigure real addresses to those that were defined to the pseudo-host system.

Unit record devices can also be logically reflected by VMto be those that were defined to the pseudo-host system. Actually, real devices need not exist. VM can define virtual unit record devices, and this flexibility extends to the point that you can chose a third site for printing or punching cards if that is necessary. In fact, you may hold the output of particular jobs that were processed pending the



"No, you can't see Mr. Washburn. But he can see you."

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VM provides possibly the best security features of any host control program.

arrival of a suitable unit record device for your particular requirements.

Even teleprocessing devices are reconfigurable with regard to channel and device addressing. Additionally, device emulation readily lends itself to substitution in this category.

Thus these restrictions are lessened considerably if not eliminated by the flexibility of VM.

PERFORMANCE RESTRICTS USE

You might be asking yourself now, "If VM is so great, why isn't it used more often?" The answer is, in a word, performance. All the logical configuration and address changing involves a considerable amount of overhead. VM intercepts channel programs and translates them into that which has been configured as the logical set of addresses. In a production environment, this overhead would be intolerable, but the performance necessary to support a production and development environment is not necessarily the performance needed in an emergency situation, where the continuation of critical processes is at issue.

Most contingency plans are concerned with providing an ability to run only critical application systems while a new fully equipped data center is built. This implies that the overall throughput requirement would be considerably lessened in times of emergency, suggesting that the performance degradation experienced with VM is tolerable. Also, the typical data center runs 35% to 50% of its time in support of development work, giving considerable room for performance degradation in times of emergency. Convenience reports or management tools can be held in abeyance to further decrease the amount of absolutely necessary work.

In most cases no problem exists in converting from a smaller cpu to a larger one, or in going to a cpu with larger memory. In these cases performance might not even suffer. The problem arises in changes to a smaller cpu, to a less efficient model, to one with a smaller memory, or any combination of these. Even in these cases, however, the difficulties should be no more severe than the lessening of throughput. Given an emergency situation and given the options available using VM, only very large systems would have a limited number of candidates for temporary emergency replacement.

The average dp user will thus find a large number of candidates for an offsite or backup facility. The small dp center will also find a considerable number of candidates for backing up his operation, and the large user will find a number of candidates he never expected, including machines with smaller cpu's.

Once your level of expertise in using VM increases you can use VM in the mode for which it was primarily designed. VM was designed to enable users to test new applications and new systems without the impact they currently have on a single host control program shop. Testing a new version of your host control program usually requires standalone time within the data center. Using VM one can run a test version and production version concurrently. Performance considerations are necessary, of course, but you might find that the benefits of this type of operation far outweigh the performance degradation encountered.

Those organizations providing backup facilities for contingency planning purposes that themselves do not have a production environment may find this concept quite interesting. One of the reasons companies hesitate before enlisting the services of a contingency planning firm is the fear that in case of disaster they would find themselves in competition with another organization. This problem can be alleviated to a great extent by using VM because the programs of two or more companies can run simultaneously.

VM also provides possibly the best security features of any host control program in existence. Each system or user defined to VM and all its data files can be isolated from any other user with a minimum of effort and with considerable integrity.

Maintenance of a VM-based contingency plan is also considerably lessened by virtue of the fact that VM looks at a particular data center in a logical manner. Such changes as additional storage, new disks, or different versions of your operating system are easily handled by VM by simply introducing parameters indicating the changes made.

VM allows the maximum use of the resources at hand. A degree of flexibility heretofore missing from most contingency plans is provided because specific address schemes and specific device characteristics are no longer necessary. This is perhaps the logistical breakthrough necessary to the development of a workable contingency plan. The VM contingency plan should provide hope for those plans that are collecting dust because they have outlived their usefulness and cannot be easily updated, and may be good news to those shops where no contingency plans exist. ✲

"Rogers, I like your conceptualization, your initialization, your prioritization, and your implementation, but *you*, I can't stand!"

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MATTHEW MURPHY

Mr. Murphy is manager of systems support at The Atlantic Companies, and was previously employed as a program support representative with IBM. He is a graduate of St. John's University with a BS in business. He is not the progenitor of Murphy's Law.

Fran Tarkenton, ABC Television.

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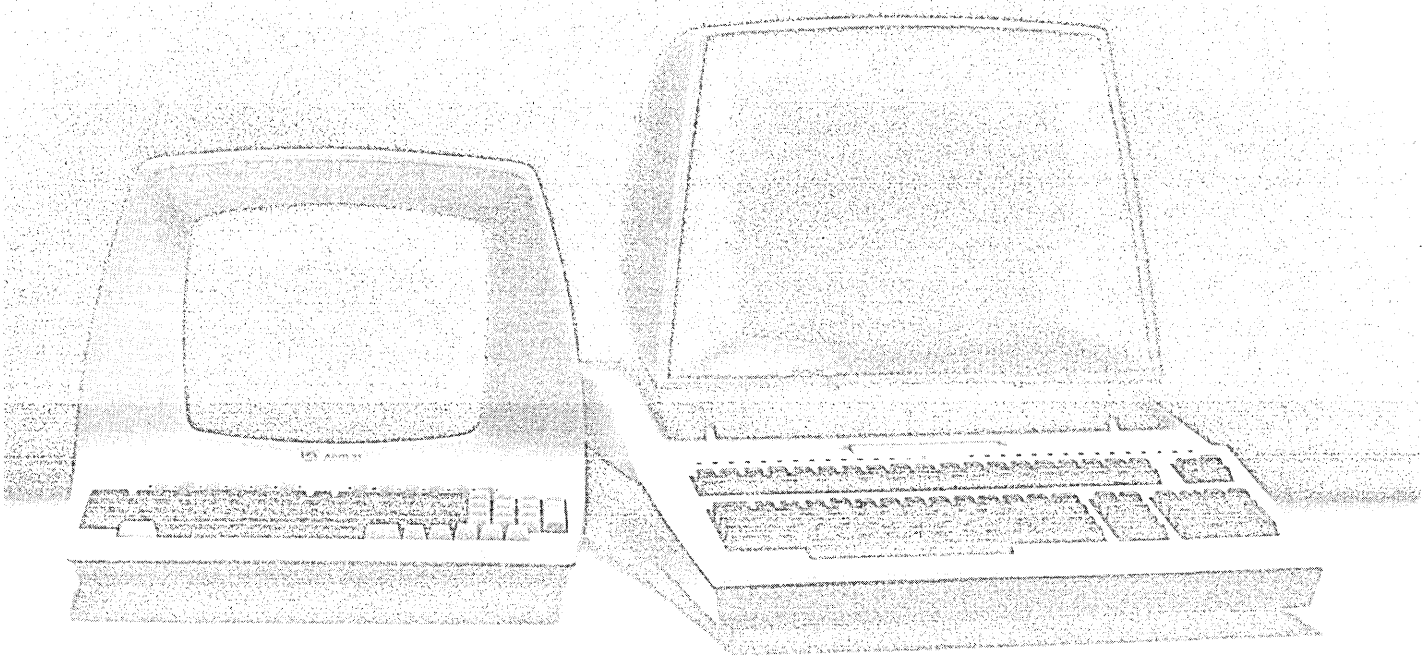

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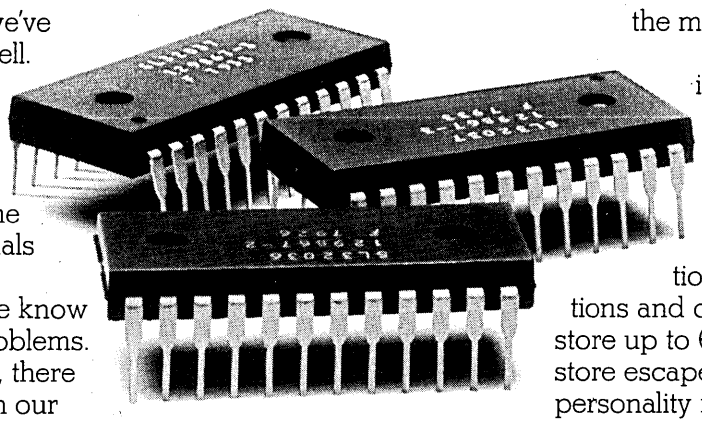

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The success of the volunteer logistics support group in using unfamiliar technology suggests that the microcomputer has come of age.

GRASSROOTS, MICROS, AND PAPAL VISITS

by Sarah Rolph

When Pope John Paul II decided to include Des Moines on his U.S. tour, the Des Moines diocese was thrilled with the honor, but the possibility of crowds far outnumbering the population of the town was disturbing.

The Living History Farms, a museum and demonstration farm, was chosen as the site for the papal mass. The huge flat open area of the farms was made into a natural amphitheater, and the picturesque home of the state cornhusking championship was a perfect symbolic setting for what was officially known as "A visit to the people of rural America."

The house of Bishop Dingman, head of the Des Moines diocese, was the headquarters of logistics planning. Colonel Thompson of the National Guard and his staff operated out of the Bishop's basement, while the foyer, dining room, living room, sitting room, library, and kitchen were abustle with the activities of multitudes of volunteers. Upstairs in the Bishop's chapel, prayer groups were continual.

Outside, press conferences for the hordes of local reporters were held under the oaks on the Bishop's expansive front lawn. Here, too, gifts for the Pope from the people of Des Moines were assembled for inspection by the press and by religious organizers. A ceramic Polish bride doll, seated on a hope chest with the insignia of the Pope's native Krakow, was the official gift from the governor of Iowa. The diocese presented a rural scene it had commissioned a local artist to paint, featuring an old farmhouse and a country road, with the church spire rising as the central focus of the town in the background, to represent the church as the heart of the community.

Then there were the gifts from other towns and states—samplings of produce, arrays of seed packets, a metal wall sculpture of a windmill. There were personal gifts and letters, and gifts from community groups, such as a photo of the local basketball team, which had been autographed by every member. Donations supplied by the community included a papal chair fashioned from Iowa oak. Medications and standby ambulances for

the first aid tent at the Farms were donated by local hospitals. And at the Bishop's, endless meals and snacks were provided to officials and volunteers.

AN APPLE FOR THE BISHOP

Early on, an active member of the church who works for the state of Iowa as a computer operator had a good idea. In contemplating the crush of volunteer work, much of it clerical—receiving and replying to a mountain of requests for official prayer cards, for example—Patty Croat mused, "It's too bad they don't have a computer." She had heard of Apple computers; her boyfriend, a programmer, has one he plays games on. She went down to the local computer store and asked if these little computers could help out. Paul Miller, marketing manager of the store, lent Patty an Apple, a disk drive, and some software—a mail list package and a new DBMS package. A demonstration was set up for the colonel, the Bishop, and various diocese staff.

"It blew my mind," said the Bishop, who had never seen a computer before.

The group was sold at once on the possibilities and began suggesting applications. Some were impossible, such as keeping track of donations—such a hefty volume of money was expected that a timesharing service was enlisted. Some good potential applications were never arranged—it would have been very helpful to coordinate housing offers, for example, but the idea of using the Apple system to find guests for hospitable community members didn't arise in time.

There were aspects, though, for which the use of the Apple proved invaluable. Transportation and parking arrangements were made much easier—an estimated 38 miles of parking was reserved along local roads for buses, and these checkpoints were coordinated with shuttles and communicated to travelers. A bus crisis arose in and around Iowa, as church groups, many of them from places as far away as St. Louis and Minneapolis, reserved an estimated 900 buses.

The naiveté of the volunteer users was probably a blessing. Certain that the volunteers would be able to handle the project, Ms. Croat began looking for enough equipment to pull the job off. Miller sells Alpha micros as well as the Apple. His first impulse was to suggest the Alpha, for it handles larger amounts of information at a time, but the Apple was chosen because of the need to use only volunteers and to start at once with as little training as possible (about 20 minutes per person).

Finding the equipment threatened to be a problem. A few people had Apples and were willing to lend them, but the data base to be generated—probably the largest amount of information ever processed with Apple machines—would require about a dozen machines. Miller first thought of borrowing some of the machines he had sold to schools, but abandoned that idea when the Iowa Civil Liberties Union filed a lawsuit against the county and the school system for considering the papal visit a holiday (the school suit was dropped, and the county won the right to let workers off; many businesses declared unofficial holidays as well). Miller's store has no stock to speak of, since most Apple dealers rely on one of five regional distributors. Apple headquarters was contacted, but apparently receives many such requests and couldn't help out. Ms. Croat also contacted Radio Shack, and was flatly refused. Her contact claimed their machines would not handle the application.

In the Bishop's living room were long rows of Apples on tables and 15 printers hammering away.

WORK OF THE HOLY SPIRIT In her confusion and distress, recounts Patty, she went home to pray, and emerged that afternoon with the conviction that Paul Miller would be their guide to a successful project. When Miller called her back the next morning with the happy news that 10 Apples and a number of disk drives were on their way to the Bishop's house, Ms. Croat relates, "I knew it had to be the work of the Holy Spirit."

Data entry had already begun on the Apple loaned by George Catanzano, who is one of the few Apple owners in Des Moines with a dual disk drive. George, an enthusiastic Apple user who said he missed the machine while it was at the Bishop's, was one of the programmers who donated countless hours to get the application up and running. No custom programs were written, but the software packages required some modification and some explanation. Three or four programmers were available, as were Miller and a couple of his staffers.

When the Apples arrived, followed by 15 printers loaned by Centronics, the Bishop's living room was almost entirely filled up with equipment. The Apples in long rows on tables and the printers hammering away were an impressive sight. The diskettes on which the valuable programs and data were stored, however, fit conveniently into an ordinary shoe box.

For the next month, the volunteers were kept busy with the logistics support operation. Mailing labels were generated for the plethora of press releases—about 800 a day were mailed—and prayer cards. Keeping track of church members and religious leaders was another application. This information would be used for the post-visit evaluation to be sent to the Vatican.

Another major use of the system was keeping track of press credentials issued, including gathering information for the FBI and Secret Service clearance required for each pass. About 1,300 passes were issued, causing a problem when an alphabetical listing of press passes was needed. A diskette only holds 999 names —at least that was the belief. A programmer from Iowa State spent 12 hours rewriting the program, squishing all the names on one disk so the list could be sorted alphabetically.

While the Holy Spirit may be to thank for the success of the project, the actual supplier of the machines was the distributor, High Technology. High Tech, an Oklahoma City company with a main office in St. Louis, was founded by Charles Weddington as a retail computing store in November 1976. In April

Patty Croat with Bishop Dingman in his living room, which became the computer center for the papal visit.

1977, the Apple II was unveiled at the First West Coast Computer Faire. Weddington was there, was excited by the product, and arranged to meet Mike Markkula, chairman of Apple.

Weddington was pleased to find that Apple's market plan included a two-step distribution scheme. "It was the classic circumstance," says Weddington, "of being in the right place at the right time." High Tech became Apple's first distributor, and, as far as Weddington knows, "the first company in the world chartered to create a retail dealer network and distribute microcomputers."

The same month High Tech's contract was executed, June 1977, Team Electronics, a nationwide retail chain headquartered in Minneapolis, began selling the Apple with its inventory of home electronics. Team has about as many stores as High Tech has now (close to 200), but High Tech reached that mark by mushrooming almost 500% last year, and expects a 400% growth rate in the year to come.

EXPLORING OTHER CHANNELS While Apple boasts of its distribution-dealer network as the best possible way to provide users with a solution, a number of other distribution channels are being explored. The recent venture with Bell & Howell, wherein a slightly modified Apple is marketed by Bell & Howell strictly to the education market, offers the opportunity to strengthen that stronghold while relieving Apple of the burden of that market segment. Bell & Howell is in a better position than Apple to reach education clients because it has the contacts—it already sells to schools. B&H is also equipped to deal with the economic workings of educational institutions, which include a bidding system and a three-to-six-month payment delay.

Another new distribution channel for Apple is the "high end" audio dealer. Apple has reportedly been recruiting hi-fi salespeople as Apple dealers in the hope that these sophisticated stores will provide the service Apple knows is essential. As Wil Houde, Apple's director of service operations, points out, when an Apple owner has a problem with a machine he gets truly irate because the personal computer is bought with personal money.

The availability of good software is changing the marketing of small computers. Until recently, software acquisition has been entirely at the discretion and ingenuity of Apple's distributors—some produce it, some seek it out from other sources, and some offer none at all. As more formal distribution channels develop, the nature of the microcomputer salesman is changing—the market has begun to attract the professional businessperson as micro dealer. Whether this situation will compare to the ranks of dedicated computer dealers who were once hobbyists and who have grown up with the industry, and whether Apple will be able to keep its dealers primed to answer questions about software and applications remain to be seen.

Apple is clearly keeping its eggs in more than one basket—and looking for a big new basket. Markkula explains that Apple's original market plan divided the market into segments to be approached in conjunction with the estimated timing of the marketplace. The hobbyist market fueled the development of the education market through the evolution of software, and the hobby and education segments have given Apple the leverage to launch a similar effort into small business applications. This may well mean a new method of distribution, a route Markkula admits Apple is considering.

The grassroots distribution-dealer network from which Apple has profited is a product of the enthusiasm inherent in the short history of microcomputing. That enthusiasm is now in the hands of a new group of users. While hobbyists paved the way, the success of the papal visit logistics support group in using an unfamiliar technology suggests that the microcomputer has come of age. ✲

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Small Business Systems Surveyed

Microdata Reality Gets Top User Rating

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

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

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

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

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

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

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

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

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

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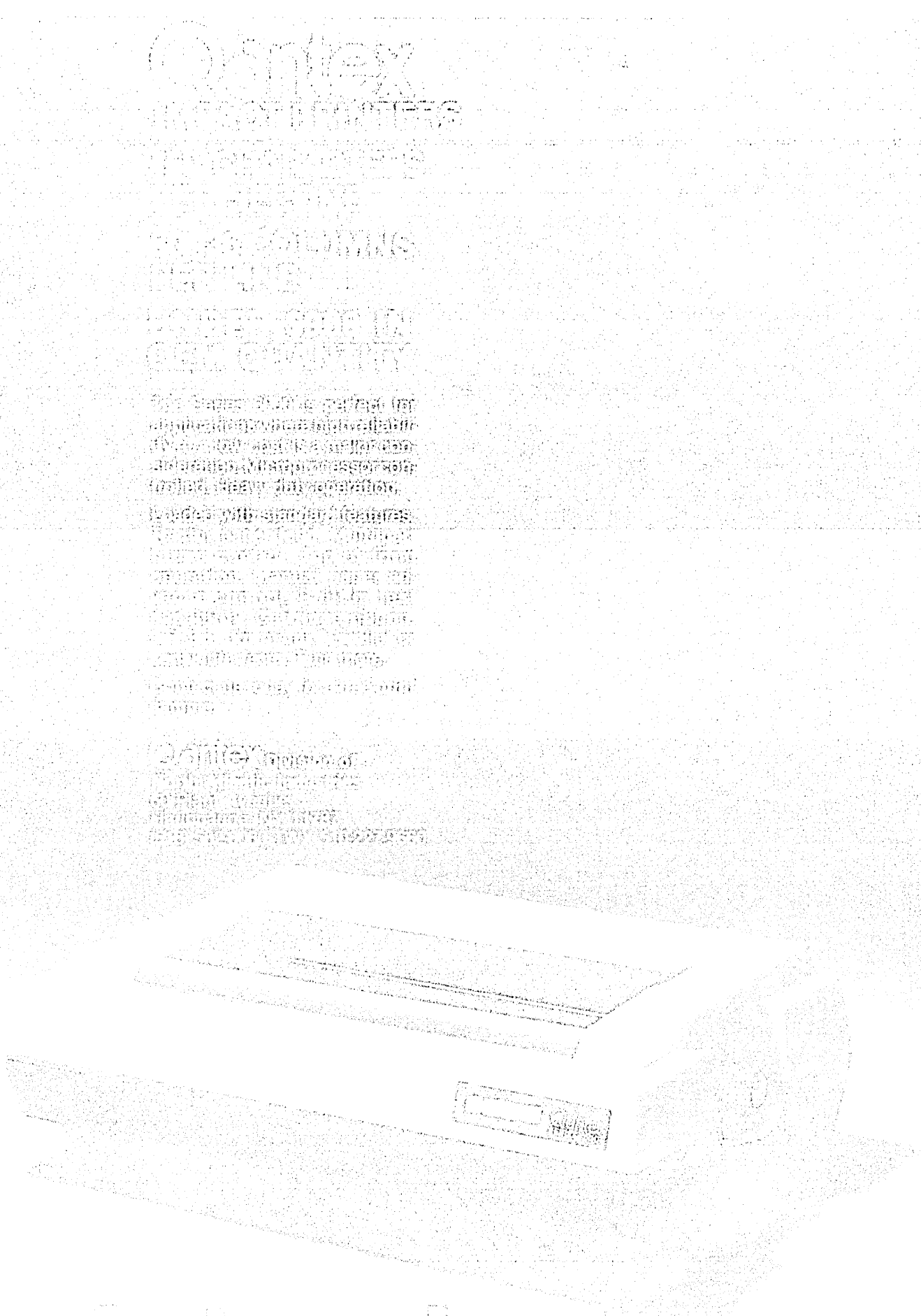

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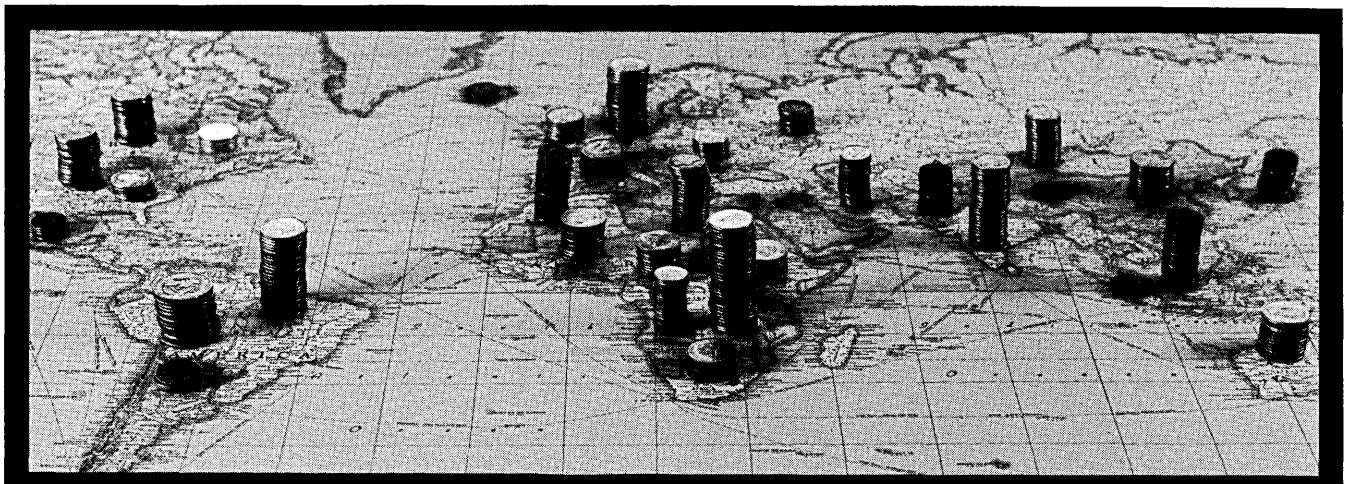

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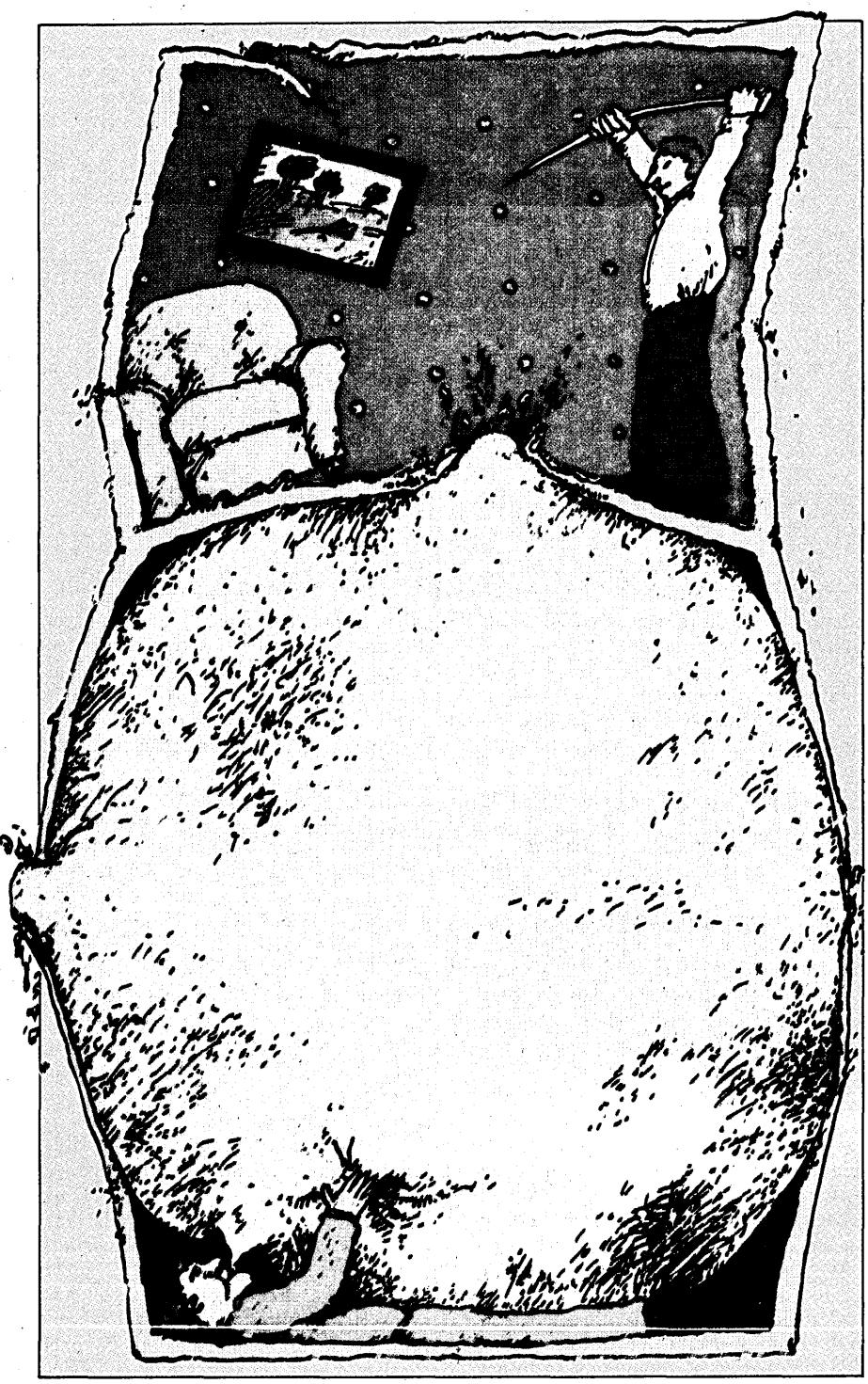
CIRCLE 117 ON READER CARD

PLANNING FOR GROWTH

by Lawrence H. Cooke Jr.



Traditionally, a company determines when its computer resources are saturated by the same mechanism some people use to tell when they're drunk—it's when no more fits in and normal functioning collapses. As a way out of this process, dp managers are increasingly turning to capacity planning.

Most dp managers would like to avoid either the underutilization of an expensive resource or the inability to process work due to insufficient capacity. Because of the variety of cpu speeds, memory sizes, number of channels, and types of I/O devices, it is difficult to make comparisons. I faced this problem for nearly two years at Midlantic Bank, West Orange, N.J. As a consequence of our capacity planning study, which I will describe, we upgraded our 370/145/158 to a 158/3031. Performance measurement took place on a Tesdata hardware monitor, a software monitor (VS1/PT), and three accounting packages: Johnson Accounting, Grasp, and Usage.

Performance Measurement. Accurate measurement antecedes any attempt at planning. Unless one can track where one is, planning is impossible. The obvious question, "How full is the computer?" requires further refinement before a meaningful answer emerges.

At the time we began our research, cpu's cost about $1 million, memory cost about $100K a megabyte, and channels cost about $10K. Other components, such as disks, tapes, and printers were spread out in the low end of the price spectrum. (Today's prices are generally lower, but the basic approach is still valid.) Note that at the early stage of analysis, the method of payment—lease vs. purchase—is not particularly relevant. Viewing gross capacity, a new cpu would cost about a megabuck; another channel would cost about 1% of that figure.

Two general principles emerged from the economics. First, any non-cpu alternative (if it were able to handle the workload) would almost certainly be more cost-effective because of the order of magnitude of cpu prices. Secondly, the cpu analysis was so sensitive to price con-

We discovered that no single factor would solve all our economic problems.

COMPARISON OF PERFORMANCE MEASUREMENT TOOLS

	Hardware Monitor	Software Monitor	Accounting Package
PRO	All measured events can be obtained in a unbiased manner	Can pinpoint events to program (region) causing the event	Permits an overview of demand and supply
	Can measure across cpu's	Can measure queues of events waiting to occur	Provides analysis tools at program and system levels in a "data-reduced" format
	Is independent of operating systems	Provides quick feedback useful for system tuning	Provides several useful reports
	Most vendors provide several useful reports	Low cost or sometimes even free	
CON	Can't determine which programs are causing events	Is operating system dependent	Can't provide short-interval measurement
	Can't measure queue lengths	Can't bridge cpu's to determine contention for resources	Provides performance data only in gross aggregates, i.e., cpu- or I/O-bound
	Reasonably expensive to install and train in use and operation	Reporting information is usually weak, requiring considerable time in data reduction and analysis	Requires custom programming on SMF data to go beyond package offering
	External cabling and attachments limit flexibility	Can't measure itself or above, causing some information loss	
		Takes cpu and other system resources (to 5%)	

Table 1.

siderations that it took nearly 90% of our analysis time.

We had on hand or were able to obtain several measurement tools to analyze the basic performance variables. Table 1 identifies the strengths and weaknesses of each one. Each tool helped us to reach an understanding of our operating environment.

Accounting packages fleshed out the picture by showing the ebb and flow of demand across shifts, weeks, and months. In our banking environment, work peaks third shift, by day of week, and at quarter and year-end. Viewing this long-range flow of data, we were able to do some scheduling changes that dampened the peaks somewhat. The basic objective, however, was to get a picture of how performance varied day to day and hour by hour. A rhythm of data flow emerged that could not be flattened further without disrupting the basic mission of the enterprise —that of serving customers by providing needed data in time for the bank to open for business each day.

We quickly found average statistics to be meaningless. Statistics over our busiest eight-hour period were discovered to be the most useful figures to examine. The time period was long enough to net out instantaneous spikes of demand, yet still short enough for us to deliver needed service in that interval. In the banking environment, we are fortunate to have our severest peaks when customers are not physically present waiting for data.

NO SINGLE SOLUTION

We discovered that no single factor would solve all our economic problems. The cpu power was the constraining variable on the third shift, while main memory was the constraint on the first shift. As a by-product of our measurement activity, we found that a memory increment, with workload rescheduling, deferred an additional cpu requirement for over a year, at about one-tenth the cost of the cpu. Savings of this magnitude, though temporary, were made possible by the measurement process.

One of the initially depressing situations facing the neophyte performance analyzer is the nearly infinite set of events one might measure. We found the key ones to be *cpu busy, channel busy, virtual paging,* and *terminal wait time.*

There are too many secondary events to mention them all. However, some are favorable, such as cpu channel overlap; others, such as individual device loading, can help isolate problems inside specific programs. Focusing on the key variables, though, is most helpful to answering the question of how full the computer resource really is.

A significant fact we learned from the measurement process was that 100% utilization was not generally obtainable. Rules of thumb showed that channels clogged at 35% utilization, cpu's bogged down at 85%, and paging at over 10 frames per second meant generally poor service to interactive users. Further, we found we could no more smooth out workflow than tunnel operators could get commuters to travel only at non-rush hours. The cpu-bound and I/O-bound programs refused to come together in ideal proportions to keep our mix in perfect harmony over extended periods.

This led us away from feeding the computer and back to focusing on optimum service levels to keep our customers reasonably satisfied at moderate costs. With adequate measurements over our environment every 10 seconds, hour, shift, day, month, and longer, we were finally qualified to do adequate planning.

As to what measurement tools you should have, we discovered: as many as you can afford, proportional to potential

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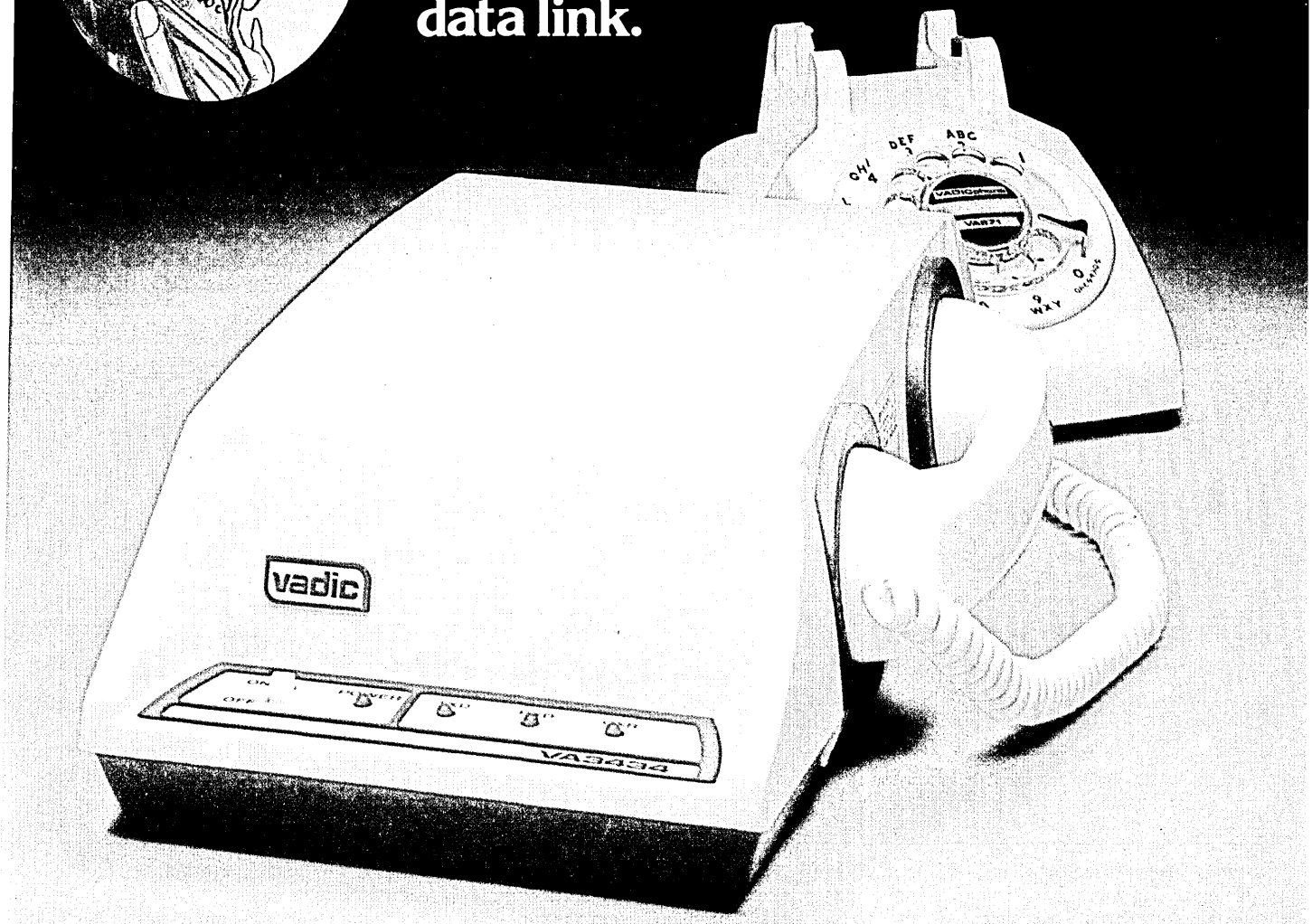

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CIRCLE 118 ON READER CARD

Facing the neophyte performance analyzer is a nearly infinite set of events one might measure.

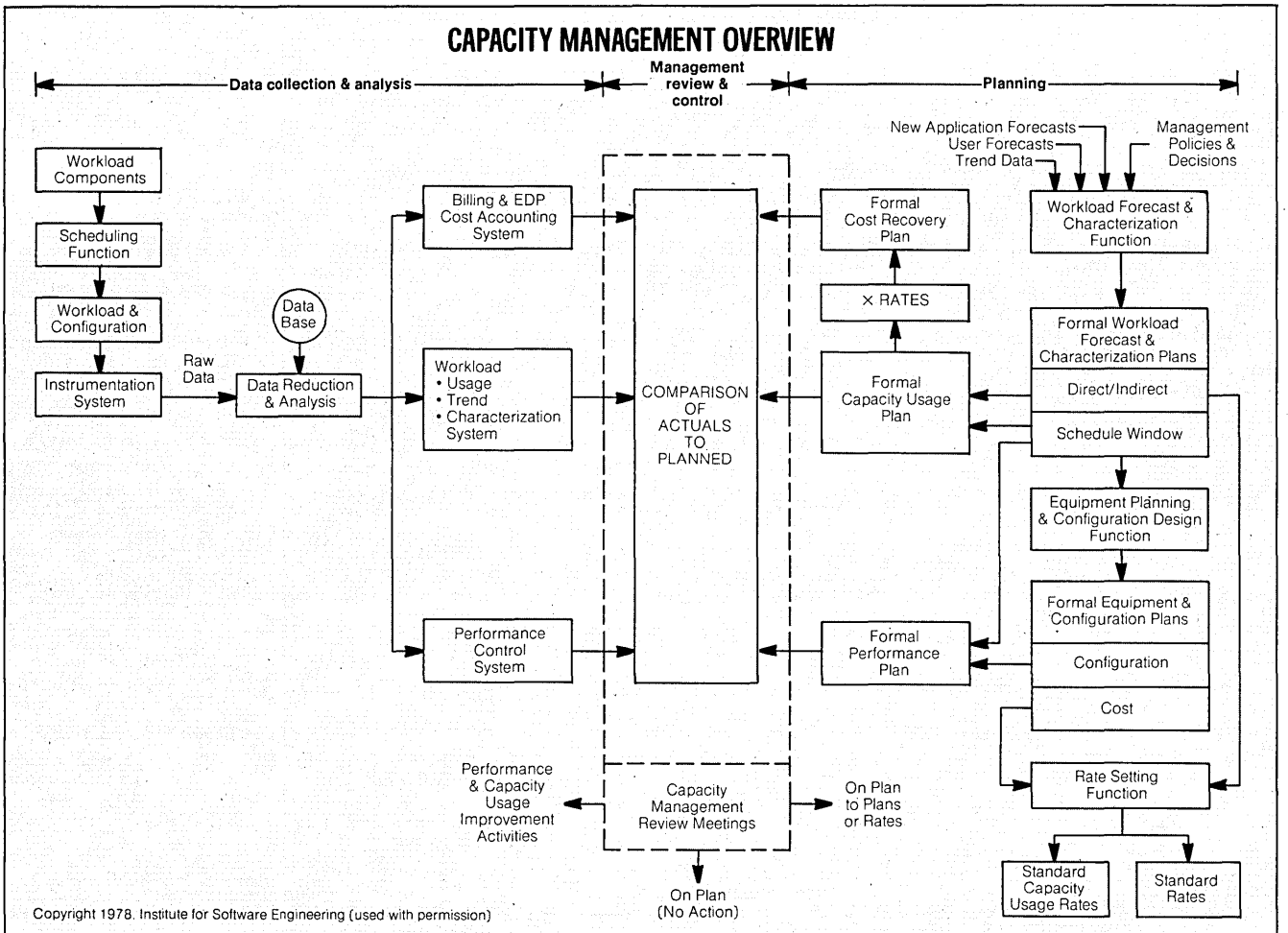


Fig. 1.

savings. Any are better than none. If a glaring lack in your measurement arsenal shows up, make an economic case for it.

Capacity planning. As vital as measurement tools are, they share a common fault: they can only measure what's presented. Predictions of the future can only come from people.

A vital aspect of planning is the service level. We felt it was not cost-effective to expect to provide service regardless of the demand that might arise. A target of the 95th percentile was found to be far less costly; it meant, however, that not all the deadlines would be met all the time. If problems were encountered on superheavy days and periods, some scheduled work would, of necessity, be delayed. We estimated that we might be late with some work five to 10 days a year. This decision is tied to the firm's service level demand, competition, and so forth. However, it should be pointed out that service level decisions are central to the capacity decision. Measurement only makes sense against a background of what is expected.

POLL THE EXPERTS

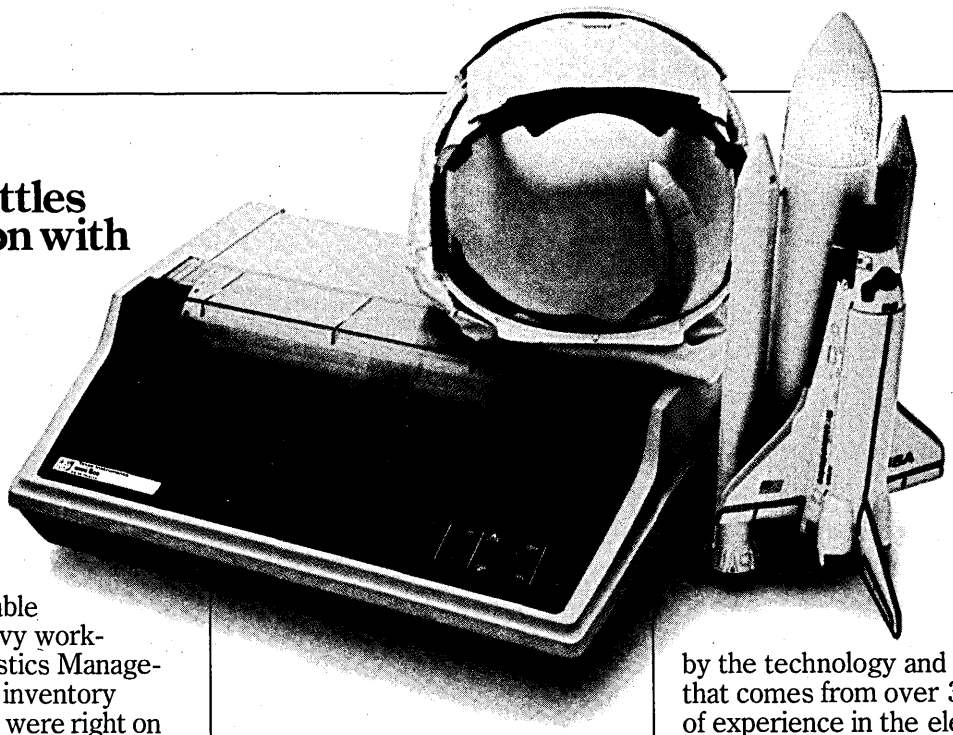
Planning is a business problem, not a computer problem. From the author's experience, the best way to forecast the future is to poll the experts to get their assessment of what's going to happen. In our case, a bank has basic lines of business, each with a different expected rate of growth. This can be affected by new lines of business, acquisitions, divestitures, demographics, and recessions. Forecasting is aided somewhat by netting out where some systems may grow faster than projected. However, it must be stressed that basic business growth is not a computer problem; this input must come from outside the technical realm. (Get forecasts from the users in writing!)

An overview of the planning process is provided in Fig. 1. This procedure, which integrates data collection and analysis, planning, and management review and control was developed by the Institute of Software Engineering. Forces act on the dashed box in the center of the chart. Activity central to capacity issues pops out at the bottom—performance and capacity improvement.

A numerical example may be helpful to illustrate the process in a simplified way. Your present computer is 80% full in some variable—say, cpu power. You expect to grow at 20% per year for the next five years. In years two through six, utilization of capacity will be 96, 115, 138, 166, and 199%, respectively. In short, it will double. Should you replicate your present computer next year, just doubling total power, and be underutilized in years three through five? Unfortunately, there's no simple answer. It's probably not possible to extend cpu power in 20% increments either. Perhaps adding 50% more computing power in year two and again in year five may be the best approach. For example, let us assume the present computer is a 370/148 with a relative performance index of 24. A doubling of power could be achieved, of course, by another 370/148; on the other hand, replacing the present machine with an IBM 3301 would achieve about the same total

Space Station.

NASA shuttles information with TI's 810.



NASA required a printer that was both fast and reliable to handle the heavy workload in their Logistics Management System for inventory control. And they were right on target when they selected TI's OMNI 800* Model 810 Receive-Only Printer. For over a year the field-proven 810 has been working virtually nonstop as an inventory tracking station, printing out information at a speedy 150 characters-per-second.

The 810 RO prints out the status and location of over 470,000 parts and supplies for all Orbiter and Orbiter ground-support components for NASA's space shuttle program. Using TI's 150-million character-life impact printhead, the 810 RO also prints transaction reports, local stock movements, purchase requests, forecast requirements and approved parts lists.

And the 810 RO is proving itself in NASA's simulator capsule used for designing the space shuttle. The 810 RO prints out data on the simulator's specification, design and testing results. It gives NASA scientists and engineers the fast, easy-to-read information they need to design and refine the space shuttle interior.

The 810 RO has also had quite an impact on NASA's accounting operations. Its wide, adjustable carriage easily handles a variety of multi-copy forms for accounting, travel authorizations, balances and fund source reports.

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CIRCLE 185 ON READER CARD

The goal of capacity planning is to manage computer power to avoid waste, yet remain flexible and progressive.

power (an index of 54 versus 48 for the dual 148s). It would do the job with some slack in years two through five.

An incremental procedure would be to either add a 4331 (an index of 11) to the 148, or replace the existing 148 by a 4351 (index of 37). Both these solutions offer approximately 50% more power.

The alternatives could be selected in year two, with the understanding that another 50% jump would be needed in year five or six. The incremental approach would keep total power closer in line with total demand, but would, of course, require computer room changes more frequently.

If the incremental approach is selected, the adding versus replacing has its pros and cons also. An additional computer, the 4331, gives more backup. The replacement approach would probably be cheaper to operate, since it might offer economies of scale and require fewer operators.

The capacity issue quickly brings in additional considerations such as backup and operational efficiency. Also, the entire picture becomes too diverse and company-related to cover these considerations here.

BENCHMARKING NOT NECESSARY

One area of common interest, though, is that of benchmarking. We found that as we became more adroit at performance measurement, benchmarking was unnecessary. Predicted rates of speed could be forecast on different configurations to within minutes for long-running and complex job mixes. Linear projections were valid in all but pathological situations (page trashing, channel overloading, etc.).

Benchmarking, however, may be a way to provide a transition to perhaps the most delicate aspect of capacity planning —communication of results to the nontechnical management who pay the bills. Benchmarking can provide incontrovertible evidence that theoretical but jargon-filled reports cannot communicate. The try-it-and-see method should be avoided if possible, because of the expense involved in locating a site with exactly the correct laboratory conditions to perform a benchmark, together with the chore of relocating personnel, duplicating data, running test transactions, and so forth. Nonetheless, if the communications gap between technicians and management cannot be bridged, benchmarking may be the convincing proof of capacity needs.

We found that generally linear, commonsense projections of capacity demand worked fine. Twice as many loans took twice the time on the same configuration. The same number of loans on a cpu rated at twice the speed took only about half as long, as we might have expected. (We're simplifying the problem enormously by discussing only one parameter; obviously, an insufficiency in memory, channels, etc., could change the results dramatically.) We encountered no mathematical problems that could not be solved with a handheld calculator.

Communicating those results, though, took great diplomacy. There probably wasn't a single paragraph in the initial draft a ceo could understand. Over the successive versions of the report, as it grew by charts, appendices, references, and so on, we weren't certain whether the decision-makers were won over by the information or whether we had just worn them down.

In summary, capacity planning first requires data and a measurement procedure for the existing environment. Next, business systems planning, to capture trends, must be superimposed onto the existing configuration. Several technical considerations have been covered above, but stripped of the jargon, the process is similar to selecting a different-sized suit. Preliminary exercise with a tape measure can guide one toward the right rack.

Then, standard financial analysis and planning can cover lease vs. purchase and long vs. short financing methods. Lastly, education and familiarity with the process of capacity planning will provide the dp industry with better computer solutions to business problems over time. The goal is to manage computer power to avoid waste, and yet remain flexible and progressive.

"I'm sure Mr. Dougherty would love to attend the banquet subject to proper seating. Mr. Dougherty only dines on the dais."

© DATAMATION

LAWRENCE H. COOKE JR.

Mr. Cooke is a senior vp at Baybanks data Services, Inc., Waltham, Mass. Prior to that, he was manager of technical support and systems and programming for Midlantic National Bank, West Orange, N. J. He has also worked at IBM, Computer Applications, Inc., and the Federal Reserve Bank of New York.

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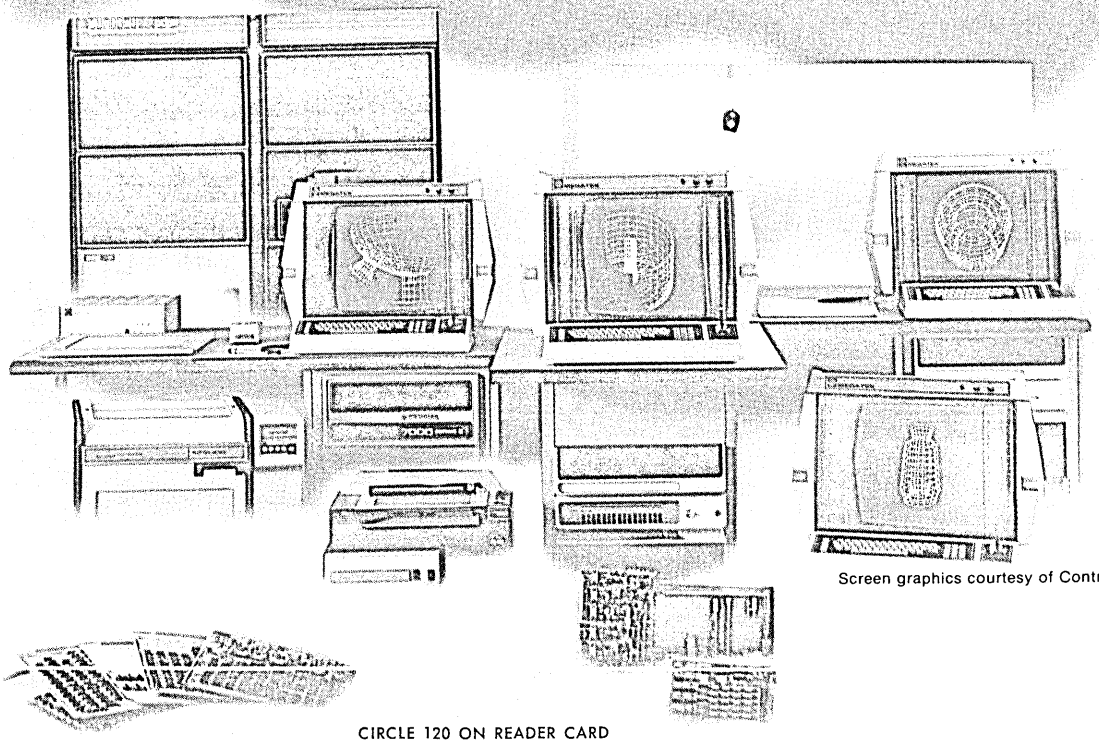

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CIRCLE 120 ON READER CARD

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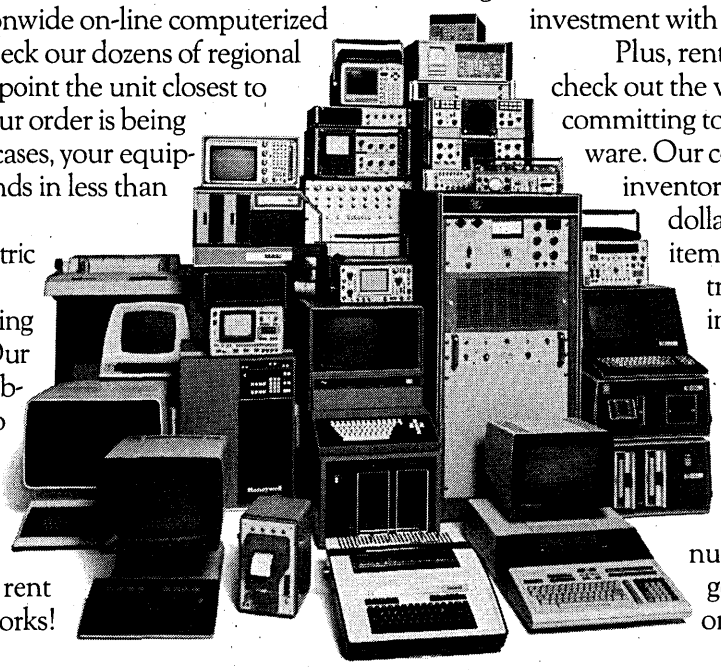

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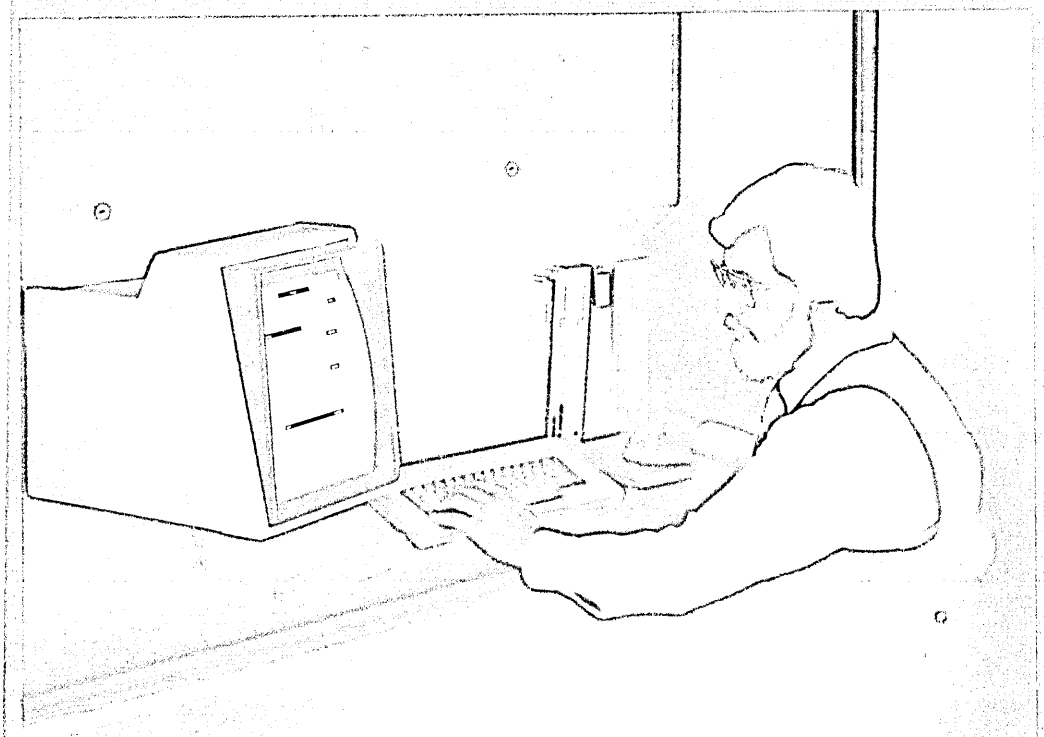

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CIRCLE 122 ON READER CARD

Should computer use be restricted for privacy? Two-thirds of the public said yes, but only 8% of computer executives.

THE IMPACT OF COMPUTERS ON PRIVACY

by Alan F. Westin

Now that computers have been used extensively for two decades in the management of personal data files by government and private organizations, just how does the American public view the impact of computer systems on society, especially in terms of computers and privacy? How do these attitudes compare with the views of key business and government leaders (including computer industry executives)? Are there demographic, ideological or other social factors that help explain the shape of public opinion? And, most important of all, what does current public and leadership opinion suggest about the environment in which computer uses will be unfolding in the 1980s?

Data for answering these questions is now available from a national survey conducted by Louis Harris & Associates, in a public service project sponsored by Sentry Insurance. The public survey consisted of a representative sample of 1,513 adult Americans interviewed in November and December of 1978. The leadership survey was composed of 618 interviews with representatives of 11 selected groups: public sector representatives (Congress members, federal regulatory officials, law enforcement officials, and state insurance commissioners), and leaders from the private sector (business employers, computer industry executives, life insurance executives, credit card company executives, credit industry executives, commercial bank executives, and doctors). The computer industry interviews were with executives from 34 computer hardware or software firms selected from Standard & Poor's Directory.

First, some of the good news. The Sentry survey found that the public and most leadership groups held some highly positive views about the value of computers to society. Sixty percent of the public feel that "computers have improved the quality of life" in the United States. Demographic groups that scored substantially higher than the public average (5% or more) included younger adults (18 to 29), the college educated, professionals, Easterners, males, those earning over $25,000 annually, and liberals.

Those groups scoring substantially lower than the public in seeing such value to computers were people over 50, those with only eighth grade educations or lower, those earning under $7,000, and women. All the leadership groups, both business and governmental, scored substantially higher than the public's 60% in seeing computers as improving the quality of life. Not surprisingly, 97% of computer executives believe that computers have had this effect.

The survey also asked whether those interviewed agreed that "because they can use more personal details, computers make possible more individualized service to people." Almost two of three members of the public (64%) agreed with this statement. This view was especially strong among males, executives, and higher income groups, and was less accepted by the eighth grade educated, lower income earners, proprietors, and political liberals. All the business executives, law enforcement officials, and state insurance commissioners held this view more strongly than the public, while federal regulatory officials, Congress members, and doctors were more skeptical. Again, computer executives supported this view fervently, at 86%.

At the same time, both the public and leadership groups see some clear and present dangers in the way that computers are being used to process personal data. Eighty percent of the public believe that "computers make it easier for someone to obtain confidential information improperly on individuals." Higher income groups, professionals, and proprietors held such a view even more strongly than the public average, as did all the government leaders and doctors. Though they scored lower than the public, majorities of all business executives and law enforcement officials still registered such a sentiment. And 67% of computer executives saw their own technology as having this effect today.

DO COMPUTERS THREATEN PRIVACY?

Turning from the general tendency to immediate dangers, the survey asked whether respondents "believe the present uses of computers are an actual threat to privacy in the U.S." Fifty-four percent of the public said yes, a jump from 34% who recorded such a view when the same question was asked in 1976. Somewhat surprisingly, 53% of computer executives—a majority and only a point off the public view—adopted the same judgment. Among other leaders, all government officials believed computers threaten privacy today more strongly than the public did, while all business leaders scored below the public.

A final measure of negative judgment came from the question asking respondents whether they believed privacy was adequately safeguarded today in computer systems. Fifty-two percent of the public replied that they felt it was not, and 53% of computer executives expressed the same view. Government officials and doctors felt much more strongly that safeguards today are not sufficient.

The survey also listed a number of

Judgments about computer impact do not divide along lines of political philosophy.

WHAT COMPUTER EXECUTIVES SAY

Computer executives are more concerned about threats to personal privacy than the public or other business executives, but the computer executives are more willing to believe that organizations need the personal data they request.

Here are some of the responses by the dp heads in the survey conducted by Sentry Insurance:

One in four computer executives (to the public's 19%) say they have personally been victims of an invasion of privacy, citing credit bureaus and government as the main intruders.

Computer executives are more willing to accept the need for information collection by organizations than the public is. Some 69% accept the need to supply many personal details for credit, insurance, and employment compared to the public's 46%, and 67% support law enforcement's need for some intrusion compared to the public's 57%. Where 72% of the public feel most organizations ask for more sensitive information than really necessary, only 44% of computer executives state this view.

On the other hand, computer executives believe more strongly than the public that Americans begin surrendering their privacy the day they open a charge account, apply for credit, or take out a loan (92% to the public's 76%). Ninety-four percent of computer executives reject the idea that people who complain about their privacy being invaded are engaged in immoral or illegal conduct (to the public's 64%). And, where 41% of the public believe that most organizations collecting personal information today don't have enough checks and safeguards against misuse of personal information, 53% of computer executives hold this view.

Computer executives are consistently ahead of the public majority that believe controversial moral activities should be left up to the individual rather than being regulated or forbidden by law. This is true of smoking marijuana, homosexual relations in private, heterosexual relations between unmarried adults, and a woman's right to elect abortion.

Also, computer executives are much stronger than the public in believing that major private-sector organizations— banks, finance companies, insurance companies, credit card companies, credit bureaus, hospitals, and employers— should be doing more to keep the information they collect confidential. Computer executives were generally *below* the public in believing that government agencies should be doing more today.

When asked about the need for new organizational policies or laws to protect privacy in the private sector, 73% of computer executives believed new laws were needed; and within this, 31% wanted *detailed and comprehensive legislation now*, more than any other industry group. Only 6%— the lowest for any industry group— said no new policies or laws were needed.

More particularly, computer executives are far ahead of the public in believing that courts (83%), the people themselves (69%), and Congress (53%) should be the primary instruments for protecting individual privacy. However, where 62% of the public believes it very important to have an independent agency to handle complaints about violations of privacy by organizations, only 28% of computer executives take this view. And 72% of computer executives oppose creation of a national privacy protection agency, to the public's 46% against.

Where the public by 61% or more feel it is important for Congress to pass privacy legislation covering health records, insurance, employment, mailing lists, and credit cards, computer executives were significantly lower in each category in believing legislation is needed.

As for what computer executives say is their own company's philosophy toward installing new privacy protections for their employees, only 11%— the lowest for all industries— say they want to be a pioneer in introducing such measures (25% of industrial employers and 38% of insurance executives say they want to pioneer). Forty percent of computer executives— the highest percentage of all industries— say they want to wait until laws are passed.

situations in which computers might be used and asked the respondent to indicate whether such uses seemed justified or not. An overwhelming 87% of the public feel it is justifiable to use computers to match employment records with welfare rolls to detect improper welfare payments. Business and government officials were about the same or even higher in expressing support for such practices, and 92% of computer executives held this view. Somewhat surprisingly, 92% of the public who classified themselves as political liberals also said that this use of computer systems was justified. Only Southerners, blacks, and persons with eighth grade educations scored substantially lower than the general public.

By a much smaller majority (53%), the public said that it was justifiable for the insurance industry to maintain a central file on people suspected of making fraudulent claims on any insurance policy. There was not a majority of any business or government group that shared this view, and only 25% of computer executives felt such use was proper. Above-average support for a central antifraud file came from older Americans, proprietors, conservatives, low-income groups, and those without college educations.

Several uses of computers drew opposition from majorities of the public. Sixty-eight percent of the public said it was not justifiable for employers to have access to a central computer file of people who had been treated for mental health problems. All business and government officials held such a view even more strongly, with computer executives at 83%. Similarly, 51% of the public said it was not justifiable for the state to have a central file of individuals given prescriptions for addictive drugs, a position held by 61% of computer executives and by higher-than-public-averages by all the business and government officials.

The public was less sure whether it was justifiable for the Internal Revenue Service to use computers to compare tax returns with the files of credit card companies. Only 48% of the public felt this was all right, though majorities of most business and government officials supported such a use. Of computer executives, 61% said this was justified. Westerners, political liberals, people living in towns, and the non-college educated were the least accepting of such a computer use.

In a question that tapped people's general feeling about the balance between computer benefits and computer dangers, the survey asked for agreement or disagreement with the statement "If privacy is to be protected, the use of computers must be sharply restricted in the future." Almost two out of three members of the public (63%) expressed their agreement with the statement, a view especially strong among white collar workers and

ATTITUDES TOWARD CONTEMPORARY SOCIAL PERFORMANCE

Question	Percent Agree	Percent Disagree	Percent Not Sure
Government can generally be trusted to look after our interests	34	58	8
The way one votes has no effect on what the government does	38	54	8
Technology has almost gotten out of control	43	41	16
In general, business helps us more than it harms us	72	19	10

Table 1.

LEVELS OF PUBLIC ALIENATION

	Percent
High (3 or 4 "negative" responses)	21
Moderate (2 "negatives")	28
Low (1 "negative")	34
Not alienated (no "negatives")	17

Table 2.

ALIENATION LEVEL AND ATTITUDES TOWAR PRIVACY

Question	Percent Public	Percent Alienation Level High	Moderate	Low	Not
Very concerned about threats to personal privacy.	31	47	30	27	21
Very close to a 1984 society or already there.	34	55	35	29	13
Have personally been victim of privacy invasion.	19	24	20	17	13
Most organizations collect too much personal information.	72	87	72	68	62
Congress should pass privacy legislation for insurance.	65	72	66	63	61
Favor a national privacy protection agency.	37	45	36	34	32

Table 3.

ALIENATION LEVEL AND ATTITUDES TOWARD COMPUTERS

Question	Percent Public	Percent Alienation Level High	Moderate	Low	Not
Present uses of computers threaten privacy	54	74	56	51	36
Computers make it easier to obtain confidential information improperly	80	89	78	79	74
Privacy not adequately safeguarded in computers	52	70	56	47	32
Justifiable for IRS to check tax returns against credit-card records	43	56	44	38	32
To protect privacy, computers will have to be sharply restricted	63	80	65	59	47

Table 4.

union members.

Not surprisingly, such a position did not sweep the computer executive sample. Only 8% of computer industry officials believed that sharp restrictions on computer use are needed to assure privacy protection in the future. On this issue, business and government leaders were substantially less in agreement that restrictions were needed than the public, though still considerably higher than computer officials.

So much for the bare summary of the questions and responses about computers on the Sentry study. Like most complex and interesting surveys, the results offer some clear readings of public and leadership views but also raise major issues of interpretation and explanation. First, do demographic or social factors help to explain the basis of these public attitudes? The short answer is no, as the mention of groups scoring significantly above or below public sentiment has already indicated. Factors such as income, education, sex, occupation, race, region, age, and community do not provide consistent divisions of attitudes toward computer uses and social values.

Nor do the judgments about computer impact divide along lines of political philosophy. Liberals score higher than the public in believing that computers have improved the quality of life but lower in believing that computers make possible more individualized service. Both liberals and conservatives score higher than the general public in feeling that the present uses of computers are a threat to privacy, and that if privacy is to be preserved, computer use must be sharply restricted in the future.

ALIENATION A FACTOR

When the Sentry survey was being planned, we suspected that a more significant factor in shaping people's attitudes toward privacy as well as computer issues was the degree of alienation that the individual felt from the institutions of American society. To test this, we developed four questions that measured people's rejection or acceptance of contemporary social performance. The questions and the public responses are shown in Table 1.

We then divided the national public sample according to the number of "negative" responses, producing the profile of alienation levels in the public shown in Table 2.

When each individual's responses to the entire Sentry survey were correlated with his or her alienation level, there

IRS comparison of tax returns with credit card files was approved by 61% of computer executives. Only 48% of the public agreed.

was a direct relation between the degree of alienation and the individual's concern about current invasions of privacy, desire for strong privacy protection, and fears about the future of privacy. In a majority of the responses, the answers "scaled" along the alienation continuum when compared with the public averages. The sample of privacy questions in Table 3 shows this clearly.

The same is true for most of the questions about computers (see Table 4). As the survey shows, there is a strong relationship between the degree of alienation an individual feels from American institutions and processes and his or her attitude toward issues of privacy and perceptions of computer benefits and dangers.

This suggests to me that the sources of people's attitudes toward privacy and computers are very deep-seated matters relating to how well or badly each person feels American institutions as a whole are doing. Such orientations will not be easily changed by "better communications" campaigns or patchwork privacy laws. Rather, they imply that the 1980s may well see far more intense conflicts over computer uses in American society than anything that we have yet witnessed.

The Sentry survey demonstrates that while the public is most immediately worried about issues such as energy, inflation, and war and peace problems, most Americans now see privacy as one of the central quality-of-life issues of our time. For want of a better term, "privacy" has been adopted as the way to express the public's demand that powerful institutions engage in open, equitable, and procedurally fair relationships in dealing with individuals as consumers, employees, and citizens. To do this, the public wants a better balance to be created between information subjects and information keepers in both the private and public arenas, and especially where high technology information systems are involved.

Though the survey shows that the public generally appreciates the positive contributions of computer use, it also reveals a deep-seated fear that computer uses are not yet sufficiently controlled and safeguarded. When almost two out of three Americans say that computers will have to be sharply restricted in the future —far ahead of what leadership groups feel—the minimum conclusion is that the public does not believe that existing privacy protections are dealing adequately with the basic problem.

Furthermore, had the study been conducted *after* the Three Mile Island nuclear mishap, I believe a majority of the public—not just 43%—would have said that technology is almost out of control. Similarly, I think more than 63% would have said that computer use will have to be sharply restricted in the future.

Thus there may well be trouble ahead for some large new federal information system projects that have been proposed for the next decade, such as the IRS Tax Administration System, the FBI's Criminal History Project, and the Future Process Design of the Social Security Administration. The same may well be true of state and local government "big system" projects, as well as private sector developments such as EFT (Electronic Funds Transfer) proposals, and some of the plastic card, personal data base plans that are being discussed.

The reasons will be not "only" concerns over privacy of the kind explicitly registered in the Sentry survey. Public concern will expand outward to uneasiness over the effect of very large systems on equitable administration and provision of meaningful fair procedure rights in decision-making, and in the very capacity of such complex systems to be managed successfully in the real world of government and private organizations.

On this aspect, the Sentry survey offers a warning to the computer industry, computer users, and public policy makers. The privacy issue is not solved and fading away. It is going to become more intense in the next decade, as "privacy" serves as the handle with which a still considerably alienated public seeks to define and install greater measures of individual or social control over an organizational system whose powers have been vastly increased by computer uses in the last 20 years.

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DATAMATION©

ALAN F. WESTIN

Dr. Westin has been professor of public law and government at Columbia University for 20 years. A lawyer and PhD in government (both degrees from Harvard), he is the author of *Privacy and Freedom* (1967) and *Databanks in a Free Society* (1972), as well as monographs on privacy and computer uses in the fields of health care and personnel administration. He was the academic advisor to the Sentry Insurance survey described in this article.

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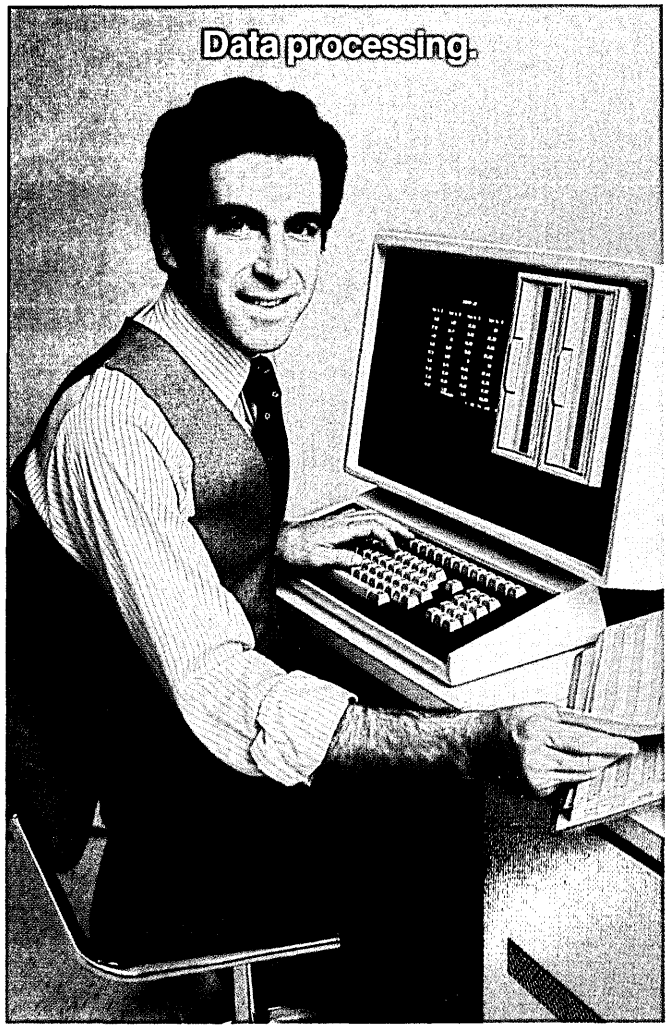

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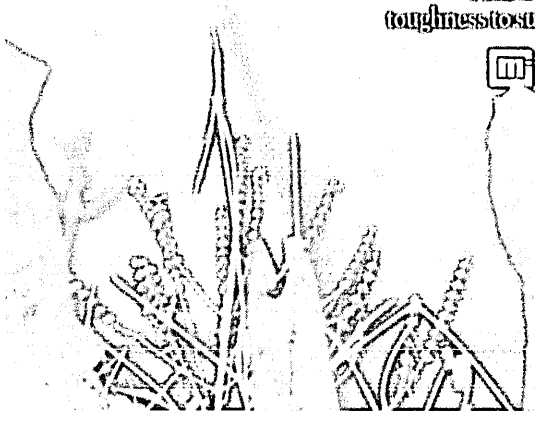

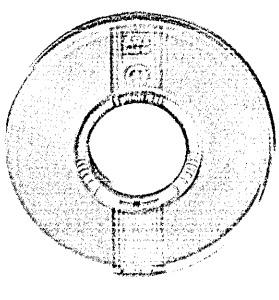

CIRCLE 124 ON READER CARD

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COMPUTER FINDS FACTS

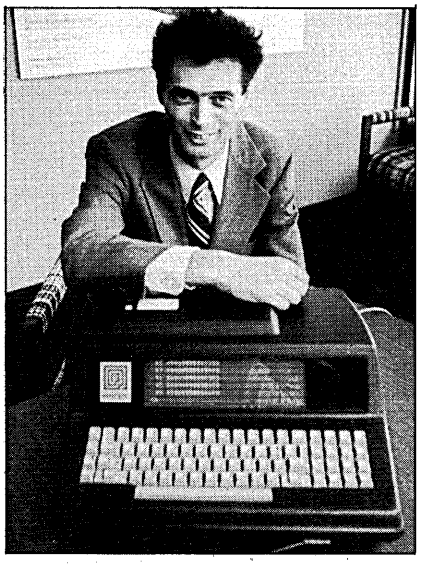
Computer design consultant Dan Nay ran an ad in the *Los Angeles Times* about three years ago to solicit business. His only reply was from Michael Wurmbrand, president and founder of Christian Missions to the Communist World, a nonprofit organization that documents incidents of human rights violations in communist countries.

Nay's assignment: design a portable computer that Wurmbrand could carry around and that would give him immediate access to a "zillion" facts his organization had compiled from its investigations behind the Iron Curtain.

The result is a very small computer and a new company in Torrance, Calif., both called Findex, as well as a $1 million backlog as of late September, when the company turned out its first production unit. As with many of the hundreds of small business microcomputers introduced in recent years, it will be marketed by distributors and oem's, including one oemer that will incorporate an insurance package for sale to the insurance industry.

The Z 80-based microcomputer weighs 20 pounds and can be carried around like a briefcase. The single unit has a 6 line by 40 character plasma display screen supplied by Burroughs Corp., a 23 column electrostatic printer and a 77 key keyboard with a calculator pad and 17 programmable function keys. It can store up to 400K bytes of memory in a built-in floppy disk drive or up to 2 megabytes on an optional bubble memory—the bubble memory, supplied by Rockwell Corp., being recommended for applications in rugged environments.

Wurmbrand, who developed the software, said he incorporated an index sequential file management system which eliminates the need for sorting. It is programmed in business BASIC, an adaptation of Microsoft BASIC, and provides users—such as salesmen—with a data base of price lists or insurance rate tables, and it allows users to keep track of appointments or gives them access to telephone numbers and addresses. Wurmbrand, the company's executive vice president, and Nay, the 45 year old president, raised nearly half a million dollars to get the company going. In October they began turning out various models of the Findex at a rate of 25 devices a month, going to 50 a month before the end of the year. "After that, who knows," says Wurmbrand.



MICHAEL WURMBRAND—A bubble memory for rugged environments.

"It's hard to fathom the extent of the microcomputer market," says Wurmbrand. "It's as if the U.S. were to declare that Spanish was our second language and everybody had to learn it. Everybody in business now feels he has to have a computer, even though he's baffled by it."

So what does he do? He relies on his computer expert around the corner—that being the computer store, or a part-time programmer, or what have you. And that's the way Findex will sell its computers—to experts for resale to businesses. Late September, the company had appointed dealers in California and overseas and had a marketing effort going to line up others, including possibly a "major calculator manufacturer" who expressed a need for 500 copies of the Findex computer.

Wurmbrand, 40, is an expatriate Rumanian whose training is in civil engineering. He formed the Christian Missions organization after coming to the U.S. 13 years ago and describes the organization, which last year operated on a $7 million budget, as "a sort of CIA, although we have no connection with the CIA."

Wurmbrand virtually was orphaned at the age of 11, when his mother was arrested by government police in Bucharest in 1951 and forced to load boxcars for three years "without a trial or without even knowing why she was arrested." His father, a Lutheran minister, spent 14 years in a communist labor camp. Wurmbrand worked his way through several universities studying civil engineering, managing to circumvent a law that prohibited children of jailed parents to go beyond the seventh grade. Wealthy relatives finally ransomed his parents for $10,000 and the family came the U.S. "The communists say they hate capitalists, but they love capital," Wurmbrand says bitterly.

COMPUTING FOR NYC

When New York City's computer system went down briefly not long ago, the man in the news was David Woodbridge, the 44 year old executive director of the Financial Information Services Agency—the city organization that handles the Big Apple's data processing.

In the private sector Woodbridge's position would be on a par with the vice president of MIS at some of the biggest corporations in the country. In fact, New York City's $14 billion a year budget and its enormous accounting and record keeping requirements—its payroll is well over 200,000 employees, as an example—make it one of the most demanding computer users in the country.

How does Woodbridge, whose department employs an array of processing gear including an IBM 3032, an IBM 3033, and a 370/168 that is being replaced with a 3033 equivalent, view this pressure cooker job?

"Unlike most big national or international corporations, all our efforts are consolidated," says Woodbridge, who has several hundred people on his staff. "And everything is done through one system. Consequently, there's a tremendous concentration of activity that is certainly unique."

The pros and cons of this approach? "It's easier to control a system like this and to realize economies of scale, but we have a number of restrictions a large corporation would never encounter."

For one thing, Mayor Koch and the powers that be in city government frown on hiring people who live outside the five boroughs; salary ranges generally aren't competitive with those at big firms and raises may take three or four months to get through.

Still Woodbridge, having put together a system that's contributed in no small part to stabilizing the city's rocky fiscal situation, has probably seen more action—and survived a greater number of crises—than many of his counterparts in the relatively subdued world of corporate dp, which he knows well. ✲

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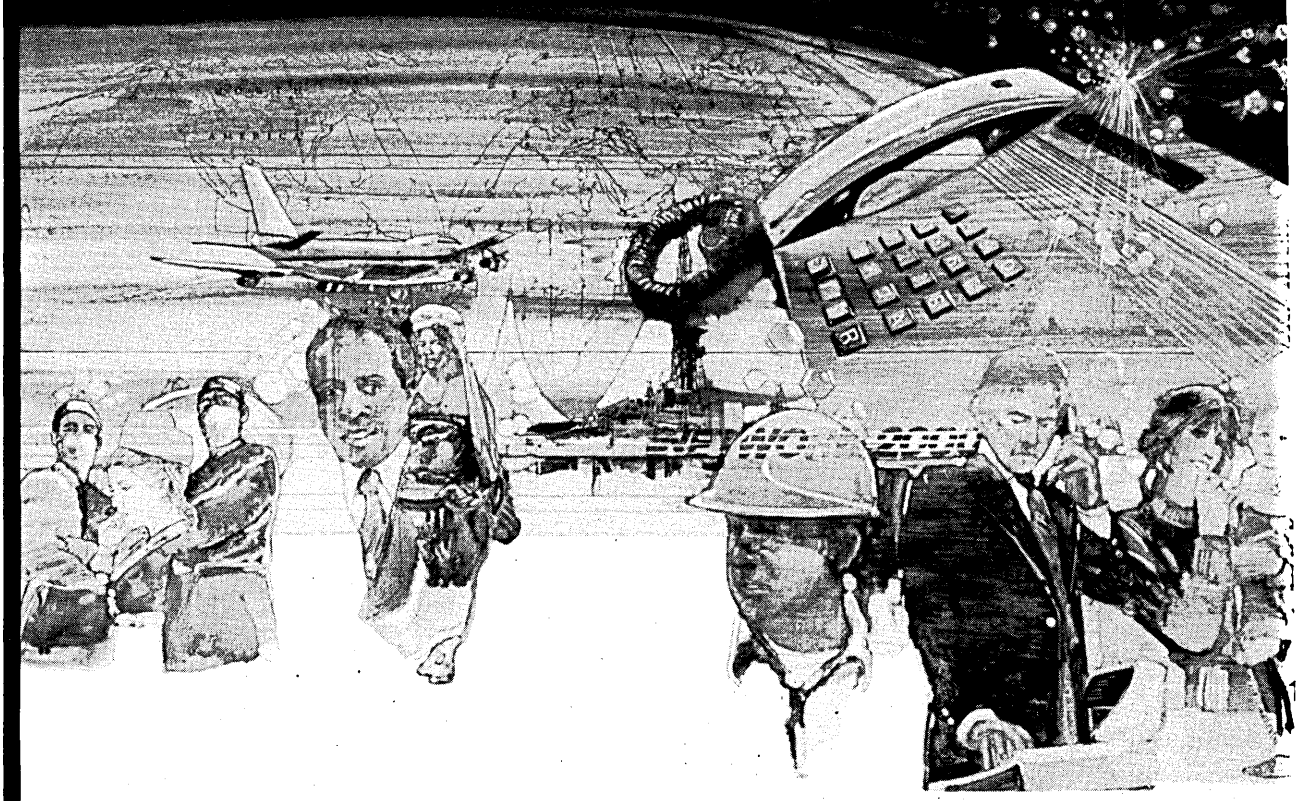
CIRCLE 126 ON READER CARD

SOFTWARE ENGINEERS



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We have openings in the U.S. divisions listed below for entry-level and experienced software engineers. When you send your resume, indicate the area of technology that interests you most, as well as your divisional or geographic preference.

Avionics Division

ITT Avionics is involved in a wide diversity of areas including electronic defense . . . communications . . . navigation/identification. Software professionals have the opportunity to stay with a project from start to finish and be involved in integration.

Openings at all levels. Bachelors preferred in Electrical Engineering, Physics or Computer Science (experience in lieu of degree considered). At least 3 years real-time Assembly language programming desired. Responsible for software design, coding, testing and integration of the software program into the hardware systems. Experience should include one or more of the following areas: E/W Computer Systems; Multi-Computer System Architecture; Firmware Coding. Positions are in Nutley located in suburban northern New Jersey.

Business Communications Division

The ITT Business Communications Division is currently developing advanced communication systems which will encompass PABX functions and data switching capabilities. Add on modules will provide data processing facilities for implementation of the "Office of the Future".

Advanced software techniques used in these systems include structured analysis, structured design and the use of Problem Oriented Languages. Openings exist for real-time programmers, telephony switching programmers, data switching programmers and software utility programmers in Des Plaines, Ill. (suburban Chicago).

ITT Courier

ITT Courier produces a full line of multi-microprocessor software-based computer display terminal and data communications products, and is currently the largest non-IBM producer of 3270-type devices. At the metropolitan Phoenix software engineering center, ITT Courier is developing state-of-the-art real-time, Assembly language software that will provide form and function to future product offerings. Software development areas include: SNA, SDLC, BSC, and IBM channel protocol communications software; real-time, multi-tasking operating systems; software development tools; smart terminal software; intelligent terminal software; and support/diagnostic software.

Software engineering openings exist at all levels at our facilities in Tempe, Arizona; West Palm Beach, Florida; East Rutherford, New Jersey.

Defense Communications Division

ITT Defense Communications Division is involved in research, development and manufacture of sophisticated communications equipment such as digital telephone circuit switching, message switching, narrow band digital voice processing, radio transmission and satellite communications and navigation. ITTDCD has been very successful in obtaining contracts in all the aforementioned technology areas during the past few years due in large part to an **aggressive internally funded research and development program.** We are interested in engineers (both in equipment and computer software design) to work in digital communications such as voice processing, circuit switching, message switching and radio transmissions . . . at our Nutley facilities in suburban New Jersey.

ITT North

ITT North Telecommunications Switching operates in a rapidly changing, micro-miniaturized computer-controlled environment. The impact of semiconductor and computer technologies on the telecommunications industry has resulted in the present conversion from analog to digital techniques which are, in fact, integrated information systems.

We seek individuals with backgrounds in computer sciences, telecommunications hardware and software development, systems analysis, programming, electrical/electronic and mechanical engineering . . . to assist in the data base design and implementation of a major digital telephone switching system in a real-time/batch processing environment. Openings are at our facilities in Johnson City, Tennessee; Delaware, Ohio; Cape Canaveral, Florida.

Telecommunications Technology Center

The ITT Telecommunications Technology Center . . . located in ultramodern campus type laboratories in suburban Fairfield County, Connecticut . . . offers Software Engineers the opportunity to apply their skills to state-of-the-art digital Telecommunications Switching Systems. Software design opportunities exist in diagnostic signaling systems, trunk and line maintenance, exchange administration, fault recovery, I.M.S. and data base administration.

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Overseas

ITT units throughout the United Kingdom and Europe (Belgium, France, Germany, Italy, Spain and Scandinavia) periodically have openings for software engineers. Relevant language proficiency is required. When you send us your resume, indicate if you would also like to be considered for any overseas opportunities we might have.

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OFF-LINE

More-power-to-you department: a parachute training facility, the Airborne and Physical Training School, being built at Tabuk, Saudi Arabia will be powered by (you guessed it) SOLAR ENERGY, with an automated control system supplied by Honeywell. The contract, valued in excess of $1 million, includes supplying and installing pneumatic controls for heating, ventilating, air conditioning, and the solar energy plant. Also included in the integrated system is a Delta 1000 building automation system. Twenty-two Delta systems have been sold in Saudi Arabia in the past three years; this installation, Honeywell says, "will be the world's first application of a building automation system to control and monitor a solar energy unit."

The Air Force Avionics Laboratory has awarded a $1.7 million contract to Rockwell International for work on bubble memories suitable for airborne digital avionics applications. The 29-month effort, part of a program to develop bubble technology for both airborne and spaceborne applications, aims to develop highly reliable, solid-state memories for use in place of disks, drums, tape, etc.

Racal-Vadic, Inc., the Sunnyvale, Calif., modem-maker, has reached an agreement in principle with Texas Instruments to supply modems for TI's 785 and 787 portable terminals (see product announcement, this page).

American Microsystems, Inc., and Tektronix, Inc., have begun a cooperative marketing program to place Tektronix 8002A microprocessor development labs with AMI customers.

TERMINALS

The Silent 700 line of terminals now has four 120cps members. The 780 series can be had in receive-only (model 781), keyboard send-receive (model 783), portable data terminal (model 785), and portable communications data terminal (model 787) versions. All use a dual-matrix thermal printhead that prints two characters simultaneously.

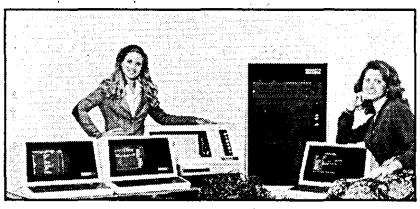
Common features of the four include 120cps bidirectional printing, full duplex operation, receive buffer, 21 character answer-back memory, and use of the 128 character ASCII set. All four can operate at data rates ranging from 110bps to 9600bps. Models 781 and 783 are both desktop models equipped with RS232 and current loop interfaces. As an option, the receive-only 781 can be fitted with a 2,000 character buffer, allowing the 781 to function as a demand printer in conjunction with a crt terminal.

The 785 has an integral 1,200bps acoustic coupler, while the 787 has a direct-connect internal originate/auto answer modem with automatic speed selection. RS232 interfacing (and operation to 9600bps) are options on the 785 and 787. APL keyboards and character sets are available for the 783, 785, and 787. The 781 sells for $1,595, the 783 for $1,795, the 785 for $2,445, and the 787 for $2,895. Deliveries are scheduled to begin in the second quarter. TEXAS INSTRUMENTS, INC., Digital Systems Group, Houston, Texas.

FOR DATA CIRCLE 292 ON READER CARD

SYSTEM

Extending the high end of its Reality Family of computer systems, this vendor has come up with the Series 8000, the first of the Reality line to use a new Performance Enhanced Processor said to provide a 20% to 30% increase in internal processing speed over previous processors. Main and secondary memory maximums have been increased to 512Kb and 514Mb, respectively. As with existing members of the family, the Series 8000 uses the Reality Data Base Management System.



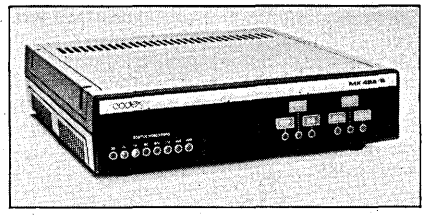
Utilities provided with the system include the DATA/BASIC applications language, English data retrieval language, PROC (a prestored procedural language that handles job control functions), Screenpro input utility and screen formatter, and a word processing package, Runoff.

Two configured Series 8000 systems are offered initially. The 8750 system includes a 128Kb processor, 514Mb of disk, 800bpi, 45ips mag tape, 300 lpm printer, and two crt terminals, and sells for $84,975. The 8770 has a 256Kb memory and a 1600bpi tape unit, in addition to the disk, printer, and terminals of the 8550; the 8770 sells for roughly $106,000. MICRODATA CORP., Irvine, Calif.

FOR DATA CIRCLE 293 ON READER CARD

MODEM

Compatible with Bell's 208A and 208B modems, this vendor's MX 48A/B 4,800bps synchronous modem allows leased-line multipoint and point-to-point



operation as well as dial-up use. The microprocessor-based direct connect modem includes fault isolation and error detection capabilities. The MX 48A/B sells for $3,900, and rents for $110 per month, $90 per month, and $85 per month on one-, two-, and three-year leases, respectively. Deliveries begin next quarter. CODEX CORP., Mansfield, Mass.

FOR DATA CIRCLE 294 ON READER CARD

6250BPI TAPE

For use with its Eclipse systems, this vendor's model 4307 magnetic tape subsystem provides IBM compatibility with

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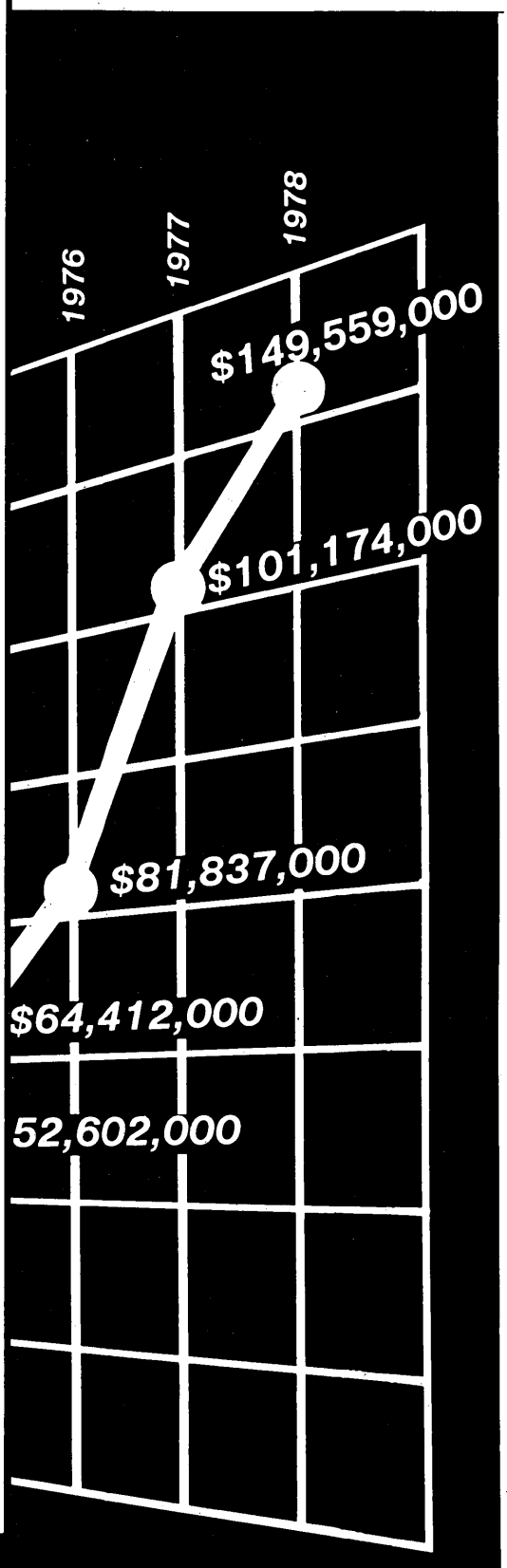

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6250bpi Group Code Recording (GCR). It also can read phase encoded 1600bpi tapes. In 6250bpi operation, the 4307 transfers data at 486,750 bytes per second. The auto-load transport reads and writes at 75ips; rewind speed is 250ips. The 4307 subsystem includes a rack-mounting transport, formatter, and cables; the subsystem can comprise up to four transports (add-on transports are known as 4307-A's, and include cables). The 4307 subsystem sells for $49,000; additional 4307-A transports are $22,000. Quantity discounts are offered. DATA GENERAL CORP., Westboro, Mass.

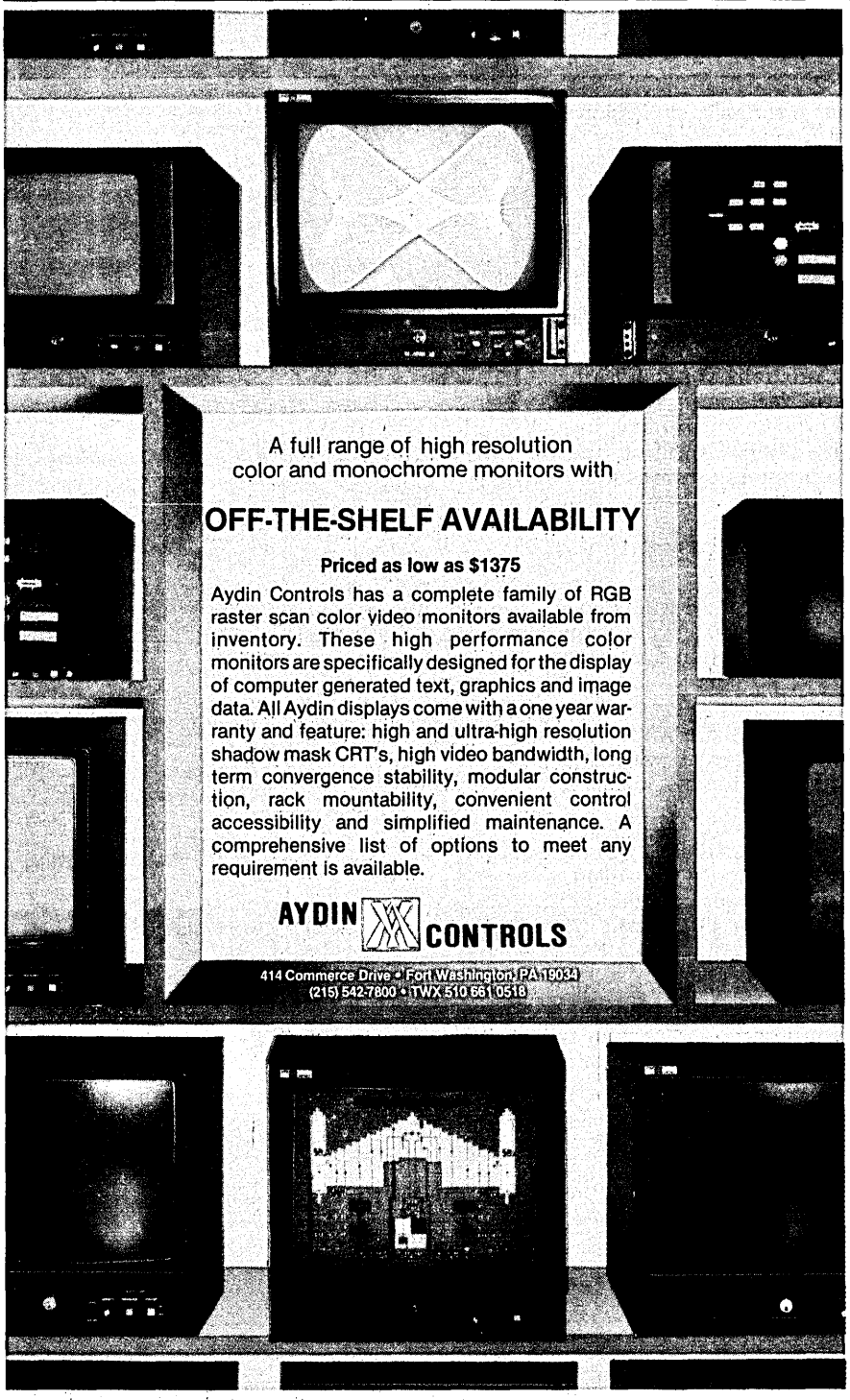
FOR DATA CIRCLE 295 ON READER CARD

TERMINALS

The Gray Giant has added a little color to its life with the introduction of its first color terminal, the 3279 color display terminal. Annouced concurrently were the 3287 four-color printer, program products to support color output, and the 3101 terminal, a Teletype-compatible unit at relatively low price subject to quantity discounts.

A member of the 3270 family, the 3279 can display alphanumerics and graphics in up to seven colors. Four models are offered, capable of displaying four or seven colors with 24 or 32 lines of 80 characters per screen. The 3287 color printer uses a replaceable four-color cartridge ribbon. The bidirectional matrix printer is offered in 80cps and 120cps versions. A Programmed Symbol Feature allows use of customer-designed additional character sets.

Prices on the 3279 color display terminals range from $4,300 to $6,700; two-year leases range from $105 per



CIRCLE 11 ON READER CARD

MASS STORAGE

Four mass storage processors (MSPs) and a large mass storage unit have joined this vendor's secondary storage offerings for its large-scale computers. Designed for use with its recently announced DPS 8 line of processors (see November, p. 56), Level 66 and Level 66/DPS systems, the company emphatically states the MSPs are not back-end processors, and no plans exist to transform these MSPs into back-ends.

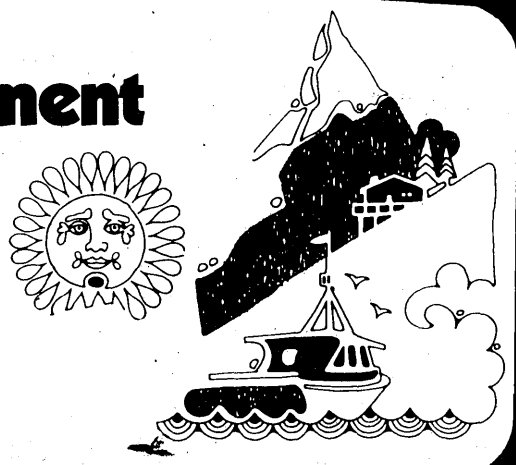
Two of the MSPs, the MSP0604 and MSP0607, are single channel devices, while the MSP0608 and MSP0609 are dual channel devices. Each can support up to 16 MSU0400-series mass storage devices (for a total capacity in excess of 4 billion bytes); MSU0500-series storage devices also can be used, with a maximum of eight units on either the MSP0604 or MSP0607, 15 units on the MSP0608, and 16 on the MSP0609. Drives from both series can be mixed on a single MSP.

The buffered MSPs are intended to optimize data transfers between disks and the processor's I/O multiplexor, with the MSP handling address conversions, formatting, seek overlapping, command retries, and alternate track processing. The MSP0604, an integrated unit, sells for $39,000 and rents over a five-year term for $874 per month. The MSP0607 is a free-standing unit that sells for $44,000 and rents for $988 per month on a five-year contract. The MSP0608 consists of one free-standing module and one integrated module, while the MSP0609 consists of two free-standing modules. Purchase prices are $62,500 and five-year rentals go for $1,400 per month for either.

For actually storing data (as opposed to helping it move between processor and peripheral), the MSU0501 stores up to 1.1 billion 9 bit bytes of data. The dual-spindle, fixed-disk device has 12 platters providing 20 recording surfaces. The MSU0501 has a peak transfer rate in excess of 1 Mbps, and an effective transfer rate of 983 Kbps. Average latency is 8.3 msec, and the average seek is 25 msec (10 msec minimum, 50 msec maximum). The MSU0501 sells for $49,650 or rents for $1,296 per month on a five-year plan. HONEYWELL, U.S. Information Systems Group, Waltham, Mass.

FOR DATA CIRCLE 291 ON READER CARD

Data Base Systems Design and Development



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- **Data Administration and Data Base Administration** for individuals with experience in the integration and control of major IMS data bases.
- **Data Base Programming** for individuals with DL/I and structured COBOL experience on large scale administrative applications involving both real-time and batch processing.

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month to $159 per month; rentals range from $123 per month to $188 per month. Depending on operating speed, the 3287 color printer sells for $6,125 or $6,500. Monthly lease fees (for a two-year term) are $184 and $216. The printers rent for $216 per month or $254 per month. Initial shipments are slated for the second quarter of next year.

The Teletype-compatible 3101 comprises a 12 inch display screen, logic unit (which can sit under the screen), and 87 key keyboard. For hard copy, a 3102 printer (announced simultaneously) can be attached to the 3101. Sales and administrative support for both products will be provided through IBM's toll-free telephone center. The 3101 is offered in six models for purchase only. Prices range from $1,295 to $1,520 for orders of 24 or fewer. A 7.5% discount applies to purchases of 25 to 49 units, a 15% reduction applies to orders of 50 to 99 units, and a 20% discount applies to orders for 100 or more. The 3102 printer sells for $1,295, with a 7.5% discount on orders of 25 or more units. INTERNATIONAL BUSINESS MACHINES CORP., White Plains, N.Y.

FOR DATA CIRCLE 296 ON READER CARD

SMALL COMPUTERS

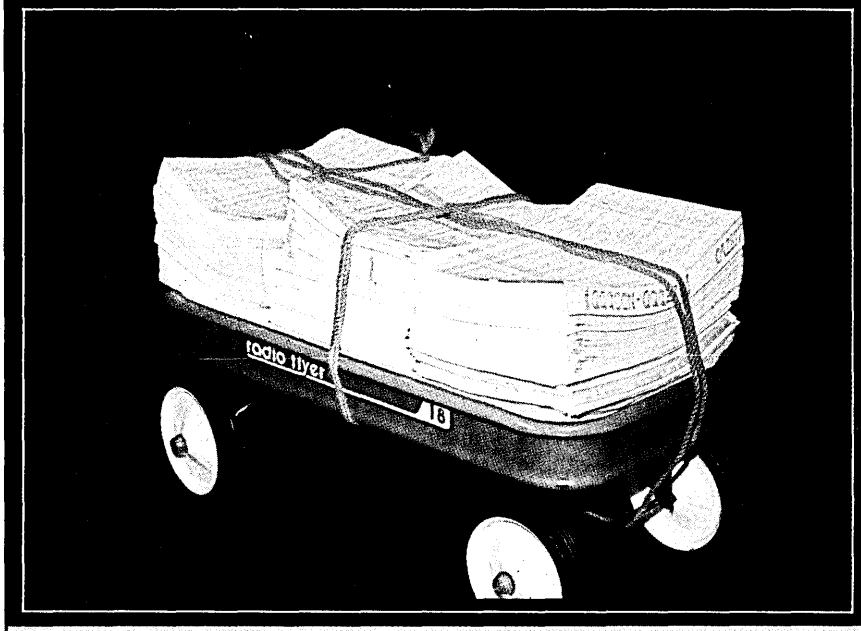
Designed for use as both standalone processors and nodes in computer networks, the B 91 and B 92 are the latest additions to this vendor's 900 family. The processors run at two to five times the speed of the vendor's earlier small systems. The B 90s are software-compatible with existing B 80s and B 800s; Series L users will welcome B 90s that run ACSYS software, allowing applications to migrate from the Series L to the B 90s. The B 90s use the vendor's newly developed Super Mini-Disk II, which provides a total capacity of 6Mb on two flexible diskettes; in addition to increased capacity, the devices have faster access time.

The multiprogramming system can control networks of terminals, while simultaneously handling data entry, programming sessions, and inquiry/response applications. The entry-level B 91 includes processor with up to 512Kb of main memory, display screen, keyboard, 90cps matrix printer, and flexible disk storage in a single cabinet. Systems can expand with the addition of line printers, disk and diskette storage, and up to 11 I/O channels and four communications channels.

Puchase prices start at $17,950 for a B 91 with 128Kb of main memory and a 6Mb Super Mini-Disk II, and $20,708 for a B 92 similarly configured. Leases start at $683 and $775, respectively, including eight-hour-a-day, five-day-a-week service. Operating system software is licensed separately. Computer Management System (CMS) software licenses for a one-time fee of $3,040 or a monthly fee of $85. ACSYS can be licensed for a one-time fee of $2,050 or a monthly charge of $55. Applications packages are available for one-time licenses ranging from $915 to $7,000, or $25 to $915 per month. BURROUGHS CORP., Detroit, Mich. ✻

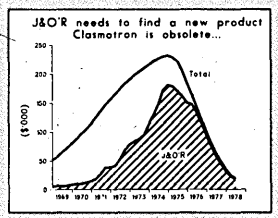
FOR DATA CIRCLE 299 ON READER CARD

Data Analysis Problem No. 12
DISTRIBUTING THE INFORMATION-



THE SOLUTION:

Distributing stacks of paper is a transportation problem your company is suffering unnecessarily. The critical problem of "distributing" a quick and clear understanding of the information buried in those stacks is solved easily with charts by **TELL-A-GRAF.**



TELL-A-GRAF, a conversational software system, puts quality graphics in your hands—and *fast.* Bar, column, line, surface and pie charts for the decision-making process can be generated in terms of minutes or hours rather than days or weeks.

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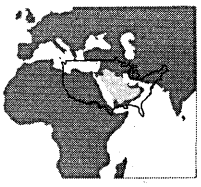
CIRCLE 12 ON READER CARD

Abqaiq, Saudi Arabia

No baseball, no morning paper, no pizza, no autumn leaves.

But here's the great life that makes Aramco people stay on and on.



If you never considered working in Saudi Arabia because you think it's all sand and hardships, consider this.

3,500 Americans like you work for Aramco in Saudi Arabia now. Ask them why they stay and they'll tell you that, besides money, it's the casual lifestyle, American-style hometowns, top-notch schools, and vacation travel they used to only daydream about.

Where on earth is Abqaiq?
Located close to the world's largest oilfield (Ghawar), Abqaiq is the center of a giant oil-gathering and processing system that handles 60% of all the oil produced by Aramco, the world's largest producer.

Does Aramco's paycheck justify living in a desert kingdom?
Yes! You get a base salary competitive with top U.S. oil firms. We compensate you for overseas cost-of-living differences.

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Another benefit: employees overseas participate in Aramco's Retirement Income Plan on an **accelerated** basis.

With this financial package, no wonder 3,500 Americans like you work for Aramco in Saudi Arabia today.

What can you do with all that money stuck out in the desert?
Aramco people use 40-day paid vacations (every 12½ months) and 12 paid holidays (average) to visit fabulous places like the Pyramids, Greek Islands, Mt. Everest, the Serengeti Plain, Hong Kong.

Doesn't a child's education suffer so far away?
No! Aramco has a modern American school system. Teachers are primarily American and more than 75% of them have master's degrees. The teacher-student ratio is 1 to 15 in grades 1 to 6; 1 to 20 in grades 7 to 9.

If you get seriously ill, or need dental surgery; where do you go?
Aramco's Dhahran Health Center is one of three hospitals outside the U.S. accredited by the Joint Commission on Accreditation of Hospitals. The Dental Clinic is as fine as any in the States. Better than most.

Aramco recruiting ads mention "comfortable housing for families and singles." Is that on the level?
At first, you'll live 12 to 18 months in adequate but not terribly attractive off-camp temporary housing. Next, it's on to comfortable on-camp temporary housing. Then, based on a housing priority-point system using job level and length of service, you'll get your permanent residence that's a carbon copy of a home in a warm climate like Arizona or Southern California.

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CIRCLE 130 ON READER CARD

SOFTWARE AND SERVICES

UPDATES

The Association of Data Processing Service Organizations (ADAPSO) has urged the Federal Communications Commission to amend the computer rules to force common carriers to provide maximum separation between computer services offerings and voice communications operations. In a formal submission under Computer Inquiry II, ADAPSO asserts the FCC's Tentative Revised Computer Rules don't go far enough, and should require maximum separation in financing, administration, R&D, maintenance, marketing, and other areas that might otherwise overlap. Concise separation, ADAPSO maintains, would avoid cross-subsidation of services, maintain a competitive environment, eliminate tying effects between the computer services and telecommunications businesses of a common carrier, and resolve current disputes between the computer services industry and common carriers.

Tomorrow's influential designers, artists, cartoonists, and animators will be as young as 16, and by the age of 21 many children will be seasoned professionals with four or five years' experience, predicted Robert M. Dunn, speaking at Infotech's Computer Graphics conference, held in London the last week of October. Dunn, of the U.S. Army's Communications Research and Development Command, notes that youngsters have used his personal computer to create graphics programs. These young users are less interested in additional computing speed and memory than good graphics and interaction. Dunn's observations lead him to two predictions: these young people will enter the job market earlier and with more experience, and they will expect to have interactive, graphic personal computing tools.

RPG UTILITY

For System/34 users, the RPG II Source Storage and Retrival System (SSRS) lets the user store, modify, and selectively extract commonly used segments of RPG II programs. One or more source data files can be maintained by SSRS, with each file containing whole programs or many program segments. Simple commands let users merge filed programs and segments.

The vendor sees SSRS as especially useful for storing often used input file specifications and calculation subroutines. Complete SSRS documentation and source diskette can be purchased for $150. The vendor also offers, for $30 apiece, standard subroutines to aid applications development using SSRS. These subroutines include name reversal, numerical dollar to English conversion, and binary searches over sequential data files. FUTURENOW SOFTWARE, Orono, Maine.

FOR DATA CIRCLE 384 ON READER CARD

MULTI-CPU UTILITY

The Shared Tape Allocation Manager, STAM, automates control of allocating shared tape units in multiprocessor installations running OS/MVS. STAM protects against allocating the same drive to more than one cpu, and it requires operator response only in unusual situations (routine allocations are automatic). Commands allow the operator to display the status of a drive on all systems, or to take a drive off-line on one or more systems. STAM also can handle mountable disks in addition to tapes. STAM is priced at $10,000 for two processors. SOFTWARE MODULE MARKETING, INC., Sacramento, Calif.

FOR DATA CIRCLE 385 ON READER CARD

CONVERSION AID

This vendor has developed conversion aids to ease migration from IBM System/3s and System/32s to the vendor's VS multiuser business systems. The packages help convert data files and RPG II applications. One of the conversion programs provides semiautomatic conversion of programs using interactive screen operations under IBM's Communications Control Program (CCP). Screen definitions are converted to specifications for this vendor's workstations, and interfile the generated specifications into using application programs. The vendor doesn't claim fully automatic conversions, noting that users probably will consolidate logic into larger programs. The programs run on this vendor's VS system, and are available at no charge to customers ordering hardware. WANG LABORATORIES, INC., Lowell, Mass.

FOR DATA CIRCLE 386 ON READER CARD

STRUCTURED BASIC

Designed to run on this vendor's microcomputers (equipped with 64Kb of memory), Structured BASIC is said to combine the advantages of a modular language with the ease of programming in BASIC. An extension of the vendor's 16K BASIC, Structured BASIC adds long variable names (to 31 characters), statement labels, and control structures including IF-THEN-ELSE, WHILE-ENDWHILE, and REPEAT-UNTIL. A Keyed Sequential Access Method (KSAM) also is provided, as is a facility for calling named procedures with global and local variables. Structured BASIC is available on either regular diskette or minifloppy for $295. CROMEMCO, INC., Mountain View, Calif.

FOR DATA CIRCLE 343 ON READER CARD

SOFTWARE SPOTLIGHT

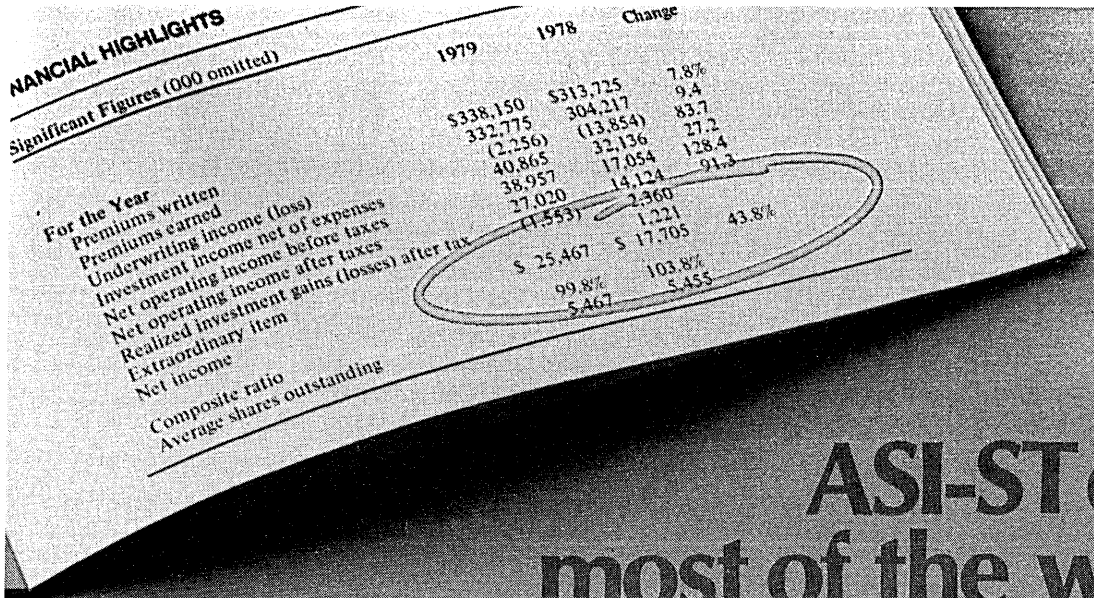
TRANSACTION PROCESSING

A transaction processing package, Pathway, allows users of this vendor's Non-Stop systems to code applications without regard to the specific characteristics of the terminal used. The package combines a set of Terminal Control Processes, a screen formatting language, a user-controlled application monitor, and an interactive screen definition facility.

Pathway divides terminal control and file manipulation into separate programs, with the vendor-supplied software handling all needed data checking and format validation. Terminal-oriented functions are handled by the terminal control process (TCP). A TCP can control multiple terminals, each logically independent of the others. Terminal handlers are written in Screen COBOL, which allows the user to define formats, input and output data mapping, validation, and message routing.

The application monitor initiates the system and supervises and controls all working processes. It lets the user control the system and generate reports on the status of processes or error conditions. Pathway can be used with applications written in COBOL, FORTRAN, MUMPS, or the vendors proprietary T/TAL language. Pathway licenses for $8,500, plus $2,000 per processor for microcode. TANDEM COMPUTERS, INC., Cupertino, Calif.

FOR DATA CIRCLE 383 ON READER CARD ✲



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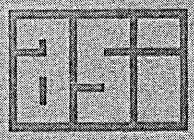

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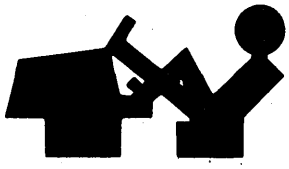

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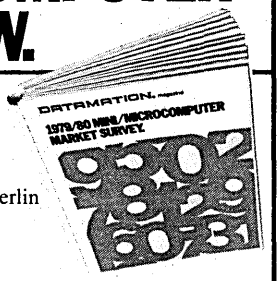

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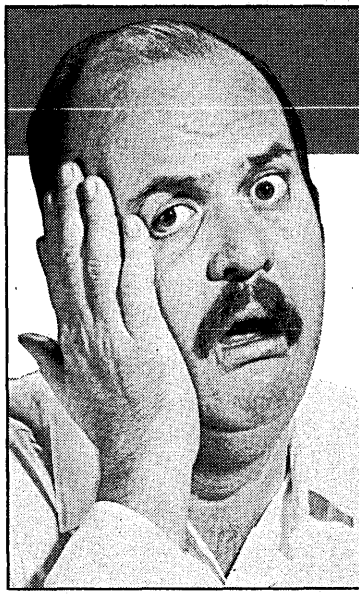

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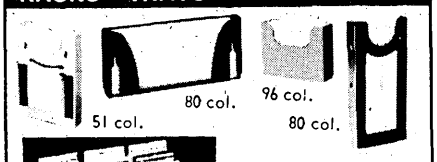

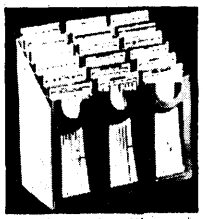

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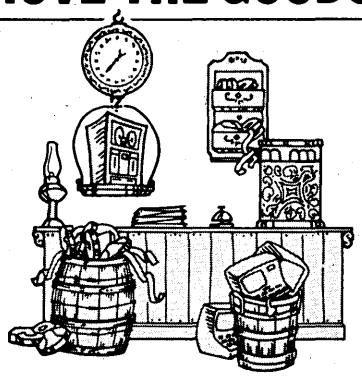

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BOOKS

THE FUTURE WITH MICROELECTRONICS

by Iann Barron and Ray Curnow

This book contains the delayed report of the (mostly) 1977 research undertaken by the authors on behalf of the Computers, Systems and Electronics Requirements Board (C.S.E.R.B.) of the U.K. Department of Industry. Without probing deeply into the U.K. government's organizational structure, it is sufficient to say that the C.S.E.R.B. essentially acts in a customer role in allocating U.K. government funds to various research activities. Incidentally, the board has no telecommunications responsibilities, which has become a serious omission in the current technological world. Iann Barron, now director of strategy for the new U.K. semiconductor company, INMOS, was the leading investigator. Ray Curnow led the work at the Science Policy Research Unit, University of Sussex, which permitted the authors to access information from a number of ongoing S.P.R.U. projects.

This work was completed in January 1978. The delay in releasing the material for public examination has seriously reduced its impact because the semiconductor and electronics businesses move rapidly. There is some reason to suspect that the precise analysis and hard-nosed recommendations did not find favor with the then-incumbent government and that it consequently tried to bury the report quietly. Fortunately, the government was not able to suppress it. Indeed, the very soundness of the work is evidenced by the small number of points that would require change today. Conclusions are presented cleanly, without the usual elaborate footnotes and pseudoscientific references that tend to destroy readability. There is very little hedging or application of fudge factors; bold statements are made.

Barron and Curnow are professionals. They have been around this industry for a long time. They do not hesitate to speak the truth as they saw it. Thus their diagnosis of ICL's troubles is to the point. Their explanation of the negative effects of an anti-PCM policy would gladden the hearts of the management of STC, Telex, and Memorex. They have nothing but scorn for flag waving, the "indigenous computer industry" approach so dear to those in power in many countries. Their theme is the application of technology, not its production.

What seems to bother Barron and Curnow most is that there is so little understanding in the U.K. of the need for grasping what can be done with technology to improve the quality of life as well as the stature of British industry in world markets. Doubtless governmental readers were less than enthusiastic over the description of the barriers to effective use of computing in the U.K. It is bluntly stated that there is a lack of collective awareness of computing, too much concentration on short range problems, too much protectionism, and too much historic, cultural, attitudinal emphasis. It is easy to see why Whitehall wanted to sit on this report as long as possible.

After all the forecasts and conclusions, the authors have provided a set of recommendations for new policies in a variety of areas—industrial, governmental, social, and educational. They stress exploitation of technology. While doubtlessly a correct analysis, it is likely to be poorly received in a country where support has been concentrated in the production sector in spite of very limited results. The "you'll do it until you learn it" theory is not very good economics. They note that "... What is totally lacking is any institution with overall responsibility for creating and implementing the policy toward information technology ...." One might make the same criticism in the United States, although our plentiful resources have helped alleviate this problem.

Given the lengthy delay in circulation of this report, one must be less than optimistic in predicting widespread U.K. readership. One is also sure that the U.S.-based computer industry will take it seriously; competitive marketing is a specialty here. Knowing what the other fellow is planning is always an edge.

This book is a major contribution. Those who forecast the future with microelectronics and the implications of the emerging technologies will study it carefully. The logic of the arguments presented makes sense to strategic and tactical planners. One can only hope that the C.S.E.R.B., the DOI, and the new Conservative government in the U.K. take it quite as seriously. There is much truth buried in these pages for a country with limited resources to apply. Nichols Publishing Co., New York (1979, 242 pp., $17.50).

—**Philip Dorn**

370/360 ASSEMBLER LANGUAGE PROGRAMMING

by Stern, Sager and Stern

Many compiler language programmers have a secret desire to know assembler language. One reason is that no compiler language allows the user to actually program the *computer*. Assembler language is the only viable means of actually programming what happens inside the machine.

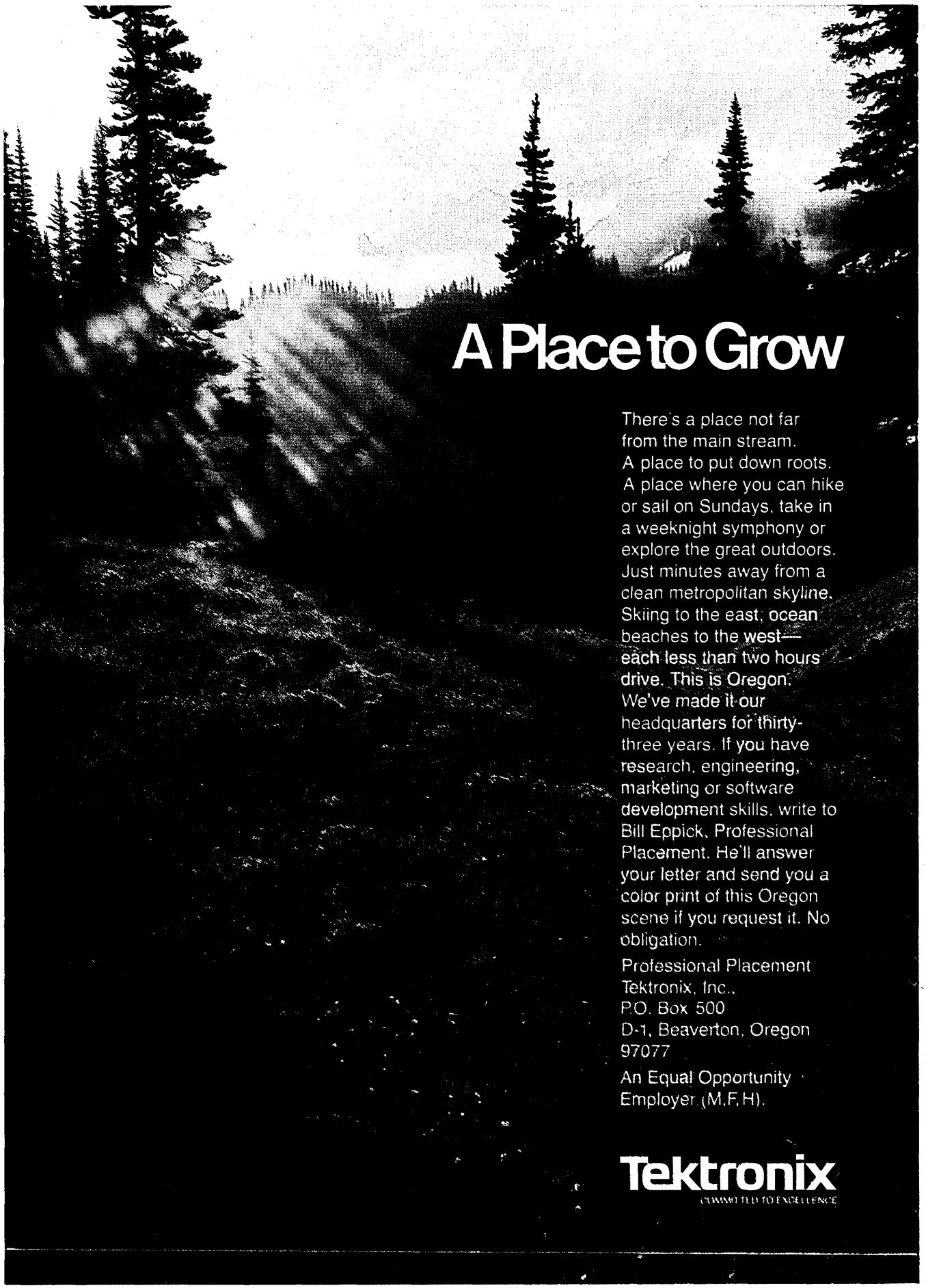
Nancy Stern and her coauthors produced this book primarily as a college-level textbook for first-year course work in assembler language. However, their book is also quite useful as a self-administered course in the subject and will quickly provide the reader with enough knowledge to write an assembler program.

After an initial description of the ground rules in assembler language such as statement format, syntax, and coding conventions, the book quickly establishes the "shell" of a working program. Then, functional clusters of instructions from this program shell are discussed according to their functional role in the program (such as housekeeping, input-output, etc.), rather than the usual statement-by-statement approach to teaching a programming language.

The authors limited this book to the 50 or so assembler statements that are used for 95% of applications programming work. It concentrates on coaching the reader to a point where he or she can do useful programming in assembler as quickly as possible. Some of the instruction sequences used for instruction are less efficient than is possible with the 360/370 instruction set; however, the reader benefits from the avoidance of too many complications during the learning process.

The scope of instruction applies to the Amdahl 470 and UNIVAC 9000 machines as well as the IBM 360/370 systems. A cursory treatment of Job Control Language for IBM DOS, OS and UNIVAC OS is included, which serves only as an introduction to the subject.

Perhaps the strongest feature of this book is the manner in which various statements and instructions are grouped together by subject area. For example, Branching and Looping with Registers is a chapter completely unto itself and provides sufficient knowledge of that subject for most initial programming needs. Even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after gaining considerable efficiency in assembler language, the reader may later return to this book for further study of such subject areas.

One disappointment in this book is the omission of any discussion about how to write and use macro-instructions. The macro is the single most powerful feature of assembler language and is considered by many expert programmers to be the primary justification for using assembler, especially for applications programming. While a thorough study of macros may have been outside the authors' intended scope, several pages devoted to that subject would have been in order.

Ms. Stern and her associates have produced a fine classroom text and possibly the best available resource for self-instruction in introductory 360/370 assembler language. If you are a programmer and have not yet added assembler language to your arsenal of programming tools, this book is a very good way to start. John Wiley & Sons (1979, 516 pp., $16.95, softcover).

—R. Edward Mitchell, Jr.

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The book begins with computer fundamentals and continues with sections on dual input/output, blocking, disk file creation and loading, core index, choosing file types, file placement, file copying, sorting, indicators, initialization, array and table searching, number conversions, printing, and some miscellaneous topics.

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The report, which includes a directory of 180 minicomputer packages and 35 microcomputer packages as well as 200 software suppliers, categorized as computer manufacturers, distributors, wholesalers, software firms, turnkey houses, and computer stores, $900.

Also new from F&S are a report forecasting the U.S. semiconductor market, no. 665 (also $900), and a report on energy management and facilities control systems, no. 673 ($850). Frost & Sullivan, Inc., 106 Fulton St., New York, NY 10038, (212) 233-1080.

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The guide is said to be aimed not only at prospective buyers but at consultants, as an information directory, and at microcomputer programmers.

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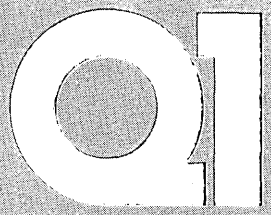

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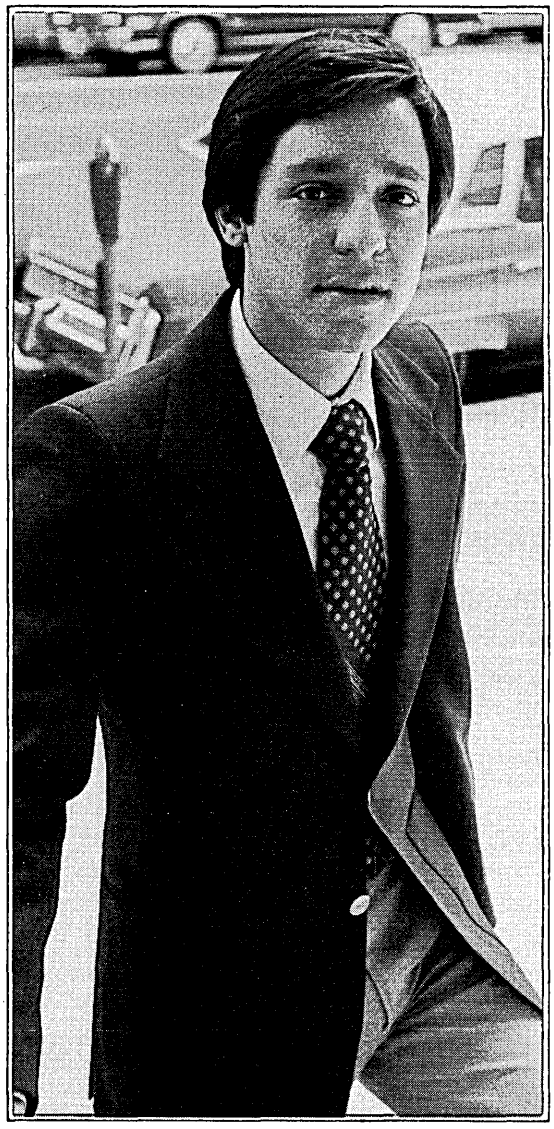

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A ground-based radar now being developed will be so "quiet" that anti-radiation missiles will be less likely to home in on its beam. The new radar will have two antennas, one to transmit low-energy beams continuously and the other to listen for returns. (Conventional radars differ by transmitting high-energy pulses so that one antenna can alternately transmit and receive.) A new antenna technique reduces the radar's side lobes -- the secondary patterns of energy that enemy missiles can home on. Hughes is building a prototype quiet radar antenna for evaluation by the U.S. Army.

Combat pilots will get a better view of the outside world with a cockpit display employing the technology of diffraction optics. The system has the same purpose as head-up displays using conventional reflective optics: to superimpose flight control information over the pilot's view of the outside world. The new technology, however, permits a wider field of view, brighter images, and a clearer view outside the cockpit. In fact, video pictures from radar or infrared sensors can also be displayed, allowing the pilot to see at night or in inclement weather. Hughes psychologists are now determining how to use the new capabilities of diffraction optics in ways that are most beneficial to a pilot.

The Manufacturing Division of Hughes Missile Systems Group in Tucson has immediate openings for engineers. Typical openings range from digital logic, analog, and IF/RF circuit design to electro-optical and IR system design. Also needed are industrial engineers and manufacturing production engineers to conceive and design production methods and tooling for the fabrication of complex hardware for missile systems. For immediate consideration, send your resume to Roy McCalla, Dept. SE, Hughes Aircraft Company, P.O. Box 11337, Tucson, AZ 85734. Or call (602) 746-6200. Equal opportunity M/F/HC.

Weapons equipped with electro-optical sensors can be guided with pinpoint accuracy from an aircraft by a specialized communications system. The new AN/AXQ-14 data-link weapon control system, developed by Hughes for the U.S. Air Force, performs two functions. First, it receives pictures from the electro-optical seeker in the nose of a GBU-15 guided weapon so the operator can guide the weapon to a target. Second, it transmits guidance signals from the aircraft to the weapon. Tests have been made in launchings from F-14, F-111, and B-52 aircraft.

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READERS' FORUM

A 4331 SETTLES IN

Nearly a year since IBM unveiled its 4300 series processor, the first 4331s are being delivered to those customers who fared well in the lottery for delivery position. Those users still awaiting delivery of their 4300s will be scrutinizing the reports of the early 4331 users whom IBM has been courting ever since the release of the delivery schedule.

Sweetheart Cup Corp. of Los Angeles (a division of Maryland Cup Corp.) received one of the first 4331s shipped to a commercial account in the Los Angeles area. Since I am a systems programmer at Sweetheart, I was able to get a good hard look at the 4331 from a user standpoint.

Sweetheart had made the decision to upgrade its hardware from a 360/30 to a 370/135 in December 1978, just one month prior to the 4300 announcement. This decision was made primarily to facilitate the installation and implementation of the corporate order processing system on which the parent company had spent an estimated 12 man-years developing. In addition, installation of more current and powerful hardware would hopefully attract and help retain skilled personnel.

Since rumors of the 4300 were flying everywhere, the order for the 370/135 was delayed. The 4331 appeared to be an ideal alternative for both the 360/30 and the 370/135, especially since the net cost of the 4331 was about the same as that of the 360 and only half that of the 370, and the same air conditioning could be used.

But when the 4331 was ordered, the Los Angeles division got a scheduled shipping date of July 26, 1981. It looked as though the move to the 370/135 was inevitable, because more computer power was needed in a short time and the lease on the 360 would expire at the end of October.

Fortunately, Sweetheart's corporate headquarters, currently using a 370/148 and a 370/145, had also ordered a 4331 (configured somewhat differently) with a tenative delivery of September 1979. Shipment of this processor was diverted to Los Angeles and plans for the 370/135 canceled.

When the Los Angeles division got news of the impending delivery, more programming personnel had to be obtained and software had to be ordered not only from IBM but also from the other vendors whose software was running on the 360/30. The software Sweetheart ordered included DOS/VSE Release 35 (no previous release supports IBM's new data organization, FBA [Fixed Block Architecture] DASD), VSE Advanced Functions, BTAM (Basic Telecommunications Access Method), VSE DITTO, POWER/VS, Sort/Merge VS Release 2, VSE/VSAM and DOS/VS COBOL. The Customer Information Control System (CICS) was placed on a separate order and was scheduled to be installed in late November.

Along with the 4300s come some new peripheral equipment, including two new DASDs: the 3310 and 3370. A new magnetic tape unit, the 8809, was also introduced. Both of the new DASDs incorporate FBA. These DASDs have fundamental subdivisions called blocks, which hold 512 data bytes each. The FBA DASDs are high performance, high capacity storage devices that sell at very modest prices.

The configuration that was to be shipped to Sweetheart on Sept. 21 consisted of the 1 megabyte 4331-J1 processor, four spindles of 3310, two 8809 units, a 3203 mod 5 line printer, and a 1442-N1 card reader punch. The system (minus the card reader and the display operator's console) arrived at Sweetheart on Oct. 2. The other two pieces, accidentally shipped to Maryland, turned up on Oct. 4. IBM's field engineers encountered problems with the tape drives and the disk controller, which further delayed turnover until Oct. 9.

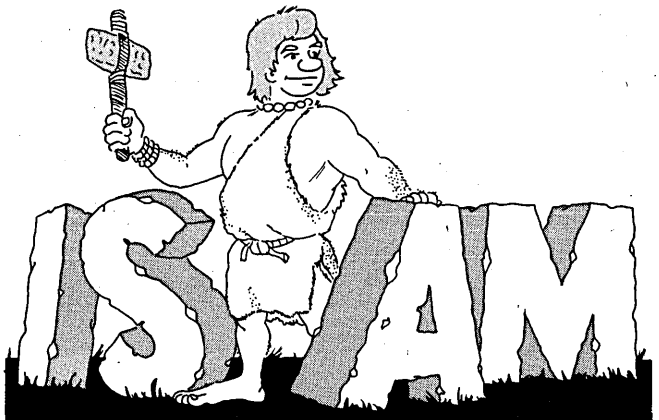
THREE-MONTH CONVERSION PLAN

In June, when Sweetheart learned that three months was all the time there was between the release of the delivery schedule and the proposed shipping date, the company knew conversion plans had to be formulated and carried out rather swiftly. To assist in the conversion, the corporate manager of systems programming, John Shasick, flew to Los Angeles to meet with the IBM systems engineers with hopes of getting the conversion plans under way. At the meeting it was decided that we would generate our system on the weekend of Sept. 21, and John would return to Los Angeles at that time. The software was ordered early in August and should have arrived in plenty of time for the SYSGEN, but for some reason it wasn't shipped until Sept. 16—via ground. Since the SYSGEN had to be postponed, both John and the software arrived the following Monday, Sept. 23.

Graveyard shift was the only standalone time available on the Region 14 data center's 4331, with the first shot being Monday night, the evening of John's arrival. After speedy preparation we proceeded to generate DOS/VSE Release 35 on FBA DASD in the middle of the night. It looked as though the installation was running smoothly until we tried to assemble the Supervisor. Fifteen minutes into the assembly the system inadvertently dumped storage, giving no indication of what went wrong until the dump was finished. "Wrong length record" was the message provided as the reason for Abend. According to the messages manual, this was the result of having overlapping extents on the system work files.

After several attempts, and making sure that there was no extent overlap, we used Baltimore's access code to call the Software Center to try and resolve the problem. After a couple of days, we were informed that this message had been encountered before, but only on FBA DASDs. To get around this, we were told to enlarge the work files and leave 250 to 500 free blocks between each work file that was on the same spindle.

The problem disappeared, only to be replaced by another. Once we were able to receive the listing from the assembler, some mysterious errors were encountered: "Unexpected end-of-book" and "unexpected end-of-file" occurred for some of the macros used to assemble the supervisor. After many hours of unproductive work, we were able to pinpoint the problem. The PID tape for VSE Advanced Functions was defective and had to be replaced. This meant more waiting and frustration. John left for



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home, and when the new PID tape arrived, I completed the SYSGEN without further problems.

LOADING SOURCE PROGRAMS

At the suggestion of the IBM system engineers, we began to load our source programs and compile them into private libraries residing on a 3348 data module. This was intended to increase the portability of our system files and did allow us to see how compatible the 360 COBOL compiler (FCOBOL) and the DOS/VS COBOL compiler were. Advanced Functions gives you the ability to have system libraries on different DASD models, but to my dismay, does not support the merging of system libraries between different architecture types.

The application program inventory included roughly 350 programs, all but eight written in ANSI COBOL. Of the remaining programs, five were written in RPG and other three in assembler. The RPG programs were rewritten in COBOL, and the assembler programs, one of which was the BTAM telecommunications program, needed only minor modifications to run on the 4331. About 90% of the COBOL programs were successfully modified with the use of a program written to access the private source library on the 360. The remaining 10% had to be altered manually due to certain peculiarities of VSAM which could not be handled properly by the ISAM Interface Program (IIP).

Virtual Storage Access Method (VSAM) and Sequential Access Method (SAM) are the only file organizations supported for FBA DASDs. This means that all Index Sequential (ISAM) and Direct Access Method (DAM) files have to be converted to VSAM. This can be accomplished by offloading the existing ISAM and DAM files to tape and bringing them over to VSAM with the use of Access Method Services (IDCAMS). In addition to IDCAMS, VSAM provides the ISAM Interface Program, which allows the processing of VSAM files by program already written for ISAM, while remaining totally transparent to the user.

Due to limitations in processor and disk storage, the 360 had been running without a spooling facility. POWER/VS added the benefit of spooling to the 4331 but also required more programming and Job Control considerations. Since the configuration of the 4331 was so different from that of the 360 and the facilities of the new Job Control Program were far greater (and also different), we decided it would be easiest to rewrite all of the JCL from scratch.

Hardware differences between the 360 and the 4331 meant additional software considerations. The 3203 mod 5 printer, for example, no longer uses carriage tapes for page formatting and has no operator control for page density (6 lines per inch vs. 8 lines per inch). Instead, these functions are handled by Forms Control Buffers (FCBs), which are coded in assembler language and cataloged into the core image library. The assembled FCBs are loaded by POWER JECL (Job Entry Control Language) or by a supplied utility (SYSBUFLD).

The system parallel was scheduled for the month of October, but was cut short because of the delay in receiving the machine. Nearly all the programs and job streams have been converted or rewritten and the testing is nearly complete; by Nov. 1 all production was expected to be running on the 4331.

During the testing phase of the parallel, many benchmarks were run against the 360. For the most part the production jobstreams tested on the 4331 ran between 3.5 and 4.5 times faster than on the 360/30 with the exception of COBOL compiles, which ran between eight and 10 times faster. In addition to the increase in processor speed, the 4331 running DOS/VSE with Advanced Functions allows for up to seven partitions (five partitions without Advanced Functions). Throughput will be maximized using the spooling software (POWER/VS) and the development of on line programs is now being considered.

I feel that the 4331 conversion went far more smoothly for the most part than originally anticipated, and that the 4331 is a very attractive replacement for the 360/30.

—Robert A. Kivi

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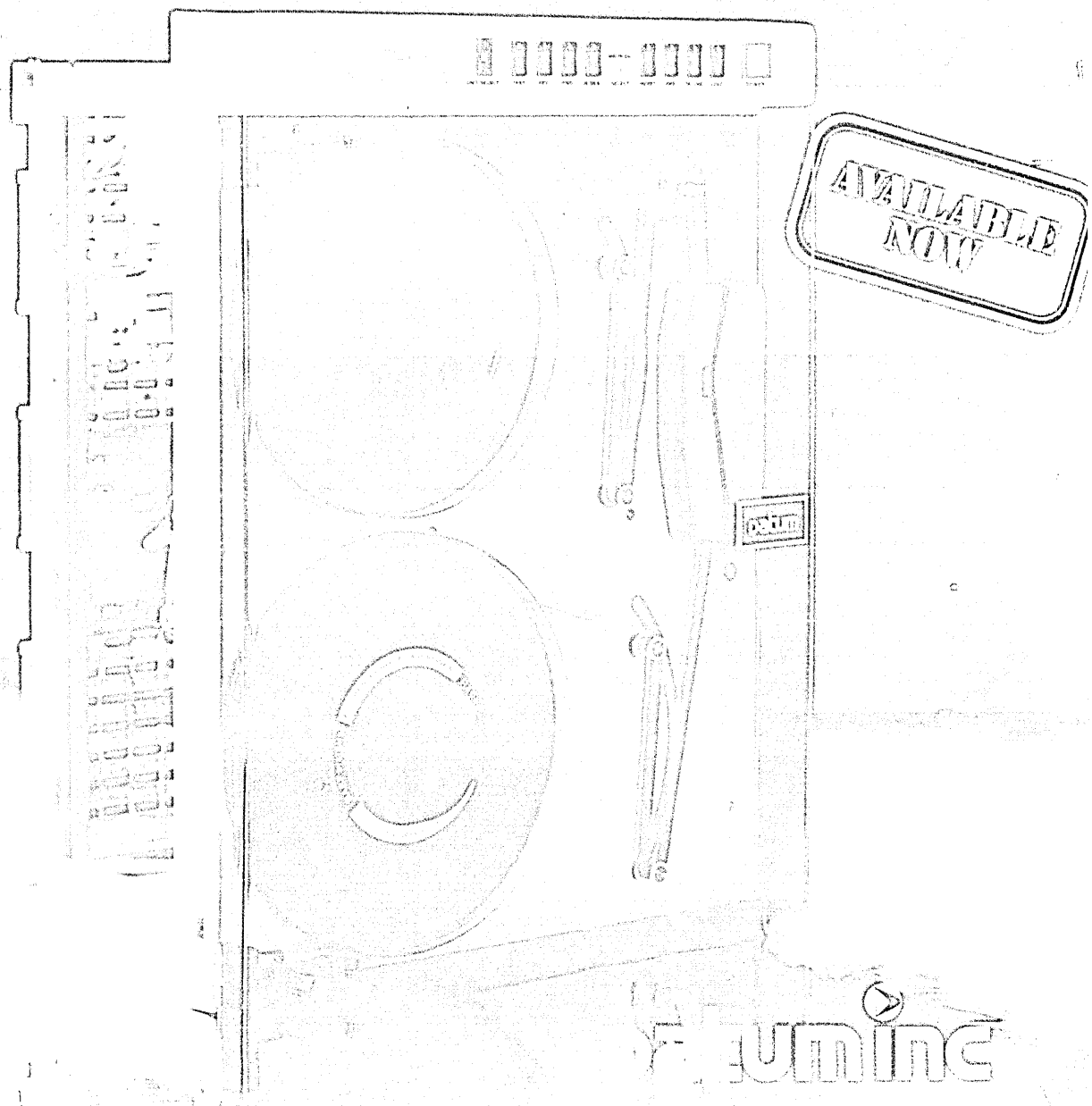

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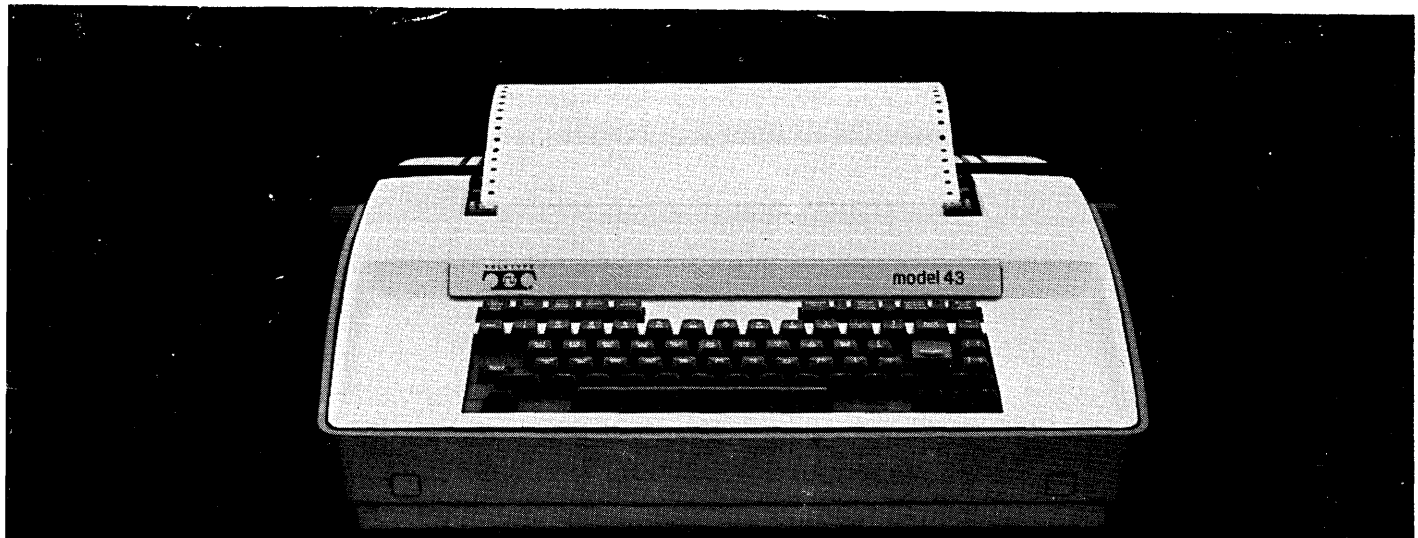

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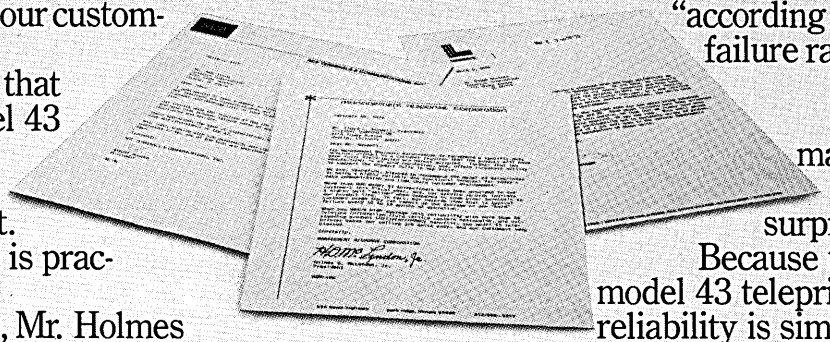

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