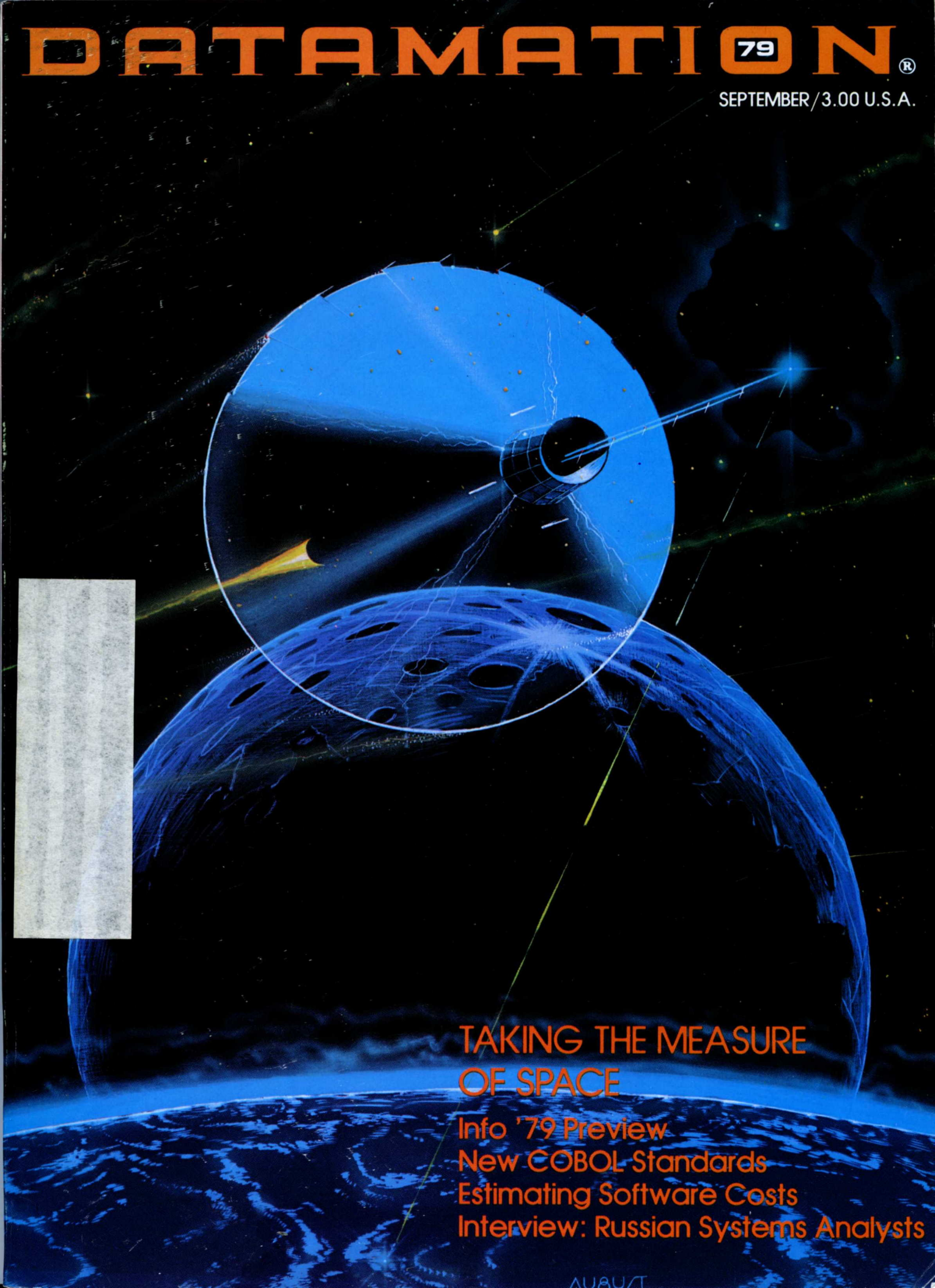
DATAMATION 79®

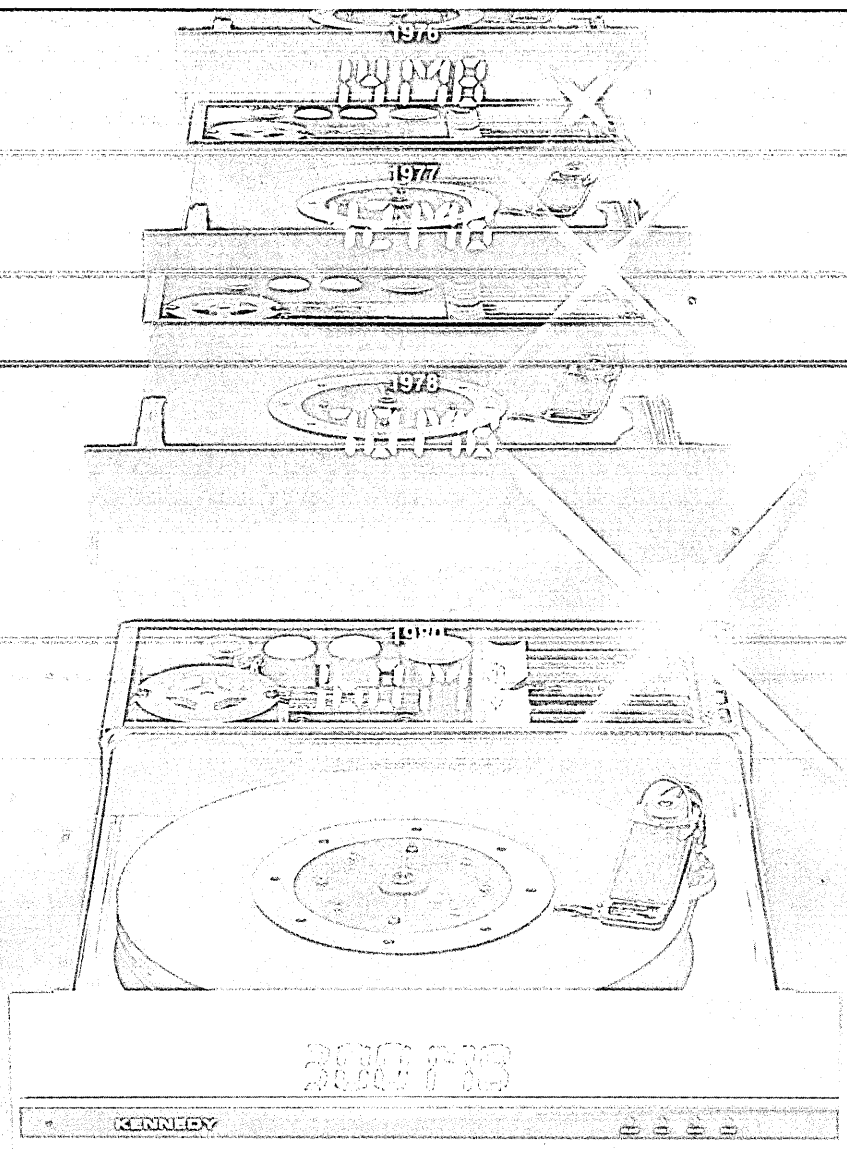
SEPTEMBER/3.00 U.S.A.



TAKING THE MEASURE OF SPACE

Info '79 Preview
New COBOL Standards
Estimating Software Costs
Interview: Russian Systems Analysts

AUGUST



We've only just begun

TECHNOLOGY

Since its introduction in 1976, Kennedy has successfully entered the disk e market with its Series 5800. Currently available in three configura- ns up to 70 Mbytes, Kennedy is committed in providing the industry with a family of devices growing to 300 Mbytes. Because the fixed media Series utilizes advanced Winchester technology it offers low cost of ownership and, of course, Kennedy Quality.

GROWTH

KENNEDY

CIRCLE 1 ON READER CARD

IBM IS ONLY HALF RIGHT.

They tell you—in seminars, magazine ads and TV spots—that today's technology enables the smallest business or smallest big business department to own a computer. And they're dead right.

What they don't tell you is that you can—and should—be doing your word processing on the same system. Frankly, their small business computer doesn't do word processing.

CADO's does.

And not just plain vanilla word processing. But an all new systems approach to text files and their use.

CADO's document-oriented word system lets you prepare or edit text files simultaneously with data processing tasks like billing, payroll, or payables. And CADO's word system lets you merge database records like customer or client files with text files. It automatically inserts names, addresses, balances or other personalized data on letters, forms or collection notices. Pagination, line numbering, page balancing, and global search & replace are all standard features! Communications? Of course.

What's more, CADO includes—free of cost—JUST ASK. It's a simple, English-language method that not only generates your own reports...it defines, enters, and utilizes data files as well!

So, for the first time, you have a system that keeps track of personnel, property, papers, and dozens of other things...writes letters or reports about them ...does it all without knowledge of programming expertise!

Finally, there is CADO software. Your nearby CADO dealer has general accounting packages and specialized industry applications...all on a turnkey basis.

The cost? Just $3.25 an hour which includes: 3 CRT terminals, a typewriter quality printer, and file capacity equivalent to 7.2 million characters of IBM formatted files. Optional high speed line printers and larger disk files are available.

Don't be half right. Write or call CADO now for your free 12-page color brochure on the system that does the whole job...at a price that's 100% right!

CADOSYSTEMS

CADO Systems Corporation
2771 Toledo St. • Torrance, CA 90503 (213) 320-9660

Please rush me a free brochure on the CADO System 20/IV—the information processor designed for the 80's.

NAME _____ TITLE _____

COMPANY _____

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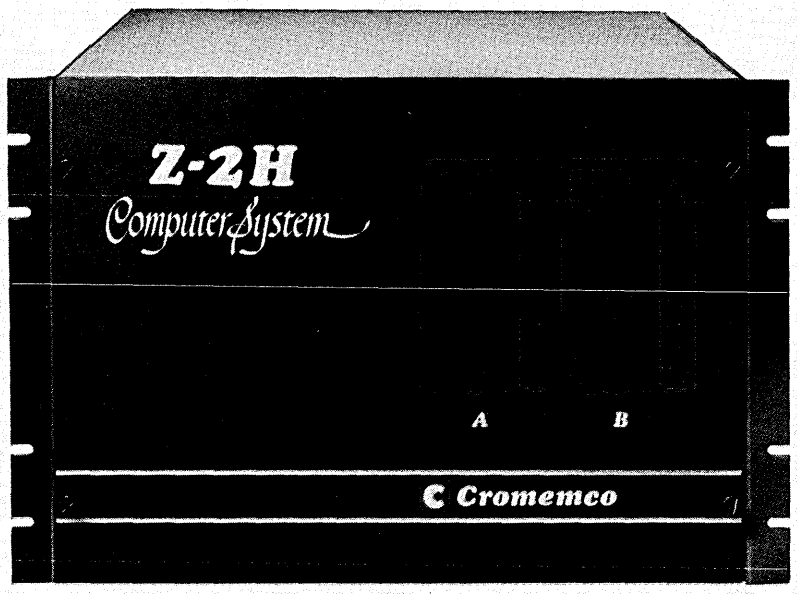


Low-cost hard disk computers are here

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

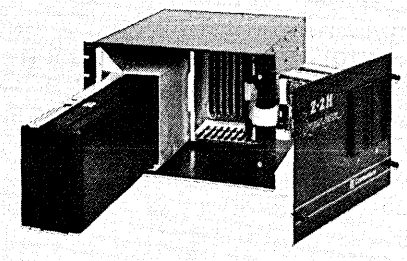
With the Z-2H you also get the broadest software support in the microcomputer field. Software Cromemco is known for. Software like this:

- **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.

Cromemco
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Tomorrow's computers now

CIRCLE 71 ON READER CARD

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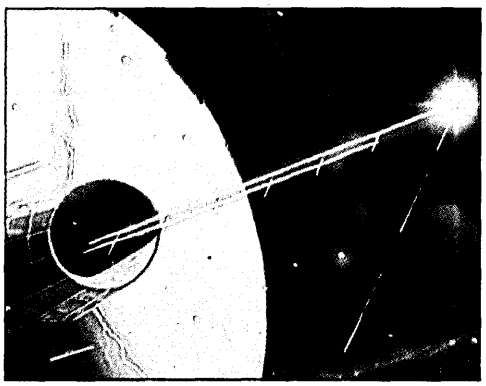
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188


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SYSTEM 2000® MAKES EXCEPTIONALLY GOOD CENTS.

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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☐ Send literature. ☐ I'm in a hurry—have someone call me.

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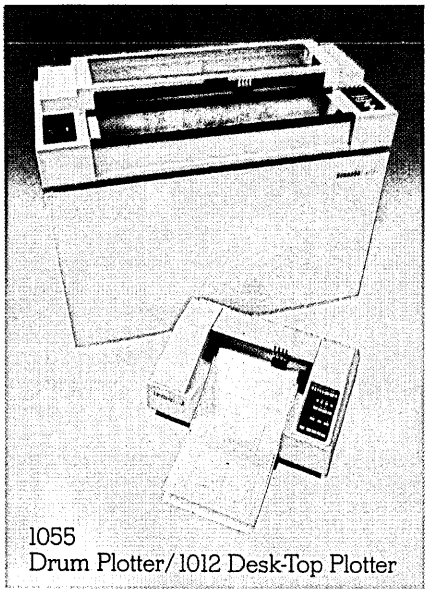
WHATEVER YOUR CALCOMP HAS

Whether your application is a general one like designing, mapping or schematics, or more specialized like 3-dimensional data presentation, structural analysis, contouring, piping isometrics or business charts and graphs, CalComp offers you the broadest line of plotters.

Nobody offers more ways to solve your graphics problems. Continuous roll, belt-bed and flat-bed plotters for cut sheet applications. Computer output to microfilm. On-line to your CPU. Off-line via tape-drive storage devices. And even on-line/off-line with floppy disk storage.

Add our extensive library of applications software packages to complement our operating software and you've got most of your problems solved.



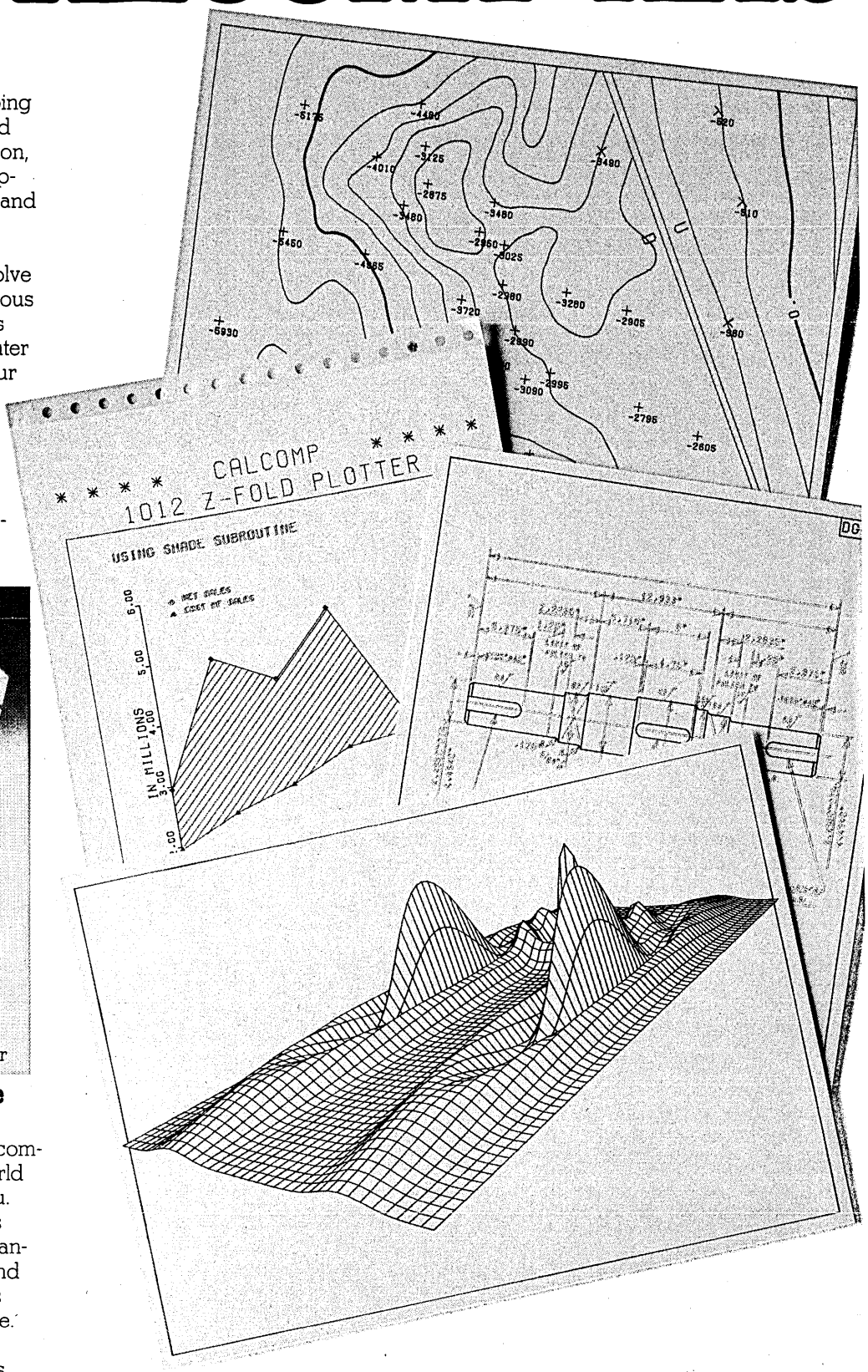
1055
Drum Plotter/1012 Desk-Top Plotter

The best answers come from the best people.

Looking at the broadest line of computer graphics systems in the world may still present a problem to you.

Like choosing which solution is right for your particular needs; planning for growth and upgrades; and making sure your system delivers consistently excellent performance.

That's where CalComp's Sales Force can help. Because our sales



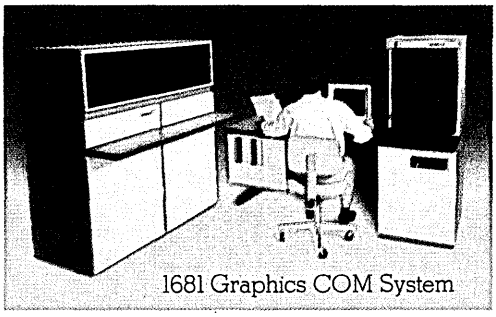
GRAPHICS NEEDS, THE ANSWERS.

representative is really a consultant. In every sense of the word.

They are, each and every one, expert listeners, too. Eager to understand all your special needs.

That's why you can expect in-depth answers to all of your questions. About system capabilities, controllers, software, delivery and more.

You can also expect to hear a lot of discussion about our systems analysts and field service engineers. And what makes them part of a support network that's truly worldwide and second-to-none.

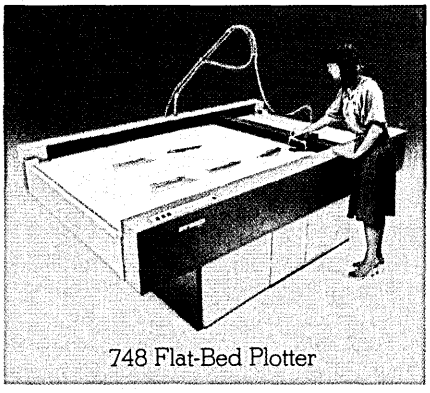


1681 Graphics COM System

At CalComp, part of the right answer is the right people.

At CalComp, hardware's a multiple choice question. Nobody offers a broader choice of answers.

Take our compact 1012 desk-top plotter, for example. You get crisp, clean 8½" x 11" or 11" x 17" size plots



748 Flat-Bed Plotter

at an impressive 10 inches-per-second. Four-pen versatility, and the convenience of Z-fold paper.

For bigger jobs, there are six other precision drum plotters to choose from. Including the largest, our new 1065, with an extra-wide 72" drum that plots at 30ips.

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

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

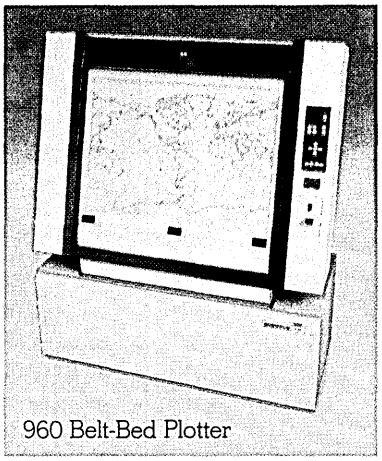
We do some of our best work on film.

Pen and ink plotters aren't all we make at CalComp.

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

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

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



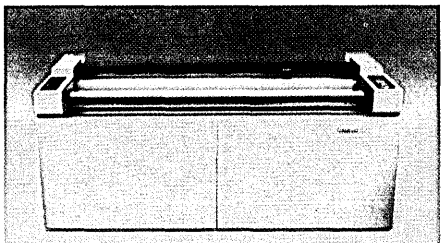
960 Belt-Bed Plotter

Nobody has more experience to draw upon.

CalComp pioneered computer graphics way back in 1960.

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

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



1065 72" Drum Plotter

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CIRCLE 113 ON READER CARD

LOOKING BACK

SEPTEMBER/OCTOBER 1959

The "first known" magnetic film computer memory in operation made its debut at the MIT Lincoln Laboratory in Lexington, Mass.—an event worthy of a cover story. In operation on the TX-2 digital computer, the memory featured a capacity of 32 10-bit words and a read/write cycle time of 0.8 microseconds, consistent with the speed of the computer itself. Bench tests had even demonstrated successful operation at a cycle time as short as 0.4 microseconds. The story pointed out "potential" advantages of a thin film memory over the "familiar" ferrite toroidal core memory: faster cycle time, lower power dissipation, greater compactness, and simpler fabrication. Both the new memory and the TX-2 computer were developed by Lincoln Laboratory under an Air Force contract, with the joint support of the Army, Navy and Air Force.

Meanwhile, the race was on for setting up computer service centers around the country. In a move that was said to have "caught IBM with its guard down," RCA had announced plans to open a series of 501 computer centers. One was operating in Camden, N.J., and a second was expected to open on Wall Street by early 1960. IBM responded by disclosing plans to open 25 to 30 data centers in major cities and stocked with 7070's. IBM said it would open its own Wall Street data center in March 1960. To put things into perspective, a 705 III was moved into Wall Street's Bache & Co. only one month earlier and was said to be "the first big machine on the Big Street."

And the rumor-mill was grinding away this month. Word was out that IBM had a new machine in final product testing, "probably a solid state machine called the 1401, said to be somewhere in the spectrum of the 7070 class." It was also rumored that "RemRand men are talking quietly about some new machines of their own." The prediction was that a solid state Univac III would surface early in 1960.

SEPTEMBER 1969

In 10 years' time, much progess was made in the field of magnetics. A patent had just been issued to researchers at Bell Labs for "a single-wall domain magnetic memory." A story on this breakthrough said these bubble memories "could someday offer a replacement for the magnetic disk." Bell Labs issued the prophetic statement that "much work still remains before these devices can be shown to be practical for use in computer or communications systems." Meanwhile, results of four years' development in the labs at RCA were announced—erasable holograms. "Significance of the new RCA technique," the story said, "is that it could make possible an optical computer memory able to store 100 million bits of data in a film one inch square that could be read out, erased, and reused repeatedly."

Outside the labs, the center of attention was IBM'S new System/3. "The 80-column card's days are numbered" was one conjecture in a story on reactions to IBM'S latest product. Competing manufacturers criticized IBM's "irresponsibility in adding another incompatible medium for data recording." On the other hand, they welcomed "the use of IBM's money" to bring a targeted 25,000 first-time users into the market. "The new user will be locked into the new and different System/3 and will have to buy everything at the company store for some time to come," the story said. "The other manufacturers may get a crack at him by the time he's ready for his third system."

And in Washington, the FCC voted to grant Microwave Communications Inc. a common carrier license, a decision that ended six years of litigation. The ruling would permit MCI to offer microwave private line voice/data service, initially to Chicago, St. Louis and intermediate points. A key concern was said to be whether AT&T would provide terminal loops to connect MCI customers' terminals with the nearerst MCI tower.

Another "milestone" decision came from the U.S. Court of Customs and Patent Appeals, which ruled that a computer program can change an already patented general purpose computer into a special purpose machine eligible for a separate patent. "The ruling clearly established that computer programs can be 'unobvious processes,' an idea that software firms have been trying to sell to the patent office for years," the story said. ✻

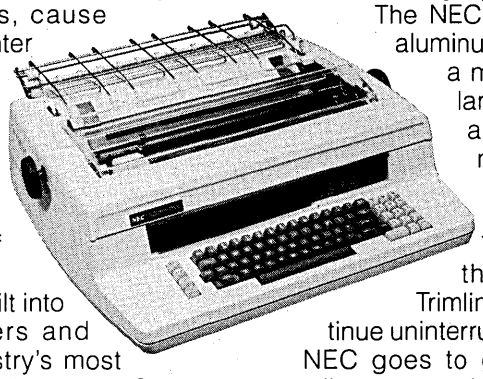
The NEC Static Withstand.

It keeps man-made lightning from knocking out our printers.

People walking on nylon carpet can easily generate thousands of volts of static electricity—enough to knock out mainframes, cause head crashes and create costly printer failures.

Most electronic operations in computer products use only 5 to 10 volts of energy. When someone with high static energy touches such a product, equipment failure can occur unless that energy is siphoned off quickly and safely.

That's why NEC designed and built into its Spinwriter™ character printers and Trimliner™ band printers the industry's most complete static electricity withstand system. Some standard NEC printers have been independently tested with 20,000-volt jolts of static electricity and not missed a single print cycle.



The NEC withstand system starts with an aluminum frame and die-cast cover set—a massive electrical ground. It puts large protective ground planes on all circuit boards and it installs more than 25 ground cables and straps throughout each printer.

The result: a man-made lightning bolt can be dissipated in thousandths of a second, while Trimliner and Spinwriter operations continue uninterrupted.

NEC goes to greater lengths to build better grounding systems into its printer products.

But then, NEC wants to build perfect printers.

Send for our new printer brochures.

NEC. Going after the perfect printer.

SEE US
AT INFO '79
BOOTH #3300

NEC

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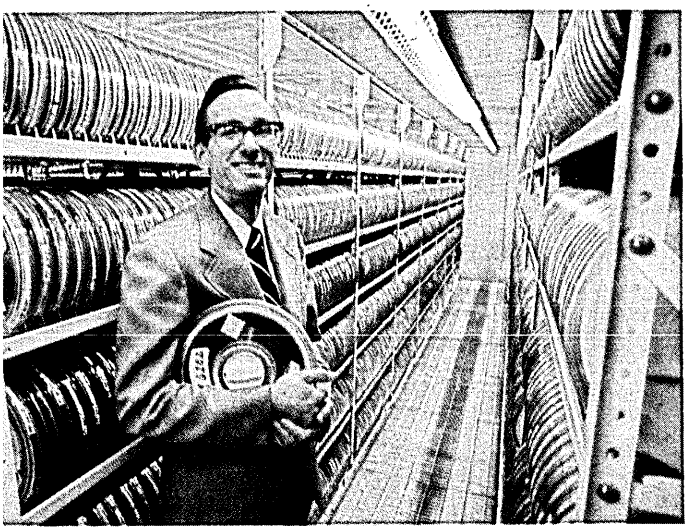
VAX Program Capacity. Ask any user.

"VAX offered us almost three times the address space of our 370/168."

Bill Miller, Senior Systems Analyst
Chevron Geophysical Co., Houston, Texas



Chevron Geophysical is heavily engaged in seismic data processing involving matrix operations on large arrays.

As Senior Analyst Bill Miller states the problem: "Our IBM systems, running on TSS, give 24 bits of true address space—for a maximum program size of 16 megabytes. But only 10 to 12 megabytes of this can be used by the programmer—and our application had grown to the point that TSS was simply cramping us.

"With the VAX-11/780, we know we can have application programs that use a full 32 megabytes as we're configured now—and it could be more if we wanted."

But Chevron didn't buy their VAX without first benchmarking it against the far more expensive 168.

Miller comments: "We developed a number of benchmarks to test specific areas of performance. On the average, the VAX CPU appears to be about a third as fast as the 168, which is really quite impressive. And it's very possible that for certain applications, we may see a negligible loss of throughput over the 168, thanks to VAX's unique page clustering scheme."

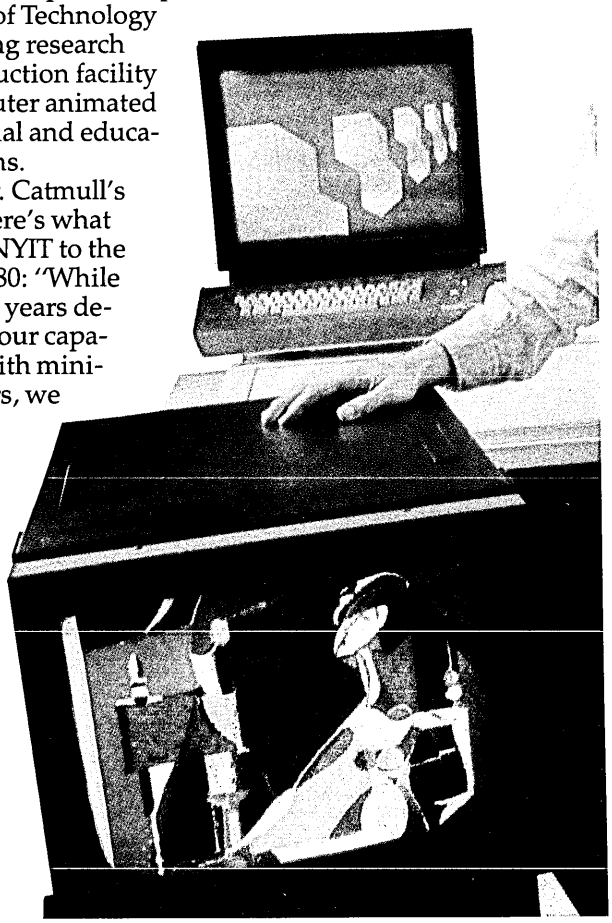
And as far as system performance to date, Miller reports: "The VAX/VMS operating system has been remarkably reliable. The people at Digital have done a phenomenal job."

"VAX's true 32-bit addressing puts its potential capacity so far out, we don't have to worry about it."

Dr. Edwin Catmull, Director,
Computer Graphics Lab
New York Institute of Technology,
Old Westbury, New York

The Computer Graphics Lab at New York Institute of Technology is a leading research and production facility for computer animated commercial and educational films.

In Dr. Catmull's words, here's what brought NYIT to the VAX-11/780: "While spending years developing our capabilities with minicomputers, we



"With a 22,000-point data base, we really needed VAX's huge memory capacity."

Peter Ackermans, Manager of Computer Systems Engineering
CAE, St. Laurent, Quebec, Canada

CAE Electronics Ltd., currently has thirteen VAX-11/780 systems under development for both flight simulation and supervisory power control.

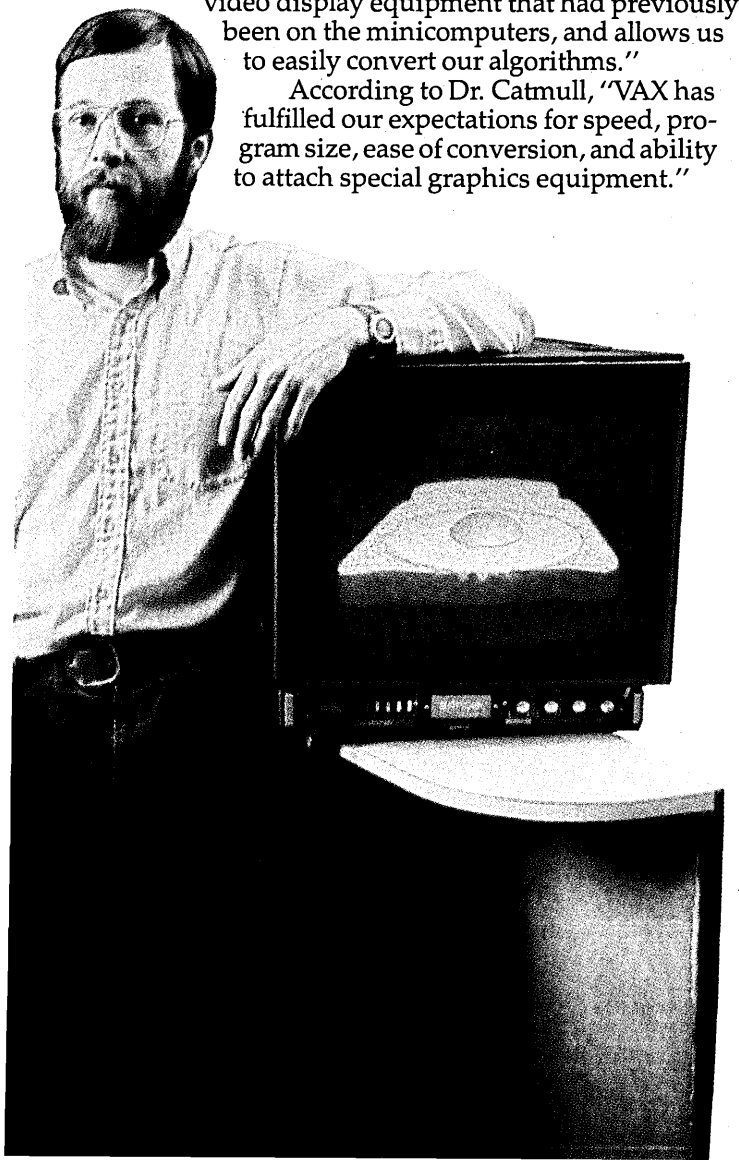
Here again, VAX capacity was key. Systems Manager Peter Ackermans told us: "Our SCADA systems for the power market need to handle a 22,000-point data base. VAX's large memory capacity and the VAX/VMS virtual memory operating system made it a very attractive machine."

But speed was also important. "In flight simulators," Ackermans continues, "top FORTRAN performance is essential, and on that score, VAX measures up well. Our FORTRAN programmers have also been impressed with the machine's debug facility and file handling capabilities."

continually ran into the problem of small address space. Our work demands the large address space we can get with a 32-bit machine. We were dealing with extremely large, randomly accessed data bases, and memory mapping is not the answer."

Dr. Catmull continues, "The VAX UNIBUS lets us easily hook up a wide range of special video display equipment that had previously been on the minicomputers, and allows us to easily convert our algorithms."

According to Dr. Catmull, "VAX has fulfilled our expectations for speed, program size, ease of conversion, and ability to attach special graphics equipment."



Digital's VAX-11/780, with its true 32-bit address space, has set a new standard for program capacity. This means that you can run large programs easily on VAX, with a potential for growth that's unmatched in the industry.

But rather than have us tell you about it, send for our new brochure.

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My application is: ☐ Education ☐ Medical ☐ Laboratory ☐ Engineering ☐ Government ☐ Resale ☐ Other.

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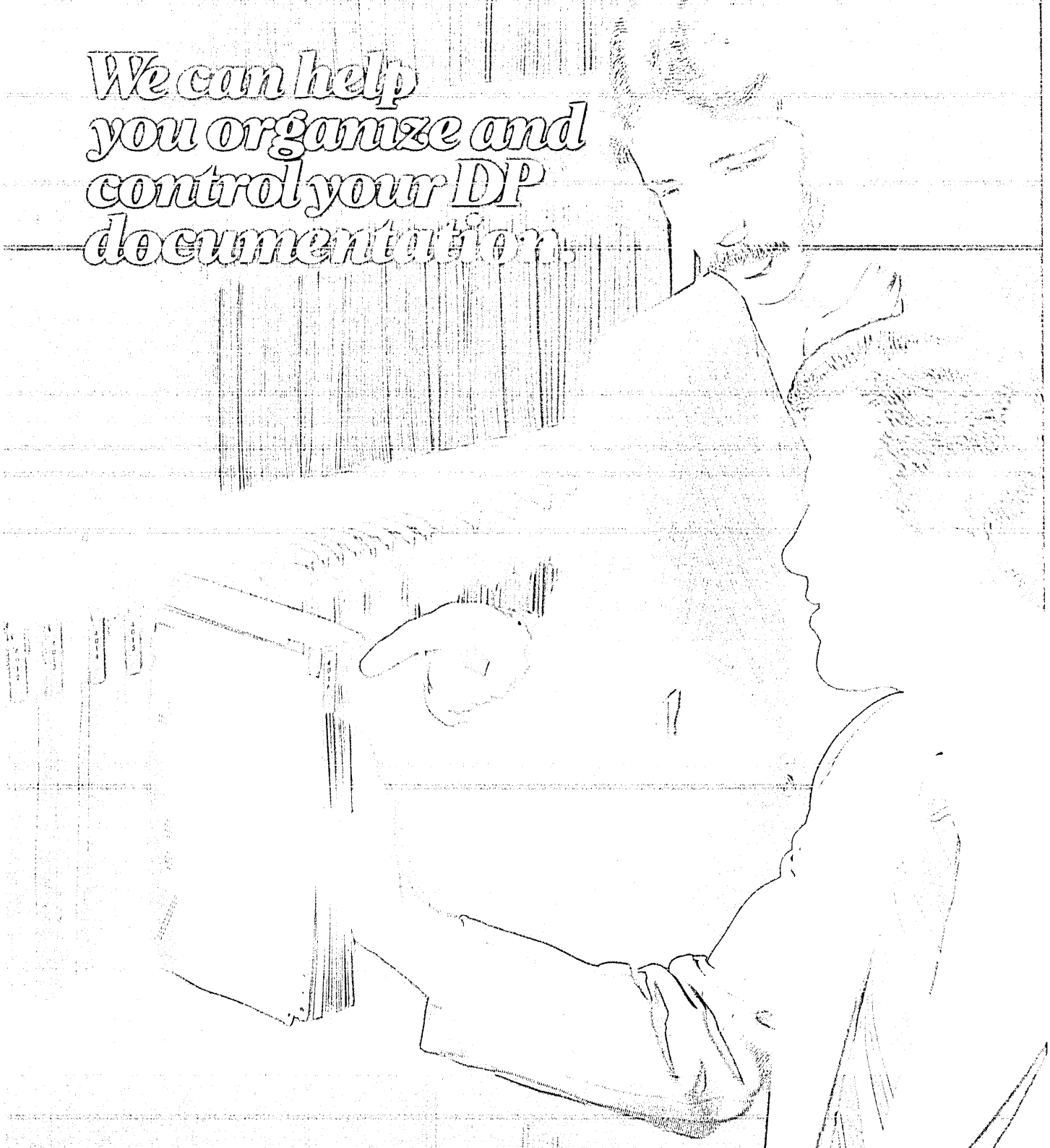
digital

CIRCLE 127 ON READER CARD

We can help you organize and control your DP documentation.



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

Find out about Structured Filing™

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

Structured Concept

Wright Line

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

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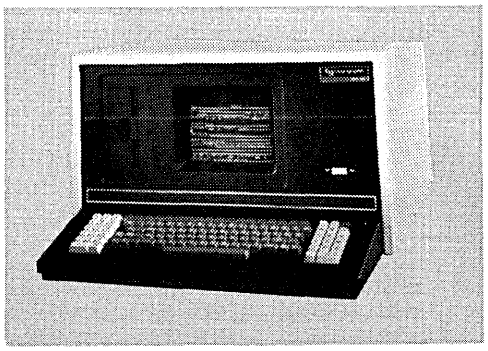
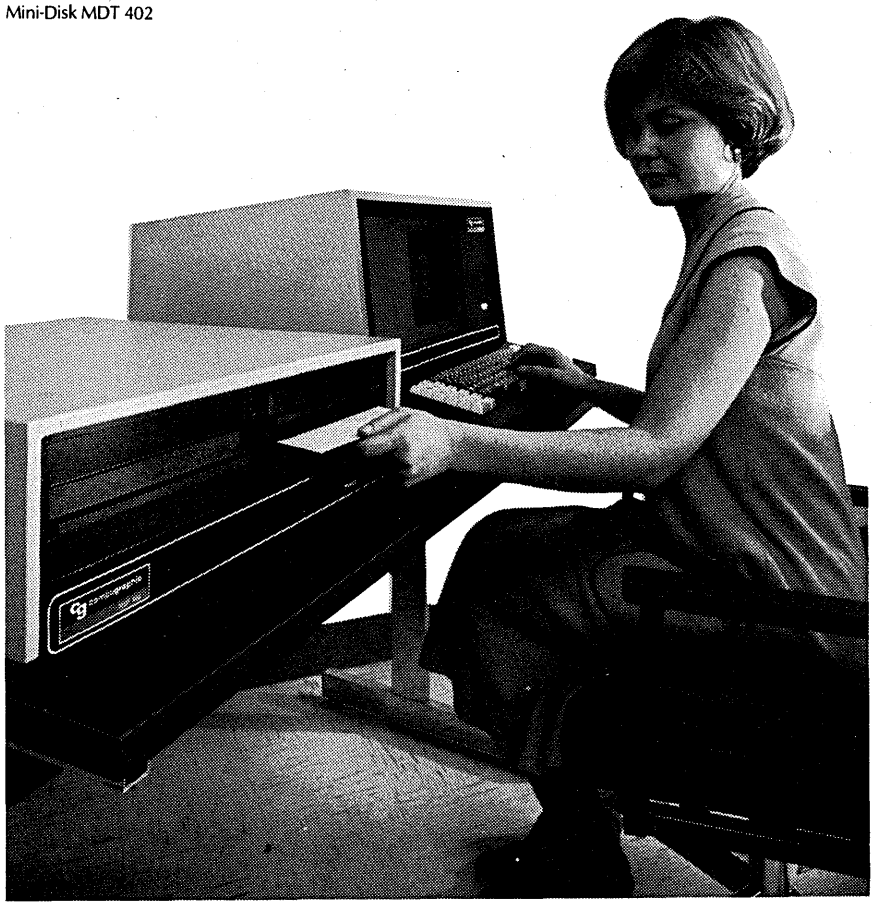
*Mini-Disk MDT 402 list price with 16K RAM Memory, CRT, mini-disk, keyboard, and disk operating system.



Mini-Disk MDT 402



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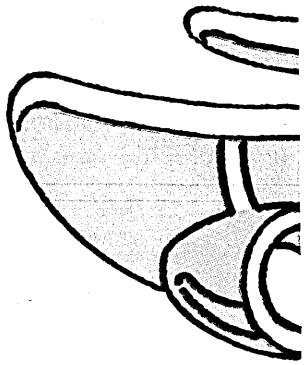
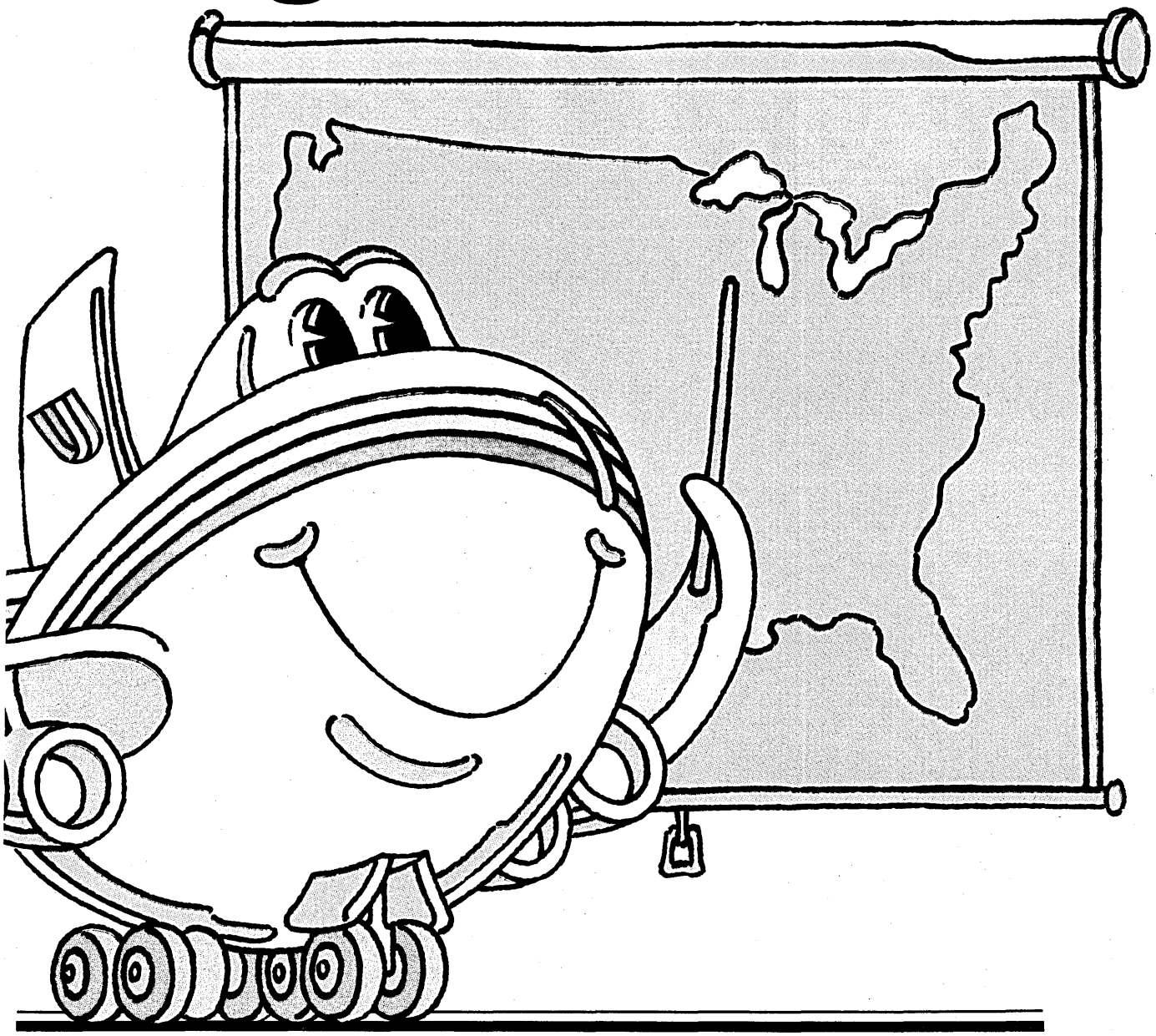


get there soonest? that goes to the most



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

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6400 bpi cartridge magnetic tape.

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

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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.

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CIRCLE 16 ON READER CARD

LOOK AHEAD

TI'S SMALL BUSINESS MACHINE PLANS	Texas Instruments has taken its sweet time developing its latest wonder machine--an innovative small business system which was expected to make a surprise debut at this year's NCC. Now, after a series of organizational and technical setbacks, the secretive company is rumored to be putting the final touches on the system which is expected to be unveiled in the first quarter of 1980. Originally dubbed the SR-70, TI's new small business system may surface as the 99/7, which slots into the high end of the company's personal computer line, or more likely the name will be the 990/1, which would target it as the low end of TI's 990 minicomputer series. The name discrepancies result from the on-going battle between TI's Digital Systems Group and its Calculator Group which formerly honchoed the project. Ironically, the system's development team was transferred to the digital group in Austin from the calculator group in Lubbock the week of the NCC. The move was precipitated by sluggish cpu speed and disk deficiencies (density and access time) which TI felt could be improved by the computer specialists in Austin. TI also wanted a higher quality product than the Lubbock group could deliver. Not surprisingly the system's price tag will be doubled--to $10K from the $5K speculated earlier (April, p.17).
MORE NEW MACHINES FROM IBM	IBM is reported ready to unveil two new products -- System/36 out of General Systems Div., and the 3033-D (also dubbed the Newport) out of Data Processing Div. The latter machine should be out early in October and sell for below $2 million with two megabytes. The /36 is also slated for introduction either this month or in October, GSD's delays with the sister machine, the /38, notwithstanding.
COMPLETE PORTABLE ENTRY	MSI Data Corp. is readying for a November introduction, a family of program-loadable, multi-application two-way communications terminal systems. The company, a leader in the hand-held data entry terminals calls its upcoming offerings its "Omega Concept." Said Donald Brosnan, MSI president, the concept "expands the horizon of our hand-held data terminals beyond their traditional role as order entry and inventory-taking devices to a point where the user can design an application terminal for a specific job and expand and enhance that terminal's capabilities as requirements grow and change by simply adding any of a whole new series of plug-in modules.
BEATING BELL TO THE PUNCH WITH ACS	When AT&T introduced its Advanced Communications Service (ACS) one of its cornerstones was a transport network that promised compatibility with all major types of terminals. While ACS remains a hopeful dream for network users, Tymnet has introduced a service that sounds like a page out of the ACS textbook.

Tymnet's packet-like network will support IBM 3270 terminal applications using special software in the net's intelligent processor "engines," already installed in most major cities. Moveover, it will allow asynchronous ASCI terminals such as teletypewriters and low cost crt's to access the same 3270 applications. This is a real advantage for users who need low volume access to a 3270 application but would like to avoid the cost of the higher priced IBM display. Last, but not least, the service will allow direct terminal access to multiple 3270 hosts and multiple 3270 applications via the Tymnet network.

For users with 3270 polled applications three interface methods will be offered. The network will handle polling when X.25 or asynchronous interfacing is used. For bisynch interfaces, the customer's host will do the polling. All this means greater flexibility for the customer who now has the option of replacing private line circuits with less costly public network data links. The 3270 service will introduce Tymnet terminal support at the higher data speeds of 4800 and 9600 bits per second. Industry sources report that a 4800 bit per second circuit would cost $150 per month per cpu port, plus $40 per terminal. At 9600bps the cost would be $250 per cpu port with the same charge of $40 per terminal. Network transmission costs will stay at three cents per 1,000 characters transmitted, the sources say, the same rate charged Tymnet 1200bps customers.

The rates are subject to FCC approval but Tymnet feels it will get the regulatory OK, barring any unforeseen objections to the tariff. All this is very frustrating to AT&T officials who are anxiously waiting for a firm date when a basic first phase of ACS could be operational. Based on what its competitors are doing now, ACS could be a full software generation behind when it gets rolling in the early '80s.

OLIVETTI JOINING AMDAHL-MEMOREX TALKS?

There are rumors in Italy that the current two-way merger talks between Amdahl and Memorex may become three-way with Olivetti completing the triangle. Olivetti's only reply was "No comment," although it is known to have been talking with Amdahl on a "commercial venture" for several months (p. 110) and in March signed a technology cooperation agreement with Memorex. So far, the Italian company has not confirmed current rumors that it is planning to reenter the mainframe market in its own right, although a deal to sell Amdahl systems has been expected. Olivetti's earlier attempt at mainframes with its Elea 6000 was aborted in the middle 1960s when General Electric bought out its computer division.

The "merging of interests" with the two U.S. companies would be part of a long and deep transformation of Olivetti by its two new top men, the deBenedetti brothers, Carlo and Franco. Carlo, the financial whiz kid, has now assured Olivetti's long term cash position by securing multi million dollar loans with international banks. Franco is heading a new technical push that will see the company's debut in large minis over the next three years, as well as a new portfolio of dp products. Olivetti's internal estimates

(continued on page 85)

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.

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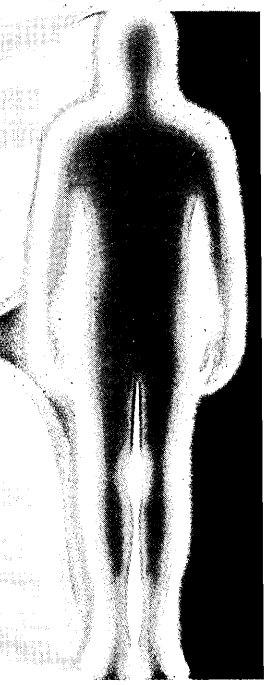
MARK IV Release 8 is a new Implementation System from Informatics. It is a working tool. A system specifically designed to expand the problem-solving power of the human mind.

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

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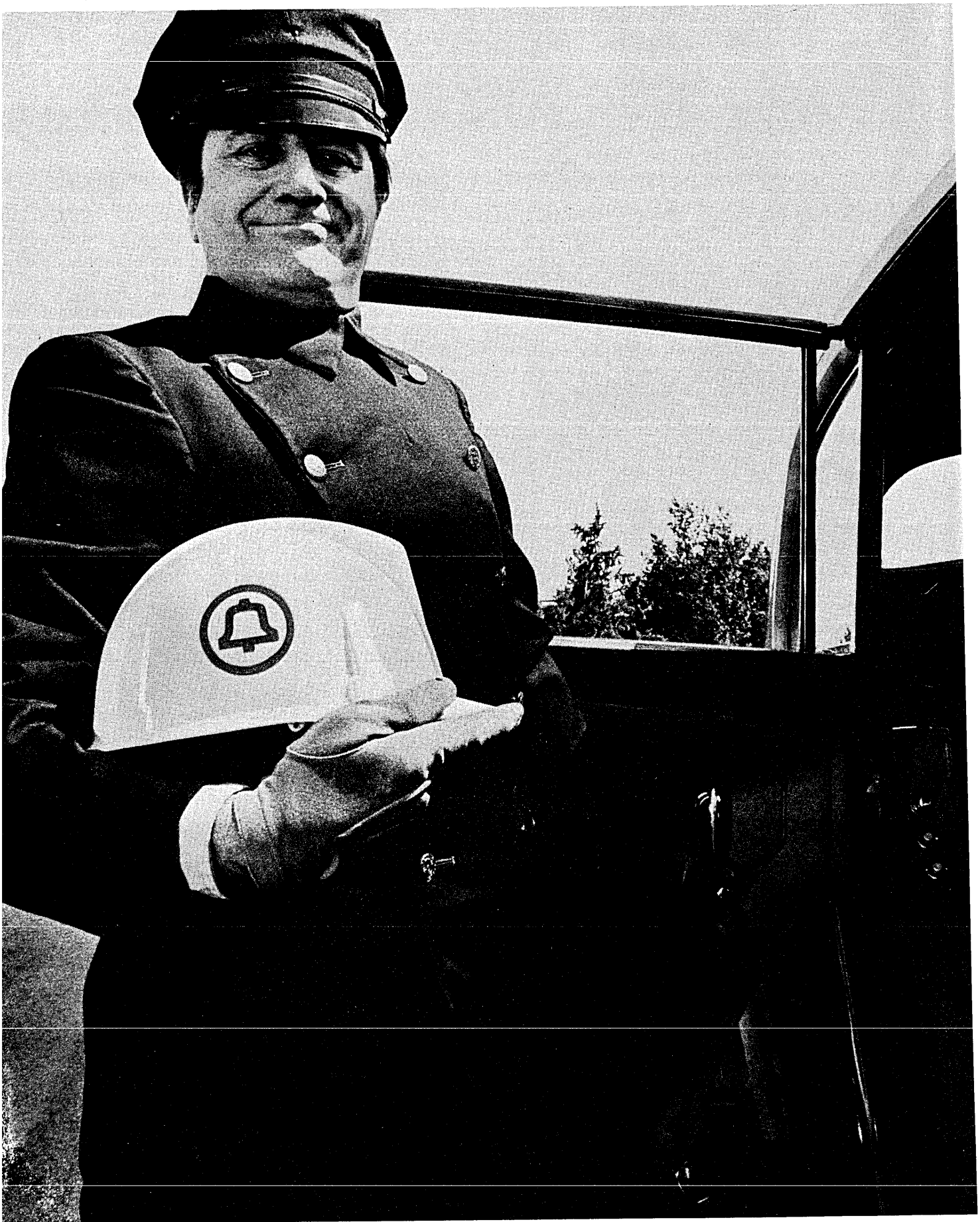
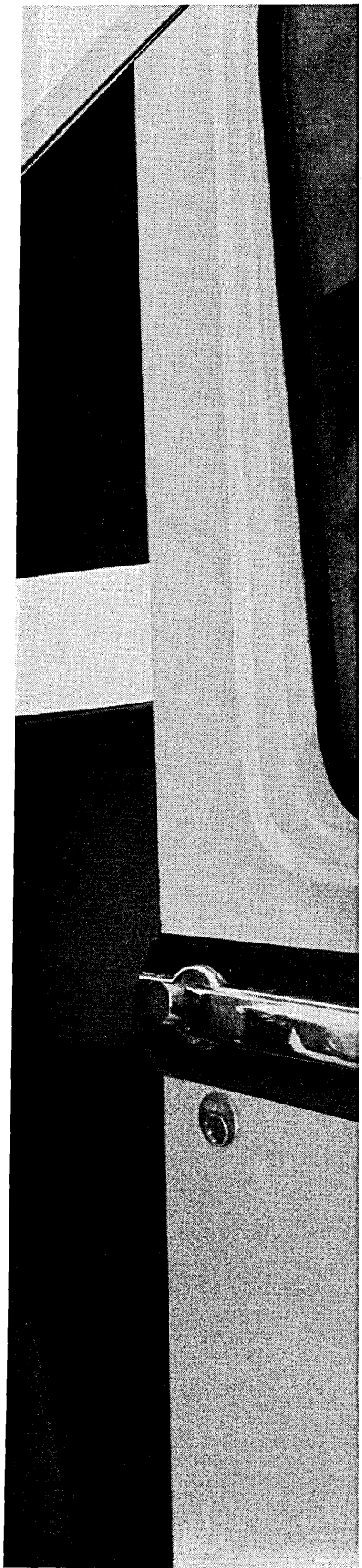
REMOTE PROCESSING SERVICES SECTION

CIRCLE 25 ON READER CARD

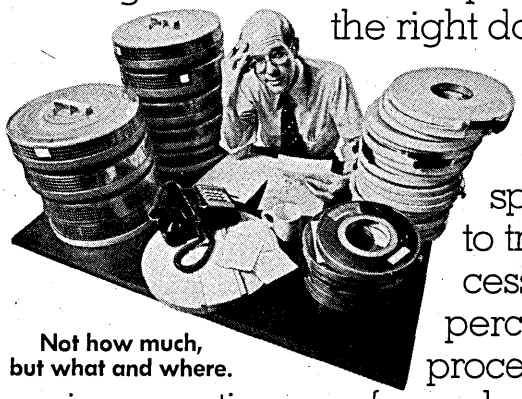
24-hr. data pick-



up and delivery.



Problem Data is one thing there's no shortage of. The business problem today is getting the right data to where it's needed in a form that's useful.



Not how much, but what and where.

In fact, American businesses are now spending nearly as much to transmit data as to process it. And as much as 40 percent of the nation's data processing capability is tied up in operations performed solely for the purpose of transmitting the data.

Solution We at the Bell System have conducted many-faceted studies of the data communication needs of our customers. And we've developed systems to meet those needs.

Consequently, today, whatever your concern—multipoint inquiry-response or order entry; credit, inventory, or payroll; analog or digital; large-scale or small—we have a solution.

There are Bell System communications specialists for every sector of industry, ready to advise you. And there's equipment covering broad degrees of sophistication, all backed by the incomparable Bell System maintenance staff—230,000 strong.

If you haven't talked systems with your problem-solving Bell Account Executive lately, your firm is missing something. In voice, data, and network services.

Fast, versatile, reliable Dataspeed® 40 terminal.

The system is the solution.

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All TP monitors are not created equal.

ADR's DATACOM/DC has five features no one else can match.

DATACOM/DC is the only TP monitor in the world that offers so many exclusive features: Video masking with powerful data editing. Automatic storage management. Consistent, easy-to-learn programming conventions. Unlimited growth capability without rebuilding or redesigning. User view facility which accommodates new applications while preserving the integrity of those already operational.

Powerful video masking. Screen formats can be created online and fields can be extensively edited. The field data is appropriately justified and decimal adjusted and each field is edited for presence, data type, value range, check digit, etc. Programmers are relieved of the time-consuming effort of data editing and housekeeping, thus making them more productive.

Complete environmental management. DATACOM/DC manages all online resources, including memory, disks, terminal devices, and tapes. It provides all communications line handling, terminal polling, message transaction, screen paging, message framing, task orientation and termination, program check, loop control facilities, and transaction restart. It supports over 30 terminal types including 3270s and teletypes.

Flexible programming conventions. Programs may be written in such high-level languages as COBOL, PL/1 and FORTRAN, and Assembler Language. No precompilers required, no unusual coding conventions to learn. An application written under one IBM operating system can be used with any other IBM operating system without source code changes.

Operates on DOS/VS through MVS. Now operating in hundreds of sites worldwide, DATACOM/DC runs under DOS, DOS/VS, DOS/VSE, MFT, MVT, VS1, SVS, MVS, and VM. Hardware environments range from a 360/30 or 370/115 to an Amdahl 470/V7 or 370/168 and from 3 to 3000 terminals on a single computer.

Multiple interfaces. DC supports all disk storage devices available for IBM 360/370/303x/43XX and all standard file access methods. It interfaces to DBOMP and many data base systems, including DATACOM/DB, written by ADR to provide the best DB/DC system. Additional interfaces with DATADICTIONARY, DATAENTRY, DATAQUERY, VOLLIE, and The LIBRARIAN/Online make DATACOM/DC a part of the most comprehensive set of software tools available anywhere.

ADR. The leader in Datapro Software Awards 1977 and 1978 for IBM 360/370 products. Over 10,000 products installed.

Please send information on:

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- ☐ **DATAQUERY**™ for data base retrieval
- ☐ **DATAREPORTER**™ for data reporting
- ☐ **DATAENTRY** for online data entry
- ☐ **DATASECURE**™ for privacy and protection

Other ADR products:

- ☐ **VOLLIE**™ for online DOS/VS program development
- ☐ **ROSCOE**® for online OS program development
- ☐ **On-line ETC**™ for all your word processing needs
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- ☐ **LOOK**® for real-time performance measurement
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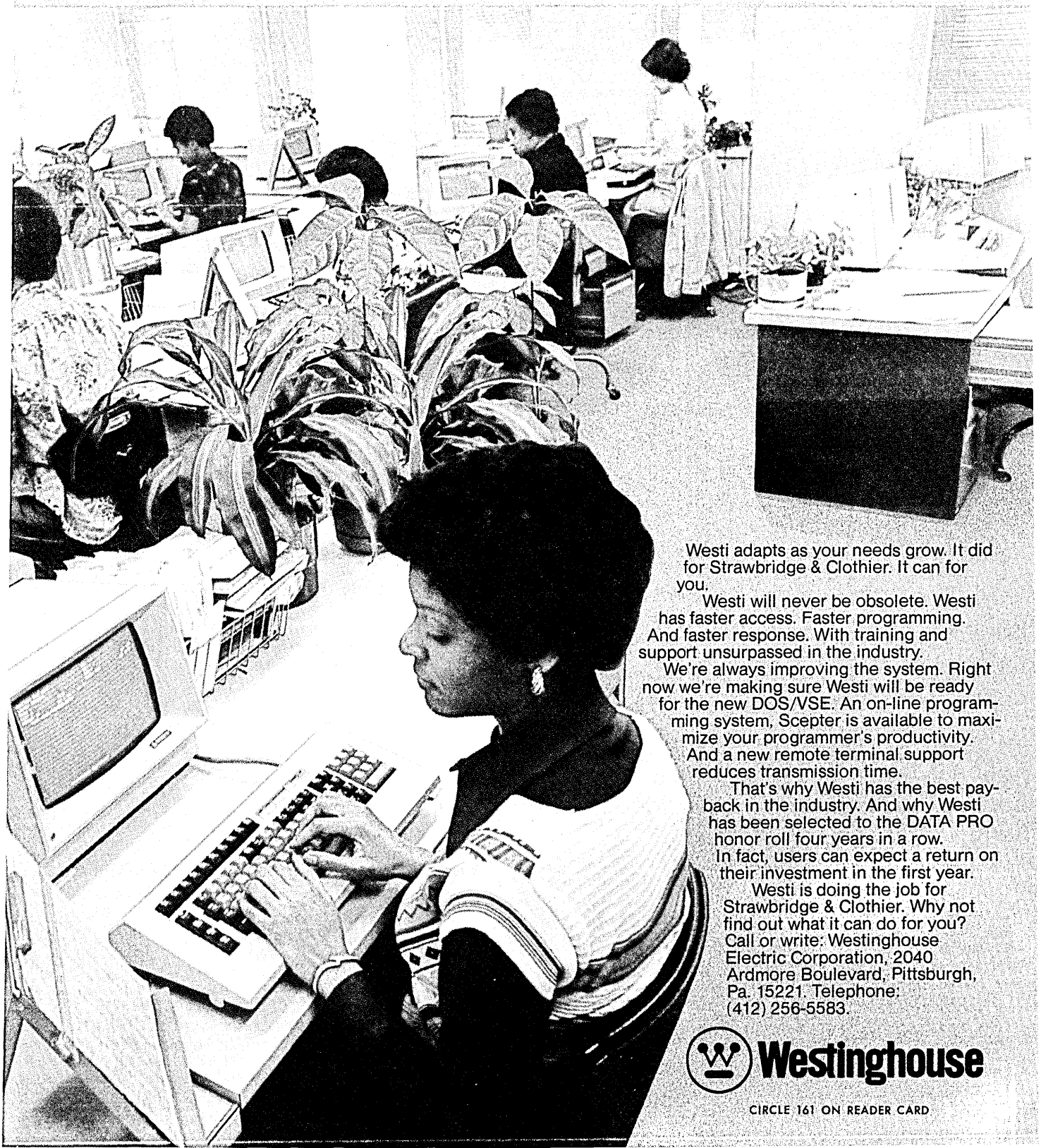
"Since installing Westi, our TP network has grown from four 3270 local terminals to 70... with 15 mini-computers and 1,000 point-of-sale terminals. Our response time has remained excellent."

Bruce Kullman
Data Processing Manager
Strawbridge & Clothier



Westi adapts as your needs grow. It did for Strawbridge & Clothier. It can for you.

Westi will never be obsolete. Westi has faster access. Faster programming. And faster response. With training and support unsurpassed in the industry.

We're always improving the system. Right now we're making sure Westi will be ready for the new DOS/VSE. An on-line programming system, Scepter is available to maximize your programmer's productivity. And a new remote terminal support reduces transmission time.

That's why Westi has the best payback in the industry. And why Westi has been selected to the DATA PRO honor roll four years in a row. In fact, users can expect a return on their investment in the first year.

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Westinghouse

CIRCLE 161 ON READER CARD

CALENDAR

OCTOBER

SIGSMALL '79, October 1-3, Dallas.

At the second annual Symposium on Small Systems, papers will be presented on business and industrial applications of microprocessors, small systems applications in entertainment and education, distributed processing with small systems, and mini and micro software advances. Contact Dr. Fred Maryanski, Computer Science Dept., Kansas State Univ., Manhattan, KA 66506.

1979 International Conference on Cybernetics and Society, October 8-10, Denver.

Sponsored by the IEEE Systems, Man and Cybernetics Society. The main theme is modeling and applications of world systems in areas relating to energy, environment, economics, technology, biocybernetics, pattern recognition, man-machine and system science. Contact Dr. James D. Palmer, (202) 426-4461.

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

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

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

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

INFO 79, October 15-18, New York.

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

ASI Conference, October 30-31, Chicago.

Data processing, office automation, resources from space, the economy, and a wide variety of training and management issues are to be addressed by 18 speakers at the 11th Anniversary Professional Training Conference sponsored by Advanced Systems, Inc. For further information contact Conference Coordinator, Advanced Systems, Inc., 2340 South Arlington Heights Road, Arlington Heights, IL 60005, (312) 981-4283.

Interface West, October 30-November 1, Anaheim.

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

NOVEMBER

COMPSAC 79, November 5-8, Chicago.

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

Federal Computer Conference and Exposition, November 7-9, Washington, D.C.

Over 6,000 attendees were present at the first Federal Computer Conference last November. A seminar on federal adp marketing for vendors is planned for Wednesday afternoon, Nov. 8. The seminar will cover procurement regulations; market and usage information about government use of hardware and software, as well as time-sharing and services; the role of the GSA; and the federal marketing structure, with emphasis on intra-agency relationships and key policy committees. Contact the Federal Computer Conference, P.O. Box 368, Wayland, MA 01778, (617) 358-5181.

Canadian Computer Show, November 13-15, Toronto.

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

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

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

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

Sponsored by the California Educational Computing Consorti-

OHIO SCIENTIFIC DOES IT AGAIN

Ohio Scientific has taken its standard Challenger III computer and married it to the new Shugart 29 Megabyte Winchester Drive. The result is the C3-C. This new microcomputer now fills the vacuum that existed for computer users who need more mass storage capability than floppies can offer – yet until now, could not justify the additional cost of a larger capacity hard disk computer such as our C3-B 74 Megabyte disk system.

Winchester Technology
Winchester hard disk drives offer small business and professional computer users the logical solution to mass storage problems that are beyond the capability of floppy disks. In addition, Winchester disks feature a track seek-time that is much better than floppies and because they spin at eight times the rate of floppies, Winchesters have a shorter latency. Both of these points reflect one remarkable speed advantage Winchester disks have over floppies.

Coupled to the Challenger III Computer
Ohio Scientific's award winning Challenger III computer is a classic. It is the only computer series that utilizes the three most popular microprocessors – 6502A, 68B00 and Z-80. This tremendous processor versatility enables one to utilize a seemingly endless selection of quality programs available from Ohio Scientific's software library as well as from many independent suppliers.

And Advanced Software
For instance, there are single user, multi-user and network operating systems. A complete turnkey small business package, OS-AMCAP provides accounts receivable, accounts payable, disbursements, cash receipts, general ledger, etc. OS-CP/M offers a complete FORTRAN and COBOL package. And there is WP-2, a complete word processing system. For information management, OS-DMS, features an advanced file handling system and program library that simplifies information storage and recall and routinely performs tasks which usually require special programming on other systems.

Yields the Microcomputer of the Future
With an eye toward the future, the C3-C, like all other Challenger III's was designed with provisions for future generation 16 bit microprocessors via plug-in options.

There are ten open slots for lots of I/O and multi-user operation. Truly, the Ohio Scientific C3-C is a computer with a future.

The new C3-C computer with 29 Megabyte Winchester Hard Disk.

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The network is accessible via low speed ASCII terminals operating up to 1200 baud. And high speed 2780/3780 compatible terminals operating up to 4800 baud.

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It starts with a central processor, the IBM 3033, operating under MVS.

It has a wide range of disk and tape storage facilities.

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Also available are useful development tools like file management and data base management software.

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um (CECC). For further information contact Ron Langley, Director, Computer Center, California State University, Long Beach, 1250 Bellflower Blvd., Long Beach, CA 90840, (213) 498-5459.

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

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

DECEMBER

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

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

The 18th IEEE Conference on Decision and Control, December 12-14, Fort Lauderdale.

For further information contact Ron Hackney, Pratt & Whitney Aircraft, Palm Beach Gardens Facility, Mail Stop R23, West Palm Beach, FL 35402, (305) 840-4000.

JANUARY

The Sixth Semiannual ATE Seminar/Exhibit, January 8-10, 1980, Pasadena, Calif.

For further information contact Sheila Goggin, Coordinator, ATE Seminar/Exhibit, 1050 Commonwealth Ave., Boston, MA 02215, (617) 232-5470.

Invitational Computer Conference, January 15, 1980, Orange County, Calif.

New developments in computer and peripheral technology such as Pascal-based systems, "two-page" printers, streaming tape drives, microprocessor-controlled floppy drives and eight-inch Winchester disks will be featured. For further information contact B. J. Johnson & Assoc., 2503 Eastbluff Dr., Suite 203, Newport Beach, CA 92660, (714) 644-6037.

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

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

WINCON 80, January 29-31, 1980, North Hollywood, Calif.

More than 500 scientists and engineers from government, military, and industry will attend the three-day meeting to probe

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The North Star Horizon now delivers quad capacity by using two-sided recording on our new mini drives! That's 360,000 bytes per diskette! A four drive North Star system accesses over 1.4 megabytes of information on-line! Think of the application flexibility that so much information storage can give you!

North Star has quadrupled the disk capacity of the Horizon computer but prices have increased a modest 15 percent. On a dollar per byte basis, that's a bargain that is hard to beat!

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North Star Horizon OEM Prices (includes 32K RAM, one parallel and two serial I/O ports),* assembled, burned-in and tested:

Horizon-1-32K-Q	$1645
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Horizon-1-32K-D	$1485
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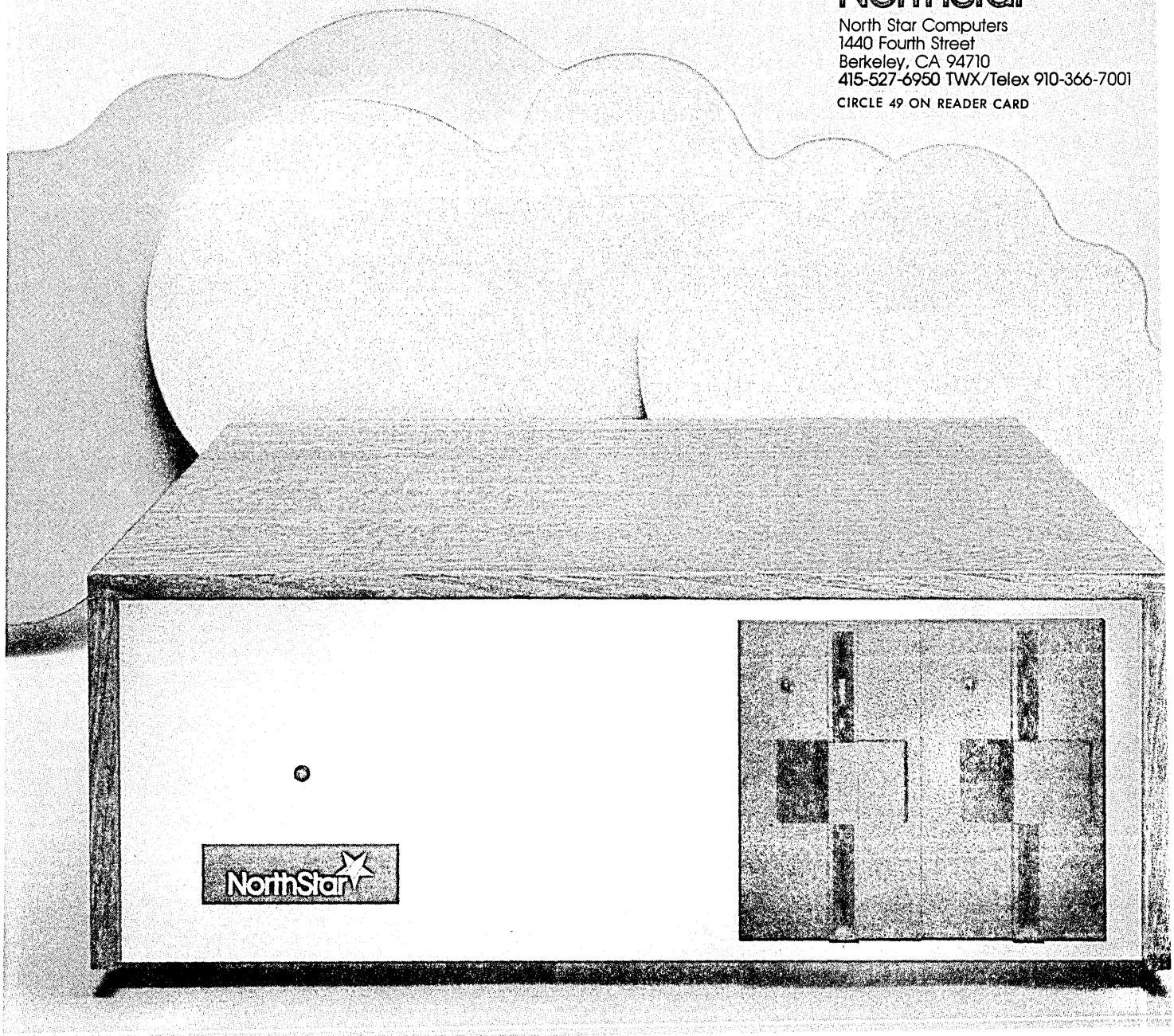

FAIRCHILD

A lot of Fairchild thinking went into the world's most powerful computer.

A passion for building faster and faster computers led Cray Research into producing the Cray-1. This uniquely designed supercomputer is four times faster than anything built before it. And it's winning out against tough competition from some of the biggest names in the industry.

When Cray needed high-speed memories and logic for the Cray-1, they came to Fairchild. They knew we had everything it takes to help them build the highest-performance computers.

That's because Fairchild has grown up with the computer industry. We've been developing and delivering semiconductor components that have kept us on the leading edge of technology since its beginning. And we plan to stay there.

A quarter of a million chips of logic went into the Cray-1. Plus another seventy-three thousand memory devices. With the help of Fairchild logic and memories, the Cray-1 can process information much faster, while using much less power.

Thanks to Cray, the industry has a new supercomputer with a standard of performance that puts it in a class by itself. Thanks to us, the world's fastest computer has superior logic and great memories. We can do the same for you. And whatever else it takes to help you make a better computer.

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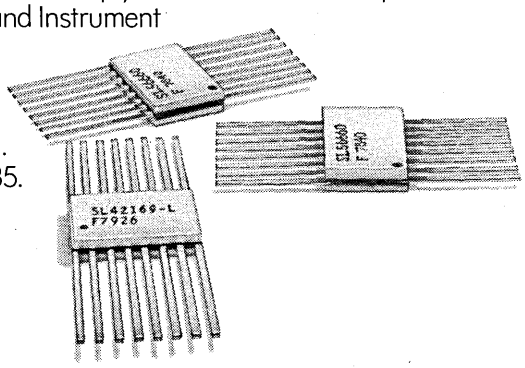

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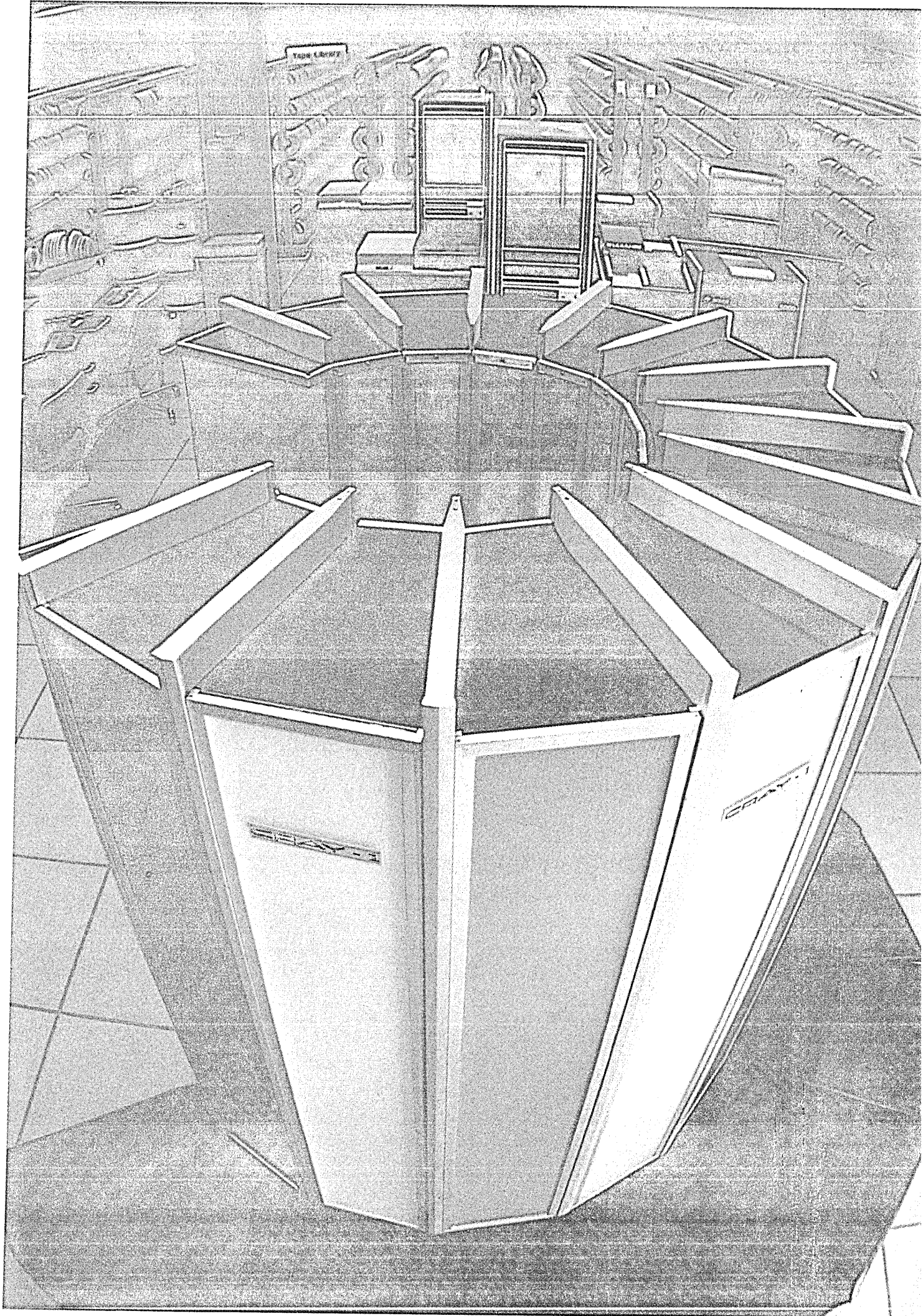
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FEBRUARY

COMtec, February 26-29, 1980, Atlanta.
Topics covered will be alphanumeric COM, scientific graphic COM, and commercial and in-house micro publishing. For further information contact Computer Micrographics Technology, 290 Fischer Ave., Costa Mesa, CA 92626, (714) 545-7676.

MARCH

Conference on Application Development Systems, March 9-11, Santa Clara.
For further information contact Mitch Zolliker, IBM Research, San Jose, CA 95121 (408) 256-7582.

MAY

The Seventh International Symposium on Computer Architecture, May 6-8, La Baule, France.
For further information contanct Jacques Andre, Campus de Beaulieu. Avenue du General leclerc, 35042-Rennes Cedex, France (99) 36 48 15.

CALLS

Papers are solicited for the Tenth International Symposium on Multiple-Valued Logic to be held in Evanston, Ill. on June 3-5, 1980. The conference is co-sponsored by the IEEE Computer Society and Northwestern Univ. The meetings will be held in the Norris Univ. Center. Authors are invited to submit four copies of papers on any topic in multiple-valued logic to: Anthony S. Wojcik, Dept. of Computer Science, Illinois Institute of Technology, Chicago, IL 60616, (312) 567-5150. Papers should be double-spaced on a maximum of 20 pages. Deadline: Dec. 1, 1979.

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

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

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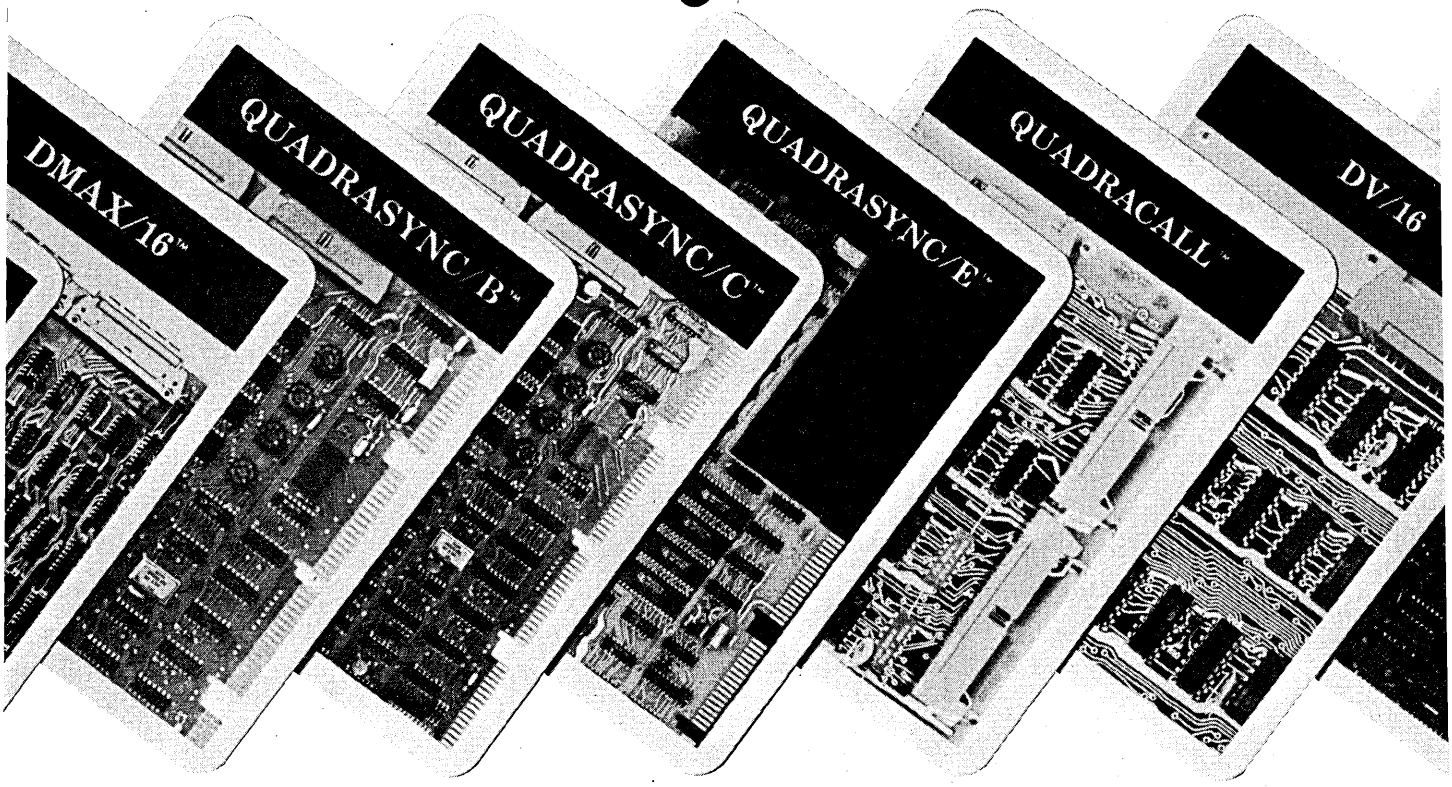

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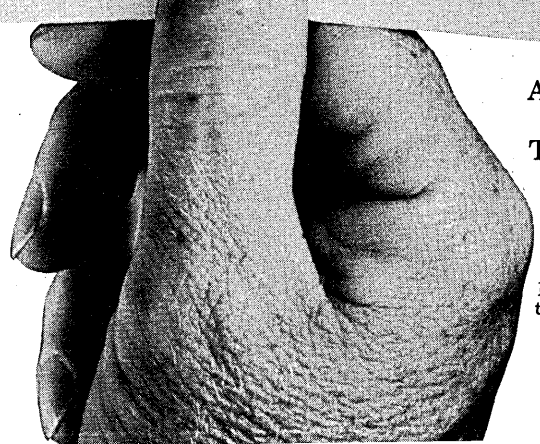

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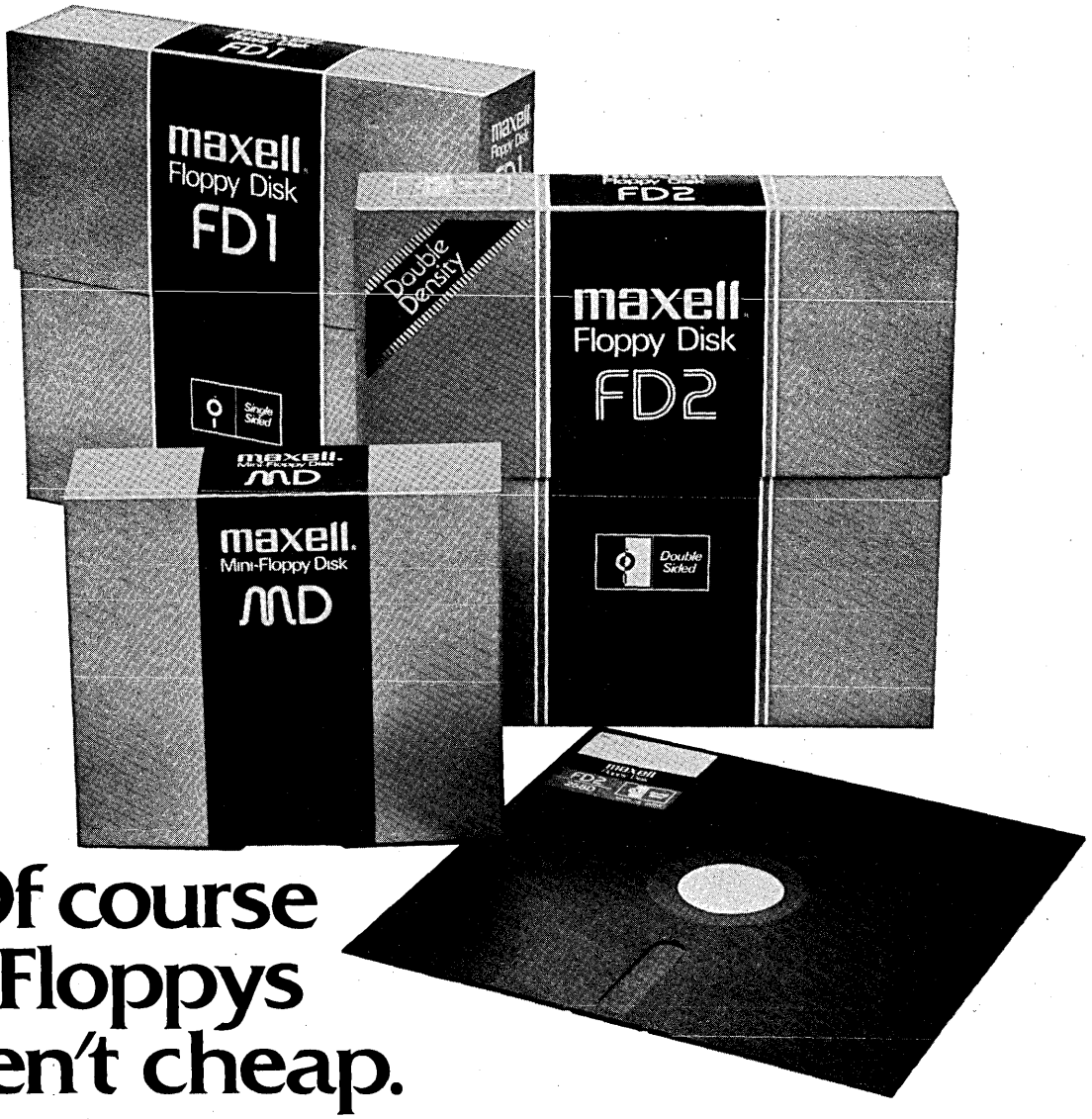

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It's no use trying to hide the fact: Maxell Floppy Disks give you the finest quality you can buy no matter how much you spend. And more and more of you are agreeing that your data is worth our perfection.

Our floppys work better with your drive.

Naturally, our floppys conform to ISO and IBM specifications. More important, they have also been approved by major OEMs, the people who recommend only those few floppys they are certain will work best with their hardware. So although we obviously don't know which drive system you are using, it makes no difference. Maxell Floppy Disks are so good they actually work better with *any* drive.

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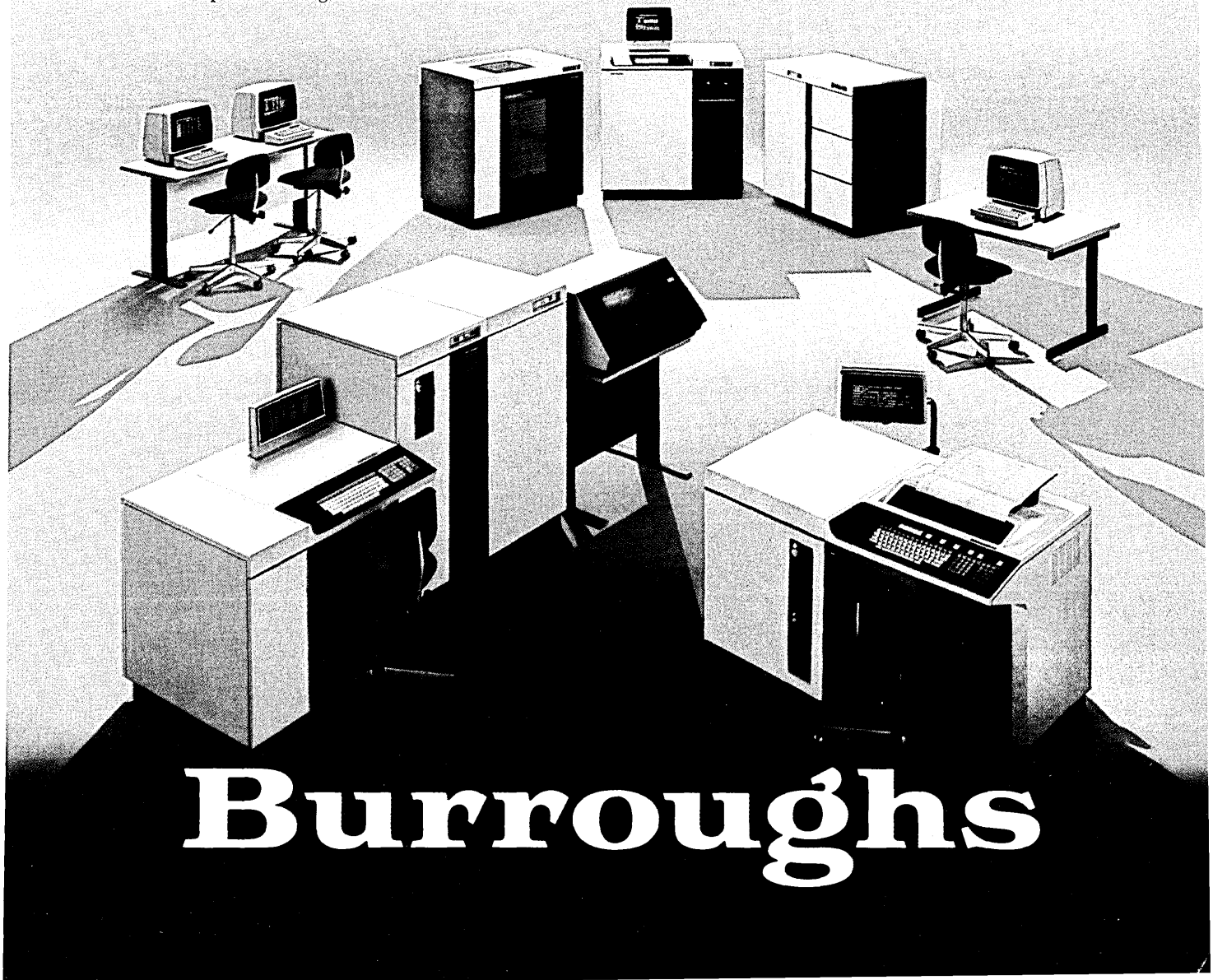

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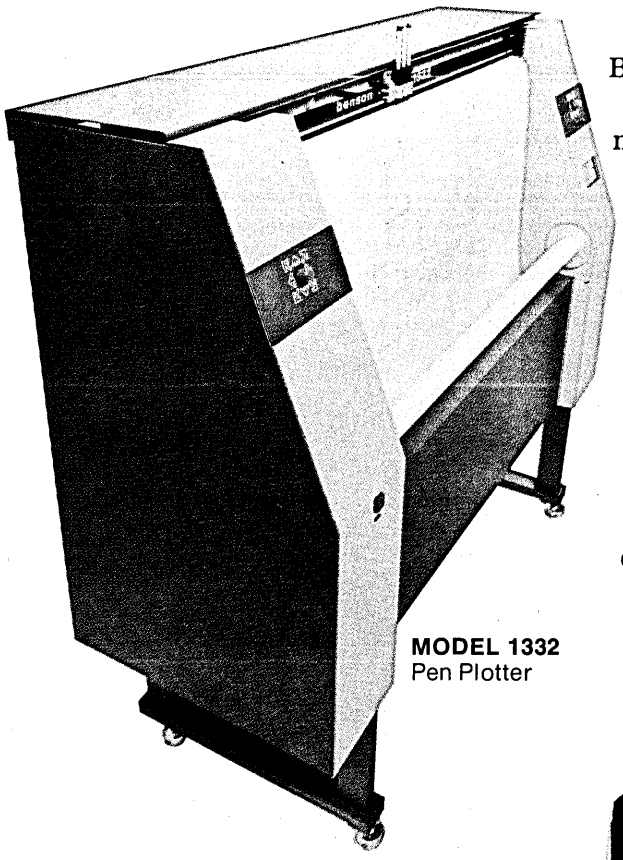
Benson, S.A., will demonstrate its electrostatic and pen plotter hard copy graphics product line at the SICOB Exhibition, Booth 3 F 3154, Paris, France.



MODEL 1332
Pen Plotter

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

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

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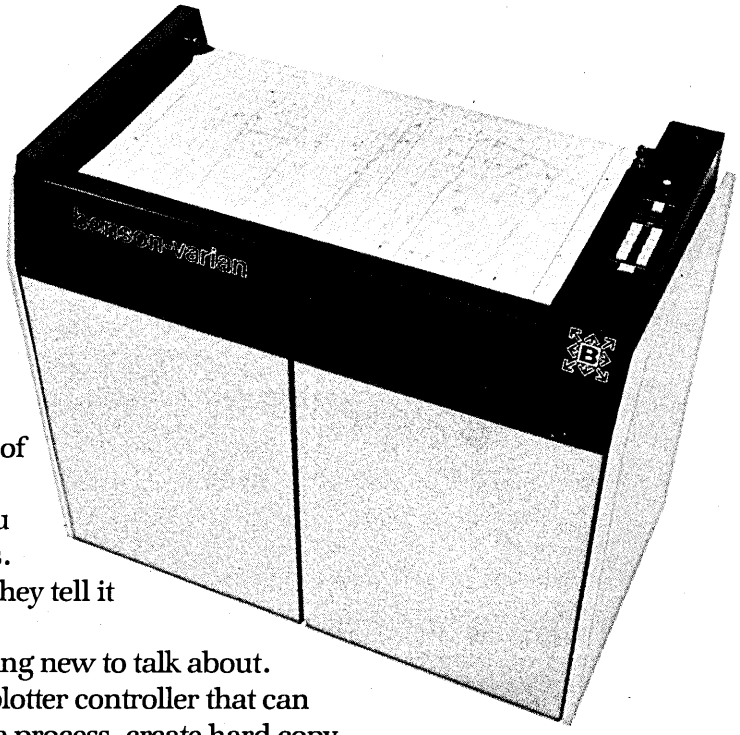

MODEL 9236
Electrostatic
Printer/Plotter

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

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

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ADVANTAGE: QUALITY Model 730 sets new quality standards for minprinters. Centronics' innovative technology fits high-end features into a compact (10 lbs.), quiet unit. Its 7 x 7 dot matrix produces clear, clean characters at 50 cps. Simple operational design ensures unsurpassed reliability.

ADVANTAGE: LOW COST OF OWNERSHIP Model 730's low total cost of ownership only starts with its attractive purchase price. It also provides more application opportunities with minimum investment. Our simple design employs fewer parts for higher reliability. That means maximum uptime, plus easier training and service requirements.

ADVANTAGE: INTERNATIONAL CAPABILITY International models of the 730 can print in any of six languages, and are available in all standard international power requirements, so it's ready for any tour.

ADVANTAGE: CENTRONICS Model 730 is leading the way to a whole new era in minprinters. Naturally, it's from the leader. Centronics. We pioneered dot matrix printing and have been ranked #1 ever since. No other company can match our strong serve in performance, selection, and value. And our high-volume production capability means we won't fault on your delivery.

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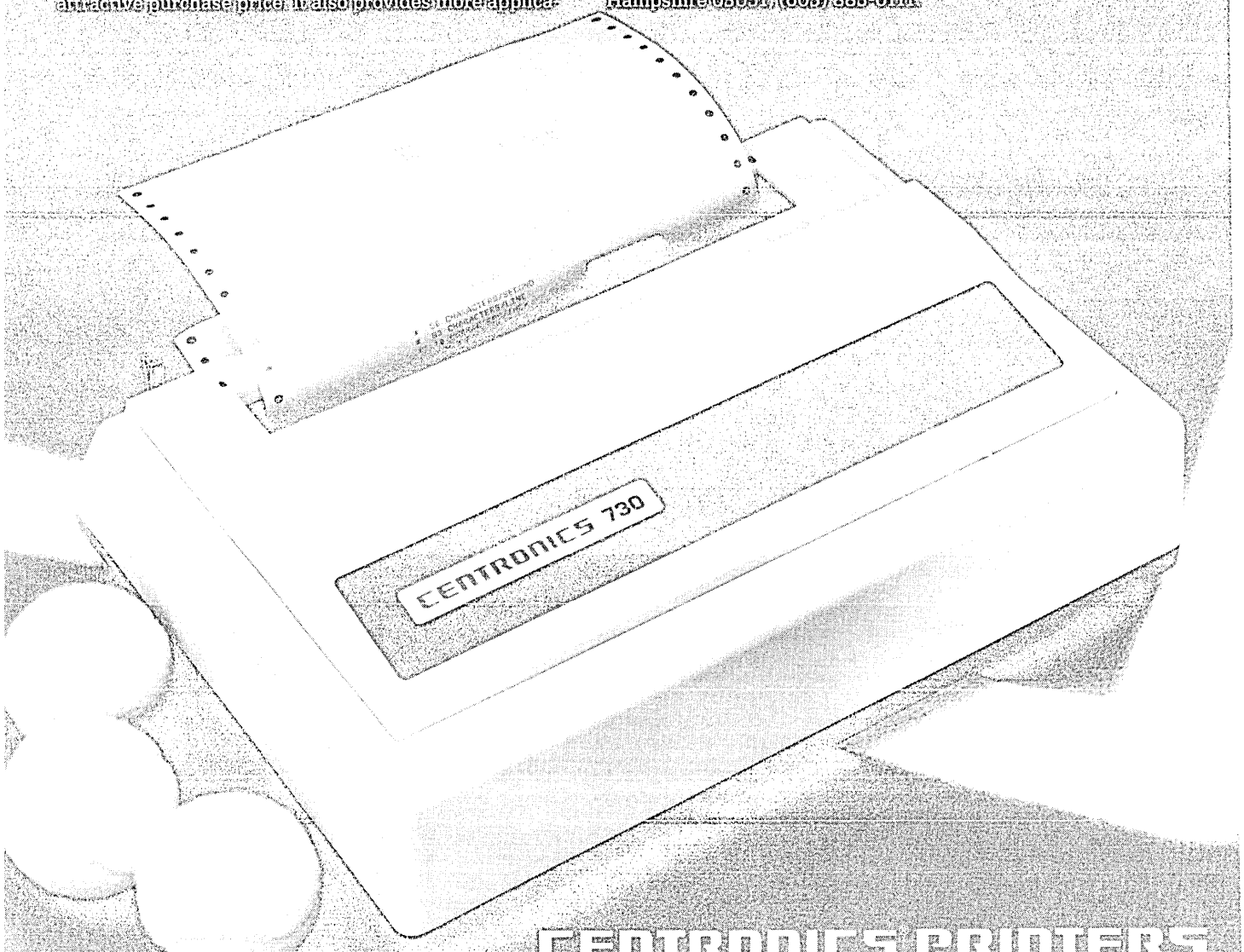


CENTRONICS PRINTERS
...the advantage

CIRCLE 74 ON READER CARD

LETTERS

CHESS COVER NO CAT-ASTROPHY

Re: Letters (June, p. 41): With all due respect for Mr. Robert A. Jackson and his analysis of your February cover, your chess consultant appears to have the situation well in paw.

Since the white corner is always to the player's right, the alignment of the players of the February Cover simply has White on the left and Black on the right (as an outsider might observe).

The White King is then situated on K5 and the last move was Black's: B-KB3.

RICHARD A. KERHIN
Systems Analyst
Kearney & Trecker Corp.
Milwaukee, Wisconsin

SETTING THE RECORD STRAIGHT

Re: Software Survey of Project Control Systems (June, p. 147), there are unfortunately some major omissions and errors with regard to our product, PC/70.

Error #1: Available through: G.E. Mark III

Correction: Available through: Atlantic Software, Inc.

PC/70 is the leading "licensed" project management system in our industry today. The G.E. Mark III network may also be used, but PC/70 is primarily an in-house, licensed product available through our firm. We are the developers, installers and trainers.

Error #2: Source language: COBOL

Correction: Source language: ANSI COBOL

The fact that both COBOL and ANSI COBOL are listed for products in this survey is clearly misleading in regard to our product.

Error #3: Hardware requirement: Honeywell

Correction: Hardware requirement: 96.5% of over 550 PC/70 installations worldwide are operating on IBM mainframes. Others include Univac, Burroughs, DEC, HP and Honeywell. Even on the G.E. network, PC/70 is on its IBM service, not Honeywell!

Error #4: Network size and method: 100,000, etc.

Correction: Network size and method: Unlimited

Error #5: Resources: 100+

Correction: Resources: Unlimited

Error #6: Number, Length of Calendars: N/A

Correction: Number, Length of Calendars: Unlimited

Error #7: User Accessible File: N/A

Correction: User Accessible File: Yes

Error #8: Estimated Users: N/A

Correction: Over 550

Error #9: Training: In Development

Correction: Training: Comprehensive, phased workshops on-site and regionally

Error #10: Cost to rent or buy: Timeshare

Correction: License at $22,500 or Timeshare

ROBERT B. WOLK
Executive Vice President
Atlantic Software, Inc.
Philadelphia, Pennsylvania

I was very disappointed to discover that the survey of project control systems did not include my company's products. Our first system, the Event Scheduling System, has been marketed since April 1978. ESS currently has six users in the automobile manufacturing, textile, electronics industries and the military. Most of these users are running multiple projects on the system.

The second product we offer is called MicroPERT and is currently being field tested and documented. That system currently has one user, an electronics manufacturer.

Both of these products are oriented toward graphics output. Both systems offer network diagrams and Gantt charts, among the variety of outputs available.

The systems are designed to run on Tektronix 4050 series (desktop) graphics computer systems.

LELAND C. (CHUCK) SHEPPARD
Sheppard Software Company
Milpitas, California

SCRAMBLED COMMUNICATIONS

The table listing the top-ranked vendors in the data communications field in July's issue ("Piecing Together The Datacom Industry," p. 110) was scrambled in typesetting. Although most of the data was correct, the entire table is reprinted on pp. 42, 43 in this issue for readers' convenience.

ORWELLIAN NIGHTMARE

I read with great interest "Beyond DP: The Social Implications" (July, p. 98). Messrs. Anderson, Glaseman, and Pyles contemplate the dream world of computers and communications—fascinating stuff for the dp professional and small boy in me. It truly boggles the mind. But dreams have a way of turning into nightmares, too.

As a practical manager I wonder about the effectiveness of extending the office into the employee's home. How would I monitor the productivity of my people when they're out of sight and physical contact? How productive would they really be without the disciplines imposed by the office environment? What morale problems would arise without the support and camaraderie of their co-workers? Imagine the excuses for missing deadlines—all those distractions at home: the kids, tv, etc.

But who wants the workplace in the home anyway? Aren't those "distractions" what home is all about? Home is a respite from the job—a shelter from the daily toil where people can be themselves and relax with their families. Going home means getting away from work. When your home is your office you never can really get away. Ask any home-based salesman about that. I think you'll find a lot of grassroots revulsion for this kind of thinking. An alternative might be to have companies directly subsidize employee energy costs with the savings realized by more pervasive dp, e.g., the "paperless office."

As a U.S. citizen, comments like "Adjustments will be necessary, too, in such value concepts as privacy" made by responsible persons scare the hell out of me. I'll do my own adjusting, maybe, at my own pace, and thank you to keep your hands off my vital statistics. We Americans cherish our nonsystem of individual

When printed in DATAMATION's July issue (pp. 112 and 113), some of the lines on the right side of this table were out of order. Here is how the entire table should have looked. Please refer to "Piecing Together the Datacom Industry," page 110 in the July issue, for explanations of the entries.

THE TOP 50 U.S. MANUFACTURERS IN THE DATA COMMUNICATIONS INDUSTRY

Estimates

RANK	COMPANY	TOTAL DATA COMMUNICATIONS REVENUES $K	DATA COMMUNICATIONS PRODUCT REVENUES (% of total)	PERCENTAGE OF DATA COMMUNICATIONS REVENUES ATTRIBUTABLE TO MAIN PRODUCT CATEGORIES			
				NETWORK/NODE CONTROLLERS	COMPUTER FRONT-ENDS	MODEMS/ MULTIPLEXORS	OTHER
1.	IBM	$144,000	<1.0%	0%	100%	0%	0%
2.	Motorola	$66,200	3.0%	0%	0%	90%	10%
3.	Racal-Milgo	$63,000	100.0%	0%	0%	70%	30%
4.	Comten	$46,649	90.4%	20%	80%	0%	0%
5.	General DataComm	$31,169	100.0%	0%	0%	90%	10%
6.	Paradyne	$25,899	100.0%	0%	30%	70%	0%
7.	Rixon	$22,000	100.0%	0%	0%	90%	10%
8.	Northern Telecom/Spectron	$20,000	5.0%	0%	0%	0%	100%
9.	Burroughs	$18,800	1.0%	12%	88%	0%	0%
10.	Computer Communications	$17,129	100.0%	0%	100%	0%	0%
11.	Honeywell	$16,500	1.0%	0%	100%	0%	0%
12.	Control Data	$15,800	<1.0%	0%	100%	0%	0%
13.	Sperry Rand	$15,600	<<1.0%	0%	100%	0%	0%
14.	Hewlett-Packard	$14,800	<1.0%	0%	0%	0%	100%
15.	Infotron Systems	$14,387	100.0%	0%	0%	100%	0%
16.	Intertel	$12,500	100.0%	0%	0%	60%	40%
17.	NCR	$12,200	<1.0%	0%	100%	0%	0%
18.	Racal-Vadic	$12,000	100.0%	0%	0%	100%	0%
19.	Timeplex	$11,517	100.0%	0%	0%	100%	0%
20.	TRAN Telecommunications	$11,293	95.0%	40%	0%	50%	10%
21.	Periphonics	$11,000	100.0%	0%	100%	0%	0%
22.	Bolt Beranek & Newman	$10,550	35.0%	35%	0%	0%	65%
23.	Memorex	$8,750	5.0%	0%	100%	0%	0%
24.	Tektronix	$8,607	1.0%	0%	0%	0%	100%
25.	Anderson Jacobson	$7,615	28.0%	0%	0%	100%	0%
26.	M/A-COM	$7,160	7.2%	49%	23%	28%	0%
27.	Dynatech	$6,600	34.3%	0%	0%	0%	100%
28.	T-Bar	$6,350	50.0%	0%	0%	0%	100%
29.	Penril	$5,620	40.0%	0%	0%	100%	0%
30.	Micom Systems	$5,400	100.0%	0%	0%	100%	0%
31.	Atlantic Research	$4,970	11.0%	0%	0%	0%	100%
32.	Rockwell International	$4,500	<<1.0%	0%	0%	100%	0%
33.	International Data Sciences	$3,700	100.0%	0%	0%	0%	100%
34.	Prentice	$3,500	100.0%	0%	0%	100%	0%
35.	United Technologies	$3,500	<<1.0%	0%	0%	100%	0%
36.	Plessey	$3,400	2.0%	90%	1%	0%	9%
37.	Gandalf Data	$3,300	100.0%	0%	0%	100%	0%
38.	ComData	$3,014	100.0%	0%	0%	100%	0%
39.	Coherent Communications	$3,000	100.0%	0%	0%	100%	0%
40.	Wavetek	$2,567	10.0%	0%	0%	0%	100%
41.	Data Access	$2,415	15.0%	0%	0%	100%	0%
42.	Interactive Systems	$2,250	75.0%	0%	0%	80%	20%
43.	L. E. Walz	$2,025	90.0%	0%	0%	0%	100%
44.	Novation	$2,000	100.0%	0%	0%	100%	0%
45.	Federal Screw Works	$1,970	4.0%	0%	0%	0%	100%
46.	Harvey Hubbell	$1,967	<1.0%	0%	0%	100%	0%
47.	Datastream Communications	$1,800	100.0%	30%	45%	20%	5%
48.	Carterfone Communications	$1,610	12.5%	0%	0%	100%	0%
49.	Omnitec Data	$1,600	100.0%	0%	0%	100%	0%
50.	Digital Communications	$1,427	100.0%	30%	25%	40%	5%

Estimates and Reported Data

TOTAL U.S. REVENUES (% of total)	1977 TOTAL REVENUES $K	1978 TOTAL REVENUES $K	1978 NET INCOME (LOSS) $K	NUMBER OF EMPLOYEES	FISCAL YEAR END	Q†
47.6%	$18,133,184	$21,076,089	$3,110,568	325,517	Dec. 31	A
77.0%	$1,853,514	$2,219,744	$125,182	68,000	Dec. 31	A
85.0%	$52,900	$63,000		1,900	March 31	R
85.0%	$36,320	$51,621	$6,869	1,400	Dec. 31	R
92.7%	$20,122	$31,169	$2,274	662	Sept. 30	A
83.0%	$15,358	$25,899	$3,087	625	Dec. 31	A
66.0%	$16,000	$22,000	$1,980	380	Dec. 31	R
96.0%	$183,825	$402,390	$26,190	12,607	Dec. 31	R
58.4%	$2,126,822	$2,460,002	$253,364	54,638	Dec. 31	A
85.0%	$13,522	$17,129	$1,106	340	June 30	A
74.5%	$2,911,100	$3,547,800	$201,400	86,328	Dec. 31	A
67.0%	$2,301,456	$2,738,327	$166,962	45,950	Dec. 31	A
65.0%	$3,292,186	$3,674,157	$176,619	88,275	March 31	A
56.6%	$1,360,000	$1,728,000	$153,000	42,400	Oct. 31	A
90.0%	$9,000	$14,387	$4,209	200	Dec. 31	R
85.0%	$8,448	$12,500	—	275	Oct. 31	E
53.4%	$2,311,939	$2,610,520	$193,731	62,000	Dec. 31	A
92.0%	$8,700	$12,000	—	270	April 30	E
67.0%	$8,020	$11,517	$545	278	June 30	A
50.0%	$10,800	$11,887	($2,722)	500	June 30	R
95.0%	$10,000	$11,000	—	200	Dec. 31	R
100.0%	$26,573	$30,185	($397)	816	June 30	R
55.0%	$450,112	$633,266	$50,197	11,085	Dec. 31	A
63.7%	$454,958	$598,886	$56,846	19,147	May 27	A
83.8%	$20,921	$26,834	$1,330	641	March 31	A
88.8%	$74,121	$99,317	$6,095	2,907	Sept. 30	A
73.2%	$14,991	$19,247	$1,508	250	March 31	A
88.0%	$9,359	$12,667	$1,101	335	Dec. 31	A
95.0%	$10,021	$14,050	$1,178	600	July 31	R
90.0%	$1,200	$5,400	>$600	125	March 31	R
95.0%	$32,675	$45,183	$1,357	1,061	Dec. 31	A
87.2%	$5,744,000	$5,668,800	$473,800	114,000	Sept. 30	A
100.0%	$2,900	$3,700	—	—	July 31	E
90.0%	$2,200	$3,500	$500	45	April 30	E
63.0%	$5,550,670	$6,265,218	$234,144	152,213	Dec. 31	A
90.0%	$150,000	$174,000	$7,300	17,000	March 31	E
100.0%	$1,500	$3,300	—	115	July 31	E
100.0%	$2,525	$3,014	—	70	June 30	E
90.0%	$2,254	$3,000	$333	75	Dec. 31	E
67.0%	$18,953	$25,667	$1,608	677	Sept. 30	A
100.0%	$6,601	$16,101	$1,117	200	Aug. 31	A
90.0%	$3,100	$3,000	—	64	Dec. 31	E
100.0%	$2,000	$2,250	$100	7	Oct. 1	R
90.0%	—	$2,000	—	60	Jan. 31	E
100.0%	$47,801	$49,269	$2,819	840	June 30	A
80.5%	$211,024	$260,118	$20,521	8,400	Dec. 31	A
100.0%	$101	$1,800	—	20	Sept. 1	R
100.0%	$10,776	$12,900	—	270	March 31	E
100.0%	$1,200	$1,600	$100	50	June 30	E
100.0%	$1,180	$1,427	$72	39	June 30	R

Q†: Source of revenue and income data, A = audited report, R = unaudited report, E = estimated

choice, our freedoms to be anomalies, to live with distortions of fact, and to harbor romantic illusions and prejudices; to hope against all odds and to fly in the face of common sense. Some of the most creative thought has been born in this chaotic caldron.

In short, I don't want anyone, corporations or government (and the distinction is blurring) manipulating my lifestyle, values or concepts. Don't bother attempting to fold me into the national information mainstream. I find the notion of institutions and think-tank types shaping my future involuntarily repugnant. The whole thing smacks of Orwell's *1984* with Big Brother watching over everyone allegedly for their own good.

A final word of caution by analogy. All along we have tended to view the Russian economy as vulnerable in the long run because it does not rely upon the judgments of individual managers and the price mechanisms to clear the marketplace, but upon the decisions of central planning committees. Because of the enormous number-crunching involved, surely their system will eventually fail as they slowly drown in a raging sea of unprocessed data. Right?

Given the iron resolve of the U.S.S.R. and their near-total disregard for human freedoms, coupled with advanced dp technology which the West will directly or indirectly provide, they may very well pull it all off. Then Orwell's fiction will become a reality.

I submit that the kind of national personal and institutional computer hookups and data bases envisioned by Messrs. Anderson, Glaseman, and Pyles ought to be viewed with the same healthy suspicion and hostility currently accorded nuclear energy.

JAMES B. POTTER
Director, Management
Information Systems
Publicker Industries, Inc.
Greenwich, Connecticut

Having witnessed some of the consequences of moving toward an automated society, it was a relief to find dp professionals interested in the social ramifications as discussed in "Beyond DP: The Social Implications." It is about time man began acting to control social transitions rather than just reacting or exploiting its effects.

The groups least affected by the transition will be children and affluent adults. Children find computer use easy because they have not restricted their definition of this powerful tool but accept it as something to be investigated and played with. Affluent or economically independent adults will find the transition to a technocratic society easier because they are constantly being exposed to a world of new gadgets, for example, the microwave oven.

My concern is for groups who traditionally have been excluded from the mainstream of society, particularly mentally retarded people and people who are unfamiliar with dp equipment, its use and its abstractness.

STEPHEN BAILEY
Hallmark Cards Inc.
Kansas City, Missouri

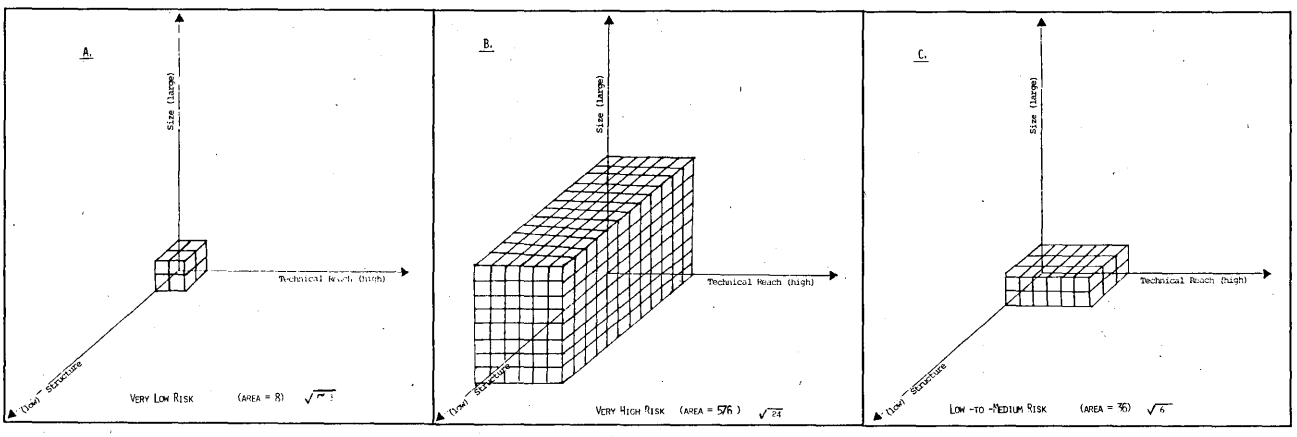
BETTER LATE THAN NEVER

We apologize to all those who searched in vain for the missing graphics in "On Estimating" (June, p. 164). Here, then, is Fig. 1, below, as advertised on p. 169 at the end of paragraph two under "How to Estimate," and Table 2, at right, as mentioned in line eight on p. 172.

Table 2. Sample estimates and their variances.

Project Number	Estimates	Actual	Percent Variance	Within Tolerance?
1	$ 1,000	$ 900	-9	Yes
2	4,000	12,000	+300	No
3	27,000	31,300	+16	Yes
4	8,000	9,400	+18	Yes
5	10,000	15,000	+50	No
6	14,000	15,200	+9	Yes
7	1,000	1,200	+20	Yes
8	20,000	17,400	-15	Yes
9	9,000	10,400	+16	Yes
10	6,000	7,000	+17	Yes
	$ 100,000	$119,800		8 of 10
	Totals within 20% of estimate			80% of projects within tolerance

Fig. 1. Examples of different risk alternatives: On the three axes (Structure, Size, and Technical Reach) the risk is roughly proportional to the square root of the area contained inside the boxes. The units are Company-relative, as is noted in the text. This risk should be compensated for by widening the range around the estimate; i.e. Case A may be estimated accurately to 90–95% tolerance, Case B, perhaps ± 50%. In terms or risk, Project B is far riskier than Project A, therefore, less precision is available in the estimate. Risk, as project size and complexity grows, seems to obey the "square-cube" law.



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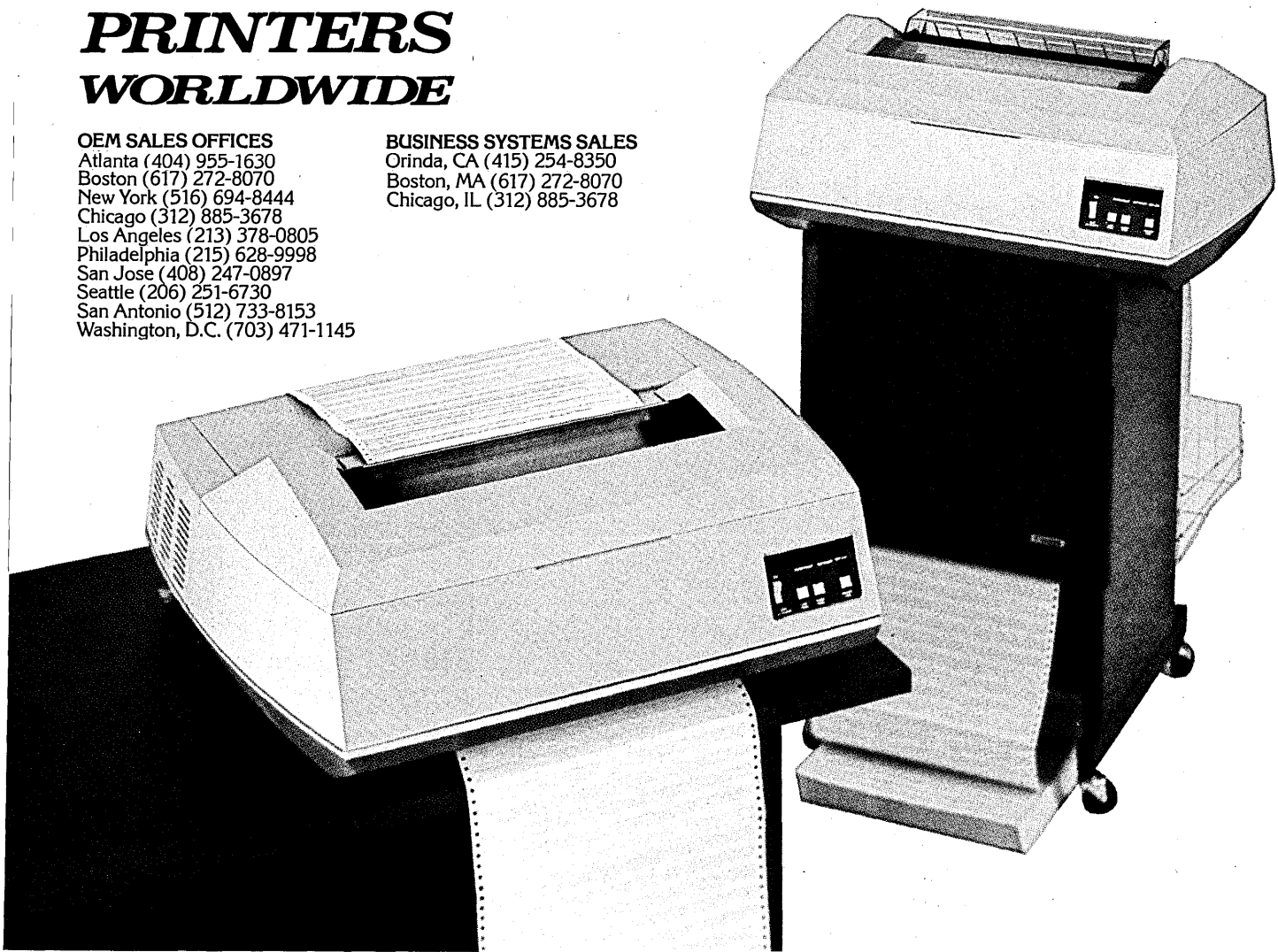

The more you dema
the more you sh

Chances are, you'll find that the performance you need is already there.

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For more complex multi-processing tasks, the HP 1000 computer has the power and flexibility to meet your needs. You can choose from a broad range of computation power to process your data, from the low-cost M-Series to the high-speed floating point F-Series. All of the configurations use upward-compatible RTE operating systems, so you don't have to rewrite your programs when you change jobs or move up to another model. And if you need additional storage, you can expand the systems to two megabytes of main memory starting at only $18K/per megabyte.

The HP 1000 system also comes with a number of applications tools to minimize your programming costs. HP's new DATACAP/1000 software, for example, lets you design a real-time factory data collection system according to your shop floor needs. And to help you manage vast quantities of technical data, we developed our powerful IMAGE/1000 data base management system. Just a few simple keystrokes give you up-to-the-minute information on inventory levels or instrument check-out status. If you'd like a really clear picture of your information, HP's GRAPHICS/1000 will plot your data in a way you can understand: as a bar graph, pie chart, logarithmic graph, and more.

nd from a computer, ould look at HP.

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General purpose interface cards let you adapt the HP 1000 to a variety of tasks, including A/D conversion and multi-point communications. What's more, with the plug-in HP-IB (interface bus), you can process and control data from over 200 sophisticated measurement and testing instruments.

Talking to the computers is easy, too. The HP 1000 uses BASIC and FORTRAN as well as assembly and microcode languages. And our powerful communications software, DS/1000, lets you hook HP 1000 computers together in any network configuration you want—across your plant or around the world.

A continuous growth plan.

HP's family of computer products is constantly growing to meet your scientific, engineering, and manufacturing needs. Whether it's instrumentation front ends, CRT terminals, plotters or digitizers, HP's compatible products let you add to your system at any time without writing new software. And of course, you get HP's full support, service, training and documentation.

Go ahead and ask your own computer some tough questions. Then ask ours and see the difference. For a hands-on demonstration of the HP 1000, just call your nearest HP sales office listed in the White Pages. Or for more information write Hewlett-Packard, Attn: Roger Ueltzen, Dept. 459, 11000 Wolfe Road, Cupertino, CA 95014.

Here are just a few of HP's range of products for manufacturers and engineers:

1. HP 9845 Desktop Computer.
2. HP 9825 Desktop Computer.
3. HP 1000 Model 45 Real-time System with HP 7906 Disc Drive and HP 2648A Graphics Terminal.

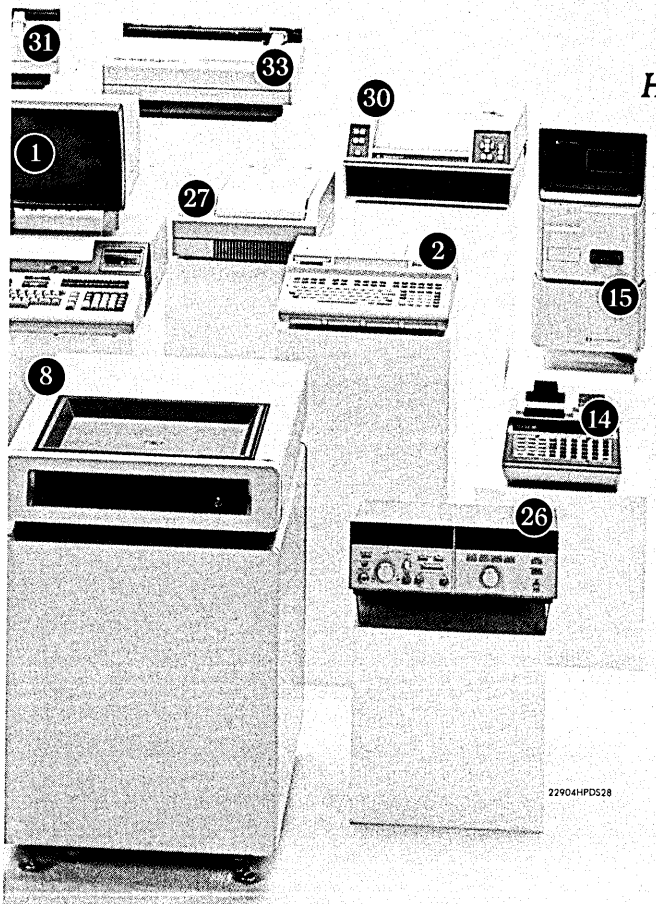
4-6. HP 1000 F-, E-, and M-Series Computers.

7. HP 2108 Board Computer.
8. HP 7925 Mass Storage Unit.
9. HP 2240 Measurement & Control Processor.
10. HP ATS Automatic Test System.
11. HP 12050 Fiber Optics.
12. HP-IB Link IEEE-488 Standard Interface.
13. HP 2621 CRT Terminal.
14. HP 3075 Data Capture Terminal.
15. HP 3077 Time Reporting Terminal.
16. HP 3455 Voltmeter.
17. HP 3495 Scanner.
18. HP 5328A Universal Counter.
19. HP 5342 Microwave Frequency Counter.
20. HP 436A Power Meter.
21. HP 4262 LCR Meter.
22. HP 8566A Spectrum Analyzer.
23. HP 8754A Network Analyser.
24. HP 3325A Synthesizer/ Function Generator.

25-6. HP 8660A & HP 8672A Synthesizer/Signal Generators.

27-8. HP 9876A & HP 2608 Printers.

29. HP 2631G Graphics Printer.
30. HP 7245A Thermal Plotter/ Printer.
31. HP 7221A Plotter.
32. HP 7225A Graphics Plotter.
33. HP 9872A Programmable Graphics Plotter.
34. HP 9874A Digitizer.
35. HP keeps it coming.



HEWLETT hp PACKARD

22904HPDS28

CIRCLE 26 ON READER CARD

LETTERS

FISH ARE JUMPING

The cartoon on page 39 of your April edition shows the first two lines of a Middle English poem.

Though your cartoonist may have deliberately made the setting drab, I feel the illustration would have been more appropriate if the stenographer had been young, in a flowered dress and sitting near an open window with a bird singing on the bough of a tree outside.

That carping criticism aside, it was a pleasure to find "Sumer is icumen in" in your informative magazine.

T.G.H. MCNAUGHTON
Blantyre, Malawi

MORE MYOPIA

It is obvious from reading the article "Third Generation Myopia" and the subsequent letters from Mr. Reeves and Mr. Lung that the differences between the system programmer and the applications programmer are not recognized.

Application programmers are needed to take advantage of the computer's capacity to solve scientific/commercial/industrial problems. In order to perform this successfully it is important that the programmer have a good working knowledge of the problem environment and a relevant high-level language. Systems programmers, on the other hand, must solve systems oriented problems (of which there are plenty). An in-depth knowledge of the computer's hardware and software is essential to perform this task.

We are now in the age of structured or modular systems (to give it a name); this has only been successful with a high-level language, and further high-level languages are being developed to support it. Nobody really expects to find structured code from ALC; we are delighted when the code is reentrant and overjoyed when the relevant data is protected by some sort of software gate. I accept that ALC uses less memory (even when badly coded), I accept that ALC uses the machine more efficiently and is fast (even when badly coded), I can even accept that you can do everything (given enough time) with ALC. I question, however, its transportability, is maintainability, and its "superior programming technique" capability. Considering the situation that a good library of macros is used with ALC, then how can this be differentiated from higher level languages? As Mr. Lung pointed out, since 1967 computer storage has substantially increased in size (he omitted mention that prices have also fallen) and even when the supporting software is written in ALC, things like data bases, time-sharing, and communications require memory space.

I am glad that there are still people like Mr. Mitchell, Mr. Lung, and Mr. Reeves. I would be even happier if they and people like them could get together and solve the real dp problems.

DAVID W. BOUGOURD
Systems Consultant
Am Wolfsberg
West Germany

IBM ON AT&T

Re: the June Look Ahead column, your readers could be left with the impression that I dispute the Justice Dept.'s authority to enforce the AT&T 1956 Consent Decree. Clearly, Justice has that authority.

My quoted comments were made only in relation to the issue of whether the decree can be modified.

IBM believes AT&T should be permitted to offer ACS on an unregulated basis, and if the Decree prevents this, that it can and should be changed.

D.N. PICONNE
Office of IBM Director of
Telecommunications Practice
IBM Corp.
Armonk, New York

CORRECTION

A typo occurred in our NCC preview (May, p. 125). The presentation "Sexual Barriers in Business and How to Overcome Them" was written by Ida W. Mason, not Ira. We regret the error. ✲

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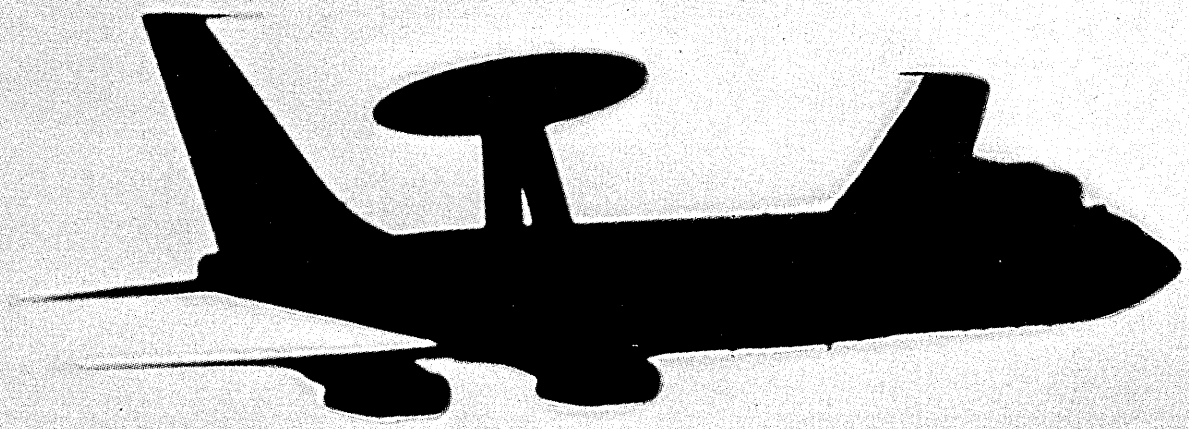

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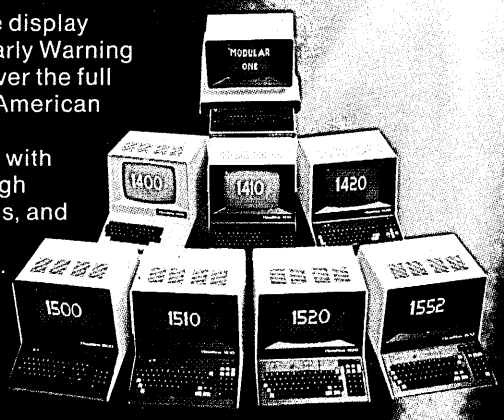

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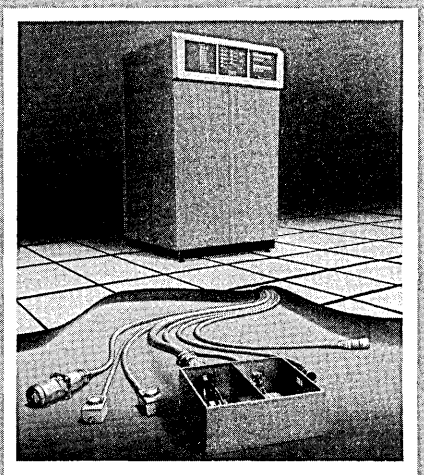

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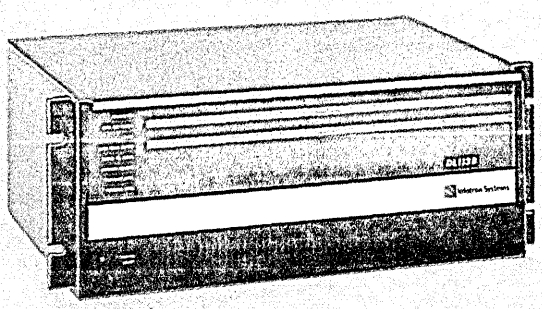

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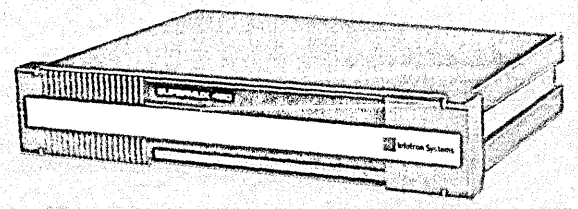

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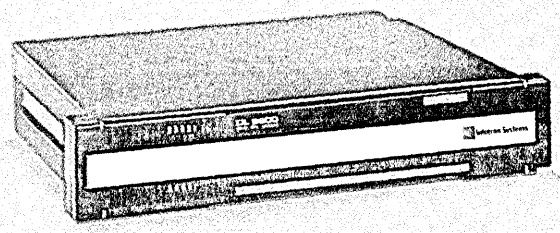

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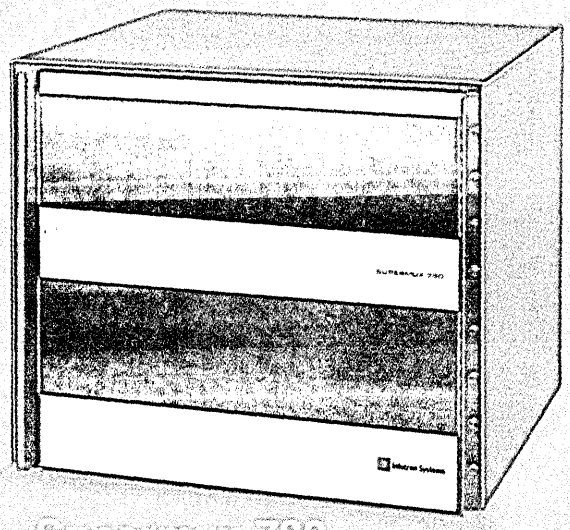

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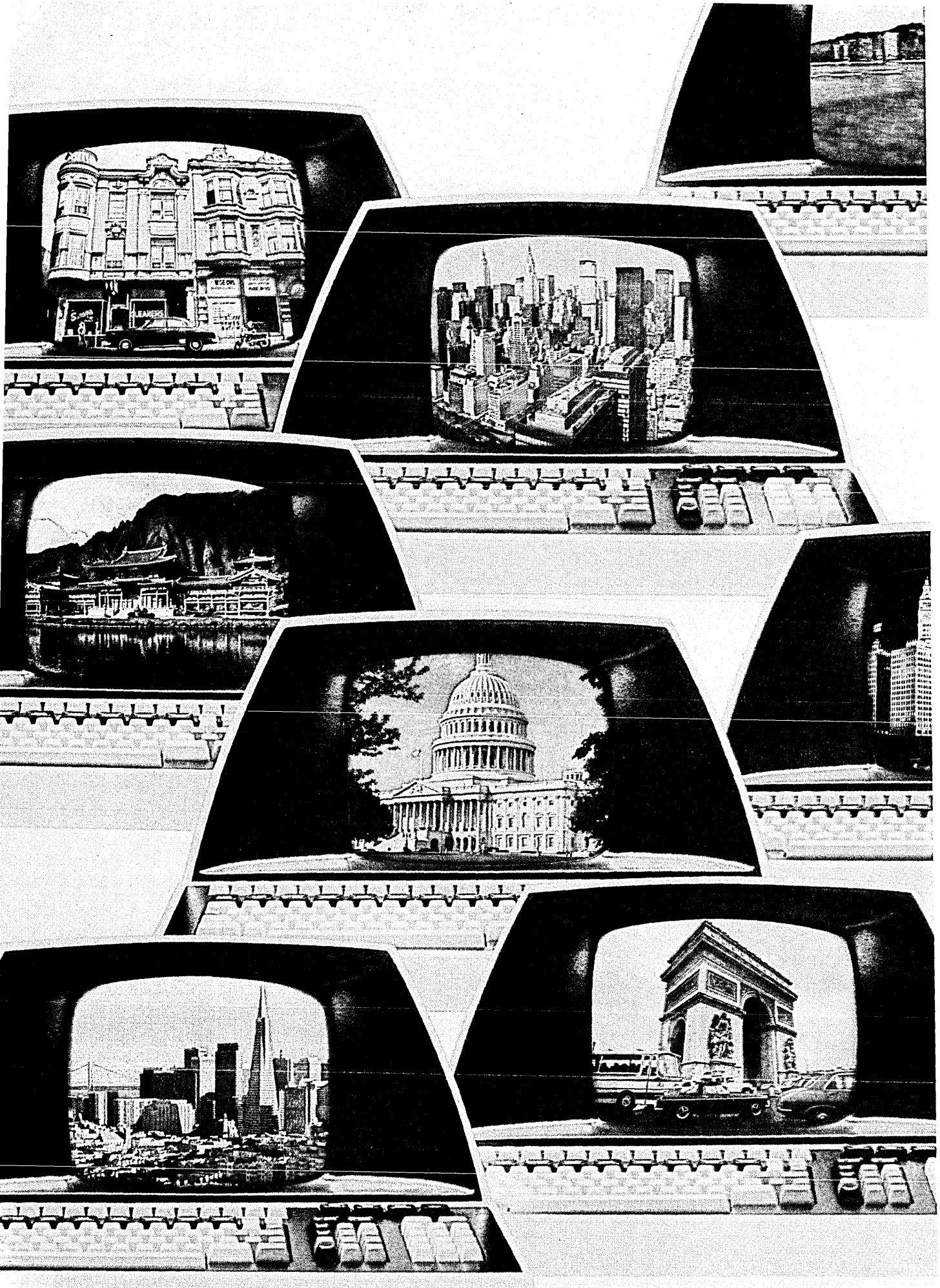
CIRCLE 38 ON READER CARD



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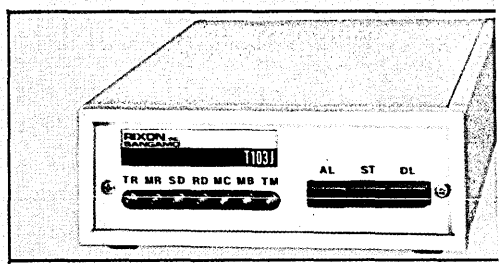

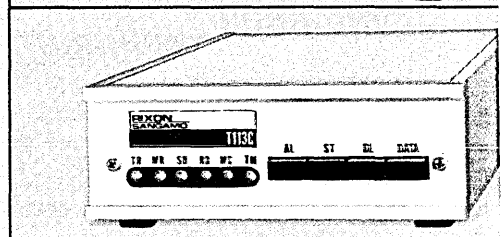

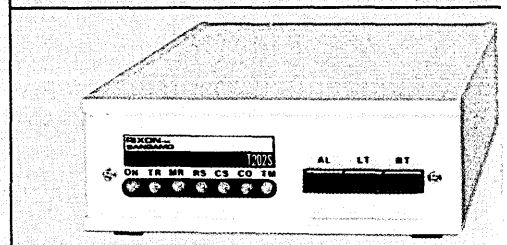

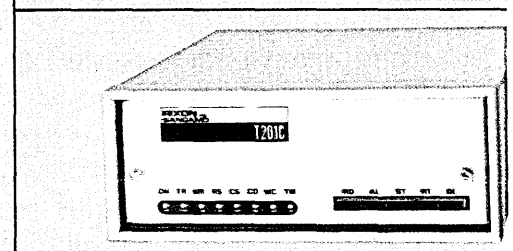

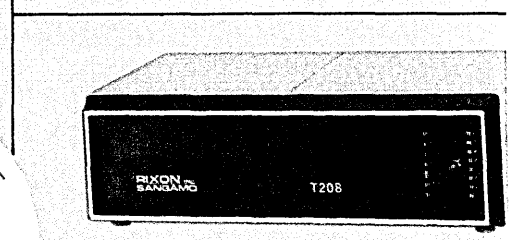

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CIRCLE 112 ON READER CARD

The new VISUAL 200 terminal has the features of competitive terminals and will code-for-code emulate them as well. A flick of a switch on the rear panel programs the VISUAL 200 for compatibility with a Hazeltine 1500, ADDS 520, Lear Siegler ADM-3A or DEC VT-52. To an O.E.M. customer it means no change in software to displace the older, less powerful terminals in his product line with the new, reliable and low cost VISUAL 200. To a Distributor it means offering a single modern terminal which is compatible with all the software his customers have written for the older terminals. And you're not limited to mere emulation; you can outperform them at the same time by taking advantage of the additional features and human engineering of the VISUAL 200, such as:

- Detachable Solid State Keyboard
- Smooth Scroll
- Tilt Screen (10° to 15°)
- Large 7 x 9 Dot Matrix Characters
- Others in the Feature Comparison Chart

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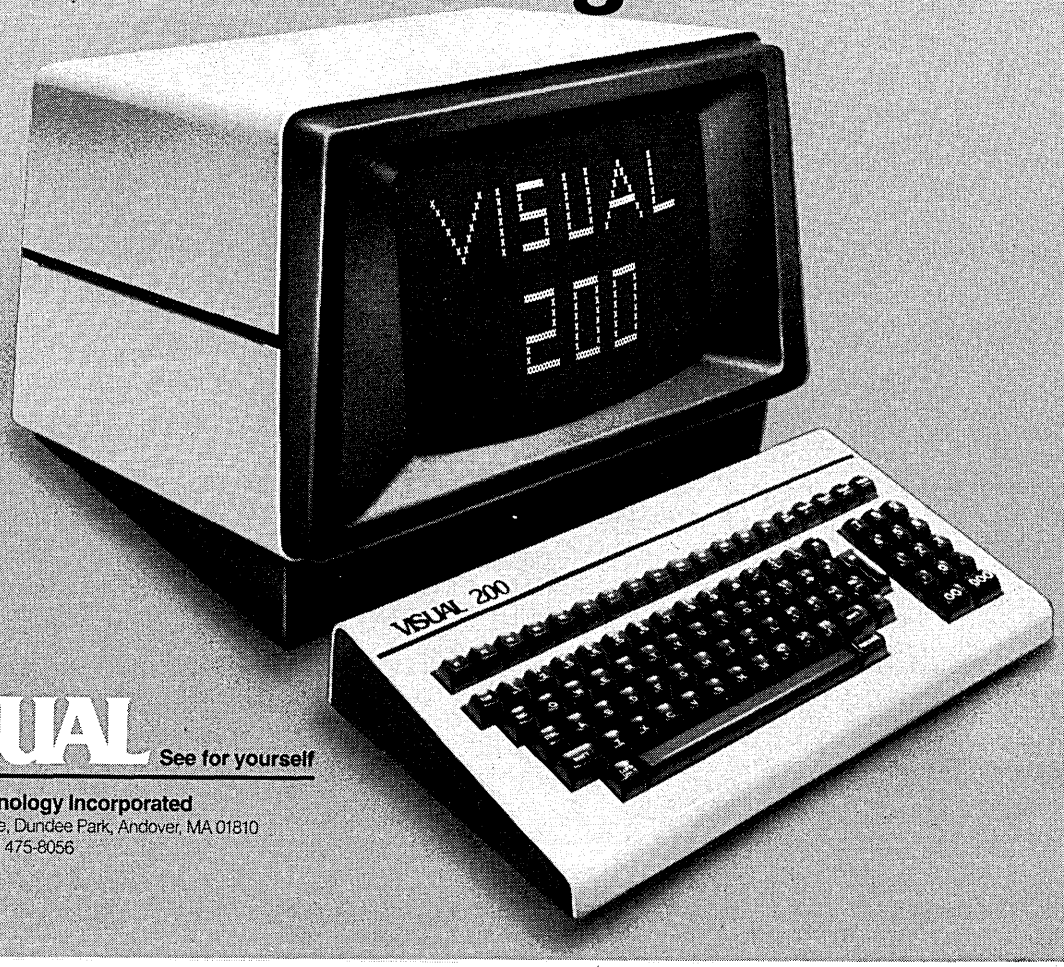
FEATURE COMPARISON CHART

FEATURE	Visual 200	Hazeltine 1500	Hazeltine 1420	Lear Siegler ADM-3A	Digital VT-52	ADDS 520	ADDS Regent 20	ADDS Regent 40
24 x 80 Screen Format	STD	STD	STD	STD	STD	STD	STD	STD
7 x 9 Dot Matrix	STD	STD	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**
Background/Foreground	STD	STD	STD	**NO**	**NO**	**NO**	**NO**	STD
Insert/Delete Line	STD	STD	**NO**	**NO**	**NO**	**NO**	**NO**	STD
Insert/Delete Character	STD	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**
Clear End Line/Field/Page	STD	STD	**NO**	**NO**	STD	**NO**	**NO**	**NO**
Blink	STD	**NO**	STD	**NO**	**NO**	**NO**	**NO**	STD
Security Mode	STD	**NO**	STD	**NO**	**NO**	**NO**	**NO**	STD
Columnar and Field Tab	STD	**NO**	STD	**NO**	**NO**	**NO**	**NO**	STD
Line Drawing	STD	**NO**	**NO**	**NO**	STD	**NO**	**NO**	STD
Upper/Lower Case	STD	STD	STD	**OPT**	STD	**NO**	STD	STD
Numeric Pad	STD	STD	STD	**OPT**	STD	**NO**	**NO**	STD
Composite Video	STD	**NO**	**NO**	**NO**	**NO**	STD	**NO**	**NO**
Current Loop	STD	STD	**NO**	**OPT**	**OPT**	STD	STD	STD
Serial Copy Port	STD	STD	**OPT**	STD	**OPT**	**NO**	STD	STD
Hold Screen	STD	**NO**	**NO**	**NO**	STD	**NO**	**NO**	**NO**
Detachable Keyboard	STD	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**
Solid State Keyboard	STD	**NO**	**NO**	**NO**	**NO**	**NO**	STD	STD
Typamatic Keys	STD	STD	STD	**NO**	**NO**	**NO**	STD	STD
Cursor Addressing	STD	STD	STD	STD	STD	STD	STD	STD
Read Cursor Address	STD	STD	STD	**NO**	**NO**	**NO**	**NO**	STD
Cursor Control Keys	STD	**NO**	STD	**NO**	STD	**NO**	**NO**	STD
Secondary Channel	STD	**NO**	**NO**	STD	**NO**	STD	**NO**	**NO**
Self Test	STD	**NO**	STD	**NO**	**NO**	**NO**	**NO**	STD
Baud Rate to 19,200	STD	STD	**NO**	STD	**NO**	**NO**	**NO**	**NO**
Smooth Scroll	STD	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**
Microprocessor	STD	STD	STD	**NO**	STD	**NO**	STD	STD
Tilt Screen	STD	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**
Switchable Emulations	STD	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**	**NO**

The new VISUAL 200 obsoletes competitive terminals without obsoleting the software.



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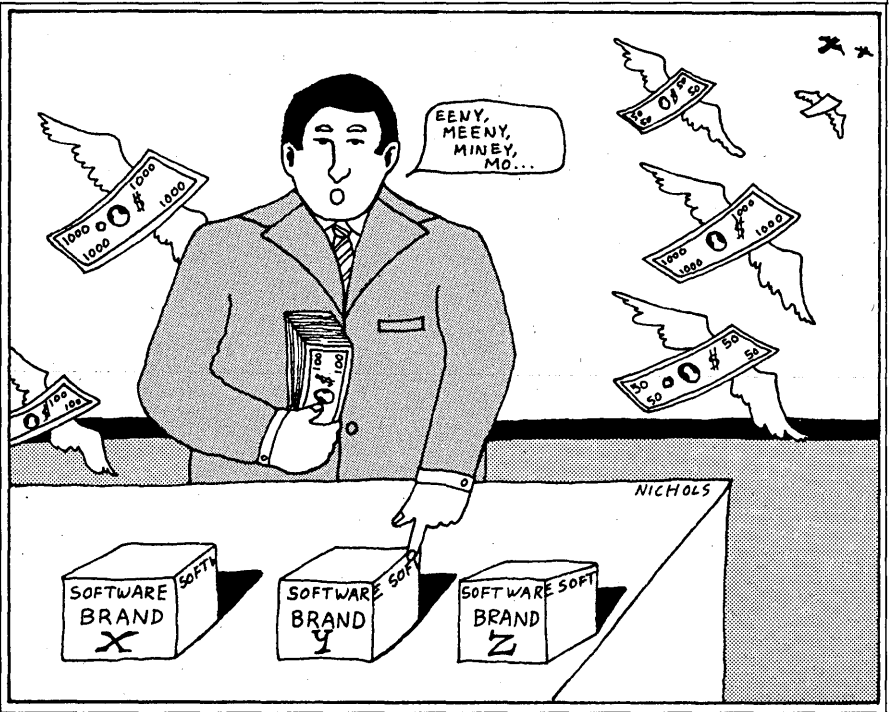
JOHN L. KIRKLEY, EDITOR

EDITOR'S READOUT

YOUR TAX DOLLARS AT WORK



We understand that a particularly virulent disease, especially partial to dp managers, is still plaguing the computer community. Known as DBMS fever, it most often seems to strike managers whose file handling capabilities have reached a critical mass.

For many organizations the implementation of a data base management system can have a soothing, salutary effect. But for others, the results can be toxic.

If you're feeling the early warning symptoms—that rush of adrenalin when your vendor tells you a DBMS comes free with his newest system, or you're indulging in compulsive brochure collecting—there is hope. We would like to bring to your attention an antidote published by the U.S. government. It's a General Accounting Office report titled, "Data Base Management Systems—Without Careful Planning There Can Be Problems," and it's free.

Seems that the GAO decided to study the use of these systems throughout various federal agencies. Although only 18 agencies were visited, there are apparently scads of DBMS scattered throughout the government. And the report gives the general impression that many were installed in a slapdash, wasteful fashion, costing taxpayers boodles of money.

The report's format is simple. First some salient points are made about how to acquire or implement a DBMS. Then come the horror stories—little tales of the crypt that tell what happened to various agencies that disregarded what the GAO feels is prudent practice. And each one has a price tag on it.

For example, there was the agency that justified the acquisition of a DBMS in order to set up a user-oriented query language, develop an integrated data base, and support much on-line work. One small problem—the agency did not survey its user's needs. They bought the system, says the report, because the dp director wanted the latest technology.

Well, four years and $1.2 million later, the first application finally became operational. And hardly anyone used it. There was no integration of data, no on-line processing, and the user-oriented query language lay idle.

"In our view," growls the report, "expenditures of at least $1.2 million could have been avoided if a user requirement study had been performed before spending all the money on what has been essentially a nonproductive area."

Only one of the agencies visited had done a cost-benefit study before buying and many failed to follow any systematic evaluation process during the selection period.

The report goes on to talk about some of the government's more absurd procurement regulations, the need for standards, and the failure of agencies such as the General Services Administration and the National Bureau of Standards to provide clear-cut procedures and technical guidance.

Comments such as, "The acquisition cost of a DBMS appears to be relatively insignificant when compared to the long-term commitment that an agency must make to application software, computer hardware, communications, procedures, training, and support . . ." not only make for informative reading but can help moderate the effects of DBMS fever.

A free copy of the report can be had by writing the U.S. General Accounting Office, Distribution Section, Room 1518, 441 G. Street, NW, Washington, DC 20548. Include the report number, FGMSD-79-35 and date, June 29, 1979, when ordering. ✲

WE'VE MOVED

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Hewlett-Packard

Computer Advances

Volume 4 Number 4

Keeping pace with competitive computer costs

Fiber optics makes the network

Lifting the ceiling on productivity

Today's manufacturer, faced with the growing need to increase efficiency and productivity while at the same time reducing costs, is finding it increasingly difficult to remain competitive without turning to some sort of on-line computer information management system.

In the **engineering** department, computers of all sizes are being used at every stage of product design and development to solve technical problems.

On the **manufacturing floor,** computers from desktops to minis to larger systems are being applied to such tasks as machine and process control, materials and production management, warehousing, and shipping.

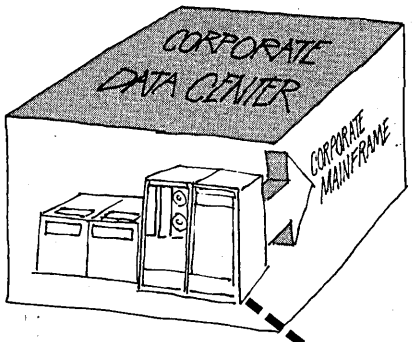
And in **marketing and sales,** computer systems not only process orders, but provide analysis for product forecasting and business trends.

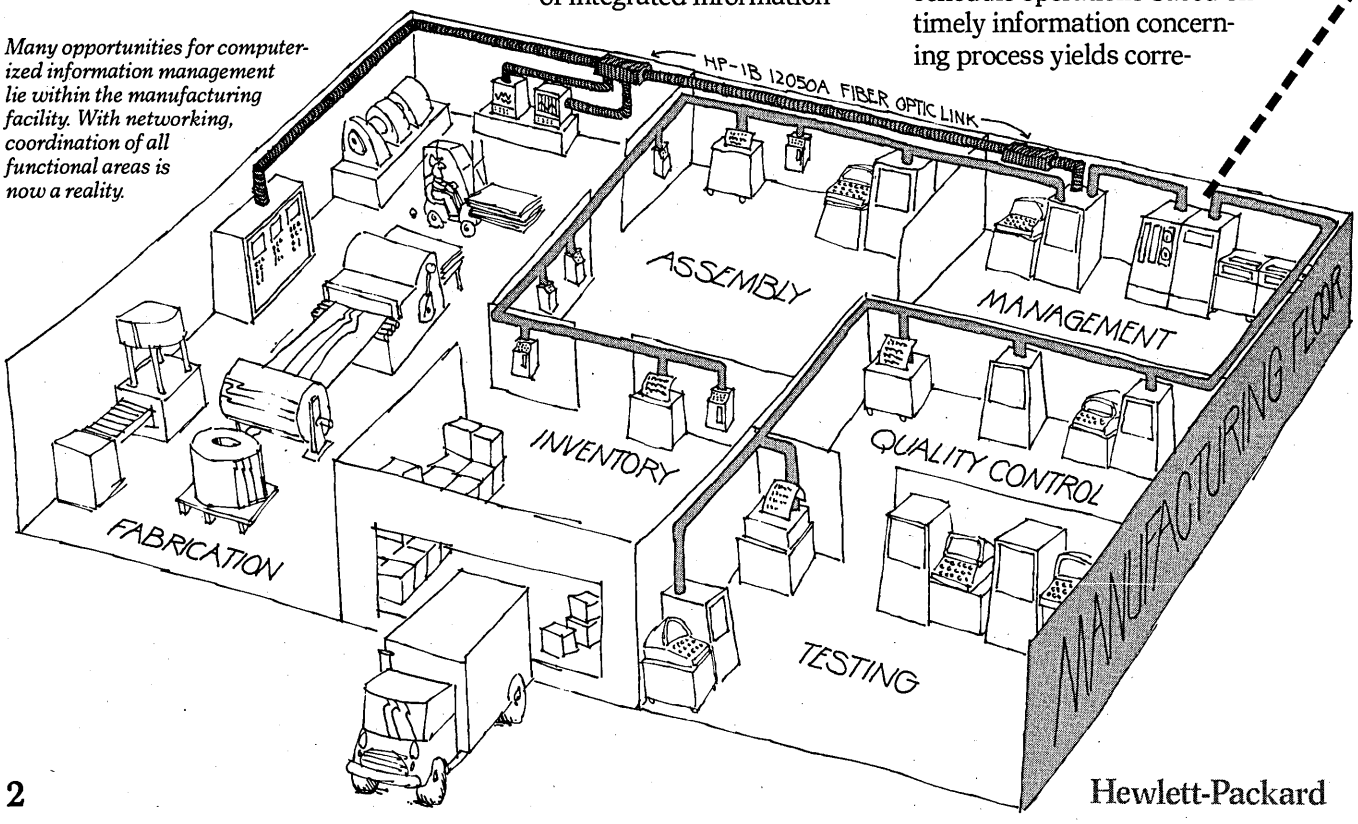
Finally, as an **administrative** tool, computers play key roles in cost accounting, financial management, accounts receivable, and payroll.

Historically, the information needs of most manufacturing companies were processed on one central computer system. Over the past few years, however, many innovative companies have begun to recognize the benefits of distributing their processing in order to give each department more responsive control over their own systems. In this process of placing computer power closer to its users, manufacturers still need to ensure that they maintain the advantages of integrated information and centralized planning and control.

Overall planning is vital to assuring that major functional areas are not isolated from each other.

For example, purchasing managers might review test and quality assurance data before placing new orders with a supplier; or manufacturing managers could scrutinize production data to determine lead times for delivery to customers; or production managers can reschedule operations based on timely information concerning process yields corre-



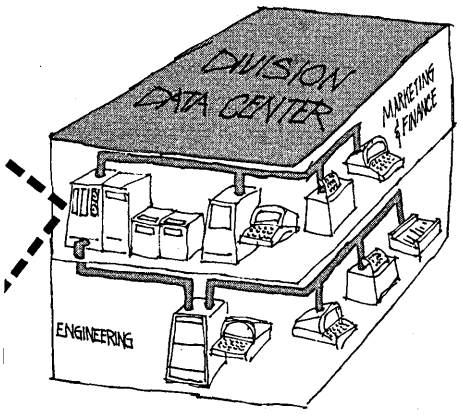


Many opportunities for computerized information management lie within the manufacturing facility. With networking, coordination of all functional areas is now a reality.

lated with the production plan.

Today, some computers are capable of integrating these distributed functions via networking, providing a consistent information system solution.

Hewlett-Packard has a broad range of products that include a



variety of networkable computers, software, peripherals, and instrumentation. As a result, integrated information systems can now be planned to increase productivity in all areas of manufacturing companies, and provide all the benefits of distributed processing while still allowing centralized coordination.

Light—years ahead

Fiber Optics, a technology considered to be tomorrow's data communications technique, has already been incorporated by HP into its 12050A Fiber Optic Link—the first HP-IB (HP's IEEE 488 interface standard) optical data transmission device ever.

Manufacturers can now benefit from the many valuable advantages offered by this technology, which include electromagnetic immunity, safety within explosive environments, high speed, and remote instrument communications.

With the Fiber Optic Link, a user can transmit data through the most severe surroundings imaginable with total electrical isolation, providing complete immunity from noise.

This means that fiber optic cables can operate in the presence of both electrical fields (high voltage, switches, relays, lightning, etc.) and magnetic fields (rotating machinery, transformers, etc.) without being affected by spurious electrical spikes that endanger data being carried to a computer. And since no electrical energy is being transmitted by the Link, even if damaged it is safe to use in an explosive environment.

This makes the 12050A an excellent way to transmit data between an HP1000 or HP9800 computer and remotely located HP-IB-compatible instruments. Not only can a single Link connect up to 14 instruments in clusters at distances of up to 100 meters (328 feet), but multiple Links can be used to connect many more instruments.

Under certain conditions, fiber optics can transmit data at rates up to 20 times faster than standard coaxial cable—vital in many real-time instrumentation applications. The data transfer is 20K bytes/second between an HP-IB device and the computer. Furthermore, the Link enables a computer to handle a service request interrupt (SRQ) from any remote device within 100 μs.

Hence, with the trend toward smarter and faster instruments, the Link provides a way to prevent costly, time-consuming communication bottlenecks. As a result, the 12050A Link is outstanding for today's growing computer-based instrumentation applications.

Highly reliable and easy to use

In application, two 12050A Link units must be used for each remote site. Dual channel fiber optic cable connects the two units. In this way, each Link functions as a transmitter/receiver, with HP-IB bit-parallel protocol automatically converted to bit-serial information for transfer over the fiber optic cable.

No special programming is required for operation of remote devices. HP-IB devices communicate programmatically via the 12050A units just as they would in local operation.

With the silicon-on-sapphire (SOS) microprocessor that is contained in each 12050A, data integrity is carefully maintained. If a transmission error is found (using a checksum comparison algorithm), retransmission automatically continues until the correct data byte is received.

As for durability, the fiber-optic cable has proved more rugged than conventional wire cables.

Seeing the light

For more information on how this new technology can apply to the manufacturer, **please indicate A on the reply card.**

Factory data collection: putting it to work

Now, factory managers can quickly and easily put together a real-time factory data collection system—without extensive and costly programming—tailored to a variety of specific user applications.

DATACAP/1000—HP's new applications software tool—enables you to build an interactive system that allows fast access to a continuing flow of accurate and timely factory information. The ability to retrieve data on critical production processes or procedures—at any time and in either display or hard-copy format—has created a "quality information" process. With this new capability, managers can now see problems as they arise, and take corrective action immediately to prevent situations that could cost the company much time and money.

With DATACAP/1000, all information is captured in real-time directly from the factory floor, and can be validated to ensure accuracy—resulting not only in lower information-handling costs, but in quality information upon which to base important production decisions. If it is available, information concerning every phase of production can immediately be at the fingertips of everyone concerned. No longer will the manager be flooded with too much data, or data that is unorganized or delayed somewhere in the system.

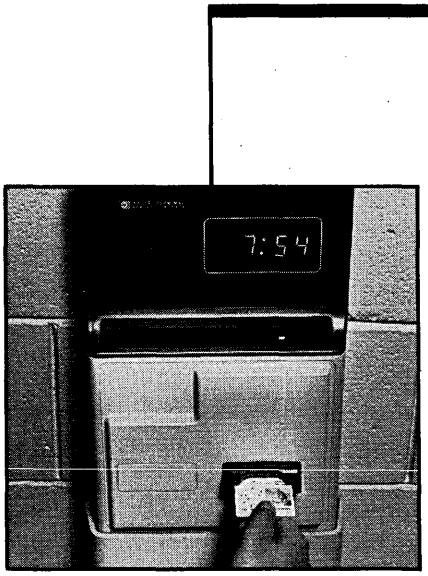
In short, DATACAP/1000 is an efficient means of keeping manufacturers alive and productive in today's competitive business world.

Hard-nosed software... the DATACAP approach

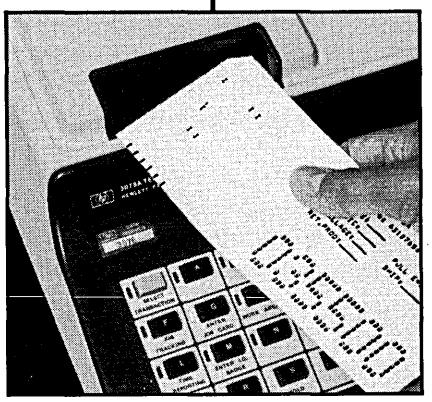
DATACAP/1000 is a data-entry software product designed for use with an HP1000 computer system. It enables users to process information collected by data-capture (HP3075/76) or timekeeping (HP3077) input terminals—as many as 56 per computer—in real time for immediate use. In addition, instrumentation can also be controlled by a single HP1000 through the HP-IB 12050A Fiber Optic Link or other local interfaces.

Using DATACAP/1000, slow and error-prone manual methods of recording data are eliminated, and gathering of information is not only up-to-the-minute, but accurate and cost-effective. And, for even more powerful data processing, distributed systems networks (DSN) can be established to communicate between HP1000 and HP3000 systems.

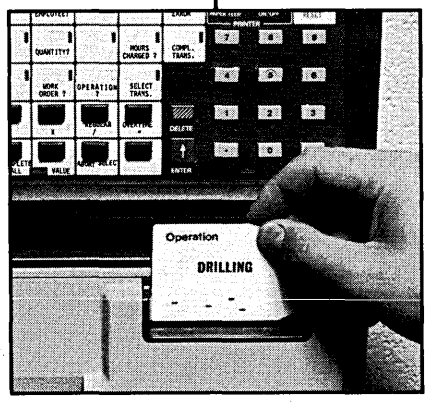
When combined with IMAGE/1000—HP's data-base management software—DATACAP/1000 is able to organize the continuous flow of up-to-date manufacturing and work data to generate automatic status



"GOOD MORNING, JOHN"

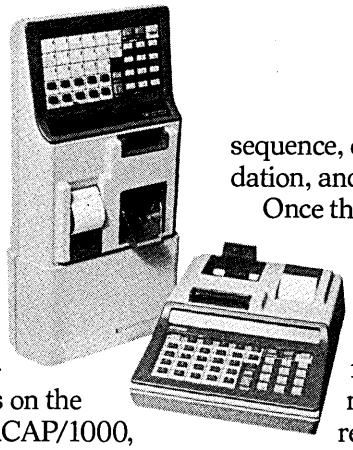


ENTER JOB CARD



OPERATION?

reports on either CRT display terminals or hard-copy line printers.



How it works

There is no turnkey solution applicable to all problems on the factory floor. DATACAP/1000, however, can be easily tailored to meet most user requirements. And once placed on line, it requires no special programming expertise to operate.

To adapt DATACAP/1000 to a specific application, a user must define specifications for data-entry transactions that will represent the bulk of factory data processed by the manufacturer. This is accomplished through a simple, interactive process on a display terminal using plain language, and typically includes instructions for entry sequence, entry method, data validation, and storage.

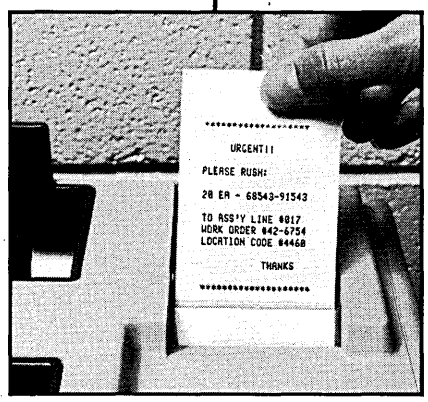
Once the user has designed all possible transactions that will be required (for example, one for inventory control, one for work-in-progress monitoring, and others representing different phases of factory production), a program is created through DATACAP/1000 that will continually monitor all or a portion of the many factory input terminals.

After the DATACAP/1000 programs have been established, data entry itself can be made at any one of the many input terminals deployed throughout the factory floor, using one of four input modes: a function/numeric keyboard, alpha-numeric punched (80-column) cards, mark-sense (pencil) forms, or type-III plastic perforated identity badges.

In addition to numerics, the keyboard includes 15 prompting lights to guide the user through each transaction, and 10 special function keys. Keyboard data is displayed on a 15-digit visual readout, which can also be used to display data being sent to the terminal from the computer. For hard-copy recording, a 50-lpm thermal printer is available. For security purposes, a code may be assigned to a user, allowing access to specific transactions only.

For each data transaction, temporary storage is provided until the user indicates that the transaction is complete. At that time, DATACAP/1000 records the data (along with the transaction number, terminal identification, data, and/or the time of day, if requested) on magnetic tape, cartridge disc file, the IMAGE data base, or a storage

Continued on page 8



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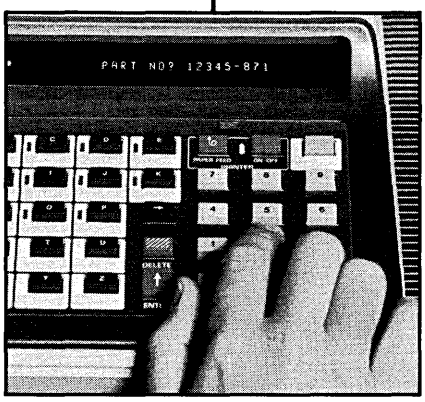


PART NUMBER?

DATA BASE

Materials management made more manageable

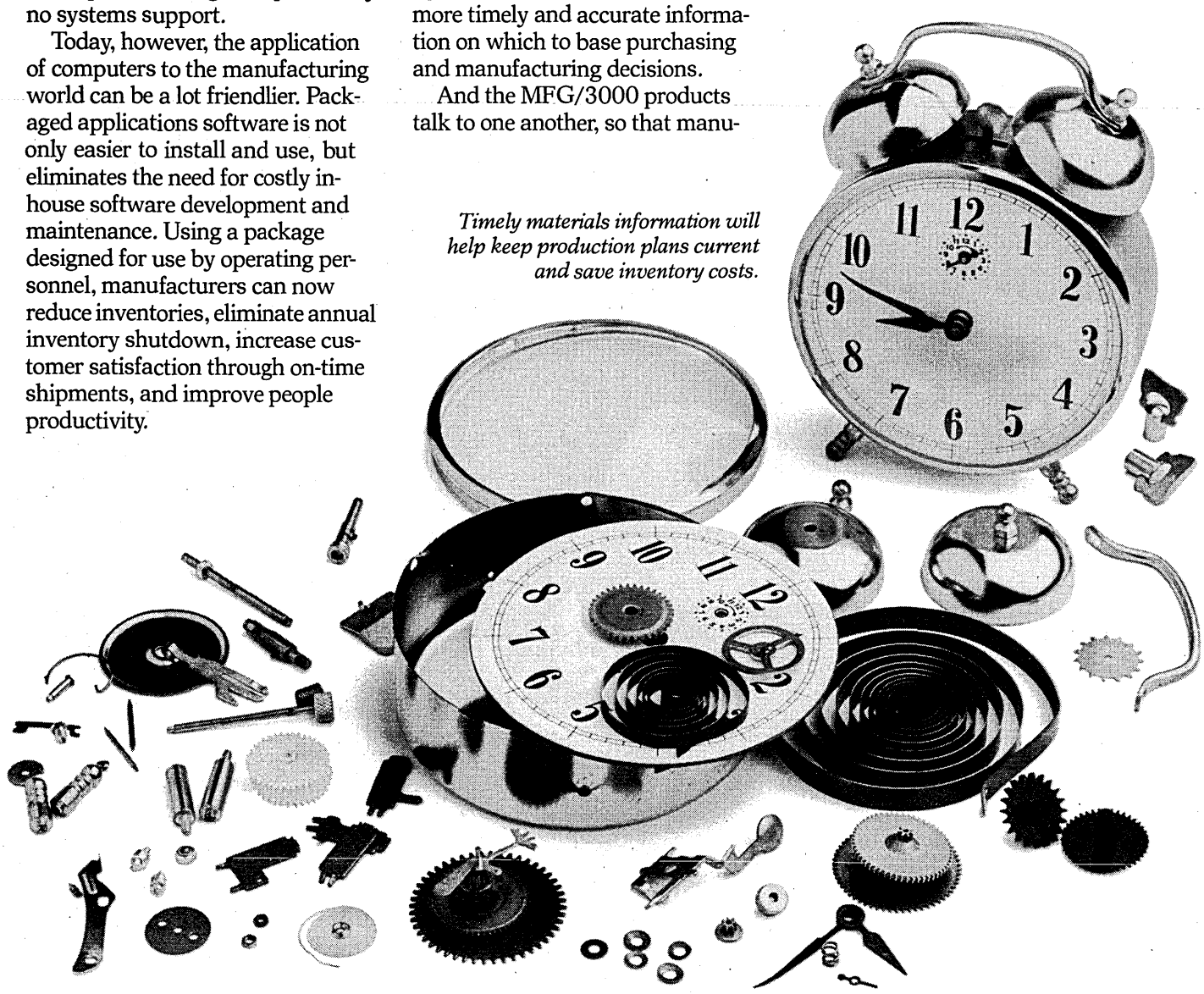
In the past, the users of material requirements planning systems were faced with a number of frustrating data processing problems: long turn-around time, inaccurate data, lack of good documentation, costly and inflexible software, long and difficult implementation, inadequate training, and practically no systems support.

Today, however, the application of computers to the manufacturing world can be a lot friendlier. Packaged applications software is not only easier to install and use, but eliminates the need for costly in-house software development and maintenance. Using a package designed for use by operating personnel, manufacturers can now reduce inventories, eliminate annual inventory shutdown, increase customer satisfaction through on-time shipments, and improve people productivity.

An integrated solution

Within the past year, Hewlett-Packard has introduced four software products—all part of MFG/3000—that help manufacturers to improve inventory management, control costs, and obtain more timely and accurate information on which to base purchasing and manufacturing decisions.

And the MFG/3000 products talk to one another, so that manufacturing users from more than one department now can communicate and use information collected from almost everywhere in the manufacturing operation, from engineering and assembly to inventory control and product planning.



Timely materials information will help keep production plans current and save inventory costs.

An important advantage of MFG/3000 is the ease and speed with which the user can enter, retrieve, and modify data via an interactive terminal. Easy-to-use HP CRT terminals are used to enter data on forms that resemble those typically used in materials planning and control departments.

On-line transaction menus are shown on the terminal screen to guide the user in making entries. If unsure of the proper entry to make, the user can initiate a "help" procedure, which will display information on the screen to assist in making the correct entry.

MFG/3000 was designed primarily for the manufacturer who assembles standardized multipiece products in lots, and includes the following products:

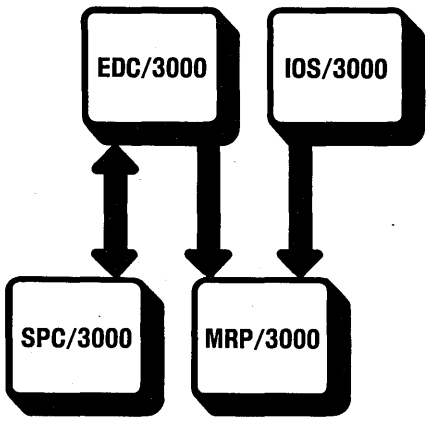
EDC/3000, the Engineering Data Control portion of MFG/3000, is used to maintain an IMAGE/3000 data base on every item in the materials inventory. This includes part numbers, product descriptions, costs, bills of material, standard routings, and engineering or materials changes.

With all data easily entered and edited on interactive CRT display terminals with specially formatted screens, EDC/3000 allows users to have high confidence in the accuracy of all information.

IOS/3000, HP's Inventory and Order Status product, maintains information in an IMAGE/3000 data base to manage the use of materials documented by EDC/3000.

By continually reviewing all data interactively, the user can predict and control inventory activity. And IOS/3000 will maintain a complete and accurate record of all on-line transactions affecting inventory balances.

In the event of exceptional inventory conditions, IOS/3000 will issue recommendations for corrective action well before the situation becomes critical.



MRP/3000, Material Requirements Planning, simulates the complex flow of material necessary to meet a production schedule.

Using bills of material, parts on order, and inventory status information provided by the other MFG/3000 products, and a company's master production schedule, MRP/3000 recommends a plan for material acquisitions that will satisfy that schedule.

If a particular material or component is in short supply, MRP/3000 either suggests an order to replenish the supply, or expedites an existing order.

SPC/3000 calculates Standard Product Costs—including material, labor, and overhead—of each subassembly, assembly, and finished product in a manufacturing operation. Based on the current costs entered into the EDC/3000 data base, SPC/3000 establishes a standard cost for a product at each stage of its assembly.

With this product, not only is time saved in the calculation of a product's cost, but a manufacturer can simulate any changes in a production process before actual implementation of a new standard.

Each element of MFG/3000 has been designed to solve a particular manufacturing problem. To achieve a total solution to the materials management challenge, however, they should be implemented together to form an overall integrated materials planning and control system.

At HP, the expertise gained from years of manufacturing experience has been used to successfully develop an off-the-shelf software package to substantially enhance the management of materials planing problems. Tested and proven by use at numerous customer installations, MFG/3000 is quickly implemented and easy to use. It is truly a cost-effective approach to help increase the manufacturer's productivity.

If you would like more information on Hewlett-Packard's packaged applications software for materials management, **please check D on the reply card.**

A pacemaking mini network

The following story gives an example of how a manufacturer has successfully applied the technique of Distributed Systems Networking (HP DSN) in integrating manufacturing process applications:

A distributed processing network of three Hewlett-Packard 1000 minicomputers is the key to testing and quality assurance at Medtronic, the world's largest manufacturer of cardiac pacemakers.

"The HP system has helped increase the efficiency of our pacemaker testing by 400 percent," said Vern Menk, senior project engineer at the Rice Creek Facility in Fridley, Minn.

By using Hewlett-Packard's DS/1000 software to link the three computers, Medtronic has created a system it calls MED-NET (for minicomputer electronic data network). This system operates five stations for performing long-term life testing, low-volume qualification testing, and high-volume receiving-inspection testing of pacemaker components.

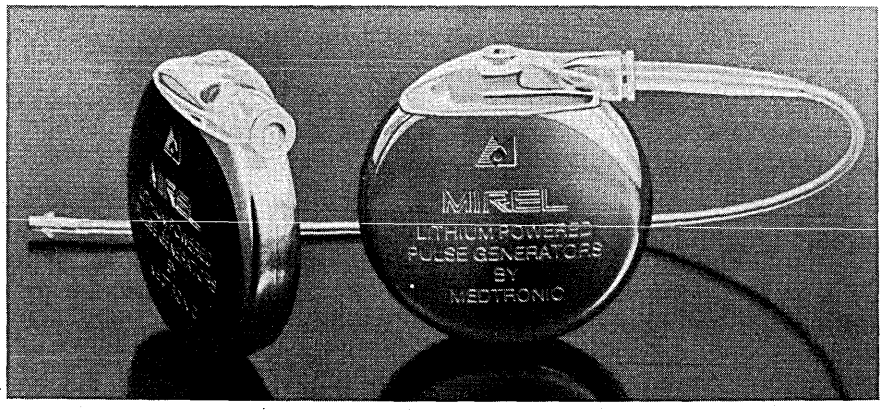
Other features of the network are shared resources and mutual back-up among the minis, simultaneous, real-time test program development, interchangeability of the computers, and ease of interface with the HP-IB (interface bus) links.

One HP1000 is the central processor, which is used for program development, pacemaker life tests, and for checking out test hardware. This processor also stores test programs for downloading the two satellite computer systems currently testing about 40 different parts and devices. Seven other HP1000s are used by the company for other related purposes.

A portion of the data collected is transmitted to an IBM 370 system for archival storage and trend analysis.

The multiprogramming capability of the HP1000 allows simultaneous testing of both fast and slow-running device types, a feature not often found on test systems that are commercially available.

If you would like more information on HP Distributed Systems Network software, **please check E on the reply card.**



Factory data collection (continued)

medium provided by the user via a special subroutine.

DATACAP/1000 also provides other user features. For those requiring an audit trail for specific types of data, a logging of all pertinent transactions can be selected and recorded. To ease support and maintenance, documentation for each transaction specification can be provided.

For more information on HP's factory data collection software, DATACAP/1000, **please check B on the reply card.** To find out more about HP's durable, low-cost data capture terminals, **check C.**

Computer Advances is written to inform professionals of the latest technical contributions from Hewlett-Packard. You are invited to receive issues at your place of business or residence. Write Bob Ingols, Editor, Computer Advances, 11000 Wolfe Rd., Cupertino CA 95014.

HEWLETT hp PACKARD

Check the charts. WANG beats IBM.

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

We suggest you take a careful look at both of them.

Because that way, you'll appreciate Wang's remarkable VS computer family and the new VS 100 processors that much more.

Here are some of the things you'll appreciate most:

Major industry analysts consider Wang's VS systems more advanced than IBM's 4331 and 4341.*

The VS family provides a completely integrated approach to computing with word processing, data processing and telecommunications, all available on the same system.

Wang's VS computers deliver the highest degree of programmer productivity of any system.

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

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

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

The VS is extremely easy to use. Any programmer familiar with IBM 370 procedure can become productive in a single day. Even clerks or supervisors with no computer experience become productive within a matter of hours.

The VS can grow from the level of a System 34 to that of a 370/158 – without reprogramming, without major equipment swap outs. No other system can do that.

If you'd like to know more about the Wang VS family, including the new VS 100 processor, call us in Lowell, MA, at (617) 851-4111. Or send in the coupon below.

And we'll continue this chart-to-chart talk.

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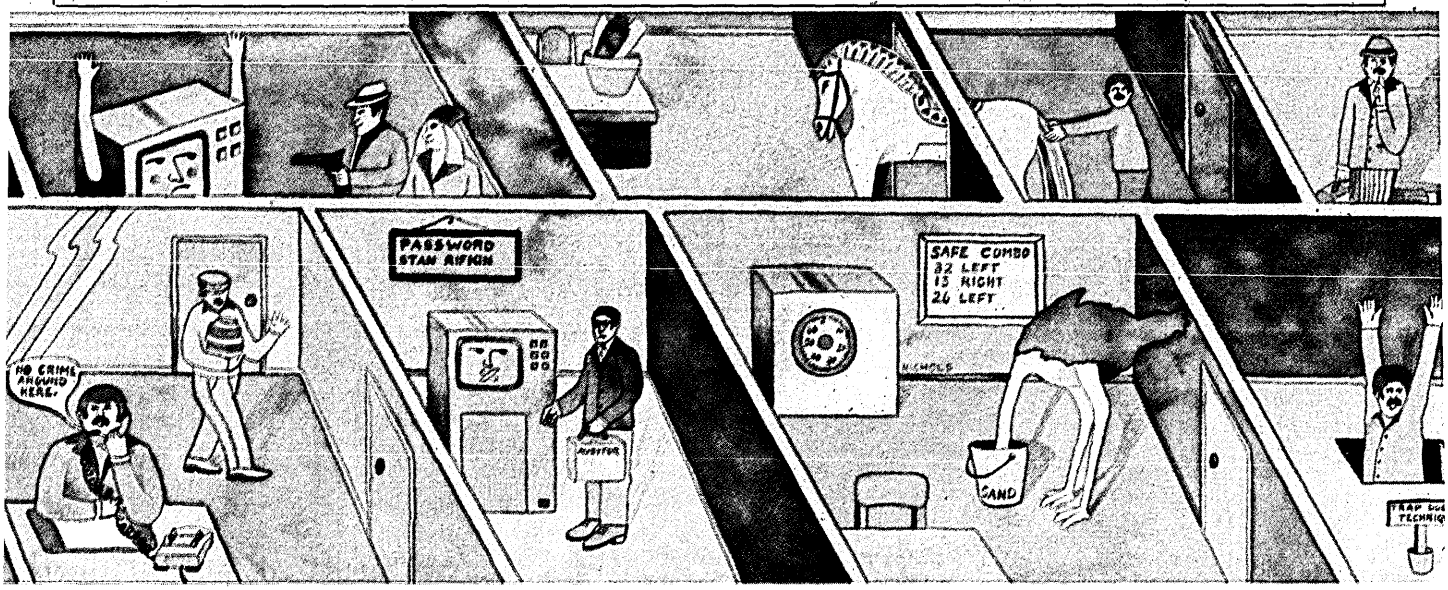
*Industry Analysis Report for Executives, Advanced Computer Techniques Corporation, New York, New York.

FOCUS

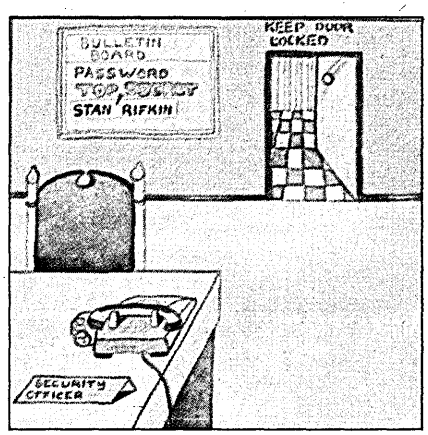
THE HEAD-IN-THE-SAND CAPER

Computer crime appears to have a great future. Laws are inadequate, countermeasures are ineffective, and often business' basic attitude seems to be, "Let's ignore it and maybe it will go away."



A QUESTION OF VULNERABILITY

Forget the fancy hardware, it's the people interface that needs the attention.



The question of computer crime and the vulnerability of computer and telecommunications systems was unavoidably raised during the deliberations of the National Commission on Electronic Funds Transfer (EFT) back in 1976, when that blue-chip advisory group was developing its recommendations to Congress on the coming of the cashless society.

Raised, but rather quickly disposed of.

"The community of the commissioners was very interested in making sure everything was all safe and sound," dryly remarked an ex-commissioner recently, "but they didn't want to spend too much time on the subject. Being largely a group of bankers, bank commissioners, credit company, savings and loan, and credit card people—they didn't really want to admit to difficulties in the existing system or even in proposed systems."

Two of the 26 commissioners were representatives from federal agencies; one from the General Accounting Office and another from the Federal Trade Commission. Perhaps predictably, much of the overt concern about system vulnerability was expressed by the government's representatives: odd-men out amid a general sense of well being and perhaps even complacency.

"Nobody could prove to them that it was a problem," explained an agency official intimately involved in the proceedings. "Their position was that besides the vulnerability, there had to be a threat. (Our) view was that if you have the vulnerability, and you have all the money, a threat is going to come right along."

The FTC representative, seconded by his GAO colleague, formally proposed that the EFT commission at least recommend the formation of an interagency government team to watchdog security problems in EFT development. By vote of the commission, it was rejected, 24 to two.

The vote was a metaphor for the clash of relative values inherent in any discussion of computer-related crime. Bankers and businessmen—dp executives and salesmen included—are conditioned to accept a certain level of risk as tolerable. Others, with different values and responsibilities, and a sense of threats more malevolent than those of the marketplace, have less tolerance.

It's the cash crime—preferably complicated, and meticulously executed—that captures the fancy of novelists and the public at large. But genius is rare, even in crime—and while examples abound of lesser folk using and abusing computers for criminal purposes—it's perhaps a measure of the art that a generation will remember Stan Rifkin as a tech-wiz who pulled off a brilliant computer crime only to flub the getaway.

Rifkin, the computer security consultant who ripped off $10 million plus from a California bank which he had professionally advised, told the FBI after his arrest that he had actually considered executing a fraud by inserting a "Trojan Horse" program among the bank computer's legitimate software input, but decided against it because the scheme was too complicated and the "Trojan" would require too much computer testing before use. Instead, he bluffed his way into the bank's wireroom, noted the password openly displayed on a bulletin board, walked to a telephone and called in a transfer order, impersonating a bank officer with the password.

A nice bit of business, as the mastermind of the Victorians' Great Train Robbery might have said—but all con, no computer.

This report was prepared by DATAMATION editors Angeline Pantages, Vin McLellan, and Edith Myers.

"Who needs to invest in hardware," asked Jerold Isaacson, of the Computer Security Institute, "when a guy like Rifkin can just walk into a bank's money transfer room, get the password off a bulletin board, make a call, and collect $10 million?"

Isaacson, an EFT security expert formerly with the New York Federal Reserve, suggests that bankers don't worry about external attacks on their networks —wiretapping, intercepting and changing data—because they know only a stupid criminal would go to such lengths when alternatives are so much easier and cheaper. "The Fed understands that it will have to deal with sophisticated electronic attacks in the future," he said; hence the financial community's major investment in encryption. "But that's in the future. For now, it's cheaper to pass $50 to a clerk somewhere."

Like the rest of the edp community, bankers have apparently been slow to realize that the most vulnerable part of their systems is the human/electronic interface: the people involved in handling the input and output of their systems, the people who open the doors to those offices, the people who put passwords on bulletin boards. The vast majority of crimes involving computers have involved simple data diddling, changes in data input or output—and except for the aura of respectability our culture attaches to a computer printout, the system is no more culpable than the paper of a fraudulent balance sheet. All known EFT frauds, said Isaacson, have involved improper access to data at the bank or illicit manipulation of data—all manual 19th century criminal techniques, preventable by good internal security.

There are, however, vulnerabilities beyond—truly "undetectable" crimes that can be described in detail; electronic attacks on system integrity from insiders, against which there are no known defenses. Because computer operating systems are not completely predictable, we have no analytical method for proving that an OS is *not* performing unauthorized acts; thus there is no systematic defense against any of several known techniques by which a programmer could corrupt a system for illicit gain.

"Computer operating systems are not predictable in that we do not know how a computer operating system will function under all conditions," explained security expert Donn Parker of SRI, International, "which is why computer operating systems tend to be more works of art than engineering accomplishments. And so far, we have been unable to prove the integrity of significant computer programs. With a great deal of effort, we can prove that a program does perform according to its specifications, it's positive specifications; but we can not prove that it does not do any more than what it is specified to do."

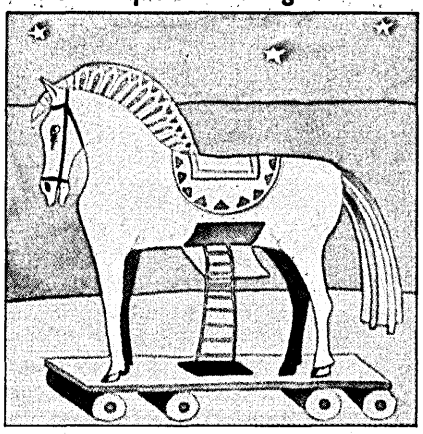
Parker has been funded by the National Science Foundation for several years to preach his particular message against complacency. While he, too, notes that the more immediate problem is in establishing conventional security within the edp environment, he highlights the further vulnerabilities. The computer industry just hasn't developed sufficient controls that can be built into computer systems—or even the analytical tools that could detect some of the known sophisticated methods to breach system security.

"Computer systems are simply too large, too complex, and—at the customer's insistance—too flexible and easy to use, for manufacturers to build in even the levels of integrity and resistance we *can* achieve," said Parker. "I think computer manufacturers will readily agree that their systems are vulnerable to very sophisticated attacks and they are not capable of designing commercially available systems that are going to resist that kind of attack, but they take the position that their products are secure enough relative to the needs of their customers."

—V.M.

OF TROJAN HORSES AND TRAP DOORS

In sophisticated computer crime, the technique's the thing.



"Vulnerabilities of edp to losses from accidental and intentional acts take many forms, limited only by the foibles and ingenuity of people," notes a report on dp bank security from the Federal Deposit Insurance Co. The FDIC uses four general catgories of threat in discussing dp vulnerabilities—physical, transactional, programming, and electronic. Each requires different levels of skill, knowledge, and access on the part of the criminal.

In the FDIC categories, physical acts include destructive attacks on equipment, data, or programs; false data input through normal manual methods, and scavenging for information available in physical form. Transactional acts include imposturing (assuming the identity and privilege of another person) and "piggybacking" (unauthorized second use of a still-open terminal which another person had properly used to access the system). Electronic threats are described as wiretapping and electronic hardware modifications that could produce the same results as software meddling—access, information, or tainted output—but it's the area of programming attacks that is generally considered the wonderland for the criminal technocrat.

With the array of techniques available to the malicious and the mendacious —a spectrum of criminal potential by no means fully explored—perhaps it's little wonder than many consider computer-related crime to be a growth industry. Criminal computer abuse may be changing our sense of scale regarding big-time crime. With EFT systems, for example, fraud and embezzlement will likely be rarer but involve larger dollar amounts. Some of the more impressive dollar figures are still attached to cases in which nothing more sophisticated than data diddling was involved. In Chicago, a corporation's president, dp manager, and a programmer were charged with an intriguing $40-million fraud after they allegedly inflated inventory to cover poor performance. The hyped inventory was discovered by the board of directors, who allegedly hired new executives and charged them with gradually deflating the inventory so as not to impact publicly traded stock. Sometime later, the SEC moved in.

Most computer-related crimes seem to be inside jobs. The computer system is never more vulnerable than in the hands of those who feed and care for it. The possibilities of manipulating a computer's software programs to distribute money and information into the wrong hands are numerous, and the gamesmanship inherent in the art has brought more than a few programmers to consider it a challenge to their ingenuity to "break the system."

Some of the techniques they've used are easily understood—like the "salami technique," rounding off odd fractions in, for example, bank accounts and dropping the extra mills into another account. But the ways in which such software modifications can be hidden can be infinitely sophisticated.

The method Stan Rifkin said he was considering—a Trojan Horse attack, situating an unauthorized computer program within authorized programs to gain access to computer resources—can be used to explain the difficulties of defense. With the Trojan's secret code deftly hid-

den among the five to six million instruction inside a computer system at any point in time, trying to locate the code even when you know it's there is like getting the proverbial needle out of the haystack.

And a Trojan could include a logic time-bomb, a program that would order the computer to execute instructions sometime in the future—on a given year, day, and time; transfer money, for instance—and/or destroy all internal evidence that there had been any illicit access to the system. Steal, then erase yourself! It brings a certain elegance to the criminal potential of a computer system.

Avenues of complexity are still spreading. Another known technique for corrupting a system's integrity involves an asynchronous attack, using the asynchronous nature of most computer operating systems to confuse the OS into executing two programs while it records only one continuous program run.

Yet another involves the discovery or insertion of a "trapdoor" within a computer program.

In the development of large computer programs, it is the practice of programmers to provide breaks in the code for the insertion of additional code and intermediate output capabilities (something like subtotals). Most operating systems are designed to prevent additions or modifications to their code, but programmers sometimes insert these "trapdoors" to handle necessary changes while the system is in its development phase. Although they are to be removed during the final editing of the program, sometimes they are overlooked. In other cases, these hidden holes in the program are inadvertently created in large complex programs through weaknesses in the design logic. And, in still others, a programmer had purposely inserted a trapdoor for his own, illicit, later use.

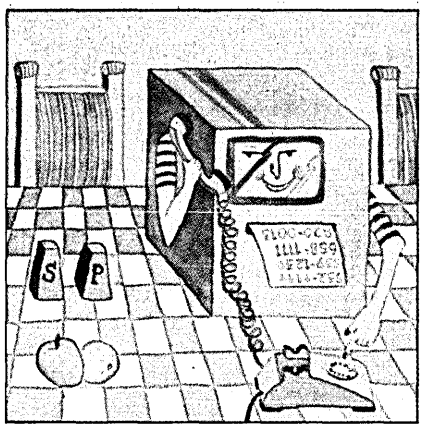
The trapdoor can be used to hide instructions given to the system so that the computer's own internal controls aren't aware of what's happening. It's like a large well-hidden cave in an otherwise well-controlled park; anything could be happening in there and no one would know.

Examples of the more common type of computer-related crimes are no longer difficult to come by—although, as with other white collar crime, it is generally assumed that only a minor fraction of the discovered crimes are reported. And while there are rare examples of each of the sophisticated techniques mentioned above, these are mainly areas of long-term potential. Somewhere, some computer science collge undergrad had probably just discoverd a new trick. What will he do with it?

And if he just "borrows" information, will anyone ever notice? **—V.M.**

A KITCHEN TABLE GANG

The personal computer may be used for more than Star Wars.



The lack of edp auditing techniques sophisticated enough to check today's complex systems is a constant subject of discussion. But Robert Abbott, the head of EDP Audit Controls Inc., a California firm, says the problem is less the availability of techniques than "the unwillingness of the industry to accept curtailment or restrictions." Two trends illustrate Abbott's point: the home hobby computer and the implementation of changeable microcode in today's systems.

Suddenly, with the proliferation of personal computers, he says, all computer systems face a real threat—penetration from the kitchen table: "I am concerned about the hobbyist who can buy a computer, put it on his kitchen table and write a program which allows his computer to dial phone numbers and print out those which are answered by a computer. The tone is easy to distinguish, you know. Then he can develop various strategies that allow him to access that computer."

Why is it so simple? He growls, "because people don't like to change the password or entry procedures with the frequency needed. When an employee leaves a company, for instance, every password, phone number, and valid account number should be changed."

Unless the computer user takes "a severe posture" in implementing tight procedures, he is "courting disaster of serious proportions." The heart of the matter is that the hobbyist is undisciplined. While Abbott believes some computer people may not have the right business ethics (he condemns the "idiotic reasoning" of those employees who feel it is a "fringe benefit to play with their employer's computer"), the industry at large has developed a discipline and set of ethics that the home hobbyist does not have. The computer user, he reemphasizes, must protect himself against this situation.

Abbott's second hot button is the implementation of changeable microcode in today's systems—a development that makes in impossible to assure system integrity. First, changeable microcode itself means that the knowledgeable can make the system appear to be something (or be doing something) that it is not. For instance, "I could generate my data in microcode so you would think it is coming off the disk when it isn't." In the hands of the criminal, this facility becomes a great weapon for undetected stealing of data or assets.

Isn't the fact that many vendors are making microcode a "trade secret," not releasing technical details, a safeguard? Abbott insists that nothing is secret when someone with the right knowledge wants to unravel the code. From what Abbott says, the trade secret handling of microcode is only good for keeping out those with an honest need to know. In one instance, Abbott's firm was auditing a client's system and asked the vendor for information on the system microcode. The vendor refused. Hence, says Abbott, his team has been unable to verify the integrity of the *total* system.

Another problem is that some vendors are making their microcode accessible and changeable remotely, says Abbott. The vendor can perform tasks, such as maintenance and system reloading, from "anywhere in the world." This facility defrays the vendor's rising manpower costs, but it also creates a new vulnerability—the clever criminal may learn enough to do his deeds remotely.

Going back to the point of developing better auditing techniques, Abbott asserts that the edp auditing community has to get together with the research/development part of the computer sciences community. Controls, he feels, must be considered at the very beginning, when new technologies and systems are being conceived. **—A.P.**

RED FLAGS OF FRAUD

The environment may be blatantly ripe for computer crime, but if no one cares, no one is caught.

About $432,458,763.25 worth of undetected computer crimes occurs each year.

If you are not laughing at this statement, join the crowd. Security experts successfully pull this statistical flimflam on audiences everywhere. But it does represent a grim reality. Like an insidious disease, most crime committed through

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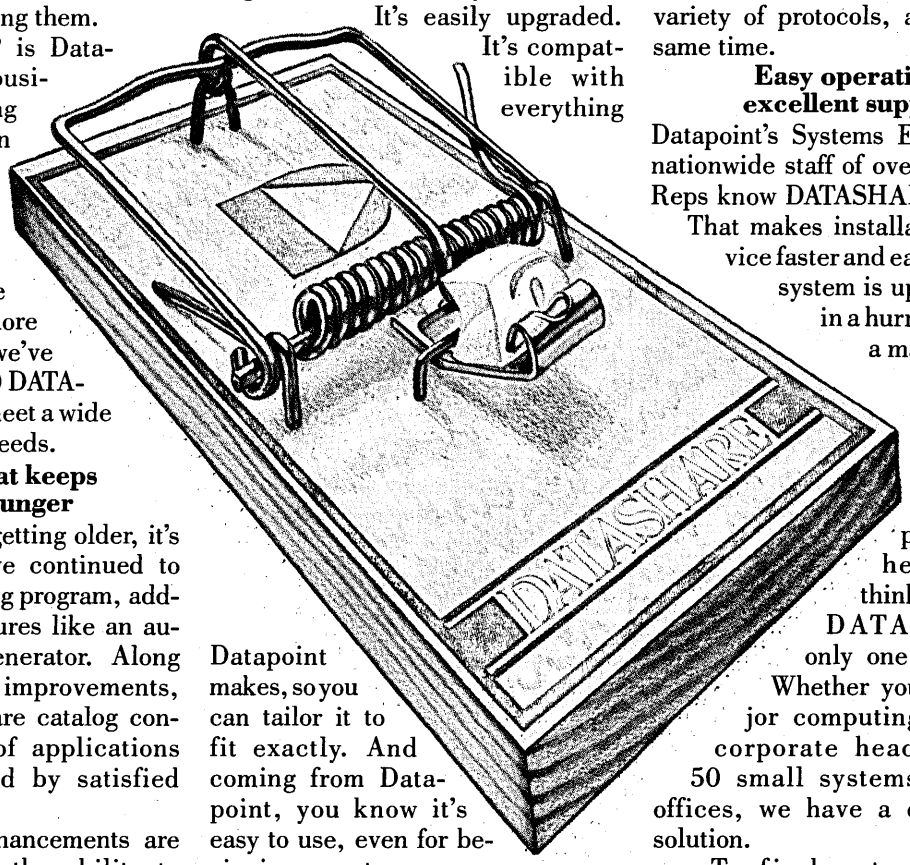

A single DATASHARE system allows as many as 24 users to execute the same or different programs concurrently. And systems can be linked to accommodate even more users. Virtual Memory techniques make the generation and operation of processing systems fast and easy. Communications can be terminal-to-terminal, system-to-system, or terminal-to-mainframe, in a wide variety of protocols, and all at the same time.

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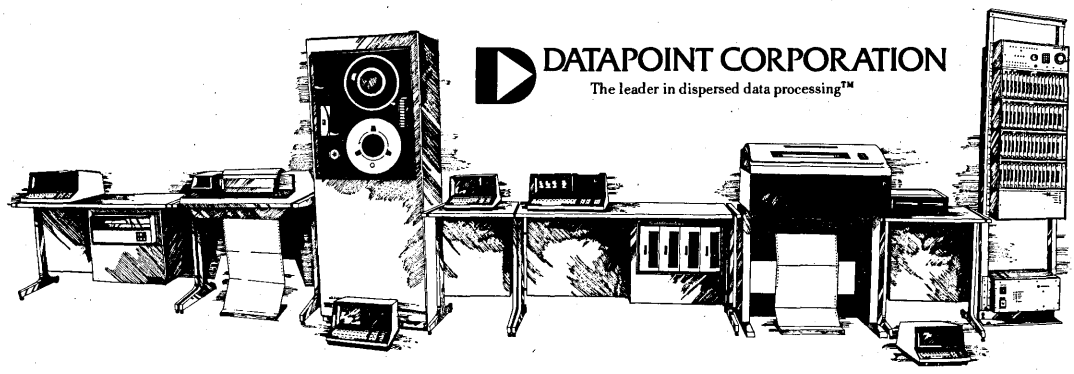

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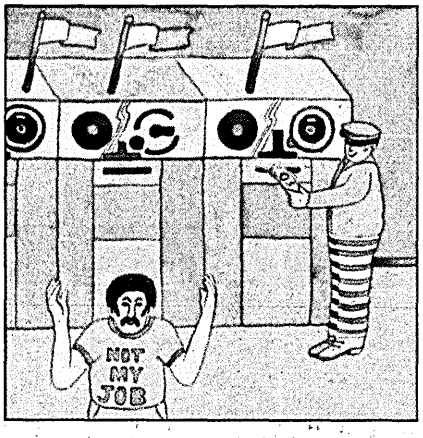
manipulation of computer processes or data is difficult to detect and feared too horrible or embarrassing to mention if discovered.

Why are computer crimes and abuses so difficult to detect? While there are many technical reasons, others fall under the category of "not my job."

For instance, most universities have not, so far, deemed it their responsibility to teach courses like edp auditing and controls. Only in recent years has the internal edp auditor been required to learn the right combination of edp, auditing, and business skills. And similarly, the outside auditing firm has been loathe to take responsibility for doing more than verifying the client's financial statement.



Detection of computer crimes or general business fraud? "Not my job."

But the auditing profession, at least, has been undergoing a gradual but major overhaul. In particular, the "big seven" auditing firms have been examining the problem of fraud detection, holding numerous seminars and funding study projects.

A recent project, funded by the Peat, Marwick, Mitchell Foundation, was the study done by a multidisciplined group at Brigham Young Univ., "Auditor Involvement in the Detection of Management Fraud." Its impetus was the conclusion of the 1978 findings of the Commission on Auditors' Responsibilities: the independent auditor, the commission said, does in fact have a duty "to search for fraud, and should be expected to detect those frauds that the exercise of professional skill and care would normally uncover."

The Brigham Young report is an enormous compendium on the causes of white-collar crime, and comes complete with a 60-page bibliography. One of the most fascinating aspects is its delineation of "red flags" that indicate a company's vulnerability to fraud or its likelihood of corporate hanky-panky.

While stopping short of the technical red flags one might find in the computer room itself, the study identifies 97 such warning signals and shows which were exhibited in many famous computer and other white collar crimes—including the Equity Funding scandal. (One of the study team, Prof. Marshall Romney, was an auditor called in on the Equity Funding case. Readers will recall that the firm, among other things, created $2.1 billion in bogus insurance policies to bolster the stock and create other benefits for its perpetrators.)

The Equity Funding fraud alone, according to the study, exhibited 37 red flags and illustrated blatantly that fraud detection at the time seemed to be "nobody's job."

To show the breadth of the study and the magnitude of someone's responsibility, here are Equity's red flags:

RED FLAGS AT EQUITY FUNDING

"Auditor Involvement in the Detection of Management Fraud" examined the major forces that influence the decision to commit fraud. Ninety-seven variables, or red flags, were identified. The Equity Funding Case exhibited 37 of them, as follows.

I. SITUATIONAL PRESSURE RED FLAGS
- A. PERSONAL PRESSURES/FINANCIAL
  1. "Other" man/woman.
  2. Undue family, company, or community expectations.
- B. PERSONAL PRESSURES/OTHER
  1. Peer group pressures (At least 100 employees were involved).
  2. Greed or desire for self-enrichment and personal gain.
- C. COMPANY PRESSURES/FINANCIAL
  1. Unfavorable economic conditions within an industry.
  2. Heavy investments or losses.
  3. Insufficient working capital.
  4. Extremely rapid expansion through new business or product lines.
  5. Reduced ability to acquire credit.
  6. Urgent need for favorable earnings (to support high price of stock, meet earnings forecast, etc.).

II. OPPORTUNITY RED FLAGS
- A. PERSONALLY DEVELOPED OPPORTUNITIES
  1. Very familiar with operations (including cover-up capabilities).
  2. In a position of trust.
- B. PERSONALLY DEVELOPED OPPORTUNITIES DUE TO COMPANY ENVIRONMENT
  1. Employees not informed about rules and disciplines of fraud perpetrators.
  2. Rapid turnover of key employees —quit or fired
  3. No annual vacations of executives.
  4. No rotations or transfers of key employees.
  5. A dishonest management and/or environment.
  6. A dominant top management (one or two individuals).
  7. A firm always operating on a crisis basis.
  8. Unrealistic productivity measurements.
- C. COMPANY STRUCTURES
  1. Related party transactions.
  2. Very complex business structure.
  3. No effective internal auditing staff.
  4. Highly computerized.
  5. Several different auditing firms used.
  6. Reluctance to give auditors needed data.
  7. Auditors changed often.
  8. Auditor hired lacks expertise.
  9. Several different banks used, none of which can see the entire picture.
  10. Large year-end and unusual transactions.
  11. Poor internal accounting control —or does not enforce an internal control system.
  12. Unduly liberal accounting practices.
  13. Poor accounting records.

III. PERSONAL CHARACTERISTIC RED FLAGS
- A. PERSONAL TRAITS
  1. Low moral character.
  2. Wheeler-dealer.
  3. Likes intellectual challenge.
  4. Highly motivated, skilled, intellegent and/or creative. —**A.P.**

BUSTING IN, GUNS BLAZING

The Europeans may be a bit more subtle.

"We are not such a villainous lot as you," joked Adrian Norman, A. D. Little consultant and computer crime expert in London. Europe, he explained, has had some instances of computer abuse, but "we have not had an Equity Funding scandal yet."

Norman is now working with the British National Computer Centre on a comprehensive collection of case studies,

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HP 250 The HP 250 is a powerful small business computer that has a typewriter-like keyboard and an adjustable video screen with eight programmable "soft keys" to make the user feel right at home. Priced from $23,500, the HP 250 can support five local terminals and even act as a terminal for the HP 3000.

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HP 300 Advanced Hewlett-Packard technology has packed an impressive amount of capabilities into the HP 300, a business computer designed especially to handle specific departmental jobs like order entry, customer files or personnel records. Priced from $36,500, the HP 300 can accommodate 16 users from an innovative display console that simplifies operating and programming the system.

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processing compromise.

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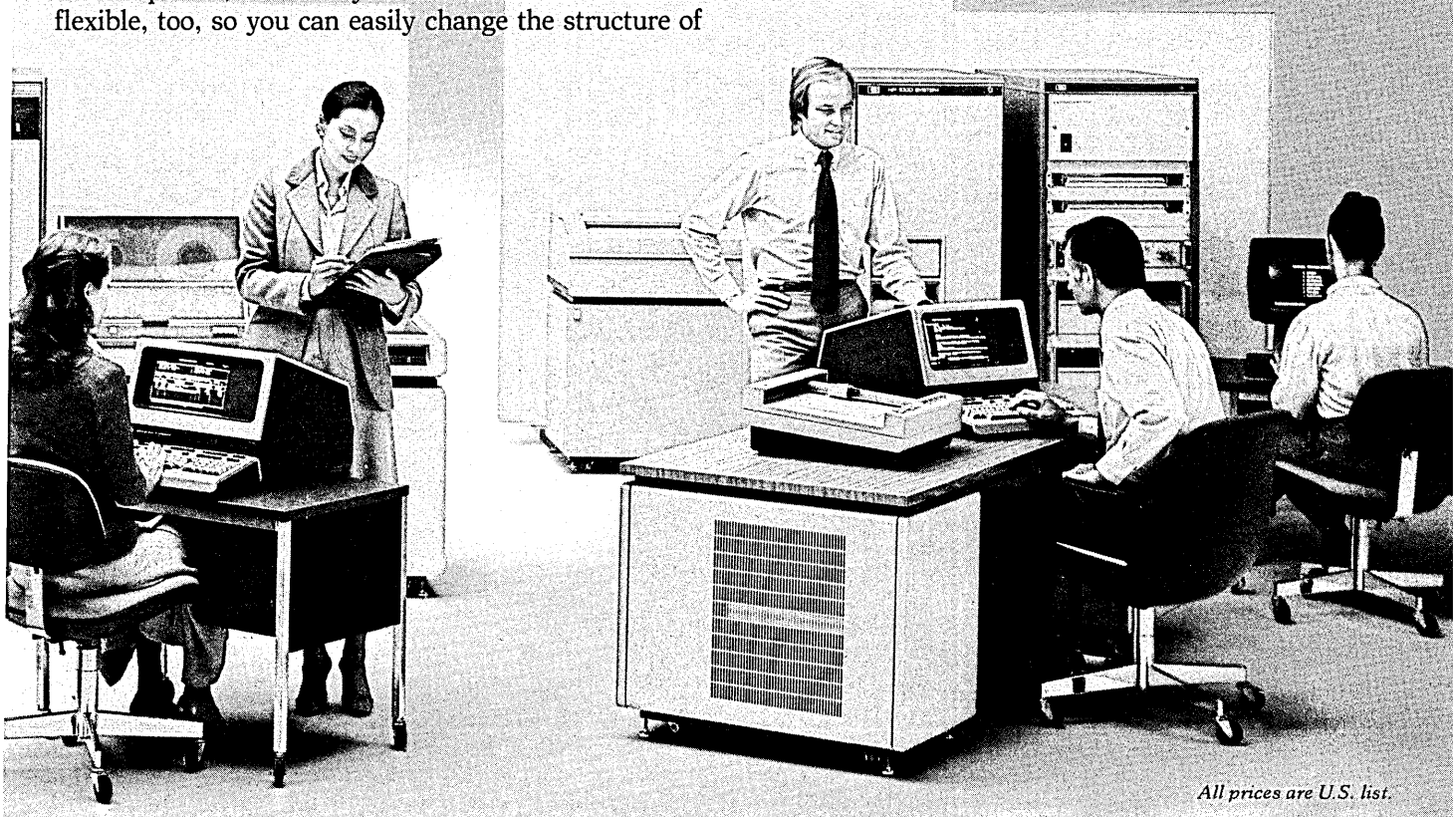

All prices are U.S. list.

HP 3000 The HP 3000 Family is Hewlett-Packard's most powerful business computer line. Both the Series III (pictured above) and the Series 33 use MPE-III, a multiprogramming operating system that facilitates on-line transaction processing at terminals throughout your company. The Series 33 (which can support up to 32 terminals) is priced from $58,500, while the Series III (64 terminals) starts at $105,000.

HP 1000 The HP 1000 Systems Family consists of five upward-compatible models (from $20,000 to $100,000) designed to meet the diverse needs of engineering and manufacturing environments. All use HP's powerful RTE operating systems, and the HP-IB interface bus lets you monitor and process data from over 200 Hewlett-Packard instruments.

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a part of the Centre's work on computer security.

He listed a few of the kinds of incidences found in Europe. Germany, for example, he said, had an experience with "some ghosts." Apparently, the government suspected something was wrong when it noticed that an unusual number of pensioners were dying off in the summer months. What was happening was that as deaths were being reported to the pension department, a few clever employees were simply changing the addresses of the deceased and routing their paychecks into their own pockets. Under the German system, the pensioners were required to come in for verification once a year—during the warm summer months. Therefore, the crooks would "kill off" the already deceased just before inspection time.

This kind of computer data manipulation seems to be the most common occurrence, said Norman. Perhaps where the Europeans are leading the U.S. is in industrial action—the unions' use of selective strikes in which only computer center personnel go out on strike, rather than the entire work force (June, p. 72).

Some European countries are suffering another type of industrial action—the computer center bombing. Italy has had 25 such occurrences—a terrorist action of the Red Brigade, a leftist group that believes that computerization is part of a western plot to maximize social controls and "implant special espionage sections within every fundamental institution."

According to London's *Daily Telegraph,* each occurrence has resulted in about $1 million worth of damage to the computer center and was clearly carried out by technological experts. Honeywell Information Systems Italia was one such target, losing four systems ($4 million worth) at its corporate center.

Norman pointed out that European countries have not had as much computer fraud and thievery as the U.S., and they are vitally interested in keeping things that way. European experts are constantly visiting the U.S. to examine new developments in controls, detection, and law. Some countries are examining the Ribicoff bill now in the Senate to see whether it is applicable to their system. The U.K., said Norman, does not need such a bill since its law is structured to "chase the thief no matter what method of thievery." But they still have the same problems of detection and prosecution.

To help solve some of these problems, Norman and other dp and law enforcement researchers in the field have formed a Computer Crime Club in London. And their honorary president is the "historian of computer crime" himself, Donn Parker of Stanford Research Institute.

Norman notes that the attitude of the police in the U.K. is that they need to understand enough to call in an expert—much as a pathologist is called in to examine the body "once the police have decided someone is dead." Hence, the police are beginning to use industry experts as "computer pathologists."

After a little more discussion with Norman on the difference between the American and British crime scene, we weren't quite convinced that the U.K. lags the U.S. in computer crimes. As Norman very wryly pointed out, the American criminal, "like your Bonnie and Clyde," has traditionally preferred to go busting in through the front door, guns blazing. The British "prefer to go in through the back in the dead of night," and have produced, for example, some of the most expert safecrackers in the world.

The British could indeed be the masters of the undetected computer crime.

—A.P.

THE RELUCTANT RIP-OFF VICTIM

Businesses, out of embarrassment or fear of public panic, are not reporting most computer crimes.

"The probability of a computer-related crime being detected is about one percent. Of those, only 15% are being reported to law enforcement agencies."

This statement was made by Joseph T. Woodall, a special agent of the Federal Bureau of Investigation in the Los Angeles office at a local seminar conducted by the EDP Auditors Assn. It was an echo of statements made at virtually every forum where computer-related crime and computer security are discussed.

Reluctance to report is the most oft-cited problem in prosecution of what is termed computer crime. Jay J. Becker, a deputy in the Los Angeles County District Attorney's office and director of the one-year-old National Center for Computer Crime Data, thinks it is *the* big problem. When he started the center he hoped it would become, among other things, a vehicle to bring business, law enforcement people, security people and the general public together to talk about the reasons why computer crime isn't reported. "We've got to get the reasons out into the open." He believed then and believes more strongly now that the reasons have their basis in myths.

"Possibly," he said when he started his efforts, "the reluctance of business to report computer crime is based on what they think we (the public) think and possibly we don't think that at all." Business, in failing to report perceived computer crimes, is "afraid of panicking the public. They (businessmen) rely on what they believe is a general public expectation that computer systems are inviolate and the more we get rid of that idea the less tenable that argument."

In the year Becker has been running the National Center for Computer Crime Data, which he sees as an information clearing house for prosecutors, investigators and anyone else interested in the subject, he has been trying to get a "dialogue" underway on the reasons for nonreporting of computer crimes. So far, he says, he hasn't been successful.

He's continually giving talks, he says, to a diverse selection of organizations. "I express my concerns and back them up with anecdotes but the dialogue I want has not happened."

Who needs to be educated? Becker believes the public has ceased to believe that computer systems are inviolate and that it (the public) wouldn't loose faith in a company just because it was a victim of computer crime. "After all, we've been talking about embezzlement for years."

But he feels companies aren't so sure that this is true. And, he feels, they wonder about cost. He talked of a conversation he had with Ray Ellison, National Computer Crime Centre of the U.K. He gives talks to firms about secure computer systems. He's constantly asked what it would cost to come up with a sufficiently secure system. "If they can't figure that one out, how can they possibly analyze the cost of nonreporting or reporting a perceived computer crime."

But he feels there is cause for hope. He had high hopes for a federal grant of some $400,000 of Law Enforcement Assistance Administration (LEAA) money due to have been awarded in August for a compilation of materials to help in the prevention of and fighting of computer crime, primarily as aids for prosecutors

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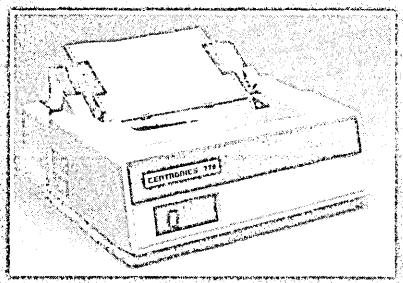

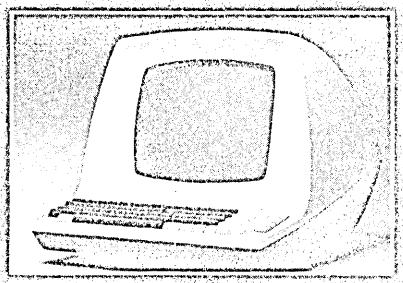

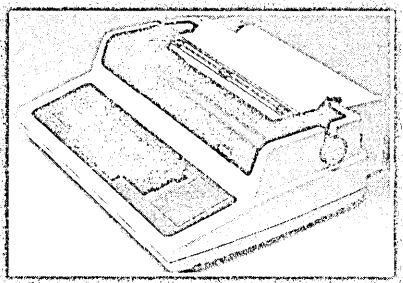

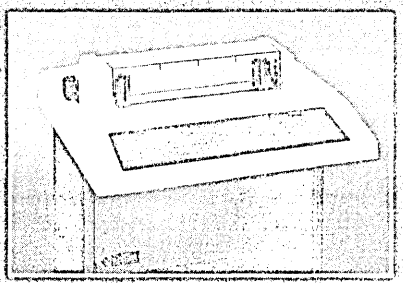

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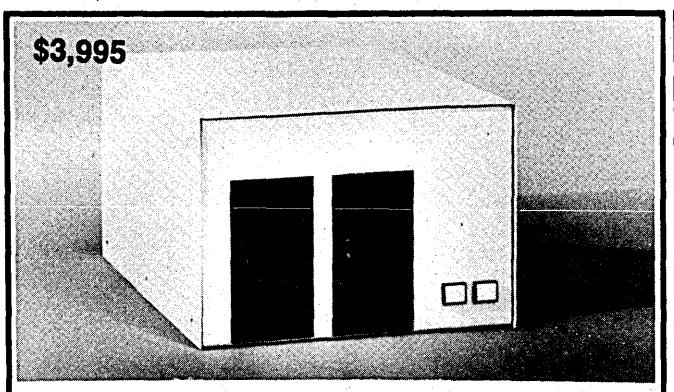

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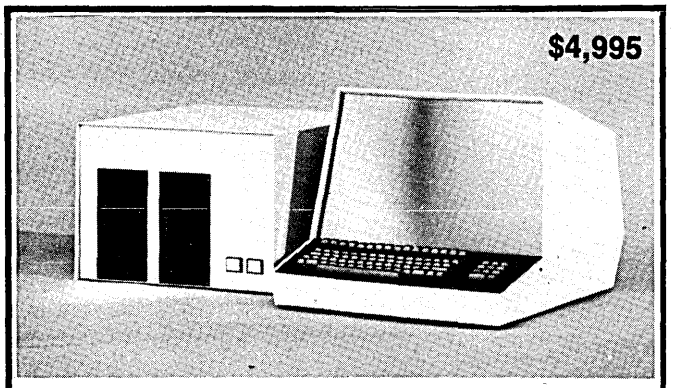

SEE System 6784 Unique Standard Features

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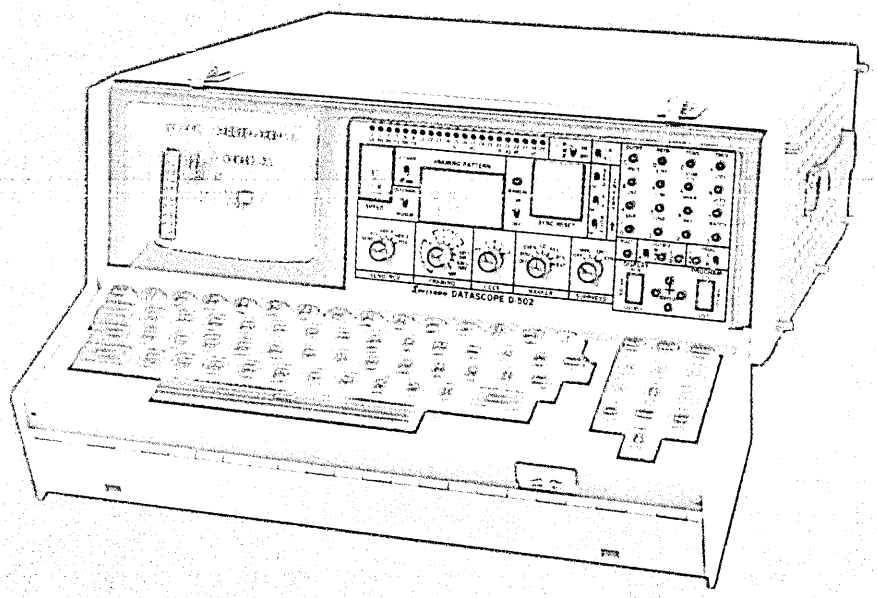

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CIRCLE 86 ON READER CARD

and investigators. He hopes he can volunteer the services of his center to the successful bidder in the RFP which was issued last May 21.

U.S. Senator Abraham A. Ribicoff (D., Conn.) has said he feels his proposed Federal Computer Systems Protection Act which would make certain computer crimes federal offenses, would encourage reporting, but Becker isn't so sure. "He (Sen. Ribicoff) bases this belief on the notion that his bill would make it more clear that a crime has been committed (in any kind of computer-related crime) and that when it is clear a crime has been committed it's hard not to report it. In the cases that have come to light so far it has been clear there was a crime because, in most cases, it was theft and still there has been reluctance to report."

"Unfortunately," Sen. Ribicoff has said, "all too often the victims of big computer crimes—insurance companies, banks, brokers, even the federal government—are so embarrassed by their misfortune that they do not report the offense to law enforcement agencies."

"If we know about it, sometimes that's enough," said Woodall of the FBI's Los Angeles office.

And if Becker can win the big fight of getting business to accept the fact that the general public can take the knowledge of a computer crime in its stride and without panic, that might really be more than enough. —E.M.

MAKING IT A FEDERAL CASE

Pending Senate legislation proposes tougher computer crime laws; the states are also getting into the act.

Books have been written about how few reported computer crimes are brought to just conclusions. The problem has been first, the applicability of existent law, and second, the difficulties in finding and presenting the evidence.

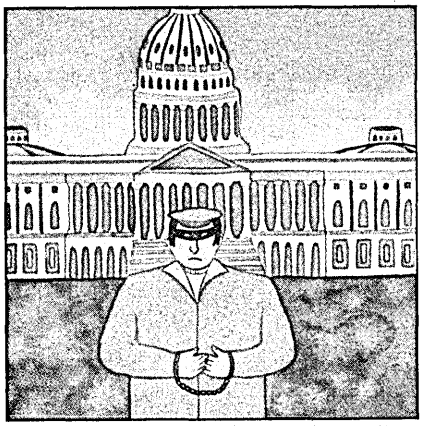
Legislatures all over the country are trying to correct the first problem. The second Senate draft of the Federal Computer Systems Protection Act, S. 240, is now in committee, and its prime proponent, Senator Abraham Ribicoff, is quite optimistic that this Congress will pass it.

It deals with abuse of federal dp systems and networks, systems of "certain financial institutions," and systems operating across state boundaries. In effect, it says that anyone who uses a computer to defraud or "obtain money, property, or services by means of false or fraudulent pretenses, representations, or promises" will be slapped with a fine of up to 2½ times the amount of the fraud or theft and a sentence of up to 15 years. Anyone who "without authorization directly or indirectly accesses, alters, damages, destroys, or attempts to damage or destroy" any computer or computer network or any computer software, program, or data such systems contain, will be given a fine up to $50,000 and a sentence up to 15 years.

Ribicoff has aimed his bill at solving the difficulties the courts have had in prosecuting computer crime under existing law. He noted that "a major computer crime conviction was won in one well-known case only because the perpetrator had used a telephone line to penetrate the computer system of a federal contractor across state lines.... In the same case, a part of the indictment was dismissed because electromagnetic impulses which transmitted valuable data were determined not to be 'property' as defined in the interstate transportation of stolen property statute."

Under this law, the use of telephone lines would not be a requirement to qualify a computer crime as a federal crime. And the definitions of data as property would no longer be a burden to law enforcement officials; the alteration, destruction, or theft of data is well covered.

Many in the computer industry



have criticized the bill for not differentiating between the kinds of misuse that do damage and those "unauthorized" accesses that produce something as harmless as a Snoopy calendar. Ribicoff has responded that the same type of "browsing, unauthorized access and manipulation which creates a Snoopy calendar could also facilitate major fraud.... In addition, the criticism... is oblivious to the fact that federal prosecutors have discretion in their application of the law."

In other words, it is tough enough to find and prosecute the serious crimes, so dp people presumably need not fear going to the slammer for keeping bowling league scores in storage.

Many state legislatures have already passed or will soon pass some version of computer crime bills. Florida, Colorado, California, Michigan, and Illinois are among them. Colorado's bill contains an added element that corporations should find interesting. This legislation states that it is a duty of a victim to report a computer crime—addressing another major problem in detection: the fear or desire of a company to avoid the embarrassment and potential civil action that might arise from being ripped off. The Colorado clause does not make reporting mandatory, but is seeking to change business' attitude toward coming forward. It further makes the reporting victim immune from any civil charges that result.

Federal regulations applicable to dp operation in specific industries are also appearing. Lawyer Robert Bigelow, in *Computer Law and Tax Report*, reported that the Food and Drug Administration issued new rules this spring that regulate how computer systems used in manufacturing, processing, packing and storing drug products should be operated and controlled to meet the drug characteristics required by law. Bigelow says that the drug manufacturer who fails "to set up and enforce the appropriate controls on security, backup, access, and documentation" may be opening itself up to prosecution. And the programmer and systems analyst that fails to do his part may also be liable.

The problems of prosecution are endless. One is simply the lack of dp knowledge on the part of law enforcement officers and their impossible task of gathering evidence. It is evidence that obviously does not come in traditional forms —fingerprints, signatures, or a blunt instrument.

Honeywell's Jerry Lobel, one of the industry's foremost educators in the field of security and privacy, notes that the "most important thing to teach criminal justice people is how computers work so that they can approach the problem intelligently." How for instance are they to make a warranted search of a file?

Some of these problems are already being addressed. For instance, the FBI has a computer crime school in Quantico, Va. Donn Parker and lawyer Susan Nycum, both established experts in this field, are now developing a manual to help law enforcement agencies (under a grant from the Law Enforcement Assistance Administration).

But Lobel puts his finger on the ultimate problem that the law and the potential victim face: "Most systems are not auditable and there are too few people able to institute the proper audit controls. It will be several years before we can get a handle on this." —A.P.

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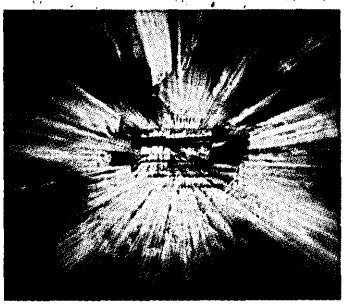

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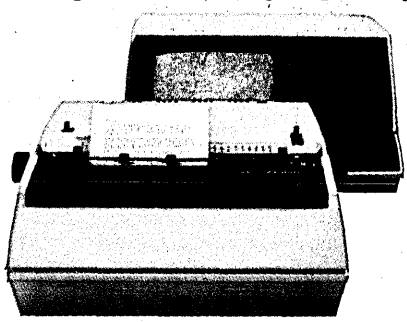

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Laventhol & Horwath says, "Lexitron word processing lets us be even more responsive to our clients"

CIRCLE 30 ON READER CARD

LOOK AHEAD (continued from page 18)

over the first five months of this year show a massive 50% increase in sales in Italy over the same period in 1978, and a 27% growth for the group as a whole including its overseas business.

DATA BASE MACHINE FOR SMALL USERS

Small-/ and medium-scale computer users are not being overlooked. A data base machine for that segment of the industry is under development by the same folks who were first to announce the 8-inch Winchester disk drive.

The special purpose processor, independent of whatever host processor (or even intelligent terminal) you may have, will run a relational dbms. It will be microprocessor-based, low in cost, quick and responsive, and support data bases from 8MB to 2 gigabytes, say the people at newly-formed Britton-Lee, Inc., Los Gatos, Calif.

Dave Britton and Geoff Lee were among the founders of International Memories, Inc., but soon thereafter Britton was ousted as president by investors. Lee followed, and the two formed a company to help get BASF Systems into the 8-inch Winchester drive business. This done, Britton-Lee is now under contract to set up the automated manufacturing facility and to turn production over to BASF personnel. The bucks they get are going into B-L's second venture, intelligent db managers. They're scheduled to have a prototype by year-end.

ON-THE-SPOT AIR TICKETING

Three airlines, United, Eastern and Pacific Southwest are testing self-servicing ticketing machines at airports. The key to the automatic ticketing is the magnetic stripe on the back of air travel cards, Travel & Entertainment cards or bank cards. Depending upon configuration, information from this stripe can be used to verify credit, create a billing record, check the cardholder's reservation and issue a ticket in his name. To date, only United's machines offer the complete combination of these functions. United's units were assembled by its own computer people. Eastern and PSA are using equipment manufactured by Cubic Western Data of San Diego.

RUMORS AND RAW RANDOM DATA

While Memorex employees (p. 86) were sporting their hand lettered badges proclaiming their employment by Memdahl (in anticipation of an Amdahl-Memorex merger), some employees at Microdata, Irvine, Calif. minimaker looking to be acquired by McDonnell Douglas were sporting buttons proclaiming: "Our favorite airplane is the DC-10."...Is the DCA, annual brawl of what once was the Digital Computer Assn., dead? Maybe. Fred Gruenberger who by his absence at the meeting where next year's chairman was to be appointed got that honor, has resigned it with recommendation that the annual bash be terminated...

Datamation's editorial headquarters have been relocated at 666 Fifth Ave., NY 10019; Tel. 212-489-2574. Editorial and sales office addresses in Los Angeles, Mountain View, Boston, Dallas and Washington, D.C. remain the same.

NEWS IN PERSPECTIVE

MERGER IN SILICON VALLEY?

Merger of Memorex and Amdahl seen as a benefit to both parties as talks continue in Silicon Valley.

In the Silicon Valley area of California, employee badges that clip to one's outer garment are a common sight. Made of a credit card-size plastic laminate, they bear the corporate logo or insignia and the employee's likeness and number. At Memorex Corp. last month, some employees had made up gag badges bearing the corporate names of Memdahl and Amdorex. The consensus at that company was that Memdahl was the better name.

Within the industry, however, there is disagreement as to who would get the better of the deal in a merger of Memorex and Amdahl Corp. The two plug-compatible manufacturers announced they were holding "exploratory discussions looking toward a possible merger," and that if successful the exchange of common stock would be in a ratio of 1.2 Amdahl shares for each Memorex common.

"Looks to me like they might be putting together the Chrysler of the computer business," says Martin Simpson of Martin Simpson Co. in New York. His view may be a bit far-out, but maybe not. Michael Burwen of Input, the consulting and research company in Palo Alto, Calif., says, "Someone at Memorex told me he was glad that he didn't have stock in either company."

Such views notwithstanding, people tend to see a merger as a good move, one that could benefit both parties. Says Burwen, "As an outside, objective observer, it looks to me like a super move by both companies because it creates an almost full-line company with a size that enables it to compete in the systems market."

Memorex was founded in 1961 to manufacture magnetic computer tape. It expanded its product line with the delivery in 1967 of disk packs, followed in '68 by its first IBM plug-compatible disk drive. It ventured into mainframes in '72, a line withdrawn the following year and written off at a cost of $39 million. The company, which employes some 11,000 people worldwide, last year had sales of $633 million and profits of $50 million.

Disk drives continue as the major business at Memorex. But according to the 1979 Disk/Trend Report published by James N. Porter, Memorex has relinquished its leadership position among independents to Storage Technology Corp., which was first to the marketplace with plug-compatible 3350 drives. The company also continues as a leading supplier of media, is into the communications processor business and terminal products, and is also vending tape drives supplied by Fujitsu Ltd.

The much younger Amdahl Corp. was formed in 1970 to develop large-scale mainframes wholly compatible with IBM's. By the time the first machine was shipped in 1975, the company had spent close to $50 million. The capital to finance this venture came mainly from the Chicago venture captial firm of Heizer Corp. and the Japanese mainframe maker, Fujitsu Ltd. Currently if both firms were to exercise their warrants to purchase more Amdahl stock, Fujitsu would own 34% of the company, Heizer an additional 25%.

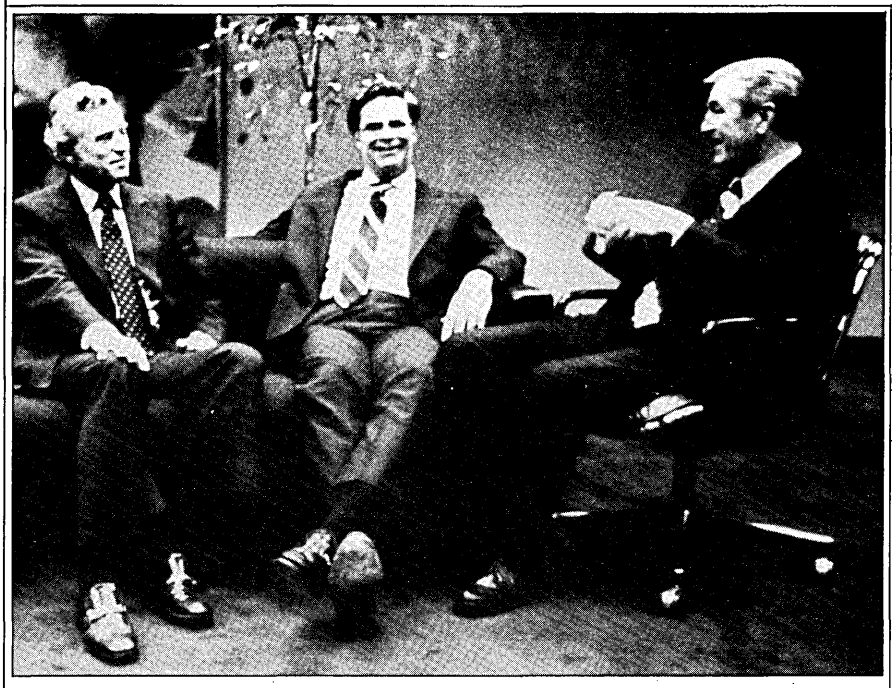
Proposed merger is viewed as an attempt to build a systems company large enough to finance expansion into new technologies and markets.

Despite startup problems, however, the company has experienced a phenomenal growth. Revenues last year topped $320 million and earnings $48 million. But in January IBM announced its 4300 series computers with its attractive price-performance levels, causing users to hold back on orders and installations of not only Amdahl computers but also those of IBM, itself. Amdahl's revenues in the first half of 1979 were only a trifle more than in the same period in '78, but earnings were down by 28%.

A third-party company with a presence at both firms is Fujitsu Ltd., which not only has a large equity position in Amdahl Corp. but also is a supplier to Amdahl of components and subassemblies. And Memorex sells Fujitsu tape drives. According to *Business Week*, Fujitsu would own 22% of the combined companies. But no one questioned on this matter thought that Fujitsu had anything to do with bringing the two parties together.

Instead, people view this proposed merger as an attempt to build a systems company, one capable of supplying mainframes and peripherals, one whose diverse product line would make it less susceptible to harsh business cycles, and one large enough to be able to finance expansion into new technologies and markets. Industry consultant David E. Gold of Saratoga, Calif., thinks the combined companies would still lack an adequate in-house semiconductor capability, as well as communications products. He minimizes Memorex's success with its front-end processor.

Robert Domenico of Palyn Associates Inc. says Amdahl does not have a large semiconductor production capacity but does have a very advanced processing capability. "In the LSI/VLSI world to come,"



AMDAHL CHIEFS: From right, Eugene R. White, deputy chairman of the board; John C. Lewis, president, and Gene M. Amdahl, founder of the company who is retiring from his position as chairman of Amdahl Corp.

says Domenico, "he's (Amdahl) probably got enough processing capability to take care of all his own requirements and maybe some of the LSI requirements of Memorex." The San Jose, Calif., consultant explains that Amdahl's capabilities currently are designed to aid in the development process, not to enter into mass production of LSI chips. He thinks their plan for the future is not to farm out the processing work, as they did in the past, but to bring that in-house.

Input's Burwen, however, minimizes the importance of an in-house semiconductor capability, "because it's such a small part of what creates the revenue stream." Adds Burwen, "There's an element missing in both companies. That's a very strong software capability, which I think they will have to develop fairly quickly in order to compete at the level where they must compete." He says Amdahl is building that capability but isn't there yet. "It's key. A full-line systems supplier must also have that software."

"Someone at Memorex told me he was glad that he didn't have stock in either company."

It's generally agreed that what Memorex brings to this marriage are a good marketing force, including a strong presence in Europe, an installed base, and a reputation, "although it's increasingly being nibbled at by Storage Technology," says Dave Gold.

When the merger talks were first disclosed to the public, those in the financial community said that Amdahl was not paying enough in the exchange of stock. But those in the technical community, concerned less with who's lining whose pockets, say that Memorex has more to gain from a consolidation. Frequently expressed is a concern that Memorex has not been spending enough in recent years for research and development, that in product development the company is a follower, not an innovator.

"I think Memorex management has optimized for the short-term," says Gold, adding that Memorex is not the attractive partner that some believe it to be. "I think that in many ways Amdahl has paid its dues and bought its future—although, depending on what IBM does with its H Series, it's not clear. I think Memorex in many ways has sold its future."

"We think the plug-compatible concept is a very viable one, long-term."

It's generally believed that Amdahl has the stronger management and that that's what Memorex wants from this merger. But a securities analyst who asked not to be identified is critical of Amdahl management, as well.

Still, when all is said and done, the future of the PCM business is not at all clear. Martin Simpson thinks it's possible to make money at it over the short haul but considers it dangerous over the long term because, as he puts it, IBM has shown a reluctance "to have other people eat their lunch." But Gideon Gartner of the Gartner Group, a Wall Street research firm, takes the opposite view. Is there a future in the PCM business?

"We think there is," says Gartner. "We think the plug-compatible concept is a very viable one, long-term." The reasons, he adds, are that the so-called IBM environment, including the PCM's, will continue to get larger and larger. And the users will continue to want a second source.

—Edward K. Yasaki

COMMUNICATIONS

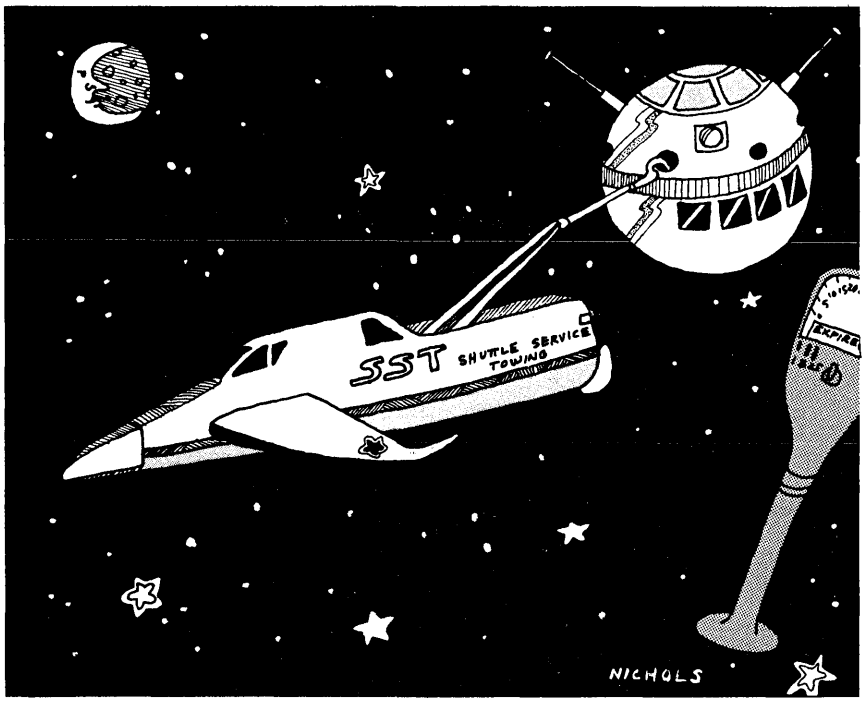
WANTED: SPACE IN SPACE

Some equatorial countries, who demand "parking spaces" for their own use in outer space, may be heard at 10-week World Administrative Radio Conference this month.

Suppose the government of Colombia informed the U.S. that communications satellites "parked" above its land were trespassing. To go a bit further, suppose the days of "free parking" for geosynchronous satellites anywhere above the equatorial region were gone forever. That would mean that any U.S. communications satellite stationed over that narrow belt, the only location a communications satellite can be positioned and still appear stationary to any earth antenna, would have to pay rent for the orbital space it occupies some 22,000 miles above the earth, or else get towed away.

Sound far-fetched? Not at all. Indeed, a little-known declaration in 1977, sponsored by Colombia and endorsed by several other equatorial countries, claims equatorial orbit sovereignty. And not only do these countries want this valuable orbital space declared their sovereign property, but they also want satellite "parking spaces" reserved there for their own use, even though they have no immediate plans to use these slots.

That's but one of many prickly issues that will be hammered out in a 10-week international confab that begins this month. On September 24, some 1,200 delegates from 154 countries will gather in Geneva, Switzerland to divvy up the world's airwaves and orbits. This meeting, one of the largest international conferences ever held, is called the World Administrative Radio Conference (WARC) and is sponsored by the International Telecom-



munications Union (ITU), a United Nations body.

The first gathering of the ITU was back in 1865. On the agenda was the adoption of an international code for telegraphy, or the Morse code. More than a century later, vast improvements in technology have caused the world to shrink. But as WARC 79 nears, it's becoming more and more apparent that politics could serve to pull nations apart once again.

The world has greatly changed since the last general WARC in 1959, when satellite communications was not yet in existence. Many more changes can be expected before the next general WARC in 1999. The

Some battles, if lost, could pose grave problems for the U.S. telecommunications industry.

20-year interval between meetings is one signal that the conference is an important one. There are, of course, many other reasons that WARC 79 has great significance.

The upcoming WARC will have the authority to consider, and possibly rearrange, the entire electronic spectrum available for radio, tv, radar, Citizen's Band, satellite transmission, and radio astronomy. The actions of WARC 79 could affect the direction of new technology research, the cost of many forms of electronic transmissions, and several aspects of national security. Any changes in existing regulations for global telecommunications are of special interest to the U.S. telecommunications industry, both the manufacturers of hardware and software and the international communications carriers. Significant change could render existing equipment obsolete or, at least, require expensive retooling.

Radio waves, a finite resource, are no respecters of national boundaries. Thus, to maintain order in global communications, the U.S. believes that the best available means is through support of the ITU. There is increasing concern, however, that the U.S., along with the other major world powers—the U.S.S.R. and the People's Republic of China—may not be allowed to run the show at WARC 79 as they have at past WARC's. And some battles, if lost, could pose grave problems for the U.S. telecommunications industry.

"There is growing apprehension that Third World countries, which now comprise over two-thirds of the membership of the ITU (as in all U.N. agencies), and therefore command a majority if they choose to vote *en banc*, might use the occasion of WARC 79 to attempt to win a round in what they view as the continuing conflict between the developed countries of the 'North' and the developing countries of the 'South,' " explains a report on WARC 79 prepared by the Congressional Research Service (CRS) at the request of Senators Barry Goldwater (R., Az.) and Harrison Schmitt (R., N.M.).

Under the heading of the "New World Information Order," these less-developed countries (LDC's) have voiced a number of grievances. Their concerns include a more "balanced" flow of information between North and South; the prior consent of governments before their people are exposed to foreign "propaganda" or cultural influence—particularly in anticipation of the future development of direct broadcasting by satellite; and the demand that portions of the increasingly crowded spectrum be reserved for developing countries that might not be able to use it until some unspecified time in the future.

While only the latter concern will be officially placed on the WARC 79 agenda, the others are certain to be raised in general debate. And the LDC's are quick to point out that they represent 90% of the world's population and control 10% of the spectrum, while the industrialized countries control 90% of the spectrum and account for only 10% of the population. It's time the tables turn, they argue.

The U.S. position is that the spectrum should be allocated for specific services, not for specific countries. Furthermore, the U.S. contends, it should be allocated on a first come, first served basis. "The LDC's want to make sure there is room at the inn when they get there," states Glen O. Robinson, head of the 64-member U.S. delegation for the conference. A law professor at the Univ. of Virginia and a former commissioner of the Federal Communications Commission, Robinson adds that while the LDC position is understandable, it's just not feasible. "In 1973, for example, one satellite carried 250 telephone circuits. Now each satellite can handle 24,000 circuits," he points out. Because technology changes so fast, Robinson claims, "there can be no guarantees [made to any country]."

One big factor that cannot be known until the conference convenes, Robinson admits, is how well organized and unified the LDC contingency is. According to the Congressional Research Service study, which was released in early July, "It does not now appear that the Third World will speak with one voice at WARC." The study adds, however, that most of the feedback the U.S. has gotten from foreign countries has come primarily from "technicians or technocrats, rather than political or govern-

Seventy-two U.S. delegates from government and private industry will attend Geneva conference.

ment leaders." And it's almost a certainty that politics will play a key role in the deliberations.

"I have been concerned with the growing politicization of the ITU as a result of the efforts being made by Third World nations to accomplish political objectives in what has been in the past a forum for technical discussion," remarks Sen. Goldwater, a member of the Senate Communications Subcommittee which has closely followed the U.S. preparations for WARC 79. The Arizona senator hopes to be one of eight federal legislators that will make the trek to Geneva this month with the other 64 U.S. delegates from government and private industry.

Similar sentiments about the conference degenerating into a political forum have been voiced by Robinson, who leads the

U.S. delegation. In recent testimony before the House International Operations Subcommittee, he expressed concern that ideological rhetoric carried on too long could "sabotage the conference."

While the skirmishes that are certain to ensue between the LDC's and the industrialized nations are the ones causing the greatest consternation for U.S. policymakers, they most definitely will not be the only battles fought. In sectioning off the spectrum, any increase in one band necessarily requires a decrease in another band. One U.S. proposal requests an expansion of the AM radio band to make possible an additional 700 AM radio stations. This proposal is aimed at increasing minority ownership of these financially attractive broadcasting stations. But officials in West Germany, for instance, have voiced concern

There also exists the possibility that resolutions will not be reached by the targeted close of the conference on Nov. 30.

that such an increase in the AM band would place the U.S. into frequencies their country is using for navigation and sea services. They worry that such an allocation could cause interference in those services for Europeans.

Other proposals submitted by the U.S. to the ITU last January include:

–co-equal sharing by broadcasting and land mobile services (e.g., Citizen's Band) in the ultra-high frequency (UHF) band;

–future consideration of changes that would provide for inexpensive two-way voice and data communications via satellite to remote areas where terrestrial facilities are not available;

–expansion of fixed satellite service;

–splitting the satellite service in the 12 GHz band into two sub-bands for fixed satellites and direct broadcast satellites, effectively tripling the number of orbital positions available to each; and

–expansion of the number of frequencies available to the amateur service.

Because the decisions made at WARC will have treaty status, they will be reviewed by the Senate before U.S. endorsement is given. The U.S. can take "reservation" to any or all of the WARC decisions, in effect refusing to abide by the majority rule. Such a practice, however, is considered politically detrimental to the country's relations with the Third World, as well as contradictory with the U.S.'s stated objective of promoting harmony in global telecommunications. So, while the ITU has no official sanctions against countries that do not endorse its rules, there are strong unofficial political and economic incentives for U.S. agreement.

There also exists the possibility that resolutions will not be reached by the targeted close of the conference on Nov. 30. That's a matter of concern to Sen. Schmitt, also a member of the Senate Communications Subcommittee, who sees parallels with the Law of the Sea Conference. After eight meetings, the Law of the Sea conferees still could not reach decisions on international rules to govern exploitation of the oceans and seabeds. "WARC is the same kind of forum, and the same issues will be there," Sen. Schmitt warns.

Even assuming that the issues of WARC 79 can be resolved in 10 weeks, several people in private industry think the 20-year span until the next general WARC is much too long. "The evolutionary cycle of technological change may have permitted two decades to elapse between WARC's in the early part of the century," comments Terry Mahn, a Washington communications attorney with Toth & Mahn. "But the phenomenal pace of technology today precludes that kind of a timetable now," Mahn asserts. "It's absurd to assume that this meeting can set the directions for global telecommunications for the remainder of the century. I don't think that can happen at this meeting; I don't think it can ever again occur in only 20-year intervals."

By the end of next month, we'll know for sure. As for now, the CRS study claims, the mood in the U.S. is one of "cautious apprehension." According to a recent report from Kalba Bowen Associates, a Cambridge, Mass., research firm that is monitoring the situation, there is good reason for apprehension: "By the end of the century—and this prediction may be made with confidence—no aspect of human society will fail to bear the imprint of the decisions made at the WARC of 1979."

—Becky Barna

PERIPHERALS

AMPEX GOES THE PLATED DISK ROUTE

Ampex has achieved a packing density of more than 1,000 tracks per inch and 12,000 bits per inch.

In a laboratory last month, a thin film plated disk was spinning away. On every eighth revolution, a flying read-write head was seen crashing onto the shiny surface of the platter, producing nary a scratch.

It was Ampex Corp.'s dramatic way of showing the product with which it is entering, this month, the oem marketplace for plated disks. The new magnetic disk, known as Alar, is said to be compatible with Winchester head technologies, as well as standard ferrite and thin film heads. With the Winchester technology, the company claims, as many as 500,000 start-stops can be expected without failure. And packing densities are said to be four to five times the capacity of oxide coated disks.

Using thin film heads made available to them, the people at Ampex have achieved a packing density of more than 1,000 tracks per inch and more than 12,000 bits per inch. This is not the technical limit, cautions Irwin Roth, disk product program manager, but rather what they've achieved in the lab with available heads.

According to Roth, one way to increase packing density is to control the thickness of the magnetic film. "With plating," he explains, "we can control to a fraction of a

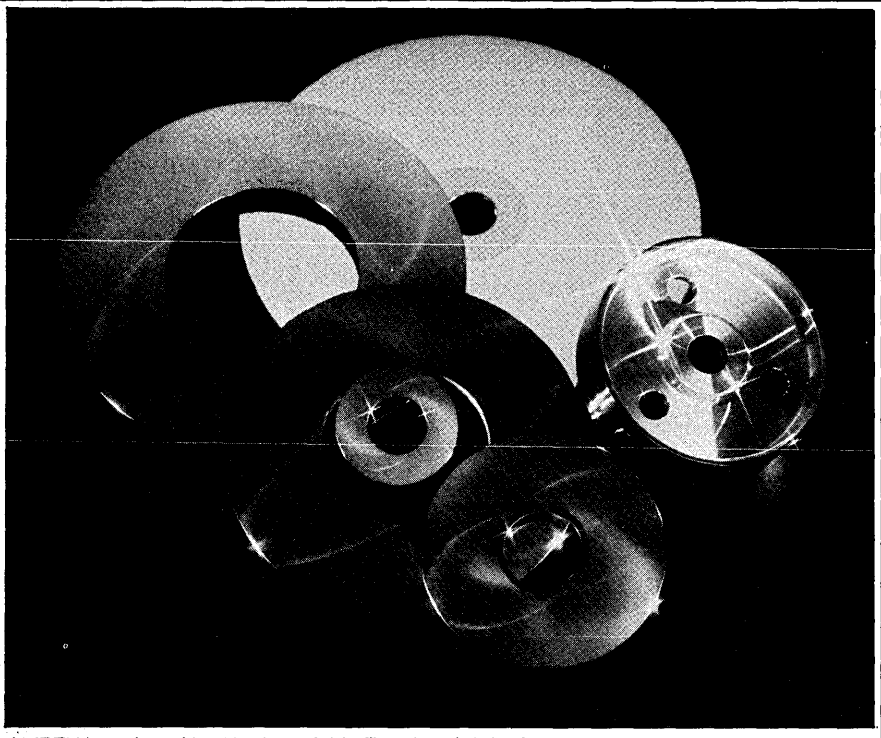
To get the greater packing densities, it's time to go next to thin film heads and plated disks.

micro-inch." And that's much closer than can be done with coating techniques. But Roth also admits readily that coated disk makers are improving their technology, too, so this is not to imply that plated disks will soon obsolete coated disks.

Ampex is no newcomer to the technology of electroplated magnetic media. It has been producing plated disks for use in its own Videofile storage and retrieval systems and for its slow-motion video recorders, known to sports fans as instant-replay machines. In addition, the company has been supplying them to makers of head-per-track storage devices in disk diameters ranging from 4 inches to 16 inches. Current production of its plated disks for both video and digital applications is said to run between 40 and 60 per week.

According to Ampex's Paul D. Baba, a number of customers could have 8-inch Winchester drives on the market with thin film disks early in 1980 if they progress through their tests as planned. Baba, who is general manager of the materials and devices group, audio-video systems, explains that people are continually pushing technology to its limits. And while the older coated disks and ferrite heads have not reached the limits of their capabilities, it is becoming increasingly difficult to squeeze more performance out of them. Thus, to get the greater packing densities, it's time to go next to thin film heads and plated disks.

Industry analysts who study the disk drive technologies and markets, however, don't look for that transition to occur for awhile. In his study of the 8-inch disk drive market, Santa Barbara consultant Raymond C. Freeman Jr. says, "Plated 8-inch disks are available in sample quantities for those who wish to experiment with them



AMPEX introduced its Alar line of thin film plated disks for emerging microdisk market in diameters that range from 2 to 24 inches.

and prepare for the inevitable coming of thin film technology." But he also observes that there is no strong competitive pressure yet to make the switch. "Winchester technology should enjoy an acceptable life cycle without threat of early displacement."

And James N. Porter, a disk drive consultant in Mountain View, Calif., who recently came out with his 1979 Disk-Trend Report on rigid disk drives, agrees that plated disks won't show up right away. As for their use in oem drives in the 8-inch format, he comments, "It's very questionable whether there will be much usage of thin film heads or any significant use of thin film disks over the next couple of years." Porter notes that there won't be an adequate supply of thin film heads in the marketplace, and those that do show up won't be configured for use with 8-inch drives but rather for the 14-inch size. Further, those companies that have the capability to develop a high-performance drive, such as the IBM 3370 range, will be

IBM will use thin film heads first on its larger drives, probably in the fourth quarter.

directing their efforts at the large-capacity 14-inch drive.

Freeman, too, expects that IBM will use thin film heads first on its larger drives. He writes: "Their initial shipments (of thin film heads) are likely to be in the large 3370 drive (expected in the fourth quarter of this year) and almost surely in the billion byte machine expected late in 1980 or early in 1981. Thin film disks could be introduced with the heads or, more likely, in a subsequent announcement."

In addition to Ampex, an earlier supplier of plated disks to oem's has been Poly-Disc Systems Inc. of Torrance, Calif., which has been developing nickel cobalt surfaced disks in both the 8- and 14-inch diameters.

—Edward K. Yasaki

TECHNOLOGY

MASSIVE TASKS FOR CHIPS

U.S. Navy development at Livermore aims at putting supercomputers on chips.

A small U.S. Navy development effort at Lawrence Livermore Laboratory, a government high-technology research institute in Livermore, Calif., has made substantial progress toward achieving the Department of Defense goal of putting supercomputers on chips within the next four to six years.

So impressed was the House Armed Services Committee with Livermore's progress in its S-1 development effort, the committee quadrupled the Navy's requested funding for the project and all but publicly scorned the internal Navy politics that have limited the scope of the project.

In HR 4040, the proposed 1979 Defense Appropriations Bill, the committee inserted a line item directive that the additional funds were to supplement the project's on-going funding and be used to implement the S-1 multiprocessor configuration, a crossbar linkage of 16 second-generation S-1 processors—each of which will process typical scientific mixes of logical and numerical operations at approximately the same speed as a Cray-1, currently the largest commercially available scientific processor.

The Navy expects the multiprocessor S-1 configuration will offer processing muscle to take on computational problems a full order of magnitude greater than those which currently can be addressed by the largest computing system.

The S-1 was designed as a high speed real-time signal processor, albeit with strong internal general processing support, to fulfill Navy needs in environment prediction and analysis; submarine surveillance through massive sensor input; and weapons system simulation. But it is commonly accepted that an order of magnitude increase in capability generally brings a full qualitative difference in the applications where a technology is brought to bear.

The S-1 uniprocessor—the independent processor that will be the multiprocessor module—is itself an extremely fast, apparently very cost effective supercomputer of unique architecture and unique history. The S-1 is a multiple instruction, multidata machine, the first large MIMD machine ever built. Compared to the conventional cpu design which calls for a single instruction stream operating on a single data stream (SISD), or even the single-instruction, multiple-data machines like the Illiac IV, the MIMD design is hardware intensive. But with the lowering trend of hardware costs, such a trade-off is freely accepted for the generality of implementation that MIMD architecture allows.

A unique computer-aided design system, SCALD (Structural Computer-Aided Logic Design), is both midwife and sibling to the S-1 processor. SCALD, developed as an integral part of the S-1 project, has been termed "probably the most broadly significant area of the S-1 project," by a blue-chip Navy review team of academic and industry specialists. In the last year SCALD has already had a major impact on computer-design concepts in this country.

SCALD has been described as basically a powerful bookkeeping system which supports a structured approach to design, an approach closely analogous to structured programming. The SCALD system leapfrogs the conventional design manpower circuit by permitting the designer to work solely at almost a block diagram level.

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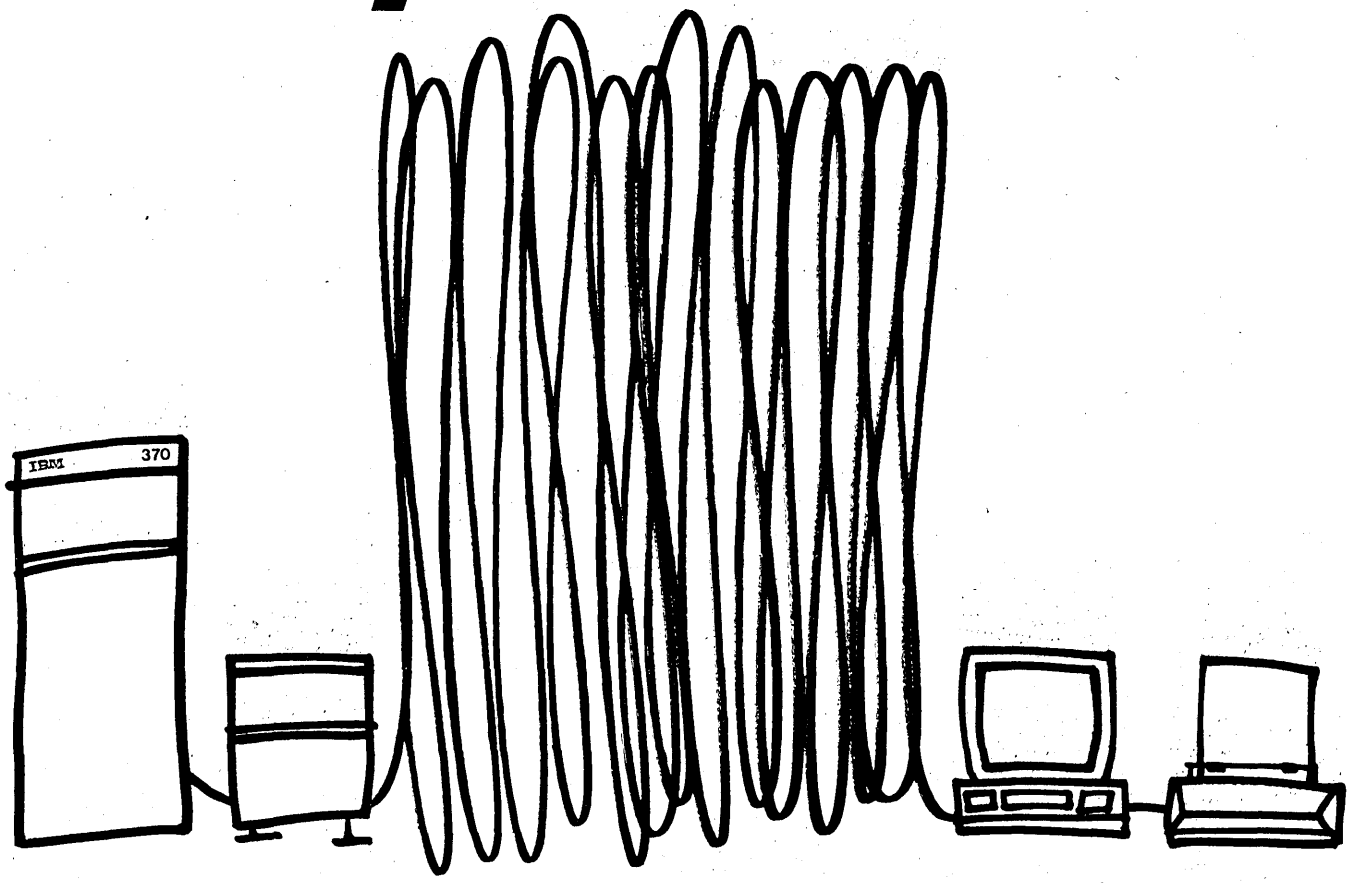

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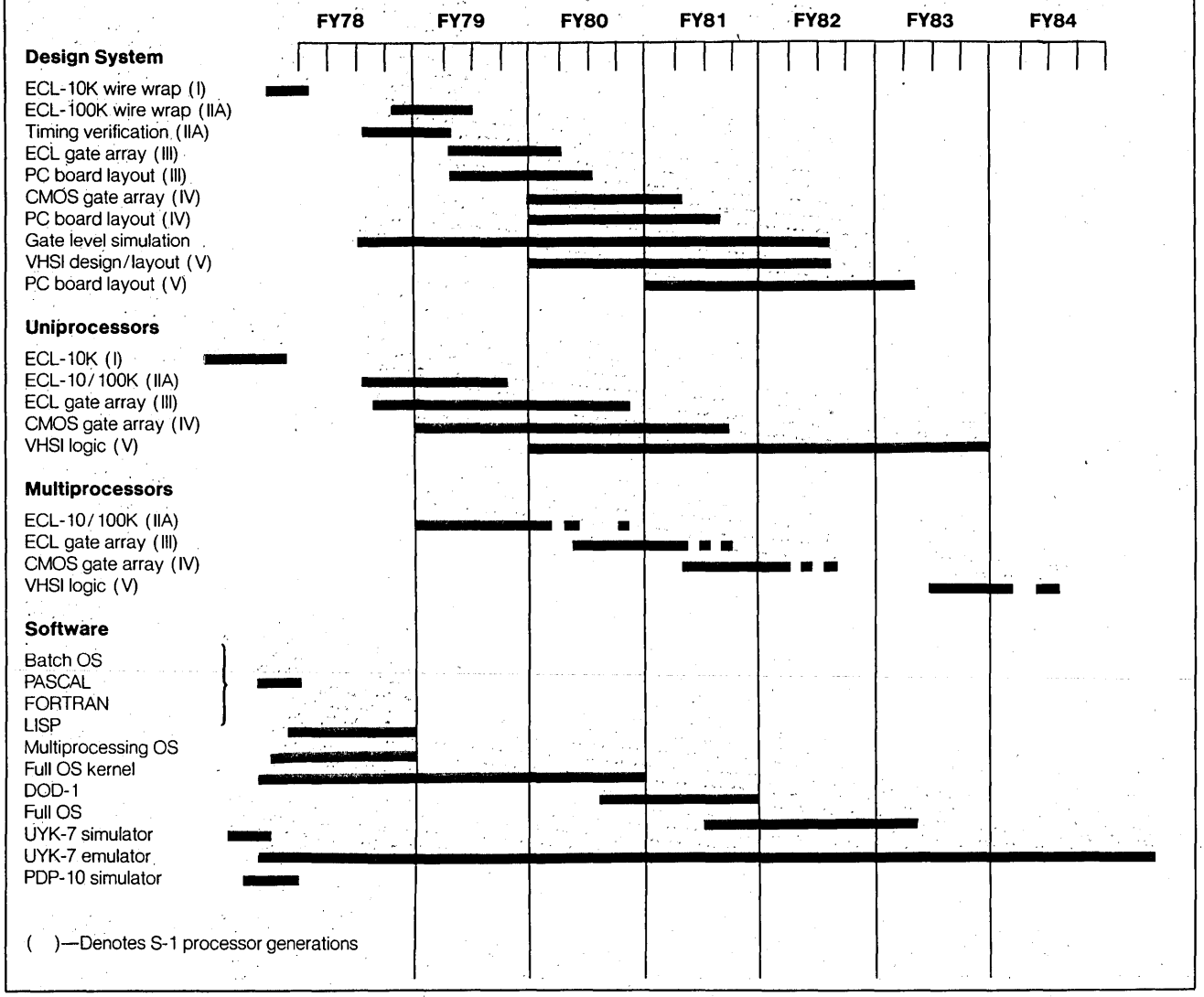
CIRCLE 122 ON READER CARD

SUMMARY OF THE S-1 PROJECT FIVE-YEAR PLAN (PROPOSED)



take a rather small group of engineers and let them input—in rather high level graphics—just what they want to do in the system, and then we've got a set of programs that expand that design out in work that is typically done by many many engineers and draftsmen," explained Thomas McWilliams, the principal developer on SCALD. Whereas most computer-aided design systems focus on automating the low-level physical skills—automating PC board generation, for instance—SCALD uses its ever-increasing library of detail design to automate the expansion of register-level drawings (block diagrams) into the full scale design package.

"What we do is produce essentially a set of macros, each of which is a graphics presentation, and these macros when put together will automatically expand to a complete set of schematics," said McWilliams. "But we never, for instance, expand out by hand basic symmetries and references throughout the design. What we have done is focus more on the front end of the design: reducing the amount of effort that draftsmen and engineers would typically do, eliminating the middle-level engineering. Conventionally, the lead engineers do only the first stage, the high level design—but in our case, they're the only people who exist. The descriptive notation is sufficiently concise and workable that we can pretty much go from there to implementation in an automatic fashion."

A unique computer-aided design system is both midwife and sibling to the S-1 processor.

SCALD, according to the Office of Naval Research's industry/academic review team, has finally introduced structured description of logic as a design tool. "Computers are simply not designed this way, although they ought to have been for some time," notes the ONR review report. "SCALD does what should have been done, is elegant in detail, and contains some excellent, previously unheard of, features. . . . The fact that a few individuals were able to complete the design of a complicated processor in such a short time is a most convincing demonstration of its effectiveness!" declared the ONR review, exclamation point and all.

While conventional large scale computer design efforts typically command perhaps 100 man-years of design effort, the S-1 design was completed during a single calendar year in a total of two man-years of design effort. A pace—and indeed, a cost—that mocks many current computer design efforts. "Manpower savings well in excess of an order of magnitude may be realized, and have actually been demonstrated in practice during both the S-1 Mark I and Mark IIA design," noted Lawrence Widdoes, with McWilliams a principal designer for the project. SCALD also allows designs to be recompiled rapidly

when new integrated circuits become available. Hence a designer can quite effectively use a previously implemented design to reduce his design time on a new project, or an upgrade of an on-going project.

The ability of SCALD to recompile a design in terms of a new technology, probably newer components with higher efficiency, is central to the S-1 program. The Livermore team has presented the Navy with a five-year plan that uses the interplay between SCALD and the S-1 uniprocessor as a ladder by which both systems are fully exploited over a fairly limited time frame.

The first model of SCALD was used to design the prototype Mark I version of S-1, using ECL 10K wire-wrap technology. The Mark I S-1, which now runs SCALD II, is refining the design and recompiling it for the Mark IIA version of S-1, which will include ECL-100K wire-wrap technology. The SCALD III system will be used to generate gate array masks in recompiling S-1 design for Mark III, the S-1 threshold of LSI technology.

"The whole program is focused on LSI implementation," explained McWilliams, "and these other machines, the Mark I and Mark IIA, have been stepping-stones—to debug the architecture, the basic design, the design system, the applications and so forth." The five-year plan currently before the Navy calls for successively upgrading the SCALD system until it gets to the point where it's compiled the proven design of the S-1 down to a single chip, the Mark V. "Actually," said McWilliams, "the Mark V is likely to be one to four chips, depending on the technology available; essentially a microprocessor-sized supercomputer. This is what the technology in general is looking to support, talking a four- to five-year time scale."

SCALD finally has introduced structured description of logic as a design tool.

The SCALD design system has been drawing major attention from commercial vendors but, remarked Digital Equipment Corp.'s engineering vp Gordon Bell, "the particular architecture used in the S-1 processors is innovative and elegant and perhaps also quite important in the commercial future." Bell had been keenly aware of the project since its inception in 1976—McWilliams was a former student of his—and had been involved in informally advising the government as to the significance of both S-1 and SCALD. Like the ONR review team, Bell felt that dollar for dollar, the S-1 project had been an economy buy for the Navy.

"The history and cost effectiveness of the S-1, Mark I, continues to startle specialists," said Dr. Lowell Wood, special studies group leader for Livermore's Physics Dept. and S-1 coordinator. "And the people who have come through on review have been at least as startled by the cost effectiveness we expect to get out of the second generation," the Mark IIA, the first of which is expected to be completed by next spring, the component processor for the S-1 multiprocessor.

The prototype Mark I model did not have arithmetic capabilities built into it, explained Wood. It executes arithmetic by microcode subroutines, and it runs high level programs about a third as fast as Control Data's CDC 7600. "The Mark I came in with an implementation cost of about $85,000," said Dr. Wood. "The second generation machine, the Mark IIA, which we expect to realize for about $250,000, runs the Department of Energy simulation benchmark codes, the so-called LL internals, about as fast as the Cray-1."

Direct comparisons with the Cray machine are somewhat showy and misleading. The high precision Cray is focused on different applications than the 36-bit S-1, which needs high volume but less precision for real time signal processing. Still, it allows for a technology reference. Large-scale arithmetic capabilities are, of course, built into the Mark IIA design, and the architecture is basically identical to the first generation S-1; but while it runs the same software, the gate count has roughly doubled.

Compared to the Cray-1, the ECL 100K technology of the Mark IIA will have component cost and power effectiveness that has improved "by a factor of 30 to 40," said Wood. Simply because SCALD implementation allows very up-to-date technology to be included in the design—in this case, Fairchild's 100K MSI series of components that became available only in mid-1979.

"SCALD allows us to recompile the architecture down into a new technology on a one-year time scale," said Wood, "which is about as fast as a new technology rises, at least at the present time.... SCALD is rather paced to that. We design in terms of what is available in spec sheets before we commit to prototyping. We evaluate samples in as large a quantity as we can, and by the time we get through the prototyping process—at the present time wire-wrap boards, but subsequently, for the third generation, on pc boards—we have engineering prototype quantities. And about the time we're ready to replicate for Navy evaluation systems or whatever, we have large scale production available and the costs are becoming reasonable.

"SCALD is thus pitched at the very leading edge of the semiconductor industry, and we kind of just move along at the same pace the leaders of the semiconductor industry move, so far as the technology available. We restricted the first two generations exclusively to commercially available components—indeed, in most cases, multi-sourced products—but with the third generation we'll be going into semiconductor LSI," he said.

The S-1 Mark IIA uniprocessor is constituted of approximately 2,500 ECL-100K MSI circuits in performance-critical areas, and approximately 6,900 ECL-10K circuits elsewhere. The transistor population of the Mark IIA's arithmetic unit alone is greater than that of the entire cpu of the Cray-1. Gate circuit densities within this arithmetic unit are about 20 times greater than those in the Cray-1 cpu. The internal logical structure of the S-1, Mark IIA, consists of five micro-engines, relatively special purpose programmable controllers, operating in parallel to provide high performance. Four of the micro-engines form the instruction pipeline; a single micro-engine handles memory traffic in parallel with the operation of the instruction pipeline.

Although S-1 design is optimized for the multiprocessor linkage, a single uniprocessor system can be configured by connecting the processor directly to a memory controller, a configuration which requires neither hardware nor microcode changes. The S-1 instruction set architecture allows the programmer to address two billion 9-bit bytes of main memory uniformly, without using base registers—more than any other high performance computer.

Stanford Univ. and Stanford Artificial Intelligence Laboratory have been major subcontractors throughout the S-1 project, today largely as prime subcontractors for the S-1 software work. For an intermediate operating system, the S-1 project is transporting Bell Lab's UNIX to the S-1, but the ultimate goal of the Stanford/Livermore software team is to bring in an "extremely ambitious large scale time-sharing system," according to Navy sources. "It's modeled fairly closely after MULTIX," said one. "You might say it will be MULTIX done right, along with a lot of other good features taking advantage of things learned along the way."

Second generation machine runs Department of Energy simulation benchmark codes about as fast as the Cray-1.

The funding for the S-1 project has never been extravagant. Beginning with an original grant from the Office of Naval Research for a partial year's work in 1976, the S-1 project has been maintained on core funding of between $1.5 and $2 million annually, and the Navy's 1979 budget proposed to continue that level of funding. In the light of the expressed congressional interest, however, the Navy is reviewing both the current and long-term S-1 program, according to Joel Trimble, the ONR officer with oversight responsibility on S-1.

The leverage offered for a relatively small additional investment was what convinced the Armed Services Committee to add another $4.5 million to the Navy budget for the S-1 multiprocessor. "There was

no point to slowing up the technological pace for a couple of a million dollars," explained Anthony Battista, the member of the committee staff directly involved in the decision. "There are some projects where no matter how much money you put in, you're still limited by either the laws of physics or some technical problem. This wasn't the case here. So we just added the money to make sure that there was money that was in constance with the progress that could be made."

—Vin McLellan

OFFICE AUTOMATION

NOT A DP FUNCTION

Automated offices must be viewed and handled as a communications environment, not as a dp application.

Computers are being applied to the job of factory automation, controlling not only separate devices but also entire manufacturing processes. They're also doing the same in warehouses and refineries. And they're being used to control the heating and air conditioning in large buildings. But will it work in the office?

People with a data processing orientation are trying to automate offices by providing a computational capability, but that's not what's needed, according to consultant Tim Tyler. Offices are not established to process data, Tyler contends, but rather to communicate—for employees to communicate among themselves or with outsiders and to facilitate one company communicating with another. Thus offices must be viewed and handled as a communications environment, not a dp application.

"Practically all time spent in the office environment is spent either preparing communications or communicating," Tyler writes in a report published last month by Strategic Business Services of San Jose, Calif. ". . . Any computation or even analysis is only incidental to the basic function of communications."

What's hindering the automation of that communications function is people's continued reliance on paper as the main medium of intercourse. "As long as paper and voice remain the primary interoffice communication media, all attempts to automate offices will occur on a standalone (and piecemeal) basis," he writes.

To date, of course, there has been nothing to indicate that offices in the near future will be paperless. Indeed, the trend appears to be toward the papermore office. Pundits have long been saying that we live in an analog, not a digital, world. We're all accustomed to writing things down, to carrying scraps of paper, maintaining a private address book. And a veritable fortune has been invested in office equipment oriented to paper—from typewriters and word processors to copiers and file cabinets, and, lest the company mail department fail us in our efforts to spread the paper word, the facsimile machine. As one white-collar worker exclaims, waving his arm over a desk cluttered with paper, "It's almost a fulltime job just trying to keep my desk clean."

Yet, despite this inundation, people have a preoccupation with generating more paper. This psychological attachment to paper and the analog world, the difficulty of arbitrarily reducing the paper flow by half—much less removing it entirely from the office environment—is not addressed by Tyler. Nor does he treat the politics of it all.

But he makes a good case for the economics of ending our reliance on paper, and even explains how the savings achieved from such an ambitious undertaking can finance the electronic systems that replace paper.

He notes that the price of paper continues an upward spiral, that personnel costs are on the increase, and that at the

By eliminating paper in the automated office, these annual savings . . .		. . . will finance the leasing of these hardware complements	
Source	Billions	Systems (000)	Crt's (000,000)
Printers, copiers, paper	$19.1	480	8.6
Paper handling expense	55.0	1300	23.4
Mail and courier service	8.6	220	4.0
Totals	$82.7	2000	36.0

DATA: Strategic Business Services, San Jose

same time we are seeing prices decline for such things as data storage, processing capability, and data communications.

"It is obvious that the rate of technological change is actually increasing," he explains, "and the cost spread between paper-oriented systems and electronic technology is widening at an increasing rate."

Elsewhere, Tyler observes that whenever a lower cost process arrives on the scene, it tends to replace the more expensive method. "Past experience indicates that if cost spreads are sufficiently wide, the more expensive technology will be replaced, regardless of either current investment or personal preference."

As shown in tabular form on these pages, the funds are there for anyone who wants to finance a move to the paperless office. In a larger breakout, he shows that by eliminating paper and thereby improving personnel utilization, we could reduce by more than $200 billion a year the amount spent for personnel, hardware, and services oriented to paper.

—E.K.Y.

WP: MAKING PROGRESS

It's on the verge of becoming an offshoot of information processing.

After more than ten years in the maturing process, word processing is now on the verge of becoming an offshoot of information processing. The technology fueling this is certainly on-hand, and the necessary packaging and "psychological environment" are also beginning to evolve, confirms Datapro Research Corp.'s Amy Wohl. While this "slow steady progress" continues, leading inexorably toward the office of the future, word processing expert Wohl sees the need for more packaging solutions.

At the heart of the packaging issue, Wohl explains, is "the inventory, service and support problem." These packaging prerequisites become even more important, she maintains, as word processing branches out from the simplistic "French vanilla systems." Packaging wp for ease of use is also a must. Word processing systems, she insists, should be user programmable "and not turn everybody into merry programmers."

Speaking at the recent Syntopican VII, the International Word Processing Association's Annual International Conference and Exhibit in Chicago, Wohl predicted that "managerial support work stations" would be big on the word processing scene by the 1980s. This wp concept, pioneered by Citibank in New York, links management and secretarial workstations to a computer.

Vendors, busy designing multifunction workstations, Wohl points out, are facing

FEDERAL WP USAGE BLASTED

Word processing's track record in the federal government has been less than heartening. In a recent probe of the Washington wp scene, the General Accounting Office dismally concluded that most government agencies had turned the technology into a bane rather than a boon to productivity.

"Most departments and agencies," the watchdog authority found, "are not in compliance with regulations covering the management of word processing systems. Furthermore, most agencies can neither demonstrate that they have increased their productivity nor that their word processing systems are, in fact, cost effective."

The Feds currently are consuming about $80 million worth of word processing wares a year. If this appetite continues, Uncle Sam is expected to be ordering over $300 million in wp delicacies by 1982. While these statistics may be good news for prospect-hungry vendors, they evoke considerable concern on the part of GAO investigators worried by the government's poor implementation of the technology to-date.

The cutting edge of GAO's criticism is aimed squarely at the individual agencies which have mismanaged their word processing ventures. Some of the blame, the federal auditors contend, also lies with the National Archives & Records Service (NARS), whose four-year-old wp program for doling out agency applications aid "has been ineffective," according to the watchdogs.

To shore up these gaping management loopholes, GAO urged agencies to heed established regulations and told NARS to promptly issue pertinent word processing guidelines aimed at giving the federal flock a helping hand in planning their wp schemes. Originally due out in June, these guidelines are expected to be available this month.

Meanwhile, as a result of the GAO findings, many chagrined agencies are beginning to get their wp acts together, according to one GAO insider. Some agencies have been on the right track all along—the Social Security Administration and the Department of the Army were two "isolated" examples of agencies which the GAO found to have "well-managed and productive" word processing setups.

Several agencies were also singled out by the GAO for having poor wp operations. Included on the loser list was the Office of Education, the Environmental Protection Agency, the Internal Revenue Service, the Department of Commerce, and the General Services Administration. This fingerpointing was intentional, reveals one GAO staffer. "We wanted to kick the agencies indirectly," he admits. "Now agencies are starting to look at word processing in a little different light."

—L.F.R.

several user "impediments." At the top of the list is cost. Currently, she says, this equipment is too expensive for the average user. Another user stumbling block results from the fact that currently no vendor is offering this gear as a package deal. The "traumas of change" for office personnel must also be overcome, she declares, so a person can "sit in the office and not suffer reorganization problems necessitated by current equipment."

The successful office of the future suppliers will have to expand their equipment muscle by moving into more areas than they're in today.

At the same Syntopican session, Quantum Sciences Corp. consultant Melody Johnson ticked off the weaknesses and strengths of the various top-ranking word processing vendors. The successful office of the future suppliers, she said, will have to expand their equipment muscle by moving into more areas than they're in today. These include word processing, data processing, integrated wp/dp, photocomposition, copier capability, dictation, voice processing, facsimile, and satellite communications for larger companies.

In the race to corner the office of the future market, Johnson sees IBM "losing market share, but having most of the key elements." Xerox, she says, suffers from the lack of dp capability—capability they are hoping to beef up through possible acquisitions. Both IBM and Xerox, she points out, are weak in photocomposition. While still "the best" in facsimile, Xerox's weak spots, she pinpoints, are in dictation and integrated wp/dp.

Wang, a strong office of the future contender, has "covered immense ground in the last one to two years," Johnson asserts. Strong in photocomposition, the company has yet to come up with a standalone wp system.

Exxon Enterprises, which always "creates a tremendous amount of excitement" with its products, leaves "only the tip of the iceberg showing," according to Johnson. The company's "current product position is not that strong," but its plans to plunge into such new areas as copiers and voice processing could change that positioning dramatically.

Johnson sees word processing companies responding more to user needs. So much so that they're even willing to turn to their major rivals for equipment. She cites IBM's use of the Qume printer as an example of this newfound competitive collaboration.

Today, Johnson argues, "no one vendor is yet prepared to be an office of the future vendor. But users are not ready to accept (the technology) either."

Exxon Enterprises leaves only the tip of the iceberg showing.

—Linda F. Runyan

SYSTEMS

BECAUSE IT WAS NEW YORK

Virginia Edgerton's concern about what she saw as potential for degradation of an on-line police system led to her dismissal.

"People get killed here," said Virginia Edgerton about New York City.

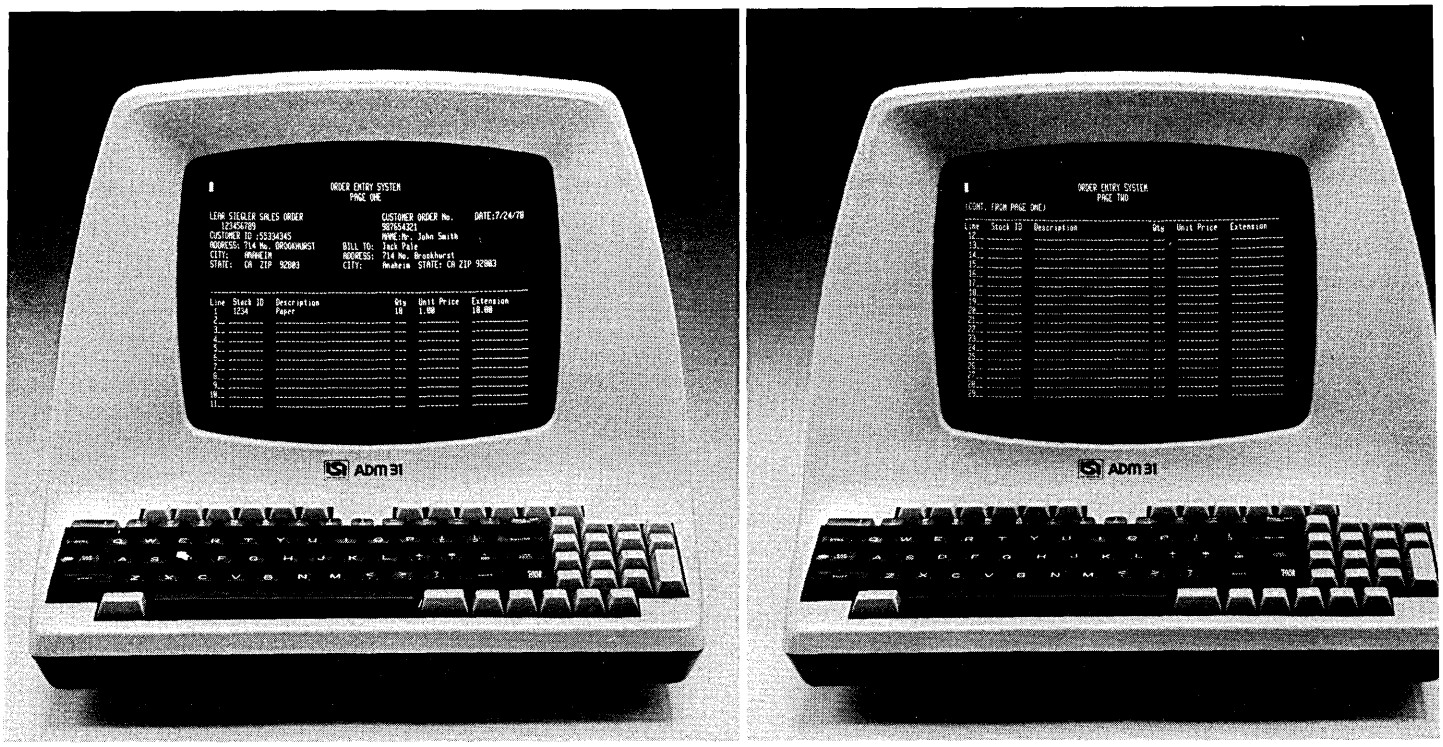
This, she explained, was the primary basis for her concern back in June of 1977 when, as a senior information scientist on a project of the New York City Criminal Justice Coordinating Council, she saw a potential for degradation of an on-line system used to dispatch police cars in response to emergency calls.

"It's because it was New York," she said. "If it had been Augusta, Me. or Aurora, Ill., it wouldn't have been so critical. I live on 34th St. and I hear sirens 24 hours a day."

The system in question, called SPRINT, accepts as inputs from a police terminal New York City street addresses and responds (typically within seconds) with street coordinates and the location of the nearest patrol car. Police dispatchers, upon receipt of emergency calls for assistance, enter the addresses given and use the output to direct the nearest patrol cars to the scene.

Edgerton was employed in a project called CIRCLE established to install an on-line system called PROMIS, intended for use by prosecutors to keep track of various data pertinent to cases scheduled for trial. Chairman of the project was Manhattan District Attorney Robert M. Morgenthau.

SPRINT was operating on a pair of IBM 370/158 computers, one of which was being used for backup and test purposes. At first, Edgerton thought PROMIS would be implemented on the backup computer. When it became obvious to her that it was



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CIRCLE 126 ON READER CARD

VIRGINIA EDGERTON—"We care about our fellowman."

to go on the main host she became concerned about the degradation potential for SPRINT with the computer handling the additional load.

"I wanted to take the chicken-way out at first," she recalls. She asked her supervisor, project director Sarwar A. Kashmeri, if she could be assigned to another project. "He

"I wanted to take the chicken-way out at first."

seemed to agree, but a day or two later it was as if the conversation had never taken place and it was back to SPRINT."

She claimed illness and went home. "I stared at the walls for two hours. What to do? I'm not an activist. Should I resign in a huff? Should I resign quietly?" She called the headquarters of the Institute of Electrical and Electronic Engineers (IEEE) and asked the receptionist, "Is there someone there who knows about ethics."

She was referred to IEEE's Committee on Social Implications of Technology, which assigned the case to a subcommittee of its working group Ethics and Employment Practices, chaired by Stephen Unger. He referred Edgerton to Dr. Howard Eskin, manager of systems programming at the Columbia Univ. Computer Center, in order to obtain a preliminary assessment of the technical aspects of the situation.

"They wanted to find out if I was a lunatic," she recalls. "I almost hoped they would decide I was a lunatic."

Dr. Eskin reported back to the working group that the matter was complex, that Edgerton was raising a legitimate issue and that definitive answers could not easily be found.

"After that the IEEE told me what to do," Edgerton said. She was advised to call in sick for two days and was helped to prepare a memo outlining her concerns to project

"After that the IEEE told me what to do."

director Kashmeri. He rejected it.

Two weeks later (again on the advice of and with the help of the IEEE working group), she circulated a revised version of the memo to the members of the Criminal Justice Coordinating Council, the organization employing her. For this she was discharged by Kashmeri on grounds of insubordination.

She then asked the IEEE Committee on Social Implications of Technology to formally investigate the situation. The committee wrote to Kashmeri asking for his version of the matter. There was no response and after what was deemed a suitable interval a letter was sent to District Attorney Morgenthau asking him to look into the situation and respond to the *prima facie* case presented by Edgerton. This letter was answered by Kashmeri who said Edgerton's dismissal was "effected because 1) her distribution of the memorandum to the members of the CIRCLE Committee was in direct violation of policy established by me, and 2) against expressly given orders that all communications sent to the members must be approved by the Project Director."

He also said that "the issues raised in her memorandum were at that time (and still are) under continuing discussion with the computer staff of the New York City Police Department and members of the CIRCLE Committee."

There was additional correspondence between the IEEE committee and various city officials with responses as recent as this summer, "but no positive responses," said Unger last month. "To the best of my knowledge no study has been done (of the degradation potential for SPRINT)."

He said Morgenthau finally did respond but that it wasn't a positive response. The committee never pushed for reinstatement for Edgerton because she didn't want it. "In retrospect I think that was a mistake," said Unger. "Pushing for reinstatement might have made our case stronger and she could always have declined to go back."

But he feels maybe Edgerton did have a positive effect. "SPRINT is still running on the same two computers but there has been an informal indication that a second computer will be brought in for the SPRINT system."

Edgerton, too, feels her efforts had some effect. PROMIS for all of New York's burroughs was to have gone on the SPRINT computer, but so far only Manhattan is on. She feels she delayed the rest. "And they (the CIRCLE Committee) now have a budget for an analyst. Before it was only me (with computer expertise)."

Unger feels culmination of the matter came last April when the IEEE, at Intercon, its national conference, presented an award to Edgerton for "Outstanding Service in the Public Interest." The award consisted of a certificate and $750.

The money has gone into a fledgling company Edgerton has been running since she left the employ of New York City. It's called Intelligence Technology Resources Inc. and is primarily a service bureau operation for small organizations.

"I had enough money to live for a couple of months," she recalls, "and I gave myself two months to get a client. I had doubts about my selling ability. After the fifth week of everyone saying no, I went home and began throwing up. I wasn't sick but I was even throwing up Alka Seltzer."

A friend with 20 years of selling experience assured her that sales frustrations usually lead to one of three things: "You become an alcoholic, you begin smoking two packs a day or you go home and throw up. I felt better when I decided I was normal after all."

The next week she got two clients. One was a lawyer who was a friend of a friend. "The lawyer was seeing a shrink and his shrink was threatening to strangle his bookkeeper. He thought the shrink could use my services. I was taking most of these people (prospects) out to lunch but the

At first she was only going to pick up weak little old ladies.

shrink didn't want lunch, just my services."

Edgerton said ITR "has always paid its own way excluding my salary." Her expenses include leasing of computer time from a service bureau in midtown New York City, help as needed and a telephone answering service 24 hours per day.

Her market continues to be primarily what she calls shrinks—psychiatrists, psychologists and similar counselors. Her first lawyer decided he didn't want the service but he did pay. "Lawyers need word processing and I can't provide that now."

She tried offering an inventory control system for bakeries and went so far as to print up brochures featuring a cookie dancing on a terminal. But she backed away because "the CIA couldn't be more paranoid. They don't even want you to know what their ingredients are."

Edgerton said her accounts receivable are five times what they were when she started the company but profit is yet to come. "It's coming along and I know it's the right thing to do. Sometimes I think it's

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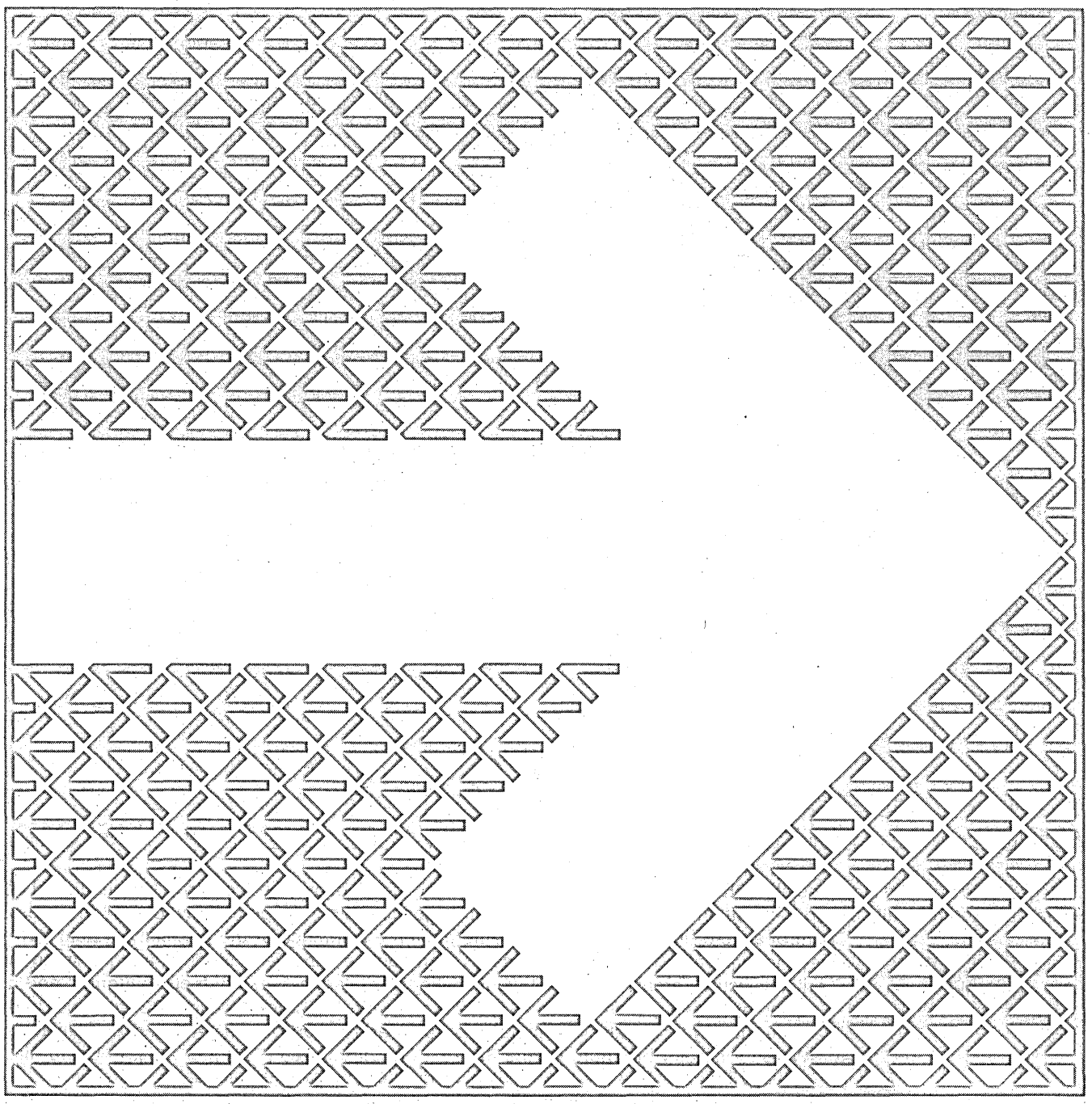

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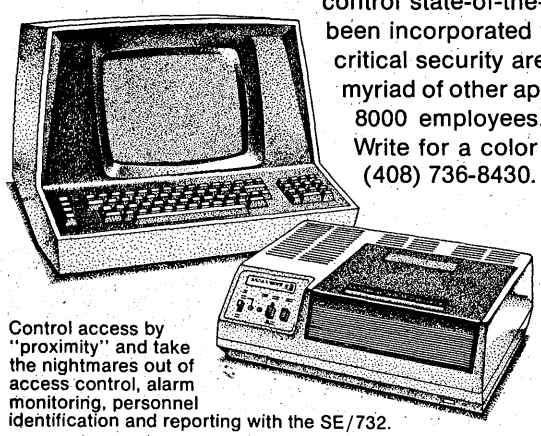

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CIRCLE 70 ON READER CARD

irrational, me doing this, but I feel, when all logic fails, gamble."

She's found other ways to keep eating and paying her rent. "I found that colleges are willing to hire part time instructors. They're called adjunct faculty. I teach two classes in early morning and a couple of classes at night."

And last summer she drove a cab Saturday and Sunday nights. "I learned that television is unreal." She hasn't seen anyone killed but she has witnessed robberies and muggings and "three people from my garage were shot, one fatally."

At first, she said, she was only going to pick up weak little old ladies, then only females and finally "anyone who didn't look out-and-out hostile. There's keen competition for cabs and if you don't book well you might not get a cab the next time."

And the cabs weren't always in top condition. She had one where the bottom fell out and another with a door that wouldn't close. She said her experiences as a cab driver have reenforced her belief in what she did as regards SPRINT.

Edgerton is expanding the scope of ITR, too. She has done some brokering of computer time for universities and last summer conducted a two week seminar for "people looking for second careers, people in jobs they don't like, displaced teachers, housewives wanting to get back to work." She would like to offer seminars to corporations. "I have many friends who could come in and teach from the academic and consulting worlds."

She's active in the IEEE, too, as chairman of the Professional Activities Committee. In this capacity she met recently with Representative William Green of New York's 18th Congressional District. "We're trying to get through to Congress, to tell them that we care about our fellowman."

—Edith Myers

SECURITY

THIS CRIME WAS REPORTED

Proprietary Computer Systems went to the FBI right away when "suspicious" things began happening on its computer system.

Computer crime watchers generally perceive a widespread reluctance to report suspected infractions.

The reluctance may be widespread, but it certainly is not universal. When employees of Proprietary Computer Systems Inc. of Los Angeles noted suspicious happenings on their computer system last December, the firm immediately reported this to the Federal Bureau of Investigation.

"We have monitoring devices on our system which told us suspicious things were occurring," said Bill Barencik, PCS president. PCS offers computer time-sharing services, primarily in word processing and text editing.

What was reported to the FBI was that unauthorized accesses were being made to the PCS system. "The FBI wanted to catch the guy in the act," said Barencik. "We cooperated with them in an on-going monitoring that lasted from December until last June. We knew the accesses were coming through our Chicago multiplexor."

PCS even assigned an employee to the full time job of handling the monitoring. "I felt sorry for him," said Barencik. "The unauthorized accesses were occurring like clockwork, three or four times a week, always at 4 a.m. our (California) time."

The investigation culminated in early July with the indictment by a federal grand jury in Los Angeles of David T. Herr, vice president of business development for Bowne Information Systems, New York City. (Bowne and PCS are business rivals.)

The grand jury indictment charged Herr with accessing PCS computers between December 1978 and June 1979. He is alleged to have obtained code numbers and passwords to do this to obtain proprietary data from the system 196 times, using 48 hours of computer time. He also is charged with deleting codes in the PCS system which prevented PCS customers from accessing the company's computers.

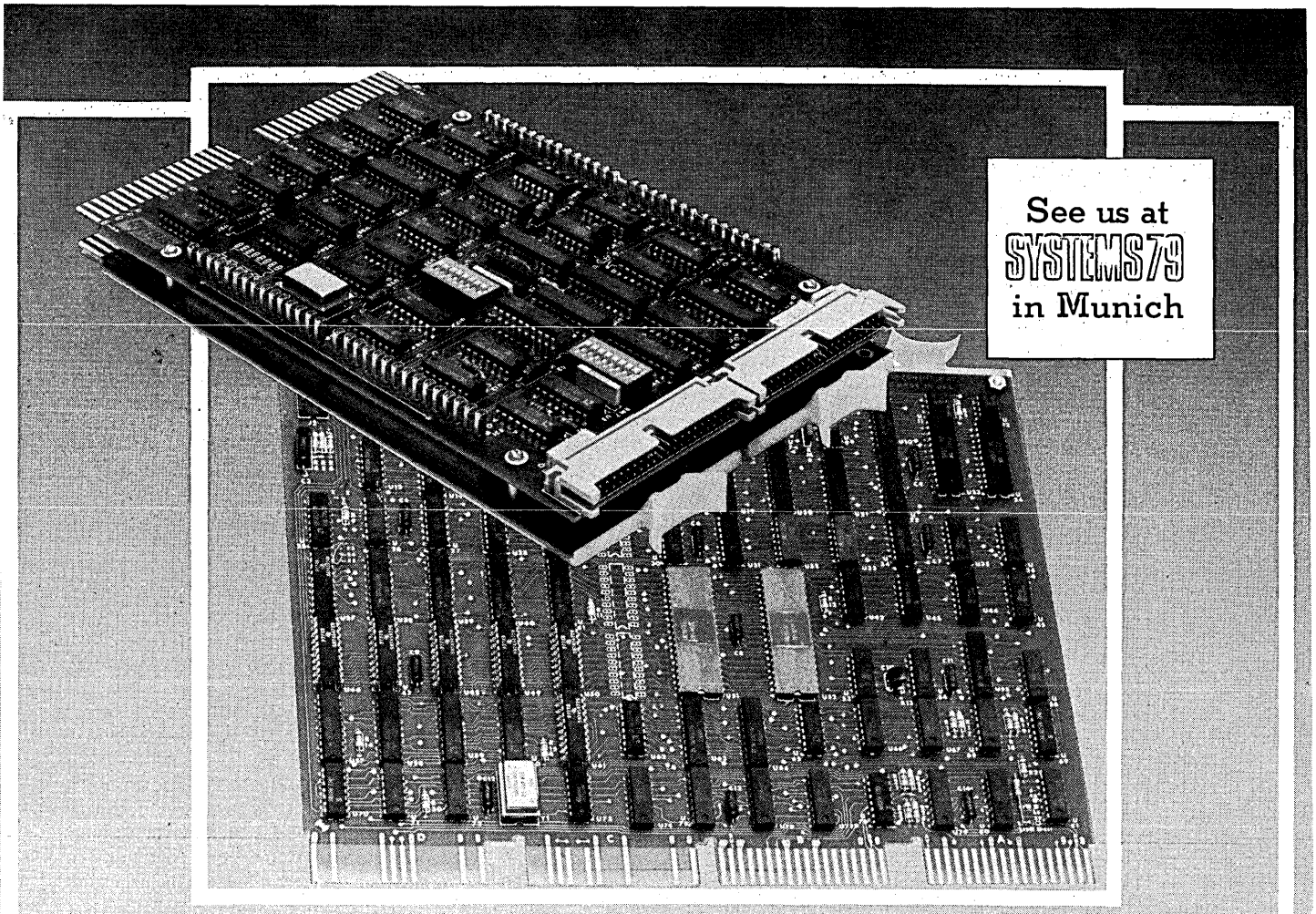
The indictment did not indicate how Herr allegedly obtained the code numbers or passwords. The FBI's investigation continued after the indictment and was still going on late last month.

Herr entered a not guilty plea to charges of ten counts of wire fraud in a Los Angeles federal court in late July. Simultaneously, his New York attorney, Patrick Wall, was preparing a motion to exclude certain evidence from the trial, reportedly evidence obtained in a search of Bowne's New York City offices.

A tentative trial date of Aug. 28 was set at the time of pleading but sources close to the matter were not expecting it actually to come to trial until some time this month or next.

Bowne Information Systems, a subsidiary of Bowne & Co., was not named in the indictment. Herr was still a Bowne employee in late August. Dale Ries, president of Bowne Information Systems, declined to comment on the case in late August but he did say that the company's continuing employment of Herr indicated the firm's faith in his innocence.

—E.M.



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SOFTWARE

BEGINNERS' SOFTWARE WOES

New York software firm feels IBM's policy of referral of software houses to entry level users has problems.

A small New York software company is unhappy with IBM's handling of software for the entry level computer user and has told IBM so.

Commercial Software Inc. has complained both to IBM's General Systems Div. and IBM corporate. What the company and its top executives, president Tony Abbott and vice president Joe Raff, don't like is IBM's policy of referring customers for its System/32 and System/34 to third party software companies and, at the same time, disclaiming responsibility for the referrals.

They contend the method has resulted in the development of thousands of very small software and programming houses—often

IBM said it has no official list of preferred third party software companies.

with a cast of one. And most of them are dependent for their survival on having IBM as their marketing organization.

Not everyone makes it. Raff started his own software organization for the entry level user market. He knew of the obstacles: "I thought I could get around them, but I couldn't make it at the prices I had to charge because of the competition." He gave up and threw in with Abbott and CSI.

IBM's General Systems Div. has managed to sell more than 50,000 System/32s and /34s in the last several years. It has done so with a paucity of software, and what there is in applications is limited in excellence. There just aren't enough people at GSD—or enough money in it—to support this big base of low priced equipment users.

And so, the referral policy. IBM said it has no official list of preferred third party software companies. Referrals, usually three to a customer, are made by sales offices.

Abbott and Raff claim the referral policy has resulted in a cut-rate, cutthroat business. Most of the small firms, subsidized by IBM, they claim, charge too little to get the business. "The average is about $20 an hour." This isn't enough to survive, they say, but as long as someone is willing to charge those prices, the larger, well established software houses cannot afford to get into the GSD market, particularly for System/32s and /34s. And the small companies constantly live on the brink of disaster.

The entry level computer user can be hurt by the situation because a software supplier may go out of business or abandon him before a contract has run out, Abbott and Raff contend.

Another problem with the GSD method of selling small systems, CSI claims, is that the salesman does not bring software into the picture until the hardware is sold. The entry level user does not always understand that the software can cost as much as the hardware and that it can take longer than a few months to develop. This "low perceived value" of software has contributed to the low prices and the chance of failure, says Raff.

Raff and Abbott note that the other small business hardware vendors are beginning to learn what a problem this can create. They say that increasingly, companies like Basic Four, Prime, Data General, Datapoint and others are bringing software or turnkey companies in with them to make a sale. Digital Equipment Corp., they noted, recently has instituted accreditation for distributors using its equipment in turnkey offerings.

CSI said it was referred to a potential IBM customer in the trucking industry. The president of the company already had received a $15,000 bid from another firm for its software. CSI found the trucker's requirements were so sophisticated that it estimated a cost of $50,000. The president, at first, was "outraged at the price" but later boasted that his applications were as sophisticated as anything he knew of in trucking. How did he know? Abbott and Raff said he read the IBM manual on applications in his industry, borrowed from his IBM salesman.

The two CSI executives said third party software suppliers to the IBM entry level market live and die at the discretion of the IBM salesman or district office. "They can be blackballed if they do something wrong and that ranges from doing a bad job (not unreasonable) to hurting the hardware sale." Raff, once a GSD salesman, said a company can get into trouble by recommending less hardware or bidding too high a price for the software and thus giving the user room for second thoughts.

"Figure," he said, "that 75% of the advertising agencies are in the New York area, and IBM has most of that business. If a software company specializing in this market is blackballed in New York, he's dead."

Raff also said that the IBM salesman can and does control the level of software pricing. When the policy was first instituted, he explained, salesmen had a habit of giving the user ballpark estimates of what the software might cost. Some complaints from third parties halted this practice. Now, he contends, the salesman can still influence pricing by telling the third party software house what a competitor is bidding, how big the user's budget for software is, and so on.

Raff and Abbott talked of their experience with a third party company they used as a subcontractor. "When we first talked to them, they said they loved the GSD market and were doing well. The next time we saw them, they admitted they were only making enough to pay themselves $12,000 a year. Then they proposed a merger—or would we offer them jobs. They've had a lot of contracts but they just couldn't charge enough for them."

Generally, third party software firms do not seem to have grave complaints about IBM or their own potential for survival. Some would prefer that IBM qualify the software houses and take some responsibility for the referrals. This, they feel, would raise the quality and reputation of the third party software community dealing with IBM small business systems. But the last thing they want is to have IBM stop making the referrals. "We don't want to spend six months selling a customer on hardware," said one.

Abbott and Raff note that IBM GSD told them that surveys it had done of the third

The entry level user does not always understand that the software can cost as much as the hardware.

parties indicated a general happiness with the way things are. The CSI executives belittle this assertion. "Sure, that's like saying 'all prostitutes are happy, according to their pimps.' " They also assert there isn't a third party firm that will admit to a problem or criticize IBM—a good way to get blackballed.

Is the entry level customer—that trucker or distributor or retailer that's never owned a computer before—really getting hurt by IBM's way of doing business? The CSI executives readily concede that it's a mixed review. Some get excellent service; others have disasters. The good salesman, the smart buyer, and the quality software firm, they contend, can develop a good installation. It doesn't matter who the vendor is. The bodies of customers who didn't fare well with any small business manufacturer are strewn all over the industry, they admit, and there are a few lawsuits to prove IBM, if it is a villain, does not stand alone.

There's the case of the distribution firm, with time critical requirements of food perishability. It took on a System/32 and an IBM referral. The software house had five people. IBM came in with a quick bid and a fast delivery promise. A year and one-half later, the software house was down to one and the applications hadn't been documented, debugged or anything. The dp

NEWS IN PERSPECTIVE

manager, hired after the debacle, has been getting all the software rewritten. The problem now with IBM? "Our salesman and system engineer change every six months. No one got to know our account. We tried to get them to come in and look at our problem but they weren't skilled enough. Too, our company wasn't guided on how to spec properly."

The president of the trucking company mentioned earlier had a long, arduous task getting his system on the road. "To convert

The IBM salesman can and does control the level of software pricing.

my operations to computer, I've been forced to get an education. In fact, I've spent more time on this than I did starting my business, buying a home or picking a wife." He went to IBM on the advice of his banker, because it was "the Cadillac of the industry . . . But I found they'll sell you a Cadillac, but won't give you a driver training program."

His first software referral was a one-man band who had implemented several packages in the trucking industry. During the first appointment with this programmer the man was late. Then he spent half of the appointment time talking on the phone to a customer in trouble. "The second appointment, I figured I wasn't going to use him. He didn't show up." This president still is hunting for a software outfit and rethinking his order.

Another trucking firm, Dahn Trucking, had a better experience. It said that "before we bought our system, we actually had an idea of the type and size we needed. We went for bids from third parties before we ordered the hardware. The company IBM referred to us did a good job and IBM checked our progress."

A West Coast consultant said he had brought IBM to a client in property management—after another supplier, a turnkey firm, had disappeared after delivering "a board, a disk, and a keyboard." The IBM salesman, he said, was an expert in this field, and brought in a one-man shop—also expert—to do the system, "and it was done right."

Can the industry's ironmongers of small business systems do a better, more even-handed job of serving the small company? The executive of a software company specializing in larger mainframes thinks that the recommendation method is palatable, but only as long as it is "fairly administered." He feels that too few firms are doing a good job of it, keeping the software industry small and keeping firms from effectively marketing against each other and the hardware vendors. "They're forced to live with scraps from the master's table, just as the machine shops live off General Motors. The method breeds discrimination and, in some cases, corruption. Kickbacks are not unusual when the lists are not of-

ficial and not qualified, when the vendor refuses to take any liability and the user doesn't know any better."

This executive said he already has testified in a case in which a user was burned by a mini supplier who didn't introduce the other 50% of his costs—software—until after delivery of hardware. "The courts are increasingly willing to listen."

Abbott and Raff have made a number of suggestions to IBM as to how it might change its policy. First, they asked GSD to establish a continuing forum for discussion with software firms. So far, they say, GSD has been "hiring consultants to talk to third party suppliers." Second, they feel GSD should train its salesmen on selecting and handling third parties. Third, they want IBM to establish a liaison officer to deal with them on a full-time basis. Fourth, they suggested that IBM go one of two ways: discontinue the referrals completely or go into the business of providing full solutions to this user base, "so we can really compete with you."

"To convert my operations to computer, I've been forced to get an education."

IBM GSD, they said, explained it could not drop the referrals and would hurt an entire industry if it did. IBM had, after all, said GSD, created jobs for thousands through this method. Abbott said IBM also asserted that it simply could not afford to provide total solutions because of the enormous cost and low profit in doing so. "IBM said they would love to have our company on its list of referrals."

While GSD did not give signs of changing because of the CSI complaints, Abbott and Raff still have hopes they will get a corporate hearing.

—Angeline Pantages

SWITCH AT HONEYWELL CENTER

Shel Klee, a key figure in development of Xerox's CP-V operating system and its Honeywell successor, CP-6, leaves Honeywell.

Shel Klee, director of Honeywell's Los Angeles Development Center, left Honeywell effective Sept. 1 to join Transaction Technology Corp., Marina Del Rey, Calif.

Klee was a key participant at Xerox Data Systems in development of CP-V, an operating system for multiuse computing much beloved by Xerox users. When Xerox bowed out of the general purpose computer business in 1975, CP-V, called one of the world's five fully versatile operating systems, was deemed by many to be the most valuable thing Xerox had to sell.

When Honeywell took over Xerox's general purpose computer operations, Klee joined Honeywell and in 1976 was named to head up the Los Angeles Development Center. The center's primary charter was development of Control Program-6, a successor to CP-V designed for use on Honeywell level 6 computers.

There were those among CP-6 watchers who felt Klee's departure did not bode well for the new operating system. Klee himself was unavailable for comment on his reasons for leaving. Calls to him were being returned by a Honeywell public relations officer.

On the surface, though, it appeared as if CP-6 was alive and well and on schedule. Sandy Panzarella, president of Science Dynamics Corp., Torrance, Calif. on-line service bureau for the medical profession and Honeywell's first customer for CP-6, said, "They shocked me. They delivered on time."

Science Dynamics took delivery of CP-6 and a Honeywell level 66 computer in July but installation didn't begin until mid-Au-

gust "because we had to get new power and new air conditioning in the computer room." Panzarella expected to be running diagnostics on the new machine under CP-6 by late August. He expects to be in production under CP-6 by next January.

He admitted he is anxious about benchmarks, but noted "we've rewritten most of our software in anticipation of CP-6. We hear it's doing well at Carleton Univ. (Ottawa, Ontario, Canada) and we've watched it at the Los Angeles Development Center and it seems pretty stable. We're excited. These are exciting times."

Replacing Klee at the center is Richard Litschgi, who had been manager, CP-V/

It appeared as if CP-6 was alive and well and on schedule.

CP-6 operating systems development. Like Klee, Litschgi went to Honeywell from Xerox. At XDS he was CP-V operating system manager.

Klee joined XDS predecessor, Scientific Data Systems, in 1964 after four years with Burroughs and two and one-half with Control Data Corp. Holder of a masters degree from Brooklyn College, he got into the computer arena as a user, at Lockheed Corp.

—E.M.

MARKETING

HOW TO LINE UP OEM HOUSES

Digital Equipment Corp. has strict policy of talking to their customers and viewing their business plans.

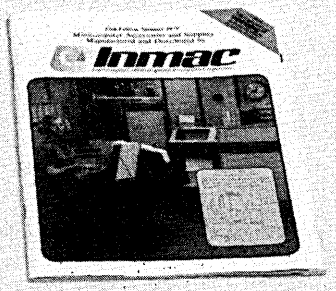
Seven months after it announced a distributor program amid much fanfare, Digital Equipment Corp. finally began to name selected oem's and system houses as "authorized Digital Computer Distributors."

The first 13, most of them small system houses in vertical markets, were announced in late July, and the group is expected to grow slowly but steadily.

Although the distributorship program has encountered some resistance and lack of enthusiasm among the 250 commercial oem's and system houses eligible, many users—particularly newcomers to dp—probably will appreciate DEC's attempt to designate well run companies with superior track records among the host of competing oem's. In order to qualify for the distributorship and a chance to display the DEC logo, system houses and oem's must be endorsed by at least five end users and allow DEC to survey all customers served in the previous year—as well as to allow DEC personnel to review their internal business plans.

According to DEC sources, the program originally evolved out of DEC's concern over credit risks and losses among the commercial oem's in the last several years. With a shift in the classic oem market—original equipment manufacturers designing for micro rather than mini-based systems—DEC's commercial oem business has evolved to supply mini hardware for system houses who add an applications software package and usually sell to a particular vertical market. It's an important and profitable business; which is why DEC chose to use the distributor program to give them more intimate involvement and leverage with the oem's rather than just tighten oem credit requirements, explained a DEC source.

Another factor in the DEC strategies behind the program may have been a realization that the on-going trend toward lower hardware costs must be ultimately reflected in lower volume discounts, a major part of the operating margin among small capital restricted oem's. A lower discount schedule will unavoidably weaken DEC's ties with the oem's—and DEC's increased



One way to order everything (all day on the phone)

Before he bought from Inmac, one customer required a pile of catalogs second only to Mt. Everest.

When the time came, he'd know just where to look for supplies.

A disk pack?
He'd go right to that 35-pound catalog under the philodendron.

A CRT stand?
Right to the furniture catalog. (Too bad he didn't read the fine print that said "2-month wait".)

EIA cables?
In the catalog that looked like last year's winning entry in the stump-the-engineer contest.

One day he needed a disk pack. And a CRT stand, 5 EIA cables, one box of thermal paper, 6 print-wheels and a harmonica ribbon.

If he didn't get them quick, he couldn't finish the Big Project. And top management was really breathing down his neck.

By the time he got all the catalogs together, figured out what would work with what, and made all the calls . . . 9 a.m. became 9 p.m.

And part of his order got stuck between Texas and Terre Haute.

Never again.

So he subscribed to the Inmac catalog. After all, 70 pages wasn't much for every supply he needed. Plus he could store it in a drawer.

He got rid of almost all those other catalogs. But his office looked empty. So he went out and bought a poster of Nepal.

With a great view of Mt. Everest.

Our way to order everything (10 minutes on the phone)

How you can get 1,000+ supplies and accessories. No hassle, no wait.

Order from the FREE Inmac catalog for precision performers. Magnetic media. Printer paper. Cables compatible with DEC, DGC, HP, TI and IBM hardware. Ribbons. Computer-room furniture. More. Guaranteed for 45 days. Some up to 10 full years.

Over 1,000 supplies in the FREE Inmac catalog.

Quality recognized by over 20,000 users around the world.

And you won't wait for what you need. Inmac strives to ship products the day after you order . . . from both east and west coasts.

For your free Inmac catalog, circle the number below.

Formerly:
Minicomputer Accessories Corporation

Inmac
International Minicomputer Accessories Corporation
Corporate Address: 2465 Augustine Drive, Santa Clara, CA. 95051

CIRCLE 23 ON READER CARD

interest in marketing applications packages among the *Fortune* 500 could have a similar impact—and the authorized distributor program sets up a counter-influence.

Digital, of course, stresses a more positive aspect of the program. End user market surveys have shown that the target companies to whom oem's sell today are ever smaller and less sophisticated in terms of data processing. Comparing surveys done four years ago versus another last year, C. M. "Buzz" Brooks, operations group manager for commercial oem's, said that users now rate security and stability of the software house nearly as important as price and performance. "Security has become much more important," he said. "It's something the buyer out there is looking for: the stability of the company, the capability of the company. Is it a quality shop? It's one of the largest purchases a small business will make."

Brooks said the underpinnings for the distributor program include several new DEC offerings to small oem's to help them develop and manage their growth properly, including training programs and a series of management guides. And although DEC's credit policies remain the same for both the new distributors and other nondistributor oem's (and DEC offers no capital finance to either), "we believe the distributorship will give oem's ammunition with which to apply to their own banks for new credit lines," explained marketing communications manager David Riquier.

If, as some expect, many of the smaller oem's will be forced into refinancing due to cash-flow problems and changes in the discount schedule, credentials of the sort might become very valuable. Software houses traditionally have had difficulties proving their worth to bankers; accounting practices force them to expense software development and they often have very little else in the way of assets. They seldom have even a hardware inventory, as DEC drop-ships directly to the purchasing end user.

End user market surveys have shown that the target companies to whom oem's sell today are ever smaller and less sophisticated.

Many of the larger oem system houses have complained that the distributor program offers them relatively little for the bother and risk of allowing DEC privileged access to their customer base. Many are well-established firms themselves which see little benefit in having DEC vouch for them, accredit them to use the DEC logo and share the expense of joint advertising—at least in terms of the flexibility lost in such close identification with a vendor.

"Frankly," added an executive at one of DEC's major oem's," I'd be more interested if I thought I could trust DEC to send someone who knew something about my business, about the business in general, to speak with my customers. They're sending out iron-headed salesmen who only know computers."

"You hate to have your customers bothered for no good reason," agreed Brian Boyle, president of Interactive Management Systems of Belmont, Mass., one of the first distributors chosen. "But," he said, "I think the oem who can qualify has everything to gain and nothing to lose. Unless he doesn't want his corporate identity tied with DEC."

Among other oem's, there's been some mistrust, what with the expressed intent of DEC's new MDC (manufacturing, distribution and control) group to move more aggressively into selling applications software against the oem's, even teaming up with some oem's in joint marketing agreements.

At DEC, Riguier dismissed some of the worries as paranoia. "If this was just an attempt to gather information (about oem sales), we wouldn't have to go through all this to get it."

Brooks added, that he and his oem sales force can only be successful if his oem clients are successful. The information gathered to qualify distributors will be used solely for that purpose within DEC, Brooks promised. Although other DEC

groups sell directly against the oem's in the upper end of the market, he asserted that there is no conflict of interest in Digital's inquiry into oem business practices.

Until recently, however, resistance and distrust among the oem's seemed to threaten the whole program. "In June," admitted one DEC source, "people here were going around calling it a disaster. They only had a handful of applications after spending $300,000 to push the program. They were starting to really hustle to get some more names."

Many of the larger oem houses have complained that the distributor program offers them relatively little for the bother and risk.

Brooks, more recently, said he had between 40 and 50 companies applying and hoped to have between 100 and 150 within a year.

"We feel that it will take off more after our national advertising campaign hits," he said. "There will be a demonstrated performance by Digital supporting this whole campaign in our advertising and promotion."

"We cannot make any judgment on the oem's who do not apply to become distributors," explained Brooks, "but we can say positively of the people who have gone through it: 'We have checked with the end user and they have a satisfied user base out there.' That is the cornerstone of the whole program."

—V.M.

TURNAROUNDS

OUT FROM CHAPT. XI

Soaring sales buried underlying problems of shaky controls and company spent more than a year in bankruptcy.

"It's only a procedural matter now," says Diva, Inc. president Ronald Harmon. "We expect to be out of Chapter XI in 60 to 90 days."

It's been a long, difficult struggle for Harmon and the Eatontown, N.J., disk-storage subsystem manufacturer he heads, but after 14 months Diva looks like it's about to emerge from bankruptcy. That's good news for the firm's employees, creditors, suppliers and customers, many of whom have remained loyal despite the firm's financial difficulties.

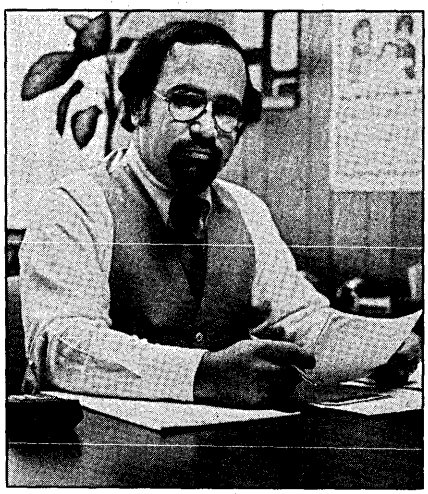
"We've been pulling hard for them," notes a source at Kodak, one of the customers which has stood by the financially troubled concern. "They've really scrambled to keep things together during this period and we're very pleased. They've got good hardware and loyal employees."

Founded in 1969 by three Bell Laboratories engineers, Diva's sales soared during the early and mid-1970s, and consequently its underlying problems—managerial squabbling and shaky financial controls—weren't readily apparent. The rude awakening, however, came in June 1978 when the company, the first to demonstrate a practical design for high-capacity mass storage data systems for minicomputers, technically, at least, closed its doors.

With bankruptcy came a major managerial overhaul. Harmon, who originally signed on with the company in 1977 as vice president of engineering, became president and chief executive officer while Les N. Rubin, the company's controller, was named vice president of operations. "It was on the job training," Harmon admits. "A P&L statement was Greek to me."

Still, Harmon managed to tighten financial controls, set up interim financing and paid off a major share of the company's $2.5 million debt. Moreover, with a drastically pared staff (150 to 35), Diva managed to continue production and sales, and turned over service of its 2,800 or so customers to Syntonic Technology, Control

NEWS IN PERSPECTIVE



RON HARMON—from vp engineering to president—the story of a turnaround.

Data's service organization.

"Initially when they heard the news, a number of our customers reacted with shock and dismay, but then they saw we intended to stick by them and they've remained very loyal," Harmon says.

Gradually, as revenues began to build—they're about $2 million now—Diva began to call back a number of laid-off employees, some of whom had moonlighted even though they'd taken other jobs. "Everybody who came back wore five hats, including me," says Harmon.

End of story: today Diva, one of the few firms to sell plug-compatible disk storage systems for DEC, Interdata, and Data General gear—often at prices as low as 50% below that charged by the manufacturers—is just about back on the track, and Harmon says its end user and oem customers can expect some new product announcements early next year. "Financially, we've become a very sound company," Diva's president asserts.

With a drastically pared staff, Diva managed to continue production and sales and pay off most of its $2.5 million debt.

—Laton McCartney

INTERNATIONAL

SELECTING TERMINAL VENDORS

It took nearly three years of intensive study before Denmark's savings bank organization gave the nod to Italy's Olivetti.

Olivetti, the Italian office machines giant, has been given a "once in a lifetime" chance to emerge as Europe's top distributed processing company in the 1980s.

The company has been selected to build a massive 5,000 terminal network for Denmark's community of savings banks. The $100 million deal will be signed in Ivrea, Italy, this month, and is said to be one of the largest ever placed in Europe.

Most of the world's leading dp companies bid for the network, which is to be built over the next four years. The long selection process for the contract began in the fall of 1977, and Olivetti was nobody's favorite to win the prize, say observers. As a result, the company's triumph over IBM, NCR, Philips, and other top international names has been greeted with surprise in Denmark.

The original favorite to secure the order was the Swedish minicomputer maker Datasaab, builder of the savings banks current network. Datasaab's failure to win the contract has now cast grave doubts over its future.

Datasaab's misfortune could be the making of Olivetti. The contract will allow the Italians to develop a "debut" ring of large minicomputers as well as new terminal processors and visual displays from scratch, and at no cost to the company. When finished, Olivetti believes it will be left with one of the most modern and complete sets of distributed processing tools in the computer business.

The development of the new system will be closely monitored by the Danes, initially in Ivrea and later in Copenhagen. In addition to this, the contract has now become a focus for the whole international banking community, because of its system structure of clearly defined and standardized interfaces throughout the whole network.

In addition to this, one of the differences has been noted: "Many European banks have formed regional centers to concentrate and switch traffic from individual branches to their central dp complex," said Aage Melbye, head of the Danish Savings Bank Data Center (SBC) which services all the bank's dp requirements. "We prefer each branch of each savings bank to be directly on line to our central Amdahl-IBM mainframes and Collins front-end."

Melbye said that all the data traffic will be routed via the sophisticated Nordic Datanet circuit-switched network which currently is being built. Like many European banks, SBC's savings banks currently use private lines leased from the PTT's.

The varied leading edge technology that the SBC banks require will offer Olivetti a unique opportunity to plug the major gaps in its line. "We've been given a once in a lifetime chance to change our whole production and design—perhaps even our

whole company," said a spokesman in Ivrea. "There's little doubt that this development will form the heart of our systems for the 1980s," he added.

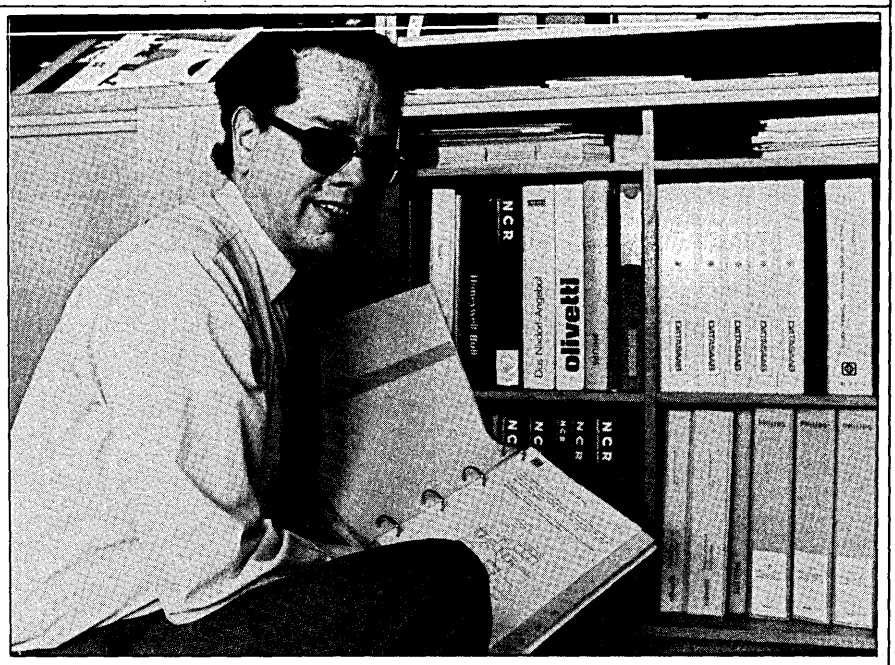
Olivetti is believed to be preparing a major world press campaign following the signing of the contract in Ivrea on the 13th of this month. Details of a deal with Amdahl that will allow Olivetti to add the Amdahl 470 mainframes to the top of its line in

The varied leading edge technology that the banks require will offer Olivetti a unique opportunity to plug the major gaps in its line.

Italy and perhaps elsewhere could also be finalized at this time, say sources. Olivetti declined to comment, but confirmed that talks with Amdahl on a "commercial venture" had been in progress for several months.

With its entry into large minis (from 64K to one megabyte) and the boost to its terminal ranges, and a possible Amdahl tieup, Olivetti has embarked on a plan that could turn it into the European NCR. The U.S. company, with a similar history of typewriters and accounting machines, was turned around into a major computer company by its head, William S. Anderson.

SBC is very confident that a more integrated Olivetti product line will help its savings banks to keep the jump on their commercial counterparts. Most of Denmark's small savers are with SBC's 110 member banks, which have combined assets of some $10 billion. Business at the



"WE WERE concerned whether (Datasaab) would still be in business in five years," says Aage Melbye, general manager of Denmark's Savings Bank's Data Center.

banks is increasing by upwards of 10% in transaction volume each year, Melbye said. "To match this expansion, dp services billed to our center last year grew by 20%, to some $25 million," he added.

"We're looking to improve the quality of information the man at the counter can get from his bank. We want to give him faster service and more complete and usable information."

He said the banks were looking for a more integrated approach to teller applications. "In addition to word processing and desk-top computers in the mix, each employee will have his own terminal," he said.

"By 1974 we had decided that our network of IBM front-ends and Datasaab terminals would not cope with our growth during the next decade," said Melbye. A combination of factors led to the disenchantment with Datasaab. SBC discovered that the useful life of its Datasaab terminals would end by 1983. The distributed processing facilities of Datasaab's minis were not as good as SBC had hoped, and the Swedish company plans to replace the Facit printing modules in SBC terminals with its own kind when SBC would prefer to keep them. In addition, Datasaab gave notice of increased service fees.

At best, the Swedes offered a gradual renewal and improvement of their system via costly reengineering and a "midlife kicker" to get SBC through the latter half of the 1980s.

"We were unhappy with this. We want to work with our supplier to design a cohesive approach for the whole 1980s and to build new systems for our needs." But a more damning reason for rejection of Datasaab came when SBC began an exhaustive study of the profile of the five final companies it thought might be able to handle the contract. "We were concerned whether the company would still be in business in five years," Melbye said.

SBC is confident that a more integrated Olivetti product line will help its savings banks to keep the jump on commercial counterparts.

He picked a team of 10 people who worked full time for three months to evaluate material on its list of possible contractors. Those rejected included Cii-Honeywell Bull, Siemens, Digital Equipment Corp. and Nixdorf. The five finalists were IBM, NCR, Philips, Datasaab and Olivetti.

Though Melbye did not comment, the prevailing view among Danish observers is that Datasaab made the finalists' list because SBC needed an assurance from the company that its terminals would be maintained until 1983, by which time installation of the new replacement systems should be complete.

Melbye did stress that from the technical point of view the Datasaab proposal for new equipment was up to the standards of the others.

But the team of investigators uncovered weaknesses in the company's makeup that cast serious long term doubts about its ability to survive, say sources close to SBC. These doubts have since been reinforced by the resignation of Datasaab's chairman Hans Werthen and several part time board members. Latest reports from Sweden suggest that the Swedish government is asking Werthen to return because no one from the Datasaab/Stansaab merged organization wants the position which is chosen in rotation by the government and Saab-Scandia, the huge diversified automaker that is Datasaab's parent.

A spokesman for the Swedish Dept. of Industry has since intimated that Datasaab's operation will have to be pruned down because the company has been suffering huge losses. SBC was by far Datasaab's largest customer.

Of the other finalists, NCR and IBM were the first to be rejected. Sources disclose that one factor working against NCR was the "weak influence" of its Danish subsidiary on the U.S. parent. As usual, IBM was

in the right place. "IBM's new 8100s were available to us, but we felt they were too big for our requirements," said Melbye. He claimed that IBM's 3600 banking terminals were "too expensive and too inflexible." Once out of the running, and aware of Datasaab's position, IBM's internal view was that Philips was sure to win the contract. This reflected the general opinion in Denmark's informed circles, according to sources.

One informant close to SBC said that, in the end, Philips' position was compromised by three major factors, the chief one being that it is a very conservative organization. SBC's investigators had difficulty getting information from the company on the "economics" of its data division. Another factor that arose was that Philips, Denmark, apparently was weak in explaining the situation to headquarters in Eindhoven, Holland.

Investigators found weaknesses in Datasaab's makeup that cast serious doubts about its ability to survive.

When it became clear last winter that the order might be slipping away from them, Philips is said to have suddenly produced blueprints of new systems it had on the drawing board. According to Melbye, Philips did have some insufficiently developed systems. "They would have required some delay to our whole installation scheme," he said.

In contrast, SBC was impressed by Olivetti's Danish subsidiary and by the company's willingness to cooperate in providing information, he said. "All along, the company showed a highly responsive attitude, and showed us that they wanted to work closely with us. But more than anything, we were very impressed with their product development plan and technical and engineering skills," he added. Melbye said that in the past it had been his philosophy never to buy systems that had not been on the market for at least a year. So why were the banks prepared to become guinea pigs now? "Olivetti's attitude and the pilot system they've already built, convinced us that we'd get the systems we need." He said he felt that other banks were now moving toward cooperation with suppliers and away from off the shelf systems.

"On purely economic grounds, we worked out that we can get our systems from Olivetti for two to three times less than off the shelf systems of today that have the required capability."

Melbye said SBC and its member banks had learned an enormous amount from the thought and consideration of its prospective vendors. "We are sure the whole contract will have had a profound significance for all of them. We know they all put in maximum effort to win it."—**Ralph Emmett**

FRENCH COUNTER DOMINATION

France appears ready to go a long way toward achieving a prominent stance in domestic and foreign computer activity.

After years of talk about United States domination of the "informatics" industry, the French have begun to toughen their policies in both domestic and foreign markets. Recent events have shown a reinforcement in the government's preference for computer purchase, ambitious plans to launch a satellite offering the same services as Satellite Business Systems (the IBM-Comsat-Aetna consortium in the U.S.) to France and possibly other European nations, a surge in purchases of U.S. and other foreign companies by French firms, and a determined effort to sell the Russians the computer system for Tass.

The big question is to what lengths are the French prepared to go to achieve success? The answer, to judge by one recent case, appears to be a long way.

In the public sector, the French already have a preferential purchasing scheme designed to help the national computer firm, Cii-Honeywell Bull, along the road to financial viability. At the end of last year, this same policy made a partial inroad into the private sector.

The story started in 1977 when Solmer, a steel company, decided it needed to replace a pair of aging Iris 60s originally supplied by the Compagnie Internationale pour L'Informatique (Cii), now merged with Honeywell Bull.

Solmer, then privately owned, had proposals from IBM, Cii-HB, and Sperry Univac. IBM finally came up with twin 3031s. Cii-HB proposed a Level 66 solution and Univac put up a 1100/82 biprocessor for the steel plant application.

Sources, anonymous but interested, claim that the Univac configuration was 20% better in performance and cheaper than the Cii-HB offer. IBM was much more expensive than either of the other two, they say. Univac is also said to have offered an attractive guarantee of a minimum 99.5% availability—and demonstrated better than this at its other French sites at the railway authority, SNCF, and at Air France. Another point in favor of Univac was its experience with the huge Italian steelmaking concern, Italsider. Cii-HB will not comment on price/performance of its

system.

At the beginning of November 1978, Solmer told IBM and Cii-HB that it was no longer dealing with them, and on November 23, it signed a contract with Univac.

Less than 24 hours later, France's director of the electronics and informatics department of the industry ministry, Jean-Claude Pelissolo, had been asked by

Univac was bounced from a bid in which Univac configuration was 20% better in performance and cheaper than that offered by Cii-HB, which turned out to be the winner.

Cii-HB, of which he is also the government board member, to intervene. Univac was forthwith asked to suspend the contract, and three months later the order went to Cii-HB for a Level 66 DPS-3 system.

The rationale behind this is that the government has bailed out the parent companies of Solmer by writing off long-term debts. So, the argument runs, Solmer has to toe the party line when it comes to ordering computer equipment. Solmer itself was unhappy with the government action. Officially, it is not commenting on the deal. Outside sources say, "There is already a lot of unemployment in the steel industry. The Solmer people don't want to lose their jobs."

The latest if not the last laugh is Univac's. The suspended contract was finally put to arbitration and Univac came out with $1.22 million in compensation. Given several other factors, there are many who share the verdict of dp industry daily paper, *La Lettre de l'Industrie Informatique*, which called the Cii-HB win "a Pyrrhic victory which will do more harm than good to the national computer company."

Though the firm itself is happy with its unexpected windfall, it is not clear who will pay for the Univac compensation. Both Solmer and the government deny that they will pick up the tab. One hypothesis is that Cii-HB dropped its price to compensate, but this is not confirmed by the company. If France is trying to put its steel industry on a firmer footing, choosing a less cost-effective system is probably not the best way to go about it. And most ironic of all, the central processor for the new Solmer system will probably not be made in France.

Whether such government interventions are going to become a common occurrence in the French market is not clear. One person who doesn't think so is the aggrieved chairman of Sperry Rand France and general manager of Sperry Univac, Jacques Dumas. He believes it was an isolated example of over-hasty action by Pelissolo. "He made a mistake because he acted without knowing the history of the affair or the technical details involved. We had been working on this for over a year, and Solmer's decision was taken on the basis of a lot of study," he says.

Dumas reckons that other government civil servants were reluctant to back up Pelissolo's action, and indicated to him that his move was out of line with the avowed policy of the government and President Giscard d'Estaing to let market forces prevail. However, most thought Pelissolo had the confidence of the government and therefore didn't want to stick their necks out by opposing him.

France's other efforts also seem to be unequivocal. The Telecom-1 satellite system is due for launch by the French Launche Ariane, in 1982 and will have two operational satellites by 1983. This will cover French territory for data communications services, similar to SBS, with Telecopy (facsimile) services as well as facilities for videoconferencing. The $350 million system will use smaller antennas than SBS. But with larger antennas the satellite would be able to cover most of Europe. France's director general of telecommunications, Gérard Théry, has already been over to the United Kingdom to offer Telecom-1 to the British Post Office, without too much apparent encouragement. Some observers see the French as wanting a European monopoly of such services, and the idea of a direct SBS-Telecom-1 link is not apparently distasteful to French PTT minister, Norbert Ségard.

"He made a mistake because he acted without knowing the history of the affair or the technical details involved."

In addition to new markets like satellites, the French are turning to new territories, and not necessarily standing on diplomatic ceremony. Following President Carter's embargo on the Univac export to Tass last year, the French stepped quickly into the breach and now have a signed contract to deliver a wholly French-built system based on an Iris 80 processor, nine French minis and 108 terminals. This is worth nearly twice what the original Univac system cost. Despite the lifting of the embargo by Carter, the French see themselves as going ahead with delivery later this year, hinting strongly that the approval of Cocom, the vetting body for strategic exports to the Eastern bloc, will not be necessary. As for reports that Univac believes it is back in with a chance, officials say, "They can always hope." Of course, it is open to Tass to buy two systems if it really wants to take the systems apart.

The French are also expecting to sign a cooperation deal with the Soviets for research and hardware exchange. At the same time, remarkably, they have already signed up with the Chinese for technical cooperation and, according to Jean-Pierre Souviron, former telecommunications man and now head civil servant in the industry ministry, there are already "some small contracts" signed with the Chinese in the dp area. No further details of these have yet emerged.

More conventionally, the French are bolstering their industry by buying up foreign companies. Some of these moves

French are also expecting to sign a cooperation deal with the Soviets for research and hardware exchange.

(though the minority) are also government financed. Such is the case with France's erstwhile largest service bureau, CISI (Compagnie Internationale de Services en Informatique), a subsidiary of the French atomic energy agency. The firm has a lot of computer power tucked away in its research centers and in its subsidiary SIA in London. Its latest acquisition is Proprietary Computing Systems, whose APL expertise will fit in well with an APL-drive by the French company, which also markets intelligent APL terminals. CISI's title as largest European service bureau has been usurped by GSI (Générale de Service Informatique), controlled by the French electrical and electronic giant, CGE (Compagnie Générale d'Electricité). Shooting for a $150 million turnover this year, it has recently bought Spain's largest service bureau, and has designs on Datatab of New York and Chicago. The company has already bought Transcomm, also in the U.S. GSI's direct parent is CIT-Alcatel, the multibillion dollar-a-year telecommunications subsidiary of CGE. CIT-Alcatel, too, is building up in the U.S. Its most significant recent acquisition is the Friden postage meter operation. The move puts CIT-Alcatel into second place in this market and gives it a handy base for selling office systems in the U.S. The firm has already made a name for itself in foreign markets where it has sold its time division telephone exchanges in 16 countries, and hints strongly at further U.S. purchases.

The reason for all this French activity is not too difficult to discern. With so much political involvement in the sector over the last ten years, failure is out of the question.

—Andrew Lloyd

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BENCHMARKS

MICRODATA AGREEMENT: McDonnell Douglas Corp. said it reached a definitive agreement to acquire Microdata Corp. and that it has formed a subsidiary, MICD Holding Co., to purchase all 2.3 million outstanding shares of the Irvine, Calif., computer firm at $32 a share. It said the offer to buy the company's stock—for a total of $73.6 million—was to expire Sept. 5, but could be extended. The company also said if it can't acquire a minimum of 90% of the firm's shares it will settle for 45% of Microdata's shares and become a minority holder.

PERTEC AND PHILIPS: The talk at the annual meeting last month of Pertec Computer Corp. was: who's the major company trying to buy a minority position in the company? Chairman Ryal Poppa would only say that if the board agreed to the buy, it would operate at "an arm's length relationship" with the company. A few days later, the company turned out to be North American Philips Corp., which will acquire 45% of Pertec's common stock for about $56.1 million. Philips will make a $15-a-share tender bid and Pertec will issue some new common at the same price. At the meeting, Poppa said the company's troubled microperipherals operation, which sells computers to the very small business market, still was operating in the red, but that he was optimistic that it would be profitable this year. The operation was the result of the acquisition of MITS, an Albuquerque, N.M., firm that was a pioneer in the personal computer market. "It was not the best acquisition we ever made," Poppa admitted to some 200 stockholders at the meeting.

ITEL'S FORTUNES: Itel Corp., which reported a $60.2 million loss in its second quarter ended June 30, agreed to lop off four of its service bureau operations. Sold to Computer Sciences Corp. for $19 million was the company's three service bureaus in White Plains, New York and Los Angeles that produce annual revenue of $36 million. Its AuTex Service Corp. division in Wellesley, Mass., that collects and disseminates information for the securities industry, is to be sold to Xerox Corp. for $22 million. Meanwhile, the company is in the midst of a dramatic reorganization program to cut costs and to gain the confidence of its lenders. Its stock, which earlier in the year reached $37.50, was down in August to around $9. The company attributed its troubles to "dramatic changes in the IBM-compatible market," after IBM announced its 4300 series of computers at drastically reduced prices. It said the IBM action caused "an important cash generator of the company (its computer leasing business) to become a cash user, thus affecting our operating plans." Itel has a major stake in the transportation leasing business which it said is affected by its troubles in the computer market where "some customers and prospects became hesitant to make long-term commitments, such as purchases or full-payout leases."

MEMOREX BUY: Memorex Corp., which was negotiating a merger with Amdahl Computer Corp. (page 86), has agreed to beef up its European operations with the acquisition of add-on memory systems sold there by Electronic Memories & Magnetics. EM&M will sell its European lease base for the memory systems which are installed at some 200 locations. Products involved in the sale, for which a price was not disclosed, include memory systems for the IBM 370 and 303X mainframes. The move enables Memorex to fortify its European operation of some 600 employees in 50 service areas serving the plug-compatible market—a feature said to be very attractive to Amdahl Corp.

MINIMAKERS: A survey by Datapro Research Corp. disclosed that users of minicomputers made by Modular Computer Systems, Inc. and Prime Computer Corp. have greater overall satisfaction with them than do users of 16 other competitive vendors. They were followed by Hewlett-Packard, IBM, Microdata, Sperry Univac (formerly Varian), Basic Four, Digital Equipment Corp., Burroughs, Four Phase Systems, Data General, Datapoint, Tandem Computers, NCR, Interdata, Wang Laboratories, ICL (formerly Singer), and General Automation, Inc. A total of 12 categories were mentioned in the survey. Prime scored No. 1 in ease of operation, reliability of peripherals, effectiveness of maintenance, satisfaction with operating systems, compilers and assemblers and applications program satisfaction. Modcomp placed first in ease of conversion and Hewlett-Packard placed first in reliability of the mainframe. Datapro said it interviewed 509 users representing 1,344 installed minicomputers and is making the results available in two reports, each priced at $15. (Datapro Research Corp., 1805 Underwood Blvd., Delran, NJ 08075).

NORRIS ON TAXES: Control Data Corp.'s chairman William Norris says capital gains taxes should be reduced for small companies in order to spark a rebirth of technological innovation. Testifying in Washington before a House Inflation Task Force, Norris said a large company environment is not conducive to innovation. "In contrast, there are many small, technically-oriented companies where the management is entrepreneurial and . . . where developing ideas and innovations into useful products and taking big risks are a way of life." Mr. Norris suggested that capital gains taxes be deferred for those companies where proceeds from stock sales are reinvested in the business. He said the full corporate tax rate for such companies should be boosted to the $200,000 level.

OVONIC LICENSE: A licensing agreement which is expected to lead to the first widespread use of ovonic memory units has been signed by Energy Conversion Devices Inc., Troy, N.Y. and Sharp Corp. of Japan. Under the agreement Energy Conversion will share an initial $500,000 payment and proceeds of a 4% royalty w1th Burroughs Corp. with which it has been jointly developing ovonics. The memory units use materials that can be switched back and forth between amorphous and crystalline states enabling them to retain stored data even in the absence of power. They are based on theories of Stanford R. Ovshinsky, Energy Conversion's founder. To date there have been limited sales of the units through Burroughs to Du Pont Co.

MICROSTORAGE: Since their introduction six years ago, floppy disk drives have become the standard storage devices for microcomputer-based systems, says a report from Creative Strategies International, "Peripheral Memories 1: Floppy Disks and Low-Cost Winchesters." The report forecasts that in a five-year period, floppy disks will begin to be displaced from some applications by newer technologies with superior price/performance, particularly low-cost hard disks or mini-Winchesters and magnetic bubble memories. But, says Creative Strategies, the erosion in floppies' functional market share will be more than offset by expanded production of microcomputer-based systems. The company predicts that worldwide unit shipments of floppy disk drives will rise from 656,000 in 1978 to 2,810,000 in 1983. It indicates new storage technologies are expected to enter the microsystems memory market in the next two years, including: very low-cost consumer/commercial grade 5-inch floppies; 8-inch diameter mini-Winchesters; 4 to 6-inch flying head micro-Winchesters; "back-end" processors combining disk controller and data base management functions in specialized hardware; and on-line archive devices in both video-disk and automatic cartridge tape library configurations.

TAXING SITUATION: John C. O'Mara, executive director of the Computer Security Institute, Hudson, Mass., said he is contemplating a reduction in the institute's federal income tax to the tune of $491.67. This amount covers a $430 registration fee for an IRS member who attended the institute's Fifth Annual Computer Security Conference in New York City, plus interest at 1.5% a month. The IRS had not paid the fee after two letters, three invoices, eight calls and nine months. O'Mara said that out of more than 600 conferees, the IRS was the only organization which failed to pay its registration fee. ✲

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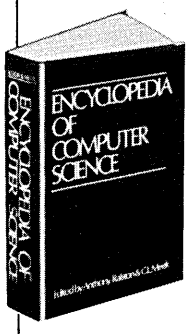

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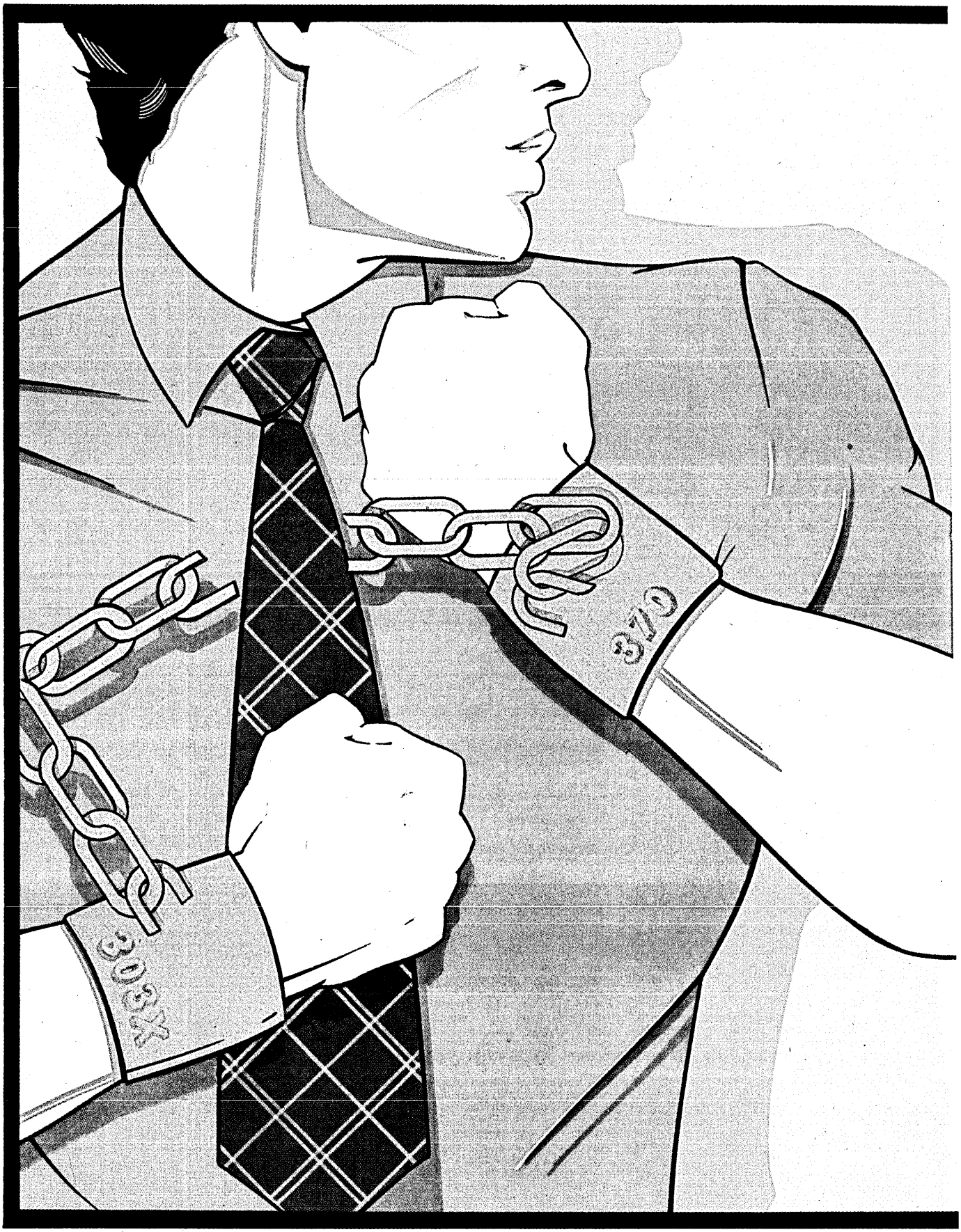

CPU Unchained

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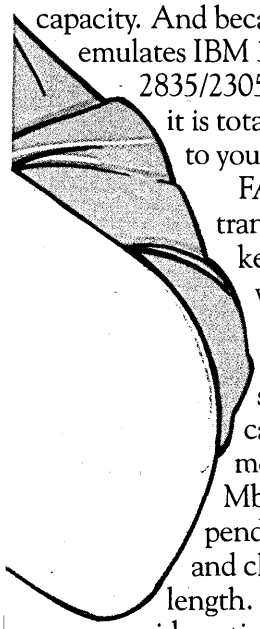

FAST-3805's transfer rates help keep your CPU working at full speed, too. With our standard single-byte wide capacity, you'll move 1.5-2.0 Mbytes/second, depending on the CPU and channel cable length. Our two-byte wide option will double capacity to 3.0-4.0 Mbytes/second. And since FAST-3805 can be optionally 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.

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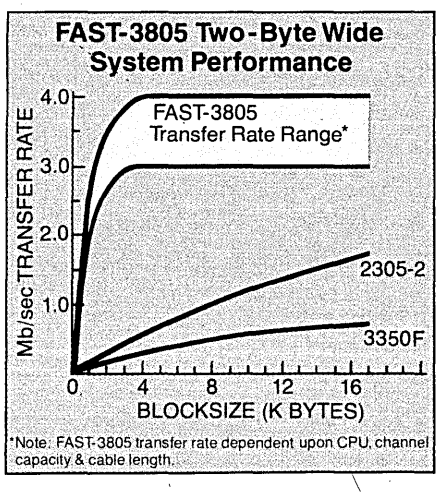

PERFORMANCE COMPARISON

	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

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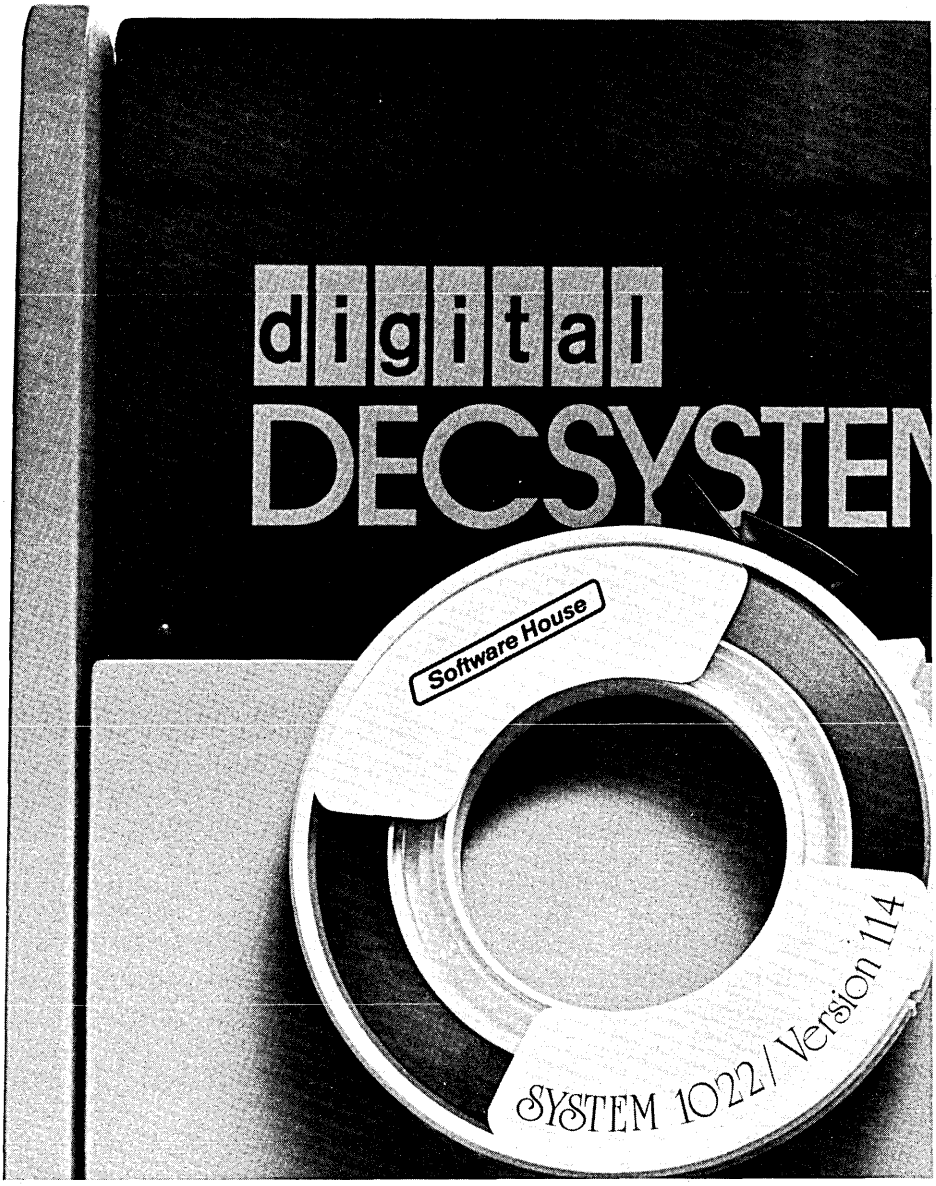

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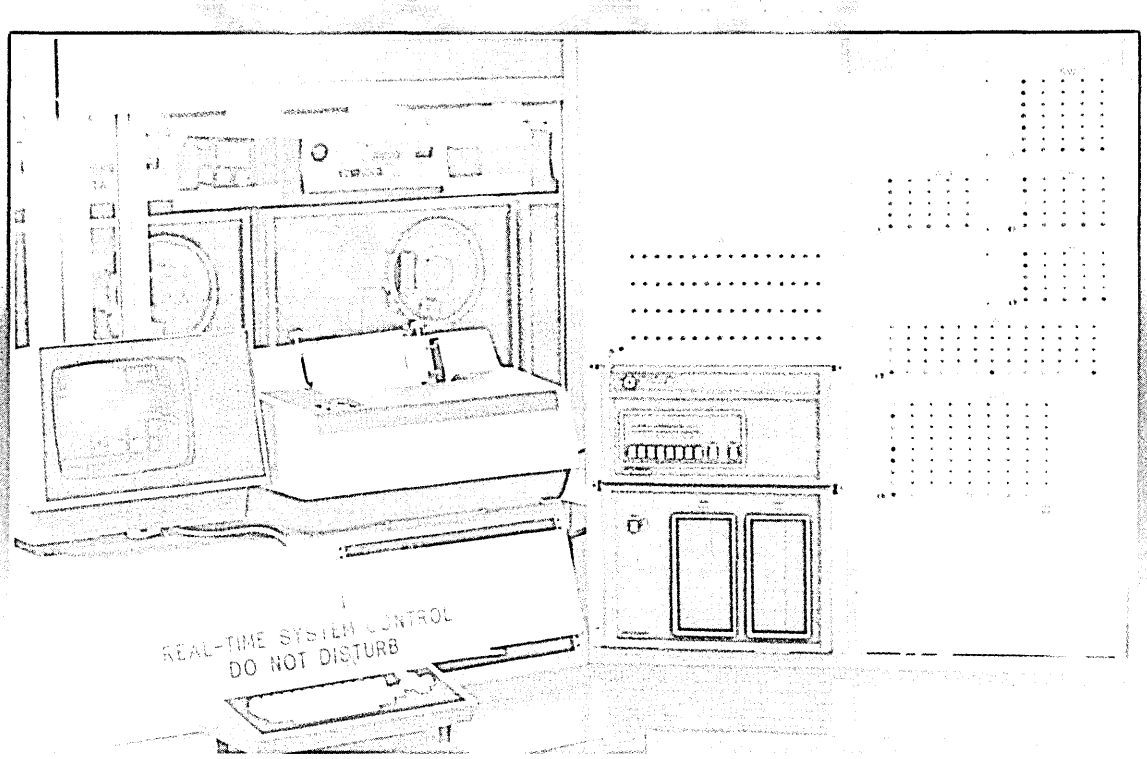

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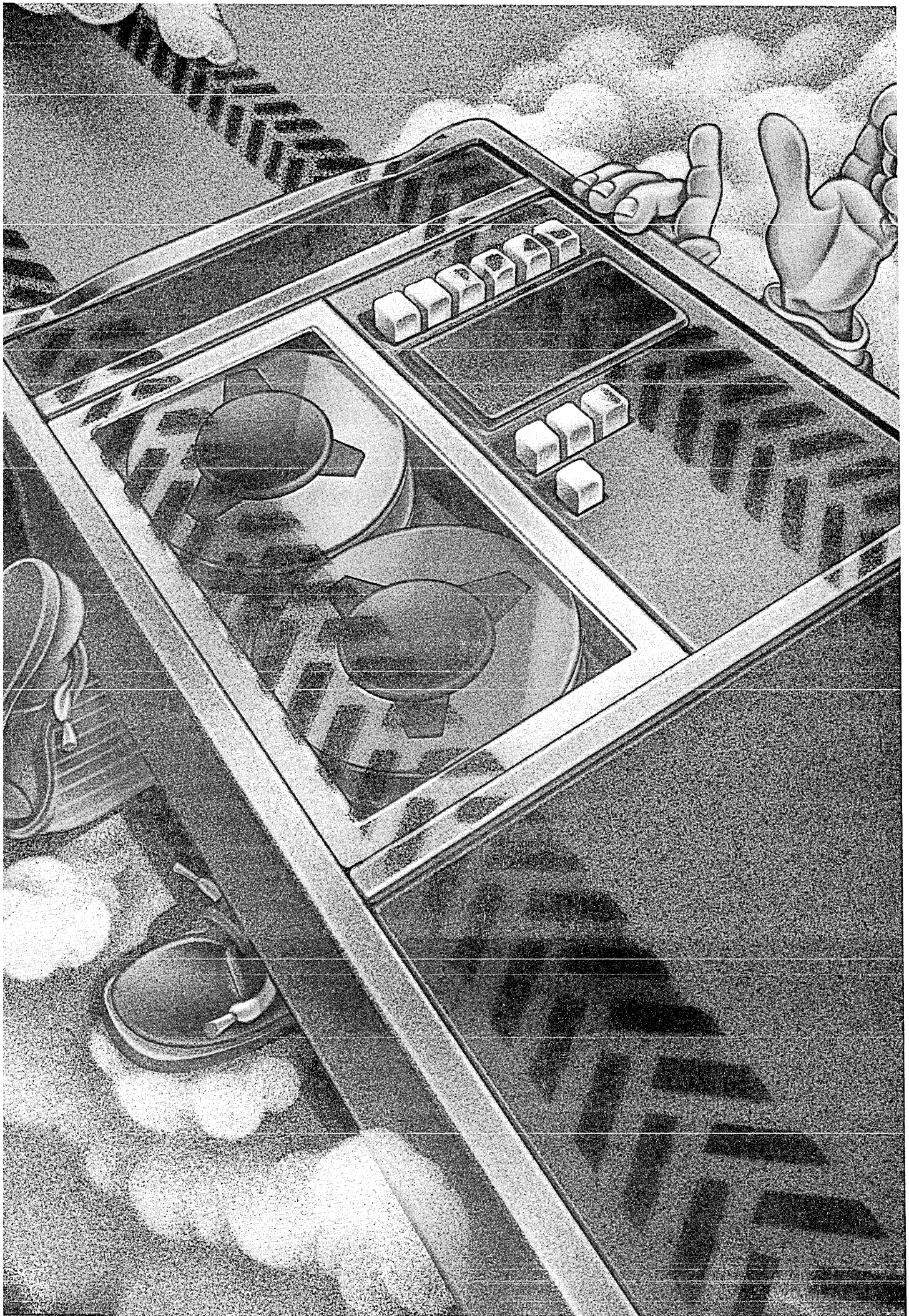

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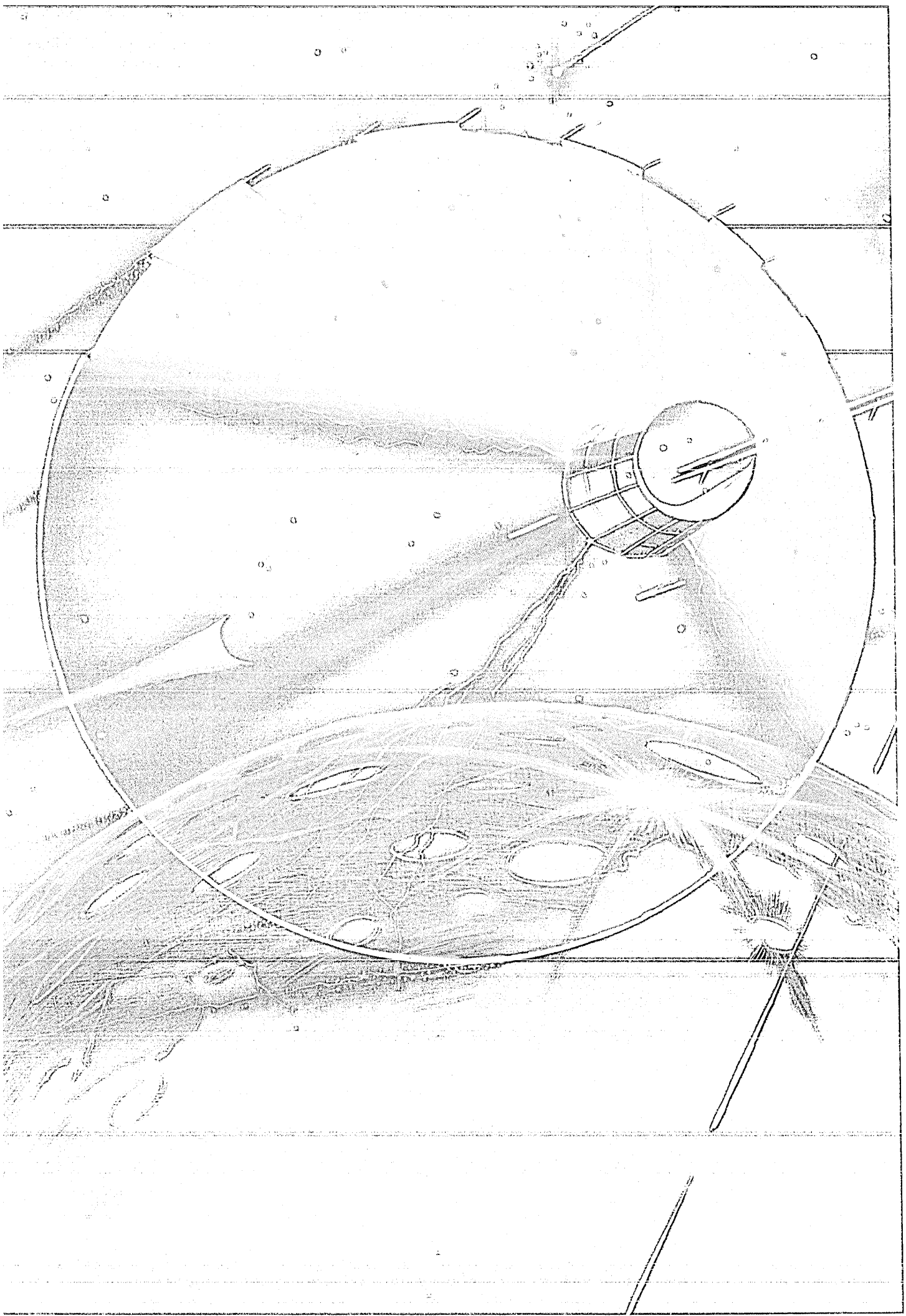
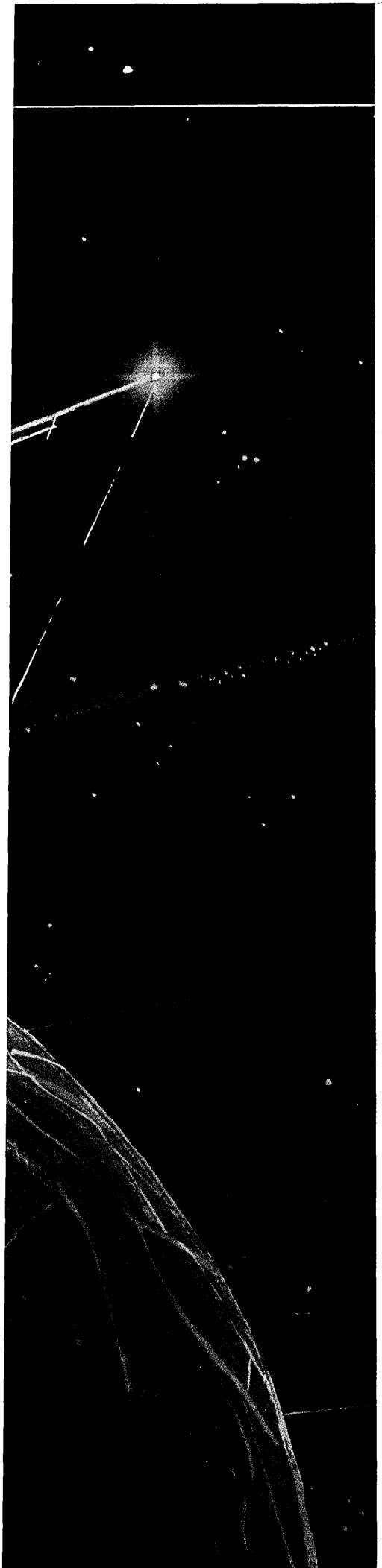




Large-scale real-time digital communications networks and information storage and retrieval systems are now part of earth orbital science.

TAKING THE MEASURE OF SPACE

by J. F. Durkin and G. W. Cunningham

Before the era of the man-made satellite, scientific measurement was essentially earthbound. For two decades now, with scientific experiments carried onboard satellites, the scientist has been reaching out for knowledge in the vacuum of space. As he has intensified his extraterrestrial pursuits, he has added a new dimension to the scope and complexity of scientific investigation.

Earthbound scientific inquiry—astronomy with its huge telescopes, the particle accelerators of high energy physics—was the exclusive domain of the scientist and his technicians. This is no longer true. The fundamental principle of all measurement—the measurement isn't complete until the data is in the hands of the experimenter in a form he can use—has required the use of large-scale digital communications networks and information storage and retrieval systems. In April 1978, a telemetry on-line processing system (TELOPS), developed by IBM's Federal System Division for NASA's Goddard Space Flight Center in Greenbelt, Maryland, became part of some of mankind's most intricate, far-reaching scientific investigations.

The first U. S. satellite, Explorer 1, launched on January 31, 1958, weighed 30 pounds. Over half of this weight was made up of scientific instruments to detect radiation and micrometeorites. These first measurements from space confirmed a prediction made years ealier by the head of the physics department at the University of Iowa: that there existed regions of intense radiation surrounding our planet, trapped there by the earth's magnetic field.

These regions, known as the Van Allen radiation belts, were the first discoveries made with scientific satellites; the growing list now includes the solar wind, the quasi-stellar objects at the edge of our universe called quasars, and the magnetosphere—the magnetic envelope around the earth that wards off most of the deadly streams of atomic nuclei from deep space known as cosmic rays.

NEW TECHNOLOGIES; MORE QUESTIONS

With new, lighter materials and ultralightweight low-powered solid-state electronics, the intensity and variety of investigation has increased. One satellite may now house 30 or more different experiments with instruments measuring such phenomena as X-rays and ultraviolet light from solar flares, gamma rays from far beyond our galaxy, and radio waves

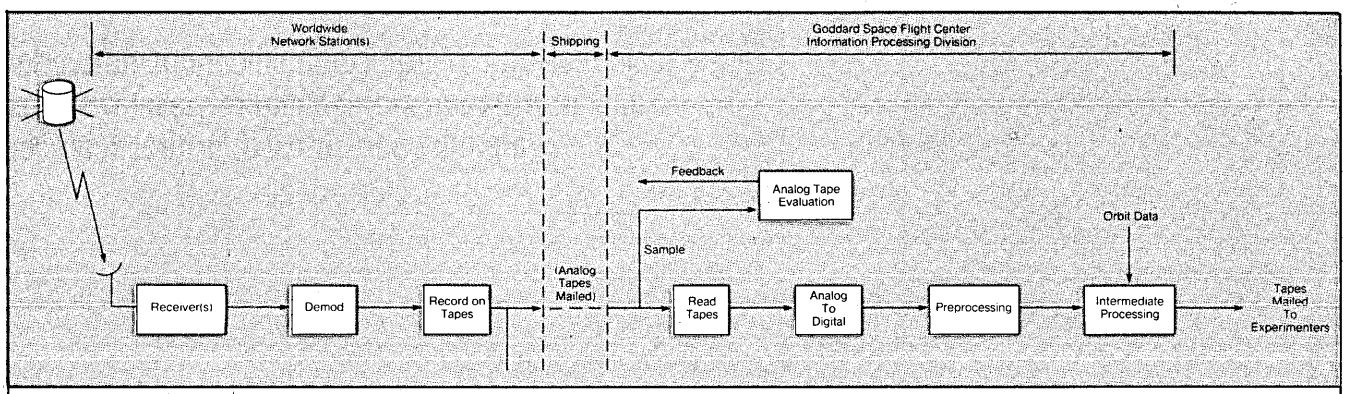


Fig. 1. Previous system for collecting and processing satellite data.

from the planet Jupiter.

Scientists have been searching for answers to add to the list of discoveries: Do flares and other solar activity follow classical sunspot cycles? Are high energy radiations from deep space the echoes of the "big bang" from which the universe might have been created 10–15 billion years ago? Are the periodic bursts of radio waves from the planet Jupiter related to the orbit of its mysterious satellite Io?

Improvements in technology increased the number and complexity of the questions; and harder questions meant harder problems in getting the data back down to earth and in the hands of the scientists.

Until recently, each satellite, as it orbited the earth, would record its measurements (see Fig. 1). As it passed over a ground station (there are about 40 scattered around the globe from Johannesburg, South Africa, to Fairbanks, Alaska), it would transmit its measurements in analog form. At the station, the data was recorded on magnetic tape and shipped to the Goddard Space Flight Center in Greenbelt, Maryland. There it was digitized, prepared via computer for presentation, recorded again on magnetic tape, and mailed to scientists within NASA and at industrial laboratories and universities around the world.

Typically, it would be six to eight weeks from when the measurements were taken until they were in the hands of the experimenters. The reason for the delay was a combination of the volume of data and the need for accurate satellite position and attitude. The satellites produced an average of about 250 million measurements a day. Since the time and place of a scientific measurement are as important as the measurement itself, each measurement had to be accurately tagged with the time it was taken and then correlated with the satellite position and attitude at that time. Greater accuracy in satellite position and attitude requires a greater number of satellite observations by ground tracking stations; to get them would take several days.

During this time, the volume of data coming from the satellites was too much to be held online, such as by disk storage, so it was stored off-line on magnetic tape. When the definitive orbit and attitude data were finally available, the cumbersome mechanics of a tape library were brought into play.

A 12- to 15-hour "quick look" at partially processed data was available, but it didn't alleviate the situation much. Although the data was sufficient for deciding to turn an experiment on or off, it was totally inadequate when one tried to turn on certain equipment to monitor a solar flare that was detected a few minutes ago, say, and would last less than an hour; or when one wanted to turn off sensitive instruments because of a recently developing hazardous condition on the satellite.

These were growing concerns because new experiments were being planned that would require real-time control of onboard equipment; many of the new experiments would produce more data, with much of it at higher rates—and with more experiments there would be more experimenters.

A system was needed that could get the data to the experimenters in a matter of days—quick looks in a matter of minutes. It had to handle up to 25 active satellites at one time and have a data storage and retrieval capability for another 75—all potentially averaging about a half billion bits of data a day with peak rates of more than two million bits per second. The immediate storage capacity for the 25 active satellites had to be 800 billion bits. In addition, the system had to be adaptable to new satellites; therefore, it had to possess a generalized processing capability that could be easily and quickly adapted to new requirements with only minimum parameters to describe the satellite characteristics.

The quick-look response times required a real-time processing system and an on-line data base with the access speed of disk storage. But the volume of data meant keeping the tape library. Thus, the new system presented a problem to current technology—how to get a tape library on-line, and then how to get the information and storage retrieval system that would be needed to operate the library to function as part of a real-time communications network involving up to 40 tracking stations and 100 satellites.

Large-scale information storage and retrieval systems had been done before, as had large communications networks, but not together, and not with this combination of high input data rates, short response times, and large data volumes.

A complicating factor, inherent in telemetry systems, was the nearly random distribution through the data base of the data from any one source. This results from the continuous and simultaneous sampling of data from many experiments per satellite, many satellites per ground station, and many ground stations. Another unique characteristic that would figure heavily in the complexity of the new system is that it would have the most expensively acquired data base in the world, and owing to the nature of investigation by satellite, it would have little or no chance of recapturing lost data. Therefore, an elaborate system of error checking and fail-safe recovery was necessary.

The solution was a new system in which the principal role would be played by TELOPS (a telecommunications on-line processing system). It was designed by NASA's Goddard Space Flight Center

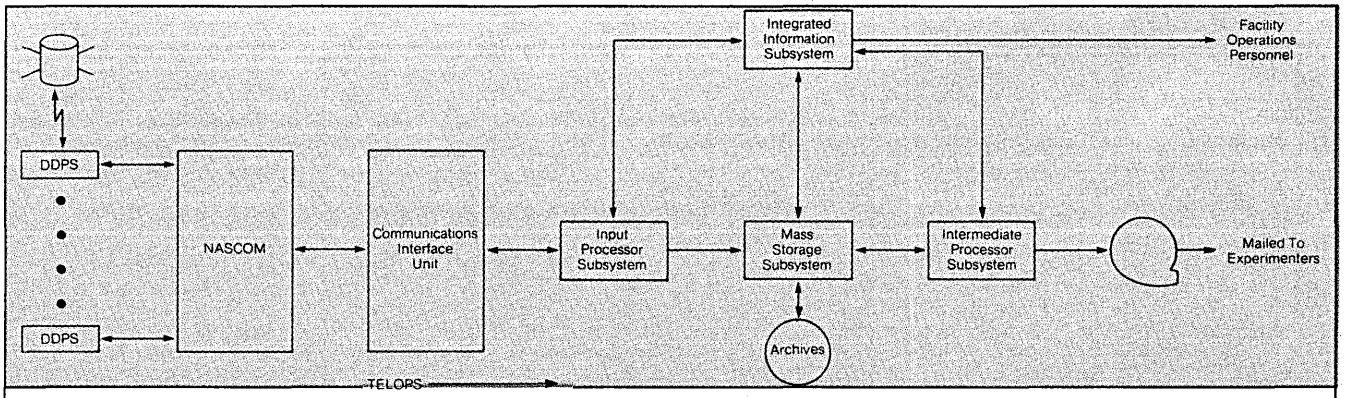


Fig. 2. Functional overview of TELOPS.

(GSFC) and IBM, and features a mass storage system that combines the data capacity of a large tape library with the access speed of on-line disk storage, and includes a communications input unit that accepts input rates up to 2.688 million bps with simultaneous outputs to the remote stations for retransmissiion requests at up to 1.344 million bps.

The other major parts of the new system are the several ground stations that have been converted to digital data processing systems (DDPS). A functional overview of of TELOPS showing its four subsystems is shown in Fig. 2.

The DDPS stations contribute significantly to the improved response times. Instead of the analog tapes being sent by mail to the processing system (which is now TELOPS) at GSFC, the analog data is converted to digital form and transmitted directly over NASA communications (NASCOM) lines to TELOPS at GSFC.

These stations can also accommodate the increased data volumes and rates. Each can support up to 12 data streams simultaneously with a data buffering capability for when peak loads exceed capacity.

From NASCOM, which is a collection of communications lines, computers, modems, and terminal equipment that services NASA throughout the world, the data feeds into the communications interface unit (CIU). The CIU buffers the data three ways among NASCOM, the input processing subsystem, and the convolutional decoder units (CDU's). The CDU's are needed because some of the data (about 10%) is encoded before its transmission from the satellite to preserve information in satellite transmissions that have a very low signal-to-noise ratio. (Each bit of information is expanded into several bits in an optimally encoded pattern so that if one or more bits are lost in the downlink transmission, the decoding process has a high probability of reconstructing the original bit pattern.)

Because it operates continuously in real-time with expensive data that is difficult and sometimes impossible to replace, TELOPS has total redundancy in its equipment. There are two CIU's connected to NASCOM with the third serving as a backup. There are two 370/145s, each with one megabyte of storage and 3215 operator consoles. The data storage units (eight disks, eight tapes, and the mass storage system) are shared by both computers while eight 3270 displays, two 1403 printers, and a 2501 card reader are switchable to either computer via two 2914 manual switches. One computer handles the operational load while the other serves as a standby.

The convolutional decoder units, attached to the CIU's, were designed and developed by Linkabit Corp., and the CIU's by IBM's Federal Systems Division. Each CIU is controlled by a built-in microprogrammed processor. The intermediate subsystem runs on a Univac 1108 multiprocessor.

TELOPS software (125,000 instructions) was written in assembler language. The high data rates and the requirement to fully use equipment placed heavy constraints on the cpu, storage, and I/O channels. These constraints were best accommodated by using assembly language code.

TELOPS operational software consists of control programs, system services, and application programs. The application programs perform the functions of the TELOPS subsystems. The control programs and the system services provide the resource management control and the I/O and data management services necessary to support the application programs.

TELOPS, which uses a standard OS/VS/1 operating system, runs as two OS jobs, one in each of two partitions in main storage. The OS scheduler is used to initiate execution of the various application modules that carry out the TELOPS subsystem functions. The IBM 3270 display stations and their interface with the integrated information subsystem use the national military command system information processing system (NIPS) formatted file system. This includes the standard NIPS teleprocessing software plus that written specifically for TELOPS.

INPUT PROCESSING SUBSYSTEM

All CIU operations are initiated and controlled by the input processing subsystem as it performs the communications handling and preprocessing of data in TELOPS. The communications link from NASCOM through the stations to the satellites is perpetually open and ready for data, so input processing must continuously monitor all lines, buffer and log all incoming traffic, and send acknowledgements to and request retransmissions from the stations when necessary.

The CIU's collect and multiplex the incoming data and transfer it to the 370 over a block multiplexor channel. In order to maintain a continuously open interface to the incoming data, READ commands to the CIU's are chained as long as input data is available to sustain the 370 channel read rate.

To accommodate low data rates and still meet the three-second response time for sending acknowledgements to the station, the CIU's generate a unit exception every second to allow partially filled buffers to be scanned.

Due to the high data rates of TELOPS, error conditions from the CIU's are identified in status words sent with the input data rather than as channel sense commands so as to avoid breaking the channel read chain and therefore running the risk of missing input data.

Reading the CIU's and capturing

the input data on disk and tape are completely interrupt driven. This is accomplished by creating the equivalent of a branch-entry into the I/O supervisor of OS. This reduces the competition with other tasks for system resources by eliminating the need for a task switch when high data rates require immediate service.

The basic unit of work from here on is a message, defined as a single stream of a single type of data from a satellite at a single bit rate. (The data from the satellite can, in general, have different bit rates and be of several different types.) A message can vary in length from 150 bytes up to 200 megabytes. Each is made up of three or more NASCOM message blocks (Fig. 3) which in turn are made up of several frames separated by time and status data. A frame contains one sampling of the onboard sensors. The smallest functional element of data is a data point, which averages 10 bits in length. The data points are the measurements taken continuously by the scientific equipment onboard the satellites.

Parts of each message, as it comes from the CIU, are interleaved among several communications lines, and input processing must therefore demultiplex them into unique message blocks. The interleaved input can involve up to 10 messages on each of 11 CIU input lines, all of which can be receiving data at the same time, thus requiring a "110-way message sort."

The input processing module "NEWDEAL" reads the data from the new data disk and separates unique messages. In performing the message separation, the module checks for errors and missing message blocks. Because messages can be as large as 200 megabytes, they can be received over a relatively long period of time. Message separation and error checks must therefore be performed on pieces of a message as they come in, and at speeds close to the incoming data rates. The partial messages are written to disk in a slot-sorted pattern to enable a message selection module (SELECT) to read the pieces of multiple input messages (up to 110) by track switching rather than with a separate select and read operation. The SELECT module reads the data using a slot algorithm which was previously written into the cylinder description record. With this information, SELECT with the aid of an I/O service module reads and sequentially assembles each message by selectively switching the disk heads to pick up message pieces on-the-fly with only a minimum delay for head/track switching, thus keeping up with the incoming data.

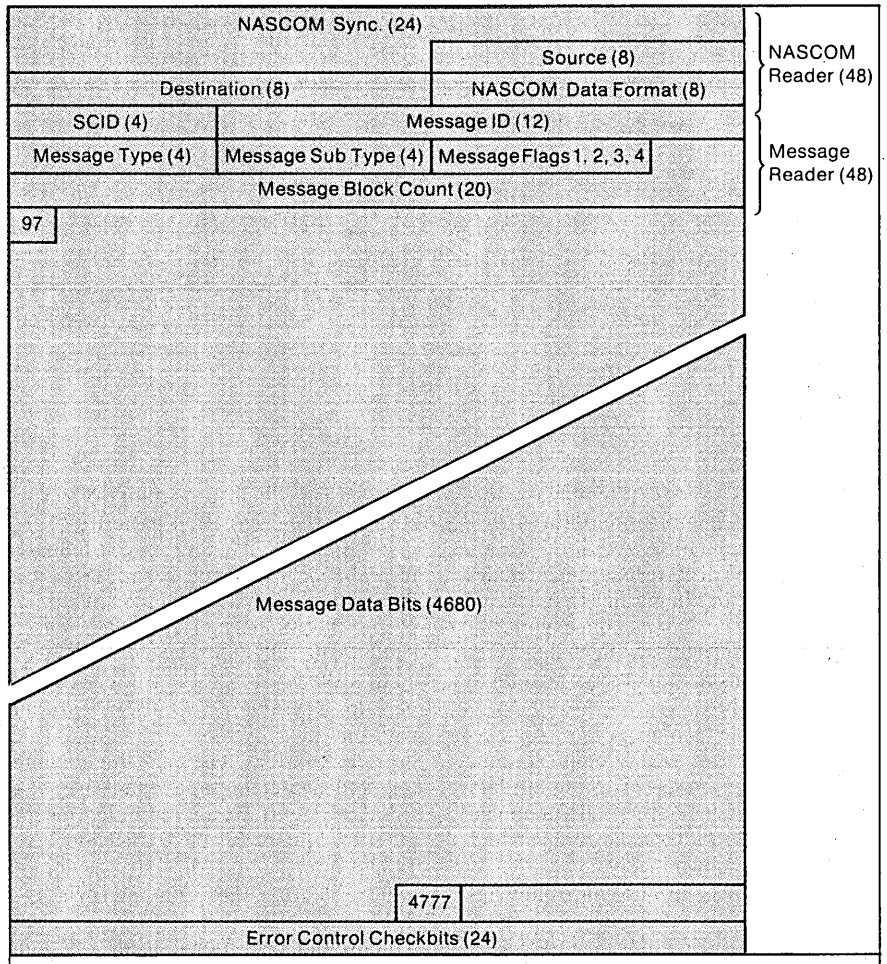
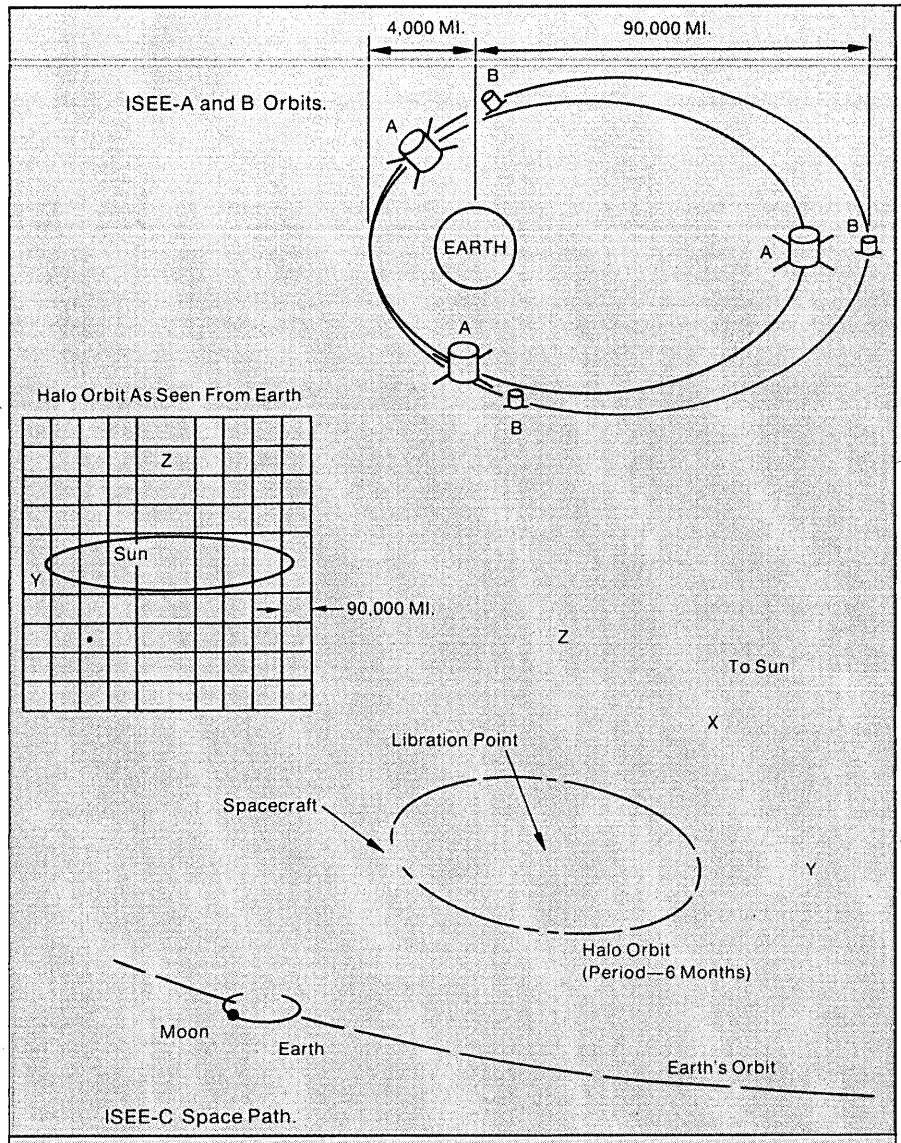


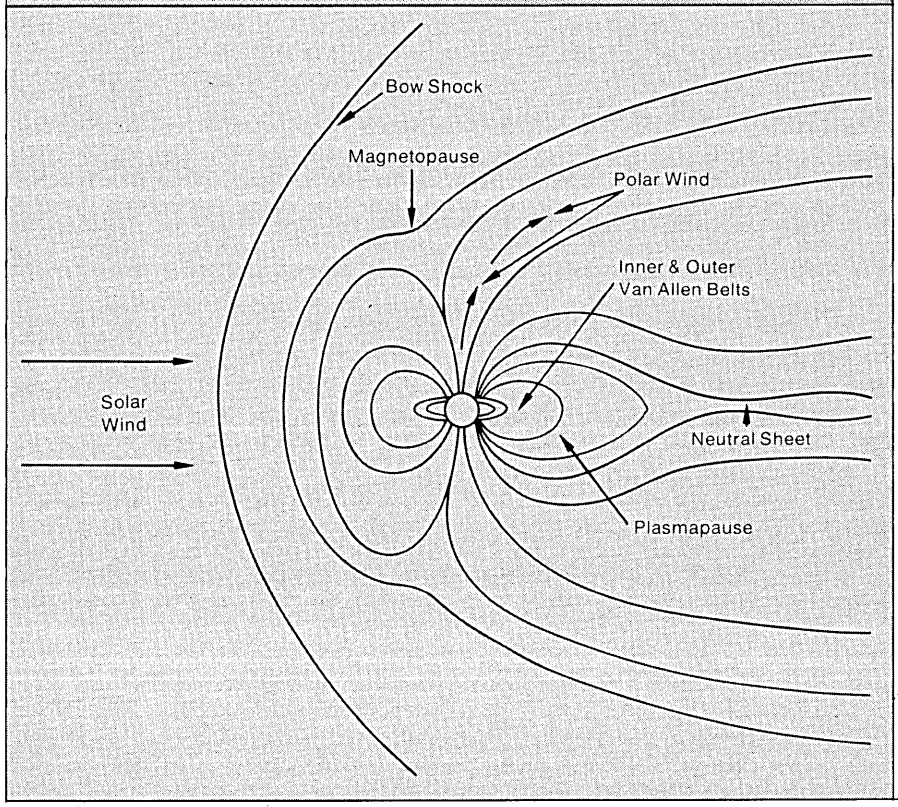
Fig. 3. Message block format - 4800 bit block.

The output of the input processing subsystem consists of pre-edit files, one for each input message. In forming the pre-edit files, the following must be determined: what satellite the data came from, during which pass over the station, what station, what data type, was it sent in real-time from the sensors, or was it played from an onboard tape (having been recorded earlier when the satellite was out of station range), and what was the particular configuration of the sensors at the time.

While the majority of satellite message attributes could be accommodated by a generalized parameter-driven pre-edit module (of approximately 7,000 lines of source code), significant variations in structure from one space vehicle to another could not be accommodated by a single algorithm. A driver module was designed for the pre-edit processing for each space vehicle data stream (of approximately 500 lines of source code per module). This two-part design was a significant improvement over the previous method of designing a single, unique pre-edit module for each new space vehicle.

Data is received continuously, and from it a data base of pre-edit files is built up in mass storage that will subsequently be processed into edit files in a batch mode by the intermediate processing subsystem. For a quick look, a faster access to the data is involved. Since quick looks are scheduled, intermediate processing can have immediate access to the data. The quick look data is requested by the intermediate processing subsystem which passes the requested message ID's to the input processing subsystem which scans the incoming data for the requested messages. It then transfers the data to the intermediate processing subsystem via the channel-to-channel adapter between the 370 and the Univac 1108. Three simultaneous, asynchronous conversations can be maintained. The output is available in a few minutes in the form of crt displays, printouts, graphs, and charts for immediate analysis by scientists present for the occasion at GSFC. (*Cont'd p. 132.*)





TELOPS PROCESSES ISEE DATA

One of the newer scientific projects for which TELOPS is processing data is the International Sun Earth Explorer (ISEE). It is a joint NASA and European Space Agency program that involves 34 experiments and three satellites: ISEE-A, ISEE-B, and ISEE-C. The A and B spacecraft were placed in highly eccentric earth orbits to investigate the earth's magnetosphere, the solar wind, and the shock wave formed by their interaction. The C spacecraft was placed in a halo orbit about the libration point between the earth and the sun. It is sufficiently outside earth's influence for comparison with results of the A and B missions and of probes to outer planets. Among the particular phenomena studied will be the bow shock, magnetopause, plasmapause, and neutral sheet, all of which require space-time separation and knowledge of conditions in the interplanetry medium upstream from the earth (towards the sun). This project will aid in understanding the mechanism of magnetic storms and the exchange of plasma between the interplanetry medium and the plasmasphere. Plasma physics investigations concerning transport coefficients and wave motions in a collisionless medium will be carried out. Particle intensities, composition, and anistropies will be measured from very low energies up to 500 MeV. Isotopes of both solar and galactic cosmic rays are to be resolved, and solar X-ray and possibly cosmic X-ray bursts will be observed. These investigations are being conducted by the University of Iowa, the Observatorie de Paris, and Stanford University.

The scientific basis and novelty of the ISEE mission depends on the comparison of simultaneous measurements produced by identical instruments on the A and B spacecraft. For maximum usefulness, the measurements supplied by the C spacecraft on the upstream solar wind must be taken at the same time as the simultaneous measurements of A and B. The monitoring and control of these ISEE experiments, with their multiplicity of sensors and high degree of interdependent activity, requires near real-time communications and data evaluation/presentation support from TELOPS. ✲

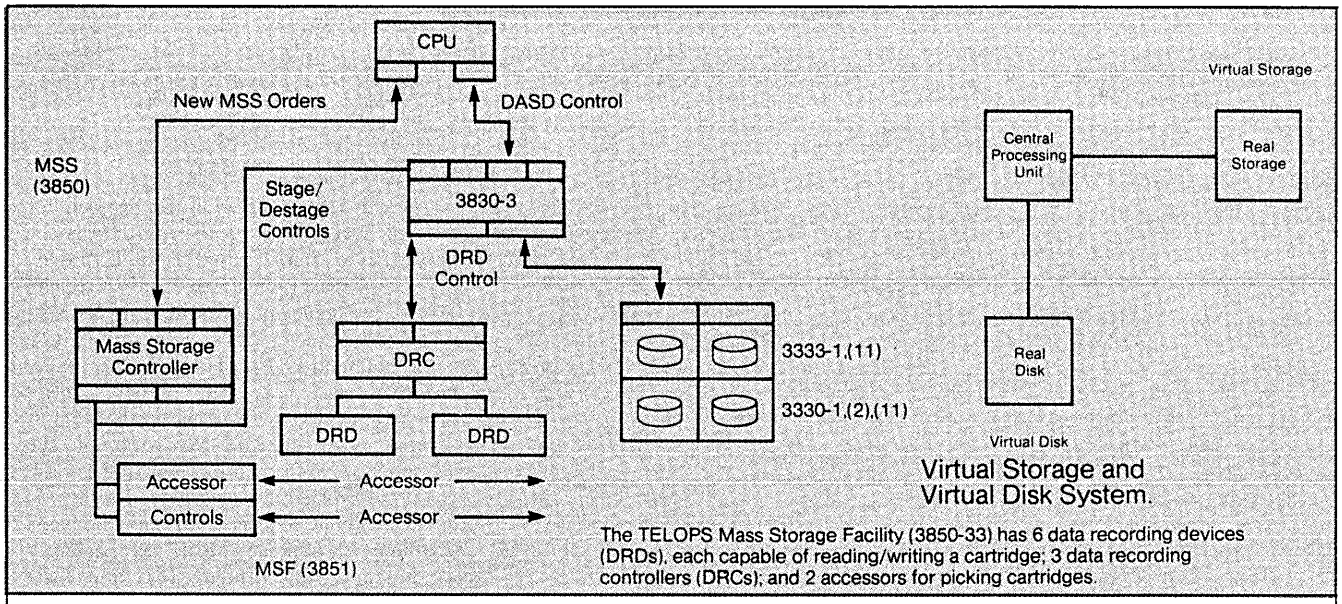


Fig. 4. Virtual storage and virtual disk system.

MASS STORAGE SUBSYSTEM

The TELOPS mass storage sybsystem (MSS) combines the storage capacity of a tape library with very nearly the access speed of disk, and in so doing is the primary means by which TELOPS accommodates the large volumes of data with short access times. Its main component is an IBM 3850 mass storage system that employs the concept of virtual disk. In the TELOPS application, four disk packs are made to look to the users like 1,691 disk packs of 100 megabytes each, and it includes the mass store communications services of the standard VS-1 operating system and some unique TELOPS user code. Moving data into and out of mass storage involves a process referred to as staging wherein requested data is "staged" from the mass storage device onto the four real disks, and "destaged" back into mass store when no longer needed. Staging is transparent to the users.

The total of over one trillion bits of storage is entirely on-line. Data retrieval is by files only, and through a system of indices, access can be random or sequential. Average access times are less than a minute and most DASD access methods can be used.

The MSS provides storage for the pre-edit files, the edit files, the correlative files, orbit and attitude files, and TELOPS software. The satellite data is kept there for up tc six months after which it is moved to the archives where it is retained indefinitely.

In the 3850 mass storage system, data is stored in DASD format images on magnetic tape which is wrapped around 2" x 4" cartridges that reside in honeycomb-like storage cells. When a data transfer is requested, an accessor moves to the appropriate cell, takes the cartridge from it, and carries the cartridge to a read/write device where it is loaded and the data is transferred either from the cartridge to the real DASD, or vice versa (see Fig. 4). Each cartridge, of which there are 3,380 in the TELOPS MSS, holds up to 50 megabytes of data.

For reliability, the entire mass store equipment is internally redundant. There is also backup for all data. This is accomplished either by copying files to multiple cartridges, or having the ability to invoke the processing necessary to create lost data from backup tapes created during the previous processing. The index to the data base is maintained on two separate storage devices.

The processing of satellite data in TELOPS is completed by the intermediate processing subsystem (a remaining part of the previous system) by taking the pre-edit and correlative files which were created and placed in mass store by input processing, and creating files suitable in format and content for the experimenters. There is also the processing of pre-edit files which involves such things as satellite attitude computations, time smoothing of data, and spacecraft housekeeping computations (e.g., keeping track of the sequences of data from the various onboard sensors).

One of the MSS control and utility functions is to provide for the management of virtual volumes in the mass store. These services include "mounting" and "demounting" of virtual volumes on available virtual "units," allocation of data sets on these volumes, grouping data sets of like satellites and file type together, opening and closing of data sets, as well as staging and destaging of the telemetry data between cartridges and staging drives.

MSS services also support the operations personnel via crt displays, showing on request which volumes are mounted and where, which volumes have been assigned to what satellites and file types, lists of data sets on each volume, etc.

Periodically, it becomes necessary to free mass storage space for new data by retiring data to the archives owing to age or relative inactivity. When required, archive tapes can be mounted and data can be returned to on-line status by reading it, and then writing it to mass storage. Archiving of files is performed under the direction of file management personnel prompted by terminal messages generated by TELOPS software.

INTEGRATED INFORMATION SUBSYSTEM

The integrated information subsystem is a complete management information system for TELOPS. Through interactive display consoles, immediate printer output, and periodic reports, it gives information for decision making on TELOPS operations.

The IIS consists of a data base and a set of services for storing, retrieving, and maintaining the information. The data base includes current information on telemetry data as well as telemetry data that now exists only in the archives.

The IIS data base exists on a set of real DASD volumes (current information) as well as on a set of virtual volumes in the mass store. As the allocated space fills up, data base maintenance people, via terminal commands, selectively move older data to virtual volumes where it is still available, but at increased access times. All IIS data on real or virtual DASD volumes is duplicated.

When a message arrives at TELOPS via communication lines (or via backup tapes from DDPS stations), a current status record is created and added to the IIS data base. Updates to this record are made at appropriate times such as when

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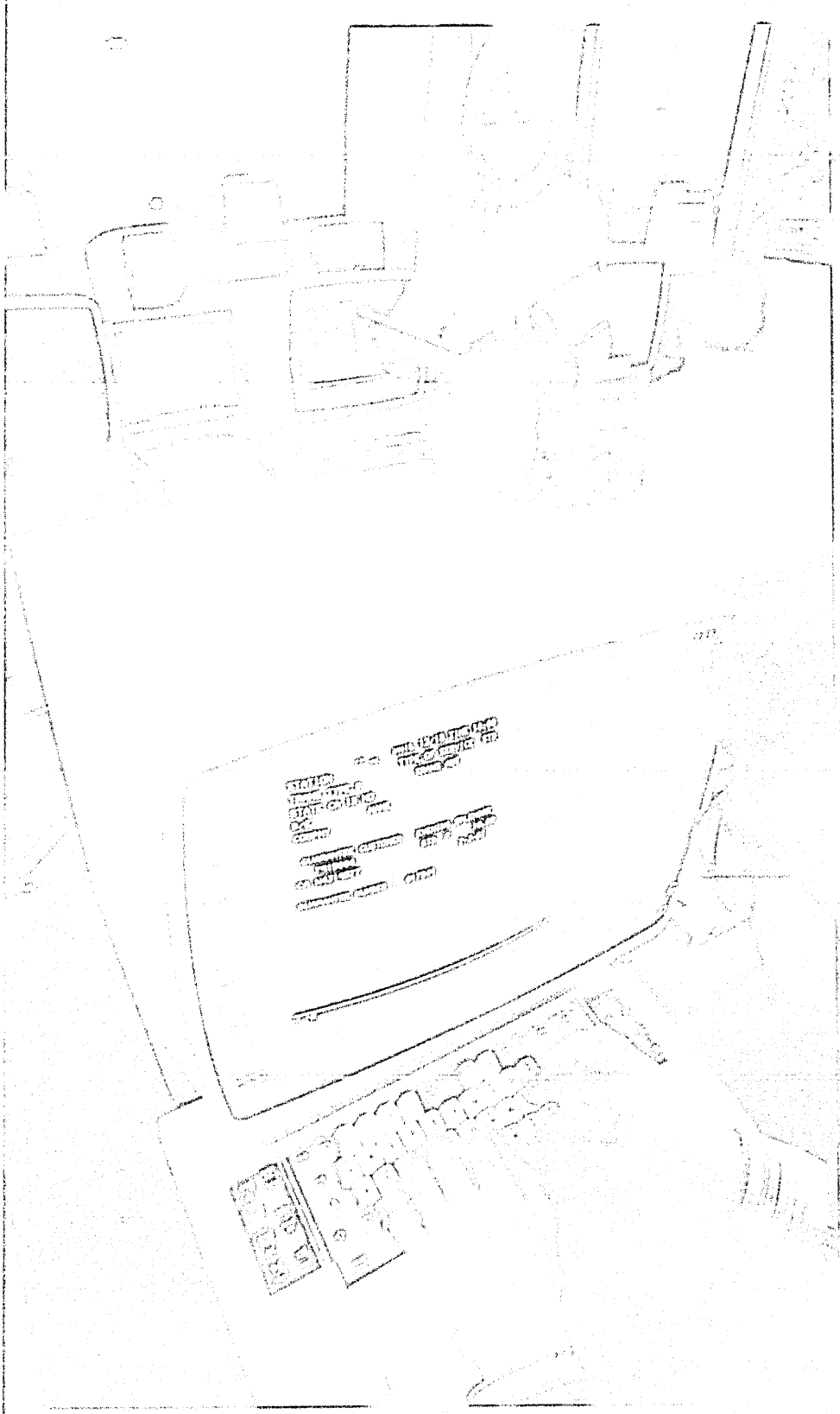

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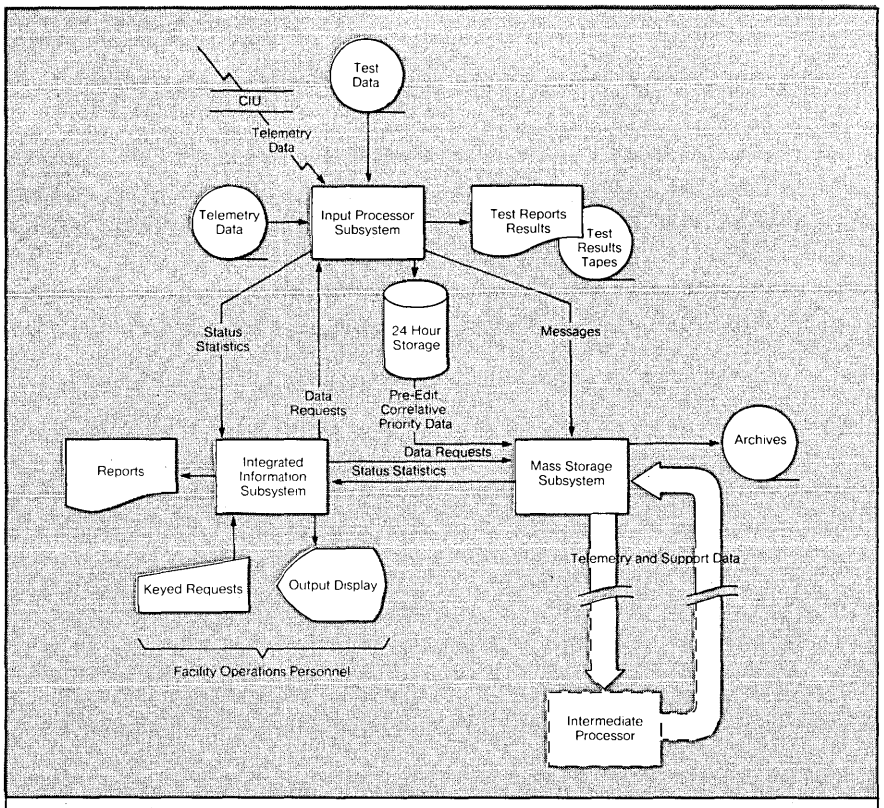

Fig. 5. TELOPS operational data flow.

the summary block was received, when retransmissions were asked for and received, when the message entry into TELOPS was completed, and when it was pre-edited.

The services for retrieving information from the IIS data base fall into two general categories: direct and sequential. The direct-access services are used whenever a TELOPS program needs access to specific records, and the keys are known in advance. Sequential services are used whenever the keys are not known in advance, but a range of keys is to be searched.

Most of the information in IIS records can be viewed directly using display terminals, and selected information may be updated. Certain other information, such as the record key, time of arrival, and location in the mass store, may be viewed but not altered from the terminal.

For report generation, the NIPS package is used. Also, reports may be generated by simple programs coded in PL/1.

The services for maintaining the IIS data base include mechanisms to define, add, deactivate, reactivate, and delete satellites from the system. Once a satellite has been added to the system, facilities exist to define, add, and change the characteristics of the various projects associated with the satellite. This minimizes the modification of TELOPS software to accommodate the new satellite.

Additional services are provided for moving old data from real to virtual DASD volumes and for making checkpoint tapes of the IIS indices. Such checkpointing provides protection against catastrophic failures in the system (such as fire).

As can be seen (Fig. 5), some satellite telemetry data still comes from stations by mail on magnetic tape, but only a small percentage. The telemetry data coming through the communications interface unit from onboard satellite experiments totals 450 million measurements a day and peaks at 270 thousand a second. The data traffic is even heavier in the mass storage subsystem where, in steady state operation (no net increase in data stored), it has a combined input/output rate, including intermediate data accesses, of 8,000 megabytes per day.

The effort at keeping TELOPS operational (duplexed equipment, data redundancies, testing, status monitoring, etc.) culminates in the restart capability that is embedded into the TELOPS software. Data needed to restart the operation in case of software or equipment failure is continuously being written in duplex to disk storage by various modules throughout the software at intervals as small as a fraction of a second. A complete system recovery, including CIU reconfiguration and changeover to the entire backup system, can be made in less than 15 seconds with only the corresponding amount of data lost.

In the evolution of methods for gathering data from space, the trend is towards higher data rates and fewer ground stations. The data relay satellite, with its wide-angle view of the earth and its celestial vicinity, will collect data 22,000 miles in space. Scientific satellites will beam their data to one of a set of data relay satellites in synchronous orbit about the earth. The data will be relayed to an always "visible" ground station. This might appear to simplify the satellite/DDPS-Station/NASCOM/TELOPS communications network by reducing the number of intermediate nodes. However, this will be more than offset not only by a significant increase in data processing requirements, but also by yet another event on the horizon of earth orbital science—the Space Shuttle.

With the wholesale orbital deployment of scientific experiments and the in-orbit satellite maintenance and repair business that Space Shuttle will bring, the resulting sophistication of onboard equipment will greatly increase the data rates and the requirements for real-time control. The Shuttle Orbiter itself, whose experiment data will initially be processed by TELOPS, will eventually have peak data rates of up to 48 million bits a second—more than a ten-fold increase over those of today. So, planning is already underway for yet a newer system. ✲

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Dr. Cunningham is an editor, writer, and systems analyst for the Federal Systems Division of IBM in Gaithersburg, Maryland. In his seventeen years with IBM he has held various technical and technical management positions on large defense and space programs. He is currently an editor/writer/analyst on a major solar project.

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Mr. Durkin is a program manager for the IBM Federal Systems Division. He joined IBM in 1956 and has held key technical and management responsibilities in program management, systems engineering, programming, and automated testing for TELOPS, the FAA Enroute Air Traffic Control System, and the Goddard Space Flight Center Real-Time System.

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0275000-630	CONNECTOR WIRE	02	PC	81	$.000	34	1H	A			
2800186-001	PRE-MATRIX C7G				1			$.000	TUBE	33	D 1J
0275000-631	CONNECTOR,NO P/L	24	PC	33	$.000	55	1K	B			
0275000-717	GUN ASSEMBLY				1			$.000	TUBE	33	R 3F
0275000-639	PHOSPHOR P11	02	OZ	81	$.000	34	3J	B			
0275000-641	CONNECTOR,NO P/L	24	PC	33	$.000	42	1K	B			
0275000-717	GUN ASSEMBLY				1			$.000	TUBE	33	B 5R
0275000-642	INSULATOR GLASS	02	PC	81	$.000	12	9L	A			
2800186-001	PRE-MATRIX C7G				1			$.000	TUBE	33	D 1J
0275000-650	POST MATRIX	02	PC	81	$.000	14	1J	B			
0275000-717	GUN ASSEMBLY				1			$.000	TUBE	33	D 4J
0275000-651	BRACKET PLATE	02	PC	89	$.000	57	2K	S			
0275000-658	NECK TUBING	05	PC	89	$.000	45	1J	D			
2800384-001	BULB ASSEMBLY				1			$.000	TUBE	83	M 2J
0275001-905	TUBE 63045A				1			$.000	TUBE	33	P 1J
0275000-664	BULB 7IN	02	PC	81	$.000	120	1J	A			
0275000-716	BULB ASSEMBLY				1			$.000	TUBE	33	D 3K
0275000-671	IMPLOSION CAP	02	PC	89	$.000	14	1J	E			
0275001-830	TUBE ASSEMBLY				1			$.000	TUBE	33	Y 5T
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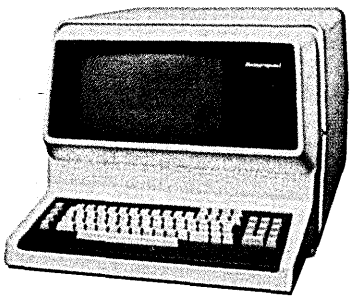

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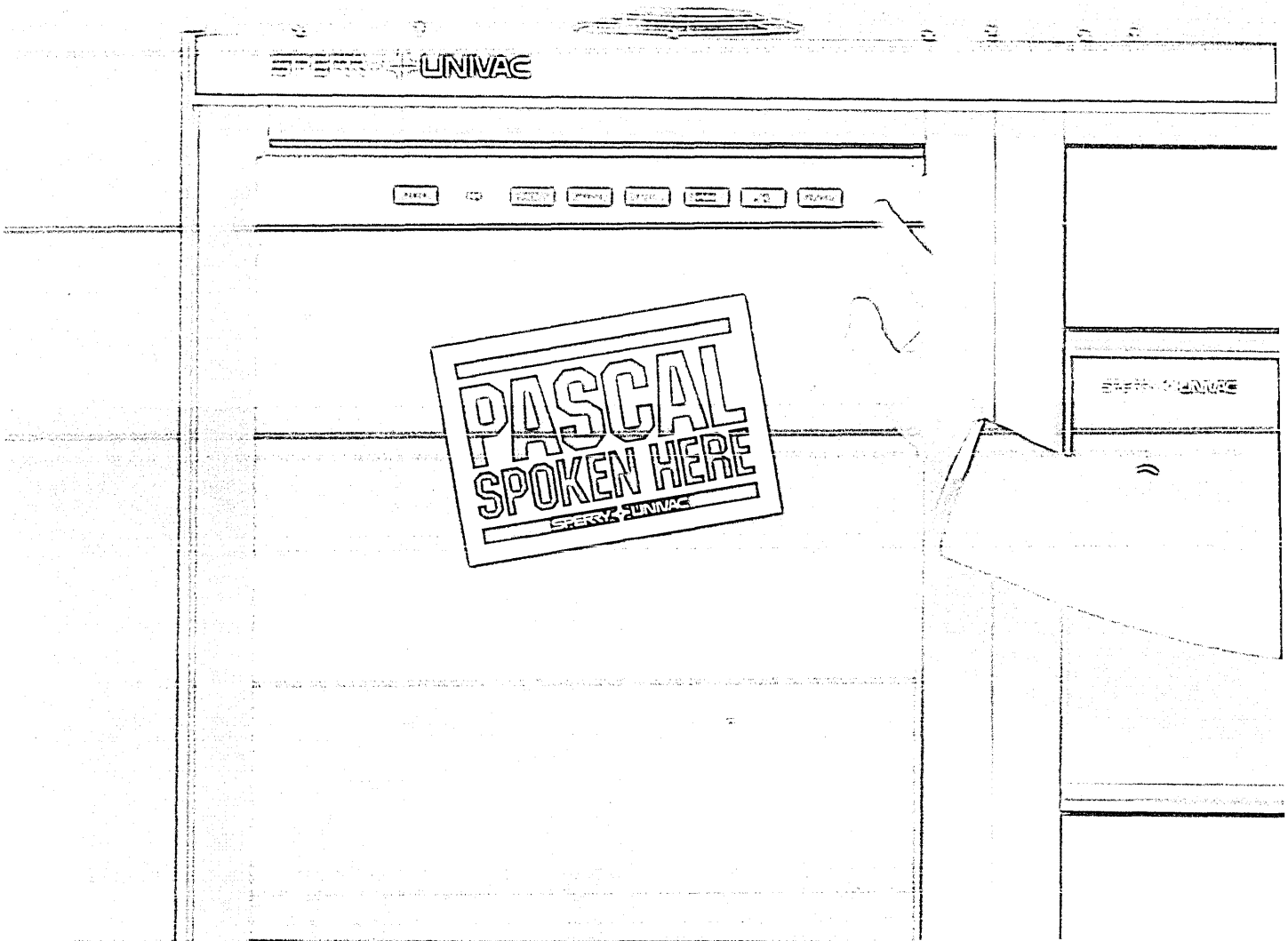

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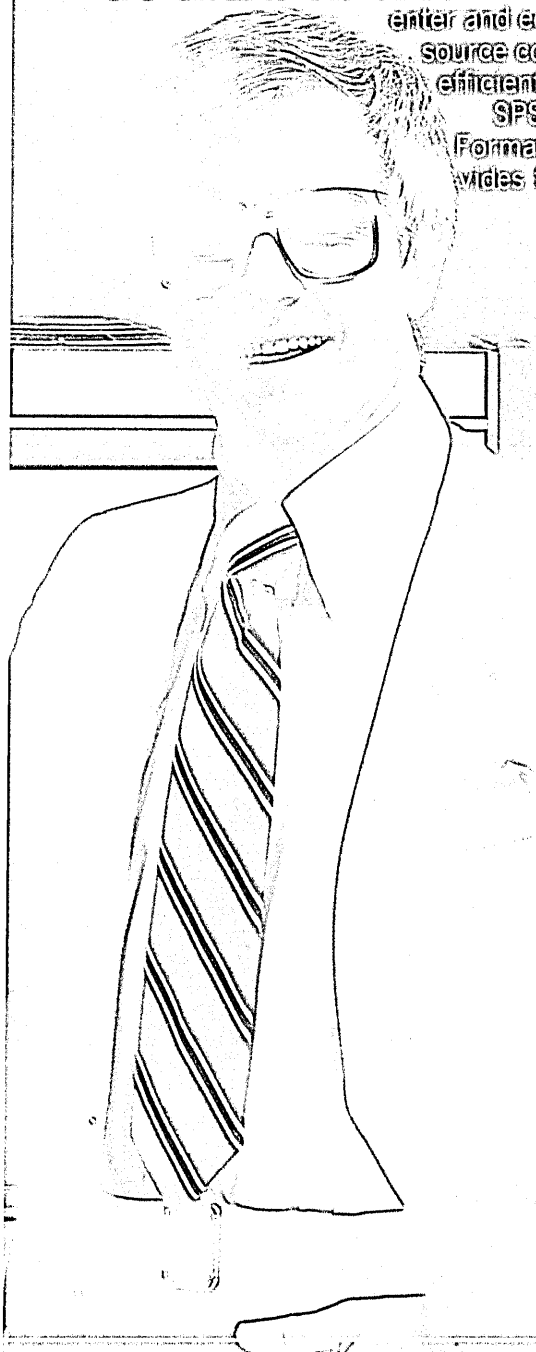

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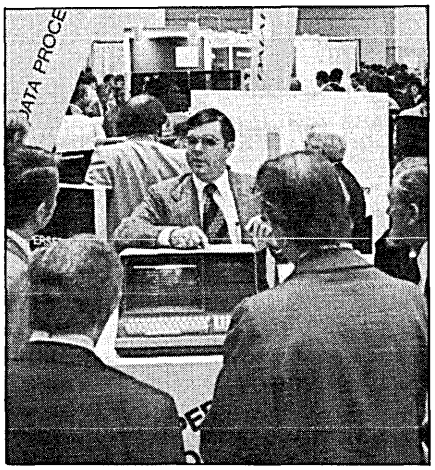
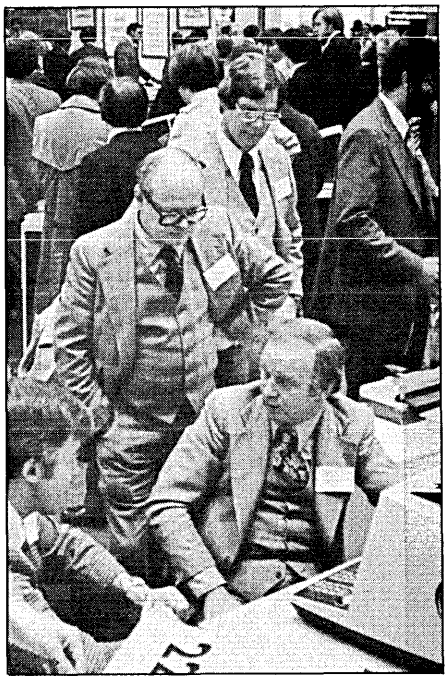
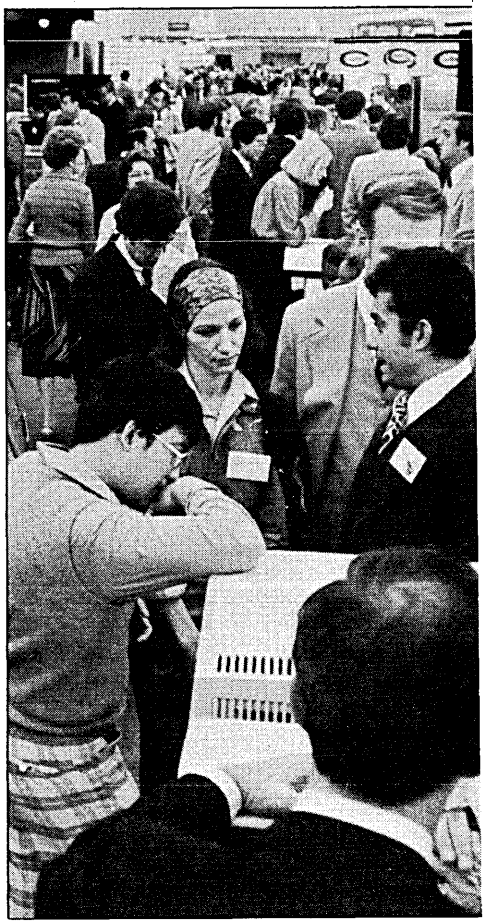






by Tom McCusker, News Editor

Listen and wait and see what happens.

That more than likely will be the attitude of persons attending four days of discussions on office automation next month at the International Information Management Conference at the Coliseum in New York, Oct. 15-18.

Better known as Info 79, the conference has drawn no less than 58 persons who will speak on ways to integrate today's and tomorrow's technologies into what is being called the "office of the future." But many of the speakers either are consultants, talking about "blue sky" applications, or representatives from huge companies (Exxon, Avon, ATT&T, INA, RCA) who are pioneering in bits and pieces of integrated office automation systems, the practicality of which still is in question.

Listen, for instance, to Larry J. Wells of Creative Strategies, International, who has just completed a study of the U. S. market for dictation equipment. He says the market will continue to flounder while awaiting some form of integration with word processing systems. The market research firm says in the report: "Future systems will revolve around the concept of improved speech transmission. The most intriguing model for future office systems relies on the emergence of automated speech recognition as a viable technology." All of this, says Creative Strategies, a market research firm, is beyond the next five years.

The office automation subject is among 12 related to the information handling business that are to be discussed by 250 speakers at Info 79, the sixth such conference to be held, along with an exposition of computer and word processing equipment. Other topics are information management, data processing management, advances in information technology, small business systems, financial systems, marketing systems, manufacturing systems, insurance, hospitals, banking, and law office automation.

(The price is $265 for all four days, $95 for a single day and $50 for a half day at the conference and exhibits. Exhibits-only registration is $5 if you have an invitation from an exhibitor, or $10 if you don't. The affair is staged by the show management firm of Clapp & Poliak, Inc., which will provide attendees with the program, hotel reservation forms and advanced registration information. Write to them at 245 Park Ave., New York, NY 10017.)

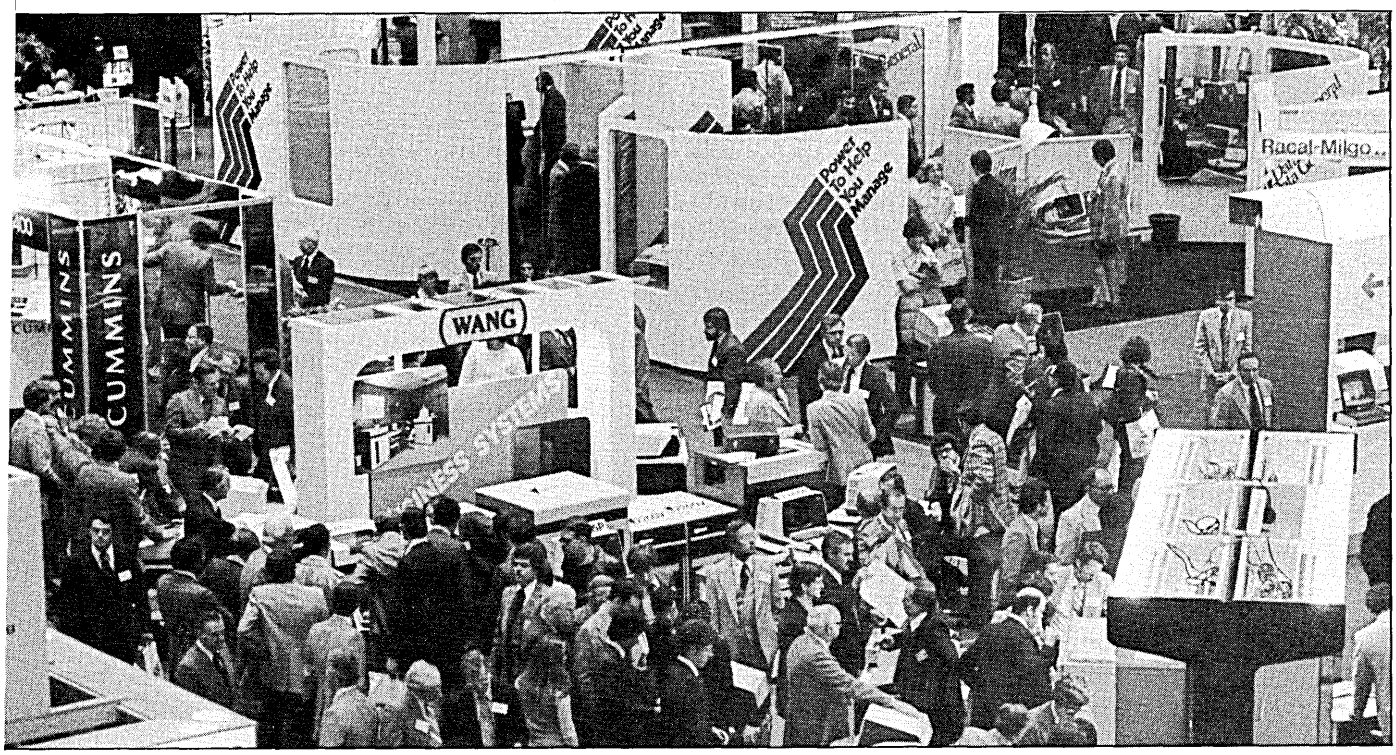
Since it was launched in 1974 as a sort of replacement for the twice-annual joint computer conferences which had been changed to a once a year National Computer Conference, the Info conferences have had a mixed reaction, but in recent years have started to thrive. Its first conference in 1974 in New York drew some 9,000 and 123 exhibiting firms. The next year the number of exhibitors plunged to 104, but jumped to 135 in Chicago in 1976 and this year Info is expected to draw some 200 exhibitors and a turnout of 17,000.

So successful has it been, that the sponsors have decided to hold it in New York every year, instead of alternating with Chicago. In Chicago, they will launch another conference and show in November 1980, to be called Info MFG, catering to manufacturing attendance, which last year at Info 78 in Chicago accounted for nearly a third of the turnout.

Clapp & Poliak people say the Info MFG conference will address such subjects as inventory controls, purchasing, vendor performance, materials requirements, warehousing, production forecasts, capacity planning and product design. It said machine and process controls involved directly in production won't be covered.

The New York conference will use four floors of the New York Coliseum, the first two to be occupied by the exposition and the top two for the conference. The sponsors think the turnout of 17,000 should consist of representatives from at least 16 fields of the information using community: information equipment manufacturers, suppliers of information services, consultants, people from transportation, communications, wholesaling, retailing, distribution, banking, insurance, hospitals, education, government,

Some question whether ddp will ever represent a significant percentage of corporate computing.



the investment community and, of course, manufacturing. Its speakers have been drawn from the nation's largest corporations, banks and financial institutions, insurance companies, government, healthcare institutions, universities, and accounting and law firms. They say the emphasis at the conference and the show is on practical applications and on problem solving.

OFFICE AUTOMATION

A problem to be solved in many of the 17 sessions on office automation will be when to start thinking seriously of a move toward the office of the future. A morning and afternoon session will address the subject, "The Office of the Future Today," in which speakers who have implemented integrated office systems will share their experiences and conclusions with the audience. Cochairmen of the two sessions are Robert M. Dickinson and Dr. Stanley M. Welland of Exxon. Dickinson heads the office systems technology division at Exxon's communications and computer sciences department and Welland is a senior adviser to Exxon's computer business venture operation, Exxon Enterprises.

Dickinson will present a paper on a "Headquarters Planning and Coordination Program" for office of the future systems and Welland will discuss "How to Determine User Needs." Other speakers are Peter Keen of MIT's Sloan School of Management, who will talk about "Implementing Advanced Office Technology —the Process of Managing Change," and Prebble J. Westley, a senior analyst in office equipment for Esso Eastern, Inc. of Houston, "A Regional Headquarters Internal Program." Case histories also will be presented by the following: Elio R. Rotolo, Security Pacific Bank; Joseph R. Kiernan, RCA; John J. Walsh, Avon Products, Inc.; and Daniel J. Drageset of Atlantic Richfield. The session is to be held all day Wednesday, Oct. 17.

In a session on planning for office information systems, Robert L. Fronk, a senior management consultant with Arthur D. Little, Inc., the Cambridge, Mass., research firm, will list the many technologies and their applications in a session titled, "Office Automation for the 1980s," and Richard B. McClellan of Exxon will talk about a "Systems Approach to Information Management in the Office." Another session will explain how to organize for the office automation revolution. John J. Connell, executive director of Office Technology Research Group of Pasadena, as association of large users interested in administrative management, will discuss the problems of planning and implementation, and Gad J. Selig of Continental Group, Inc., and Leslie F. Welson of INA Service Co., will describe two user approaches to the subject.

There also will be sessions on technologies available for information management in the office, a day-long session discussing progress in electronic mail and many other sessions on word processing. One, "Applications and System Considerations for Integrated Word and Data Processing in a Minicomputer Environment," examines several approaches to the multifunction system that combines word and data processing. Speakers are Robert Greenblatt of National Word Processing and Dr. James E. Kasprzak, who is chief of management assistance for word processing with the Army. Another session, "Data Processing in the Word Processing Environment," examines systems that are available to allow users of word processing systems to perform data processing tasks. The session, chaired by Amy D. Wohl of Datapro Research Corp., will feature talks by Anthony T. Petrigliano, a word processing specialist with Price Waterhouse & Co., and Jerry Eisen, a managing consultant with International Telephone & Telegraph Corp. Miss Wohl will discuss capabilities of current systems; Petrigliano will offer some user experiences and Eisen will talk of the myth of integrated systems.

The second largest subject to be discussed at Info 79, in terms of speakers, will be advances in information technology and it is aimed at subjects such as distributed processing, minicomputers, graphics, security and data base technology. Some 40 speakers will participate in the sessions which begin Monday afternoon, Oct. 15, and run through Thursday noon.

A session that should draw huge crowds will offer an update on distributed data processing (ddp), entitled, "The Changing Concept of Distributed Data Processing," to be held Monday afternoon, Oct. 15. The chairman, Larry D. Woods, manager of distributed comput-

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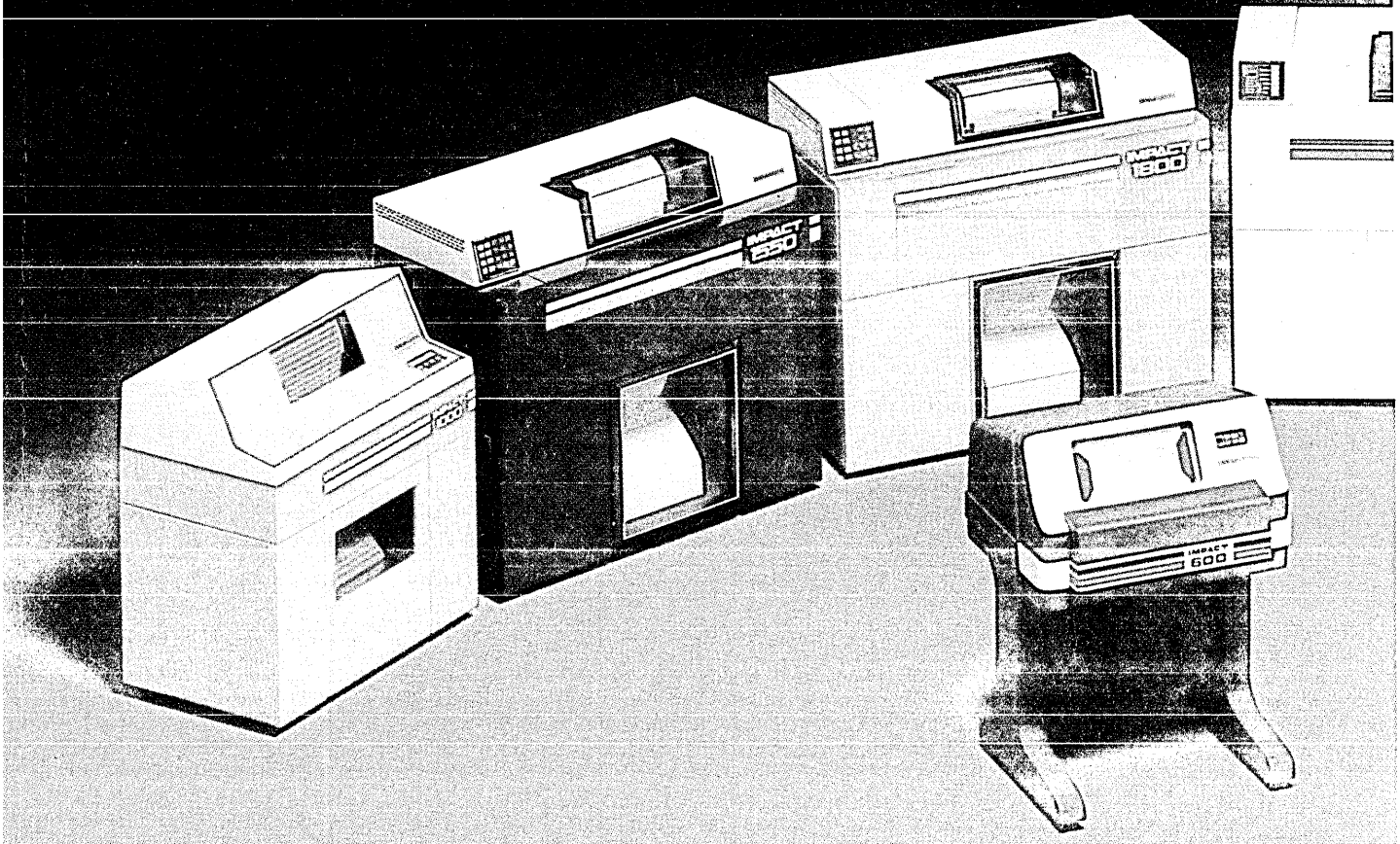

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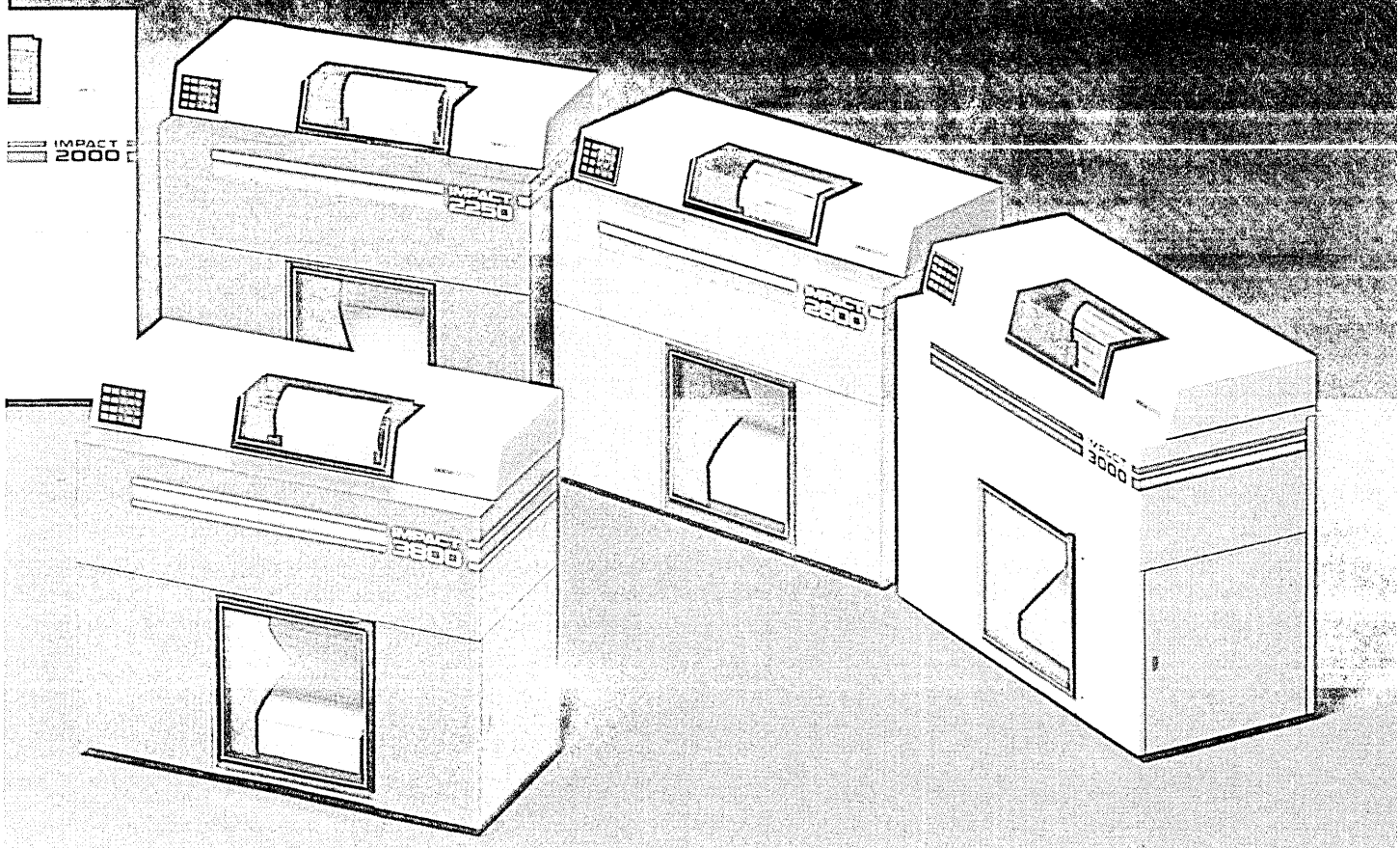

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CIRCLE 74 ON READER CARD

Is office automation the exclusive purview of very large organizations?

ing with Deere & Co., Moline, Ill., will present a paper on "What Has Happened to Ddp?" Howard W. Woods, Jr., manager of data processing with Atlantic Richfield Co., Dallas, and James E. Brownell, with Allstate Insurance Co., Northbrook, Ill., are the other two speakers at the session. The organizers note that the large amount of publicity given ddp in the past few years seemed to indicate it was going to become rapidly a large part of the computing of most large corporations. But its success hasn't come as quickly as some anticipated. And some observers question whether ddp will ever represent a significant percentage of corporate computing.

Dr. Jared Anderson, president of Two Pi Corp., Santa Clara, Calif., will discuss the use of "Multiple Minicomputers and Mainframes." Anderson said the advent of the IBM 370-compatible minicomputer has made possible the interconnection of these computers into powerful local networks. He'll discuss appropriate operating systems, as well as estimated comparisons between multimini networks and representative large mainframes.

Interactive graphics technology has improved to the point where management now can get "face-to-face" hands-on use of information, whereas in the past they had to rely more and more on their staff for analysis and forecasting. Applications software and graphic display systems give them that avenue for analyzing large amounts of data quickly and easily. Some applications will be discussed in a session, "Interactive Graphics—a New Approach to Data Analysis for Management Planning and Decision Making." The two speakers will be Lawrence A. Bruckner of the technical staff at Los Alamos Scientific Laboratory in Los Alamos, and Adam Bosworth of Citibank in New York.

A large portion of the program is being devoted to data base technology. Among these sessions: "Techniques in Data Base Administration," "Trends and Future Opportunities for Distributed Data Bases," "New Approaches to Data Base Long Range Planning," "A New Methodology for Planning Data Base Supported Information Systems," and "Data Base Processors—a Technology Update."

Dennis K. Branstad, who heads the National Bureau of Standards computer systems security group, will speak on new concepts of computer network security at a session on "Computer and Communications Security for Data Processing," chaired by Peter S. Tasker of the MITRE Corp., Bedford, Mass.

Edward I. Metz, a vice president of the market reseach firm Input, will chair a session on "Mass Storage Systems—Performance and Economic Trends," in which he'll discuss the effects of large floppies and new high-density disk units introduced recently. Metz will examine their effects on applications development in data base management, distributed data processing and office automation. Other speakers at that session will explore performance and economic projections for mass storage.

DATA PROCESSING MANAGEMENT

Some 15 persons will present talks at a Data Processing Management portion of Info 79, on subjects such as project management techniques, structured methods to improve quality and productivity in system development, capacity planning, software productivity, audit and control techniques. Productivity is an important subject. Bruce M. Stevens, data center manager with Volkswagen of America in Warren, Mich., chairman of a session on "Structured Methods to Improve Quality and Productivity in System Development," says structured approaches to system analysis, design and programming have demonstrated improved communications between users and analysts and between analysts and programmers. The result appears to be more satisfactory systems and improved programmer productivity.

Productivity in software development will be discussed by Frank L. Van Husen of SEI Computer Services, Chicago, and Michael Cervine of Panasonic Corp. in Secaucus, N.J., who explain that productivity techniques are being applied to many new systems development projects. They say the information manager would do well to use such techniques as standard practice.

Finally, Howard Feinlieb, vice president for system development at National CSS, Inc., in Wilton, Conn., will chair a session on productivity in implementing information systems. Although hardware costs continue to decline, people costs are becoming an increasingly large percentage of the total application cost. Fortunately, the speakers in this session say, the methodologies are becoming available to reduce the people intensity of the process.

The 15 speakers at a session on information management will discuss such wide ranging subjects as policy, the 1980 corporate environment, managing the proliferation of minicomputers and decision support systems. Howard I. Morrison, president of Arthur D. Little Systems, Inc., Burlington, Mass., will chair a session on "Managing the Proliferation of Minicomputers." Their very low price, he says, has led to the sudden and unscheduled emergence of computing equipment in large organizations, a problem of planning and control for many of these companies. From the corporate view, the classic problems still must be addressed—justification, make or buy, dealing with vendors and managing the selection process. The speakers will present case histories and then review them in a panel session.

At the session "Information Systems Planning for the 1980 Corporate Environment," speakers will examine the manager's role in coping with all sorts of new technologies. Among those mentioned are systems for planning, control and decision making, operational data processing, communications, office systems, records management and information resources. How these can be integrated into a common plan that is responsive to all levels of management will be discussed.

Is office automation the exclusive purview of very large organizations? Not so, say speakers at a session being held as part of Info 79's small business systems section. The small business is being overlooked, say organizers of a session titled, "Office Automation for Small Business Organizations." Office automation is more than word processing, and both large and small businesses have lots of opportunities to increase productivity through a smaller scale automation program. Opportunities to increase productivity in small offices will be discussed by Richard L. Hoberman, manager of management advisory services with Seidman & Seidman, the New York consultancy firm. Norman Schibuk of Multiple Funding Corp. of America will discuss time-shared dp services for small offices and Donald C. Aronson, a senior consultant with Quantum Sciences Corp., will talk about increasing productivity through telephone communications.

Other subjects at the small business systems talks will be concerned with techniques for buying small systems to be followed by a clinic for executives concerned about their small systems. ✲

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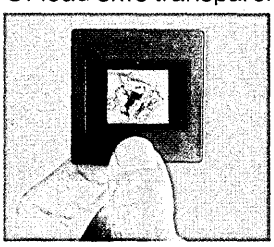

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MANAGING A LARGE MULTIVENDOR OPERATING ENVIRONMENT

by Paul F. Starita

For the past several years, the Bank of Montreal's data processing operations have grown by about 50% a year. During this period, also one of double-digit inflation, we have managed to control our operating costs so that today we process about two million on-line banking transactions a day for less than 10¢ a transaction.

We believe this to be a remarkable achievement; especially so for an on-line service extending through five time zones to over 1,000 of the bank's 1,239 branches, with more branches being added to the communication network on a regular schedule.

Recent industry presentations, explaining how we keep costs down in our fast-growing multivendor shop, have resulted in a great deal of interest in our approaches. Representatives from leading banks and financial institutions worldwide have come to study our installation. They want to know the management and operational techniques we use to plan our resources and to ensure that these resources are used effectively.

Here, we will outline the answers we give to the five questions asked most frequently:

1. What is our operating management philosophy?
2. How do we approach hardware resource planning?
3. How do we anticipate and manage rapid growth?
4. How do we control and minimize operating costs?
5. How do we handle multivendor relationships?

The Bank of Montreal, founded in 1817, provides a full range of banking services in all ten provinces of Canada, from Newfoundland to British Columbia. Its 25,000 employees not only support this domestic operation, but also provide international banking services in the bank's 22 foreign offices. The bank's total assets reached $34.97 billion on April 30, 1979, up considerably from $28.43 billion a year earlier.

Major computer applications include both an on-line real time system for domestic branches and an on-line Master Charge authorization system, supporting North American and European merchant inquiries through its three authorization centers. Master Charge is a large application supporting 1.4 million active cardholder accounts and 100,000 client merchants. The major growth, however, has been in the on-line banking system, which now supports more than 4.5 million accounts over its 4,500 terminals connected to the 3,000-mile-wide communications network.

Early in 1979, we introduced the Multi-Branch Banking service to our customers. Unique in Canada, this service permits deposits and withdrawals to be made to a customer's account from any on-line branch in the country. It also permits balance inquiries and immediate updating of savings passbooks, if these are requested.

To support on-line services, the data processing function of the bank is distributed across Canada with large central computers located in Toronto. The regional data centers—Halifax, Montreal, Toronto, Burlington, London, Winnipeg, Calgary, and Vancouver—are primarily

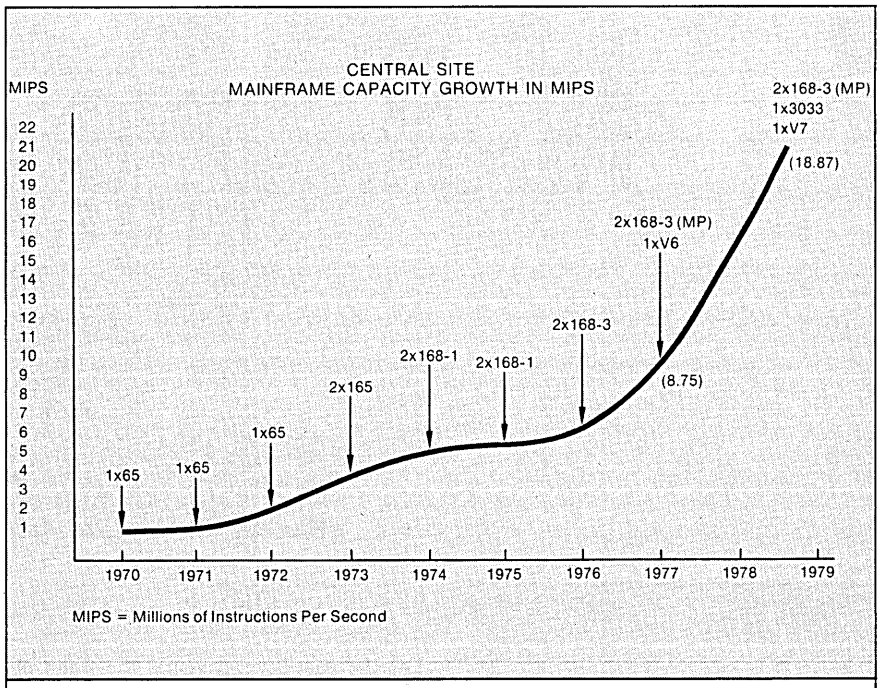
All resource planning and on-going operations are based on formal goals demanding excellence, not adequacy.

data-capture points connected to the central computer installation. In addition to data capture, the Montreal, Toronto, Winnipeg, Calgary, and Vancouver data centers act as terminal communication concentrator points for our on-line banking system.

Communication lines between the branches and the regional data centers operate at 2400bps, with 4800bps high-speed lines used to transmit transactions between the regional concentrators and the central computers. During peak periods as many as 75 transactions per second have been processed for a sustained period, with rates reaching as high as 80 per second. Over five million transactions have been processed by the system for a single business day's operation.

Currently, the bulk of our central site on-line processing is handled by an Amdahl 470V/7 and an IBM 3033 working in tandem in a fully shared environment. Both computers have 8MB of memory. We also have an IBM 168MP with 14MB of memory (Fig. 1). For on-line storage, we use both IBM and Memorex disks, with approximately 140 each of 3330- and 3350-type disks, for a total of 69 billion bytes (Fig. 2). In addition, the tape library now has over 60,500 tape volumes in use (Fig. 3).

The operating system is MVS Rel. 3.7, with MVS/SE installed. MVS/SEA is installed on the Amdahl 470V/7. Release 4.1 of JES2 is installed supporting about 45 RJE terminals and 30 local and 40 remote TSO/TCAM supported terminals.



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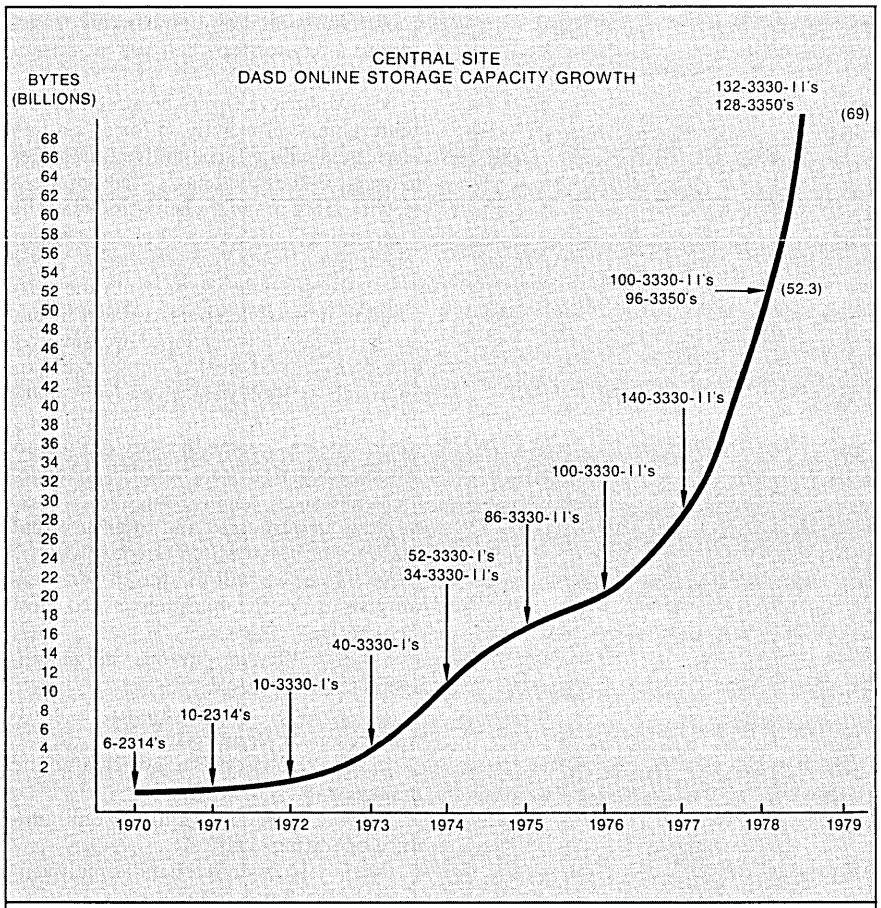


Fig. 2.

OPERATING PHILOSOPHY

The key to our management philosophy is that all resource planning and on-going operations are based on formal goals and objectives which demand "excellence," not adequacy. In short, our philosophy is based on establishing well-defined standards along with methods of measuring deviations from them.

For operating systems, service level standards are established in the form of "contracts" with our users. In the case of our on-line banking system, the contract includes agreed upon parameters such as:

1. On-line system hours of operation each day.
2. The percentage level of availability, measured in levels of user terminal availability, during operating hours.
3. Delivery of reports by specific times of day.

Excellence becomes the standard by establishing internal objectives which exceed service levels contracted with the

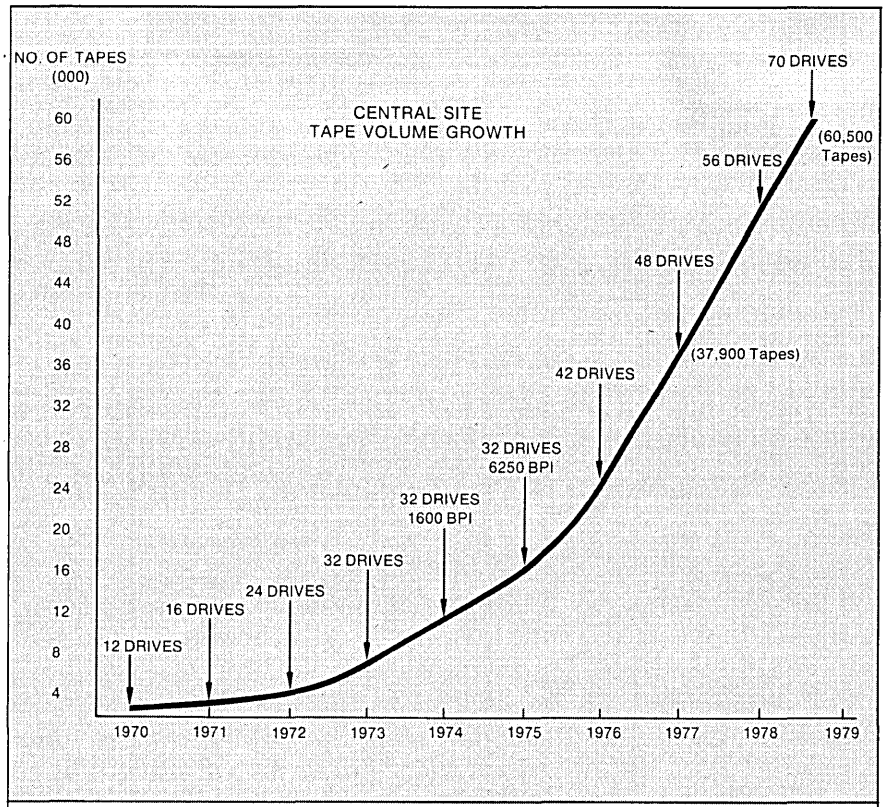


Fig. 3.

user. If 11 hours of on-line system operations are required to support all time zones, we would set 11½, 12 or possibly 13 consecutive hours of operation as the internal standard. Similarly, if 97.5% on-line terminal availability is required by a user, internal standards may be set at 98.5, 99 or even 99.5% for that system. All operations are monitored and measured against both internal and user standards.

Our planning for future operations adheres to this same basic principle. We stay in close touch with the marketing and advertising plans of the bank to ensure that we are aware of how these plans may affect the bank's growth projections. And we work closely with our users to determine the amount of computer power that they intend to purchase from us over the next two years. Product managers within our division represent this division to the users for the generic services they purchase from us. Once a plan is developed, we critically review it to make sure that it is realistic—that it is consistent with historical trends. We then translate it back into the resources that this facility would have to have in order to meet user demand.

Let us look briefly at some of the ways in which we have applied our philosophy to resource planning.

RESOURCE PLANNING

One of the biggest challenges we have faced in overall planning has been the tremendous rate at which new automated services have been introduced and the speed with which new branches have come on-line—about 50 a month. Upgrades have been continually required to our mainframe computers to permit us to handle this expansion. In 1971, for instance, we had a 360/65. In 1974, we went to two 370/165s. In 1975, we upgraded to two 370/168s. But by 1977, we were getting close to 100% capacity on these computers.

At that point we had three options. We could have stopped adding branches and/or new systems, but this was not a viable option. We could have tried to explore additional software changes to increase system capacity. Or we could have gone to a bigger, faster computer.

Much work had already been done to change software to increase throughput. In the fall of 1976, for instance, the use of a hardware monitor identified one six-instruction loop in a module that was consuming 57% of the cycles going to the applications. Modification of the module raised transaction throughput by 17 transactions per second. Other high-payback enhancements further raised throughput rates by an additional 10-15 transactions per second. By this time, however, additional potential changes that could be made were complex and costly and would have increased throughput only marginally.

As a result, once again we looked to improved hardware to help us meet our growing demands. Having quantified future user needs, we explored how we might continue to apply our "computer leapfrog" approach to use faster and faster mainframes. At the time, we knew that Amdahl was coming out with its 470V/6 computer. After benchmarking, we installed this system in June 1977. The system, which ran our on-line processing for 14 months with no backup and no hardware failures, almost doubled our capacity. Without it, we simply would not have been able to continue growing.

This "computer leapfrog" approach is still continuing to meet our ever-increasing computer workloads while helping us to achieve our contracted and internal standards. When the V/6 was nearing full capacity, we installed the newly announced IBM 3033. Shortly after that we replaced the Amdahl 470V/6 with an Amdahl 470V/7. Today we operate these two computers in tandem, each one backing up the other. But we know that the 8MB capacity of these machines will be exceeded by our on-line requirements by the end of this year, so we are installing an additional 4MB capacity to both machines and are planning to upgrade the V/7 to a V/8, which will give us sufficient on-line capacity for the next two years, our normal resource-planning time frame.

BENCHMARKING

Of critical importance to leapfrog decisions, is our benchmarking function. Manufacturers' statistics on their hardware and software systems seldom reflect how these systems will perform with customized applications in one's own operating environment. There can be great differences between a manufacturer's claims and what is actually achieved in any particular environment. Such differences can render an overall resource plan quickly obsolete and cost a shop both lost time and money.

Our benchmark approach was developed in 1975 as part of the acceptance criteria of the on-line banking system prior to putting it into production. Though the system was found to be adequate to meet the first year's needs, the benchmark helped to identify potential future performance problems. We then made enhancements to the system and reran the benchmark in 1976.

Carefully preplanned use of service bureaus can be an extremely effective approach to keeping unit costs down.

SECTION II – OPERATIONS PERFORMANCE REVIEW:

	THIS MONTH	LAST MONTH
SYSTEM VOLUMES – SEPTEMBER 1978		
# OF CHEQUES – MECH VOLUME/DAY:	746,265	658,263
CRITICAL REPORT LINES/DAY	715,600	691,463
AVERAGE TRANSACTION RATE (14:00 – 14:15 HRS.)	39.10	36.59
PEAK TRANSACTION RATE:	49.4 TRANSACTIONS @ 97.7% CPU ON TUESDAY, SEPTEMBER 5TH, 1978 BETWEEN 15:00 – 15:15.	

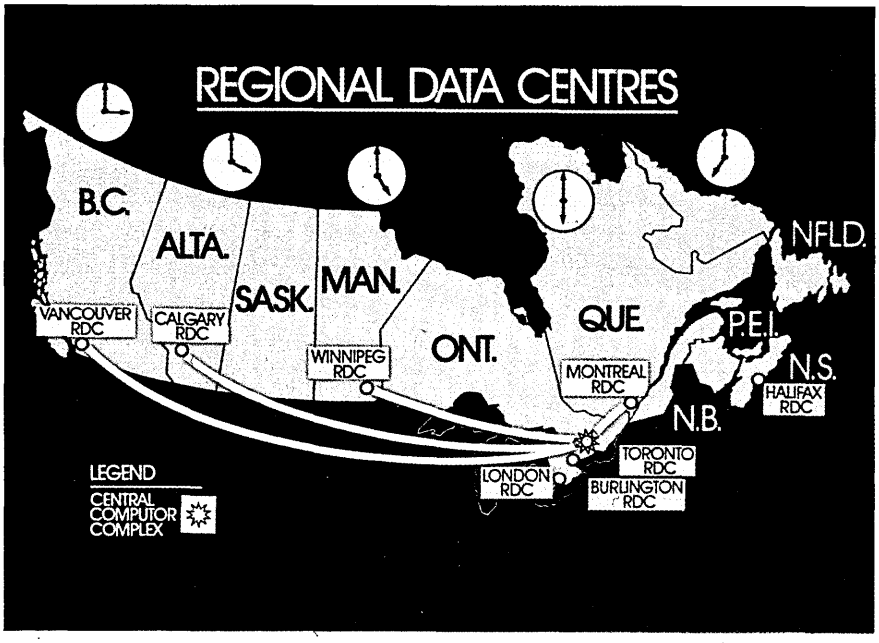
AVAILABILITY	SEPTEMBER 1978	PERFORMANCE OBJECTIVE ACHIEVED	CHANGE
C.C.C. ON-LINE:	99.1%	–	+1.0
PEAK CPU UTILIZATION (85%):	97.7%	NO	–2.1
NUMBER OF OUTAGES DURING CONTRACT HOURS:	0	–	– 0

AVAILABILITY	SEPTEMBER 1978	PERFORMANCE OBJECTIVE ACHIEVED	CHANGE
BRANCH ON-LINE (95%):	97.8%	YES	+1.3
REPORT DELIVERY (90%):	82.1%	NO	–7.7
% OF BRANCHES WITH SECOND DELIVERIES (NIL):	8.8%	NO	+2.8

SECTION I – CUSTOMER SERVICE REVIEW:

	THIS MONTH	LAST MONTH
SYSTEM VOLUMES – SEPTEMBER 1978		
# OF BRANCHES	906	899
# OF TERMINALS	4,062	3,881
# OF ACTIVE ACCOUNTS	4,199,923	4,143,791
# OF CLOSED ACCOUNTS	868,206	813,212
# OF ACCOUNTS/ACTIVE BRANCH	4,636	4,609
AVERAGE TRANSACTIONS/DAY	1,989,608	1,747,241
MAXIMUM TRANSACTIONS		
DATE	SEPTEMBER 29TH	AUGUST 1ST
VOLUME:	3,280,911	2,435,429
TRANSACTIONS/ACTIVE ACCOUNT/DAY	0.45	0.40
TERMINAL RESPONSE TIME*	N/A	N/A

* NOT AVAILABLE DUE TO EQUIPMENT FAILURE



In 1977, the system was taken to Sunnyvale, California, to assess the processing capability of the Amdahl V/6. In 1978, runs were carried out at Gaithersburg for the IBM 3032 and 3033, as well as at Sunnyvale for the V/7. During that period many additional runs were undertaken at the bank's data center to validate new software components and hardware configurations.

We have found that a benchmark must meet six major criteria if it is to be effective. These are:

1. It must produce repeatable results. That is, given two runs in the same environment the results must be very similar. Our experience indicates that reliable benchmarks produce results with less than one-half of one percent variation between like runs.

2. A benchmark should drive the cpu to busy values in excess of 98%.

3. A benchmark must be portable. It should be relatively easy to take a benchmark to another installation and run it. A benchmark should not depend upon any nonstandard facilities. The bank benchmark has been executed at Poughkeepsie, Gaithersburg, Maryland, and Sunnyvale, as well as at Canadian locations.

4. A benchmark should be fairly easy to set up. Our benchmark requires a maximum of 20 hours, only four hours being dedicated time. The rest of the setup can be done in a shared environment. Although its complexity and its ability to support repeated benchmark runs with varying parameters has been increased fivefold, setup time has increased only from 12 to 20 hours.

5. The benchmark should be quick. This means that once started it should be completed in a reasonable amount of time. Additionally, restoration of the environment in order to rerun should also be short. The bank benchmark takes approximately 15 minutes to run and 20 minutes to reset for rerun.

6. Benchmarks must have an established record such that management has confidence in the results. Unless this is so, the results and the recommendations based on them will have little likelihood of acceptance by the corporate executive.

For planning purposes, we depend on benchmark results at the Bank of Montreal for three main reasons:

1. To determine the capacity of new hardware or software offered by our vendors.

2. As part of the acceptance criteria when new hardware is actually installed.

3. Having a detailed and explicit knowledge of the performance and capacity of the system makes it possible for us to project future capacity upgrade requirements.

In early 1979, we put on-line about 70 branches in our Atlantic provinces. In planning for this expansion we looked both at the number of branches and at their locations to calculate the number of transactions that would be added. Since these provinces are in a different time zone, we realized that their transactional peaks would occur about an hour earlier than they occur in central Canada and two to three hours earlier than in the west.

In effect, therefore, we measured the impact of putting the Atlantic provinces on-line not in terms of the number of transactions, but in terms of when these transactions would occur. Because they added nothing to our peak period, we were able to put these branches on-line with almost no effect on capacity, except for increased data-base storage. We were thus able to add them with minimum additional cost.

Eventually, however, given sufficient application growth, a new, larger computer will be necessary. Normally, when a new computer is installed, there is a great deal of unused capacity during its early life. And this, of course, raises the unit cost of the processing. To keep costs below a chosen base line, it is necessary either to fill the unused capacity with another application, which is very difficult in a large on-line environment, or to reduce other costs associated with the application, which may not be possible. However, in our resource planning, we establish guidelines for how much we want to charge or how much the user is

willing to pay for each unit of service.

COST STANDARDS

When we analyze the requirements for future demand, we establish this cost as a standard for on-line applications. We make sure that our future plans either will not affect this cost or, hopefully, will lower it. This places very stringent demands on our staff because as a system grows it tends to migrate toward a larger computer and incrementally increased costs for extra storage.

A good example of our approach to pricing is our on-line banking system. We are now able to provide our users with the capability of processing 60 transactions a second for under 10¢ a transaction. This cost includes terminal maintenance and depreciation, low-speed line concentrators, high-speed lines, and, of course, our central site cpu's and all support personnel. Any planned hardware or software upgrades must at least retain, and ideally reduce, present processing costs.

Another approach we use in planning for application and volume growth is to obtain bids from service bureaus for the planned service. Because we operate in a competitive mode, we frequently purchase services from outside service bureaus when it is logical to do so. For instance, there are service bureaus that offer particularly attractive rates at certain times of the day or week because of their demand schedules. And these times of the day or week might well correspond with our own specific needs, especially since the bank is spread over so many different time zones.

However, we have also discovered that carefully planned use of service bureaus can be an extremely effective approach to keeping unit costs down. Basically, we hold off as long as possible on installing an incrementally larger computer, by giving out the added work to service bureaus at an economical rate. Then, when we install the new hardware system, we can pull back this work from the bureaus to fill the unused capacity. We therefore do not incur an initial period of system installation in which we have an excessive amount of unused capacity. The result: lower unit costs.

In conjunction with all these planning approaches, one final consideration is also a critical factor. Operating and benchmarking results permit us to predict probable software/hardware failure rates. Other factors such as alternate hardware, power supplies and air conditioning systems, alternate communications routes and associated switching devices, etc., are all taken into account relative to outage prevention and recovery. Probable failure rates have been identified in conjunction with an evaluation of their effects on users. In this way we determine what measure of redundancy is essential to meet contractual agreements and what measure is necessary to meet our internal standards. This permits minimum essential levels of backup to be identified, avoiding unnecessary cost.

OPERATING CONTROLS

From day to day, objectives and standards of measurement are critical components of our ongoing operations.

Standards have been defined for evaluating the reliability of new application code after delivery to production. Essentially, these standards are related to the number of incidents (or bugs) per number of lines of code in production. We track these incidents carefully, and take appropriate action when the standards are not met.

Once in operation, applications are monitored constantly relative to user contracts and internal standards. In addition, the entire installation is continually monitored for abnormal conditions, i.e., "incidents."

By definition, there are no trivial incidents; all must be investigated, explained, and followed up with appropriate corrective or preventive action.

Keeping operational control of a system as large and fast-changing as ours is an immense task, but one for which we have developed effective procedures. If an on-line system goes down, for instance, "escalation" procedures designed to communicate information as rapidly as possible to operating and user personnel are automatically brought into play.

We recognized early on that if the individual charged with fixing a problem is busy trying to explain it to other people, he will experience constant interruption while attempting to solve the problem. We therefore formed the Users Services Department, which is responsible for distributing pertinent information as quickly as possible and answering inquiries about an "incident." This leaves those taking immediate corrective action free to concentrate exclusively on restoring the system to the users in the shortest time possible.

When an on-line incident occurs, the production manager will advise User Services of the basic nature of the problem and the expected duration. That information is sent out over our Telex network and, for normal, small incidents, is not generally followed up with any verbal communication. If an incident is more significant—that is, 15 minutes or more in duration—we begin a verbal escalation procedure in which appropriate people at higher levels are automatically called.

All incidents are recorded on a Hardware System Trouble Report (HST), each on a separate, prenumbered multipart HST form. This identifies the seriousness of the incident, the exact conditions encountered, and the corrective action taken to restore operations if a service interruption occurred.

At 10:00 each morning, an incident analysis meeting is held to review the "morning report." This identifies all HST's in the preceding 24 hours, as well as all those from previous days for which resolution and/or corrective action has not been completed.

When we first started these morning meetings about four years ago, we invited far too many people to them to make them effective. Moreover, because we held them too early, about 9:15, people were not able to give the essential information needed. It is only in about the last year that we've refined the group to its current 10-12 participants, and set the time later so that people would have more time to prepare for the meeting.

Representation at the meeting is now limited to one individual from each of the internal groups that may be required to take corrective action, as well as from each of our hardware vendors.

All incidents listed on the report are discussed, and the problems are assigned by the chairman of the meeting to the appropriate representative, whether from IBM, Amdahl, Memorex, or an internal support group. This individual is then responsible either for solving the problem or for completing its investigation to the point where the cause is established and transfer to the appropriate area for correction can be recommended. This meeting lasts no more than one-half hour.

Interestingly, there are no arguments about responsibility at the meeting. One of the reasons these meetings go so smoothly is that a special group has been formed to act as a mediator between the vendors and the bank. This group of three or four people makes the final decision if there is any question as to who is responsible for taking corrective action.

REPORT CARDS

A performance management meeting is held weekly. This is end-user oriented, includes about 15 senior managers, and generally lasts from one-half to three-quarters of an hour. It addresses any incidents related to user contracts, such as outages which interrupted on-line service, and the week's report delivery record. All discussion is focused on performance against agreed standards. Essentially, it

The vendor realizes that his own standard was established almost arbitrarily.

provides the "Operating Report Card" for the past week, a management summary for which much of the input is obtained from the daily morning meetings.

Other input to this weekly meeting may also be provided by the results of additional benchmarking which has been done. This would provide:

1. Analyses of the performance and capacity of new releases of software. In our environment it is very important that new releases of either operating or application software do not reduce our processing capability.
2. Analyses of hardware and configuration changes to ensure they have not reduced our capacity or throughput.

Benchmarking is not used just as a planning tool. Benchmarks and ongoing performance evaluations and measurements—of both production conditions and volumes experienced—are critical tools for monitoring ongoing operations. The results of these continuing analyses become inputs to the planning process, in addition to regular assessments of current operations.

Less frequently, once or twice a year, executive-level meetings are held with each of our vendors. Vendor contracts are awarded, normally once a year, on the basis of price and performance. When they are awarded, there are no surprises. The vendor has been given a "Vendor Report Card," based on contractual agreements, on which vendor's performance is measured against agreed-upon standards. For Vendor Report Card discussions, vice presidents of Amdahl, Bell, IBM, Memorex, and our other vendors actually come to our facility.

Our evaluation includes such criteria as:

1. Responsiveness of marketing personnel to questions, inquiries, and requests.
2. Vendor representation/attendance at meetings.
3. Benchmark support provided by vendor SE's.
4. Vendor equipment maintenance and performance, e.g.:
   a) Average number of problems per month (equipment).
   b) Average response and repair times (by location from which support service is provided—if more than one) for critical, noncritical, and maintenance requests.
   c) Percentage of problems exceeding restore objectives.
   d) Price competitiveness.
   e) Benchmark results of hardware performance.

Whereas the major penalty to vendors who do not achieve satisfactory performance is a loss of incremental business for the next year, we are now in the process of attempting to incorporate penalty clauses into our contracts for failure to achieve preestablished standards. Thus far, we have been successful in doing this in at least two cases.

In another case, the vendor started out by saying that our standard was in excess of his normal standard. At our insistence, however, the vendor has spent a great deal of time examining the rationale behind our standard and has come to recognize that we have a real need for it in order to achieve a satisfactory service level to our users. The vendor also realizes that his own standard was established almost arbitrarily. So the vendor is now trying to achieve what he recognizes as our requirement. In short, our philosophy of excellence is actually having an effect on the service our vendors are giving us. And this, in turn, is helping to keep our costs down.

To summarize, our entire operating environment is totally structured around the concept of establishing formal goals and objectives which demand excellence, stated in quantifiable and measurable standards and performance objectives.

All aspects of both our resource planning functions and our ongoing operations and operations support are conducted in this framework. We have even expanded these concepts to make them applicable for external contractors, such as service bureaus and vendors.

I personally believe that only our total dedication and continuing adherence to these key principles have permitted us to cope with the high growth of service demands we have experienced and to maintain and improve controls during such a dynamic, inflationary period. ✲

PAUL F. STARITA

Paul Starita is vice president, Operations and Services, Bank of Montreal. He is responsible for computing facilities, communication planning and operation, data processing facilities, and operation planning and control for this $32 billion worldwide bank. Previously, he was the vice president of Innovation Data Processing and a vice president of Reynolds Securities, Inc.

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Dates and Cities

September
5 Pittsburgh, PA
6 Syracuse, NY
11 Cincinnati, OH
11 Dallas, TX
11 New York, NY
11 Philadelphia, PA
11 Vancouver, BC
12 Montreal, QUE
12 Atlanta, GA
13 Dearborn, MI
13 El Paso, TX
13 Newark, NJ
18 Cleveland, OH
18 Houston, TX
23 Toronto, ONT
25 Boston, MA
27 Denver, CO
27 Louisville, KY

October
9 Amarillo, TX
9 Dayton, OH
9 Kansas City, MO
9 Quebec City, QUE
9 San Jose, CA
9 Tallahassee, FL
9 Washington, DC
11 Detroit, MI
11 Orlando, FL
11 San Antonio, TX
16 Altoona, PA
16 Milwaukee, WI
16 Mobile, AL
16 Oklahoma, OK
17 Erie, PA
18 Greenville, SC
18 Los Angeles, CA
23 Evansville, IN
23 Hartford, CT
25 Harrisburg, PA
25 London, ONT
25 Portland, OR
30 Columbus, OH

November
1 Piscataway, NJ
6 Bridgeport, CT
6 Hamilton, ONT
6 Seattle, WA
7 Ottawa, ONT
8 Austin, TX
8 Toledo, OH
8 Westbury, NY
13 Buffalo, NY
13 Ft. Lauderdale, FL
13 St. Louis, MO
13 Tulsa, OK
14 Chicago, IL
15 Albany, NY
15 Phoenix, AZ
15 Pittsburgh, PA
15 Richmond, VA
15 Shreveport, LA
20 Indianapolis, IN
27 Rochester, NY
27 San Francisco, CA
28 Baltimore, MD
29 San Diego, CA

December
4 Ann Arbor, MI
4 Minneapolis, MN
4 Saddlebrook, NJ
5 Boston, MA
6 Ft. Worth, TX
6 Salt Lake City, UT
11 Cleveland, OH
11 Nashville, TN
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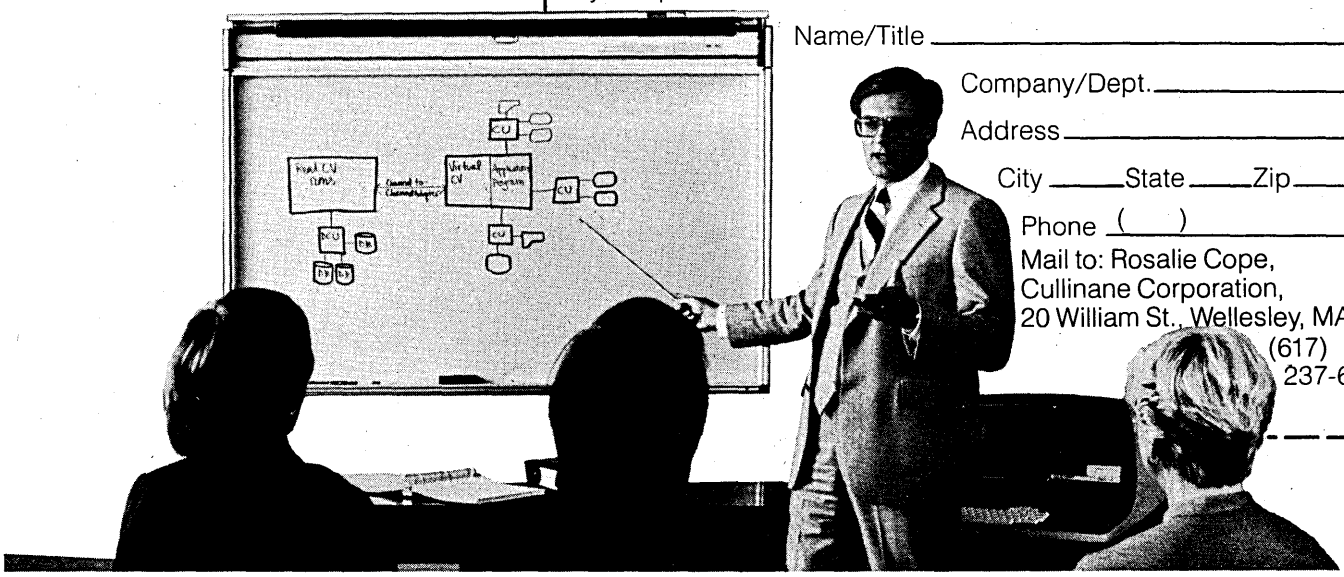


Cullinane

AN INTERVIEW WITH SOVIET DP PROFESSIONALS

STELLA NOSKINA: The VUM machines I worked on are very similar to IBM's, but some of the commands are different. After working on those, I already know the IBM assembly language. But we couldn't run an IBM program—we didn't have the same storage, or disk, and other things.

FAINA DRAPATSKY: In Russia there are a lot of smaller departments or offices, and every office has its own machine, and its own programs. One office doesn't know what another has. More than that, we keep our programs secret.

by R. A. McLaughlin

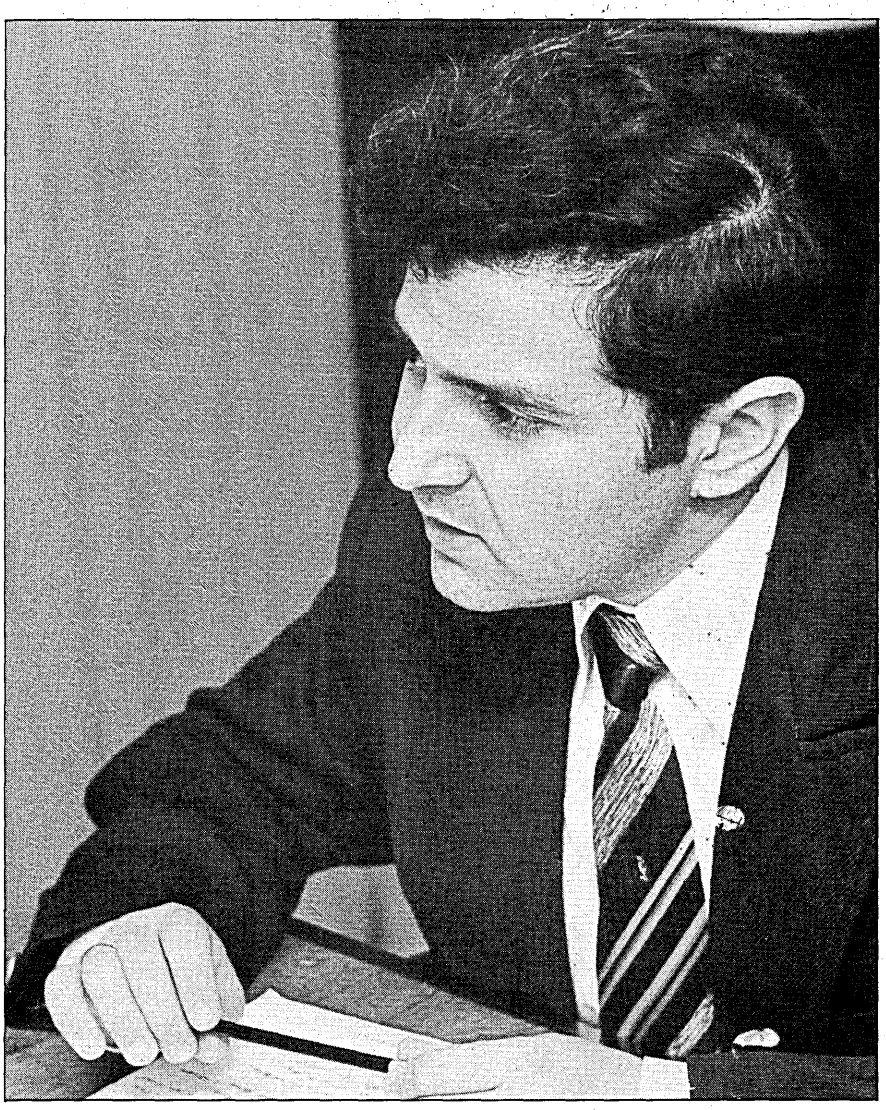
Recently, DATAMATION took advantage of a unique opportunity to interview three Soviet data processing professionals who had immigrated to the U.S. this spring. They were Faina Drapatsky, a systems analyst and programmer; her husband, Leonid, a peripherals designer, and Faina's identical twin, Stella Noskina. At the time of the interview, the Drapatskys had been in this country for two months, and Stella Noskina only two weeks. Despite some rather severe language barriers and their reluctance to speak openly on some sensitive subjects, we learned a great deal regarding the state of the art of data processing in the Soviet Union. What follows is an edited transcript of our conversation, which took place in Chicago.

DATAMATION: *Leonid, your resume shows that you have worked at the Institute of Cybernetics of the Ukranian Academy of Sciences since you received your degree in 1965. Did you choose to work there, or were you assigned to work there?*

LEONID: I had always dreamed about working in mathematics, in cybernetics. Norbert Weiner had always been my favorite scientist, and I attended a university in the Ukraine with a special group concerned with mathematics and cybernetics.

I received an associate engineering degree through day-time studies in tech-

How far is it from the U.S.S.R. to the U.S.? Between 10 and 20 years.



LEONID DRAPATSKY: It takes five or six years before we see a translation of a book on computer subjects, but in my field, electronics, abstracts and translations are prepared very quickly.

nical school. After that, I worked part-time as an engineer. I wanted to work in a laboratory as an electronics technician or a mathematician, but there was no opening for me. So for the first eight or nine years I worked as a designer at a special design bureau; it was the only opportunity I had at the time.

Only during the last few years did I work at the laboratory on peripheral devices—the work I had dreamed about.

DATAMATION: *How many years have you worked on peripherals design?*

LEONID: Five years.

DATAMATION: *I notice that your Masters thesis topic in Electronic Engineering was on a display terminal with a light pen. Are those in common use in the Soviet Union?*

LEONID: Yes. Actually, my thesis topic was on the same work I was doing at the design bureau. The thesis was easy for me, since I was working on the design every day.

DATAMATION: *The display with the light pen was for the MIR 2 computer?*

FAINA: Yes, MIR is an acronym for the Russian words for "Machine for Engineering Problems."

DATAMATION: *I have seen MIR 2 mentioned frequently. Are they old machines? Or is it a continuing series?*

LEONID: It's a continuing series, oriented to engineering, solving differential and integral equations. The language used with this machine is one that engineers can speak easily.

DATAMATION: *Is it a special language? Or is it an ALGOL, or . . .?*

LEONID: No, it's a special language.

FAINA: We call this language Analique. It's like FORTRAN, but it's not a copy. We often call it the Russian FORTRAN, but it's not the same.

DATAMATION: *Faina, you were working as a systems analyst and programmer. Are the terms used the same way as in the U.S.? An analyst would be the one who studies the problem and decides what the program or set of programs should look like.*

FAINA: Yes, usually when I'd finished looking at a problem, I began to design an algorithm. After that I wrote the program, and debugged it.

DATAMATION: *You were working at the Department of Highways?*

FAINA: Yes. I worked in the department involved with economic problems. For example, we solved such problems as distribution of raw materials, optimizing how to bring these materials to the different sites.

DATAMATION: *Stella, what about you? You were working as an analyst/programmer like your sister, in the Ministry of Light Industry. That ministry is part of the government, right?*

STELLA: Yes.

DATAMATION: *What were some of the programs you worked on?*

STELLA: We produced reports, economic reports, for the ministry.

DATAMATION: *Before that you were in the systems programming laboratory of . . .*

STELLA: No. It is a plant, a factory. It's like IBM, a computer manufacturer.

DATAMATION: *And you were doing algorithms and systems programs for the M-4030 computer? What we would call operating systems?*

STELLA: I wrote the programs for the operating system, what we called the "mathematical provision," to attach display devices to the system.

DATAMATION: *These machines that you*

were working on there are supposed to be like the IBM 360. Does this mean that their systems programs are also like the IBM 360's? The operating systems?

[Editor's note: At this point in the conversation, the interviewees conferred in Russian in an attempt either to agree on what the question meant or on how the answer should be phrased in English. The language barrier sometimes made a topic too difficult to pursue, leading to our taking another tack in posing questions.]

LEONID: It wasn't possible for them to use an American operating system, so they had to write their own.

DATAMATION: *What I was trying to find out is if the M-4030 could run an IBM 360 program.* [... another interchange in Russian...]

STELLA: I think not. We haven't enough storage, nor the disk, or other things.

DATAMATION: *That means that you, at VUM, had to write the whole operating system, and even if someone had given VUM an IBM operating system, they couldn't use it? They may learn from it, but couldn't run it?*

STELLA: There are many commands that they don't execute on IBM.

DATAMATION: *The instructions on the M-4030, then, are similar, but maybe not all of them?*

FAINA: Not all of them, but mostly.

LEONID: But even with their poorer equipment, they would like to be able to do the same things as an IBM system, by making their mathematical provision [operating system] more flexible. Marvelous programmers. It's very difficult for them.

DATAMATION: *The Soviet's understanding and training of mathematicians and theorists in logic or computing is supposed to be very high, and so I understand what you mean: the people are making up for what the machines don't have. We could talk about that for a while. What kind of training do you get to be a systems analyst? What courses? How many years?*

FAINA: My sister and I graduated from the math department of the university in Kiev. After that, I graduated twice more, the last time taking special computer courses. I took a special course for my Master's at the university in Kiev, spending about a year and a half, and then I took a course offered in our department—I worked with my husband at the Institute.

DATAMATION: *I was just trying to find out if much of the education to be a systems analyst or progammer happens at work instead of at the university. Frequently, in the U.S., people get introduced to data processing in a university,*

but they learn a great deal more about computing when they go to work.

FAINA: Yes, our company has such special classes, too, but it's not a big part of the education.

DATAMATION: *Do you have terminals on which you can compose programs?*

FAINA: At the Institute of Cybernetics we had terminals, but not at my last job at the computer center.

DATAMATION: *What kind of terminals did you have? Did they have a keyboard and a printer?*

FAINA: We had a printer...and a console with a keyboard.

DATAMATION: *Then, when you were trying to create a program, did you have interactive programming languages? Where you could enter a command and the system says "oops, there is a format error" or "you didn't put those in the right place in the command?" Do you understand "interactive programming"?*

[...interchange in Russian again...]

FAINA: Yes, we have the same thing.

DATAMATION: *Okay, that makes the job much easier, right? Now, when you're working on analysis and programming in the Soviet Union, what feels like the biggest limitation? The greatest obstacle? What makes the job hard?*

FAINA: I think the biggest difficulty is that we haven't good algorithms for solving problems. For example, this program I worked on for optimizing the distribution of building materials; we didn't have a good algorithms so we had to make it...

LEONID: Step by step. Approximate. It's just what you say. You have a special program; you call it...

DATAMATION: PERT.

FAINA: They don't have that. We try one method, after that we try another. It's my opinion that in Russia there are a lot of good programmers, but we don't have good software.

And another thing. In Russia there are a lot of smaller departments or offices, and every office has its own machine, and its own programs. And one office doesn't know what another office has.

DATAMATION: *So you can't help each other. You can't share.*

FAINA: More than that, we keep our programs secret. That problem we were talking about, that optimization problem, there was another office working on the same problem, for the railroad. We never told them how we solved the problem.

DATAMATION: *And never found out how they solved it.*

FAINA: Right.

DATAMATION: *Is it the same for most things? For example do you have libraries of good mathematical routines that everyone shares?*

FAINA: Yes. Every office—no, not every office—every programmer usually has their own library. I have one, too.

DATAMATION: *But do you get these from someone else, or does VUM send out those library programs?*

FAINA: We have two kinds of libraries. One kind is for general work, for integration or math functions; usually we receive a set of programs like that with the machine. But there is another kind of programs, of our own. For example, programs to output some documents.

DATAMATION: *A report writer.*

FAINA: Yes. Like that. And I put all the programs I used on a magnetic tape.

DATAMATION: *Um-hmmm, so that was your own personal library. And usually you didn't give your library to anyone.*

FAINA: I want to say, that I *can't*, I ...

LEONID: Once she tried to give it to her manager, but he didn't want it.

DATAMATION: *Didn't want it? That must make it very difficult, if everyone must write the same programs. Tell me more about what it was like to be a systems analyst or programmer in the Soviet Union. Did you work long hours? Did you have much interaction with other people? What can you think of?* [...long interchange in Russian, very long this time...]

FAINA: I must tell you that there are better conditions here than in Russia. In Russia we had no such position, exactly, as analyst. We had people who dealt directly with the customers. We called these people "postanovschik." They would describe—only describe—the problems to be solved. I developed an algorithm and wrote the programs myself.

DATAMATION: *But you didn't state the problem, you didn't talk to someone to find out what the problem was?*

FAINA: I couldn't see what the problem was, but still I did part of the work.

DATAMATION: *Let me ask another kind of question. When you are a systems analyst or a peripherals designer in the U.S., it is very easy to move from one job to another, or from one state to another, one company to another. Is it very easy to do that in the Soviet Union?*

FAINA: No. Certainly not to another town.

LEONID: In Russia, there are a lot of things that would be difficult for you to understand in America. For example, we cannot change our apartment as easily as American people do. There is a special pass, and we can't get it. It is difficult.

DATAMATION: *I'd like to know something about what data processing professionals in the U.S.S.R. are exposed to, what they know of data processing in other countries. What publications do you see?*

LEONID: We get a lot of journals. We have a special institute which prepares publications in different fields, especially in computers, management, electronic design. We can get a lot of these journals. I can read the abstracts, and I can get the original journal—*Datamation, Communications,* or *Spectrum,* for example—and get these articles translated for me.

STELLA: And there are technical libraries, in each town.

DATAMATION: *I would have thought that Soviet dp professionals would know technical English, at least as it has to do with data processing, because so much dp documentation is in English. And in fact, the programming languages probably are in English, aren't they? The commands you use probably came from English—words like "Move," "Clear," or "Add."*

FAINA: We have different compilers. My machine, the Minsk 32, used Russian COBOL. Others, like the ES series, used English COBOL. And there was only the English FORTRAN, only the English assembler, PL/1, and so on.

DATAMATION: *You had a Russian language assembler? Or did you have commands like "CLA" for clear and add?*

STELLA: Yes, it was all English.

FAINA: Only COBOL, only one special language version. And we get only English messages in our operating system.

DATAMATION: *Now, tell me, do you know about people in the U.S. and Europe who do good work in systems analysis? Jerry Weinberg is well known for thinking about computing and computing problems; he wrote* The Psychology of Computer Programming. *Ed Yourdon is another famous American systems analyst. Kit Grindley is English, and so is Michael Jackson.*

FAINA: We usually study translations, like Starkman and Moc? Marc . . .?

DATAMATION: *McCracken?*

FAINA: Yes, McCracken, and Stabley, Katzen, and Germaine.

STELLA: The first book we began studying on the IBM 360, was by Starkman.

DATAMATION: *You seem to know the names of some of the people who did the documentation, and wrote textbooks, but not some of the others who are equally famous. Does this mean that you do not see as much of the writing in English for systems analysis and programming as you see in engineering or other technical subjects?*

LEONID: It's true. We see translations on computer subjects only five or six years after they are available in English, but in my field, electronics, abstracts and translations are prepared very quickly.

DATAMATION: *How important are people like yourselves in Soviet society? Are systems analysts considered very important? Are they respected? Are you paid more money than other people?*

LEONID: It depends on the qualifications of the person, how many years he has worked in this field, and also on whether the office he works in is a military office.

DATAMATION: *That means if I'm a programmer, how much I am paid would depend on all those things. But is a programmer paid more than an engineer?*

LEONID: No, it's comparable.

DATAMATION: *What about a doctor, a medical doctor?*

LEONID: Comparable, usually the same. Only those people who have PhD's, or managers responsible for many people, or especially well qualified people—their salaries are higher. Engineers in all fields are usually paid from 100 to 200 rubles. [The official exchange rate is $1.45 to a

ruble. The *un*official rate is from $0.20 to $0.37.]

DATAMATION: *What about people who are not educated, who don't have degrees —the computer operator, or the laborer, or secretary? Do you have secretaries?*

LEONID: Yes, we have. For all those people, it is very difficult. Their salaries are very low, from 80 or 90 rubles a month.

DATAMATION: *Okay, so that tells me that if I'm a data processing expert, I'll be paid more than some other people, but I'm not rich either. I don't have cars and a swimming pool. . . Do you know what "status" means? What kind of status would people like you have?*

LEONID: The Soviet Union's society is a class society. There are several big classes: the workers, the agricultural people, and the intelligentsia. Data processing specialists, engineers, we are in the intelligentsia. Three big classes.

DATAMATION: *How different are the workers and the farmers? Are those classes paid about the same?*

FAINA: More.

DATAMATION: *More than whom?*

LEONID: Workers and farmers are paid more than engineers. And they are paid about the same as each other. It depends.

DATAMATION: *The salary of the worker depends on how much he produces?*

LEONID: Yes, how much he produces, and his qualifications. Sometimes it depends on the quality of his work, not the quantity.

DATAMATION: *How high would the salary of a qualified worker be?*

LEONID: 200, 250 rubles.

FAINA: And 300 too.

LEONID: Well sometimes. Not usually. A good kind of worker, a qualified worker, is like a PhD. But it's easier, in Russia, to be a worker than an engineer.

DATAMATION: *Less trouble?*

LEONID: Sure.

DATAMATION: *What about housing? Do you get different housing, different apartments or anything?*

STELLA: No, no.

LEONID: It's the same for workers and engineers, the same.

DATAMATION: *So your neighbor might be a worker?*

FAINA: Yes.

LEONID: I have friends who are workers; they are nice people.

DATAMATION: *You said you traveled on your job some, Leonid. What kind of traveling did you do?*

LEONID: Business trips to other institutes and laboratories. I traveled to Moscow, Leningrad, Odessa, Minsk. And manufacturing places, too. For example, for our peripheral device, the one we were working on, a laser facsimile receiver, we needed information on special kinds of film. It's like a thermal film, or Diazo. We called it Visikolor. And we needed non-silver halide film. So we'd go somewhere where they could produce it.

DATAMATION: *Do you have a patent?*

LEONID: Yes, for a laser facsimile, but it's not only my patent. I share it with two others.

DATAMATION: *Laser facsimile is very advanced. Would it be limited in application? That is, must you have a microwave medium to transmit laser facsimile across country? If you're in Moscow and want to send something by facsimile to Leningrad, can you do it?*

LEONID: Yes.

DATAMATION: *By laser facsimile?*

LEONID: No, not laser now; it's ink facsimile, using a pen. We're only working on the laser unit in our lab at the institute. We were building the device especially for the Ministry of Topology and Geography, for sending high resolution maps.

DATAMATION: *How big an image can you send?*

LEONID: Oh, big, maybe three or four feet square—a meter square.

DATAMATION: *Can they send color images?*

LEONID: We can prepare one negative for red, another for blue, and a third for green.

DATAMATION: *I see, and reproduce the color as we would for a magazine page, photographically.*

LEONID: We dedicate a computer to run the facsimile transmission, an ES 1040, the most recent.

DATAMATION: *The 1040 is the most recent machine? That's like a small 360, something over a Model 30. I thought they had a 1050, and 1060, and beyond.*

LEONID: Only on paper, not in reality. Not in hardware.

DATAMATION: *Let's consider data transmission for a moment. How good is the communications medium, especially the telephone system, in the Soviet Union? Can it handle your facsimile unit?*

LEONID: We use a special kind of cable. . .

DATAMATION: *Coaxial?*

LEONID: . . .coaxial cable between Moscow and several other cities, including Kiev and Leningrad. And for communication between Moscow and Vladivostok, for example, they use space.

DATAMATION: *Microwave?*

LEONID: Microwave satellites for transmitting newspaper, journals and general information.

DATAMATION: *That's in current use for newspapers?*

LEONID: Yes. We get the pages in Kiev, Leningrad, Vladivostok at the time they are ready in Moscow. We're also working on electronic mail, trying to use facsimile for telegrams. But is isn't ready yet. The Soviet Union does use terminals, with modems, for communications, but very often they have foreign equipment, not their own. In facsimile, they may have their own equipment and, in parallel, some from West Germany, Japan, England.

DATAMATION: *What can you tell us about other peripherals, printers for example?*

LEONID: In our last model, the ES computer, we use a Polish printer with a print train. But the black material for the paper. . .

DATAMATION: *The ribbon?*

LEONID: Yes, the ribbon, it's frequently out of order. They can't get the ribbons, and so the computer is down.

DATAMATION: *I have heard that disks are a big problem—they are unreliable, or can't store much data. Is that true?*

LEONID: No, they are not a problem. In the ES, or Ryad, computers, the problem was cooperation. The magnetic head is produced in Poland; the Russians couldn't produce good read heads.

DATAMATION: *It would be interesting to know what things are in common use. Most* DATAMATION *readers would like to know how fast the printers are, how much the disks store. What do they use for input most of the time?*

STELLA: Usually, in my plant, we prepared input on paper tape.

FAINA: And also perfocards.

DATAMATION: *Punched cards?*

FAINA: Punched cards. We call them "perfocards."

DATAMATION: *This seems to be one basic way that the Socialist countries are different from the rest of the world, in their use of paper tape especially. Paper tape died out as a primary input or output medium in the U.S. by about 1960. We still use punched cards, but usually not paper tape.*

FAINA: In my office, it depends on how much data you have. If there is a lot of data, we usually use paper tape. If not very much, we might use cards. We don't have such good equipment for punched cards.

DATAMATION: *How is most of the processing done? In batch mode? On-line?*

FAINA: Usually, after I had my input punched, I ran my program when they gave me machine time. And if my program stopped, another programmer could use the machine while I went back to correct any errors.

DATAMATION: *We'd call that batch processing. Is some work also done through terminals?*

FAINA: No, usually through batch processing.

DATAMATION: *Well, batch processing and on-line processing are one way to measure the state of the art of computing in a country. Another way is by the applications. Right now we have a very great interest in data base applications, using very large data bases, and the kind of programming you do to use data bases is slightly different. Do you understand our concept of data bases?*

FAINA: Yes, we have the same concept.

DATAMATION: *What other kinds of applications or concepts are most important, given the highest priority there?*

LEONID: I think that manufacturing automation is very important to them now, and not only the automation of manufacturing, but also of design, engineering research, and control systems.

DATAMATION: *Specifically, how much are they doing in computer-aided design? Say that you have a display and a light pen and you are building a part. Can you picture that part? And turn it? Expand it? Change it?*

LEONID: Yes, yes. We use those systems for manufacturing design drawings, architectural drawings, and for manufacturing solid state circuits...

DATAMATION: *In two dimensions?*

LEONID: Three dimensional. One system has three displays. And the engineer sits near the keyboard. All of the displays have light pens, and the designer can put whatever he wants on the screens.

DATAMATION: *If he changes something on one screen, is it automatically changed on the others?*

LEONID: Yes. It's a nice system.

DATAMATION: *Very nice.*

LEONID: And when the designer finished the drawing, he can have a hardcopy on an output device. More than that, the system may be connected to a manufacturing automat, such as for solid state circuit manufacturing. There are special programs which can design the electrical schematics and build the product.

DATAMATION: *The plot.*

LEONID: The real thing. The circuit. But there are not many such systems, maybe two or three in all.

DATAMATION: *After manufacturing automation, what is the next most important application area?*

LEONID: I think financial or economic cybernetics.

DATAMATION: *Do they do anything in computer-aided instruction, teaching machines?*

LEONID: Yes, even machines that teach another machine.

DATAMATION: *What is the biggest limitation to the increased production of computers in the Soviet Union?*

LEONID: Hardware. Technology.

DATAMATION: *But you have very good manufacturing. You're paying a great deal of attention to manufacturing automation...*

LEONID: In the institutes.

DATAMATION: *Why don't they build more? Are there too few trained people? What stops them from saying, "In our next five-year plan, we will build 20 more computer factories."*

LEONID: It's an economic problem. It takes a lot of money.

DATAMATION: *In some fields they spend far more than we do, such as defense.*

LEONID: The military field gets everything it needs.

DATAMATION: *But computers are key to military applications.*

LEONID: But there are differences in computers for military purposes and for general purposes.

DATAMATION: *Some differences. Airborne computers are different, but tactical computers on the ground aren't that much different.*

LEONID: In manufacturing these computers, the difference is in detail, in treatment, in special quality.

DATAMATION: *That's the same as here. But there are many similarities between military and civilian computers.*

LEONID: And there are a lot of military computers that we don't see at all, and don't hear about. They are built in special institutes, at plants that build only for the military.

DATAMATION: *What about software? Do they buy programs?*

STELLA: I hear that there are maybe two places where there are Amerian-made computers, in Kiev, and they have American disks, with software.

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Minicomputers are copies of DEC and HP systems.

DATAMATION: *Is there any software industry? Where someone has an idea for a program, writes it, and tries to sell it? Does that ever happen?*

LEONID: Often. We have special associations of users. And they know where the software is for that kind of computer.

DATAMATION: *Do they have conferences?*

LEONID: Yes.

DATAMATION: *But only for the users of one kind of computer? Or would all computer users have a meeting?*

LEONID: No, because the languages are different, and they're specialized. The MIR line is specialized for engineering and scientific tasks. Minsk is for business and economic tasks.

DATAMATION: *The ES?*

LEONID: The ES is general purpose, the most powerful.

DATAMATION: *BESM?*

LEONID: That's for scientific, for fast solutions of large problems.

DATAMATION: *What about the Dnieper?*

LEONID: Oh, this is a very old machine, quite general. It controls the manufacturing.

DATAMATION: *Like numerical control, or process control?*

FAINA: Process.

DATAMATION: *What do they have in minicomputers?*

LEONID: I am not familiar with this work, but I know they discuss it and it's considered a big problem, which way to go.

DATAMATION: *Which way? Minicomputers have been around a long time—just integrated circuits, small size, perhaps large memories, 64K or 128K. You mean they haven't figured out how to go into minicomputers? Or do you mean microcomputers?*

LEONID: Minicomputers. But they have some copied from PDP machines.

DATAMATION: *Oh, DEC computers.*

LEONID: Yes, also copies of Hewlett-Packard.

DATAMATION: *Are there many installed? Are they building minicomputers very rapidly?*

LEONID: Not very rapidly. For special applications, for research in medical technology, experiment control, research.

DATAMATION: *But not so much for general purpose application?*

LEONID: No.

DATAMATION: *What about microcomputers?*

LEONID: I don't know. I know that we tried to prepare an optic computer, however, with fiberoptics and lasers, but only in a research lab.

DATAMATION: *Do they use fiberoptics for anything?*

LEONID: Sure, for telecommunications, for facsimile devices, and they have a special display with fiber optics. You have such things, too.

DATAMATION: *Do people use microfilm a great deal in the Soviet Union?*

LEONID: Yes, and microfiche...and the device I built for facsimile is also for microfilm.

DATAMATION: *What about office copiers, like a Xerox machine?*

LEONID: Yes, but not of as high a quality. And it's a funny thing; we don't have as many copiers because they can be used for political purposes.

DATAMATION: *Did they do much in optical reading or voice recognition?*

LEONID: Yes, they had a reading automat, with a reading head that was a matrix of photodiodes and a light beam. But the software was very difficult. They stored a prototype of each character and had to compare each character read with what was in memory. It took a dedicated machine. Voice recognition is still in the experimental stages.

DATAMATION: *Were there laboratory developments of things you haven't seen in the U.S., that we don't have?*

LEONID: I don't think so. Because of the distance between Russia and the United States, 10 years, or 20 years, especially in hardware.

DATAMATION: *Is there a shortage of data processing personnel in Russia? Here we seem to have more jobs than we have qualified people to fill them—even though there is unemployment in other fields.*

LEONID: Yes, the Soviets need a lot of programmers. It's a very fast growing field.

DATAMATION: *It seems that you three won't have great difficulty in finding jobs in the U.S. Faina has already found a job, isn't that right?*

FAINA: With Velsicol [a chemicals manufacturer in the Chicago area].

LEONID: I'm not as optimistic as my wife, because of my field. The distance between the U.S. and Russia in hardware technology is very great, so I may have to be a simple designer or simple engineer for some time, to advance my technical knowledge.

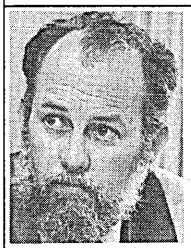
DATAMATION: *It will be easier for you, won't it Stella? You can learn IBM assembly language easily.*

STELLA: I already know it.

LEONID: And there are so many opportunities. I was very surprised when I first looked at the *Chicago Tribune* and saw so many advertisements for jobs, more than 60 pages! ✲

Since the time of our conversation, Stella has had several job interviews; she expects to be working for a Chicago area college very soon. Faina seems quite happy at Velsico. Leonid, despite the many pages of classifieds in the Tribune, *and despite his superior language facility, continues to have more difficulty finding employment, probably due to the relative narrowness of his specialization. All three are settled comfortably in the Chicago suburb of East Rogers Park, which they feel is "not so much like a European city, but more like a village."*

R.A. McLAUGHLIN



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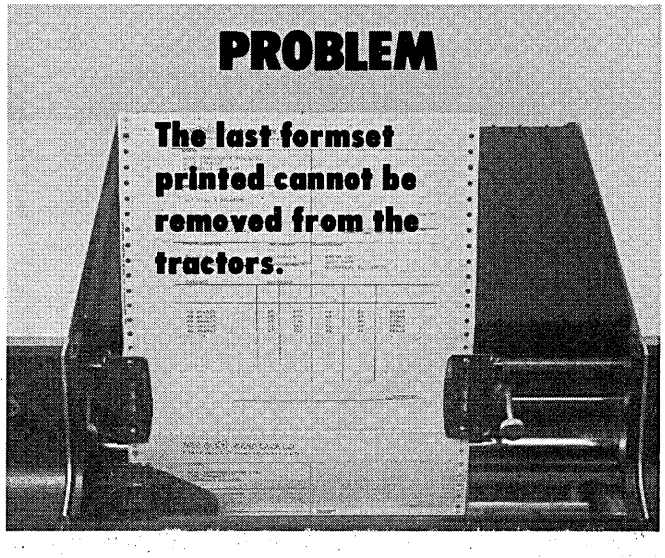

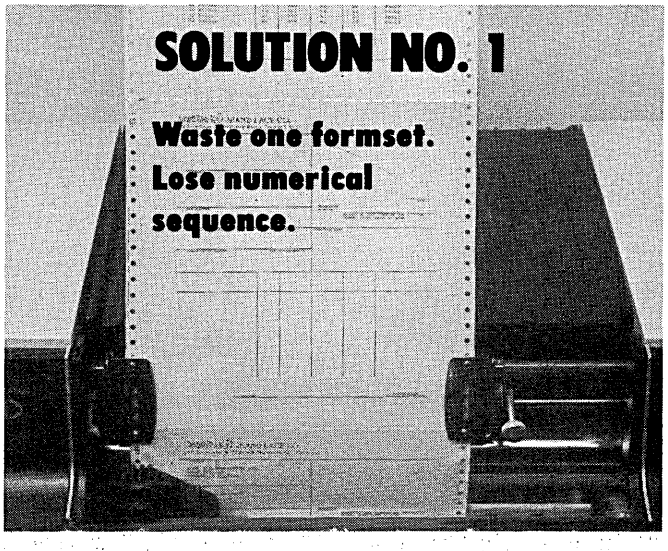

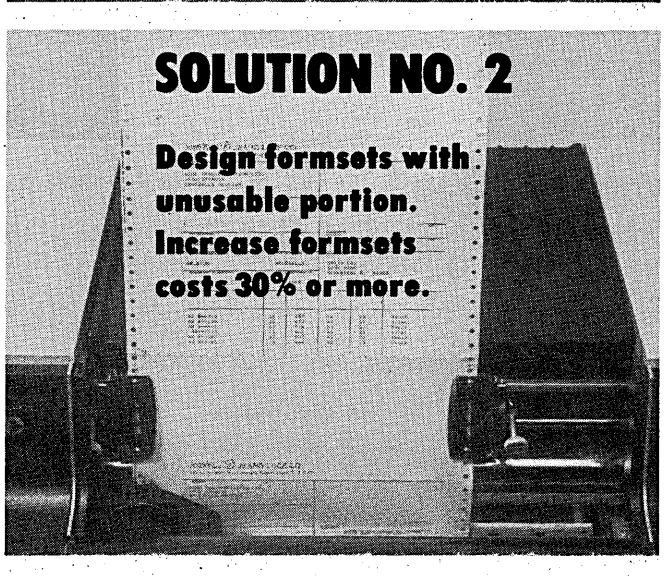

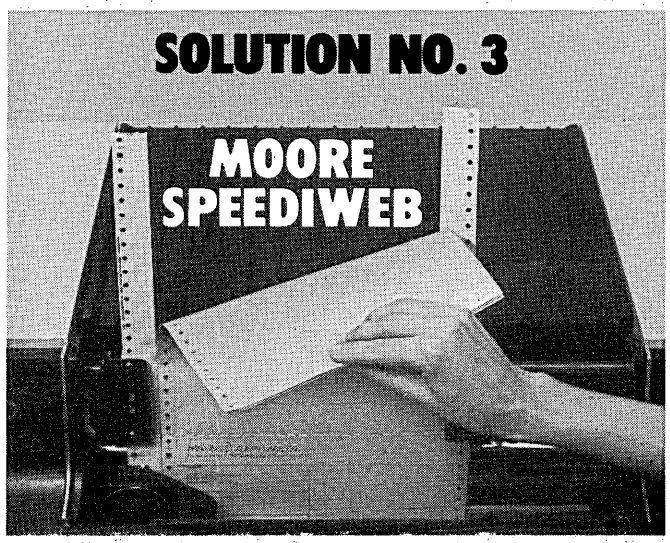

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- **SyncSort DOS is a "team player."** If you decide to move from DOS/VS to OS/VS, you won't have to shake up your lifestyle. Because all those labor-saving features you got used to in DOS are included in SyncSort OS. Things like INCLUDE/OMIT, SUM and OUTREC.
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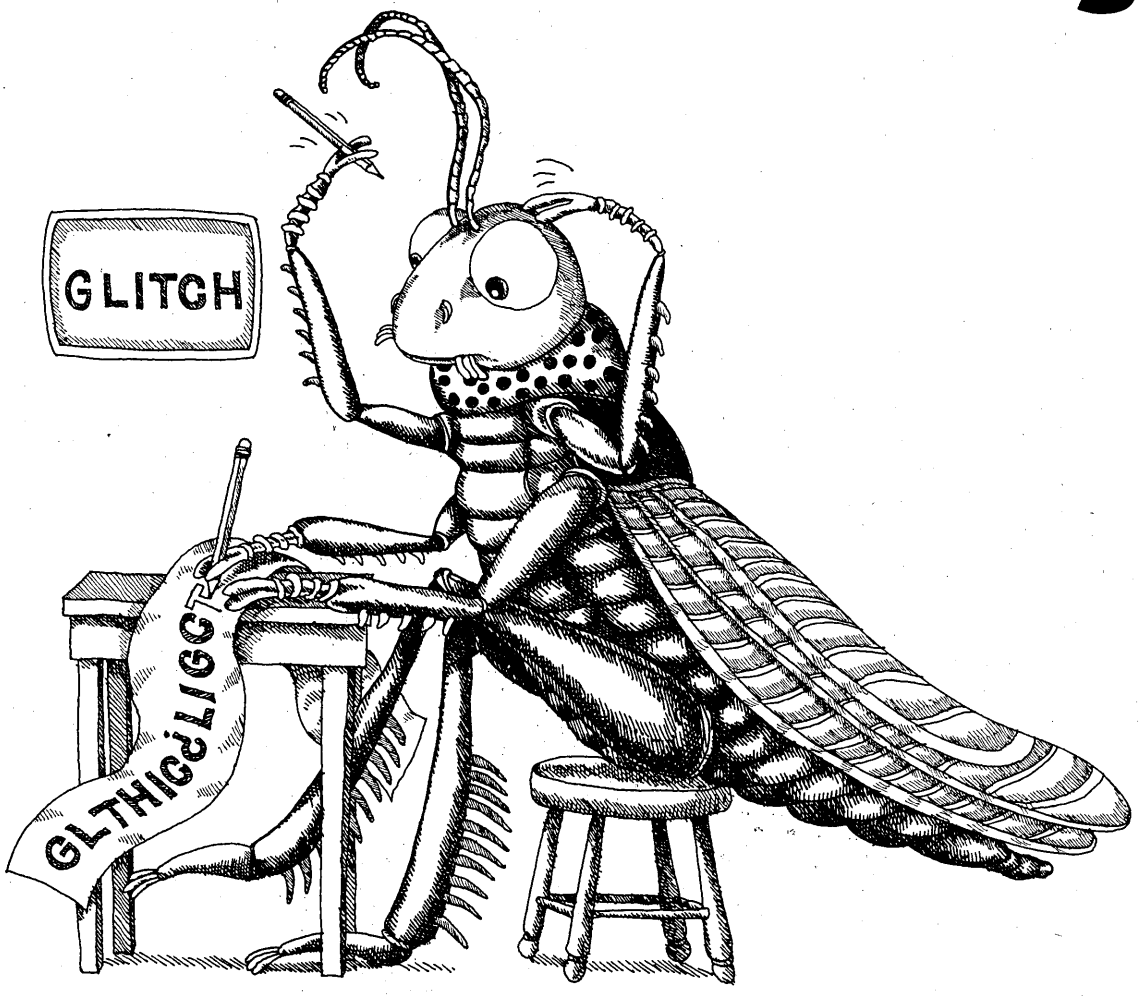
CIRCLE 149 ON READER CARD

The Read/Write Error Bug.



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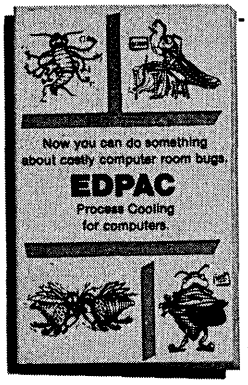

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CIRCLE 4 ON READER CARD

More frequent energy shortages will mean more problems for dp and wp equipment users. Enlisting the aid of utility companies will help decrease the damage.

MINIMIZING POWER PROBLEMS

by Henry H. Petersohn

Can the utility company be counted on to protect dp and wp operations from damage and disruption due to power problems?

The question will be increasingly important in the United States during 1979-80, as shortages promise to be much more severe than in previous years.

The spare generating capacity of utility companies is fast diminishing. The utility companies' National Electrical Reliability Council announced months ago that construction of new generating plants was insufficient to meet normal increases in electric consumption. Building new power plants is a long process—typically 8 to 15 years.

Because of the Three Mile Island incident, nuclear fueled generating plants in Massachusetts, Virginia and Pennsylvania have been closed, and other nuclear fueled power plants are being shut down with little or no public notice. Oil fired generating plants might normally be expected to supply the missing kilowatts; however, oil itself is in tight supply with refineries allocating gasoline and both federal and state authorities concerned about plans to ration gas. Existing coal fired generating plants do not have the capacity to fill the gap.

Shortages in overall supplies of power will intensify the effects of power quality deficiencies.

What is the responsibility of the utility company in providing power? What are your responsibilities as a power user? Where responsibilities are not clear, what can and should a computer center or a word processing center expect in the way of advice to minimize power induced problems?

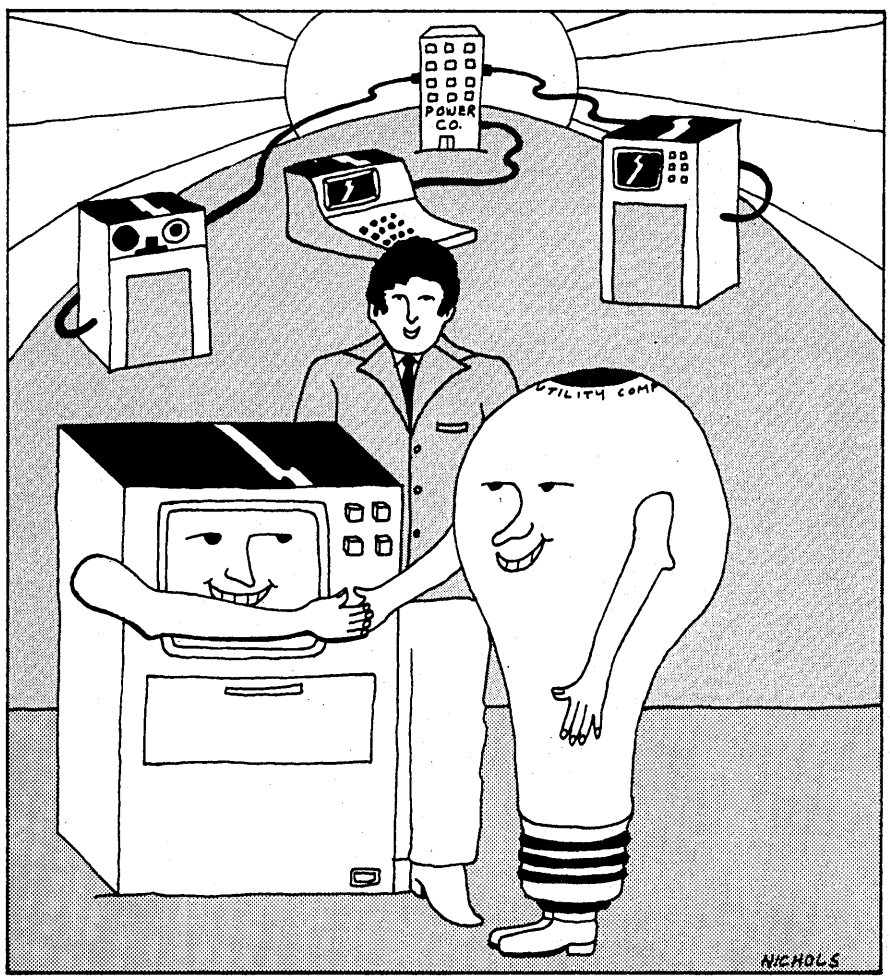
I will outline five areas in which utility companies might be asked for assistance.

1. Advance notice of brownouts could be provided.

Find out the present policy of the local utility company regarding advance notification of brownouts. Advance notice is rare, often consisting simply of televised warnings that tomorrow's heat might be worse than today's and some unspecified voltage reduction might be necessary. Perhaps one reason power companies shy away from providing advance notice of brownouts is that such predictions could make the utility company legally responsible if a brownout didn't occur or if an unpredicted one did occur. Predicting tomorrow's maximum temperature profile is inexact at best. Also, attempting to provide advance notice would require a trained staff with a list of contacts for all computer centers. Then there are the potential hard feelings of customers not notified. Other power users believe *they* have critical needs. Can one group of customers be notified and not another?

2. Power companies could tell users how to cope with brownouts.

In recent television and newspaper interviews electric power company representatives were asked to tell how they will cope with short supplies in their area due to the closing of nuclear generating plants. Their responses included comments to the effect that they will buy power from somebody else or may institute



rotating brownouts.

With nuclear power plants closed, there may be no power to buy. Rotating brownouts may be inconvenient for us as home owners and apartment dwellers, but as computer center managers and staff, our businesses may be shut down.

Find out if your electric company has a plan to cope with power shortages. If it does, find out if you can get a copy or at least pertinent extracts. The plan may simply state that they will produce power according to the state P.U.C. tariff, which may specify only best efforts as judged by the utility company. Put your request for information in writing so that it is not lost or misunderstood. Read their response and consider how their present plans hurt or help your organization.

The utility company must be told in advance about the effects of brownouts and other power problems on your computer center. Telephone calls are not remembered. A letter in needed. Suggest changes to the power company that will help your operation and get their response. Perhaps your less critical equipment can be shut down by prearrangement to avoid a brownout. Remember, utility companies are sensitive to public opinion and do not want to antagonize a vocal and influential customer.

3. Utility power to the building could be improved.

Electric company power mains to buildings aim at complying with NEMA, NEC and other codes and standards. Do these standards recognize the special quality needs of computing equipment? The obvious answer is that these standards are not adequate for computer equipment, since so many manufacturers are selling a host of power regulation and protective equipment. Local power—even in new buildings—may be inadequate. Check your computer or word processing manufacturers for more information. IBM, Univac and some other vendors provide special booklets about power planning and improvement. Don't hesitate to ask your building engineer to provide more detailed information on the quality of power you actually receive. It may be necessary to hire a consulting engineer to appraise the quality of power in the building.

The problems of marginal and/or unsatisfactory building power are not likely to improve without strong user effort. If the utility company is at fault it will cooperate, but electric utilities' costs to increase power quality may be very high, and computers, terminals and word processing equipment are small power uses compared to total power supplied by a utility.

Another complicating factor is that other power users in the building may cause quality problems, either by sudden demands for power or by creating noise that circulates through all the power lines in the building.

4. Computer center power problems can be corrected.

Power supplied by the electric utility varies in quality from place to place although it commonly meets a minimum standard. This power company standard, however, will not always meet the needs of the computer user.

Serious problems at the utility company are reflected at the customer's premises and are acted upon promptly. Minor power anomalies such as switching transients and slight brownouts can originate at the power company, on its distribution lines and from power users. These minor abnormalities are commonly ignored because they are so numerous and are considered acceptable by the utility company.

Utility company expertise is devoted to meeting power company standards, not the more stringent computer requirements. As a result, the utility company may not have the instruments to define computer center problems. The utility company engineers may be ignorant of the subtle power improvements needed by the computer user. The utility company may not be staffed to provide advice to computer centers and may believe that this service is beyond its responsibility. In fact, it may ignore the issue because of potential legal liability or damage to its image.

At best, the utility company is a dubious source of advice on computer grade power. Frequently, advice is available from power protection equipment vendors. The computer manufacturers may also be able to give advice, although they may downplay the issue to avoid taking legal responsibility for equipment performance. (Indeed, there have been some contracts in litigation because of question on power quality and requirements.) A qualified independent consultant may be the best source of advice.

5. Plan for improved future power.

What can the computer center do to ensure that good power will be available and expensive failures avoided? The commonplace answer is buy equipment. This is typical knee-jerk reaction reflecting the fact that power is a complex area to analyze. This reaction may be as bad or perhaps worse than the ill it supposedly cures.

The most sensible approach to protecting your computer is to work with the utility company as part of a logical plan that leads to timely cost-effective results. Here is an eight-step plan adapted by permission from *Computer Failure and Energy Shortages* by Henry H. Petersohn, 1979, The Technology Press, Inc., Box 125, Fairfax Station, VA 22039:

1. Establish the parameters of the problem. Quantify the apparent costs and effects. Provide a written problem statement.

2. Obtain an engineering verifiation. Be certain that the problems are actually power induced. Are the parameters realistic?

3. Prepare an initial cost-benefit analysis for management. A decision to take action makes good sense if you save dollars. It's an extravagance if the action is simply "keeping up with the Joneses."

4. Obtain a management decision. Problem solving costs dollars and takes time. Be certain that management wants to study and solve the problems.

5. Request engineering recommendations on alternative solutions. Hasty purchase of equipment can be a costly folly. Competent advice can save many times its cost in determining what, if any, equipment is needed.

6. Revise the initial cost-benefit analysis. The most cost-effective alternative can only be determined if precise figures are used.

7. Commission a formal engineering plan for implementing the preferred solution. If equipment is needed, installation costs will be minimized with good planning. Although the document is primarily an engineering plan, management, data processing and other knowledgeable parties should contribute.

8. Request a management decision based on a review of the power study. Circumstances change between the start of a power study and its conclusion. Top management may have important long-term objectives to consider. They should have an opportunity to optimize the proposed plan while lending official support. ✱

HENRY H. PETERSOHN

Dr. Petersohn's 20 years in the dp field include work in management and applications analysis and design. He does consulting work in the areas of general management and dp, including data communications, dp operations and dp power.

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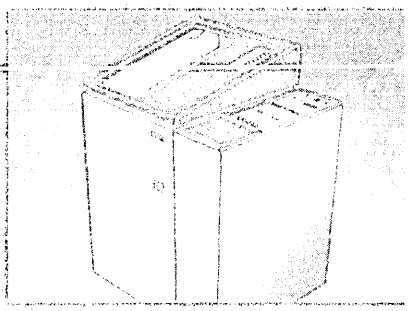

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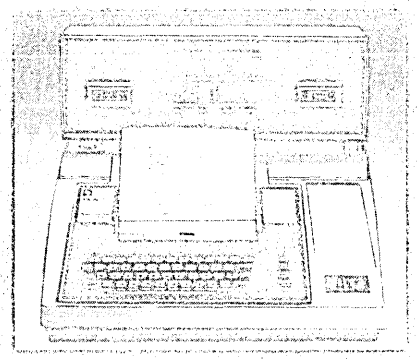

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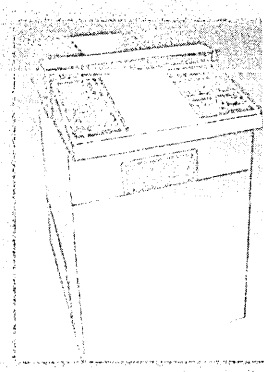

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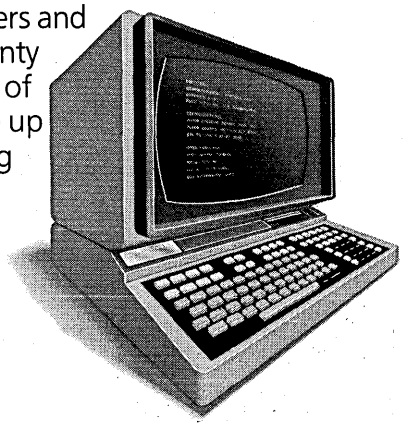
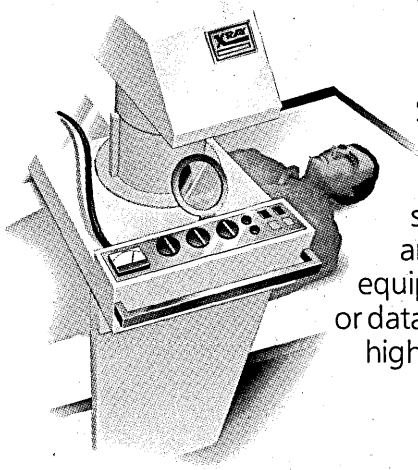
CIRCLE 75 ON READER CARD

How to avoid the sines of trouble...

Electrical and electronic equipment—computers to N/C machines—must be operated at rated voltage for peak performance and reliability. Fluctuating power can cause erratic operation and damage components. Equipment failure, substandard operation and reduced equipment life are the result.

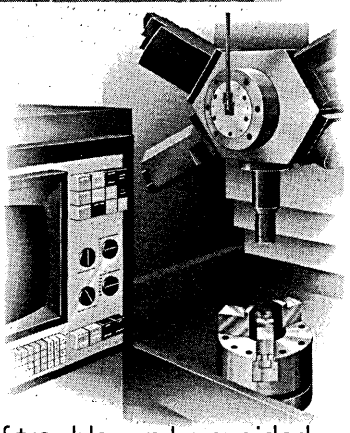
The sensitivity of computers and peripherals can cause plenty of headaches. The inrush of start-up current can spike up to ten times the operating amperage. Memory and programs are lost, schedules jammed and hardware damaged.





Sudden increases and decreases in voltage spell trouble for sensitive X-ray, diagnostic and patient monitoring equipment. Fogged plates or data error can result from high frequency transients.

Numerically controlled machines are subject to line voltage fluctuations in the power distribution network. And they operate in an electrically noisy environment. Equipment damage, production problems and downtime are the common result.



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CIRCLE 100 ON READER CARD

The new standard adds structured programming and generally simplifies the programmer's task.

THE NEXT COBOL STANDARD

by Robert Fried and Robert McKenzie

The COBOL language is about to take another step forward in its continuing evolution. Before the end of 1981, we can expect a new American National Standard COBOL to replace the current 1974 standard. The next standard will contain important changes and additions to the 1974 language, just as the current standard significantly enhanced COBOL 68. There will also be some deletions. And not all of the changes described here will appear in the next COBOL standard; some of the changes may be rejected as the ANSI COBOL Committee (X3J4) continues its work.

Computer manufacturers and others will develop compilers to meet the new standard. (Presumably, some are working on their compilers now.)

Not every compiler will have every feature. The standard contains several modules, and it describes the features of most of them in levels. Compiler developers can (and will) choose to include some modules and not others, as they have in the past.

Most vendors also include extensions to the standard in their COBOL compilers. The extensions often reflect special features of a vendor's hardware, operating system, or other system software. But we can also expect some compilers to continue supporting items deleted in the revision of the COBOL standard.

Possibly the most important addition to COBOL is structured programming. It allows the programmer to explicitly delimit a statement in the Procedure Division. This feature can simplify COBOL coding that previously required additional GO TO statements and procedure names.

The example below shows the READ and IF statements using structured programming. The statements after END-READ are executed regardless of whether the AT END condition occurs. Similarly, the MOVE after END-IF is executed regardless of the value of FILE—END.

```
IF ITEMA = ITEMB
   READ FILE-A AT END
      MOVE 1 TO FILE-END
      CLOSE FILE-A
   END-READ
   MOVE ITEMB TO ITEMC
   IF FILE-END = 1
      DISPLAY ITEMC
   END-IF
   MOVE ITEMD TO ITEME.
```

The following verbs have structured programming delimiters:

ADD	RECEIVE
CALL	RETURN
COMPUTE	REWRITE
DELETE	SEARCH
DIVIDE	START
EVALUATE	STRING
IF	SUBTRACT
MULTIPLY	UNSTRING
PERFORM	WRITE
READ	

PERFORM has been changed to allow in-line PERFORM statements similar to DO WHILE or DO UNTIL in other languages. In the example, if the first occurrence of ITEMB is not equal to "X": (1) the in-line PERFORM statements are executed, moving an "X" to the first 10 occurrences of ITEMB; then, (2) the message is displayed.

```
IF ITEMB (1) NOT = "X"
   PERFORM
      VARYING ITEMA FROM 1 BY 1
         UNTIL ITEMA < 10
      MOVE "X" TO ITEMB (ITEMA)
   END-PERFORM
   DISPLAY "ARRAY INITIALIZED"
```

The new EVALUATE statement adds a CASE capability to COBOL. In the first example, 1 is moved to REGION if OFFICE equals "A01", 2 if OFFICE is in the range "A02" through "C16", and so on. If there is no matching value, 0 is moved to REGION.

The second example shows how EVALUATE can be used with more than one variable, as in a decision table. (See Table 1. The reserved word ANY tests TRUE for any value.)

The new CONTINUE statement transfers control to the next executable statement. It can take the place of a conditional or imperative statement. In the example, the MOVE statement is executed regardless of whether the READ detects end-of-file:

```
IF NEED-RECORD
   READ FILE-A AT END
      CONTINUE
   END-READ
   MOVE ITEMA TO ITEMB.
```

Changes in interprogram communication simplify the programmer's attempts to write modular programs:

- Programs can now be contained in other programs.
- The PROGRAM-ID paragraph can identify a program as INITIAL or COMMON. INITIAL causes the program and programs in it to be initialized every time they are called. COMMON allows a program to be called from outside the program that contains it.
- Data can be declared as EXTERNAL; other programs in the run unit can

```
EVALUATE OFFICE
   WHEN "A01" MOVE 1 TO REGION
   WHEN "A02" THRU "C16" MOVE 2 TO REGION
   WHEN "C17" THRU "L86" MOVE 3 TO REGION
   WHEN "R20" THRU "R99" MOVE 4 TO REGION
   WHEN OTHER MOVE 0 TO REGION.

EVALUATE LOW-STOCK WEEKLY-USE LOCAL-VENDOR ON-ORDER
   WHEN "Y", 16 THRU 999,  ANY, "N"   GO TO RUSH-ORDER
   WHEN "Y", 16 THRU 999,  ANY, "Y"   GO TO NORMAL-ORDER
   WHEN "Y", 8 THRU 15,    "N", "N"   GO TO RUSH-ORDER
   WHEN "Y", 8 THRU 15,    "N", "Y"   GO TO NORMAL-ORDER
   WHEN "Y", 8 THRU 15,    "Y", "N"   GO TO NORMAL-ORDER
   WHEN "Y", 0 THRU 7,     ANY, "N"   GO TO NORMAL-ORDER
   WHEN "N", ANY,          ANY, "Y"   GO TO CANCEL-ORDER
```

Table 1.

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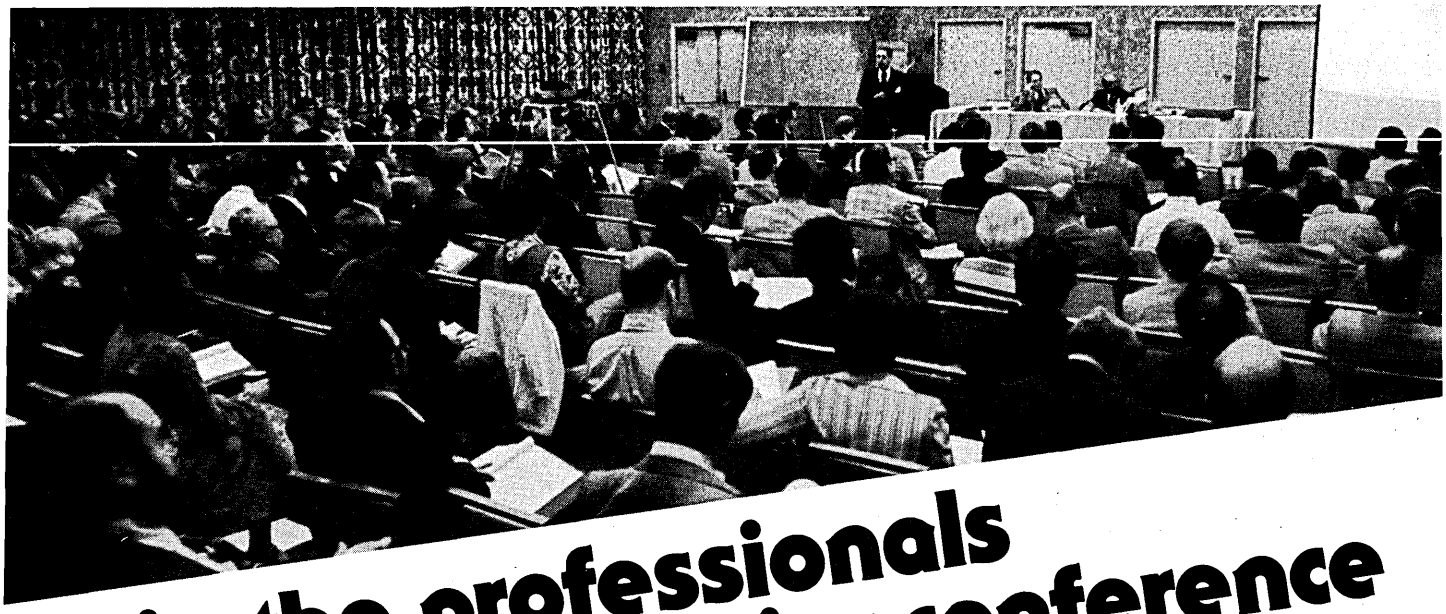

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Evolution of the New Standard

COBOL development is a continuing process. The COBOL Committee of CODASYL continually reviews and acts on proposals to update the COBOL language. The Committee periodically publishes a *Journal of Development* (JOD) to document its development of the language. The latest version of the JOD was published in January 1978.

Last year, the ANS COBOL Committee (X3J4) took this version of the JOD and the 1974 standard as the basis for its revision. Since then, it has been reviewing the elements of COBOL on an item-by-item basis, working toward the next standard.

For each item (and deletion) in the JOD, ANSC X3J4 decides to include it as written, recommend changes to the CODASYL COBOL Committee, include a subset of the item, reject the item, or include the item as it was described in the 1974 standard.

In addition, ANSC X3J4 reviews proposals that the CODASYL COBOL Committee has adopted since publishing the JOD. ANSC X3J4 does not make additions to the language unless they are in the JOD. And it often includes more recent CODASYL changes if they clarify or solve problems in the JOD.

The COBOL language changes discussed here reflect ANSC X3J4's actions through May 1979. These changes represent the probable highlights of the next standard.

After ANSC X3J4 completes its work on the revision of the 1974 standard, it will submit a Draft Proposed American National Standard (dpANS) for comment by the user community. The dpANS and the procedures ANSC X3J4 followed in developing it are then reviewed by parent committees as part of their normal approval process.

Following approval, ANSI will publish its new American National Standard for Programming Language COBOL. *

then refer to it. A program can also have GLOBAL data. This data can be referenced by other programs contained in the same program.

- The CALL statement can pass data by CONTENT or REFERENCE. CONTENT causes the data itself to be passed to the called program. REFERENCE is the same mechanism used in COBOL 74.

Here is a list of new features that is not all-inclusive, but is intended to suggest the forward direction of the COBOL language.

- A new format of the RECORD clause explicitly specifies variable- length records. Also, a Working-Storage data item (LENGTH-A in the example) contains the size of a variable-length record after an input (or before an output) operation:

```
RECORD VARYING FROM
  50 TO 200 CHARACTERS
  DEPENDING ON LENGTH-A.
```

- Reference modification is a new way of referring to data. Statements can access part of a data item by specifying its data-name, a starting position, and a length. The examples in Table 2 show how reference modification works:

```
03   ITEMA   PIC X(15)   VALUE IS "ABCDEFGHIJKLMNO".
03   ITEMB   PIC 99       VALUE IS 10.
```

			Value Moved
MOVE	ITEMA	(2:3) TO ...	BCD
MOVE	ITEMA	(ITEMB:2) TO ...	JK
MOVE	ITEMA	(ITEMB/2:ITEMB - 6) TO ...	EFGH
MOVE	ITEMA	(ITEMB:END) TO ...	JKLMNO

Table 2.

- Boolean expressions, data items, and literals have been added to the language. The examples in Table 3 show the results of relational conditions using Boolean expressions:

```
03   ITEMA   PIC 111 VALUE IS B"001".
03   ITEMB   PIC 111 VALUE IS B"110".
03   ITEMC   PIC 111 VALUE IS B"111".
03   ITEMD   PIC 111 VALUE IS B"011".
03   ITEME   PIC 111 VALUE IS B"000".
```

		Value
IF	ITEMA OR ITEMB = ITEMC ...	TRUE
IF	ITEMB OR ITEMD = B"111" ...	TRUE
IF	ITEMB EXOR ITEMD = B"111" ...	FALSE
IF	ITEMA EXOR ITEMB = ITEMC ...	TRUE
IF	ITEMA EXOR ITEMB = NOT ITEME ...	TRUE
IF	ITEMB AND ITEMD = B"010" ...	TRUE
IF	ITEMA OR B"010" = ITEMD ...	TRUE

Table 3.

- The INITIALIZE statement sets selected types of data fields to predetermined values. It can operate on group or elementary items. In the example in Table 4, N/A means that the statement does not affect the data item:

			Statement 1 Value	Statement 2 Value	Statement 3 Value
01	ITEMA.				
	03 ITEMB	PIC XX.	spaces	N/A	spaces
	03 ITEMC	PIC 999.	N/A	012	000
	03 ITEMD	PIC $$,$$9.99.	N/A	N/A	$0.00
	03 ITEME	PIC 111.	000	N/A	000
	03 ITEMF	PIC 9(5).	N/A	00012	00000

```
1)  INITIALIZE ITEMB ITEME.
2)  INITIALIZE ITEMA REPLACING NUMERIC BY 12.
3)  INITIALIZE ITEMA.
```

Table 4.

Many of the enhancements to current features make it easier to write COBOL programs. Others extend the language to make it more powerful and versatile.

- The compiler must allow qualification to 50 levels; the 1974 standard requires only five.
- Tables can have up to 48 dimensions, rather than the three in COBOL 74.
- The alphabetic test now treats lower-case letters as alphabetic. For example, IF ITEMA IS ALPHABETIC is true if

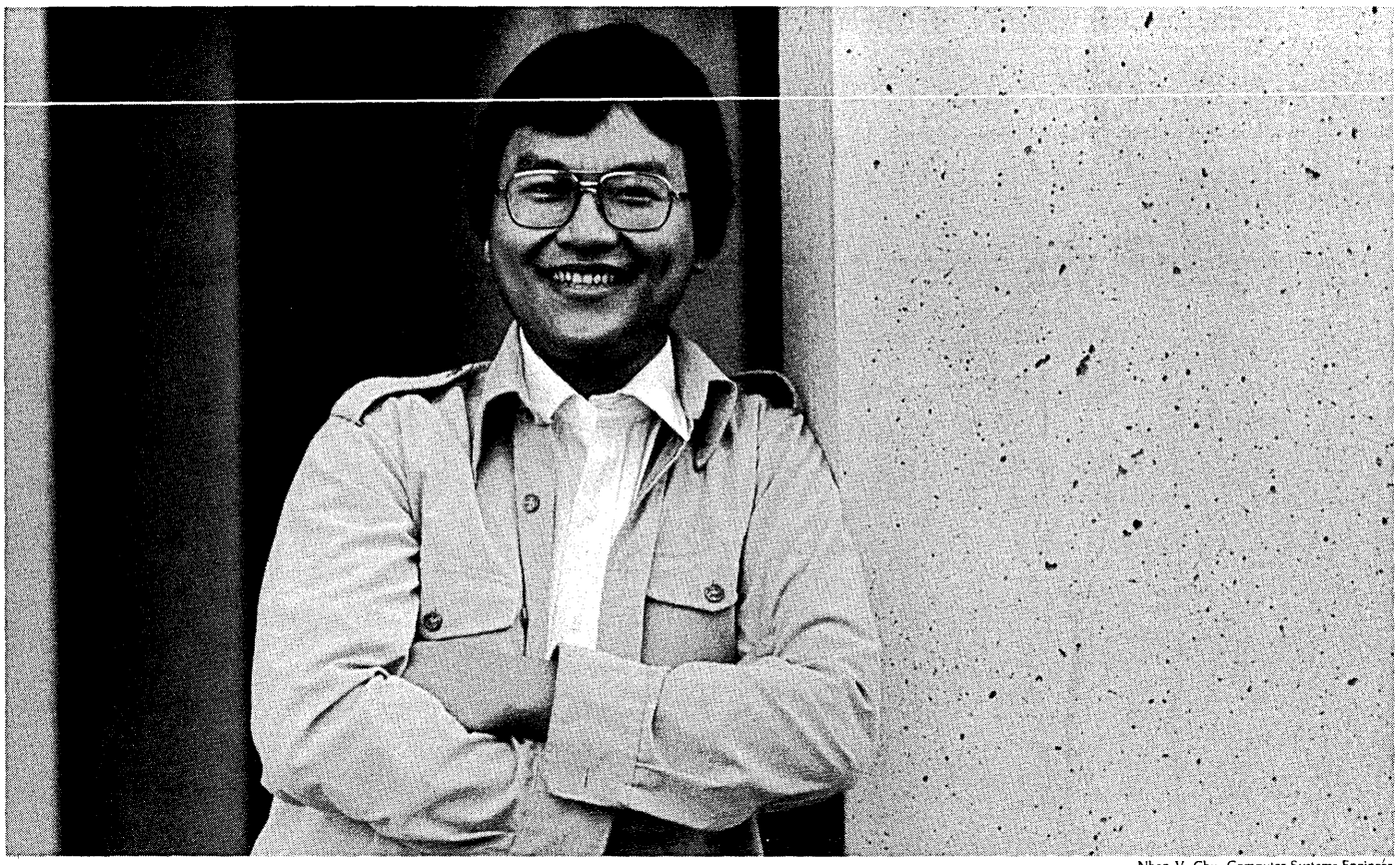
```
INSPECT ITEMA CONVERTING "IPRT" TO "MTAI".
INSPECT ITEMA CONVERTING "OPRT" TO "DBAC" AFTER
  INITIAL "I".
```

Result: "DATAMATION" / "DAPRIABCDN"

Table 5.

		Value Before	Value After
03	ITEMA PIC Z9/99/99.	9/01/79	9/01/79
03	ITEMB PIC 9(6).	??????	090179

Table 6.



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ITEMA contains "Massachusetts".

• The INSPECT statement contains a new format that replaces characters in a data item. It replaces the characters specified in one operand by the corresponding characters in another. In both examples in Table 5, the original value of ITEMA is "DAPRIRPTON":

• In the VARYING phrase of the PERFORM statement, the compiler can allow an unlimited number of AFTER...BY ...FROM...UNTIL phrases. In the 1974 standard, the limit is two.

• The MOVE statement now performs de-editing. A numeric edited item can be moved to a numeric item, removing the editing symbols. The example in Table 6 shows the results of executing the statement MOVE ITEMA TO ITEMB:

• In the OPEN statement, the EXTEND option now applies to relative and indexed files, as well as sequential. The I-O and EXTEND options create a file if it doesn't already exist.

• The SET statement can now change the value of a conditional variable. In the example, the SET statement is the equivalent of MOVE "NP" TO ITEMA:

```
03  ITEMA PIC XX.
    88    PROFIT-MAKING     VALUE "PR".
    88    NON-PROFIT        VALUE "NP".
    88    NOT-FOR-PROFIT    VALUE "NF".
SET NON-PROFIT TO TRUE.
```

The SET statement can also be used to change the value of external switches.

• The MERGE and SORT statements can now have multiple GIVING filenames.

• The SORT statement can now specify a stable sort: records with identical key values remain in the original order after sorting. The GIVING file-name can now refer to an indexed or relative file.

• The ACCEPT statement now has a DAY-OF-WEEK option. ACCEPT ITEMA FROM DAY-OF-WEEK stores the day of the week in ITEMA. The values 1 through 7 represent Monday through Sunday.

• The OPTIONAL phrase of the SELECT clause applies to indexed and relative files as well as sequential.

COBOL programs will be easier to write. Some additions will remove restrictions and requirements that exist in the current standard. They apply mainly to program punctuation and required entries.

• The comma, semicolon, and space characters can be used interchangeably. In the 1974 standard, the comma and semicolon can be used in some places and not in others.

• The Environment, Data, and Procedure Divisions are optional. In the Environment Division, the word IS is now optional (as it was in the other Divisions); and the Configuration Section is optional.

• FILLER is no longer a required word in data description entries; and FILLER can be used in a REDEFINES statement:

```
03 ITEMA PIC 9(10).
03 FILLER REDEFINES ITEMA.
   05 ITEMB PIC 99.
   05       PIC X(6).
   05 ITEMC PIC 99.
```

• The word THEN has been added as an optional word in the IF statement. It had been deleted in the 1974 standard.

• CALL statement parameters need no longer be 01 or 77 level data items. Any elementary item can also be passed as a CALL parameter.

• In the 1974 standard, user-defined words must be unique or capable of being made unique. The next standard requires uniqueness only if the word is referenced.

The next standard contains several changes and deletions that could require modifications to current programs. In some cases, ANSC X3J4 has included transitional items. These items will probably be deleted in later revisions; they are called transitional to warn against continued use. COBOL users can also use the transitional period to remove the items from existing programs.

Some of the deletions listed here may, of course, appear in some compilers as extensions to the standard.

• The ALTER statement is deleted.

• The REVERSED phrase of the OPEN statement is deleted.

• The Identification Division can no longer contain comment entries or the paragraphs:

```
AUTHOR
INSTALLATION
DATE-WRITTEN
DATE-COMPILED
SECURITY
```

Of course, comment lines (an asterisk in position 7) can contain this information.

• The MEMORY SIZE clause is deleted from the OBJECT-COMPUTER paragraph.

• The revision deletes the PICTURE character "A" and the category alphabetic for data items. The 1974 standard does not specify semantics for the alphabetic PICTURE. Therefore, this deletion requires only a minor change in current programs.

• The ENTER statement is deleted.

• The BLOCK and CODE-SET clauses are moved to the SELECT statement. However, they can continue to be used in the File Description Entry for transitional purposes.

• The ACCESS MODE, RECORD KEY, ALTERNATE RECORD KEY, and FILE STATUS clauses are moved to the File Description Entry. For transitional purposes, they can continue to be used in the SELECT statement.

• The CORRESPONDING phrase of the ADD and SUBTRACT statements is transitional. It will probably be deleted in a future revision.

• The RECORD CONTAINS clause has been changed. If it is not used, a program writes fixed-length records whose size equals the longest record.

• RERUN is no longer active during SORT and MERGE operations.

• INSPECT with both TALLYING and REPLACING is a transitional item. This combination format will probably be deleted in a future revision.

• The revision deletes the "integer TO integer CHARACTERS" option of the RECORD CONTAINS clause.

• In the evaluation of arithmetic expressions and operations, the intermediate data item is now defined as exactly 18 digits (the most significant).

• The composite of operands is no longer limited to 18 digits for arithmetic operations. This could cause some programs to operate differently because more precision may be used in intermediate results.

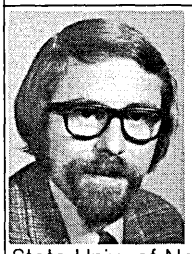
• The values in FILE STATUS items for end-of-file conditions are different from those in the 1974 standard, and some new values have been added. ✲

Comments and suggestions on the upcoming standard should be sent to:

ANSC X3J4
CBEMA/X3 Secretariat
1828 L Street NW
Suite 1200
Washington, DC 20036

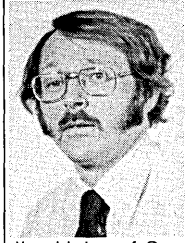
--ed.

ROBERT FRIED



Mr. Fried is a project leader for COBOL documentation at Digital Equipment Corp. Prior to joining DEC last year, he held dp positions with the State Univ. of New York College at Oneonta, where his responsibilities included design and development of both applications and systems software. Before joining SUNY in 1970, Mr. Fried held dp positions with the ITT-Sheraton Corp. and RCA, and worked as an independent systems consultant.

ROBERT MCKENZIE



Mr. McKenzie is a member of the ANS COBOL Committee X3J4 and a supervisor of COBOL at DEC. Before joining DEC in 1976 he was an instructor at the Univ. of Southern Mississippi. Mr. McKenzie was a systems developer/programmer for Burroughs Corp. for five years prior to joining USM; he has also worked as a independent consultant.

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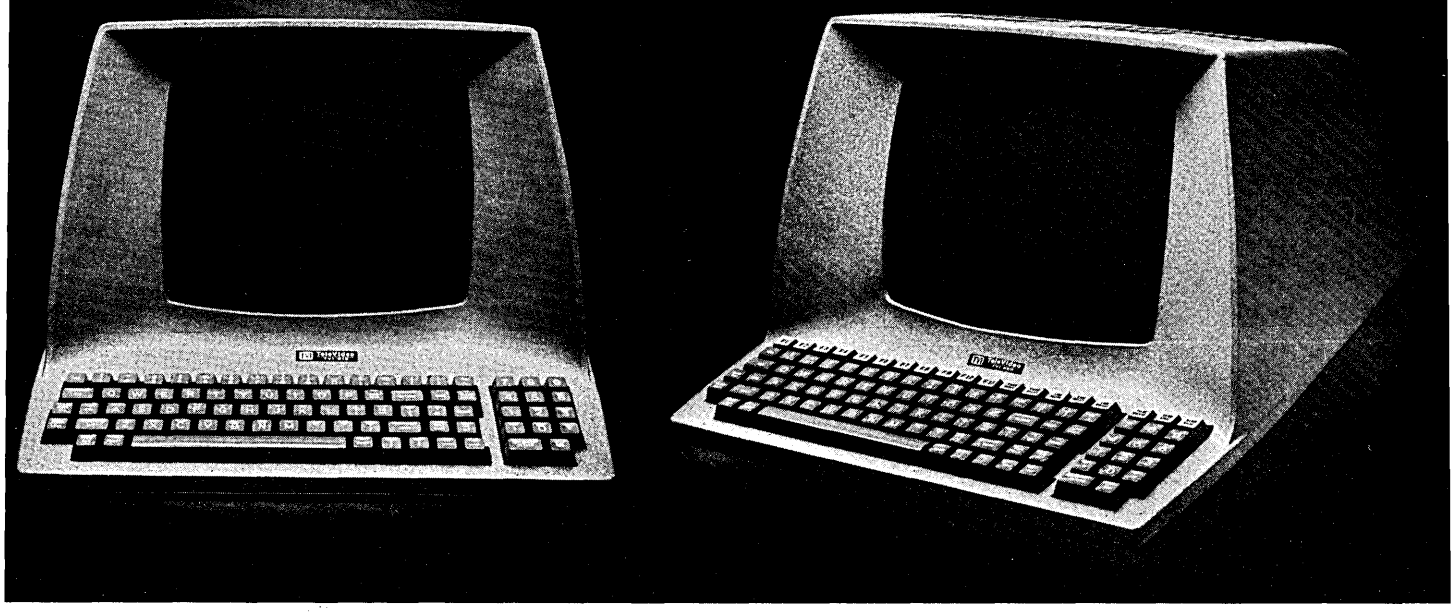

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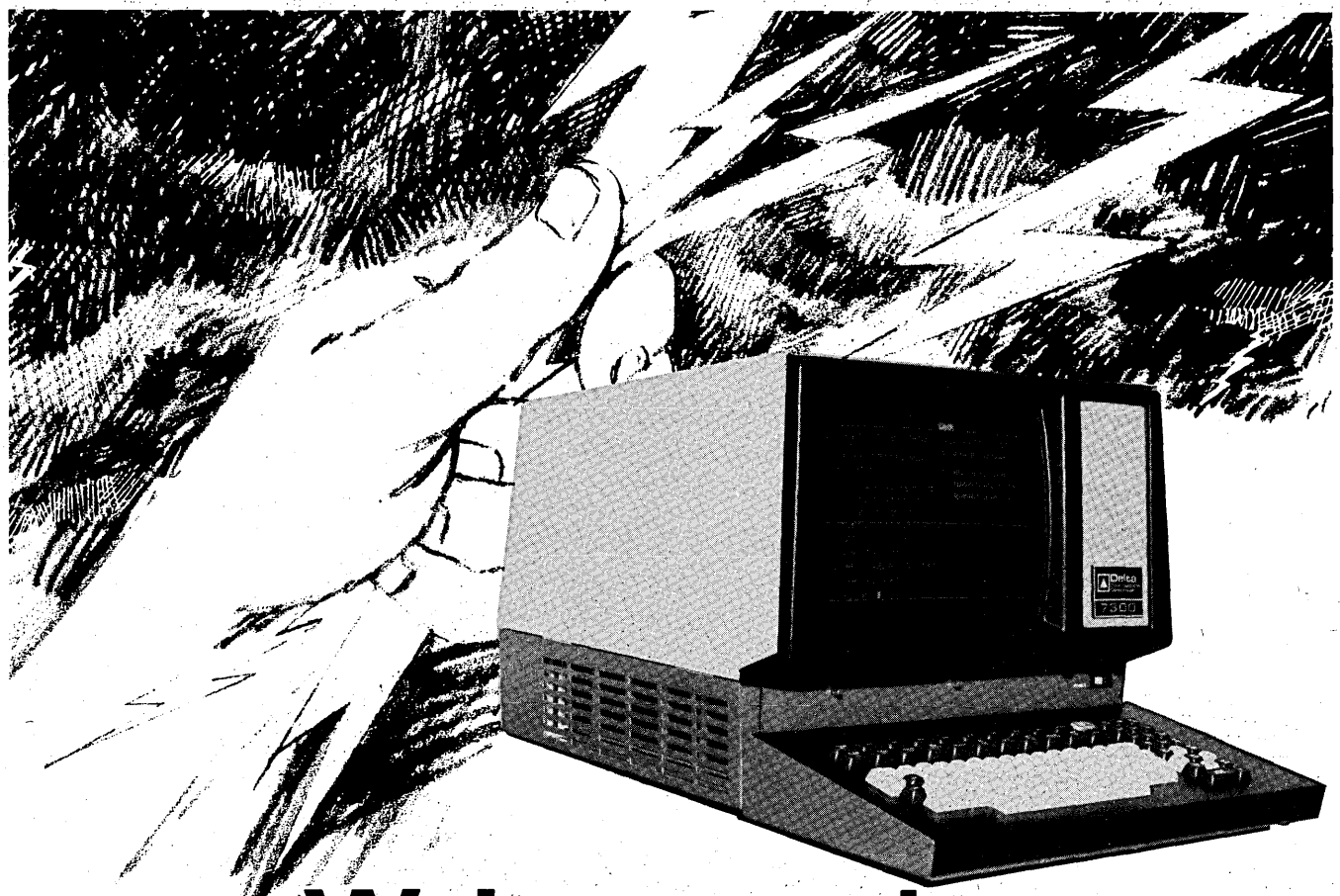

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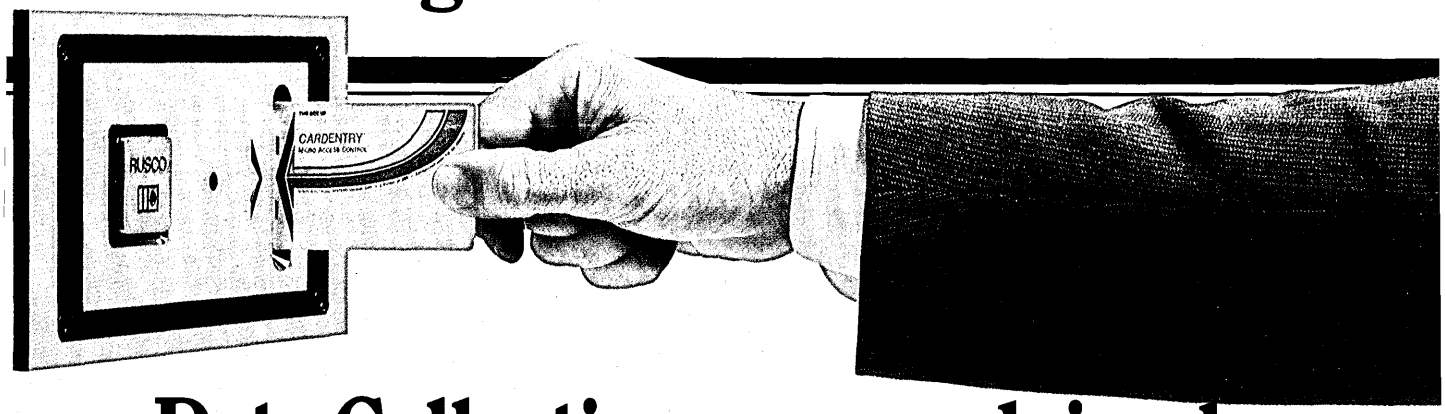

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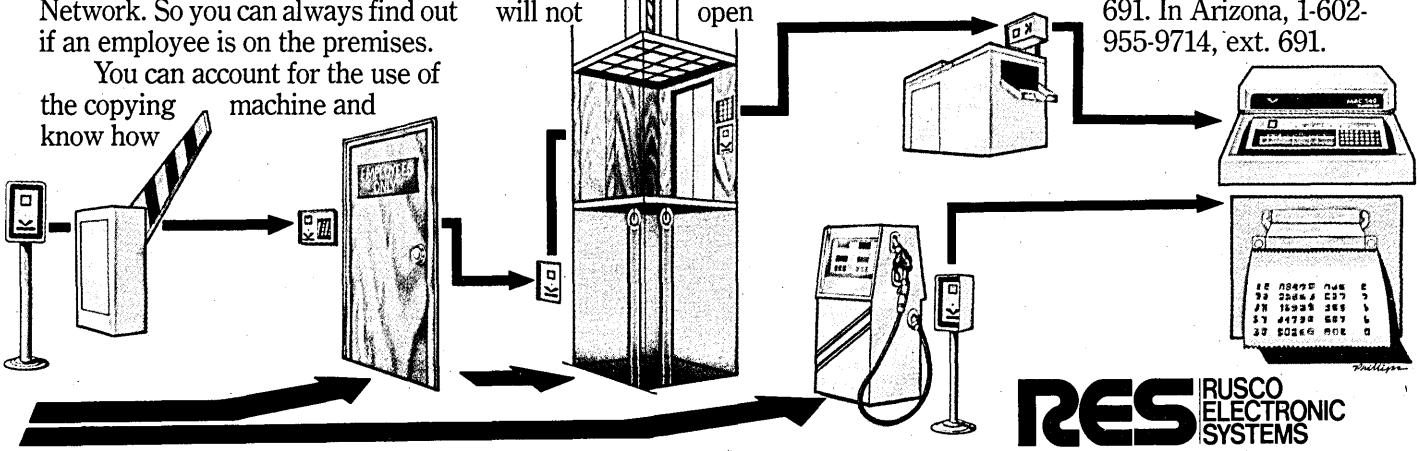

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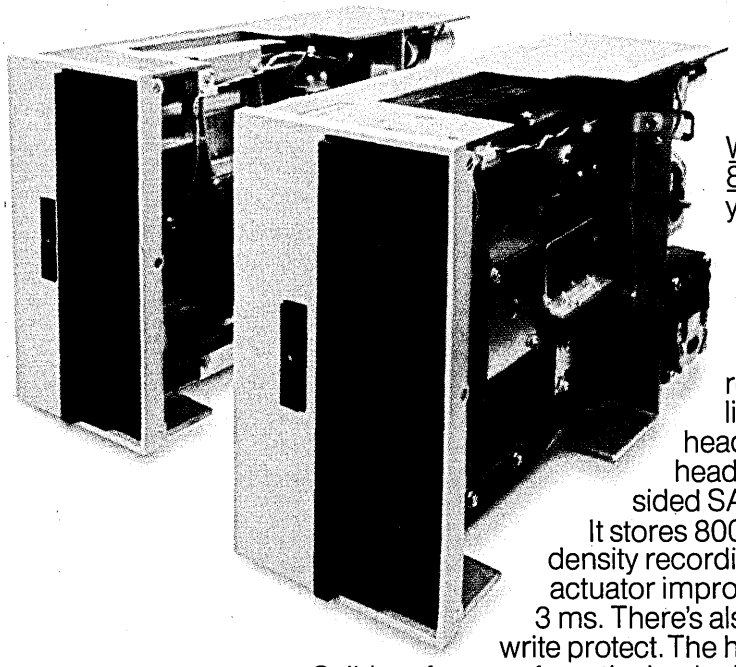

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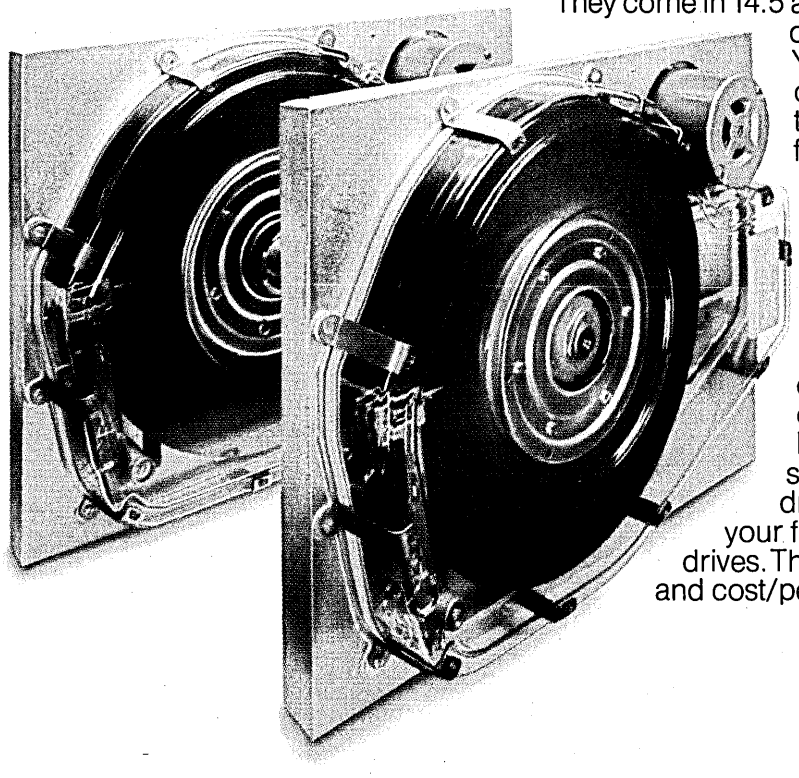

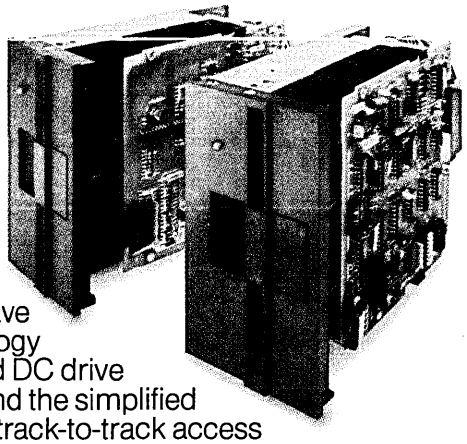

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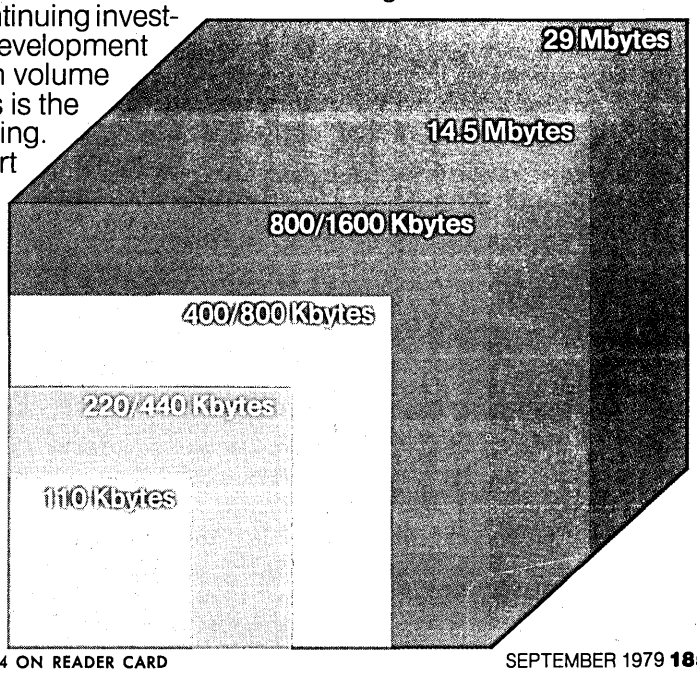

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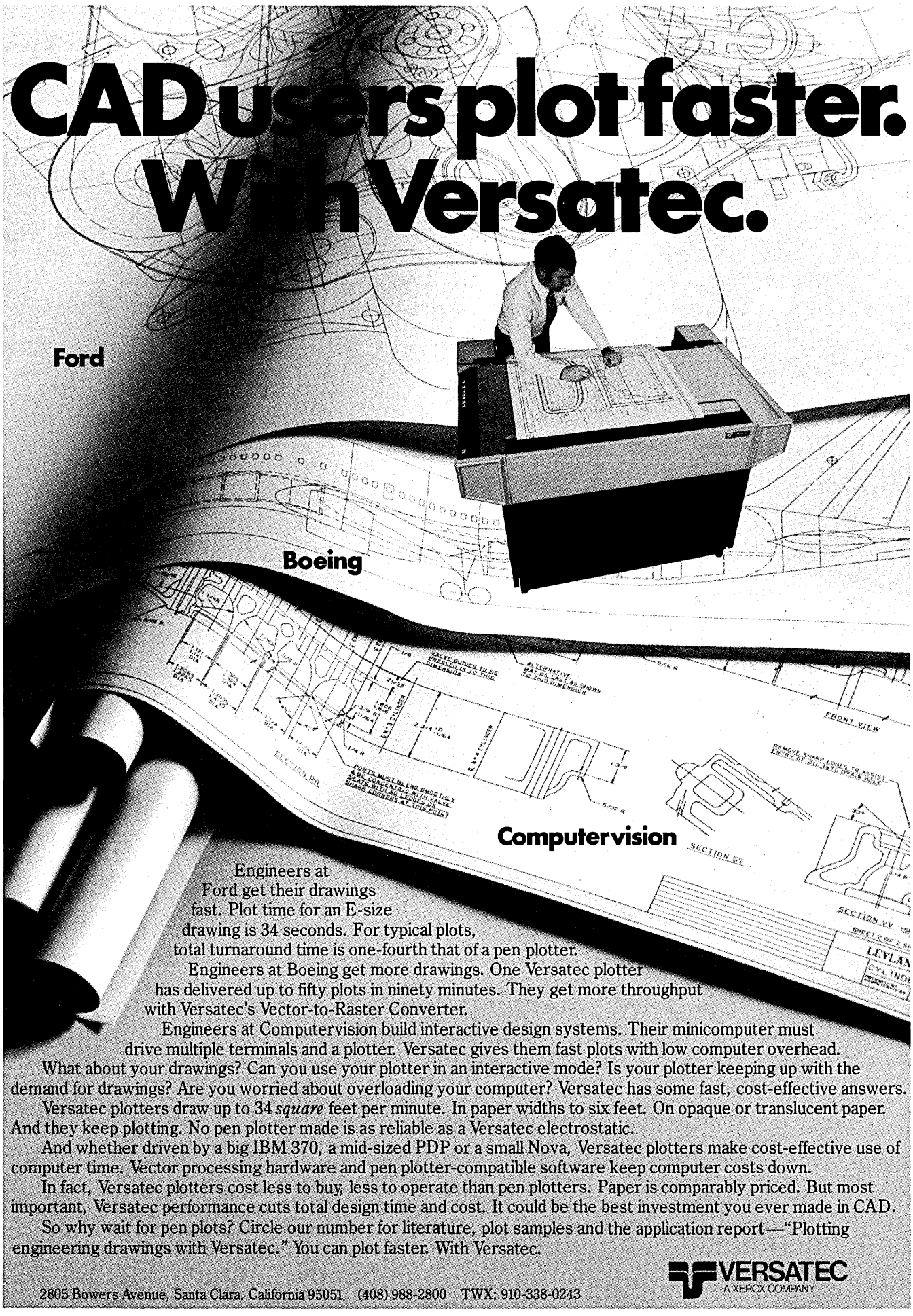

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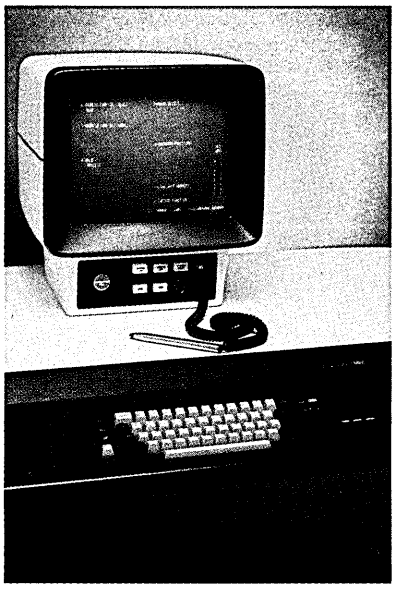

The Magnuson alternative is called Strategic Architecture. Strategic Architecture means the M80 is organized strictly by function. Each subsystem and each circuit board in the M80 is dedicated to a specific purpose. The result is a modularity far surpassing that of any other computer to date. In fact, a modularity so flexible that it enables Magnuson to adapt the M80 to the 360/370 and 4300 requirements today and into the future.

Because of its modularity, Strategic Architecture allows you to grow in measured, building block fashion. When your company needs 10% more power, you can add just 10%. By simply plugging in additional circuit boards, you can increase power incrementally—up to four times original capacity, if needed. This flexiblity means a smooth upgrade path and a vastly extended life cycle for your CPU.

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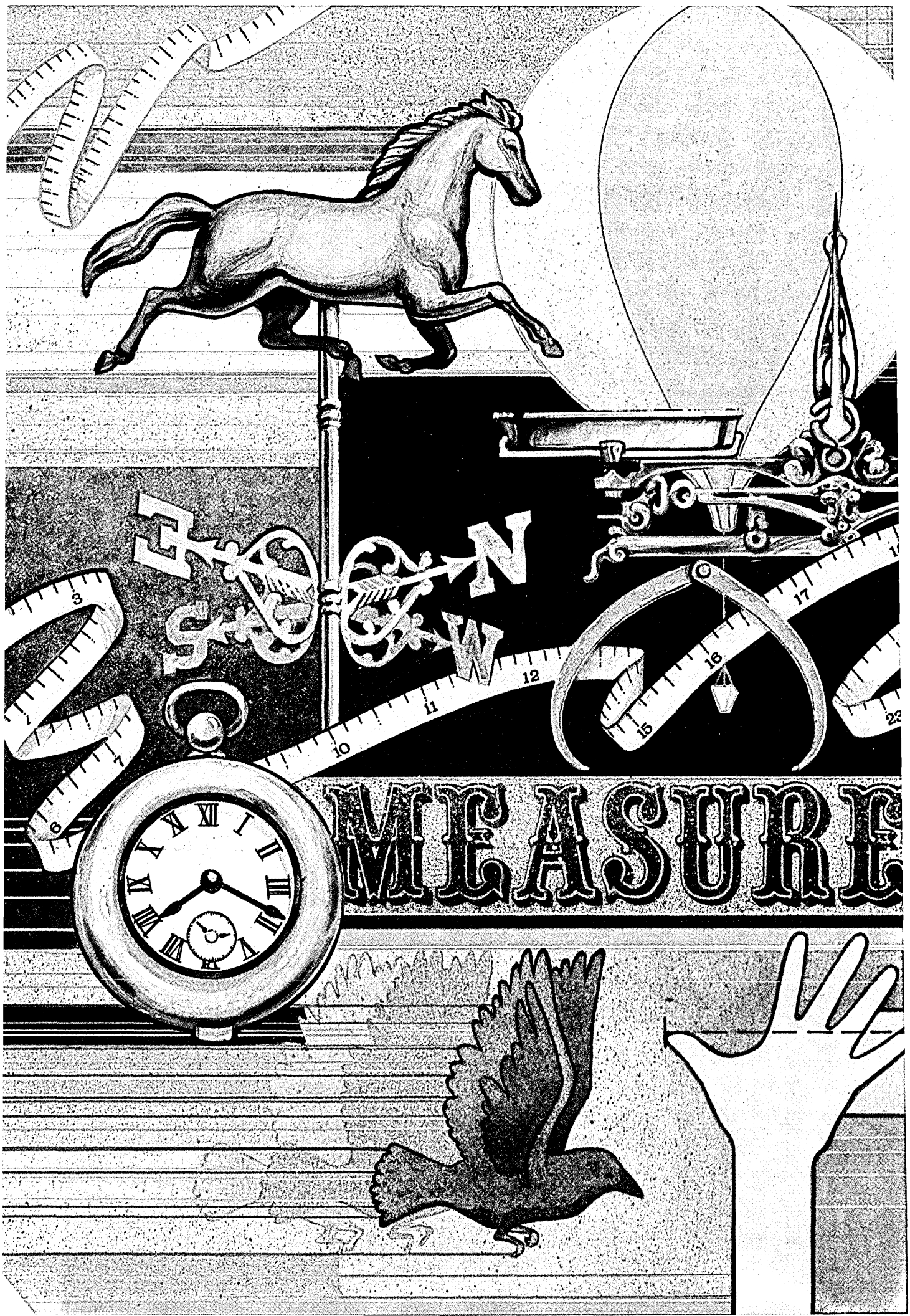
CIRCLE 129 ON READER CARD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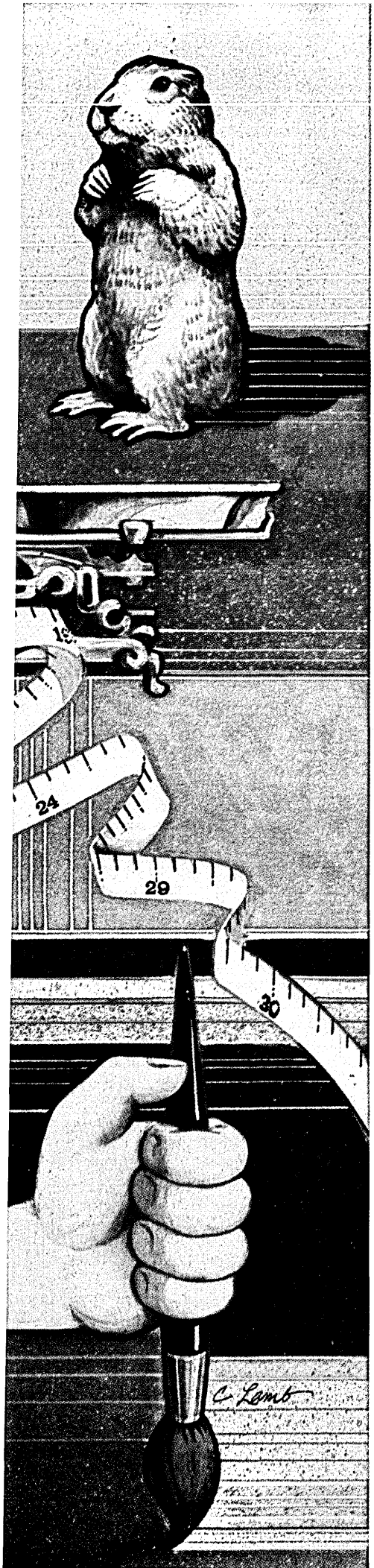


Managers need an understanding of how application software behaves, what factors can be controlled and what factors are limited by the process itself.

ESTIMATING SOFTWARE COSTS

by Lawrence H. Putnam and Ann Fitzsimmons

Few managers are able to predict the time and resources needed to develop large-scale software systems. Progress is often measured by the rate of expenditure of resources rather than by some count of accomplishments. Unrealistic estimates often result in last minute efforts to get code written quickly, resulting in cost overruns and poor quality software.

Software development can be brought under control. It requires an understanding of how application software behaves, what factors management can control and what factors are limited by the process itself.

The basis of effective management is the fact that the software development process exhibits a characteristic behavior, which can be exploited, so that the expensive results of unrealistic approaches can be avoided.

Traditionally, managers make two incorrect assumptions about software development: that people and time are interchangeable and that productivity levels are relatively constant for all software projects within the same organization.

The first assumption is that development effort is simply the product of people and time and that the time can be specified arbitrarily by management. Thus, the manning level is the development effort (in man-years) divided by the predetermined development time (see Fig. 1).

For example, suppose that the organization has to work under constraints. If the manpower available were limited to 25 people, the time would be determined as 100 man-years divided by 25 people, or four years. However, if the system had to be finished in two years, the relation would become: Manpower equals 100 man-years/2 years, which equals 50 people.

Managers arrive at the second assumption by taking some overall productivity figures from previous projects that they think are similar. However, they do not examine closely the precise characteristics of that similarity. An estimate of total source statements derived from the specifications is divided by the productivity figures to give a man-year estimate. For example, assume that we have to build a system of 100,000 source statements (SS = 100,000) and our productivity is 1,000 source statements per man-year, by analogy with a previous project. The development effort thus equals 100,000 SS/1,000, which equals 100 man-years.

Unfortunately, our experience shows that these relationships are too simple, except in the case of very small programs, such as those of less than 7,500 source statements, or that employ a few people for a few months.

For larger programs we now know that people and time are not interchangeable. Fred Brooks, manager of the IBM 360 operating system project, has described this phenomenon so graphically that a variant of it has become known as Brooks' law: "Adding people to a late project only makes it later." The reason is clear. As the number of people on a project increases arithmetically, the number of human interactions increases geometrically. More and more time must be spent on human communication and less and less on productive work. The only way to avoid this inevitability is to reduce the number of people who must interact by stretching out the time.

We also now know that productivity is not constant. Rather, it is a complex function of the effort, time and technology tools being applied to the development task. You can't improve productivity without changing these factors. It is not unusual for a group of programmers to achieve a productivity of, say, 5,000 source statements per man-year on a small, relatively simple business application while doing only 1,000 source state-

ments per man-year on a large real-time system.

With this kind of variation in productivity, it is little wonder that estimates based on the constant productivity assumption are not reliable.

SOFTWARE LIFE CYCLE

Over the last five years we have studied the manpower vs. time pattern of several hundred medium- to large-scale software development projects of different classes. These projects all exhibited the same life cycle pattern—a rise in manpower, a peaking and a tailing off (see Fig. 2). Use of the manpower curve and the corresponding equation allows us to determine the number of people needed at any time t. The time of peak effort is denoted by t_d; this time is very close to the development time for the system, which is also the time when the system reaches full operational capability. The falling part of the curve corresponds to the operations and maintenance phase of the system life cycle. During this phase the principal work is modification, minor enhancements and remedial repair (fixing bugs).

The data points shown on the manpower diagram indicate that there is scatter or noise in the data underlying the process. Empirical evidence suggests that the noise component may be up to ±25 percent of the expected manpower value during the rising part of the curve. This part of the curve corresponds to the development effort.

The form of the equation is:

$$\dot{Y} = K/t_d^2 \cdot t \cdot e^{-t^2/2t_d^2}$$

where:

$\dot{Y}$ is the manpower at any time t.

K is the area under the curve and corresponds to the total life cycle effort in man-years.

t_d is the development time (time of peak manpower).

Large software systems and some small ones seem to follow this general pattern, called the Rayleigh curve. Other small systems, however, seem to have a more rectangular manpower pattern (see Fig. 1), probably because the manpower applied is determined by management or by contractual agreements. Many small projects are established as level-of-effort contracts, leading to rectangular manloading.

Rectangular manloading patterns are seldom found in large projects, apparently because managers have so little intuitive feel for the resources needed to do the job that they hesitate to specify the loading pattern. Rather, they tend to react to the needs of the system. This reactive approach results in time lags and on occasion in underapplication of effort, but the overall effect is a reasonable approximation to Rayleigh manloading.

As we have seen, the manpower equation allows us to determine our manloading—if we know the total effort (K) and the development time (t_d). We

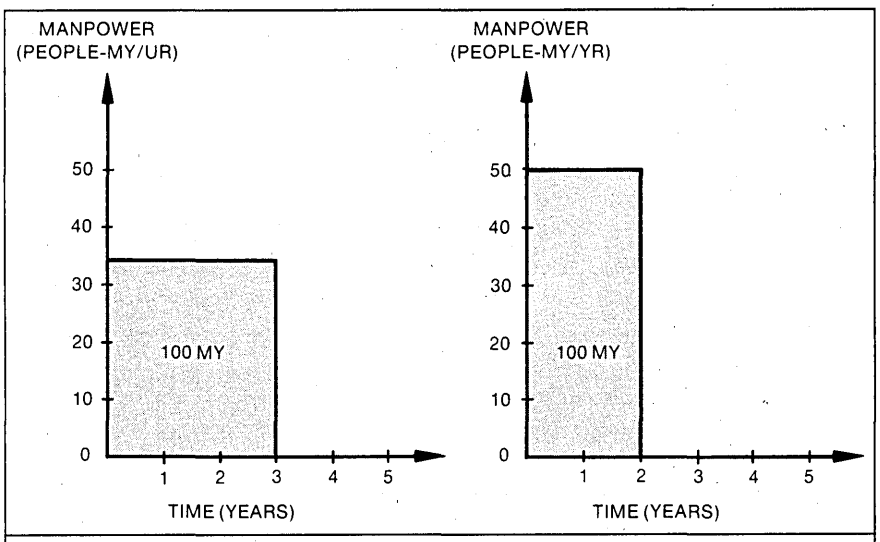


Fig. 1. The assumption that 50 people for two years is equivalent to 33 people for three years turned out not to be valid for large-scale software development.

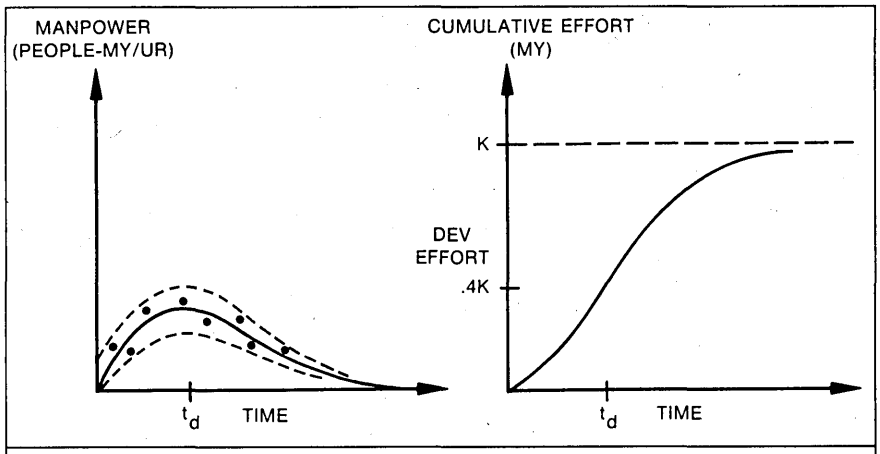


Fig. 2. The curves defined by this equation, originally applied by Lord Rayleigh to describe other scientific phenomena, have been found to fit reasonably well the manpower pattern of software development, at least within the "noise" of the data points (lefthand curve).

can find K and t_d once we know the expected size of the system, but first we must obtain the best estimate of the system size, and do it before development begins.

Before we begin to size the system, we should decide what we really want from a sizing technique. Obviously we need an estimate of the expected number of source statements. We use source statements rather than machine language instructions because they are what people write and what people can most easily relate to. People have some intuition for the size in source statements, whereas to get machine language estimates requires an uncertain conversion which introduces additional possibilities for error.

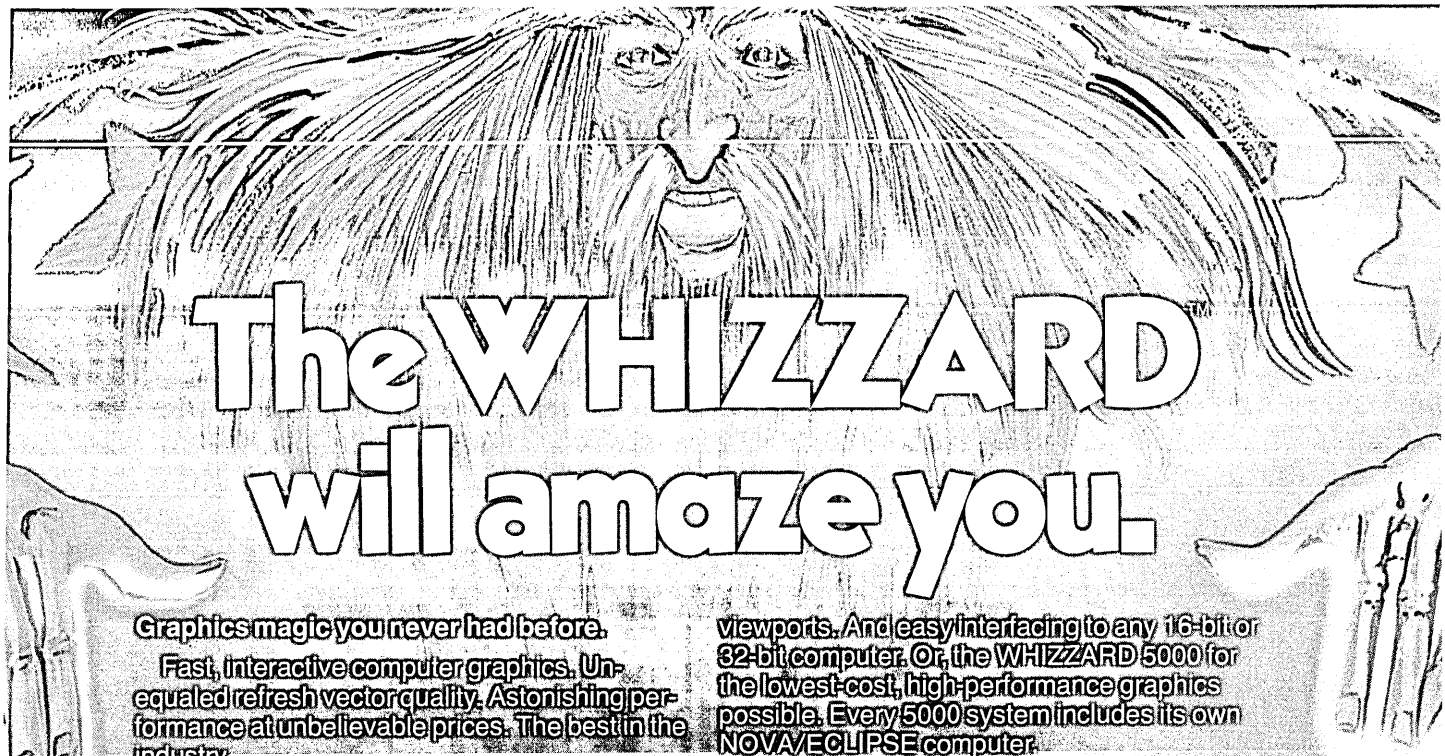
Less obvious is the need for an estimate of the uncertainty (or range) of the source statement number. The uncertainty estimate allows us to project the risk associated with our source statement estimate—something every manager should have. It also permits us to generate risk estimates for cost, schedule, and manpower—information we never had before.

At least three different estimates should be made before development of the system begins. They should be made once during the systems definition phase and at least twice during the functional design and specifications phase.

More than one estimate should be made because better and better data are available as we go from early systems definition into the functional design phase. A look at the system life cycle (Fig. 3) helps us decide when these estimates can be made.

FEASIBILITY SIZING

During the early systems definition phase we need broad estimates of the ultimate system size, development time and cost so that we can establish basic economic feasibility. At this point we have no hard data about the system we are considering because it is too early—no design has been done. Therefore, all we really can do is make an intelligent guess as to the range of size of the



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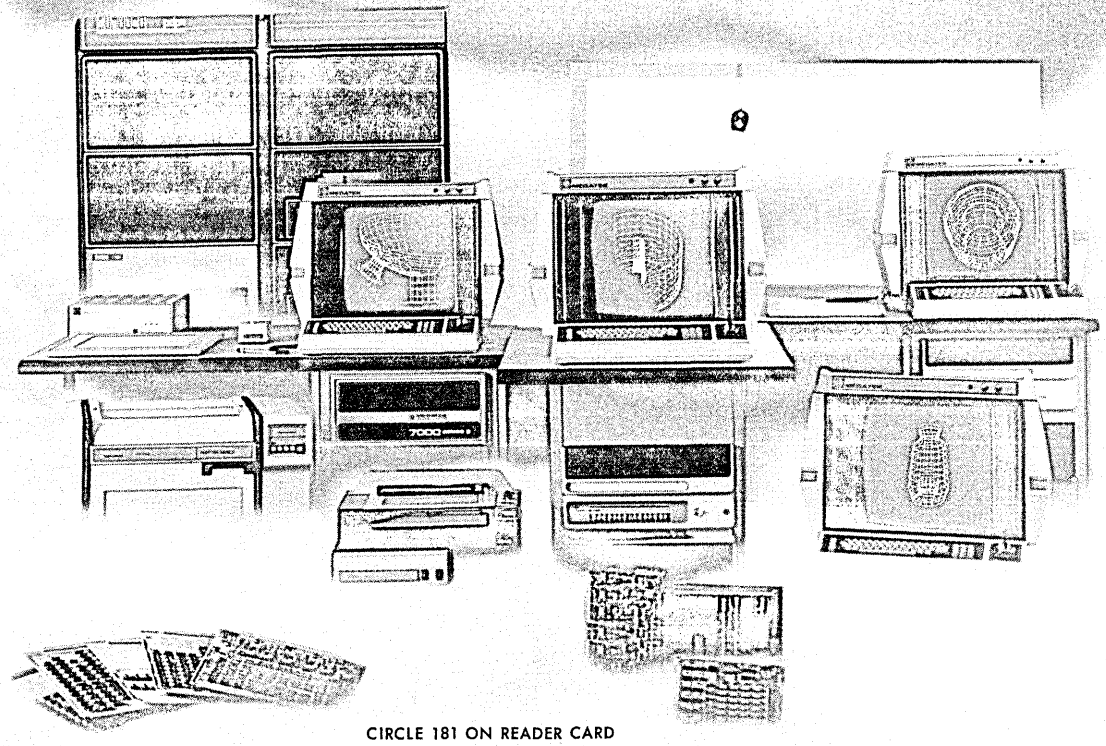

CIRCLE 181 ON READER CARD

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Our top-of-the-line HP 2647A has a multi-point feature that lets you plot your tabular data in a variety of formats without writing any software. Or, for more sophisticated applications, you can program the terminal using simple, English-like commands in AGL, our graphics extension of BASIC.

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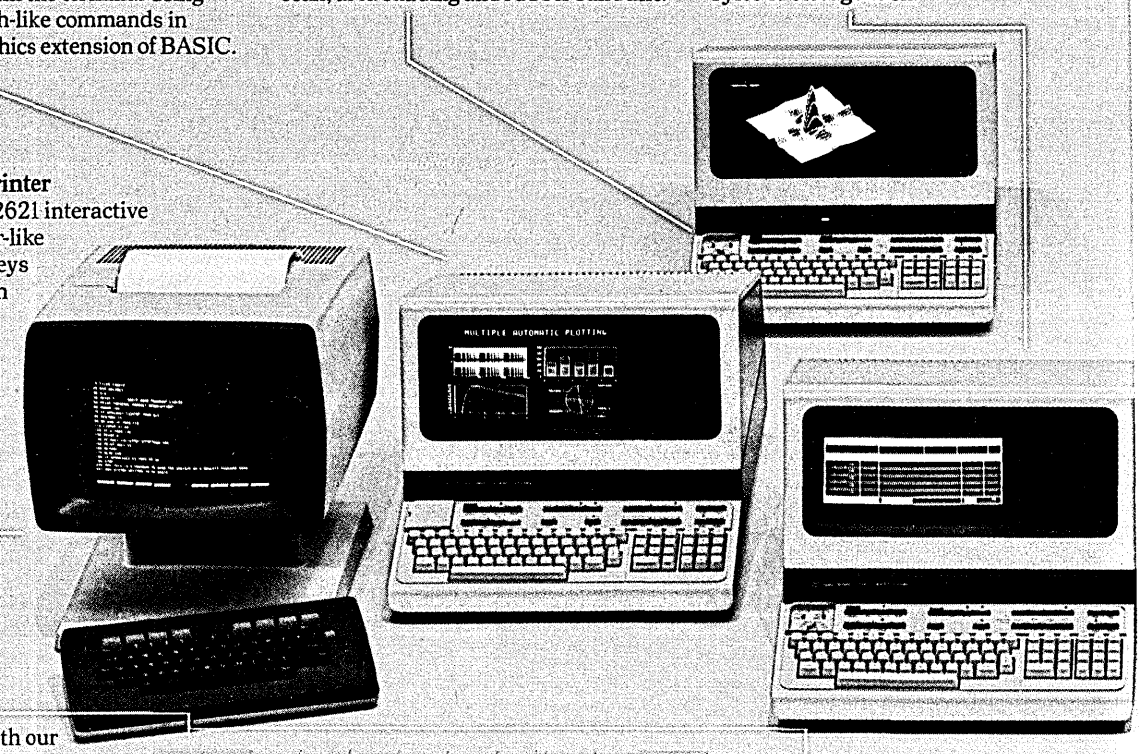

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Designed for easy operation by plant personnel, the table-top HP 3075A and wall-mounted HP 3076A terminals can be configured for applications like job or product status tracking, labor data reporting, and work-in-progress monitoring.

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The HP 7225A offers a cost-effective approach to professional hard copy graphics. By changing a plug-in module, the 7225A will provide the appropriate interface, language, and graphics capabilities for a variety of computer and instrument systems.

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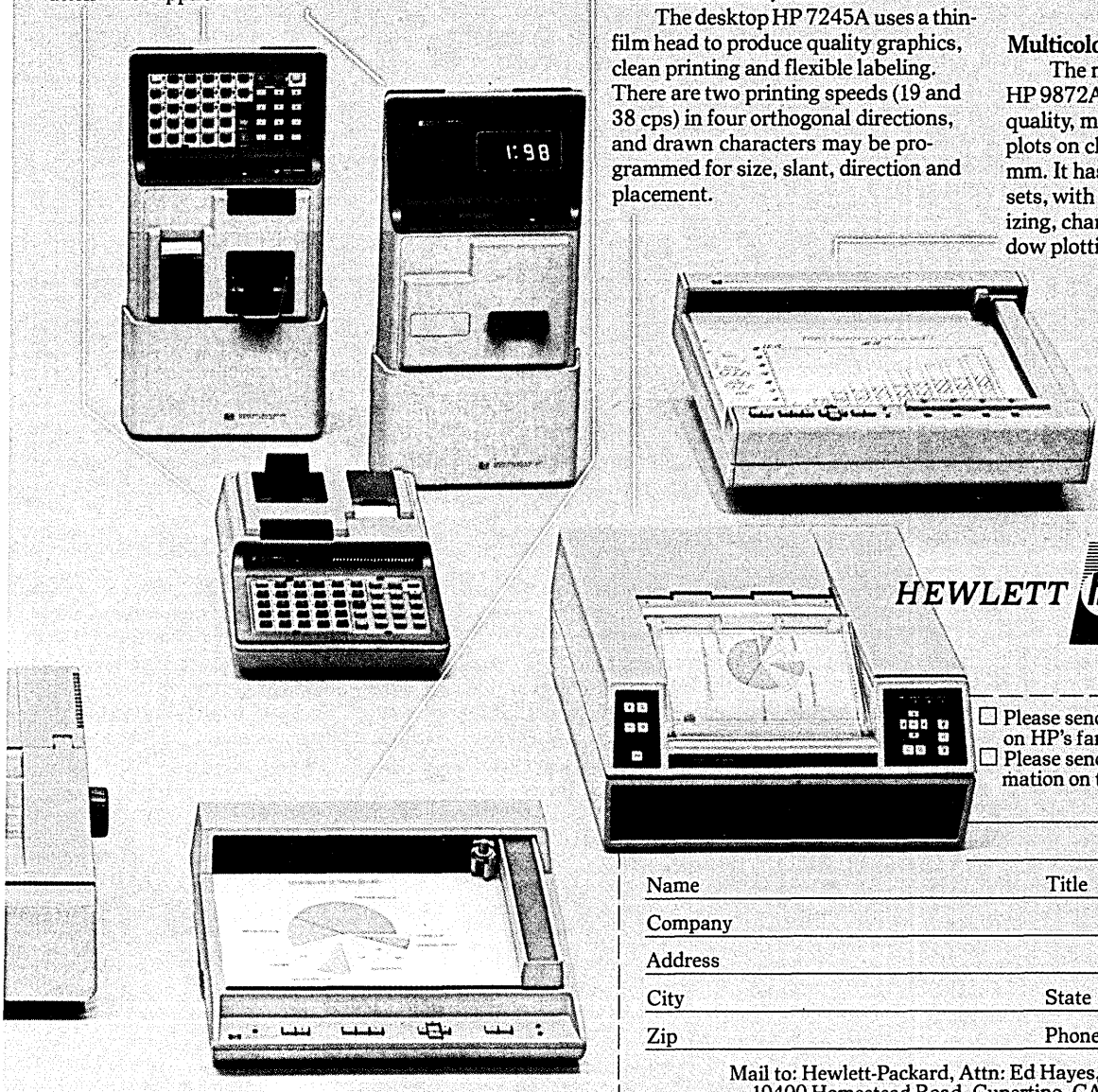
The desktop HP 7245A uses a thin-film head to produce quality graphics, clean printing and flexible labeling. There are two printing speeds (19 and 38 cps) in four orthogonal directions, and drawn characters may be programmed for size, slant, direction and placement.

Multicolor Graphics Plotter

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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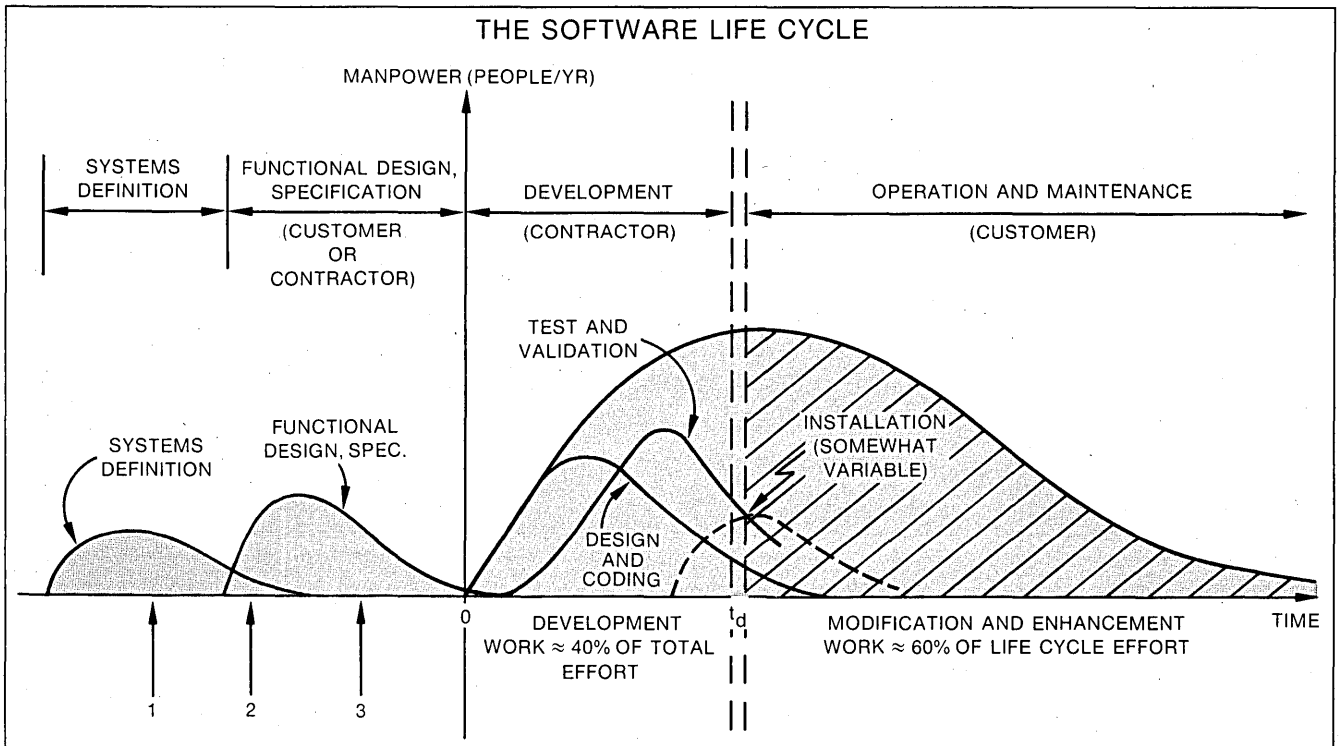


Fig. 3. Formal development begins at time 0, but before that, as information about the system is developed in the systems definition and functional design and specifications phases, it becomes possible to estimate the size of the system with increasing precision at points 1, 2, and 3.

system, based on what we've done in the past and what little we do know about it. If we let a equal the lowest possible number of source statements and let b equal the highest possible number of source statements, we can determine the expected size and its standard deviation (or uncertainty) by using the laws of statistics and probability.

Let us assume that we are two weeks into the systems definition of a large-scale inventory control system called SAVE. Based on past experience and what we know about this system at this point, we might broadly estimate it to be between 50,000 and 140,000 source statements. Using our statistical equations, we know that the expected number of source statements is:

$$SS = (a + b)/2 = 190{,}000/2 = 95{,}000$$

The standard deviation is:

$$\sigma SS = |b - a|/6 = 90{,}000/6 = 15{,}000$$

The expected size is:

$$95{,}000 \pm 15{,}000$$

By "expected" statisticians mean that there are 68 chances out of 100 that the true size lies within one standard deviation of the mean, i.e., between 80,000 and 110,000 source statements. There are 99 chances out of 100 that the true size falls within three standard deviations of the mean, i.e., between 50,000 and 140,000 source statements and less than one chance that it lies outside these limits.

While this method results in what seems to be a disconcertingly large range, it is important to understand that it is as good as we can do at this time, considering that we have almost no solid information about the system we want to build. Managers who insist on getting better estimates (meaning smaller ranges or even absolute numbers) must learn instead to work with averages of the quantities and a measure of the variability of the quantities, i.e., the standard deviation.

This is an important philosophical point because it means that only a certain level of accuracy and precision is possible at this stage and all efforts to do better are futile. As Aristotle wrote, "It is the mark of an instructed mind to rest satisfied with the degree of precision which the nature of the subject admits and not to seek exactness when only an approximation of the truth is possible."

As we continue into the life cycle and learn more about the final system, the statistics improve and uncertainty is reduced. Thus, as we approach the start of detailed design, we can reduce our risk to ranges that are considered to be within the limits of engineering accuracy in other branches of the engineering art. We achieve this result by breaking the system into pieces and estimating the pieces separately. Then we combine the pieces by means of our equations, letting the statistics of aggregation reduce our uncertainty.

Function	Smallest	Most Likely	Largest	Expected	Std Dev
File Handlers	25000.	40000.	70000.	42500.	7500.
Utilities	5000.	15000.	26000.	15167.	3500.
System Procs	12000.	36000.	50000.	34333.	6333.
Total				92000.	10422.

Table 1. A polling of the project team for SAVE at the early functional design phase provided the smallest, most likely, and largest estimates (average of team) of the number of source statements in each subsystem. From each range the expected value and its standard deviation was calculated.

Toward the beginning of functional design, we should know what the major subsystems will be. At this point, the members of the project team who have worked on the systems definition should estimate the size of each of the major subsystems as follows:

Let a be the smallest possible size (in source statements).

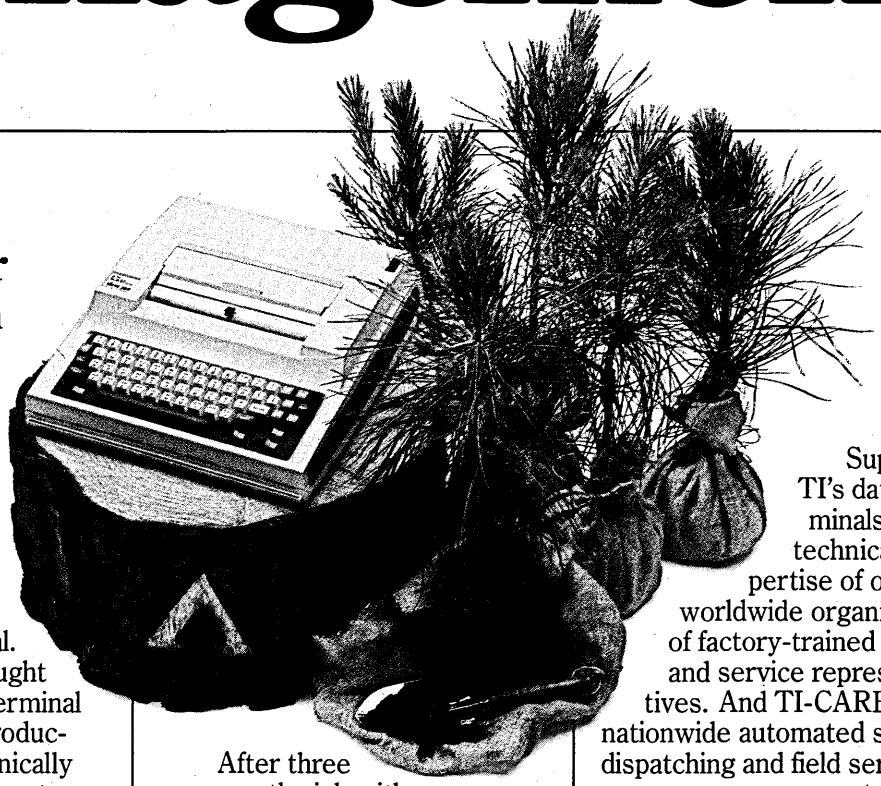
Let m be the most likely size.

Let b be the largest possible size.

The averages of these estimates for SAVE—in effect, a Delphi polling of experts—resulted in the first three columns of Table 1.

Parenthetically, we might note that we went through this procedure with several groups of systems engineers and they are quite comfortable with it. Most analysts or engineers are reluctant to give a single estimate of size. When they are

Branch Management.



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Weyerhaeuser brought TI's 743 on board as a terminal in their computerized production system that electronically scans the sweep and diameter of all logs, to determine their most productive value and end use as lumber.

The field proven 743 goes to work right in Weyerhaeuser's mill, where it logs detailed sawing operation information using its reliable 30 characters-per-second thermal printhead. It issues quantity, volume and shift productivity reports for mill production, and detailed figures for calibrating and maintaining the mill's equipment. And the 743's typewriter-like keyboard makes it easy to handle a pile of information without creating log jams.

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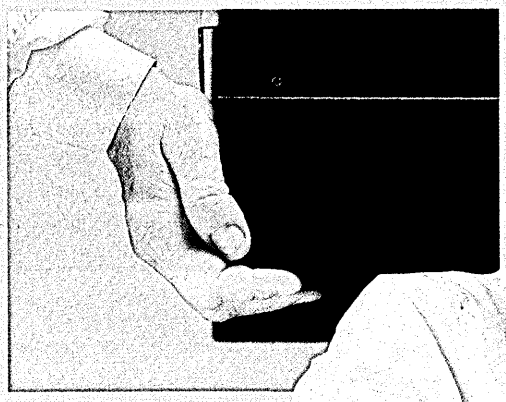
It employs a filtering system that removes particles down to .3 microns – proven in thousands of Tridents.

Unlike competition, it has a tunnel cover which keeps contaminants from reaching the pack area.

What's more, the Hunter reminds operators not to leave the cartridge bottom cover out to gather contaminants during operation.



And finally, the Hunter clean air seal isn't broken when the drive is serviced. (The competition's seal must be broken just to replace a fuse.)

Hunter wins hands up.

At this level of performance, you need a solid, rigid frame to help maintain accuracy and reliability. No tilts allowed.

And with Hunter, you get it.

Now, we wouldn't want to point the finger at anybody in particular, but some frames actually twist visibly when you lift one corner.

Try it.

Price fight.

We use an industry-standard 5440-type cartridge of proven reliability. It has no unusual features that could limit the number of media manufacturers or drive the price up. Like a servo surface. The competition, on the other hand, uses a unique cartridge that requires a written servo surface. Future availability and pricing could obviously be affected.

Saves 3-8 minutes in copying.

The Hunter is designed to be right on track—time after time—in copying fixed to removable media. Simply, the Hunter preserves the cartridge advantage by using a single fixed disk

MPETITION IN DUST.

servo surface to position on the cartridge disk. Seeks are faster and surer than the competition by a time factor of more than 13 to 1.

Our loader is really tops.

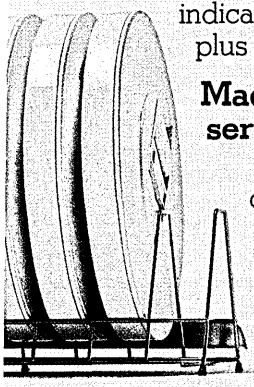
The Hunter cartridge receiver is as simple as can be.

Complex mechanisms with bearings, rods, plates and switches just aren't needed.

On the top-loading Hunter, gravity does the loading. And gravity behaves the same way time after time.

Score another point—a "scoreboard."

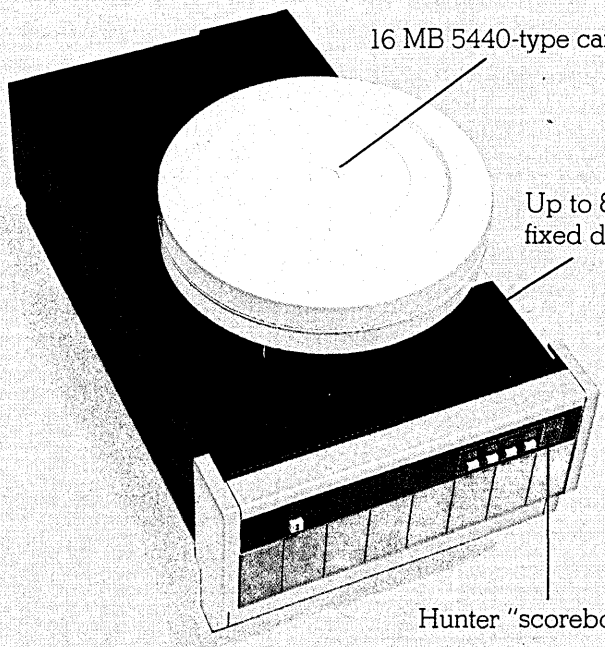
To avoid unnecessary service calls, the Hunter has a prominent front panel display that indicates operator or program errors plus malfunction information.

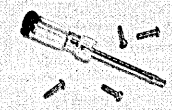


Made for fast "pit stop" service.

The Hunter utilizes self diagnostics and a modular component concept for fast, cost-effective servicing with a minimum of downtime.

For example, the power supply, power amplifier and transformer can be disassembled from the unit by removing only four screws. No de-soldering necessary.





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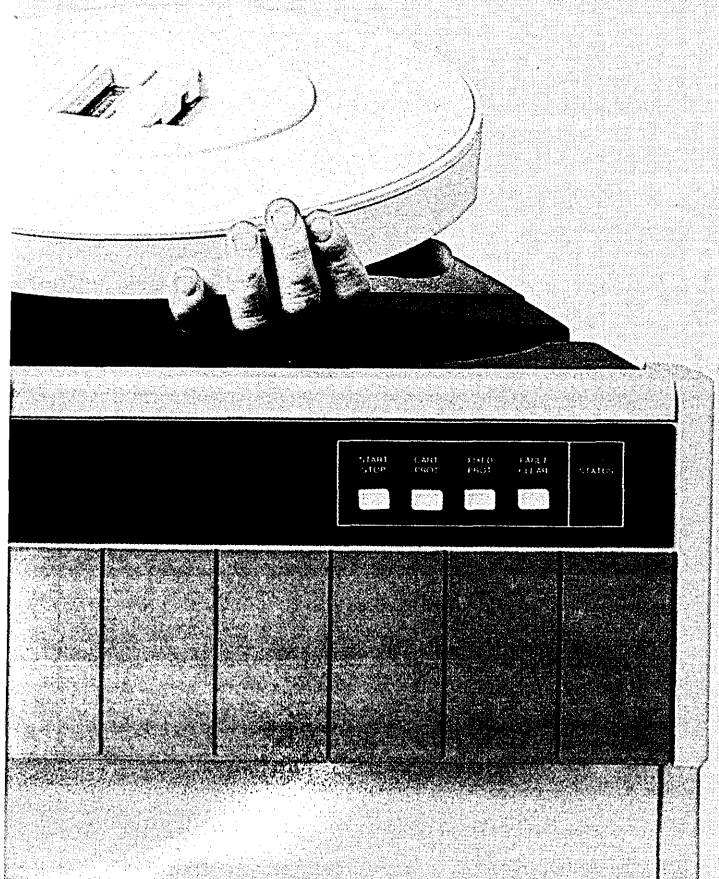

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CIRCLE 33 ON READER CARD

forced to do so, they will bias it on the high side. They prefer to give a range of sizes, because they can make this range as large or as small as they need to, depending on what they know about the system at the time. Psychologically, giving a range is not a threatening commitment.

The estimates for the three subsystems in SAVE resulted in a broad range of possible sizes. Note that the distribution is skewed on the high side in each case. This bias is typical of the beta distribution, the characteristics of which are used in PERT estimating. The PERT technique has been used successfully in other fields for more than 15 years and we adopted it here in order to find the overall system size range and distribution.

1. *Expected value.* An estimate of the expected value of a beta distribution is:

$$E_i = (a + 4m + b)/6$$

This formula simply biases the result so that the expected value falls on the side about which we are more uncertain. The expected value for each subsystem is listed in the fourth column. Then the overall expected value is just the sum of the individual expected values.

2. *Standard deviation.* An estimate of the standard deviation of any distribution (including the beta) may be found by dividing the range within which 99% of the values are likely to occur by six:

$$\sigma i = |b - a|/6$$

The standard deviation of each subsystem is shown in the fifth column. The overall standard deviation is the square root of the sum of the squares of the individual standard deviations. This value turns out to be much smaller than one would guess by just looking at the individual ranges. The reason is that some actual values will be lower than expected and others will be higher. Such variations cancel each other to some extent.

At this phase the results for SAVE were:

Expected value: SS = 92,000
Standard deviation: σ = 10,422
68% range: 81,578 to 102,422
99% range: 60,735 to 123,264

The chances are fifty-fifty that the actual value will turn out to be either greater than or less than 92,000 source statements. In each case the chance that the ultimate size will be in the range shown is qualified by the proviso that the input estimates do not change. Note that we have reduced the uncertainty significantly—from 15,000 to 10,422—simply by knowing enough about the system to divide it into three major subsystems.

FUNCTIONAL DESIGN PHASE

When the functional design is a little more than half complete, a final investment decision must be made, as well as a manning plan, a life-cycle cost and a milestone schedule. At this time the preliminary specification and system design is nearly completed or at least reasonably well defined. System analysts and engineers should now be able to break the system down into its major functions and have a fairly good idea of the size range of each one.

Now we simply repeat the statistical process we have described, using the larger number of different functions. In effect, breaking the system down into more functions enables us to reduce the uncertainty in our estimate and to obtain a better estimate of the expected size.

The results with the greater number of functions now available are shown in Table 2. At the time of this analysis the project team had been working on the system about 12 weeks, and the key results were:

Expected value: SS = 98,475
Standard deviation: σ = 7,081
68% range: 91,394 to 105,556
99% range: 77,231 to 119,718

Several properties of the successive sets of data may be noted. The expected value of the size has remained within one standard deviation of the previous estimates. The size of the standard deviation has steadily declined—from 15,000 to 10,422, and on the third iteration to 7,081. In addition, what may be called our uncertainty ratio (standard deviation divided by source statements, or σSS/SS) has dropped from 16% to 7%.

Moreover, the results of applying this sizing technique to SAVE—from early systems definition through functional design phase—were similar to our experiences with groups of analysts on other projects. ✲

(This is the first in a series of three articles. Part 2 will appear in the October issue.)

Pert Sizing

Title: Save (Functional Design Phase) **Date: 15-Feb-79**

Function	Smallest	Most Likely	Largest	Expected	Std Dev
Maintained	8675.	13375.	18625.	13467.	1658.
Search	5577.	8988.	13125.	9109.	1258.
Route	3160.	3892.	8800.	4588.	940.
Status	850.	1425.	2925.	1579.	346.
Browse	1875.	4052.	8250.	4389.	1063.
Print	1437.	2455.	6125.	2897.	781.
User Aids	6875.	10625.	16250.	10938.	1563.
Incoming Msg	5830.	8962.	17750.	9905.	1987.
Sys Mon	9375.	14625.	28000.	15979.	3104.
Sys Mgt	6300.	13700.	36250.	16225.	4992.
Comm Proc	5875.	8975.	14625.	9400.	1458.
Total				98475.	7081.

Table 2. Midway through the functional design phase of SAVE, the project team had enough information to break out 11 functions. At this level of detail the uncertainty (standard deviation) was reduced to less than half that of the first set of estimates. Moreover, at about ±7 percent the uncertainty is no worse than that of many other engineering values.

LAWRENCE H. PUTNAM

Mr. Putnam is president of Quantitative Software Management, Inc., a firm specializing in software cost estimating and life cycle management. He has had extensive experience in industry and government in planning the quantitative aspects of software life cycle management. Mr. Putnam was manager of system technologies for General Electric Co. Prior to that, he developed and implemented systems to plan, budget and control large-scale software systems for the U.S. Army. Mr. Putnam is a member of IEEE, IEEE Computer Society, AIAA and the Society of the Sigma Xi.

ANN FITZSIMMONS

Ms. Fitzsimmons is vice president of Quantitative Software Management, Inc. of McLean, Virginia. She has designed and developed the computer-based implementation of the software estimating system produced by QSM. Before joining QSM, Ms. Fitzsimmons was a research staff member at General Electric/Information Systems Programs, where she was responsible for research projects investigating the use and impact of modern programming practices and management methods on software development projects throughout GE. Ms. Fitzsimmons received her degree in mathematics from the Univ. of North Carolina.

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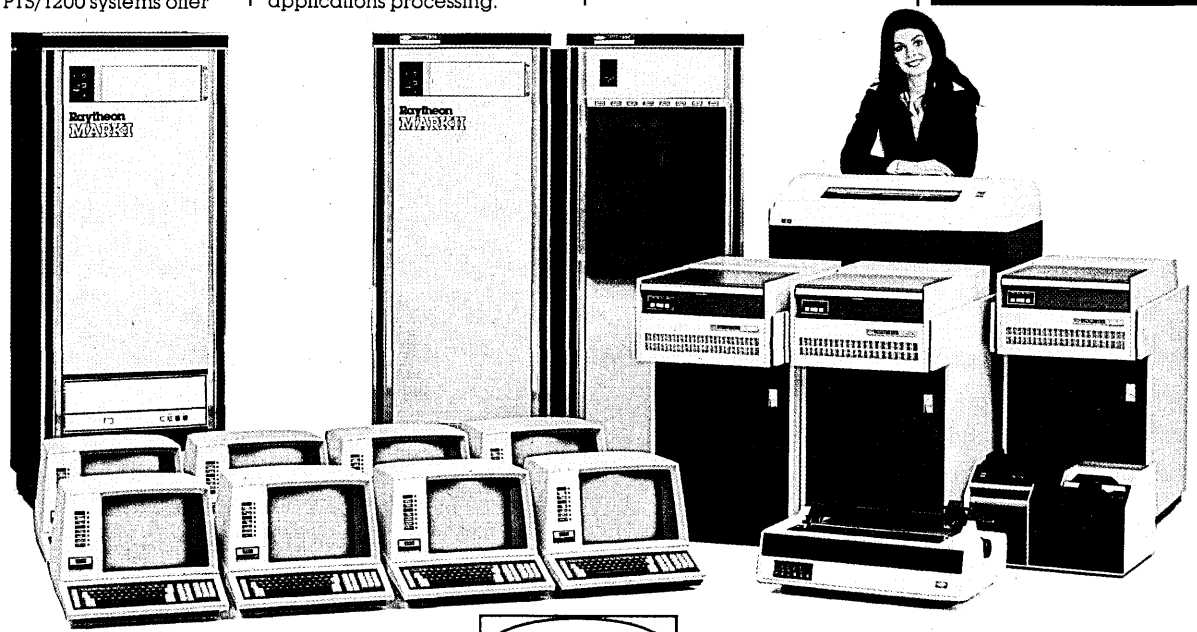

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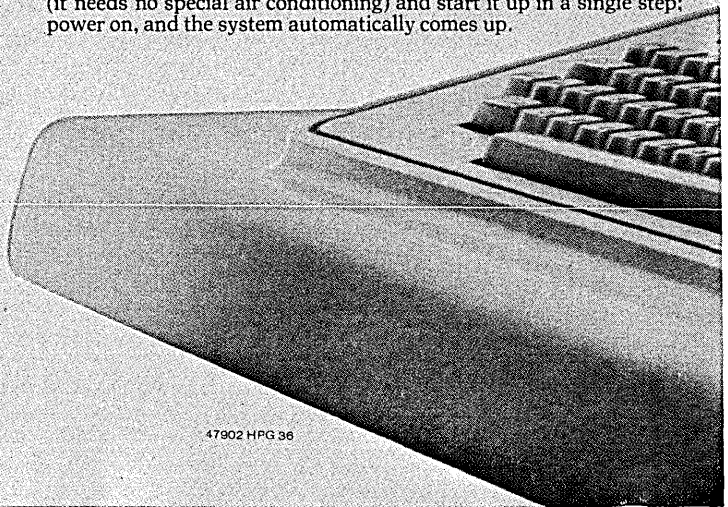

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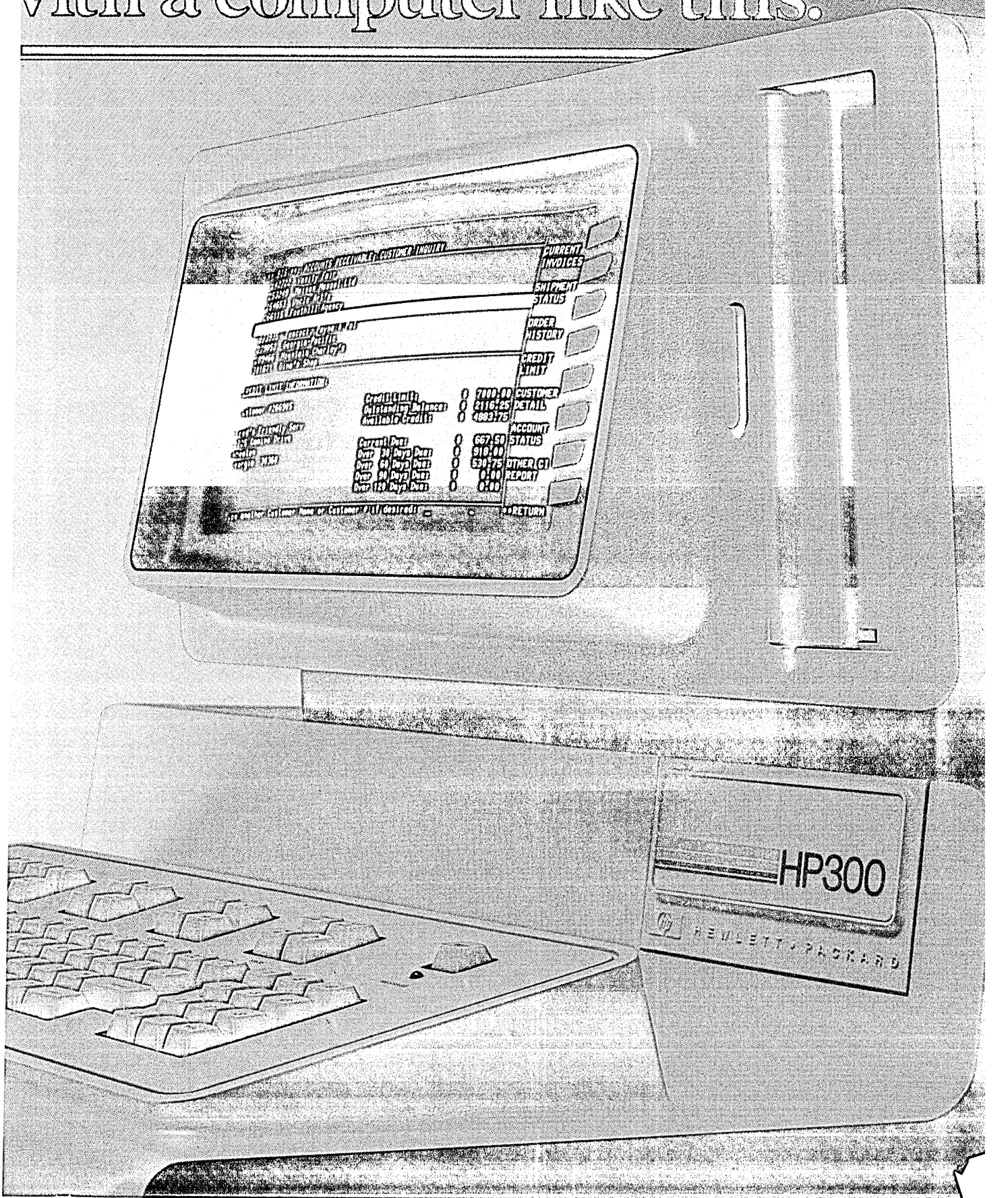

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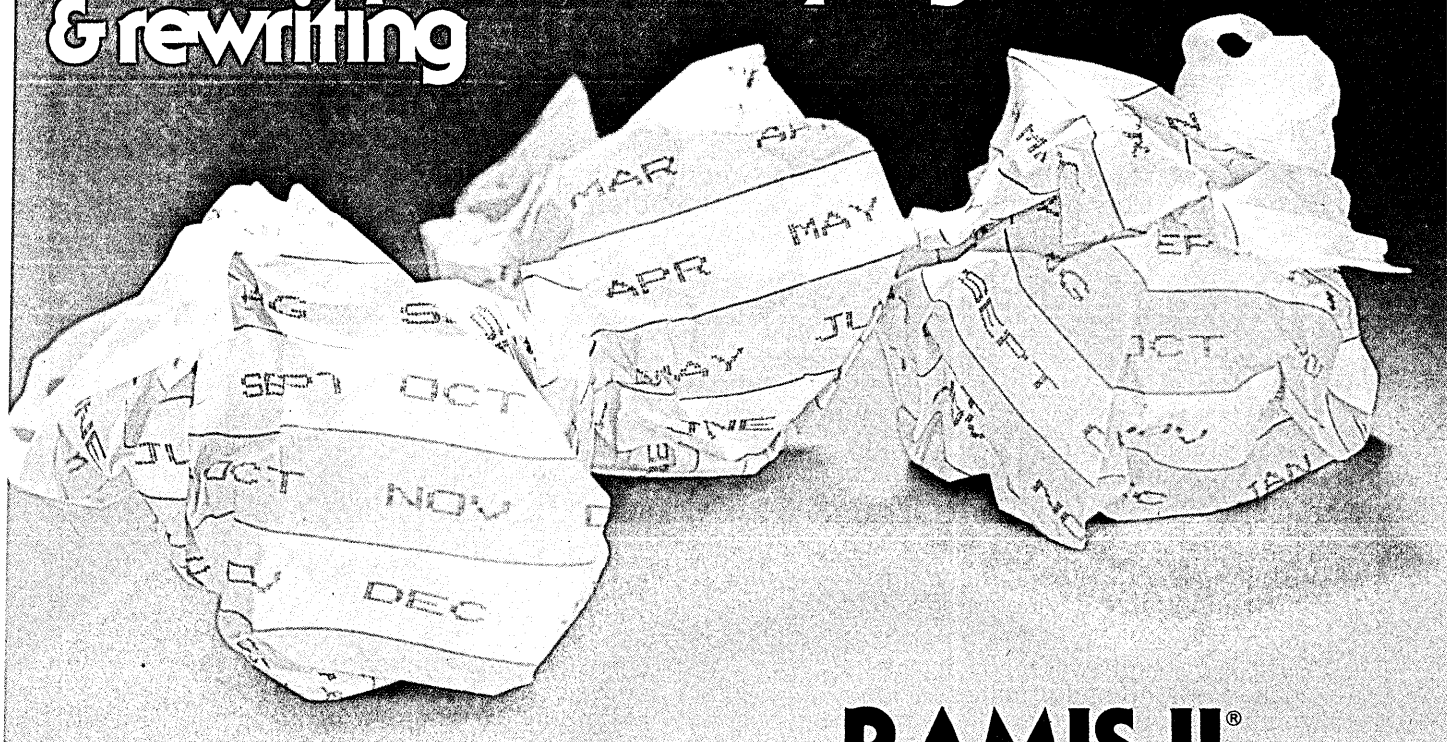
CIRCLE 67 ON READER CARD

70% of programming time is spent modifying & rewriting



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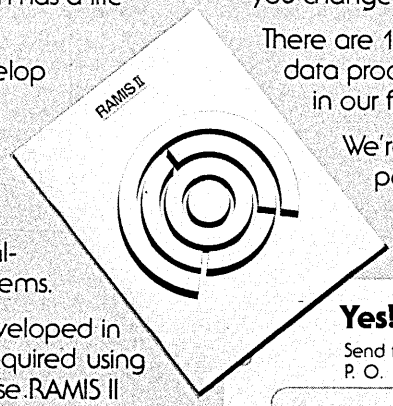

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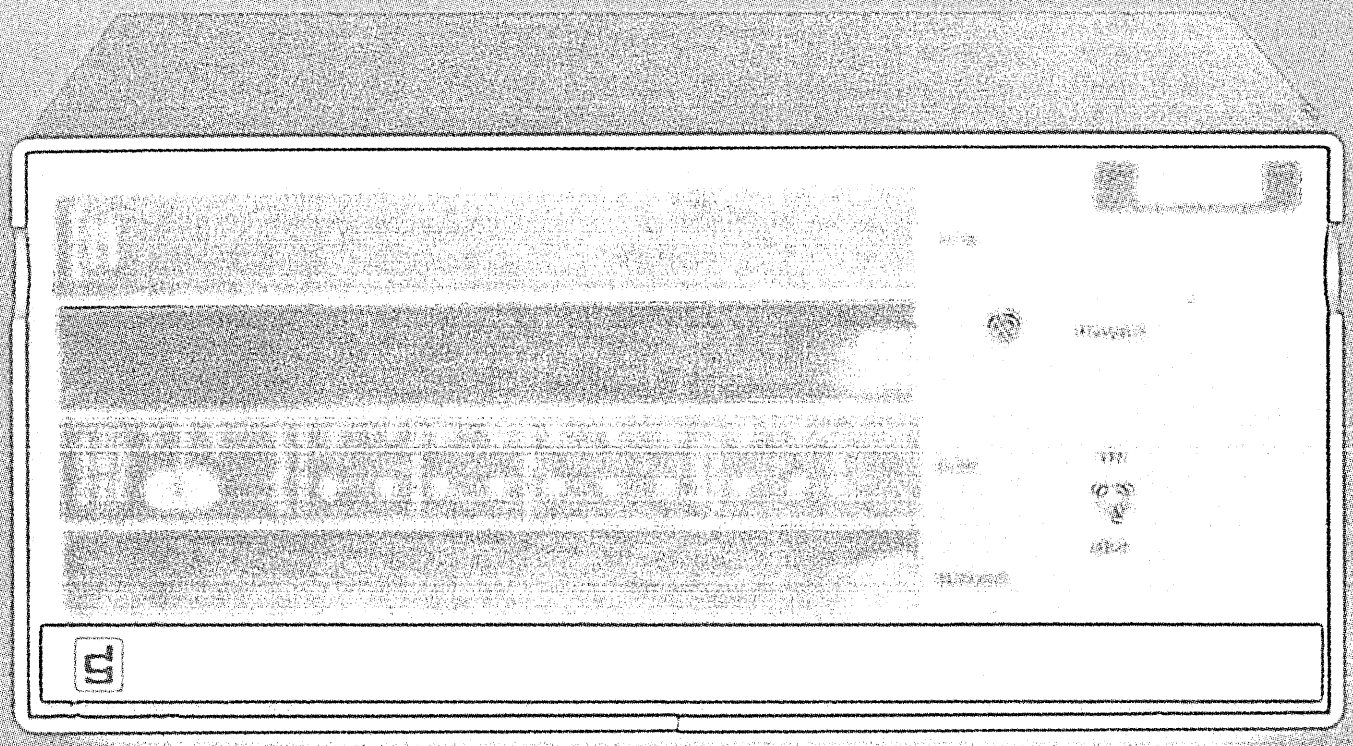

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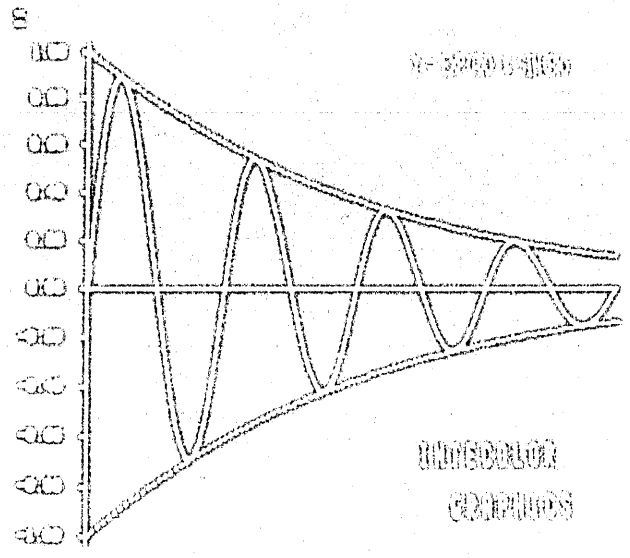

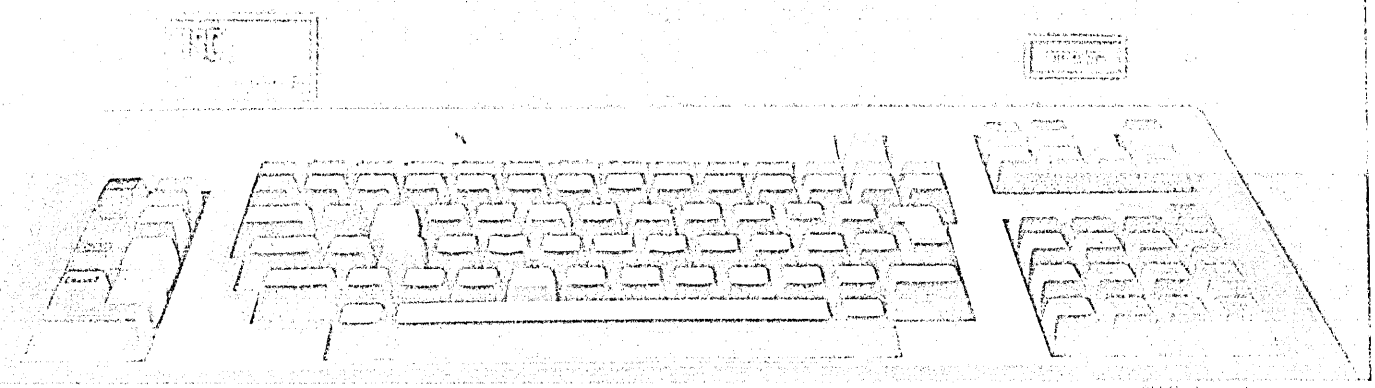

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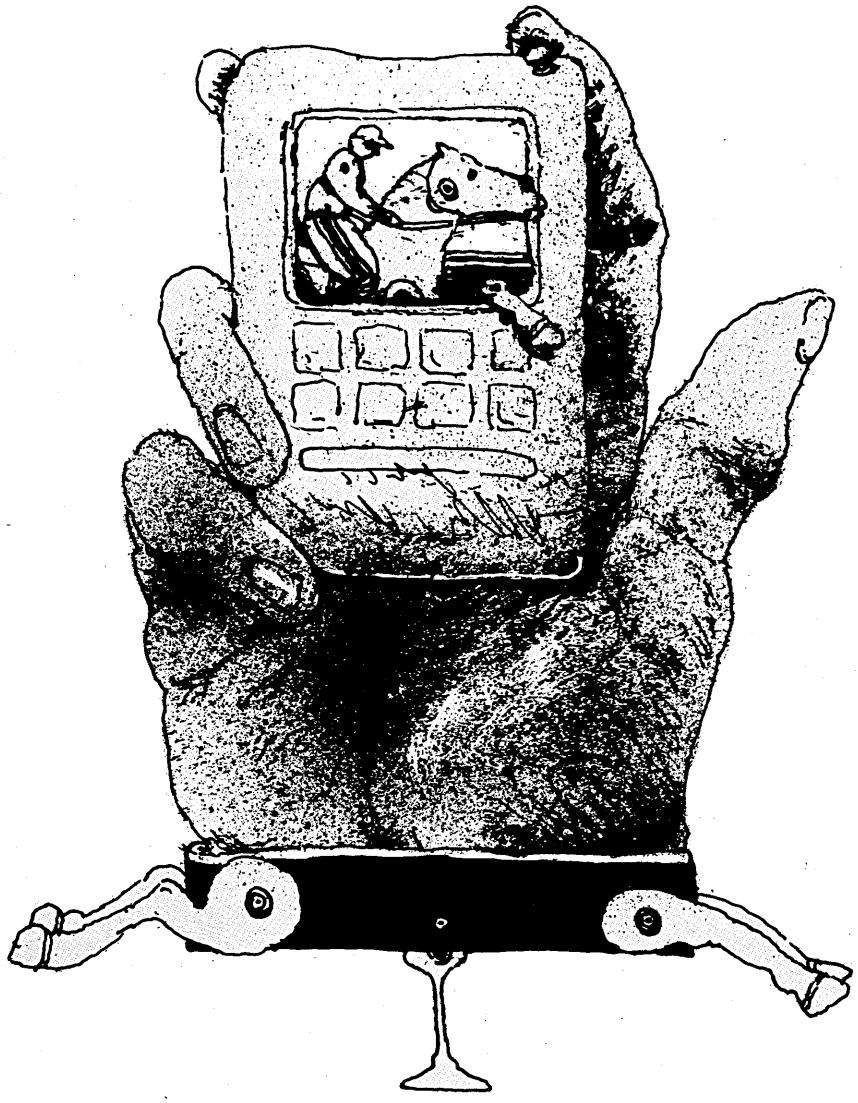
CIRCLE 28 ON READER CARD

A user's evaluation of "the most exciting calculator ever designed."



FROM NAGS TO RICHES

It was with great anticipation that I tore open the small cardboard box that came in the mail from the Starshine Group in Santa Barbara. Memories of Captain Midnight decoder rings came rushing back as I lifted the small undistinguished plastic calculator from its bed of polyurethane balls. I searched for the involved instruction sheet on how to manipulate "The Racetrack Computer," that reputedly held the key to fortunes in winnings, and found a small folded green paper printed on one side with hand sketches of the calculator and perhaps a dozen sentences outlining the example problem that inevitably accompanies computer instruction booklets.

I quickly keyed in the four required numbers, one at a time, as instructed. My answer was 21.793; the instruction booklet said 76.027. I tried again—same result. Must be broken, I thought, but to salvage something, I went ahead and tried a few races from the cupboard full of old *Daily Racing Forms* that all horse players hoard like gold. Nothing much turned up, so I resigned myself to repacking the calculator to return for repair. As a last resort, I had my daughter go through the steps that by now I was sure were written by a Korean bicycle manufacturer. "Is it supposed to be this?" She showed me the device with 76.027 staring at me in red readout. Suitably impressed, I requested her to go through the now decoded instructions for her limited father. "Use this button twice like it says here," she said, proving the so-simple-a-child-can-use-it adage. It is a most illogical method that uses the same key for two separate inputs, but it yields the instructed results.

Back to the forms with renewed energy. I promised myself I wouldn't look at the results sheets (carefully clipped each day from *The Los Angeles Times*) until I had done at least four days' race cards of nine races each. I lasted one card and then broke down and looked.

The first trial had produced three winners out of nine races, six places (second horse) and seven shows (third horse). Considering that the best public handicappers produce only about 30% winners in the long run, this first attempt looked promising, and I felt some of the advertised excitement. Three more race cards produced the following statistics which in my opinion, as a long-time handicapper, are somewhat (but not very) short of spectacular.

Out of 35 races (one race lacked the necessary statistics to input into the calculator) there were 14 winners (40%), 21 places (60%), and 27 shows (77.7%). How about the payoffs? In this particular sample, the return on the win bets was 6%, on the place bets 18%, and on the show bets 8%—on the order of a healthy savings account rate except that these returns are per bet, not per year. Herein lies the intrigue of playing the horses.

I decided that 100 races should be a sufficiently large sample to smooth out any statistical aberrations that might be giving a falsely optimistic note to these early returns. Along about the 15th race in, I noticed a stray decimal point cropping up. Being an old hand-held calculator buff, I immediately tooled to the corner drugstore for a long-life alkaline battery. This cured the stray point problem, and I went back to the main point of amassing race outcomes.

PLAYING IN EARNEST.

After some thought, I decided the next phase of the test should be without any hint of possible bias on the part of the experimenter, so I took the next few weeks one race day at a time. Each day I bought the new *Form* and did the racecard beforehand. The next morning (sometimes that afternoon, I must confess), I would record the results of the experiment on paper (and sometimes in cashed or torn parimutuel tickets). The results of the total of 12 days handicapping over 102 races is shown in Table 1.

These results show a healthy re-

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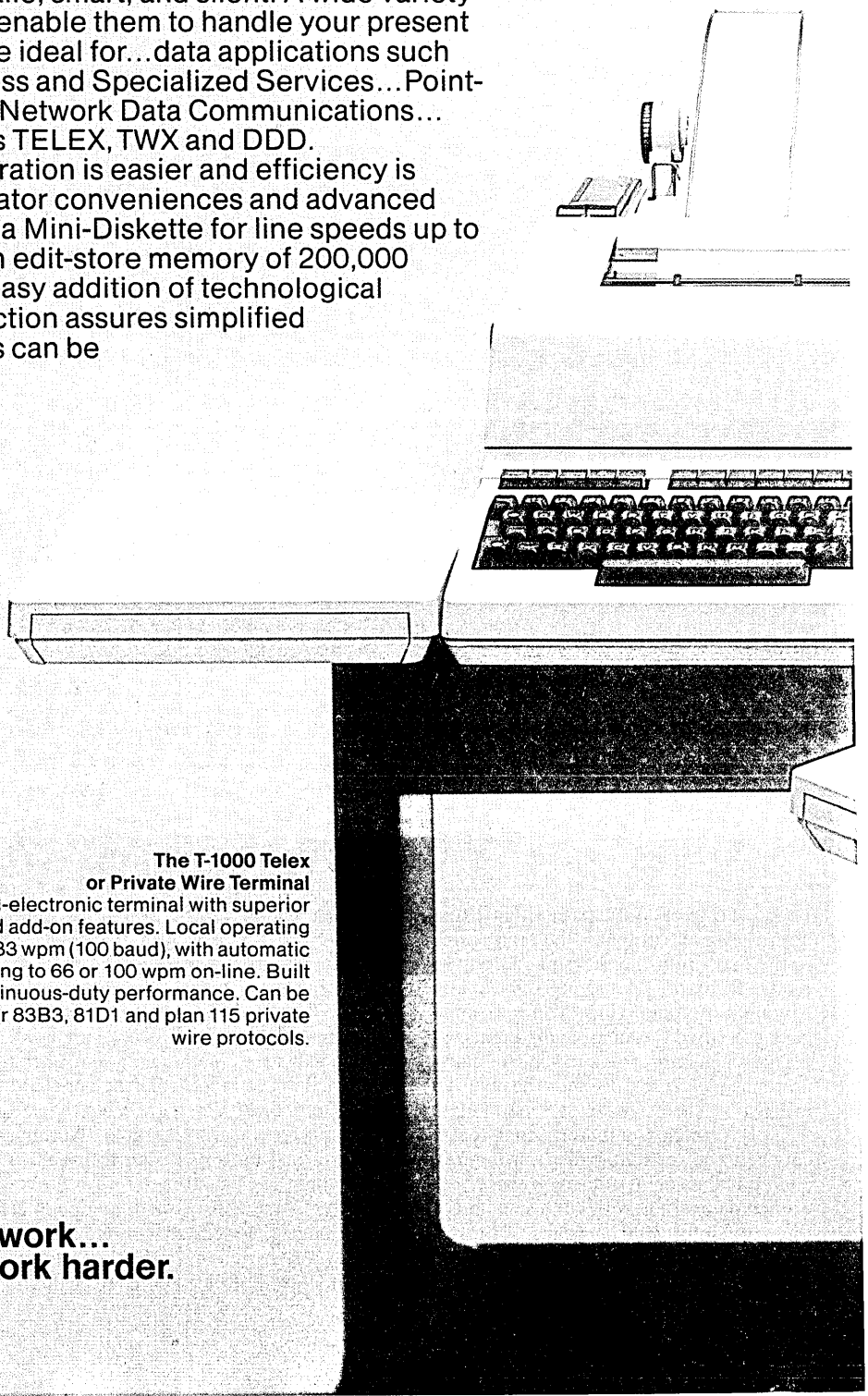
CIRCLE 80 ON READER CARD



The T-1000 Telex or Private Wire Terminal
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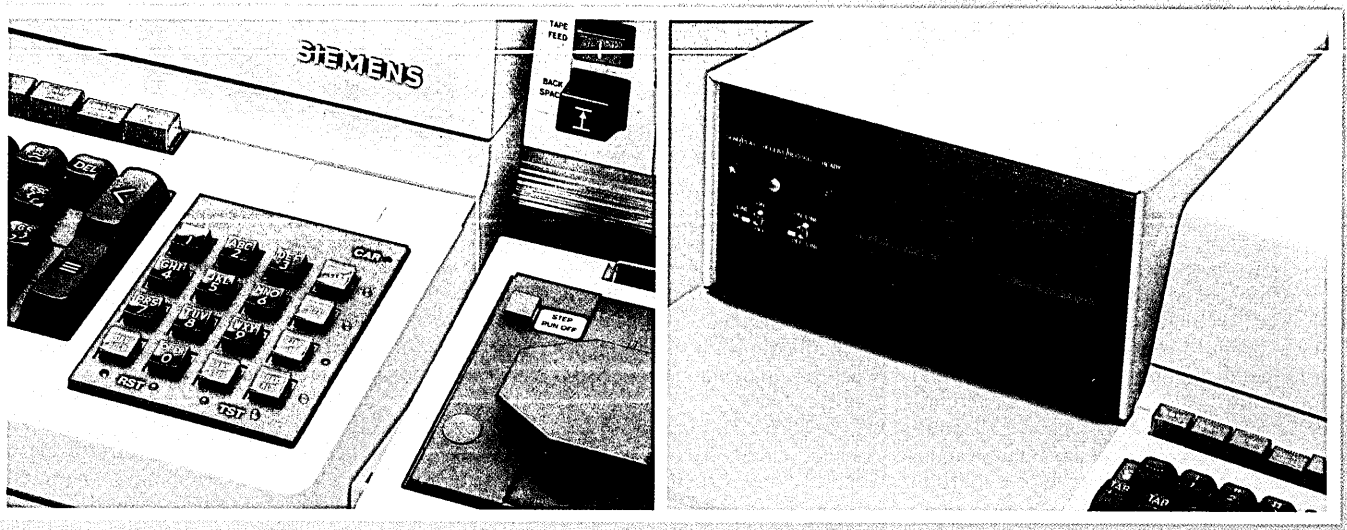

The PT-80 TWX/DDD/Voice Terminal
A truly versatile terminal. Employs RJ11C Direct Line Connection (DLC). Switches automatically from basic 110 baud TWX mode to 300 baud computer input-output mode, with speeds adjustable from 110, 150, 200 and 300 baud. Standard typewriter keyboard eliminates operator training. Typewriter touch means faster off-line preparation. 12 x 9 matrix assures excellent print quality, with paper size for 80 or 120 characters. Super silent ink-jet printing optional.

	RACES	WINS	%	PLACES	%	SHOWS	%
NUMBER	102	39	38.2	54	529	69	67.6
DOLLARS	204	260.80	27.8	231.20	13.3	203.60	0

Table 1. Race results for 12-day trial.

turn in both the win and place pools, and no profit at all in the show pool. The win percentage is about the same as the early test, but the place and shows percentages have dropped somewhat. Nevertheless, for a handicapping procedure as easy and mechanical as "The Racetrack Computer" provides, these returns are substantial. By the end of the trial I had become sufficiently at ease with the procedure to handicap a total racecard in less than 45 minutes—about five minutes per race. The simplicity of the input almost guarantees an error-free calculation once the user masters the somewhat obscure directions. It would be possible for the handicapper to go to the races and handicap each race between races, and still have time for beer and peanuts.

The system is, indeed, simple. Four numbers are input to the calculator for each horse in the race: two speed figures, today's race weight, and the sum of the last three races finish places.

The speed figure of a horse is a relatively direct measure of how quickly a given horse got from the start to the finish the last time. Many computer studies have shown that recent speed is the most powerful single predictor of a horse's next performance. Studies[1] show that the top recent speed figure horse wins in 27% of sprint races and 31% of route races. Since the test workout achieved almost 40% winners, there must be additional predictive power in the other inputs.

Highweight horses—that is, those horses that are assigned the higher weights in today's race—win about 50% more often than a randomly selected sample of horses. Now, weight does not help horses run faster. In order to try to equalize a given race, the rules of thoroughbred racing place more weight on horses that have been running well lately. Hence, a higher assigned weight in today's race is an indicator of a superior horse. The calculator algorithm is designed to make use of this fact.

The final input—the sum of recent finish places—is another direct measure of the demonstrated ability of the horse to do what we want: finish up front. Taken together, the speed, weight, and recent finish data improve the win predictability from the 30% for raw speed to the almost 40% achieved with the calculator in the test.

The chip in the calculator is probably quite simple, comprised of three additions, one subtraction, a square and a divide function.

ROOM FOR IMPROVEMENT?

The speed figures contained in the *Daily Racing Form* are far from a perfect measure of the actual speed of the horse. The *Form* definition of speed is based on the track record at the distance run. Track records vary from track to track, and this variance is reflected as inaccuracies in the speed figure. Additionally, the track itself varies in inherent speed from day to day due to weather changes and differences in track preparation. In the case of extreme weather changes such as rain, the track can actually be as much as three seconds slower for a race that takes about one minute to run.

The *Form* does annotate its data when the track is "off," and if you use the calculator, it is advisable to avoid using data where the track is labeled anything but "fast."

There are methods to correct for track record variations, track speed variations, and track changes.[2] It is quite possible that the win percentage can go as high as 45% when using precise speed figures. Whether this increase is worth the time and expense is dependent on the intensity of the handicapper's quest for the Holy Grail of perfection.

The results from the brief test show that "The Racetrack Computer" can project winning horses reasonably reliably, and with sufficient frequency to produce a profit for the careful bettor. With a 40% win probability, the intelligent bettor should be prepared to face a loss string at a 95% confidence level. This means that the bet size should be much less than 1/6 of the "bank" to avoid "tapping out."

Let's make believe that we start with a bank of $100 and go over to Hollywood Park or Aqueduct (or both if you are in Las Vegas). If we use the actual results from the first 14 race days that were done for this article, we see the progression in Table 2. (We used $10 win bets to make the arithmetic easier.)

So after 14 days, a bank of $100 has produced $451 profit by wagering the stake multiple times. Note that the bets are the same size—"flat betting," in horse players' language—and the compounding is derived from spending the same dollars over and over again. Although a 25% return may not seem much, it can total up rapidly if you are fortunate enough to visit the track on one of the winning days.

Three out of the 14 are losing days. One of those days half the money was lost, a most discouraging occurrence if that happens to be the day you choose to go from paper profits to real money. So, although the expected return in the medium run is quite positive, there is about a 20% chance that you will lose money on any given day that you choose. For this reason, caution should be exercised. Also, one must remember Murphy's Law. For example, I actually tried out the new betting system at Hollywood Park five times and managed to hit two of the three losing days noted in Table 2.

Is the calculator the most exciting calculator ever designed? It depends on how you like an occasional day at the races with a much higher than average bettor's chance to win. I wouldn't mortgage the house right now, but I am saving up a little kitty to get the money back from that day I lost half of what I bet.

—Tom Barber

	Day	Bet	Return	Bank	
Santa Anita	3/16	$ 90	$ 224	$234	
	3/17	70	103	267	
Hollywood Park	4/14	90	143	320	
	4/15	90	99	320	
	4/18	80	41	280	•
	4/19	90	89	289	•
	4/20	70	146	365	
	4/21	80	124	409	
	4/23	90	98	417	
	4/29	80	111	448	
	5/2	90	100	458	
	5/3	80	78	455	•
	5/5	90	164	530	
	5/6	90	111	551	
	TOTAL	1,180	1,631	551	

• LOSING DAYS

Table 2. Starting bank $100.

1. Davis, Frederick S., *Thoroughbred Racing: Percentages and Probabilities*, Millwood Publications Inc., New York, 1979

2. Quiren, William L., *Winning at the Races: Computer Discoveries in Thoroughbred Handicapping*, William Morrow & Co., New York, 1979

Tom Barber is manager, Electric and Hybrid Vehicle Project, Energy and Technology Applications, at the Jet Propulsion Lab in Pasadena, Calif.

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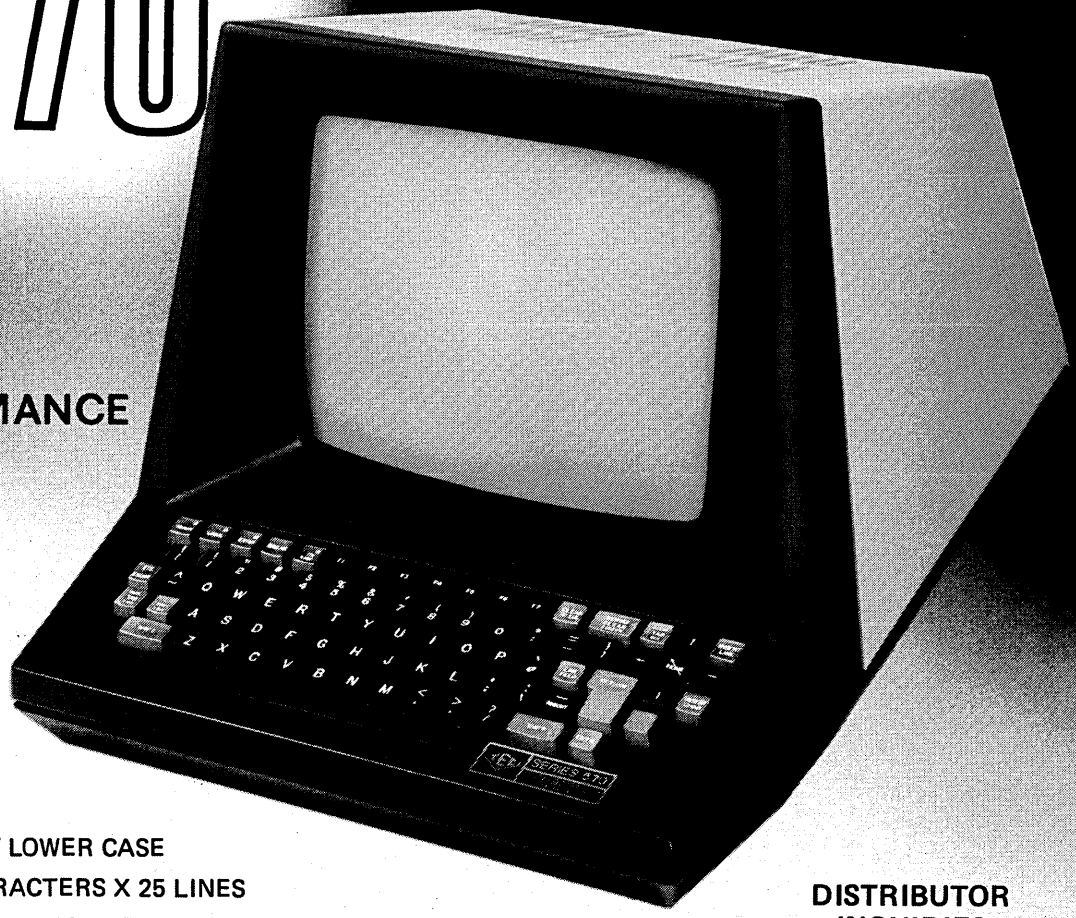

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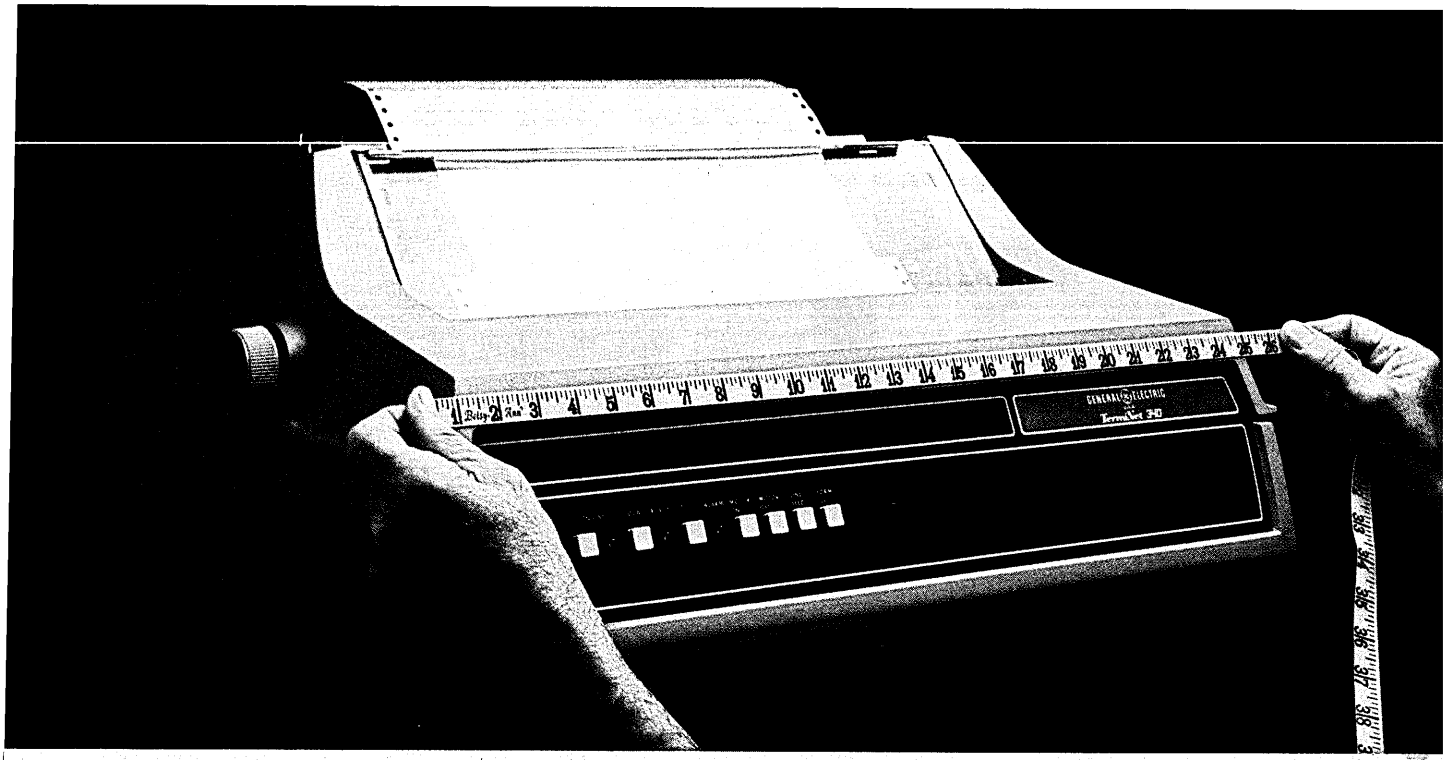
CIRCLE 102 ON READER CARD



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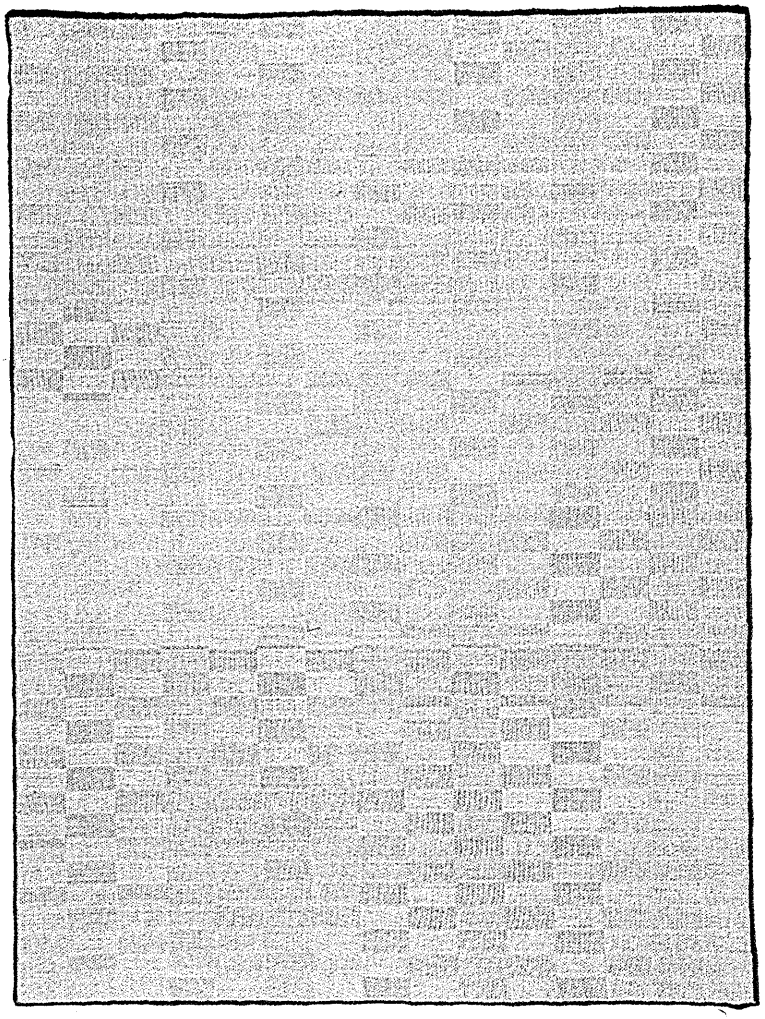
The French Revolution was only one of the problems facing M. Jacquard when he sought acceptance of his "programmed" loom.



THE LOOM OF LYONS

by Molly Gleiser

His eyes alight with anticipation, a boy in his late teens descended the stairs to the cutler's workshop. Today was the day his patron had agreed to the trial run of his machine to make knife blades. He opened the door and stared, aghast. There in ruins, smashed wood and bent iron, lay the machine he had worked on so many hours by candlelight.

"Patron," he cried, "who would have dared...?

"Your machine," replied the man who might have made a fortune from it, "has upset my workmen. Perhaps they are right. They have their habits and anything that threatens to change them makes them apprehensive. Enough!" He held up his hand, silencing the boy. "I employ you as workman, not inventor. Get on with your work and shut up."

Knife blades seem a far cry from computers, yet this boy, Joseph Jacquard, was the man whose invention of a loom that wove patterns led directly to the punched card still used today.

Joseph-Marie Jacquard was born in 1752, a time of unprecedented peace and prosperity, in the village of Couzon, about three miles from Lyons in central France. Lyons, the second largest industrial city in France, located at the junction of the Rhône and Saône rivers, hummed with the noise of silk looms; there the weaving trade flourished. Both of Jacquard's parents worked in the trade. His father, a weaver of gold and silver embroidered silks, and his mother, a pattern maker, were a modest, practical couple who believed in the virtues of thrift, loyalty, and hard work.

Jacquard never went to school, but was taught to read by his mother, and showed mechanical ability early, making models of houses and wagons from old scraps of wood. At the age of ten, over his mother's protests, his father took him to work at the drawloom. At that time, it was the only machine that wove patterns, and it was operated by raising the weighted vertical warp threads by hand in strict succession, returning them in exactly the same sequence, and repeating the process indefinitely. The space behind the loom was cramped, and children as young as five, "drawboys," were used for this operation, becoming part of the machine in producing the pattern.

Jacquard remained hunched over this work for two years until his mother, frightened by his poor health, sneaked him away as an apprentice in a bookbinding shop owned by a cousin, Jacques Barret, where he learned the rudiments of machine design. At 16, he transferred to the cutler's and when the catastrophe with his first machine occurred, left for a typefoundry, everywhere making small improvements in pieces of machinery.

His mother's death brought him home and when, a few years later, his father died, leaving him the house, two looms, and a small sum of money, he became interested in effecting improvements in the drawloom. His ambition was to abolish the function of the drawboy. Through research in the libraries of Lyons he became aware that the only inventor who had managed to completely eliminate the drawboy had been Jacques de Vaucanson. Vaucanson, a maker of automata had made a mechanical duck that ate, quacked, waddled, and digested food, as well as an automatic chess player and a flute player. Vaucanson had worked in Lyons at one time as an inspector in silk factories. He was still alive but his loom had been lost.

At first, Jacquard devoted only evenings to his invention, but then it began to occupy his daylight hours as well.

"I am obsessed by my research," he once said. "I start (to weave) a fabric and suddenly an idea comes to me. I abandon the loom and jot down a few notes on paper. I am absolutely sure that one day I shall succeed..."

Of course under these circumstances, his business did not prosper and Jacquard was saved from bankruptcy by a large loan from his bookbinding cousin. Even that did not suffice. When it was exhausted, Jacquard, thinking that out of sight of the loom he would forget it, took a

job as a laborer in a limemaking factory. But his obsession continued.

Luckily for him, he had married, some years earlier, Claudine Boichon, the daughter of a gunsmith. Claudine resented being restricted to a domestic life, and had somehow acquired the milliner's trade. She now took a job in a hat factory and her earnings kept Jacquard, herself, their son, Jean-Charles, and the weaving maching going. Jacquard worked on it for almost 20 years without even a glimmer of success.

Meanwhile, times were changing. In the winter of 1789, temperatures in Paris fell to 20 degrees below zero and followed a bad harvest. Through court extravagance, the Treasury was empty. Taxes climbed, and many workers spent half their wages on bread alone, while the unemployed starved. The cry of "Liberty, Equality, and Fraternity" went up. The French Revolution raged.

A CALL TO ARMS

But the Revolution did not decrease the price of bread and now bands of starving brigands roamed the land. A call to arms was sounded and with people no longer able to afford weavings, Lyons suffered particularly badly. There was trouble on the border, too. Austria and Germany, their own monarchies threatened, declared war on England. An internal reign of terror rose, and anyone, aristocrat or peasant, even suspected of being against the French Revolution could find himself under the blade of the guillotine, his head in a basket or displayed on a pike.

Jacquard must have been thrown into a tremendous state of conflict by the Revolution. With his experience as a child laborer, his sympathies were with the underdog. Yet, like his fellow tradesmen, the revolutionary excesses horrified him. The ensuing period of Jacquard's life is covered in confusion. Some accounts simply state that he fought for the Revolution. But his most recent biographer, Pierre Chanlaine, in his *Vie de Jacquard*, is quite clear. When his bookbinding cousin announced, "(The people of Lyons) refuse to accept the tyranny of bloodthirsty brutes...I am signing on in the army of the insurrection," Jacquard left his wife at the milliner's and joined his cousin and fellow townsmen as sergeant in this antirevolutionary army.

The revolutionaries at once placed Lyons under seige and kept up a never ending stream of cannon fire. With overwhelming forces, they battered their way into Lyons and when the starving people surrendered, they set about reducing the city to a mass of rubble.

Jacquard, meanwhile, terrified of instant execution, hid in a basement while a patrol combed the remaining buildings for stragglers. Only his son knew where he was hiding, and the boy, because of his youth—he was 15 at the time—was free to roam the town. He hung around the recruiting officers of the revolutionary army, chatting until he managed to persuade them that he wanted to join them in the defense of his country against Germany. Then he talked them into giving him two passes out of the city and some "clothing" (presumably uniforms). Soon after, he and his father found themselves fighting on the banks of the Rhine in the Regiment of the Rhône and Loire on the revoluntionary side. And there, responding to a cry of "Forward!" against a superior enemy, Jean-Charles was shot and died at his father's side.

Returning home, Jacquard found the hat shop where Claudine had worked was closed. He traced her to a sordid laundry; privation had taken its toll, and she never did recover from their son's death.

But Lyons, through a clever move, saved itself. The town sent word to Paris that the ruin of Lyons would give great satisfaction to the enemy in England. The decree against luxury fabrics was rescinded and the weavers returned to their trade —Jacquard, among them, buried his grief by immersing himself in his invention. He made continual improvements and in 1801, though it was still not perfect, he won a bronze medal for figure weaving at an exposition in Paris, the first success he had had in almost 30 years.

Soon after this, a friend told him

Jacquard's portrait woven with colored thread gave Babbage the idea of using punched cards in his Analytical Engine.

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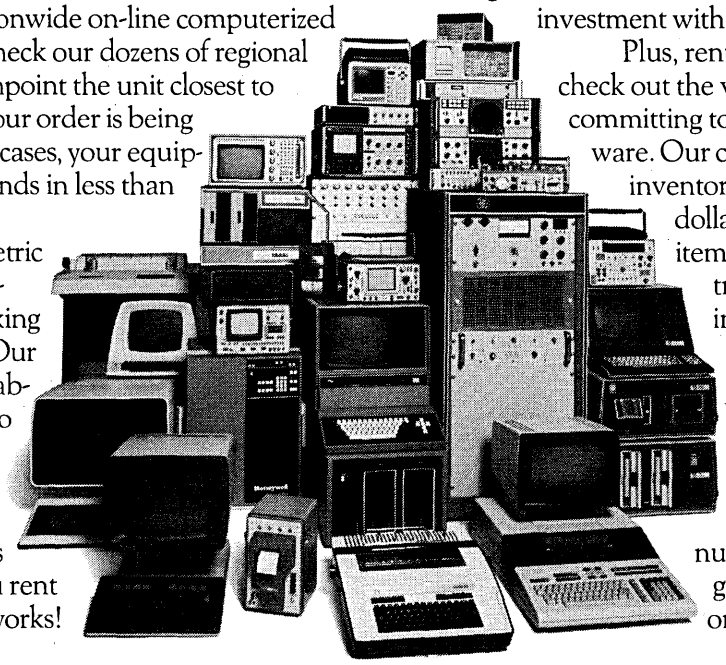

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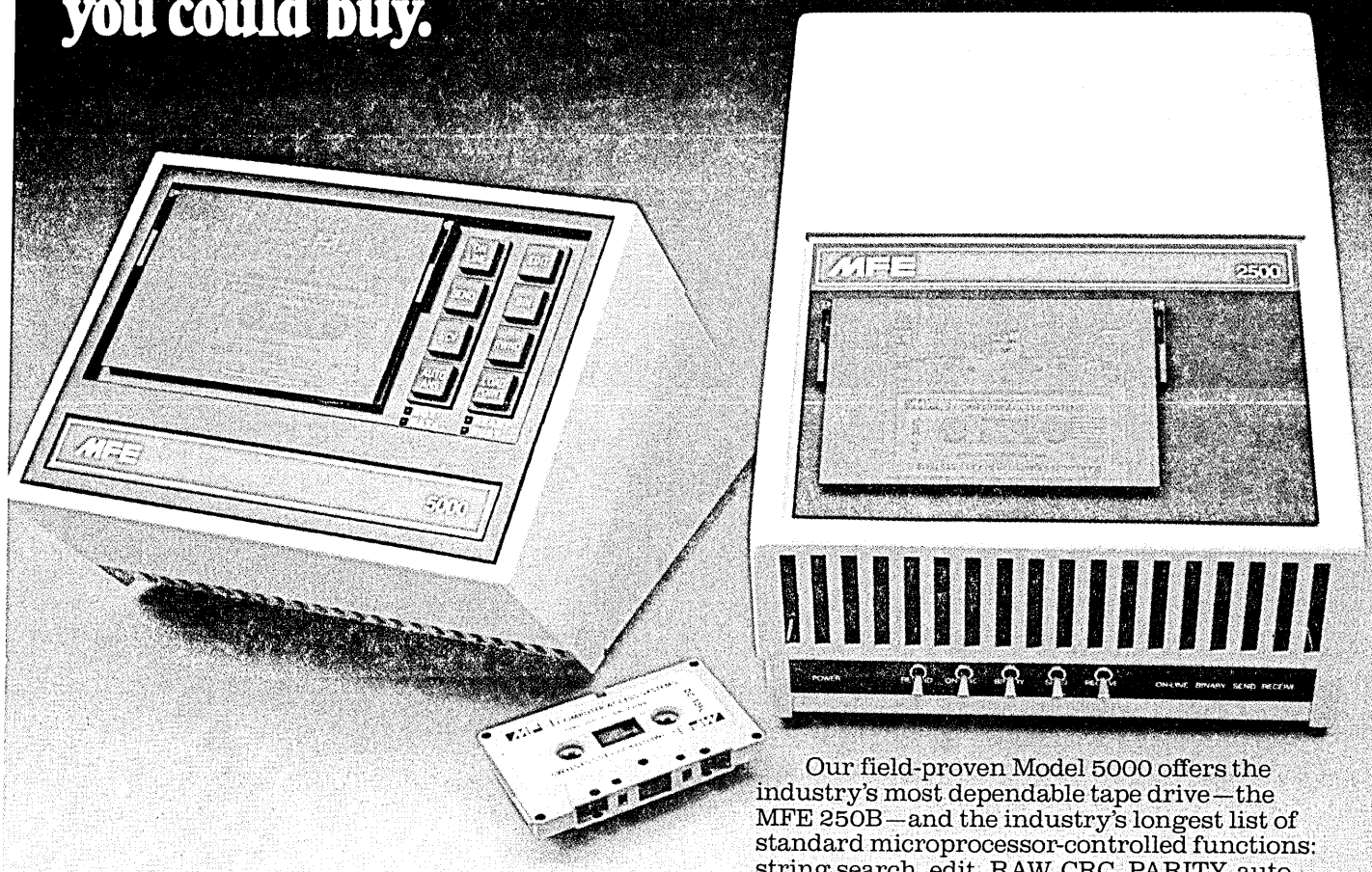

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CIRCLE 203 ON READER CARD

By 1812, 11,000 Jacquard looms were in use in France.

that the Society of Arts in London had offered a reward for a machine that could weave fishnets. Not to be outdone by London, the French Society for the Encouragement of National Industry also offered a medal and 10,000 francs. Jacquard had made such a machine and had shown it to friends, but he had thrown it aside. Luckily, when the Prefect of Lyons heard about it, he ordered Jacquard to show it to him and then sent it to Paris where Napoleon had already begun his attempts to revitalize French industry.

Under orders from Napoleon, Jacquard was arrested and escorted to Paris under guard. There, he and his machine were presented to Napoleon and Carnot, the famous mathematician who served on various commissions to examine the merits of French inventions.

"Are you the man who can do what God cannot—tie a knot in a taut string?" Carnot asked.

"I cannot do what God cannot, but what God has taught me," replied Jacquard and, with a clear demonstration of the machine, he won the medal and the 10,000 francs. In addition he was given the job of repairing and arranging the models and machines in the Conservatoire des Arts et Metiers.

There, while still struggling with his own invention, Jacquard heard from a manufacturer in Lyons that the missing Vaucanson loom lay in storage in the Conservatoire itself. Jacquard searched the attics; three days later, the cobweb-covered machine was in his hands.

VOILA! LE PUNCHED CARD

The Vaucanson invention involved guiding the warp threads by means of holes punched in cards, an idea Jacquard had already heard of. It had originated with Basil Bouchon in Lyons in 1725, and was further developed by another inventor, M. Falcon, who replaced the punched roll of paper used by Bouchon with punched cards. But the Vaucanson machine was the only one that entirely eliminated the work of the drawboy, and would have been invaluable had its mechanisms not been so complex, so expensive, and limited to very small patterns. However, it greatly simplified Jacquard's work, and when he returned home to Lyons he based his loom on the ideas of Vaucanson.

In the Jacquard machine (which is still in use today), horizontal steel rods with springs at the end "sense" the holes punched in a rectangular piece of cardboard. When a rod "feels" a hole it passes through and activates a mechanism for lifting the appropriate warp thread, which is then skipped in the weaving, while the other threads are regularly woven. The way in which the holes are punched programs the pattern.

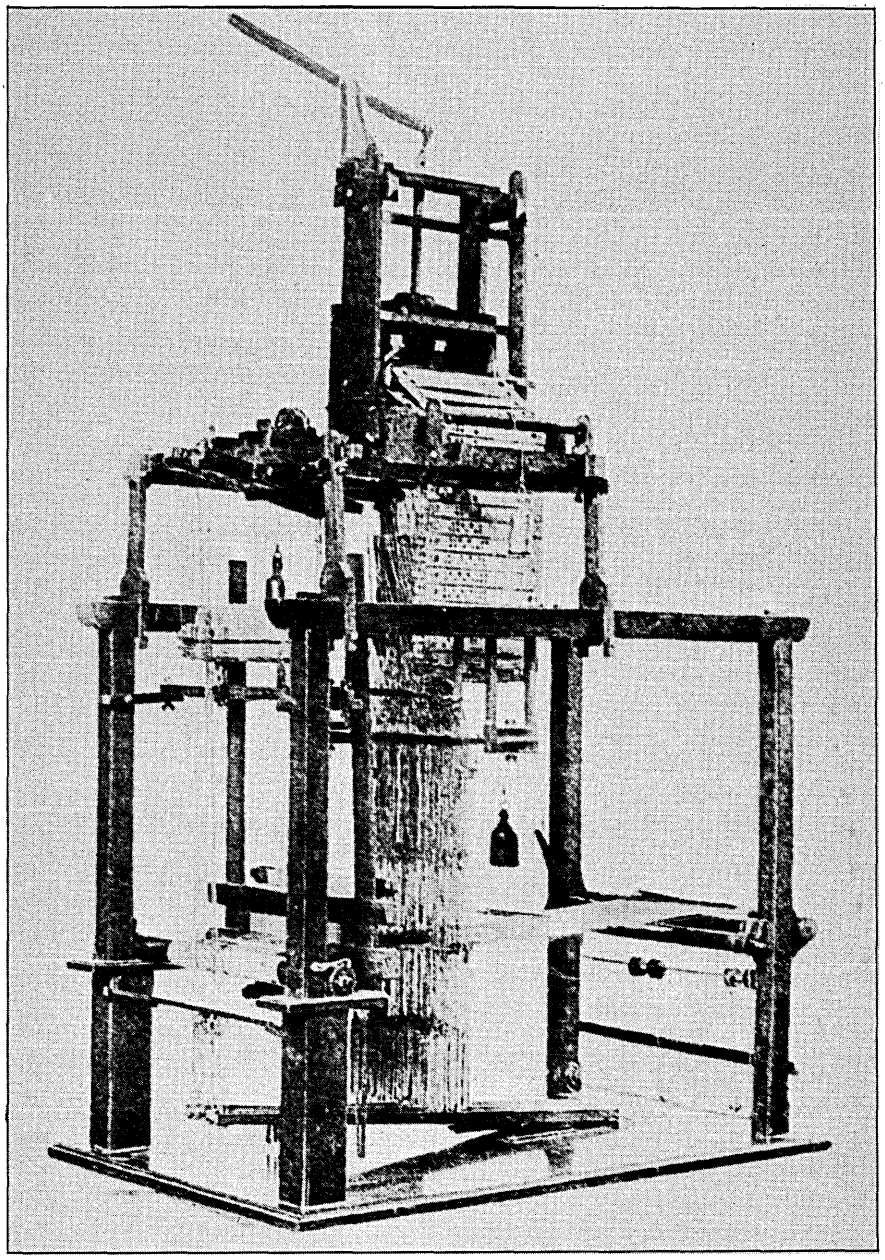
The loom superbly accomplished his mission of eliminating the work of the drawboy and a commission soon voted to adopt it throughout the silkweaving industry. However, Jacquard's difficulties were not over.

In order to keep the weavers fully employed, Napoleon, after he crowned himself Emperor in 1804, declared that all robes of state must be in silk. He ordered new silks for draperies and upholsteries for the various palaces, Fontainebleau, the Tuileries, and Saint-Cloud, for headquarters in Rome and Florence, and for his Empress and young son.

But the weavers of Lyons had not forgotten the unemployment of the Revolution. They held a meeting. It was a one-man machine. It would put half of them out of work. It eliminated the work of the drawboy. How would they support their wives and children?

Protest against Jacquard mounted and the cry went up: "Throw him in the Rhône!"

The mob surged down the Rue de la Grande-Côte, gathering strength. A



This model of the Jacquard loom was a complete success and in widespread use in France before the fall of the Empire.

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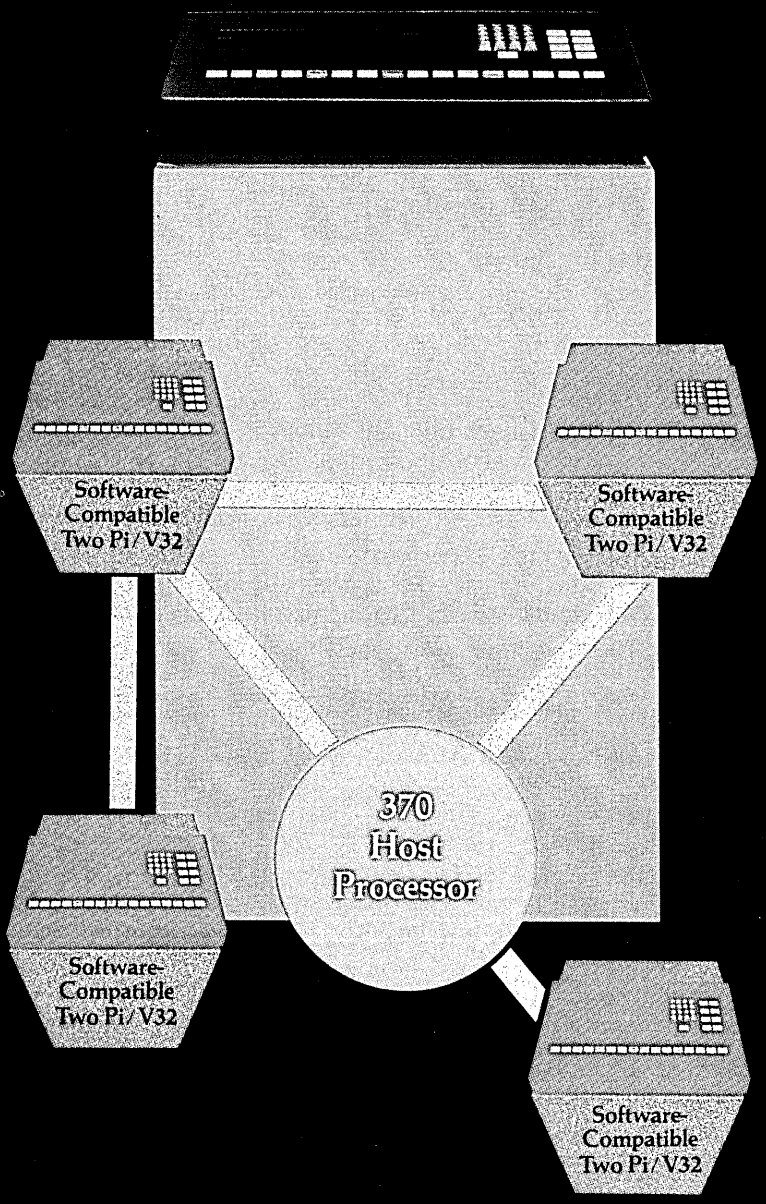

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Did you anticipate moving up to the NCR 8430?

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Not specifically. After all, ours is the first 8430 installed and wasn't available then. But as an agency sponsored by the Florida Medical Association to handle insurance for all the doctors in the state, we surely foresaw very rapid growth. And we were pleased by NCR's assurance we could move up to more powerful systems without obsoleting our software.

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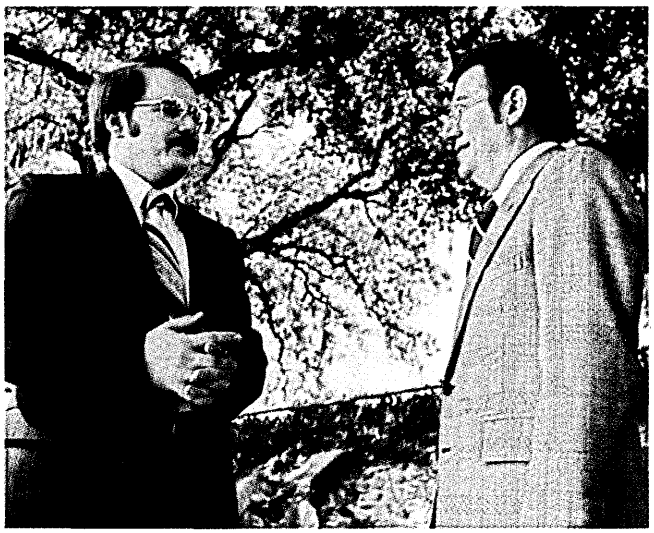

James W. Walker, M.D., (right) is president of Professional Insurance Management Company (PIMCO) of Jacksonville. Paul Middleton is his NCR account manager. The photo was taken in the formal garden behind the PIMCO offices on the edge of the St. John River.

WALKER:
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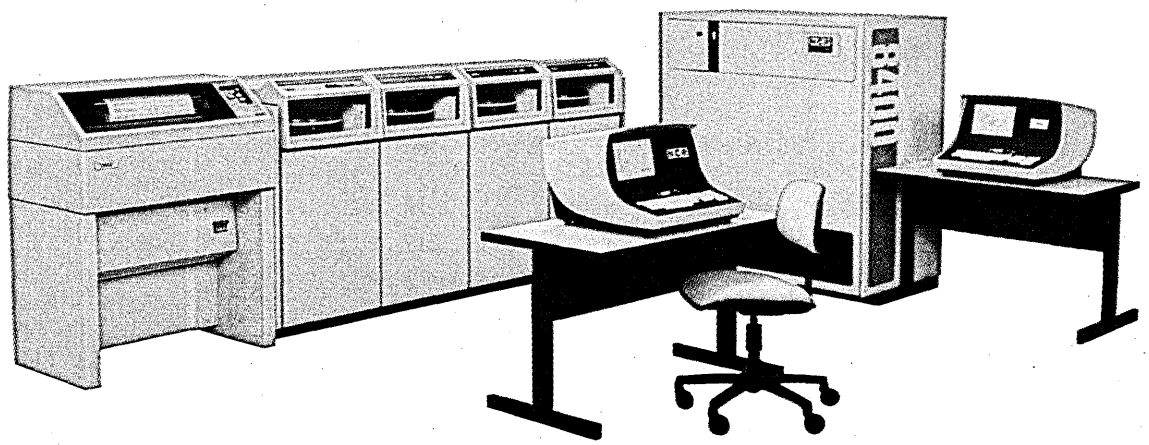

1980 World seminar project management

HOW YOU CAN PREVENT FOUR COSTLY MISTAKES

In project management, yesterday's cut-and-dried PERT and CPM network methods may be the source of your scheduling and budgeting problems, particularly in a turbulent environment combined with austerity economics.

Until recently, project managers had no alternative between the simple but weak barchart and the overly complex critical path networks which rarely extended beyond scheduling and cost reporting phases. Computers became a necessary evil to track progress with PERT/CPM network-based techniques. The losses which occurred in organizations due to the non-productive management of these planning and implementation issues are enormous.

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You can turn your **planning power into dollar power for productive management** of your projects with the Global Method by attending the upcoming 2 day World Seminar - Project Management conducted by A.P. Martin, President of Proactive Management Group Inc. Prior to designing this unique workshop, Alan Martin has directed several multimillion dollar projects, consulted senior executives in nearly every facet of project management and delivered seminars on four continents. He is the recipient of several awards from General Dynamics for the introduction of innovative methods to Canadair's industrial engineering in the 60's and the designer of an advanced project networking scheme for Du Pont in the early 70's. His diversified experience includes the management of distributed data base systems, export market development, microwave engineering, World Bank highway development and TV election coverage projects. He has designed resource allocation heuristics for international airports, participated in tripartite consultations in the Middle-East and evaluated projects ranging from an engineering school in Iran through Prairies' grain handling, food inspection policy, government printing, law enforcement, process control networks, to normative budgeting and urban planning.

US and Canadian participants in this program found Mr. Martin "competent, experienced, practical, sensitive to participants' needs, time conscious and with a friendly sense of humour". Client references are available upon request.

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• Seattle	Jan. 14-15	• Atlanta	Feb. 25-26
• Vancouver	Jan. 17-18	• Miami	Feb. 28-29
• Calgary	Jan. 21-22	• New Orleans	March 3-4
• Minneapolis	Jan. 24-25	• Houston	March 6-7
• Chicago	Jan. 28-29	• Mexico	April 1980
• Detroit	Jan. 31-Feb. 1	• Europe	June 1980
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gendarme failed to disperse them, and they arrived at the quay just as Jacquard appeared for his daily constitutional.

Jacquard tried reasoning.

"My loom," he argued, "will increase Lyonnaise industry. At present only the rich can afford our fabrics. Tomorrow, by the grace of my machine, all classes of society will use them. What you will lose, you will get back double. I shall bring about a prosperity to the manufacturers that will be a source of well-being to the workers."

"Yes," came the reply, "and while we wait we shall be begging in the streets."

And the cry went up, "To the water!"

Jacquard was seized by both arms and legs. The mob attached stones to his feet, and had hauled him to the edge of the quay when the gendarme who had previously tried to disperse them reappeared with police force.

This was the first of several attempts on Jacquard's life. At one point, the Conseil des Prud'hommes, a Ku Klux Klan-like organization that had appointed itself guardian of the public interest, publicly broke up the machine on the Place Sathony, and as Jacquard later said sadly, "The iron was sold for iron and the wood for wood." Finally, however, the French weaving industry felt the effects of foreign competition, and was forced to use the machine.

In 1806, Napoleon, declared the machine on which Jacquard held a patent public property. In exchange, Jacquard received a modest annuity of 3,000 francs for each machine sold. By 1812, 11,000 Jacquard looms were in use in France.

Claudine died, and Jacquard retired with an old family servant, Toinette, to Oullins, southwest of Lyons. He was not forgotten. In 1819, the jury of the Lyons Exposition voted him a gold medal, and King Louis XVIII—the monarchy had been restored—named him Chevalier of the Legion of Honor.

In 1834, when 30,000 Jacquard looms were in use in Lyons alone and many more all over the world, Charles Babbage admired a portrait of Jacquard. About 30 inches square, precise as a line engraving, but made in beautiful colors, it had been woven in silk thread on a Jacquard loom, using some 24,000 cards, each punched with 1,050 holes. It inspired Babbage with the idea of "programming" his "Analytical Engine" by means of punched cards.

In 1844, Jacquard died at the age of 82; a few years later, a statue of him was erected in the Place Sathony in the exact spot where years earlier his loom had been publicly destroyed. ✲

MOLLY GLEISER

Dr. Gleiser was born in England and came to the U.S. as part of the fabled brain drain in 1952, to work at places such as Ohio State Univ. and MIT. Later she worked on solar energy, long before it was fashionable, at the National Physical Laboratory of Israel. After doing more on thermodynamics at the Lawrence Berkeley Laboratory until 1970, she turned to freelance writing and editing.

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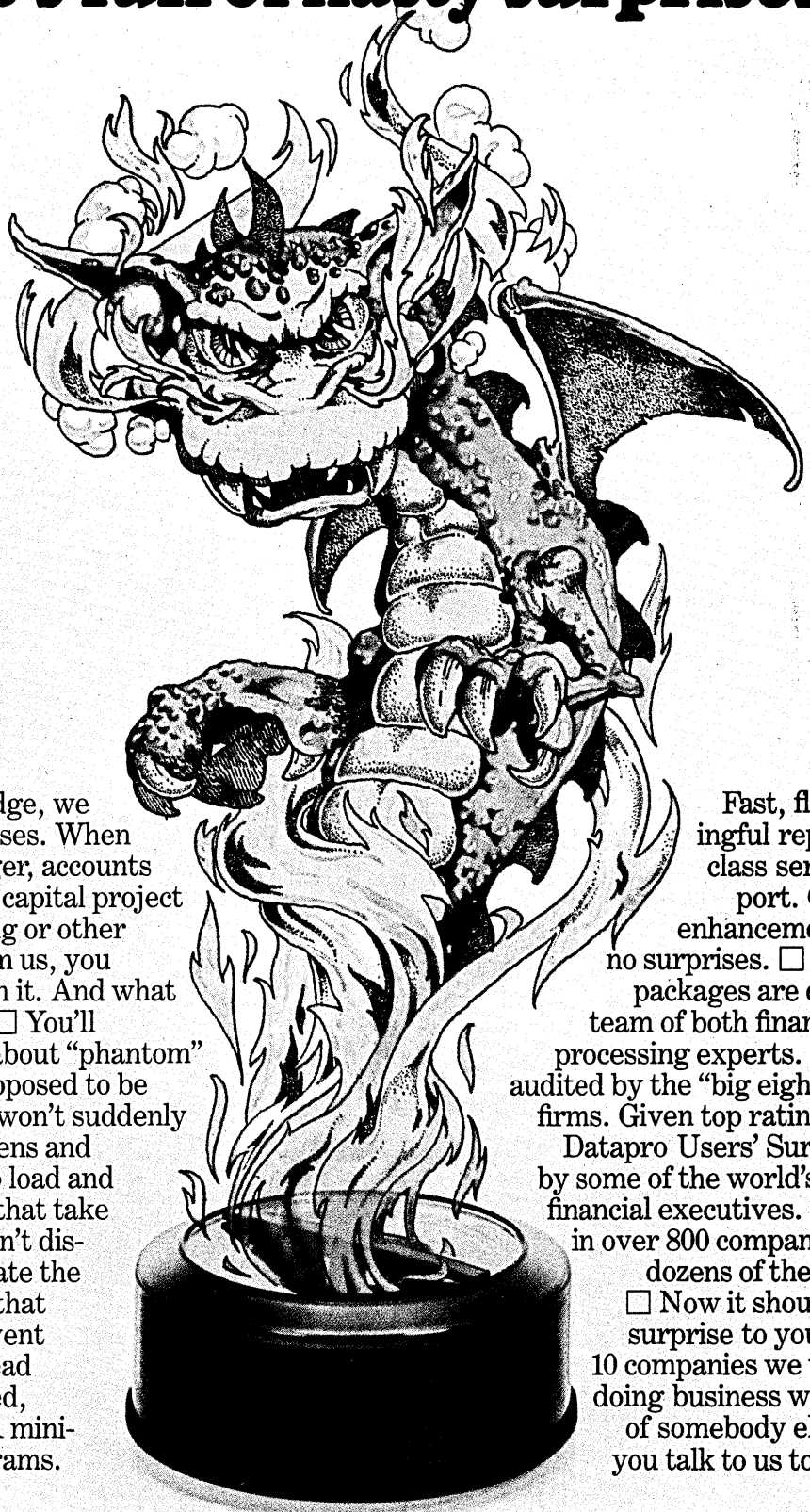

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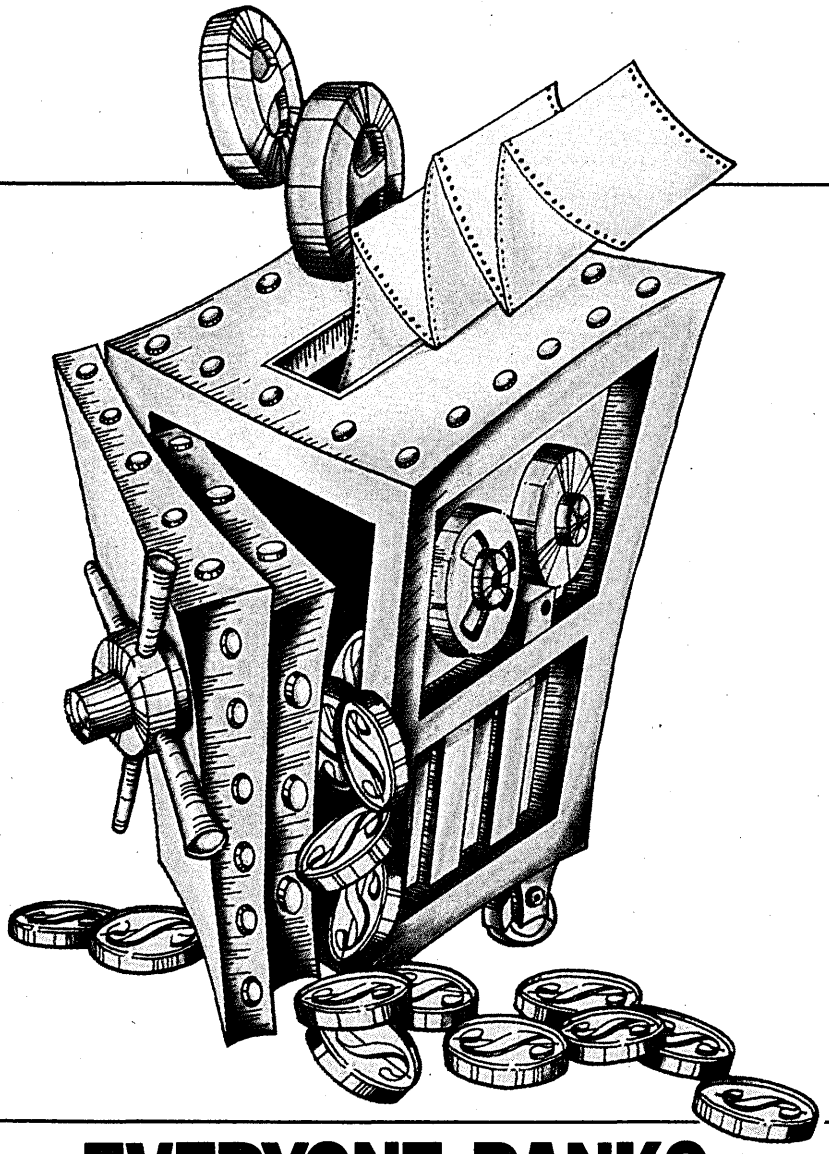

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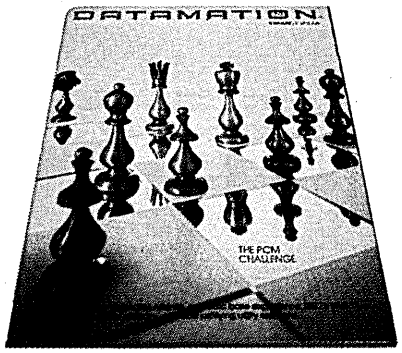

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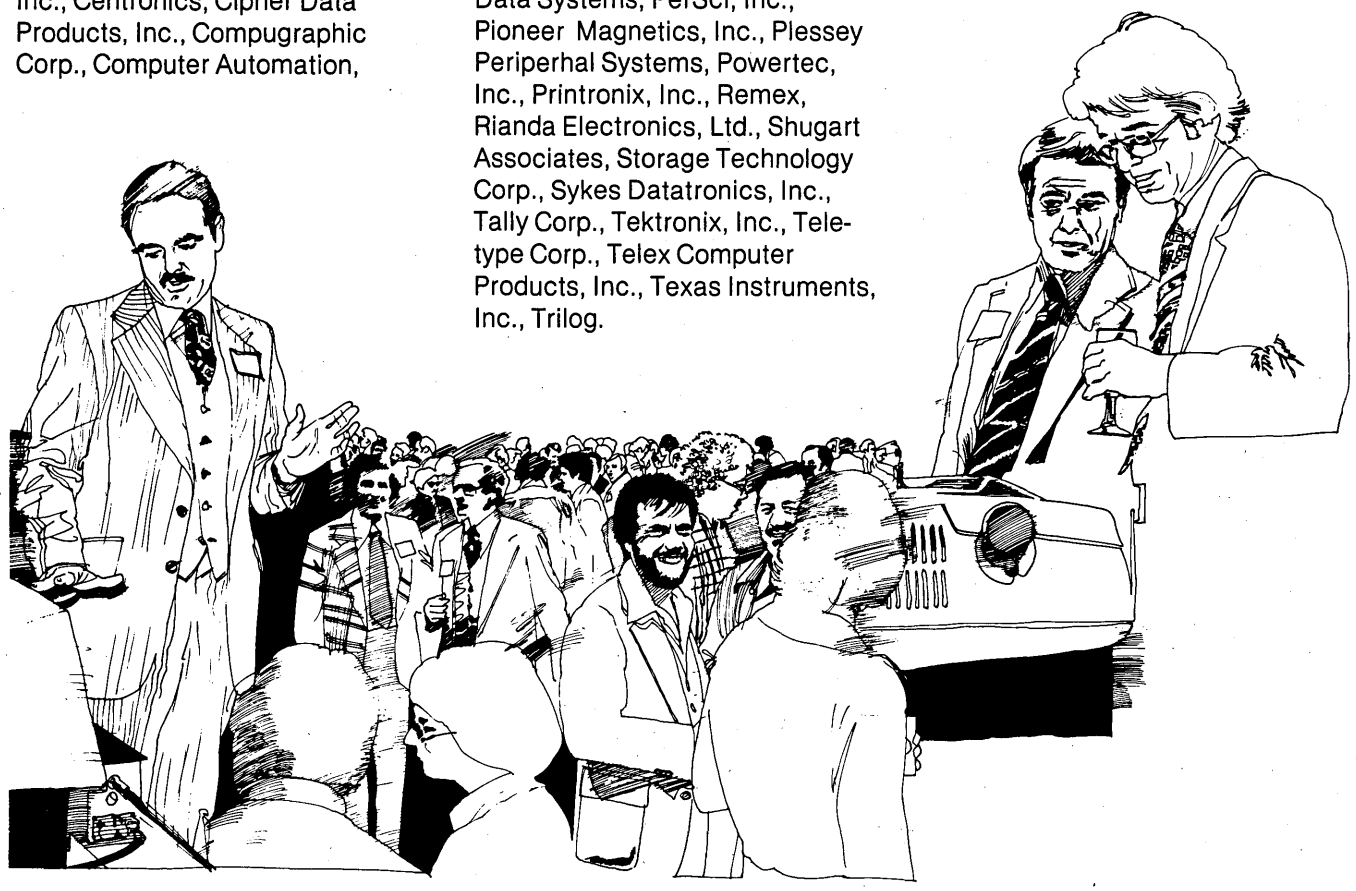

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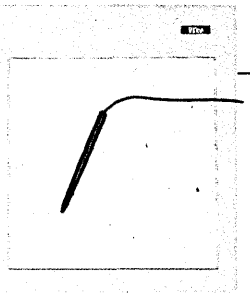

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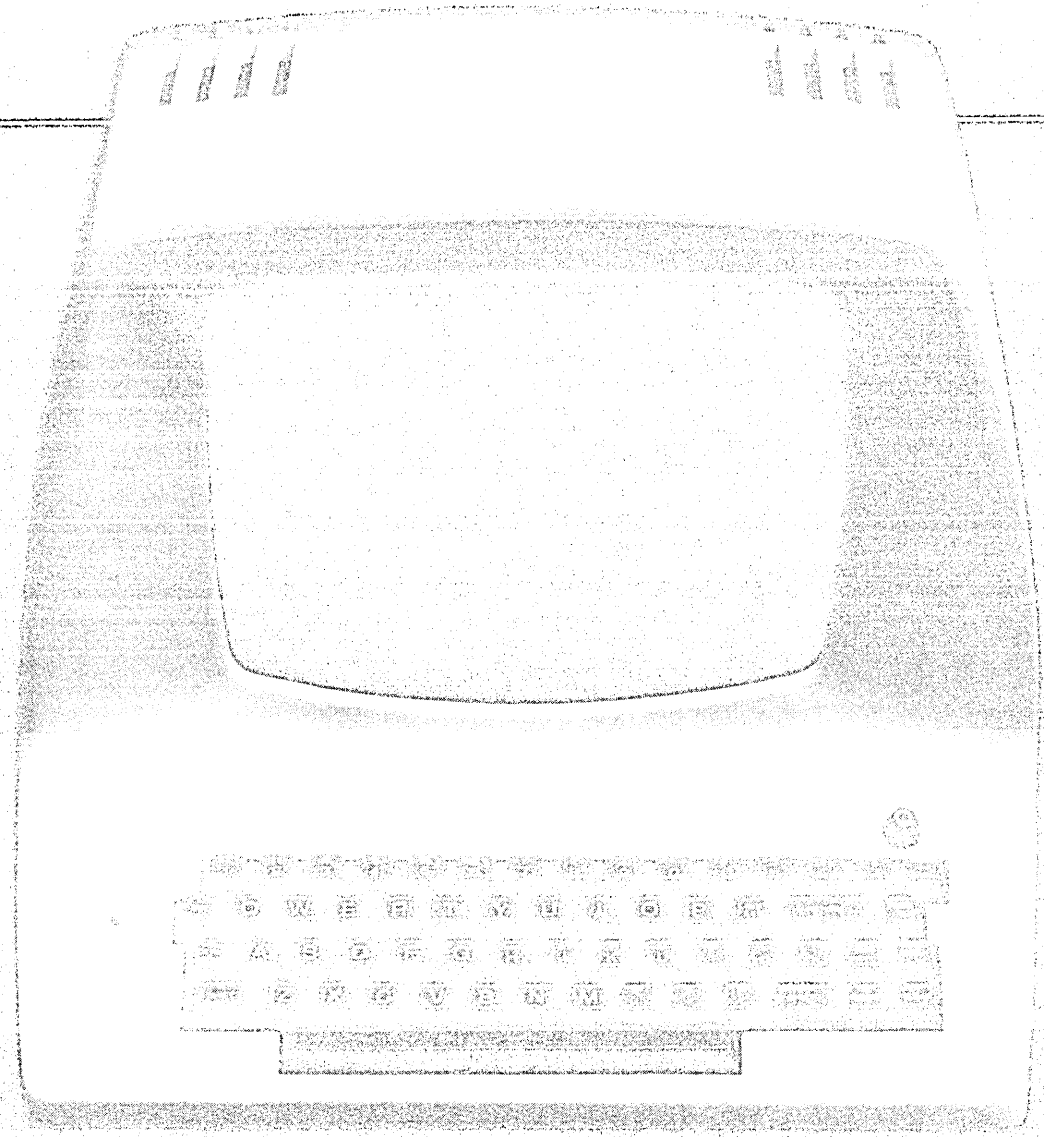

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Circle 98 on reader card

PEOPLE

HE CAME BACK TWICE

Not many people leave a company twice, only to return.

One such is Richard A. Foster, since last January president of Interstate Electronics Corp., Anaheim, Calif. A major charter he has been handed as president is to get the company away from dependency on military work into a higher concentration on commercial activity. "We want to sell more products and fewer systems," said Foster. "There's a higher return on sales with products."

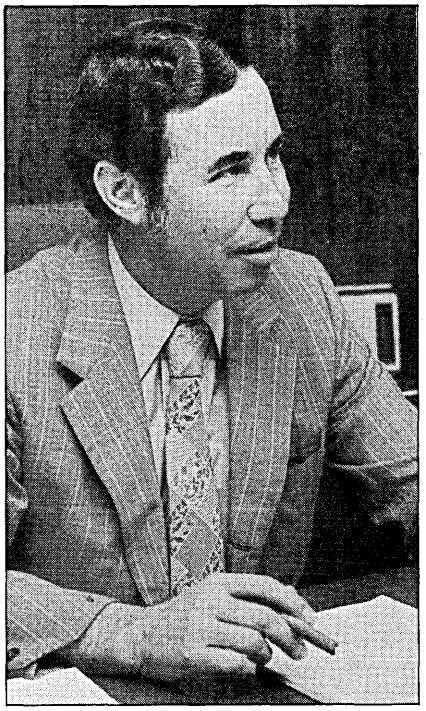
The company, which had $60 million in sales last year, still does better than 90% of its business in government markets but Foster hopes within five years to get the commercial product business up from 25% to 50% of total.

He's banking on two high technology lines, voice data entry systems and plasma display products. In the voice data entry area they have been marketing an end user system for more than a year and this month will introduce an oem product, "what we call the low price product." The average price for the existing product is $40,000. The new, single board product will sell for between $1,000 and $3,000.

In plasma display, Foster said they already have terminals that are fully price competitive with Mil Spec crt terminals "and we have the technology to make them price competitive with commercial crt's. We hope to have working models by the end of this year and demonstrable models in 1980. What we have done is to simplify the electronics and reduce the number of components."

How did Foster happen to leave and rejoin the company twice? The first time, leaving was a matter of following the company's founder, Paul Reedy. Foster joined Interstate in 1957, the year he received his electrical engineering degree from Stanford (he received a masters in engineering from UCLA in 1966). In his first eight years at the company he served as project manager, project engineer, field office manager and electronics engineer.

When he left to follow the company founder in 1965, he became manager of engineering for The Reedy Corp., organized the engineering department, and participated heavily in customer contact, marketing planning, and proposals. The company was involved with digital data systems and instrumentation. It lasted one year then was absorbed by Garret AiResearch which had provided its original capital.



RICHARD A. FOSTER — "We have a lot of retreads."

Foster was offered a chance to return to Interstate in marketing. "I'd always wanted to get into marketing."

His second departure eight years later was a result of "one of those offers you can't refuse." He was asked by Peter Swerling, who in 1973 was leaving the Rand Corp. to form a company to do interconnect work for private telephone systems, to join him as vice president of marketing.

The 1974 gas crunch had a lot to do with his second return to Interstate. "I was commuting from my home in Fullerton to Santa Monica. It was getting to the point where I was thinking I'd have to move, when Dave Scott (then Interstate president) offered me the chance to become general manager of the Systems Div. It had always been my long-term objective to get into general management."

He doesn't consider his being a two-time returnee to Interstate to be all that unusual. "We have a lot of retreads." But he couldn't think of anyone else who has returned twice.

He relates the history of Interstate as if he'd never been away, which isn't surprising since both breaks were only for a year. "A number of years ago we had one source of income, one Navy program called, at different times, Polaris, Poseidon, and Trident. In the mid-'60s we began a diversification effort into other government-related business. In the last two or three years we have concentrated on diversification into high technology product areas."

Interstate got into voice data entry when it hired "a couple of people" from McDonnell Douglas who had been involved in speech recognition research activity McDonnell Douglas closed down on the West Coast. "They brought this activity to the attention of management and the decision was made to invest R & D dollars. Then a small company, Scope Inc. in Reston, Va., which had a product, decided to divest itself of it and we bought it. The McDonnell Douglas guys improved on it and we brought it to market."

Foster thinks Interstate has a time window for the product of "a year or two before the big boys get in. By then we will have defined our markets."

LIAISON TO THE OUTSIDE

If enthusiasm for a job is a guarantee of success, Bill Marston should become one of the most successful small company presidents of all time.

Marston is the new president of Pick & Associates, Irvine, Calif., producer of the Evolution small business system.

"It's the most fantastic thing I've ever seen," he says of the firm's product. "These people are geniuses," he says of its staff. "I've never had more fun in my life," he says of his job.

"All the company needs at this time," he said, "is day-to-day organizational capability." He thinks he has

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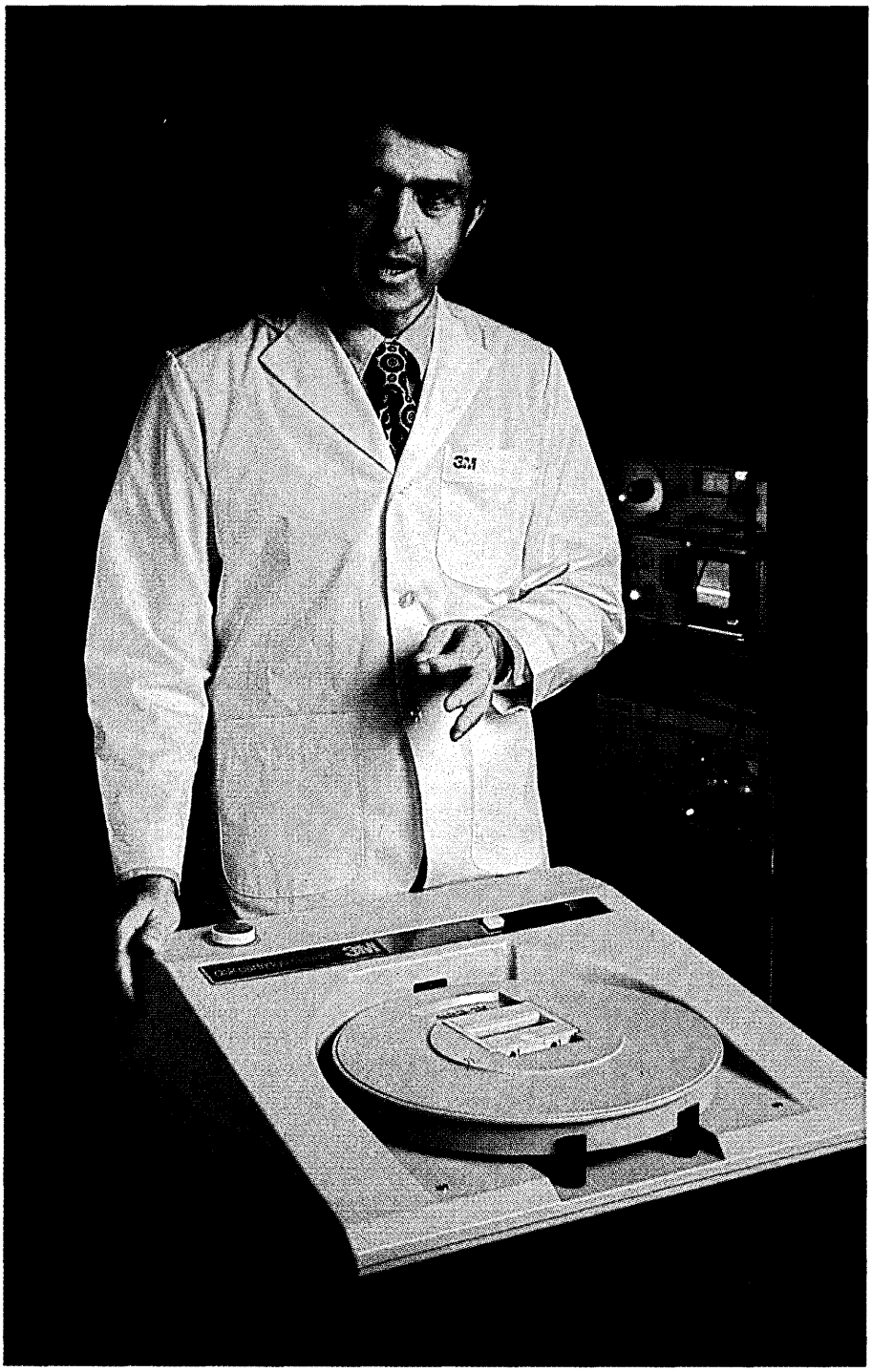

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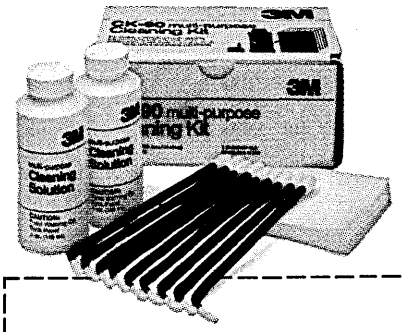

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PEOPLE

BILL MARSTON — "I'm a floating Prez."

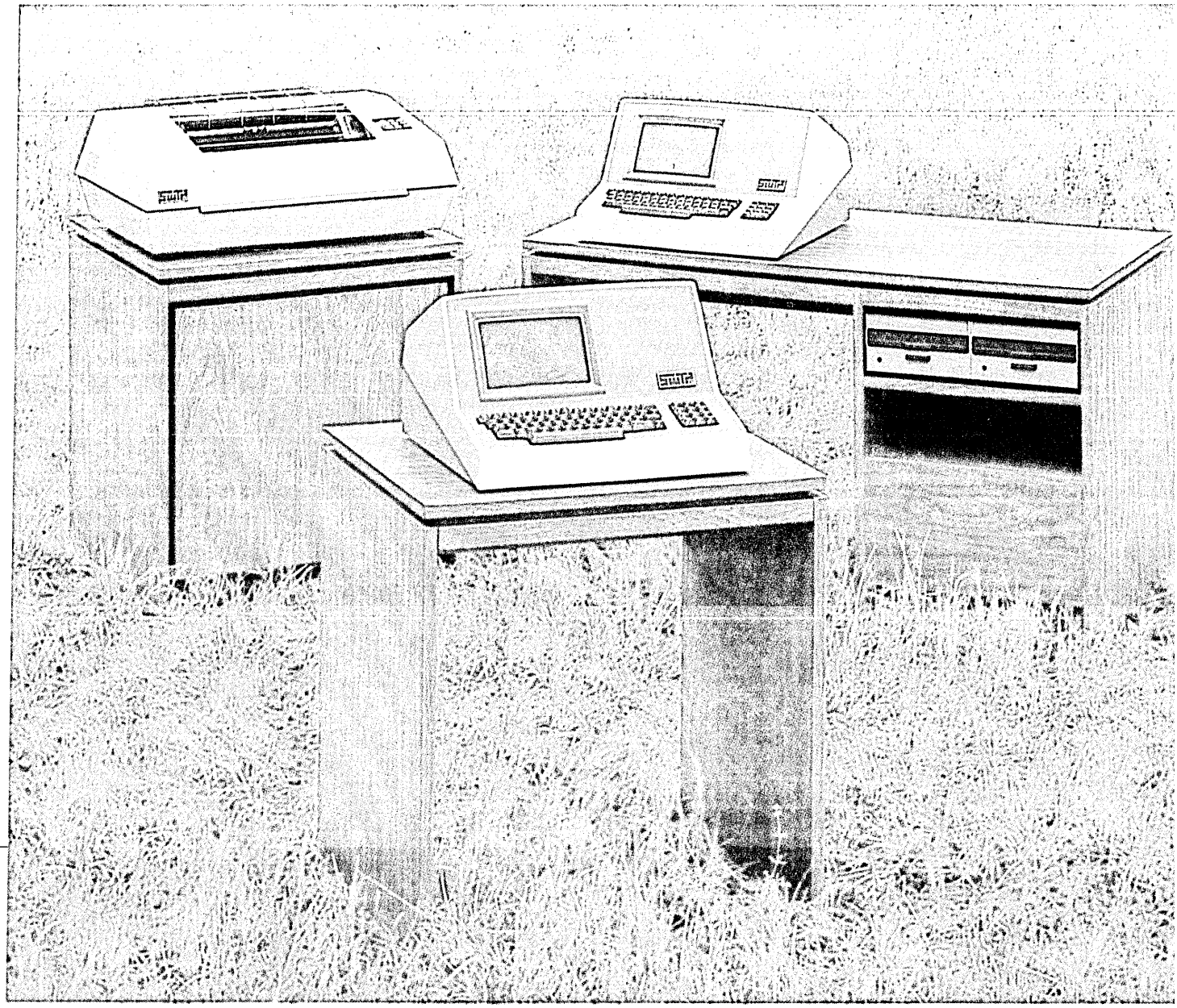
brought them that. He sees himself as something of a liaison between the "geniuses" and the outside world. "I'm the only one who wears a tie." One of the first things he did as president was to discontinue the annual party "which tended to become a little wild and to spill out into the company parking lot." Instead he started a weekly luncheon to maintain the camaraderie among the employees. It's a potluck. "The food's always good, especially when Anna brings her Swiss steak."

Marston's enthusiasm is matched by his optimism. The company installed 10 systems in the year ended last June 30 and he's planning for installation of 307 in the current fiscal year. He sees a potential of doing $23 million in business in two and one-half years but "I'll be tickled if we do half that."

The Pick firm has an arrangement with Intertechnique, a French firm, under which it takes Intertechnique hardware and Intertechnique sells Evolution systems in Europe under a royalty arrangement. "We were profitable last year even without the royalty income."

He said people in the U.S. "tend not to realize that Intertechnique is a $100 million company rooted back in the French underground. Its founders were buddies of Charles de Gaulle."

Marston first met Dick Pick, founder and chairman of Pick & Associates, in the early '60s when they were living in adjoining beach communities. "We played volleyball together." Marston, at the time, was selling copiers for Xerox



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CIRCLE 88 ON READER CARD

Corp. in the Los Angeles financial district.

A native of Pasadena and a political science graduate of UCLA, Marston completed a stint with Army Intelligence in 1960 and decided to settle in Newport Beach. "I figured if money was going to be handed out that was the place to be." He decided he wanted a service business and became a stockbroker. "In 1963, at the age of 25, I decided I couldn't live on it (his stockbroker's salary)."

So he joined Xerox. A friend, another former stockbroker, became a salesman for Teleregister with the same territory. "At about the time Teleregister was acquired by Bunker Ramo, he (the other former stockbroker) introduced me to Tony Barnett (now with Telenet) who hired me to work for Bunker Ramo." He worked first on the West Coast then moved to Chicago. "Dick (Pick) and I kept in touch."

From Bunker Ramo, Marston went to a company called Numeridex, which was producing a microprocessor-based numerical control program, as vice president of marketing. "I opened up their West Coast sales office right next door to Pick & Associates," he recalled.

His next stint was in marketing for the Microfilm Products Div. of Bell & Howell Co. in Chicago. "I never really liked Chicago." He joined Pick last May.

He said his new company is 44 employees strong and growing. They're outgrowing the present facility, said Marston, and "we're looking for a new one which we can move into by next April. I don't even have an office. I'm a floating Prez."

He hopes to see Evolution-type systems adapted to microprocessors, systems that would sell for under $20,000. "We've never really done any good market research. We need to know what's needed. There's nothing to prevent us from adding peripherals. I may even do it (the research) myself."

The Pick firm sells its systems through dealers it likes to call "Associates." The company had 15 associates in early summer and was "seeking new ones every day." Its best source? "Microdata dealers," said Marston.

Dick Pick is credited with being the architect of Microdata's Reality System and Evolution is promoted as being equal to "two Reality systems." His company currently is involved in litigation with Microdata but Marston's only comment on that was: "Ask Dick Pick."

MAN OF MANY DISCIPLINES

Leon Levinson is a believer in a multidiscipline approach to solving problems.

As director of research for Image Resource, Westlake Village, Calif., it would seem he is in the right position for one with this belief. John Cool, Image Resource president, describes his firm as one "concentrating on the field of computer graphics with a special emphasis on film technology and color processes."

Levinson has worked with film technology and color processes for more than 30 years, first with Technicolor Corp., later as president of the Color Div. of Dymat Photomatrix Corp., and most recently with his own company, PhotoScience Research Laboratories.

Cool's background includes 24 years in electrical research, computer design, technical support, and computer applications. Other expertise in the two-year-old firm includes: Jerry Droll, vice president and operations director, 15 years as a consultant in graphics processes and devices; Edmund Newbert, computer design, 12 years in digital computer design and technical support; Dick Lewis, programming director, 21 years in programming; and Robert Bittner, mechanical director, 24 years in mechanical packaging design.

LEON LEVINSON — Chemistry, psychology, photographic science and computers.

And what does this diverse combination of talent hope to do? For one thing, said Levinson, "advance the cause of hard copy color output for computer graphics. It's in its infancy. What does exist is expensive and inflexible. We're working on a device of our own for producing color hard copy directly from video signals which overcomes both these problems." They call the device a laser camera and have filed a patent application for it.

Levinson's multidisciplined thinking goes way back. He began college as a chemistry major at UCLA in 1941. After two years, he was drafted and spent three years in the South Pacific as an infantryman. Then back to UCLA to study chemistry, math and physics, after which he transferred to the Univ. of California at Berkeley and became a psychology major. "I had a strong interest in experimental psychology."

He was graduated in psychology and enrolled in graduate school in Berkeley. "But then I decided it was time to get out and find a job in the real world. I took a leave of absence from grad school and I'm still on it." This was in 1949. Real world jobs were hard to find. Through the influence of his father who was manager of Kodak's Hollywood processing laboratory, he got a temporary job at Technicolor. He stayed there for 22 years.

His interest in computers began while he was head of Technicolor's Research Div. in the '60s. "I knew the company had a large computer capability (Spectra '70s). Through our accounting people I arranged to take a one week course in FORTRAN." But when Levinson was instrumental in getting a terminal into his division it was on the Allen Babcock Time Sharing Service and he had to learn PL-1.

The terminal was obtained for and primarily used for engineering research, mostly in optical design, but Levinson soon developed a sideline. The company was asking for return on investment analyses from each of its divisions and the divisons were having difficulties doing this in a reasonable amount of time. "We found we could do it with a half-hour turnaround so we started selling this service to the other divisons."

Levinson left Technicolor "regretfully" in 1970 because the company was phasing out its dye transfer color processing process, a process he felt was "never carried as far as it could have gone. It is most cost effective in quantity production," he explained. "In 1970, with the impact of television on the motion picture industry, the ordering practices of producers changed. They began ordering film prints in small quantities until they were sure their films would go over." So Technicolor moved to the color negative-positive process used by other labs and Levinson move to Dymat Photomatrix Corp., a company started by another Technicolor alum. While with this firm, he became involved, among other things, with hardware for the micrographics industry. He left Dymat in 1975 when the division he headed, dependent solely on a large government contract, suddenly found itself with no work because of a budget cut. He and his wife, also a former Technicolor employee, formed PhotoScience Research Laboratories which happened to be located across the street from Image Resource. And so the beginning of Levinson's latest multidisciplinary venture. ✲

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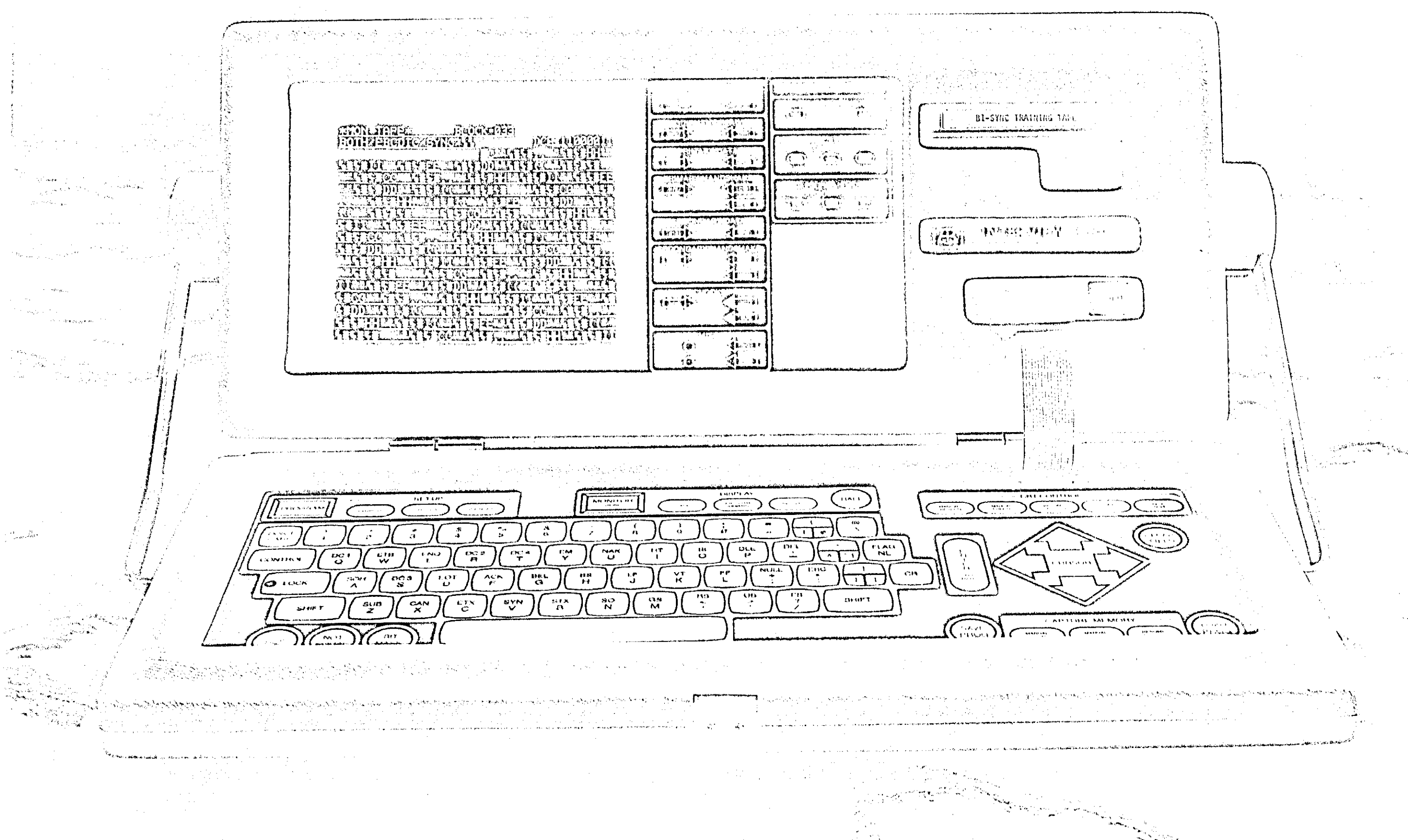

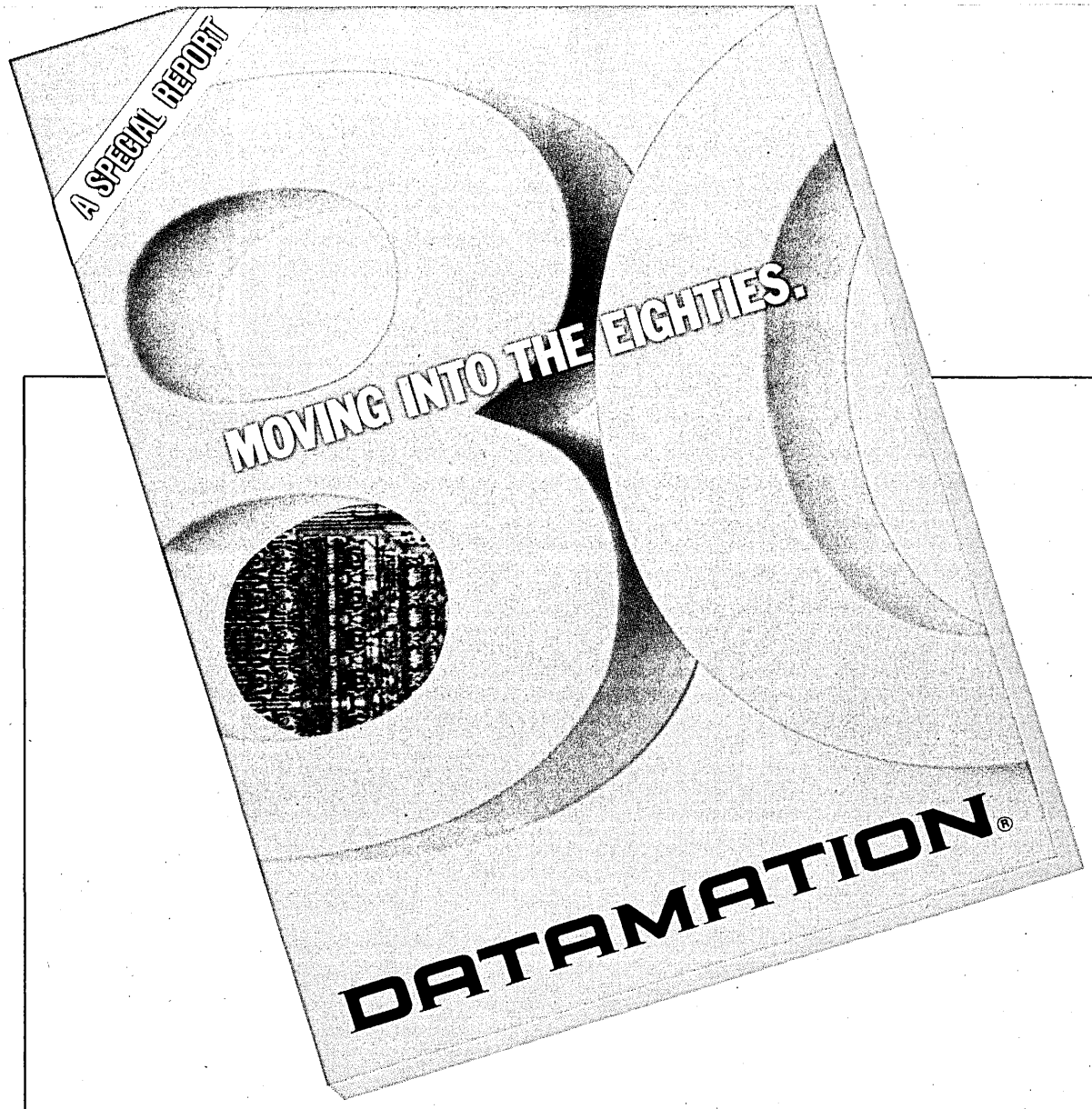

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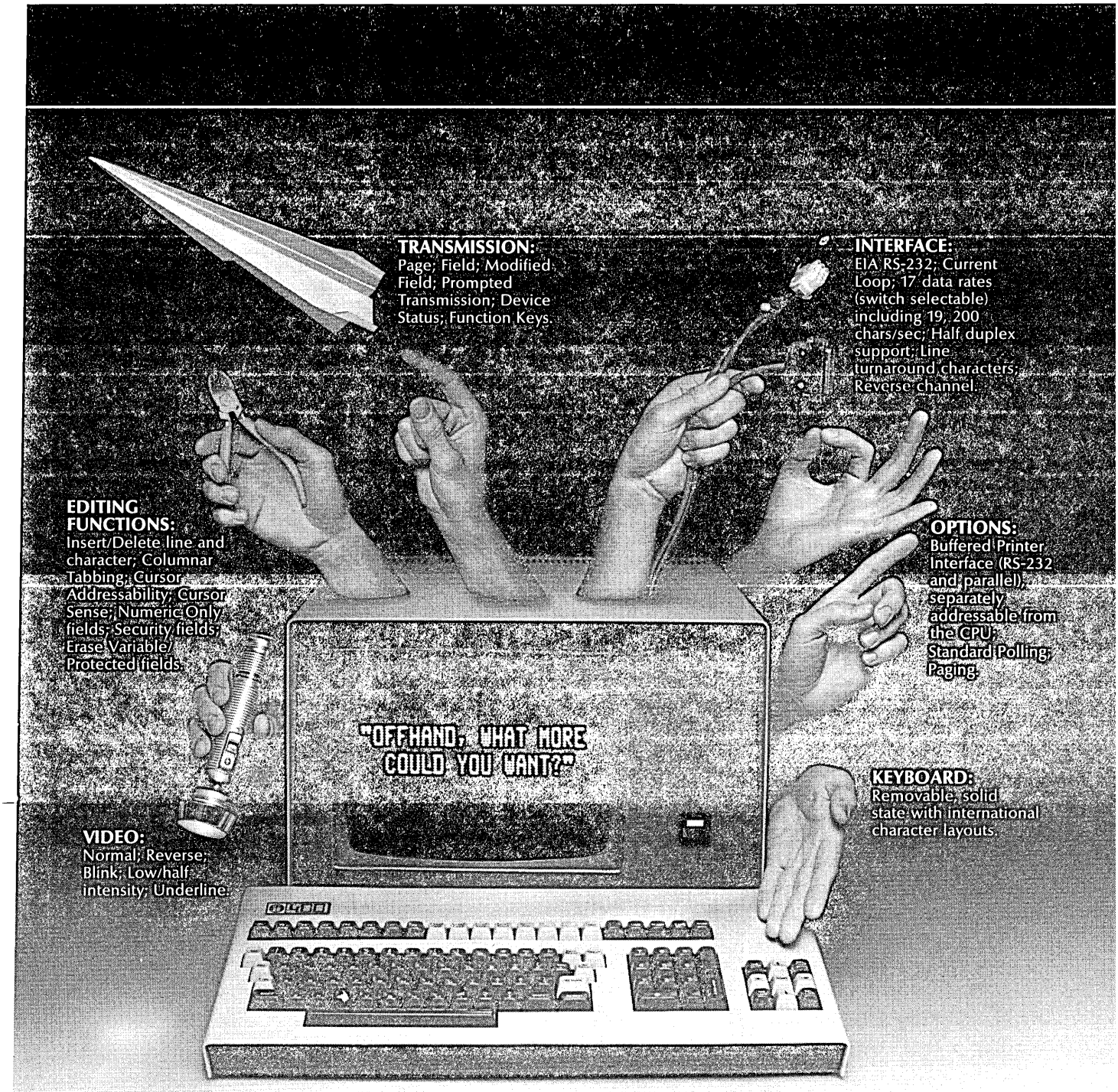

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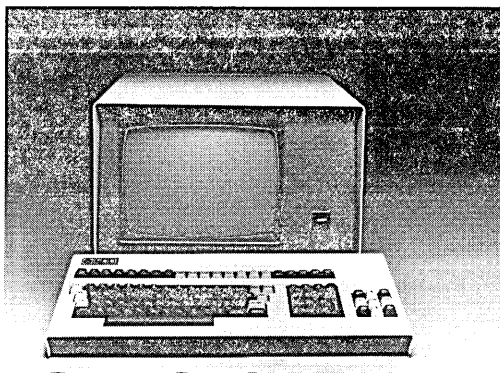

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CIRCLE 125 ON READER CARD

HARDWARE

OFF-LINE

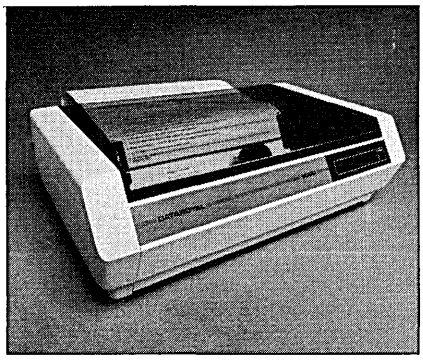
Harris Labs of Marshalltown, Iowa has given a new twist to the definition of "home computer." The firm markets what it calls a Home Control System, a microcomputer control system to be installed in new homes at the time of construction. The system, based on a TI 9900 microprocessor, can control as many as 256 electrical circuits (light switches, wall outlets). Instead of light switches, the contractor installs TouchSensors. The system also has a Master Panel (more than one, if desired) that shows the status of each circuit (don't forget to turn out the bathroom light). The micro also functions as a calendar/clock, so any circuit can be programmed to switch on or off at a given date and time. Or the Home Control System can turn your radio on at 7 a.m., Monday through Friday, skip it altogether on Saturday, and get you up at 6 so you can make it to the links Sunday morning. The Home Control System adds about $3,000 to $6,000 to the price of the house; the developers expect prices to drop as sales volume climbs.

Floating Point Systems delivered its 1,000th array processor at the end of July. Chevron Geophysical Co. in Houston took delivery of the AP-190L which will be used with an IBM 3033.

The Southern California Computer Dealers Association has initiated a toll-free telephone referral service. Calling (800) 432-7257, extension 815, puts a potential customer in touch with a "friendly voice (not a computer)" that will ask for the caller's location. The caller will be given the names and addresses of three nearby computer stores.

PRINTERS

The microprocessor-based IPS-5000 family of dot-matrix impact printers comes in 80-column and 132-column versions. Characters from the 96-character upper and lower case ASCII set are formed on a nine-by-nine dot matrix at 150cps; the



printer's microprocessor and 256-character buffer support bidirectional printing. The pin-feed tractor drive accepts paper widths from 1½-inch to 10-inches; an original and up to five copies can be printed. Standard interfacing is in the form of an eight-bit parallel TTL level interface, with RS232 and current loop interfaces available as options; serial interfaces run to 9600bps. In single quantities, an 80-column IPS-5000 sells for $975, and a 132-column version is $1,075. Oem quantity discounts are offered. DATAROYAL, INC., Nashua, N.H.

FOR DATA CIRCLE 415 ON READER CARD

DISKS

Within the span of a week, this vendor brought out a large (635MB per spindle) disk subsystem for mainframes, and an eight-inch, 11.7MB rigid disk for use with small systems.

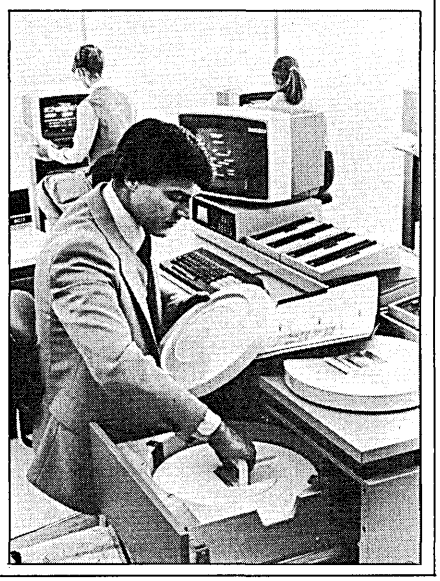
For use with IBM mainframes and compatible processors, the 3652 disk subsystem uses a dual spindle, double capacity version of the vendor's 3350-equivalent drive, providing 1,200MB capacity per module. An Intelligent Dual Interface (IDI) feature provides dynamic dual-port access to each spindle, two-string switching, and automatic backup of a disk string via one of two controllers. The 3652 also offers 2.28MB of fixed-head storage per spindle; moving heads have an average access time of 22msec, rotational latency averages 8.4msc at 3,600rpm, and the transfer rate is 1.198MBps. A standard 3652 configuration, consisting of a 3655 Primary Storage Control and Disk Drive Module, two 3652 Disk Storage Modules, and one 3656 Alternate Storage Controller and Disk Storage Module, sells for $191,000, or leases for $6,845 per month on a two-year contract. Each 3655, 3652, and 3656 packs 1,200MB of data on two spindles.

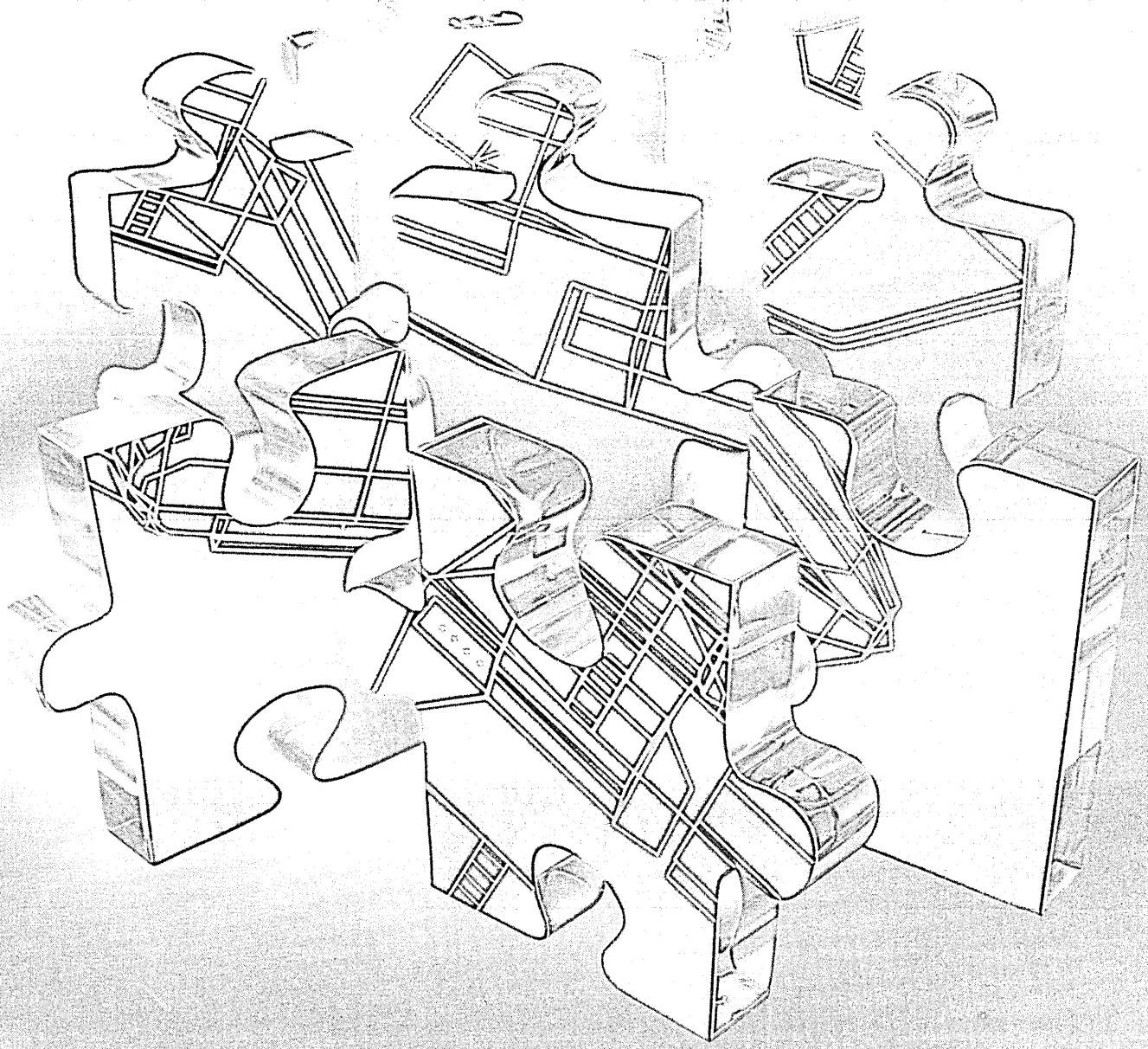
Oem's building small systems can get by with a few orders of magnitude less storage than the gigabyte 3652. The model 101 eight-inch rigid disk drive stores 11.7MB on two fixed disks. The Winchester-technology drive is packaged for mounting in place of a floppy drive. The 101 has an average access time of 70msec, and an average latency of 10.1msec. In lots of 100, the model 101 sells for $1,560. MEMOREX CORP., Santa Clara, Calif.

FOR DATA CIRCLE 416 ON READER CARD

SMALL BUSINESS SYSTEM

Multiprocessing, increased throughput, increased memory, and support for up to six terminals, characterize the BC/7-900, an upward compatible, new top-of-the-line in this vendor's BC/7 family of small business systems. The BC/7-900's multiprocessing capability supports up to four concurrent jobs. Built around a new processor, the system is said to run about 1.5 times as fast as the previous top-of-the-line BC/7-800; additionally, the 900





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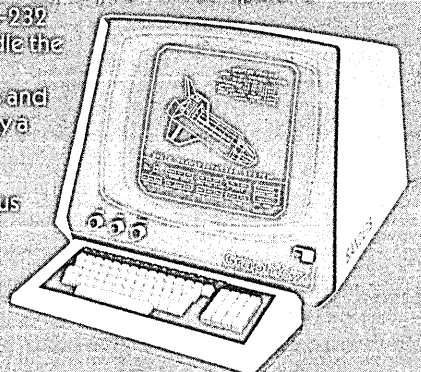


CIRCLE 53 ON READER CARD

supports twice as much memory—256KB. Memory cycles at 1usec per two-byte fetch. For secondary storage, the system can support up to 4MB of diskette storage and a pair of 20MB cartridge disk drives. The BC/7-900 also offers spooling transparent to applications programs, file sharing between users, and user program sizes to 48,152 bytes. Users can develop programs using RPG II or the vendor's proprietary ESCORT applications language. A BC/7-900 with 256KB of memory, 40MB of disk storage, four workstations, and diskette storage can be leased for $1,846 per month on a five-year agreement; the same system sells for $76,587. First deliveries are slated for the second quarter of next year. SPERRY UNIVAC, Blue Bell, Penn.

FOR DATA CIRCLE 417 ON READER CARD

FLOPPY CONTROLLER

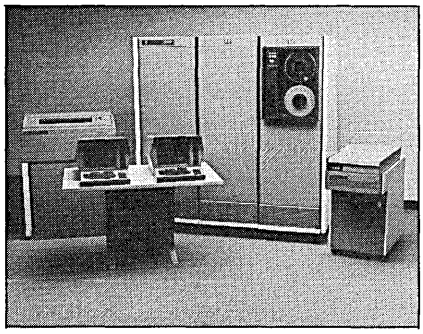
The model 204 Universal Flexible Diskette Controller interfaces single density standard size and minifloppy diskette drives to 8-bit and 16-bit microcomputers built around the Intel Multibus. The 204 uses the vendor's 8271 floppy disk controller chip and can control two single-sided or one double-sided drive; an additional controller chip can be added to the 204, doubling the number of drives it can handle. The 204 supports IBM 3740 formats. For special applications, the controller can handle up to 2KB sectors on minidiskettes or 4KB sectors on full-sized diskettes. Data transfers are handled by DMA. Software customizes the 204 for use with a number of drives, including Shugart, Memorex, Pertec, and Wangco offerings. A single 204 controller sells for $680, with discounts available on quantity purchases. INTEL CORP., Santa Clara, Calif.

FOR DATA CIRCLE 418 ON READER CARD

WP BELLS & WHISTLES

Several peripherals, synchronous communications, and a mathematics package have joined the options for this vendor's model 8000 line of word processing systems. The Rotary VII printer is a 26.3-inch wide, dual headed daisywheel printer that allows use of two type fonts or character sets in one document; the Rotary VII sells for $7,200. For use with the new printer, or the existing Rotary V, and VI printers, an $1,895 sheet feeder can insert standard-sized single sheets or multiple part forms. For users needing a migration path from IBM Mag Card II systems, a $3,995 mag card reader lets users transfer information from cards to diskettes. Synchronous communications (IBM 2780 compatible) operates in background mode, transmitting data at speeds ranging from 2000bps to 4800bps. The $1,000 package can run while an operator enters or edits a document. The math package

HARDWARE SPOTLIGHT



SYSTEMS

The S800 now tops this vendor's line of number-crunchers. Sporting 48-bit pipelined architecture and 6KB of cache, S800 systems are designed to accommodate up to 128 interactive users performing scientific, engineering, and commercial applications. The vendor's Vulcan virtual memory operating system lets each user perform concurrent time-sharing, multistream batch, RJE, and real-time processing. Software support includes a macro assembler, and language processors for APL, BASIC, COBOL, FORGO, FORTRAN-77, and SNOBOL; the TOTAL data base management system also is available, as is an interactive text editor.

As for performance, the vendor says the S800 is nearly twice as fast (1.8 is the factor given) as its previous top-of-the-line S500 (said to be in the same class as DEC's VAX-11/780). The comparison was made over a mix of APL, BASIC, COBOL, FORTRAN, and RPG compilations and executions.

Initially, the S800 is offered in two configured systems. The S850 system supports up to 96 users, and the S870 can handle 128. Both systems include an S800 processor with integral Scientific Arithmetic Unit (hardware floating point processor) and a Maintenance Aid Processor (MAP) for diagnostics and monitoring. The S850 comes with 960KB of error correcting memory, system console, MAP console, 80MB of disk, 45ips tape, 600 lpm printer, DMA communications processor (two asynchronous or one synchronous port), and software; it carries a $285,000 price tag. The larger S870 system comes with 2MB of main memory, 300MB of disk, additional power supplies and cabinetry, and the rest of an S850 system. The S870 is priced at $370,000. Deliveries are scheduled to commence in the first quarter of next year. HARRIS CORP., Computer Systems Div., Fort Lauderdale, Fla.

FOR DATA CIRCLE 414 ON READER CARD

supports operations ranging from column and line totaling to calculating scientific formulas. Ten memories are provided for intermediate results. The math package carries an $800 license fee. CPT CORP., Hopkins, Minn.

FOR DATA CIRCLE 420 ON READER CARD

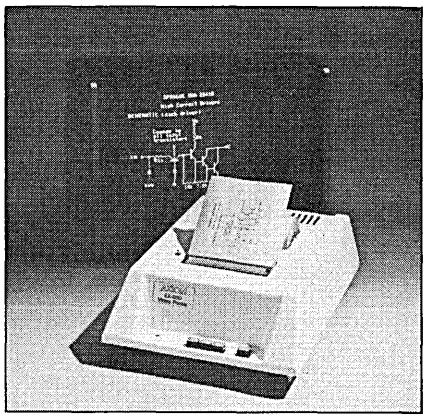
6250BPI TAPE SYSTEM

For use with PDP-11's and VAX-11/780 processors, this vendor's model 804 tape system sports 6250bpi recording and media compatibility with IBM systems. Model 804 combines a dual density (6250bpi/1600bpi), 9-track, 75ips tape transport and formatter manufactured by Storage Technology, with this vendor's controller adapter board. The board, built with bit-slice technology, fits into a Small Peripheral Controller (SPC) slot in the host's chassis. It includes 4KB of RAM, and it can operate in word or byte transfer mode. The model 804 system is said to run under all DEC operating systems using the TM11 handler. Deliveries begin this month, with quantity one pricing starting at $28,200 for a single transport system. AVIV CORP., Woburn, Mass.

FOR DATA CIRCLE 419 ON READER CARD

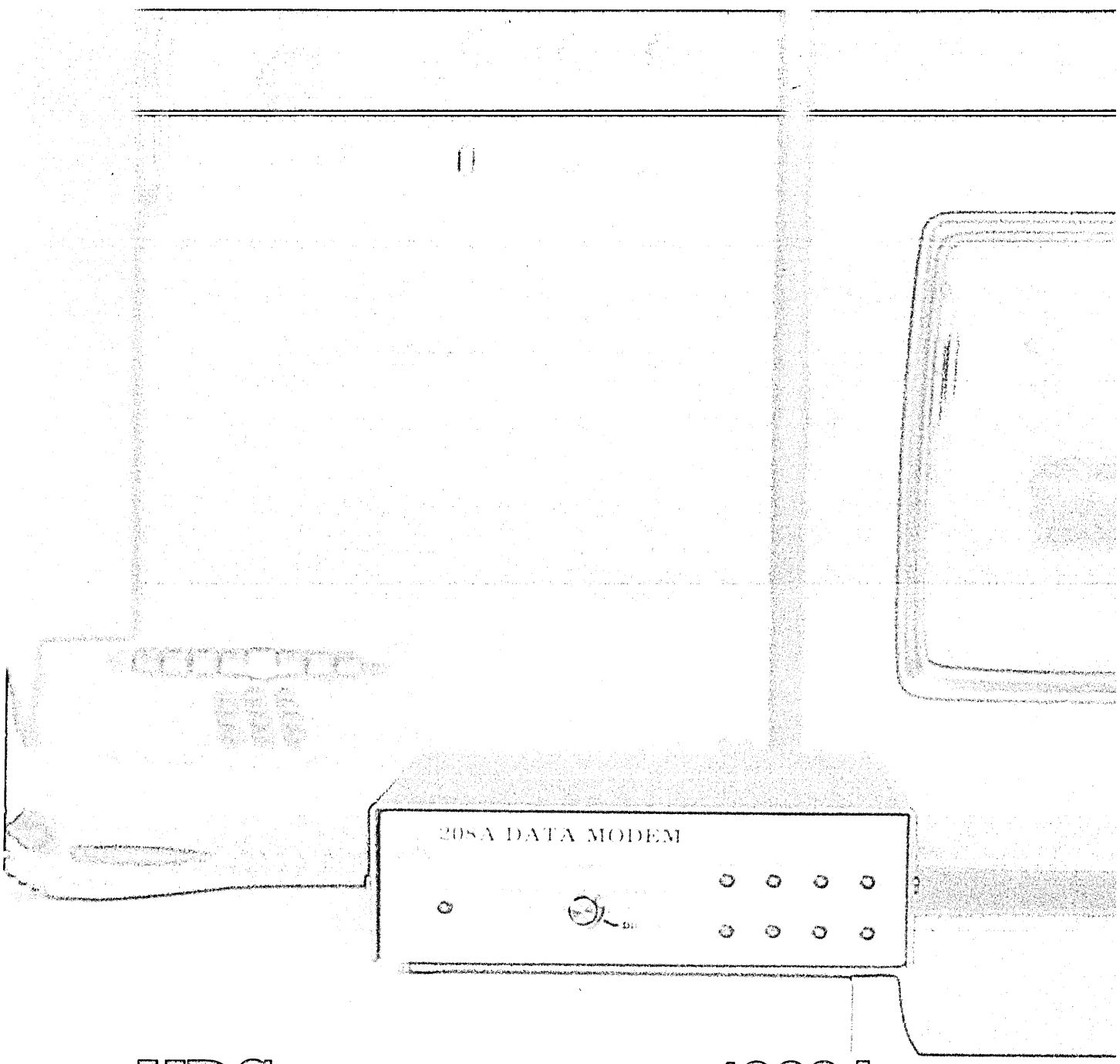
SCREEN PRINTER

The EX-850 Video Printer can make a hard copy of graphics and alphanumerics on



aluminized, 5-inch-wide electrosensitive paper. Using a raster-scan printing technique, the EX-850 forgoes the need for a digital interface by accepting a standard video signal (composite or separate video and sync) from a user's crt terminal, video monitor, or computer capable of generating a video signal for output. Since the EX-850 copies the screen, without regard to its contents, any character set, alphabet, or font can be printed. The screen copy function can be initiated by a front panel button or from an external command; a screen copy takes 13 seconds. A single EX-850 sells for $1,250; in lots of 100, the price drops to $937. AXIOM CORP., Glendale, Calif.

FOR DATA CIRCLE 421 ON READER CARD



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UDS has leapfrogged current LSI technology with nanosecond microprocessor performance! All components are industry standards — no custom or single-source parts are used.

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- **Cost/effectiveness.** Microprocessor power and innovative design make the UDS 208 your best buy for data communications at 4800 bps.

For further details on the UDS 208 or our lower speed modems (103s, 201s, 12 • 12s etc.) contact Universal Data Systems, 4900 Bradford Drive, Huntsville, AL 35805. Phone 205/837-8100; TWX 810-726-2100.

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CIRCLE 9 ON READER CARD

OEM TAPE TRANSPORT

With the introduction of the D-451 tape transport, this peripheral controller manufacturer has entered a new market. The 45ips microprocessor controlled tape transport can be configured for seven- or nine-track NRZI and Phase Encoded formats; PE recording density is 1600bpi, and NRZI densities can be 800bpi, 556bpi, and 200bpi. An imbedded formatter can control up to four transports. Production deliveries are to begin next month; quantity one pricing starts at $3,900. DATUM, INC., Anaheim, Calif.

FOR DATA CIRCLE 423 ON READER CARD

DIAGNOSTIC TERMINAL

Two models—the user diagnostic display and the support center diagnostic display—comprise this vendor's diagnostic display terminal offerings intended for use by oem's building systems around the vendor's CS family of business systems. In addition to functioning as Dasher display terminals, the two units (dubbed Dasher D4 and D5) provide voice communications between a user and a central support center; additionally, when two of the terminals are linked, both can participate in a dialog with the computer—whatever is keyed in at one terminal or received from the host appears on both crt screens. When a user experiences trouble with his system, a phone call to a central support center can bring a service representative on-line. User and service rep can talk over the problem using the terminals' voice communications capabilities. Using the data communications facilities of the terminals, the two can demonstrate and attempt to solve the problem. The user terminal (D4) has an integral communications controller, while the support center model (D5) uses a table-top communications controller; these controllers use a custom modem and support both voice and data communications (full-duplex, and split speed). In diagnostic mode, the user's terminal transmits to the support center at 2400bps, while the support center responds at 150bps (quite fast enough for messages originating at a keyboard). When used simply as terminals, the units function as earlier Dashers, using upper and lower case ASCII, and communicating over RS232 interfaces at speeds of up to 19.2 Kbps. The D4 sells for $4,500, and the D5 for $6,500; both are FCC approved. DATA GENERAL CORP., Westboro, Mass.

FOR DATA CIRCLE 425 ON READER CARD

DISK EMULATOR

Designed to emulate RF08 fixed head disks, the DE08 is a 256K-word solid state bulk memory system for use with PDP-8 minicomputers. Software compatible with existing operating systems, the DE08 operates at the same speed as main memory. Data transfers can range from one word to 4096 words. The DE08 sells for $13,500. COMPUTER EXTENTION SYSTEMS, INC., Houston, Texas.

FOR DATA CIRCLE 422 ON READER CARD

THERMAL PRINTER GRAPHICS

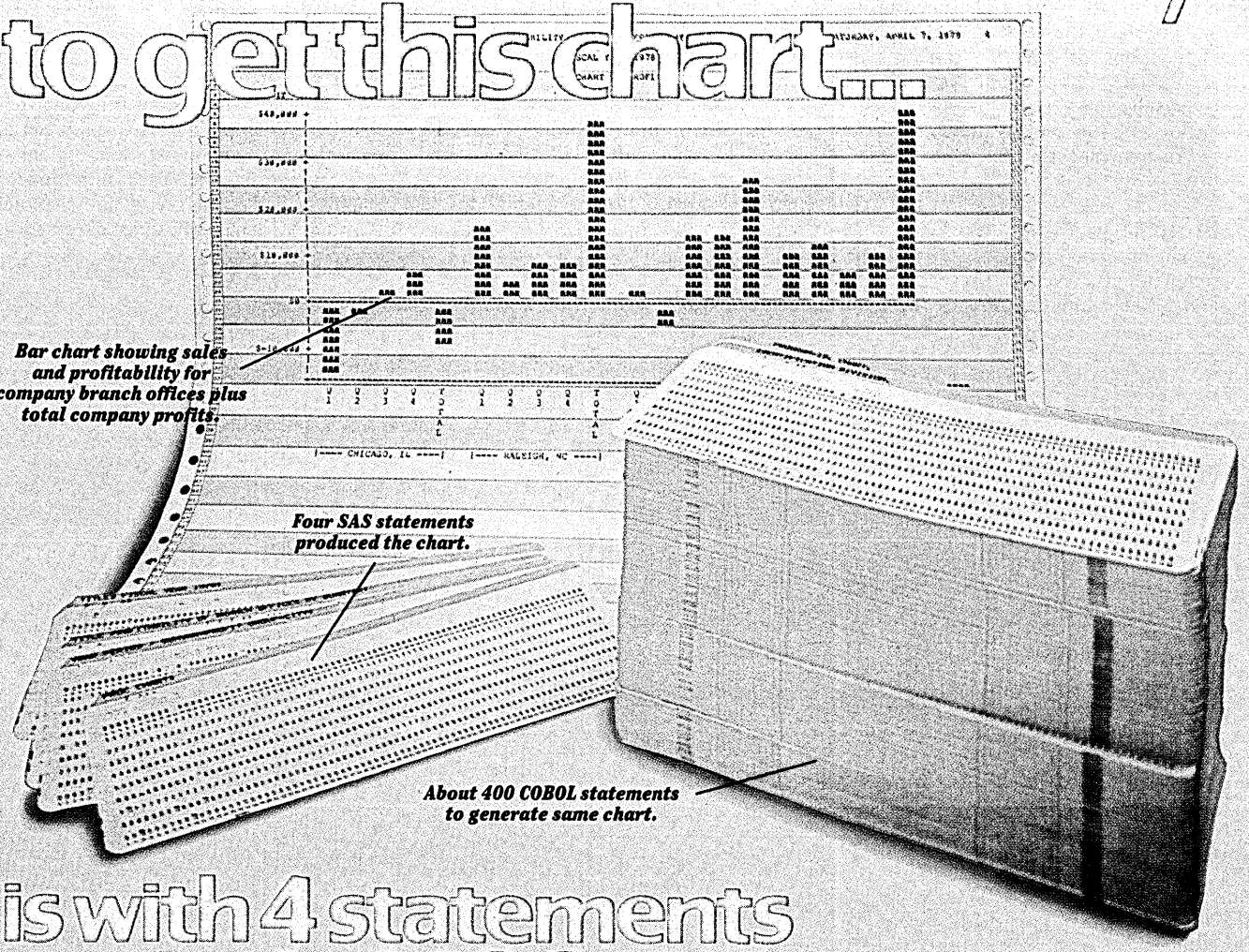
Graphics capabilities have been added to this vendor's T-80 thermal matrix printer. Text and graphics can be interspersed on the 80cps printer. Graphics are formed using a raster scan technique; alphanumerics are formed on a five-by-seven dot-matrix. Resolution is 70 points per inch, horizontally and vertically. The upper/lower case ASCII T-80s can use eight-bit parallel interfacing or RS232 or 20mA serial interfaces. A T-80 with plotting capabilities sells for $1,330; oem 100 pricing is $875 per unit. DATAPRODUCTS CORP., Woodland Hills, Calif.

FOR DATA CIRCLE 426 ON READER CARD

3270 RESPONSE MONITOR

The TP-270 monitors 3270 bisync traffic in both directions from the EIA interface. Operated from the central computer site, the TP-270 measures response time in the network, as well as specific elements contributing to the response time. For a speci-

The most efficient way to get this chart...



is with 4 statements instead of 400.

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CIRCLE 46 ON READER CARD

fied remote terminal address, the TP-270 can provide event counts and interval measurements. With an optional printer and interface, the TP-270 can log individual functions, or print a complete status report. The TP-270 Remote Network Analyzer sells for $2,195. TELEPROCESSING PRODUCTS, INC., Simi Valley, Calif.

FOR DATA CIRCLE 427 ON READER CARD

SYSTEMS

A pair of virtual memory systems represent new entry levels to this vendor's S500 and S100 computer families. Both systems run the Vulcan virtual memory operating system, and both can be field upgraded within their families. The S530, priced at $170,000, comes with 384KB of error correcting MOS memory (expandable to 3MB), 80MB of disk, 45ips mag tape, system console, and Direct Memory Access Communications Processor (DMACP). The smaller S123B comes with 144KB of error correcting memory (expandable to 384KB), system console, 40MB of disk, 45ips tape, 180cps printer, and asynchronous controllers for two additional terminals; the S123B is priced at $89,000. Vulcan is included with both systems. HARRIS CORP., Computer Systems Div., Fort Lauderdale, Fla.

FOR DATA CIRCLE 428 ON READER CARD

WORD PROCESSING

WordSmith 1 comprises a full-page (63-line by 96-character) crt display, serial printer, and magnetic storage options—IBM-compatible mag card unit and/or floppy disk. The mag card unit handles both single- and double-sided cards; cards

originating on IBM equipment can be read, edited, and rerecorded for later use on IBM machines. Cards also can be copied to or from floppy disk. Each full-size floppy holds up to 200 pages of text, as well as 200 pieces of boiler plate. WordSmith 1 list prices start at $11,900. DOCUPRINT INC., subsidiary of Documation Inc., Melbourne, Fla.

FOR DATA CIRCLE 424 ON READER CARD

DISK

Add another well-known peripheral maker to the growing list of contenders in the rapidly developing 8-inch Winchester disk market. The vendor's D8000 packs 20MB on the three recording surfaces (a fourth surface is used for servo tracks); the entire disk package is said to fit into the same space as a full-size floppy drive (4.62 inches high, 8.55 inches wide, and 14.25 inches deep). Performance specs call for an average seek time of 50msec, and transfer rates of 870KBps. The disk's interface uses a bidirectional command/status bus and byte-oriented data transfers. It is said oem's should be able to alter the design of their current floppy disk controller for use with the D8000. In lots of 100, the D8000 sells for $1,800. Evaluation units should be available by December; production shipments are slated to begin in March of next year. PERTEC COMPUTER CORP., Peripherals Div., Chatsworth, Calif. ✲

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SOFTWARE AND SERVICES

UPDATES

A PDP-11/60 running the Forth language/operating system is being used as an on-line monitoring and record keeping system by the Department of Pulmonary Medicine of Cedars-Siani Medical Center in Los Angeles. The system collects data from five on-line sources, maintains a data base of this information, and prepares reports. Patient admittance and intensive care patient records enter the system via on-line terminals; other data come from an automated blood gas lab, pulmonary function test equipment, and an exercise lab.

ATLAS (Abbreviated Test Language for All Systems) is an abbreviated English-like test-oriented language that allows the expression of test specs and procedures for manual, automatic, and semiautomatic testing. Use has reached into the industrial, commercial, and military communities, from ATLAS's initial application in avionics. The IEEE has recently published "Standard ATLAS Test Language," which has been approved by ANSI and adopted by the Department of Defense.

When NASA's Space Shuttle begins operations (slated for sometime next year), live tv coverage will bring Earth-bound NASA personnel, as well as the general public, into space with the astronauts. NASA ground stations will receive signals originating in the shuttle; these signals will be sent among NASA facilities by RCA Americom's satellite tv network. This shuttle tv network also can feed commercial broadcasters.

The title and marketing rights to Betacomm have been sold by Informatics to Retida, a Saddle River, N.J., firm owned principally by Bengt Holmgren, Betacomm's original author.

SERIES/1 DATA BASE

RMS is a data management system for the IBM Series/1 under the RPS operating system. The system supports sequential access, based on multiple indices, as well as direct access through a system-supplied hashing algorithm. Variable-length records, dynamic space allocation, multivolume files, and password protection are available under RMS. A "transaction mode" helps users check out new applications with real data—in this mode all modifications to the data base are temporary until explicitly made permanent. A single copy of RMS can be had for $7,800, with discounts available to volume purchasers. All prices include the first year of maintenance. DATA STRUCTURES INC., New York, N.Y.

FOR DATA CIRCLE 430 ON READER CARD

SOFTWARE SUPPORT

"Class-C," a program support service, is this plug compatible mainframer's offering to users who no longer can get IBM support for noncurrent operating systems and back-level releases of current systems. Class-C provides central site telephone support (a toll-free 800 number) with 24-hour answering, access to support specialists; problem research and determination; monthly identification of known fixes; and resolution of new problems (charged on an hourly basis). Class-C support covers: DOS, DOS/VS (through R33), OS/MFT, OS/MVT, VS/1 (through R5), SVS (through R1.6), MVS (through R3.0), and VM/370 (through R4). Monthly support rates are: $175 for DOS; $200 for MFT and MVT; $250 for VS1, SVS, and VM; and $300 for MVS. ITEL CORP., Data Products Group, San Francisco, Calif.

FOR DATA CIRCLE 432 ON READER CARD

TRS-80 FORTH

Forth, which we've heard described as a cross between a programming language and an operating system, can be had for the ubiquitous Radio Shack TRS-80 personal computer. The structured language, which uses reverse Polish notation, is said to be sufficiently conservative in its use of memory to make a 16KB disk-based system practical. The package includes its own disk I/O; it runs on the TRS-80 without Radio Shack's TRSDOS. Provision is made for the user to add extensions to the system; new commands can be compiled into the language and used immediately (deletion also is possible). Assembler code also can be imbedded in Forth programs.

This implementation of Forth includes virtual memory support, double precision integer arithmetic, in-line editing, BASIC-like string handling and arrays, user-callable disk and tape I/O, and line printer support. Most of the package is supplied in source form, as the majority of the Forth package is itself written in Forth.

Candidly the vendor says the package "is not recommended for the neophyte programmer." The vendor recommends reading the microForth Primer ($15) as an introduction to the system. The package, which goes by the unpronounceable name of MMSForth, comes on diskette (with demo programs) for $65. MILLER MICROCOMPUTER SERVICES, Natick, Mass.

FOR DATA CIRCLE 431 ON READER CARD

APPLE DISASSEMBLER

For Apple users curious about how a purchased piece of object code works its magic, this vendor offers a two-pass disassembler. The disassembler generates an assembly language program, complete with symbolic labels, from raw machine code. Invalid opcodes and unrecognized instructions are listed as data. The disassembler creates a text file that can be listed totally or in part; the text file also can be used as input to the assembler. On cassette tape, the disassembler sells for $35; on disk it goes for $39. MICROPRODUCTS, Redondo Beach, Calif.

FOR DATA CIRCLE 433 ON READER CARD

CICS AID

Written as a release-independent CICS application, the CICS Display Utility (CDU) package lets the system programmer monitor data internal to CICS. Both general and specific data can be inspected. General monitoring features of CDU provide for displaying the status of terminals, files, programs, transactions, and VTAM and system control information. Specific data available via CDU include the contents of memory locations, and the display of ISAM, BDAM, or VSAM records with translation. CDU also provides facilities for core and file updating. CDU is written to use a 3277 model II display. The package carries a perpetual license fee of

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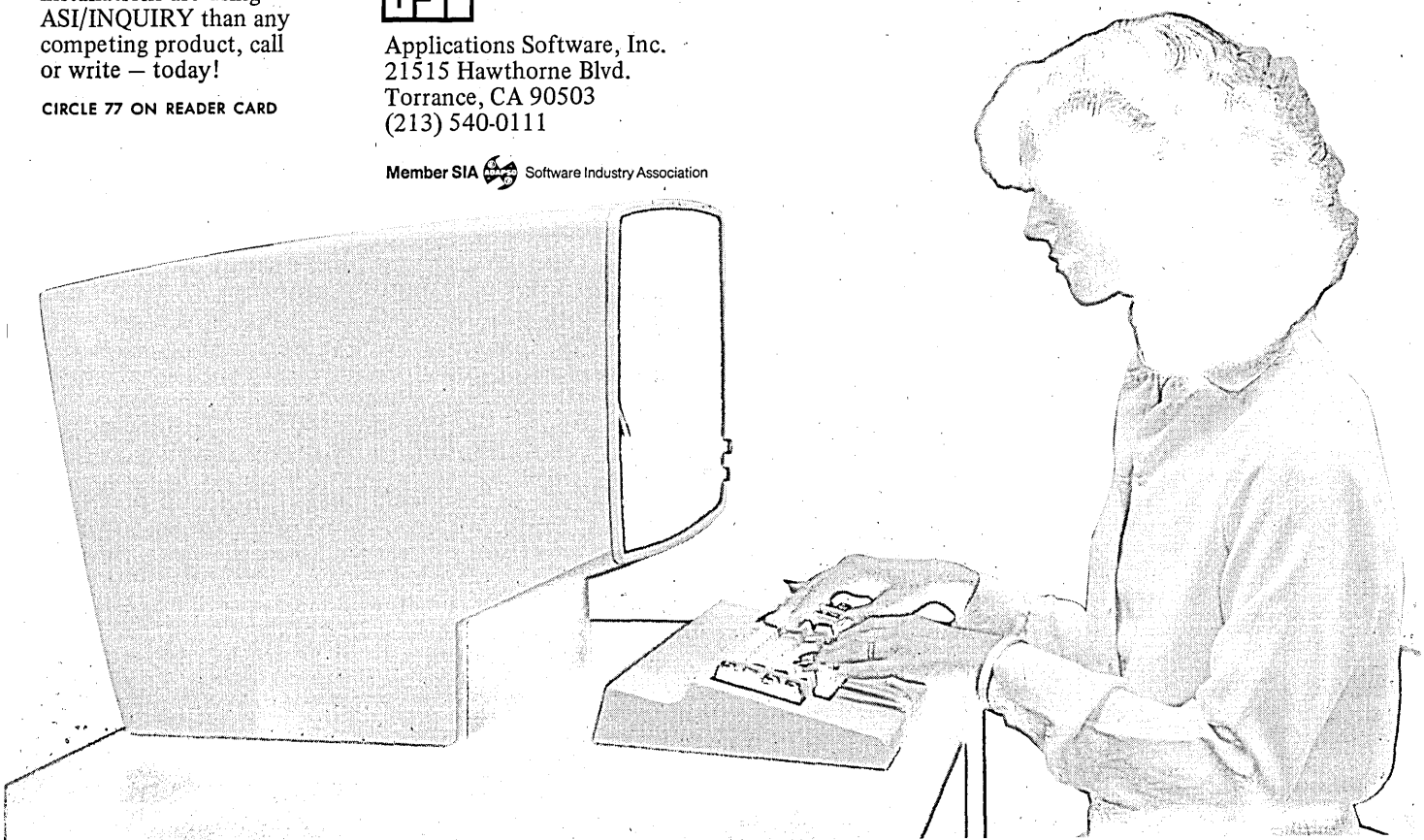


$4,800. COMMUNICATION SOFTWARE AIDS, Canton, Mass.

FOR DATA CIRCLE 434 ON READER CARD

8048 CROSS-ASSEMBLER

The 8048 cross-assembler, for this vendor's Starplex Development System, lets users translate 8048/49/50 source into object code for subsequent loading and testing on the target micro. The cross-assembler accepts Intel mnemonics; additional assembler directives also have been implemented. The cross-assembler for 8048 micros sells for $350. NATIONAL SEMICONDUCTOR CORP., Santa Clara, Calif.

FOR DATA CIRCLE 435 ON READER CARD

TRANSACTION PROCESSING

Designed for use on the vendor's recently announced Series 3200 minicomputers, the Reliance transaction processing system is comprised of a COBOL compiler, data management system, and transaction processing software. Reliance is said to support as many as 128 terminal users. The system's COBOL compiler conforms to the ANSI 1974 standard, and includes table handling and interprogram communication facilities. Data base management functions are provided by DMS/32, which includes a number of integrity features such as automatic record locking and unlocking, transaction rollback, and recovery capabilities. Reliance also lets the user interactively design program-independent screen forms. Under Reliance, all users share terminal and data management system modules, increasing system resource utilization. Each transaction needs only the resources unique to it. Reliance carries a $12,500 price tag, which includes three weeks training, installation, and one year of maintenance. An implementation of RPG II, priced at $2,500, also is offered for use with Reliance. PERKIN-ELMER CORP., Computer Systems Div., Oceanport, N.J.

FOR DATA CIRCLE 436 ON READER CARD

SNA SUPPORT

The System Network Architecture Program (SNAP) runs under RPS on a Series/1 and allows non-SNA terminals to participate in SNA networks. With the mini functioning as a cluster controller, SNAP lets IBM 4978 and 4979 crt's emulate 3270 record mode interfaces and participate in the SNA environment. The SNAP software allows these terminals interactive access to IMS and CICS programs. Two levels of user interface are provided: a batch mode providing read/write access to the network for communications to and from the host cpu, and an interactive interface supporting as many as eight 4978/79 terminals. In both cases, SNAP allows multiple concurrent sessions, with each session having an SDLC line to itself. SNAP requires 128KB of memory, and an SDLC adapter for each line, in addition to the hardware requirements of RPS. SNAP can be had under two pricing plans. Under one, the first Series/1 is licensed for $6,500, and subsequent processors are licensed for $3,450 apiece. The second plan calls for a one-time payment of $2,000, plus a monthly fee of $250 per processor on a 24-month agreement. THE DMW GROUP, INC., Ann Arbor, Mich.

FOR DATA CIRCLE 437 ON READER CARD

SOFTWARE SPOTLIGHT

HEALTH EDUCATION

VitaFacts is a series of educational packages written for popular personal computers (at this time the Apple II, Commodore PET, and Radio Shack TRS-80). Written for the layman, each package addresses a health topic. The first six offerings are: Heart Attacks, Birth Control, Your Blood Pressure, Teenage Drinking and Drugs, Growing Up, and Talking About Sex. A number of additional titles are said to be in the works. Each lesson is approved and endorsed by The College of Family Physicians of Canada.

Each lesson includes a program cassette, an audio cassette, and a booklet containing introduction, instructions, glossary and, in some cases, illustrations. The user loads the program cassette and starts program execution. At this point, the user starts the audio tape, listening to the presentation until the announcer instructs the user to do the first set of exercises on the computer. This sequence of "listen then do" continues to the end of the lesson. Each VitaFact title sells for $19.95. RICHMOND SOFTWARE., Ottawa, Ontario, Canada.

FOR DATA CIRCLE 429 ON READER CARD

SERIES/1 UTILITIES

Written to run under IBM's Event Driven Executive (EDX), this pair of utilities for the Series/1 may prove useful during program development and maintenance projects. EDXREF produces a sorted cross-reference directory and, optionally, a list of source statements. EDXDMP prints disks or diskette records in the user's choice of hex or character format. One or more record can be printed; the user can specify the beginning record and number of records to be printed. EDXREF and EDXDMP each carry a one-time charge of $95, which includes source code, documentation, and one year of maintenance. LEGLER SYSTEMS CO., Orinda, Calif.

FOR DATA CIRCLE 438 ON READER CARD

BASIC

BASIC for the 16-bit Intel 8086 microprocessor has been added to the list of language processors available from this well-known microcomputer software source. Known as BASIC-86, the language is said to conform to the ANSI subset standard for BASIC. Programs written under the vendor's 8080 BASIC (reportedly, there are more than 200,000 such installations) run without modification under BASIC-86. BASIC-86 offers conventional features such as double-precision arithmetic, PRINT USING, nested IF-THEN-ELSE, trace facilities, error trapping, and renumbering. It also supports additional features, including WHILE-WEND, CHAIN, and COMMON statements, variable names of up to 40 characters, and dynamically allocated strings. Two versions are offered, both for the Intel SBC 86/12 microcomputer. The "Extended" version sells for $350, and the standalone disk version is $600. MICROSOFT, Bellevue, Wash.

FOR DATA CIRCLE 439 ON READER CARD

CROSS-ASSEMBLER

Users running 8080-type microcomputers under CP/M can also develop programs for the 65XX family of microprocessors by using this vendor's cross-assembler. The cross-assembler accepts MOS technology mnemonics and generates a hex file that can be loaded into the target processor via a suitable monitor (TIM, SIM, KIM, AIM,...). Provision is made for converting this object file into Intel format for burning into PROM at a later time. Source code can be entered in free form. Labels can contain up to eight characters. The cross-assembler requires 7KB of memory. It sells for $350. JSK CONSULTANTS, New York, N.Y.

FOR DATA CIRCLE 440 ON READER CARD

POWER/VS UTILITY

Bimspool retrieves output from the DOS/VS POWER/VS spooling queue, and via CICS, prints the output at a local or remote 3270-type terminal printer. The package allows printing at remote locations without resorting to RJE equipment; it reduces the delays associated with output routing; and it enhances the confidentiality of data by printing it at the site or department responsible for the data. The utility includes a crt function for performing control functions, such as displaying queues, starting printer tasks, and flushing undesired output. Intervention at the crt is not required for printing, which can run unattended so long as forms changes are not needed. The package can be purchased for $4,000, with an annual maintenance charge of $500 per year (after the first year). It also can be licensed for $2,000 per year or $200 per month, with maintenance included. B I MOYBLE ASSOCIATES, Minneapolis, Minn. ✲

FOR DATA CIRCLE 450 ON READER CARD

Small Business Systems Surveyed

Microdata Reality Gets Top User Rating

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

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

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

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

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

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

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

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

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

SOURCE DATA

BOOKS

PRINCIPLES OF DISCRETE EVENT SIMULATION
by George S. Fishman

MODELLING AND ANALYSIS USING Q-GERT NETWORKS
by A. Alan B. Pritsker

MODELLING LARGE SYSTEMS
by Peter C. Roberts

"It is the mark of an instructed mind to rest satisfied with the degree of precision which the nature of the subject admits and not to seek exactness when only an approximation of the truth is possible."

Aristotle

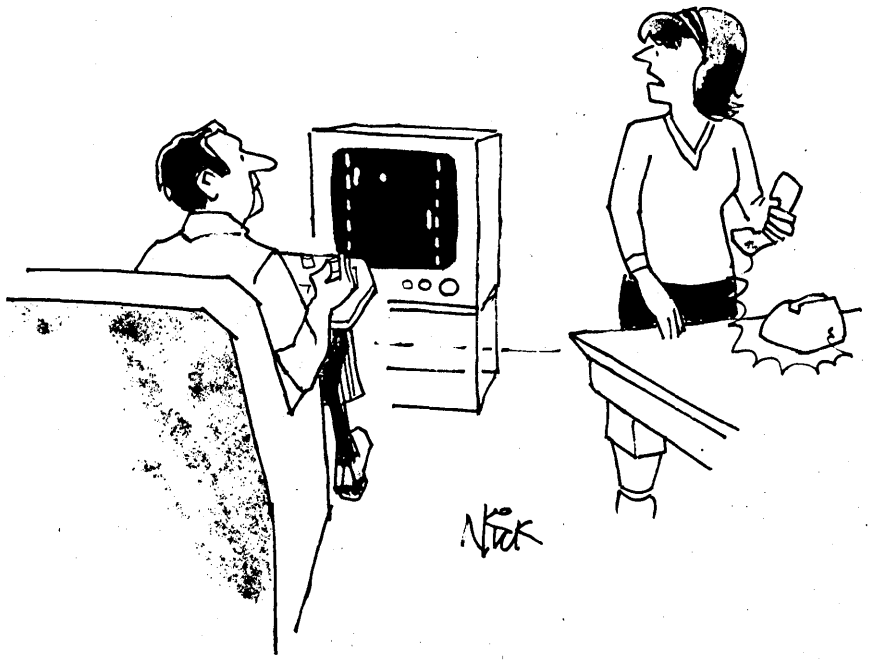
Since the advent of the electronic digital computer in the mid-forties, mathematical modeling and discrete event simulation, using the computer and a high-level modeling language, has considerably extended the forecasting horizons of sociologists, economists, businessmen and engineers into territory that had been the exclusive preserve of mathematicians—and, perhaps, seers, sorcerers and stock brokers.

Fortunately, although many of the prominent problems facing the world today still cannot be adequately dealt with using this tool, most network and queueing problems that one encounters in the macro-world—inventory control, job-shop scheduling, PERT networking, route optimization, trunk-line utilization—now can be analyzed to the degree of accuracy and at a cost commensurate with the problem requirements.

The three books reviewed here are nicely representative of the dynamic growth, both in depth and scope, that simulation and modeling languages are undergoing. The first is a comprehensive and difficult textbook written for the graduate student who has a good grounding in statistics and some familiarity with programming. It is the type of book in which, to paraphrase an old cliché, if you have to ask the meaning of *ergodicity*, you can't afford to take the time to read it. On the other hand, professor Fishman has impeccable credentials: his work is part of the Wiley Series on systems engineering and analysis; his papers have appeared in, among others, the *Journal of Operations Research Society of America*; he has published at least one earlier text on simulation. And he deserves to be studied.

About one-fifth of the book is occupied with detailed listings and explanatory sections demonstrating four of the major simulation languages—SIMSCRIPT, SIMPL/1, SIMULA and GPSS. But this is only subsidiary to the major thrust of the work. Emphasis is placed on the knotty problems always associated with statistics such as convergence, bias, variance, normality, replication, etc. It is the author's interweaving of this arcane subject with modeling practices that makes this book unique. All in all, this is a book strictly for the advanced student with a lively interest in questions relating more to statistical rigor than to language and technique.

The second book is concerned with Q-GERT, an acronym for Graphical Evaluation and Review Technique, with the "Q" appended to denote that queueing analysis plays an important role in this recently developed language. The fact that its name sounds something like PERT suggests that this system is an extension of PERT methods. As noted early in the text, the language is proprietary (Pritsker and Associates, Inc., Consultants in Systems Engineering, P.O. Box 2413, West Lafayette, IN 47906) and has been written in ANSI FORTRAN IV for ease of under-



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standing and portability on any operating system that supports the FORTRAN compiler.

The book documents Q-GERT in a manner easily followed by a potential user. Basically, the *activity on branch* concept is used where a branch represents an activity involving processing time or a delay and where the nodes represent decision points and waiting queues. According to the GERT family tree, 16 predecessor languages were developed before Q-GERT evolved, so it should be a mature language. There are five basic nodal types—source nodes for general transactions, statistical nodes for statistical maintenance, sink nodes to specify stopping conditions, regular nodes for the functions of receiving and routing, and Q-nodes for holding transactions and collecting queue statistics. These operations are extensively treated in the text.

The book includes a good set of example problems, 18 in all, and each chapter has a set of exercises to implant and extend the ideas just presented. Sampling from various important probability distributions is very convenient and programs up to about one thousand nodes are said to have been built. Using a CDC 6500 system, total cpu time operating in a multiprogramming environment for the example problems ranged from 4.1 to 32.0 seconds. This included load and compile, input and echo check, simulation and output. A very creditable performance.

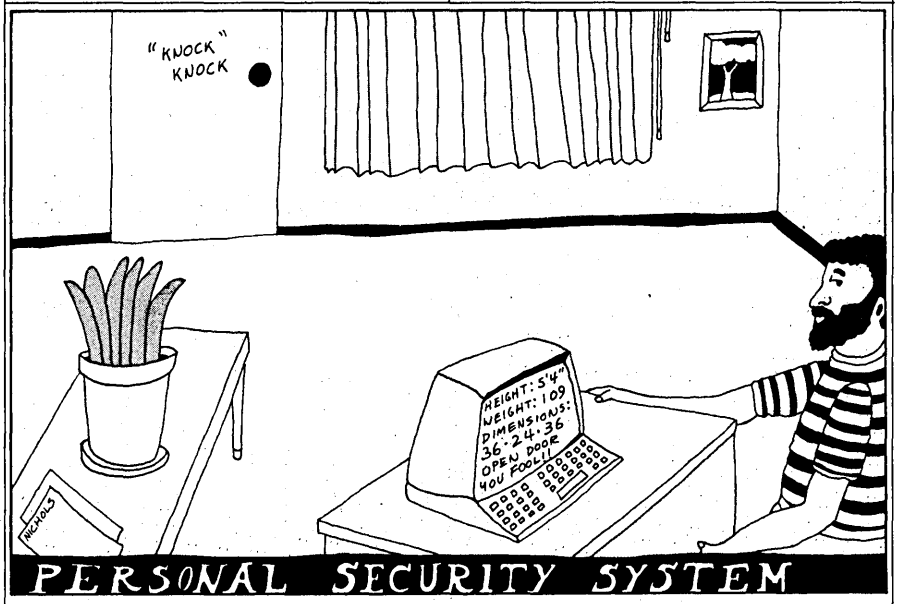
According to a recent listing, approximately 80 commercial and academic institutions are presently using this interesting network language. I expect a number of others who take the time and effort to learn its form and syntax will find its convenience and graphical documentation rewarding.

The third title is an exciting and important book—but not in the manner the title implies. It is *not* an update of the "limits to growth" genre (Meadows, *The Limits to Growth*; Mesarovic & Pestel, *Mankind at the Turning Point*). It is exciting because of the sweep of Roberts' view and it is important because the technology he is talking about—simulation modeling, of course—may emerge as *the* most effective way of our understanding the world's problems. This is a little book about the *concepts* of modeling and, as noted in the introduction, "The text is introductory—and should perhaps be made compulsory reading for anybody wishing to express an opinion on a world model, let alone build one."

Because it is such a cornucopia of ideas beautifully stated in that uniquely British style (the author is head of the Systems Analysis Research Unit of the Department of the Environment in the U.K.), I hesitate to say much more except buy this book and discuss it with your friends. There is something for everyone within these short 120 pages; the book includes comments on celestial mechanics, commodity cycles, security and truth, Forrester's Model (and seven others) and the next generation of world models.

This brief quotation, randomly selected, gives a flavor of Roberts' style: "—consistency, parsimony of parameters and predictive power are the hallmarks of successful models." Aristotle would be pleased.

—John Alrich



PRIVACY—HOW TO PROTECT WHAT'S LEFT OF IT
by Robert Ellis Smith

The handling of information and the transfer of data by businesses and by government agencies has become an issue for both the organizations and the individuals involved. Privacy has become both an industry catch phrase and an issue of citizens' rights, as well as the subject of a growing body of legislation. The following two reviews are meant to address the privacy issue from two perspectives in order to probe the subject more deeply.

Our reviewers are James L. Rogers, associate professor of Computer Engineering and Information Sciences at Case Western Reserve Univ. in Cleveland, Ohio, and Naomi Lee Bloom, staff consultant in the management consulting division of American Management Systems, Inc., an Arlington, Va. systems consulting firm specializing in financial information systems. **—ed.**

This book does two things very well: it presents a report of the current state of affairs with regard to privacy and due process protections, and it provides detailed information on how the citizen can invoke those protections. The roughly 60% of the book that does this is subtitled "Informational Privacy," and it covers record-keeping practices and protections in banking, criminal justice, consumer credit, consumer investigations, employment records, federal and state government, insurance, mailing lists, medical care, privileged communications, education, use of the Social Security number, tax records, and telephone use. The remaining portions of the book treat privacy issues that are not related to information or record-keeping and, hence, not directly related to computers. But they do cover other aspects of applied technology—wiretapping, automatic identification (voice and fingerprint comparison), polygraphs and other stress analyzers, and assorted electronic surveillance devices.

The author of *Privacy—How to Protect What's Left of It* has been involved with privacy concerns since as long ago as 1973. It was in 1973 that the American Civil Liberties Union received funding for a Washington-based Privacy Project, and Robert Ellis Smith was retained as associate director. He edited the monthly newsletter of the Project, the *Privacy Report*, which was published from August 1973 through September 1974. At that point, the ACLU's Privacy Project underwent a severe budgetary retrenchment: the operation was moved to New York, and the *Privacy Report*, under new editorship, resumed publication in January 1975. Smith remained in Washington, where he promptly began publication of his own newsletter, named the *Privacy Journal*, the first issue appearing in November 1974.

In its over four years of publication, the *Privacy Journal* has become a standard information source on the privacy scene, and Bob Smith has become indispensable in his role of collector, reporter, commentator and professional gadfly.

Smith's book is written in much the same style as the *Privacy Journal* it-

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self; it has the breezy informality one associates with a newspaper's city desk. Smith moves back and forth with great ease between reporting and wry comment; in his commentary, he is quick to note the ironies—the Catch 22s—in the material he reports.

Each of the chapters in the "Informational Privacy" part covers its particular topic in the same way. Smith first presents a section, which typically takes 75% of the chapter, summarizing the current state of affairs—applicable laws (federal, state, and, in some cases, local), current operational practices of the record-keeping organizations (especially where these are in apparent defiance of the laws), and relevant court decisions. Copious references to the U.S. Code and to published law cases are provided.

Since record custodians do not publish state-of-the-art reports describing how they treat their data subjects (that is, the people about whom they collect, store, and disseminate data), the information on their operational practices has to come from the data subjects themselves. As publisher of the *Privacy Journal*, Smith has been collecting this kind of data for more than four years from many sources, including legislative committee hearings, newspaper items, magazine and journal articles, lawsuits, and communications to the *Privacy Journal* editor. In addition, Smith has drawn on his own personal efforts to probe the system (for example, his three-year fight to see his own data in the files of the Medical Information Bureau). Each chapter, then, contains a wealth of information about how people are actually being treated, information which has never been assembled in one place.

Each chapter concludes with a section headed "What Can You Do?" in which Smith goes back to the earlier material and summarizes how others have fared in negotiated resolutions, court cases, administrative decisions, out-of-court settlements, and how they are faring in on-going battles. He advises about courses of action that work, and others that do not. He lists names and addresses of complaint offices, information sources, advocacy groups, etc., and even provides form letters that can be used to request record copies, and to negotiate fair agreements with individual record-keeping organizations.

Smith also provides an extensive index, allowing the reader to locate all the references to a particular law. It also collects all the references to states and cities scattered throughout the individual chapters. In fact, one could use the index of this book to take such factors into account in evaluating job offers from different localities.

The single serious flaw in the entire book is the chapter on computers, in which Smith attempts to provide, in his

own words, a "layman's explanation of how electronic data processing works." The result is a disaster. In describing or defining about thirty basic concepts in computing—ranging from key punching to multiprogramming—Smith errs in matters both of fact and of accepted usage. The lead in those special (now obsolete) mark-sense pencils did *not* contain magnetic particles. Information is *not* read from magnetic tape when the "...electrical impulse... is 'bounced back' from the tape to make the circuit..." The magnetic disks in a disk pack are *not* "paper thin." A company renting its unused computer time to another company is *not* an example of timesharing. Chess playing on computers does *not* involve programmers placing "...in the unit all the possible moves in a chess game..." Describing cores as "magnetized rings of microscopic wire" is not just inaccurate: it will confuse anyone who later encounters a description of the essential functions that wires *do* perform in core storage. As a final example, the basic distinction between program and data gets lost when we are told that changing the prices of supermarket products in a store computer is done by changing the contents of program.

These kinds of errors are so glaring and so pervasive that they destroy the credibility of the author on technical matters. This is a shame, and it need never have happened. Once the author and the publisher committed themselves to a chapter on computers, the editor should have had the material reviewed. Knowledgeable people could have been contacted at a chapter of the DPMA or ACM, or the computer science department of a college or university. In any case, it would have taken one person about half a day to correct the mistakes, straighten out the confusions, and clear up the terminology. The time would have been well spent.

Despite this flaw, this is an extremely valuable work. It fills an important need, and provides an invaluable collection of information. Anchor Press/Doubleday (1979, 346 pp., $10).

—James L. Rogers

PRIVACY
by Robert Ellis Smith

If you aren't already sufficiently alarmed about intrusions on your rights to privacy, Smith's very readable book catalogues the horrors of mailing lists, easy government access to bank records, and lax controls over medical claims. While suggesting specific techniques for passive resistance by the enlightened citizenry, the book's recommendations will leave the noncomputer person with a sense of helplessness. But we know better.

Privacy frequently acknowledges the enormous boost computer technology has given the intrusion business. The book describes how easily various data banks are searched and matched to learn more about the unwary who have been so foolish as to buy insurance, obtain credit, earn taxable income or drive a car.

However, the realities of data processing are left out. Files of different structure and format, using different and poorly documented coding schemes, are not easily or inexpensively consolidated. Although all of the sophisticated indexing systems referred to by Smith do exist, I feel more exposed by the careless handling of paper files and my neighbors' gossipy tongue, than by the threat of an automated FBI search of my employer's and bank's incompatible data bases.

For the reader interested in privacy issues stripped of their technical subtleties, this is an excellent book. For busy computer professionals overwhelmed by the flood of "must read" technical literature, *Privacy* provides no system design or implementation guidelines. There are no recommended file keying schemes for optimizing the often conflicting objectives of easy access and maximum protection of personal data. Help is offered to the individual in search of privacy, not to the systems person trying to prevent or at least control the problem at its root. *Privacy* does not attempt to treat the disease, but it does offer two aspirins for the symptoms.

—Naomi Lee Bloom

VENDOR LITERATURE

USED COMPUTERS

New and used equipment—personal computers, minicomputers, and peripherals—are offered in this vendor's 48-page, illustrated catalog. The selection includes PDP-8s, PDP-11s, and LSI-11s from DEC, Novas from Data General, printers from Centronics, Hewlett-Packard 3000s, and the Commodore PET and the Apple II personal computers. Crt's and teleprinter terminals, video display boards, modems, printers, plotters, and tape equipment also are listed. Books and software for the personal computing market also are offered. The catalog includes prices and ordering information. NEWMAN COMPUTER EXCHANGE, INC., Ann Arbor, Mich.

FOR DATA CIRCLE 401 ON READER CARD

THERMAL PRINT MECHANISM

A data sheet explains this vendor's model Q3 thermal printer mechanism for oem's. Design features, as well as standard and optional capabilities, are listed. A full page is devoted to specifications, including interfacing, character fonts, paper (and feed mechanism), and physical characteristics. A functional block diagram, and a mechanical drawing of the mechanism are included. COMPUTER DEVICES, INC., Burlington, Mass.

FOR DATA CIRCLE 402 ON READER CARD

FACSIMILE

A colorful fact sheet describes the dex 1100 family of facsimile transceivers. Compatibility with other vendor's equipment is stressed, with the fact sheet asserting dex 1100 machines can talk to "nearly all other fax systems anywhere in the world." Transmission speeds, copy quality, portability, transmission reliability also are discussed. The three models in the product line are described briefly, and specs for the family are provided. GRAPHIC SCIENCES, INC., Subsidiary of Burroughs Corp., Danbury, Conn.

FOR DATA CIRCLE 403 ON READER CARD

CARTRIDGE TAPE

This vendor's model 1200 cartridge tape storage system is the subject of a three-panel fold-out brochure. Descriptions are provided of the model 1200, the model 200 Minidrive used in the 1200 system, the formatter, and available interfaces. System specs and data cartridge specs also are provided. Configuration and options are listed. QANTEX DIV., North Atlantic Industries, Inc., Hauppauge, N.Y.

FOR DATA CIRCLE 404 ON READER CARD

COBOL

"Will our programmers be required to learn a new compiler language?" "What are the largest COBOL programs we can compile on the system?" "What is the status of your documentation and does it reflect the latest changes?" These are three of the ten questions the vendors of BLIS/COBOL suggest potential users ask of software suppliers. Presented in a four-page flier, the questions are followed by this vendor's answers; a phone number and a postage-paid card are provided for readers left with unanswered questions. INFORMATION PROCESSING, INC., Winter Park, Florida.

FOR DATA CIRCLE 405 ON READER CARD

REMOTE COMPUTING

"You run your operation too well to be boxed in by computer limitations," opens a 12-page brochure describing this vendor's worldwide remote computing service. Calling the Mark 3000 Service "the IBM-compatible remote computing service that helps keep you on top of all your company's computing needs," the brochure goes on to enumerate the resources available to expand the user's dp operation. Applications software, technology, and training also are covered. A postage-paid inquiry card is bound into the brochure for readers interested in more details. GENERAL ELECTRIC INFORMATION SERVICES CO., Rockville, Md.

FOR DATA CIRCLE 406 ON READER CARD

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ACCESSORIES

"Mini Starter System," a six-page, fold-out brochure, describes a variety of furniture and filing cabinetry of interest to minicomputer installations. Included are storage units for diskette and cartridge disk media, workstations and terminal stands, decollators, chairs, and filing cabinets for printouts. MONARCH COMPUTER PRODUCTS, INC., New Windsor, N.Y.

FOR DATA CIRCLE 407 ON READER CARD

COMMUNICATIONS PROCESSOR

A four-page flier presents this vendor's CC-85 Advanced Communications Processor. The discussion covers hardware and software design, communications concepts, throughput, and field-proven capabilities; block diagrams depict a typical network, CC-85 architecture, and the architecture of the vendor's Network Communication System operating system. The closing page is dedicated to listing features and characteristics of the CC-85. COMPUTER COMMUNICATIONS INC., Torrance, Calif.

FOR DATA CIRCLE 408 ON READER CARD

PROJECT MANAGEMENT FORM

This publisher of edp self-study courses offers a free copy of its Project Management Form to interested readers. Intended to simplify manual control over dp projects, the form provides areas for task descriptions, and both planned and actual usage of time, manpower, and materials. The form is used in the vendor's Developing User Oriented Systems course. INFO III, Woodland Hills, Calif.

FOR DATA CIRCLE 409 ON READER CARD

FAST-FOOD SYSTEM

A computer-based system in the people-intensive fast-food environment is explained in an eight-page, four-color brochure. The booklet examines how the vendor's Positran fast-food system fits into all areas of operations: cash profits, sales profits, payroll profits, inventory profits, drive-through profits, and remote profits. SCAN-DATA CORP., Norristown, Penn.

FOR DATA CIRCLE 410 ON READER CARD

DATA COMPRESSION

A file compression and encryption software package, Shrink/IMS, is the topic of a 12-page, illustrated brochure. The booklet begins by describing Shrink as a software solution to the hardware problem of increasing storage requirements. Subsequent discussions cover the package's features said to improve computer utilization, and the various operating environments capable of supporting Shrink. The second half of the brochure consists of a technical overview illustrated with block diagrams. Included in this section is an explanation of the Huffman encoding technique used by Shrink. The closing two pages of the brochure list some of the company's other software products, as well as its national and international sales offices. INFORMATICS, INC., Woodland Hills, Calif.

FOR DATA CIRCLE 411 ON READER CARD

SINGLE-BOARD COMPUTER

An eclectic design philosophy, explains this colorful, 12-page brochure, led this vendor to select components based on virtue, not origin. The brochure continues to describe the vendor's MSC 8004 single-board computer. The presentation covers the board's MULTIBUS compatibility, its Z80 microprocessor (and the Z80's upward compatibility from the 8080 series), its read/write and read-only memory, and its on-board 32-bit floating point arithmetic processing unit. Also covered are on-board programmable interfaces, and support software available from the vendor. MONOLITHIC SYSTEMS CORP., Englewood, Colo.

FOR DATA CIRCLE 412 ON READER CARD

TECH CONTROL

A 28-page brochure describes this vendor's line of patching, switching, and tech control equipment. The catalog covers digital, wide-band, and analog patching equipment, patching/switching systems, test equipment, and other products. ATLANTIC RESEARCH CORP., Alexandria, Virginia.

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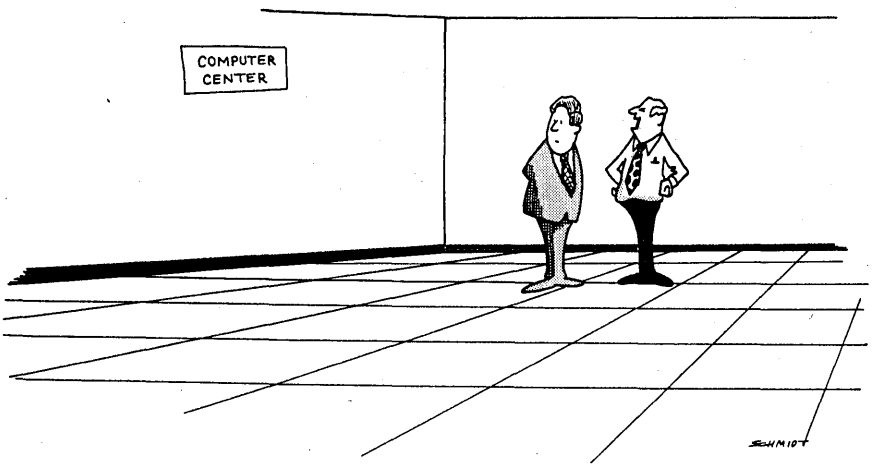

"We installed everything under the raised flooring."

REPORTS AND REFERENCES

SYSTEM/38: ANALYSIS AND FORECAST

As part of Creative Strategies International's Impact/Opportunity series, this volume analyzes IBM's new small business computer, its position in the General Systems Div. product lineup, and the opportunities it may create for software and peripherals vendors.

The market potential appears large. For example, Creative Strategies notes that some 32,500 S/38 machines were ordered last year and that by 1983 IBM should have racked up some 136,000 orders. By that time, the report claims, S/38s will be consuming 147,000 megabytes of main memory and 76 million megabytes of disk storage, providing significant opportunities for plug-compatible suppliers. Also included are predictions as to possible additions to GSD's offerings: "System/36" upgrades for the S/38 and enhancements to the 5250 crt terminal. A breakdown of projected S/38 installations shows manufacturing and wholesale trade users accounting for fully 58% by 1983.

The 121-page report includes 17 figures, visually well done, and 32 tables revealing such notable statistics as the average S/38 user will eventually run 1.75 machines.

The report sells for $995. CREATIVE STRATEGIES INTERNATIONAL, 4340 Stevens Creek Blvd., Suite 275, San Jose, CA 95129 (408) 249-7550.

SMALL BUSINESS SYSTEM MARKET

"The Small Business Systems Marketplace in Western Europe, 1978-1986" is one of the Market Series from Pactel SA, an international consulting firm. The other volumes in the series are "Computer Mainframes," "Business Communications," "Microcomputers," "Data Transmission Equipment," "Minicomputers," "Computer Terminals," "Data Entry Equipment," "Peripherals and Memory," and "Word Processing." Each report has generally the same outline for ease of reference between reports, beginning with an

introduction and executive summary, continuing with market analysis including major product strategies and a financial overview, product markets including analysis of individual products, marketing aspects of technology, including user requirements, and competition including market shares. The price of one report is $995. All 10 reports sell for $6,170. PACTEL SA, 19055 Pruneridge Ave., Cupertino, CA 95014 (408) 725-1140 or PACTEL SA, Grand Rue 56, CH-1700 Fribourg 2 (Suisse) (037) 23-35-50.

COMPUTER INDUSTRY FINANCIAL STATISTICS BY SIC

Dun & Bradstreet, Inc., has put together a financial analysis of industry Standard Industrial Classifications 3573, 7372, 7374 and 7379, which stand for computers and peripherals, programming and other software services, data processing services, and other computer related services respectively. The statistical report, described in the introduction as "the most comprehensive system for gauging a company's financial and operating condition that has ever been made available," is meant to provide information for comparisons at two levels. At the broad industry level, medians and ranges are shown for profits on sales, profits on net worth, receivable collection period, sales per employee, inventory turnover, etc. Also shown is the number of companies in an industry using short-term and/or long-term borrowings and their relation to annual sales. At the individual level, figures are meant to allow a business to compare its condition with that of the industry as a whole in such areas, for example, as receivable collection period length, cash position, long-term debt, and investment in fixed assets. Price $165. Dun & Bradstreet, Inc., 99 Church St., New York, NY 10007.

DATA BASE PLANNING

Leo J. Cohen, founder and principal consultant at Performance Development Corp., specialists in data base systems, performance management and project planning, has written a new report entitled "Pre-Data-Base Survey." The report, edited by Ronald G. Ross, a former DATAMATION author, aims at extending PDC's service analysis approach, a requirements definition methodology. The idea is to begin at the beginning and commit to a series of implementation stages, taking into account the needs of the organization. The recommended stages are: pre-data-base survey, service analysis, data dictionary, data base architecture, data base architecture design, DBMS package selection, cost benefit analysis, and implementation specification. The report includes a discussion of management's role in data base planning, measuring user

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satisfaction with dp systems, reasons for data base system failures, personnel and hardware needs for data bases, and choosing applications, including isolating a good first project. The 83-page report sells for $13.95, or $12.50 prepaid. Performance Development Corp., 1101 State Rd., Bldg. P, Princeton, NJ 08540 (609) 921-3770.

THREE FROM FTP

FTP (formerly Faim Technical Products) issues short, informal reports that consist of transcripts of talks by computer professionals. The transcripts are easy to read and fun because they are so casual. Available technology, rather than being summarized, is spoken of frankly in detail and company names are often brought up. The question and answer sessions, featured at the end of each report, can be amusing or enlightening, as the presentation on occasion raises the ire of those attending the talk. Also, attendees may raise questions about a product or subject that a standard research report might shy away from. For instance, in the report "Small Business Machines—Their Time Has Come," Vol. VI, No. 3, the speaker agrees with the attendee that the uses for which micros are being touted may well be seen as a major threat to corporate MIS management. The bad reputation of the micro, due to poor software, missing documentation, and unreliable hardware, is discussed, and leads into an analysis of potential vendor liability. Vol. VI, No. 1 is entitled "MIS Management—Future Issues and Concerns"; the speaker is Dick Brandon. No. 3 is entitled "An Update to Career Planning in Information Management." $25 each. FTP, Inc. 414 Route 111, Smithtown, NY 11787.

FLOPPY DISK DRIVE MARKET

"Worldwide Shipments of U.S. Manufactured Flexible Disk Drives" is available from IDC for $1,500. The 43-page report includes market share data showing Shugart as the undisputed leader in units shipped. There is a three-page management summary and discussion of the market by product application—processing terminals, small business computers, personal computers, word processing systems, and minicomputers. There are 19 tables and 6 figures. The report concludes with two pages of discussion of the future of flexible disk drive technology. It is predicted that there will be more plug-compatibility among major vendor offerings. Significant improvements in recording densities following a change in substrate material for disk media are predicted, with vendors reportedly considering two- or three-ply laminated plastic film, fiber reinforced film, and plastic film laminated on both sides of metal foil. Finally, it is predicted that performance improvements will be stimulated by the new IBM diskette magazine now available on the S/34, S/38 and Series 1 machines. INTERNATIONAL DATA CORP., 214 Third Ave., Waltham, MA 02154 (617) 890-3700.

COMPUTER EQUIPMENT CATALOG

A 600-page catalog of computer products will be available the first quarter of 1980. Aimed at executives in systems houses, oem's and other buyers of computer hardware, software and supplies, the expected circulation is over 25,000.

Equipment will be indexed by manufacturer and by product. There will also be an advertising section. The directory will cost $25. Makers of computer products, software and accessories are urged to write for applications for free listings in *Data Guide*. SENTRY PUBLISHING CO., 5 Kane Industrial Dr., Hudson, MA 01749 (617) 562-9308.

NEW FROM DATAPRO

A directory of suppliers and three "All About" reports have been reprinted and updated from the Datapro 70 loose-leaf information service. "All About Plug-Compatible Disk Drives" is a 21-page report featuring the usual survey of user opinions of equipment. In this case, 129 users rated their total 1,841 installed disk drives according to maintenance performance, hardware reliability, ease of operation, and overall performance. The report also contains discussion of the market, guidelines for selection, and equipment descriptions. "All About Teleprinter Terminals" covers over 14,700 installed machines rated by 307 users according to ease of use, keyboard feel and efficiency, print quality, hardware reliability, maintenance service, and overall satisfaction. Specs on 124 teleprinters from 54 vendors and a review of features and applications of the major types of communications terminals are also included in the 38-page report. "All About Plug Compatible Tape Drives" features results from 92 users rating a total of 1,272 installed tape drives according to overall performance, ease of operation, hardware reliability, maintenance service promptness, and maintenance service effectiveness. The 18-page report also discusses product and market characteristics and offers selection guidelines. Each report is $12.

This year's *Datapro Directory of EDP Suppliers* profiles 1,000 companies that supply "all types of products and services of interest to computer users, planners, designers, vendors and operating staff." Information on companies includes location, size, management, financial status, product line, and sales and service organization, arranged in charts for easy comparison. The 204-page directory features 75 more companies than the 1978 edition. $24. DATAPRO RESEARCH CORP., 1805 Underwood Blvd., Delran, NJ 08075 (609) 764-0100.

EAC DIRECTORY

The Electronics Association of California, a trade association focusing on small- and medium-sized companies, offers an annual directory of member firms. Included is a "product guide," which cross-references companies by kind of equipment made. The paperbound booklet is $25. EAC, 795 Kifer Rd., Sunnyvale, CA 94086 (408) 735-7440.

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PASCAL PROGRAMMING

A course entitled "Advanced Programming Techniques Using Pascal" is being offered Nov. 14-16. Aimed at refining the skills of Pascal programmers and teaching them how to build a comprehensive and effective software development environment, the course does require a basic knowledge of Pascal. Class size is limited. Fee: $450. SOFTWARE CONSULTING SERVICES, 901 Whittier Dr., Allentown, PA 18103 (215) 797-9690.

PERIODICALS

COMPUTER USE IN SCIENCE SPECIALTIES

A bimonthly newsletter about the use of computers in psychiatry and clinical psychology, formerly "Micro-Psych," has been renamed "Computers in Psychiatry/Psychology." Each 13-page edition contains a wide variety of short articles, reviews, and reports on conferences and projects, such as the Mental Health Information Systems Project, an initial step toward a position paper on "potentially high impact computer support systems." There is also quite a bit of user dialogue through letters, and many articles are contributed by readers. Some articles may be of interest to users in fields other than psychology as examples of tailored applications. An ongoing report, for example, of one reader's battle to analyze MMPI (Minnesota Multiphasic Personality Inventory) data with his Apple computer details the quagmires of copyright law.

Vol. 1 articles include "Guidelines for User Access to Computerized Patient Records," "Why Do Psychiatrists Avoid Using the Crt?" "A Device Integrating Computer Assisted & Videotaped Instruction," and "An Interactive 6800 System for Generating Narrative Text and Psychiatric Reports." A subscription to Vol. 2 (6 issues) is $15. The best of Vol. 1, a 52-page compilation, is available for $12. COMPUTERS IN PSYCHIATRY/PSYCHOLOGY, 26 Trumbull St., New Haven, CT 06511 (203) 562-9872.

John Wiley announces a new quarterly, *Journal of Computational Chemistry*, to appear in spring 1980. Organic, inorganic, physical, or biological chemistry is to be covered. Papers will be refereed and are expected to be "at or near the state of the art limits for the particular area of work." Prospective authors are invited to contact Dr. Allinger at the Dept. of Chemistry, Univ. of Georgia, Athens, GA 30602. Annual subscriptions will be $50, from the Subscriptions Dept., JOHN WILEY & SONS, 605 Third Ave., New York, NY 10016. ✲

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SCIENCE/SCOPE

Major developments toward an optical filter that can be tuned electronically to specific wavelengths of light have been reported by Hughes scientists. The device is tuned by a microprocessor that varies the electric field distribution onto an electro-optic crystal. One filter with a lithium-tantalate crystal has been operated across the visible light spectrum from deep blue to deep red. Another has been tuned into the infrared portion of the spectrum. The device promises to find important uses in pollution monitoring, multispectral imaging, and monitoring color consistency in a wide range of commercial products.

Using digital techniques to perform image processing tasks like scan conversion and information storage, a new microprocessor-controlled display system is finding a wealth of applications from medical diagnoses to non-destructive testing. The system, called the Hughes Anaram 80™ digital signal processor, is designed to create images with the natural look of analog displays while providing the data-handling benefits of digital techniques. The system can display 60 images per second, freeze one picture for an hour, enhance obscured detail, and display four pictures simultaneously for comparative analysis. Uses include medical ultrasonography, X-rays, radar, graphics terminals, and image transmission.

The way in which the brain processes visual information has been used to develop a set of rules to portray how combat pilots locate ground targets. The concept, which draws on years of research involving realistic simulations, was created by Hughes to improve equipment, procedures, and training. It divides the pilot's search into three stages -- an orientation, a preliminary look, and an examination of likely targets. Each step, the pilot makes decisions based on what he sees or expects to see. Because the concept follows the pilot's thinking, engineers can determine which stage of the target acquisition process is most difficult, and how it might be simplified by the design of more efficient systems.

Hughes is seeking engineers to develop advanced systems and components for the following satellites: GOES D, E, and F for NASA; Anik C for Canada; GMS II for Japan; LEASAT for the U.S. Navy; and SBS, the next-generation domestic system. Fields with immediate openings include advanced communications, scientific and engineering programming, systems test & evaluation, microwave & RF design, structural design, spacecraft stress analysis, power systems design, data processing systems, control electronics computers, operating systems, and network systems. Please send your resume to T.W. Royston, Dept. SE109, Hughes Space & Communications Group, P.O. Box 92919, Los Angeles, CA 90009.

Two weapon-locating radars have achieved significant cost savings by equipping them with a computer using current microprocessor and memory technologies. The AN/TPQ-36 mortar-locating radar and the AN/TPQ-37 artillery-locating radar, in production at Hughes, are designed to track enemy shells in flight and determine their origins in an instant. Though the original computer easily met most requirements, Hughes developed a new one that would be more effective and cost less to build and maintain, while still being compatible with existing hardware. Estimated savings over the life of the program are $28.7 million to the Army.

Readers' Forum is designed for an exchange of ideas and experiences. Your contributions are invited.

READERS' FORUM

COMPUTER BUFFS SHARE EXPERTISE THROUGH CLUBS

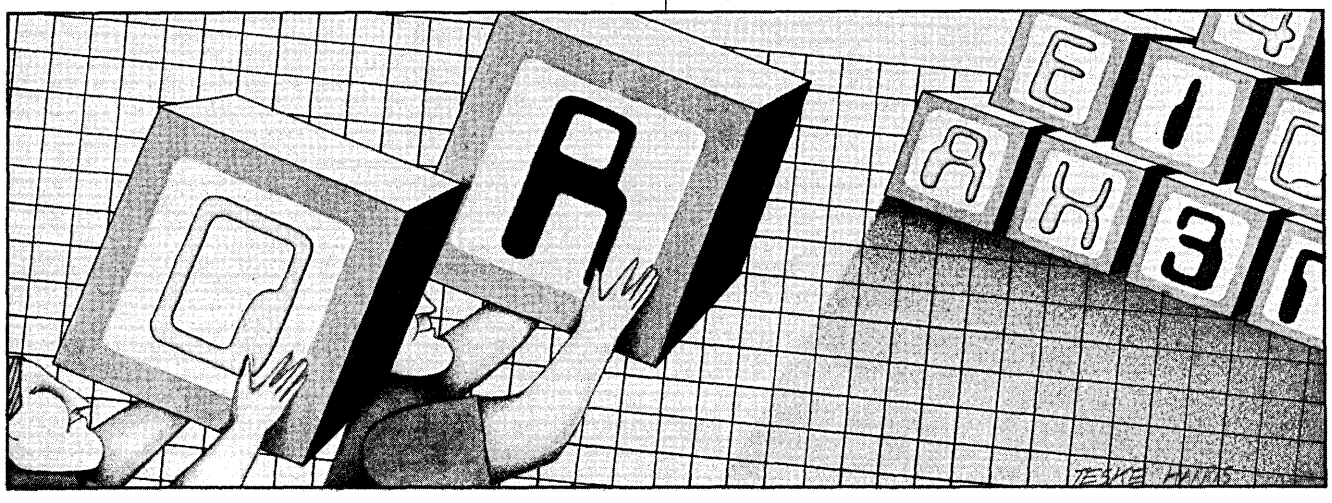
Two and one-half years ago, when I joined the fledging New York Amateur Computer Club, we hobbyists formed a virtually secret society. Most of our members were hardware buffs who spent most of their leisure time soldering chips onto boards and debugging completed Altairs and IMSAI's, which arrived via mail order with little more than a schematic.

Painfully, these hobbyists learned assembler language so they could write their own operating systems and I/O interfaces. My parents, representatives of the lay community, responded with a mixture of horror and skepticism when I arrived, flushed with enthusiasm from an early computer fair, insisting that great numbers of people would have microprocessors installed somewhere in their environment in the not too distant future.

Today, Radio Shack advertises its "take home and plug in" computing appliance on major tv networks, local and national news media abound with tales of home computing applications, *BYTE* and *Interface Age* are dispensed in my Greenwich Village bookstore, and even my Mom has drawn graphics on a TRS-80. Meanwhile, our computer club population has diversified to include software enthusiasts, and has attracted increasing numbers of new members who have never before interacted with a computer.

In this highly inflationary economy, the price of computers continues to drop and equipment itself becomes easier to use immediately following purchase, thanks to complete plug-in systems that bring up BASIC at the push of a power switch. Those of us who began as informed computer professionals before turning to home computing as an avocation must take responsibility for enforcing an orderly evolution of standards.

Our computer world is one of interdependence. The tools we employ are so complicated that the volume of specialized knowledge needed to use them precludes their mastery by every individual. Therefore, each of us must choose an area of specialization and use it to help solve the problems encountered in maintaining the gadgets that are becoming an integral part of our lives. Each new gadget we buy that is packaged in a manner that allows us to use it with a minimum of instruction is a building block provided by someone else's area of expertise. We can expand on that block, embellishing structure and function and watching human knowledge grow to great, sophisticated proportions. Gone are the days of divergent home-brew systems painstakingly constructed one connection at a time.



The New York Amateur Computer Club provides a major forum for just this type of sharing. Our members gather in general meetings and in specialized users groups to ask questions for the purpose of receiving aid from those of their cohobbyists who have already tackled and solved a problem with which an enquirer is currently faced. We are able to use equipment soon after purchase, happily expanding the hardware, building software for novel applications, using canned software for creation of games, art, music, accounting or controller functions, or pursuing whatever use we desire to make of our new tool to further our individual area of interest.

Sharing knowledge means that the components we employ become standardized modules of hardware and software. The Tower of Babel is breaking down as increasing numbers of users buy modules of equipment and software from warehouse shelves or exchange for free via the exchange facilities offered by home computing periodicals and organizations. Our aim is communication and this can only be engendered via consistency.

Since such a large percentage of home computer owners now attempt to regain their investment by putting their machines to commercial use, it is important that these amateurs-turned-entrepreneurs aim at developing their products in a manner that provides this consistency for the potential consumer. The growing user community must be able to articulate its problem in a common jargon so they can be understood by others. Membership in a society of fellow home computer buffs naturally enforces the consistency born of standardized development because building blocks of experience are shared among members.

—Abby Gelles

THE STRUCTURED PROGRAMMING CONSPIRACY

Everyone has an opinion on Structured Programming.

Some say it's the best thing to hit the software field since higher order languages.

Others say it's a fancy window dressing for what most programmers have been doing all along.

Still others say that it's a mild-mannered improvement over traditional practices, but nothing to write home about.

And then there's my opinion. I believe, or at least I find it fun to believe, that Structured Programming is part of a fascinating plot—a political maneuver to end all computing political maneuvers—and a failure at what it set out to do.

To understand my somewhat paranoid belief, you have to understand something about the history of computer programming languages.

Most of you know that Jean Sammet is the greatest living historian of programming languages. Her roster of languages, published regularly, lists a mind-boggling assortment, with enough languages on the list to practically guarantee that no one has heard of all of them.

But most of you know that Jean Sammet's list, though valid, is also a smokescreen behind which hides the fact that there are really only two programming languages—FORTRAN and COBOL. Sure, there *are* other languages and a lot of useful work is done in them, but from a statistical point of view none of the others really count for much at all. If all the programs in the world were stacked in histograms categorized by languages, FORTRAN and COBOL would be the skyscrapers, and all the others would look like Mom and Pop grocery stores.

That is not, however, to say that FORTRAN and COBOL are exceptionally *good* programming languages. To the contrary, FORTRAN and COBOL are archaic, clumsy and barely adequate languages for the tasks at hand. FORTRAN is badly lacking in capability to deal with a variety of data types, especially data structures; and COBOL, which has wonderful data structures, is verbose and hard to modularize. When it comes to *quality* in programming languages some Mom and Pop grocery stores suddenly get exceedingly tall.

What we have, in fact, is a form of institutionalized inertia. Nearly everyone agrees that FORTRAN and COBOL have grown ungracefully gray, but there is such a massive investment in existing programs written in those languages and programmers trained in those languages and compilers to support those languages that their success continues on regardless. It is a classic case. FORTRAN and COBOL are exceedingly popular precisely and solely because FORTRAN and COBOL are exceedingly popular!

Now, what has this to do with Structured Programming? The answer is, a lot. Whatever else FORTRAN and COBOL are and aren't, they are crummy Structured Programming languages. If the writing of structured code involves constraining the programmer to a limited set of control constructs—namely the sequence, the IF-THEN-ELSE, the CASE and the LOOP (DO-WHILE and DO-UNTIL), with an adequately nested BEGIN-END structure to support it, then look at the score. The ELSE was invented after FORTRAN. The CASE is beyond the capabilities of both. The LOOP is more powerful than anything offered by either. And most importantly, BEGIN-END structure is totally absent from both.

The fact that FORTRAN and COBOL are archaic is not, of course, news. FORTRAN was made obsolete a few years after its birth by Algol 60, but it was already too well entrenched to be dislodged. COBOL, mandated by the U. S. Department of Defense, was spared competition for almost ten years, but then was also one-upped by a still-clumsy but better PL/1. What is most remarkable about these languages is that they have survived, in spite of all reason, any attempt to improve what they offer.

FRUSTRATED LANGUAGE DEVELOPERS

Think, now, of the frustration of generations of language designers, offering up superior programming languages to the great god Digitanus, only to have them spurned. Take your Algols, and your Lisps, and your APL's, and your PL/1's, and any other language you care deeply about, and trashcan them—that was the message that persistently repeated with each new language.

I was one of those advocates of a better language. Don't laugh, but I was one of a small cadre of people who believed that Neliac was the right language! Not only was it a better language *per se*, but we planned to add to its basic scientific capabilities a strong commercial capability, making it a strong competitor of *both* FORTRAN and COBOL. We failed, of course, but that failure is another story told in another place.

Now all of this is background for my theory that Structured Programming is a political plot. It's time to get specific about what the plot is, and why.

All of the better languages that came along after FORTRAN and COBOL could be considered to be confrontations to those entrenched languages. That is, they were attempts to replace FORTRAN and COBOL by offering something better. Frontal attacks on an entrenched position. From a political point of view, if the replacement languages were seriously viewed to be *really* replacement languages, then the method of approach to change was overt, out front, and straightforward.

But as years of this kind of confrontation went on, it became obvious that the better mousetrap approach was not going to work. FORTRAN and COBOL could not be overwhelmed from the front; but perhaps they could be undermined from within.

What if, goes my paranoid theory, the language advocates who knew FORTRAN and COBOL had to go, began casting about for a way to do that undermining?

What if, continues my theory, they decided to invent not a

new language but a new methodology?

And what if, after its dramatic acceptance in the marketplace, it became obvious to all that FORTRAN and COBOL were incompatible with it?

Could not this new methodology be a Trojan horse which would, in effect, destroy FORTRAN and COBOL from the inside?

Had you set out to define Structured Programming to be precisely that new methodology, you couldn't have done a better job. We have already seen how lacking the required forms those languages really are. Imagine, if you can join that far in my theory, the anticipated joy that accompanied the realization that the proper methodology had been found.

And imagine further, the incredible excitement of having Structured Progamming become dramatically popular, nearly instantly—at long last, the instrument for displacing FORTRAN and COBOL had been found, and was at work.

I love irony. Perhaps that's why I love this theory. Because what happened next, if you accept my theory, is the greatest computing irony of all time.

Everyone did indeed realize very quickly that FORTRAN and COBOL and Structured Programming did not mix. And, wonder of wonders and irony of ironies, everyone stepped up immediately to the task of solving that problem. Far from destroying FORTRAN and COBOL, Structured Programming stirred up a hornet's nest of new activity for them. Ten thousand Structured Preprocessors, give or take a few 1,000, were built to allow FORTRAN programmers to write in a structured variant of the language and have it translated into standard FORTRAN. A gross of books, give or take a dozen, were written on how to create Structured COBOL. Consulting firms sprang up all across the country to present in-company lectures on making the old programs into newly structured ones. Program design languages were invented, using FORTRAN or COBOL as a base. In short, FORTRAN and COBOL thrived. The Trojan horse, moved stealthily into the enemy's camp, never got its doors open.

There is one tantalizing question that remains unanswered. If a frontal attack won't dislodge FORTRAN and COBOL, and neither will an explosively successful undermining, then what will?

Now *there's* a question to *really* sink some thought into!

—Robert L. Glass

LOCAL NETS: THE BROADBAND COMETH

From the commentary and material currently available describing local networks, one might be inclined to believe there are very few working installations, and also that the installations on line are all isolated lab experiments. The reality of the situation is that there are many, many users who have decided to use local networks, and have already installed them. Several years ago, when I first became involved with these networks, my experience was limited to having read material about Aloha, Ethernet, and other "exotic lab" systems.

There is much talk also about standards, and the magical $100 black-box interface device, designed to allow the user to connect anything from a mini or terminal to a Cray on this also magical medium (the Ether, as Bob Metcalf described it). There are some standards evolving now, especially in the fiber-optic applications market. The largest problem, as I see it, is recognition of what constitutes a "local network."

The primary systems in use today that may become any kind of a standard are: baseband coaxial, fiber optic, and broadband coaxial. These are most commonly implemented.

The most confusing medium at this point is the baseband system. The researchers who developed the technology only really agree on one point—the cable has to be driven, and let's drive it with pulses. Capacities range from 1-megabit rates, as the NBS' system defines, to about 50 megabits for the Network Systems approach. These are all single-channel bit streams, totally reliant on protocol and attached-device intelligence. They generally are limited to a two kilometer diameter of service area, due to the characteristics of the passive coaxial backbone.

Fiber optics is indeed a wave of the future, and with all of the attributes of isolation on its side, why not? It has been shown to carry tremendous data rates over short distances, and in some cases reduced data rates over distances of up to 300 kilometers (a Canadian application).

At this point, a dozen or more manufacturers are offering their version of fiber links for use in data communications environments. Some applications require, or are at least able to use the relatively short standard pieces offered. Again, the two-kilometer diameter limitation has been invoked for local networks of this type, and this two-kilometer limitation appears again and again in articles defining the size of a local network.,

WHERE ARE INSTALLED SYSTEMS? The principal systems are in the laboratories. It is here they were born and here they reside (Ethernet, for instance). Baseband coaxial systems reside also in places like Lawrence Livermore Labs in California (50Mbps), NASA Houston, and Brookhaven Labs in Long Island. You've probably noticed that the whole section regarding broadband local networks is missing —it really isn't.

The most common installation in a commercial facility is not fiber optic, or baseband coaxial. It is broadband coaxial. This sytem is installed and operational in General Motors plants and offices, Ford Motor plants, American Motors plants, Dow Chemical plants and offices, colleges, universities, military bases, and between banking organizations in Manhattan.

The main reason for this quiet proliferation is cost-effectiveness. While still lacking in some areas of standards, such as modems, the coaxial broadband approach is backed by a 20-year history of development. MTBF ratings on cable equipment is up to 480,000 hours; it can support data rates of 100 plus Mbps in full duplex mode; it can multiplex thousands of low-speed (up to 9600bps) data circuits on one cable, and multidrop thousands of times over several tens of miles. It also can carry television, security, and voice analog signals concurrently. To top all of this off, the coax can power its own repeaters up to several miles, can branch or star or hybrid in its topology, and you can TDM via your own protocol on any of its available spectrum. There is one other reason: the network is available—you can get it; there are people out there making these systems.

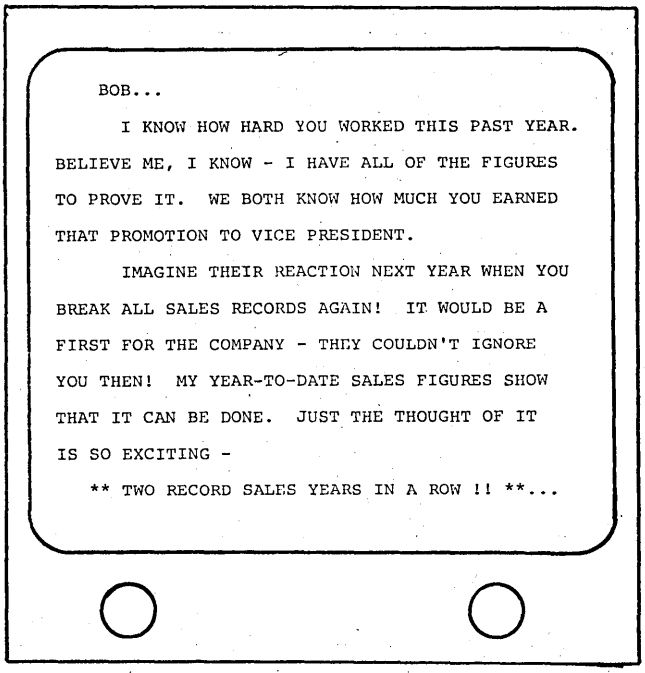
There are several vendors who are doing this work. Design of the system is handled by either CATV consultants in consort with data consultants, or by companies such as Network Resources, providing the reduction of requirements to hardware requirements and specifications/recommendations. These consultants are generally responsible for aiding in the installation, also. They recommend contractors, equipment vendors, and aid in the training of technical support people.

The reason this support is already in existence is simply the time that the CATV people have been doing their job, wiring up cities and plants. They have been improving and documenting their progress a lot longer, on a cost-effective basis, than the other local network technologies. The cost of broadband coaxial plant cabling can be as low as $1.41/ft. The effective coverage area for local systems is greater that 20 miles in diameter; in fact, the city of Portland, Oregon, is wrapping up a *50-mile system*, including data, voice circuits replacing leased lines, and video services for municipal services (such as safety films).

The term local networks needs definition. If we are to go by the now-defined two-kilometer general description, what will we define the broadband system as? The other pressing need in network definition is the dissemination requirement. Are you one of the people who didn't know what the broadband system was? You should—because in cost-effective planning for the large systems of the present and the future, the local network people agree on one thing: the broadband is coming.

—Mark Athens Dineson

COMPUTER STROKES



The big machine worked a few extra milliseconds last night. Today, Program 87-5B, "Post-Promotional Executive Soothing," will work its magic again.

When promotions were announced yesterday, the company ended up with at least one wounded ego. How could Bob have been left out? Hadn't he been the rising star? How could they ignore the record sales of his division? And what about the countless evenings he had spent at the office, the missed dinners, the cancelled tennis dates?

Bob was more than a little subdued this morning—certainly not his fast-track self. As he dragged past the rows of desks to his office, he thought about that call he got last month about an out-of-state job. But those thoughts vanished as he reached his office door. On his desk the message was waiting. His office never has been the same since that terminal arrived. And now he stared at the screen—which, strangely, was already on as he walked in the door.

It was hard to tell when he stopped actually reading the message because his eyes were on that screen for so long. But clearly his mind had wandered—he had that distant gaze we are all prone to having early in the morning—when he caught himself and sat down to recover.

By the time he finished his first cup of coffee, Bob had settled down quite a bit. He idly scanned the sales forecast on his desk and thought that he probably wouldn't follow-up on that other job today after all. In fact, if he worked late tonight, he just might be able to finish that big sales report for the presentation tomorrow...

—William Agresti

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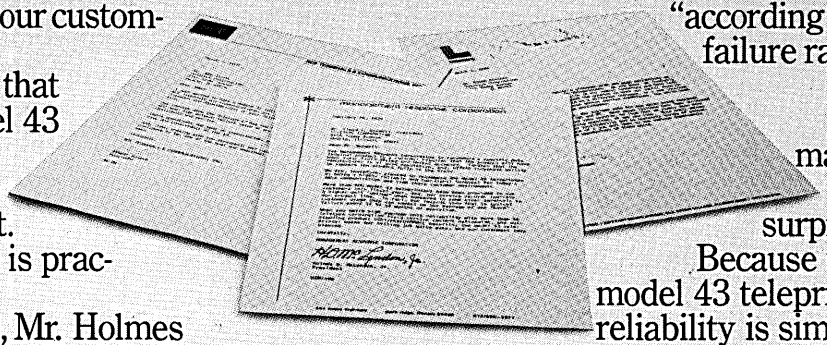
PPD 105

CIRCLE 2 ON READER CARD

IT'S HARD TO KEEP A GOOD MACHINE DOWN.

At least that's what our customers tell us.

They report that the Teletype* model 43 printer is the most reliable machine they've ever bought. And that downtime is practically nil.



For example, Mr. Holmes McLendon of Management Response Corp. writes us to say that with "high average unit reliability, the model 43 teleprinter makes our selling job quite easy, and our customers very pleased."

Thanks, Mr. McLendon.

And Mr. Robert Jones of Leasametric, a company that currently rents out over 1000 of the model 43 teleprinters, reports that "according to our records, the failure rate ranges between 1½% and 2%."

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CIRCLE 3 ON READER CARD