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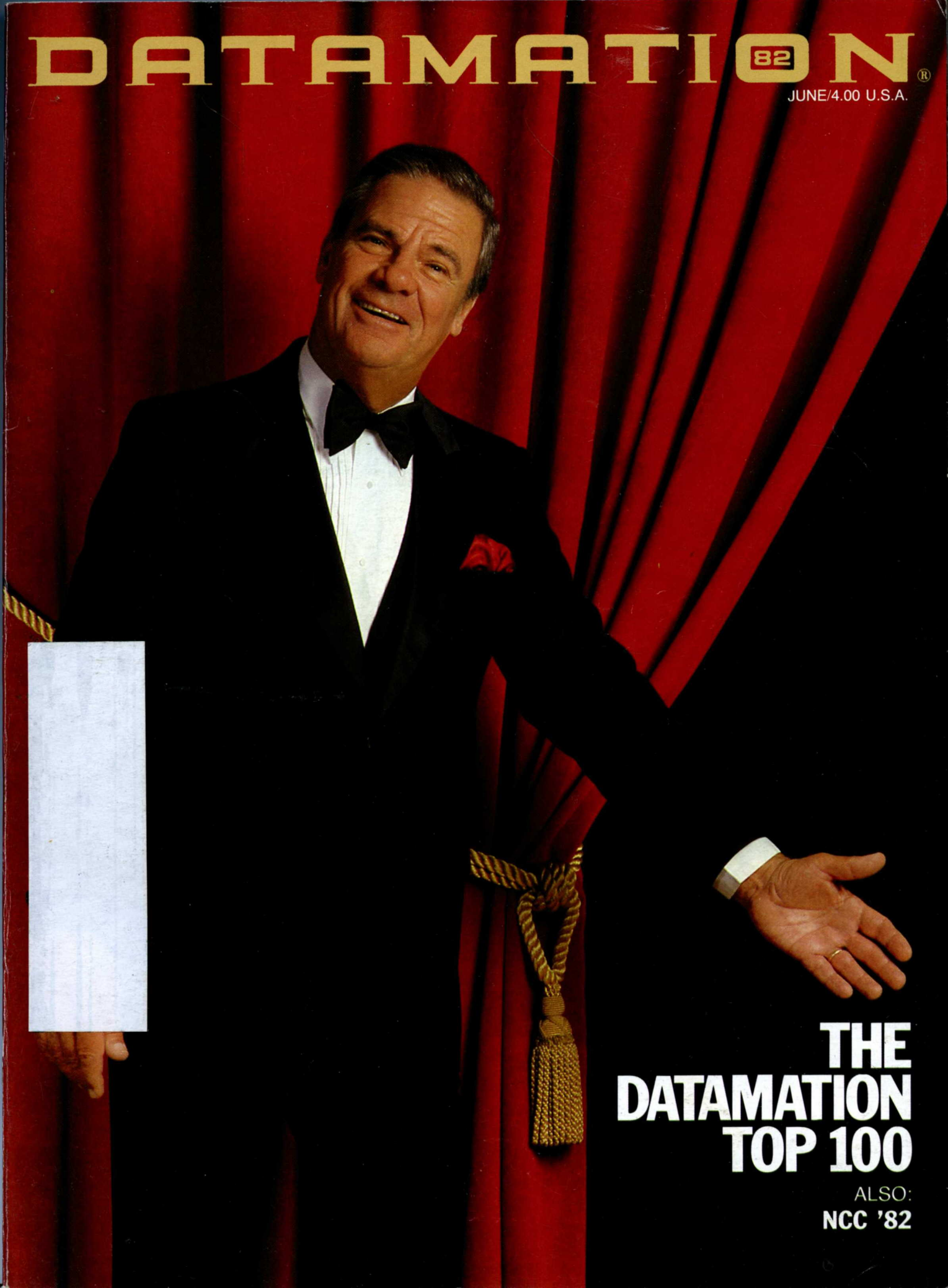

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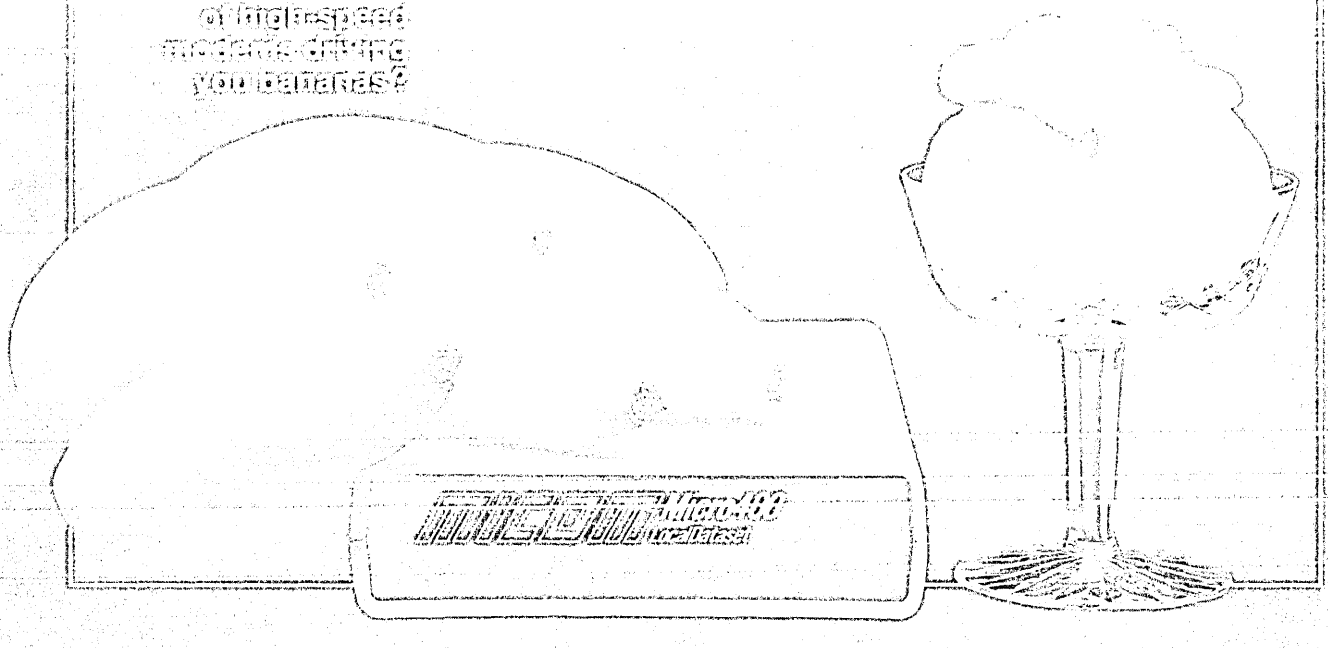

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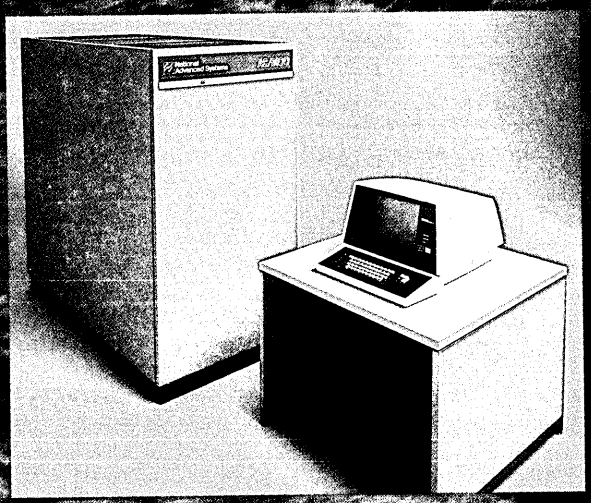

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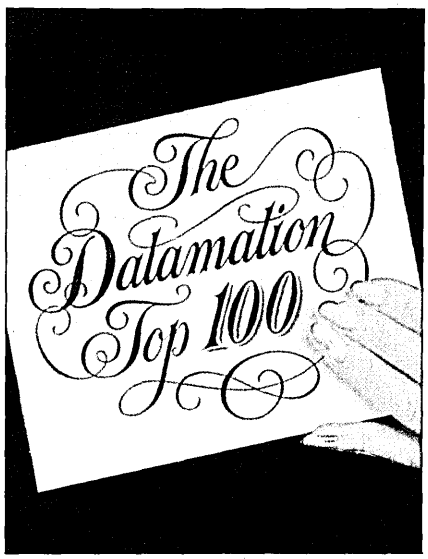

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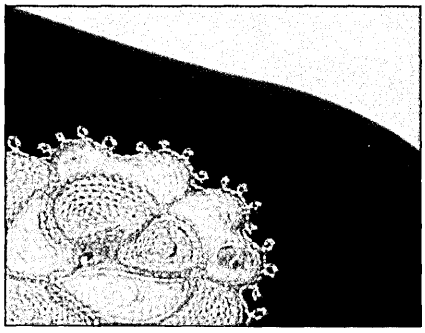

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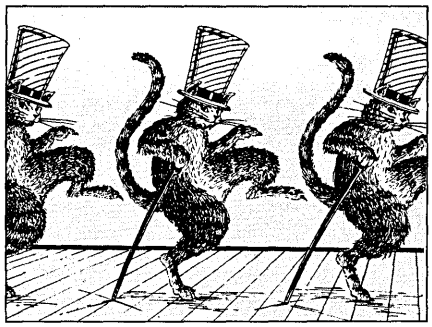

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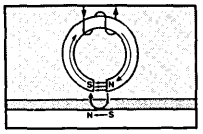

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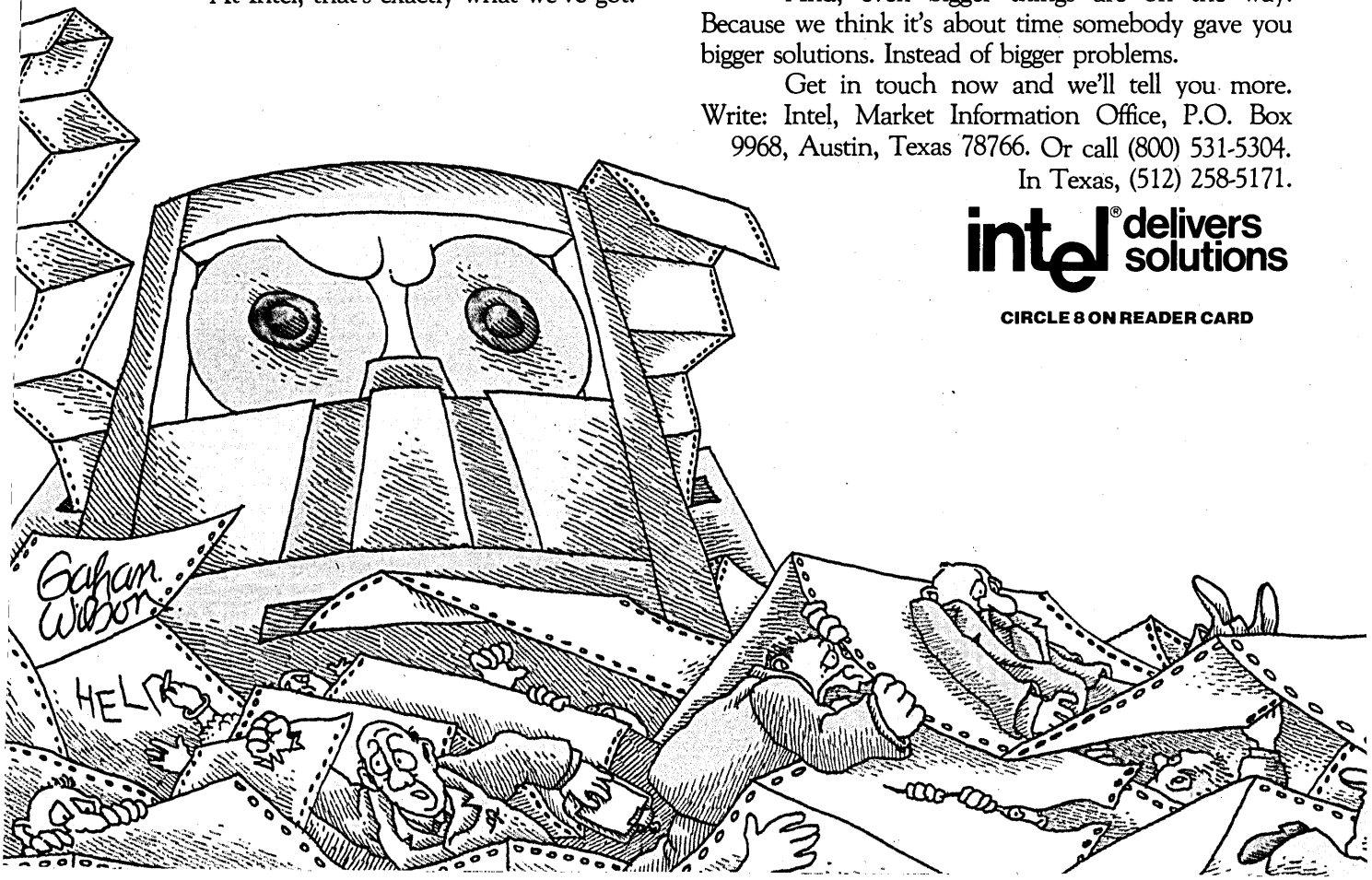

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LOOKING BACK

LISTENING BOX

June 1962: At IBM's Advanced Systems Development Lab in San Jose, Calif., some revolutionary ideas came closer to reality with the development of the experimental SHOEBOX, a voice recognition machine that acted on spoken commands and responded to 16 words, 10 of which were numbers. It could answer arithmetical questions because it recognized six command words: plus, minus, subtotal, total, false, and off.

Most differences in speech rate, pitch, and inflection did not fool SHOEBOX —it responded almost as well to singing as to normal speech. It operated with considerable background noise, but was baffled by whispered or shouted commands.

The SHOEBOX design was based on the lab's discovery that speech could be mechanically recognized "by a unique feature of the speech wave which arises from its phase structure." These phases are not discernible by the human ear, but experimenters found they could use them to make voice recognition machines simpler and more reliable.

W.C. Dersch, of the San Jose lab, believed that with improvements in both measurement and logic, a device could be constructed that would be capable of identifying and responding to 10,000 words and phrases. He saw many uses for voice recognition equipment besides the generally accepted goal of a totally open computer shop where users interfaced directly with the machines: "Jet fighter pilots could use voice control and voice verification to replace many complex manually operated instruments in already highly complex instrument panels. A small vocabulary machine might be used to enter data suitable for automatic industrial processing. Utility meter readers, operators of automatic equipment, and cash register operators are among those who would benefit from the development of voice controlled devices."

Perhaps the best "side benefit," Dersch figured, was that users of SHOEBOX or other voice recognition equipment would have to improve their pronunciation or risk being misunderstood by the machines.

SALVOS FROM BIGSHOTS

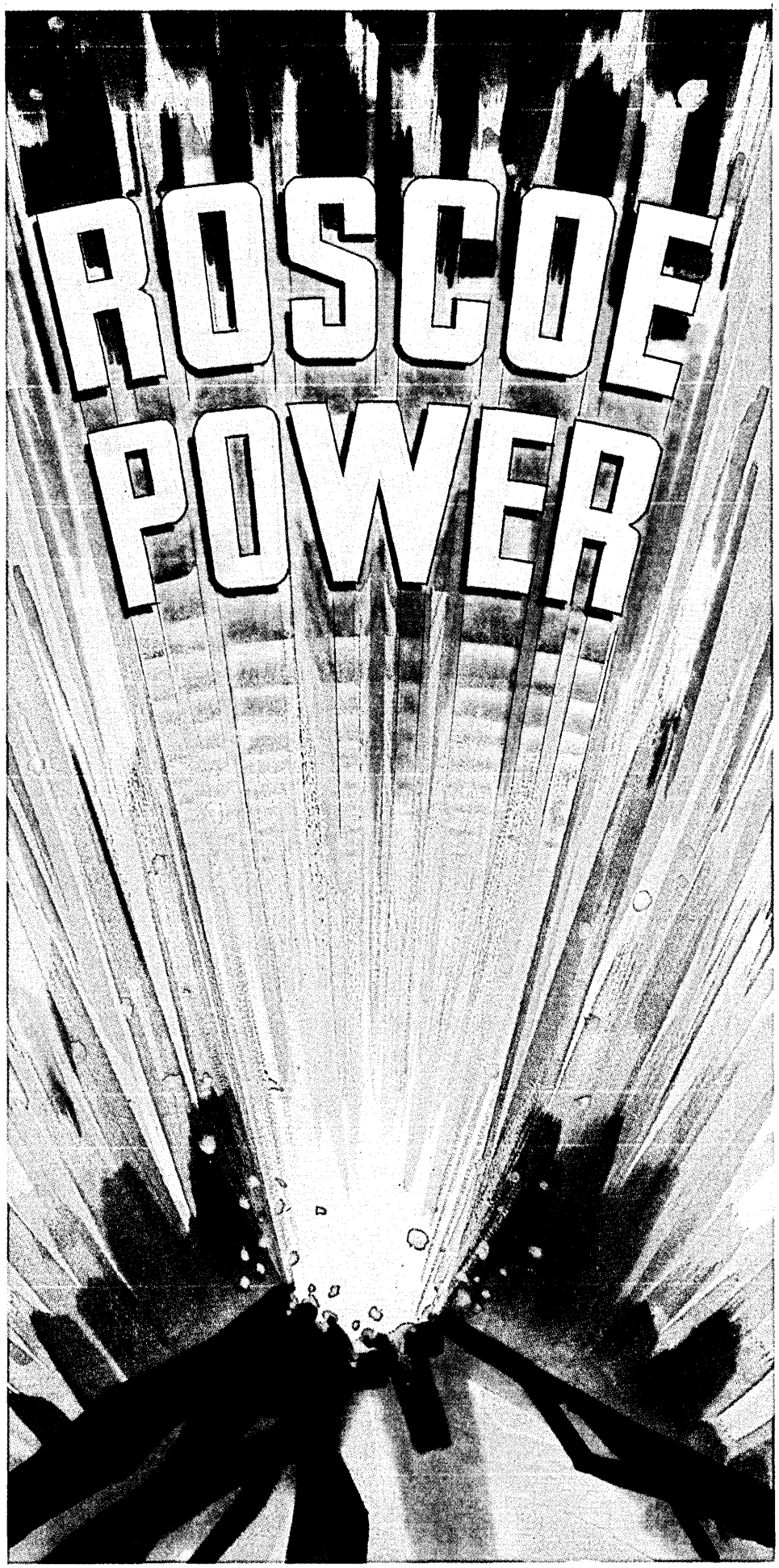
June 1972: "Effective vs. Efficient Computing" was the conference's somewhat mundane title, but the bigtime computer folk in attendance rose above it and offered numerous colorful comments. Edith Myers's coverage of the 1972 UCLA/Informatics Symposium featured opinions from some of the industry's more outspoken preachers, teachers, and businessmen.

The theme of the powwow seemed to be "tear it down and let's build it again." Terrance Hanold, president of the Pillsbury Co., tossed the first stone when he greeted attendees with this line: "I regard computers and the structures we build on them as much too important to leave to computer people." Dr. Herbert Grosch, the keynote speaker, was downright combative: "We have your yachts, but where are the customers' yachts? Where are society's yachts? We're using our racket for our own benefit, for fun, and making our racket so esoteric we can call it a profession. We don't qualify in ethics. We don't qualify as to certification, but we do qualify in not taking directions from anybody."

Ephraim R. McLean, assistant professor of information systems at UCLA, expressed his disappointment by recreating this life cycle of a typical edp system: "Unwarranted enthusiasm, uncritical acceptance, growing concern, unmitigated disaster, search for the guilty, punish the innocent, and promote the uninvolved."

The symposium's final session was chaired by Guy Dobbs, vice president, technical development at Xerox Computer Services, and Walter Carlson, ACM president. Their topic was how noncomputer people see computers and computer people. Dobbs's answer: "The public's view of the computer industry is not very flattering. There is a public perception of failure to deliver what was promised. We must not be guilty of the ultimate sin, the sin of intellectual arrogance. We must know and understand the user's problem better than he does. We must have a sense of our own fallibility, a sense of humility." *

—Deborah Sojka



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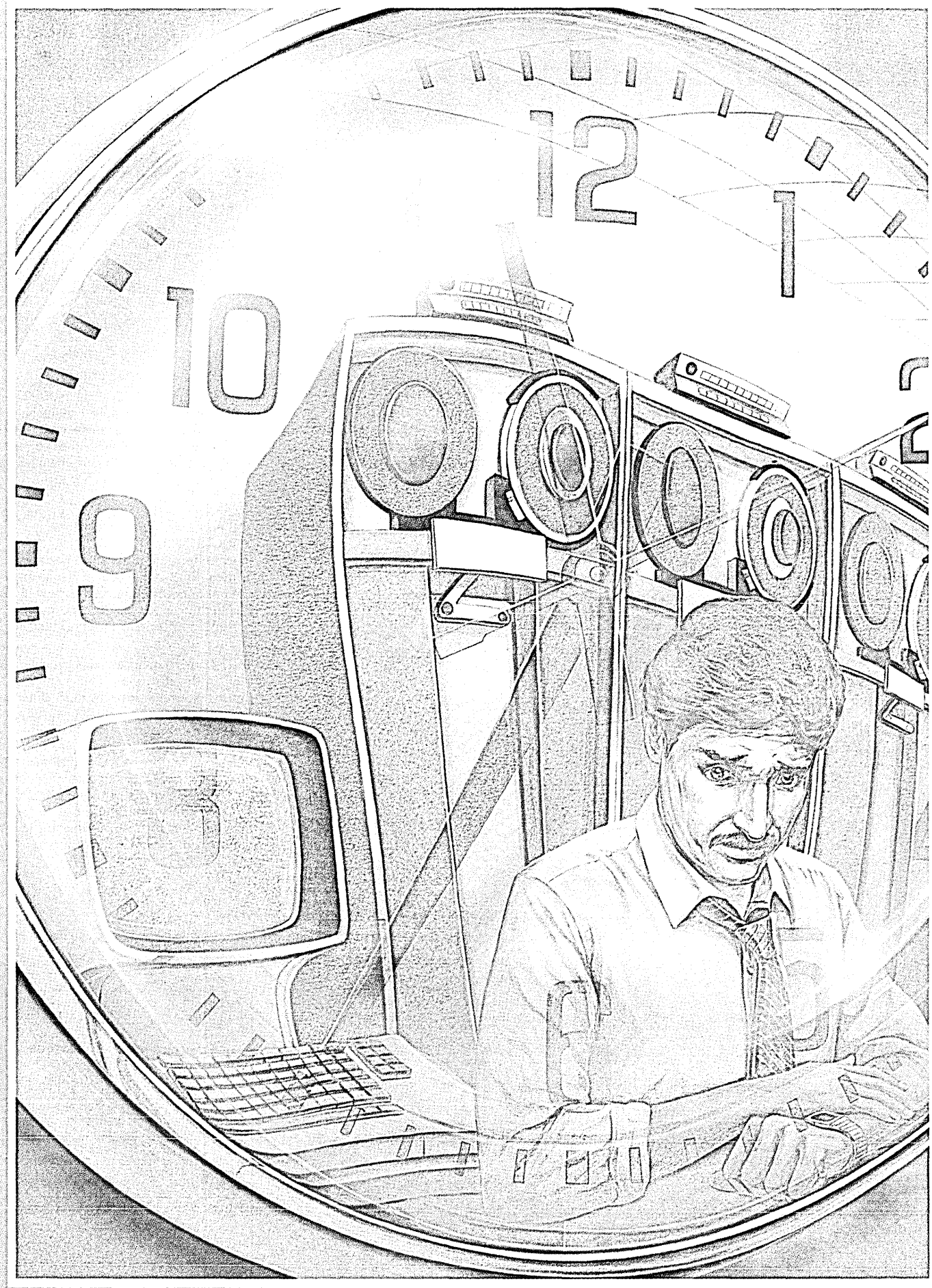
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Time. The enemy of every Data Center Manager. Beating the clock is the name of the game. And that means boosting production efficiency.

Only one software company can help you take complete charge of your entire production process, and manage it more productively: UCC.

Our Production Workload Management software packages move the workload to, through, and out of the data center. On time. In time. Every time. They manage every production activity ... from receipt of input through delivery of output. They are:

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- The UCC-11 Automated Re-run Tracking System

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Dear Ma:

Racal-Vadic's Built-in Automatic Dialer eliminates dialing errors and a telephone!

Racal-Vadic's VA3450 triple modems may look the same, but something extra has been added.

It's a built-in automatic dialer that "talks" to terminals.

Just think, Ma. Three modems — a VA3400, a Bell type 212A and a Bell type 103 — plus the auto dialer, in a compact, low profile package specifically designed for remote terminal users.

With this $75 option, up to 60 digits can be stored in memory and accessed by the terminal through a simple "conversation" with the modem dialer.

Eliminates Dialing Errors and a Telephone

Auto dialing offers a number of advantages, Ma. Operator dialing errors are eliminated since correct phone numbers are stored in the modem's memory. This is particularly true in tandem dialing where 15 or more digits are involved. Re-dialing can be automatic. Also, a telephone is not needed (sorry about that, Ma) which saves money and minimizes unauthorized phone calls.

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The auto dialer communicates with the terminal operator through a number of messages that can be printed or displayed on the terminal CRT screen. These include HELLO, I'M READY, TIME OUT, FAILED CALL, MEMORY OVERFLOW, NUMBER ?, DIALING, ON LINE, MENU, NOT FOUND, and INVALID. The menu stored in the modem memory permits the operator to issue commands to the auto dialer such as RETURN TO IDLE MODE, PAUSE FOR DIAL TONE, STORE NUMBER IN MEMORY, BACK SPACE TO CORRECT ERROR, DISPLAY TELEPHONE NUMBERS IN MEMORY, PRINT MENU, DIAL NUMBER FROM KEYBOARD, PUT NUMBER ADDRESS IN MEMORY, and RE-DIAL LAST NUMBER.

Available in These Four Models

VA3451 PA/SA (VA3400, Bell 212A, Bell 103)	**$975**
VA3452 PA/SA (VA3400, Bell 212A)	**925**
VA3453 PA/SA (VA3400, Bell 103)	**900**
VA3212 PA/SA (Bell 212A, Bell 103)	**900**

There's lots more to tell, Ma. Better write or phone for the whole story today.

Your independent thinking son,

Alexander Graham Jr.

Racal-Vadic Member IDCMA

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Alabama: (800) 327-6600 • **Alaska:** (907) 276-5616 • **Arizona:** (602) 947-7841 • **California:** S.F. (408) 298-7290, L.A. (714) 635-7600, **S.D.** (714) 565-1557 **Colorado:** (303) 779-3600 • **Connecticut:** (203) 265-0215 • **Delaware:** (301) 649-6000 • **District of Columbia:** (301) 649-6000 • **Florida:** Fort Lauderdale (800) 432-4480, Orlando (305) 423-7615, St. Petersburg (800) 432-4480 • **Georgia:** (800) 327-6600 • **Hawaii:** (808) 523-8881 • **Illinois:** (312) 255-4820 • **Indiana:** (317) 846-2591 • **Kansas:** (913) 764-7977 • **Louisiana:** Baton Rouge (504) 924-6826 • **Maryland:** (301) 649-6000 • **Massachusetts:** (617) 245-8900 • **Michigan:** (313) 973-1133, Lansing (517) 337-7374 • **Minnesota:** (612) 944-3515 • **Mississippi:** (800) 327-6600 • **Missouri:** (314) 821-3742 • **Nevada:** (800) 422-4591 • **New Jersey:** North (201) 445-5210, South (609) 779-0200 • **New Mexico:** (505) 299-7658 • **New York:** Binghamton (607) 785-9947, N.Y.C. (212) 695-4269, Rochester (716) 473-5720, Syracuse (315) 437-6666 • **North Carolina:** (800) 327-6600 • **Ohio:** Cleveland (216) 835-8400, Dayton (513) 859-3040 • **Oregon:** (503) 224-3145 **Pennsylvania:** East (609) 779-0200, West (412) 681-8609 • **South Carolina:** (800) 327-6600 • **Tennessee:** (800) 327-6600 • **Texas:** Austin (512) 451-0217, Dallas (214) 231-2573, Houston (713) 688-9971 • **Utah:** (801) 262-3000 • **Virginia:** (301) 649-6000 • **Washington:** (206) 364-8830 • **Wisconsin:** (414) 784-9379 • **Canada:** Calgary (403) 243-2202, Montreal (514) 849-9491, Toronto (416) 530-5755, Vancouver (604) 681-8136

CIRCLE 22 ON READER CARD

LOOK AHEAD

WAITING FOR LA GOUDE

Latest word on 3705 replacements from IBM points to fourth quarter shipments of the La Goude, France-developed machines, code named Mirage and Chambord. Customers have been pressing for beta tests of the machines throughout the spring, but were refused by IBM. Shipping dates for the new controllers, which use 4300 technology, have already slipped twice. Sources are now saying the first beta tests will begin this summer, with announcement of the machines coming at the same time. Says one source, "Anything out of La Goude seems to be jinxed (a number of offerings from there, including a batch of modems, have been poorly received by IBM's users in the U.S.), so nobody knows quite what to expect."

Meanwhile, Comten says it's ready for the IBM announcement. The NCR subsidiary expects to be able to compete on price/performance, as well as offer users more function than IBM can deliver.

P.C. POWER

Competition in the personal computer market is heating up considerably, with IBM boosting performance on its machine and getting ready, sources say, to introduce a smaller P.C. Software continues to be the key to the market, and companies otherwise known for their mainframe packages are getting into the act. Applied Data Research, for instance, has a contract to put some of its software on one of DEC's new personal machines.

NOW YOU SEE 'EM, NOW YOU DON'T

From phenomenal success to phantom sales, Datapoint now faces a possible $20 million to $25 million write-off in the third quarter, speculates one investment analyst close to the company. Why? It started at the top, where exec bonuses are tied to stock performance, and cascaded down in the form of unrealistic sales goals during sluggish economic times. The outcome: resignations from five marketing officers and a wrist-slapping for Richard Palermo, who resigned from the board and took a demotion from exec vp, head of domestic marketing, to staff vp.

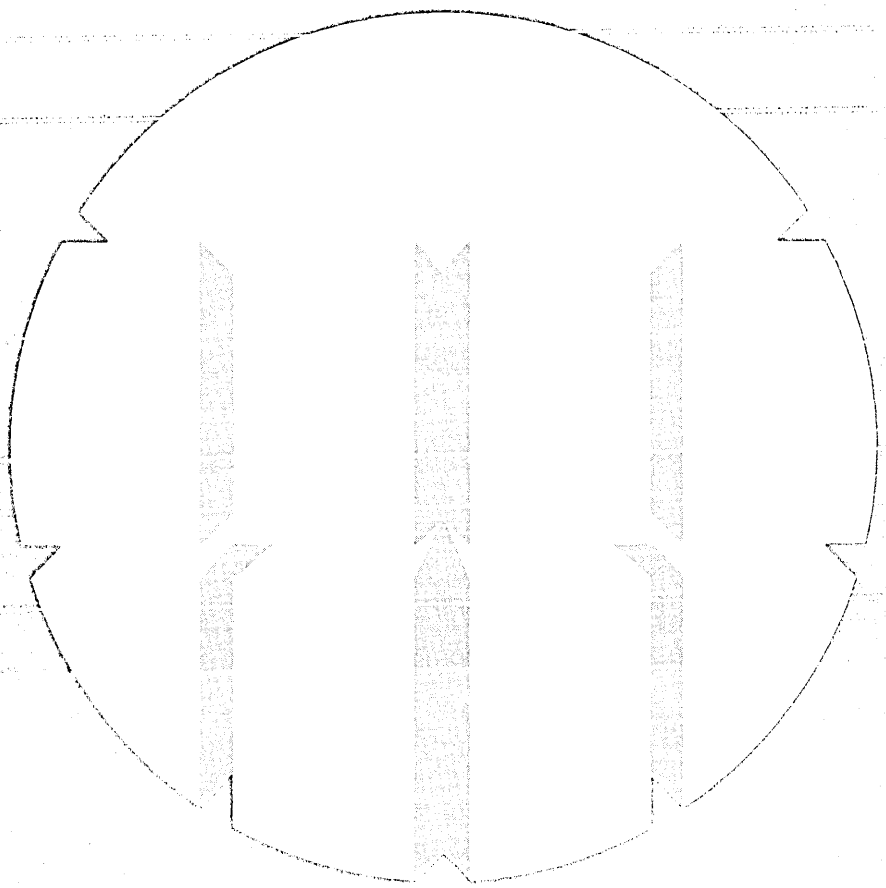
WHERE'S THE JUNCTION?

IBM has a pilot Josephson Junction manufacturing line going in East Fishkill, N.Y., but says it doesn't expect computers based on that ultra-fast technology to make it to the commercial market until the '90s. It does, however, leave open the possibility that a military application may arise.

Meanwhile, researchers at IBM, CDC, Cornell University, and elsewhere (including Japan) are looking at gallium arsenide as a possible high-

LOOK AHEAD

	speed circuitry technology for future machines. It doesn't require the supercooling Josephson Junctions do, but it is substantially harder to work with than silicon and JJ-type materials. Sources say IBM has made a substantial commitment to GaAs and will use it before JJ. But silicon will be IBM's principal logic material for the rest of this decade.
LITTLE DRIVE FOR DRIVES	It's been a bad year for disk drives at Control Data. First the Lark had mysterious problems, none of which were nailed down and all of which, CDC says, disappeared -- but not before the Lark manufacturing site was torn apart and rebuilt. Now faced with a softening in orders across various oem product lines,CDC is resorting to layoffs throughout the summer -- 600 people for eight days at Computer Peripherals and 9,500 people at Magnetic Peripherals for up to 12 days in July, the same amount of time they were off in May. Some 700 people are slated for "temporary" layoffs of up to one year.
RAMMING 'EM THROUGH	IBM claims that as of the end of last year it had shipped more 64K RAMs and larger memory chips than the rest of the world combined. Trouble is, nobody else can use them since they're designed for IBM boards alone. Nevertheless, IBM is qualifying some six outside vendors of 64K RAMs because demand within IBM's customer base is "tremendous." Strangely enough, the first vendor to be qualified will be a Japanese company.
PSST! WANNA SAVE $200K?	Wanna save $200,000 on a CDC 720 to 730 upgrade? Have CDC do it and it costs $225,000. Have CMTI in Denver do it and it costs $25,000. (Do it yourself, you pay $40 to build the board.) CDC's 700 manufacturing strategy called for basically two machines -- the 720/730 and the 740/750/760. To move among different price/performance ranges, you either slow it down or speed it up. To move from a 720 to 730 requires one board, several wires, and some engineering savvy. The same is true for the 800 series. CMTI also offers an alternative to CDC maintenance and plug-compatible peripherals. By '84 the company hopes to offer a "substitute" operating system that preys on NOS Version 2.0 shortcomings.
RUMORS AND RAW RANDOM DATA	We hear IBM's Boca Raton, Fla., Personal Computer operation has become known within the corporation as the Pac-Man division....Four-Phase has terminated its Product Planning group of about six people and has opted instead for turning that function over to the whims of its oem customers.



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CALENDAR

JUNE

NCC, June 7-10, Houston.

More than 600 exhibiting firms and 80 technical sessions will be found this year at the Astrodomain. Pioneer Day will honor the developers of FORTRAN. Contact AFIPS, 1815 N. Lynn St., Arlington, VA 22209, (703) 558-3610.

NCGA '82, June 13-17, Anaheim, California.

The National Computer Graphics Association's third annual conference and exposition will offer over 120 exhibitors in the graphics field in more than 17 application areas. Contact the National Computer Graphics Association, 2003 M St. NW, Suite 330, Washington, DC 20036, (202) 466-5895.

World Computing Services Congress III, June 20-23, Copenhagen, Denmark.

Computer service firm reps from around the world will gather to discuss issues relating to the computer services industry and participate in workshops on international trade, management, and technical issues. Contact Thomas Farewell, ADAPSO, 1300 N. 17th St., Arlington, VA 22209, (703) 522-5055.

Syntopican X, June 21-24, Kansas City.

For Syntopican's 10th anniversary, the conference will focus on the key role of the new information manager. Contact IWPA, Conference Services Dept., 1015 N. York Rd., Willow Grove, PA 19090. (215) 657-6300.

COMDEX/Spring '82, June 28-30, Atlantic City.

This annual event is especially geared toward the needs of small system vendors and their ISOs (independent sales organizations). Contact the Interface Group, P.O. Box 927, 160 Speen St., Framingham, MA 01701, (617) 879-4502.

Videotex '82, June 28-30, New York City.

The conference will examine the several areas deemed most important for expansion of the videotex market. Special emphasis will be placed on meeting the challenge of marketing videotex in the U.S. Contact E. R. Dawe, On-Line Conferences, Ltd., Argyle House, Joel St., Northwood Hills, Middlesex, England, 011-44-9274-28211.

JULY

International Manufacturing Systems Conference '82, July 11-15, Buffalo, New York.

The conference theme is "The Technology of Productivity." Exhibits, vendor presentations, plant tours, and seminars will comprise this year's show. Contact IMSC '82, 186 North Water St., Rochester, NY 14604, (716) 232-3950.

ACM SIGGRAPH '82, July 26-30, Boston.

The first two days of SIGGRAPH will feature computer graphics from introductory to advanced levels; the last three days will concentrate on technical sessions. Contact Convention Services Dept., 111 East Wacker Dr., Chicago, IL 60601, (312) 644-6610.

AUGUST

10th IMACS World Congress, August 8-13, Montreal, Canada.

This year's theme is "Systems and Simulation and Scientific Computation." Contact Prof. S. Sankar, Concordia University, Department of Mechanical Engineering, 1455 de Maisonneuve Blvd. W., Montreal, Quebec H3G 1M8, Canada.

Second International Computer Engineering Conference and Show, August 15-19, San Diego, California.

The technical presentations will include graphics, CAD/CAM, robots, database management, and human-machine interfacing. Contact the American Society of Mechanical Engineers, United Engineering Center, 345 E. 47th St., New York, NY 10017, (212) 644-7740.

SEPTEMBER

ICCC '82, September 7-10, London.

The Sixth International Conference on Computer Communication is hosted by British Telecom and sponsored by the International Council for Computer Communication. Contact ICCC '82, P.O. Box 23, Northwood Hills, HA6 ITT Middlesex, England, 44-9274-27511.

Eurographics '82, September 8-10, Manchester, England.

The University of Manchester Institute of Science and Technology hosts this year's conference on computer graphics. Contact Eurographics '82, c/o 170A Park Rd., Peterborough, England PE1 2UF.

Swissdata '82 and Ineltec, September 8-12, Basel, Switzerland.

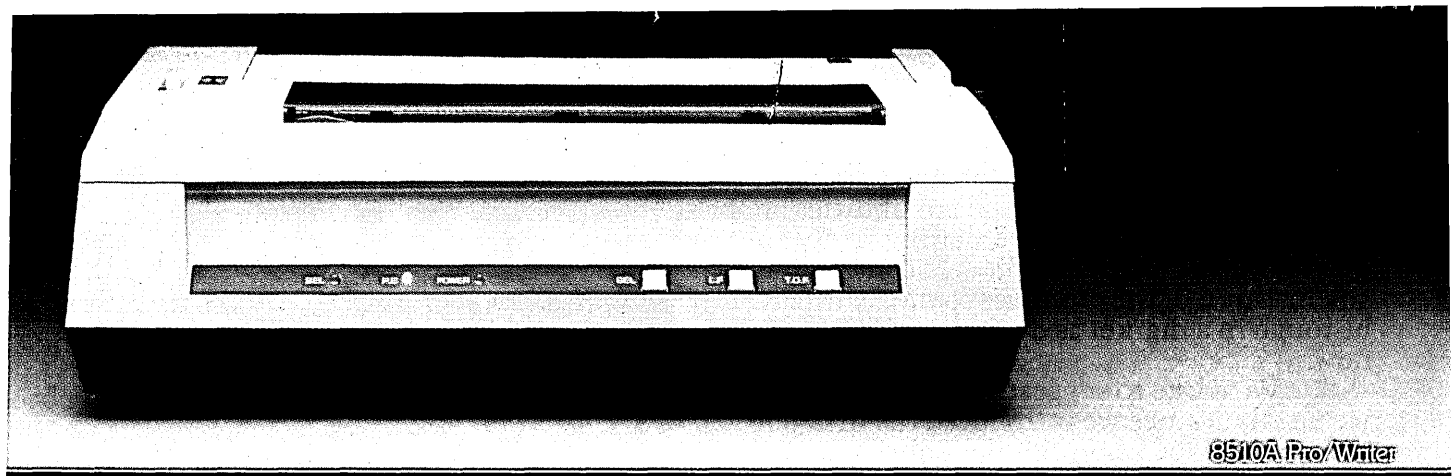
These two shows are blended into an industrial electronics and computer sciences trade fair by the Foreign Commercial Service at the American Embassy in Bern. Contact Kurt Gross, American Embassy, P.O. Box 1065, 3001 Bern, Switzerland, 031-43-70-11.

COMPCON Fall '82, September 20-24, Washington, D.C.

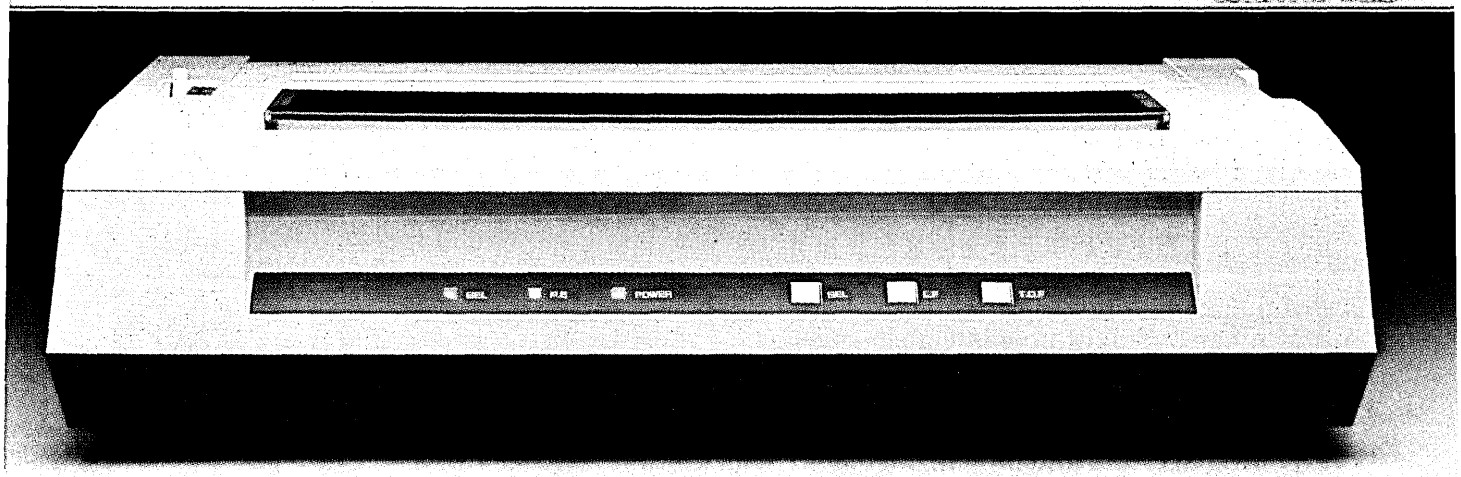
The fall meeting concentrates on computer networking, including local area networks, value added networks, international systems, and network management. Contact COMPCON Fall '82, P.O. Box 639, Silver Spring, MD 20901, (301) 589-3386.

Federal Computer Conference, September 28-30, Washington, D.C.

Sponsored by Federal Education Programs, the conference functions primarily as a forum for information exchange by federal adp users. Contact Federal Education Programs, P.O. Box 368, Wayland, MA 01778, (617) 358-5181.



8510A Pro/Writer



8550 Pro/Writer II

OUR LINE KEEPS GROWING WIDER.

C. Itoh's high-performance family of low-profile printers has grown bigger and better than ever. There's the Series 8500 Pro/Writer, our feature-loaded 8" compact with 120 cps print speed and 80-column capacity. And now there's Pro/Writer II, the new 15½" wide-track that prints up to 230 columns at a fast 120 cps print speed.

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10. Easy-load cartridge ribbon
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Pro/Writers are designed for easy maintenance throughout and feature "Microcomputer-on-a-board" technology and convenient, operator-replaceable print head. Result: Mean Time to Repair for a trained technician is just half an hour—worst case.

It all adds up to the dependability and high performance OEM's have been waiting for. C. Itoh's reliable Pro/Writer family of printers. It's growing wider all the time.

For full details, contact C. Itoh Electronics, Inc., 5301 Beethoven Street, Los Angeles, CA 90066. (213) 306-6700

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DESIGNED FOR THE OEM

Communications technologies are coming at you from every angle, and the possibilities are brilliant. Effective resource sharing. Truly automated offices. Integrated process control. But sifting through the promises to the realities can be tough in a market as dynamic as this one is now.

We'd like to suggest you take the attitude we've taken since we introduced the first general purpose local communications system to the industry. Take the road that allows you the most flexibility, freedom of choice and independence.

Choose a local network system that puts you at the controls. Choose a network with the maneuverability and the power to take you wherever you want to go.

LET THE OTHER GUYS ARGUE ABOUT MEDIA.

One of the things creating confusion about local communications right now is that a lot of heat is being generated about issues that don't really matter.

Choice of medium, for example. At this point, both baseband and broadband have a place in communications technology. While everybody is arguing about the relative merits of one medium versus the other, the answer for you may be, in fact, both.

What you need is a local communications system that will do the job with whichever medium or combination of media are right for you. And with architecture that will allow you to use still other media in the future.

And although more and more systems will become available that allow you a choice of media, right now there is only one. Net/One™

We were the first to build a media-independent system and to date we're still the only one. But we feel it's significant that others are now following, and that media independence is clearly the direction local communications technology will go in the future.

Go with a loca that lets you

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LOOK FOR A SYSTEM YOU CAN DIRECT. Everything about Net/One has been designed to respond to your needs, as they evolve, and to be completely adaptable to evolving communications technology. System architecture is completely modular, and can be easily updated for future requirements.

A Net/One system is delivered with complete operating software, so you can use it immediately for most applications without writing a single line of software. But the system is also fully programmable, so you can add non-standard interface protocols, or customized services and applications. If and when you choose to.

Net/One is the only general purpose communications system on the market today that gives you programmability. And that's in addition to being delivered with the widest range of multi-vendor compatibility of any system available. Physical interfaces currently include RS-232; IEEE-488; 8-, 16-, and 32-bit parallel; RS-449; and V.35. Our current software interface protocols include Async, Bisync, HDLC, and DEC DR-11B/W.

MAKE SURE THE POWER IS THERE. The specs have to add up to a system that's not only maneuverable, but powerful and far-reaching enough to keep up with you as your needs grow.

Net/One is made to move information. Lots of information. Fast. (Up to 10 megabits per second.) Several thousand devices in a building or complex can use Net/One simultaneously.

A local communications system should be able to take you anywhere you want to go, as fast as you want to get there. Easily. Efficiently. Consistently.

Please call or write for detailed system descriptions, and for our "How to Choose a Local Area Network" brochure. Ungermann-Bass, Inc., 2560 Mission College Boulevard, Santa Clara, California 95050. Telephone (408) 496-0111.

Net/One from Ungermann-Bass

CIRCLE 25 ON READER CARD

1 area network go anywhere.

Prime.
One line of compatible systems. A whole spectrum of powerful solutions.

Just a few years ago, advanced technology and system compatibility were mutually exclusive. But when Prime began making computers, technology and compatibility became one.

Big. Better. Best. The Prime 50 Series includes the Prime 250-II, 550-II, 750, and the new Prime 850. The Series is so flexible, it can handle virtually any application you have. And so powerful, it can meet your most demanding needs.

If you're in a start-up mode, the perfect way to begin building your system is with the Prime 250-II. If you need more power, you'll find the solution in the Prime 550-II or the Prime 750. And if you're looking for maximum performance, the Prime 850 is the most powerful mini available today.

You should know too that any 50 Series system can be networked with any other. They can also communicate directly with mainframes. And all Prime systems support a broad band of industry-standard languages.

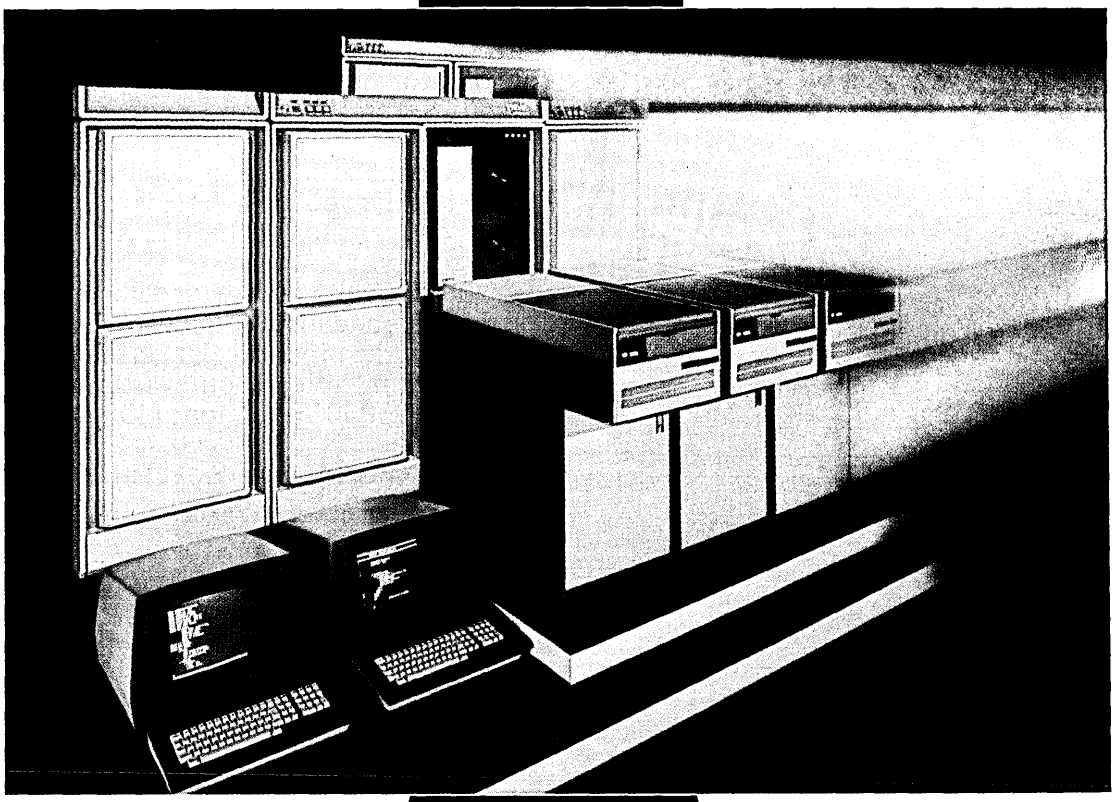
The economy of compatibility. The Prime 50 Series is designed around a single operating system, which makes all systems compatible with each other. So you can easily and economically move up to a larger system, or expand to any number of small, remote systems. And you'll have nothing new to learn because the same software goes with you.

A spectrum of solutions. The 50 Series was designed to provide a broad spectrum of solutions for just about any application you might have, including manufacturing, financial, education, utilities, engineering, energy, automated office, you name it.

Consider Prime first. Today, more than ever before, you need the compatibility and the spectrum of solutions that only Prime can offer. For more information, write to us at Prime Park, MS 15-60, Natick, Massachusetts 01760. In Europe, write Prime Europe, 6 Lampton Rd., Hounslow, Middlesex, TW3 1JL, England. Telephone: 01-570-8555.

PRIME
Computer

CIRCLE 26 ON READER CARD



Visit us at NCCC, Booth #2103, June 7-10

LETTERS

SOMEBODY OUT THERE LIKES US

I don't know how you manage it, but you consistently turn out a vital publication. The February issue, from the CAD/CAM series to Stafford Beer, was outstanding, with illustrations to match.

Your magazine so pleases me that I felt I must convey my appreciation for your contribution to the field and, more particularly, to my continuing education.

THOMAS F. DEAHL
Proprietor and Principal Consultant
Microdoc
Philadelphia, Pennsylvania

"The Shorter Catechism of Stafford Beer" was an extremely welcome article, introducing this remarkable man and his work to a new audience. I hope it will take to heart your admonition that there is "no way to summarize his thoughts in a few paragraphs," and seek out some of his many writings.

In this regard, your readers may be interested in a little known but very readable introduction to some of his ideas (and at a remarkably low cost) in the form of a book of six lectures sponsored in Canada by the CBC (*Designing Freedom* by Stafford Beer). I'm not sure of the exact price, but expect that $4 sent to CBC Publications, Box 500, Station A, Toronto, Canada M5W 1E6 would net you a copy.

Thanks for a continually interesting publication.

DOUG DYMENT, Ph.D.
Consultant, Computer Technology
Protean Services Incorporated
West Vancouver, B.C., Canada

SO THERE

Reader Danielle R. Bernstein stated (Letters, March) that the story "In Loco Parentis" (December) was offensive to working parents, computer users, organized people, and gifted children. She then asked if she had left anyone out. I'd like to respond to that question.

Yes, you did, Ms. Bernstein: loving parents, concerned computer users, caring people, and well-adjusted children. But then, I suspect that most of those people found the story far more amusing than offensive, and they probably managed to read it without any involuntary squirming.

ARTHUR D. LEBLANC
Halfmoon, New York

NO SHORTAGE?

Your story "Solving the EE Shortage" (News in Perspective, March) perpetuates a popular myth, namely the alleged shortage of EEs. THERE IS NO SHORTAGE OF EEs.

The alleged shortage is propagated by academic institutions who need a continuing supply of students, and by big business which prefers to continually replace experienced EEs with new (i.e., cheaper) EEs. They are aided and abetted in this by the IEEE, which is dominated by both the academics and business executives.

If there were a shortage, then supply and demand would mean that salaries would increase. In fact, the engineer's salary in real constant dollars has been decreasing. If there were a shortage, then engineers would constantly be trained by their employers instead of being discarded like worn-out machinery. If there were a shortage, then EEs would be supported by technical and clerical help to free the engineers for engineering duties. Instead, we find many engineers underemployed as technicians and in other subengineering jobs. If there were a shortage, then why are there no engineers over 40 years of age (managers don't count as engineers)? If there were truly an engineering shortage, then these experienced engineers would be retained by their firms instead of "eased out" to pasture.

There is a simple solution to solving the "engineering shortage": raise salaries to the point of paying engineers what they are worth instead of taking advantage of them. There are many hundreds of thousands of former EEs that got smart and got out of engineering because there was no future in it.

Raise the ante. Give the engineers some security. Treat them as people and not as machinery. Train them. Give them professional-level work and support them with paraprofessionals to free the engineer from nonprofessional duties. Then there will be no "shortage."

Businesses expect loyalty for low pay. Yet only a minuscule amount of the engineering population is ever able to qualify for a pension.

For more objective factual reporting, please contact the Committee of Concerned E.E.s, P.O. Box 19, Massapequa Park, NY 11762. They can provide you with the statistics, reports, and other hard evidence to prove what I know from firsthand experience is true.

WILLIAM B. ADAMS
Springfield, Virginia

IPL, ANOTHER VIABLE PCM

I read with interest "Magnuson Besieged" (News in Perspective, March). There were certain statements made that may be somewhat misleading or misunderstood. Mr. Edelson's comment, "Amdahl Corp. has made it; others haven't," could be misunderstood to mean that Amdahl is the only PCM vendor that has done or is doing well. This clearly is not the case, as is evidenced by the fact that IPL has reported record revenues for 1981. We have also completed 18 consecutive quarters of profitability.

The comment that "IBM is in the catbird seat" seems to indicate that now that Magnuson is in financial difficulty, there is only IBM in the 4300 marketplace, and nobody else is a serious contender for any degree of success.

If your perception of the PCM market is IBM, Amdahl, and nobody else, we would welcome the opportunity to offer you a presentation of IPL as a company and a vendor.

PATRICK LUCCI, JR.
Manager, Marketing Services
IPL Systems Inc.
Waltham, Massachusetts

IF YOU SAY SO

With computers, always keep in mind that it's babbage in, babbage out.

LEON KATZ
Department of the Army
U.S. Army Military Personnel Center
Alexandria, Virginia

ADD ANISTICS TO THE LIST

"Database Management Systems" (September) did not provide a complete list of

"Lanier, will you guarantee to help my system pay off tomorrow as well as today?"

With every Lanier electronic office system you get something extra: the Lanier Support Program. The first program of its kind to be defined in writing. It promises that we'll not only show you how to use your equipment, but how to use it to its maximum. And we'll continue to do that, as new state of the art applications are developed.

"How does the Lanier Support Program work?"

"Our Initial Support Guarantee states that we'll assist your staff for the first 90 days following installation. In two areas: training and application development. Training to help you use the Lanier equipment efficiently. Application development to help you streamline your current applications and develop custom applications."

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"What happens after the Initial Support Guarantee is up?"

"We offer an Extended Support Guarantee. A guarantee renewable on a yearly basis. This contract includes four visits each year from your Marketing Support Representative to ensure you're getting the most from your Lanier system."

"Who is this Marketing Support Representative?"

"Your personal Lanier specialist. Each MSR is specially trained to meet the needs of all companies—even those with multiple locations. MSR's are assigned to your account even before your Lanier system is installed. They provide training. They help you develop and implement applications. They even follow up to make sure there are no problems. A valuable resource."

"How do you keep our applications up-to-date?"

"With 'The Update' Package. This special package shows you the most recent applications, developed by Lanier MSR's or contributed by our customers.

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"In writing."

Deby Fain, National Market Support Manager, Electronic Office Systems Division

'The Update' also includes other materials—product announcements, system housekeeping advice and information on upcoming seminars in your area."

"How do you keep our operators up-to-date?"

"With Advanced Operator Seminars. These are held throughout the year to promote increased production, give instruction and discuss new ideas. Lanier also offers Customer Update Seminars. These workshops will inform you and your staff of the latest software product developments."

Lanier is known for being the most "customer-concerned" in the business. That's because we stay with you. Through installation, through training, through new applications, through more training. For years to come. Anywhere in the world.

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JULY

July 12, **Financial Management's Use of Computer Graphics,** San Francisco, The Pacific Plaza
July 15-16, **Applications Software Packages: Evaluation and Selection,** Chicago, Center for Continuing Education
July 16, **Management's Use of Computer Graphics,** Los Angeles, The Los Angeles Hilton
July 19-20, **Data Communications: Concepts/Management Overview,** New York City, Vista International
July 19-20, **Administration and Control in a Data Base Environment,** San Francisco, Holiday Inn Financial District
July 19-20, **Data Communications: Regulation, Analysis, Design,** New York City, Vista International
July 21-22, **Data Dictionary/Directory Systems (DD/DS),** San Francisco, Holiday Inn Financial District
July 21-22, **Distributed Systems: Concepts/Management Overview,** New York City, Vista International
July 21-22, **Local Area Networks,** New York City, Vista International
July 22, **Toward the Factory of the Future,** San Francisco, Holiday Inn Financial District
July 22-23, **Strategic Planning for Information Systems,** Denver, The Fairmont
July 22-23, **Integrating DP & WP,** Cambridge, Faculty Club
July 22-23, **Measuring and Improving Programmer Productivity,** Cambridge, Faculty Club
July 26, **Decision Support Systems,** San Francisco, Holiday Inn Financial District
July 26, **Systems Analysis,** New York City, Vista International
July 26, **Business Graphics,** Chicago, The Palmer
July 26-27, **Management of Software Engineering,** Washington, D.C., The Shoreham
July 27-28, **Improving Your Leadership and Management Skills,** New York City, Vista International
July 28-29, **Systems Design,** New York City, Vista International
July 29-30, **Management Skills for First-Line DP Supervisors,** New York City, Vista International

AUGUST

August 2-3, **Strategic Planning for Information Systems,** New York City, Vista International
August 5-6, **Local Area Networks,** Washington, D.C., L'Enfant Plaza
August 9, **Business Graphics,** New York City, Vista International
August 9-10, **DP Concepts for Management and Users,** Philadelphia, The Stadium Hilton
August 9-10, **Demonstrating DP Performance to Non-DP Management,** Cambridge, Faculty Club
August 9-10, **Data Base Management Systems,** Carmel, Holiday Inn
August 9-11, **Network Design,** Denver, The Brown Palace Hotel
August 9-13, **Strategic Management for Information Technologies (Summer Institute),** Southbury, CT, Harrison Conference Center

IMPORTANT NOTE!
Coming in June
Two Major state-of-the-art Briefings

June 21-22, **Mini/Microcomputers: The Revolution in Hardware and Software Markets and Business Strategies,** New York City, The New York Hilton
June 25, **Strategic Planning for Information Systems: Integrating Corporate and Systems Planning,** San Francisco, Hilton Hotel & Tower

To receive further information, please contact Jill Kemp at the Datamation Institute Seminar Center at 850 Boylston Street, Suite 415, Chestnut Hill, MA 02167, or call (617) 738-5020.

CIRCLE 28 ON READER CARD

LETTERS

database vendors. I would like to make you aware of the ARIS Database Management System. ARIS is a fully relational DBMS that runs on the DECsystem-20 computer operating under TOPS-20. This system allows access via hashed keys or inverted file structures. The links defining relationships among data sets are completely flexible and are specified at execution time. It can be used conversationally, through batch or through a host language interface with COBOL or FORTRAN. This system is available for purchase, lease, or on a timesharing basis.

MICHAEL SINGER
Vice President
Anistics
640 Fifth Avenue
New York, New York

WRONG NAME, WRONG PLACE

I found "Battle of the Networkers" (March) to be a very informative and comprehensive piece.

However, there are some significant inaccuracies regarding A. B. Dick's networking system. Our network is called the Loop and not the Magna III, as indicated. In addition, A. B. Dick's corporate headquarters have been located in Chicago since its founding 98 years ago. Your listing indicates we are located in Minneapolis, Minn.

I am sure you would agree that these are confusing and inaccurate statements that should be corrected in your next issue.

ROGER HALLIGAN
Manager
Corporate Advertising and Public Relations
A. B. Dick
Chicago, Illinois

We would like to note that the correct address for Prime headquarters is:
Prime Computer, Inc.
Prime Park
Natick, MA 01760

STEPHANIE HAACK
Account Executive
Creamer Dickson Basford
Providence, Rhode Island

MAKE THAT BADLER

In "Behind the Scenes" (In Focus, March) the author quotes Mark Jaffee, who credits Norm Bacler as a pioneering researcher. As a former undergraduate student of his, I am sure he would like his name spelled correctly, namely "Badler." At the time I studied graphics with him, Dr. Badler was manipulating "Bubble-man," a creature composed of multiple spheres which constituted a representation of a person. The research was aimed at an alternative approach to traditional dance labanotation.

JAMES H. WEISSMAN
Systems Programmer
Bank of America
San Francisco, California

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Fast, efficient electrosensitive Video Printers from AXIOM free you from messy, inconvenient, and costly chemicals, toners, and ribbons. AXIOM's print technique yields a high-resolution output with excellent contrast. And AXIOM printout photocopies beautifully.

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The new Model EX1650 gives you superb resolution of up to 3000 dots per line, and the total time to make a completely dry, fade-proof, full-size copy is only 23 seconds per screen, with no warm-up time required. The compact Model EX855 prints in an even more impressive 13 seconds, and is perfect for many applications where a smaller (5 inch wide) print format is desirable.

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And now, perhaps the best news of all. AXIOM Video Printers have the industry's lowest cost per printout. Only about 2 cents each for the EX855 and about 7 cents per printout for the EX1650. Compare that with the usual 15 to 20 cents per image with silver-based process video printers, and 75 cents per print with instant cameras!

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This superior AXIOM technology,convenience, and economy is priced lower than you might expect, and much less than some of the big name competitors whose products offer less. Why not call or write for more information about how the legendary AXIOM Video Printers can benefit you, today!

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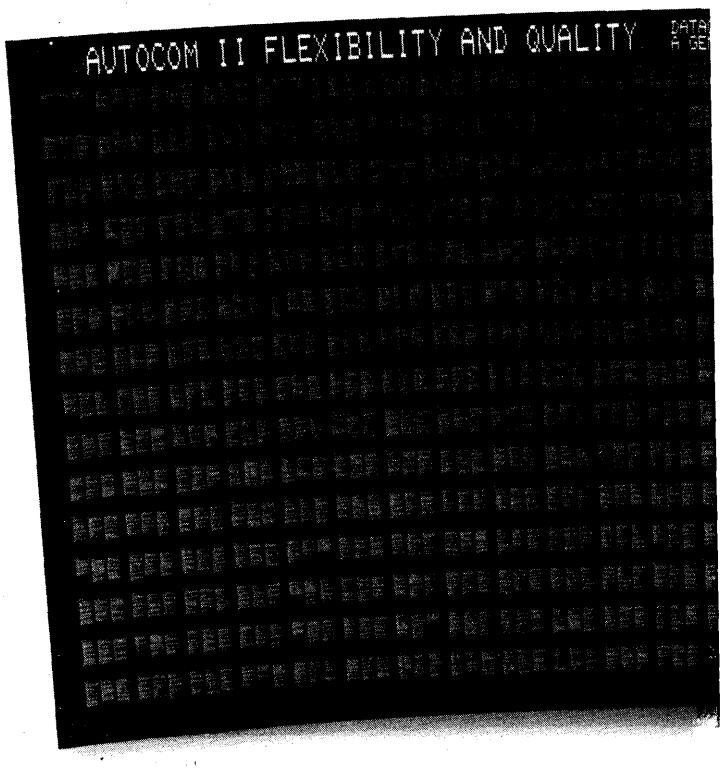

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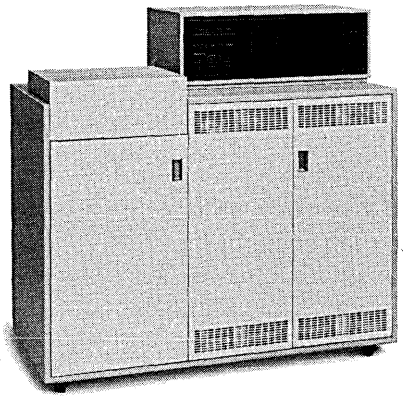
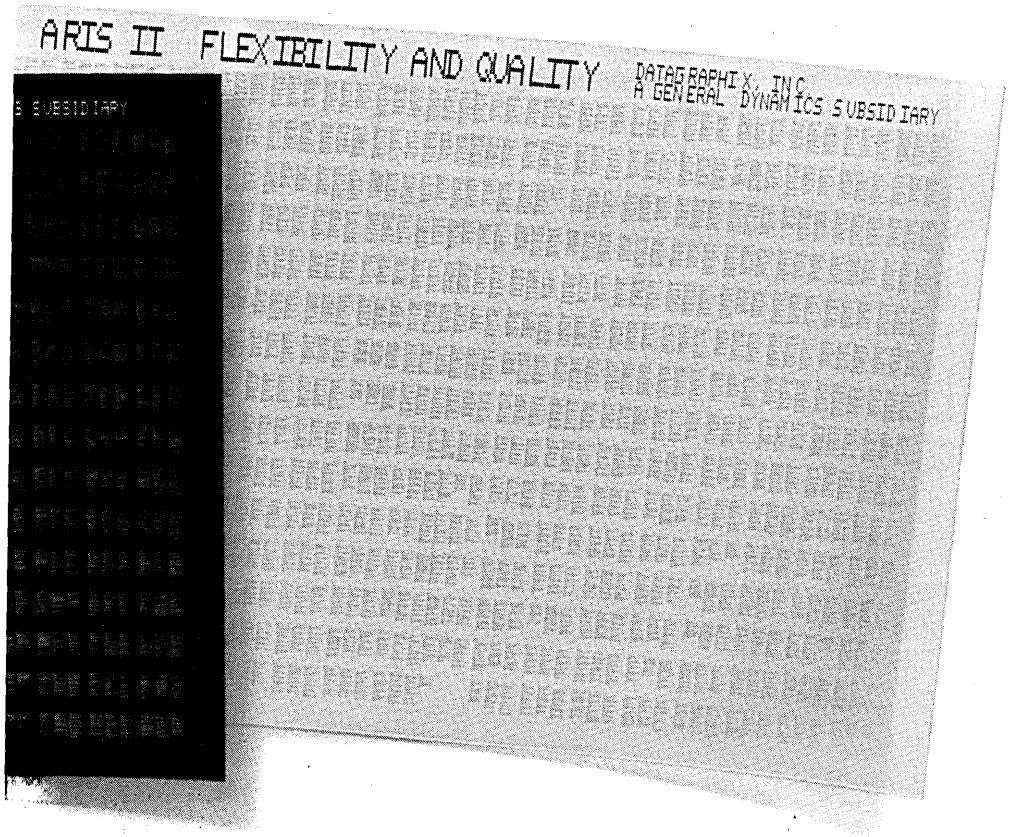
As an information management and retrieval system, computer output microfilm gives you control of massive amounts of information in a small amount of space. In fact, each microfiche can contain up to 288 times more data than a printed computer page.

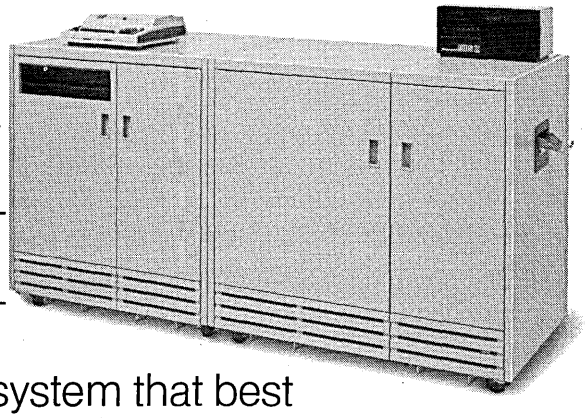
For almost 30 years, companies have been turning to DatagraphiX for their COM needs. Because our systems give them a return on investment that simply can't be equalled by other methods of output. A minimum of 35% should be attained in the first year alone. Plus, we give you something other COM companies don't: choice.



Whether you want the archival benefits of wet process systems, or the convenience of dry process systems, DatagraphiX is the source to come to. Our AutoCOM systems are the world's most popular COM recorders—easy to use,



CLEAR-CUT ROI.



inexpensive to operate. In fact, we sell and service everything needed for total COM support. And now we've introduced ARIS II, a 12,000 LPM dry process recorder utilizing state-of-the-art laser imaging technology, multifont convenience, and the expertise of the people who invented COM.

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CIRCLE 30 ON READER CARD

TeleVideo's 16 Bit Breakthrough

INTRODUCING THE TS 8000 SERIES

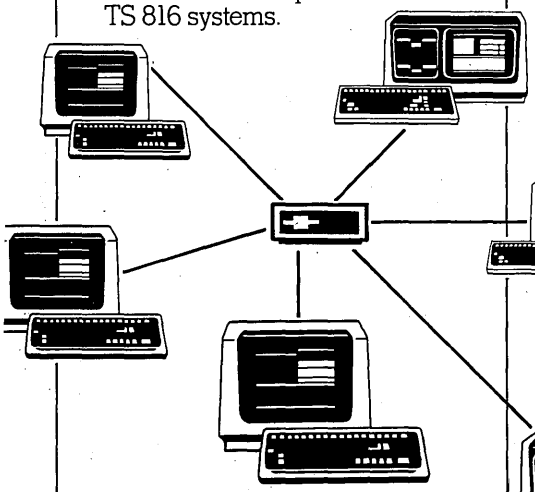
16 Bit microcomputers that are compatible with TeleVideo's® 8-bit multi-user, multi-tasking system.

PRODUCT: TeleVideo's TS 8000 Series 16-bit small business computers.

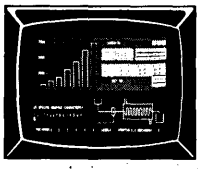
CONCEPT: High speed and mass storage capabilities in small business computers that run 16-bit programs. In addition, TeleVideo's multi-CPU architecture allows a mix of both its 16-bit and 8-bit computers to operate simultaneously in its shared-use system.

TS 8000 SYSTEM ENVIRONMENT

FEATURE: The TS 8000 series of fully integrated, stand alone computers are compatible with TeleVideo's 8-bit TS 806 and TS 816 systems' service processors. Up to six users are supported on the TS 806 and up to 16 on the TS 816 systems.



GRAPHICS CAPABILITIES



The TS 8000 series provides excellent quality, high resolution graphics capabilities suitable for most business applications. Complex data can be displayed as clear charts, graphs, diagrams, line drawings, and other visual effects. In addition, TeleVideo is introducing the TS 802G and TS 802GH, 8-bit stand alone computers which also can function as satellite stations in a shared system, with graphics capabilities.

TS 8000 SERIES FEATURES:

CP/M 86 operating system is built-in
Intel 8088 16-bit chip
5 MHz CPU processing speed

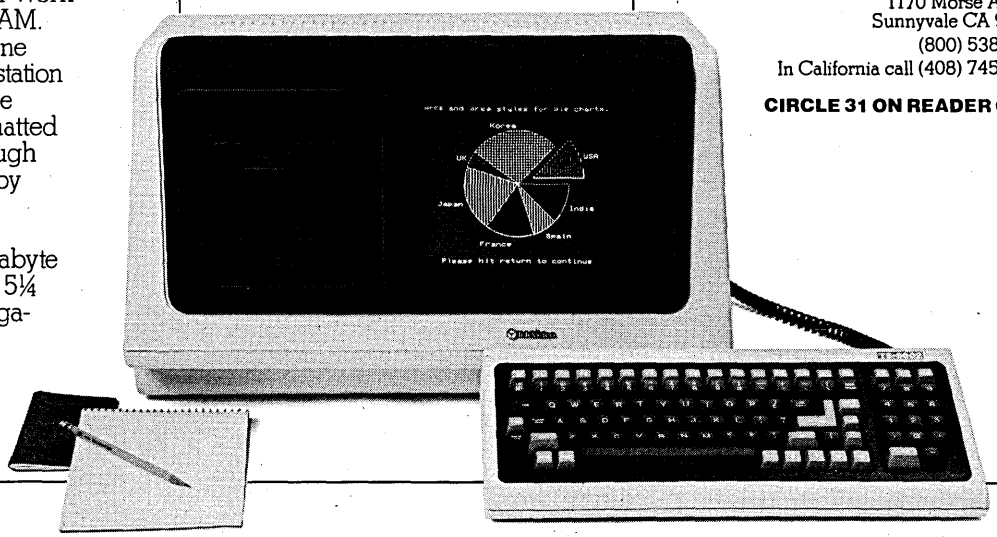
RESULTS: The fast processing speed and great memory capacity of TeleVideo's 16-bit microcomputers support the very large base of the more powerful and versatile 16-bit software. Programs originally written for minicomputers and smaller mainframes can be adapted to run on the 8000 series.

This means minicomputer performance at TeleVideo's microcomputer price.

More information available at NCC and COMDEX NCC Booth #7128 and COMDEX #304.

THE TS 8000 SERIES STORAGE CAPACITY

TS 8000—Computer Workstation with 256K RAM.
TS 8002—Stand alone computer and workstation with 256K RAM, one megabyte of unformatted on-line storage through integrated dual floppy disks.
TS 8002H—Single floppy with 0.5 megabyte and one Winchester 5¼ inch disk for 9.6 megabyte of unformatted memory.



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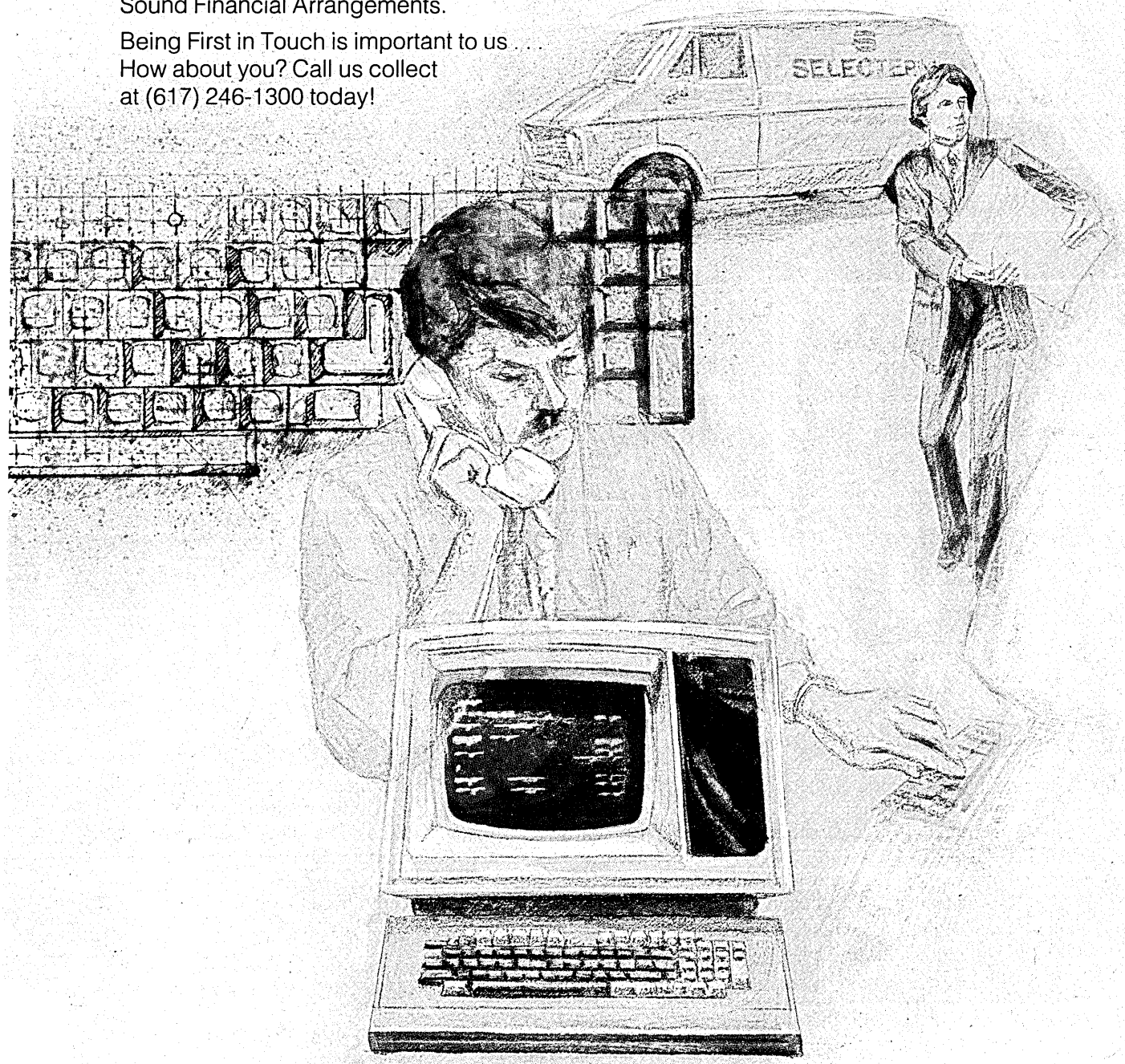

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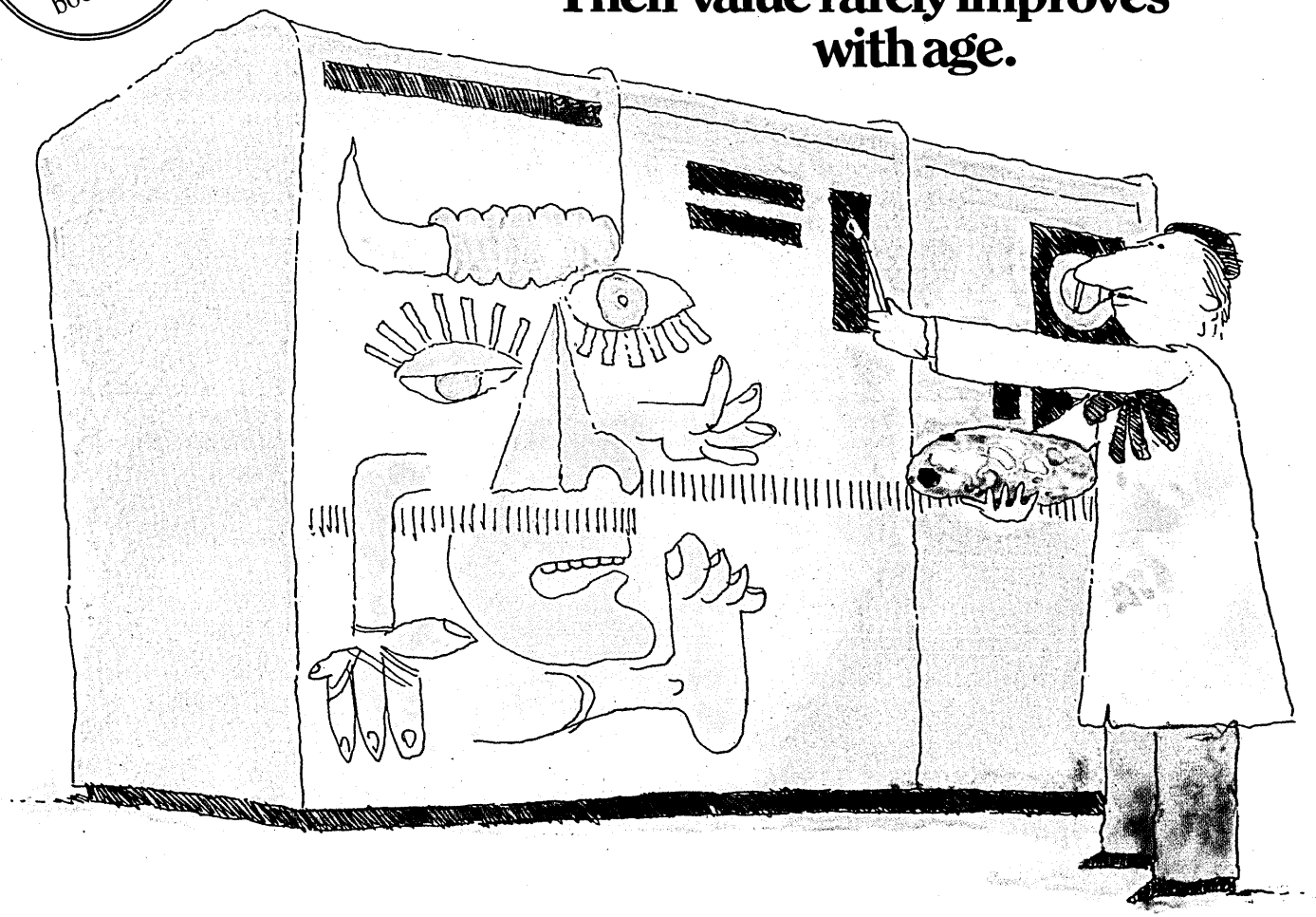
Some data base management systems are like some modern works of art.

We'll be demonstrating our product line daily at NCC, booth 3104

Their value rarely improves with age.



Some data base management systems look good when you first buy them, but soon seem out of place in a continually changing corporate environment. What was once an avant garde approach to online data management looks old fashioned in today's world of distributed data bases and multi-node computer networks. And because of their highly complex and inflexible designs, only a few highly specialized people are capable of understanding them.

ADABAS from Software AG is the data base management system designed for the 80's and beyond. It offers a unique combination of state-of-the-art relational-like architecture, a full complement of application development and system maintenance tools, and a user friendly operating environment.

ADABAS is ideally suited to helping organizations make the transition from centralized to distributed data processing. It assures fast system development when applications are written using NATURAL, Software AG's productivity-oriented development language. It provides fingertip information access through built-in capabilities such as online inquiry and report writers. Its simplified design increases staff productivity since no personnel must be dedicated solely to data base support. It assures accurate results with an online data dictionary. And its value continually increases because Software AG is committed to maintaining state-of-the-art system software.

If you're looking for a contemporary solution to your data base management problems look closely at ADABAS for your IBM processor or ADABAS-M for VAX/PDP-11s. Use the coupon to arrange for a showing, or to attend a management seminar.

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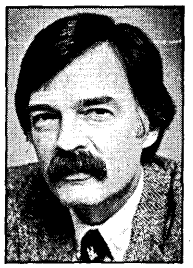
CIRCLE 33 ON READER CARD

John L. Kirkley, Editor

EDITOR'S READOUT



TED'S FRACTURED FORECASTS

Ted Withington, a vice president at Arthur D. Little, Inc. and a DATAMATION contributing editor, is a 20 year veteran of this industry. Studious of demeanor, precise of speech, Ted is known for his accurate forecasts of industry trends. Every spring, however, a strange metamorphosis takes place. Ted goes tilt. With a mad chortle he rushes to his typewriter and produces another edition of his fractured forecasts. We are pleased to present it here for your amusement and edification.

By the late 1980s computer pollution will have become a problem. The cost of service will be so high, and the cost of replacement so low, that millions of computers will lie discarded near garages, appliance stores, office supply stores, and hardware shops. The EPA (by then revitalized) will take umbrage and demand biodegradable computers.

The new industry of genetic engineering will respond by developing a specialized bacterium that eats silicon chips and excretes common sand. These bacteria will be seeded in waste dumps and will succeed in degrading the computers there, but complications will arise. The infection will spread from the town dump in Maynard, Mass., to the CB radio in a garbage truck and thence to Digital Equipment headquarters, from which it will spread to the world. A pandemic of computer silicosis will ensue, with computers and office machines being consumed everywhere.

The genetic engineers will make short work of the problem by designing a specific antibiotic for the computer-eating bacteria. The antibiotic will be circulated through the cooling systems of all exposed computers and will quickly kill the silicon-eating bacteria. The pandemic will end, but the incident will be remembered as the first instance where mass debugging of computers was literally necessary.

Meanwhile, in the computer industry, the European Economic Commission's investigation of IBM will find it guilty of anticompetitive practices, and will order harsh changes in IBM prices and policies. In response IBM will shut down IBM Germany, IBM France, and IBM U.K. One hundred thousand IBM employees will be out of work, but not for long. In the respective countries, Siemens, Cii-HB, and ICL will form new subsidiaries (each larger than its parent) to serve IBM customers. Each subsidiary will be manned by the ex-IBM employees, will offer Japanese-made IBM plug-compatible products, and will be managed by a combination of ex-IBM and Japanese executives. The EEC will be happy; European nationalism will have been preserved.

In 1988, the chief executive of IBM Japan will be promoted to ceo of the parent company. IBM Japan will have shown the fastest growth rate of any IBM component, because by 1988 it will be manufacturing and shipping to the United States all the IBM mainframe computers sold in the U.S. Because the computers bear the IBM name, the U.S. government will not object; American nationalism will have been preserved.

AT&T, freed of government regulation, will immediately introduce facsimile machines, personal computers, videoconference equipment, and digital PABXs. In order to have these products available quickly, AT&T will obtain them from (respectively) Matsushita, Sharp, Sony, and Nippon Electric. These four companies will then set up new laboratories near the headquarters of Western Electric, Teletype Corp., and Bell Labs to employ the engineers leaving those organizations because they have nothing left to do.

Finally, in the early 1990's, AT&T (by then cash-rich and in control of nothing) will be permitted to buy back all the Bell Operating Companies of which it divested itself in the early 1980s.

By the late 1980s Japanese developments in ultralarge-scale integrated circuits and automated manufacturing techniques will have made possible trailer-sized, general-purpose electronic factories. Design requirements will be entered from remote terminals, silicon-bearing sand and other raw materials will go in one end, and finished products will come out the other. Japanese industry will experience an unprecedented wave of exports of these automated factories—and then will wonder why Japan's balance of trade suddenly turned negative in 1990.

In 1992 an ex-systems programmer will be elected President of the United States. As one of her first acts she will abolish the embargo on the export of computer technology to the U.S.S.R. She will arrange for IBM to provide technical data to the Russians about all its latest products, particularly about the System/380 matrix-modular mainframes, the MVM-SP/EX/EXII operating system, and the IMSQL-R knowledge base manager. Within two years U.S. intelligence will report a rising incidence of aborted Russian missile tests, failed space shots, and scrambled military maneuvers. The Russians will issue an urgent call for a resumption of disarmament negotiations.

Investment advice: buy yourself some beachfront property. The price of sand has no place to go but up.

IN FOCUS

MONA LISA IN THE NUDE?!?

by Merrill Cherlin

Computer aided investigations into old master paintings are uncovering some interesting tales.

Is that really Christ's image on the Shroud of Turin? Where, on the grimy walls of an Italian palace, is a Leonardo da Vinci masterpiece hidden? And, most urgently, was Mona Lisa painted in the nude? The answers to these and other questions are beginning to be solved by art scholars—with the help of the computer.

The world of art historians and conservators is a fairly conservative one, and the invasion of the computer into this cozy sphere is often looked upon with distrust. Nevertheless, some startling discoveries have been made recently with the computer's help, and it's certain to be just a matter of time before its use becomes more commonplace.

At the moment, only a few individuals are pioneering the computer aided investigation into old master paintings, and we decided to learn about their methods.

Marion Mecklenburg is the director of the Washington (D.C.) Conservation Studio, and has worked for years on the restoration of paintings for private clients as well as for the State Department and the White House. He is currently working on the paintings inside the rotunda of the Capitol building as well as on a Gilbert Stuart portrait of George Washington. What he has seen constantly in his work is the network of fine cracks in the paint, cracks which seem to be inevitable in any painting of great age.

According to Mecklenburg, no one really knew the reasons for the deterioration, but speculation was that somehow oscillations in humidity affected the canvas, alternately expanding and contracting it.

Mecklenburg already had BS and MS degrees in structural engineering and was knowledgeable in material behavior and analysis of structures when he decided to go on for a PhD at the University of Maryland. He began working with Dr. James Colville, associate dean of the College of Engineering, in computer analysis techniques.

"It dawned on me that we could use the computer to solve certain problems,"

Combining the skills of artists and engineers is no easy feat.

Mecklenburg says. "Supposing it were true that oscillating humidity was causing problems in the fabric; we should know enough properties of the fabric and of moisture to model it on the computer. I modeled variations of moisture on linen, but no matter what I did I couldn't duplicate the problems. Either we were programming wrong or the problem was occurring in the other layers of the painting.

"Painters would start with a linen canvas, then size it—covering it with a sort of glue—then cover it with a ground [a white priming coat], then paint the actual picture in oils on top of that.

"When we looked at the other layers we immediately found the problem lay in the size, ground, and paint layers, not the

THE CRITICS' CRITICS: Once the old master paintings have been restored, computers can help determine the ideal display conditions. They can also help find paintings behind other paintings.

PHOTOGRAPHS COURTESY OF DR. JOHN F. ASMUS

fabric. The Smithsonian funded a more detailed study. "Chemistry caused some of the problems but the failure was really a physics problem. It turns out that the paintings were subjected to low humidity for too long a time, causing the paint and glue to become extremely brittle. The painting's wooden stretcher would shrink from lack of moisture and release stress in certain patterns of cracks. The ancient method of restoring a painting was to slap it on another piece of linen with glue. But that doesn't do a damn thing; that's not the real support layer as was always thought. We found that we must restore the painting to high humidity, causing the paint to become more plastic. Then we press it on fiberglass or honeycomb aluminum. It was the computer that told us what direction to look in."

In order to gather the data, Mecklenburg conducted a huge literature search to find out what was known on the subject, then invented special equipment to do the physical testing of materials. Now that he has results, he feels the next step is to get the information out to the people practicing conservation and allow them to review and criticize his work. He and Colville will present their findings in September at the meeting of the International Institute for Conservation of Historic and Artistic Works.

Colville says he wants to create the "awareness that we need to combine the skills of artists and engineers."

The Smithsonian is already the major clearinghouse for computer aided work in the arts. Its motivation in this particular case is to improve the chances of preserving objects for a longer period of time. As Mecklenburg says, "They're not eternal. Someday they'll all be a heap of dust. But we hope to prevent deterioration as well as restore those paintings already going bad. By juggling time, moisture content, and temperature, we can tell where the painting should crack first, how much stress it will take to make it crack, etc. We can analyze each painting or we can develop guidelines with significance for museums. For instance, museum environments may not have to be as tightly controlled as has been thought. Through computer modeling we can do a lot of testing without building and destroying actual paintings. It's amazingly accurate.

The Mona Lisa has been revarnished many times, and now image processing is being used to subtract the varnish's spectrally resolved opacity.

"We use the finite element procedure, developed by the aircraft industry, which is just not practical to do without a computer. A problem that takes us two or three minutes to solve would take 25 years of a person's life done manually, and would inevitably be wrong, since he or she would be certain to make some mistakes."

At Mecklenburg's studio, staffers work painstakingly to restore paintings done by the great masters, paintings that are often worth hundreds of thousands of dollars apiece. When asked if the fact that a painting was "worked on," or tampered with, would decrease its value, the conservators said no. On the contrary, its value would be increased by the price of the restoration job.

John Asmus, who does laser research for the Defense Department, also teaches at the University of California—San Diego Center for Art Science Studies. His avocation involves using lasers to clean and restore works of art, an area that has led him to bring computers into the act. He

explains, "Every once in a while I run into an art restorer who has a problem—the customer won't pay him because he's unhappy with the restoration. Usually it has nothing to do with the quality of the restoration; rather, it's that the painting came out looking differently from what the owner thought it would look like. A Rembrandt, for example, often looks very dark and subdued before the restoration, but when you take off the old, brown, oxidized varnish there is a lot of bright color underneath. But the customer thinks, 'Oh, now it's no longer a Rembrandt; they made it garish looking.'

"It occurred to me that maybe we could take a crack at predicting what a painting would look like after the brown varnish was removed. I rounded up some of my friends and we used the remote sensing facilities [at Scripps Oceanographic Institute] to try to predict what a painting would look like if it were clean. In the process of all this, an art historian that I work with, Carlo Pedretti of UCLA, said that he and Lord Kenneth Clark had been troubled by some aspects of the Mona Lisa for a long time and wanted to get a better look at it by having it cleaned. But the Louvre refused to clean it, saying that every time you disturb it you may contribute to its eventual deterioration. So Pedretti and Clark suggested we use the Mona Lisa as our test case. Walter Cronkite was interested in doing the story for his *Universe* program, and his people got a good color transparency of the Mona Lisa. We took it up to the Jet Propulsion Lab and digitized it into 6 million pixels. From some friends in conservation I got some specimens of old varnish that had been used in France in the turn of the century—the Mona Lisa has been revarnished many times but it is believed the major amount was applied to it somewhere around 1900—and we measured the varnish's optical transmission. We used the image processing facility to subtract the varnish's spectrally resolved opacity from the image of the Mona Lisa.

"That was a quick-and-dirty, Saturday afternoon experiment. I'd like to get a research grant from somebody to do it right. The areas that Pedretti and Clark want to look at are the garments, which are very dark. If you bring up the intensity there, then the sky and the face are way overexposed. I'd want to do some leveling so that the brightness was constant across the picture. That way we could see maximum detail in all parts of the painting. We'd have a lot of 'noise reduction' to do, as the varnish creates a lot of glints and so forth.

"Lots of scholars have thought lots of things about the Mona Lisa. One speculation is that she was painted nude, with the clothes added later. Clark and Pedretti, who are the world's foremost Leonardo scholars, feel that it's most unlikely, but conceivable. If you clarify the image you may be able to confirm or dispel the thoughts that some of the paints were added later."

Asmus also used a computer to locate a lost Leonardo da Vinci masterpiece—a mural that was supposed to have been painted on the walls of the Palazzo Vecchio in Florence, Italy. Leonardo was commissioned by Savonarola to paint the mural when that political and social reformer was the ruler of Florence. But after Savonarola was burned at the stake as a heretic, the Medicis returned to power and had their own court artists cover over the previous administration's art works in about 1500. The mural hasn't been seen since.

Asmus was asked by officials of the Florentine government to locate and clean the mural under the nearly 500-year-old masonry materials. He set up an ultrasonic scanning system with a small computer and created an image via averaging and imaging of the ultrasonic echoes.

"We found it," Asmus says, "but the different political factors slow down completing the 15 or so steps from the point of conceiving of the project to search for a missing painting to the point where you actually unveil it. It may take another 30 to 40 years before we work through the various technological, political, and sociological problems. You have to have lots of patience to be in this field."

A computer is being used to help locate a lost Leonardo da Vinci masterpiece—a mural that was supposed to have been painted on the walls of the Palazzo Vecchio in Florence, Italy.

Once the paintings themselves are restored, computers can determine the ideal display conditions. Robert Organ, chief of the Smithsonian's Conservation Analytical Laboratory, says, "You can program for humidity in air space, in museums, or in historical buildings to see if you need to keep it at a constant level or if you need a constant temperature. This also must be done for the air inside display showcases. One object can cause another to decay because of the flow of humidity and deteriorating gases around and through the case. In addition, mural paintings on historical buildings change because the salts in the wall come out and disperse over the painting. Excessive dryness causes this, and you want to control it so it doesn't recur. The computer can solve all these problems.

"Image enhancement is also being used a great deal in the fine arts. We can take a picture of an object and make it denser so it can be seen better. This way we have recovered information in old documents too faded to read, and of course this has been used on the Shroud of Turin to clarify the image."

Conservators of old paintings for the most part are not anxious to embrace the computer's solutions. As Mecklenburg says, "We're dealing with a hell of a lot of tradition. It can be very touchy. You have to slide in information, saying, 'Let's examine this,' rather than, 'Everything you're doing is wrong.' "

Asmus is sympathetic, though. "Things get tricky when you get involved in the actual art conservation practice. It's an age-old craft. I used to think they were afraid of modern technology because they didn't have the mental capacity to grasp a lot of it. But more and more I respect their skepticism. A byword of the trade is more damage has been caused to works of art in the name of conservation than through all other causes combined.

"A conservator will say, 'Well, if this was good enough for Pliny back in the first century, it has withstood the test of time. I'm not likely to make any very big mistakes if I use his technique.' That sounded funny to me 10 years ago, but I've seen so many things go wrong with the best of intentions.

"A lot of new materials have been invented—adhesives, varnishes, coatings, and things—by modern chemistry. Time after time after time, these were advertised to art conservators as the answer to everything, the end-all, nonyellowing, reversible varnish. Then 10 years later somebody says, 'Oh, oh. Sorry about that—it caused this very great problem and you can't get it off now. It's interacting chemically with your Reubens. Well, too bad. Just don't use it anymore.'

"That happens over and over again. So there is some justification in being skeptical. We're all human beings. There are lots of opportunities for jealousies and rivalries. A lot of scientists become darlings of the media because their work involves space age technology and Michaelangelo works of art. Meanwhile, a lot of conservators have worked all their lives on developing their skills and techniques and are shunted into the background."

Computers are being readily accepted in other areas of the arts, however. Archeologists have been using multivariate analysis on everything from stained glass to pottery shards to trace the age and origins of various finds. Currently, five major museums in the United States are linked by computer to share a huge databank of archeological information. A growing concern among some archeologists, though, is that art forgers could get access to the information as well, and they feel that tighter security measures should be taken.

In Germany, image enhancement is being used on aerial photographs to locate archeological sites. And new uses for the computer are thought of all the time.

As the computer establishes its respectability in other areas of the fine arts, conservators will no doubt accept it too. ❋

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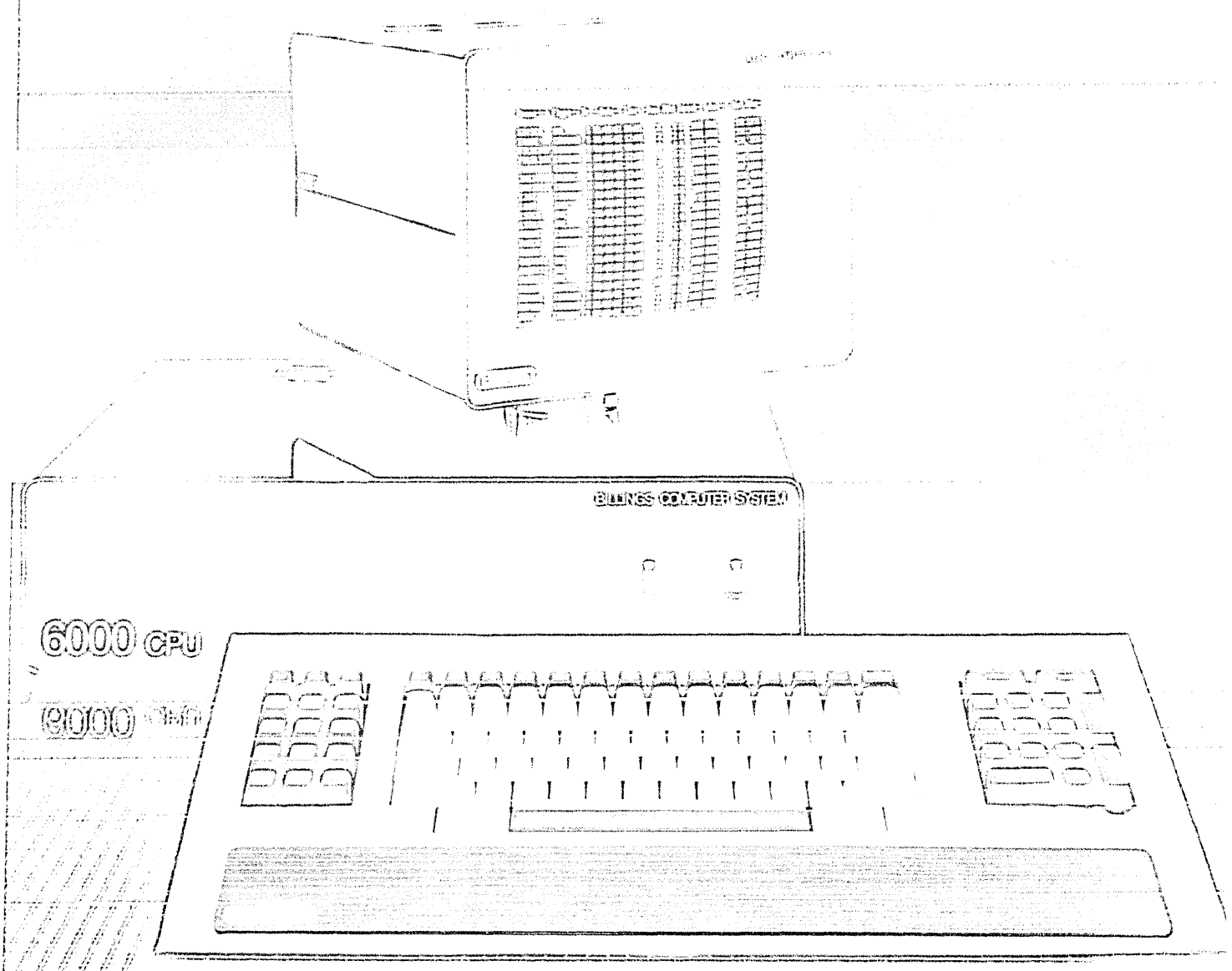

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NEWS IN PERSPECTIVE

THE PCMS

NOT JUST A COPYCAT

Amdahl is trying a new tack, and this PCM's goal is to be a systems alternative to IBM.

The Amdahl Corp. is readying its own large-scale operating system for what could turn out to be a battle for survival against IBM, according to informed sources. These insiders describe the project as the most ambitious and expensive software development effort ever mounted in the whole $2 billion PCM computer world.

"It starts to fulfill a deep yearning the company has to become a legitimate systems alternative to IBM—not just a copycat," one source explains. "It starts to get them off the merry-go-round of IBM copying that they have been locked into for the past seven years."

But the Sunnyvale, Calif., PCM leader has a deeper motive for the interactive operating system it has under wraps. "Survival. Amdahl has picked up intelligence about proprietary microcode that IBM is supposedly preparing to shut out Amdahl's PCM hardware," the insider continues. "One software module, SRD [Systems Repository & Directory], sits in front of IBM's [MVS] operating system and screens it from all but IBM-supplied subsystems.

"IBM could well make the SRD available with the new extended MVS architecture when it is shipped next year," he adds.

Also of growing concern to Amdahl, say sources, is that IBM can use its new bureau service to broadcast microcode changes in MVS remotely, quickly—and frequently. IBM would make such changes while maintaining compatibility with its users' applications programs, but for Amdahl and other PCMs the MVS operating system would become a blur, a constantly moving target.

No one seriously expects Amdahl to duplicate IBM's bureau and remote support function. Such a move would be a major drain on profits that have already dwindled badly since 1978, as Amdahl's accounts show. A more workable, though still risky solution, sources explain, is for Amdahl to minimize dependence on MVS, avoid much of the microcode trap, and offer its customers another interactive solution.

Insiders say that IBM has very carefully prepared its strategy for what is known as "vertical microcode." Says one former IBM employee, "Amdahl may resort to legal means to try to force IBM to reveal the technical details of its microcode. The case would drag on and be very expensive for Amdahl. Probably the best they could hope for is that IBM would be forced to reveal details of its microcode when a new product is announced. But by then, in the fast-changing world of MVS, it would already be too late for Amdahl."

"Amdahl knows that it cannot hope to keep compatibility with MVS in such a mercurial environment," says one insider, "so its only sensible long-term strategy has been to develop its own operating software—the lesser of two evils."

From Amdahl's point of view, a complete rewrite of MVS—an operating system that cost IBM billions of dollars and legions of programmers to develop—is out of the question, even, as one former IBMer says, "doing it the right way."

Back in 1973, IBM's operating systems, according to its own figures, were 96% batch and 4% interactive. By 1980, the interactive portion had risen to 30%, and by 1985, when IBM makes available its Future System (code named Trout), it will have topped 60%. Amdahl's strategy is that even without a full MVS replacement, a new interactive timesharing operating system would give its users much of what they need, and cut dependence on MVS.

Amdahl's software project—which until now has been the company's best-kept secret—rates a strict "No comment" from Amdahl management.

The Amdahl project is being handled by Tom Simpson, a former IBMer and one of the select few to be elevated to IBM's hall of fame as a Research Fellow. Simpson was principal designer of such major software classics as HASP and JES 2.

Sources claim he was lured away from IBM by a $400,000 bonus and other perks. Amdahl declined comment. But it was what Simpson was carrying with him when he left IBM in October 1979 that was the principal incentive for the whole deal. That something was a new timesharing operating system, known within IBM as RASP,

Sources say Amdahl is readying its own large-scale operating system.

which Simpson had been designing for a number of years.

RASP was one of a number of alternatives to IBM's 360 operating principles (which built MVS) that was developed within the company but didn't pan out.

"Simpson clearly wanted the software to see the light of day. He was one of a small band of dedicated software designers—known within IBM as 'Wild Ducks'—who was more interested in being creatively occupied than in just feeding the MVS machine," says a former colleague of Simpson's. "As I understand it," he went on,

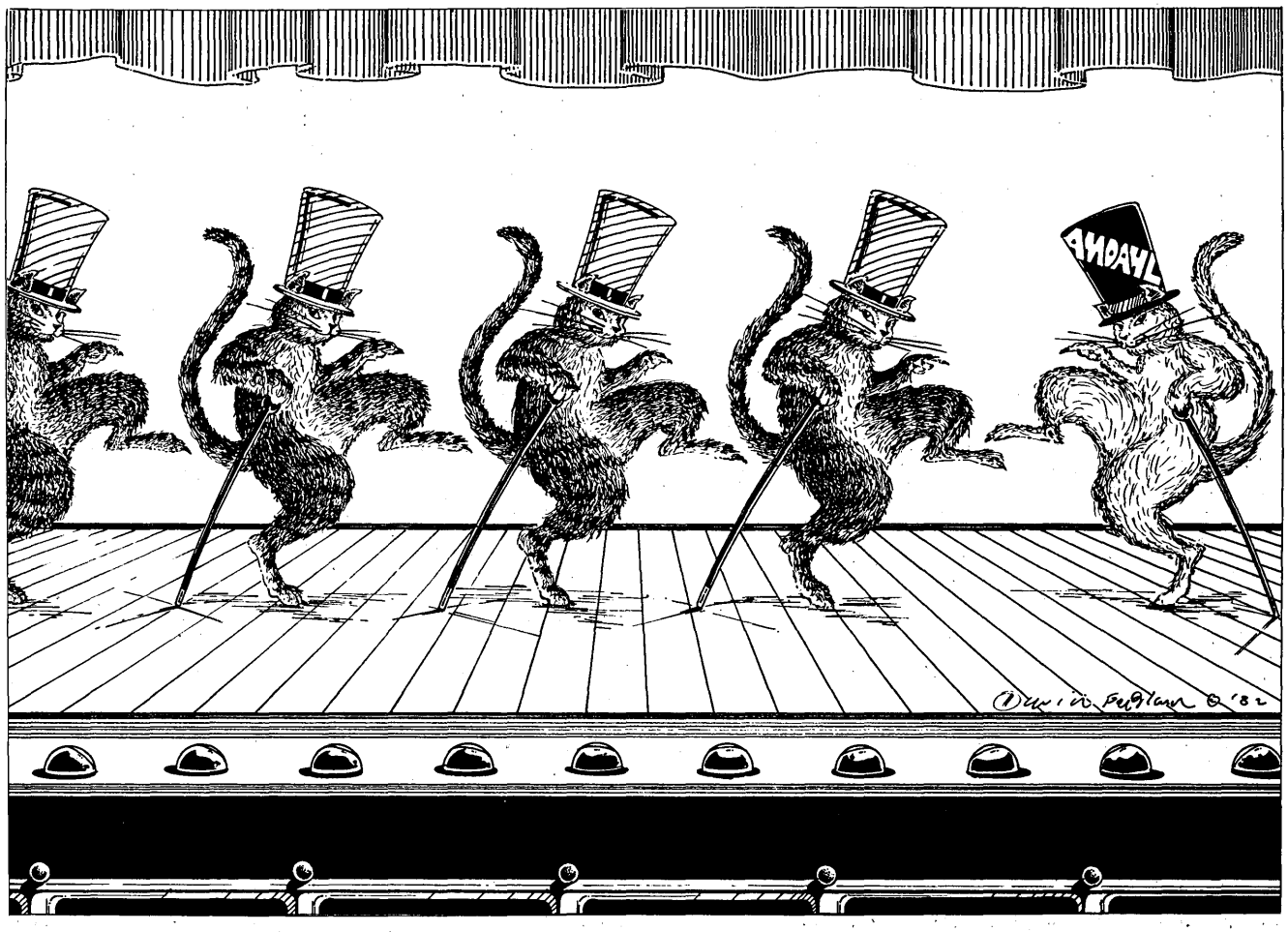

ILLUSTRATION BY DAVID FEBLAND

"IBM gave him permission to take his work with him." The fact that Simpson arrived at Amdahl's door with RASP was confirmed by Amdahl insiders.

Though development aims change and almost invariably clash with marketing goals, two development teams, one in Dallas under Simpson and one in San Jose, Calif., have refined RASP into an operating system that combines the best interactive qualities of IBM's MVS and VM operating systems.

"It's a totally new design which is not internally compatible with MVS/VM, but which has externally compatible interfaces to both IBM and Amdahl customers and their applications programs," says one source. One of Amdahl's biggest problems is that it has to build its external interfaces through its own versions of IBM's data communications and database management subsystems, he added.

One Amdahl insider says the company will "definitely" continue to support MVS for the immediate future—microcode permitting! If its users accept the new operating system, as Amdahl hopes, MVS will merely run in the background of the new software, handling utilities, maintenance, and whatever continuing batch demands users have.

Were it not for the proprietary microcode threat that increasingly lurks in all IBM MVS unbundling, the decision to go forward with the operating system would be less strategic and more opportunistic.

"IBM's timesharing system, MVS/TSO, is largely regarded by its users as a 'donkey,' and is continually outperformed by VM/CMS, which took only a fraction of its development costs," said one IBM insider.

According to sources, IBM management is wrestling with the decision of whether it should marry TSO with its Virtual Storage Personal Computing (VSPC) package to produce a high performance timesharing system. But VSPC (March, p. 48), though extensively used by IBM World Trade, is universally loathed by TSO and VM developers alike. Sources add that so far a "low performance timesharing system has been more to IBM's liking" because of the increasing revenue it reaps from the attendant hardware the user needs.

Insiders say that IBM has very carefully prepared its strategy for what is known as "vertical microcode."

So, from Amdahl's point of view, there *is* opportunity, and the company is trying to ram its advantage home in two other ways. One is by hiring VSPC's principal designer, Englishman Martyn Joyce, to head its San Jose development effort. If there is any advantage to incorporating VSPC's proven end-user features to the operating system, he'll add them. And secondly, the company has developed its own Unix-like end-user timesharing system, UTS, to allow large 32-bit minis into the applications mix.

Another factor has been the purchase by Amdahl of Tran Telecommunications, which designs, builds, and installs digital communications networks, and which seemingly will now have the ideal host operating system.

According to Amdahl contacts, the new operating system has already been shown to select customers, who have signed nondisclosure agreements. Talk within Amdahl development was of a fall announcement of at least part of the software. But this was scotched by other Amdahl insiders.

All along, the more conservative elements in the company have balked at moving off the so-far safe road of MVS compatibility—even an inch. "Amdahl is generally a conservative company and has been slow to diversify into both peripherals and software. There is a good-sized faction in the company that has tried to kill this project all along," said one source.

One interested party, namely Fujitsu, seems to have been a staunch supporter of the development. Says one insider,

"The company's one-third stake in Amdahl adds muscle to its views, but it also pumped $10 million into the development to keep it on track." (When asked about, this Amdahl again maintained its silence.)

One thing about the announcement seems certain, and that is that the operating system will reach users' sites with a minimum of fuss and "no fanfare." At least that has been the company's intention until now.

Whether the company will "cheekily" try to sell the software to IBM's users is an open question. "It certainly would make a few eyes boggle at IBM. Nobody has ever dared to challenge them with large-scale plug-compatible software before," a former IBMer explained.

The Amdahl project, of course, has major implications for a PCM hardware industry that has been increasingly battered by IBM pricing. Being the "leader" of the PCMs, Amdahl's initiative could herald a move from hardware plugs to software plugs, which matches IBM's shifting revenue sources.

The development of plug-compatible software has already started at the medium (4300) level of IBM's business, where IBM's pricing has been particularly aggressive—and aggravating to the PCMs.

At least two companies are reaching for the safer havens of software plug-compatibility. Spartacus Computers, Burlington, Mass., is completing development of a new interactive operating sytem for medium and small IBM users (with attendant hardware), and Nixdorf Computers U.S., Waltham, Mass., has done the same thing for IBM's DOS users by offering them their own new operating system on Nixdorf hardware.

There is word of other companies—particularly in California—that are in the embryonic stages of developing whole new value-added 370 architectures and systems software for IBM's smaller users. Not all these companies are small new ventures, for Intel and some of the other semiconductor companies are among their number.

RASP was one of a number of alternatives to IBM's 360 operating principles that was developed within IBM but didn't pan out.

Maybe what Amdahl can learn from all of this is, if you want to be successful against IBM, see what it is doing and do the exact opposite.

Top Arthur D. Little analyst Ted Withington already has alluded to the merits of this approach when designing a strategy for survival for European PCMs (International, Feb., p. 192-19). Withington advises the Europeans to refrain from trying to copy the "federation" of unbundled processors and software that will be forthcoming in IBM's Future System, slated for 1985. He says that they should instead concentrate on specific processors, and sell state-of-the-art versions of them (plus added software value) back to IBM's customers.

Working along this line of thought, it might make most sense for Amdahl to hit back at IBM with a bundled networking package, drawing all its stray elements in around the new operating system.

Seemingly the worst thing that Amdahl could do is to continue on its merry-go-round of MVS copying and attempt a full compatibility with IBM's Trout federation. This road, as Withington points out, heads only to an abyss. "The PCM business as we know it today will become virtually impossible, even for those competitors who can match IBM's prices."

—Ralph Emmett

NO MORE WAITING FOR IBM

The announcement of new mainframes in advance of IBM's introductions is one indication of the brashness being exhibited by NAS.

In Europe, IBM is said to have a mainframe marketing strategy called Ten in Five—install 10 times the processing power in five years. It all sounds very credible and doable to Dharam Ahuja of National Advanced Systems, the Mountain View, Calif., vendor of IBM software-compatible mainframes. He thinks a large, aggressive company could easily consume 10 times the processing power in five years. Indeed, he sees the mainframe business, measured in dollars, growing at 10% a year over the next five years while processing power grows at a minimum 50% per year.

Ahuja, vice president for worldwide marketing at the National Semiconductor subsidiary, says the amount of installed power at NAS's customer base has grown by some 200% just in the last two years. At the end of 1979 that number was between 400 and 600 MIPS, he explains, but had grown to almost 1,300 MIPS by the end of '81. He sees this reaching 8,000 MIPS in 1987. In the number of cpus installed by NAS, he sees a similar expansion from more than 700 at the end of March '82 to more than 1,800 in '87. By the latter time, he adds, the company's product line will consist of mainframes with power ranging from 2 to 50 MIPS.

In support of this contention, Ahuja describes a presentation he recently made to some people at General Telephone & Electronics, pointing out how much processing power was already installed in the telephone industry. On that occasion, he asked them what would happen if one of their operating companies were to install a computerized telephone directory system. How much would that increase the need for computer power? Ahuja explains that people in that industry believe this will happen in the next three or four years. Applications now are being user-driven, rather than data processing department-driven, he asserts, and the rate at which computer power is growing is large.

"The appetite for processing power as these kinds of applications come along is just going to be tremendous," he says.

As if in preparation for this torrent of demand, NAS last month was scheduled to announce two of its big guns, the models 9060, an 11-MIPS uniprocessor comparable in power to the dual-processor IBM 3081D, and the larger dual processor 9080 with 20 MIPS. Both mainframes are being supplied to NAS by Hitachi Ltd., the Japanese maker. And, significantly, Ahuja says the first customer shipment of the 9080 will occur next month, earlier even than the first delivery of Amdahl Corp.'s large 5860 system.

The announcement of new mainframes in advance, instead of waiting for and reacting to IBM's introduction, is an indication of the brashness being exhibited by NAS. Until now, the PCMs kept their new processors in the wings, ready to announce as soon as IBM made the first move. The PCMs then compared their latest offerings with competitive IBM machines. But the folks at National are taking delight in IBM now having to compare its machines with those previously announced by NAS.

"They're saying the [IBM] 3083J is equal to National Advanced System's 9000 model 2. And we love it," says Ahuja.

The percentage of IBM users who would consider a PCM machine has increased.

"We're going to keep that offensive strategy, quite frankly, and stay ahead of IBM and let them catch up." He thinks IBM has a 20-MIPS processor ready for announcement, but the company refuses to wait for Big Blue to make the first move.

While the AS/9080 now tops the company's mainframe lineup, the firm in April introduced the bottom of that line, the 6100 family. This product, long in development at the firm's lab in San Diego, Calif., under the code name Shark, is in the 1.5 to 2 MIPS class. This pits the 6100s against the top of the IBM 4300 family. And with the 6100, NAS has set a new lower limit to the markets of interest. For all intents and purposes, the AS/3000s are no longer in production down in San Diego, and the 6100s replace the 5000s. The installed base, then, consists of 525 of the AS/3000s and 5000s,

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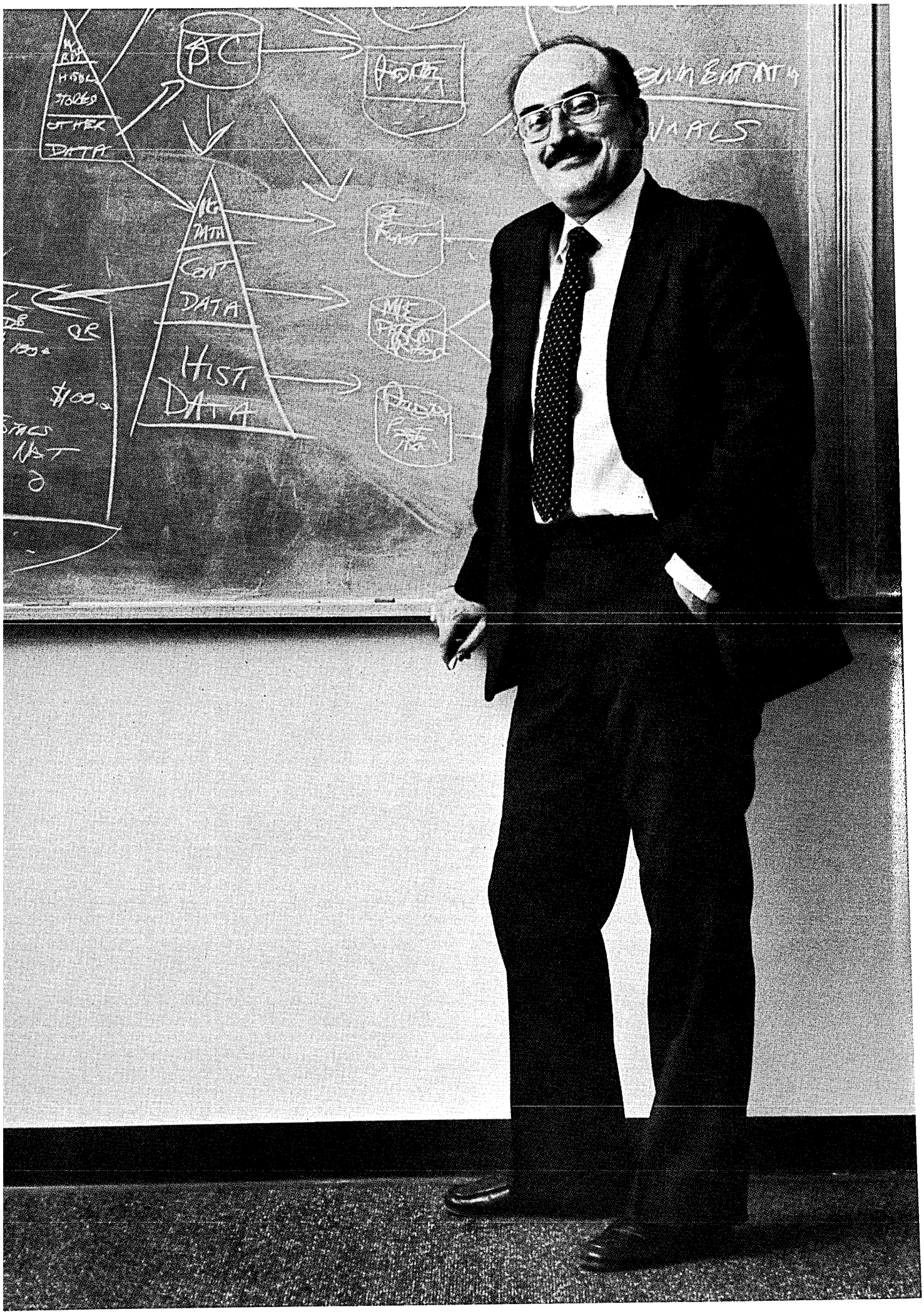
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NEWS IN PERSPECTIVE

165 of the AS/6000s and 7000s, and more than 50 of the AS/9000s. All but the 7000s and 9000s are now out of production.

"In the past year we have displaced Amdahl machines at a number of locations," says Ahuja. "We have intercepted Amdahl on-order machines and we have won [contracts] head-on with them and IBM in many situations." A year ago no one would have considered NAS to be in the same class or market with Amdahl, much less able to win against the more experienced PCM vendor. But NAS's customer base has shifted from the relatively unsophisticated customers to the nation's major corporations. More significantly, Ahuja says that since January of this year 80% of the orders for the 9000 have been from customers who took delivery of their first NAS machines last year. So the company not only is courting the sophisticated computer users but is also getting repeat business from its own installed base.

In San Diego, the company is manufacturing not only the new 6100s but also add-on memory systems for IBM 370s and compatible mainframes. Recently, it also went into production of add-ons for the Hitachi machines. "There is a very healthy upgrade business for memory on our installed base," says Ahuja. He estimates that two years ago the average AS/3000 and 5000 user had 2 megabytes on the machine. Today it's between 4MB and 5MB.

Most important is the perception that the percentage of IBM users who would consider a PCM device has increased. Ahuja cites the Federal Reserve banks around the country as an example of IBM diehards that recently have begun soliciting competitive bids from Amdahl and NAS.

—Edward K. Yasaki

IN DEFENSE OF PCMS

Just because one PCMer bit the dust doesn't mean there's something inherently unsound about the PCM business, IPL Systems asserts.

It's a vicious circle. The Japanese plug-compatible manufacturers (PCMs) turn the screws on IBM, and IBM responds by price slashing. As a result, several American PCMs—"innocent bystanders," as one of them says—get scalped in a pricing war.

It was pressure from American PCMs that last forced IBM to bare its pricing fangs. That was 1979. The potent price/performance blend on IBM's medium-sized

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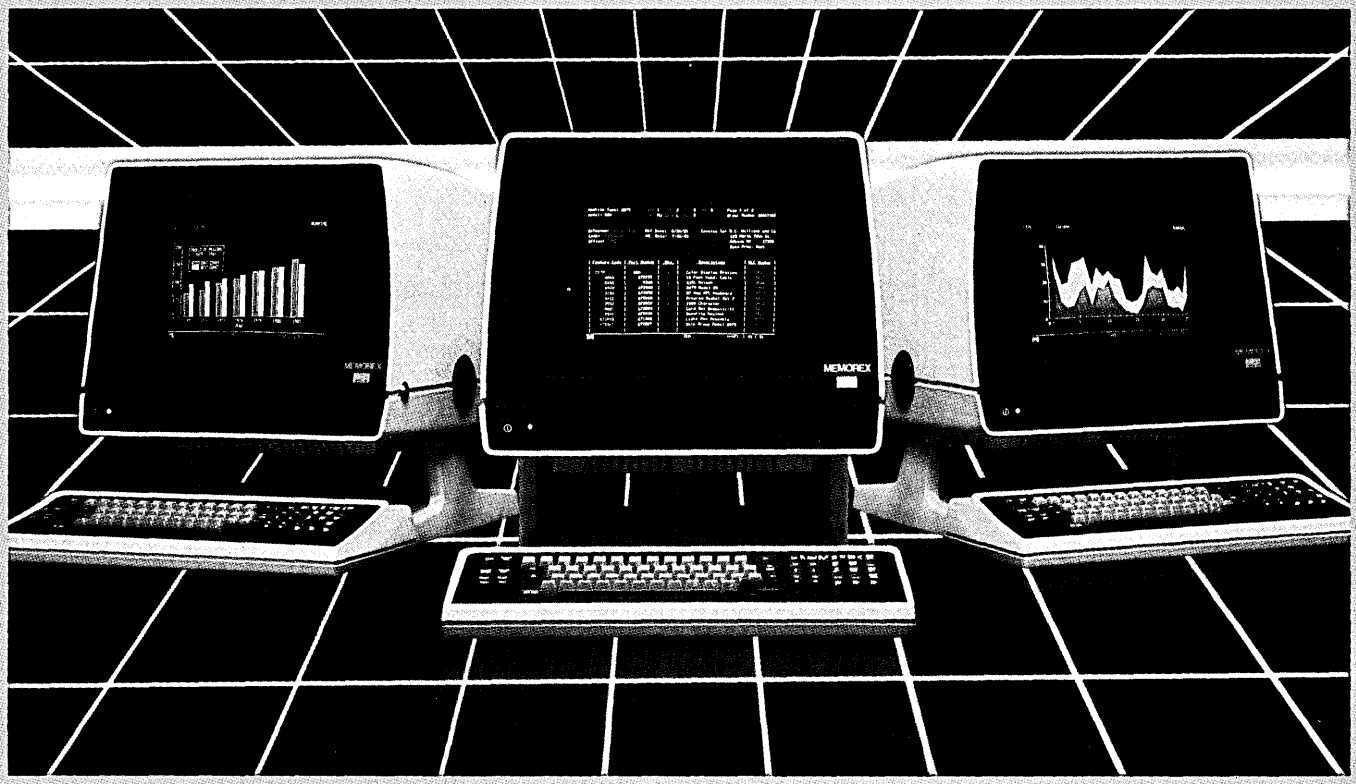

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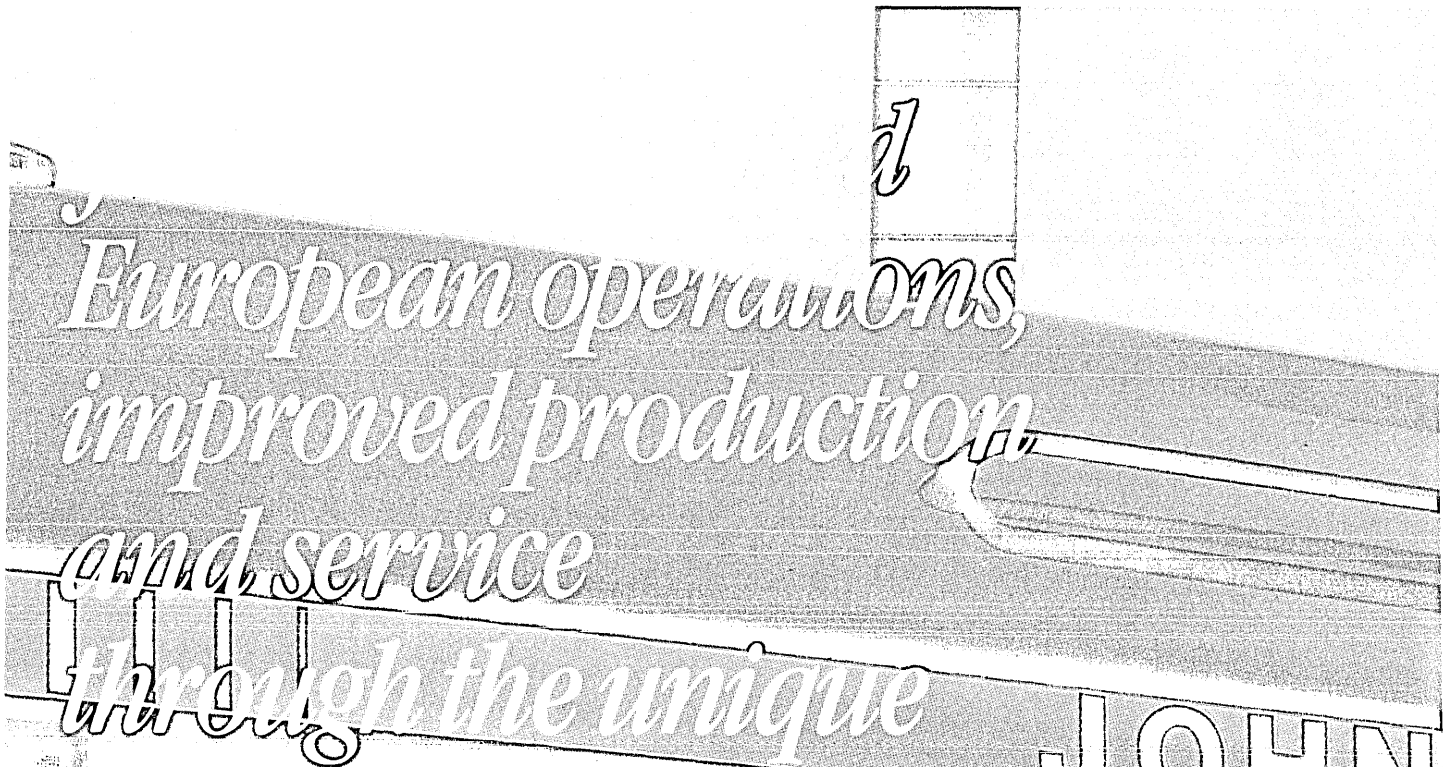

A. B. Tinter, Manager, Business Systems
John Deere Europe, Africa and Middle East

"Manufacturing operations of all John Deere's European facilities will be tied together on a network of Tandem NonStop Systems. With Tandem, we cut our computer costs for shop floor control in half, and we maintain inventories on parts, labor, materials and work-in-progress without waste and without shortage. Our Tandem network also allows us to coordinate scheduling of 'start assemblies' in remote factories as needed so that all sub-assemblies will arrive at the designated final assembly plant without delay and without having to stockpile. The result is better service to our customers and far more economy and efficiency for us.

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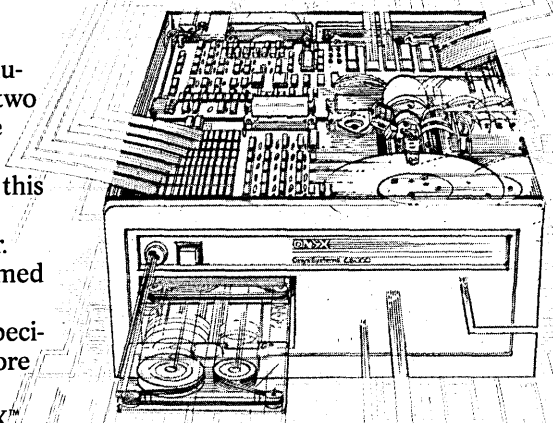
Winchester disk drives that utilize slow-moving stepper motor head positioning devices won't do.

ONYX's IMI Winchester disk storage system, with its servo-driven voice coil



head positioning, is more than twice as fast!

So, obviously the ONYX C8002 *will* do.

And, as developed, the ONYX C8002 features expandable memory up to 1 Mbyte, and disk storage up to 160 Mbytes on-line. Its cartridge tape backup offers cyclical redundancy checking on every backup. Both the Winchester disk storage system and the cartridge tape backup are *internal.*

Now it's 1982. The UNIX system's pre-eminence among 16-bit operating systems is established. And ONYX is the only company that has significant production experience with UNIX systems.

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NEWS IN PERSPECTIVE

4300s enfeebled a whole industry, and most American PCMs live in fear of a repeat.

Nevertheless, this is exactly what may be in store due to the inexorable rise of the PCM "Club Japan," whose lineup boasts such worthies as Fujitsu, Hitachi, and National Semiconductor, all of whom are building powerful IBM-compatible mainframes on the back of Big Blue's software.

Rather than being a victim of IBM's reprisals, American PCMs increasingly feel that by aligning themselves with Club Japan, they stand a better chance of absorbing IBM pressure. The most notable proponent of this philosophy is the largest U.S. mainframe PCM, Amdahl, which as been allied with Fujitsu since the mid-'70s and is now one-third owned by the Japanese company.

But you don't have to be big to go down this road. The latest to try is the $20 million Waltham, Mass.-based IPL Systems, which has just signed a joint development deal with the multibillion-dollar Mitsubishi Corp.

"Put simply," says IPL president and founder Steve Ippolito, "we aspire to be the biggest and the best of the PCMs."

But currently, the only thing "big" about this 4300 class PCM is its ambition. The company's size is in line with its start-

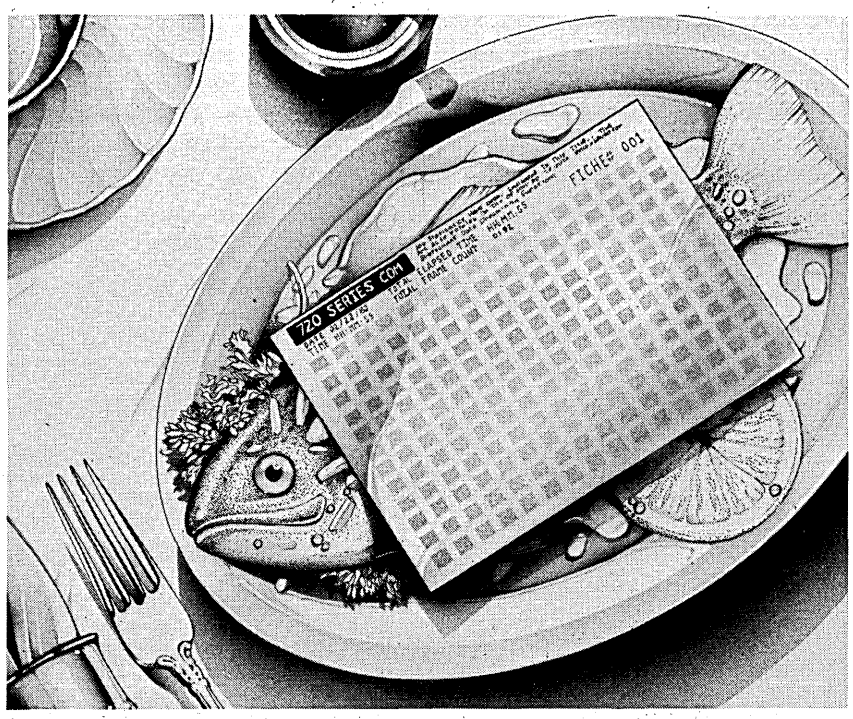
IPL has just signed a joint development deal with the multibillion-dollar Mitsubishi Corp.

ing objective in 1976—to dominate the medium-sized PCM business. "But that objective has changed," Ippolito notes. "We have plans to build machines in MIPS [millions of instructions per second] ranges greater than anything IBM is building now."

To put this in perspective, IBM is expected to announce an 18 MIPS machine (code named Baldwin) by year-end, and to round out its H Series by announcing a 25 MIPS version (Sentinel) next year, sources claim. In comparison, IPL's current top of the line is the 1.5 MIPS 4446, which was the fastest 4300 compatible PCM machine until eclipsed in April by a new 2 MIPS model from National Advanced Systems (see related story, p. 40).

The key to the sculpting of a processor range—in IPL's case, stretching from 0.6 MIPS to beyond 25 MIPS—appears to be Mitsubishi's advanced VLSI technology and a sophisticated computer aided design system. And like IPL itself, whose growth so far has been attributed to fast semiconductor circuitry inside its machines, the Japanese giant uses advanced ECL logic. Now moving one step further, Mitsubishi has managed to cram 1,000 logic gates onto each chip. By way of comparison, IBM's 4300 has only 700 gates per chip, and its 303X mainframe has just 16 gates per chip.

"The fruits of the Mitsubishi deal



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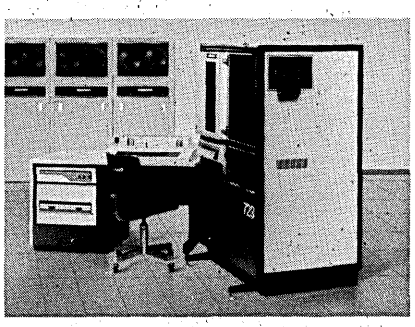

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will be higher capacity machines for both partners," claims Patrick Lucci, IPL's manager of marketing services. "The deal is for our mutual benefit, and so far there has been no investment in us by Mitsubishi."

"[PCMs] have to offer more than just a fast box."

Though this deal could help ensure the company's survival and future growth—"take some of the manufacturing and engineering weight off our backs," as Ippolito puts it—IPL has more pressing concerns. Will the company respond quickly to the new NAS machines? "We don't respond to NAS announcements; we respond to IBM announcements," asserts Ippolito.

Like IPL, IBM's current top of the line, the 4341 Group 2 machine, performs at about 1.5 MIPS. Sources are looking for a summer announcement of the 4351 (internally known as the E5), which they say will offer 2.5 MIPS for about $800,000. A multiprocessor version of the E5, the 4 MIPS 4361, could also be announced by year-end to top off IBM's 4300 family.

Comments one source, "It's interesting to note that the 4361 will probably cost around $1.2 million. This means that 1 MIPS on this 4300 machine will cost about the same as 1 MIPS on the smallest H Series, the 3083 model E, when the two are shipped next year."

In other words, the price per unit of instruction on IBM's medium-scale 4300s and large-scale 308Xs will converge next year, though the storage and I/O ranges on the H Series (or 308Xs) will still be greater. Ippolito says his company is prepared to match both announcements, and insiders add that at least a 2.5 MIPS contender should be forthcoming from IPL this year.

Another pressing concern for IPL is what its vp of sales, Ron Bleakney, calls the IBM customer's "perceptions of fast-box PCMs." Says Bleakney, "We're probably in better shape overall than any PCM right now. We have over $11 million in cash, next to no debt, state-of-the-art machines, contented customers. . . . you name it, we've got it.

"But because of the spectacular failure of Magnuson," he adds, "and the problems that other PCMs are experiencing—including Amdahl—there is the growing feeling among users that there is something inherently unsound about the PCM business.

"As long as there is an IBM, there will be a PCM industry," Bleakney asserts. "That's the way of it. Magnuson failed because of poor management and because it failed to deliver a 1 MIPS machine. But people don't seem to be aware of this."

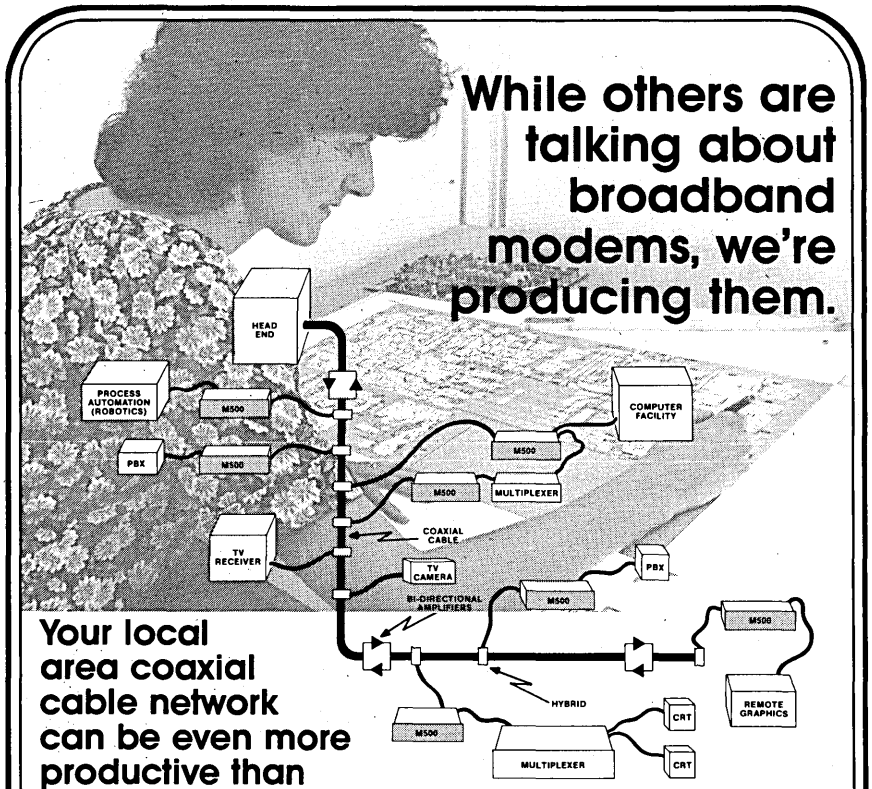
Perhaps one aspect of the IBM customer's perception, however, is valid.

"Once you have your base . . . of end users, your relationship changes. Customers look for product magnification and differentiation. They expect you to become unique."

"That is, that you have to offer more than just a fast box," says Bleakney.

Building plug-compatible cpus—especially for oems—can be a quick way to build a customer base. "In the early days the cost of sales is so low that you can register operating profits of around 40%," Bleakney comments. "Manufacturing is just glorified assembly and, as a result, your investment in plant and equipment is very low." (Even last year, after only its second year of end-user selling, IPL managed $17 million in sales from $1.8 million worth of manufacturing equipment, its 10-K report showed.)

"Once you have your base, and I mean by this a family of end users, your relationship changes. Customers look for product magnification and differentiation. They expect you to become unique," Bleakney explains.



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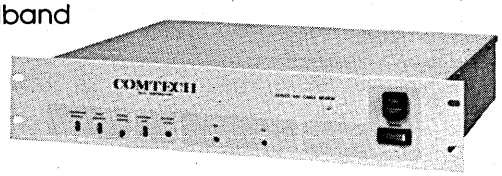

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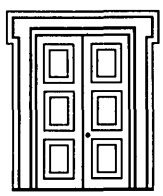

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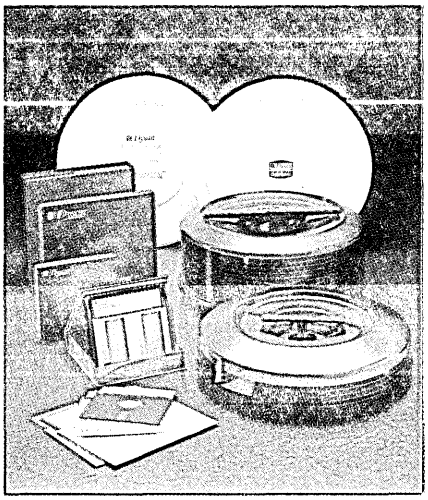

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"Selling just a box," says Nixdorf U.S. director of product planning and marketing Mike Backler, "doesn't really help the user that much. He still has to configure, install, maintain, and tune his system software and programs."

Backler, whose company is challenging the hardware PCMs with a more "total systems" philosophy, says the user wants the box to come as an integral part of a system, and to be fully transparent to him. Rather than doing it himself, he would like the systems vendor to take full responsibility for everything so that he can just get on with the job of adding new applications.

"We have plans to build machines in MIPS ranges greater than anything IBM is currently building [in its 4300 family]."

Another key Nixdorf point is that IBM can package its system software and hardware together so that in the years ahead the cpu can almost be given away. This, of course, will make hardware-only PCMs like IPL extremely vulnerable to shifts in IBM pricing. This is no less true at higher levels, say for Amdahl, Trilogy, etc., than at the medium level, where IBM has already shown its teeth, observers point out.

The answer seems to be to develop your own system software (including operating system) and applications packages, and try to entice the independent software industry to develop lots more packages and applications, and thus find new customers for you.

According to Spartacus Computers president George McQuilken, the operating system is crucial because it determines what the other software and communications will look like. "If your box has its own IBM plug-compatible operating system, it needn't just hang passively on the end of a big IBM mainframe," McQuilken points out. "It can become its own center [host] or be actively distributed or actively dedicated."

So far there are no signs that IPL is developing its own PCM operating system. "It would show up in its engineering and development budget, which has remained stable at around 9% of sales over the past few years," says one observer. He points out that developing PCM software is very expensive (see related Amdahl story p. 38), and often risky.

Ippolito would not be drawn. "We haven't ruled it out," he said.

According to one source, the company does intend to develop systems software, though—especially in the communications area. "I expect them to make their processors more attractive to users by offering a local networking capability. Currently they are working on a project to offer an Ethernet capability for Olivetti [which owns one third of IPL and sells its machines throughout Europe]."

"We are determined to capture the imagination of both the public and the investment community."

The company declined to comment. But it is clear that Bleakney was not just making hollow sounds when he talked of the company's quest for a more universal appeal.

"Obviously, we have plans. We are determined to capture the imagination of both the public and the investment community. And we intend to increase demand for our products among blue chip companies," he said.

As for Ippolito, the normally reserved and clinically logical ceo made one further boast. "We'll be bigger than Amdahl, you wait and see."

It's doubtful that Amdahl, at 25 times IPL's size, is trembling in its boots. But "IP Who?," as Amdahl insiders call Ippolito's squad, just might bear watching—"even if only for amusement value," they say.

—Ralph Emmett

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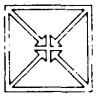

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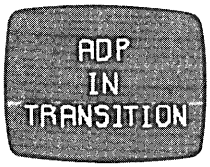

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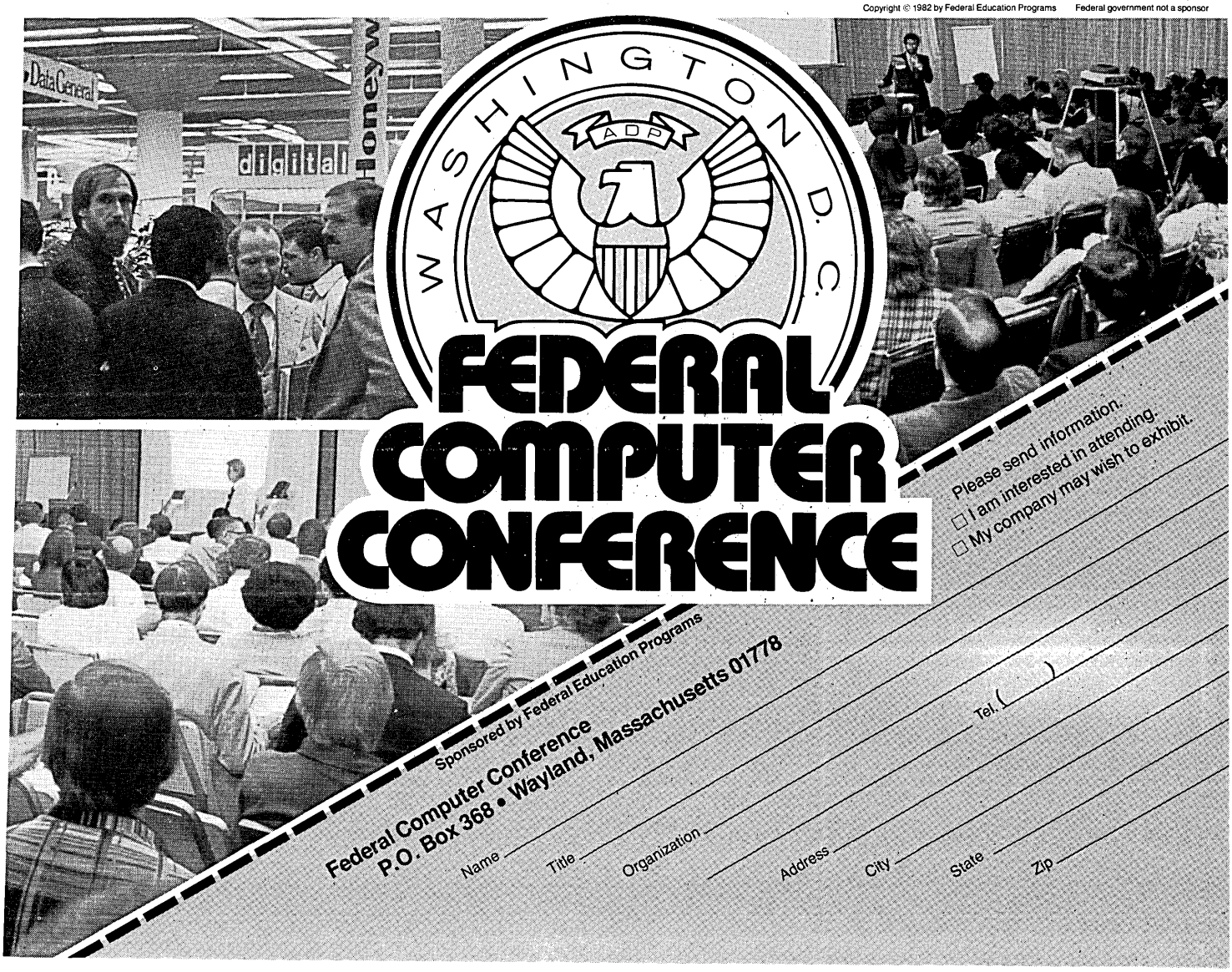

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SERVICES

TRACKING A CENTIPEDE

If you look at the whole instead of the parts, Control Data is a services company, period.

Getting a fix on Control Data Corp. is like trying to count the legs on a moving centipede. It's not just a simple matter of tracking one product type through several industries. Control Data has four distinct parts to its business mix: systems, services, peripherals, and financial. That's only the beginning. Behind each of those legs is an army of moving parts, each carrying on its own planning, marketing, and product development activities. Imagine the management task of bringing all those moving parts into unified step.

The man charged with making that happen is Bob Price, who took over as CDC president in July 1980, and is heir-apparent ceo to company founder William Norris. The signs of change are everywhere—top management has been restructured, the marketing organization within systems and services is moving toward a team marketing approach, and new product announcements have implications that cross multiple operating groups.

Yet another sign of change went into effect the first quarter of this year (CDC reports on the calendar year). Commercial Credit results were reported on a consolidated basis instead of under the equity method of accounting.

"I fully expect all four [parts of the company] to contribute significantly to corporate revenues and profits," said Price. Five years down the road he predicts the breakout will be one-third services, one-third peripherals, and one-third financial and systems. In five years, however, said Price, "it is going to become harder and harder to tell what is what. It is going to be hard to tell if something is a financial service or an information service because we will be offering them on a combined basis. That's why we are reporting corporate business on a combined basis as opposed to breaking Commercial Credit out."

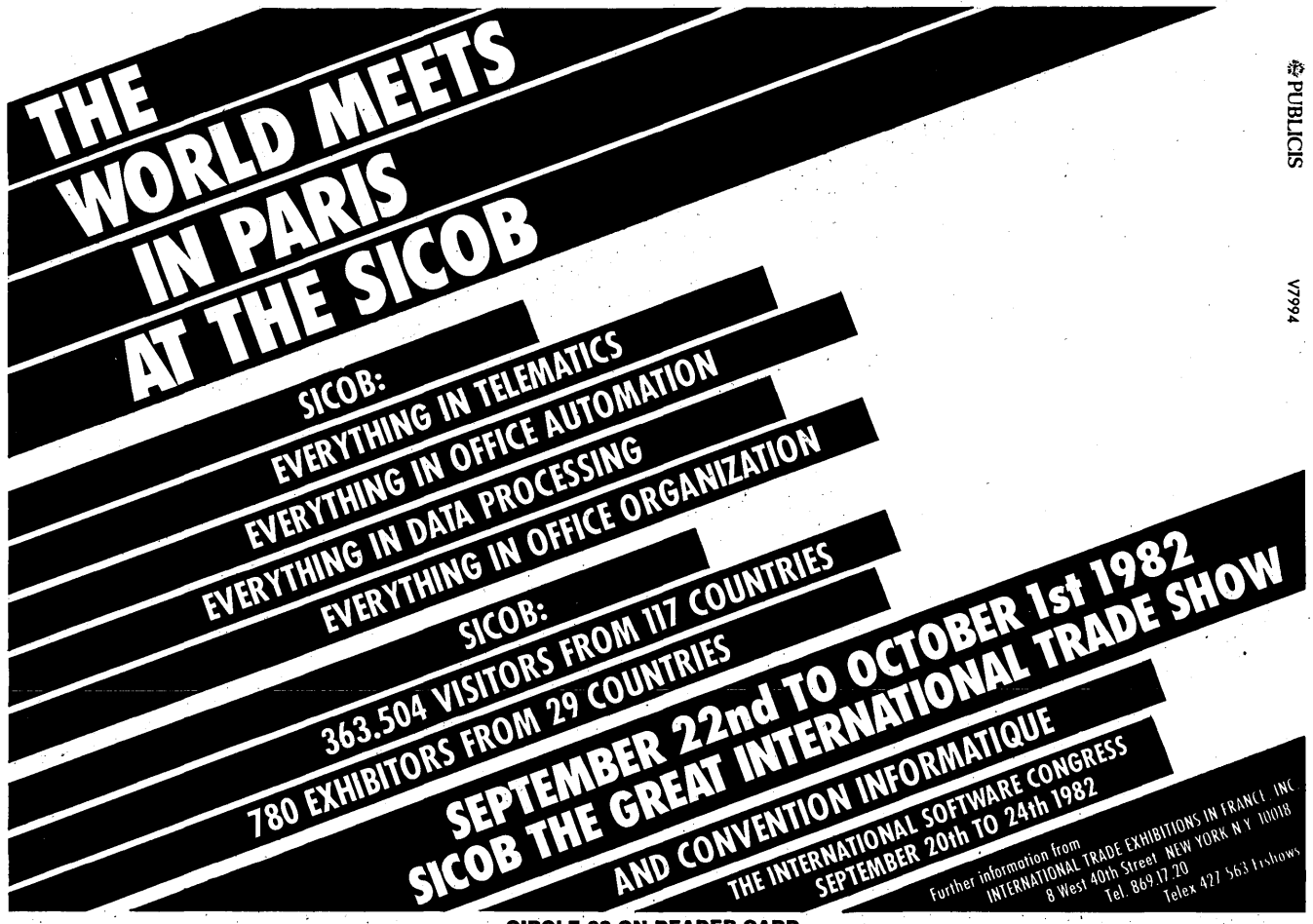
CDC is evolving from four distinct companies into one—a service company that sells solutions or information, not hardware. To better manage this new orientation, Price put in place a corporate level structure that mirrors key functional areas—marketing, technology development, and planning—not product lines.

"I know what happened at IBM," said Steve Rickelman, vice president of computer systems marketing. "They had several divisions focusing on different levels of product offerings. Their people came in direct conflict with one another at the same account over whether to sell them a lot of little machines or one big one. At CDC our growth kept all the hardware products in one organization and all the data services in another. CDC's conflict was whether a customer should buy a service or a system."

The rapid ascent of end users toward the top of the decision-making process has had a profound effect on the way vendors must view the marketplace. As CDC and other mainframe vendors are finding, one software package can make or break a sale. It's applications that are driving the market today.

CDC's strategy is first to sell the solution, then to sell the systems or services to deliver that solution.

"End users don't care what an application is running on. They just want the problems solved," agreed Rickelman. So



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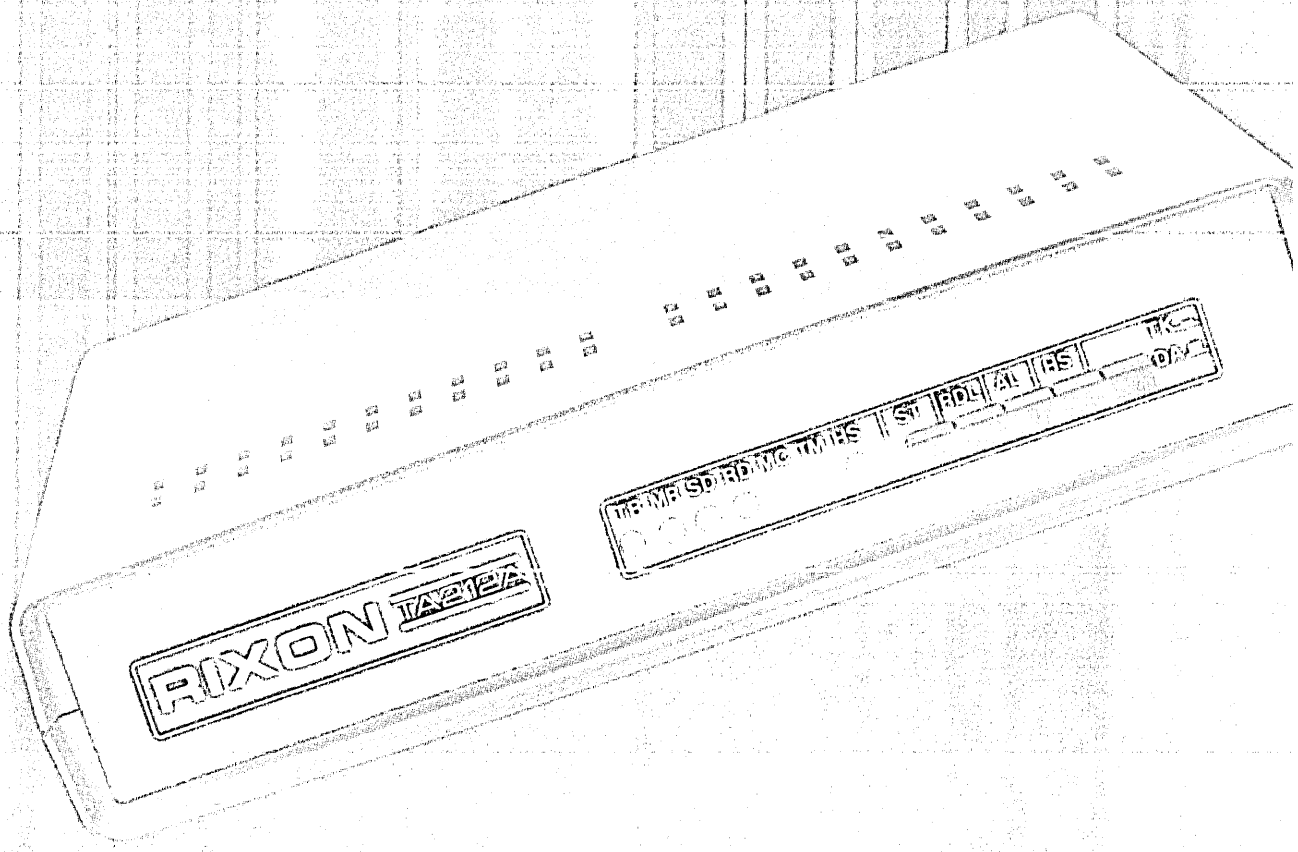

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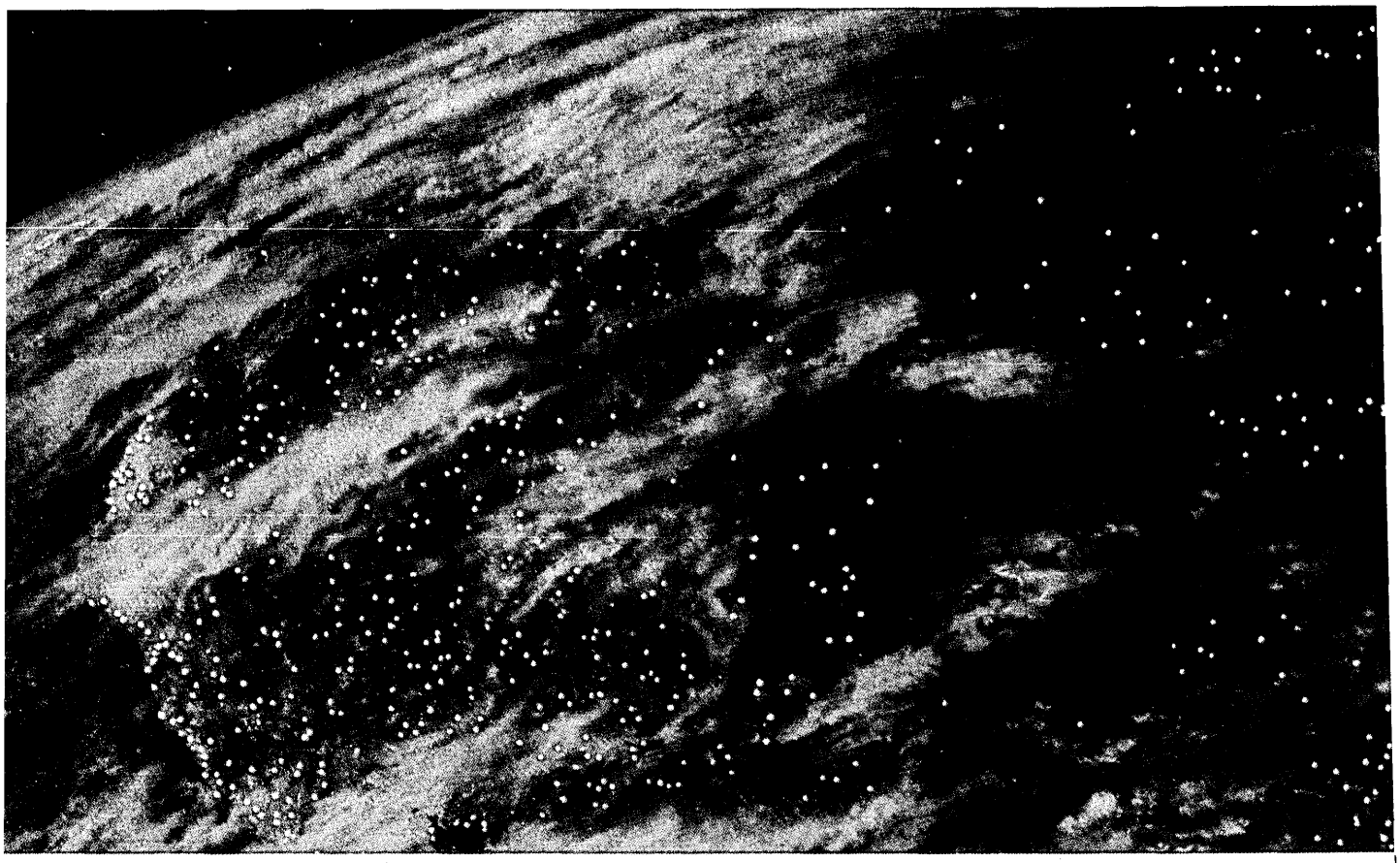

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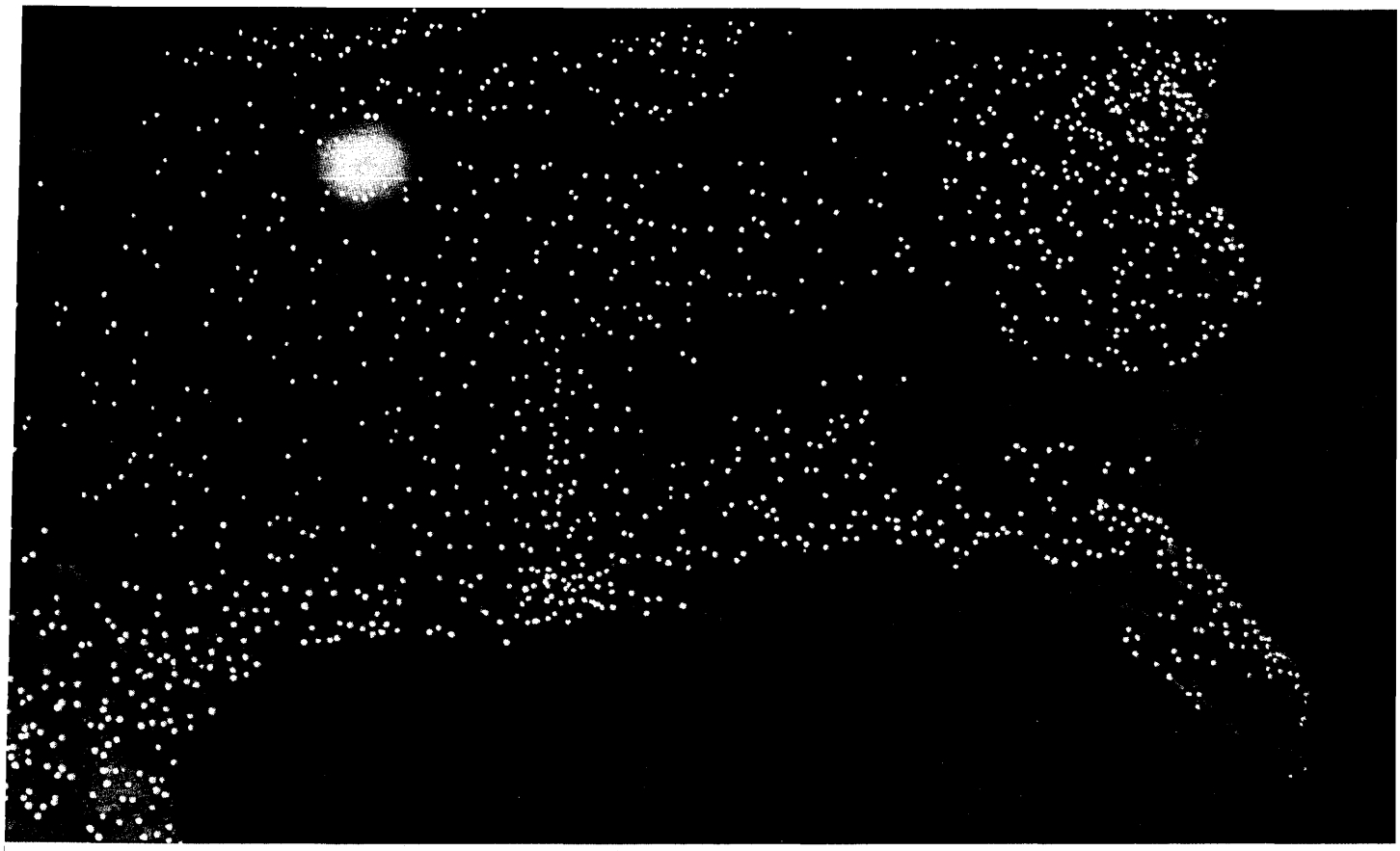

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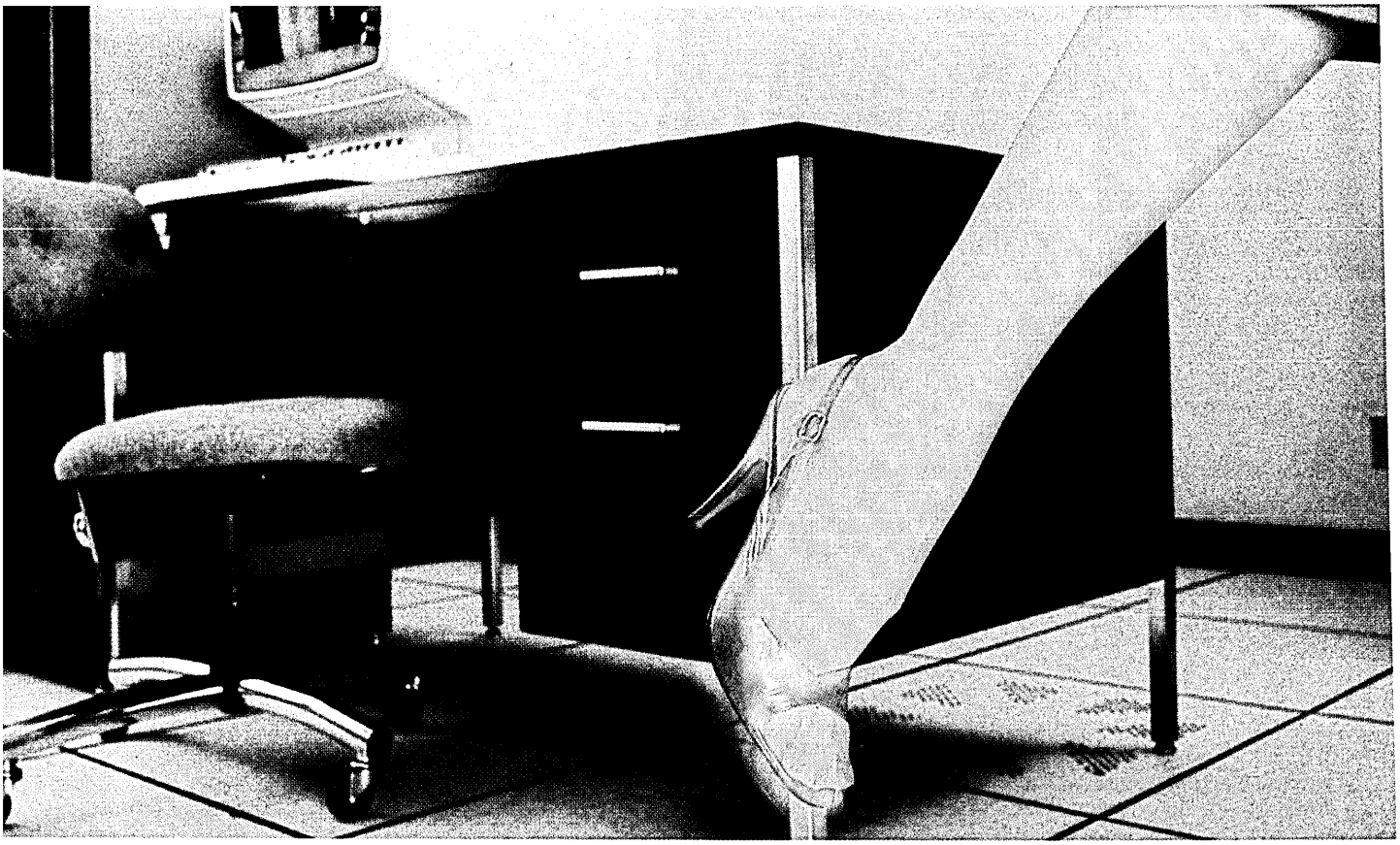

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CIRCLE 60 ON READER CARD

CDC is focusing its resources on providing solutions to its targeted markets. Two target markets slated to receive the greatest amount of support over the next couple of years are CAD/CAM and seismic processing for oil companies.

In the seismic area, as part of the 800 announcement, CDC is offering an "entry-level Cyber seismic processing/interpretation system" that comes bundled with a Cyber 825 and maintenance at one price. In short, CDC is selling a very specific solution for a set price, using an old, foresaken marketing method in a modern, application-specific situation.

While these changes have not been lost on Wall Street, it's not completely clear the analysts understand this means a new way of thinking about CDC. One Boston-based analyst wanted to know if CDC was looking to the service bureau business to "carry it through." Carry it through what? Bad times in computer systems sales? Bad times in the peripheral business? The mainframe business does not mean the same thing to CDC as it does to, say, a Burroughs or a Honeywell. Mainframes are merely a piece of the big jigsaw puzzle of possibilities that can be packaged together and sold as a solution. So first you sell the solution, then you sell the service or the mainframe and peripherals to deliver that solution.

That is not to say, however, that CDC is getting out of systems, or that systems will become a forgotten sister. On the contrary, systems is an integral part of the total corporate picture, says Price. The breadth of the recent 800 series announcement attests to that.

The new five-member family of 800 machines "is the highest performing general purpose machine we have produced and offers the industry's broadest performance range in one compatible machine line," said Price. What's more, the 800 line is compatible with the software and peripherals used in the previous Cyber 170/700 family. However, in keeping with CDC's corporate strategy of selling service and not just hardware, one should look at the implications of two products that were introduced as part of the 800 announcement: Plato and the remote micro facility (RMF).

Some users had hoped the 800 Series would see CDC shift from its 6-bit word structure to the more commonly used 8-bit structure. It didn't happen.

Plato is CDC's computer-based education concept that has been around for years, but has been disparaged as the corporate albatross. Yet, Plato has a way of turning up in about every other CDC press release for one reason or another. And well it should, for the company has quite an investment tied up in that service. Price estimated it has cost the company on the order of $900 million to develop Plato hardware, software, and courseware. And, sure enough, Plato turns up in the 800 announcement, but this time, and for the first time, it looks as if CDC finally has a marketable product on its hands. Because of some features included in NOS Version 2.0 and the expanded memory of the 800 series, Plato can be purchased for about $15,000—loaded and operated like an application on the 800 machine. No more delivering Plato over Cybernet, where the connect costs could eat up most any justifiable benefit.

CDC has also done something about the cost of a Plato terminal. It has replaced the costly, dedicated IST3 Plato terminal with a multifunction 721 terminal capable of handling alphanumeric data, graphics, and on-line editing. To function as a Plato terminal requires a special Plato interface program, and a 5¼-inch disk drive is required, which costs about $3,000. The 721 is a multifunction workstation that can also act as a standalone microprocessor. By adding an 8-inch floppy drive and two pieces of software, the 721 becomes a CD 110.

Plato has been modernized and stands ready to cash in on the rising need for computer-based training, both in education

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	VT100 CRT DECscope	1,695	162	90	61
	VT101 CRT DECscope	1,195	115	67	43
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	VT132 CRT DECscope	1,995	190	106	72
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	TI Insight 10 Terminal	695	67	37	25
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	TI787 Portable KSR, 120 CPS	2,845	273	152	102
	TI810 RO Printer	1,695	162	90	61
	TI820 KSR Printer	2,195	211	117	80
LEAR SIEGLER	ADM3A CRT Terminal	595	57	34	22
	ADM5 CRT Terminal	645	62	36	24
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and industry. Among the programs available on the 800-based Plato are courses on COBOL, FORTRAN, and other languages. The company also hinted that training courses for learning the company's CAD/CAM programs would be the next likely area for software announcements.

Suddenly Plato, the longtime cash drain, is looking more and more like a cash cow. Think about it. Plato is one of the earliest "blue sky" ideas Norris headed off on, and now it appears to be coming to maturity. Is it a service? You can get it via Cybernet. Is it a software program? It runs like an application on NOS 2.0. One thing for certain, those who use Plato on the 721 terminal will be buying more peripherals and software. The centipede effect is beginning to set in.

Here's another little jewel CDC slipped in with the 800 announcement: it's called the remote micro facility (RMF) and sells for about $775 per package. It will be available this month or next, said Frank Vince, vice president of product line management for computer systems. He describes the offering as a "straightforward little package, not terribly sophisticated" that when loaded into a microcomputer, allows that micro to talk to a Cyber running NOS 2.0. Vince doesn't mean the micro and mainframe will only do simple low-level protocol handshakes; he's talking file and job transfers—the upper-level stuff where "real" action takes place. At present, the company only has RMF packages ready for its own micro, the CD 110, and Apple's machines; Tandy is soon to follow, Vince said. The company will probably do interfaces for any micro that looks promising.

The breadth of CDC's 800 family permits a user to get a Cyber 825, the entry-level product, for as low as $400,000. At the top is the 875, which sells for a little more than $3 million. While the air-cooled 825 is said to be equivalent in performance to the 720, it requires only about half the power and has about five times the memory, up to 1 million words of central memory compared to any 700 series system that has an upper limit of about 262K words.

The Cyber 875—which is rated at about 10 to 15 times the performance of a 720, or roughly equivalent to a 176—operates with "substantially less" power than its equivalent, says the company. When a second processor is added to the 875, performance hits near 20 to 30 times that of a 720, memory goes to a maximum of 2 million words, and the price jumps to $4.6 million.

All series 800 models feature higher reliability, a performance monitoring system that does not itself affect performance, remote diagnostics, and operate with both NOS Version 2.0 or NOS/BE, according to the company. The Cyber 826 and the 835 are being delivered now; the 855 is scheduled for July, and the 875 in November. Delivery of the 865 model is to begin early next year.

While the overall reaction of users to the 800 series announcement was very favorable, some users had hoped to see CDC shift from its 6-bit word structure to the more commonly used 8-bit structure. Another shortfall in the eyes of some users is the way CDC handled the central memory. While the 800 series boasts up to 2 million words in memory, the memory has been partitioned off into 131K word box sizes, making only 131K words available per job. But, defended a CDC spokesperson, "you can get to the additional memory by using an instruction provided in the NOS 2.0 operating system."

No 8-bit structure, no virtual memory. "That's unfortunate," said Margaret Drake, deputy director of the scientific computing division for the National Center for Atmospheric Research, Boulder, Colo. "The 800 was to be CDC's product for the '80s. It's unfortunate they are not offering 8-bit ASCII characters and virtual memory. They appear to be running in the old architecture. I must say, old customers who want to emulate the old system are quite pleased.

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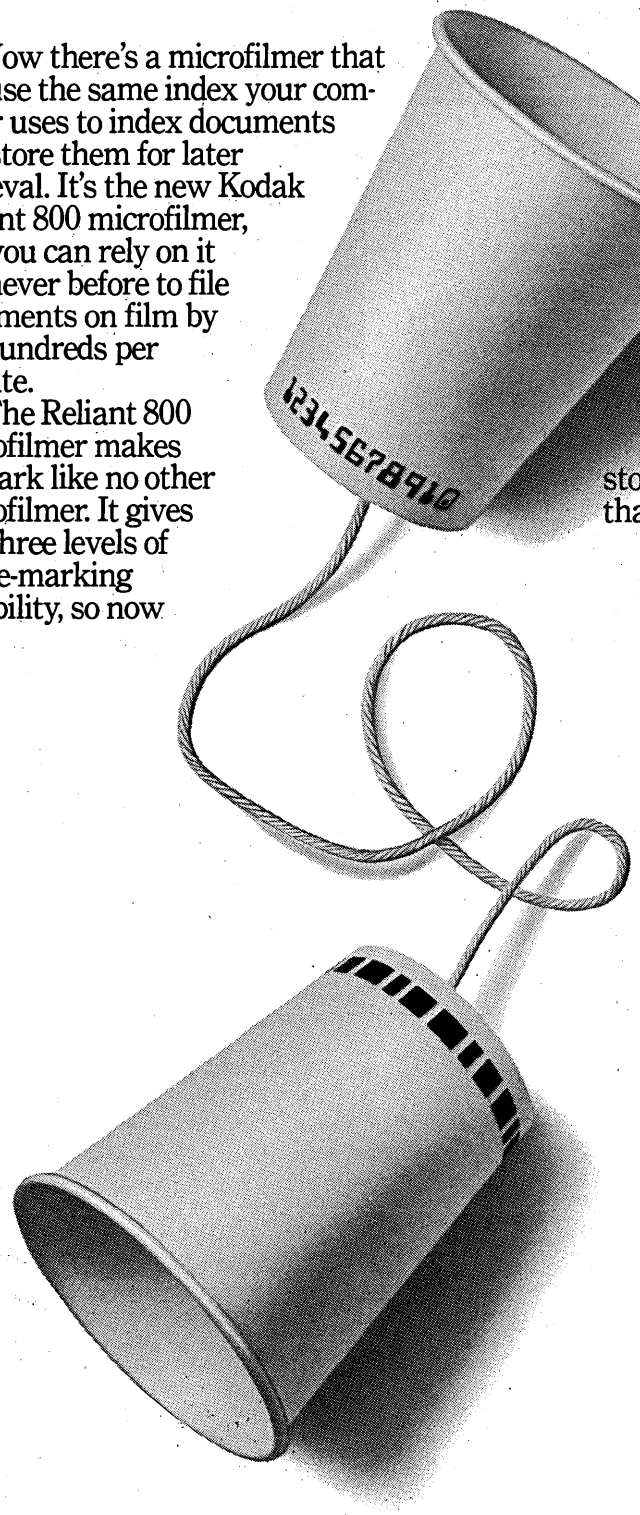
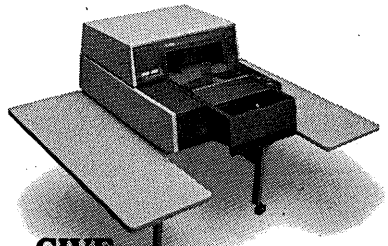


Kodak



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But to us this is looking very unexciting. The 6-bit structure makes communications with our other equipment—a CDC 7600, a Cray 1-a and IBM 4341, all 8-bit based systems—a pain in the neck . . ."

The rumor at a recent CDC users meeting where the company demonstrated the 800 was that the machine was designed to run in an 8-bit mode. In fact that is called its native mode. Delivery of the native mode capability, according to leaks from marketing, could happen anytime between 1985 and '89. The design of the newly announced 825-42 disk drive—a four head parallel device—is seen by some as an indication that CDC may be moving toward the 8-bit world.

Meanwhile, CDC's Vince acknowledged a few shortcomings on his own. The 800 machine tops out in memory at the 2 million word level. The old compilers are the culprit. "We would have to do a major compiler redesign to take advantage of greater than 2 million words," he said. "That was too much of an effort. Eventually we are going to do away with the compiler, but not in the foreseeable future."

—Jan Johnson

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MICROGRAPHICS

APPLE PLANTS THE SEEDS

If the Technology Education Act passes, Apple wants to donate between $200 and $300 million worth of its machines to schools.

Here it is—the state-of-the-art version of that hallowed gastronomical and medical principle, brought to you by Rep. Pete Stark (D.-Cal.): "An Apple Computer a Day Keeps Foreign Competitors Away." And it was the headline on one of his recent "Dear Colleague" letters.

This is not the latest legislative foray into the reciprocity morass. Nor is it overtly directed toward the Japanese, Germans, French, or other perceived threats to the computer industry's well-being. It is merely Congress' acceptance of Apple Computer's offer to ensure that when the schoolchildren of America report for work, they punch in on an Apple.

The Technology Education Act of 1982, No. 5573 in your House program and No. 2281 on your Senate calendar, would

Apple rival Commodore has already donated $15.2 million of gear in the last three years.

amend the Internal Revenue Code of 1954 to encourage contributions of computers and other sophisticated technolgical equipment to elementary and secondary schools. The measure is a direct response to Apple's proposal to donate 103,000 computer centers to the nation's schools. That's donate, as in "free, no charge." Value of the gifts is somewhere between $200 million and $300 million.

But since there's no such thing as a free lunch, Apple would be compensated for its efforts with a tax deduction of an estimated $27 million. To allow this to fly, the bill would liberalize the charitable deduction for such donations by treating them the same as contributions of scientific equipment for research and experimentation at colleges and universities. The measure would also provide for a temporary raising of the maximum allowable charitable contribution from 10% to 30% of a corporation's taxable income. Without that provision Apple's 1981 sales of $334.8 million would preclude it from making its planned giveaway.

If all goes according to plan, Apple

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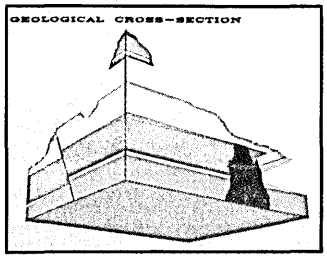
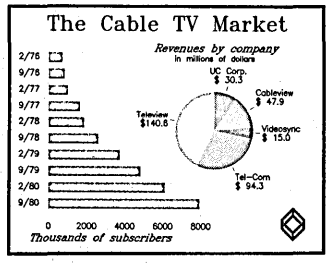


Geological Processing for Energy-Related Fields



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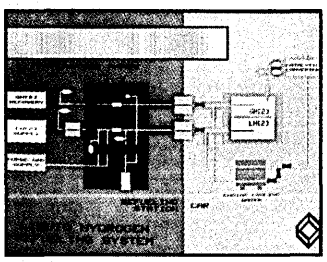

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Precision Visuals is the pioneer in graphics software tools. We have earned a reputation for doing a good job for demanding customers (our customers particularly appreciate our emphasis on documentation and support).

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CIRCLE 66 ON READER CARD

would start the program next February and accomplish it within a year. It would also have company.

"We want our brethren to join with us," says Fred Hoar, Apple's vice president of communications. "This isn't just for Apple. We expect other manufacturers to make the offer as well. We need to accelerate our technical education. We're fourth in the world in scientific literacy, behind Russia, German, and Japan. We haven't had an increase in the number of graduating electrical engineers in 10 years. Somebody has to step up to this."

Actually, Apple chairman Steve Jobs and Representative Stark sat down to this. By chance, they had adjoining seats on a return flight from Hawaii. The pair first exchanged business cards, and then telephone calls. The conversations begat H.R. 5573, which now has 75 cosponsors, which begat S. 2281, sponsored by Sen. John Danforth (R.-Mo.) with volunteer help from Sen. Alan Cranston (D.-Cal.).

Donating in return for charitable contribution credit is the American way. Everyone does it. The Apple Education Foundation has contributed about $750,000 in micro systems to educational institutions since 1979. Apple rival Commodore Business Machines has donated $15.2 million of equipment in the last three years. Tandy Corporation began a $500,000 grants program last January. Twelve companies, from mainframes to micros, have told the National Science Foundation they would gladly consider donating equipment for use by its division of science education and research.

But rarely has giving it all away been done on the order of magnitude proposed by Apple. Now you know why the Technology Education Act is called, not always politely, "the Apple bill." Not everyone is anxious to taste it.

"It's a very interesting ploy on their part," says Bruce Downing, director of industrial marketing for Commodore. "I don't trust their motives. I think they've got a product they know won't be competitive very long and they're unloading it on educators. They wouldn't be doing this if they didn't know they had a product [the Apple II] that will be dead in year.

"The biggest problem is the Treasury losing $27 million [in tax money]."

"Outright saturation doesn't help computer literacy that much. There's a tremendous need for support of the tool. Just dropping computers in without support would frustrate the user. I don't see Apple spending its resources on them."

"I applaud their thinking. It's honorable and it may be really advanced," says Charles Phillips, Tandy's Radio Shack division senior vice president. "But I don't know how well thought out it really is. A computer in each classroom won't solve the literacy problem. I guess what's good for Apple would be good for the rest of us in this situation. But I think Jobs may be pulling back a little. And I think this is a short cut to their getting more of a market share."

But Apple and its Congressional friends may have to take the long way home. Stark, for whom the bill is a top priority, has forged an impressive list of cosponsors. But even as chairman he will have no picnic convincing his Select Revenue Subcommittee, and subsequently the Ways and Means Committee, to accept his vision of America's classroom. Danforth, whose Taxation and Debt Management Subcommittee held one hearing last month, will have an even tougher time convincing the Senate Finance Committee that an Apple a day should be the standard children's diet.

"The biggest problem is the Treasury losing $27 million," a senior Danforth aide says. "They haven't said anything yet. But the mere fact that it would cost them revenue might make it impossible to pass. If all things were equal that would not help at all."

"There's bound to be controversy

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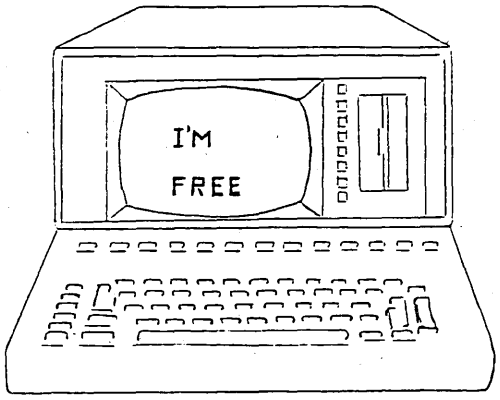
AN APPLE COMPUTER A DAY

KEEPS FOREIGN COMPETITORS AWAY



Dear Colleague:

The Technology Education Act of 1982 is rapidly gaining support with 56 current co-sponsors counted. This legislation responds to an offer from the Apple Computer Company to donate 103,000 computer centers to our nation's schools; a gift of some $200 to $300 million in value. The Joint Economic Committee has estimated the revenue reduction to be $27 million. This bill has recently been introduced in the Senate by Senator Danforth.

over being so generous to computers," Stark's chief subcommittee aide admits. "It's perceived by some as providing too much benefit to computer manufacturers. Normally companies can only take the basis [cost] as a deduction. This is basis plus one half the difference between that and the wholesale cost. Why give them that?"

Because without it, "we'd go broke," Jobs concedes. Even with Congress' largesse, this will be no bargain for

"We'll do whatever we can to increase our market share," says Commodore's Downing.

Apple. It will have to crank up its production on an unprecedented scale. Embryonic plans for that upgrade have been made and a general scenario designed should the company's wish come true. But Apple is awaiting more positive signs from Capitol Hill before putting its assembly on line.

"We do expect those costs will be returned in future sales both for us and our competitors. This is an investment by Apple in the human capacity. We call it 'Kids Can't Wait,' because they can't. This should make a major contribution to technological education and stimulate industry demand."

There apparently is plenty of demand to be supplied. Apple's statistics indi-

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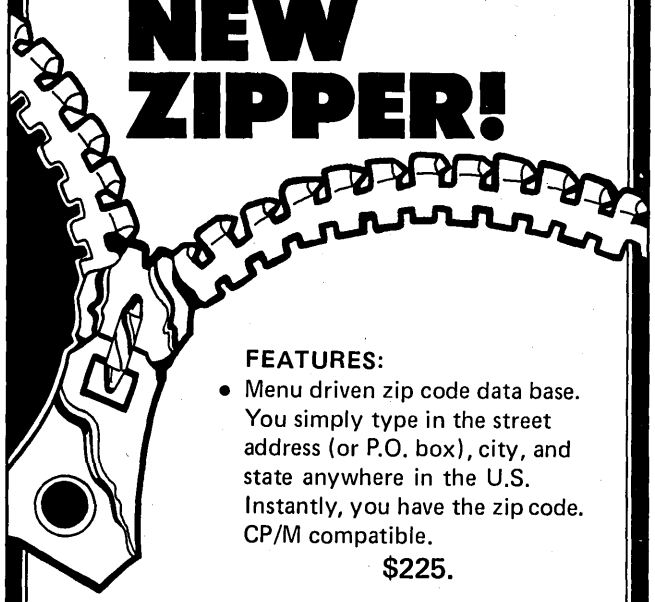

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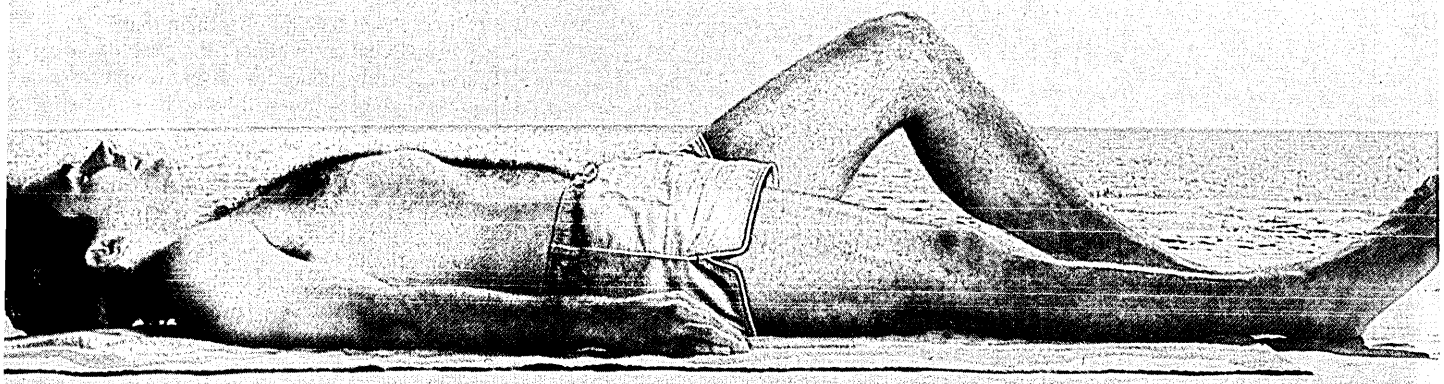

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As you can see, we're anything but backwoods when it comes to computer technology. In fact, we utilize an IBM 4341 under OS/MVS. We also have a strong commitment to continuing training with company sponsored education.

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Data Base Analyst

You will function as a data base designer and have primary responsibility for logical and physical data base design activities. You will analyze the company's application needs for batch and on-line operations to increase reliability. Position reports to Data Base Administrator and requires a degree in Computer Science, or equivalent, plus at least four years DP experience with at least one in data base systems. Strong background in large-scale computer systems, concurrent batch and on-line systems programming, and user interface highly desired. Location: Corporate headquarters in Manchester, NH.

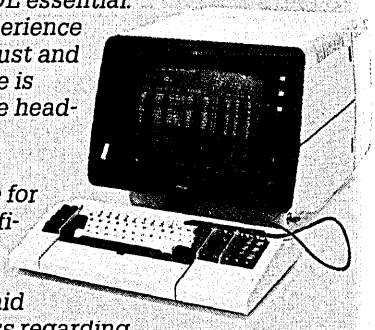
Systems Programmers—On-line Systems Group

Your understanding of VTAM and NCP could be the key to an exciting new opportunity for you. You will have the chance to work on all software maintenance and installation; figure in networking design and implementation plans, evaluate networking software and recommend, then measure performance, and do fine tuning.

Our software environment includes VTAM, NCP, NCCF, TSO, MSNF, IIS, and CICS. Knowledge of SMP mandatory. Experience with TSO, CICS, NPDA, and/or MSNF desired. A 4-year degree in Computer Science is necessary, plus a minimum of 1 year as a Systems Programmer supporting a communications environment. Location: Corporate headquarters, Manchester, NH.

Analyst/Programmers

You will be working on varied and diverse projects. Requires BS/BA degree in Computer Science, Math, or Business Administration. COBOL essential. A minimum of one year experience with on-line systems is a must and some exposure to data base is helpful. Location: Corporate headquarters, Manchester, NH.



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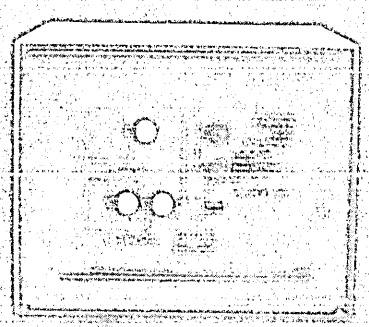
Bright Idea

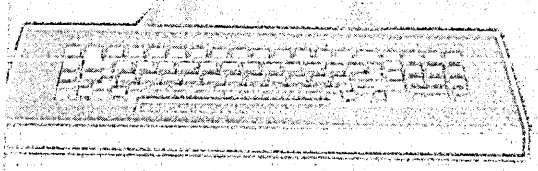
BATTERIES AND BULBS is just one of the many bright ideas developed by Alfred Bork and the staff of the Interactive Technology Center at UCI. This computer-based learning program makes extensive use of graphics to lead the student through an amplified investigation of electrical circuits using observations simulated on the computer. The computer dialogs for Batteries and Bulbs, as with other UCI-developed course material, is designed to work for students of all ages. Some build intuition, some add reasoning capability and some increase understanding of science.

The material was developed on a Tektronix 4051, a complete black and white graphic computer system that is compatible with DEC's PDP-11 series of minicomputers. The 4051 offers a high degree of interactivity, flexibility of display format (characters and graphics can be mixed and controlled independently) and animation capability. In fact, no other graphic computer system offers the combination of features that UCI found in the Tektronix 4051.

So, if you're in the market for bright ideas, we'll be happy to send you a list of the computer-based learning material available from UCI's Interactive Technology Center. Or, if you're investigating your own, we'll send you complete information on Tektronix graphic computer systems.

Dr. Alfred Bork, Director
Interactive Technology Center
University of California, Irvine





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cate an outstanding inventory of 2 million personal computers in a marketplace of 140 million. That computes to 1.5% penetration, well short of saturation.

But Phillips tells tales of visiting educational sites and finding Tandy's output gathering dust in a closet. It would appear that the life expectancy of a system decreases with the degree of unfamiliarity of those who use it. Schoolchildren are not renowned for lengthy attention spans. Whether a micro system is free or breaks a school's budget won't alter that fact of life.

Undaunted, Apple wants to plant as many seeds as possible.

"This program is very much in the Apple tradition," Hoar contends. "We hope the software companies and peripheral manufacturers make contributions as well. This should be a regenerative process for all of us. "Of course, we hope this makes us prominent. Our marketing people support it wholeheartedly. We think once a school has a personal computer, it's likely to buy more. And if they have an Apple, we hope they buy more Apples."

"The bill right now is not a major concern or priority for us," Commodore's Downing says. "It is an interesting idea. If it goes through, we'll figure out a way to take advantage of it. Getting conspicuous in schools is a high priority for us. We'll do whatever we can to increase our market share."

"We're watching it, " Radio Shack's Phillips says. "Our accountants have done some homework. If it happens, it happens. If it becomes the law of the land, we will participate. We won't be surprised."

They shouldn't be. After all, a Tandy or Commodore a day might taste just as good as an Apple.

—Willie Schatz

SUPER-MICROS: BIG HIT

Supermicro makers this year should ship systems valued at some $447 million worldwide.

There's no doubt but that the very portable Compass business computer introduced by Grid Systems Corp. was the hit of April's Office Automation Conference, held in San Francisco. More than just a black box with keyboard and display, the announcement was of a true system that included plans for a nationwide network by which software updates could be transmitted to users, as well as an integrated set of software packages and even networking at the local level that would provide access to internal databases.

The Compass, based on the ubiquitous 16-bit microprocessor chip, falls into a class of machines that have come to be called supermicrocomputers. Grid Systems happens to use the Intel 8086 chip, but others of this genre include the Motorola 68000 and Zilog Z8000. Harnessing the power of these processor chips to produce small desktop computers and workstations are more than 50 companies, including Intel itself, which last month announced a transaction processing system that incorporates software from Informatics Inc.

But in addition to the 16-bit processor chip, the other technological forces impelling the supermicro business include the 64K RAM memory chip, the small, low-priced Winchester disk drive and mini-floppy, the arithmetic processor chip such as Intel's 8087, which provides floating point and decimal arithmetic capability, and the appearance in recent months of new, lower priced peripherals.

"Taken together, you have what I call a supermicro that is a powerful 16-bit system with powerful peripherals that costs less than $15,000 and sits on your desk," says Omri Serlin, author of a new study on

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NEWS IN PERSPECTIVE

PROJECTED WORLDWIDE SUPERMICRO SHIPMENTS BY U.S. MANUFACTURERS (THOUSANDS OF UNITS)

	1982	1986
SHIPMENTS, U.S.	18	117.5
SHIPMENTS, WORLDWIDE	20	235
INSTALLED BASE, U.S.	18	375
INSTALLED BASE, WORLDWIDE	20	615

Source: ITOM International Co.

supermicros. These systems, he adds, "are going to take over a major share [of applications] now being handled by minicomputers, simply because they provide essentially identical capabilities at much lower price." He explains that it is for this reason that systems vendors such as Burroughs, NCR, and Savin have signed oem agreements with supermicro maker Convergent Technologies; they lack low-end products with the price/performance of these new systems and, accordingly, have gone to oem agreements as interim solutions.

"So, a major portion of the market is going to come out of the hides of the minicomputer makers," Serlin adds. "The other portion will be an expansion of the market to encompass those businesses that would have considered a minicomputer to be too expensive." A $50,000 price tag is beyond the range of these businesses, he explains, but at a price of $15,000 it begins to make economic sense.

Supermicros may erode the mini market because they provide almost identical capabilities at much lower price.

The analyst sees U.S. manufacturers of supermicros this year shipping systems valued at some $447 million worldwide, including hardware, software, media, and maintenance. In five years, at constant dollars, that's going up to $5.5 billion.

Serlin, a consultant in Los Altos, Calif., thinks the largest demand is in the office environment and among small businesses. This should come as no surprise to the people at Intel's commercial Microsystems Operation. Among its customers for the so-called 86/445 transaction processing system is Advanced Computer Systems Inc. of Dayton, Ohio, which is putting together a medical accounting system for use not only by large clinics but also an office with, say, three or four doctors. Another systems house, Data Retrieval, has in mind a system for legal offices, incorporating word processing with litigation and document management.

The capabilities of these computer systems is unquestioned, but the computer power of these 16-bit chips remains unanswered. People typically like to compare the power with a Digital Equipment PDP-11/45, some even claiming it approaches an 11/70 or even a VAX. But there is very little benchmarking being done, perhaps because the systems are only now reaching the point where the hardware and software play together. Serlin looks for some test results in the next six months, meanwhile content in the knowledge that if one is really reaching the power of an 11/45, it is being done at a price of perhaps one fifth that of the DEC machine.

As viewed by Serlin, computers in the 1970s were grouped by size, starting with minis on the bottom, then medium- and large-scale mainframes, and on top the supercomputers. "Nobody is talking about medium-scale computers anymore," he asserts. "You have minis, you have superminis, mainframes, and dataflow machines instead of supercomputers." And he sees a third transformation taking place.

"Ten years from now I don't think you'll even talk about minis versus mainframes. What you're going to be talking about are ad hoc-based designs versus MPU-based designs." Serlin explains that the vast majority of machines will be based on processor chips available as off-the-shelf components from semiconductor manufacturers. And then there will be computers designed for a specific architecture and implemented with bit-slice processors or logic circuits; these will tend to be higher performance machines, those that need whatever tweaking is possible in order to achieve that speed.

Because of this, he adds, there will be little incentive to build a new computer from scratch "when all you have to do is pay Motorola $40 and get a chip that does the job of a whole board full of components."

But more significantly, says Serlin, "one of the nice outcomes of that would be what I call the automatic standardization of software. If everybody is building machines based on the same chip, or very few chips, then you automatically have a large base of machines that are basically executing the same instruction set. As a consequence, they can run the same software."

Some of that, of course, can be seen today. There exists a gaggle of applications programs that run under the highly popular CP/M operating system out of Digital Research. That popularity stems primarily from the fact that CP/M runs on the Intel 8080 microprocessor and the Zilog Z80, which is upwardly compatible with the

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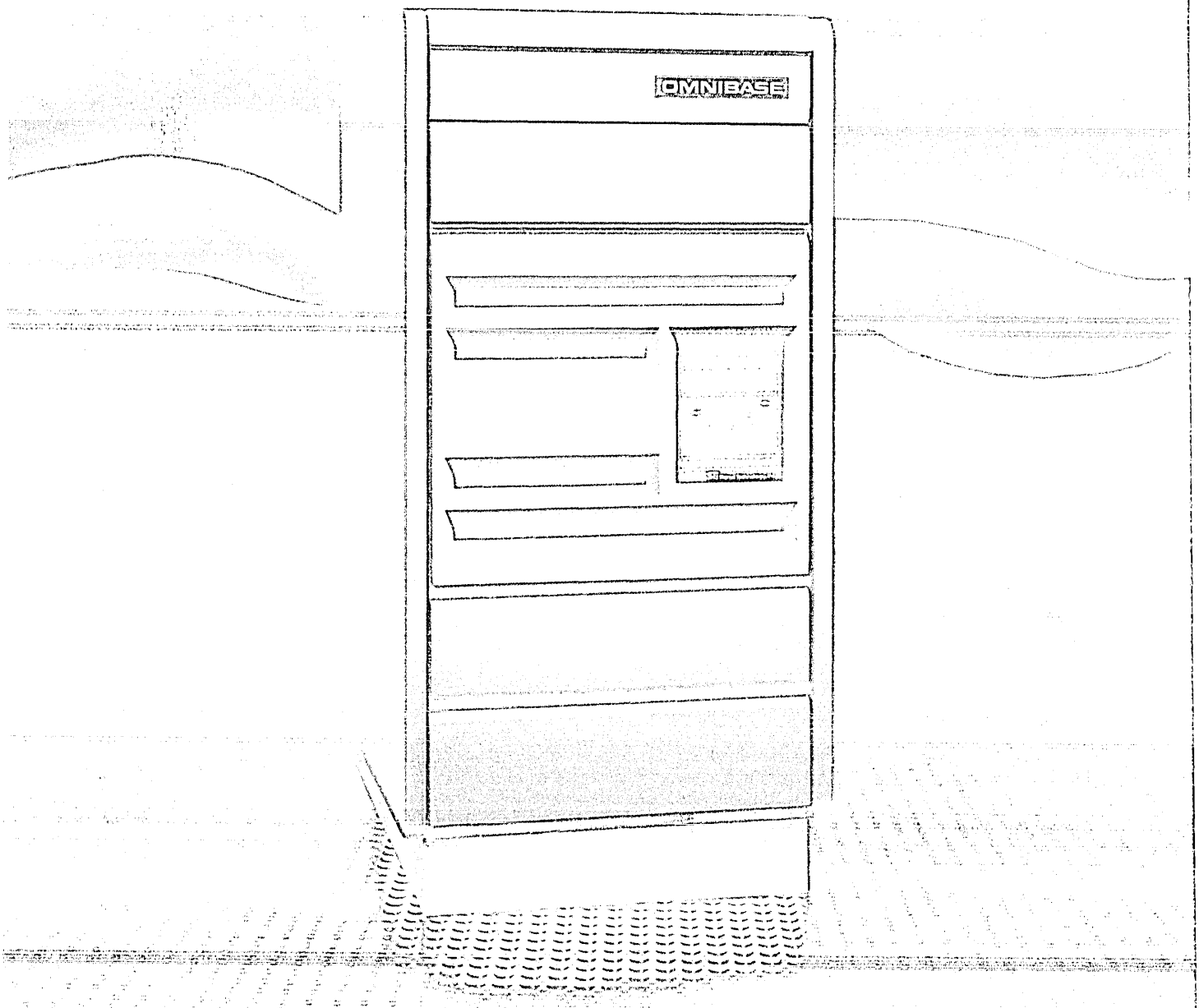

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8080, and those two chips dominate the 8-bit world. Some of this uniformity is also being anticipated with 16-bit processors.

"As a consequence of this," says Serlin, "what I'm looking for 10 years from now, say, is a slew of MPU-based machines that essentially will run the same operating system. And that's very important because that also gives the third-party software people a tremendous incentive to develop software, independent of the manufacturers." The consultant is also quick to acknowledge, however, that there will continue to be ad hoc hardware designs with proprietary operating systems.

Indeed, a study last year by Computer Technology Consulting of Los Altos Hills, Calif., indicates that many systems houses, showing no interest in standardizing on one or a few operating systems, are instead choosing to develop their own. But Serlin sees this as merely a short-term solution whereby people are trying to get that last ounce of performance out of a machine. He says, "As chips become more powerful, I think this will become less of an issue and people will be more willing to buy the advantages of common software."

This move toward a common operating system, he adds, "will, by far, be the major result of this supermicro revolution—something people have been searching for, obviously." He says software portability has been a big issue, something scholars write papers on. "And here it's occurring almost as an offhand, accidental result of what's happening in the semiconductor industry."

—Edward K. Yasaki

COMMUNICATIONS

RING THE BELL

The comment period on the proposed settlement of the AT&T/Justice antitrust suit has ended. Now it's up to Judge Greene.

Finally, everyone has had his say. The Justice Department. AT&T. Those who would ring Bell's bell. The rate makers, the butchers, the bakers, and the candlestick makers. When the comment period closed on the Justice Department's proposed antitrust suit settlement with AT&T, there was an audible sigh of relief in Washington.

Then the parties gathered their collective breaths and waited for the next word. And there was no promise, verbal or oral, that those spoken or written by U.S. District Court Judge Harold Greene would be the last. Estimates of when Greene would deliver his ultimate verdict vary widely, but the consensus is that any time before July would be a miracle of modern jurisprudence.

It might take the distinguished jurist that long to plow through the mountain of comments he and the Justice Deaprtment (to which they were supposed to be sent) received on the proposed settlement. More than 150 arrived on April 20, the final day for those who wanted to get their two cents or 2,000 words in.

The FCC urged that the operating companies be allowed to offer terminal equipment, intercity services, and enhanced computer-based information.

The comments covered the emotional spectrum, from disgruntled AT&T stockholders ("I no longer feel safe with my excellent blue chip investment which was supposed to have been a rock of Gibraltar in my retirement years"; "You are taking the world's finest telephone system and splitting it up in the name of 'competition.' What a crock!") to predictable complaints and laments by competitors and their trade groups. The National Association of Regulatory Utility Commissioners (NARUC) said the settlement "is actually anticompetitive because it would not prevent significant anticompetitive behavior by AT&T." The Computer and Communications Industry Association (CCIA) argued that the settlement fails "to remedy the anticompetitive effects of the vertical integration of AT&T's Long Lines Department and its wholly owned subsidiary, Western Electric Company." CCIA suggested structural safeguards in the form of "complete and permanent divestiture of AT&T's service groups—Long Lines and the Bell Operating Companies [BOCs] from one another, and from AT&T's manufacturing arm, Western Electric."

The most weighty federal agency comments were those of the Federal Communications Commission. The FCC urged that the BOCs be permitted to offer terminal equipment, intercity services, and enhanced computer-based information. It called the settlement's restrictions on the BOCs "unnecessary and unwise" and said they should be lifted to allow the divested concerns to compete in almost all areas of the telecommunications industry.

The BOCs undoubtedly would sell their souls for that freedom. AT&T would offer double to keep them chained.

"Anybody who thinks AT&T wants these restrictions lifted is crazy," says a source with knowledge of Bell's planning documents. "AT&T considers having the BOCs in the equipment and service fields as antithetical to its long-term interest. Their worst-case scenario is to have Greene allow the BOCs into those fields. They want those guys out of those businesses.

"AT&T won't have to worry about the BOCs as it stands now. There's a natural monopoly in intrastate service. Regulation can be left to the states. It's a clean break. You can bet they'll dig in on this one."

The phone company may resist on other modifications to the decree. So may Justice, for entirely different reasons. Or they both may fall head over heels with whatever Greene concocts, call it a day, and keep their August vacation plans.

And Jimmy Carter may run for President in 1984.

Greene has already indicated that he "may"—read "will"—hold further hearings before determining if the settlement meets the mandatory "public interest" standard. These probably will involve expert input on two particularly difficult and sensitive issues: what the BOCs can and can't do and how much they're worth.

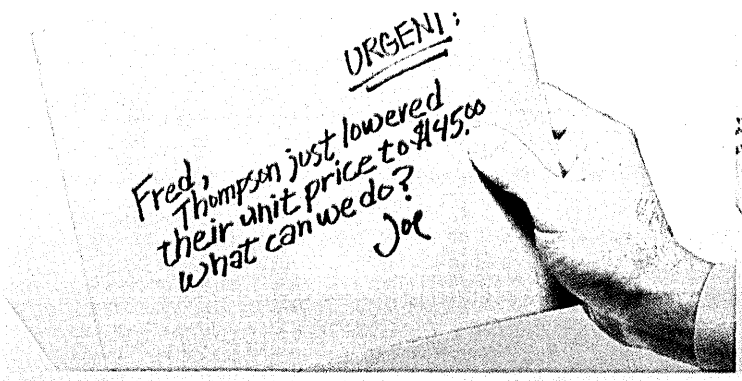
"The valuation problem is tremendous," says an attorney representing a major competing trade association., "The BOCs could get really screwed. [AT&T chairman] Charlie Brown said it would cost the company $5.8 billion in taxes if H.R. 5158 [the telecommunications bill that Bell is fighting with a $2 million lobbying offensive] went through. That may be duplicitous, because I think it's the same under the settlement. But they've got to arrive at some equitable algorithm for the valuation of the BOCs. Otherwise 195 [Broadway, AT&T's headquarters] will screw the seven dwarfs [the new BOC consolidations]. The operating companies will be dogs."

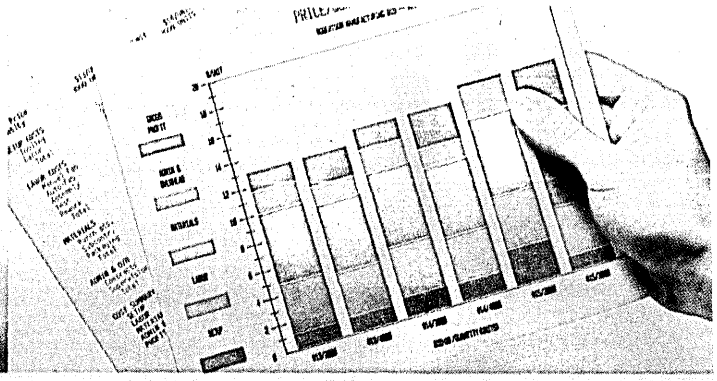
Not necessarily. Judge Greene's hands may be tied in a legal Gordian knot. There is a school of thought that holds that the Tunney Act, the law that prescribes the

The BOCs undoubtedly would sell their souls for that freedom. AT&T would offer double to keep them chained.

method for judicial review of a proposed consent decree, allows a judge to approve or disapprove it but does not permit him to rewrite it. He may suggest changes, but the terms are strictly up to the parties. If that philosophy were to prevail—and Greene's actions indicate he is not a believer—the judge's taking of further testimony would be fruitless. Gerald Connell, lead attorney for Justice in the case, said federal law provides for the disapproval of a consent decree only where Justice can be positively shown to have "given away" its case. Not even the most ardent antiBell advocate would buy that.

Another class is in session, however. This one proffers the theory that under a judge's inherent equitable powers—those derived from the "natural" or "moral" precepts of society as opposed to the body





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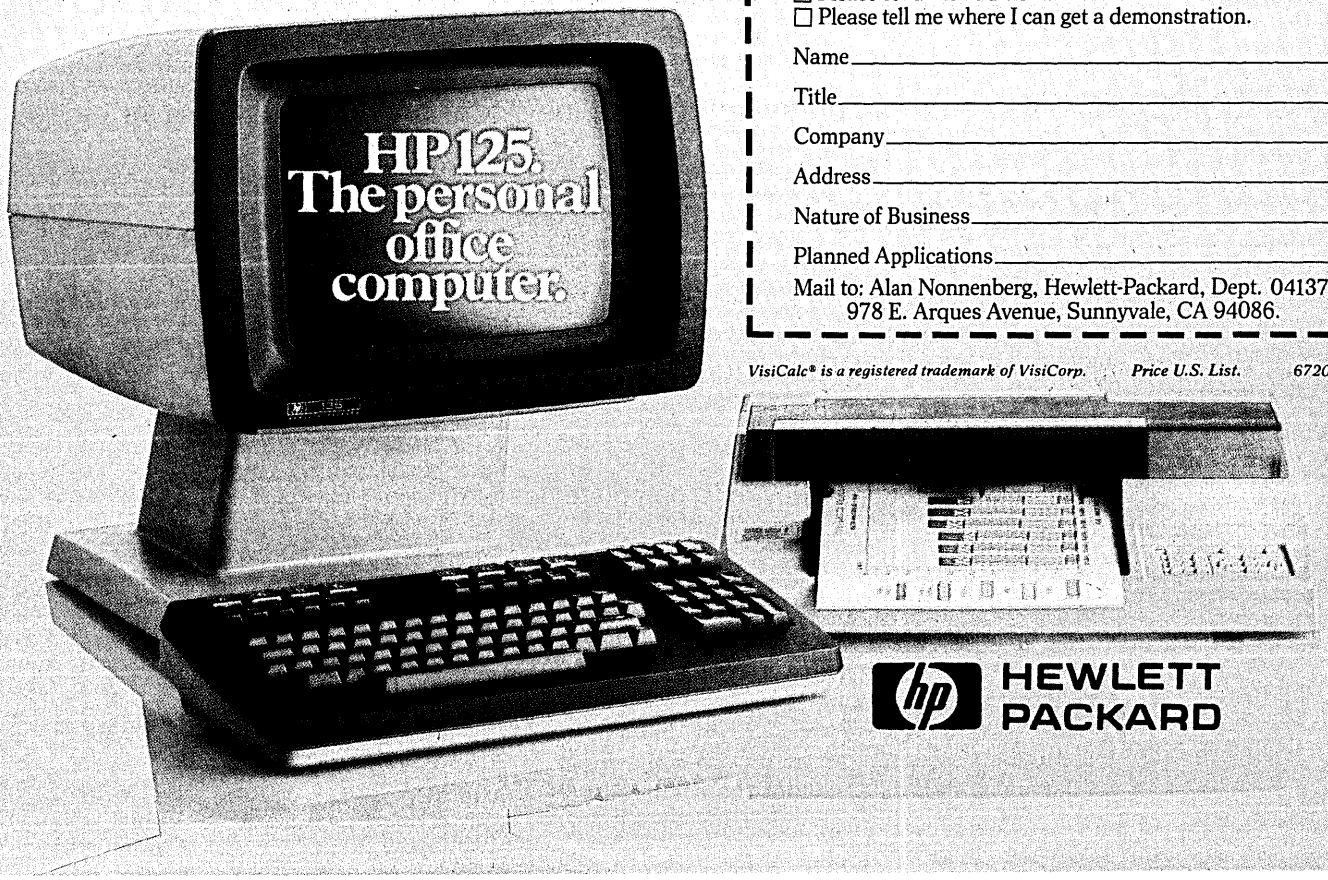

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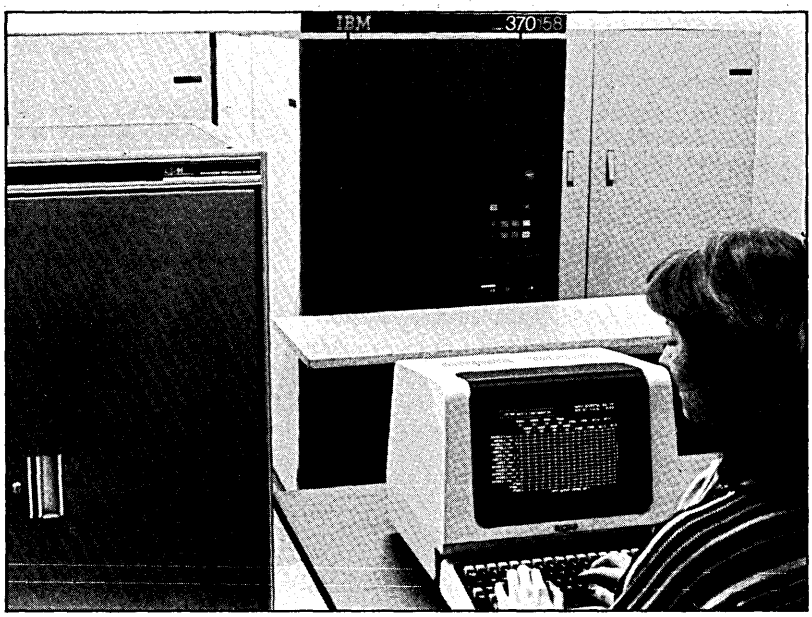

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of statutes comprising the "law"—he can do any damn thing he pleases. Thus, even if Greene were technically bound by the Tunney Act, which is also not clear, he could require further testimony and convene hearings until he is satisfied that's all there is and there is no more. This play lasts until fall before the first act closes. Then, with all disgruntled parties appealing, it continues until autumn 1983 before the curtain falls.

"There's no question he's going to have to get help," the attorney says. "If this is determined to be a straight Tunney proceeding, then he can accept it or not in the public interest. If it's not, his equitable powers may allow more latitude. But then AT&T may mandamus [a writ that would force him to do what the law says he must] him to accept or reject it. I think he'll run afoul of Justice if he messes around with Tunney. They seem to be playing by a sort of gentlemen's rules, which I think gives him the wherewithal to call in special masters or anyone else he needs to help him. I think everybody's going to get two shots at this.

"Greene's going to jawbone them out of scrutiny of the press. He has to fend off the Carrs and Baxters. He won't shrink from doing what he has to do."

"I think Greene's going to jawbone them out of scrutiny of the press. He has to fend off the Carrs [Ronald Carr, Deputy Assistant Attorney General for Antitrust] and Baxters [William Baxter, Assistant Attorney General for Antitrust]. Greene won't shrink from doing what he has to."

If that requires reopening the trial, bet the wife and kids the judge will do so. If it means wrapping it up as is, Greene will do that as well. But playing it as it lays is considered extremely unlikely by all sources. There are sure to be substantive changes involving the powers of the BOCs, the publishing of Yellow Pages, and access to patents. A separation of Long Lines, as presently provided for in H.R. 5158, is possible but not likely. A separation of Western Electric is even more remote.

If the parties had it their way, they'd call a truce now and go home. Freeing the BOCs is anathema to AT&T; altering the decree in any substantial manner is equally distasteful to Justice.

"These guys absolutely don't want to go back to trial," a source says. "That may be Greene's ultimate weapon in getting them to agree to what he suggests. Any modification, politically speaking, is better for Justice than going back to trial.

"One thing is an absolute lock. No matter what Greene does, somebody will appeal it."

Isn't this where we came in?

—Willie Schatz

MANUFACTURING

CAD MEETS CAM

Sperry Univac has bolstered its CAD/CAM arsenal with a mainframe-based general-purpose system.

Sperry Univac says it is removing the slash from CAD/CAM with what it claims is a system that joins design and manufacturing processes with a central database. Based on its 1100 series of mainframes and V77 minis, the Unis*CAD package is the latest product in Univac's attempt to broaden its coverage of the manufacturing sector, a target industry it is banking on heavily for future growth.

Unis*CAD is hoped to appeal to large manufacturing concerns that have seen the benefits of mini-based, turnkey CAD/CAM systems but are tired of having to worry about moving data between incompatible design and manufacturing systems, according to Charles R. Williams, vice president of the firm's Americas Division. "We are trying to address the entire process of designing and manufacturing products. This will save money, shorten lead times, and reduce labor in manufacturing."

Univac is counting on gaining considerable market share in manufacturing computer systems, a market it sees as one of the biggest growth sectors in the next few years. The firm has a strong customer base in manufacturing and has committed more than $100 million in development funds since announcing the original Unis products in 1975. Some 1,200 persons within the Blue Bell, Pa.-based firm are serving the marketplace and 33 special marketing units have been set up to sell systems.

He claims the efforts so far have paid off with a tripling of domestic manufacturing sales in the past five years. He notes that the manufacturing segment of the U.S. economy is anticipated to grow at an annual rate of 9% through 1986, but Univac itself is committed to a target of boosting its manufacturing sales by 20% a year within the same period. With sales slated to double every five years, Williams says, Univac by 1986 will achieve about 30% of its domestic sales from the manufacturing market. If all goes as planned, that should lead to the firm controlling a 20% market share in four years' time.

Manufacturing is the main one of seven market segments Univac has set its sights on as it has become clear to the company that it, like its traditional mainframe rivals, cannot hope to sell all things to all people. The other segments are distribution, airlines, energy, public agencies, communications, and financial. Clearly, in the current depressed domestic economy, manufacturing systems show great potential to help manufacturers increase productivity and reduce costs. Univac hopes to benefit.

The firm's plans center on the Unis line of products, which range from a series of planning, scheduling, and control software systems to the latest Unis*CAD system. They will evolve over the coming months to provide what Univac thinks is a unique approach to CAD/CAM.

Unis*CAD's main attribute is its use of a mainframe to maintain a single central database that as many as 256 interactive graphics terminals can share. It is the firm's belief, and that of several CAD/CAM observers, that such a centralized approach will enhance the overall design-to-manufacturing process by using the "geometry" of parts as a common thread holding together different phases of the process. In other words, once a desired part has been defined to the computer by an engineer, its specifications dictate subsequent actions and events, both in engineering and manufacturing departments.

The Univac approach is aimed at competing head on with distributed multivendor systems that have been the norm for so long, says one Univac official. "Our package provides a consistent personality to the user and is therefore easier to learn and use," says Williams.

The V77 minicomputers handle design, drafting, numerical control interaction, and mesh generation, it was explained. Univac has devised interfaces for Megatek and Adage graphics terminals, which themselves perform computing in the process of manipulating images on their screens. This leaves the mainframe—an 1100/60 or bigger—to handle a common parts description database, other Unis modules, and whatever additional tasks a user needs to run. For example, the mainframe could be programmed to handle finite element model analysis, Univac said at the Unis*CAD introduction in New York. Interfaces to such large modeling programs as the popular NASTRAN will be available, the firm noted.

The company claims to have tripled domestic manufacturing systems sales in the past five years.

Post processors, designed to produce program tapes for machine tools, are the final stage of Unis*CAD. Several leading tool manufacturers are working with Univac to develop such processors. In addition, Univac has provided interfaces for

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CIRCLE 88 ON READER CARD

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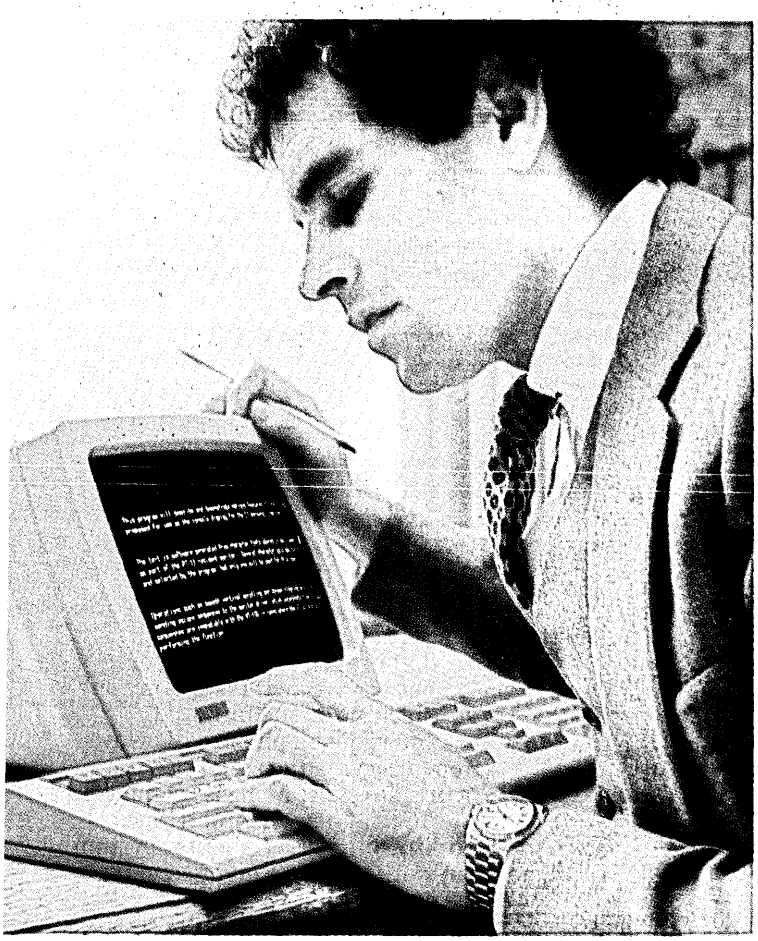

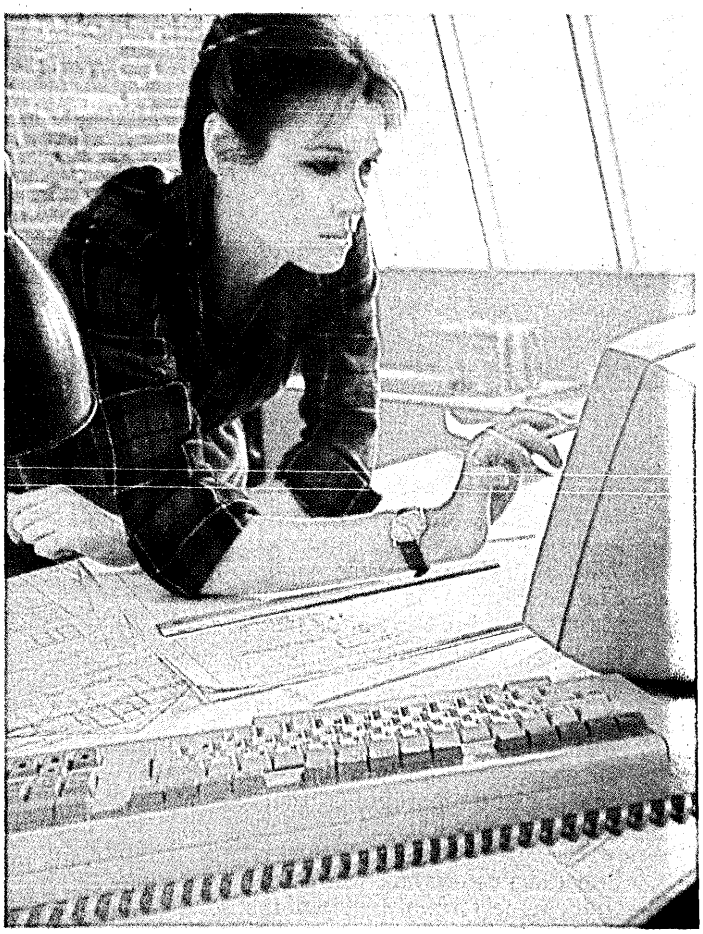

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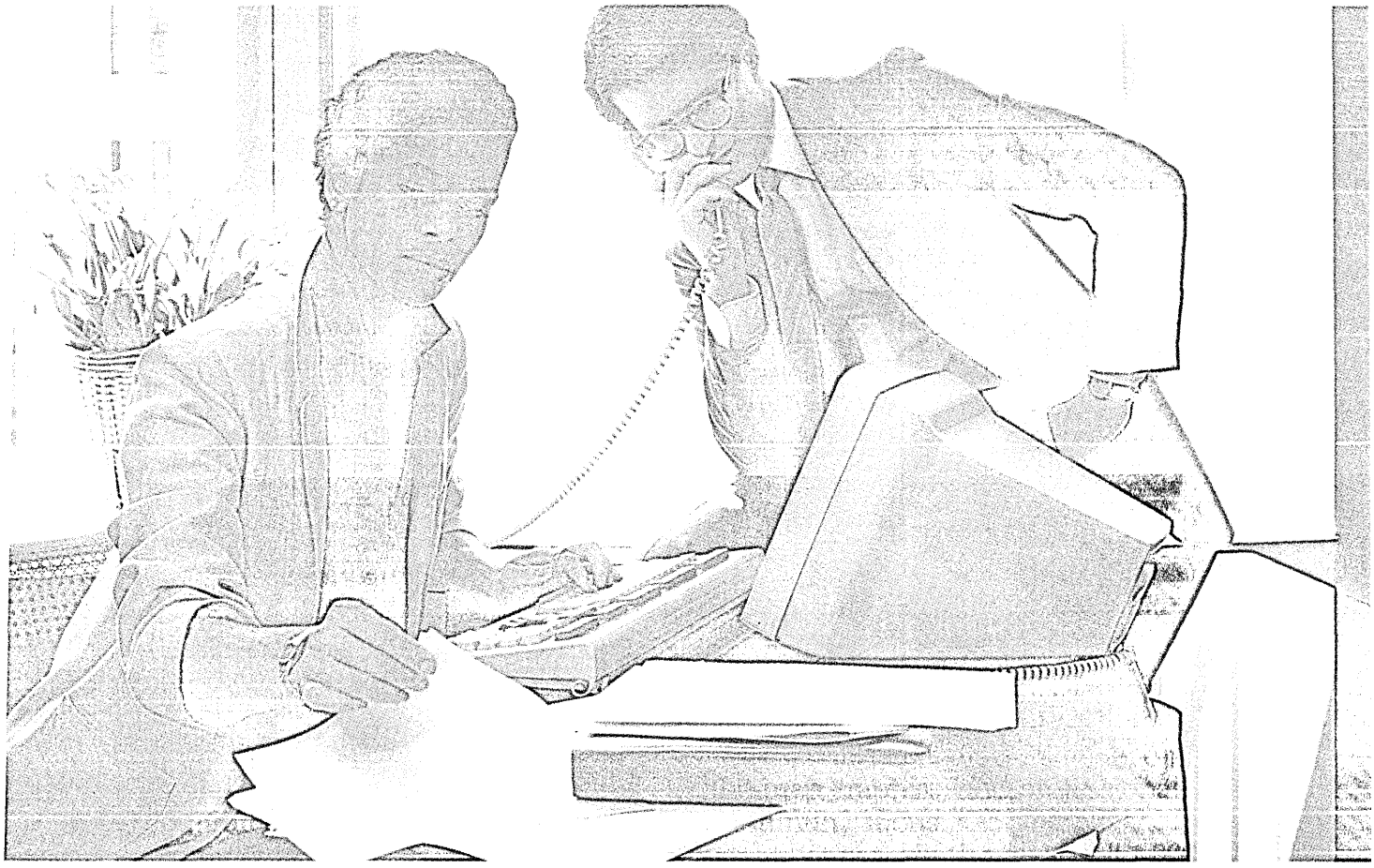

menus, prompts, and help commands.

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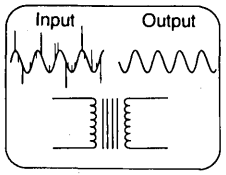
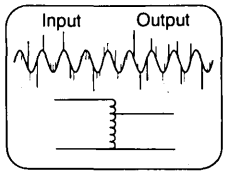
WHY ISOLATE?

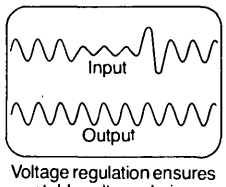


Line-to-load isolation shields computer from sharp, destructive voltage spikes.

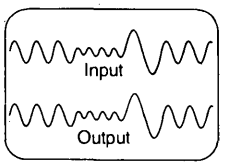


Without isolation computer is exposed to spikes even when power is supplied by voltage regulator.

WHY REGULATE?



Voltage regulation ensures stable voltage during brown-outs or voltage surges.



Without regulation, voltages sag and surge even when power is supplied by isolation transformer.

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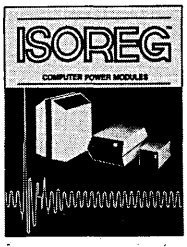

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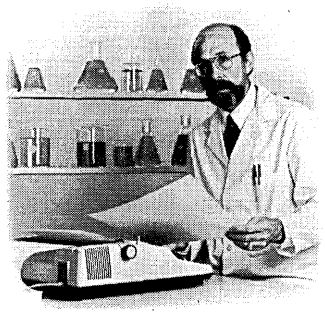

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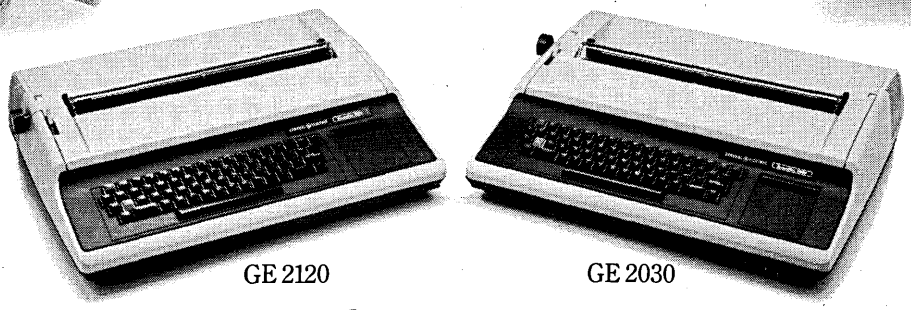

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GENERAL ELECTRIC

CIRCLE 91 ON READER CARD

Unis*CAD to work in conjunction with other Unis modules so that an integrated system is available to whatever degree the user desires. Unis*CAD can be used on a stand-alone basis or with as many Unis modules as are needed.

Univac's J.J. Murphy, director of the Americas Division's Manufacturing Industry Center, said the price of a typical Unis*CAD workstation will be in the $105,000 range, making it competitive with minicomputer-based systems and delivering advantages obtainable only from a mainframe.

Univac boldly suggests that current estimates of the CAD/CAM market showing a $5.8 billion market by 1986 are undervalued by at least $1 billion. That extra increment will come from mainframe-based, integrated systems such as Unis*CAD, which have so far escaped the projections of most analysts, Univac claims.

Three releases of Unis*CAD are currently scheduled: the first, available now, provides basic design, drafting, and numerical control facilities; the second, scheduled for later this year, will feature hybrid geometric modeling; and the third release will offer engineering analysis, macro capability, and bill-of-materials input to other Unis modules. No release date was given for the latter.

Meanwhile, Univac said it is planning additional Unis products for introduction in coming months, and Unis*CAD is the first of these. With that family in place, it will venture into a market where only an estimated 4% of productivity-hungry manufacturing firms in the U.S. are using CAD/CAM at all. How it will fare, only time will tell. But it would seem Univac has its work cut out for it.

—John W. Verity

MINICOMPUTERS

AETNA MARCHES AHEAD

The insurance company plans to install some 300 agency systems by the end of the year.

Despite what appears to be a slow start in marketing, Aetna Life & Casualty says it is moving firmly ahead in its bold plan to sell as much as $70 million worth of IBM Series/1 minicomputers to independent insurance agents. The Hartford, Conn., company claims it had installed 110 systems by early May and has begun efforts to tie agents' machines into the home office's mainframe computers.

Aetna's plan to install a total of 1,400 small computers by the end of 1984 is an attempt to boost sales of insurance policies and, as one top data processing official in the company puts it, "increase our influence over the market." Perhaps never before has a scheme to sell so many computers been in actuality such a directed effort to generate additional sales of another product. In this case that product is insurance, and Aetna is hoping its machines will make it easier for agents to find more business for themselves and easier to do business with Aetna. The company says it is just breaking even on the Series/1 sales and will find its payback in increased future underwriting.

Aetna is not alone in its quest, of course. Several other very large insurance companies—State Farm Mutual, Commercial Union, and Fireman's Fund, among others—are also banking on selling computers to agents in expectation of future profits. Additionally, a host of noninsurance companies, large and small, are marketing computers to agents who deal in what all would agree is a highly information-intensive business. The competition between the various marketeers is fierce, although estimates of the total number of independent insurance agents range as high as 65,000. Many of those, however, are small, one-man shops and are not prospective users of the systems Aetna and its kin are selling.

Marketing of Aetna's Gemini system began last year after pilot testing of seven systems installed at agent sites. The company is currently shipping "20-plus systems a month," according to Jim Bradley, assistant vice president in charge of the project. Last June, however, Wall Street insurance industry analysts heard Irv Sitkin, an Aetna vp and top dp official, say that shipments this year would be "between 35 and 45 systems a month." But during the month of April 1982, Aetna installed only about eight systems, according to figures supplied by Gemini officials. The company explained that the reason the rate looked so slow was that those shipments were for orders taken in January, when business was indeed much slower.

The firm's goal is to have "more than 300 systems" installed by the end of the year, according to Bradley. As of early last month officials said they expected to meet that goal.

With its 110 systems installed, Aetna is thought to be well along, compared to some of its competitors. Fireman's Fund, for instance, in late March disclosed plans to install some 700 Series/1 machines but has only a single pilot system installed. Bruce Isbell, president of a wholly owned subsidiary that will develop and market the Fireman's Fund agency system, said production deliveries of the system will begin in September. With a package selling in the $45,000 range, a potential market of some 18,000 to 20,000 agencies is being eyed by Fireman's Fund, says Isbell.

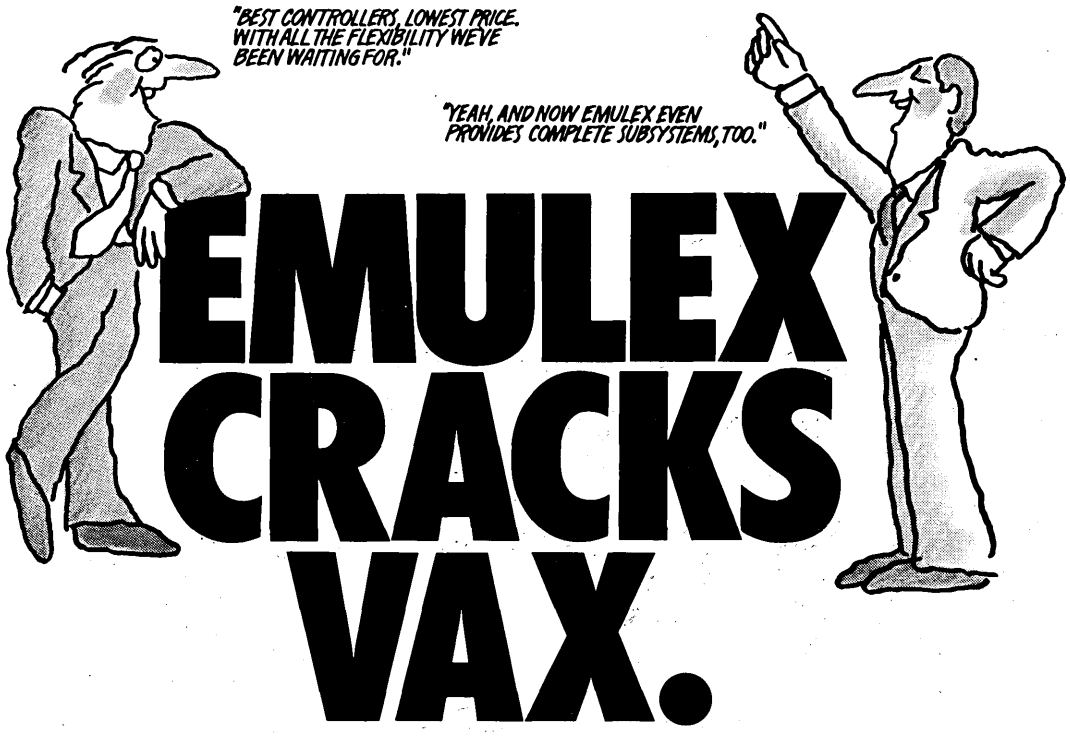
It came as little surprise to industry observers when Aetna disclosed it would use the IBM Series/1 minicomputer for its Gemini project. The company is known to be one of the most true-blue IBM shops around. (Aetna does run some Amdahl equipment, too, though.) And it is a partner with IBM in Satellite Business Systems. In April 1981, the company said it had ordered more than 1,000 Series/1 machines with a value of up to $70 million. It was thought to be the largest single order of Series/1 equipment since the machine was introduced in 1976 as IBM's first true minicomputer.

Aetna says it chose the Series/1 as the result of a lengthy evaluation of some 50 insurance agency software packages which narrowed down to one offered by McCracken Computer Inc. of Lexington, Mass. That package was written in a language called PXL which ran with its own operating system, PXS, which in turn ran under the Series/1's EDX executive. The choice of the McCracken package implied the use of the Series/1, according to Bradley, who adds that an independent Aetna software group also evaluated the PXL/EDX combination and found it compatible with the project's needs.

Aetna is up against several competitors, including other insurance firms and a host of systems builders.

One of the most pressing needs for Aetna was getting to market quickly, says Bradley. Before Aetna introduced Gemini publicly, Commercial Union and others had already introduced Series/1-based systems. Aetna's marketing window wasn't threatening to close in the very near future, but there was a requirement to get a system to market quickly and reliably, he recalls. "We had a choice between developing software from scratch or buying a package that was already out there," he says. "We decided to buy the McCracken package and modify it."

The Series/1 seemed to fit the requirements for the heavy communications that will be required when the agency systems are connected on-line to Aetna branch offices either through 8100 processors or small 4300s, comments Jeffry A. Alperin, assistant vice president of the firm's Information Systems Support group, which helped in evaluating the final choice of hardware and software. "We knew we would have to communicate with our own systems and disparate ones at other underwriters," he notes. "Communication networks today have a conglomeration of protocols. Aetna today has more than 9,000 terminals installed and expects to have



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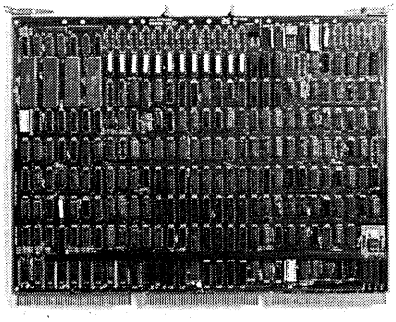

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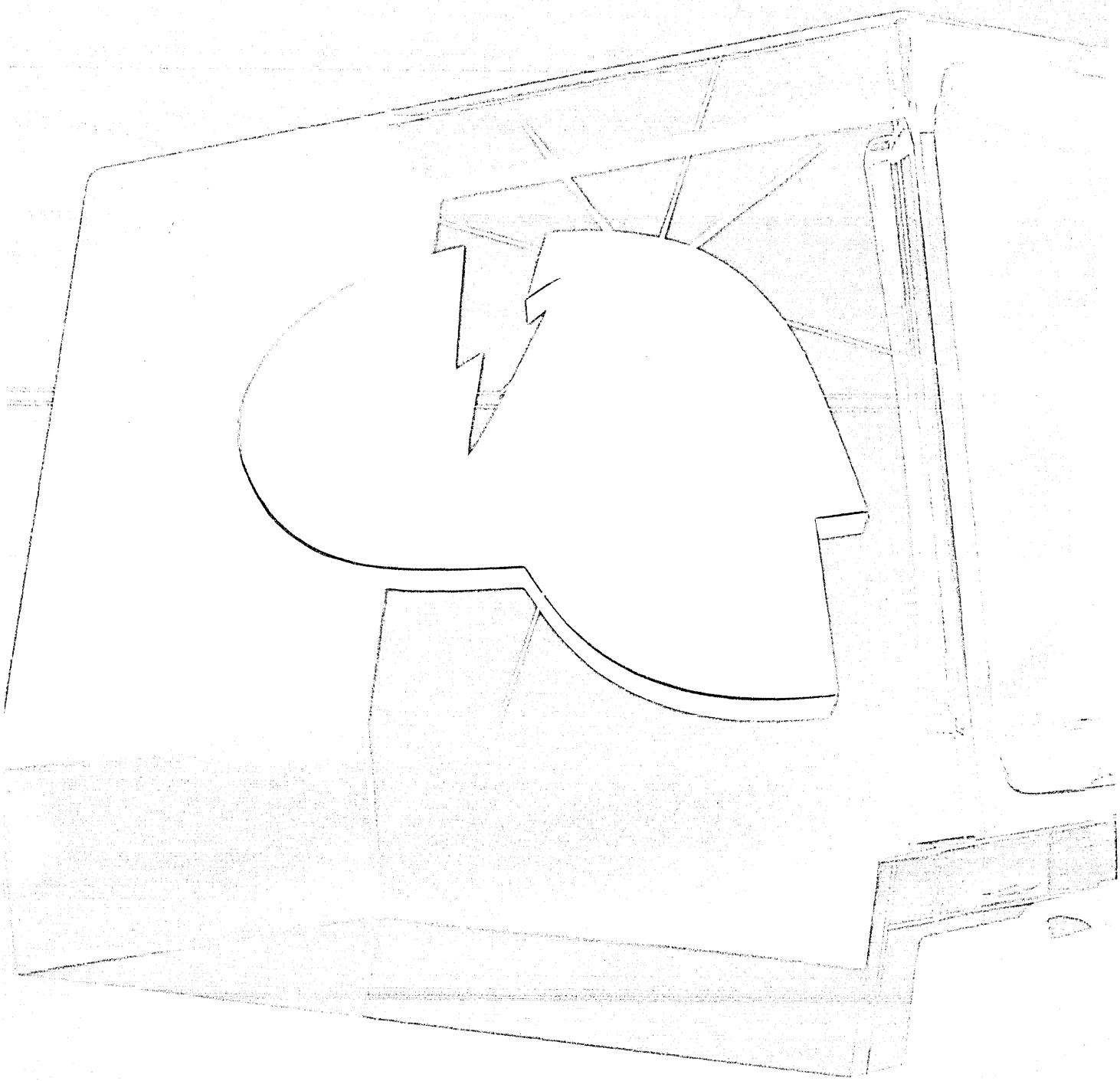

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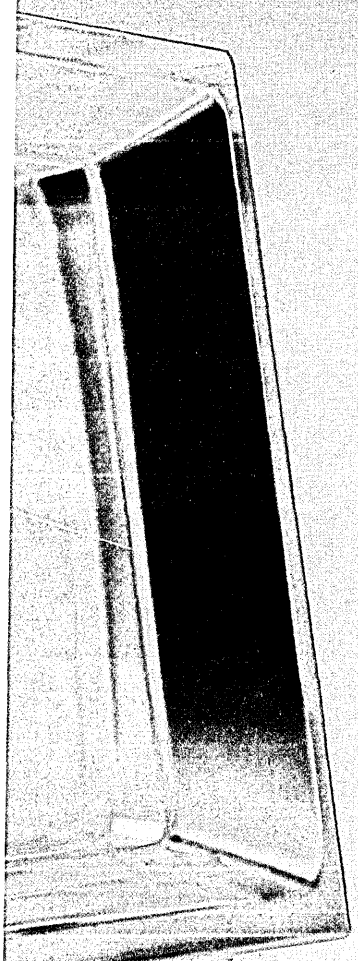

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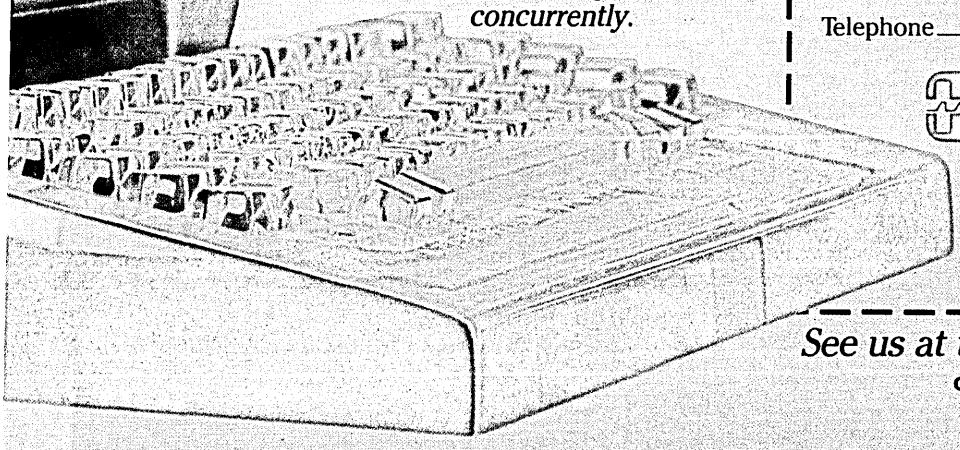

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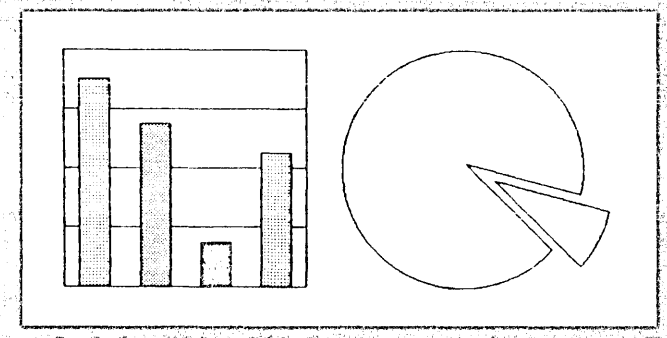

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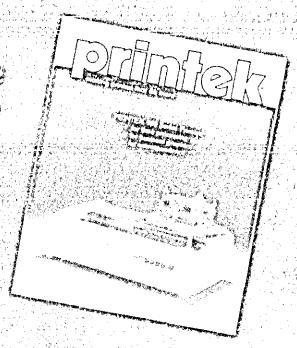

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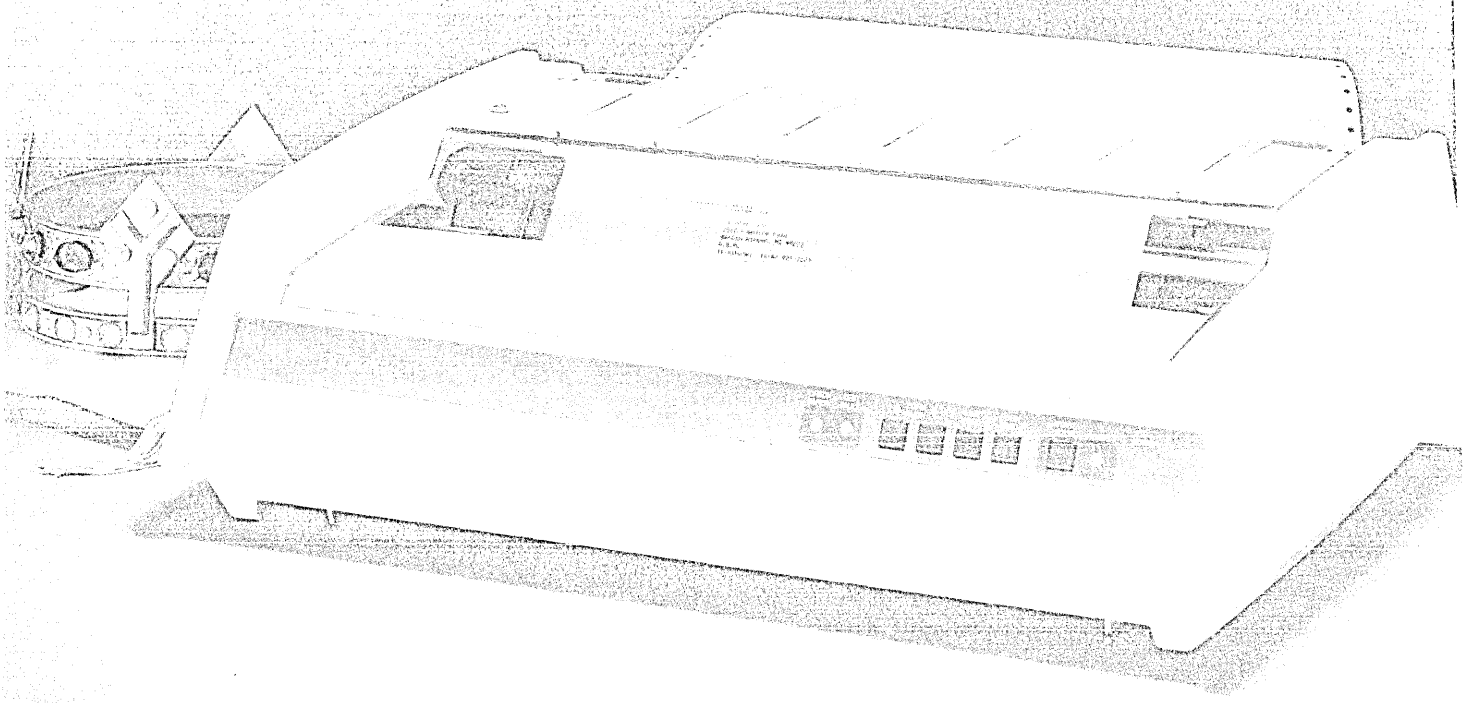

CIRCLE 54 ON READER CARD

25,000 by 1985, not including those hooked onto Gemini systems. Gemini would add 5,000 to 10,000 more."

Aetna is a heavy user of IBM's SNA, so the Series/1 seemed a good choice for distributed processors since it has been designed with SNA in mind right from the beginning, says Alperin. "Communications in and out of the processor were perceived as very rich. We can do SNA, X.25, bisync and async."

When first put on the model 4952 Series/1 processor, the McCracken package ran into problems, recalls Bradley. He says the firm then opted for the larger 4955 processor, which has been shown to be able to handle local processing as well as the communications burden required for interfacing back to home office mainframes.

The company had some doubts about using a package written in PXL, since it was peculiar to the Series/1 and would hinder efforts to move applications to another machine of a different architecture. After being reassured by IBM and investigating the matter further, Aetna went ahead with its project based on EDX. In fact, Aetna has become one of EDX's most important users, according to industry sources. The firm knew EDX was not as functionally rich as the other main Series/1 operating system, RPS, but it would enable applications to be put on the system more quickly. So, Aetna chose to stay with EDX and to try to influence IBM in its development of the operating system.

C.R. "Bob" Aumann, EDX product planner at IBM's Systems Product division in Boca Raton, Fla., says Aetna "has proposed well over 50 EDX enhancements to IBM, some of which have been accepted and some of which have not."

Sources say Aetna has pushed IBM hard in recent months to provide more RAS (reliability, availability, serviceability) features to EDX because it wants to make the operating system hardier in the field. Aetna, after all, is itself maintaining the software on all the Gemini systems it installs and has been very sensitive to EDX bugs and shortcomings as its customer base grows into the hundreds. Aetna is said to have confronted IBM openly at a recent Miami meeting of Common, the IBM small users group, concerning what it thinks is an inordinate number of program temporary fixes (PTFs) made to EDX. Obviously displeased, IBM officials at the meeting countered that Aetna has had its fair share of influence on the evolution of EDX, sources claim.

Asked about the Miami meeting, Joe Thornton said he was unaware of such a confrontation at the Common Series/1 futures session. Aetna representatives, he said, had expressed some concern that the next scheduled Common meeting would be devoted primarily to presentations by IBM, leaving little time for users to express their views.

Like Aetna, Fireman's Fund has chosen to use the EDX operating system on its Series/1 systems, but it will write its applications in a different manner. Using EDL, an EDX-specific language, applications will be driven by a database management package acquired from Tominy, Inc., an Ohio software firm that specializes in Series/1 programming tools, according to Fireman's Fund vice president Isbell. He noted that his group had looked into the PXS package Aetna is using and the RPS and CPS operating systems IBM offers before deciding upon EDX.

"We were satisfied that it would operate in a commercial environment," he recalls. "We found that there are a large number of licensed users running EDX in commercial applications. So far we haven't encountered any problems."

IBM officials confirm that EDX's success in commercial applications came as a surprise to the company, which had expected such programs to be written under RPS. That operating system has been designed to resemble a mainframe OS in its functionality and is seen by many users as more stable than EDX. RPS, however, requires more work on the user's part during system generation and many Series/1 users have opted for the more productive EDX.

—John W. Verity

DATA CENTERS

ODE TO A SUCCESS STORY

Leader of a state dp center weathered controversy to build what has become a model for multivendor shops.

Ten years ago, when legislators of the state of California elected to consolidate state data processing activities in what was to become the Teale Data Center, they launched a stormy equipment procurement controversy (March 1974, p.122) that was to last for almost five years.

"It was vendor against vendor, state agency against state agency, and sometimes agencies against vendors and vice versa," recalls one center employee.

Through it all, center director Ira B. Isbell managed to keep the center both going and growing until his death in May 1981. And now, center employees and other state officials, who are proud of the fact that the center is serving more than 90 state departments and is considered "the data center leader in state government," are honoring Isbell with formation of the Ira B. Isbell Memorial Fund, a nonprofit corporation to provide funds for college students studying data processing. The $20,000 scholarship fund will be made available to California state employees and their immediate families, said David R. Lema, Isbell's successor as Teale Center director.

"Much of the success of the Teale Data Center was the result of the leadership provided by Ira B. Isbell," said Sandy Keeton, Isbell's long time secretary and an acting trustee for the memorial fund.

Isbell worked for the state for 35 years. Before heading up the Teale Center, he headed the state's Department of Motor Vehicles' (DMV) EDP Service Division.

The Teale center is a multivendor shop. Isbell's often stated philosophy on new technology was to be near the front of the pack but not to be the first one to install new software or new equipment.

Isbell fully supported the state's policy of competitively procuring hardware and software, said Jim Wilson, chief deputy director of the center. "Within the framework of IBM architecture, the TDC has installed equipment from 15 major PCMs and software from 25 different vendors. Isbell was successful in turning the potential pitfalls of a multivendor shop into a positive atmosphere of healthy competition between the installed vendors. The center remains a model for successful multivendor shops."

By 1980, the center was using an Amdahl 470/V8, an IBM 3033, and an IBM 370/168-3AP as the main sources of computing power. The center also by this time was providing access to two IBM 4341s operating in duplex and dedicated to timesharing services, with some 1,000 terminals in operation.

In 1979, Isbell initiated action to acquire a second facility for the TDC. This was prompted by legislative approval for the State Department of Finance to implement statewide a standardized California Fiscal Information System (CFIS) to be run at the TDC and by concern that the data processing files and service for so many critical state processes were housed in one facility.

Startup of the second facility, named the Isbell Computing Facility of the Teale Data Center, was in June 1981, one month following Isbell's death. This facility currently has an Amdahl 470/V5 and an IBM 370/168-3UP operating in duplex and an IBM 4341 dedicated to system testing.

"The success story of the TDC also is a success story for the California state departments that utilize it, and for the taxpayers of the state who are enjoying the benefits of effective, low cost data processing," said Wilson.

Donations to the Ira B. Isbell Memorial Fund can be made by contacting the Sacramento Savings & Loan Assn., P.O. Box 872, Sacramento, CA 95804.

—Edith Myers

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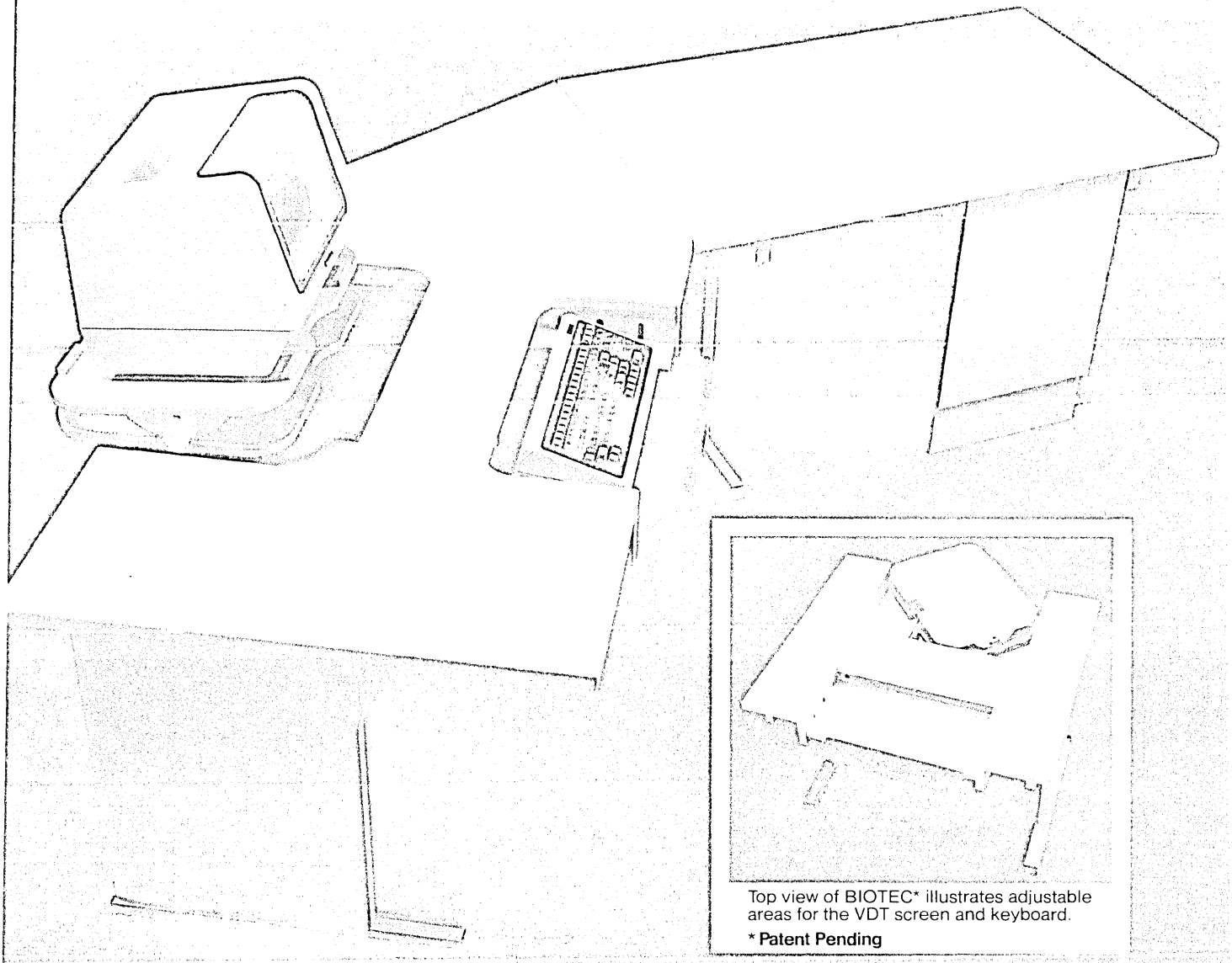

Top view of BIOTEC* illustrates adjustable areas for the VDT screen and keyboard.

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SIMULTANEOUS DUAL TASK OPERATION	✓	✓	✓		✓
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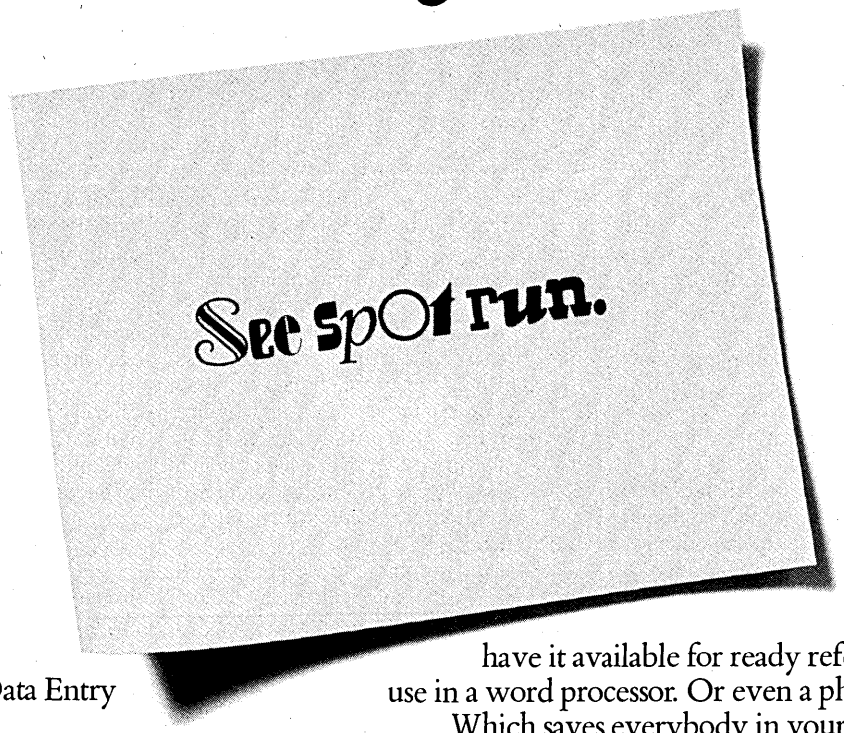

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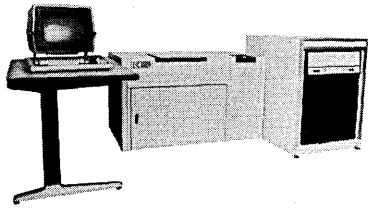

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NEWS IN PERSPECTIVE

BENCHMARKS

OUT: One of computerdom's most flashy characters has lost his company. Charlie Lecht, the self-styled computing guru, has left—with more than a little pushing—the company he founded, Advanced Computer Techniques Corp., New York, to "pursue a career of public speaking, lecturing, and writing about the computer and communications industries." He has been replaced as president by Oscar Schachter, who was executive vice president, secretary, and general counsel. Replacing Lecht as chairman is Darrol J. Stanley, a director who is vice president of Birr Wilson & Co., the firm's investment banker. Lecht remains the company's largest stockholder but has even been replaced on the company board by another man from Birr Wilson, Edward C. Fisch. A spokesman said Lecht would continue to assist the company but would have no day-to-day responsibilities.

DEPARTURE: Telecommunications user groups can no longer operate in a vacuum. Instead, they must interact with the needs of the environment around them. These are the views of Walter Heide, director of telecommunications at McGraw Hill and president of the International Communications Association (ICA). Heide envisions a certification program for telecommunications managers similar to the CDP process for dp professionals. In addition, he advocates interaction between user groups that might eventually lead to a confederation of communications organizations similar in structure to AFIPS. He would include regularly scheduled contacts with international user groups as well as domestic associations concerned with such areas such as word processing, which are becoming increasingly important to telecommunications professionals. Last but not least, Heide favors expanding ICA membership to encompass smaller companies eager to learn about telecommunications management. For an organization restricted to companies with an annual phone bill of at least $1 million, a move to embrace members from smaller businesses would be a dramatic departure. But Heide sees a critical need to advance the professional aspects of telecom managers.

SOCIALIZED: A year after the French government said it would nationalize most industries, an agreement was reached for Honeywell to reduce its stake in Cii-Honeywell Bull to 19.9% from 47%. Compagnie des Machines Bull, majority shareholder in Cii-HB, will purchase 27.1% of Cii-HB stock held by Honeywell for $150 million, according to spokesmen in Minneapolis. Honeywell said the agreement calls for a 10-year technical and commercial association between the U.S. and Cii-HB. It will cover continued distribution arrangements of each others' products, technology exchanges, and cooperative developments. At the French end, observers noted that the proposed deal would give Cii-HB more latitude in product delveopment marketing but place more of the financial burden on French shoulders. It was not clear at press time how the new government will structure its nationalized computer/communications companies, which include Thomson/CSF, Compagnie General d'Electricite, Matra, and Cii-HB. Some Cii-HB officials have been heard to speak of producing IBM-compatible hardware and teaming up with Japanese makers.

RED INK: Profits continued to plunge at Datapoint Corp. in San Antonio, where the firm disclosed that a loss would be shown for the quarter ended April 30. Chief executive Harold O'Kelley blamed the loss on adverse business conditions and the "reversal" of a large amount of sales recorded in that and previous quarters. In some cases, officials said, the firm had to go as far as repossessing equipment from customers who hadn't paid for it.

Datapoint has also tightened its credit policies in an effort to stem the losses. The loss comes on the heels of several belt-tightening moves by the maker of distributed processing equipment, including the layoff of some 250 field marketing personnel and the shutting down of certain sales offices. Also instituted were a wage freeze, the shutdown of a plant in Waco, Texas, and a cutback in activities at a Berkeley, Calif., development center.

NO GO: ADAPSO, the computing services trade organization, decided not to sue IBM over the latter's reentry into the computing services arena after a nine-year absence. ADAPSO officials had privately discussed suing the industry leader over what it thought could possibly be proven as violation of IBM's 1956 Consent Decree with the Justice Department.

Citing an unfavorable political climate in Washington and other factors, ADAPSO opted to not pursue a stand that would have called for IBM to market computing services from an arms-length subsidiary. Members of the trade organization noted that the group's relationship with IBM has eased recently and indicated they thought more could be gained through channels other than a direct court confrontation. ADAPSO members are worried, of course, that IBM will use its tremendous hardware market share to gain an unfair advantage in selling services.

MANAGEMENT RESISTANCE: Continental Telephone Corp. bought into Management Assistance Corp. in late April, upping its stock holdings to 14.5%. "Totally unacceptable," declared MAI's board, judging the moves an unfriendly takeover attempt. "Further purchases [of MAI stock] would not be in the best interests of shareholders or employees," said Raymond P. Kurshan, chairman and president of MAI. Continental said it might acquire more stock in order to gain equity accounting treatment but was reported to have called MAI's charges of takeover "preposterous." Continental, nevertheless, is the single largest shareholder of MAI and has slowly been building up its interest since early this year, when it purchased 7.58% of the outstanding MAI common. That share was boosted to 12.13% in April.

MAI, which makes small business computers under the Basic Four name and services a wide range of other manufacturer's machines, would seem a likely candidate for takeover since its Sorbus service area is one of the strongest third-party maintenance organizations around. MAI's stock has slid in recent months from a high of $18 to about $9 a share. It vowed to fight a takeover attempt.

NEW POST: Dataproducts Corp. in Woodland Hills, Calif., has a new chief executive officer to replace Graham Tyson. The man is Charles A. Dickinson, who actually isn't so new since he was already president of the printer maker, which has seen profits sag in recent months.

Tyson, 59, will retain his post as chairman. In the first nine months of its current fiscal year, the firm's earnings declined to $5.7 million, down from $12.6 million a year ago.

RENAMED: Entering its 21st year with a new name, Informatics General Corp., the erstwhile Informatics Inc., Woodland Hills, Calif., was looking for NYSE listing (it had been OTC) this month under the symbol IG. The big software company was also looking for more business from hardware, including possibly an oem arrangement with IBM. Chairman and president Walter Bauer told shareholders at the firm's annual meeting that the name change was made because the term Informatics was becoming generic for information science. "It's in Webster's dictionary," he said, "and we're trying to get it removed. We own the name in the U.S." He also said he sees computer services firms jumping into hardware sales "with both feet." He said Informatics' hardware sales accounted for 1% of sales in 1980 and went to 5% in 1981. He looks for this to grow to 15% to 20% in five years. "The hardware will come through us. The hardware manufacturers will look to software and service firms to get them into various industry niches." He hinted that his company, which already oems Wang computers and has an Ontel microcomputer in its Informaticom workstation offering, could be offering IBM personal computers soon. Informatics General has an acquired software package for insurance agents which runs on these. ✻

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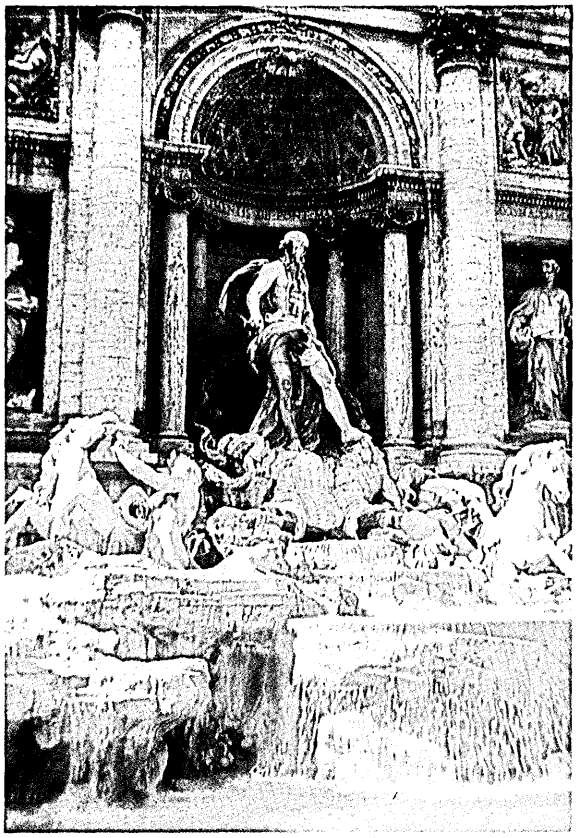

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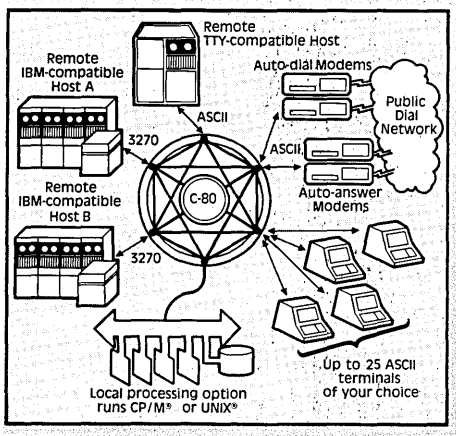

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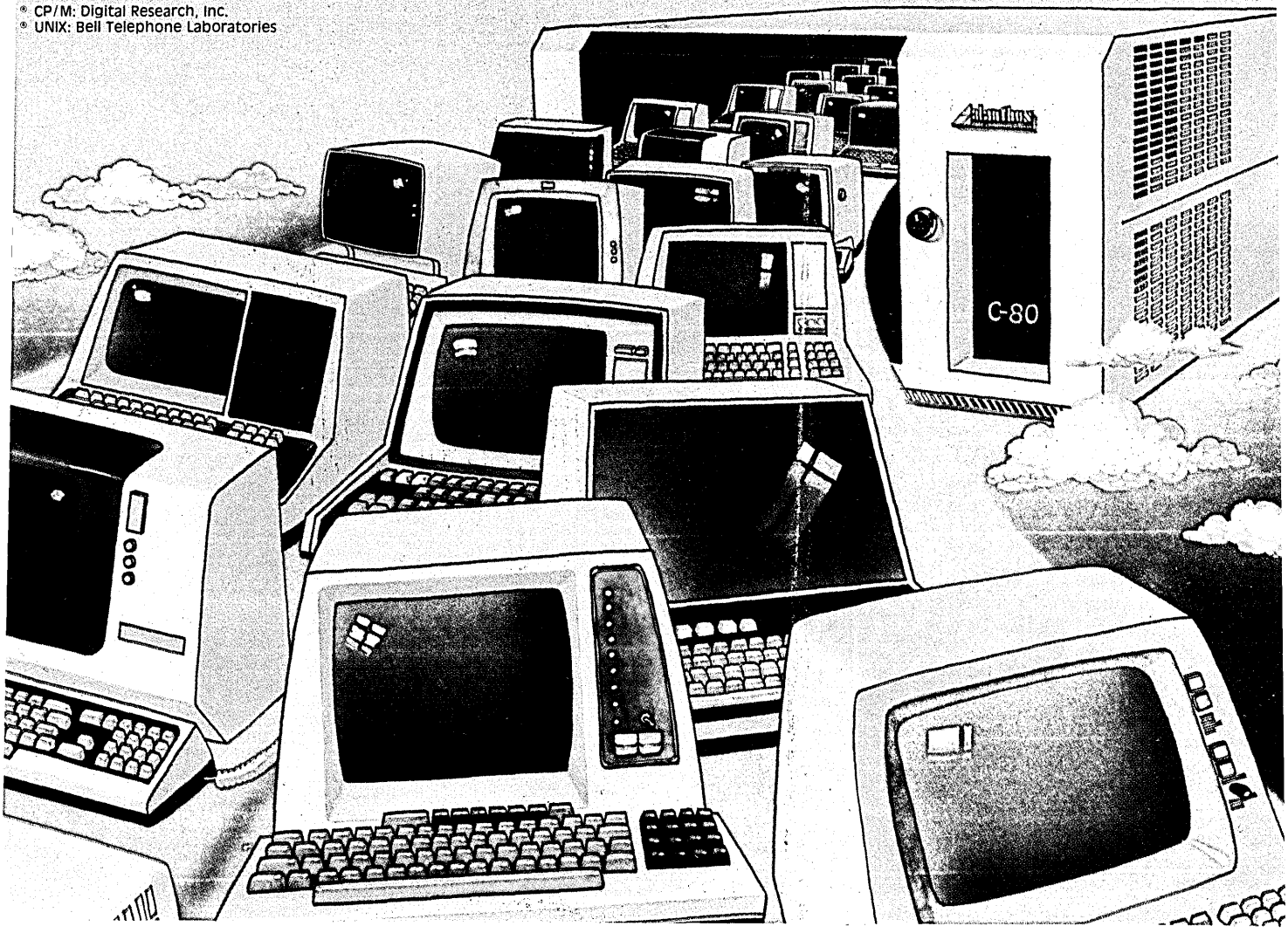

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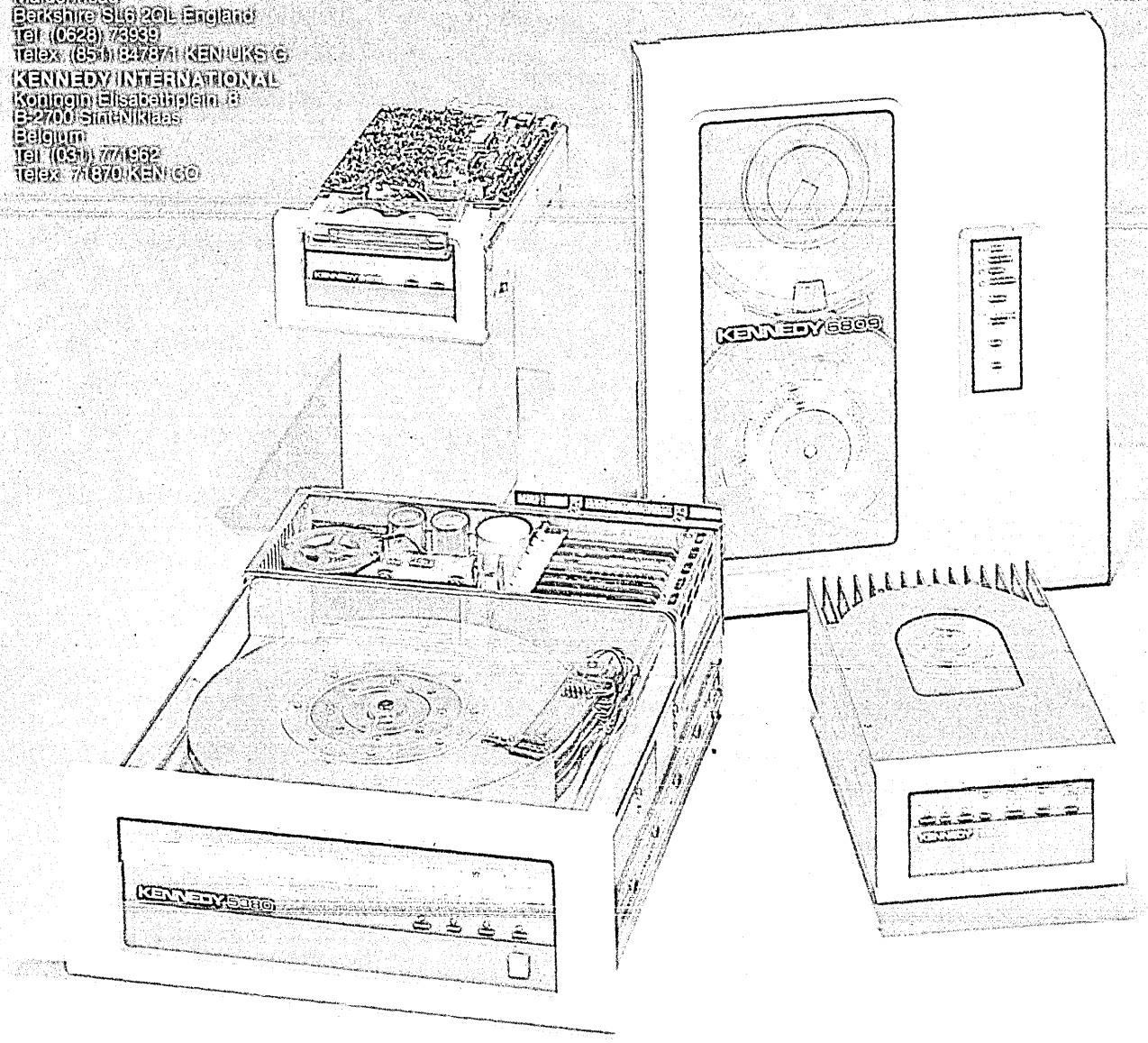

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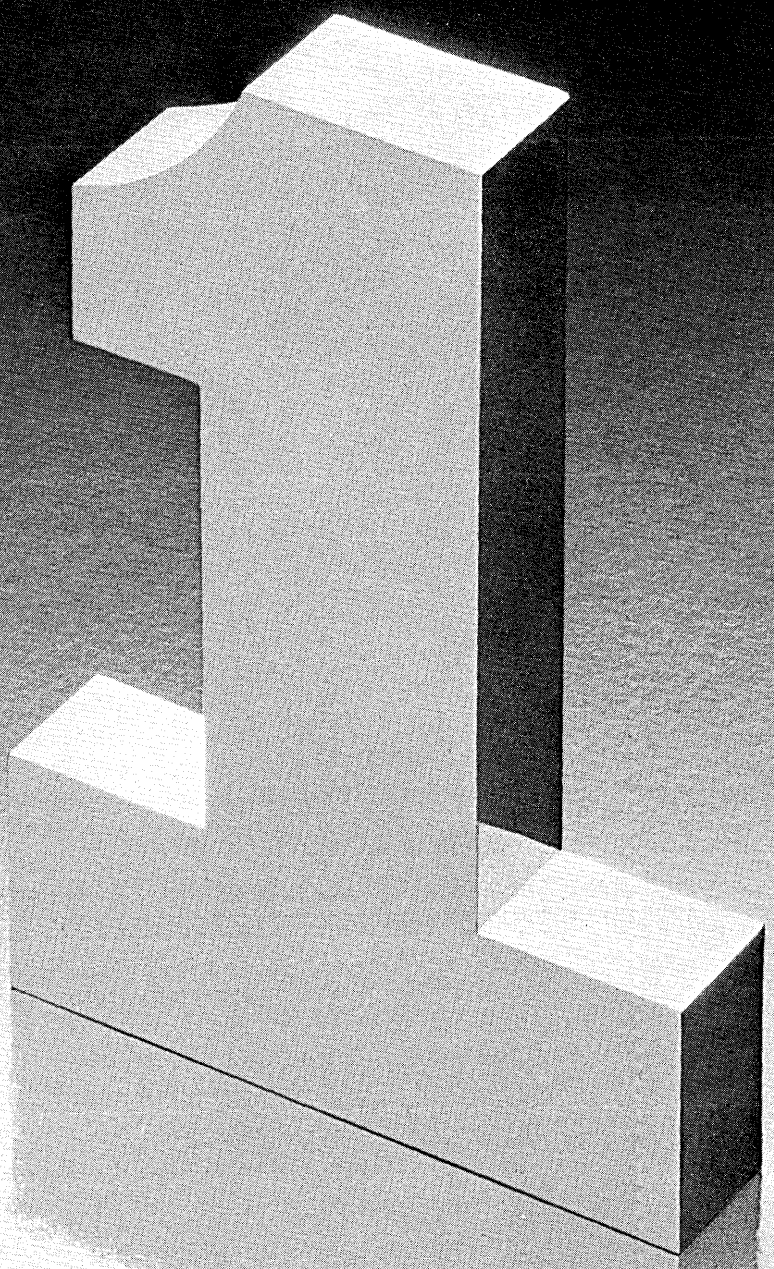

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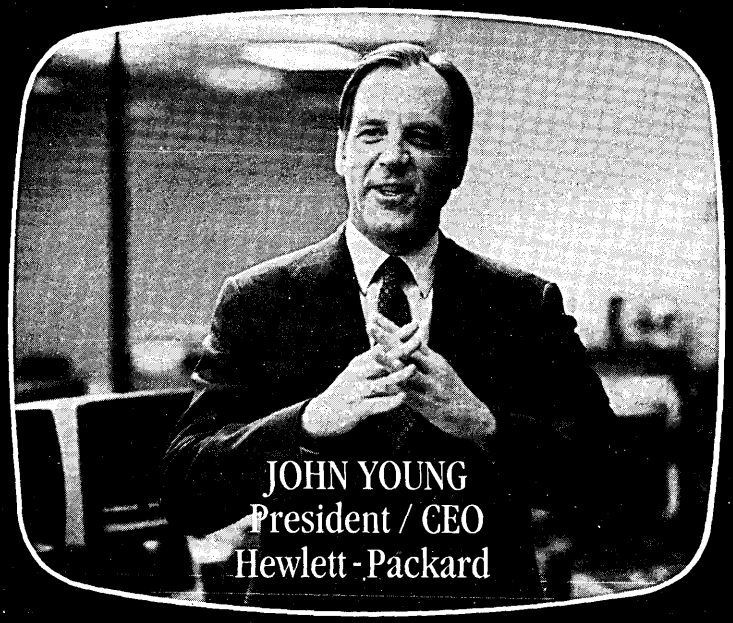

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"Business Week is the mainstay of our print advertising campaign."

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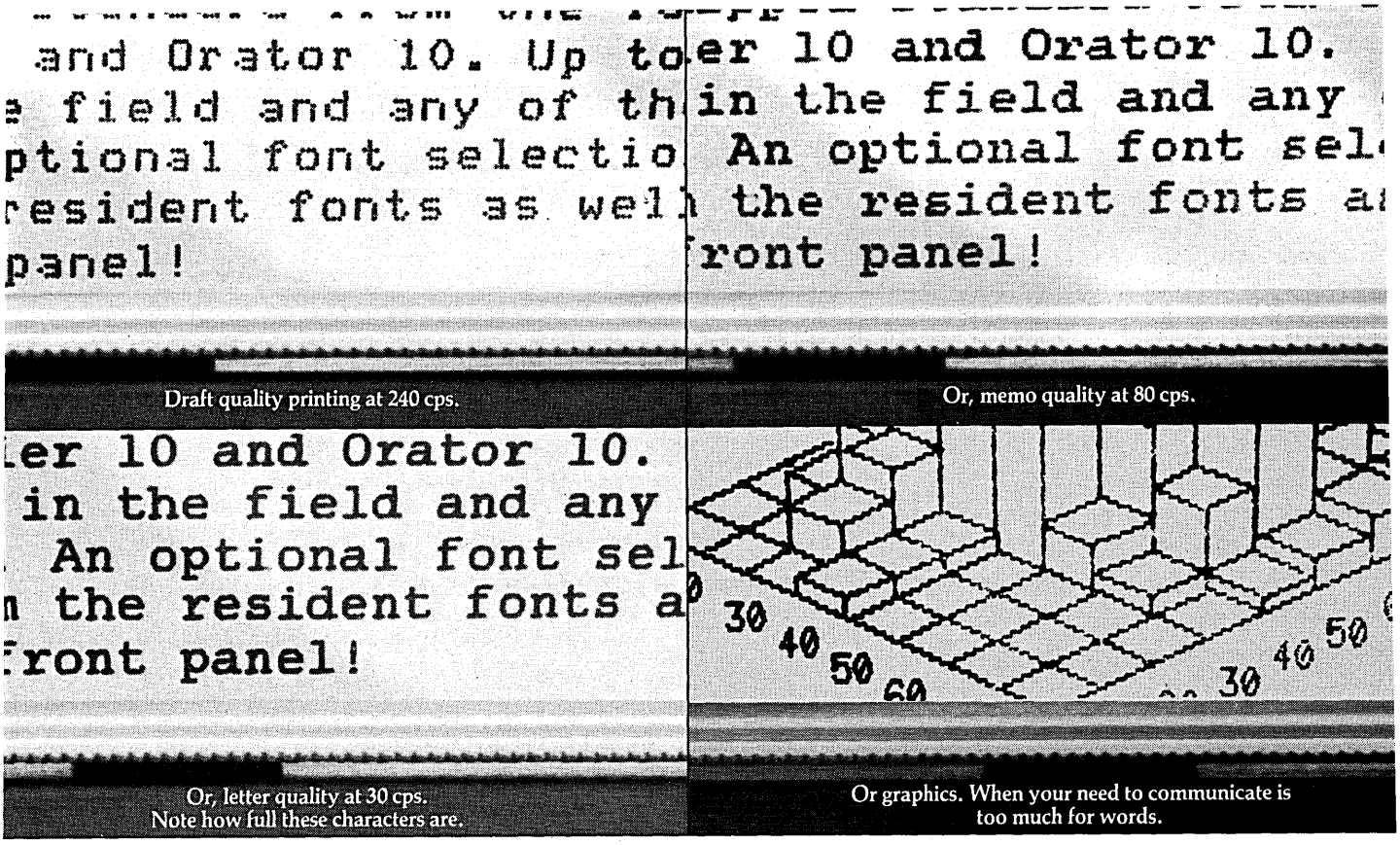

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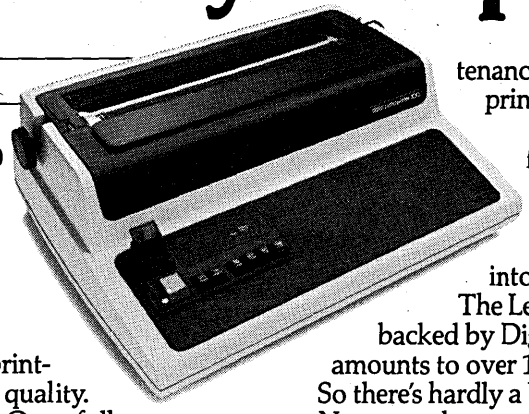
The Letterprinter 100.



Digital's new Letterprinter 100 gives you the versatility of four separate printers in one printer. Yet it costs the same as many ordinary single-purpose printers.

Let's look closer. Push two buttons and you can switch printing speeds. From 30 cps letter quality. To 240 characters per second. Or to full bit map graphics. Even to an optional memo quality 80 cps.

You can not only choose speeds automatically. You can choose typefaces. Up to five different ones all by pushing a button. Or on command from the host computer.

But here's something really remarkable. All of this versatility sits on a desk. Thus the Letterprinter 100 is not only very versatile, you can put it nearly anywhere.

And it requires none of the preventative maintenance that many traditional printers require.

Which makes it the perfect printer for people who use printers. And the perfect printer for people like OEMs who build printers into bigger systems.

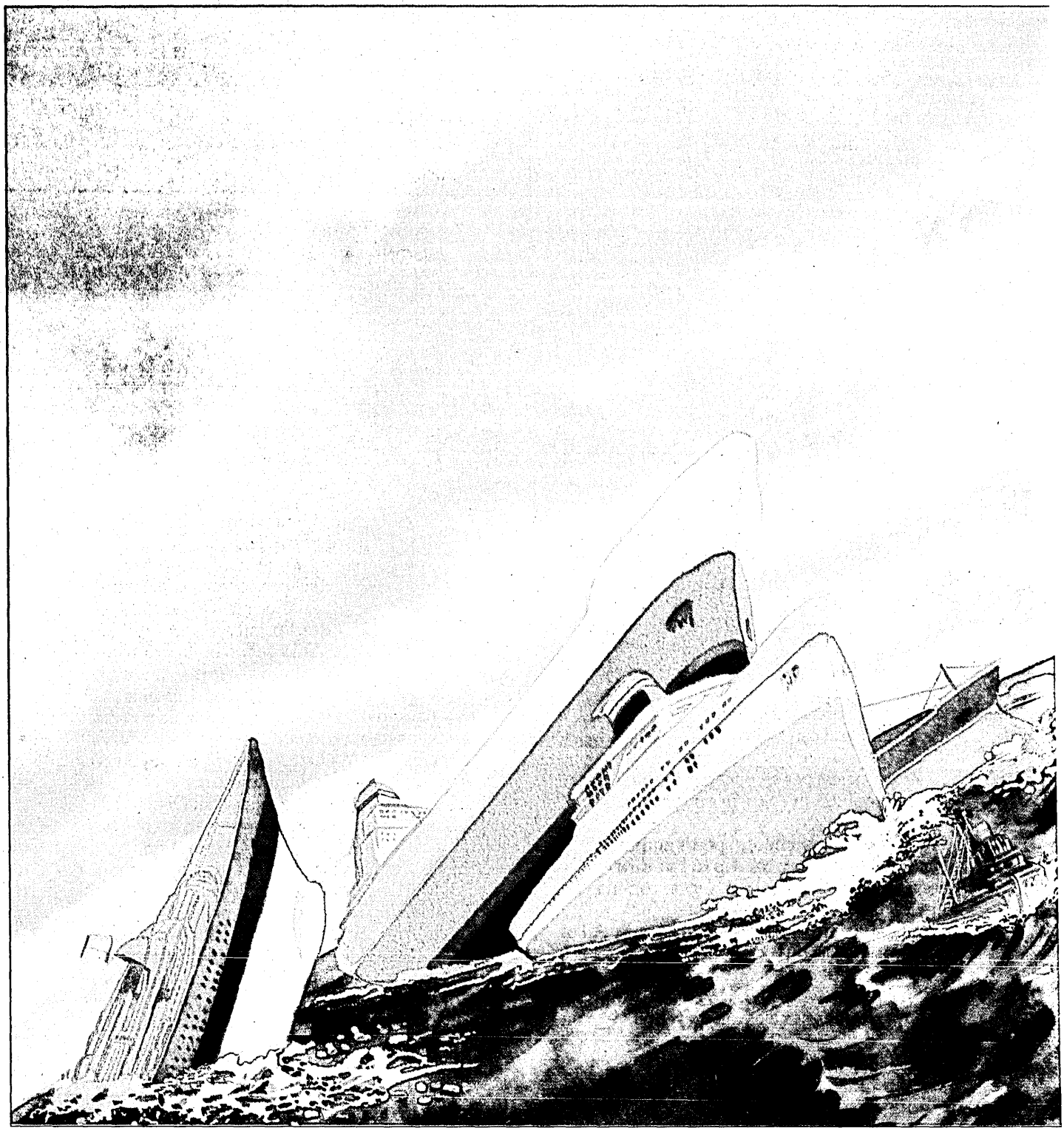
The Letterprinter, of course, is backed by Digital's service. Which amounts to over 16,000 people worldwide. So there's hardly a better printer you can buy. No matter how you want to use it.

To buy your printer, see your local Digital terminals distributor or sales representative today or contact: **Digital Equipment Corporation,** Terminals Product Group, 2 Mt. Royal Avenue UP1-5, Marlboro, MA 01752. Telephone toll-free (800) 225-9378 (outside the continental U.S. or in Massachusetts call (617) 480-4077 between 8:30 A.M. and 5:00 P.M. Eastern time.) In Europe: Digital Equipment Corporation International, 12 Av. des Morgines, CH-1213 Petit-Lancy/Geneva. In Canada: Digital Equipment of Canada, Ltd.

digital

The information business is in transition, and that means rough weather for some big companies. A few will founder and as they do, sleek, specialized outfits will sail smoothly past.

SEA CHANGE IN THE INFORMATION INDUSTRY



by Stephen T. McClellan

The information technology industry is undergoing radical change. Yesterday's big winners are today's sad losers. And yesterday's specialty beginners are today's established leaders. Who will be the winners of tomorrow? What are the prerequisites for success in the future? Unfortunately, AM International is not the only obsolete company around—other such disasters will surface before long. Moreover, Digital Equipment, Wang Laboratories, and Storage Technology are not the only success stories of today. Others will join them before long. But for every company that joins the top ranks, another will drop out.

An industry transition is now well underway. Many companies are still asleep, while others are aggressively gaining market share. Technology is accelerating. Markets are fragmenting. Companies seem to be either gaining share or losing it. There is no in-between. And, frighteningly, there is little room for error. Once a market lead is lost, it seems it is never regained. Today, events move too fast. It is easier to start from scratch in a new market than to recapture a lost one.

Seven critical factors will determine the future information technology winners:

- Specialization
- Size
- Uniqueness
- Communications and systems
- Software and service
- Marketing
- Equity financing

Probably no one company is so ideally positioned that is has all these seven characteristics. But to be successful, a company must be positioned correctly in most of these crucial areas.

ILLUSTRATION BY ANDREA RARIFFI

By far the most important single trend throughout the industry is the fragmentation into numerous specialized markets.

By far the most important single trend throughout the industry is the fragmentation into numerous specialized markets. What is happening in this industry is what Alvin Toffler, in his book *The Third Wave*, says is happening to society at large—that it is "demassifying." Some of the more notable new areas, with their respective leaders, include minicomputers (Digital Equipment), distributed data processing (Datapoint), word processing (Wang), disk storage (Storage Technology), and nonstop computers (Tandem Computers). Today is the era of the specialist. Only a short while ago, the computer industry was comprised of just mainframes, peripherals, and services. Large-scale mainframe computers are now playing a smaller role in the overall information technology marketplace. Specialized companies have pioneered and dominate almost every specialty market. In just a decade, Digital Equipment, by specializing, has gone from being a small minicomputer company to number two in the industry, behind only IBM. Specialized companies are aggressive in R&D programs, and marketing and management styles. By concentrating in narrow market sectors, efforts are not spread too thin, and reaction time or lead time is short. Moreover, successful specialists can also have marketing, service, and financial strength.

We do not rule out the possibility that generalist companies might transform into more specialized firms, but such a transformation would be difficult. Technology, markets, and applications are changing too rapidly for generalist, all-things-to-all-people companies to stay abreast. Today, the broad-based generalists, such as the mainframe companies and Xerox, are being forced to act like octopuses, keeping their tentacles in several different areas but not concentrating or leading in any. IBM may be the only company with enough resources to prove that this approach can be successful. Meanwhile, IBM is making impressive progress in personal computers and CAD/CAM—two major areas of specialization.

Two forces are driving the industry toward specialization: accelerating technology and customer/user sophistication. Almost every mainframe computer company reproduced a picture of a semiconductor on the cover of its 1981 annual report. Each sees the importance of such technology in the future, and it is the tremendous advance in semiconductors that has thrown the door wide open to new industry participants. Everyone now has easy access to cheap microprocessor capability. Customers are becoming bolder, seeking out a better way. They are not afraid to integrate their computer installations with multiple vendors' hardware. Opportunities for specialty companies are as numerous as user requirements.

TABLE I

THE CHANGING LEADER BOARD IN INFORMATION TECHNOLOGY

DATAMATION TOP 10 FOR 1981	McCLELLAN TOP 10 FOR 1990
1. IBM	1. IBM
2. Digital Equipment	2. Digital Equipment
3. Control Data	3. Storage Technology
4. NCR	4. Wang Laboratories
5. Burroughs	5. Hewlett-Packard
6. Sperry	6. Control Data
7. Honeywell	7. Burroughs
8. Hewlett-Packard	8. Electronic Data Systems
9. Xerox	9. AT&T
10. Wang Laboratories	10. Japan Inc.

Many generalists seem to be developing hardening of the arteries. While IBM has moved into personal computers and CAD/CAM and Burroughs into peripheral storage equipment through Memorex, these initial attempts to specialize may not be enough. General purpose broad-based companies have strengths that must be utilized if they are to compete successfully in the era of the specialists. Their advantages are service and software, customer base, and financial resources. Such strengths cannot be optimized, however, unless these large companies become more streamlined. One way to streamline would be to reorganize or divest into smaller, specialized units that can attract, through appropriate financial and emotional incentives, the entrepreneurial, creative people who have heretofore been attracted only to the smaller specialty companies.

Even with efforts being made by the generalists to specialize, the current leading specialty companies will probably overtake many of the generalists during this decade. The lineup of the top 10 industry leaders in 1980 will be radically changed by 1990 (see Table I).

SMALL IS GOOD

It used to be that large size meant more R&D, marketing clout, more products, and greater credibility. Times have changed. It is now an advantage to be small, with annual sales of around $1 billion or less. Large size is a burden, invariably leading to tardy decision making and slow product development. Marketing emphasis is diffused. Meanwhile, technology and markets are accelerating.

Smaller companies in this industry can more easily specialize and expand the frontier of technology and new products. The 32 bit super minicomputer; nonstop, fail-safe computer; computer aided design; and local networking were all originated by small information technology companies. Small firms are willing to take more risks, can enter markets faster, have shorter R&D cycles, and generally have no rental bases to inhibit new product introduction.

Small companies can also attract the most creative people. They can grow faster, and their stock prices often rise more rapidly than those of larger, slower growing firms. The shares can be used effectively as financial incentives to entice and hold on to the best people in the industry.

Small companies offer exciting environments in which to work. Great responsibility is obtained quickly. Actions translate directly into results. An entrepreneurial atmosphere with direct access to management is a stimulating place to work. Such an experience is an attraction that outweighs financial incentives. It is clearly demonstrated in Tracy Kidder's book, *The Soul of a New Machine*, that hotshot computer engineers just out of school preferred the sweatshop environment, long hours, and low pay at Data General to the structured organization of a larger company. At Data General they had the opportunity of "putting their name on a computer that got out the door. . . ."

In the era of specialization, unique, proprietary products are replacing general purpose, commoditylike hardware and services. Specialty companies are the very embodiment of uniqueness, each serving an individual application or market while making no attempt to sell standardized products across all markets. Automated design and testing of semiconductor circuitry for rapid development of unique products will be key. In the future, specific application computers and terminals designed to suit separate classes of users, such as those installed at banks and airlines, will also be evident in insurance companies, manufacturing plants, retail stores, and other outlets. Mainframe computer vendors and others are already beginning to design and build custom semiconductors to provide unique hardware.

You have the information. We have the way to move it.

It's extraordinary how far American business has gone in managing information in the office.

And how frustrating it can be to get that information where it's needed, once it leaves the office.

Your computers, for example, can swap data with each other.

But if you need to transmit that data to less sophisticated or incompatible equipment, you can't.

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So, returning to our example, your computers and terminals are now able to talk to any other terminals, anywhere in the world. Even those on other networks.

You can even deliver the same information to an unlimited number of terminals, automatically.

And we're continually adding new service features to our Spectrum with an eye to satisfying your future requirements.

The way we look at it, whatever other productivity problems American business has, it's producing more and more information.

And getting that information where it's needed—speedily, reliably, efficiently and economically—that's what ITT Worldcom is all about.

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TOO MANY DATA CENTERS ARE RUNNING OUT OF CONTROL.

Today, data centers are hectic environments even when everything is running perfectly.

The slightest little problem can throw not just the whole department, but the entire company into turmoil.

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In a few years, nothing in this industry will stand alone.

As the industry fragments, and specialization intensifies, a myriad of new proprietary products will emerge, addressing hundreds of narrow markets and applications. It is likely that the small companies will carve out these new niches and will benefit most. To be sure, mass, low-cost production will have its place. Most industry participants, except mainframe manufacturers, have been accomplished mass producers for some time now. The pendulum will swing back, however, to shorter production runs of a wide variety of more custom, market-unique products. This change may present a difficult transition for many of the large, established vendors. The challenge will be compounded by the need for IBM compatibility, which most users are increasingly requiring. To be unique, yet still compatible, may not be easy.

Before long, general purpose commodity products will be subject to fierce price competition, increased economic sensitivity, and a Japanese onslaught. Already, several sectors of the industry are taking on some of these commodity characteristics, including semiconductors, mainframes, oem minicomputers, printers, and timesharing data networks. Soon, areas such as small disk storage devices, word processing, and personal computers may become fungible commodities.

TABLE II

COMPOUNDED GROWTH IN SERVICE IN INFORMATION TECHNOLOGY, 1979-81

IBM	28%
Xerox	75%
Digital Equipment	38%
Hewlett-Packard	40%
Wang Laboratories	68%
Storage Technology	60%

TABLE III

BALANCE SHEET STRENGTH IN INFORMATION TECHNOLOGY COMPANIES

LITTLE OR NO DEBT	UNDER 30% DEBT	OVER 30% DEBT
IBM	Wang Laboratories	Sperry
Digital Equipment	Storage Technology	Honeywell
Hewlett-Packard	Computervision	Burroughs
Tandem Computers	NCR	Xerox
Electronic Data Systems	Control Data	Prime Computer
Data General	Computer Science	Centronics
Apple Computer	Dataproducts	AM International

END OF STANDING ALONE

In a few years, nothing in this industry will stand alone. All equipment will communicate and be hooked together into a single network. Products will be systems oriented. Personal computers, telephones, copiers, and word processing will all be tied into larger communication and computer networks. Databases will be shared. Voice, video, and data will intermingle. Even today, office and data processing managers are becoming increasingly hesitant to commit to new equipment that might be unable to communicate with future office automation systems. Demand for Wang's word processing equipment by major corporations accelerated last year after Wang introduced its Alliance software, enabling its word processing to be tied into data processing products. Large users were no longer worried that in the future the word processing equipment will be left out in the cold—standing alone. Other large corporations are considering standardizing around one type of personal computer—say, IBM—rather than a proliferation of different vendors, so that eventually all the microprocessors will be compatible and able to hook into a larger network.

Almost every office and data processing product today must increasingly have system visibility for the future, and those products already so configured will soon occupy their place in the sun. Network systems are still a little conceptual and deferrable as Datapoint has experienced lately. Companies that are blindly stamping out standalone products such as typewriters, copiers, and standalone word processing systems, however, will be obsolete in the marketplace before long unless there is a definite design to encompass communication capability.

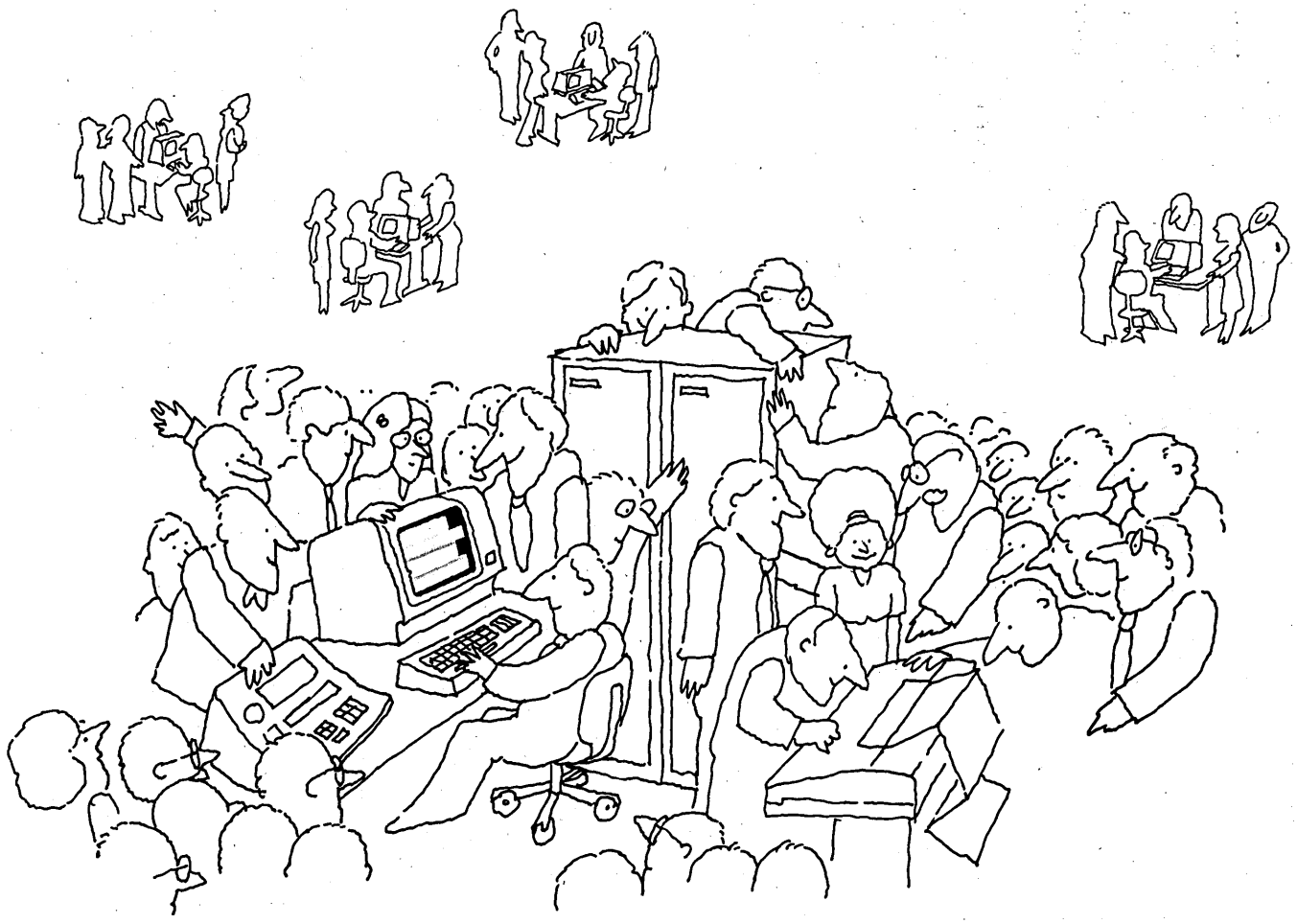
Software, service, and maintenance have outgrown hardware sales at many computer companies during the past few years. This high rate of service expansion is illustrated in Table II. Hardware companies that are not experiencing such growth in service businesses may be losing position.

The data processing service and software sector of the industry, i.e., companies specializing here, is growing at a rate of 21%, far faster than hardware, according to International Data Corp. Demand for software alone is exploding at a 28% rate. The scales toward service and software are tipping furiously, particularly with the growing programmer shortage. Such businesses will become major profit centers for most companies. Software and service are more easily differentiated and more proprietary than hardware. Software development cannot be force-fed. More bodies and more money do not hasten production of software. Two pregnant elephants cannot have a baby elephant in a year; gestation still takes more than two years, modern medicine notwithstanding. A maintenance service force takes time and money to build as well as field density to be profitable. Once achieved, it represents a major competitive advantage and an insurmountable marketing hurdle, especially in the systems environment, to any company lacking such capability. The Japanese entry into the U.S. systems market is greatly inhibited by lack of service.

A direct sales force is necessary for control over customers, support, and prices, and is a primary prerequisite for successful market penetration. The Japanese are not likely to make a major entree into the U.S. market soon, because of the lack of such a selling and service capability. Other channels are supplements, not substitutes. The most successful companies in the business will be those that build an internal sales force along with integrity and reputation from the outset, as is occurring at Tandem, Cullinane, Wang, and Storage Technology, rather than those that start with dealers or distributors and then attempt to switch to direct selling later on.

The rush to add alternative distribution channels such as dealers and stores is misleading. Companies moving in this direction, such as IBM, Digital, and Xerox, are already strongly entrenched with broad, effective direct end-user sales forces worldwide.

Stores are passive, with limited ability to initiate new prospects. The surge in new computer stores is rapidly leading to over-



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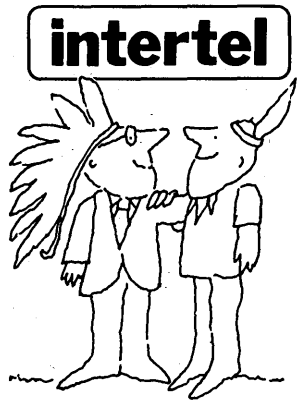

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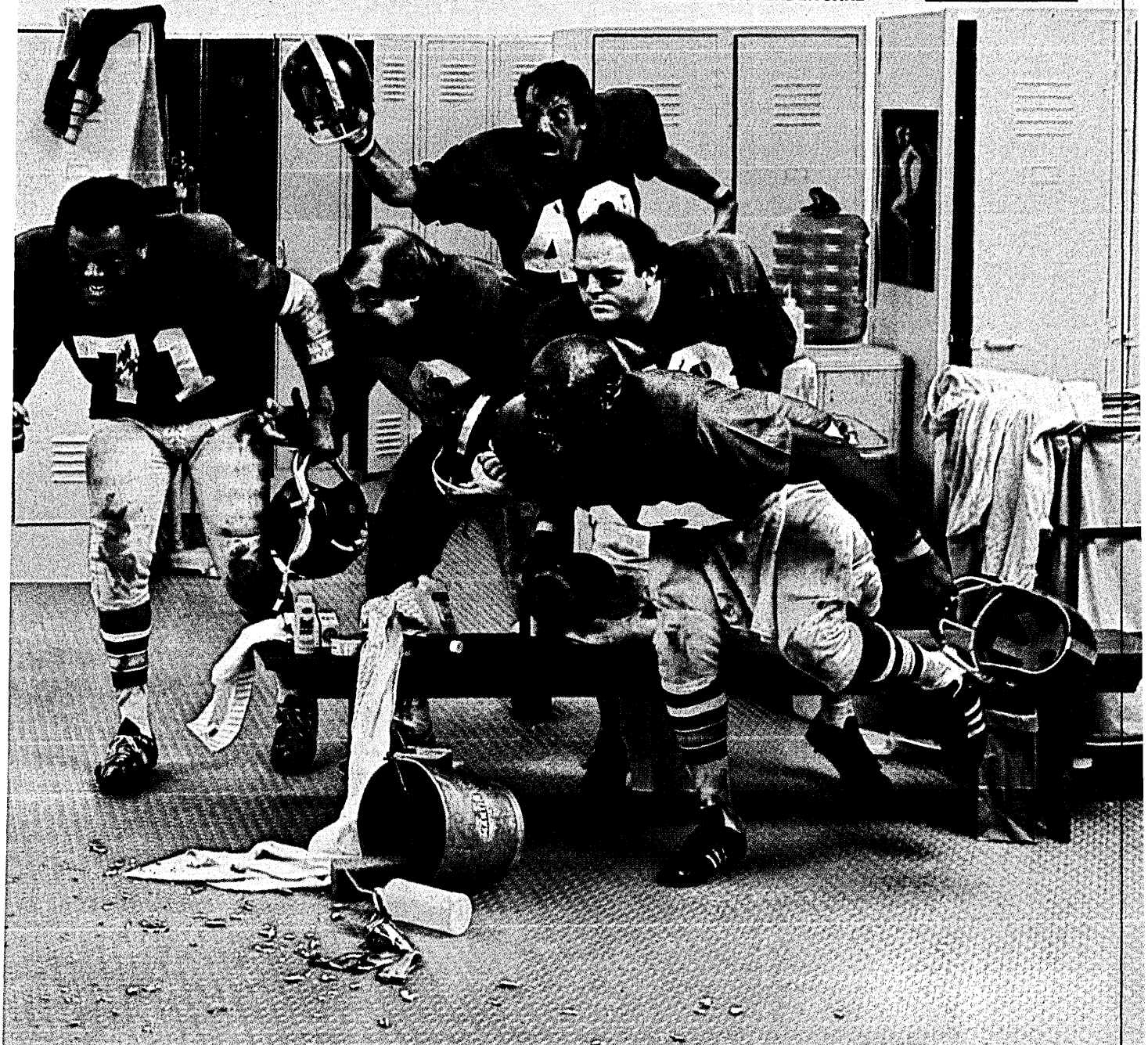

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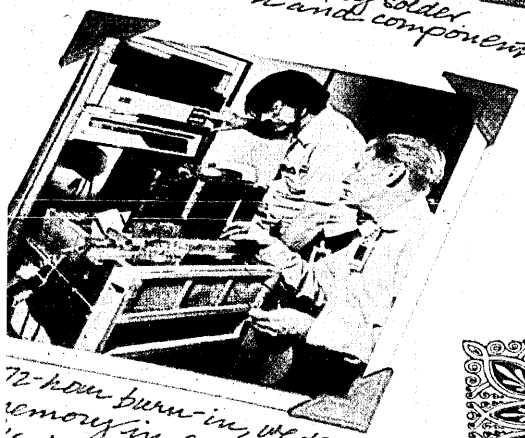

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CIRCLE 102 ON READER CARD

crowded marketing avenues. Sears just announced 45 new stores. Computerland stores and Radio Shacks are everywhere. Digital stores are in many cities despite precious little traffic. The shelf space battle in the multiple vendor stores will become intense.

The dealer and distributor channel is hard to control and often not effective in reaching larger customers, which leads one to ask, Why did Datapoint purchase, at great expense, the TRW distributor organization abroad? Why is CPT opening its own branch sales offices in the larger U.S. cities? Microdata found out the hard way that dealers often do not give a company control over its own end markets.

REQUIRING EQUITY FINANCING

Equity financing rather than debt will be necessary to reduce financial risks and limit earnings volatility. The information technology market will be fraught with product, technology, price, and market risks as technology accelerates and markets change. These business risks are high enough without being compounded by financial risks. Debt financing leads to higher earnings volatility which may be pleasant on the upside when business is good, but can be disastrous during slowdowns. Investor, employee, and customer earnings expectations become overinflated in good times and overly depressed in bad times. Return ratios are good enough in this industry without being magnified by debt. Equity financing helps to eliminate at least one fixed cost and also gives a company the flexibility to finance through debt as a last resort. The winners in the future will be financed with equity, but the stock market may not be as generous in bestowing high price/earnings multiples. Not every company will be able to raise funds readily through equity.

In viewing the successful companies to date in the industry, it is apparent that most have been financed largely, or exclusively, through equity. There are exceptions, and some impressive companies have used debt, but they have limited it to under 30% of capitalization. The majority of companies with over 30% debt to capitalization have had difficulties, exacerbated significantly by their debt load (see Table III).

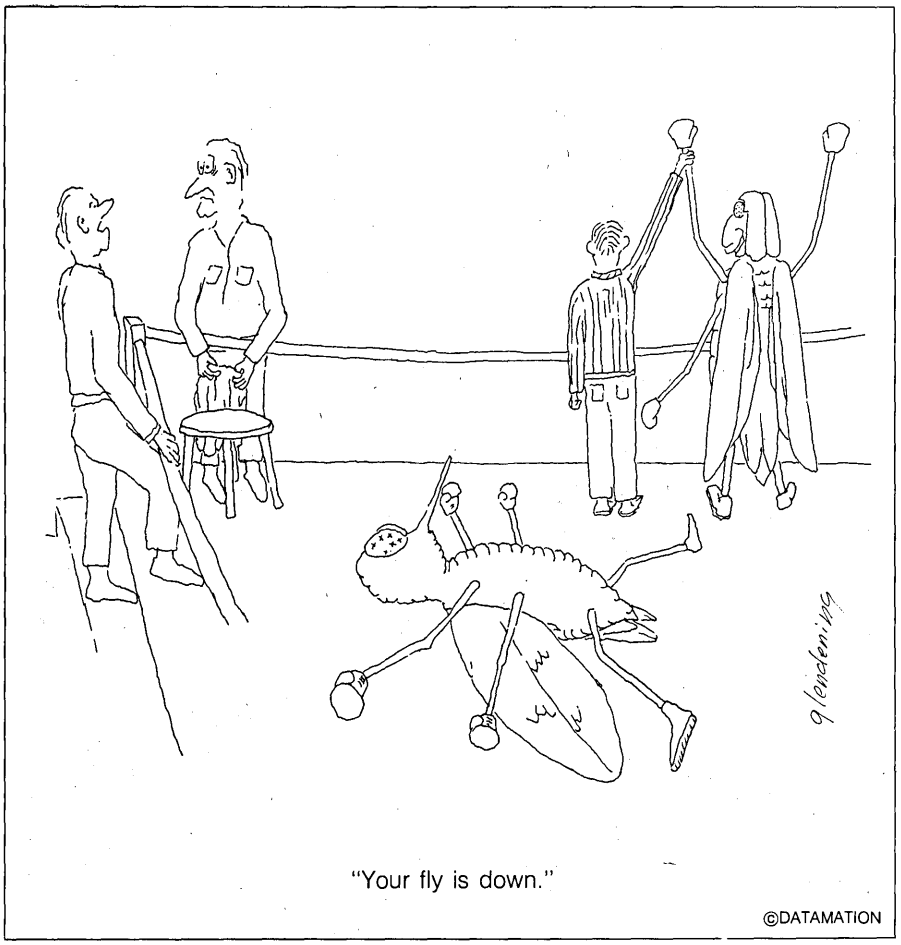
Computers have penetrated our society so widely that demand is becoming more sensitive to the economic influences on the end-user customer. Ten years ago, the information technology industry was comprised of mainframes and peripherals that were mainly used by large businesses for accounting and financial tasks. Now, there are dozens of specialty markets and specialty products. In the future, there may be hundreds of such fragmented markets and application-oriented information processing machines. At present, there is computing power in aircraft, automobiles, offices, stores, banks, factories, laboratories, homes, games, watches, and weapons. No wonder when the economy goes into recession, the information technology industry lurches as well. Fewer new cars, houses, and manufacturing plants, and reduced research, retail spending, and bank savings mean less demand for computers.

Many strong, leading information technology companies have recently experienced economic-related profit declines for the first time, including IBM, Sperry, Datapoint, Data General, and Tymshare. More industry participants are incurring pressures during the recent recession than during 1974-75. In the future, such economic sensitivity will become even more pronounced. Management will have to be better prepared and faster in reacting to avoid the impact.

Specialty companies are taking over the information technology industry. General Mills dropped out of computers back in 1960 to concentrate on the food business. Today's equivalent generalists either have to become bold, creative, and imaginative in rescripting their strategies or go the way of General Mills in this business. To think big may mean to sink big! Uniqueness will be the order of the day, although recent office automation functions such as an "electronic wastebasket" with an uncrumple feature, and an "electronic janitor" may be going a little too far a little too quickly. Networks and systems, as well as service and software, will proliferate. Markets may get more crowded, but it will be a long while before markets get to the point where, as Yogi Berra once described his favorite restaurant, "Nobody goes there anymore because it's so crowded." Economic sensitivity is still another factor that will loom larger in the future.

What is a company to do in the face of all this? Data General bought a monastery a year ago for use as a training center. This is one way to meet a challenge—ask for divine help. Short of that, management will have to help itself. Some companies will win, others will lose. Which companies end up in the winning column and which on the losing side may be surprising. *

Steve McClellan is president of the Computer Industry Analyst Group with Salomon Brothers, Inc. He previously worked as a securities analyst with Spencer Trask & Co., and with the U.S. Department of Commerce.



"Your fly is down."

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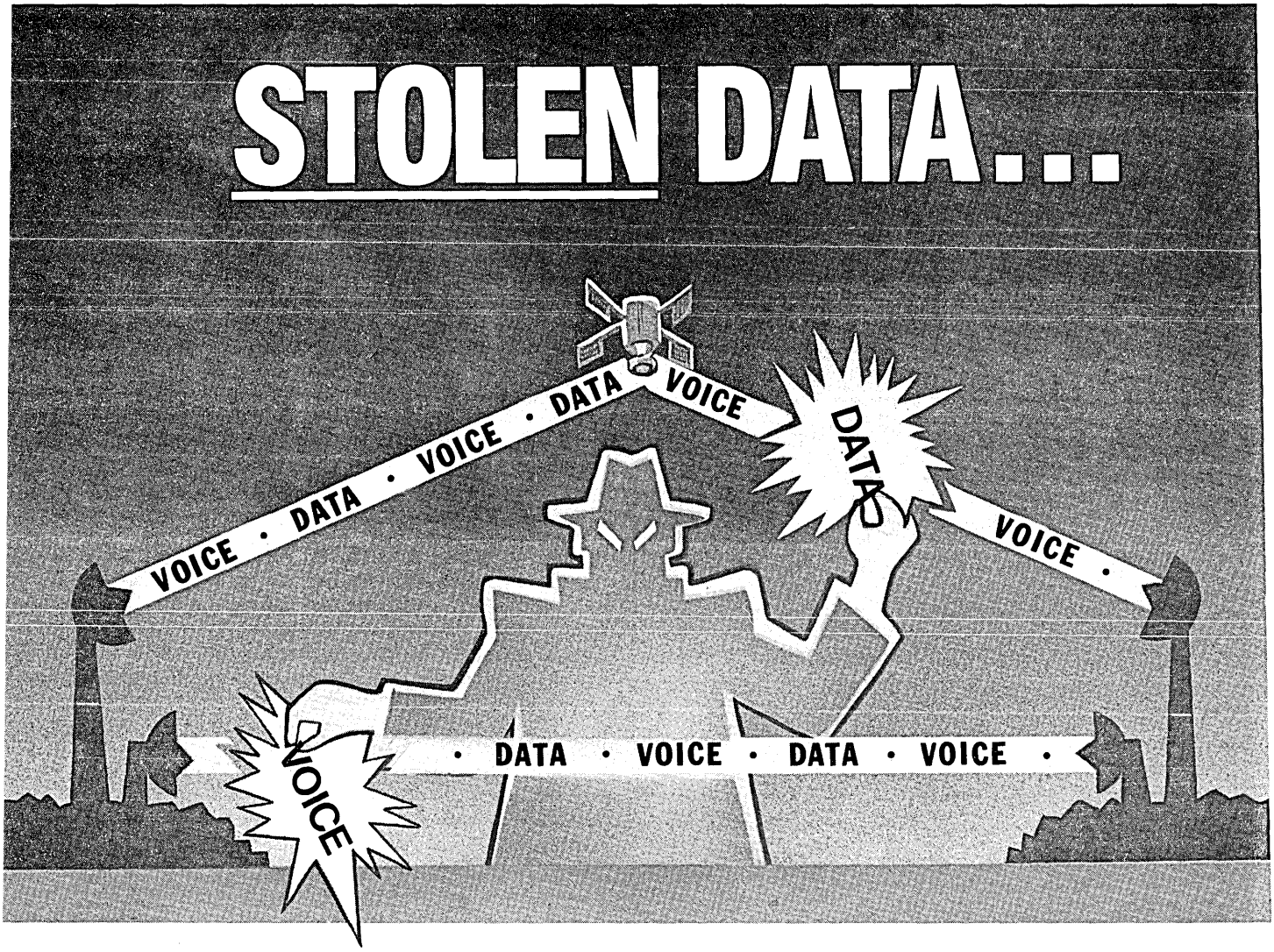
CARTOON BY GLENDENING

WHAT MAKES THE



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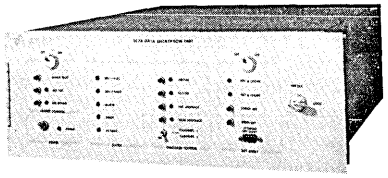

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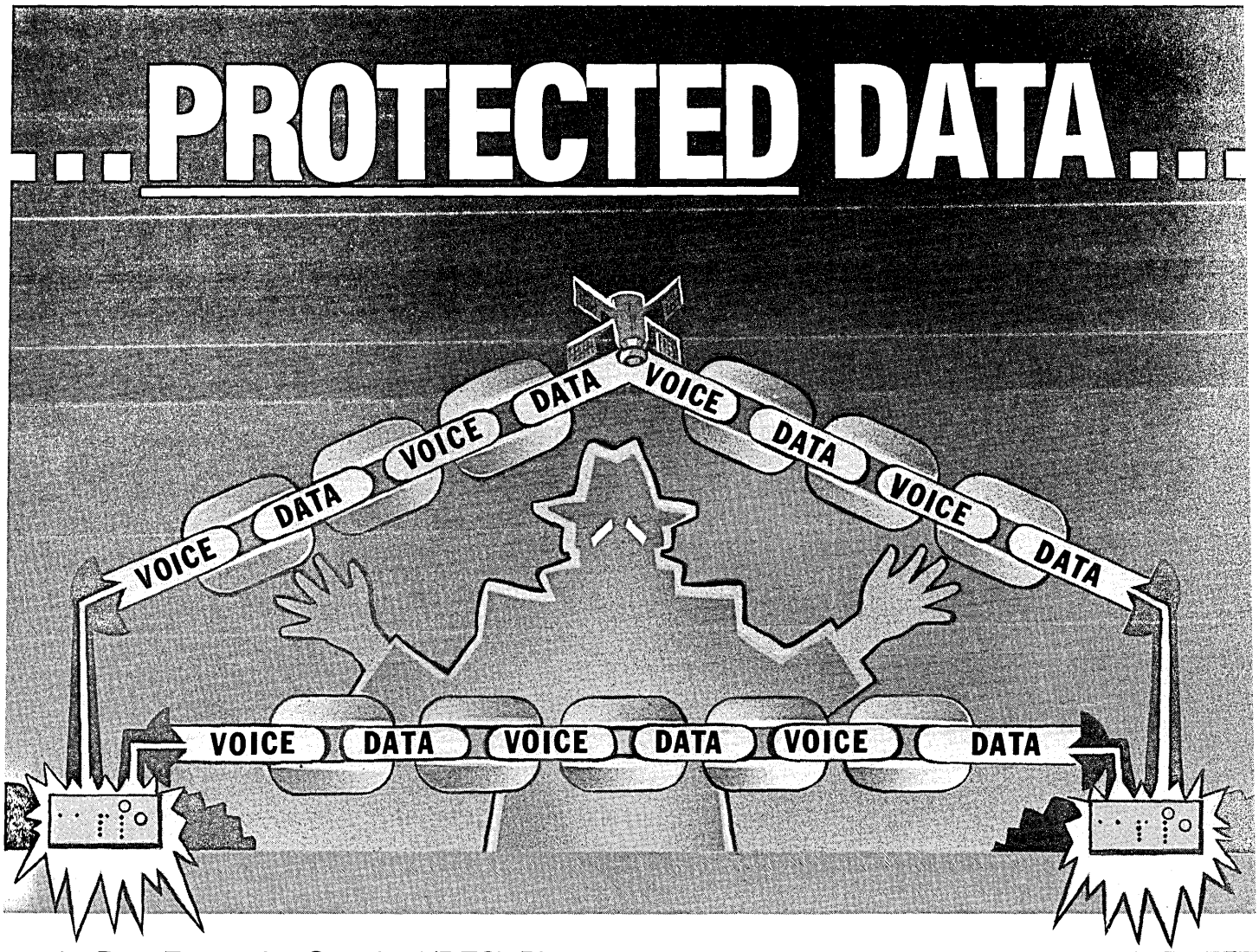

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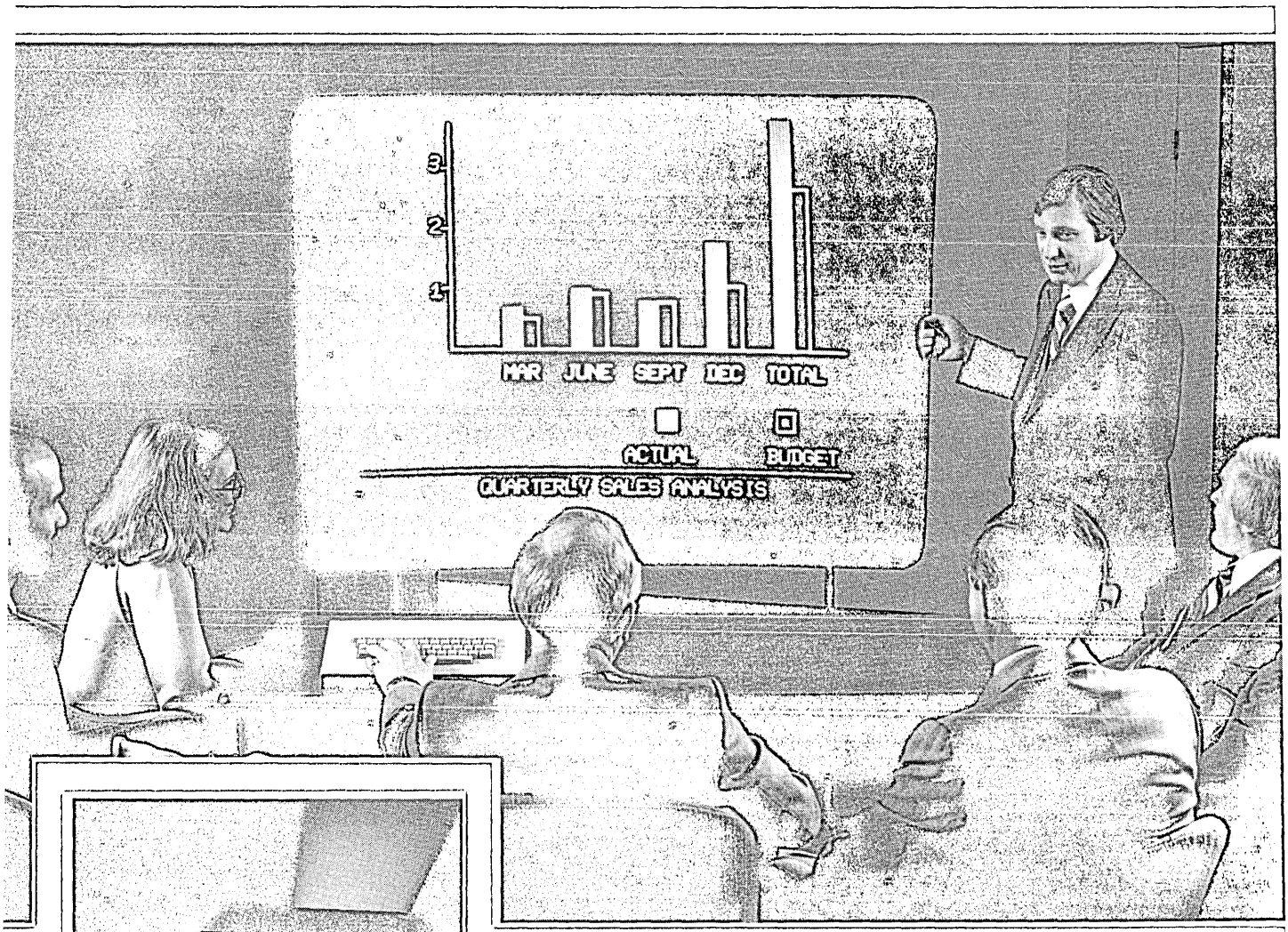

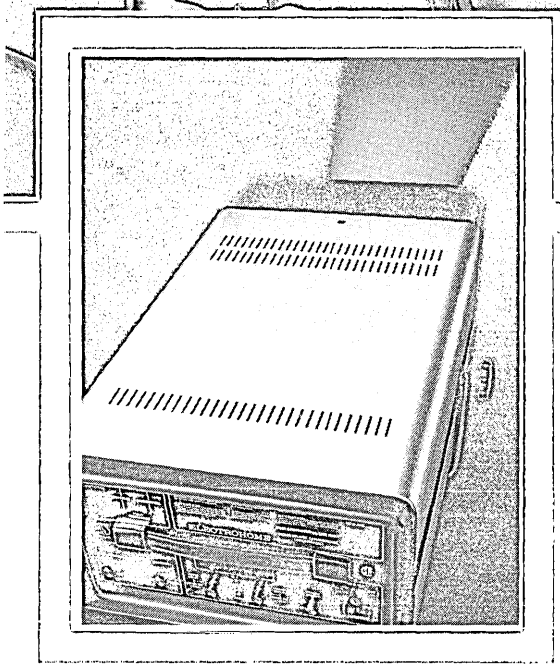

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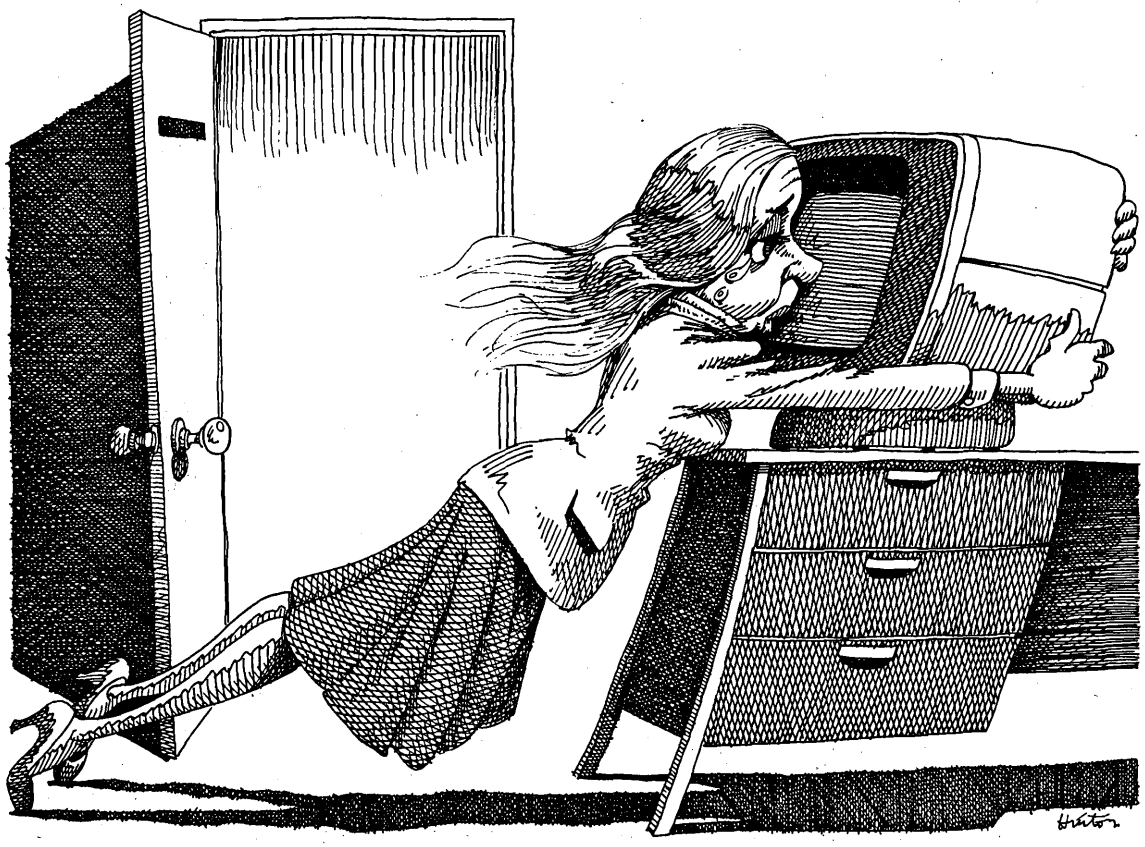

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CIRCLE 105 ON READER CARD

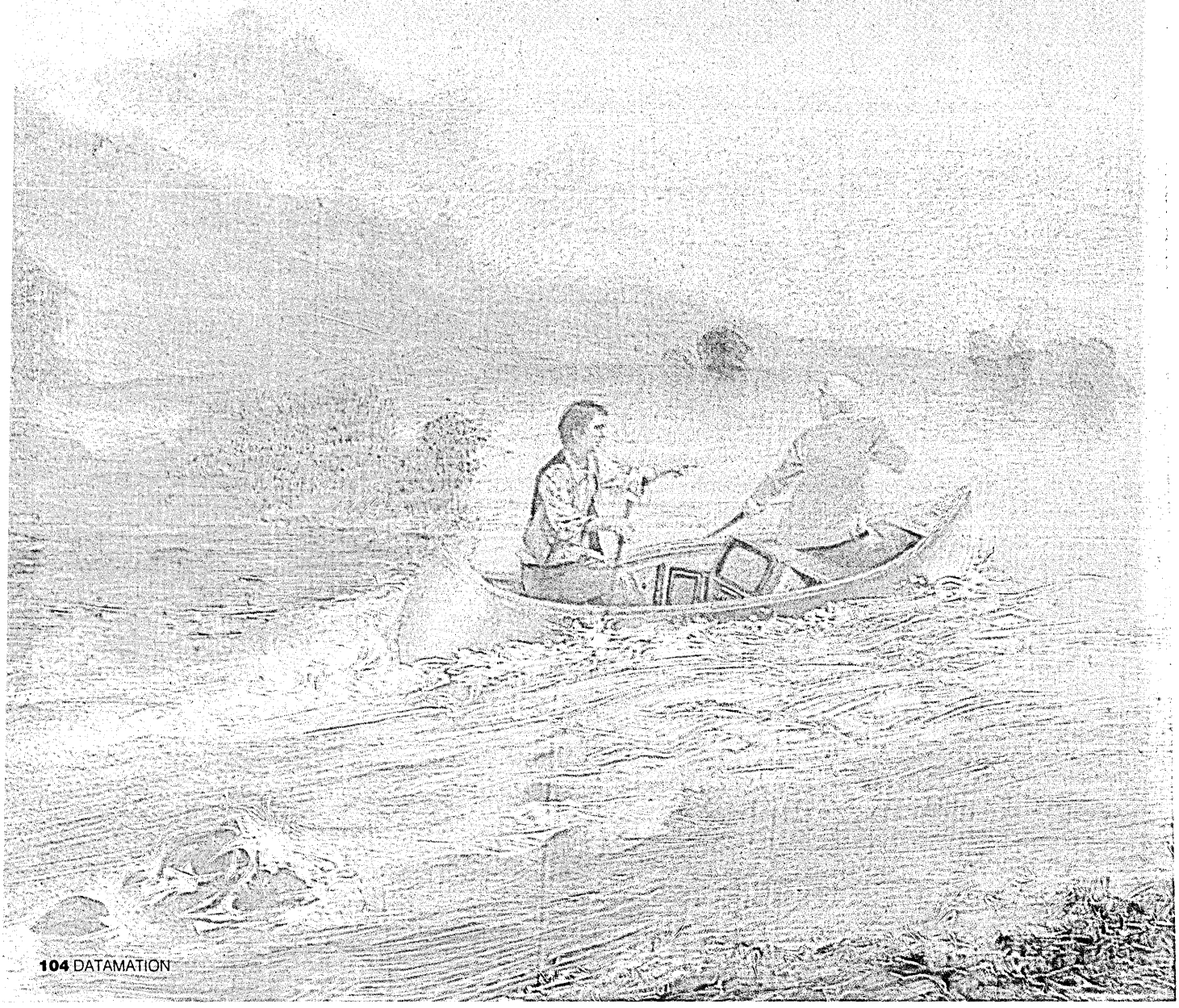
Because mainstream distribution no longer takes vendors everyplace they want to go, they've started to explore new channels.

IN SEARCH OF THE VALUE ADDED

by Esther Dyson and Burton Grad

An industry is likely to be shaped long before it's "ready" by forces that have little to do with its ideal structure. For example, why do automobiles come from Detroit? Or electronics from Silicon Valley? Why are light aircraft made in Wichita? Why do we buy encyclopedias from door-to-door salesmen, and dictionaries in bookstores?

And, of course, why do we buy mainframes from salesmen, minis from oems, and micros from outlets? Does this make sense, or is it mere historical accident and likely to



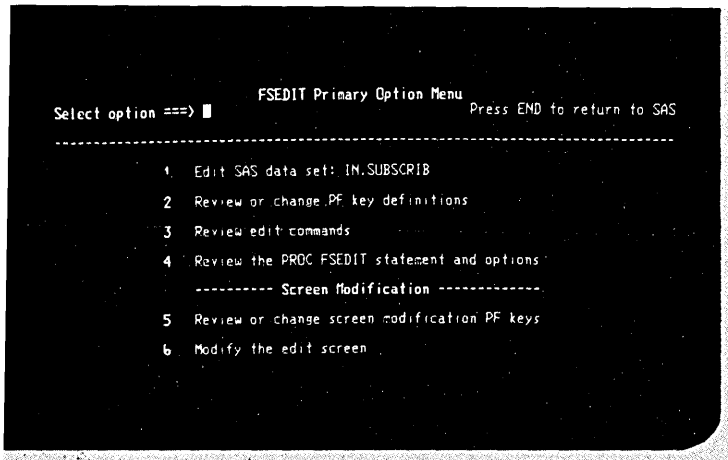
change? Certainly there's history involved. The history of computer hardware and software distribution reflects a never-ending search for the value-added—that premium value to the user that enables the vendor to charge much more than his costs—as it shifts from residing in the hardware to its present locus in the fuzzy area between standard software, custom software, and service and support.

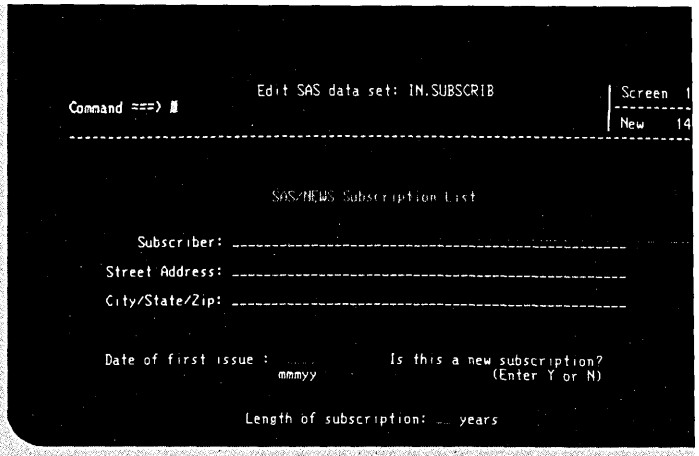
The mainframe computer, sold by business machine outfits like Remington Rand (owned by Sperry) and IBM, followed the pattern that had been set up to lease tabulating machines and sell the follow-on punched cards. When the punched card programs needed changing (software maintenance), the manufacturer sent out a technician (or offered a service center) to rewire the board to perform its new task. To compete with these first two computer vendors, all the other companies entering the business fell into line; they fielded individual salesmen, systems engineers, and technicians covering individual accounts and working out of manufacturer-owned branch offices.

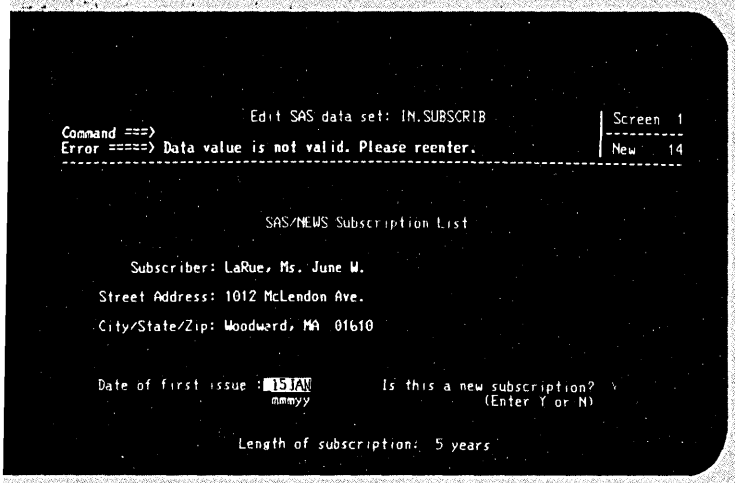
And so it still is today. The salesmen, dedicated totally to the products of their company, live on salary plus commission; the systems engineers and technicians are salaried support. The products themselves are manufactured and shipped to the buyer only after a firm order is received, hence the delivery delays and months of backlog that are typical of the mainframe business. The customer waits for the machine; the machine does not sit in inventory waiting for an order (unless the manufacturer is in deep trouble).

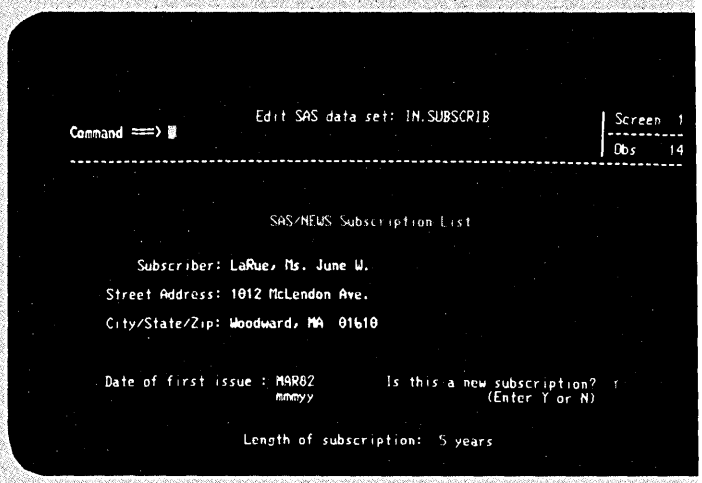
Software, service, and support are integral parts of this distribution channel. Once part of the purchase price, and more sales tool than profit generator until IBM started unbundling in 1969, first software and now service and support are on the way to becoming the more lucrative parts of the business. Can a

ILLUSTRATION BY RICHARD BORER









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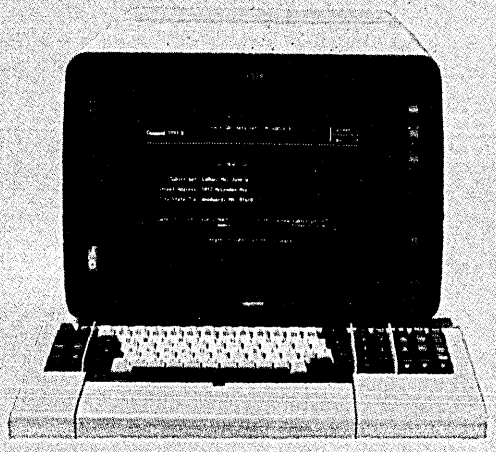

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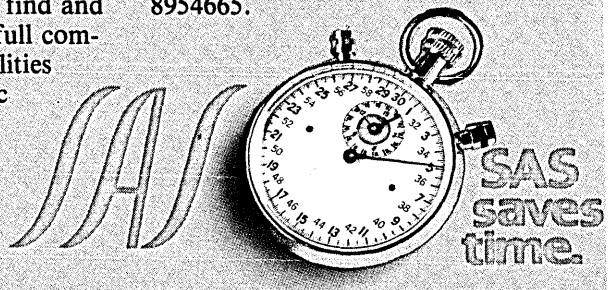


CIRCLE 106 ON READER CARD

Once the system was installed, the user could avoid the ominous Pointed-Finger Law: no one is ever responsible for the failure of a multivendor system.

mainframe play razor to the blades of service and software? Or is software maintenance the real blade, while software and hardware are the razors? More and more systems software companies are upping their maintenance charges, or, like Computer Associates, withdrawing perpetual license plans in favor of fixed-term contracts. Syncsort and CGA are already there.

Hardware, of course, was expensive to produce in the olden days, and that made the software look cheap. You could throw a little something in for free if your equipment cost hundreds of thousands of dollars. To be sure, a lot was left up to the customers, who in those days were few and sophisticated—and loyal.

But once IBM unbundled, that vast base of installed equipment provided a ready market for blade vendors—standalone software houses. Concentrating on IBM equipment, these firms lived very well on the crumbs that fell off IBM's table. Today, IBM is even encouraging applications vendors like Management Science America, and other mainframe vendors are following suit, for they know full well the hardware business that software can generate. But the shift in revenue (i.e., value-added) from hardware to software—and IBM's increasing aggressiveness in systems software—augurs a change in this cozy arrangement.

The upstart minicomputer companies established an entirely different type of organization. They originally set themselves up to sell unsupported, lower-powered machines to the most sophisticated, and most penny-pinching, market of all: technical and scientific laboratories. So Digital Equipment and its disciples fell naturally into the pattern set by other suppliers of equipment to scientists and engineers. Small but growing quickly, they had neither time nor money to invest in elaborate distribution organizations. Instead, they relied on outside distributors who not only bought, inventoried, and installed the equipment, but also served as systems integrators, collecting from various suppliers components that would be assembled and delivered all of a piece to the customer.

MOVE TO MORE ADD-ONS

From oscilloscopes with add-on data collection devices and data analyzers with add-on plotters, the systems integrators moved naturally to computers with add-on storage and even add-on programs. The more accommodating systems houses provided some special interfaces or custom programming to set up a system precisely tailored to a customer's needs. Gradually, many of the most successful systems integrators became full-fledged turnkey systems houses, developing major application tools and specializing in vertical markets.

The standard practices of hardware discounting and below-cost software prices resulted from this structure. From the manufacturers' perspective, the systems integrators offered a much lower-cost distribution channel than the manufacturers' own (even considering the discount the manufacturers had to offer as a part of their costs), but it left the manufacturers with little control over the disposition of their products.

Another result was the absence of a standalone software products business, unlike the situation in the mainframe market. Software products in the fragmented minicomputer market were generally not portable because they were built for a particular system, namely the hardware and operating system used by the systems integrator. In the mainframe market, of course, most IBM products were not portable from IBM—but the IBM market was enough. Despite DEC's 40% market share, it never attained the cachet of IBM as the standard in its marketplace. (There's a whole industry of VT-100 look-alikes, it's true, but there's no DEC equivalent of the Amdahls, National Advanced Systems, Magnusons, IPLs, et al. While portable operating systems such as Pick, Unix and UCSD p-system may change things, no new standard has yet emerged.)

In a similar vein, few custom programming houses specializing in non-IBM minis ever arose. The system integrators took care of that task. And the user was happy. He wanted the whole system, without the bother of chasing after hardware here, software there. And once the system was installed, of course, he could avoid the ominous Pointed-Finger Law: no one is ever responsible for the failure of a multivendor system.

Now, however, the systems integrators and the small business computer vendors (systems integrators for the "general" market) are finding themselves pinched from below by the micro vendors. There's little value-added in expensive, custom-tailored systems when ever more powerful micros with inexpensive mass-produced packages are being offered by outfits with neon lights and carpeting. Meanwhile, their erstwhile suppliers, minimakers such as DEC, Data General, and HP, are expanding their service and support operations and getting into the systems integrators' business, offering value-added with office automation (DEC and Prime, notably), manufacturing management (DEC and HP), and other turnkey systems directly to end users.

Those most recent arrivals, the microcomputers, slipped into the market disguised as toys. The customers who bought them were used to tinkering with things to figure out first how they worked and second how to make them work better. They were happy to buy software from separate vendors; they felt clever that way, and they could shop around rather than rely on some hardware vendor with ulterior motives. They needed no handholding, thank you. The way to reach these people was through general purpose distributors who handled a variety of equipment and in turn sold to retailers. Even though this business has now shifted to a new kind of customer, generally a business or professional person, the micro distribution pattern has so far remained largely unchanged. Businessmen are finding themselves in unaccustomed surroundings as they search for the latest in deskware.

This situation, however, will not last. The larger manufacturers—Apple, IBM, Radio Shack, Xerox—are quickly taking on the lucrative task of acquiring and distributing the software to go with their machines. (Tandy has done so from the start, although TRS-80 software is also available through non-Tandy channels.) Again, the software represents a source of tidy profits and, for the retailer, account control. Still to be resolved are the problems of software piracy (not an issue as long as volumes were low enough and the accompanying support and enhancements extensive enough that the vendor knew each customer) and charging for installation service.

CHAIN CONCEPT EMERGES

Another new factor is the emergence of the large manufacturer-independent retail chains. Tandy's Radio Shack is a forerunner to show that the chain concept will work as far as the customer is concerned; ComputerLand is the largest of the independent retailers, tied to no particular manufacturer. Many other outfits are piling into the business, which will soon include Xerox (not exactly an independent, but it does carry other vendors' equipment), Sears, Macy's, Bloomingdale's, and the rest of the usual suspects. Like Tandy, which created separate Radio Shack Computer Centers (although it also has computer departments in its regular stores), Sears is creating a new, discrete chain of Business Systems Centers, which should grow to 50 outlets (from five) this year.

But these efforts are small potatoes so far. Vendors want more outlets so they can move more machines, and consumers want them because they're good places to learn about computers. To meet this demand, new outlets are rapidly being set up through franchising. Franchising is a get-big-quick way of establishing an organization: the central organization avoids a heavy investment by requiring the franchisees to put up their own funds. But for that shortcut, the franchisor may sacrifice control of standards, and ultimately of the business itself.

While franchising may be the best

The chief distinction between mainframes, minis, and micros is their methods of distribution, and those methods are changing rapidly.

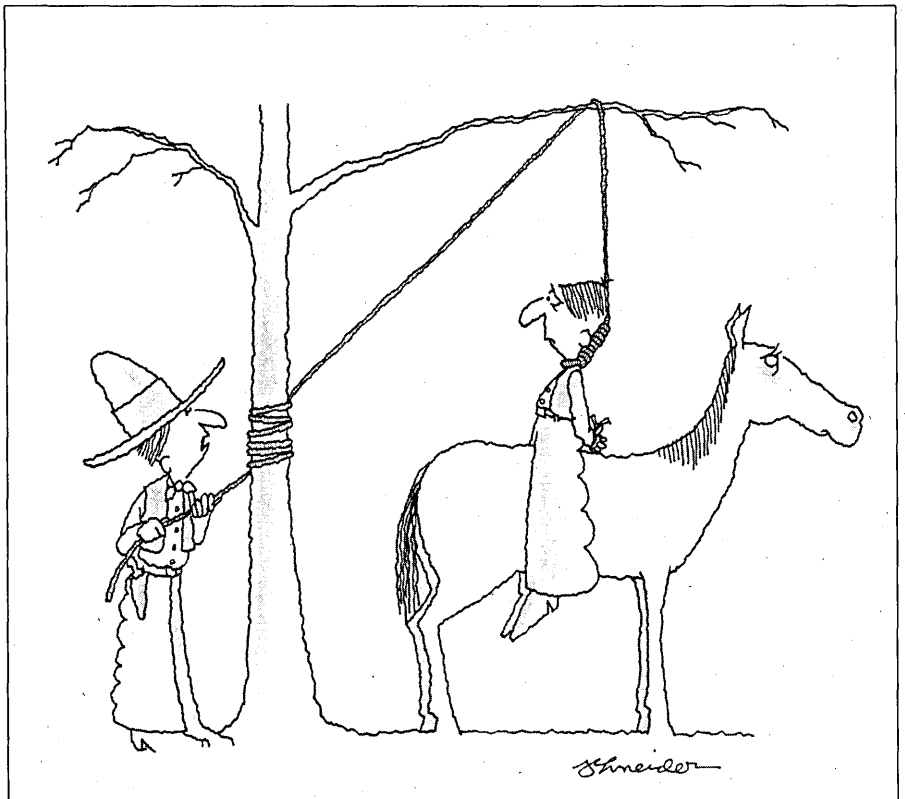
way to get effective management of outlets in a business where entrepreneurship outranks employment, time and management involvement are still necessary to build an effective organization with a nationwide (or regionwide) reputation. ComputerLand, for example, has been abuilding for five years. We expect to see a lot of franchisors—and even more rapidly, franchisees—come and go over the next few years while a few sound, deliberate franchisors such as ComputerLand and some well-managed chains of centrally owned stores, such as Tandy's and possibly Sears', continue to expand.

How rational are these different methods of distribution? And what happens as the distinction between mainframes, minis, and micros disappears? Already, it seems, the chief difference is nothing other than the methods of distribution, and those methods are changing rapidly. Soon, the distinction between minis and micros may be almost meaningless, although the term mainframe will remain for those shrinelike machines that can be tended only by experts.

While we do not see any grand coalescence of this fragmented industry around any single new approach to distribution, a new series of approaches is emerging. The market is segmenting itself differently. The shift is most visible at IBM. Where marketing forces were once focused along product lines, now they are deployed according to the kind and size of customer. IBM's National Accounts Division sells to the largest accounts; the National Marketing Division sells to everyone else (except customers so small they are reached only through third-party channels). Each sells the entire IBM product line.

Simultaneously, many systems integrators and computer retail outlets are merging into one camp: vertical market vendors who offer turnkey systems. They'll sell micros or minis, whatever it takes to do the job, along with the requisite software, which is probably a package developed by someone else. Thus the standardization and low-cost hardware of the traditional micro vendor, the retail outlet, is joined with the vertical market expertise and service orientation of the traditional mini vendor, the systems integrator. The business is probably run out of a storefront (à la micro), but it offers "house calls" or on-site service (à la mini).

Another traditionally "micro" approach to selling—mail order—is also spreading. Once used solely to reach hobbyists, mail order is now used by IBM to sell its terminals, by Sage Software to sell its utilities software packages, and by Apple's recalcitrant dealers to sell their computers—all to business users who don't (or think they don't) need service and don't want to pay for it. CGA's Allen Services also runs a successful telephone sales team—four people who generate several million dollars in annual sales without ever moving from their desks. For microcomputer software in particular, there are a few other distribution methods that make sense, notably bookstores and networks such as The Source, which can advertise or even distribute software over phone lines—and bill the customer automatically.



"Stop whimpering—you agreed to settle out of court."

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SEMINAR SALES SUCCEED

Perhaps the most successful—and thus most-copied—innovation has been the seminar sale. Honed to a fine art by Cullinane, this is a way of tightening up the traditional mainframe sales approach of one-on-one salesmen. Sales leads, however generated (bingo cards, mailing lists, referrals, or whatever), are invited to attend a seminar held conveniently in their very own city (or nearby). Sort of a "prospective users' group," the seminar offers customers the chance to meet each other and trade gossip and information, as well as to grasp the rudiments of the product. They will do so relatively willingly because they're aware that attendance carries no obligation. (Once you've invited a salesman in, he's harder to get rid of.) Customer and vendor have the chance to look each other over at a relatively low cost (to the vendor) per contact. This sharply raises the success rate per sales call, because only truly interested customers proceed beyond the seminar state and invite a salesman in.

While seminars were originally developed to cut the cost of sales on the high end—a kind of trading down—they are now also being used to bring customers into the store—a kind of trading up. Tandy, for one, is enjoying great success with its VisiCalc and word-processing seminars, usually sending away a couple of customers (out of 50) with computers under their arms, as well as enticing people who return to buy later. This spring, the company began to market its products by industry, with a one-week series of seminars for lawyers. Doctors will get their turn in the fall.

Although there are few conclusions to be drawn about distribution—it's a collection of practices rather than a single concept—it seems clear that the balance of power between vendor and customer plays an important role. In the beginning, when customers knew little and the vendors were the apostles of a new religion, the vendors sold the mainframes and threw the software in for free. As users became more sophisticated and developed dp departments, they looked around for better deals and sometimes found them. They

SCIENCE/SCOPE

Computers are being called upon to help create the "super chips" that will give military electronics system a tenfold increase in data processing capability. Hughes is using computer-aided design programs to develop Very High Speed Integrated Circuits (VHSIC) and the systems in which these chips will be used. Computer help is essential because of the tremendous amount of circuitry per unit area. VHSIC chips are as complex as 100 Los Angeles street maps printed on a thumb tack, and they themselves are mere components of larger, more complex systems. Computer programs will help engineers design, lay out, and test a chip. They describe an entire system (a signal processor, for example) at many different levels of detail simultaneously to predict the system's performance under various operating conditions.

Better and timelier weather forecasts will be possible when a microwave sensor is launched aboard a military satellite in the mid-1980s. The instrument will tell how hard rain is falling in a specific area rather than simply how much has fallen over a wide area within 24 hours. It also will determine wind speed, atmospheric water content, soil moisture, and sea ice conditions. Because the satellite will follow a low polar orbit, the sensor will gather important data on the little-studied polar regions and oceans. Hughes will soon deliver the prototype Special Sensor Microwave/Imager to the U.S. Air Force.

Intelsat VI will become the world's most sophisticated commercial communications satellite upon launch in 1986. The drum-shaped, spin-stabilized satellite will have twice the capacity of Intelsat V. It will be able to carry 33,000 telephone calls and four TV channels simultaneously. It will weigh more than 8200 pounds at launch, measure 12 feet in diameter, and deploy to 39 feet in height. Hughes heads an international team building Intelsat VI spacecraft for the International Telecommunications Satellite Organization.

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Larger vendors are expanding their distribution forces. They are making the investment in distribution so they can get the returns.

took on some of the distribution task themselves, looking for the product, integrating hardware and software, setting up their own systems. This led to the rise of third-party software suppliers, independent peripherals vendors, and leasing businesses.

As the market expanded again with the advent of cheaper and more powerful hardware, the typical user lacked a dp department and wanted a complete system, no questions asked. To his aid came the oem, who would package a mini supplied by a manufacturer that was growing so fast it didn't have the time or money to invest heavily in direct sales and customization.

The same thing is starting to happen with the micros. Tandy has filled all its customers' needs all along, but most of the others are just starting. Apple, for example, will soon be offering the Lisa, a user-friendly system complete with database management system, word processing, and a host of other functions. It has also made increasing efforts to support and distribute Apple software developed by outsiders in its Special Delivery Software program.

We are moving back to the bundling of old. The System 38 from IBM with its database management system, the 4321 with built-in application-generating tools (SSX, also from IBM), the turnkey auto parts dealer system from Triad, automated office systems from a host of vendors from IBM to Datapoint to Tandy, and the "Family System" from Apple are all examples. Software vendors too are bundling: you got your DBMS from Cullinane; now you can get a neatly integrated financial system along with it.

What has changed is that the products now offered are, more often than not, standard. The integration of software and hardware, and the software itself, used to be the custom value-added offered by full-service mainframe vendors or systems integrators, but now they are mass-produced. What this means is that the few mass-producers of this "value-added" have an edge for the moment. But as they are joined by lesser competitors, bundling will become a matter of course, and value-added will lie in service and support—i.e., full control of distribution. That's why the larger vendors are buying up systems houses, expanding their distribution forces, and offering turnkey systems for industry-specific applications. They are making the investment in distribution so they can get the returns.

The second change is that the vendors are setting up distribution channels to reach certain kinds of customers, not to sell certain kinds of products. They are distinguishing among "national accounts," manufacturers, financial institutions, and so forth. These different customer groups may all buy much the same products in the end, but they are doing so from different sales teams who have intimate knowledge of their customer bases. The industry is maturing; it is becoming structured to serve the customer. ❋

Esther Dyson is vice president-research at Wall Street's Oppenheimer & Co. and a frequent contributor to DATAMATION.

Burton Grad is president of Heights Information Technology, Inc., (a professional computer services firm in New York and San Francisco) and is also president of BG Associates, Inc. He is a member of the ADAPSO board and president of the software industry association section of ADAPSO.

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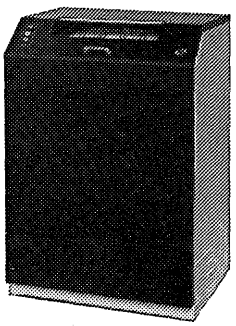

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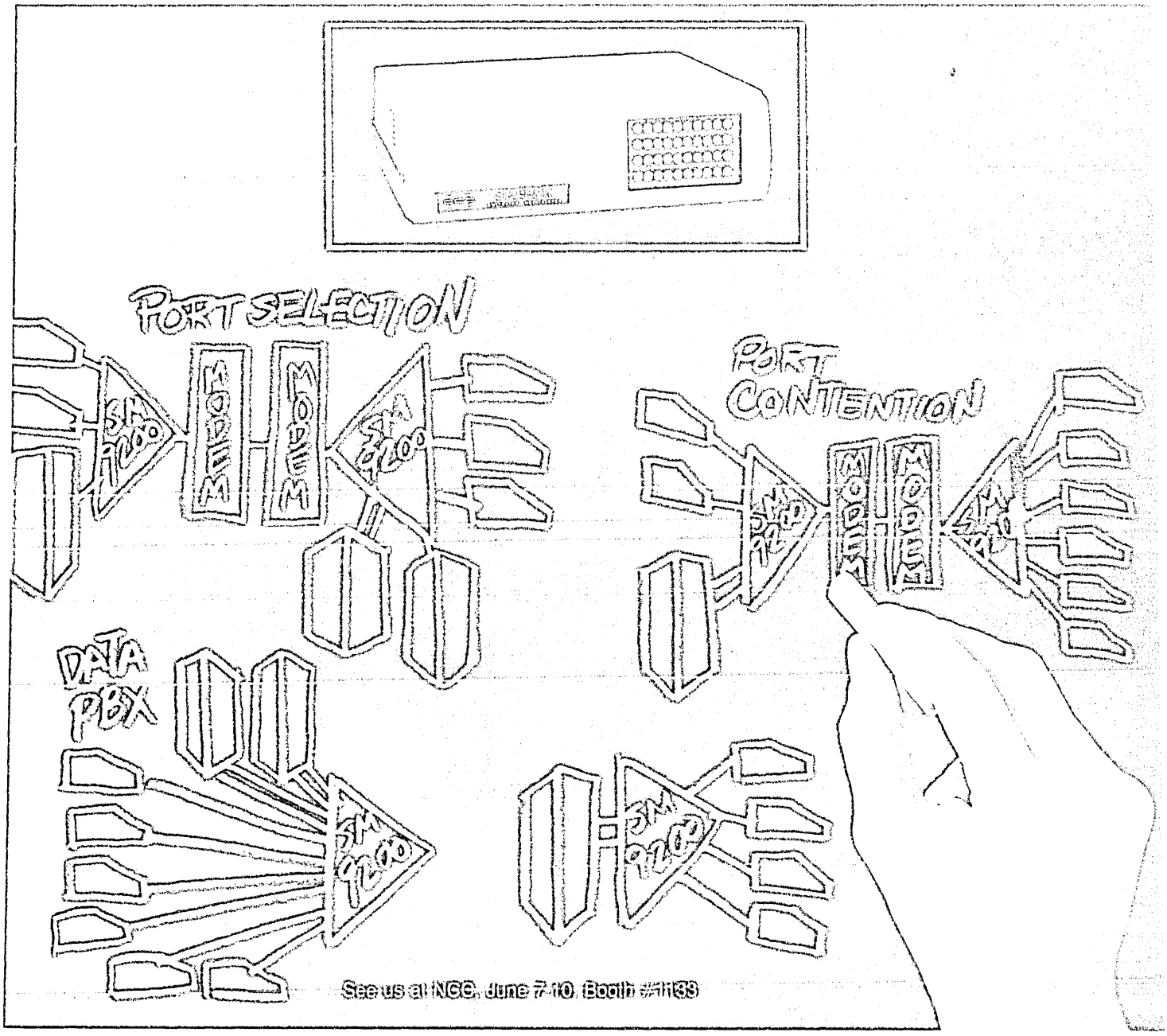

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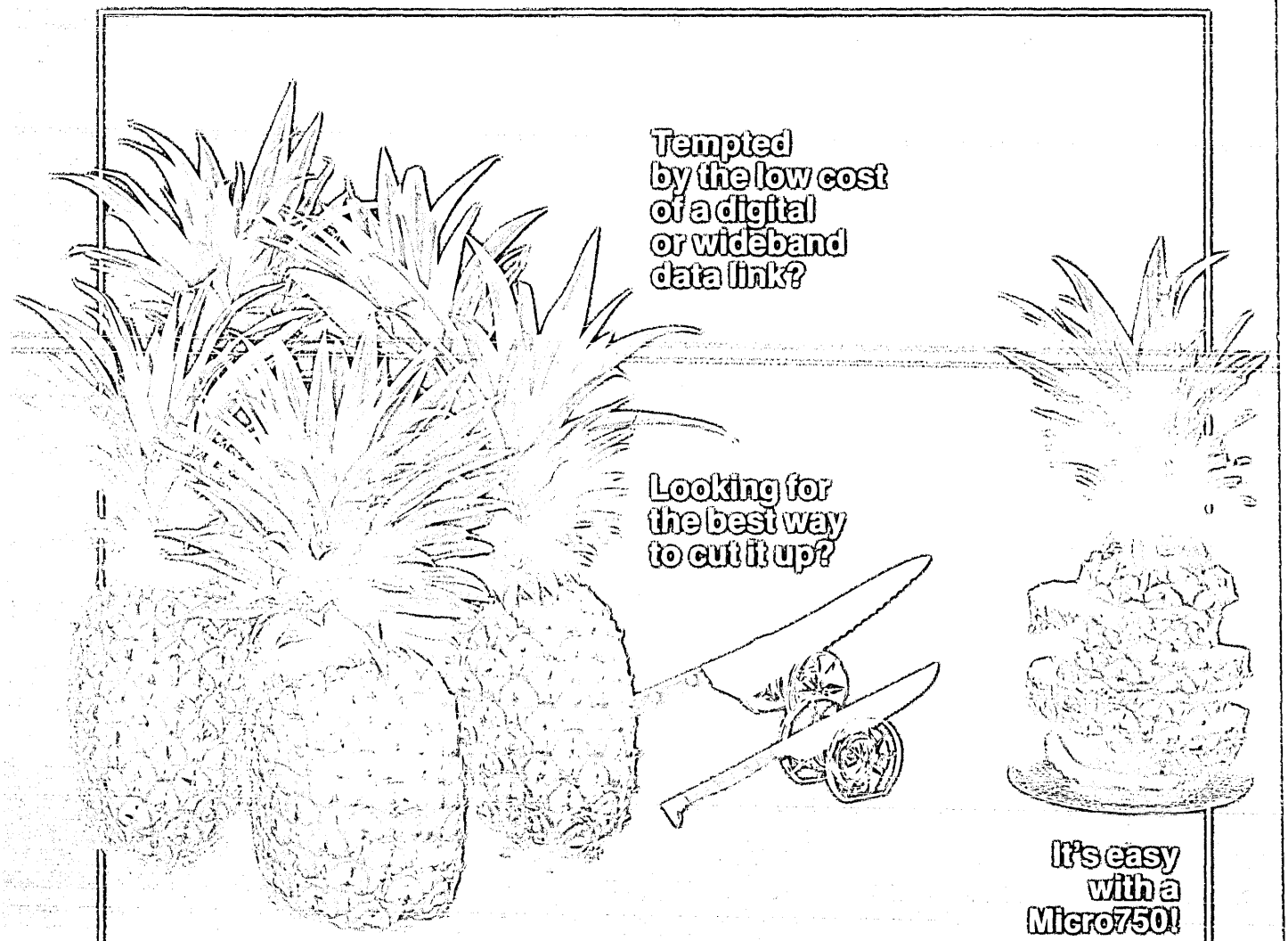

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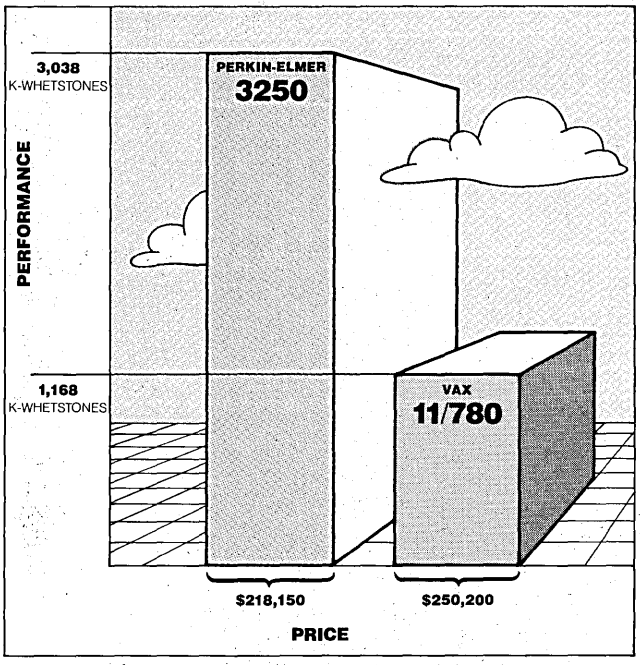

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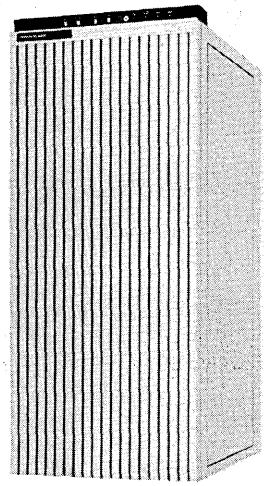

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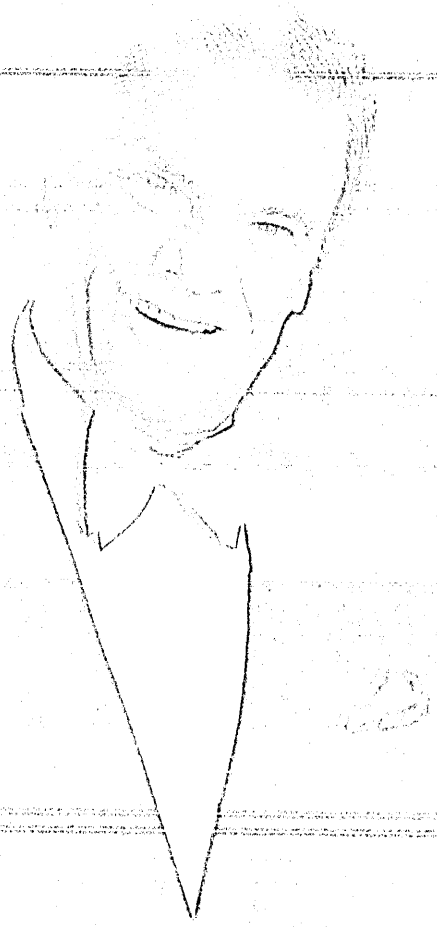


The foremost U.S. companies in the data processing industry

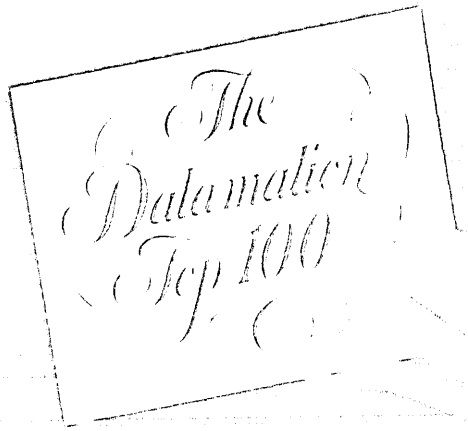
by Pamela Archbold

The year 1981 represented something of a shakeout in the computer industry in that companies with inherent strengths moved steadily ahead in the DATAMATION 100. At the same time, the recessionary pinch, flood tide interest rates, and adverse currency fluctuations exposed fundamental weaknesses in other companies, some of which lost significant ground or slipped out of the rankings altogether.

On average, however, revenues of the Top 100 companies grew from $55.6 billion in 1980 to $67.8 billion, a healthy 21.9% increase. Some industry segments fared far better than others (see Table 1). Among the companies that came up big winners:

- Digital Equipment Corp., which moved from fourth to second place in the rankings, with revenues of $3.6 billion, a growth rate of over 30%.
- Tandy Corp., which shot up to 21st from 35th position the previous year. Tandy's dp-related revenues, $460 million as opposed to $220 million in 1980, jumped a whopping 109%.
- Apple Computer, which had the highest percentage jump in revenues of any company in the Top 100—142%. On revenues that went from $165 million to $401 million, Apple vaulted from 47th to 23rd place.
- Storage Technology, which made a less dramatic but still impressive step up from 13th to 11th on revenues of $922 million, a 53% increase.
- Tandem, which went from 53rd to 38th position in the past year. Its $242 million in revenues represented an increase of 88% over 1980.

Other companies that scored impressive gains included: Wang Laboratories, which broke the billion dol-



PHOTOGRAPH BY HENRY WOLF, MAKEUP BY SHERNE

Revenues of the Top 100 companies grew from $55.6 billion in 1980 to $67.8 billion.

lar a year milestone for the first time with revenues of $1.008 billion, a healthy 48% improvement; Computervision Corp., the CAD/CAM manufacturer that saw its revenues climb to $270 million, a 41% jump; Paradyne, scoring a 78% increase on revenues of $135 million; the word processing company CPT had revenues of $123 million, a 60% jump.

Eleven new companies joined the ranks of the DATAMATION 100. The newcomers included Comdisco, the computer leasing concern, and Diebold, which has traditionally been thought of exclusively as a safe manufacturer but lately has made strong inroads into the automated teller machine market.

With dp-related revenues of $151 million, M/A-COM Inc., the telecommunications manufacturer, also made the list for the first time, reflecting the strength of the data communications equipment market last year. Lead by Rolm, which made a spectacular jump from 50th* to 28th on revenues of $331 million, the top 10 datacom vendors making the list (see Table II) averaged a 34% jump in revenues for 1981.

Even stronger were the micro manufacturers (see Table III), which averaged a 53% increase and included newcomers Cromenco and Cado Systems Corp.

Also strong was the 1981 word processing market. Lead by IBM, with estimated word processing revenues of $1.6 billion, the top 10 word processing (see Table IV) concerns accounted for revenues of well over $3 billion and featured some exceptionally strong 1981 performances, among them, that of a newcomer to the list, Philips Information Systems, Inc., which more than doubled its revenues to $140 million.

NEC, a Japanese owned peripheral and personal manufacturer, also joined the list. The Japanese are also involved in a number of joint ventures such as the one between TRW and Fujitsu.

High inflation rates and the stagnant economy took their toll, however. Hardest hit was AM International, the 65th largest company in last year's Top 100. AM dropped out of the rankings in 1981 and earlier this year filed for bankruptcy, citing losses in excess of $500 million.

Finding itself short of cash, last year's 10th largest company, Memorex, also vanished from the list, having been acquired by Burroughs, which also gobbled up Systems Development Corp. Meanwhile, Bunker Ramo, last year's 48th ranked company, was purchased by Allied Corp. and has become part of Allied Information Systems Co.

Gone as well are Conrac, Auto-Trol, and Anacomp, all of which failed to generate sufficient revenues in 1981 to qualify for the Top 100. Three additional omissions: Exxon, which lost an estimated $100 million-plus with Exxon Enterprises (now called Exxon Office Systems Co.), American Express, and Interactive Data, owned by Chase Manhattan Bank. None of these cash-rich companies like to talk publicly about their ventures in data and word processing and consequently can't be evaluated meaningfully as Top 100 candidates.

Recession-sensitive concerns like Planning Research, which depends to a major extent on the slumping building industry, saw revenues drop, registering an 8% decline on 1981 sales of $106.6 million. Problems with the auto industry adversely affected a number of dp companies. Among those hit: Reynolds and Reynolds, with revenues of $115 million, down 5%.

Competition from PCMs like Amdahl, whose revenues increased from $394 to $442; a heavy dependence on foreign business at a time when the dollar was strengthening; and problems with the U.S. economy, all slowed mainframe growth in what is already a ma-

*In the 1981 survey, Rolm was incorrectly ranked 91st.

TABLE I

% GROWTH OF DP INDUSTRY SEGMENTS

Mainframes	9.4
Minis	30.6
Micros	52.7
Office systems	32.3
Data Communications Equipment	33.6
Processing Services	26.0

TABLE II

DATA COMMUNICATION EQUIPMENT MANUFACTURERS

RANK	COMPANY	1981 REVENUES ($ millions)	1980 REVENUES ($ millions)	% CHANGE
1	Rolm Corp.	271.7	197.4	37.6
2	Racal Corp.	240.0	212.0	13.2
3	Motorola Inc.	180.0	126.0	42.8
4	Hewlett-Packard Co.	150.0	120.0	25.0
5	M/A-COM Inc.	125.0	76.3	63.8
6	Paradyne Corp.	96.1	56.2	70.9
7	International T&T	56.0	42.0	33.3
8	General DataComm Industries	52.3	50.3	3.9
9	Datapoint Corp.	47.4	36.4	30.2
10	Dataproducts Corp.	35.4	30.7	15.3
			average growth	33.6%

TABLE III

THE MAJOR MICRO MANUFACTURERS: HOW THEY STACK UP

RANK	COMPANY	1981 REVENUES ($ millions)	1980 REVENUES ($ millions)	% CHANGE
1	Apple Computer Inc.	401.1	165.2	142.7
2	Tandy Corp.	293.0	149.6	95.8
3	Hewlett-Packard Co.	235.0	200.0	17.5
4	Commodore International, Ltd.	140.0	104.0	34.6
5	Gould (SEL)	140.0	100.0	40.0
6	Cado Systems Corp.	68.2	50.6	34.7
7	Cromemco Inc.	59.0	45.0	31.1
8	M/A-COM (Ohio Scientific)	25.0	20.0	25.0
			average growth	52.7%

TABLE IV

THE TOP 10 WORD PROCESSING PRODUCERS

RANK	COMPANY	1981 REVENUES ($ millions)	1980 REVENUES ($ millions)	% CHANGE
1	International Business Machine	1,600.0	1,200.0	33.3
2	Wang Laboratories Inc.	605.1	470.4	28.6
3	Lanier Business Products, Inc.	228.0	192.5	18.4
4	Northern Telecom	172.0	162.6	5.7
5	Xerox Corp.	132.0	85.5	54.3
6	Philips Information Systems	123.0	64.2	91.5
7	NCR Corp.	112.0	90.0	24.4
8	Raytheon Co.	75.0	70.0	7.1
9	CPT Corp.	68.8	43.2	59.2
10	Burroughs Corp.	50.0	50.0	
			average growth	32.3%

TABLE V

THE TOP MAINFRAME PRODUCERS

RANK	COMPANY	1981 REVENUES ($ millions)	1980 REVENUES ($ millions)	% CHANGE
1	International Business Machine	12,000.0	11,000.0	9.0
2	Burroughs Corp.	1,254.8	1,015.2	23.6
3	Honeywell, Inc.	1,108.6	1,062.0	4.3
4	Sperry Corp.	917.7	842.2	8.9
5	NCR Corp.	915.0	908.0	0.7
6	Control Data Corp.	623.4	566.9	9.9
			average growth	9.4%

TABLE VI

HOW THE MAJOR MINI MANUFACTURERS FARED

RANK	COMPANY	1981 REVENUES ($ millions)	1980 REVENUES ($ millions)	% CHANGE
1	Digital Equipment Corp.	2,068.1	1,728.3	19.6
2	Data General Corp.	573.2	504.6	13.5
3	Hewlett-Packard Co.	435.0	375.0	16.0
4	Prime Computer, Inc.	309.0	238.5	29.5
5	Honeywell, Inc.	300.0	250.0	20.0
6	Wang Laboratories Inc.	272.3	150.0	81.5
7	Management Assistance Inc.	224.0	196.9	13.7
8	Tandem Computers, Inc.	212.9	112.6	89.0
9	Nixdorf Computer Corp.	159.3	138.3	15.1
10	McDonnell Douglas Corp. (Microdata)	150.0	100.4	49.4
11	Datapoint Corp.	142.2	109.2	30.2
12	Perkin-Elmer	140.3	144.6	– 2.9
13	Gould (SEL)	130.0	87.0	49.4
14	Intergraph Corp.	91.1	56.5	61.2
15	General Automation Inc.	80.9	88.0	– 8.0
			average growth	30.6%

ture market. As seen in Table V, IBM's revenues increased 9% in contrast to 17% in 1980. Sperry, which lost $100 million because of adverse currency swings, generated $917 million in mainframe sales last year, an 8.9% increase, and NCR, at $915 million last year, saw revenue growth of below 1%.

Honeywell also had its problems, particularly in France, where the Mitterand government threatened to take Cii-Honeywell Bull, which made a large contribution to profits in the past. The figures: $1.1 billion in 1981, a 4% increase over last year.

Control Data in turn registered a solid year on revenues of $623 million, a 9.9% gain, and Burroughs, largely as a result of its aggressive acquisitions policy, improved its figures—$1.3 billion in 1981—by 24%.

Auguring well for the mainframe vendors were these factors:

- An increased swing towards cash purchases plus accelerated third party financing activity should help Honeywell and several of the other mainframes.
- IBM has improved its lead time in cpu deliveries, which should strengthen it competitively against the PCMs. DATAMATION estimates that more than a third of its customers are also planning to upgrade their systems.
- Burroughs and Honeywell customers should benefit from increased customer upgrades.
- IBM, Honeywell, Sperry Univac, and NCR (which does a large amount of business outside the U.S.), were caught in an unusually severe currency swing which had a disproportionately large impact on earnings—one that should not carry over into 1982.
- The mainframers, especially IBM and Burroughs, have actively expanded into everything from CAD/CAM to telecommunications, and are positioning themselves competitively to weather the increasing maturity of the mainframe market.

Minicomputer revenues were not on a par with the spectacular growth they showed in past years, but most of the manufacturers managed to register impressive numbers nonetheless (see Table VI.) Prime and Data General, which lost some favor among investors because of managerial changes and earnings that fell below estimates, still registered revenue gains of 29.5% and 13.5% respectively. Data General's revenues climbed to $573 million, Prime's to $309. HP, with sales of $435 million, registered a 16% increase. Honeywell's mini revenues jumped 20% to $300 million; MAI's were up 13.7% to $224 million. The most dramatic gains were shown by Wang, up 81.5% to $272.3 million, and Tandem, up 89% to $212.9 million. Gould, Inc., which has also become a major factor in the 32-bit supermini arena through its acquisition of SEL, racked up revenues of $130 million, a jump of 49.4%.

High inflation rates and the stagnant economy took their toll.

The mini market became much more competitive as buyers became selective. As a result, a number of mini manufacturers had decreases in sales. The biggest loser was Sperry Univac, whose sales declined by 27.6% (see story p. 128); General Automation's revenues dropped 8%, and Perkin-Elmer had a loss of 2.9%.

Success of companies that provide processing and value-added services depended largely on the nature of their customer base. Those concerns selling to a broad customer base have generally weathered the recessionary storm in better condition than companies dependent on one or two industries (see Table VII).

Automatic Data Processing, with its diverse customer base and broad range of offerings, moved relentlessly towards the $1 billion a year mark on revenues of $613 million, an increase of 20.9%. Computer Sciences Corp., which depends heavily on government contracts, did not fend as well, with only an 11.4% increase on $624.7 million in revenues. Comshare fell victim to the economy; sales were $82.2 million, off 5.5% from 1980 (see story p. 210).

TRW, in turn, saw its service revenues increase 25.9% to $485 million. Another winner: Electronic Data Systems, which went from $408.5 to $473.7 million, a 15.9% swing.

Perhaps the biggest story in the service field, however, was General Electric Co. In the past, GE has been reluctant to reveal its revenues by industry segment, but in 1981 it announced service revenues in excess of $500 million, an 80% jump over the $305 million that DATAMATION estimated it generated in 1980. Significantly, too, GE went on an acquisition binge, acquiring a number of software concerns. With total estiamted dp-related revenues of $750 million, up 57.8%, GE should be a $1 billion a year dp company by 1983.

SOFTWARE: THE TAIL WAGS DOG

To gauge how active the software market was in 1981, you have to read between the lines. While not showing up directly, much of the tremendous increases in micro revenues are directly attributable to the success of software products like VisiCalc.

This exceptionally strong growth in the micro area has caused established software concerns like Management Science America to move into the micro software field with its acquisition of Peachtree Software, Inc. MSA's revenues went to $73.1 million, a 36% jump. Informatics, in turn, saw its software sales climb 42.6% to $54.5 million. Total dp revenues were $150 million, a 19% increase.

Dwarfing the figures of the indepen-

TABLE VII

COMPUTER PROCESSING SERVICES

RANK	COMPANY	1981 REVENUES ($ millions)	1980 REVENUES ($ millions)	% CHANGE
1	Computer Sciences Corp.	624.7	560.3	11.4
2	Automatic Data Processing	613.0	507.0	20.9
3	General Electric	550.0	305.0	80.3
4	TRW	485.0	385.0	25.9
5	Electronic Data Systems	473.7	408.5	15.9
6	Shared Medical	131.6	106.6	23.4
7	Bradford National	130.0	110.0	18.2
8	Dun & Bradstreet	129.5	109.0	18.8
9	National Data	96.0	81.0	19.6
10	Datacrown	63.1	50.1	25.9
			average growth	26.0%

TABLE VIII

THE TOP 10 PERIPHERALS PRODUCERS

RANK	COMPANY	1981 REVENUES ($ millions)	1980 REVENUES ($ millions)	% CHANGE
1	International Business Machine	5,000.0	4,500.0	11.1
2	Control Data Corp.	1,116.4	959.7	16.3
3	Sperry Corp.	1,112.4	1,020.8	8.9
4	NCR Corp.	1,015.0	1,001.0	1.3
5	Storage Technology	786.3	512.5	53.4
6	Xerox Corp.	748.0	750.5	-0.3
7	Digital Equipment Corp.	607.6	329.2	84.5
8	Hewlett-Packard Co.	510.0	425.0	20.0
9	International T&T	400.0	291.0	37.4
10	Tektronix, Inc.	308.9	286.4	7.8

WHERE THE R&D DOLLARS WENT

Listed below are the 10 companies that spent the largest percentage of their revenues on research and development. Noticeably missing is the industry leader, IBM, which spent $1.6 billion, but that is only 5.5% of its revenues.

RANK	COMPANY	1981 R&D EXPENSE ($ millions)	R&D AS % OF DP REVENUE
1	Management Science America Inc.	15.6	21.3
2	Applicon	11.0	17.1
3	Amdahl Corp.	75.1	16.9
4	Cray Research, Inc.	16.3	16.0
5	Floating Point Systems	8.8	15.2
6	Dysan Corp.	15.8	15.1
7	Intergraph Corp.	12.0	13.1
8	Teletype Corp.	27.3	12.3
9	Computervision Corp.	27.2	10.0
10	Computer Automation Inc.	7.2	10.0

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These were neither the best nor the worst of times in the peripherals market.

DP EMPLOYMENT: GOOD NEWS, BAD NEWS

Generally, employment in the dp companies was on the upswing, with 66% of the Top 100 firms reporting increases. Here are the 10 firms that added or reduced employment levels by the greatest percentages:

TEN WHO ADDED

RANK	COMPANY	1980 DP EMPL	1981 DP EMPL	% CHANGE
1	Tandem Computers, Inc.	1,387	2,730	96.8
2	Apple Computer Inc.	1,300	2,500	92.3
3	Intergraph Corp.	765	1,275	66.6
	NEC Information Systems, Inc.	150	250	66.6
4	Paradyne Corp.	1,617	2,638	63.1
5	Philips Information Systems	967	1,538	59.0
6	Gould, Inc.	2,740	4,200	53.2
7	Cromemco Inc.	400	600	50.0
8	Wang Laboratories Inc.	9,400	13,800	46.8
9	Applicon	785	1,149	46.3
10	Cray Research, Inc.	761	1,079	41.7

TEN WHO CUT BACK

RANK	COMPANY	1980 DP EMPL	1981 DP EMPL	% CHANGE
1	Centronics Data Computer Corp.	2,600	1,900	−26.9
2	Teletype Corp.	6,194	4,974	−19.6
3	Recognition Equipment, Inc.	2,600	2,100	−19.2
4	General Automation Inc.	2,023	1,830	− 9.5
5	Computer Automation Inc.	1,200	1,100	− 8.3
6	Boeing	109,000	101,000	− 7.3
7	Texas Instruments Inc.	89,875	83,714	− 6.8
8	Signal Cos. (Ampex)	63,000	60,000	− 4.7
9	NCR Corp.	68,000	65,000	− 4.4
10	Dataproducts Corp.	4,900	4,700	− 4.0

dents are, of course, the software sales of the major hardware vendors, chief among them IBM. We estimate IBM's software revenues climbed to $4.5 billion, a 20.6% jump. (These figures appear on the company bar charts that will be found on the following pages.)

Digital Equipment generated the second largest amount in software sales with $685.8 million in revenues, a 32.8% increase. Next were Sperry with $612.5 million, up 13.5%, and Computer Sciences with $560.3 million, up 11.4%.

These were neither the best nor the worst of times in the peripherals market. Despite the state of the economy and the fact that micros were beginning to gain increasing acceptance as intelligent terminals, thereby ruffling the feathers of some traditional leaders in that field, the year was relatively strong. The average growth rate of the 49 firms selling peripherals came to 19.3%, with IBM dominating the field on revenues of $5 billion, up 11% over 1980. (For the top 10 peripheral vendors, see Table VIII.)

Oem sales by companies in the DATAMATION 100 were dominated by Digital Equipment Corp. in the minicomputer area and Control Data in peripherals. DEC estimated that some $723.8 million of minis were sold on an oem basis almost 10 times the amount of oem revenues generated by the next largest oem mini vendor, which is Gould (SEL), with revenues of $87.1 million.

Also among the top five mini vendors who estimated oem sales for DATAMATION were Honeywell with $51 million, Computer Automation with $32.7 million, and General Automation with $24.2 million.

Control Data's oem peripheral sales

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hit $360.5 million. Dataproducts and DEC were neck and neck for the number two spot, with respective revenues of $212.8 million and $212.6 million. Tektronix at $123.5 million and Centronics at $118.9 million complete the top five oem peripheral vendors.

Traditionally, dp firms trying to raise capital simply had to make a stock offering and the public and institutional investors would come running. No longer. True, several companies in the Top 100 made successful secondary and primary offerings—among them, Apple, Dyson, and MSA. But 1981 was a year when the romance between technology issues and investors paled somewhat, and the stock market in general, of course, was dead in the water.

MINI VENDORS HARD HIT

Minicomputer vendors, which in the past have not needed to pay dividends to investors because of their stocks' steady and rapid appreciation, were perhaps hardest hit. In a two-month period last year the market values of half a dozen mini manufacturers dropped $4 billion, with Datapoint absorbing the biggest losses. During this period Datapoint's stock dropped from $50 to $20.

Blue chips like IBM, whose stock dropped from $69 to $58 during the course of the year, also suffered, and ended up seeking alternative sources of capital including borrowings of $360 million in Eurodollar notes and a $168 million Swiss franc loan.

Overall, investors who bought computer stocks at the beginning of 1981 and sold them at the end of the year would have lost money on more than two thirds of all the companies in the Top 100. (For a breakdown of major winners and losers, see box "The Year of the Bear.")

Despite a lackluster stock market performance, however, the dp industry as a whole has probably never been more competitive and vital. This is brought home when you examine the relationship between IBM and the rest of the industry.

In 1979, IBM's revenues represented 47% of the total sales of all the companies in the DATAMATION rankings. In 1980, IBM's $22.5 million made up 40.6% of total industry revenues. And this year, IBM slipped again, this time generating 38.8% of the $67.8 billion in Top 100 sales.

Concurrently, the non-IBM segment of the industry has seen its own revenues increase every year, and the 24.2% growth in 1981 represented the best growth rate to date.

Another figure that underscores this dramatic growth: two years ago, to be included among the 50 largest companies in the industry, a company had to have revenues of $78 million. Today, more than 85 companies have sales in excess of that figure.

THE YEAR OF THE BEAR

Most computer stocks didn't perform as well in 1981 as in previous years. Here's a look how certain issues fared in a down market.

HOW THE TOP 10 FARED WITH INVESTORS

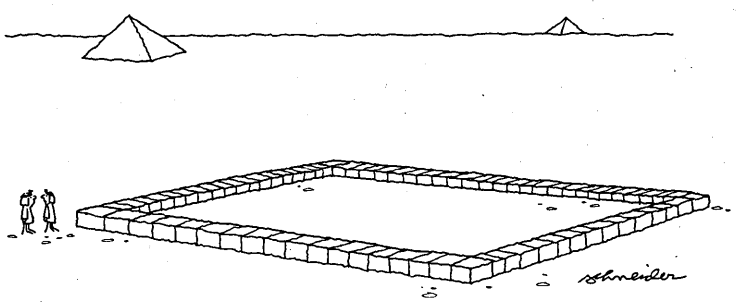
RANK	COMPANY	JAN. 2, 1981 PRICE	DEC. 31, 1981 PRICE	% CHANGE
1	IBM	69.13	56.88	−17.7
2	Digital Equipment	95.63	86.50	− 9.5
3	Control Data	35.63	35.25	− 1.0
4	NCR	74.75	43.63	−41.6
5	Burroughs	54.13	34.00	−37.1
6	Sperry Corp.	63.38	35.25	−44.3
7	Hewlett-Packard	44.13	39.63	−10.1
8	Honeywell, Inc.	112.25	69.88	−37.7
9	Xerox Corp.	60.13	40.50	−32.6
10	Wang Laboratories	40.13	33.25	−17.1

THE 10 BIGGEST WINNERS

RANK	COMPANY	JAN. 2 PRICE	DEC. 31 PRICE	% CHANGE
1	Verbatim Corp.	18.00	46.75	159.7
2	Commerce Clearing House, Inc.	29.75	57.25	92.4
3	Northern Telecom L&D	29.00	48.50	67.2
4	Storage Technology	22.88	35.00	53.0
5	Tandy Corp.	22.13	33.75	52.5
6	Comdisco, Inc.	18.40	25.38	37.9
7	Paradyne Corp.	30.75	40.88	32.9
8	Telex Corp.	5.13	6.50	26.8
9	United Telecom	17.50	21.75	24.2
10	Informatics, Inc.	24.50	26.00	6.1

THE 10 BIGGEST LOSERS

RANK	COMPANY	JAN. 2 PRICE	DEC. 31 PRICE	% CHANGE
1	American Management	34.00	10.00	−70.5
2	Recognition Equipment, Inc.	16.38	6.63	−59.5
3	Gerber Scientific, Inc.	25.25	11.34	−55.0
4	Comshare Inc.	15.50	7.13	−54.0
5	National Semiconductor	40.75	19.13	−53.0
6	Wyly Corp.	15.88	8.13	−48.8
7	Boeing	43.25	22.50	−47.9
8	Computer Automation Inc.	18.75	10.00	−46.6
9	Centronics Data Computer Corp.	24.00	13.13	−45.3
10	Sperry Corp.	63.38	35.25	−44.3



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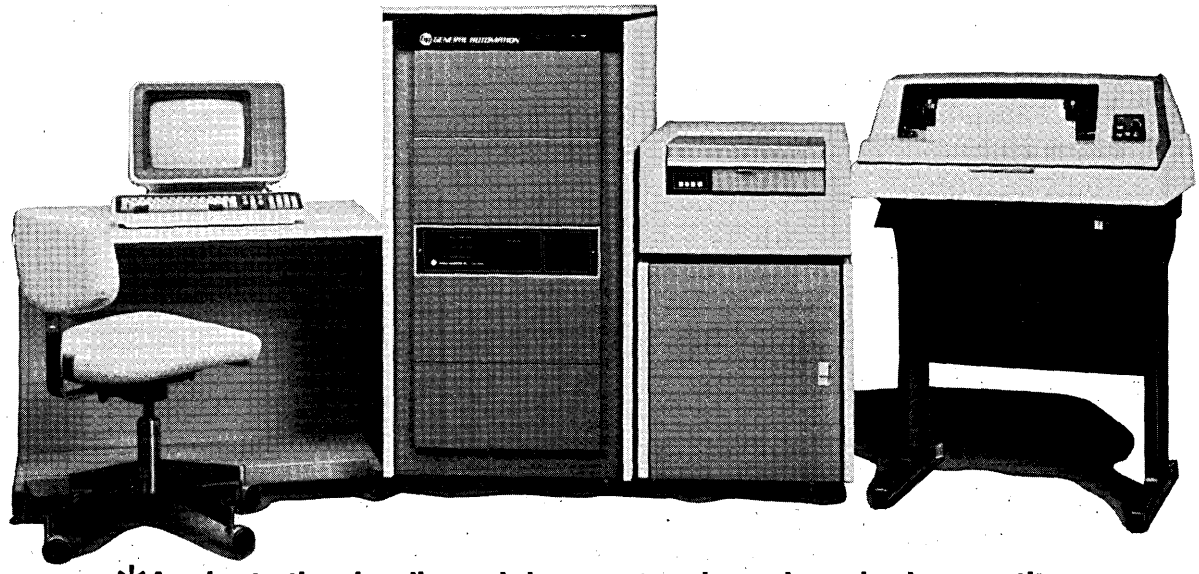

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GENERAL AUTOMATION

CIRCLE 116 ON READER CARD

THE DATAMATION 100

THE TOP 100 U.S. COMPANIES IN THE DP INDUSTRY

1981 RANK	1980 RANK	COMPANY	1981 DP REVENUE ($ millions)	% GROWTH RATE (DP)	1981 TOTAL REVENUE ($ millions)	RETURN ON EQUITY	FISCAL YEAR END
1	1	International Business Machine	$26,340.0	16.7%	$29,070.0	19.1%	Dec.
2	4	Digital Equipment Corp.	3,586.6	30.7	3,586.6	12.7	June
3	3	Control Data Corp.	3,103.3	12.2	4,162.6	10.4	Dec.
4	2	NCR Corp.	3,071.8	4.1	3,432.7	11.7	Dec.
5	6	Burroughs Corp.	2,934.0	24.6	3,405.4	6.8	Dec.
6	5	Sperry Corp.	2,781.0	8.9	5,544.0	14.1	Mar.
7	8	Hewlett-Packard Co.	1,875.0	18.4	3,695.0	16.3	Oct.
8	7	Honeywell, Inc.	1,773.7	8.5	5,351.2	13.2	Dec.
9	9	Xerox Corp.	1,100.0	15.7	8,619.0	18.0	Dec.
10	11	Wang Laboratories Inc.	1,008.5	47.9	1,008.5	16.7	June
11	13	Storage Technology	922.0	52.9	922.0	17.5	Dec.
12	20	TRW, Inc.	855.0	11.1	5,285.1	16.8	Dec.
13	12	Data General Corp.	764.4	13.6	764.4	13.4	Sept.
14	17	General Electric Co.	750.0	57.8	27,854.0	18.1	Dec.
15	14	Texas Instruments Inc.	666.7	6.7	4,206.0	6.2	Dec.
16	15	Computer Sciences Corp.	624.7	11.4	624.7	27.9	Mar.
17	16	Automatic Data Processing	613.0	20.9	613.0	17.4	June
18	30	ITT Corp.	540.0	33.3	23,200.0	18.1	Dec.
19	18	Electronic Data Systems	480.6	17.6	486.7	24.7	June
20	21	Datapoint Corp.	474.1	30.2	474.1	12.0	July
21	35	Tandy Corp.	460.0	109.0	1,885.5	39.7	June
22	19	Amdahl Corp.	442.7	12.2	442.7	10.6	Dec.
23	47	Apple Computer Inc.	401.1	142.7	401.1	22.2	Sept.
24	25	McDonnell Douglas Corp.	376.7	23.7	7,384.9	10.0	Dec.
25	27	Prime Computer, Inc.	365.0	36.1	365.0	31.8	Dec.
26	23	Management Assistance Inc.	349.1	12.4	349.1	17.1	Sept.
27	0	Comdisco, Inc.	343.9	25.0	343.9	26.6	Sept.
28	91	Rolm Corp.	331.5	32.1	331.5	27.6	July
29	32	National Semiconductor	330.0	10.0	1,094.8	18.0	May
30	26	Mohawk Data Sciences Corp.	320.9	11.6	320.8	12.2	April
31	28	Harris Corp.	313.0	20.3	1,636.2	20.7	June
32	24	Tektronix, Inc.	308.9	7.8	1,100.0	15.3	May
33	38	Tymshare Inc.	289.7	23.2	289.7	9.7	Dec.
34	41	Computervision Corp.	270.7	41.7	270.7	25.0	Dec.
35	31	Dataproducts Corp.	270.0	8.7	270.0	11.4	Mar.
36	70	Gould, Inc.	270.0	44.3	1,846.0	11.9	Dec.
37	34	Raytheon Co.	245.0	8.8	5,636.0	20.1	Dec.
38	53	Tandem Computers, Inc.	242.5	88.4	242.5	12.9	Sept.
39	37	Racal Corp.	240.0	13.2	240.0	NM	Mar.
40	40	Four-Phase Systems	233.7	18.5	233.7	NM	Dec.
41	33	Perkin-Elmer	230.0	1.7	1,096.0	18.7	July
42	36	Northern Telecom	229.3	5.7	2,151.9	NM	Dec.
43	63	Lanier Business Products	228.0	18.4	325.7	30.1	May
44	39	3M	225.0	9.7	6,500.0	12.4	Dec.
45	42	C. Itoh Electronics, Inc.	213.0	12.6	213.0	NM	Dec.
46	57	Boeing	205.5	46.4	9,788.2	26.0	Dec.
47	44	Motorola Inc.	180.0	42.8	3,335.9	17.2	Dec.
48	46	Signal Co.	176.0	6.6	5,342.6	12.2	Dec.
49	49	Sanders Associates Inc.	171.5	45.0	364.4	17.2	July
50	48	Allied Corp.	162.0	10.2	6,407.0	13.9	Dec.

1981 RANK	1980 RANK	COMPANY	1981 DP REVENUE ($ millions)	% GROWTH RATE (DP)	1981 TOTAL REVENUE ($ millions)	RETURN ON EQUITY	FISCAL YEAR END
51	66	Commodore International, Ltd.	161.6	33.2	199.5	50.9	June
52	29	Teletype Corp.	161.4	−0.9	221.0	NM	Dec.
53	45	General Instrument Corp.	160.0	−6.9	905.0	19.7	June
54	51	Nixdorf Computer Corp.	159.3	15.1	159.3	NM	Dec.
55	0	M/A - COM Inc.	151.0	56.8	541.6	19.7	Sept.
56	56	Informatics, Inc.	150.3	19.3	150.3	23.7	Dec.
57	60	Wyly Corp.	147.0	24.5	147.0	14.9	Dec.
58	58	Telex Corp.	142.7	21.0	200.4	16.2	Mar.
59	67	Dun & Bradstreet	142.3	17.8	1,331.0	29.9	Dec.
60	98	Philips Information Systems	140.0	105.8	140.0	NM	Dec.
61	61	United Telecom	137.0	7.8	2,263.0	40.4	Dec.
62	77	Paradyne Corp.	135.4	78.3	135.4	12.8	Dec.
63	64	Shared Medical Systems	131.6	23.4	131.6	NM	Dec.
64	50	Bradford National	130.0	18.0	130.0	NM	Dec.
65	62	Recognition Equipment, Inc.	125.3	1.6	125.3	NM	Oct.
66	76	CPT Corp.	123.8	60.5	123.8	23.3	June
67	52	Centronics Data Computer Corp.	118.9	−9.9	118.9	NM	June
68	0	Data Terminal Systems	118.3	10.4	118.3	NM	Jan.
69	55	General Automation Inc.	115.6	−8.8	115.6	5.2	July
70	59	Reynolds & Reynolds	115.2	−5.1	212.0	14.1	Sept.
71	74	Martin Marietta Corp.	112.0	43.5	112.0	17.0	Dec.
72	54	Planning Research	106.6	−8.1	319.6	NM	June
73	85	Dysan Corp.	104.2	65.9	104.2	6.7	Oct.
74	75	Gerber Scientific, Inc.	101.9	30.6	115.6	31.4	April
75	86	Cray Research, Inc.	101.7	67.2	101.7	14.4	Dec.
76	0	Mannesmann-Tally	100.0	17.6	100.0	NM	Dec.
77	0	NEC Information Systems, Inc.	100.0	25.0	100.0	NM	Mar.
78	94	National Data Corp.	96.9	19.6	96.9	20.5	May
79	83	Commerce Clearing House, Inc.	91.9	36.5	312.6	53.2	Dec.
80	90	Intergraph Corp.	91.1	61.2	91.1	43.4	Dec.
81	0	Diebold Inc	90.0	20.0	385.9	18.1	Dec.
82	84	Quotron Systems, Inc.	88.1	37.8	88.1	23.8	Dec.
83	73	Modular Computer Systems Inc.	87.2	7.5	87.2	5.2	Dec.
84	68	Comshare Inc.	82.2	−5.5	82.2	10.5	June
85	96	Management Science America Inc.	73.1	36.1	73.1	29.2	Dec.
86	72	Computer Automation Inc.	71.8	−11.6	71.8	5.8	June
87	100	Verbatim Corp.	68.6	41.7	68.6	6.3	July
88	0	Cado Systems Corp.	68.2	34.7	68.2	19.9	Dec.
89	82	Applicon	64.0	17.6	64.0	29.8	April
90	0	Datacrown, Inc.	63.1	26.0	86.2	NM	Dec.
91	0	American Management Systems	62.1	10.4	62.1	NM	Dec.
92	69	Sun Co.	61.0	22.0	61.0	18.1	Dec.
93	99	Printronix Inc.	60.1	23.1	60.1	18.3	Mar.
94	79	Lear Siegler, Inc.	60.0	9.0	1,532.0	20.5	June
95	0	Cromemco Inc.	59.0	31.1	59.0	NM	Dec.
96	93	Nashua Corp.	58.0	8.4	653.9	6.3	Dec.
97	0	Floating Point Systems	57.8	36.3	57.8	11.9	Oct.
98	92	MSI Data Corp.	56.9	6.9	56.9	19.4	Mar.
99	87	Triad Systems Corp.	56.6	56.3	56.6	40.9	Sept.
100	88	General DataComm Industries	55.6	5.5	55.6	5.9	Sept.

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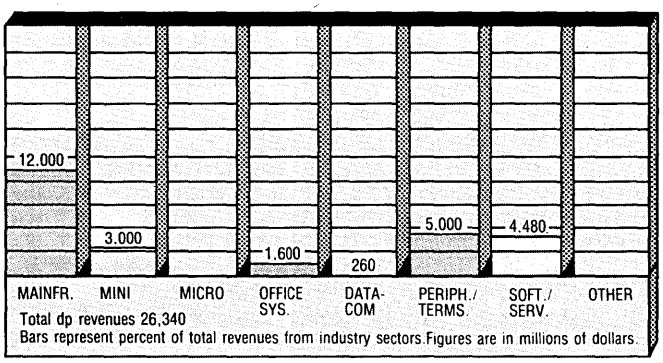

INTERNATIONAL BUSINESS MACHINES

Old Orchard Road
Armonk, NY 10504
(914) 765-1900

Last year proved one of the most eventful years in IBM's history. It was a period of transition for the company, one in which the computer giant sought to streamline its operations, penetrate new markets, and reaffirm its traditional strengths.

Specifically, the company realigned its organizational structure, consolidating its three U.S. divisions (Data Processing, General Processing, and Office Processing) into two divisions that sell a full line of information systems and products.

Concurrently with the introduction of its Personal Computer, it quickly established itself as a formidable competitor in the microcomputer marketplace while becoming increasingly aggressive in the telecommunications, CAD/CAM, office automation, and systems software arenas. IBM also reentered the computer services industry, which it had abandoned in 1973 as part of an antitrust settlement with Control Data Corp., and introduced a host of new products, including the IBM 3380 disk file; the Displaywriter, an office system; a new model of the IBM 3081 (the 3081K), the manufacturer's most powerful computer; and several new models of the IBM 4300 and 8100 processors.

Twenty-one IBM retail product centers were opened during the year as the company sought to stimulate high-volume sales of its low-end product line. IBM also announced it would sell its Personal Computer through both Computerland stores and Sears, Roebuck and Co.'s business systems stores, and began marketing other products such as terminals and printers through distributors.

To serve its new and expanding markets, IBM has increased its use of automated manufacturing, design, and testing equipment and added more than 22 million square feet of plant and laboratory space. It is currently building 4 million square feet of additional space worldwide, and last year bolstered R&D expenditures to $1.6 billion from 1980's $1.5 billion figure.

These developments came at a time when IBM's dominant market—large-scale mainframes—has leveled off, and the company's traditionally solid financial growth has been stayed by the weak economy in both the U.S. and Western Europe and the adverse effects of a strong dollar. Worldwide net earnings were $3.3 billion, compared with $3.6 billion in 1980. Net earnings amounted to $5.63 per share, compared to the 1980 figure of $6.10 a share. IBM has historically refused to divulge its product segment breakdown. For the purposes of the Top 100, we have estimated its sales, as shown in the above chart.

Perhaps the best news IBM received during the year was the announcement that the U.S. Justice Department was withdrawing its 13-year antitrust suit against the company, asserting that the case was "without merit and should be dismissed." The European Economic Community, however, continues to seek modification of certain IBM business practices in the Common Market.

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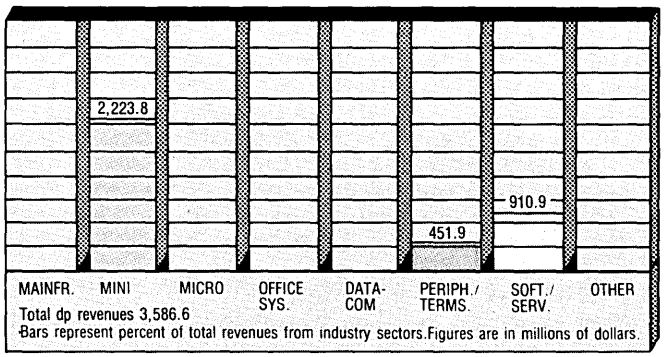

DIGITAL EQUIPMENT CORPORATION

146 Main Street
Maynard, MA 01754
(617) 897-5111

As many of its competitors fell prey to the recession, Digital Equipment, the number one minicomputer manufacturer, continued to turn in a strong performance in 1981—so much so that it jumped to the number two position in the DATAMATION Top 100. Revenues grew 30.7% to $3.59 billion, from $2.74 billion in 1980, while net income rose to $404.9 million.

Although sales to oems were sluggish, demand for the company's VAX 11/780 and 11/750 super minicomputers made up for weakness elsewhere. In fact, the easing in demand was something of a blessing for DEC because it was spending $399 million upgrading buildings and equipment in fiscal 1981. The improvements allowed the company to cut lead times on popular products.

In order to maintain its edge, DEC introduced a number of new products for a variety of markets in 1981. In the minicomputer sector, which accounted for an estimated $2.07 billion of the company's sales in 1981, DEC introduced the PDP-11/24, an entry-level addition to its 16-bit family. Its design permits the packaging of the entire central computer processor on a single 8×10 inch circuit board.

In the office area DEC introduced the DECmate work processor, a low-cost unit that combines word and data processing for offices and small businesses. In November, the company sought to assure its users that it did not intend to be left behind in the race to automate the office, with Office Plus, its blueprint for that area. A keystone of that effort, announced in October, is DECmail, an electronic mail system for DEC users.

At the low end, DEC took a tentative step into the personal computer market when it introduced a package of enhancements, the VT18X that converts its VT100 display into a CP/M-based personal computer.

To fuel its stream of new product announcements DEC increased its research and development spending by 35% to $251 million in fiscal 1981. The company also went outside for capital, raising $241 million from the sale of 2.5 million shares of common stock.

The company expanded employment by almost 8,000 during fiscal 1981, bringing its staff worldwide to a total of 63,000. It also made some organizational changes during the year, including the formation of the Technical Volume Group, which is geared to strengthen the company's ability to serve the technical oem and microcomputer markets.

Although DEC does 41% of its business outside the U.S. it has not been as hard hit by the strength of the dollar as have many of its competitors. Management's ability to maintain revenues and earnings abroad was superior to that of most companies and its currency translations programs appeared effective.

CHARTS BY CYNTHIA STODDARD

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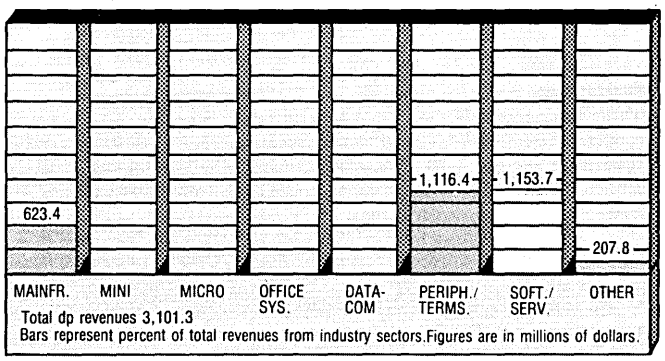

CONTROL DATA CORPORATION

8100 34th Avenue South
Bloomington, MN 55440
(612) 853-8100

Control Data's philosophy of avoiding head-on confrontation with IBM by diversifying into peripherals and services has paid off handsomely for the company. Over the last six years, earnings have skyrocketed, while returns on equity and revenues have doubled. During 1981, CDC had total revenues of $4.16 billion, up 10% from last year. Total corporate profits were up 13% to $170.6 million, despite a decline in CDC's commercial credit subsidiary, which reported earnings down 16% to $50.2 million.

CDC is one of the leading suppliers of computer services, large-scale computer systems, and computer peripherals. The peripherals business has become most important, contributing 42% of total revenues. CDC produces a wide range of peripherals and related supplies for its own computers and those of other manufacturers. Sales of peripherals and storage media went up 13% in 1981 to $1.32 billion. The oem disk drive market is the mainstay of CDC peripherals business and accounts for about 90% of its sales. During 1981, plug-compatible drives were given a strong boost because of IBM's production slowdown.

CDC's services division contributes about 37% of revenues and provides data processing, engineering, consulting, and educational services. The educational market is reached by the Plato Computer educational system. Sales for this division increased 12% in 1981 to $1.15 billion.

The mainframe market now contributes 20% of CDC's total revenues, but during 1981, the company introduced a number of new computers that could change the long-term picture at CDC. Aiming only at the large-scale scientific market, CDC introduced a new CYBER 205 computer, which quickly had eight orders at an average price of $9 million. In addition, early in 1982, CDC announced another large computer, the CYBER 170 Series 800, which is the largest series of models and machines CDC has ever introduced. CDC also made an entry into the micro arena with the Control Data 110, which has applications for small business, education, and training markets.

CDC's joint venture with NCR and International Computers, Ltd., called Computers Peripherals, Inc., sold its printing business to Centronics for stock.

While the computer segment is expected to do well in 1982, CDC's nonconsolidated subsidiary in commercial credit and insurance is expected to suffer from the slow economy, so corporate earnings are expected to be flat for the year.

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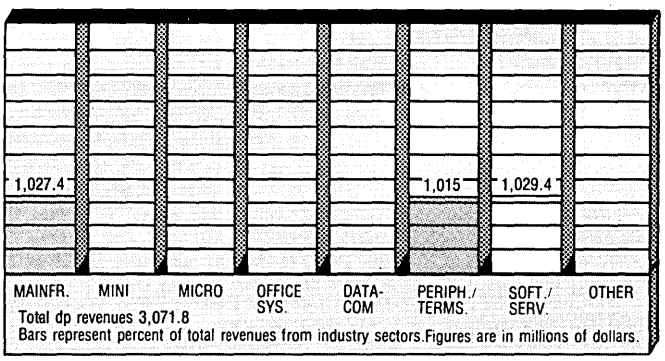

NCR CORPORATION

1700 South Patterson Boulevard
Dayton, OH 45479
(513) 445-5000

NCR had a sluggish year in 1981. Worldwide dp revenues were up only 4% to $3.1 billion, while net income actually fell 18% to $208.2 million.

The company attributed its poor performance to sales in Europe, where it does one third of its business and where poor business conditions and the strengthening of the dollar caused revenues to fall 12%.

The economy also hurt NCR in its recession sensitive line of financial and retail terminals, which account for 45% of its overall business. Revenues from those two product areas fell 2% and 8% respectively.

During the year, NCR attempted to cope with two big problems: its failure to carve out an identifiable niche for its computer systems and the increased competition it faces in the terminal business.

In an effort to strengthen its product line, the company completed a restructuring that will integrate product development more closely with engineering and manufacturing. It also launched programs to sell its terminals and small computer system through dealers and systems houses.

In addition, early in the year NCR upgraded and revamped its offering of small- and medium-sized systems with the introduction of the I-9000 series. The company introduced four models of this new family, ranging from the I-9010, a small business system that replaces the older I-8100 family, to the I-9050, which has a 32-bit processor. In October, NCR announced a $16 million order for 70 midrange I-9040 systems by the Social Security Administration of Mexico.

Late in the year, NCR made the first deliveries in France and Japan of its long-delayed top-of-the-line V-8600 mainframe.

NCR also joined the flurry of new entries into office automation with its family of WorkSaver standalone and clustered word processing systems. The WorkSaver family is based on the office workstation that NCR acquired from Convergent Technologies, Inc. NCR has created a separate office systems sales force for the WorkSaver that will concentrate on major industrial and governmental organizations in the U.S.

Although sales of retail and financial terminals were down, revenues from general purpose terminals were up 57% to $160 million, reflecting the first full year of sales from Applied Digital Data Systems, the terminal maker NCR acquired in 1980. During the year, ADDS introduced its new low-cost Viewpoint terminal.

Already a leader in the growing market for supermarket POS terminals equipped with scanning capability, NCR bolstered its offering with two low-cost controllers designed for smaller supermarkets.

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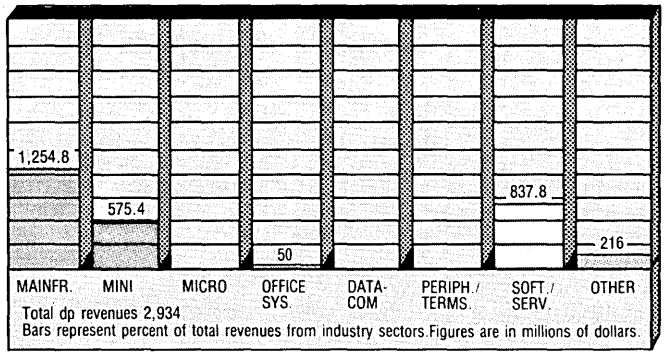

BURROUGHS CORPORATION

One Burroughs Place
Detroit, MI 48232
(313) 972-7350

During its first full year under chairman and chief executive W. Michael Blumenthal, Burroughs made significant strides toward alleviating its management problems and heading into new growth areas like office automation. When and how well it will capitalize on these gains remains to be seen.

Total revenues rose a modest 17% during the year to $3.4 billion. Fourth-quarter revenues exceeded $1 billion for the first time in the company's history.

Despite having 41% of its sales from foreign sales, earnings increased 82% to $149 million. These gains reflect the company's heavy emphasis during the year on asset management as well as other cost-saving measures.

Mainframes continue to be Burrough's major product line, contributing more than one third of the firm's overall revenues. Burroughs supports a broad line that was strengthened in 1981 by the addition of the B3955 medium-scale system. A new high-end mainframe, the long-awaited B7900, is scheduled for introduction this year.

Burroughs took a major step toward redefining its future with the $102 million acquisition of Memorex, the troubled manufacturer of disk drives and other peripherals. Through Memorex, which was ranked by DATAMATION as 10th largest dp company last year, Burroughs now has a presence in the IBM plug-compatible disk market, offering a possible way for Burrroughs to increase its penetration of IBM's customer base. Memorex should also help Burroughs improve its lackluster reputation in peripherals. Nonetheless, in taking on Memorex, Burroughs acquires a troubled company that may need time to straighten out. Analysts don't expect Memorex to be profitable before 1983.

Burroughs' major product announcement was its OFIS 1 office automation system, consisting of word processors, disk storage, and communications equipment. OFIS 1 is centered around the OFISfile desktop workstation developed by System Development Corp., which Burroughs acquired in early 1981. Burroughs is also looking to SDC, a supplier of software and data communications services, to help it become a strong supplier of data processing services to government.

Burroughs' third acquisition was of Systems Research Inc., a supplier of advanced data communications equipment and software. SRI supplied Burroughs with the CP 3680, the data communications processor Burroughs introduced in 1981.

At the low end, Burroughs has a four-year agreement for an estimated $150 million to have Convergent Technologies supply a small entry level business system combining dp and wp.

Customer service, a sore spot at Burroughs in the past, showed improvement in 1981. Improved delivery times, a greater emphasis on quality and the integration of staging centers into the delivery process have drawn approval from users.

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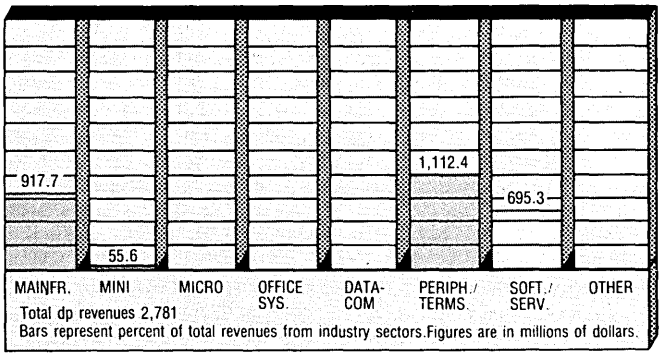

SPERRY CORPORATION

1290 Avenue of the Americas
New York, NY 10104
(212) 484-4278

The hard times in the data processing industry took Sperry Univac, the data processing division of Sperry Corp., by surprise last year. The division failed to show an increase in profit for the first time in nine years and revenues grew by only 9% to $2.8 billion, from $2.5 billion in 1980.

Management blamed its troubles on high interest rates and the strength of the dollar. The company holds the leases on its own products, making it particularly vulnerable to the high cost of money. It also does some 43% of its business outside of the U.S., a fact which caused it to lose some $100 million in currency translations last year.

Outsiders believe that part of the company's predicament is a result of the fact that it has not kept up with trends in the dp industry. They note its difficulties in the mini field, its lack of a high-end 1100/80 to give current users a larger machine to move up to, and its absence from the fast-growing office automation market as signs of the company's shortsightedness.

Of course, that is not to say that Univac failed to introduce any new products last year. The company made a number of announcements, including a new multiprocessor which doubled the maximum performance of its highly successful 1100/60 family, a series of streamlined V77 processors for that minicomputer line, as well as the UTS4000 PARS Airline Terminal, and numerous software enhancements.

During the year it spent $255 million on research and development, nearly 9% of its revenues. It folded its U.S. minicomputer sales force into its domestic mainframe force to give it a more integrated approach to the distributed data processing market. In addition, it completed an agreement with Pertec Computer Corp. to purchase Pertec's base of data entry equipment in the U.S. and Canada.

The company also saw some management changes. In March, Joseph Kroger was appointed president of Univac. Kroger had previously been president of Univac's marketing and services division. He succeeded Richard Gehring, who assumed strategic program responsibilities as a corporate executive vice president and member of Office of the Chairman.

1982 should be an important year for the company. Many of Univac's supporters believe that it will regain its momentum, using tighter controls to improve profitability and announcing new products to safeguard its place as a major supplier. Among those products expected are a top-of-the-line 1100/80 as well as a more powerful 1100/80 Array Processing System and the company's first venture into the office automation market, a workstation aimed at managers.

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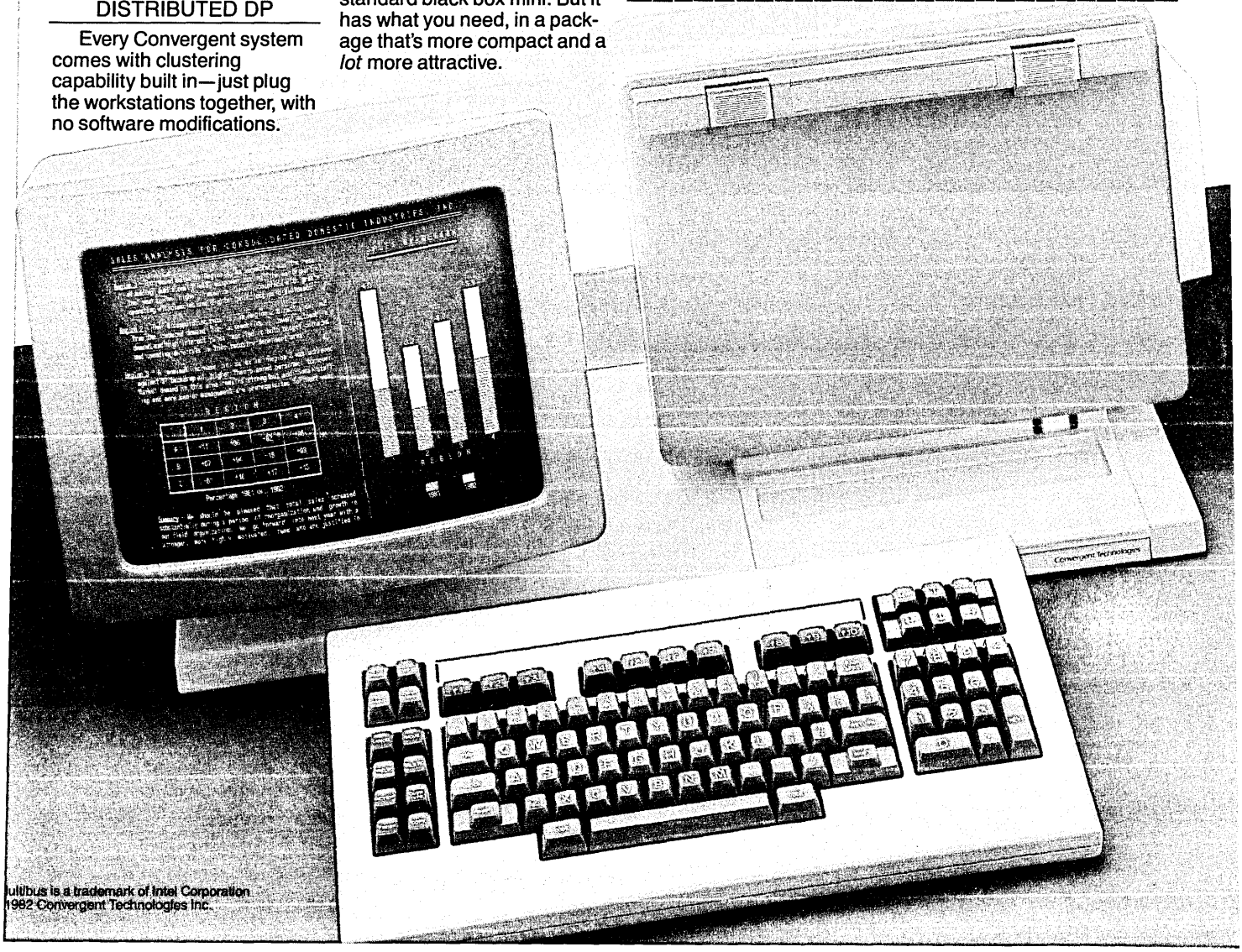

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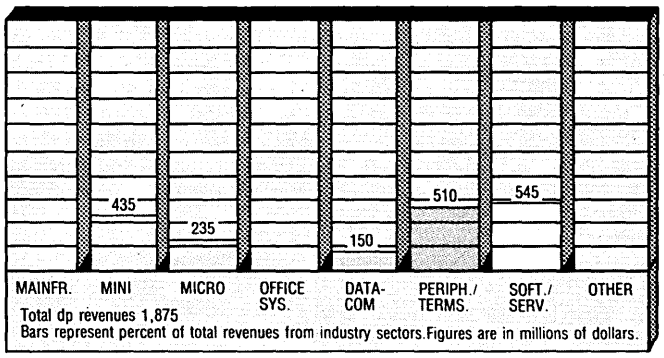

HEWLETT-PACKARD COMPANY

3000 Hanover Street
Palo Alto, CA 94304
(408) 725-8111

Hewlett-Packard felt the effects of recessed economies around the world in 1981. The number two minicomputer maker saw its data processing revenues grow by 18% to $1.88 billion in 1981, up from $1.58 billion in 1980. Although respectable, that performance did not compare to that achieved by the electronic test equipment company the year before. Between fiscal 1979 and 1980, HP's data processing sales grew 42%.

Management attributed the slowdown to a shortfall in orders in the final quarter of 1981 that ended on Oct. 31. By the end of the calendar year, however, orders had picked up again as customers responded to the new HP 3000 models 64 and 40.

Earnings for the dp segment of the company's business also grew less quickly than in previous years. In fiscal 1981, earnings before taxes for data processing products were up 12% to $319 million from $285 million in 1980. In contrast earnings grew by 55% in 1980. Management attributed the difference to a high level of product development in 1981, as well as marketing expenses associated with some major product introductions.

As it has done in the past, HP continued to fuel growth with a constant flow of new products. Products introduced over the past two years accounted for one third of HP's revenues in 1981. To maintain that state of affairs, HP introduced a personal computer for office use, the HP-125, as well as unveiling its overall plan for office automation in 1981. Late in the year, the company introduced its Interactive Office Concept, a combination of software and hardware products that HP believes will allow its users to automate their offices.

HP increased capital expenditure last year in order to build for future growth. It spent $318 million in fiscal 1981, compared with $297 million in 1980. Construction was completed on 1,387,000 square feet of additional plant capacity and on new sales and services offices totaling 371,000 feet. The company's new 478,000 square foot corporate headquarters building in Palo Alto was completed and occupied during the fiscal year.

Construction was also started on other locations, while the company acquired property in Colorado Springs; Lake Stevens, Washington; Bristol, England; and obtained an option on land in Lyon, France for future plant sites.

HP expects that capital expenditures in 1982 will rise to as high as $480 million in order to provide the plant capacity that the company believes will be needed to support its growth over the next few years. As it has done in the past, the company expects to provide those funds internally. At the end of the fiscal year the company had $146 million in cash on hand, up from $104 a year earlier, and long-term debt, primarily foreign borrowings, was $26 million, down $3 million from 1980.

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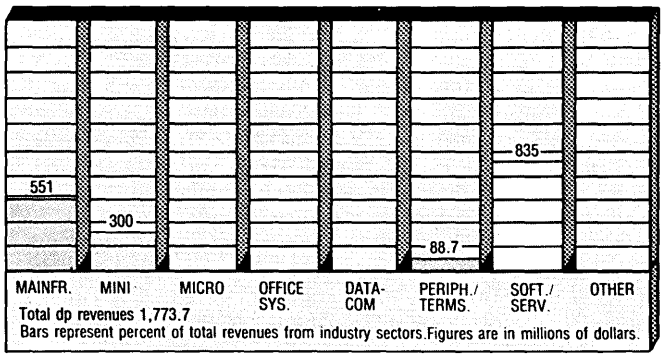


HONEYWELL, INC.

Honeywell Plaza
Minneapolis, MN 55408
(612) 870-5200

Honeywell, Inc.'s 1981 results appear to be poor (dp revenues up only 8.5% to $1.8 billion), but Wall Street analysts point out that the company is doing much better than the results show. The basis of this thinking is that Honeywell's problems are centered around its European operations, which suffered losses. The main culprit is Honeywell's once highly profitable French affiliate Cii-Honeywell Bull, 47% owned by Honeywell in partnership with Saint Gobain. The newly elected French government has decided to nationalize this operation, and the resulting confusion caused Cii-Honeywell's contribution to earnings to drop from $1.45 per share in 1980 to a loss of 61 cents per share in 1981. This loss was bad enough, but when coupled with Honeywell's other European operations, which were set back by the stronger dollar, the company appears to be in trouble, because earnings were off 27% despite an increase in sales.

Analysts point out that Honeywell's problems appear more severe for another reason. With so many other companies using the newly approved accounting method for translation of foreign operating results, which smooth out currency losses, Honeywell's loss stands out. The company is expected to change to the new method once the French government makes its final intentions known.

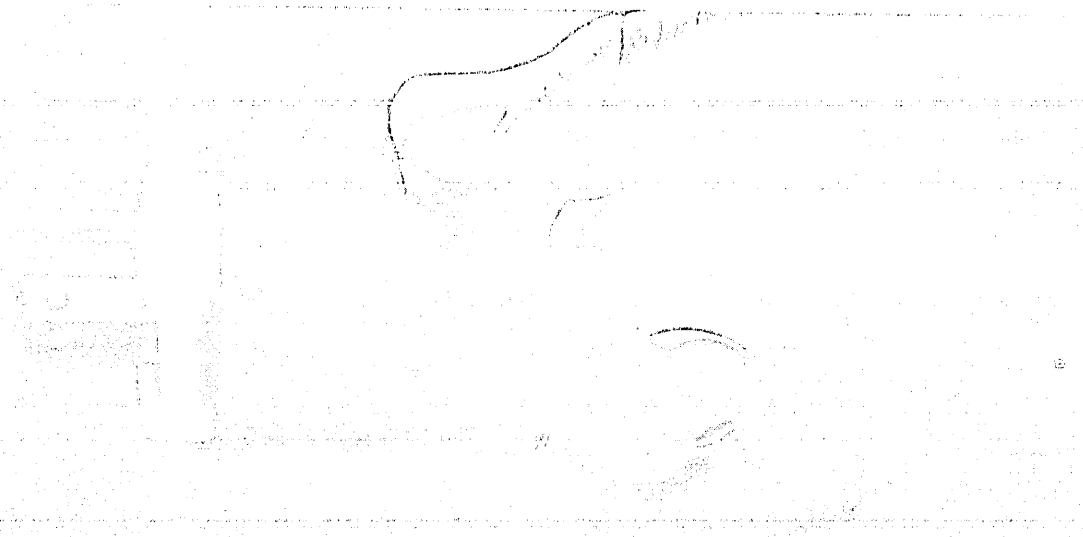
In early 1982, Honeywell, sold to General Electric Co. the 16% interest it held in General Electric Information Services Co. for a $70 million gain. The company took advantage of its depressed stock price (see table, p. 122) to buy back 1 million outstanding shares.

On the bright side, Honeywell says its order bookings are up from last year. The company hasn't turned down the thermostat on research and development, up to $369 million in 1981 from $295 million the year before. Some $192 million of 1981's R&D budget was directly related to information systems. A big chunk of Honeywell's investment in computer-related research is allotted to software development.

One area Honeywell is pushing into is networking, and last year, various efforts at developing local and long distance networks were brought together with the formation of a Networking Management Systems Division. Whatever Honeywell offers in the way of its own networks will accompany products that are compatible with IBM's SNA.

As for hardware, 1981 saw the introduction of the company's Infowriter, a low-end word processor with network capabilities; the DPS 6/31, a small computer; and the DPS 7 line of medium-scale mainframes.

Honeywell's other businesses are closely related to computing. The company remains a big factor in industrial control systems, environmental controls, aerospace, and defense.



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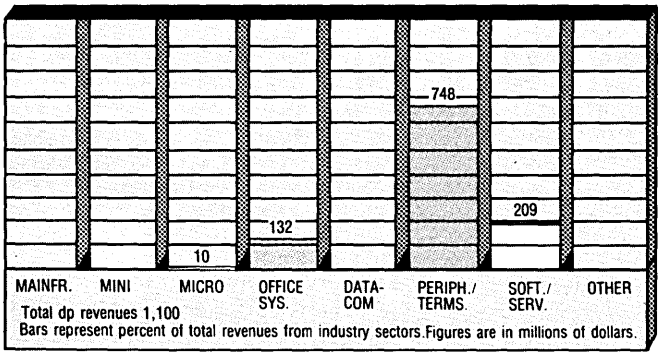

XEROX CORPORATION

P.O. Box 1600
Stamford, Ct. 06904
(203) 329-8700

Xerox Corp., the leading manufacturer of copiers/duplicators and an increasingly aggressive force in the office products arena, had revenues of $8.7 billion, up 6% from 1980. Management projects the increase will be in the double digits this year. Total dp revenues, generated by Xerox's Office Products Division (OPD), its computer services business, and peripherals subsidiaries (Shugart Associates, Diablo Systems, and Kurzweil Computer Products), DATAMATION estimates are $1.1 billion, up 16%. The OPD division, which fell short of its sales target, is not expected to make a profit until 1983; 1982 losses are expected to be substantially less than those sustained in 1981, however. Management attributes the loss entirely to ongoing investments in OPD's major 1981 product, the 8010 desktop workstation. Nevertheless, despite costs to short-term profits, Xerox plans to invest heavily in new office automation products.

Management's aggressive plan to be in the forefront of the office information systems competition—out there with companies like IBM, Wang, and Burroughs, not to mention the Japanese—was well under way in 1981. The company introduced a number of products beginning with Xerox 8010 Star Information System, a personal information system with text editing, computing, and graphics capabilities targeted at business professionals. Star, designed to plug in to the much-publicized Ethernet network, is part of the company's 8000 series of network system products announced in November 1980 that includes electronic files, printers, and communications units.

Yet another significant product introduction was the Xerox 820 information processor, a desktop system that can be used as both a word processor and business computer. Nicknamed the Worm, the 820 is part of the company's plan to compete aggressively with IBM (both its Displaywriter and its personal computer), Apple, and other higher-end micro manufacturers. In addition the company hopes that the 820—which as a low cost word processor is expected to fare better in the competitive wp marketplace than the Xerox 850 and 860—will ultimately help sell the Star.

OPD also introduced the Xerox 515 small business system, directed at wholesalers, retailers, manufacturers, and professional offices. The 515 is not a major part of Xerox's overall strategy, however.

Xerox announced its plans to drop its XTEN (Xerox Telecommunications Network) because of other demands on the company's resources, most notably in the copier area. And in a follow-up move, Xerox sold its WUI, Inc. subsidiary to MCI for $185 million, since the company was no longer considered to be strategically important without XTEN.

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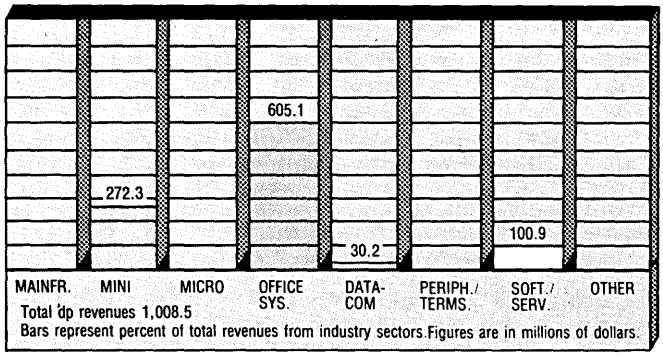

WANG LABORATORIES

1 Industrial Avenue
Lowell, MA 01851
(617) 459-5000

Wang maintained its standing as one of the fastest growing companies in the industry last year. In 1981, revenues increased 48% to reach $1 billion, from $681.8 million in 1980. Profits rose almost as fast, climbing 40% to $90.4 million, from $64.8 million the year before.

Word processing products continued to provide the bulk of the company's revenues, contributing $605 million compared to $272 million from data processing products such as the VS line of computer systems. Wang signaled its intention to build on its leading position in the word processing business and become a major supplier of advanced office automation systems with the introduction of a number of new products.

Early in the summer, the company took on Xerox and its Ethernet local networking system with its own Wangnet, a broadband-based local networking cable system. Wang believes this system is superior to Xerox's product because it has greater capacity. At the same time, the company announced its DVX (Digital Voice Exchange), a telephone-based communications system that allows users to both send and receive voice messages. With the announcement, the company moved to fulfill the promise that it had made the year before—to offer users office automation systems that incorporate six technologies: word processing, data processing, image processing, audio processing, networking, and ergonomics.

In November, Wang introduced a new family of office systems called the Alliance, designed to provide all levels of office workers with systems geared to their needs. This was the first time the company had targeted the professional, offering software to allow managers to create databases, send voice messages, keep their documents in an electronic filing cabinet, and keep track of their calendars.

At the low end of its product line, Wang made available the popular microcomputer operating system CPM for its Wangwriter and arranged to market that product through both Sears and ComputerLand outlets.

To ensure that it could keep bringing a rapid stream of products to the market, Wang increased its research and development budget by a whopping 82% in fiscal 1981. The budget stood at $90.4 million last year, up from $64.8 million the year before. It also dramatically increased the size of its staff. A total of 13,800 employees worked at Wang in fiscal 1981, up from 9,400 in 1980.

Like other U.S. companies, Wang, which does 33% of its business overseas, has felt the impact of the strong dollar on its operating margins. But during 1981, the company managed to strengthen its financial position, reducing debt as a percentage of stockholders' equity to 60% from 133%.

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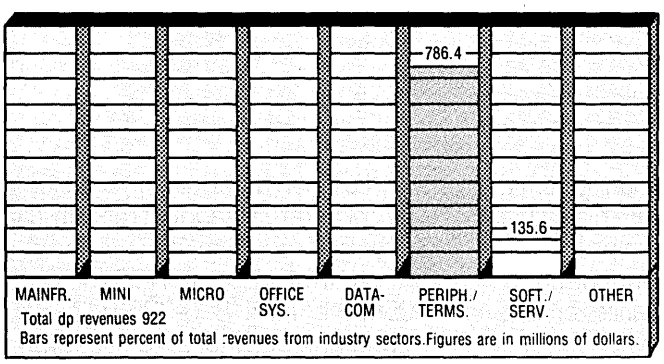

STORAGE TECHNOLOGY CORPORATION

2270 South 88th Street
Louisville, CO 80027
(303) 673-5151

Storage Technology continued its drive to become one of the largest companies in the data processing industry last year. The company revenues increased by 53% to $922 million, from $603 million in 1980. Profits rose even more. STC reported profits of $82.4 million in 1981, an 81% increase over the $45.4 million reported the year before.

The maker of IBM-compatible storage devices profited tremendously from the fact that IBM announced that its newest high capacity disk drive, the 3380, would be delayed for almost a year. Demand for IBM's older product, the 3350, and the competitive STC product, the 8650, immediately soared. By the end of the year, STC's backlog of firm orders was $485 million, compared with $172 million the previous year.

STC's position in the disk drive market is likely to provide it with continued growth for some time to come. The company now does an estimated 41% of its business in this area and accounts for some 80% of the market share among independent non-IBM suppliers. Demand for disk drives is expected to remain strong in the foreseeable future, fueling a 50% annual growth in the size of the market.

STC's other markets are also healthy. The company does some 36% of its business in tape drives, a market that has recently shown signs of reviving. The high-speed printers that it acquired with Documation last year contributed 15% of revenues, while the COM 2, a multiplexor, a communication product for making long distance traffic more economical, is estimated to have accounted for about 2% of revenues.

In a move to broaden its product lines, STC set up a tax sheltered limited partnership to develop its own IBM-compatible mainframe system. After some uncertainty as to the acceptability of this kind of partnership, the Securities and Exchange Commission last year accepted STC's accounting treatment. STC's overall research and development budget increased 36% in 1981 to $53.7 million, up from $39.2 million in 1980.

The company tried last year, for the second year in a row, to acquire its own IBM-compatible computer line. In December STC offered to buy Magnuson Computer Systems, a maker of IBM-compatible systems. But, as was the case in 1980 when the company tried to acquire Amdahl, the deal fell through. Early in 1982 STC announced it had decided to withdraw its $73 million offer because it had found that the acquisition would not bring about the benefits that had been expected. Soon afterwards Magnuson announced it expected losses of $20 million in its fourth quarter.

In recent years STC has strengthened its finances and is no longer as highly leveraged as in the past.

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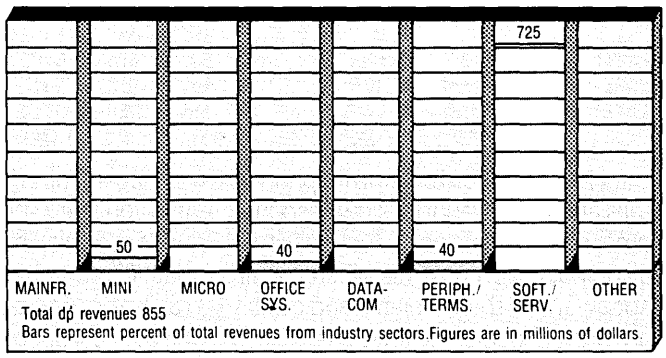

TRW, INC.

23555 Euclid Avenue
Cleveland, OH 44117
216-383-2121

TRW has for many years been involved at the fringe of the traditional data processing market, establishing itself through joint ventures and acquisitions in word processing, maintenance, and international distribution of Datapoint systems. Last year, however, saw the firm's first efforts to sell general purpose systems in the domestic market. This was accomplished through its joint venture, the TRW-Fujitsu Co., which introduced and shipped its first computer systems as TRW itself continued to expand its total base of dp revenues to $855 million.

TRW-Fujitsu in March 1981 introduced the TFC 8500 computer family, disclosing plans to sell it in a wide range of configurations including standalone, multiterminal, and distributed processing. Prices ranged from $20,000 to $200,000. Deliveries have started, but the company declines to say how many of the Fujitsu-built systems have been installed in the U.S.

Industry observers have watched the joint venture closely as a prime example of a domestic firm with distribution and maintenance teaming up with a Japanese supplier with the capacity to turn out inexpensive hardware. It is not clear if TRW-Fujitsu's plans are on target, but the U.S. partner, owning 49%, seems committed to the effort. Last year a desktop microcomputer, the Affinity 16, was introduced, with first deliveries made in September. The machine sells for under $10,000 and is said to be the first of the 3450 family of small systems.

A more established TRW dp business has been point-of-sale (POS) equipment, the marketing of which has been moved under the TFC umbrella. Selling to retail stores, discount chains, and department stores, the firm's 7880 terminal was introduced in January 1981 as a replacement for the older 2001 line sold previously by TRW. TFC also has its hands in the financial systems market—for which it last May introduced the 5200 series of terminals as well as continuing sales of automated teller and manned teller systems—and the credit authorization terminal market. The firm's model 4000 credit terminal is said to be used by 60% of the country's department stores.

DATAMATION estimates TRW garnered about $50 million in overall minicomputer revenues last year, including TFC's systems and POS/financial controllers. Peripherals and terminals were said to show revenues of about $40 million, while software revenues were estimated at about $725 million, including contract work done for the government and military.

In the fourth quarter of 1981, TRW decided to discontinue production of digital telephone switches and had to establish a reserve of $34.5 million after tax to cover future losses on that business. The company also reorganized its commercial electronics, defense, and space activities into a single unit to make better use of technology developed in each category.

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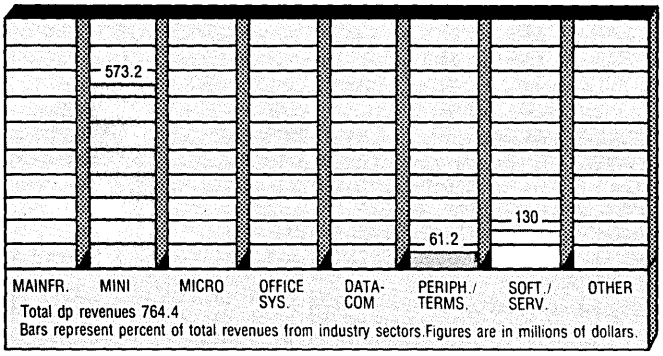

DATA GENERAL CORPORATION

4400 Computer Drive
Westboro, MA 01580
(617) 366-8911

Last year Data General saw more of the downward trend it has experienced since 1978. Revenues increased only 13.6% to $764 million, while earnings declined 7.4% to $50.6 million. Sales of the new 32-bit MV/8000 supermini and increased service revenues (up about 40%) were behind the limited gain.

In the first quarter of fiscal 1982, operating revenues tumbled to a new all-time low of 10.6%, while revenues increased 18% from the first quarter the previous year. Wall Street, skittish on technology stocks, traded Data General at around 28 in March, down from a 52-week high of 68.

Company officials maintain that DG's problems are part of the price that must be paid to survive over the long term. They believe that in order to be successful, DG must transform itself into a supplier of integrated systems to an end-user market. To that end, DG has invested heavily in the development of a field service staff, and has converted its oem-oriented sales force into one that deals directly with customers.

DG's problems also reflect the growing pressures in the mini marketplace. Pressured at the high end by IBM and at the bottom by the micro manufacturers, DG and other traditional mini makers are scrambling to define their role in the market. DG has addressed both challenges with varying degrees of success. Last year, sales of the MV/8000 numbered about 300 (at an average price of $300,000). In September DG introduced the smaller MV/6000 and also introduced more 32-bit commercial software, including a database program. Nonetheless, no matter how successful, DG's entry into the 32-bit market came after it had relinquished valuable lead time to DEC, Prime, Tandem, and others who had already gained a secure foothold there.

DG's entry into the very small business computer market was less auspicious in initial appearance. The Enterprise 1000, which appeared a year later than promised and with only two applications packages, lacked the ability to compete successfully with the CP/M microcomputers for which hundreds of business software packages are available. DG has promised the 175 distributors of the Enterprise 1000 that more applications packages are on the way. (Two distributors, CCM of Boston and ProWest of Redondo Beach, Calif., canceled their agreements.)

In November, Data General entered the office automation market with its announcement of the Comprehensive Electronic Office (CEO)—featuring word processing, electronic mail, decision support, and other software packages and utilities—to run on its Eclipse series of computers.

DG's investment in research and development increased 14% to $74.5 million. Management changes included the resignation of two vice presidents and the appointment of Frank P. Silkman, former head of IBM's Office Products Division, to run DG's three-division business structure.

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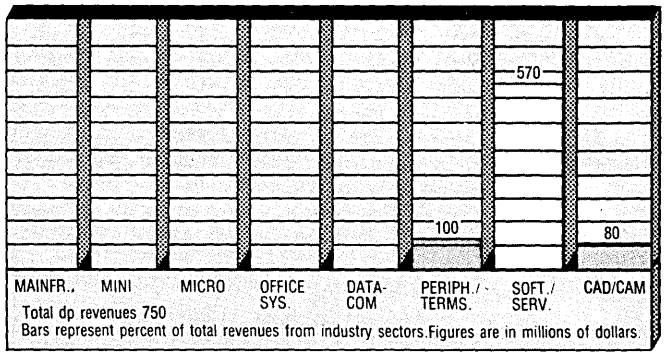

GENERAL ELECTRIC COMPANY

3135 Easton Turnpike
Fairfield, CT 06430
(203) 373-2211

General Electric opened its pocketbook in 1981, and increased its stake in the computer business in a big way. In January, it bought Intersil, Inc., a producer of large-scale integrated circuits and data communications equipment for $235 million in cash. In April, it purchased Calma Co., a CAD/CAM maker, for $100 million, with an additional payment of up to $70 million, depending on future earnings performance. During March, a new operation to sell robots was set up in Bridgeport, Conn. This operation is importing some robots from Italy, Germany, and Japan, while GE gets its production facilities set up for building its own models. Then in November, GE bought 48% of Structural Dynamics Research Corp., and formed a joint venture with it to pursue computer aided engineering.

General Electric also decided to beef up its services company, GEISCO, and acquired a number of companies in this area. Among them: the Banking System, Inc. of Dallas, Energy Enterprises of Denver, and Software International Corp. of Andover, Mass. These purchases will cost between $35 million to $68 million, depending upon future performance.

Software International is a major producer of bread-and-butter accounting packages, with about 15% of that market. Banking Systems has software that supports automated teller machines as well as in-branch transaction terminals. Energy Enterprises is a vendor of program products to the oil and gas industry. Its software will be used interactively on the GE net, and soon as part of the turnkey mini system that is under development. After adding these operations, GE decided to acquire the 16% of GEISCO, which Honeywell owned. This was concluded early in 1982, with the payment of $70 million to Honeywell.

Until this recent acquisition binge, GEISCO has been GE's main dp operation. It does business in 750 cities worldwide, with about 40% of its revenues from foreign sources. GEISCO is in every automated service sector possible, from electronic mail to the vending of raw cpu power to clients with overloaded mainframes. The group has more than 5,000 employees, 44 large mainframes in two U.S. centers and one Dutch location, hundreds of local nodes, and a vast web of communications links to serve as many as 6,000 users at one time.

The year's financial results were good for General Electric, but they only reflected a portion of what these new dp-related companies will eventually contribute to the profit picture. Revenues were up to $27.9 billion from the $25 billion of 1980, while we estimate that dp revenues increased to $750 million from $475 million.

The biggest moneymaker was GEISCO, which did $550 million in business during 1981, a whopping increase from the $350 million it grossed in 1980. At the same time, CAD/CAM brought in $80 million in 1981, versus $52 million in 1980.

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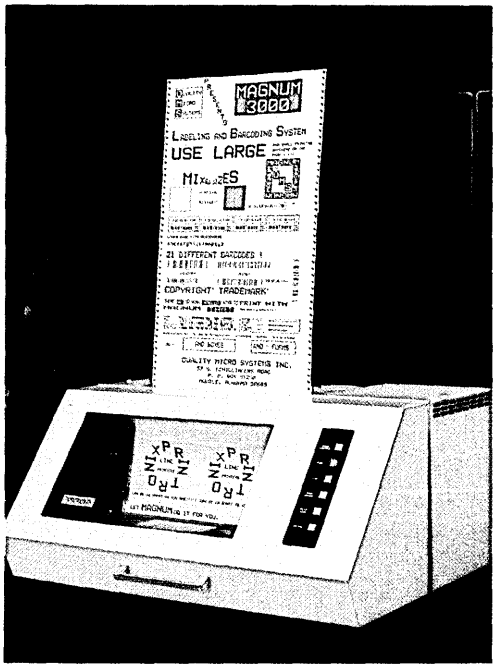

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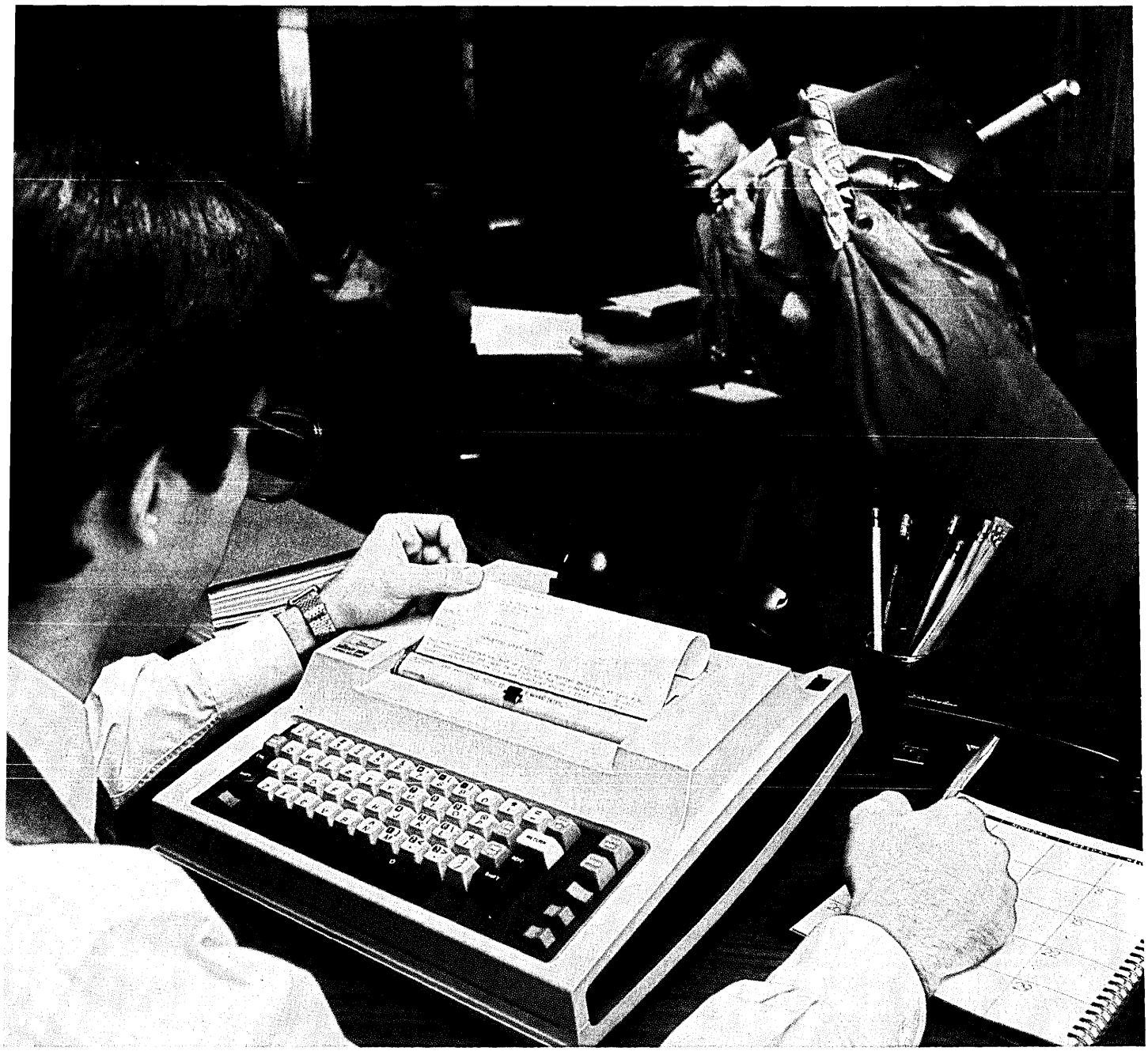

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TI invented the integrated circuit, the microprocessor, and the microcomputer.

TEXAS INSTRUMENTS
INCORPORATED

†Servicemark of GTE Telenet

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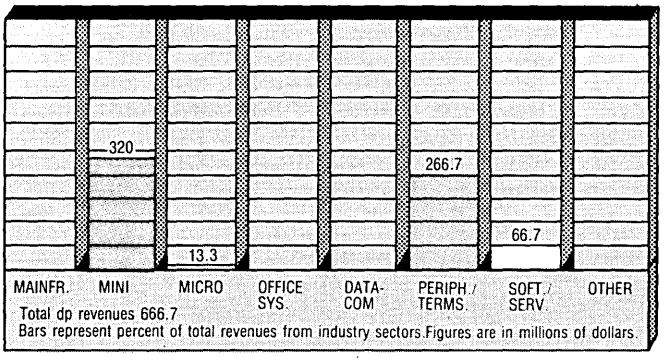

TEXAS INSTRUMENTS, INC.

P.O. Box 225474
Dallas, TX 75265
(214) 995-3773

Last year was not a good one for Texas Instruments because of competitive pressures on its bread-and-butter semiconductor businesses, and because its attempts to move into new markets have not proved as successful as it hoped. Net sales were up only 3% to $4.2 billion, while net income plunged by 49% to $108.5 million, compared to 1980.

TI apparently has not done well in its gamble to capitalize on its long-standing leadership in semiconductors to break into the computer systems business. The firm seems committed to staying in the competition, but last year's results showed that its dp business is not growing as fast as the dp industry as a whole. Dp sales were estimated to total about $666.7 million, up only 6.7% over the previous year's sales of $624.8 million. Sluggish sales of the 990 series of minicomputers and the 99/4 personal computer are the main causes of the slower-than-average growth.

Distributed processing systems were slow in moving because of high interest rates, and the personal computer product has suffered, analysts assert, from a misdirected marketing effort and a lack of quality software to help sales of hardware.

Nevertheless, the company introduced a long list of new computer products, including the models 7, 9, and 29 of the DS990 minicomputer line; a network operating system and SNA support package for the 990 processor family; a new line of low-end business systems that includes horizontal applications software; a 5¼-inch hard disk drive manufactured under license from Seagate Technology; and a variety of printer and video display terminals. TI continues to do well in the teleprinter market, but is facing increased competition in the portable teleprinter segment as DEC and others enter in force.

DATAMATION estimates that minicomputer revenues dropped to $320 million from the previous year's $331.1 million, a trend that does not bode well for the future. The minicomputer market is becoming increasingly volatile and subject to general economic uncertainties. With 1982 off to a bad economic start, it is not clear that TI will be able to maintain as strong a position in the market as it once had. Partially offsetting the poor performance in minis was an increase in peripherals and terminals sales, up to $266.7 million from the year before's figure of $237.4 million. Also, software revenues rose to $66.7 million from $50.1 million, perhaps reflecting an effort to market additional software for the 99/4 personal computer. Production schedules for that machine were increased towards year-end in response to an acceleration in orders.

One dp-related business in which the firm maintained a leadership position is seismic data acquisition and processing. The worldwide search for new oil and gas deposits remained strong during 1981, and TI was able to increase its lead in the three-dimensional analysis area.

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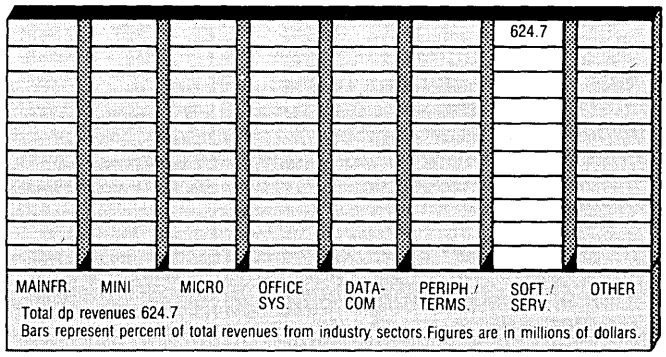

COMPUTER SCIENCES CORPORATION

650 North Sepulveda Boulevard
El Segundo, CA 90245
(213) 615-0311

Computer Sciences Corp., a leader in the computer services industry, saw its growth rate slow in 1981. Revenues were up 11.4% to $624.7 million, a level considerably lower than in previous years such as 1980, when revenues jumped 35%. For the first time in 10 years, earnings were also off sharply, from $24.7 million in 1980 to $17.1 million in 1981. This drop was attributed to write-downs on a major government contract.

The company faced other problems too. A federal indictment threatened Infonet, CSC's largest data services operation. Although the 57-count federal indictment that was filed in October 1980 (charging CSC with criminal conduct associated with an Infonet contract with the General Services Administration) was dismissed in February 1981, the government subsequently notified CSC that it would appeal that decision. CSC presented arguments to a federal appellate court recently, and now awaits a decision. In the meantime, the GSA eased the three-month suspension it had placed on CSC last November, restricting Infonet from receiving new federal contracts.

With Automatic Data Processing hot its heels, CSC is stepping up activities in several areas. Military contracts have increased and the company expects to benefit further from the Reagan defense budget. With IBM as its subcontractor, CSC is bidding against Electronic Data Systems for a military management information system for the Army called Project Viable—a $500 million to $1 billion contract.

While the government continues to be CSC's principal source of revenue, federal business has declined (from 64% to 58%) as the company concentrates on its international activities (CSC has a $254 million contract with Saudi Arabia for a computer communications system).

Last August, CSC announced that it had signed a five-year, $20 million contract with the Tennessee Department of Health for a computer-based Medicaid management information system. In October, the State of Alaska awarded CSC a $4.2 million contract for a similar computer based Medicaid claims processing system. CSC expects to continue to gain a significant part of the $100 million claims processing market.

Also in October, the company began upgrading Infonet with the installation of the first of six new Univac 1100/80 series computers to replace the older 1108s. The upgrraded service includes the new Computer Sciences Teleprocessing System II (CSTSII) operating system.

CSC has made a number of moves to broaden its product base. It has also expanded its services to public accounting firms and other small businesses with the introduction of new general ledger and payroll products, to be followed by several accounts payable/receivable products.

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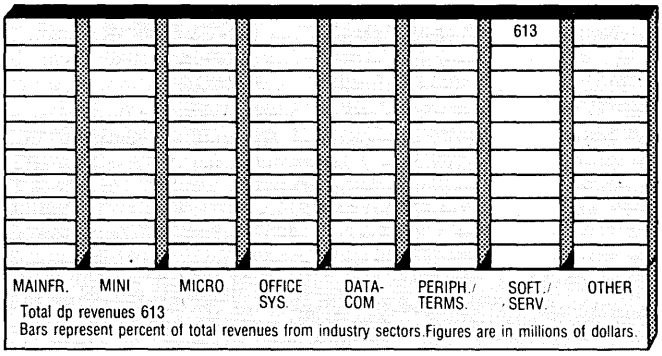

AUTOMATIC DATA PROCESSING

405 Route 3
Clifton, NJ 07015
(201) 365-7300

Automatic Data Processing came close to closing the gap between itself and processing services frontrunner Computer Sciences during 1981. ADP posted a 21% increase in revenues for a total of $613 million, while CSC only managed an 11.4% increase to $624.7 million. ADP's earnings were up an impressive 26% to $56 million, while CSC posted a decline. ADP's 1981 performance has Wall Street analysts cheering its ability to pick growing markets and use its strengths to become a leader.

The area of financial services best shows how ADP operates. In May, it acquired the Seattle-based Telephone Computing Service, Inc., which provides telephone billing services for about 90 institutions under the Pay-by-Phone name. The Financial Services group also started an automated teller machine unit, designed for small financial institutions. (ADP already has about 500 such institutions as customers.) Still not satisfied, ADP also signed a letter of intent with Financial Transaction Systems, Inc. of Tampa, Fla., to establish a network of at least 100 automated teller machines. Then in July, ADP acquired Allied Financial Services, Inc., which provides data processing services to about 50 banks in the southeastern U.S. The company never rests; even ADP's oldest and largest service, payroll processing, was given a boost by the September takeover of the payroll, accounts receivable, and general ledger processing business of the Crocker National Bank. Servicing 2,000 customers, the Crocker acquisition brings ADP's total payroll customers to 80,000 companies employing over 5.5. million workers.

Comtrend, an on-line computer graphics service for commodities, currency, and interest rate futures trading that ADP acquired in 1980, continues to grow. The company reports there are now some 650 terminals installed at client locations.

ADP's Cash Management Service is now offered through 63 banks serving some 25,000 company locations in the U.S. and Europe. ADP has indicated it plans to develop a cash management service for its 90 brokerage clients that will enable it to compete more effectively with the cash management account offered by Merrill Lynch. The Network Services division of ADP offers financial and management services (including project management, fixed assets accounting, and merger/acquisition analysis) designed to meet a distinct market within corporations.

The ADP/OnSite Service, which places DEC 2020 computers at customer locations, showed continued growth and now numbers 100 installations in the U.S. and Europe.

In its boldest effort to crack a new market, ADP reports growing acceptance of its Collision Estimating Service (the former Audatex division of Itel) by major insurance companies, independent estimators, and repair facilities. ADP has invested about $18 million in this project and analysts expect little competition to arise.

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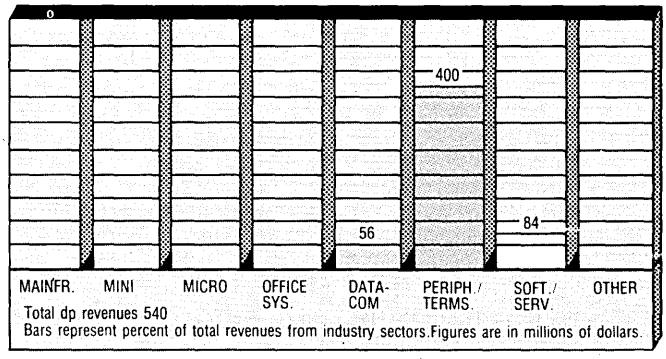


ITT

(ITT Courier & Qume)
320 Park Avenue
New York, NY 10022
(212) 940-2620

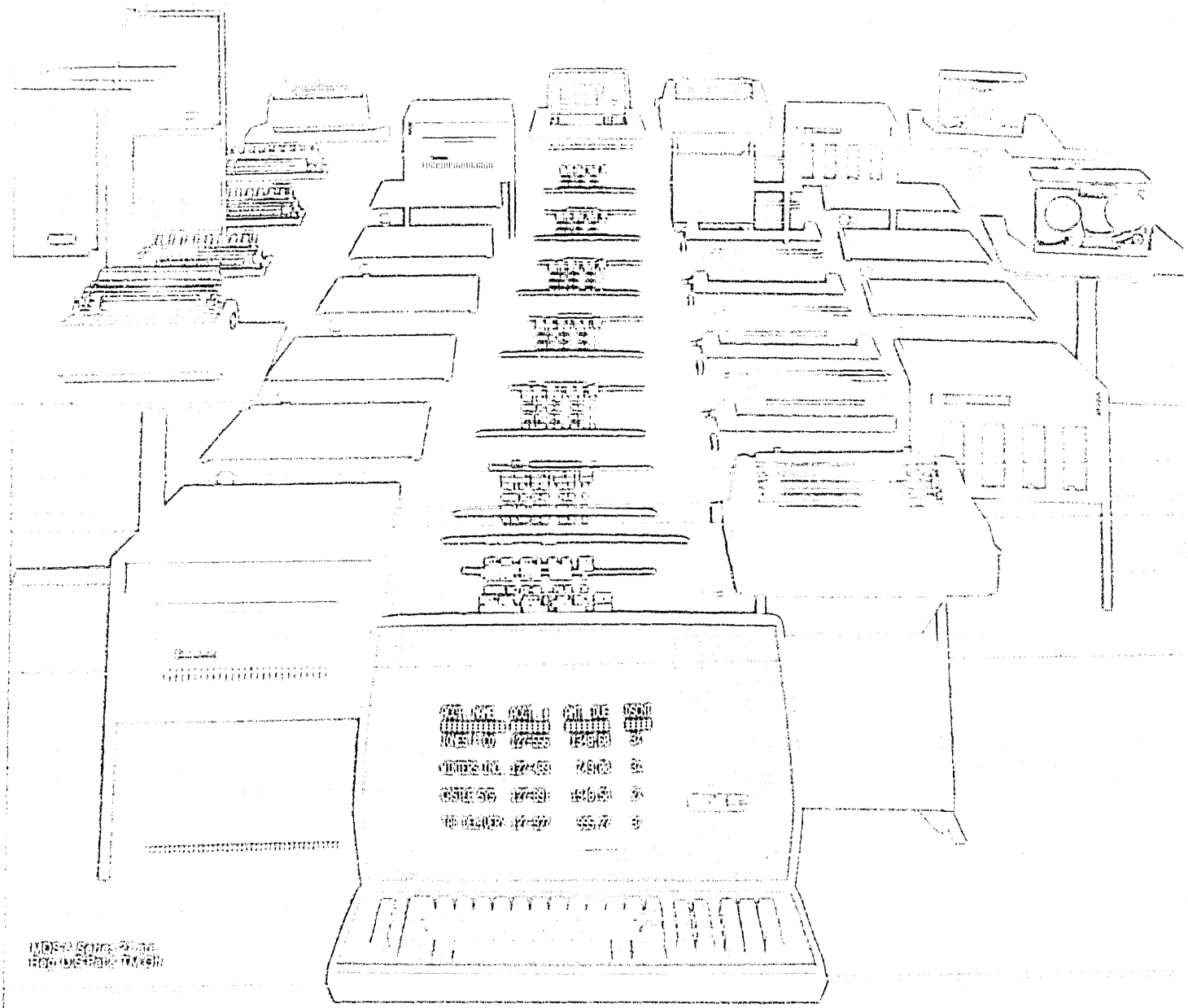
With $23.2 million in revenues during 1981, ITT is one of the world's giants. But dp is not one of its major businesses. Nonetheless, that small piece of a very big pie came to $540 million in 1981, a 33% increase over the prior year. ITT's dp subsidiaries are ITT Courier Terminal Systems, Inc. and Qume, both acquired in 1978 during an expansion into new areas of business.

Qume manufactures and markets character printers to the oem market, data terminals to dealers, and printwheels and ribbons to the distributor market. During 1981, Qume introduced two new products: a new printer and a new printer/terminal.

ITT's Courier Terminal Systems of Temple, Ariz., also manufactures computers, terminals, and printers. Its primary business is plug-compatible IBM devices, and it also sells a line of Honeywell-compatible products.

Among the new offerings of the Courier group during 1981 were a four-color terminal for text display and a terminal controller that serves as an inexpensive concentrator for distributed computing applications. The terminal is IBM-compatible. The controller works with SNA/SDLC conventions or bisync and can run up to 16 terminals, looking to IBM systems like a 3276.

One of ITT's largest businesses is telecommunications, which accounts for about one third of total corporate revenues. ITT is the second largest telecommunications equipment company in the world, particularly in switching equipment, which accounts for about half of the groups' sales. As the dp industry and telecommunications business grow closer, it is expected that ITT's share of both will become larger.



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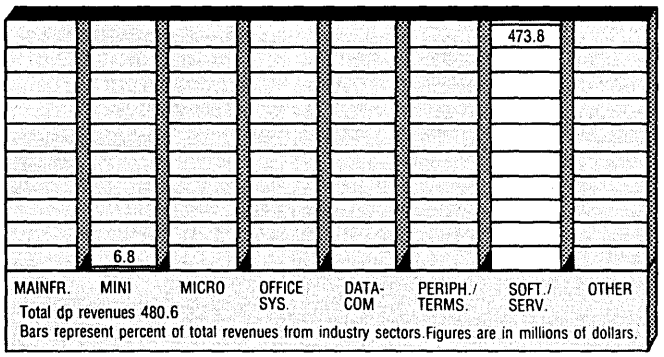

ELECTRONIC DATA SYSTEMS

7171 Forest Lane
Dallas, TX 75230
(214) 661-6311

Revenues increased more slowly at EDS in 1981 than in previous years. The company posted dp revenues of $480.6 million, up 17.6% in calendar 1981 (compared to 27.4% in 1980), while earnings went up 25% to $41.7 million.

In facilities management, which supplies 80% of EDS's revenues, the number of contracts remained about the same at 109. Major new accounts included Medicaid claims processing for both Connecticut and Indiana and a $7 million renewal of its contract to process Medicaid claims for Kansas. The company said that both the number of claims it processed and the value of its new contracts were lower than anticipated, contributing to the slower revenue pace in 1981.

For the first time, EDS obtained revenues from hardware sales. The company reported sales of $6.9 million through the Centurian Data Corp. of Richardson, Texas, a manufacturer of small business computers that EDS acquired in February 1981. Centurian's MicroPlus Business Management System is sold through a dealer network to accountants, manufacturers, subcontractors, wholesalers, oil and gas producers, and fuel oil dealers. EDS first established itself in the small business systems market through its acquisition in 1979 of CompuSource, a Southern California systems house that configures small business systems around Data General Nova computers.

Through acquisitions over the last year, EDS has established itself as a major supplier of data processing services to credit unions. In August, EDS acquired the Cunadata Corp. from the Cuna Mutual Insurance Society for $12.9 million in cash and notes. Cunadata services 1,600 credit unions in 43 states. Two other acquisitions include the September acquisition of Western Bradford Trusts (252 credit unions) and, in March of this year, Data Processing of the South (550 credit unions).

EDS said 46 banks use the IBM System/34-based product it began offering in 1980 through the acquisition of Applications Programming Service, Inc. EDS also introduced several new products aimed at large financial institutions, including Bank Info 2, its first product for large banks that is not part of its facilities management services. EDS reported growth in two other areas that are relatively new for the company: turnkey systems for hospitals and government services. EDS reported seven sales of its $1 million Patient Care Information Systems, which it acquired in 1980 from the St. Louis-based Information Resources Electronics Group.

Services to the federal government increased about one third, the company said, primarily through its Potomac Research subsidiary, a supplier of data processing and engineering services to the Department of Defense and other federal agencies. Total services to the federal government and its agencies accounted for about 20% of EDS's revenues in fiscal 1981.

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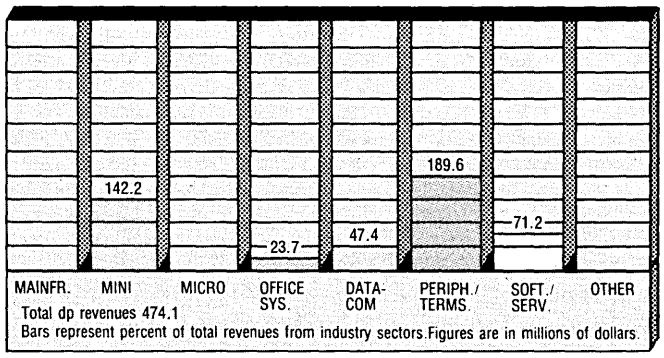


DATAPOINT CORPORATION

9725 Datapoint Drive
San Antonio, TX 78284
(512) 699-4428

Datapoint got off to a strong start in 1981, but by the end of the year the recession had begun to take its toll on the fast-growing office automation and communications company. By December orders and shipments that had been expected were not coming through. In fact, shipments dropped to levels lower than the year before.

Despite this slowdown, the company showed a more than healthy growth rate for 1981 as a whole. Revenues increased by 30.2% to $474 million, from $364 million. Earnings for the fiscal year that ended July 31 were up 45% to $48.8 million, from $33.5 million the year before.

Throughout the year Datapoint placed great emphasis on its distribution system. The company instituted a policy of buying out its overseas distributors, and by August it said it had gained control over the distribution of its products abroad. The company acquired its distributor in the U.K. and, later in the year, increased its ownership in Spain, set up a joint venture in France, and signed letters of intent to acquire distributors in Finland and Sweden, while continuing negotiations in Israel and Canada.

At the same time, Datapoint built up its domestic sales force. During fiscal 1981 the company more than doubled its force, to 500 field salespeople. The company had initially planned to take that number to 700 during the same period, but when orders began to slow down, management cut back expansion plans.

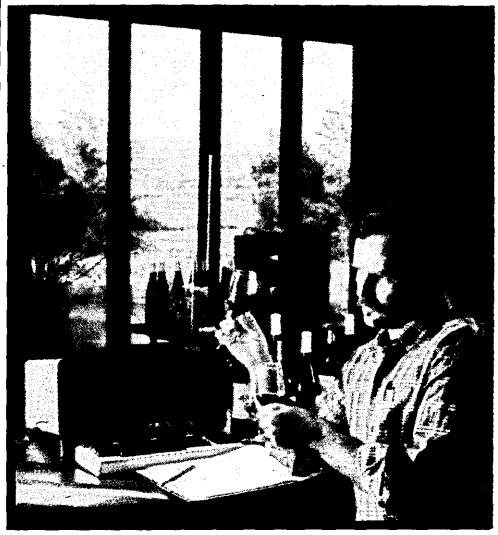
Datapoint continued to provide its sales force with a steady stream of new products to take to the market. During 1981, the company introduced the ISX third generation Information Switching Exchange for integrating voice, data, and local networking for the electronic office.

Also announced was the Rimchip, a proprietary integrated circuit chip designed to interface a processor to a Datapoint local network. Tandy Corp. plans to use this chip to allow its personal computers to communicate with Datapoint's Attached Resource Computer system.

In order to keep up in the highly competitive markets in which it is a player, Datapoint increased its research and development spending by 24% in fiscal 1981, to $34.7 million, from $27.8 million in 1980. It also raised $98.5 million with a bond offering that was completed in June 1981.

The company took steps to maintain tight control over its operations amid the current adverse marketing conditions by appointing Edward Gistaro to the position of executive vice president, finance and corporate development. As a result of the drop in orders in late 1981, Gistaro was moved to the newly created post of president and chief operating officer in early 1982 to strengthen the company's internal growth.

Introducing the DMS-3/F "Fox." More than another portable— it's a low-cost stand-alone or network station.



With its 9"diagonal screen,"The Fox" has triple the capacity of the most popular portable. Yet the outstanding feature of the 30 lb. portable "Fox" is its performance on or off the HiNet™ Local Area Network.

HiNet is a complete hardware/software network—so inexpensive that you can add a computer anywhere your business requires for about the cost of a good typewriter. Because HiNet is a network of interconnected computers, you can get information from other departments instantly.

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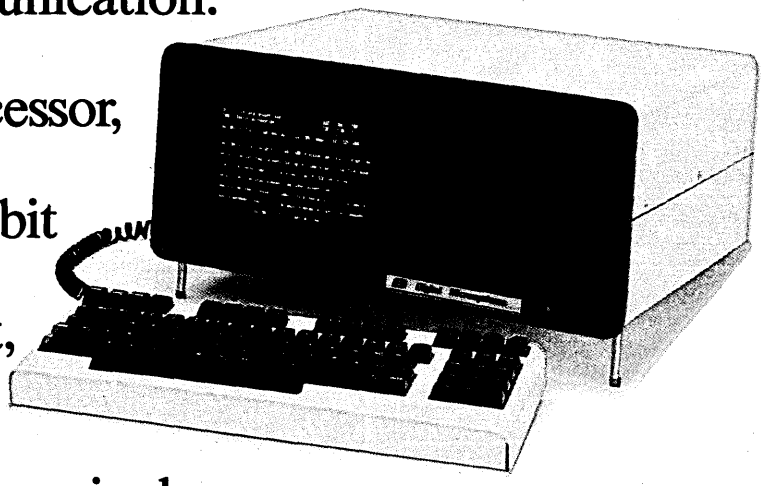
The CP/M®-based "Fox" combines a 64K Z80A processor, local storage, drives, four RS-232C serial ports, an 8 bit bidirectional parallel port, the HiNet networking port, and 32 (x3) programmable function keys. It's also capable of emulating any terminal. The DMS-3/F "Fox." Catch one now.



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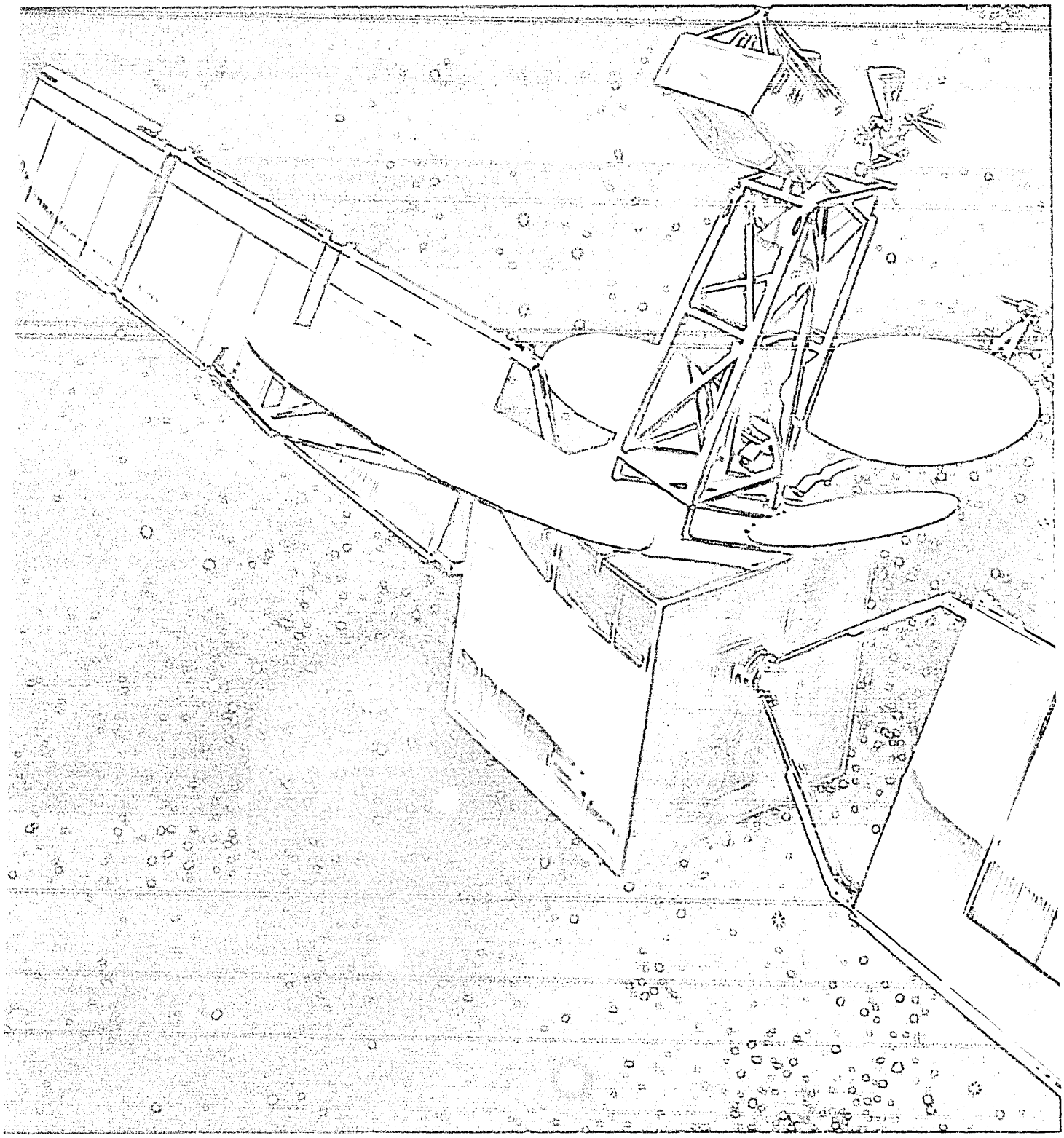
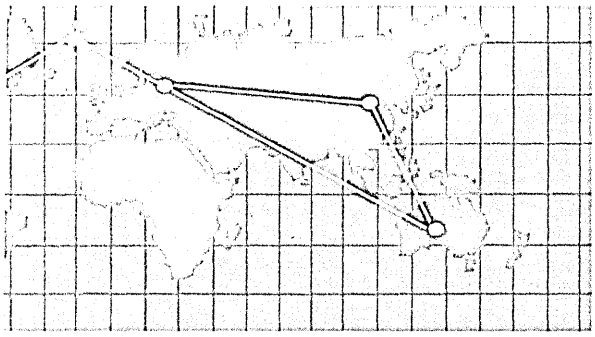


MASTER NETWORK PROCESSOR INTERFACE.



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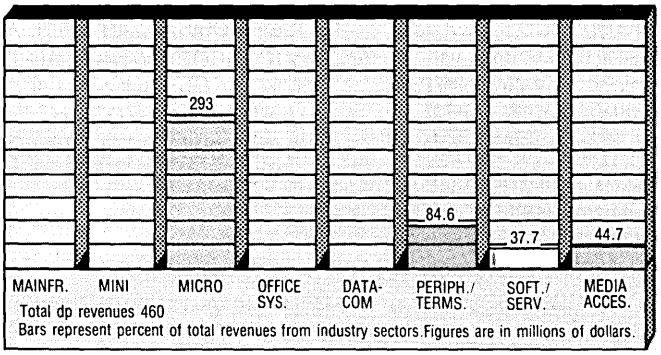

TANDY CORPORATION

1800 One Tandy Center
Fort Worth, TX 76102
(817) 390-3700

The popularity of personal computers continued to grow at a remarkable pace in 1981, and no company displayed more ability to stay abreast of the field than Tandy. Benefiting chiefly from its extensive network of Radio Shack consumer electronics stores (a key to Tandy's success from the start), Tandy posted dp revenues of $460 million last year, a 109% increase over 1980. Corporate earnings were up 51% to $200.1 million.

In a year marked by the appearance of IBM and Xerox in the microcomputer market, Tandy made several significant moves designed to preserve its dominant position in the market it helped create. These included:

- The announcement in February of the new 16-bit Model 16 featuring a faster operating speed, greater memory, and multiuser capacity
- The planned addition of another 150 Radio Shack computer center retail stores, bringing the total to 375 (more than double the number of Computerland stores), in addition to the 8,000-plus retail outlets worldwide that Tandy operates, most of which also sell computers
- Introduction of local networking for the TRS-80 Model II and Model 16 through Datapoint's ARCNET
- Introduction of an 8.4 megabyte hard disk drive
- An agreement with Children's Television Workshop (creator of Sesame Street) to design a series of educational software programs

Of all the microcomputer manufacturers, Tandy offers the broadest line of products. These include the new pocket computer that will be available this year; a color computer for home and educational markets; a videotex keyboard terminal; the TRS-80 Model III for home and small business use; the TRS-80 Model II, a small business computer; and the new Model 16, featuring a 16-bit processor, 512K of internal memory, and an operating system that allows the attachment of two additional terminals.

Beginning this year, the interface will be available enabling up to 255 Model IIs or Model 16s to be connected through the ARCNET local network (which Datapoint has already installed at more than 2,000 locations). Tandy and Datapoint teamed up originally in 1979 with the establishment of Texas Peripherals, Inc., a joint venture to manufacture disk drives. ARCNET helps Tandy in the large corporation market, where it competes head-on with the personal computers from IBM and Xerox.

Tandy announced in October that it is involved in discussions to purchase the Consumer Products Division of Memorex. In July it announced an agreement with Matra S.A. of France for a joint venture to manufacture the TRS-80 Model III there.

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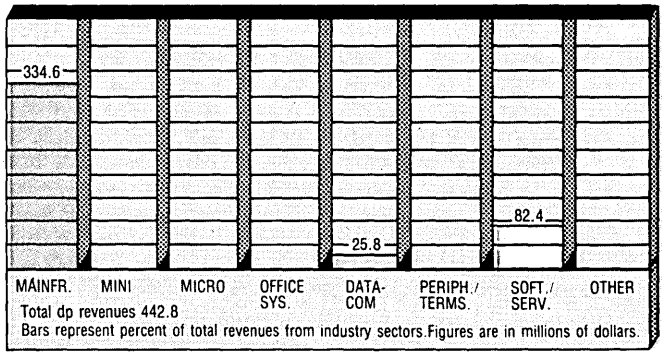


AMDAHL CORPORATION

1250 East Arques Avenue
Sunnyvale, CA 94086
(408) 746-6000

Amdahl experienced a very successful year, with shipments, sales, and earnings increasing over 1980. Sales in 1981 rose 12% to $442.8 million, while net income increased 76% to $26.8 million. The company generated a positive cash balance of $93 million, and successfully negotiated a $370 million line of credit to replace a former $260 million credit line.

A great deal has been written about customers leasing Amdahl computers but buying IBM's comparable machines. This factor pressured earnings in 1979 and 1980. To combat this problem, Amdahl made many internal cost-cutting and belt-tightening moves. During 1981, the company also took pains to ensure that the highest level of financial advice was available to management. A new senior vp of finance was named, and a highly respected economist was added to the board of directors. The new financial vp is Douglas Levick, who had been with IBM for 15 years. The economist is Burton Malkiel, who served on President Ford's Council of Economic Advisors. These appointments will undoubtably help Amdahl keep abreast of the changing economic situation.

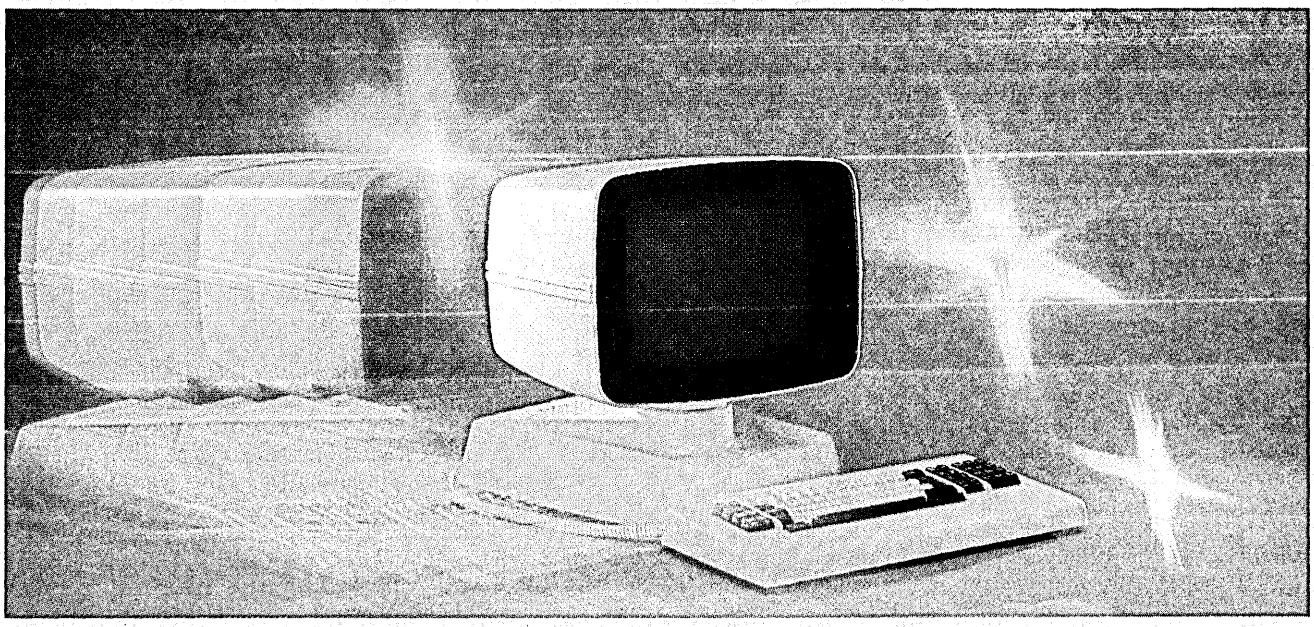
In the field of large-scale computers, Amdahl is recognized for its innovative equipment design. This design was established by the Amdhal 470 product line and extended by the new 580 series computers. The first of the 580 series, a uniprocessor model 5860, will perform at approximately twice the speed of the largest 470 uniprocessor model, the V/8. Circuit density and architecture allow the 5860 to occupy about one third less floor space than the V/8. To achieve this kind of technological advance, Amdahl has for seven years increased its R&D expenses, reaching $75 million in 1981.

Amdahl has expanded its product offerings via the acquisition of Tran Telecommunications Corp., a worldwide supplier of both public and private digital communications network equipment. These networks are used to exchange data between computers, terminals, facsimile machines, and office equipment that may be geographically dispersed. The Amdahl 4705 telecommunications processor operates as an interface between large central processors and public as well as private data networks.

On the software side, Amdahl's effort is to support the industry standard and to remain compatible by developing improvements to existing operating systems software.

Lee Data's NEW All-In-One Display System

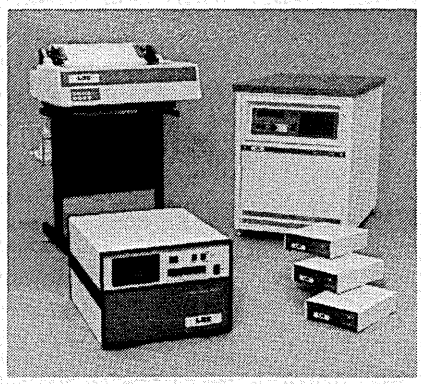
is ~~a better~~ the best choice for your 3270 requirements.



You get economy with Lee Data's Coax Eliminator™ and unsurpassed character clarity with our new high resolution All-In-One display. And you get the choice of BSC or SNA communications in either remote or local cluster systems.

DISPLAY ADVANTAGES

☐ Four 3278 compatible screen sizes in a single All-In-One display: 24, 32 and 43 lines by 80 columns and 27 by 132.
☐ Unsurpassed character clarity with no flicker achieved with a screen refresh rate of 60 times per second, twice that of similar displays.
☐ Display cabinet tilts 25 degrees vertically and rotates 180 degrees horizontally for convenient and comfortable viewing angles.
☐ Special treatment achieves non-glare and fingerprint-resistant screen, enhancing character readability.
☐ Detached and lightweight keyboard with 9′ extendable coil cable—available in five standard and many special styles.
☐ Display is lightweight, only 31 lbs.
☐ Display is also compact, with a base footprint of only 14″ x 16″.



The Lee Data Interactive Display System also includes: Model 310 Remote Controller, Model 320 Local Controller, Matrix Printer and the exclusive Coax Eliminator, Models C/8, T/1 and T/8.

SYSTEM ADVANTAGES

☐ A full range of controllers emulate IBM 3274 local and remote systems using either BSC or SNA communications.
☐ Multiple microprocessor design provides a system that easily meets the performance demands of a 32 station cluster.
☐ Select from a line of printers including printers compatible with the IBM 3287.
☐ Save coaxial cable costs with the Coax Eliminator™ that supports up to eight displays or printers on one coaxial cable or twisted wire circuit.
☐ Advanced system software offers • easy system configuration • access to multiple station addresses for individual stations • system and station statistics collection • dynamic on-screen communications line trace.
☐ Experienced and responsive service personnel in over 70 U.S. locations.

LEE DATA CORPORATION

10206 Crosstown Circle
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612/932-0300

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CIRCLE 129 ON READER CARD

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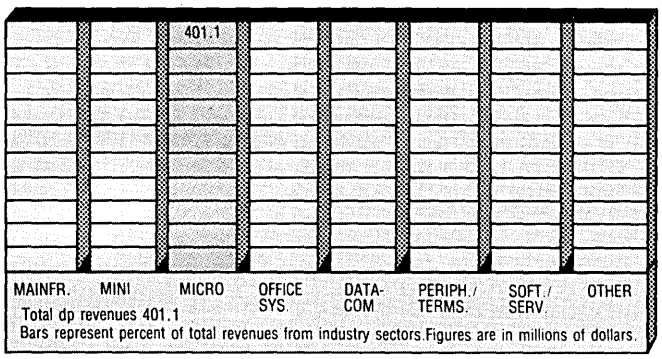

APPLE COMPUTER, INC.

20525 Mariani Avenue
Cupertino, CA 95014
(408) 973-3145

Apple continued its history of breaking records in 1981. Revenues increased by 142% to $401.1 million, from $165.2 million for 1980. Net income jumped 176% to $45.6 million. The year was marked by executive changes and the resumption of Apple III shipments. Early in the year, A.C. Markkula Jr. was named president and ceo, while founder Steven Jobs moved up to chairman of the board. The problem-ridden Apple III, which had been introduced in late 1980, was withdrawn from the market in early 1981, but by April shipments were resumed.

The Apple III is a minicomputer with 128K byte memory that retails for as little as $3,495 for the computer alone and about $4,685 for the average system. This compares to the Apple II's 16 byte memory for $1,330 alone or $2,500 for the average system. A spokeman explained Apple III's problems this way: "Apple III wasn't ready to be sold, but we rushed it onto the market. Now that we have cleared up the problem, sales are reaching 40,000 to 50,000 computers a year."

To accommodate this growth in demand, Apple more than doubled its manufacturing capacity in fiscal 1981, and now has 670,000 square feet. In addition, the company acquired land in Singapore to build a new manufacturing facility.

Research and development costs were again stepped up at Apple, reaching $21 million in fiscal 1981. Some of the results of these expenses were also introduced in the form of new software: Pascal and BASIC were both introduced for Apple III. In addition, Profile, a hard-disk mass storage system for Apple III, was introduced. The main thrust of Apple's R&D expense, however, is going into the Apple IV, or the Personal Office Station. Speculation abounds about the newest product, which is expected to be introduced in the summer. Rumor has it that the Personal Office Station will incorporate much of Xerox's Star, but at a considerably lower price. Apple has stated that its main objective is to build a computer that a user doesn't have to learn how to use.

On the marketing side, Apple II's sales were boosted by a special Family System introduced in November, just in time for the holidays. The system was priced at $2,495 and included a financial package, plus games for the children. This promotion was termed very successful, and more special promotions are expected in the future.

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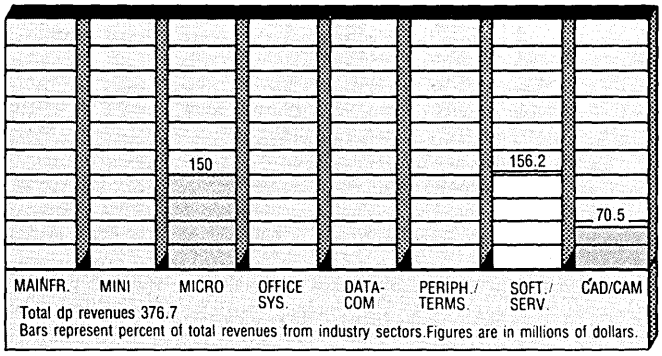


MCDONNELL DOUGLAS CORPORATION

Box 516
St. Louis, MO 63166
(314) 232-0232

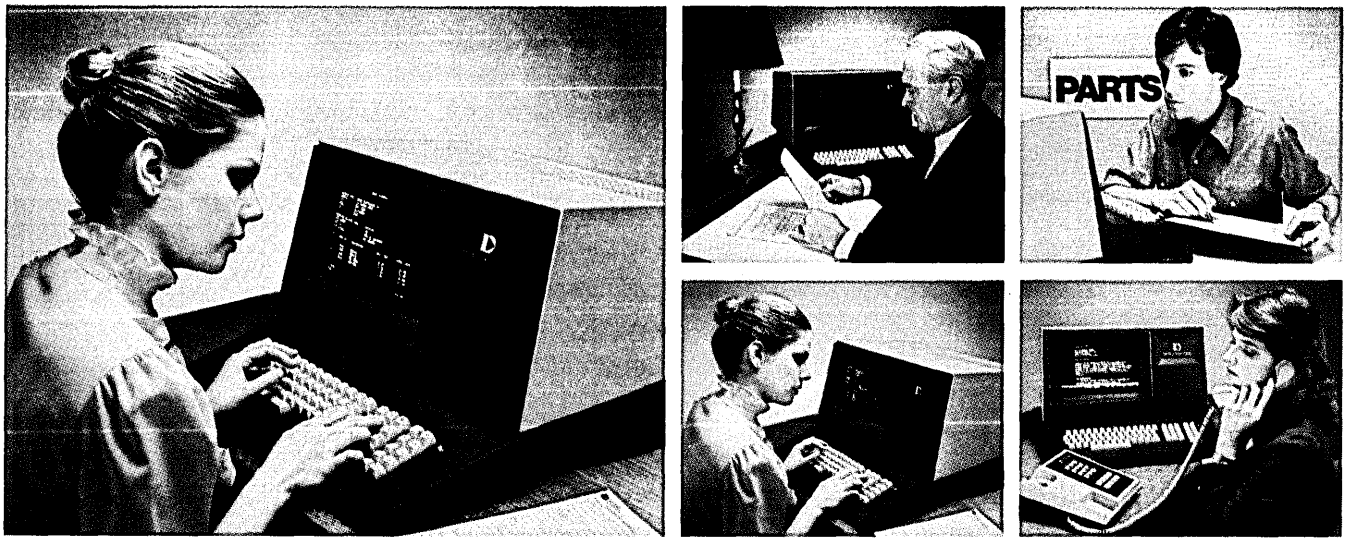
McDonnell Douglas Corp., one of the leading producers of military and commercial aircraft, had a year of moderate growth with revenues up 22% to $7.4 billion. Of total corporate revenues, $376.7 million were dp related. Of that, $226.7 million were accounted for by McDonnell Douglas Automation Co. (McAuto), the application services division. (For the Top 100, DATAMATION excludes internal sales, and this figure would double if they were included.) McAuto's revenues increased by 11% in 1981. McDonnell's other dp-related subsidiary, Microdata, a manufacturer of business computer systems, contributed an estimated $150 million to total corporate revenues.

McAuto provides industry-specific application services, specializing in manufacturing and structural engineering applications (not surprisingly, McDonnell Douglas is one of McAuto's largest customers). In addition, with a large CAD/CAM market (half of McAuto's international sales are derived from CAD/CAM) the company also services the medical hospital industry (about 46% of revenues); the manufacturing and distribution market (13%); utilities (12%); and engineers, architects, and constructors (7%). The remaining 22% is accounted for by a number of smaller markets, such as financial institutions, each accounting for about 3% of total McAuto revenues.

McAuto made several acquisitions in 1981. In December, it acquired the systems and administrative services divisions of Bradford National Corp. The systems division specializes in systems development services for U.S. government agencies; the administrative services division provides financial and health care dp services and processes claims for New York State's computerized Medicaid Management Information System. (The acquisition was made after Bradford pleaded guilty to federal charges that it had falsified payment claims.)

Also in 1981, McAuto purchased Improved Systems Technology, which specializes in educational applications, specifically in the areas of structured analysis and design methodology; and the engineering services division of BOC/Datasolve in Britain. McAuto also acquired the marketing rights to a system developed by Applied Research in Cambridge, Mass. Called BDS/GDS (for building design system/general drafting system), it is to architects what CAD/CAM is to industrial designers.

Microdata has three basic product lines, the Reality family of minis, ranging from entry-level to larger and faster sophisticated systems; the new system Sequel, introduced in early 1981, a large business system; and a distributed ddp system called Sovereign, also introduced in 1981. Microdata also markets a variety of software programs, among them RESULTS (a basic accounting/financial package) and ADMAX (designed for advertising agencies).



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Businesses have been using DATASHARE for almost a decade. Now there are close to 30,000 installations worldwide.

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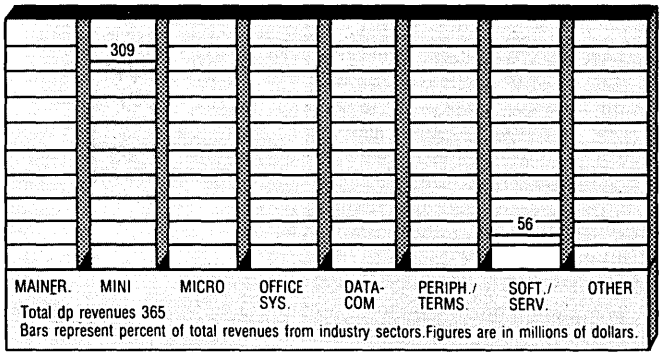

PRIME COMPUTER INC.

Prime Park
Natick, MA 01760
(617) 655-8000

Prime retained its reputation as one of the most talked-about minicomputer companies in the industry. The sudden resignation of its president, Kenneth Fisher; the introduction of its latest top-of-the-line computer, the 850; and the increasing competition in the 32-bit supermini market all served to focus attention on the growing company.

Fisher, who managed Prime's sales growth from $11 million in 1975 to $327 million by mid-year, resigned in July amid rumors of personal differences with David J. Dunn, Prime's chairman of the board. Both men denied any conflict. The search for a replacement took till Nov. 30, when Joe M. Henson, the 48-year-old former vice president of management services of IBM's General Products Division, was selected.

Prime ended the year posting a revenue increase of 36% to $365 million, with earnings of $38 million, a 20% increase. Long famous as the company that could deliver very quickly, Prime began to change the way it operated. The board of directors announced that instead of building each machine as the order arrived, Prime would begin steady manufacturing, building an inventory, and offering incentives to its salespeople to build a backlog. The program was still being worked out, but officials hope to reduce costs and increase profits substantially.

Prime expanded its main line of equipment, the 50 series of 32-bit processors, with the announcement of the Prime 850, which it began shipping in the last quarter. Capable of supporting 128 terminals and 8M bytes of main memory, the Prime 850 competes with DEC's VAX 11/780 and Data General's MV-8000 series, as well as IBM's 4341-42 and DECsystem 2060 mainframes. The Prime 850 has two processors that share a common memory and operating system, utilizing a multistream architecture that, according to Prime, gives the 850 throughput rates that are far greater than those of other 32-bit minis.

Prime also upgraded three other systems in the 50 series—the 150, 250, and 550, doubling the number of terminals that can be supported by the two low-end models and increasing the memory in the 550. Also, current users of the 750 can now support up to 96 terminals, a 50% increase. Two models, the 450 and the 650, were discontinued.

Unlike older minicomputer makers, Prime is expected to benefit over the long run from the fact that it does not have to maintain software support for a line of 16-bit minis and can concentrate on improving the end-user functionality of the 50 series computers. All Prime computers use the PRIMOS OS.

In May, Prime announced its entry into the growing computer aided design (CAD) field with MEDUSA, a CAD system with its own workstation that is available for all 50 series computers.

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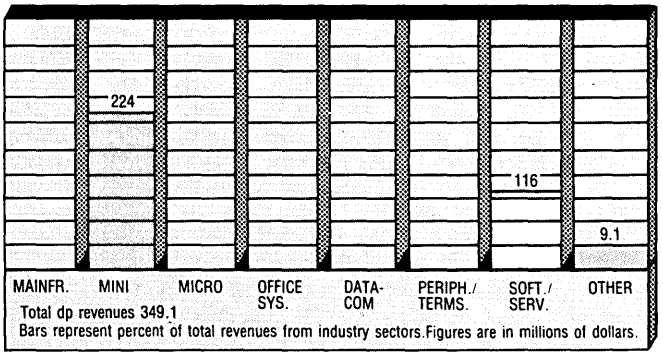


MANAGEMENT ASSISTANCE, INC.

560 Lexington Avenue
New York, NY 10022
(212) 909-1400

Management Assistance, Inc. had another disappointing year as sales of its Basic Four small computer systems continued to remain slack. Revenues increased 12.4% to $349.1 million for calendar year 1981. Earnings under pressure from foreign exchange losses and slow sales fell in the fiscal year ending Sept. 30 by 51% to $6.8 million.

Stephen J. Keane, who had served as president of MAI's successful Sorbus Service division, was named president of the troubled information division. Keane was credited with making Sorbus the strong income producer it has proved to be for MAI. In 1981, Sorbus's service fees were up about 25% to $125.9 million and now represent 36% of MAI's overall revenue.

In October, MAI acquired certain maintenance-related assets of the Pertec Computer Corp., adding 80 service representatives and expanding its services to handle various systems made by Pertec and other small systems companies. MAI expects the Pertec acquisition to be worth about $6 million in revenues annually. Also in 1981, an agreement with Florists Transworld Delivery to service the 7,000 terminals that are part of that network produced an estimated $3 million in annual service fees. Ronald A. Wallace, formerly a senior vp at Sorbus, succeeded Keane as president. Sorbus now services more than 25,000 customers with more than 1,800 service representatives here and abroad.

Revenues from sales of the Basic Four computers increased about 8% in 1981. Profits were hurt significantly by the strengthening of the dollar in Europe. Basic Four systems are designed for small- and medium-sized businesses in vertical markets such as wholesale distribution, construction, real estate management, client accounting, membership management, hospitals, dentists, and others. In 1980, the company released the entry-level S/80 system, but sales have remained slow and the company is looking to 1982 as a take-off year for that product. In 1981, software enhancements were released to permit greater functionality on the DataWord II terminal.

In February of this year, MAI announced the acquisition of RCO Corp. of Albuquerque, N. Mex., a Basic Four dealer that has developed applications programs for small businesses that are compatible with both CP/M and Basic Four operating software.

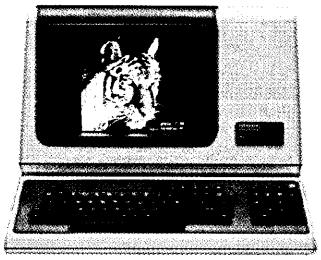
The announcement was the first of several MAI has indicated it plans to make this year about significant additions to its product line. The new products will feature office automation capabilities for small businesses, professionals, and departments of larger firms (that now account for about 10% of MAI's business). To develop these new products, MAI spent $15.2 million on research and development in fiscal 1981, up from $10.7 million in 1980 and $6.6 million in 1979.

CAPTURE RETRO-GRAPHICS™ ON YOUR DEC™ TERMINAL.

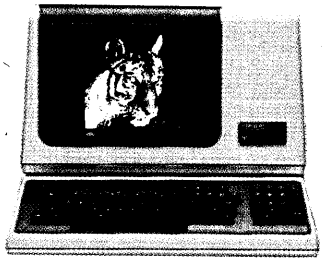
Retro-Graphics terminal enhancements are PC boards that fit into ordinary display terminals and transform them into full-featured graphics terminals — with no loss of existing features and at a fraction of the cost of comparably equipped graphics terminals.

Thousands of users have either field-upgraded their DEC VT100™ and VT132™ terminals or have purchased them with Retro-Graphics enhancements fully installed and supported.

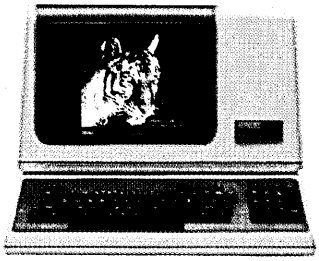
Now with DEC's newest additions, the VT101™, VT102™ and VT131™, Digital Engineering has responded in kind with our newest generation of Retro-Graphics, available for the growing VT100 family.



VT100



VT101



VT132

VT131

Introducing GEN.II™ For DEC. More Graphics Power And Convenience.

Our GEN.II Retro-Graphics products are designed to emulate both the Tektronix® 4027 and 4010 graphics terminals.

Because they are based on industry-standard Tektronix protocol, GEN.II products are both powerful and familiar to most programmers. Additionally, GEN.II's graphics intelligence is resident in the upgraded terminal, assuring rapid graphics generation because host-terminal data transmission is held to a minimum.

Graphics programming and operation are considerably eased by simple, English-like commands. For example, the following command string (either transmitted by the host or entered from the keyboard):

! PIE, 100, 0, 360, 45

will cause the terminal to draw an eight-sided polygon with a radius of 100 and fill the interior with a shading pattern.

In addition to performing *area-fill* and *polygon-drawing*, a programmer can draw *arcs* and *vectors* and *define and shape text characters* with similar high-level command strings.

Software Compatibility Assures Your Long-Term Investment.

Since our GEN.II products for DEC emulate the 4027 and 4010, compatibility with utility and applications programs, whether now or in the future, is guaranteed. Currently, Retro-Graphics products are successfully being used with ISSCO's® DISSPLA® and TELLAGRAF®, Tektronix' PLOT 10™, Megatek's Template™, Precision Visuals' DI-3000™, Signal Technology's Interactive Laboratory System (ILS)®, and Digital Engineering's own PLOTPAK™.

Graphics I/O And Solid Backup Throughout.

Digital Engineering has built a solid foundation of support tools for GEN.II. For instance, an optional I/O connector allows the operator to use a light pen or to output to a variety of impact or non-impact printers. Professional documentation assists at every level of operation. A worldwide distribution network assures prompt delivery and backup. And whether you tap our service network or opt for on-site service — from one of the largest field service organizations in the world — your problems will be quickly resolved.

Two GEN.II's For The DEC Family.

GEN.II is offered in two models for the VT100, VT101, VT102, VT131 and VT132 terminals — one with green screen and 640 x 480 resolution, and another with white screen and 640 x 240 resolution.

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CIRCLE 131 ON READER CARD

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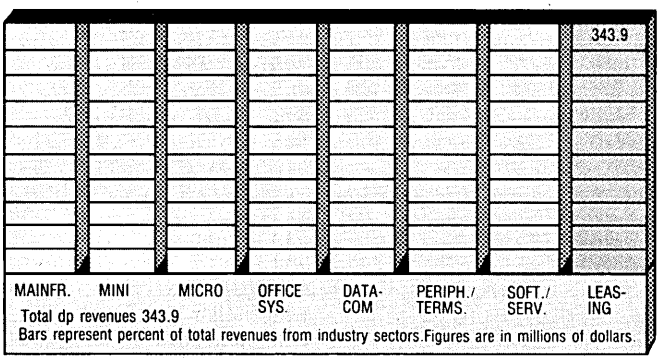

COMDISCO, INC.

6400 Shafer Court
Rosemont, Il 60018
(312) 698-3000

Comdisco, one of the largest dealers in new and used IBM equipment, posted 1981 revenues of $343.9 million, a 25% increase over 1980.

The results were achieved through significant increases in revenues both from computer rentals and from the activities of Comdisco's Financial Services Inc., its wholly owned subsidiary, which arranges tax-leveraged financing of computers, transportation, and other capital equipment. During the fiscal year which ended Sept. 30, outright sales of computers actually dropped by 16% to $125.3 million.

During its fiscal year, Comdisco sold or leased 286 cpus and increased its customer base to more than 2,500 active accounts, a 39% increase. The total number of cpus on lease is now over 700.

Comdisco expects to benefit in 1982 from the buy/sell/lease activity generated by IBM's new 3081 mainframe and by price cuts on the 3033. Also, the new leasing rules contained in the Economic Recovery Tax Act of 1981 are expected to strongly benefit Comdisco Financial Services Inc.

Comdisco Disaster Recovery Services completed its first year of operation with three centers in Illinois, California, and New Jersey. It plans to add a fourth in 1982.

To reduce its reliance on short-term borrowing, Comdisco during the year sold $50 million in 13% convertible subordinated debentures.

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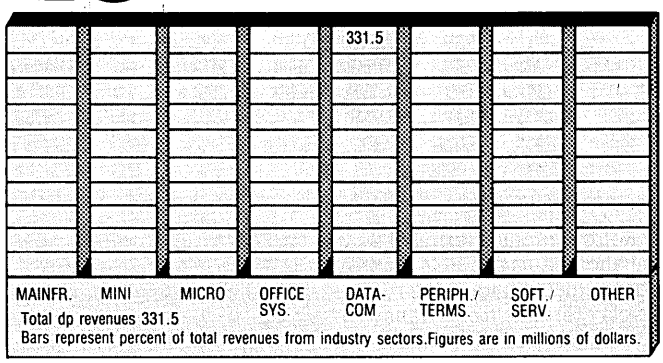


ROLM CORPORATION

4900 Old Ironsides Drive
Santa Clara, CA 95050
(408) 988-2900

Rolm's 1981 revenues were up 32.1% to $331.5 million, aided by increasing new order rates beginning in the second quarter (after a sequential decline in the first quarter). By July 1981, Rolm had a backlog totaling $104 million, up from $83 million a year earlier.

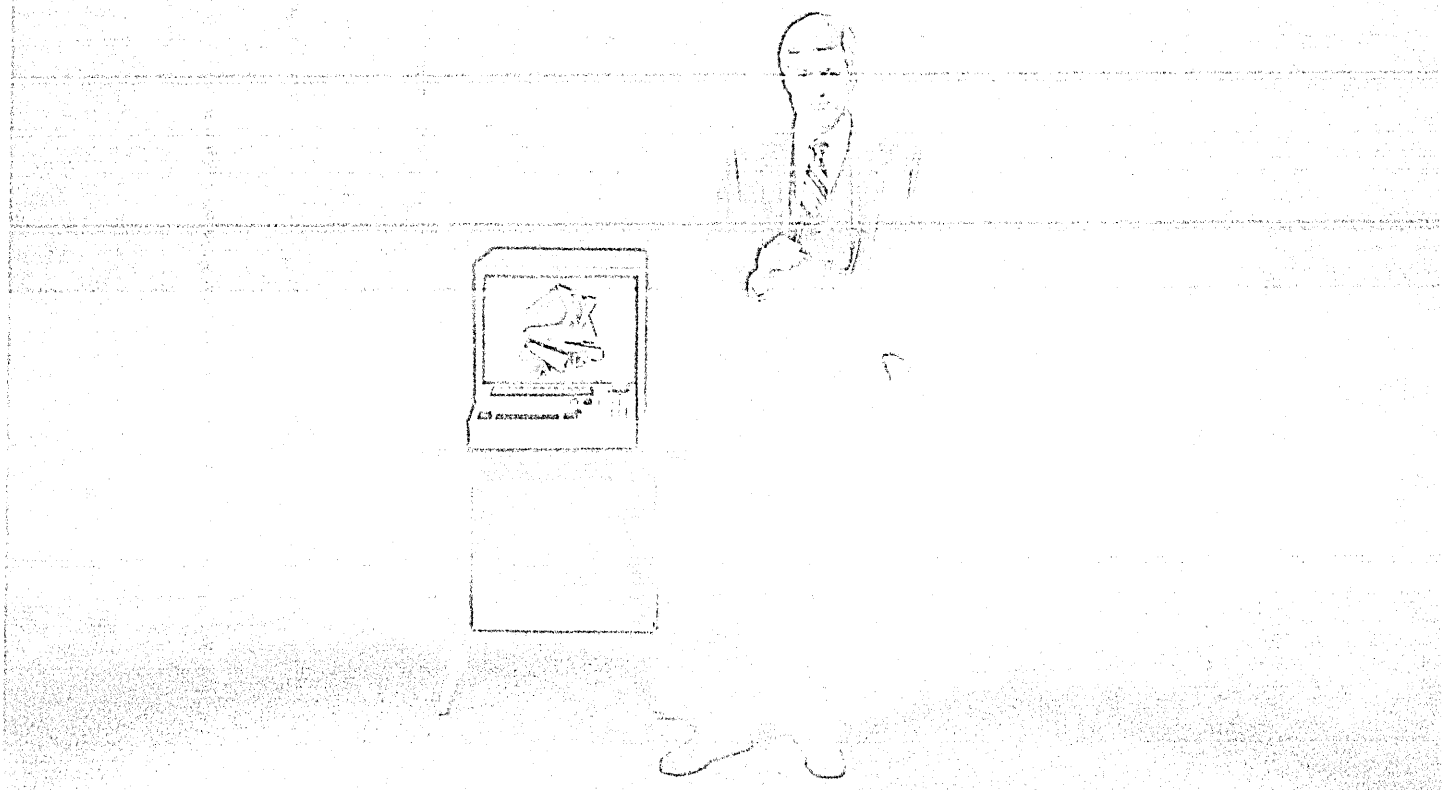
Although Rolm is still best known for its digital PBXs and telephone sets (plus its recent forays into office automation), the company remains a major contender in the military computer market. Rolm's Mil-Spec Computer division produces (to military specifications) computer products for intelligent military electronics systems. These products fall into two principal families: the Eclipse computers, which are functionally identical to Data General's Eclipse line, and AN/UYK-19 (v), which are older models ranging from a single-module processor to a medium-sized system.

Ten new systems were added to the Mil-Spec line in 1981, more than doubling Rolm's offerings in this area. Revenues for the division increased 21%, including a $7 million order from McDonnell Douglas Astronautics Corp.

But Rolm made news last year with a big thrust in the office automation market, through which Rolm execs hope to transform their firm into a multibillion dollar enterprise by the end of the decade. The first move in Rolm's strategy to make the PBX the hub of all office communications was the addition of data switching capabilities to the CBX line. The firm also decided in 1981 to manufacture executive workstations and other devices that will communicate through the enhanced switchboards. The commitment to this area is evidenced by an R&D allotment of over $5 million for the two-year-old office automation group, out of the total corporate R&D budget of $20.1 million (up from $13.4 million in 1981).

To prepare for direct competition from office automation companies, Rolm continued to place increasing emphasis on direct sales in 1981. The firm expects to continue its soaring growth rate in PBXs for at least several years. But as the $2 billion U.S. retail market for PBXs matures, Rolm is counting on its office automation strategy to pave the way for new sources of revenue.

Command Performance



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Aydin's performance is measured in *advanced technology*:

- A 1024 × 1024 raster graphic monochrome CRT display, introduced in 1968.
- The world's first color graphic CRT display installation in an electric utility control center, in 1969.
- The highest speed bit-slice technology full-graphic color CRT display, introduced in 1975.
- The world's first multi-processor, multi-user color graphic display computer, introduced in 1978.

Aydin's performance is measured in *user availability*:

- Successful achievement of display subsystem availability targets as high as 99.98%.
- High availability display configurations with single-point failure protection.
- A full QA program meeting MIL-Q-9858A.

Aydin's performance is measured in *service to customers*:

- An unprecedented 18-month warranty for OEM customers, 12 months for end users.
- Free training for all OEM customers.
- Multiple customer service outlets in the U.S. and throughout the world.

Aydin continues the revolution in color graphics and even more performance is yet to come. Watch for our future product announcements. Because you demand it, Aydin commands performance.

Aydin Controls

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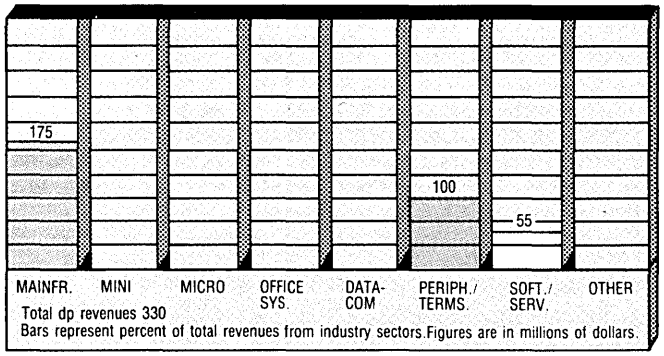

NATIONAL SEMICONDUCTOR

2900 Semiconductor Drive
Santa Clara, CA 95051
(408) 737-5262

Like the rest of the semiconductor industry, National Semiconductor had a tough year in 1981, defending itself against the combined ravages of the recession, depressed pricing, and increased Japanese competition. Revenues were down 4% to $1.1 billion. Major cost-cutting moves included the decision to drop production of bubble memory devices and to suspend construction of a new plant in Arlington, Texas.

Management problems were evident in 1981. In July, two top financial officers were fired after a policy dispute with president Charles Sporck. Their departure was followed in August by the resignation of Pierre Lamond, vice president and technical director of the semiconductor division.

During the year, several other executives left to form a new startup, Linear Technology Corp. National filed suit in October, charging that the former staffers were using trade secrets in their new venture.

This February, National got more bad news when the company's military products were removed from the government's qualified parts list because National failed to put them through required testing. In addition to semiconductor devices, which accounted for an estimated 73% of 1981 revenues, National Semi also sells IBM plug-compatible mainframes, supermarket point-of-sale (POS) systems, disk drives, and add-on memories. (During 1981 it sold its calculator and watch business.)

Although the company does not break out revenues, DATAMATION estimates sales and services of these products produced $330 million in sales, a 10% increase over 1980.

National Semi experienced a major growth in sales of its Datachecker POS systems equipped with scanning capability. In 1981, it sold 484 Datachecker systems, bringing its total installed base to 1,102—about 23% of the total market. In 1981, the company introduced POSitalker, a speech synthesis component for the Datachecker, and Miniscan, a portable scanning device.

Through National Advanced Systems, the wholly owned subsidiary National Semi acquired from Itel in 1979, it sells plug-compatible mainframes of its own manufacture, as well as systems made by Hitachi. In 1981 it sold about 150 systems, bringing its total installed based to 750. About 550 of these are the AS-3000 and AS-5000 medium-scale cpus that NAS manufactures, while the rest are the AS-7000 and AS-9000 large-scale systems made by Hitachi. The company began to see a bigger percentage of large-scale Hitachi systems in cpus sold in 1981.

NAS moved into distributed data processing (ddp) through an agreement with Paradyne Corp. to market its IBM-compatible Response ddp system. This year, NAS is expected to further increase its involvement in ddp with the introduction of the AS/6100, which will compete at the high end of IBM's 4300 series.

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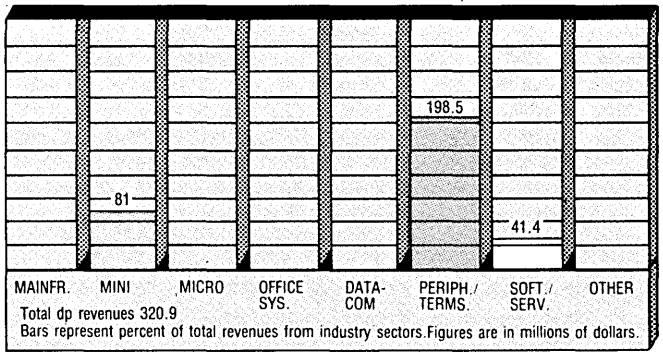


MOHAWK DATA SCIENCES CORPORATION

7 Century Drive
Parsippany, NJ 07054
(201) 540-9080

Mohawk Data Sciences, a supplier of business computers, terminals, and communications systems, had a slow year in 1981. Most of its problems came as a result of the fact that it does 40% of its business overseas. The recession in Europe combined with the strength of the dollar hit MDS hard. In fact, the company noted at one point that earnings for fiscal 1981 would have been $2.3 million higher if exchange rates had remained at 1980 levels.

On the bright side, the company's U.S. business remained strong. MDS picked up a $62 million contract from Nationwide Mutual Insurance Co. for 3,500 Series 21 computer systems, as well as a $35 million maintenance contract.

Overall, the company's revenues grew 11.6% to $320.9 million in 1981, from $287.5 million in 1980. The company showed a net profit of $19.1 million in 1981, up from $17.2 million in 1980.

In order to better position itself to serve its target markets, MDS reorganized into four divisions in 1981: MDS Systems, MDS Qantel, MDS Trivex, and MDS Service.

MDS Systems markets the Series 21 line of distributed processing systems, a worldwide communications service called WINC, the MDS 1200 and 2400 key-to-disk data entry systems, and the 2300 remote job entry system.

MDS Qantel brings Qantel, the business computer company that MDS acquired in 1980, into the corporate fold. That division markets the Qantel line of hardware and software products and is based in Hayward, Calif.

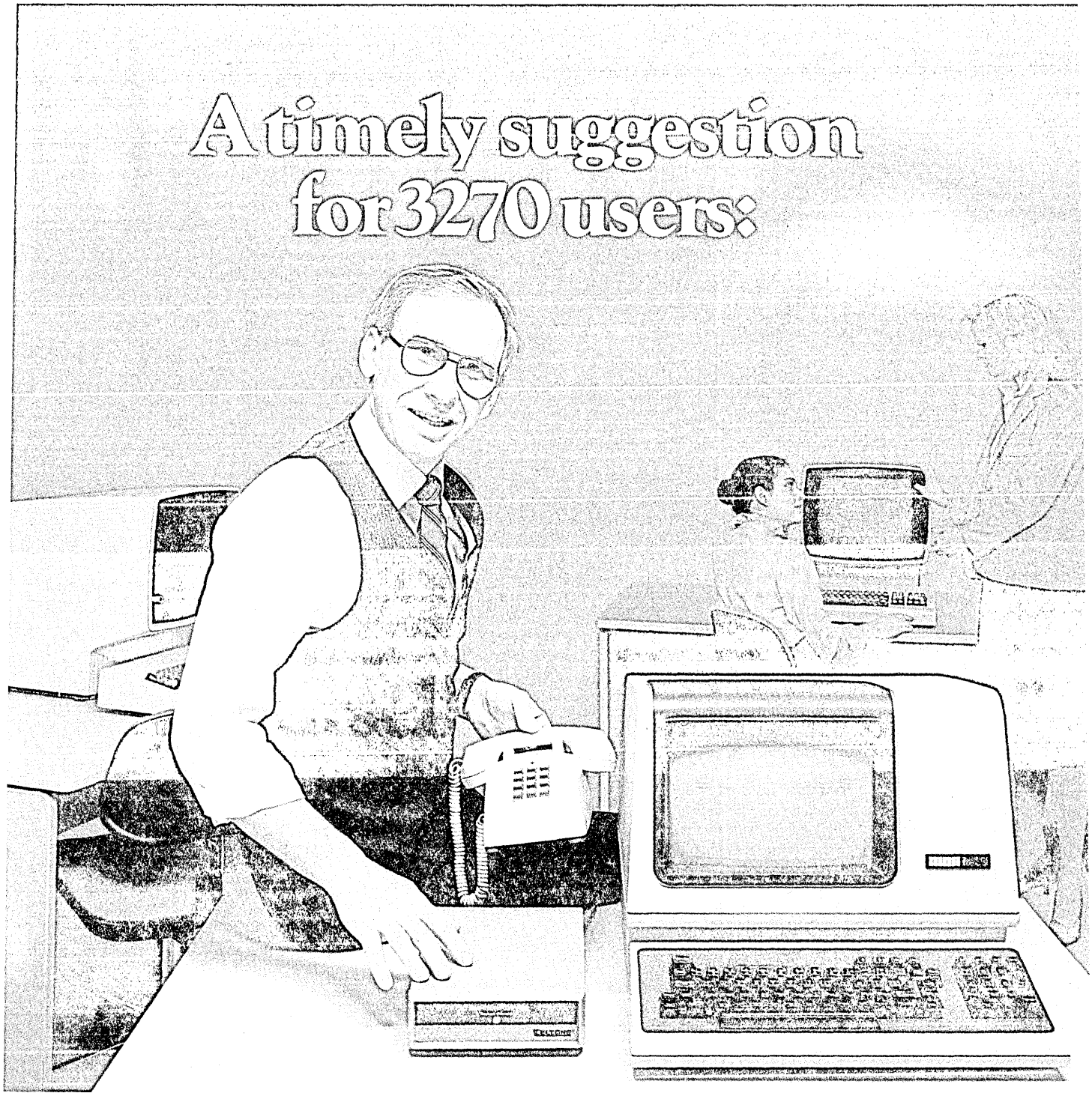
MDS Trivex provides a line of IBM-compatible terminals, printers, and controllers. It had a slow first half in 1981 because of production problems with its 80 product line of terminals and controllers.

MDS Service combines the service organizations of each of the other divisions and also coordinates the service operations of MDS subsidiaries and distributors around the world.

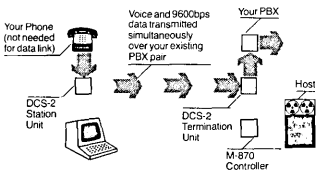
During the year, the company added a number of new products, chiefly in the software area. In fact, that business showed the greatest growth last year. Software revenues jumped 62% to $46.6 million in 1981, from $28.7 million in 1980. Among the products introduced were Word 21, a word processing package for the Series 21 line of computers, and the Series 21 Reporter package, designed to allow the creation of management reports from information on diskettes or disk files.

MDS went outside for capital in 1981, raising $41 million from a common stock offering. The company used the proceeds to repay U.S. borrowings, thereby reducing interest payments by approximately $8 million. This decrease in debt lowered MDS's long-term debt to equity ratio to 3 to 1.

A timely suggestion for 3270 users:



"Buy yourself some flexibility."



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Here's a simple, cost-effective way to build flexibility into your DP operation, and satisfy the information needs of a wider range of terminal users.

Isn't it something you'd like to know more about? Call us toll free at (800) 426-5918 or write Teltone Corporation, PO Box 657, Kirkland, WA 98033. In Canada: 91 Telson Road, Markham, Ontario L3R 1E4, phone (416) 475-0837.

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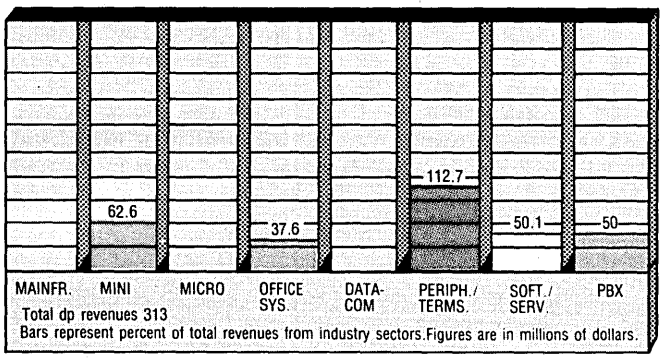

HARRIS CORPORATION

1025 West Nasa Boulevard
Melbourne, FL 32919
(305) 727-9100

Harris is a $1.6 billion producer of information processing and communications systems, equipment, and components, organized into five major operating groups.

The majority of the 1981 dp-related revenues of $313 million (up from $260 million in 1980), was generated by the Information Systems Group: Composition Systems, Computer Systems, Controls, Data Communications, Information Systems International, and Digital Telephone divisions. In 1981, a separate Customer Support organization was established to service and support data terminals, distributed data processing systems, superminicomputers, word processing, and PBXs in North America and Canada.

The Composition Systems Group provides products for small weekly and daily newspapers in the editorial copy processing/prepress marketplace. In December 1981, Harris acquired Logicon-Intercomp's newspaper text processing business, allowing the company to address the top segment of the market for those users with common databases and several hundred terminals.

Harris Computer Systems Group supplies superminicomputers to the scientific, educational, and general business environment. The series consists of the Harris 80, 100, 300, 500, and 800 lines. Major developments include the expansion of the extensive software applications library in areas like simulation, word processing, and CAD/CAM, and the addition of computer graphics interfaces to support a variety of graphics terminals and plotters.

The Harris Controls Group builds computerized control systems for electric utilities, petroleum pipelines, and railroads. These systems incorporate Harris superminicomputers, advanced software, and specially designed systems components. The first shipments of the 9000 Series Power Control Center were made during 1981.

Harris Data Communications provides multifunction distributed data processing systems and interactive and remote batch terminals. Harris Digital Telephone supplies voice and data switching PBXs and microprocessor controlled telephones. The D-1200 line of PBXs supports up to 1,000 lines while the DLS-1 supports smaller operations with as few as 40 lines or trunks. The PBX is a key component within Harris's thrust into the information marketplace.

The company also continued the development of its high-end distributed intelligence office word processing system. The new product will be targeted at larger multisite accounts that need long document processing and storage capabilities with an emphasis on telecommunications. First deliveries are expected in calendar year 1982.

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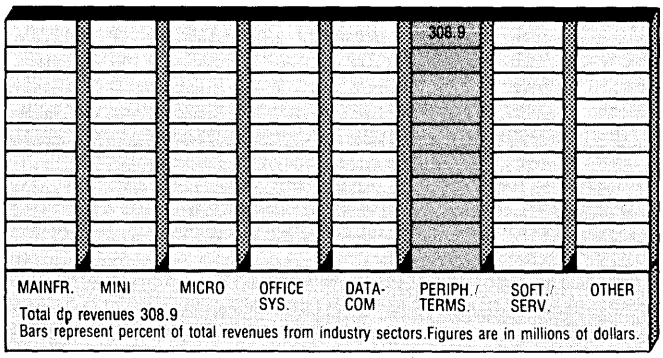

TEKTRONIX, INC.

P.O. Box 500
Beaverton, OR 97077
(503) 644-0161

Tektronix, Inc., a leading manufacturer of cathode ray oscilloscopes and graphic computer terminals and displays, had revenues of $1.1 billion in 1981, up a modest 10%. Of total revenues, 28% were derived from the company's information display group, with revenues of $308.9 million, an 8% increase. More than half of the information display division's revenues come from sales of graphic computer terminals and displays; remaining revenues are generated by engineering desktop computers with graphics, and hardcopy devices (copiers, plotters, and image-forming products).

Tektronix seems to be bouncing back from a bad year in 1980. From November 1980 through to the summer of 1981, the company was forced to shut down its plant periodically for about three weeks to prevent unwieldy backlogs, as orders were lower than anticipated. In August 1981, Tektronix eliminated over 1,000 positions to help control costs.

A series of product introductions and new developments seem to be contributing to an upward trend, however.

In April 1981, Tektronix introduced the 4110 series of graphic computer terminals: the 4112 monochrome raster and the 4144 19-inch storage tube with one color (and an option to add a second color). Possibly more significant was the introduction of the 4113 color raster terminal, expected to be a big seller and compatible with the company's product line. The 4113 represents Tektronix's increased emphasis on color raster terminals (the company has historically produced storage tube terminals).

Moreover, Tektronix has updated its 4027, previously its only color raster. Now labeled the 4027A, it has increased memory and speed and is a more intelligent terminal. The company also introduced two new copiers: the 4611 (for use with a storage tube terminal) and the 4612 (for use with color raster terminals)—the first of its products to use electrostatic copying.

Other developments may have contributed to a pickup in Tektronix's performance. In April, Jon Reed, former corporate marketing manager, was appointed new manager of the information display division. Also part of the increased emphasis on companywide decentralization was a decision to have each sales force report to its own division rather than central management.

Surprisingly, Tektronix's 4014, its oldest storage tube dumb terminal, did remarkably well in 1981 and may also have contributed to a boost in order rates. Management thinks this may be due to the fact that customers, though not necessarily ready for the company's new line, were encouraged by the introduction of upward-compatible products.

Despite a new emphasis on color raster terminals, Tektronix's markets will remain the same. The company will concentrate on engineering and scientific applications with markets in CAD/CAM, computer aided mapping, and architecture.

If you do financial planning and modeling, tear out this page.

With more than 50 financial modeling systems on the market today, having to choose one can be confusing, at best. On the surface, many of the systems look alike. Looking deeper, only one stands out.

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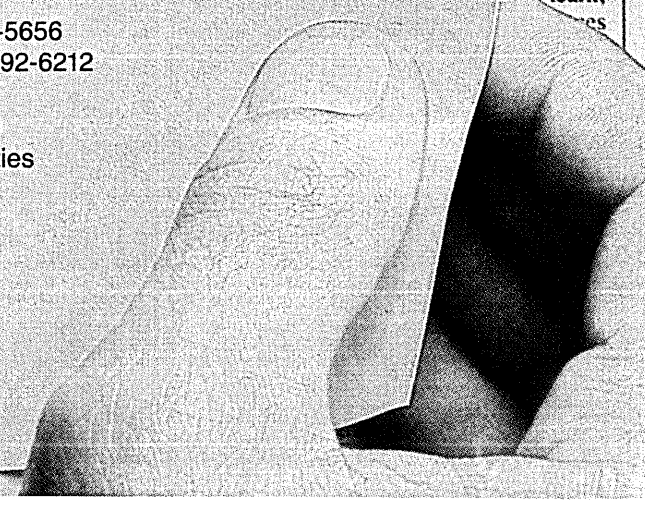
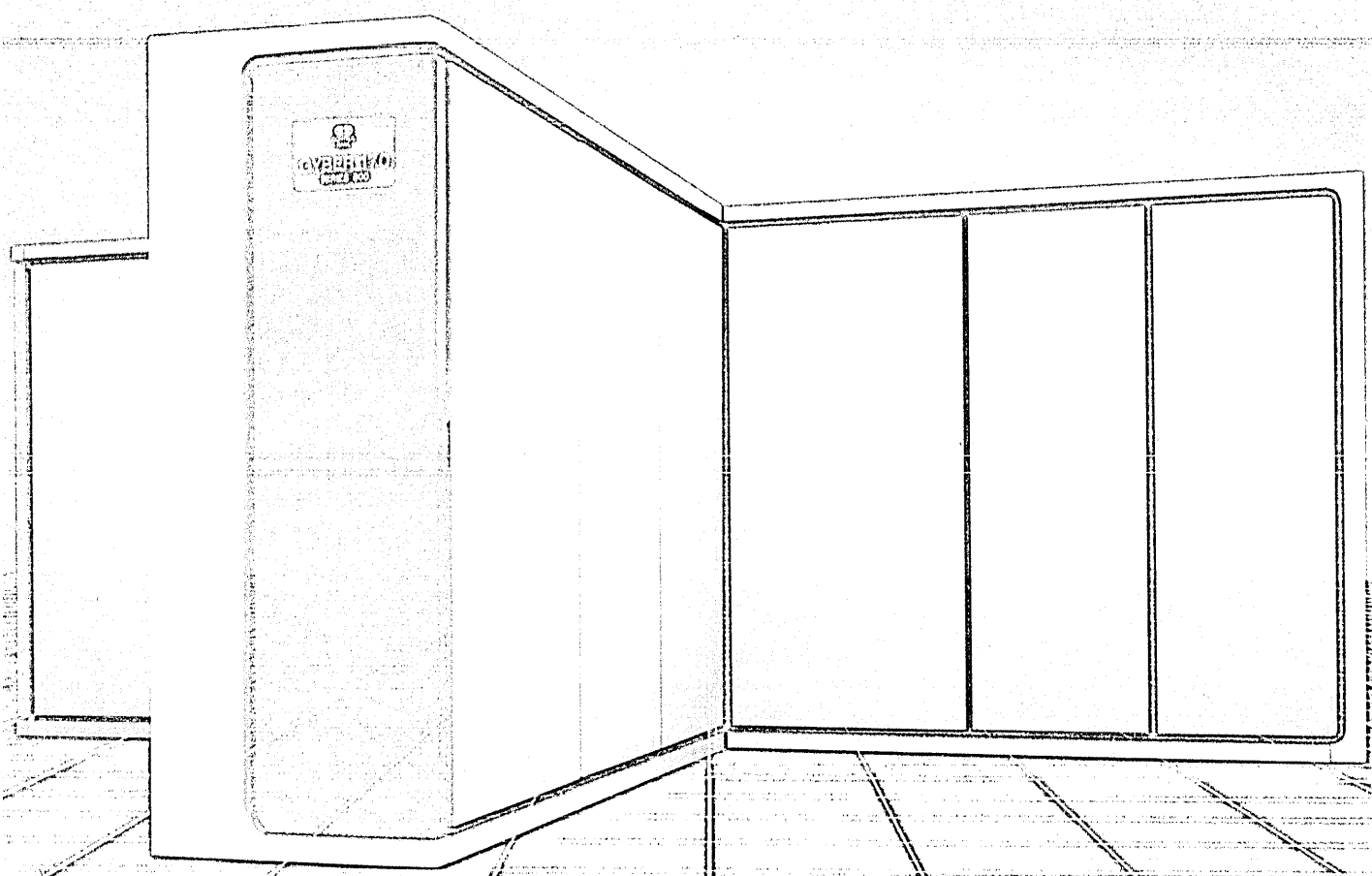


Announcing the CYBER 170 Series 800.



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Meet your major application challenges now. The CYBER 170 Series 800 has the features you need.

More performance per dollar.

The new CYBER 170 Series 800 computer systems give you more computing power and bigger memories. The result: more throughput than with any CYBER 170 computer in history, or most of the other computer systems on the market. So you can have the computing muscle you need today.

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The Series 800 also delivers on a Control Data commitment: to give our customers expanded capabilities, with all the benefits of *proven* hardware, software and support—all conversion-free.

Software compatibility.

If you're a Control Data customer, you can upgrade to the Series 800 and protect your investment in application software.

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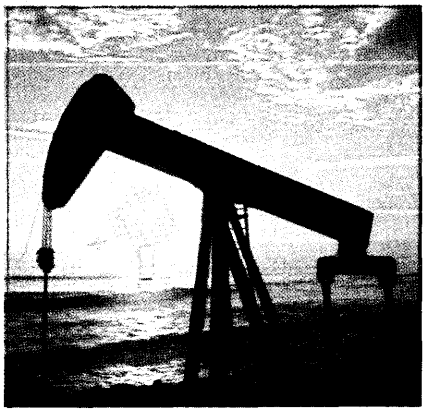
A major reason for this compatibility: Control Data's user-proven Network Operating System—NOS—now enhanced to make the computer system easier to use for everyone in your organization. Novice, casual user, applications user, programmer—NOS offers them all equal friendliness and speed.

Massive memory.

Series 800 systems give you four to eight times more memory than the maximum on the Series 700 systems. Even the compact, air-cooled 825, the smallest 800 system, offers you a central memory of from 262 thousand to 1 million 60-bit words, to handle applications from seismic processing to CAD/CAM.

Four other 800 systems let you build even larger central memories, and grow to meet future needs efficiently, economically.



Reliable and maintainable.

Series 800 architecture, software and support services are all proven in use. Series 800 systems, installed and tested with Control Data customers around the world, have already confirmed improved reliability. As for maintainability, our Remote Technical Assistance feature can often solve problems in minutes, instead of hours or days.

The bottom line: faster, more cost-effective computing for major industry applications.

With the new Series 800 systems, Control Data gives you the power—and the application programs—you need right now.

In manufacturing, we deliver integrated CAD/CAM capabilities that very few other systems can offer. In the petroleum industry, we put fast, accurate seismic processing and much more at your service.

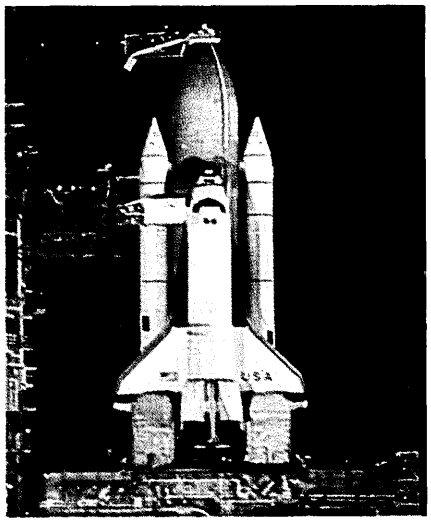
For electric utilities, Series 800-based applications handle complex power generation tasks simply and easily. For weather forecasting, you get the memory and speed you need to run advanced numerical prediction and image processing programs.

And for colleges and universities, we make it possible to process everything from complex research through student instruction.

And now our PLATO® computer-based training system runs side by side with your other applications, to deliver education and training for business and industry, as well as for the academic community.

All of these capabilities are available today—without conversion—to Control Data customers. All are available today to new customers, who need power and performance without the fear of future obsolescence.

Call your local Control Data sales office today for an immediate briefing on the outstanding capabilities—and benefits—of the new CYBER 170 Series 800.



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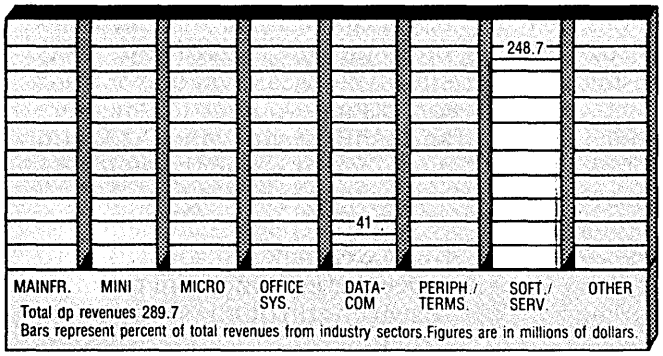

TYMSHARE, INC.

20705 Valley Green Drive
Cupertino, CA 95014
(408) 446-6000

Tymshare's 1981 revenues were up 23% to $289.7 million, but net income was down to $15.7 million, or $1.33 per share, compared with $18.7 million or $1.81 per share in 1980. The company blames the lower than expected earnings on the slow credit card business and a sharp rise in telephone expenses—due to AT&T price increases—which could not immediately be passed on to Tymshare's communications network customers.

Considered by many analysts to be the strongest technically of the major computer services firms, Tymshare continues to bolster its subsidiaries with acquisitions. In 1981, Tymshare bought ITT Electronic Travel Services, Inc.; two check processing franchises; Multipoint Communications Corp., a ddp services provider; and Microband Corp. of America, a microwave transmission firm.

Tymshare has been successful with remote services tied to use of its communications network, which tends to limit the ability of other vendors to compete. In addition to the widely used Tymnet communications network, and data transmission services, Tymshare operates a large credit card processing subsidiary, medical systems and travel management services groups, and additional EFT-based services. Recent new offerings include a tax analysis service, electronic mail enhancements, railroad management service, and a line of small low-cost terminals called Scanset. In 1981 the Tymnet unit filed applications with the FCC to build high-speed digital local communications networks in 50 U.S. cities. In conjunction with microwave and satellite long-distance facilities connecting the cities, this would enable Tymshare to bypass costly phone company facilities and exercise greater control over its own communications.

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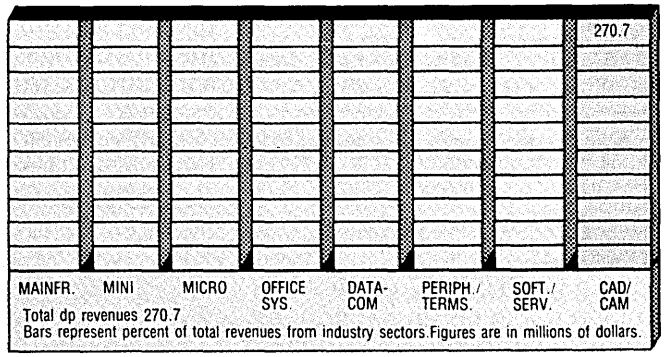


COMPUTERVISION CORPORATION

201 Burlington Road
Bedford, MA 01730
(617) 275-1800

Following explosive revenue growth of 85.5% in 1980, Computervision's 1981 revenues rose 41.7% to $270.7 million. Performance was basically in keeping with management predictions of continued strong demand for the firm's products coupled with continued weakness in the U.S. and Western European economies. Service revenues grew by 60%, continuing to outpace sales of other products—a direct result of large investments in customer support capabilities and establishment of the largest installed base in the industry.

Computervision produces computer aided equipment for automating industrial design and production. The CAD/CAM systems include a line of turnkey CAD/CAM systems that incorporate minicomputers, specialized interactive graphics, workstations, and proprietary software. Unlike its competitors—firms like Calma, Intergraph, and Auto-trol, which buy general purpose computers to combine with their own software, or IBM, Prime, DEC, and Control Data, which do the opposite—Computervision designs and manufactures its own computers, most of its peripherals, and its own software. Last year was the first year Computervision operated purely as a CAD/CAM business, following the sale of the firm's Cobilt division early in the year.

Capital expenditures included $7 million worth of additions to the firm's capital plant, financed through capital leases, and the addition of almost 200,000 square feet of manufacturing space in Sanford, Maine. In 1982, capital expenditures should continue at a rate close to $50 million, with a major investment scheduled for the completion of an administrative and R&D facility in Bedford (construction began in 1981). R&D spending increased by nearly half to $27.3 million in 1981. Over the long run, Computervision's high expenditures in this area should result in new products that should keep the company at the forefront of the industry.

Do other diskette makers have this secret ingredient

$$V(Y|X) = V\left(\sum_{j=1}^{K} \beta_j X_j + \epsilon\right) = V\left(\sum_{j=1}^{K} \beta_j X_j\right) + \sigma^2$$

$$= \sum_{j=1}^{K} X_j^2 V''(\beta_j) + \sum_{\substack{i=1 \\ i \neq j}}^{K} \sum_{j=1}^{K} X_i X_j \mathrm{cov}''(\beta_i, \beta_j) + \sigma^2$$

that we don't have?

And, can it cause the floppy diskette you're using right now to flop ... with the loss of your precious data and endless trouble? You just bet it can!

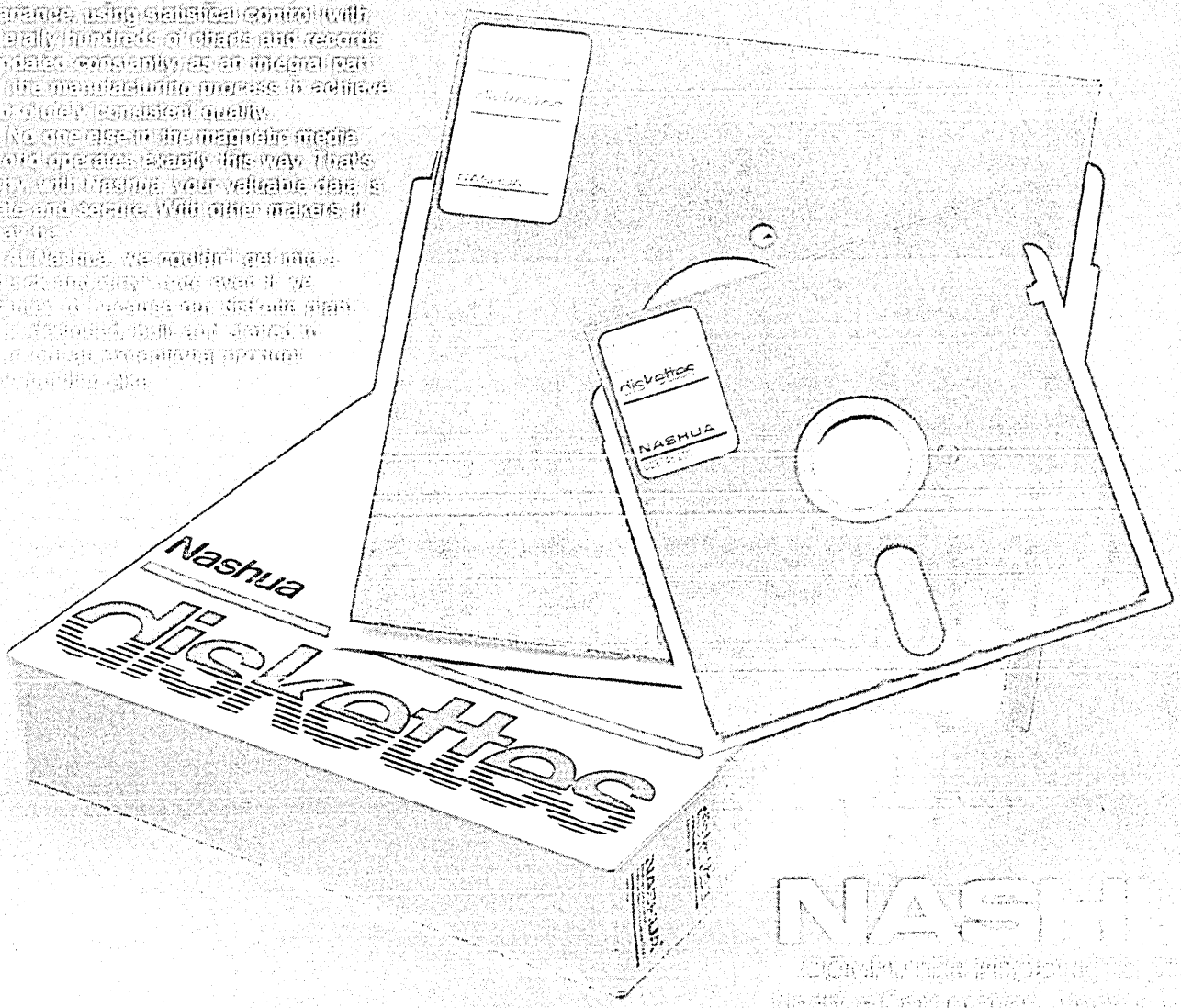
The formula above represents Variance, which is the primary enemy of quality control. At the Nashua diskette plant, production workers in clean downs and gloves wage a holy war on variance, using statistical control (with literally hundreds of charts and records updated constantly) as an integral part of the manufacturing process to achieve absolutely consistent quality.

No one else in the magnetic media world operates exactly this way. That's why, with Nashua, your valuable data is safe and secure. With other makers, it may be.

At Nashua, we couldn't get into a [illegible] more even if we [illegible] because our diskette plant [illegible] and [illegible] to [illegible] product [illegible] else.

The sharks are gathering 'round. The diskette market is exploding in size and everyone is out to grab his share, plus more. Meanwhile a lot of people are forgetting that this very precise, highly engineered product has plenty of potential for disaster for the user if things aren't right.

We make the world's most complete line of magnetic media and have published a handy little book to tell you how to select it. For your free copy of our "What Fits What" book, see your Nashua dealer or write to the Computer Products Division, Nashua Corporation, Nashua, NH 03061.



NASH

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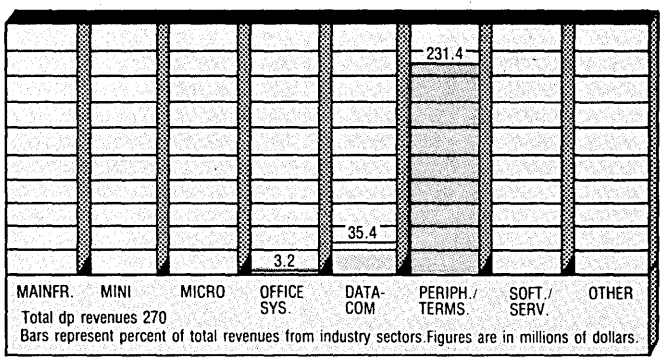

DATAPRODUCTS CORPORATION

6200 Canoga Avenue
Woodland Hills, CA 91365
(213) 887-8451

Dataproducts Corp. had a profitable year. Revenues for calendar 1981 totalled $270 million, an 8.7% increase over 1980. For the fiscal year ending Mar. 31, 1981, net income rose dramatically, reaching $17.2 million, a 134% gain over fiscal 1980. In the previous two years, Dataproducts' earnings had gone down. Revenues from recently developed new-product families reversed this trend. In the previous three years, the new products generated virtually no revenues to offset the high costs of development.

Dataproducts Corp. has two major areas of business: the data processing products segment and the data communication products segment. In the data processing products segment, Dataproducts remains the worldwide leading independent supplier of medium- and high-speed line printers to original equipment manufacturers (oems) within the electronics industry. The printers are used to convert computer output into printed form readable by humans or machines. This segment also manufactures core memories at its Hong Kong plant for use in military systems and other computer equipment. This business has been in a predicted decline, and is expected to continue to face increasing competition from semiconductors.

Data communication products include customized switching and line management systems, test analysis devices, multiplex equipment, and modems. These products are sold primarily to the U.S. government and to common carriers for use in their data transmission systems.

Two new products were introduced in 1981. The M-100, a new dot matrix printer, operates at a speed of 140 characters per second. It offers improved, near letter-quality printing and can be used for word processing and other business applications. Optional features include a programmable character generator and graphics capability. The BP-1800, a high-speed band printer, functions at a speed of 1,800 lines per minute. It can be used when high volume output is required. The 2230 drum printer, a medium-speed line printer, has been phased out.

Several major new contracts were also announced in 1981. Dataproducts was awarded contracts (for printers) with Honeywell Information Systems, Teletype Corp., AM Addressograph (a division of AM International), Tektronix, Inc., and Modular Computer Systems, Inc. (Modcomp).

In an effort to augment its traditional oem direct sales force, Dataproducts launched an authorized distributor program. The program includes new warranty, inventory, sales commission, and marketing policies designed specifically for authorized distributors, along with the services of TRW Inc. as the company's U.S. field maintenance service representative. Dataproducts also developed new subsidiaries for overseas marketing activities and built a new plant in Ireland to manufacture printers to increase its share of the European printer marketplace.

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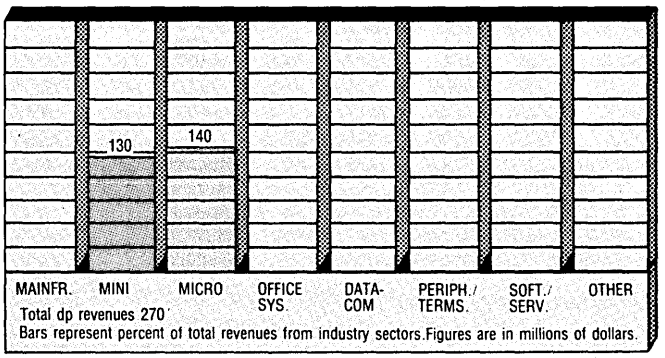

GOULD INC.

SYSTEMS ENGINEERING
& MODICON
10 Gould Center
Rolling Meadows, IL 60008
(312) 640-4000

In its first full year as a division of Gould Inc., Systems Engineering Laboratories continued to grow at a healthy pace, with revenues from sales of its 32 bit superminicomputers up 50% to $130 million.

SEL and Modicon (the manufacturers of programmable controllers acquired by Gould in 1977) together accounted for total dp revenues at Gould of $270 million, up 44% over 1980. This represents about 15% of Gould's overall 1981 revenues of $1.8 billion, from its electrical, electronic, and industrial products.

In 1981, SEL introduced its most powerful computer to date, the Concept 32/87. Designed for numerical-processing intensive applications (such as in laboratories), it is also a key part of Gould's plan to crack the factory automation market.

Modicon, which has been an important contributor to earnings growth at Gould (total corporate profits in 1981 were $95.7 million, up 29%), introduced the 2184 motion controller, which the company says can be used to control servo drives. Modicon's growth has been fueled by the tremendous expansion of the programmable controller market. Modicon, however, faces stiff competition from Allen-Bradley, which introduced a new line of controllers in 1981.

Gould made several significant moves in 1981 that are part of its strategy to become a major player in the high technology electronics market. In September it sold its Industrial Products Group to Reading Co. for $350 million. The Industrial Products Group accounted for 30% of Gould's operating profits in 1980. In December, Gould acquired American Microsystems Inc., a leading manufacturer of custom microcircuits, for a stock transaction valued at $226 million. Gould had long been seeking a semiconductor company and was rebuffed in 1979 in attempts to take over Mostek Corp. and Fairchild Camera & Instrument.

Through AMI, Gould acquires not only a leading semiconductor company, but also an important supplier of 8 and 16 bit microprocessor development systems in Millenium, the subsidiary acquired by AMI in 1978.

In August, Gould added another dimension to its electronics business through the acquisition of DeAnza Systems, Inc, the $110 million manufacturer of image display and processing systems.

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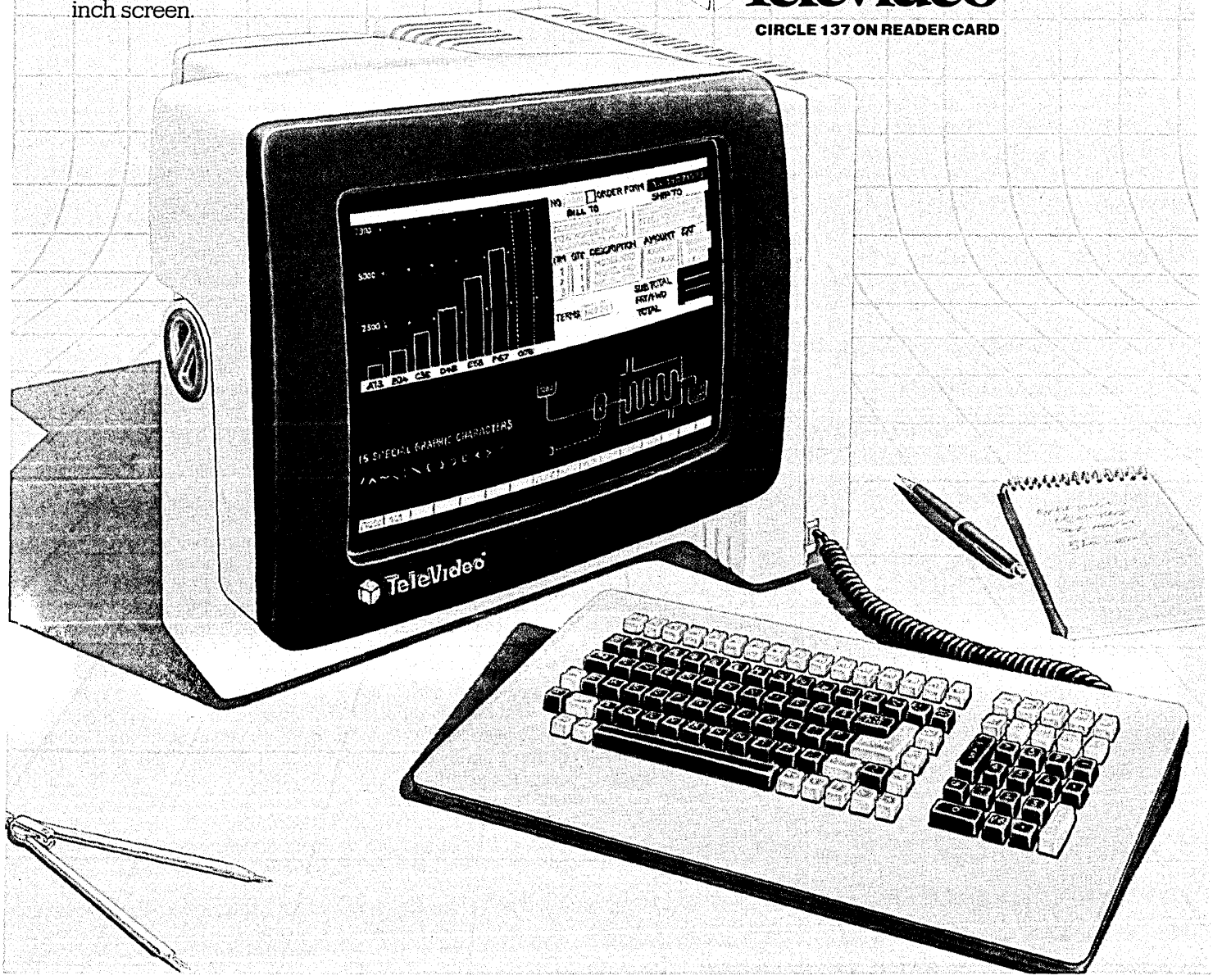

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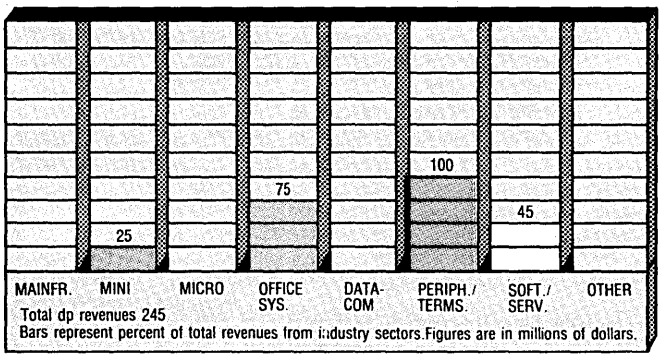

RAYTHEON CO.

RAYTHEON DATA SYSTEMS
141 Spring Street
Lexington, MA 02173
(617) 862-6600

Raytheon Data Systems, the data processing division of Raytheon Co., saw little growth in 1981. Revenues for the group stood at $245 million, which was an 8.8% increase for the year.

Raytheon Data Systems' biggest revenue producer is its line of IBM-compatible terminals. Products such as the PTS 100, 3270 intelligent terminals, PTS 1200, high end 3270 intelligent terminals, and PTS 2000 accounted for $100 million in sales last year.

The company also sells distributed data processing systems under the PTS/1200 name. Such products accounted for $25 million in revenues last year. Service and maintenance for Raytheon products accounted for another $45 million.

One of the major focuses of the company's efforts is its word processing business, which brought in $75 million in revenues in 1981. The company aims to enter the office of the future market by combining the word processing expertise that it bought when it acquired Lexitron in 1977 with the experience that it has acquired internally in data processing.

Towards that end, RDS last year undertook a major reorganization in which it folded Lexitron into its operations as a consolidated division instead of as a subsidiary. At the same time, the company combined its regional sales and service staffs for terminals and word processing into one force dedicated to all of the company's products.

In the office equipment area, RDS last year introduced a standalone workstation, the Informa 2202/2203 Information Station. It is working on a new product line, which will combine word processing and distributed data processing for a variety of industries, that it expects to introduce some time in 1983.

On the data processing side, RDS added enhancements to its PTS 2000 intelligent terminal systems, and added a member to its distributed processing system, the PTS 1210.

Raytheon Co., which reported a rise in profits of 14.8% to $324 million on revenues of $5.6 billion for fiscal 1981, includes a number of operations outside of RDS that are involved in data processing. Raytheon Service Co. provides computer equipment maintenance, Raytheon Semiconductor makes chips, Raytheon Equipment makes some displays for military use, and Raytheon Seismograph makes turnkey seismic analysis systems.

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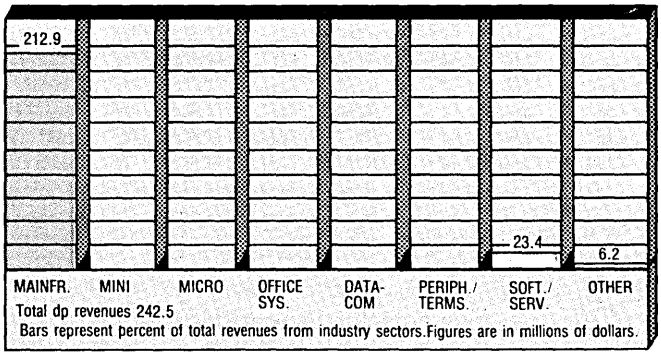

TANDEM COMPUTERS INC.

1933 Vallco Parkway
Cupertino, CA 95017
(408) 725-6000

Tandem Computers Inc., the originator of nonstop multiple processor computers for on-line data transactions, experienced another year of remarkable growth. Revenues for calendar year 1981 increased 88.4% to $242.5 million while net income was up 134% to $30.8 million. Tandem increased its customer base by more than 60% and now has 2,500 processors installed at some 500 locations.

The company introduced its second system, the NonStop II, designed to provide improved price/performance for users with larger on-line transaction needs. Both the NonStop and the NonStop II utilize multiple processors, multiple controllers, and multiple datapaths. If one part of the computer fails, the operating software automatically reallocates the workload. NonStop systems can remain running even during servicing.

Tandem offers several software packages to facilitate the development of on-line applications. These include EXPAND network software, ENCOMPASS database management software, ACCESS communications software, and EXCHANGE remote batch station software. About two thirds of Tandem's sales are to end users, who develop their own applications software, while the rest are to software and systems development houses.

Virtually alone in its market since delivering the first NonStop system in 1977, Tandem now faces direct competition. Stratus Computer Inc. of Natick, Mass., introduced its "fault tolerant" system last fall, with first deliveries scheduled for this year; Dosc Inc. of Albertson, N.Y., unveiled its Failsafe system in December; and Sequoia Systems, also of Natick, indicated it plans to enter the market in 1983.

Having surpassed the critical $100 million mark in sales, Tandem also must successfully cope with its own growing pains. During 1981 Tandem more than doubled the number of its employees (to over 3,000), opening new marketing and support offices both here and abroad, as well as expanding its manufacturing operations to three additional sites in California, Virginia, and Texas. In fiscal 1981, Tandem increased its investment in research and development by 103% to $17.8 million. The funds were devoted to efforts toward improving programmer productivity, equipment serviceability, database software, networking, and communications technology.

About one third of Tandem's revenues are from foreign sales. Important developments there include a multimillion-dollar contract from Sweden's major airline (Tandem would like to penetrate the airline market in the U.S. as well). Currently, Tandem's strongest market is manufacturing. This year, however, it introduced an ergonomically designed display terminal that it hopes will make its NonStop computers more attractive to financial and government agencies, especially in Europe.

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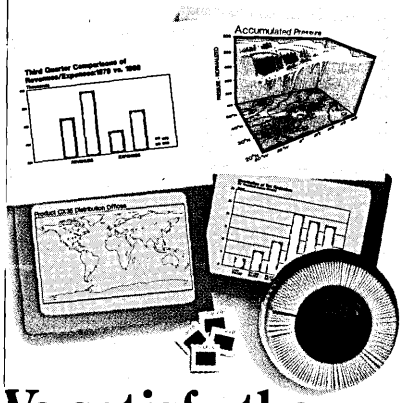

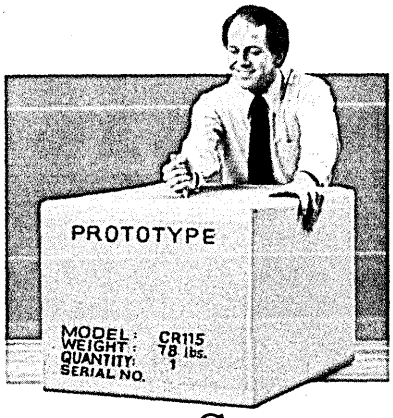

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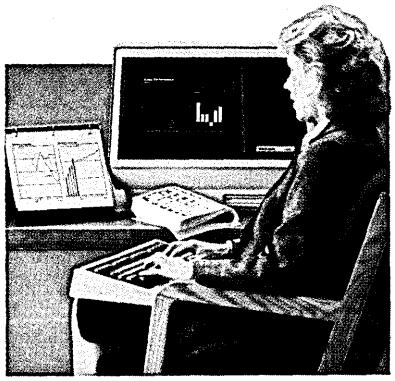

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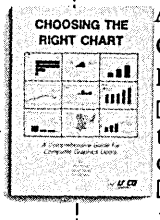

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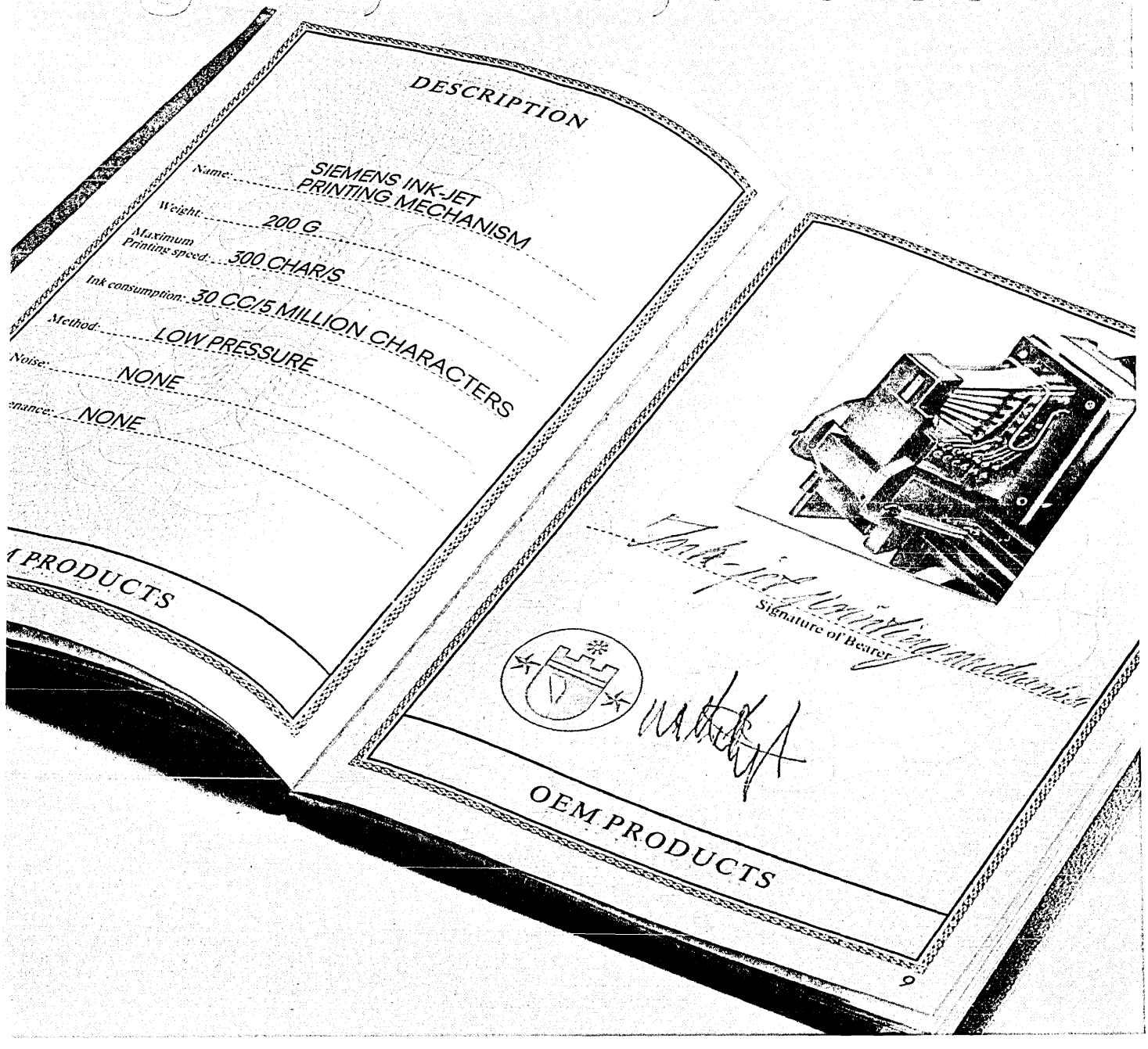

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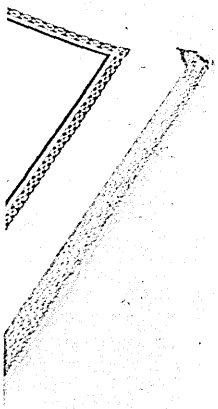

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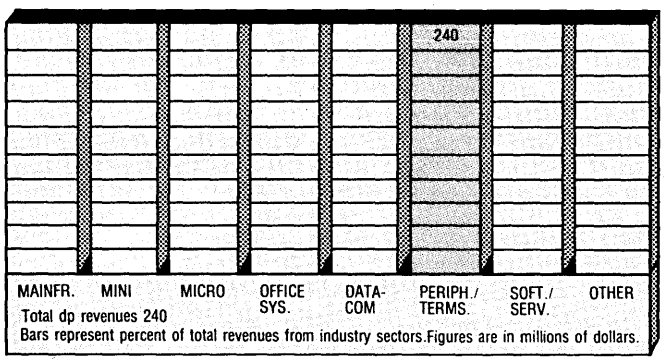

RACAL CORPORATION

8600 N.W. 41st Street
Miami, FL 33166
(305) 592-8600

Racal, the U.S. data processing subsidiary of Racal Electronics Ltd., the $1 billion British electronics company, increased its sales by 13% to reach $240 million in 1981 from $212 million in 1980.

The company consists of two separately managed concerns, Milgo and Vadic. Milgo, based in Miami, manufactures data communications products and systems. Among its products are high-speed and medium-speed modems, network diagnostic and management systems, advanced statistical multiplexors, data encryption devices, terminals, and voice digitizing equipment.

In 1981 the company introduced the Phoneplex-24, a voice digitizer, as well as the Datacryptor II, an advanced data security product. Early in 1982, Racal Milgo also announced the Network Performance Facility. An addition to its communications management series of diagnostic and control systems, the new product provides main channel data measurements in large-scale data communications networks. It also measures line protocol performance.

Through a subsidiary, Racal Telesystems, which was acquired in 1980, Racal also provides devices that allow incompatible word processors to exchange information. In the past year that subsidiary has considerably increased the number of protocols that the device can handle.

Milgo, which has been growing at a rate of more than 20% per year, plans to expand into a new headquarters facility next year. The company bought 100 acres west of Fort Lauderdale in 1981 and plans to build a 1 million square foot facility there by 1983 that will be capable of accommodating some 5,000 employees. The 300,000 square foot facility that it now occupies in Miami will then be used for Racal's satellite manufacturing operations.

Vadic, which is headquartered in California, manufactures medium- and low-speed modems. In 1980, the company surpassed the Bell System as the largest supplier of such products.

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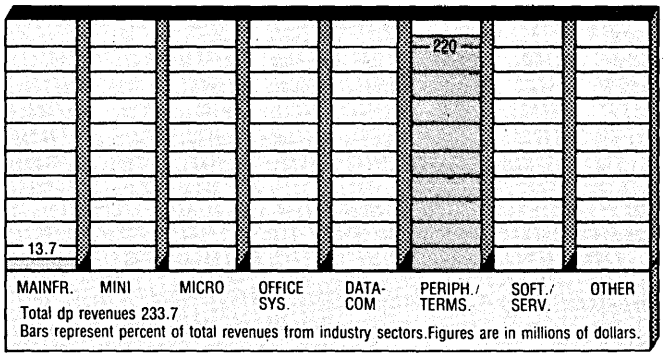

FOUR-PHASE SYSTEMS

10700 North DeAnza Boulevard
Cupertino, CA 95014
(408) 255-0900

Four-Phase System's big news in 1981 was the planned merger with Motorola. The deal was announced in December, and was expected to be completed by April. Shareholders of Four-Phase were receiving about $253 million worth of Motorola stock. Four-Phase's 1981 performance was good, revenues were up 18.5% to $233.7 million, from $197.2 million in 1980. Profits were $7.1 million (including $1.4 million from the sale of tax benefits and depreciation) vs. the $5.4 million earned in 1980.

Four-Phase designs and manufactures multifunction computer systems for distributed data processing applications. The product line consists of a family of compatible and upgradable systems, including processors, video display workstations, and software FPS designs.

In early 1981, Four-Phase acquired Two Pi Corp., a manufacturer of medium-scale IBM-compatible mainframe computers, which established Four-Phase as the only non-IBM distributed dp supplier to offer IBM-compatible back-end processing combined with front-end interactive data and text handling.

The merger will give Four-Phase the much-needed financial clout to compete with its well-heeled rivals, IBM, Wang, and Prime.

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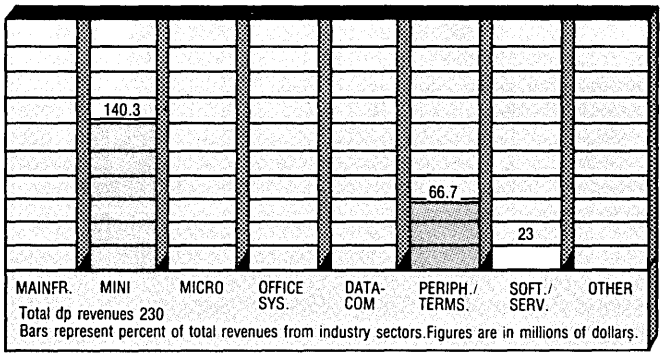

PERKIN-ELMER CORPORATION

DATA SYSTEMS GROUP
2 Crescent Place
Oceanport, NJ 07757
(201) 870-4582

Perkin-Elmer Corp., a leading manufacturer of electronic analytical instruments, semiconductor production machines, and minicomputer systems, had total revenues of $1 billion, a modest 2% increase. Its Data Systems Group, which markets minicomputer hardware, software, and peripherals, accounted for about 21% of total revenues with sales of $230 million, down 2% from last year. (Fiscal year revenues went up 8% to $232.5 million, however, possibly reflecting a strong fourth quarter.)

Perkin-Elmer's Data Systems Group (formerly the Interdata Co., acquired about 10 years ago) has become increasingly aggressive and competitive in the mini market, particularly in the commercial sector.

Probably the most significant development to support that effort in 1981 was the formation of the Business Systems division, headed by Martin Waters, former head of P-E's British software development group. Formed out of the Computer Systems Division to emphasize commercial markets and transaction processing applications, the Business Systems Division is meant to complement the newly created Technical Systems Division with its focus on technical markets: seismic, scientific simulation, CAD/CAM, aerospace, and weapons.

With the formation of the new business division, the company intends to focus its development and marketing activities and gain a foothold in the 32 bit mini marketplace, with a projected annual growth rate of 40%. Management expects the division to take advantage of this burgeoning market—P-E had an 18% market share of the 32 bit marketplace in 1981, with an anticipated 25% to 30% in 1982—and to gain an edge on some formidable competitors: DEC, Data General, and Hewlett-Packard, for instance. Some potential markets for the business division are banking, insurance, and stock trading.

Another important development in 1981 was the company's sale of its Memory Products Division to Cipher Data Products. According to Perkin-Elmer, it was sold because its product line of disk drives and magnetic tape transports were more compatible with less powerful systems than P-E is producing.

In addition, Perkin-Elmer brought in-house its terminals division, which was selling primarily to an oem market; the division is now a supplier for other P-E divisions.

Along with these changes came several new product introductions: the RQL^{32} Relational Query Language for the Reliance software; a fully supported version of Bell Labs Unix operating system; and two processors: the 3230, a midrange system that is part of the 3200 family of Megamini computers, and the 3210, a complete 32 bit computing system for scientific and commercial applications.

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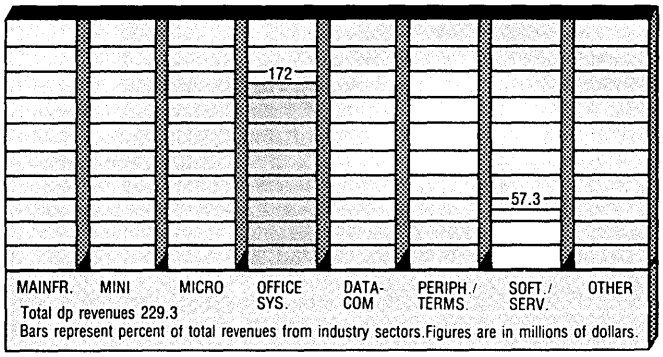

NORTHERN TELECOM LTD.

ELECTRONIC OFFICE SYSTEMS
P.O. Box 1222
Minneapolis, MN 55440
(612) 932-8000

Northern Telecom (55% owned by Bell Canada) is the largest telecommunications equipment manufacturer in Cananda and second only to AT&T's Western Electric in North America. The company is a leader in digital office switching equipment technology. The electronic office systems group is a large producer of word processing equipment and was largely responsible for the company's large write-offs during 1980. During 1981, revenues of this streamlined division rose from $217 million to $229.3 million, but more importantly, operating losses went from a $86.7 million to $15.7 million.

Total corporate revenues hit $2.5 billion, up from $2 billion, while earnings returned to the black, rising from a loss of $5.48 per share in 1980 to $3.95 in 1981.

While progress during 1981 was marked by reduced losses, the company has introduced many new products that it hopes will bring prosperity soon. Among them:

- The model 296C and model 294C on-line data entry and display systems. These IBM-compatible systems can handle up to eight display stations and 32 printers.
- The model 585, a large-scale ddp system, twice as powerful as the previously largest system. This model can serve about 80% of the requirements of the ddp market. The model 585 also enables users to add ddp and word processing capability to upgrade their networks.
- The model 503, a low-cost, desktop ddp system that can operate on a standalone basis, with a small computer, or as part of a larger network.
- Omniwork, word processing capability for the models 585 and 503X. The company reports that almost 75% of their requests for bids now ask for wp capability.
- IRIS (Intelligent Remote Input Stand), which serves the needs of the communication text processing market. This is a microprocessor-based desktop unit that attaches to IBM electric typewriters and converts them into low-cost word processors.

To pay for all this research, Northern Telecom's R&D expenses increased from $112 million in 1980 to $145 million in 1981. The company expects these new products to start contributing to sales and earnings in 1982. But just in case they don't, to keep costs down, employees were reduced from 4,100 to 4,000 during 1981.

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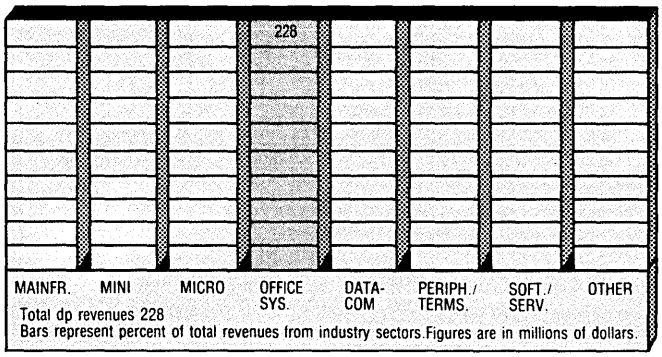

LANIER BUSINESS PRODUCTS, INC.

1700 Chantilly Drive N.E.
Atlanta, GA 30324
(404) 329-8000

In its fifth year as a public company, Lanier continues to be successful and is taking aggressive approaches to word and data processing. Lanier is also a leading supplier of dictating equipment and video display text editing typewriters for word processing applications, besides being the largest independent domestic distributor of 3M office products.

Dp revenues grew 18.5% to $228 million for 1981, while net earnings increased 47% to $25.5 million.

Business products sales continued their strong growth trend, led by the No Problem standalone and clustered electronic typing systems. Dictating products and 3M sales growth were not as strong as in prior years due to softness in the overall market for these products. Management expects the new products introduced in the last quarter of 1981 will create opportunities for continuing the growth trend in business products sales. New word processing entries included the EZ-1 Work Processor, a full-function display typewriter, and the TypeMaster, with a built-in letter-quality printer. Computereze, a multipurpose small business computer, was also unveiled.

Lanier formed a new subsidiary called Lanier Financial Services Inc., to provide alternative financing for purchasing or leasing its products. Although Lanier will continue to face challenges in word processing from IBM, Wang, DEC, and others, revenues are expected to advance at a slightly faster pace this year.

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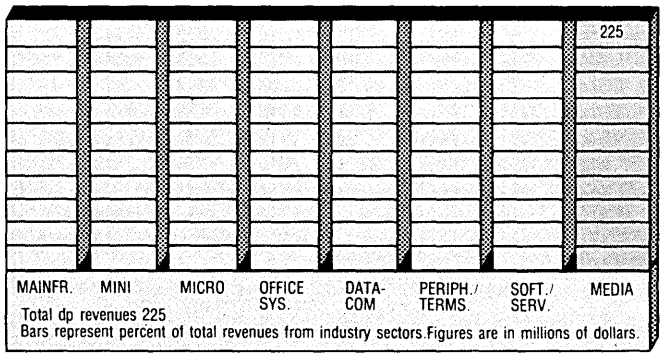

3M COMPANY

3M Center
St. Paul, MN 55101
(612) 733-1110

3M enjoyed moderate growth in its data processing-related businesses in 1981. Although the company does not disclose its dp revenues, DATAMATION estimates that such sales grew by 9% in 1981 to reach $225 million, from $205 million in 1980.

That business is dwarfed by the company's main line activities such as copiers, consumer products, and electrical supplies. 3M's overall revenues for the year grew 7% to $6.5 billion from $6.08 billion the year before. Corporate profits grew to $673 million, from $668 million for the previous year.

A reorganization that divided 3M into four major business sectors in 1981 affected the company's dp businesses. The Electronic and Information Technologies Sector, headed by Erwin Brown, executive vice president, now includes all of 3M's dp activities. A new group, the Memory Technologies Group, was created to fit into that sector. The Data Recording Products Division, with products related entirely to dp and word processing, is included in the Memory Technologies Group. The Data Recording Products Division, which makes and markets high-technology data cartridges and drives, fits into the Memory Technologies Group. Also included in this part of 3 M are Comtal, which specializes in image processing; Trendcom, which concentrates on high-speed terminals; and Interactive Systems, which specializes in broadband communications.

The majority of 3M's dp business comes from disk and tape media sold to end users. Major new product introductions in this area last year included a family of compact Winchester disk drives, designed to be the first to implement the American National Standards Institute's rigid disk interface standard. The drives are the first in a family of memory systems that will be introduced throughout the decade, according to the company.

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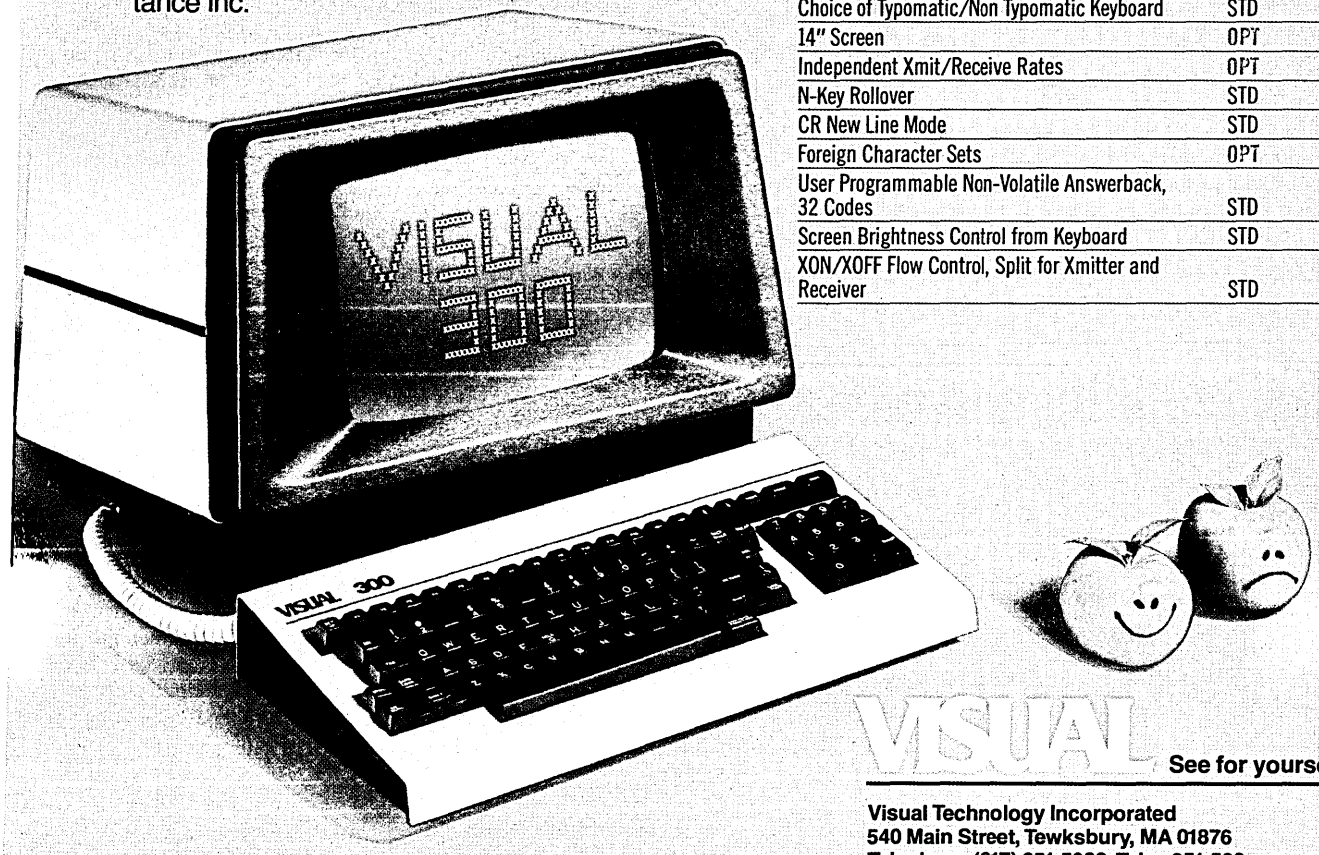
Solid State Keyboard	STD	NO
Programmable Non-Volatile Function Keys	STD	NO
Video Attributes Require No Display Space	STD	NO
Non Glare Screen	STD	STD
Smooth Scroll, Slow Scroll and Jump Scroll	STD	NO
Audible Key Click	STD	STD
Non Volatile Set-up Modes, "Menu" Style	STD	NO
25 Status Line	STD	STD
Split Screen	STD	STD
Line Drawing Character Set	STD	STD
Block Graphics	STD	NO
Sculptured Keycaps, Matted for Low Glare	STD	NO
Paging	OPT-8 Pgs.	OPT-4 Pgs.
Full Editing	STD	STD
Programmable Non Volatile Columnar Tabbing	STD	NO
Choice of Typomatic/Non Typomatic Keyboard	STD	NO
14" Screen	OPT	NO
Independent Xmit/Receive Rates	OPT	NO
N-Key Rollover	STD	NO
CR New Line Mode	STD	NO
Foreign Character Sets	OPT	NO
User Programmable Non-Volatile Answerback, 32 Codes	STD	NO
Screen Brightness Control from Keyboard	STD	NO
XON/XOFF Flow Control, Split for Xmitter and Receiver	STD	NO



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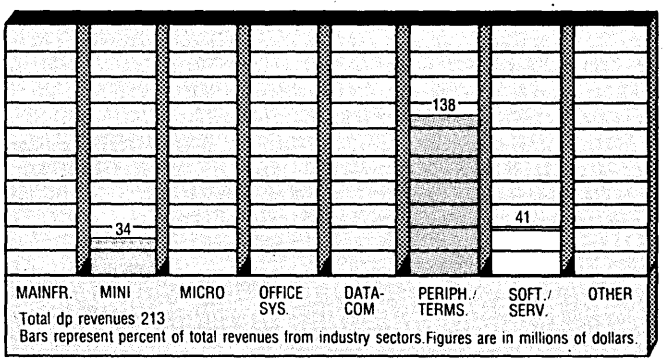

C. ITOH ELECTRONICS, INC.

5301 Beethoven Street
Los Angeles, CA 90066
(213) 306-6700

C. Itoh is a giant Japanese trading company, a sogo shosha, which has more than 10,000 employees and functions in 81 countries. All told, Itoh's business covered 7.7% of Japan's total imports in 1981 and 7.4% of the country's exports. Thus, C. Itoh Electronics is a relatively small part of the whole, even though it is, by itself, a significant force in the data processing industry.

As a sogo shosha, C. Itoh Electronics represents 10 Japanese manufacturers in the United States, and in turn represents about 50 U.S. manufacturers in the Far East. In addition to these marketing activities, during 1981 C. Itoh announced the formation of a new company, CIE Systems, which will be its manufacturing arm. The first product scheduled for sale in early 1982 is a small business computer system.

C. Itoh's 1981 revenues were $213 million, up from the prior year's $189 million. About 65% of the business of C. Itoh Electronics is oem these days, a proportion that is on the rise. Among the products marketed by CIE are terminals that emulate the DEC VT line, dot matrix printers, and daisywheel printers. The company is also moving into complete systems at the low end of the business market; it has begun to sell color crt terminals, it is providing high-resolution screens for use in word processors, and is upgrading its line of dot matrix printers to provide improved graphics.

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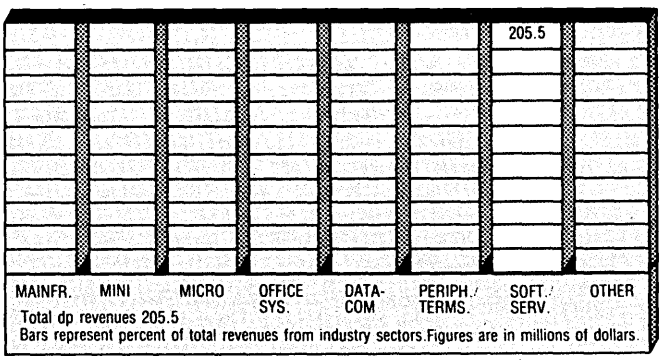

BOEING COMPANY

BOEING COMPUTER SERVICES CO.
P.O. Box 24346
Seattle, WA 98124
(206) 763-5121

Boeing Computer Services Co., a division of the Boeing Co., was formed in 1970 to meet two goals: to fulfill the data processing requirements of its parent and to offer advanced information processing services to commercial and government markets. With 1981 revenues from outside sources totaling $205.5 million, up 46% over 1980, BSC has met its initial challenges.

A large service organization, BSC has total equipment valued at over $400 million. It also operates one of the largest privately managed telecommunications networks in the world. Major data centers are located in Philadelphia, Wichita, Vienna, Va., and two in the Seattle area. BSC currently services more than 2,000 customers in the U.S., Canada, and the United Kingdom.

BSC offers an extensive library of diversified programs. Emphasis is placed on services that support engineering, business management, and data processing management. Mainstream, an efficient and economical family of remote computing services, is the primary product through which BSC provides customers with full data processing capabilities. BSC has in recent years embarked on new product development to expand its commercial business opportunities. Executive Information Services produces an intergrated approach to financial management from sales forcasting to total financial management.

In June, BSC became the first remote computing services company to provide dial-up access using IBM's SNA. BSC committed to the development of advanced communications capabilities within the framework of and compatible with IBM's stated communications direction—SNA.

Also in June, BSC expanded its services to the scientific and engineering computing market by introducing its Mainstream-EKS/VSP service. This service is based on the Cray-1 computer and capitalizes on the Cray's vector processing capabilities to provide users with solutions to large-scale computational programs up to 16 times faster than previous systems. BSC has integrated Mainstream-EKS/VSP within its Cyber multimainframe service so that engineers and programmers are able to perform data preparation and output review tools using the Cyber-based Mainstream-EKS and then process on the Cray with little attention to data conversion.

As a full service company, BCS offers training, consulting, software products and services, and complete computing for thrift institutions, as well as remote computing.

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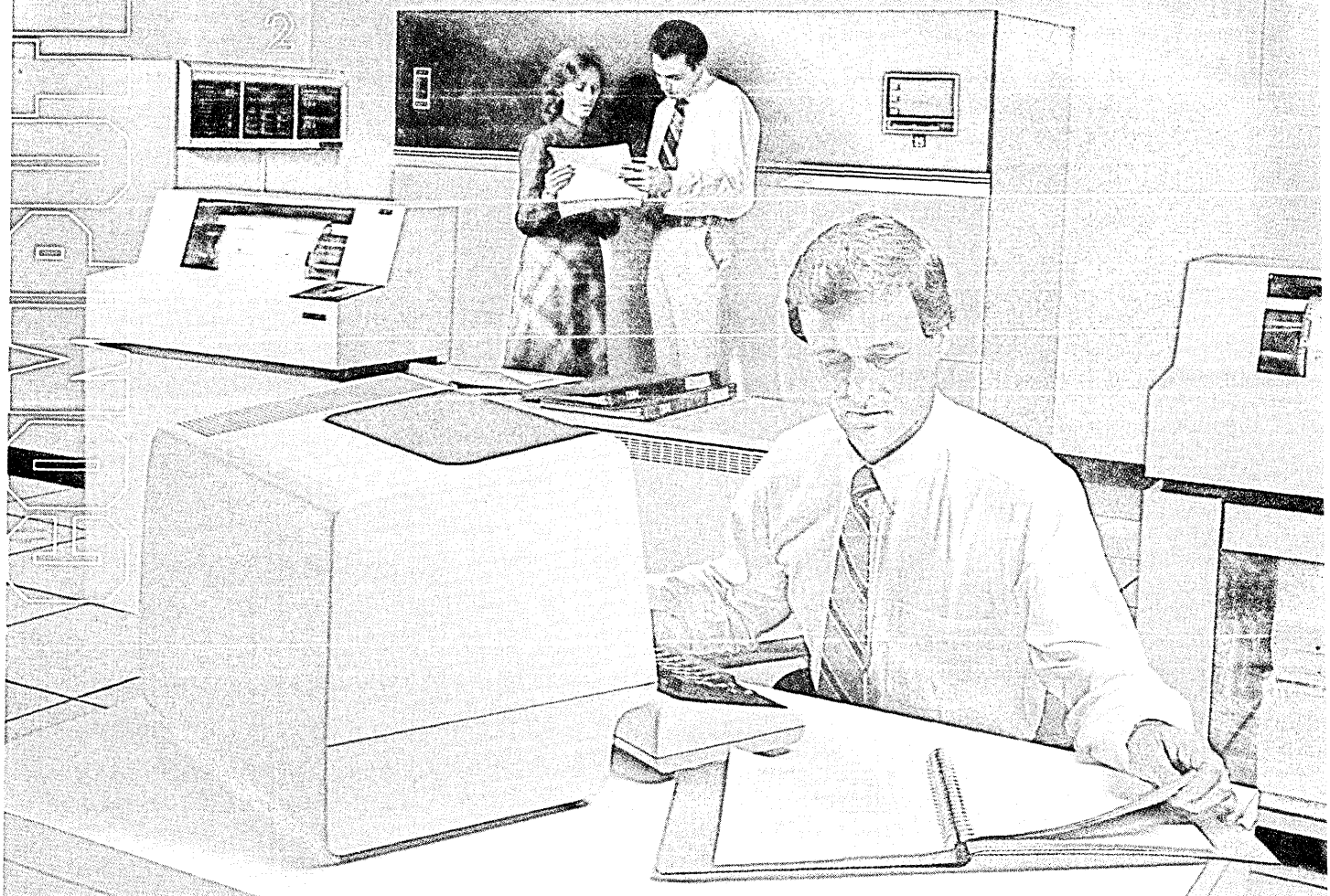

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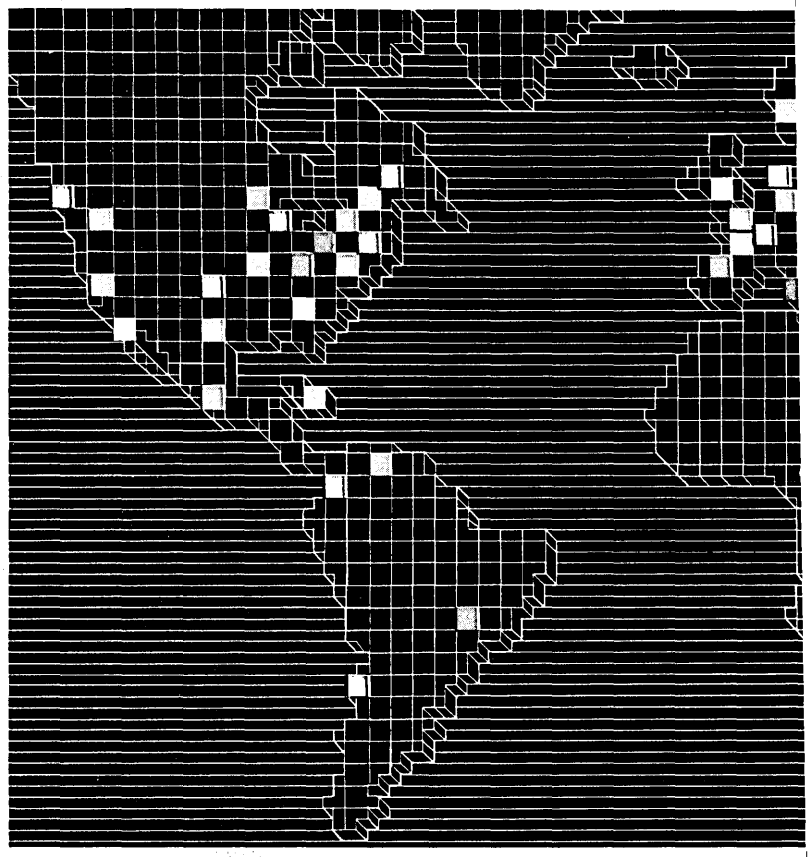

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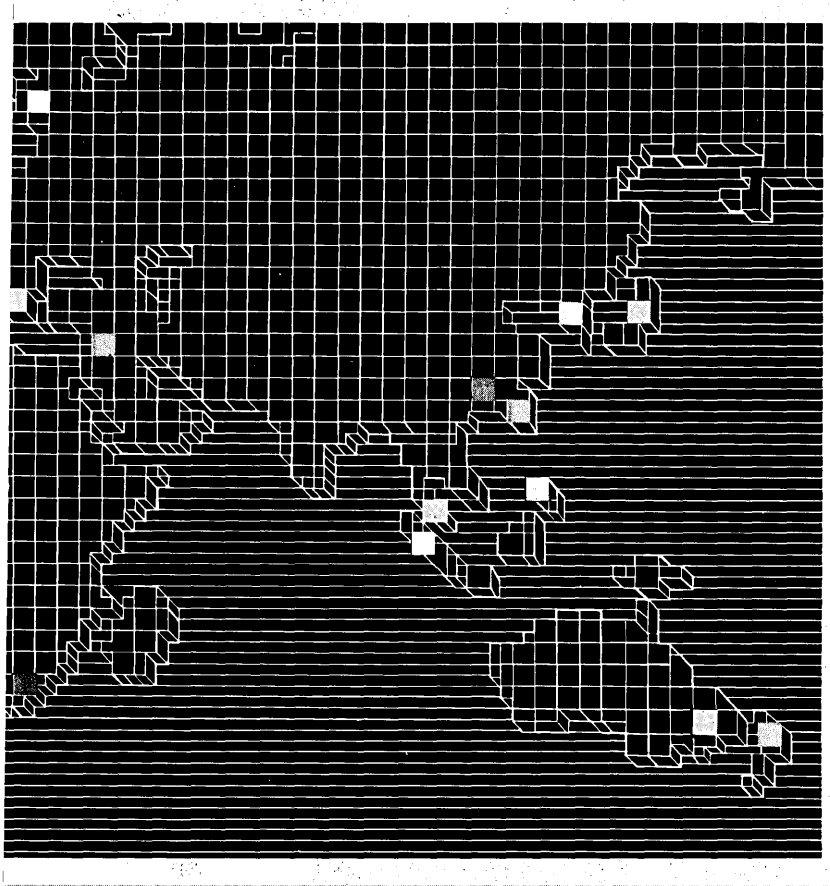

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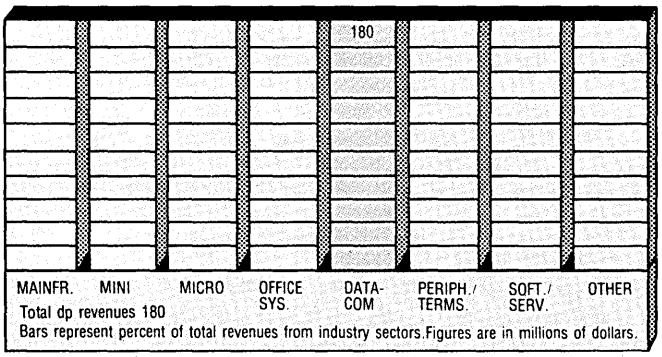

MOTOROLA, INC.

1303 Algonquin Road
Schaumburg, IL 60196
(312) 397-5000

Motorola has traditionally been a consumer electronics company, but in the last few years, it has been buying dp-related companies. Three years ago it purchased Codex, of Mansfield, Mass., and during 1981 the company came to an agreement to buy Four-Phase. Motorola chairman Robert Galvin has stated that the company wants to make a "major strategic thrust into computers and data communications."

The 1981 total corporate results were impressive, with revenues reaching $3.3 billion, up from $3 billion a year ago. Earnings increased to $49.1 million from $41.7 million. In the dp area, revenues grew to $180 million from $126 million. These revenues reflect Motorola's data communication business, where Codex has been a leading supplier.

The Four-Phase purchase is costing Motorola about $253 million, while Four-Phase revenues reached $233 million during 1981. Ironically, Four-Phase hasn't been a big user of Motorola's semiconductors, but this may change in the future. Analysts question how the acquisition will be integrated, because of Four-Phase's IBM compatibility, but none doubt that Four-Phase will benefit from its new parent's financial clout, general technological expertise, and marketing savvy.

On the data communications side, Codex introduced a number of new products last year. Early in the year, Codex announced its new DNCS 400, a minicomputer-based system that can control the most extensive data communications networks and provide comprehensive management reports to aid in network planning. With multiple line controllers, local and remote, each capable of supporting up to 128 lines, the DNCS can manage even the largest networks, even with multitier configurations.

The company introduced a new family of network control products, the DNCS 200, which is suitable for small and intermediate-sized networks. This allows users to implement the network control capabilities they need for their operations without having to make a large investment in centralized site equipment. Codex also introduced two new models of the 6000 Series Intelligent Network Processor for mini and small system users. In the modem sector, Codex introduced a 14.4 KBps modem.

In the intelligent terminal sector, Codex introduced two new systems that feature a new multitasking operating system, multiple terminal support, and a wide variety of peripherals. This series is designed for applications that require high performance data communications equipment. Late in the year, Codex entered a new market with a family of electronic data switches, including the IMS 7800 Data PABX, which is designed for traffic management.

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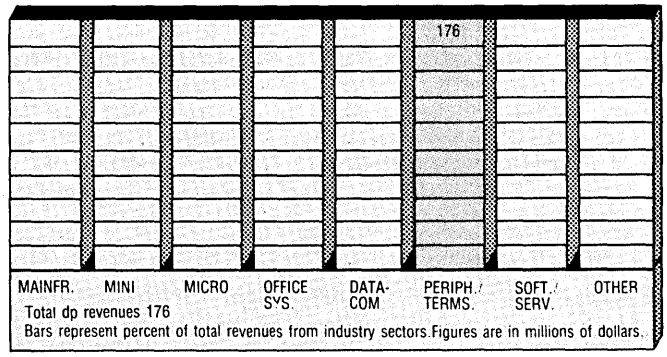

SIGNAL COMPANIES, INC.

(AMPEX CORPORATION)
401 Broadway
Redwood City, CA 92037
(415) 367-2011

Ampex spent its first year as a subsidiary of the Signal Companies, Inc., conglomerate (it was acquired in January 1981) by posting its worst revenue performance in recent years, a 6% increase to $176 million. There were signs, however, that its new role as a member of the Signal Cos. family (others include Garrett Corp., aircraft and aerospace; UOP, oil industry services; and Mack Trucks) will give Ampex the resources to help it become a major player in the computer memory market, where it now derives nearly one third of its revenues (the rest is from audio and visual products).

In 1981, Ampex announced its intention of becoming a major supplier of Winchester disk drives, introducing a family that includes the 8MB to 16MB, 5¼-in. Pyxis drive, the 42MB to 80MB, 8-inch Scorpio Drive, and the 165MB to 300MB, 14-inch Capricorn drive. The Winchester drives complement Ampex's line of cartridge drives, where its top seller continues to be the DM 9000 300MB drive. Last year, it also added another tape drive to its product line, the Virgo streaming tape drive.

Ampex continued its dominance of the core memory market (where it has traditionally been the industry leader), announcing the development of a new 9-mil core that is faster and more powerful than traditional 13-in. cores. Although the core market is a static one, having long since given way to semiconductor memories, cores are still important in areas such as process control, where a nonvolatile memory source is important. (Core memory also benefited to a certain extent in 1981 from the decisions by National Semiconductor, Texas Instruments, and Rockwell to discontinue their bubble memory efforts.) Ampex said it hopes to bolster its sales of core memory by supplying more to the military.

Ampex's megastore line of fixed-head drives, which serve as a complement to disk-based mass storage by providing access that is 3,000 times faster than disk, continued to be a big seller. The company said it may increase its offerings in that area with a semiconductor model. Currently, its most popular Megastore unit is one that is compatible with DEC PDP-11 computers.

Ampex introduced its second terminal, the Dialog 81, during 1981. The new model is similar to its predecessor, the D-80, but is equipped with an IBM Selectric keyboard, making it more applicable for business functions such as word processing.

In the fall, the company dropped its line of Ampex Business Computers, plug-compatible with Data General minis, because sales for the oem and turnkey market had been disappointing since the introduction in 1979.

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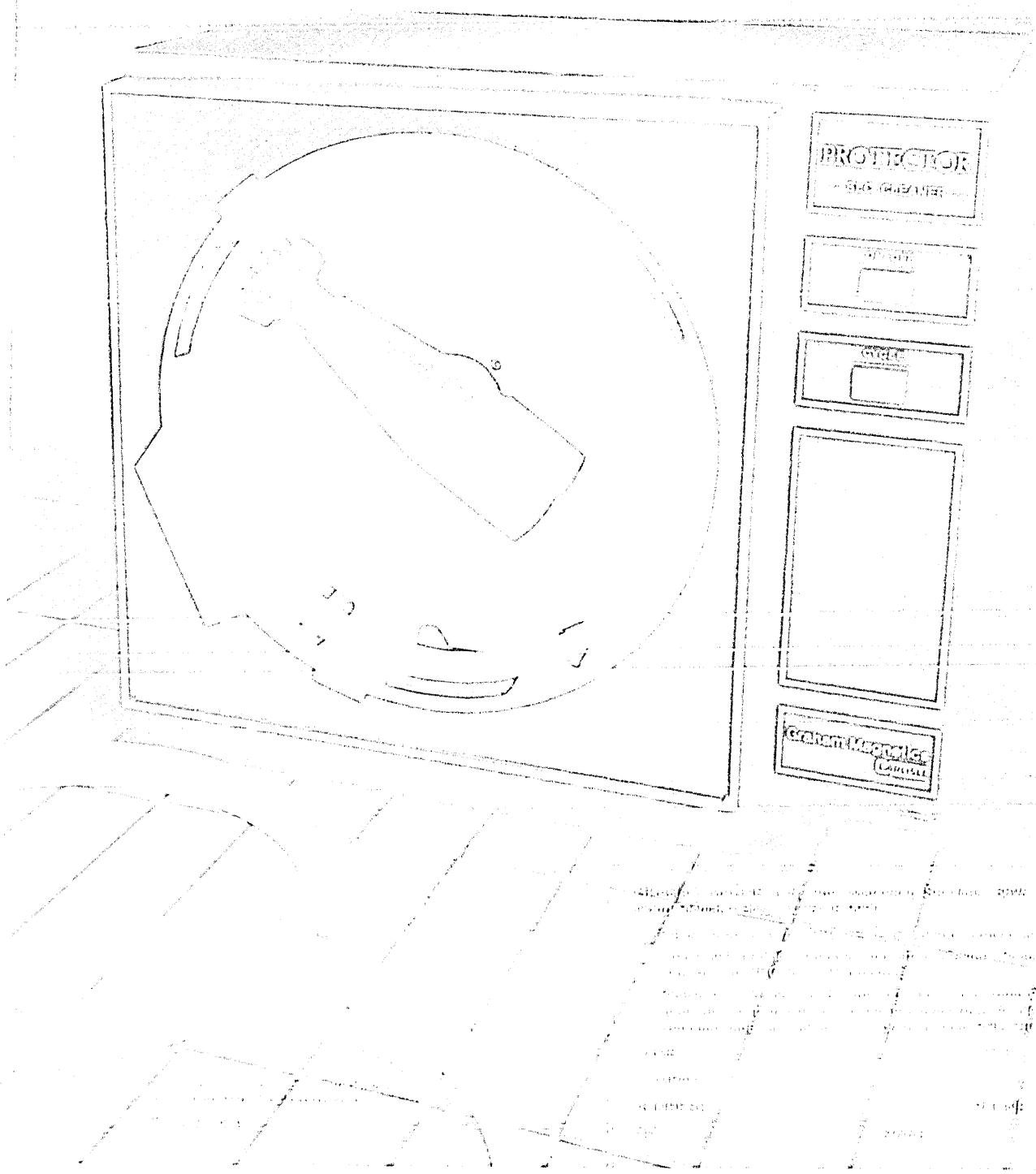

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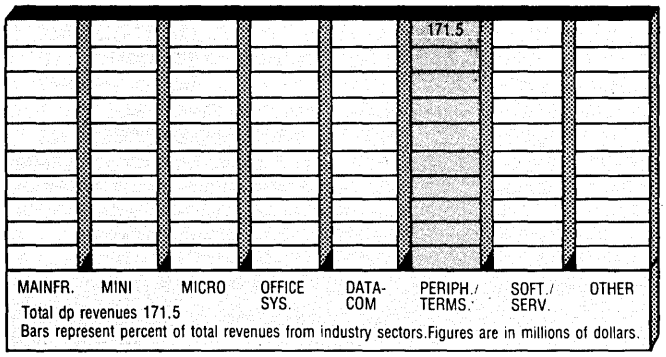


SANDERS ASSOCIATES, INC.

Daniel Webster Highway South
Nashua, NH 03061
(603) 885-4321

Sanders Associates, Inc., a leading manufacturer of advanced technology electronic systems primarily for government and defense markets, had revenues of $364.4 million, up 29.6%. Earnings also went up to $21.9 million, an 84% increase. More than half of total corporate revenues came from the government systems and products division, with sales of $193 million, up 19%.

Of total revenues, 52% were derived from dp sales, contributed by Sanders' Industrial Products Division (IPD manufactures the IBM 3250 graphic display system) and Calcomp (California Computer Products), a leading producer of plotters, terminals, and displays that was acquired by Sanders last year. Also acquired by Sanders in 1980 was Talos Systems, a manufacturer of digitizers, which Calcomp bought recently. Total dp revenues for 1981 were $171.5 million, up 69%.

Calcomp, which is being groomed to take over most of Sanders graphics display activities this coming August, sells the company's Graphic 7 stroke refresh display and Graphic 8 digital tv raster scan display to commercial markets. These interactive display systems were previously sold only by Sander's IDP division to the military and to IBM. Under the name of Vistagraphics, Calcomp markets the Graphic 7 and 8 as part of the Vistagraphic 1000 Series of stroke refresh displays, the 3000 Series of raster displays, and the Series 4000, the most recently introduced family of raster displays.

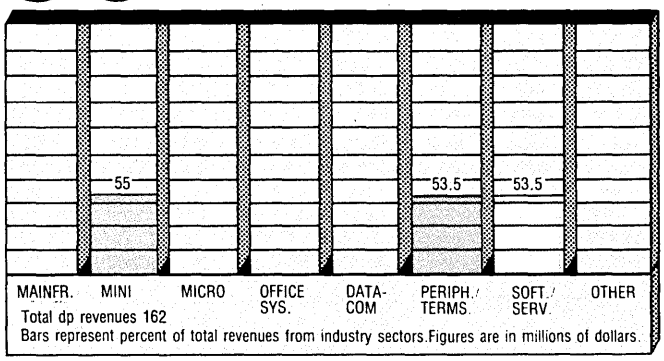
Calcomp made a number of product introductions in 1981. These included the 95X family of vector-to-raster controllers, touted as the first controller capable of driving both pen and electrostatic plotters; a 54-inch-wide drum plotter; the model 5500 36-inch-wide electrostatic plotter; and the Digitizer Series 9000, a new range of digitizers with various interface options.

For its IGS (Interactive Graphics Systems), Calcomp's turnkey CAD/CAM systems, the company introduced facilities management, job accounting, and reportwriter software packages.

Calcomp, facing competition that includes Megatek, Ramtek, and Aydin Controls in the fast-moving CAD/CAM and related markets, made several organizational changes in 1981. It expanded the office of the president to a two-person office and restructured its graphics products division into three separate divisions: plotter products, digitizer products, and the graphics display products. Calcomp's Systems division, which produces its CAD/CAM turnkey systems, remained the same. In addition, Calcomp formed a new U.S. sales and service division. These changes, according to management, were made to position the company for growth in the computer graphics markets.

A new $13 million, 200,000 square feet manufacturing facility is currently being constructed in Anaheim, Calif., adjacent to Calcomp's plant, to accommodate that growth.

50



ALLIED INFORMATION SYSTEMS CO.

(Bunker Ramo Corp.)
P.O. Box 4000R Morristown, NJ 07960
(201) 455-2000

Bunker Ramo Corp. was acquired by Allied Corp. (formerly Allied Chemical Corp.) in the summer of 1981, and this has meant big changes for the Oak Brook, Ill., maker of transaction processing systems for bankers, brokers, and insurance companies.

Allied chairman Edward Hennessy has presided over a diversification thrust in recent years, away from the maturing chemicals and oil and gas businesses and toward higher-growth fields like electronics and health care. Bunker Ramo, which Allied got for $347 million in cash and convertible preferred stock, looks like an important part of that strategy.

In February of this year Allied announced the formation of two new divisions that will consolidate related segments of Bunker Ramo and Eltra Corp., a manufacturer of electrical and industrial products acquired by Allied in 1979.

Bunker Ramo provides the core of the other division, Allied Information Systems Co., which comprises both the commercial and brokerage systems of Bunker Ramo's Information Systems Division, Bunker Ramo's Electronic Systems Division, and Prestolite Battery and Mergenthaler Linotype, from Eltra. Allied Information Systems also includes an industrial products group that is involved in textiles and auto safety belts.

Duane L. Burnham, who was president of Bunker Ramo at the time of the acquisition, was offered a senior executive position in the new organization but decided to pursue other career opportunities, Allied reported. An Allied spokesman said that there is nevertheless a fair degree of continuity at the operating level, and points to Stanley Aris, Allied Information Systems Co.'s vice president-finance, and Harvard Weatherby, the company's vice president-human resources, as evidence of this.

For 1981, DATAMATION estimates Bunker Ramo achieved a 10.2% increase in dp revenues, from $147 million to $162 million. We also estimate that Bunker Ramo's three main dp segments shared about equally in the growth. Although Allied's acquisition of Bunker Ramo instantly made the company number 50 in the DATAMATION 100, dp revenues are at the moment a drop in Allied's $6.4 billion bucket of corporate revenues. It was Bunker-Ramo's non-dp operations that originally interested Allied, but the company says it also intends to expand its new computer business. How fast, and how important a part further acquisitions might play in that process Allied is unwilling to say. The reorganization outlined here was still being put into effect.

Analysts remain skeptical of Allied's approach, pointing out that there's more to the computer industry than just buying a company. Will Allied back up these acquisitions with the cash needed for R&D and marketing savvy, which have very different meanings in dp than in its traditional business?

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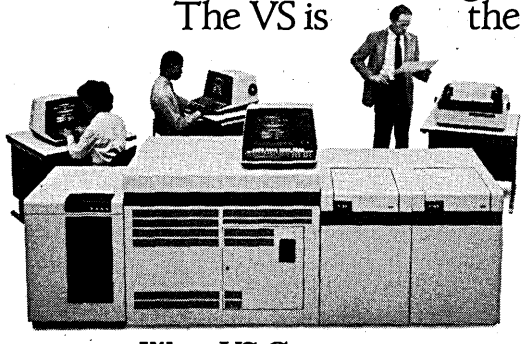

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WANG

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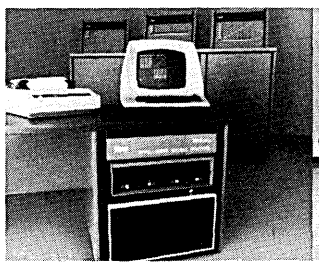
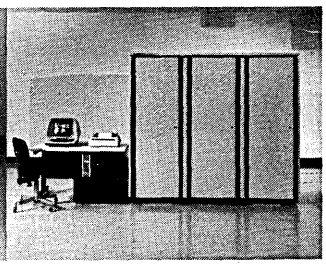


T-Bar's 3919 -Intelligent Matrix Control



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CIRCLE 147 ON READER CARD

51 COMMODORE INTERNATIONAL, LTD.

950 Rittenhouse Road
Norristown, PA 19403
(215) 666-7950

Commodore International, the dominant microcomputer manufacturer in the European market, had another good year with dp-related revenues up 33% to $161.6 million. Earnings per share reached $3.04, a 55% increase and a considerable feat, since many companies with a large percent of sales in Europe experienced an earnings decline last year. The company, which also produces semiconductor components, office equipment, and consumer products, continued its efforts to compete with Apple and IBM in the U.S. market.

The most obvious of those efforts—and part of Commodore's overall attempt to improve U.S. penetration—was the recent announcement that the company is developing a personal computer to emulate those of Apple, IBM, and Tandy. Available later this year for less than $1,000, the Commodore 64 will, with the aid of one of several special circuits, be able to use software programs designed for the leading competitive machines without modification. The system will sell mainly to business and professional customers; however, it may also appeal to the home market. In addition, Commodore began its first nationwide advertising campaign in early 1982.

Currently, the company's Computer Systems Division—which accounts for about 71% of total revenues—manufactures the Commodore PET, a personal computer that sells for under $1,000; the CBM 8000 series of business computers; and main peripherals such as the CBM 4040 and 8050 Dual Drive Floppy Disks, and the CBM 4022 Dot Matrix Tractor Printer.

Much of the division's success in 1981 was due to its low-end VIC-20 home computer rather than to its improved penetration of the U.S. business market with its higher-end computers. The $299 VIC was certified by the FCC this year, having met the agency's radiation emission requirements. This enabled Commodore to begin full-scale marketing of the machine.

Commodore attempted to solve a problem that plagues all microcomputer manufacturers. The dealers aren't always able to offer service and maintenance on every machine they sell. Therefore, Commodore signed a contract with TRW for nationwide service and maintenance of its machines. The five-year agreement costs about $10 million, but will offer customers peace of mind.

52 TELETYPE CORPORATION

5555 West Touhy Avenue
Skokie, IL 60077
(312) 982-3100

Teletype Corp., the terminal manufacturing subsidiary of Western Electric, saw both revenues and profits decline in 1981. The company's overall revenues dropped to $221 million from $249.8 million in 1980. Earnings on those sales fell to $24.8 million from $27.7 million the year before, a 10% drop.

The company's data processing activities also declined. Sales dropped to $161.4 million from $163 million in 1981. Management attributed the lack of growth to high interest rates and the uncertain economy.

But Teletype continued to introduce new products as part of its efforts to establish itself in the marketplace as a major player in the information business. It introduced two new members of the 4540 display terminal family that constitutes a major portion of its dp revenues.

The first product, a Direct Connect Controller, links directly with the host computer's high-speed input/output channel, thereby eliminating the need for an interface unit when locally connected. The second 4540 offering was Systems Network Architecture, a product designed to provide a consistent framework for compatibility with the standard network architecture of established data networks.

Also introduced in 1981 were a model 4424 display terminal compatible with Unix application programs, a model 4430 display terminal with up to 32K of buffered storage, and a model 42 Teleprinter.

Although the number of people employed by Teletype declined to 4,974 in 1981 from 6,194 in 1980, the company's sales force increased. Field offices were added in Houston and Atlanta, and a second office was added in New York to complement existing offices in Los Angeles, San Francisco, New Jersey, Dallas, and Chicago.

The company increased its research and development spending by 22% in 1981, upping its budget to $28 million from $23 million in 1980. In addition to looking to the future, the company used its R&D funds to find ways to cut costs on its present product line. Over the year, reduced costs on many products and manufacturing processes reduced the company's costs by $13 million.

53 GENERAL INSTRUMENT CORP.

1775 Broadway
New York, NY 10019
(212) 974-8700

DATAMATION estimates that 1981 was another year of declining revenues at General Instrument's Data Systems Division, which makes gambling systems for racetracks and lotteries, point-of-sale terminals for retailers, and electronic warfare systems for the military. Revenues were estimated to be down 7% to $160 million, compared to the actual 10% decline the company experienced in 1980.

The division has suffered from unexpectedly low volume in its lottery installations and recession-induced cutbacks by department stores in their spending on new point-of-sale equipment. The Data Systems Division accounts for less than one fifth of General Instruments overall revenues, which were up 9% to $905 million for calendar 1981. The majority of GI's sales are in cable tv components and semiconductors.

The dp division won contracts worth $17.5 million to install its AmTote 300 Totalisator System at racetracks in Greece, South Africa, and Venezuela. The South African contract, awarded in June, was General Instrument's seventh overseas in as many years. The company has installed the system, which allows selling and cashing of all bets at any pari-mutuel window, at about 180 racetracks and associations, as well as at off-track-betting systems in New York and Connecticut. In 1981, General Instrument added Massachusetts and New Hampshire to the list of states where it supplies computers for online lottery operations, bringing the total to six (the others are Ohio, Maine, New Jersey, and Vermont).

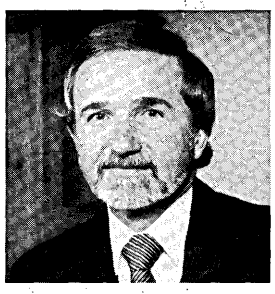
General Instrument has also become increasingly involved in the satellite earth station market, an area it believes is complementary to its investment in cable. In February 1982, the company announced it will be the exclusive supplier of earth station equipment for United Satellite Television, a new venture headed by Robert T. Howard, former president of NBC. With an investment of $5 million, General Instrument is a partner in United (together with two other firms, Allstar Satellite Network, Inc., and Pop Satellite). United has contracts giving it access to 10 transponders on Telesat, Canada's ANIK-C satellite, planned for launch Nov. 11 on the space shuttle. GI entered the earth station market in 1981 with an agreement to make earth stations with patents and technology licensed by SED Systems of Canada.

The company sought to boost its offering in point-of-sale terminals with the announcement in January 1982 of Local Area Network, a single cable system enabling retailers to combine electronic point of sale and other data processing applications with video training, catalog ordering, and voice communications into one integrated system.

The retail network was the first new product announced since last September, when General Instrument bought 20% of Sytek, a Sunnyvale, Calif., firm that designs, manufactures, and markets broadband-based networking systems and data communications products, including modems, multiplexors, and data concentrators. Founded in 1979, Sytek has sales of $2.5 million in 1980 and has installed more than 30 of its Localnet broadband systems for customers such as Bell Labs, Chase Manhattan Bank, and the Department of Defense.

General Instrument hopes that its own extensive broadband cable experience (through its Jerrold Division, which supplies about 40% of General Instrument's overall revenues, it is the industry leader in cable tv electronics), combined with Sytek's expertise in data communications hardware and software, will make it a major force in the growing market for local area networks. General Instrument already has 160 installations of its BroadCom interactive broadband network in large institutional settings.

"The proliferation of financial planning languages will create chaos throughout corporate management ranks. In the future, we will see one standard modeling language that extends from the personal desk-top computer to the central corporate information center."



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54 NIXDORF COMPUTER CORPORATION

300 Third Avenue
Waltham, MA 02154
(617) 890-3700

Nixdorf Computer is the U.S. subsidiary of a closely held West German company, Nixdorf Computer, AG. (which is called The Group). The Group had worldwide sales of about $800 million during 1980. Nixdorf Computer had 1981 sales of $159.3 million, up from $137 million in 1980. The company has 100 sales and service offices in the U.S., including three main operations: Culver City, Calif. (research), Richmond, Va. (software), and Burlington, Mass. (research and manufacturing). Manufacturing operations have been expanded so that systems for American customers are manufactured here by the company's 2,400 employees.

Nixdorf has been battling IBM and Triumph Adler in the European market for small computers for years. During 1981, it took a step that put it in direct competition with IBM in the U.S. and announced that it was producing a new IBM-compatible mainframe. Most industry observers question whether Nixdorf can succeed in this market. To meet this skepticism, Nixdorf has produced its own software and is offering the operating system, software, peripherals, and support for its mainframe entry, the 8890.

55 M/A-COM, INC.

7 New England Executive Park
Burlington, MA 01803
(617) 272-9600

M/A-Com, Inc. (formerly Microwave Associates) has been put together over the last two years by merging about 22 different companies into a miniconglomerate, which specializes in being on the edge of new technological breakthroughs. Dr. Larry Gould, the founder and chairman, has divided the company into three operating groups: Components, Cable/Home Communications, and Integrated Digital Communications. The financial results of the mergers have been impressive: revenues rose nearly 50% to $541.6 million in 1981, while net income increased even faster, growing 60% to reach $40.9 million in 1981. Dp revenues mainly from datacom gear reached $151 million.

Some of the companies have been well known in their fields. Ohio Scientific, for example, is a leading personal computer manufacturer, and Alanthus Data Communications Corp. is a major leasing company.

To help finance these acquisitions, the company recently sold a $100 million convertible subordinate debenture, which will be convertible into common stock at $36.50 per share. Once a company is acquired, M/A-Com pumps in the research and development costs necessary to bring the company around, or else spins off the portion of the company that it doesn't want. Thus R&D expenses have doubled since 1980, to over $12 million last year.

The company sometimes finds itself in competition with its own customers. For example, M/A-Com is not only supplying gear to Satellite Business Systems but is in competition with the carrier via B/C-Net, a business communications service using every trick in the book, from satellite transmission to cable. The company is building up its own private network and then will sell it to big corporate customers. M/A-Com's strategy is to avoid the use of local phone nets and instead use co-ax and cellular radio to hook users to dish sites where concentrated flows of information can be beamed to a satellite.

Among the many M/A-Com products that figure into the data communications game are encryption devices, multiplexors, modems, earth stations, and fiber optics systems. Coming soon will be executive workstations and software to enable more effective use of the digital transmission facilities the company helps build.

56 INFORMATICS, INC.

21031 Ventura Boulevard
Woodland Hills, CA 91364
(213) 887-9040

Informatics started off badly in 1981 as revenues declined in the first quarter. The company quickly took steps to turn things around and ended the year with revenues at $150 million, up 19%, and earnings at $5.1 million, up 24%.

Informatics is divided into three product areas: software products (35% of revenues), professional services (30% of revenues), and information processing (35% of revenues). The problems in 1981 were in the software products and information processing services groups. Federal cutbacks affected the information processing group, but part of these declines were offset by improvements in the distributed data processing services.

Wall Street analysts credit the software group's problems to slow new product development, which allowed competitors to steal customers. To combat this, Informatics spent a lot of time and money on R&D, and late in the year introduced a new software package. The package is designed to help programmers in writing interactive programs based on IBM's IMS database management systems. The potential market of IMS users is about 1,500 customers and increasing quickly. Analysts predict that this package will be a best-seller, mainly because IBM's IMS is very difficult to work with.

One plus for Informatics was the sale of its money-losing general accounting application software products business, which was completed in November, thus ending Informatics' losses.

During the year, a number of management changes took place; the most important was the midyear promotion of Bruce Coleman to executive vice president of operations. Coleman was responsible for the fast turnaround in the software division, and is expected to play a positive role in the future.

Like many other software firms, Informatics bought a number of companies last year. These acquisitions aren't expected to contribute immediately to earnings, but in the long run they will target the company in the markets it wants to explore. Among the acquired companies: Automated Systems Design, a specialist in information banks; Management and Consulting Services, a turnkey house selling to accountants, and Management Control Systems.

57 WYLY CORPORATION

Exchange Park, UCC Tower
Dallas, TX 75235
(214) 353-7100

A more than twofold increase in sales of its turnkey minicomputer systems was the major impetus behind the 20% revenue growth last year at Wyly, a traditional supplier of software and computer services. Wyly entered the hardware business in 1980 with the purchase of Digital Systems of Florida, a turnkey supplier of DEC PDP-11/23, 11/34, and Datasystem 300 computer systems for accounting, construction, and legal applications.

Turnkey sales grew 122% to $42 million, while overall revenues increased only 24.5%, to $147 million. Earnings increased 3.4% to $6 million, reflecting the adoption of new accounting rules on the translation of foreign operations into U.S. dollars.

Wyly, whose revenues are mainly derived from the operation of its University Computing Co. (UCC), deepened its commitment to software sales with two acquisitions. In November, it bought the Fortex Corp. of Chicago, an 11-year-old software firm that had sales of $6 million of its two financial packages: its Commercial Accounts Receivable Management System and its Property Information Management System. Both are designed for IBM computers. In July, Wyly acquired the systems division of the American Valuation Consultant, a subsidiary of the Valuation Research Corp. of Des Plaines, Ill., which has four software packages for IBM equipment: fixed asset, construction work in progress, tax preparation, and lease financial control/accounting.

Scientific and engineering computing services now account for less than half of Wyly's overall revenues, down from 61% in 1980. Actual income from the computing services division dropped 2%, due largely to business conditions in Europe, where Wyly does 25% of its business. Wyly has nine major computing systems in its data center. The computing services division also markets a turnkey numerical control system for manufacturing. Wyly invested $3 million in R&D last year.

58 THE TELEX CORPORATION

6422 E. 41st Street
Tulsa, OK 74135
(918) 627-1111

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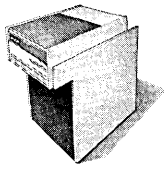
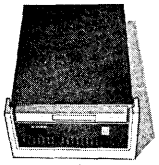
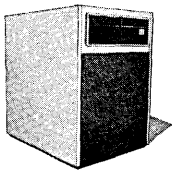


For LSI-11/23 Q-BUS: 80 MB Removable Emulates DEC RM02/03

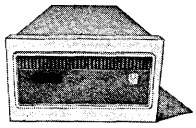


For LSI-11/23 Q-BUS: 64 MB Fixed/Removable Emulates DEC RK06/07

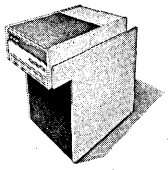


For PDP-11/04-60 UNIBUS: 675 MB Fixed Emulates Two DEC RM05s

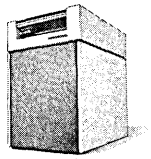
For PDP-11/70 CACHE BUS: 80 MB Fixed Emulates DEC RM03



For VAX UNIBUS: 160 MB Fixed/Removable Emulates DEC RM03

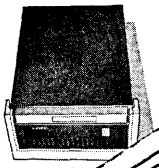


For VAX-11/750 CMI: 80 MB Removable Emulates DEC RM03

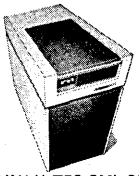


For LSI-11/23 Q-BUS: 300 MB Removable Emulates DEC RM05

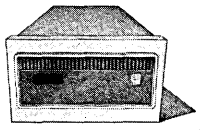
For LSI-11/23 Q-BUS: 96 MB Fixed/Removable Emulates DEC RK06/07



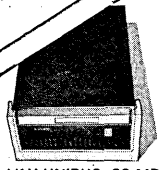
For PDP-11/04 32 MB Fi... Emu...



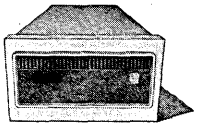
For VAX-11/750 CMI: 300 MB Removable Emulates DEC RM05



For LSI-11/23 Q-BUS: 80 MB Fixed Emulates DEC RM03



For VAX UNIBUS: 32 MB Fixed/Removable Emulates DEC RK07

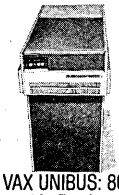


For VAX-11/750 CMI: 80 MB Fixed Emulates DEC RM03

For LSI-11/23 Q-BUS: 160 MB Fixed Emulates Two DEC RM03s

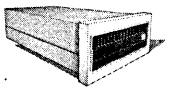
For PDP-11/... BUS: 300 MB ...movable Emulates DEC RM05

For PDP-11/04-60 UNIBUS: 96 MB Fixed/Removable Emulates DEC RK06/07

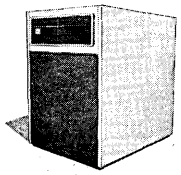


For VAX UNIBUS: 80 MB Removable Emulates DEC RM03

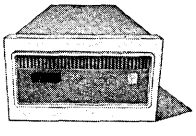
For VAX UNIBUS: 64 MB Fixed/Removable Emulates DEC RK07



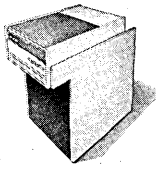
For VAX-11/750 CMI: 160 MB Fixed Emulates DEC RM80 or Two RM03s



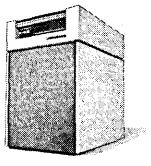
For LSI-11/23 Q-BUS: 675 MB Fixed Emulates Two DEC RM05s



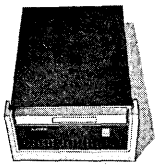
For PDP-11/04-60 UNIBUS: 80 MB Fixed Emulates DEC RM03



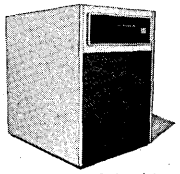
For PDP-11/70 CACHE BUS: 80 MB Removable Emulates DEC RM03



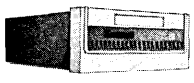
For VAX UNIBUS: 300 MB Removable Emulates DEC RM05



For VAX UNIBUS: 96 MB Fixed/Removable Emulates DEC RK07

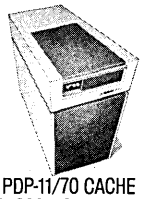


For VAX-11/750 CMI: 675 MB Fixed Emulates Two DEC RM05s

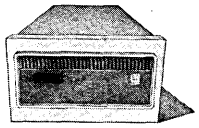


For LSI-11/23 Q-BUS: 32 MB Fixed/Removable Emulates DEC RK06/07

For PDP-11/04-60 UNIBUS: 160 MB Fixed Emulates Two DEC RM03s



For PDP-11/70 CACHE BUS: 300 MB Removable Emulates DEC RM05



For VAX UNIBUS: 80 MB Fixed Emulates DEC RM03

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saw revenues, particularly those associated with its data processing business, reach an all-time high, while profits climbed to near record levels after a slump two years ago. In 1981 Telex's revenues grew 10% to $200 million, from $181 million. Data processing revenues grew by 21% to reach $142.7 million, from $117.9 million the year before.

Profit rose at an even faster clip. Corporate profits for calendar 1981 rose by 144% to $11.3 million, from $4.6 million in 1980.

On the darker side, the computer peripherals and communications firm will remember 1981 as the year in which its chairman and chief executive officer, Roger M. Wheeler, was shot and killed. Mr. Wheeler was credited with moving the firm strongly into the IBM-compatible market, with tape drives, disk drives, and 3270-type terminals. It was also under his direction that Telex took IBM to court for antitrust violations.

The company's data processing subsidiary, Telex Computer Products, accounts for some 70% of Telex's revenues and profits. Last year revenues from peripherals and terminals rose by 32% to $96.9 million, from $73.3 million in 1980. The company's products include a full line of IBM-compatible 3278 displays, printers, and control units. Other product families include its 286C and 287C printers and the Telex 278 series of display terminals.

The company's oem/Peripheral Division markets the Series 80 magnetic tape introduced two years ago, as well as the Telex Series 6200 tape subsystem and the Telex 6250bpi tape drive.

Telex's service and maintenance operations grew by 11% last year. Revenues from the service company grew to $37.4 million, from $33.4 million in 1980.

The company's international business expanded rapidly in 1981. For the fiscal year that ended March 31, international sales were up 89% to $6.8 million, from $3.6 million a year earlier. Telex markets its products through 25 distributors overseas. It expects this side of its business to continue to grow strongly because it can now sell its products in the European, African, and Middle East markets, which it had been prohibited from doing until last year.

The company upped research and development spending by 12.5% in 1981 to $7.2 million. It finances most of its activities through borrowings, and in 1981 had approximately $10 million of short-term debt in use during the year.

59 DUN & BRADSTREET CORPORATION

National CSS
187 Danbury Road
Wilton, CT 06897
(203) 762-2511

Dun & Bradstreet Corp. strengthened its position in data processing through the growth of its major dp subsidiary, National CSS, which it acquired in 1979, and through several new acquisitions.

Revenues were up 17.8% to $142.3 million at National CSS, a major supplier of remote computer services. Two database management systems, NOMAD and NOMAD 2, continue to be the company's largest revenue producers and now serve some 2,500 customers.

National CSS introduced several new software products including CSS FINAL, a proprietary software system for financial managers that integrates financial analysis, modeling, reporting, graphics, and database management; CSS RESPOND, a fully integrated human resources system for corporate personnel departments; and two on-line accounting packages, G/L Plus and A/P Plus.

To augment its offering of specialized software products, D&B in October acquired Synergetics, whose principal product is the Data Catalog.

In September, D&B announced that NCSS will no longer sell the 3200 IBM-compatible minicomputer that was designed to give customers access to NCSS software on a dedicated on-site machine. Sales of the 3200 were disappointing since its inception in 1978, resulting in a pretax loss of $10 million in 1980 and a smaller budgeted loss in 1981.

Revenues were up at Zytron, the NCSS division that provides computer output microfilm services, although operating income fell in part because of expenses associated with a slate of acquisitions made in 1980.

Zytron has increased its services in every geographic region and added two new service centers to its nationwide network.

D&B has also worked steadily to integrate NCSS technology into its traditional business information services. One recent example of this is Salesnet, a computerized telephone marketing service for direct sales, sales lead generation, information gathering, and accounts receivable collection. Direct sales employees are equipped with terminals and video display screens linked to the Salesnet Computer and Telecommunications System, which is in turn linked to the National CSS computer network.

60 PHILIPS INFORMATION SYSTEMS, INC.

4040 McEwen Avenue
Dallas, TX 75234
(214) 386-5580

Philips Information Systems, Inc. (formerly Micom Data Systems, Inc.), a manufacturer of word processing equipment, more than doubled its 1980 revenues to $140 million, a 105.8% increase. In its attempt to keep up with the competition of IBM and Wang, Philips exceeded its own growth projection by about 8% and expects to continue on a sharp growth curve this year.

In 1979, Micom's president and founder, Steven Dorsey, formed a partnership with Philips NV of The Netherlands to utilize the name, capital, distribution network, and R&D resources of the Dutch electronics giant. In 1981, Micom adopted the Philips name and now—headed by John Clark, formerly of Intel—markets the products of Philips Data Systems (the Montreal-based affiliate of Philips NV that still uses the Micom name on its equipment). About 60% to 70% of total sales for both the U.S. and Canadian affiliates is derived from foreign distribution.

To compete with the new wave of low-priced systems currently on the market—among them the IBM Displaywriter text processing system and the Wangwriter standalone word processor—Philips recently introduced its $16,500 model 2002. The minimal dual crt system with 128K byte processor is expandable to a four-station system and programmable to handle dp functions. In February 1982, the 3003 standalone word processing system with graphics capabilities also hit the market, competitively priced at $8,900 and also intended to compete with IBM and Wang offerings.

Philips still offers its 64K, 2001 word processor and 2001 E 128K machine, as well as its Execupak executive workstation, introduced in 1980 and sold as an add-on for both the 2001 and 2002.

Plans for summer include introduction of a shared resource system that will handle sophisticated electronic mail functions.

61 UNITED TELECOM COMPUTER GROUP

2330 Johnson Drive
Westwood, KS 66205
(913) 676-3000

United Telecom Computing Group made some major organizational changes in its remote computing services operations last year. The company formed United Information Services Inc. in the fourth quarter to combine the responsibility for the domestic and international operations of United Computing Systems and On-line Services. United Computing International will now serve as the international division of UIS.

As a result of the restructuring, UIS now offers its customers solutions employing any combination of the group's capabilities in the engineering, scientific, and business markets in which it has worked in the past. In order to make those offerings more attractive, the company has also added a professional services operation to provide custom programming and consulting services.

These changes took their toll on the Computer Group's balance sheet. A weak worldwide economy helped slow revenue growth to 8% in 1981, taking revenues to $137 million. In 1980 revenues had grown 26% to reach $127 million. The sluggish growth in 1981 helped to turn an expected earnings decline into an operating loss of $1.4 million. Planned expenditures for intercity network expansion exceeded profits in other group operations.

United Telecom also made two major acquisitions in the computer area in 1981. The company acquired Megatek, a San Diego-based company that supplies low-cost, high-performance interactive graphic terminals. That purchase should give the company some of the graphics capability it was looking for when it bought Calma, a

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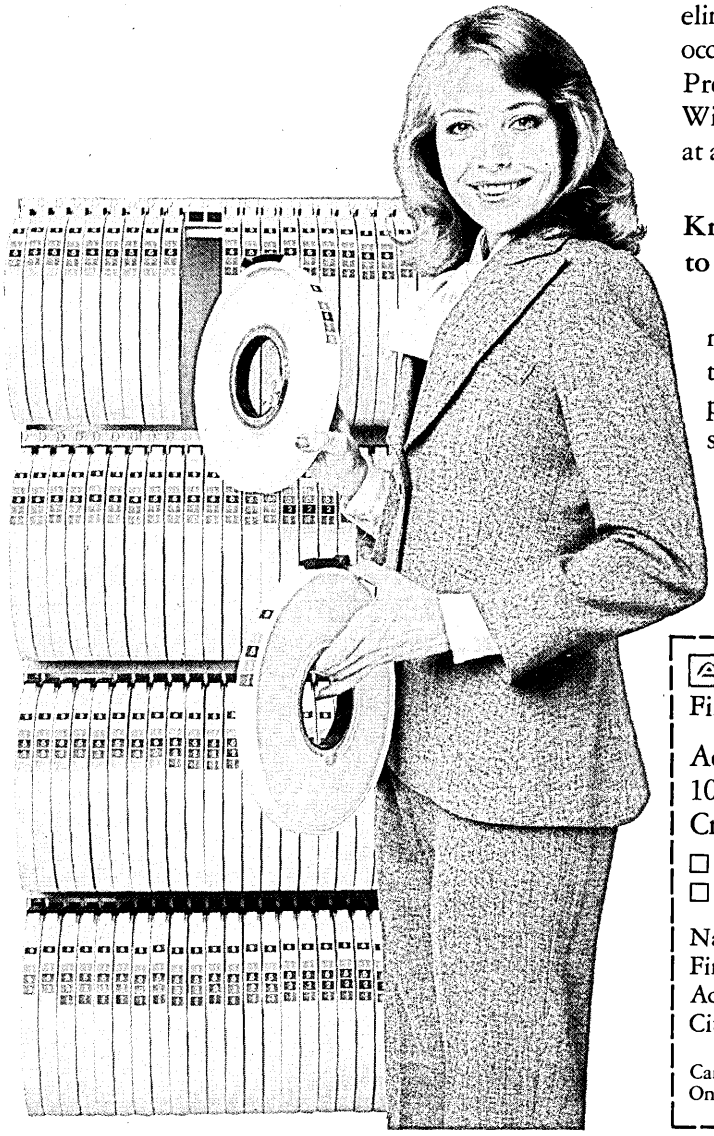

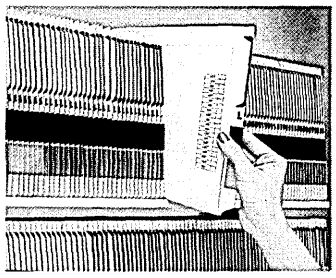

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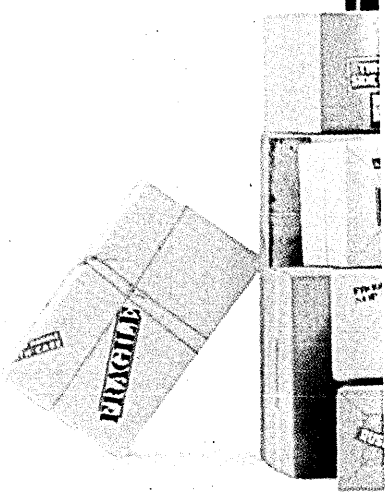

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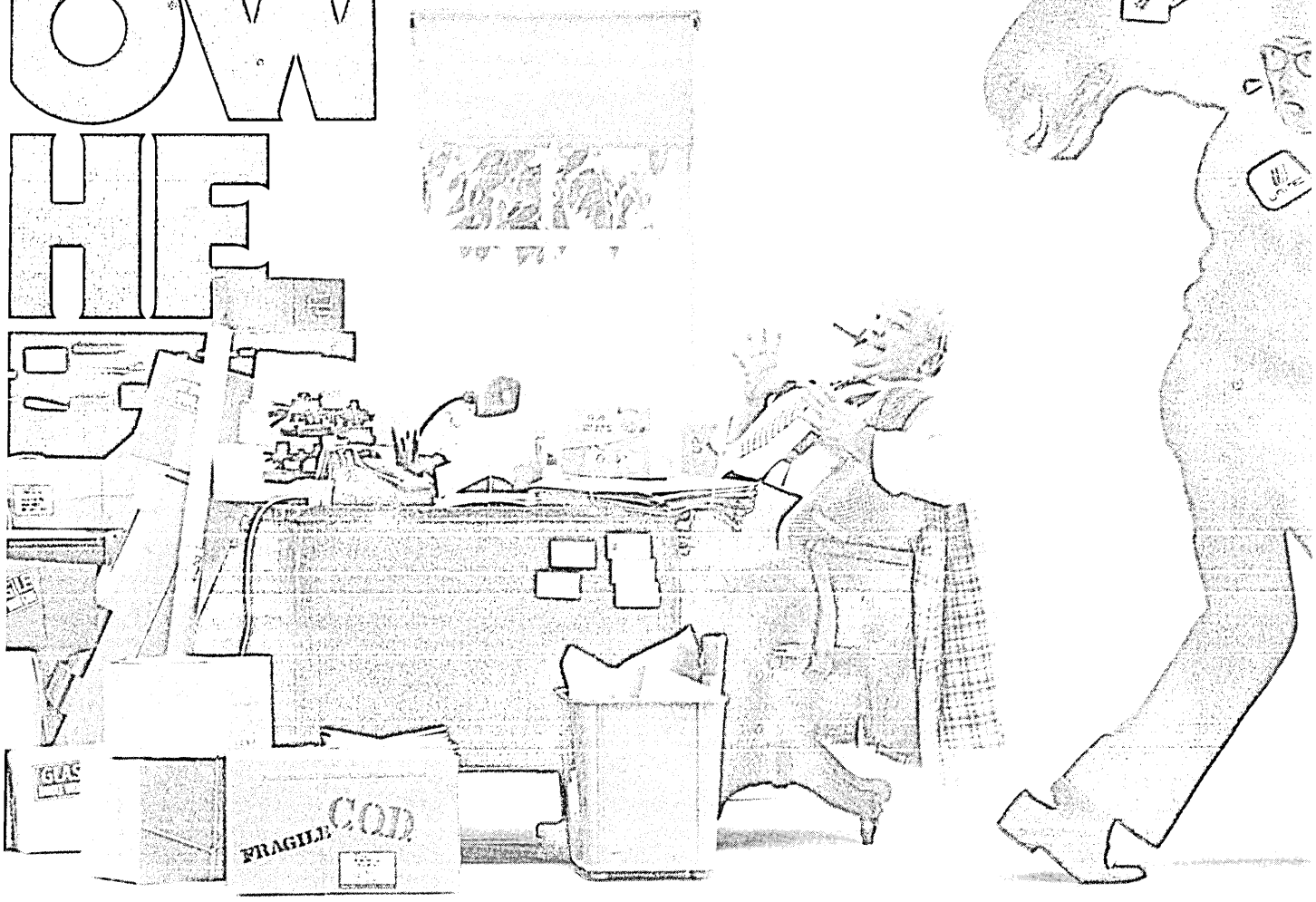
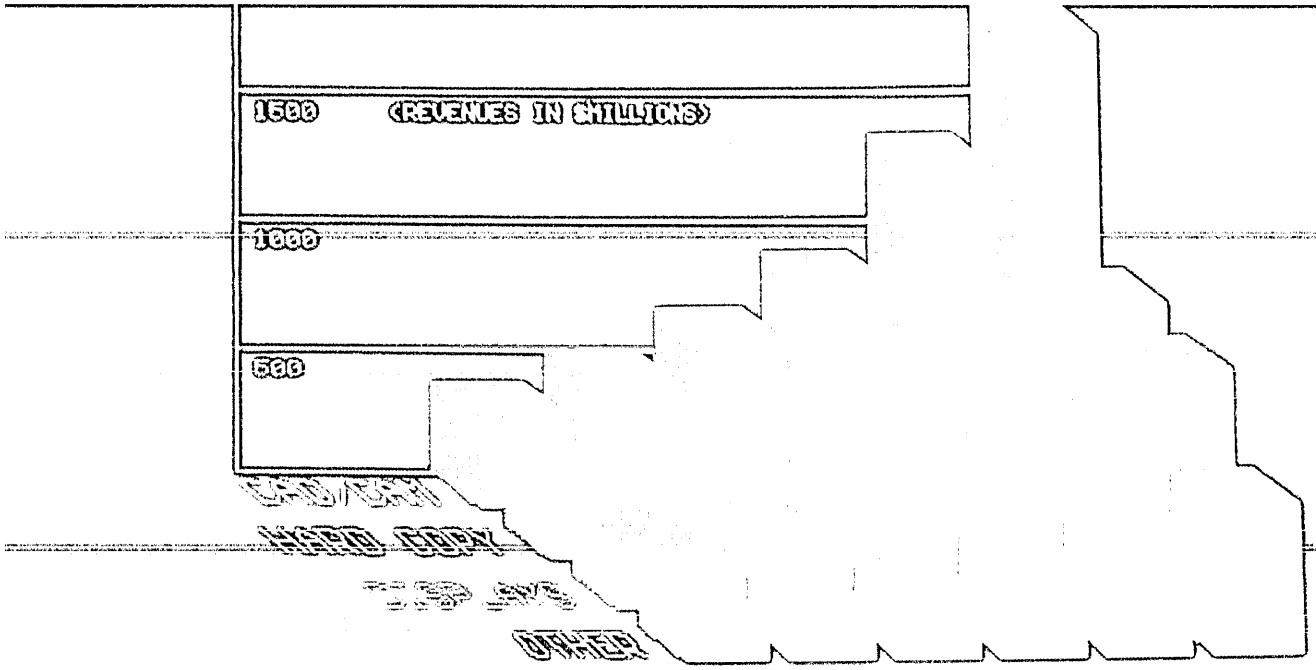
ANYTIME . . . next week. Tomorrow. Even the next flight out today!

Some day, they'll no doubt make a plaque for this guy. It will simply read, "The buck *never* stops here."



UNITED AIR CARGO

CIRCLE 151 ON READER CARD



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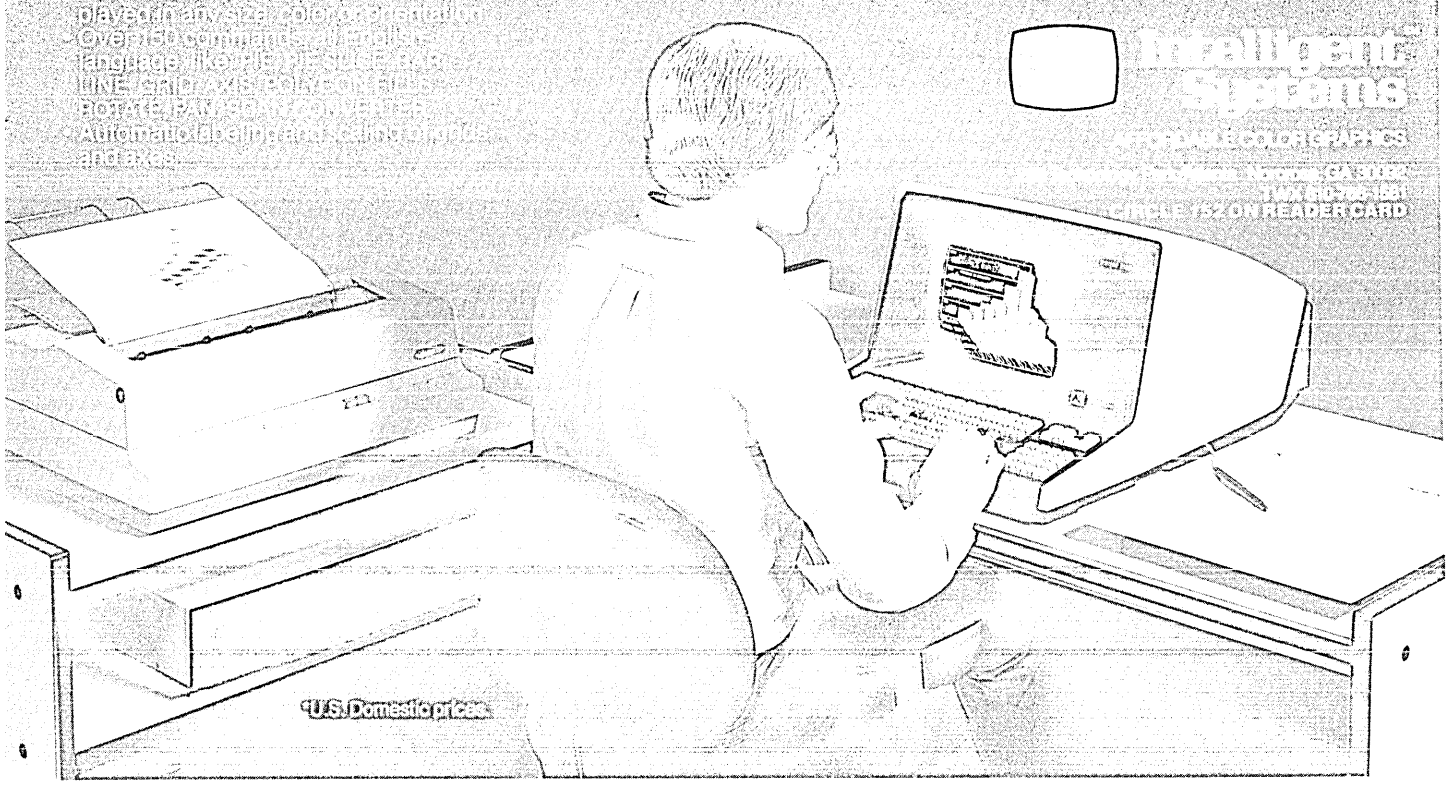


*U.S. Domestic prices.

computer aided design and manufacturing supplier that it sold last year (to General Electric). Megatek sales grew 26% to $15.7 million in 1981, but the company recorded an operating loss because of nonrecurring, merger-related expenses.

Early in 1982, United Telecom completed the $36.5 million acquisition of Insurance Systems of America (ISA). This leading supplier of software services to the insurance industry owns a controlling interest in ISACOMM, a satellite communications company that provides voice and data services through an intercity network. Future plans include combining the businesses of Uninet and the ISACOMM operations.

As a whole, United Telecom's revenues increased 18% to $2.3 billion in 1981, and profits went to $261.8 million, from $175.7 million in 1980.

62 PARADYNE CORP.

8550 Ulmerton Road
Largo, FL 33540
(813) 530-2000

Paradyne, a leading manufacturer of data communications equipment, enjoyed another successful year, introducing several new products and posting a 78% revenue gain to $135.4 million. The company reported a 112% increase in earnings to $17.5 million.

Paradyne's main source of revenue continues to be its modems, which range from 2400bps to 16,000bps. In 1981, it added two new microprocessor-based modems, the MP-14.4 and the MP-16.0, and another addition to its LSI series, the LSI-24C. The rest of Paradyne's revenues comes from its PIX and PIXNET communications processor systems, which provide users of IBM mainframes and plug-compatible systems with a simplified alternative for handling data communciations with a large number of remote terminals.

In 1980, Paradyne entered the area of distributed data processing with RESPONSE, a system that acts as a remote applications processor. RESPONSE consists of a 32-bit processor with two megabytes of memory and a PDS 270 display terminal with large disk storage. It is used in conjunction with the PIXNET processor. A new version of the PDS 270 terminal containing word processing software was scheduled for shipment in early 1982.

In April, Paradyne introduced NETWORK ADMINISTRATOR, a follow-up to its earlier Network Management Systems, ANALYSIS and DATALYZER. NETWORK ADMINISTRATOR provides centralized network control through an automatic problem tracking system. Other new products introduced in 1981 include Info Lock, an encryption device and DIGIVOICE, which allows voice transmission at 2400bps, enabling a user to place multiple conversations over one voice grade telephone line.

During the year, Paradyne made the first shipments in its eight-year, $84.2 million contract with the Social Security Administration to provide it with 1,850 intelligent terminal systems, consisting of a microprocessor controller, PDS terminals, printers, and card readers.

63 SHARED MEDICAL SYSTEMS CORP.

P.O Box 675
King of Prussia, PA 19406
(215) 296-6300

Shared Medical Systems Corp. (SMS), a leading supplier of hospital computing services, had another year of steady growth. Revenues increased 23.4% to $131.6 million for calendar 1981, while earnings were up 20% to $32.9 million. Although well under the 43% revenue growth SMS experienced during much of the '70s, last year's performance was in line with management's expectations.

SMS provides timesharing services and turnkey minicomputer systems to more than 500 acute care hospitals and physicians' groups. Timesharing services include both financial management (such as patient accounting, financial reporting, and payroll) and database management. The primary database service, COMMAND, is a patient database.

Since 1976, SMS has offered its ACTION line of turnkey patient care systems based on DEC PDP 11/70 and VAX minicomputers. The offerings in this area include laboratory, pharmacy, and interdepartmental communications systems.

New products unveiled last year include word processing, an advanced pharmacy management system for its DEC turnkey computer systems, and an advanced patient care system to run on IBM 4300 computers. Two new timesharing services are risk management and forecasting/simulation. SMS increased its investment in research and development 22% to $10.5 million. It also dropped the small amount of business it did with retail drugstores and credit unions.

SMS International was established last year, serving clients in Holland, England, and Ireland with both timesharing and turnkey systems. The firm said it does not expect SMS International to be a major source of revenue until the end of the 1980s.

64 BRADFORD NATIONAL CORP.

67 Broad Street
New York, NY 10004
(212) 530-2400

Bradford National, which provides a variety of services to financial institutions, securities firms, industry, and government, had a difficult year in 1981, reporting a loss of $10.1 million, primarily as a result of discontinued health care operations. Earnings from continuing operations were $381,000 in 1981, compared to $2.8 million for the same operations in 1980. The company was convicted of federal charges that it falsified payment claims on government contracts. The settlement, including refunds and fines, totaled $1.3 million, and included a provision that the business be sold. Bradford therefore sold one third of its 1980 revenues to McDonnell Douglas for a mere $11.5 million.

In a further pruning of its health care activities, Bradford announced earlier this year that it planned to get rid of its Health Services Division, which it acquired in 1980 from Optimum Systems to maintain Medicare patient records and make payments to doctors. Because of possible future costs resulting from the discontinuation of this division, charges against 1981 income for this division alone exceeded $9 million.

Bradford now believes its sizable resources in computer and financial services for banking, brokerage, and insurance offer the best profit opportunities. Revenues increased in all sectors of these continuing operations to $130 million, an 18% increase over 1980's restated financial statements.

65 RECOGNITION EQUIPMENT, INC.

2701 East Granwyler Road
Irving, TX 75061
(214) 579-6000

Recognition Equipment, Inc. had a difficult year. Revenues rose to $125.3 million, a 1.6% increase over 1980. For the fiscal year ending Oct. 31, REI had a net earnings loss of $8.2 million. The company was unable to generate profits because of foreign currency losses, the slow economy, and high interest rates. The major problem stemmed from the October 1980 purchase of Cummins-Allison Corp., which needed an infusion of capital to improve operations. REI had to borrow the needed capital at record-high interest rates—the price was a yearly loss.

To help it digest this acquisition, REI cut its own staff by 500 and instituted other cost-cutting moves. These maneuvers didn't help and Jay Rodney Reese, president and chief executive officer, resigned in January 1982. He was replaced by William G. Moore, Jr., former vice president and general manager of Perkin-Elmer computer operations in Oceanport, N.J.

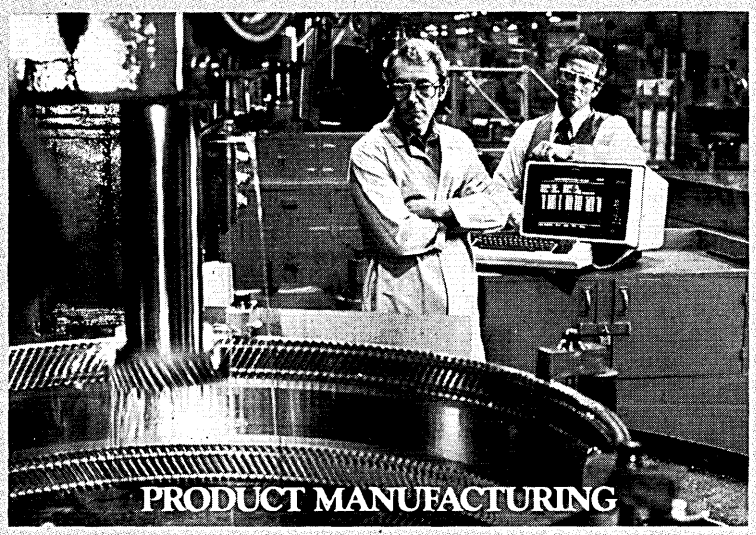
REI designs, manufactures, and markets OCR equipment for centralized processing, distributed processing, and postal/mail processing. The TRACE Image (TRIM) system is the main product in the centralized processing segment. It permits computerized processing of image data rather than the physical documents, and it is used by banks and credit card companies. As a result of the acquisition of the Data Systems Division of Cummins-Allison Corp., REI has a complete line of centralized document-processing equipment (TRACE I, TRACE II, TRACE III, and KeyScan Systems) and associated software.

In 1982 the company introduced the TRACE II 1419 Emulation System, the TRACE II 3890 Emulation System, and the TRACE I 3890 Emulation System, making these document processors able to act like IBM models.

In the distributed processing segment, the principal product is the OCR WAND reader, which can read and enter information from price tags on merchandise in nonfood retail stores into a point-of-sale electronic cash register. In 1981, the company introduced the DocuTrac OCR slot reader—a stationary version of the OCR WAND reader.

INTRODUCING THE FIRST SYSTEM THAT TAKES YOU

FROM HERE



TO THERE.

UNIS*CAD

Sperry Univac announces the only system ever to apply the awesome power of the mainframe computer to all aspects of manufacturing. From engineering design and validation through production.

*It is UNIS*CAD. The first system that fully integrates Computer Aided Design with Computer Aided Manufacturing.*

*The bottom line? Simply that UNIS*CAD makes it possible to develop and produce better products faster. A simple fact which can have enormous impact upon your bottom line.*

HOW UNIS*CAD IMPROVES YOUR PRODUCTIVITY.

*With UNIS*CAD, every functional area of the product development process is linked with a single comprehensive data base: Design, Engineering Analysis, Drafting, Numerical Control and Manufacturing Control.*

So the output from one area becomes the input for the next. Example: The geometry of the design becomes the basis for finite element analysis.

And that means the time-consuming steps of reinterpreting, transcribing, entering and transmitting data from one activity to another are eliminated. Which also eliminates the opportunity for error.

A FRIENDLY ARRANGEMENT

*UNIS*CAD is designed to be consistently easy to use every step of the way. So no extra training is required.*

For example, there is a dynamic "menu" on the terminal's single display screen. Plus a prompting line and a HELP control to assist the user.

Moreover, human engineering advances are paralleled by triumphs in technology throughout. Case in point: the hybrid approach to geometric modeling, in the design module that encompasses wire frame, surface and solids modeling.

*UNIS*CAD utilizes distributed architecture. Our 1100 series computer, our V77 minicomputer and intelligent 3-D graphics terminals.*

It is an arrangement that allows the engineer and designer to work with terminals that provide the responsiveness of a dedicated processor, while freeing your mainframe so that it can take care of other scientific and business applications.

A SYSTEM FOR HERE AND NOW.

*Sperry Univac's UNIS*CAD is not a series of independent systems destined to grow more independent as the years go by. Rather, it is a fully integrated system which can serve every area of manufacturing for years to come.*

*What is more, UNIS*CAD is available now.*

For detailed information, call toll free 800-523-2496 (in Pennsylvania, call collect 215-646-3378). Or write to Sperry Univac, Department 100, P.O. Box 500, Blue Bell, PA 19424.

And discover the first system that can truly take you from here to there.

SPERRY UNIVAC

The computer people who listen.

CIRCLE 153 ON READER CARD

Sperry Univac is a division of Sperry Corporation.

SPERRY UNIVAC and UNIS are trademarks of Sperry Corporation.

The postal/mail processing segment develops letter mail-sorting equipment. REI expects to continue marketing its MAPS system to commercial firms for presorting their mail by ZIP code. However, the extent of future mail processing business is uncertain and significant growth is not expected within this segment during the 1982 fiscal year.

66 CPT CORPORATION

8100 Mitchell Road
Minneapolis, MN 55440
(612) 937-8000

Last year was a very strong growth year for CPT, with total revenues up 60.6% to $123.8 million, 68% of which came from U.S. operations. Word processing equipment sales accounted for nearly 56% of revenues while peripherals and terminals brought in 21% of the total. Software, service, and maintenance accounted for the balance. Corporate profits more than doubled to $12.5 million for the fiscal year ending June 30, and R&D expenditures more than doubled to $4.2 million.

CPT continued its thrust at the high end of the standalone word processing market with two important system introductions. The CPT 6100 offers 33% more memory than the older CPT 6000, and the CPT 8100 becomes the firm's top of the line with 50% more memory than the older CPT 8100. Both the CPT 8000 and 8100 can be software enhanced to combine word and data processing.

Software represents an important expansion area for CPT. New packages and enhancements introduced last year included Scientific Symbols, offering Greek and mathematical characters; Comprehensive Business System, including eight general accounting programs for the CPT 8000; a Law Office Management System for the CPT 8000; and Shortcut, which offers mathematical decision-making capabilities for the CPT 8100.

In August, CPT began construction of a 150,000-sq. ft. manufacturing facility close to its headquarters. Scheduled for completion this year, the plant will house all U.S. manufacturing operations and double CPT's total manufacturing space. Construction is also under way for a 128,000-sq. ft. addition to headquarters. The company also reached an agreement last year to lease its first overseas plant, in County Cork, Ireland.

Products are sold and serviced by a network of independent dealers and distributors serving 500 U.S. cities and 60 countries.

67 CENTRONICS DATA COMPUTER CORPORATION

One Wall Street
Hudson, NH 03051
(603) 883-0111

Centronics Data Computer Corp., a leading producer of computer printer devices, had yet another year of reduced revenues, down 10% from 1980 to $118.9 million. The company also experienced a $21.9 million loss in net earnings.

Shortly after it announced last October that it had made an agreement with lender banks to restructure its credit arrangements—raising its credit limit from $49.5 million to $53 million—Centronics bought Computer Peripherals, Inc. from Control Data, NCR, and International Computers Ltd. The price was high, but not in cash; the sellers received 45% of the outstanding stock of Centronics. The purchase, however, enables Centronics to offer an expanded line of low-, medium-, and high-speed printers.

Centronics markets printers priced from $175 to $9,000 that are sold primarily to an oem market, and its product line includes the 700 Series of serial dot matrix printers and the 6000 Series of line printers. Financial difficulties have arisen as a result of continued investments made in the long-awaited electronic typewriter (based on the stroke-writing printing technique developed by Olivetti and purchased by Centronics in 1979) as well as from problems with its line of minicomputers. A six-week interruption in production in 1980 resulted in lost market share from which the company is still trying to recover.

Centronics—which also experienced a good deal of top management turnover in 1980, including the departure of ceo Michael Kaufman and several vps who followed—made several attempts to regain lost market share and get back on its feet. In April 1981 the company began delivery of a new family of low-cost serial impact printers, the 150 Series, designed for sale to oems that sell small business systems. And in November, its new line of industrial grade matrix printers, called the Printstation 350 series, was introduced.

Presumably, these new product additions, along with the arrival of Quietwriter and the purchase of CPI, will mean a better year for Centronics in 1982.

68 DATA TERMINAL SYSTEMS

124 Action Street
Maynard, MA 01754
(617) 897-3221

With the whole point-of-sale terminals market in a depressed state, Data Terminals, with almost all its sales in ECRs, naturally suffered. Revenues were up during 1981 to $118.3 million, but earnings plunged to a loss of almost $3 million, vs. a gain of $9.4 million in 1980.

Data Terminals was ill-prepared for the tightening of the market. The economic slowdown came at a time when the company was in the middle of building new manufacturing facilities, and heavily leveraged, with a total of $49.9 million in long-term debts. To its credit, management reacted very quickly to the problems. A new plant under construction in Stowe, Vt., was sold, raising cash which was then used to pay off some long-term debt. In addition, an arrangement with Ing. C. Olivetti & C., S.p.A. was concluded whereby Olivetti was able to purchase up to 22% of the company for about $10 million. DTS used that cash to pay off debt also.

Besides getting out from under the long-term debt, management moved to reduce production space because in the tightening market DTS didn't need more capacity. Its Ireland plant was closed first. Then, realizing that its Puerto Rico operation was a plus when earnings were good but useless when earnings were nonexistent, the company shut down its operations there. These closings gave DTS a saving of $6 million a year. The company also sold a German subsidiary to Olivetti.

These financial moves removed the immediate pressures, and subsequently management was able to concentrate on placing the company in the market more competitively. One move to accomplish this was the agreement with a Japanese manufacturer to import ECRs for the lower-priced market. This move enables DTS to have a product for every buyer. Management seems optimistic that these moves will put the company back on the road to profits.

69 GENERAL AUTOMATION, INC.

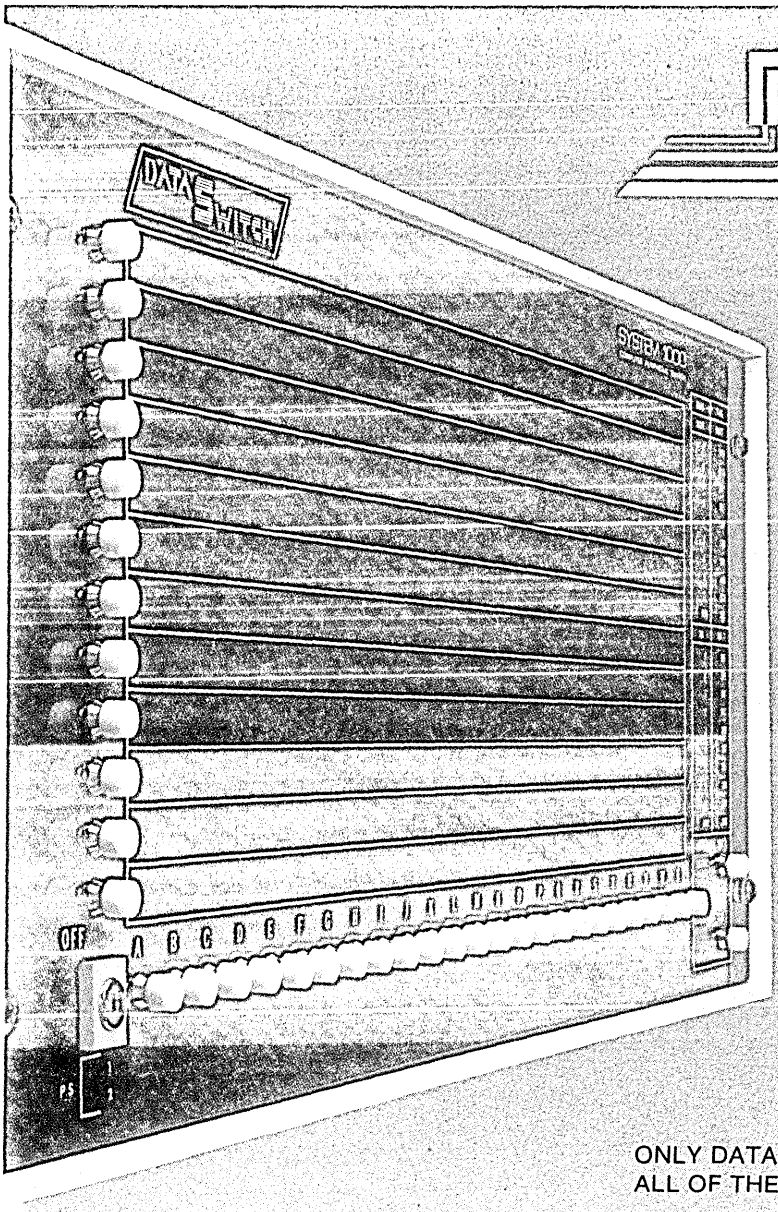
1055 South Street
Anaheim, CA 92803
(714) 778-4800

GA squeaked through fiscal 1981 with a tiny profit, giving the company's new management reason to express satisfaction with its first full year in office. No matter that the gain was not a result of operations as much as the booking of a tax offset: in the year ending Sept. 30, 1980, the company had lost nearly $15 million, so a return to black ink represents a very good piece of news. Overall, calendar 1981 sales were off a tad to $116 million, from $127 million in calendar 1980. But gross margins were up for the year and the company paid off a lot of debt, reducing the worries of lenders and the cost to investors of interest payments.

One of the really bright parts of the GA picture is not the minicomputer business (70% of sales) for which the company is best known, but the multilayer printed circuit board operation, which now accounts for roughly 30% of revenues. Overall, GA's revenues are 65% domestic and 35% foreign.

General Automation had bet big money on a couple of specialized markets for its minis and minisystems during the 1970s: automobile manufacturing and banking (with emphasis on savings banks). Whatever the long-term merits of GA's plans for its chosen vertical markets, the company suffered in the short run and simply didn't have enough going for it at the time to overcome cyclical downturns in business. The upshot was a war in the boardroom, the awkward ejection of founder and honcho Larry Goshorn, then the installation of Frank Grisanti as interim ceo, and, during 1980, the election of Leonard Mackenzie as chairman. Mackenzie has needed time to build a team of top execs to support his efforts. Some changes are still being made near the top, but the rate of executive turnover has dropped quite a bit.

During this stormy period, there have been layoffs as well as changes in the way GA does business, from which has emerged a leaner and more solvent computer maker.



DATA SWITCH CORPORATION builds large scale peripheral switches for today's IBM computer systems

- IBM still doesn't*

The Data Switch System 1000 dynamically switches any I/O control unit used with any IBM or IBM compatible CPU (even the newly announced 3880 Disk Storage Controller).

ONLY DATA SWITCH OFFERS ALL OF THESE FEATURES

- Matrix sizes to 16x24. One system replaces several IBM 2914's, or 3814's
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- Field Upgradable (on-line in most cases)
- Optional micro-processor control. (System 1030, 1100, or 1150)
- Price/Performance-ratio unequalled in the industry

Even if you are not currently switching high speed control units (like the 2835/2305), wouldn't you want your peripheral switch to be a System 1000 ... the System with the *future* built in.

Data Switch has more large scale peripheral switches installed than even IBM — ask us for a customer list.

We're switching specialists.

***Not even with the new IBM 3814.**

DATA SWITCH CORPORATION

444 Westport Avenue, Norwalk, CT 06851, (203) 847-9800, TWX 710-468-3210

CIRCLE 154 ON READER CARD

The company didn't go under, a possibility mentioned by Wall Street analysts when things were darkest, and now seems to be stable, if not sunny. GA's performance in 1982 will be the real test of present management.

Among the highlights of GA's operations in 1981 were the forming of a joint venture, called L.T.I. Strafies, in France with Matra, a printed circuit board facility; the startup of an international remarketing group that will initially handle Western Dynex disk drives; the upgrading of field service operations with an on-line tracking system; and the announcement of a new micro, the 16/250.

70 REYNOLDS & REYNOLDS

800 Germantown Street
Dayton, OH 45407
(513) 443-2000

Reynolds & Reynolds is a major supplier of computer systems and services to auto dealers, so it is no surprise that it continued to feel the impact of the ill fortunes in that troubled industry. Dp revenues fell to $115.2 million, 5% under the 1980 level of $121.4 million, while earnings fell 35% to $7.1 million.

The company has traditionally provided batch and on-line services to auto dealers, but those areas are now assuming less revenue importance in favor of the VIM III, a turnkey system introduced in 1976.

R&R's newest turnkey system, the Expansion 6000, is being tested this year in preparation for a major marketing push in 1983. The first computer to be completely designed and manufactured by R&R, it is being sold in two markets, service contractors and medical professionals. R&R believes it can be successful in those areas by capitalizing on a base of customers who already buy Reynolds Business Forms (the company's other major product), and because no computer manufacturer now has a dominant position in either market.

Through its wholly owned ReyZon Computers, Reynolds makes computer terminals. As part of its Expansion 6000 series, the company has developed a new model, the TC 1250, designed to occupy less space while providing a bigger screen than its predecessor, the TC 850.

Through its Professional Services Division, R&R in 1981 began offering its TC 1000 terminal (which is used with its VIM III computers) as a desktop microcomputer designed for use by accountants.

In June, R&R formed Reyna Finance Corp. to help its customers finance the purchase of computers and related hardware and software.

One possible cloud on the horizon is an IRS audit and challenge. After examining R&R's federal income tax returns for 1977 and 1978, the IRS has proposed an additional tax assessment for those years of $1.4 million for income derived from the sale of software licenses. The IRS position is that the income from the sale of a software license should be recognized and taxed during the year it was sold, rather than spread over the time the company is to deliver the product. While the company and its attorneys maintain their position is correct and are appealing, they point out that if the IRS is correct, it could cost $5.2 million, plus interest for the years 1979 and 1980.

This case is being watched by many other software houses, because the outcome will affect the whole industry.

71 MARTIN MARIETTA CORPORATION

(Martin Marietta Data Systems)
6301 Ivy Lane, Suite 300
Greenbelt, MD 20770
(301) 982-6675

Martin Marietta Data Systems (a subsidiary of the Martin Marietta Corp.), a major services and applications software firm, experienced another profitable year. MMDS grew 43% in 1981, moving from $78 million to $112 million in revenues. To maintain and promote business, the company hired over 400 new employees (many of these in sales and sales support positions) and invested over $4 million in updating existing products and marketing new products.

MMDS has three divisions. These are remote computing services, applications systems packages (or turnkey systems), and professional services (consulting, systems development, and facilities management). MMDS International, England, provides services, consulting, and software to several industries, including retailers and hotels.

Two new products—both turnkey systems—were introduced in 1981. The Credit Union Computer is a turnkey system that integrates Texas Instruments hardware and applications software to perform most of the typical credit union functions, such as share draft reports, payroll reports, new loan reports, and member name and address lists. The other new product is the MAS-M computer system. This turnkey system uses Digital Equipment minicomputers and functions as a general business system. MAS-M provides separate modules that perform general ledger, accounts receivable, purchasing, and other applications. MMDS is aiming this product at distributors and wholesalers.

72 PLANNING RESEARCH CORP.

1500 Planning Research Drive
McLean, VA 22102
(703) 556-2200

Last year was a difficult period for Planning Research. Revenues for its data processing businesses dropped 8% to $106.7 million from $116.4 million in 1980. The company as a whole reported losses of $1.4 million for the year ended June 30, 1981.

The professional services company has two operating groups that handle data processing activities. Government Information Services supplies computer-related services to government clients, primarily the federal government. Civilian work includes micrographic, management information, and other specialized software systems. On the military side, the company provides systems for handling and processing intelligence data, tactical command and control, and resource management. That group accounted for 25% of the company's revenues in fiscal 1981.

Computer Systems, which contributed 17% of the company's revenues, does the bulk of its business with the real estate industry. The group provides computer-based multiple listings systems to some 115,000 real estate agents and home buyers. Because of the softness of the real estate market, that business saw an overall decline in customers by the end of fiscal 1981, although it showed a higher average customer base throughout the balance of the year.

That group also provides computer-assisted dispatch services and high-speed data communications systems to public safety agencies, and markets proprietary software products to businesses.

The company continued to feel the financial aftereffects of closing its U.K. software business. It spent $3 million on closing this and other operations in fiscal 1981. Indirect costs such as those connected with providing new micrographics services also increased disproportionately to revenues.

But Planning Research believes that it will become profitable once again in 1982. Management claims it has restructured its operations to make better use of the company's strengths.

Financially, the company had reduced long-term debt by $6.9 million by the end of fiscal 1981. It had $25 million in short-term debt at its disposal at that time.

73 DYSAN CORP.

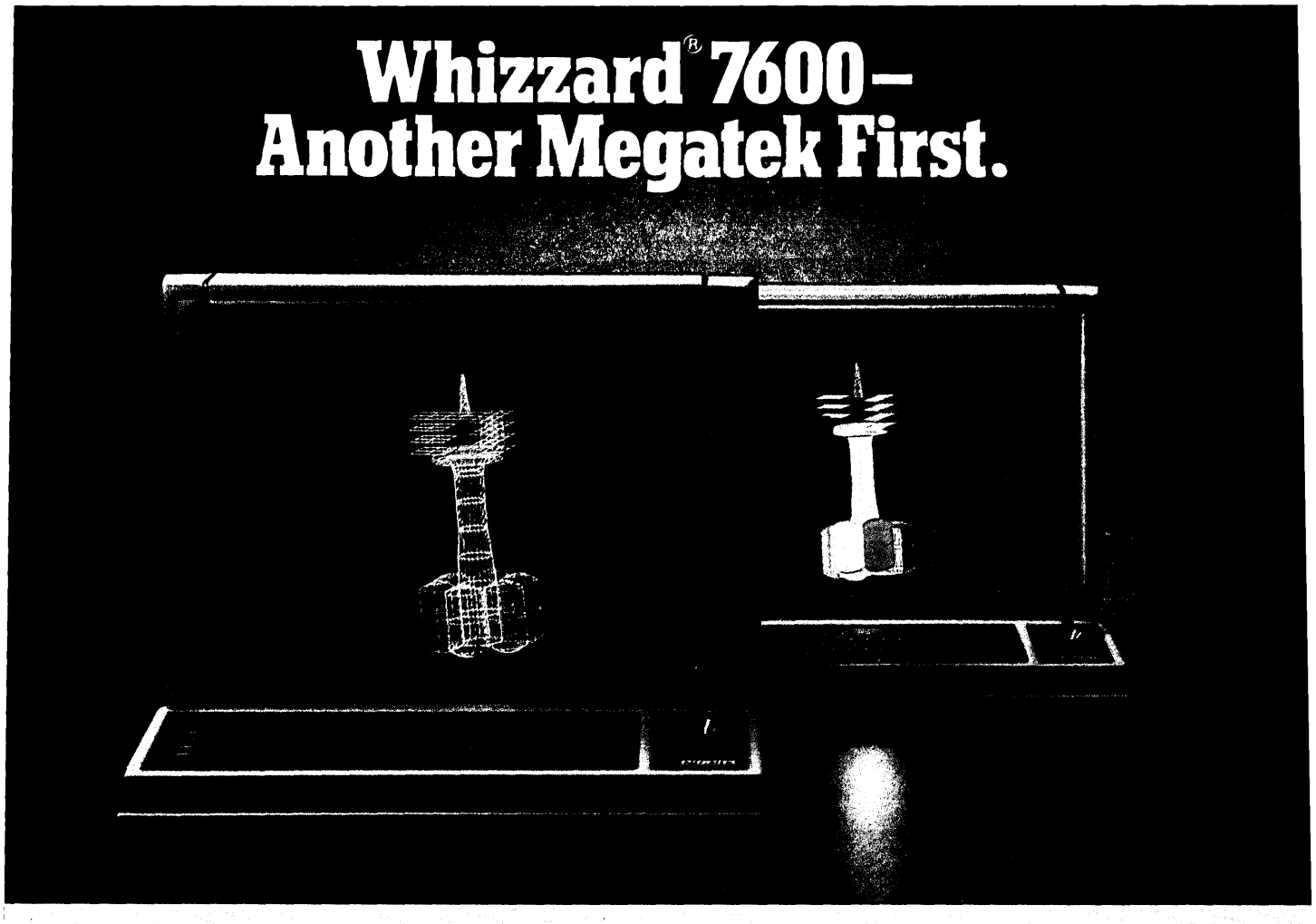
5440 Patrick Henry Drive
Santa Clara, CA 95050
(408) 988-3472

Dysan Corp. reached two milestones during 1981. The company made its first initial public offering and then broke the $100 million barrier in sales. Sales for 1981 reached $104.2 million, up 66% from 1980. Earnings didn't increase at such a pace, and were only up when compared to the 1980 adjusted figure (without the extraordinary gain from a one-time land sale).

The company is aware that its breaking the $100 million mark means more attention must be paid to organization, control, and communications aspects of the business. There's little doubt that investors think that the company is up to that challenge. On Jan. 27, 1981, Dysan made its initial public offering of $15 million in common shares. Then in December, Dysan tapped the market again for another $45 million. This is quite a feat, as our stock price table on page 122 shows, because many well-known and more profitable companies had stock price declines. (Dysan isn't included on the table because it wasn't a public company on Jan. 4, 1981.)

Dysan had 6,500 customers during 1981, with 75% of its business going to the oem market. Storage Technology is the larg-

Whizzard® 7600– Another Megatek First.



Megatek has pioneered dynamic interactive refresh graphics systems for years. Ten to be exact. Our Whizzard 5000 was the first advanced high-quality vector stroke generator. The 7000 modular, high-performance 3-D stroke system followed. Then, the 7250 dynamic, high-speed color raster system and 7290 system, which combined stroke and raster workstations powered by one Megatek Graphics Engine.™ All industry firsts.

Local intelligence

Now, Whizzard 7600. Another first. A new color graphics system with a powerful, user-programmable 16-bit 8086 microprocessor in a local intelligent front-end module. 7600 gives you a dramatic increase in intelligence. Four user tasks—structuring primitives, running applications subroutines or system peripherals—can be easily and simultaneously handled.

Real-time 3-D object rotation

The 7600 offers many other new innovations. Totally interactive real-time rotation of 3-D objects in 16 of 4096 available colors. Three-dimensional surfaces of up to 600 sides can be filled instantly. And, a 3-D surface processor comes with the system while a floating point processor can be added as needed. Scaling, clipping, 2-D and 3-D rotations are easy. You can choose either 4096^2 vector refresh or 512^2 or 1024^2 raster resolutions.

Offloading the host

What's more, this power and increased intelligence actually reduces drain on the host computer. That's because local intelligence and dedicated processors perform all calculations for complex transformations. Local intelligence also manages display lists, event queues and peripheral interaction, further freeing up your computer. Communication between the CPU and the 7600, up to 1000 feet, is by high-speed parallel data transfer. For greater distances, the 7600 is equipped with two standard RS232 interfaces.

Whizzard 7600. Latest advance in color graphics systems from Megatek where "firsts" have been a habit for years. For details, call or write Megatek Corporation, 3985 Sorrento Valley Blvd., San Diego, CA 92121 or (714) 455-5590. TWX 910-337-1270. MEGATEK, S.A., Avenue du Tribunal Federal, 34, CH-1000 Lausanne, Switzerland. Telephone: 41/21/207055. TELEX: 25037 MEGA CH.

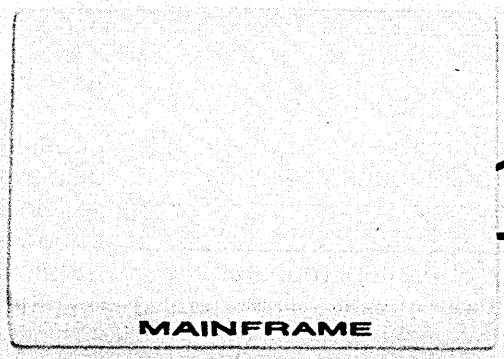
MEGATEK® CORPORATION
UNITED TELECOM COMPUTER GROUP

Data courtesy of PDA/PATRAN-G

See us at N.C.C., Booth #4012 and N.C.G.A.. Booth #502.

CIRCLE 155 ON READER CARD

Networking standards. Nobody keeps your options open like Digital.



By now, everyone understands the need for standard communications protocols. Without them, an electronic Tower of Babel would surely ensue. But there have to be different standards for different networks. A local-area network is different from a wide-area network. A public network is different from a private one.

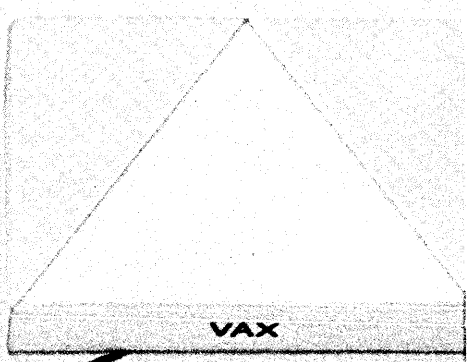
No single universal standard has emerged. Nor is one likely to. There are simply too many diverse networking environments, each fulfilling specific, mutually exclusive needs.

That's why Digital is committed to supporting and, in fact, actively promoting the more important standards now surfacing in the various environments.

Our goal is to offer our customers a range of standards to achieve any combination of networking objectives. And we've been pursuing that goal for many years.

A forward-thinking strategy.

When we first developed our networking architecture, we understood the need for flexibility. We consciously adopted an architectural strategy that would allow our networking software to work freely with a wide range of protocols, including



some that didn't even exist at the time.

The success of that strategy is now becoming apparent. As more vendors enter the networking field, Digital is uniquely positioned to offer compatibility with the emerging protocols. We've gone farther than anyone to assure that your options are open.

X.25 and other public networks.

Digital offers the X.25 protocol for use with public packet-switched networks such as Datapac (Canada), Transpac (France), and PSS (U.K.).

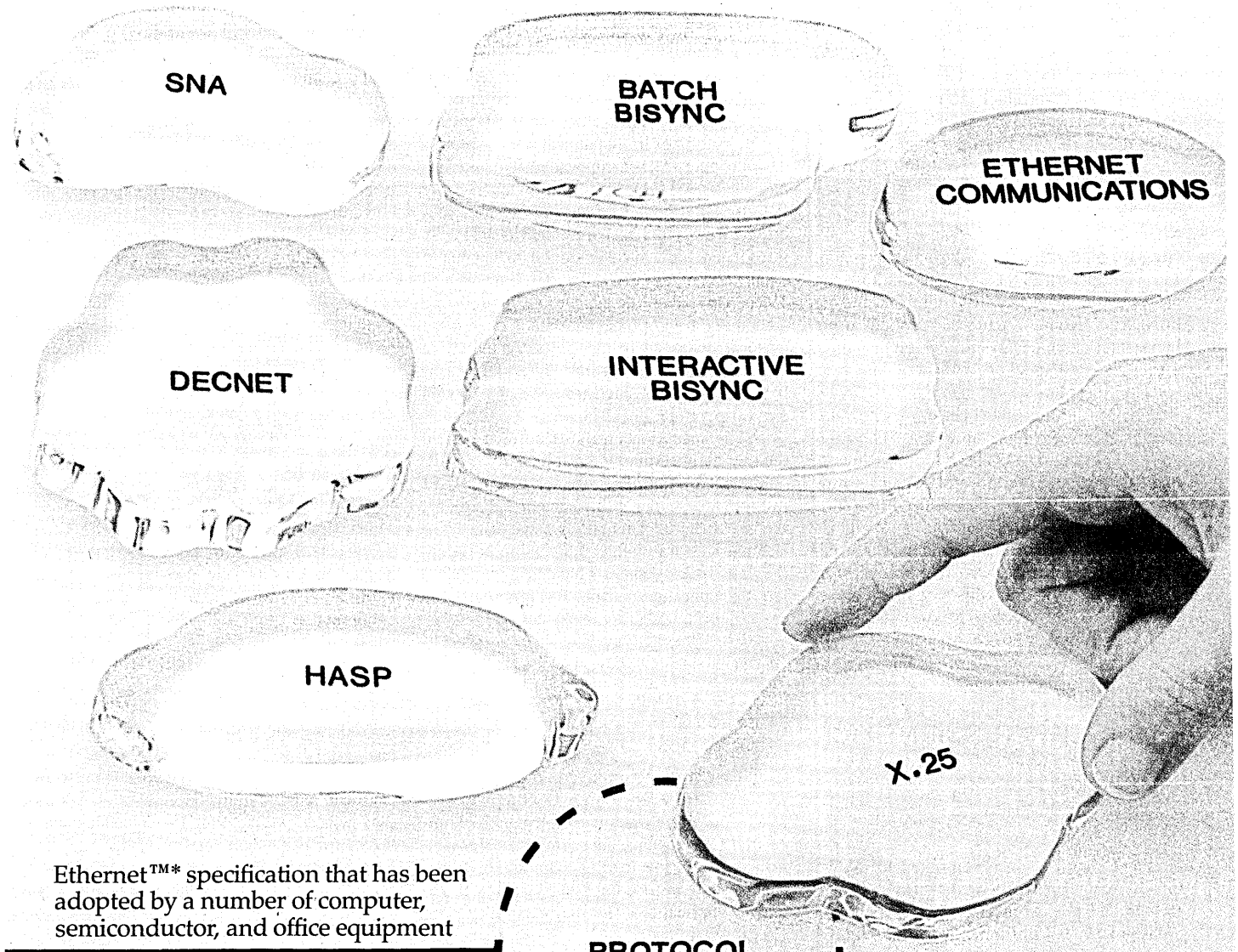
But when used with our computers, X.25 is much more than a simple link. We can provide you with the higher-level protocols that will take your systems beyond mere communications and into the sophisticated functionality that has made us a leader in networking software.

Hierarchical networks.

Even though we prefer to implement more flexible distributed networks, we are amply equipped to support SNA and related mainframe-oriented protocols such as Batch BISYNC, Interactive BISYNC, and HASP.

Local-area networks.

Digital is one of the original sponsors of the



Ethernet™* specification that has been adopted by a number of computer, semiconductor, and office equipment manufacturers. We recognized early on the need for highly reliable local-area networks. We were in on the ground floor of the definition, development and, now, the implementation of the Ethernet specification.

Distributed data processing networks.

DECnet,™ Digital's proprietary networking software, is based on a layered architecture. This is the same architectural approach followed in the model proposed by ISO. Our DECnet offers a wide range of quality networking products, products that allow such sophisticated options as adaptive path routing, down-line loading, and enhanced network management capabilities.

And so on.

We have listed a few of the many standards we are currently supporting. There are more.

But even more important than the number of protocols is the attitude we have toward them. We are determined to help you meet any kind of networking objective. And our capabilities in that regard are as far-reaching as they are farsighted.

So if you're planning a network, don't make the mistake of planning just for the present. Talk to the people who can meet your current needs and still keep your options open for the future. Talk to us.

Digital Equipment Corporation, 129 Parker Street, Maynard, MA 01754. In Europe: 12 av. des Morgines, 1213 Petit-Lancy/Geneva. In Canada: Digital Equipment of Canada, Ltd.

*Ethernet is a trademark of Xerox Corporation.

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digital

We change the way the world thinks.

est customer, accounting for more than 15% of Dysan's sales. During 1981, the company added 13 new sales offices in the U.S. and one in Paris.

The Dysan products command a premium price in many cases, which the company attributes to its superior quality and in some instances to unique features. A big contributor to the acceptance of Dysan's offerings is the company's family of lubricant coatings for media. For instance, Dysan's floppy diskettes are made of coated plastic blanks from 3M (a competitor in the end-user market), the jackets come from Hoechst chemicals and the lines from Kendall. But the product users know the label of Dysan, which has burnished, coated, packaged, tested, and then sold the diskettes.

Joint ventures have been a favorite vehicle for Dysan to explore new areas. The company is very proud of its $436,000 investment in Seagate Technology, which is now worth $64 million. Dysan is currently a partner of French Rhône-Poulenc, a chemicals company, in the disk media business. During the year, Dysan increased its ownership of Dastek Corp., the thin-film head manufacturer, from 76% to 100%. This operation has been receiving a lot of Dysan's R&D expenses, and is expected to become a profit center shortly.

74 GERBER SCIENTIFIC, INC.

P.O. Box 305
Hartford, CT 06101
(203) 644-1551

Gerber Scientific, Inc. continued to evolve into a major presence in the growing CAD/CAM industry, posting a 30.6% revenue increase to $101.9 million. Profits affected by inflationary pressures and increased R&D expenses didn't keep pace with revenues, and declined 24% to $4.7 million in calendar 1981.

Through its subsidiaries, Gerber develops and sells turnkey minicomputer systems for the cutting and layout of limp material, drafting, photoplotting, and computer graphics. Since 1980, the company's revenues have increasingly come from its drafting and photoplotting systems.

Gerber's largest subsidiary, the Gerber Scientific Instrument Co. (GSI), which accounted for 32% of revenues in 1981, introduced two new versions of its popular PC-800 series for the design of printed circuit boards. Since it was first introduced in 1980, more than 200 PC-800 systems have been sold. The new PC-800 model 2 offers options in hardware and software designed to make it applicable in any size production environment. The newer model 3 is equipped with a color graphics option. GSI also introduced several other new products, including the AutoPrep 5000, which is aimed at the graphic arts industry. The AutoPrep 5000 automates the preparation of film masks, usually a manual job requiring skilled labor; other new products include the model 41 Photoplotter, and the PMS-7000 Plot Management System that allows companies to control multiple drafting systems from a single command center.

Gerber has felt the impact of the recession most severely in its Gerber Garment Technology (GGT) subsidiary, which sells the GERBERcutter, a computer controlled system for the cutting of limp material. Once solely a CAM product, Gerber upgraded it to a complete CAD/CAM turnkey system with the AM-1 Pattern Grading and Marking System (acquired from Hughes Aircraft). In 1981 GGT introduced the AM-5, designed to appeal to small- and medium-sized apparel makers. In 1981, GGT also introduced the CP-600, a standalone microprocessor data management system, designed to cut costs by matching marker combinations with the best fabric utilization. GGT accounted for 28% of Gerber's overall revenues in 1981.

The recession and stiff competition in the interactive computer graphics field resulted in net operating losses of just over $1 million for Gerber's third major subsidiary, Gerber Systems Technology, Inc. (GST). In February, GST announced a personnel reduction and management changes designed to reduce operating costs. GST markets the IDS-80 computer graphics systems.

75 CRAY RESEARCH INC.

608 2nd Avenue
Minneapolis, MN 55402
(613) 333-5889

Cray Research Inc. enjoyed an extraordinarily successful year, selling 13 computer systems (four more than in 1980), which resulted in a 67% revenue increase to $101.7 million. Cray is the leading supplier of large-scale, high-speed computer systems for scientific applications. Its major competitor is Control Data Corp., although others, including some Japanese firms, are also targeting the supercomputer market.

In November, the company made two announcements with significant long-range implications. One was of a breakthrough in the development of the Cray-2. The other was that Seymour Cray was resigning as chairman to spend full time on research.

The breakthrough involves the cooling system in the Cray-2—a major problem in big computers with a large amount of circuitry. The Cray-2 will be immersed in a bath of clear, inert liquid that will efficiently absorb the heat and also allow a dense packaging of circuits in a three-dimensional configuration. Thus the Cray-2 will be only one tenth the size of the Cray-1, standing about two feet high by three feet long. Design changes will also allow the connecting wires to be shorter: 16 inches, compared to four feet in the Cray-1. The Cray-2 is slated to run six to 12 times faster than any computer system now available, with a 32 million word memory (the Cray-1 has a 4 million word memory) and a four nanosecond cycle time (compared to 12.5 in the Cray-1).

The Cray-2 will use 16-gate chips custom-made by Fairchild Semiconductor, rather than VLSI chips designed at Cray's research lab in Boulder, Colo.

In March, Cray announced it was closing the Boulder facility and moving the VLSI research to its Chippewa Falls lab. As a result of the change, Stuart Patterson, head of the Boulder division, resigned.

Cray himself will now act as an independent contractor on a royalty-free basis at least through 1985 (when the Cray-2 will be finished). Cray Research also has the first opportunity to fund new projects Cray may pursue. Succeeding Cray as chairman is president and chief executive officer John A. Rollwagen.

In 1981 Cray Research more than doubled its research and development expenditures to $16.3 million. The number of employees crossed the 1,000 mark to 1,079.

76 MANNESMANN-TALLY

8301 South 180th Street
Kent, WA 98031
(206) 251-5500

Mannesmann-Tally, formed in 1979 when Tally, a U.S. printer maker, was acquired by Mannesmann A.G., the West German multinational, and moved up in the low-cost printer market, posting a 17.6% revenue gain to $100 million.

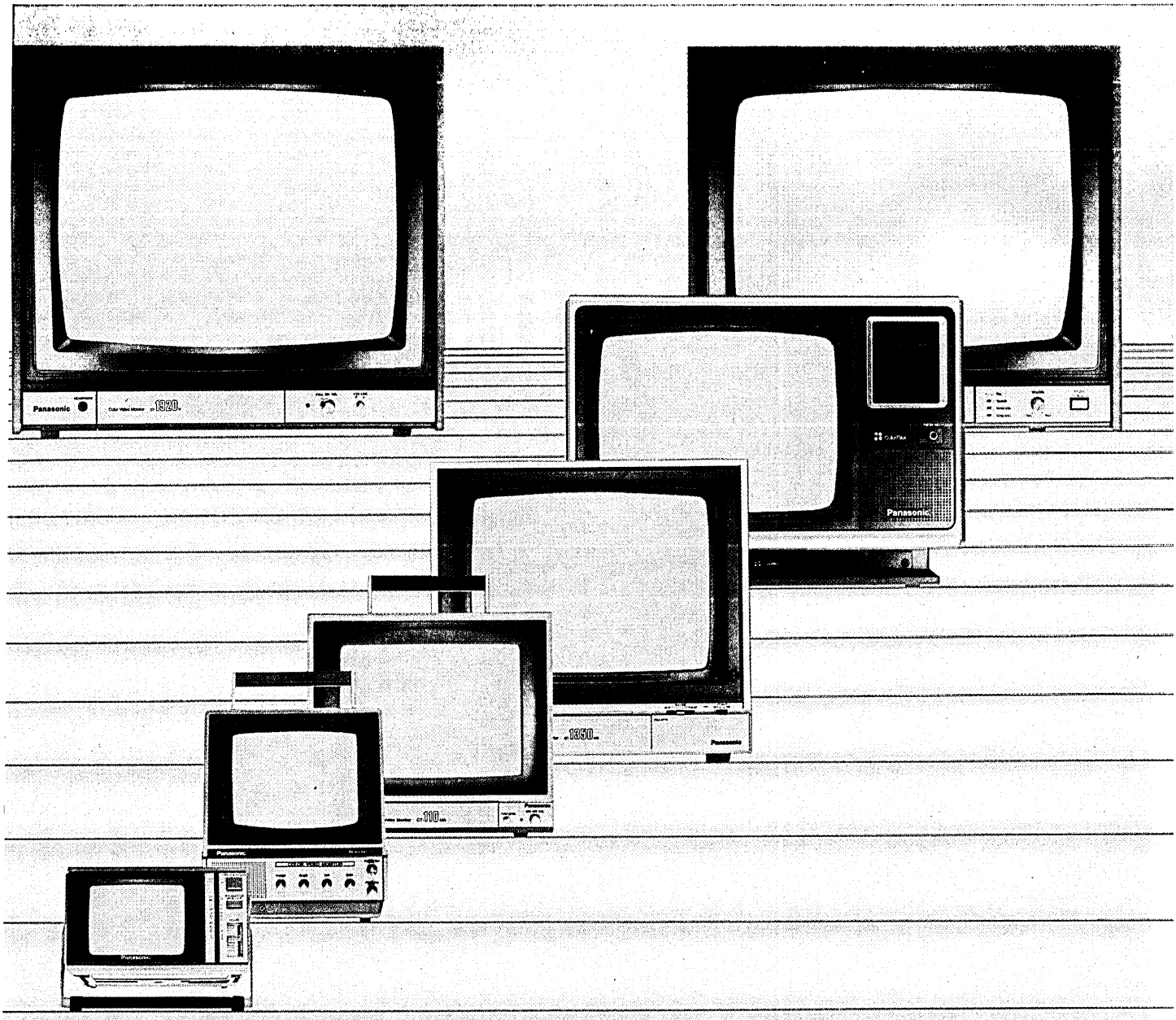
MT's main product is the MT-1000 medium-speed dot matrix printer. In 1981 enhancements were added, increasing its speed to 200cps from 160cps; new features were also added for compressed print and improved paper handling. In 1981, MT also introduced its new multifunction MT-1800 matrix printer which operates at 200cps and 50cps for near-letter-quality printing.

The MT-1000 printers, together with the MT-1612 Teleprinter, which was also upgraded to 200cps, account for about 40% of MT's sales.

MT's other major product, the M-132, a 132-column dot matrix printer that operates at 200cps and sells heavily in Europe, was upgraded last year with bar code, large character, and split form options for specialty applications in the U.S.

MT has also introduced two new families of dot matrix printers, the MT-100 and MT-400. Shipments have already begun in Europe of the MT-100, an 80-column, 160cps printer for both dp and office use. The other is the MT-400, with speeds of 200, 400, and 800 cps (the 800 will be available at the end of the year) and will also have graphics and four-color capability. MT is also introducing a new family of line printers with speeds of 300, 600, and 900 lpm, designed for office use and featuring the option of using carbon ribbon or nylon ribbon. MT is gradually phasing out its earlier families of line printer—the T-2000 (which is near the end of its product life) and the T-3000 (which will still be offered for several more years).

MT is supplying Paradyne with printers for its contract with the Social Security Administration to install 1,850 terminal systems. Other customers include Univac and Siemens. MT sales are split evenly between Europe and the U.S. The company is predicting future growth at 35% to 40% annually.



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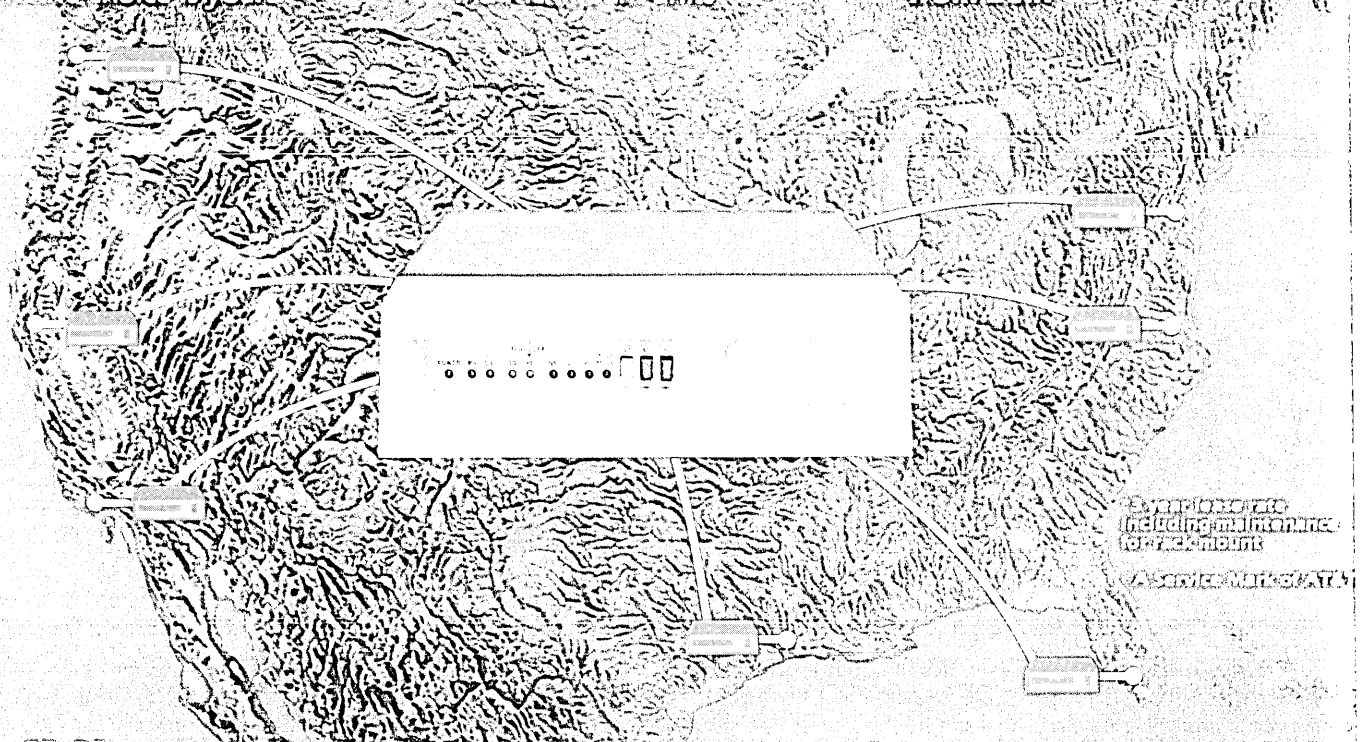

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77 NEC INFORMATION SYSTEMS, INC.

5 Militia Drive
Lexington, MA 02173
(617) 862-3120

NEC Information Systems is the five-year-old subsidiary of Nippon Electric Co. Ltd., a $5 billion supplier of communications, computer, and electronic component products and one of the world's largest computer manufacturers.

NEC Information Systems markets small business and personal computers through dealers located throughout North America. The company also sells peripheral products such as printers to data processing and word processing system suppliers.

In 1981 the company's revenues increased by 25% to $100 million from $80 million in 1980. Some of this growth was fueled by a number of new product introductions. The company introduced a high-end system for its Astra series of small business computers as well as an enhanced operating system, and increased main memory for the five-machine family.

Also announced in 1981 was the PC-8000, a personal computer aimed at professional users that costs $1,600. The system, which is aimed at users in both small businesses and large corporations, is being sold through Sears as well as other dealers.

In the peripherals area, the company introduced a new family of 8-inch Winchester disk drives, the D2200 series, and Spinwriter 3500 medium-speed character printers, plus printer ribbons and five new thimble fonts.

Employment at the company was up 66% during the year to 250 employees.

78 NATIONAL DATA CORPORATION

One National Data Plaza
Corporate Square
Atlanta, GA 30329
(404) 329-8509

National Data made four acquisitions during 1981, which moved its revenues up from $53 million in 1980 to over $96 million. This moved the company from 94 on the Top 100 list in 1980 to 78 in 1981. One merger was the pooling of interest with Rapidata, which had revenues of about $25 million. The restated financial results of the merged companies produced a revenue growth of 19.6% to $97.9 million.

NDC operates a nationwide real-time information processing system with cash management and management information services, credit card and merchandising services, and a fast-growing health care service branch. Facilities management services consist mainly of a contract with Atlantic Richfield Co. under which NDC provides credit card and collection services for the gas company. With the Rapidata merger, timesharing and remote computing services expanded to graphics database design and management, financial analysis, and other value-added timesharing services, plus telephone industry applications and additional public and private databases.

NDC also acquired Information Sciences Corp. (a timesharing company) as well as Applied Logic (Division of International Computer Services, Inc.) and Proheca, ;nc.

several new products were unveiled in 1981, including datalink, the cash management exchange, merchandise response and fulfillment services, and national electronic transaction systems)nets). major new customers added in 1981 were the new york telephone company and the pierson, heldring and pierson bank)of the netherlands).

79 COMMERCE CLEARING HOUSE, INC.

4025 West Peterson Avenue
Chicago, IL 60646
(312) 583-8500

Known principally as a publisher of current information on tax and business legislation (including micropublishing), CCH derives about 34% of its revenues from its dp services. While total corporate revenues rose 22.9% in 1981, dp revenues fared better, increasing 36.6% to reach $92 million.

Dp operating subsidiaries include CCH Computax, Inc., CCH Computax Systems, Inc., CT Law Technology, Inc., and CCH Computax Canada Inc. (which accounted for $28.7 million worth of dp revenues last year). CCT Computax is a computer processor of tax returns, calculating and printing returns from data submitted by professional tax preparers. CCH Computax Systems produces turnkey minicomputer software systems for accountants, and operates the previously acquired Professional Software Consultants, Inc. of Virginia and RJ Software Systems, Inc. of California. CT Law Technology provides law firms with computerized management of billing and general ledger services.

During 1981, CCH offered a new System 34 on-line processing service for customers to test on a limited basis, with further testing planned for 1982.

The firm repurchased more than 3.5 million shares of its common stock for $58.6 million in 1981, and remains a favorite of analysts. Analysts expect continued steady growth of CCH services because of the increasing demand for automated tax preparation and planning applications from both accounting and legal users.

80 INTERGRAPH CORPORATION

One Madison Industrial Park
Huntsville, AL 35807
(205) 772-2000

Intergraph, formerly known as M&S Computing, continues to enjoy rapid growth. Its 1981 revenues rose 61% to $91.1 million while corporate profits were up over 83% to $8.3 million. A third of the total revenues comes from foreign markets, which during 1981 were aided by a new headquarters for the firm's Brazilian subsidiary and a new distribution agreement with Mutoh Industry, Ltd., which will serve Japan and Korea.

Intergraph designs, manufactures, markets, and services interactive computer graphics systems for CAD/CAM. The systems are used primarily in architecture, engineering, and construction (AEC applications) and mapping and earth sciences (MES applications). AEC applications include plant design, drafting, and data management for complex industrial projects; MES applications encompass land-use and resource management, cartographics, and special processing and civil engineering for the petroleum industry. A typical Intergraph system may include a computer, a file processor, microprocessor, tailored application packages, and dual-screen workstations.

New offerings in 1982 included a color graphics display system, a lower-priced entry-level interactive graphics system, and a VAX-based interactive graphics system. Products are marketed to end users in the U.S. by a direct sales force and to foreign users through the wholly owned subsidiaries.

The company's first public stock offering in April 1981 resulted in sales of 1.5 million shares at $18 each. Proceeds were earmarked for capital improvements and equipment purchases (including a new manufacturing facility at headquarters for reduction of short-term debt), and for increase of working capital. For the year, R&D expenditures nearly doubled to $12 million, and the number of employees increased two thirds.

81 DIEBOLD, INC.

818 Mulberry Road S.E.
Canton, OH 44711
(216) 489-4000

Diebold, Inc., a leading manufacturer of bank security and automatic banking teller systems, had total revenues of $385.9 million, an 11.2% increase over the previous year. While most of its revenues are derived from its bank security equipment, the sale of its automatic teller machines (ATMs)—from freestanding units to teller line stations—is becoming increasingly important.

The growth of the ATM market has increased about 30% in the last year. DATAMATION estimates Diebold's ATM revenues at $90 million in 1981. Diebold estimates that if this growth continues, the number of financial institutions offering ATM services will more than double by 1984, and the company expects to enjoy a large share of that market. Diebold first introduced its ATM offering in 1973; the TABS 500 Automatic Banking System, which enables banks to offer normal teller service on a seven-day, 24-hour basis. To supplement the 500, which was used for off-line operations, the TABS 610 for on-line operations was introduced in 1976, together with the 550 for on/off-line operations. Diebold's on-line systems interface with IBM, Burroughs, NCR, and Honeywell equipment.

Diebold expects several markets to have significant growth potential. The company is implementing several in-lobby automated

teller lines that consist of a combination of human tellers and TABS units installed as teller stations. In addition, part of the installation is a TABS Teller Assist, a high-speed cash handling system, which the company claims has increased productivity 50% in testing.

Diebold also anticipates profits from networking, and claims that by the end of 1982, 34% of the institutions currently supporting a proprietary system (for their own customers only) will move to shared networks; 61% of those that have already made the transition did so in the past two years. Diebold provides software, hardware, and services to both proprietary and shared systems.

Research and Development expenditures were up 14% in 1981 to $4.36 million, and construction was begun on a $3.5 million expansion of a facility that produces TABS.

The devices that will be used to provide consumer services in the future, according to Diebold, will evolve from the equipment, software, and capabilities offered today. The company looks forward to a large share of that market as well.

82 QUOTRON SYSTEMS INC.

5454 Beethoven Street
Los Angeles, CA 90066
(213) 827-4600

Quotron experienced another year of growth with a hefty 38% increase in revenues to $88.1 million. Net income was up 40% to $12.5 million. Quotron now serves over 4,000 customer locations with its Quotron 800 Financial Information Service. Merrill Lynch, its largest customer, accounted for $17.4 million of 1981 revenues.

The Quotron 800 system—the company's main product—provides market data, news, and statistical analysis on terminals in customer offices, supported by Quotron's nationwide communications network. Quotron also offers customized services for trading, money management, and investment counseling. Three new services introduced since 1980 include a 90-day news retrieval service, a customer account retrieval service, and online storage of subscribers' proprietary information. In 1981, all of these optional services combined accounted for 42% of the revenues Quotron derives from all its financial information services, making them a close rival to the traditional market data services that virtually all its customers subscribe to.

In 1981, Quotron installed 12 preproduction units of its new Quotron 901 computer, which has increased computing and communications abilities. The company also began work on its Advanced Product Line, a new system that will add office automation features and microprocessor power to current services.

Quotron reported progress at Insurnet, its joint venture with American Information Development Inc. and the Continental Corp., to provide services to independent insurance agents. Insurnet now has a staff of 200 and centers have opened in 18 cities to provide Insurnet services.

In July, Quotron signed an agreement with the Associated Press to market the Quotron 800 abroad. At year-end a facility was established in the London AP office. A 35% increase in AT&T's rates in May and June—much greater than expected—was offset by consolidation of many costly communications lines into a few high-speed ones, and by a 9% increase in rates Quotron charges subscribers.

In January of this year Quotron replaced a $10 million line of credit with a three-year $26 million revolving credit agreement with three banks.

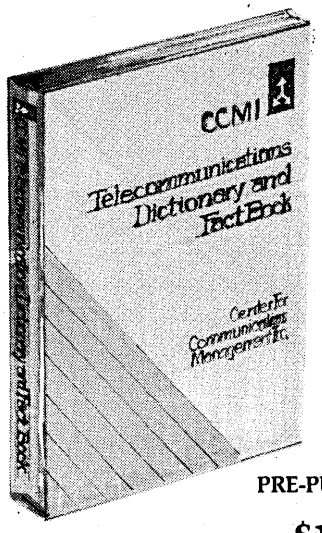
83 MODULAR COMPUTER SYSTEMS, INC.

1650 West McNab Road
Fort Lauderdale, FL 33309
(305) 974-1380

Modular Computer Systems, Inc. (Modcomp) had another disappointing year. Revenues increased only 7.5% to $87.2 million, with income from maintenance and other customer services responsible for more than two thirds of the increase. Earnings were down 68% to $1.2 million.

Modcomp makes the Classic series of high-speed computers for real-time operating situations, such as process control. Introduced in 1980, Classic computers are generally used in industrial plants and research

Telecommunications Dictionary and Fact Book



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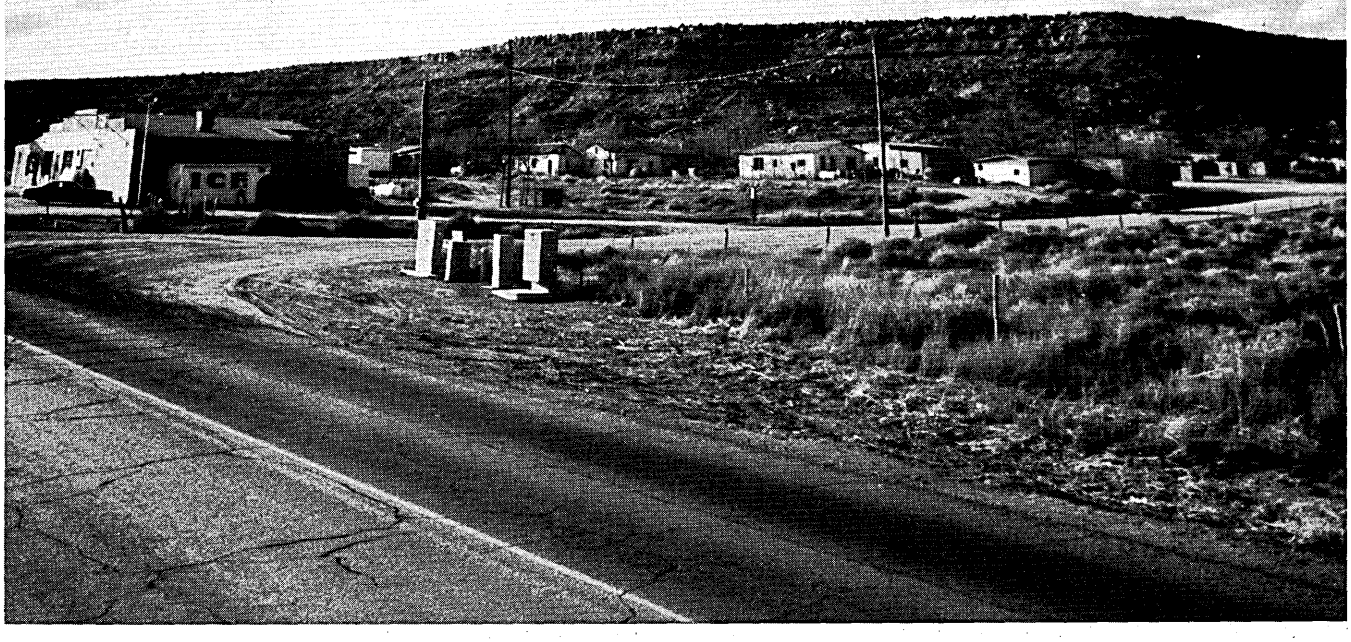

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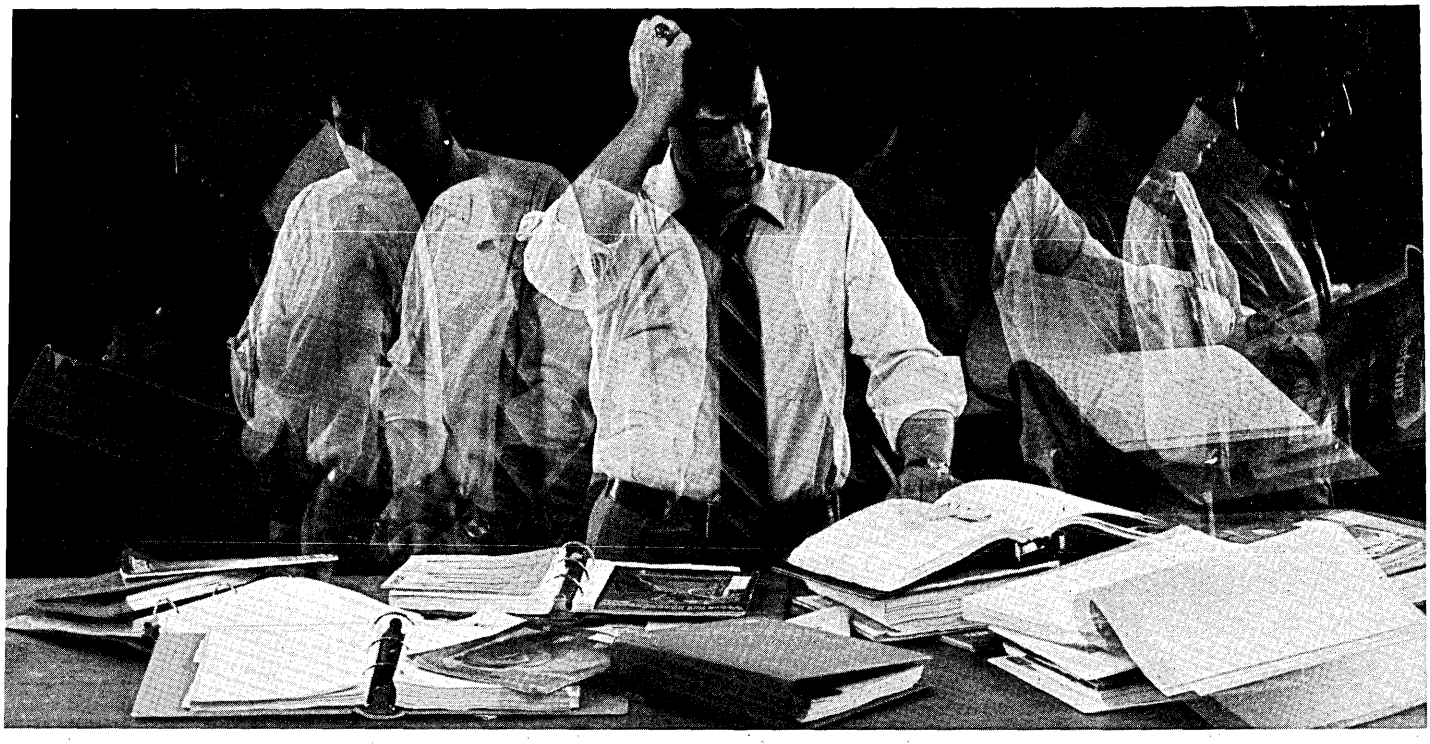

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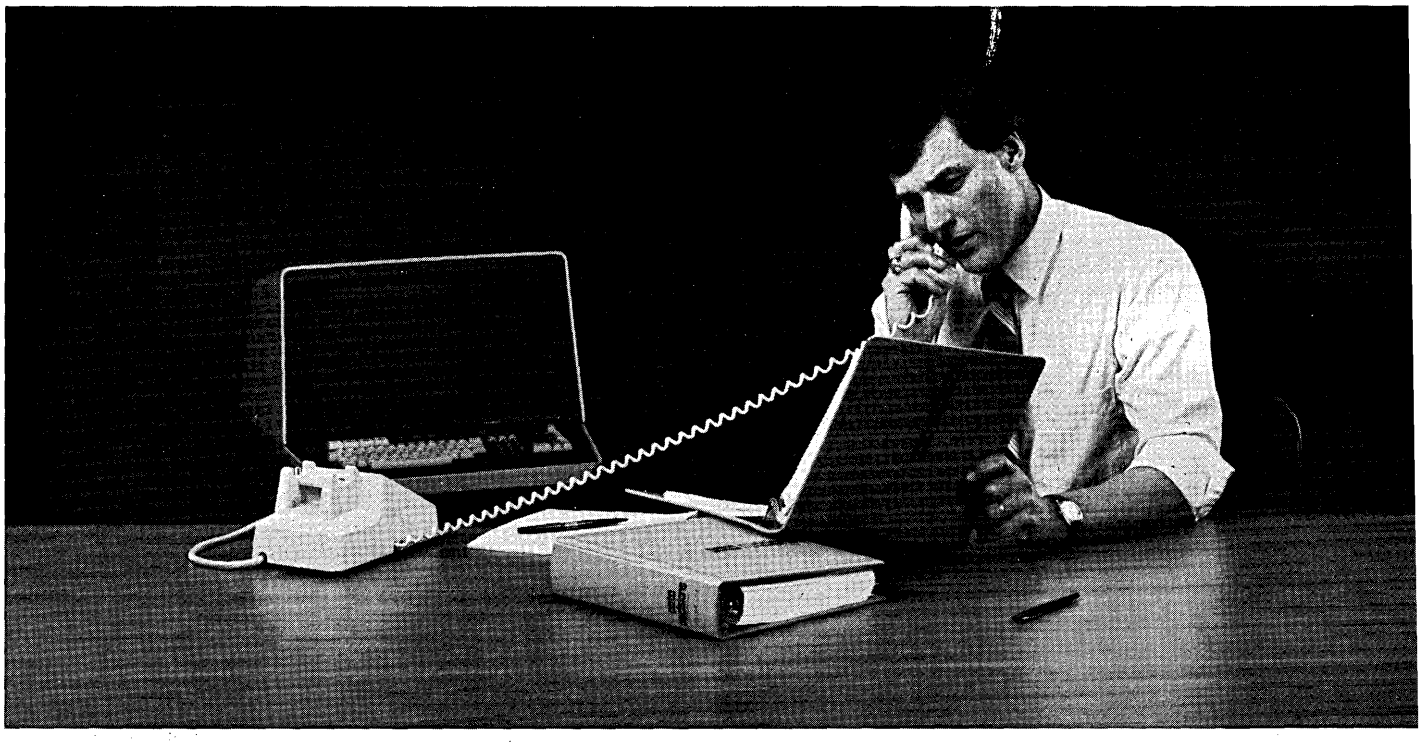

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labs, although Modcomp has recently shown growth in traditional business applications. It now has about 400 active customer accounts. The company predicted little improvement in its financial picture in 1982, in part because of the extensive resources it is devoting to its next line of equipment.

In February 1982, Modcomp acquired rights to certain real-time computer architecture and technology developed by Control Data Corp. for the military and aerospace industries. Modcomp also signed an agreement to receive technical consulting from CDC and license some of its software. According to Modcomp, the new CDC technology will provide a path for its customers to migrate to a 32-bit computer. By acquiring the technology from CDC, Modcomp can concentrate on making the 32-bit unit into a commercial system with a friendly user interface, state-of-the-art networking, intelligent remote units, and a variety of software packages.

The acquisition of the CDC technology was part of Modcomp's takeover of Continuous Computer Corp. Benjamin L. Harrison and John Griffith, founders of CCC, joined Modcomp as senior vp for marketing and business development and director of business development, respectively. In August, Alexander Giles, who joined the company in 1976, resigned as chairman and ceo. His duties were assumed by Gabriel A. Rosica, president and chief operating officer.

In May 1981, the SEC concluded a four-year investigation into the preparation of Modcomp's 1975 and 1976 financial statements. Modcomp had already restated its financial information for those years. The investigation ended when the SEC conducted an administrative proceeding and required Modcomp to file a Form 8-K, detailing the steps it had taken to prevent any further misstatement of financial information. To settle the matter, certain Modcomp employees, both past and present, consented to the issuance of an injunction without either admitting or denying the facts as alleged.

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CIRCLE 166 ON READER CARD

84 COMSHARE, INC.

3001 South State Street
Ann Arbor, MI 48104
(313) 994-4800

After stellar 100% revenue growth in 1979 and a 31% increase in 1980, this international services leader had a 5.5% decrease in revenues to $82.2 million in 1981. The weaker than expected showing was blamed on high inflation rates and management's decision to continue costly development programs. Other problems were the economic pictures in the U.S. and in the United Kingdom—Comshare's primary markets—and the firm's income tax processing services division, which drained profits until it was sold in midyear. In November, Comshare moved forward with the acquisition of Target Software, an Atlanta-based microcomputer software development and marketing firm.

New products and services continued Comshare's strategic commitment to professional markets as opposed to industrial or scientific applications. Half the company's revenues come from decision support system products. Offerings unveiled in 1981 were Orion, a new product evaluation tool for marketing managers; Audiamate, an auditing aid for accountants; Execuchart, color computer graphics for business analysis and reporting; and Microshare, a microcomputer system.

Of Comshare's 1981 revenues, 39% came from foreign operations. Comshare's service organization serves over 100 cities in the U.S. and in Europe through the Telegrid Communications Network. Users not near a Telegrid city can also access the network over GTE/Telenet, which expands Comshare's accessibility by more than 150 cities in 22 countries.

85 MSA, INC.

(Management Science America, Inc.)
3445 Peachtree Road N.E.
Atlanta, GA 30326
(404) 262-2376

MSA went public in April 1981 with an initial offering of 1.65 million shares which brought in some $16 million in net proceeds. The company develops, markets, and supports an integrated line of standard applications software packages, and has licensed approximately 6,500 packages for use by a broad range of customers, including manufacturers, distributors, banks, insurance firms, health care and educational institutions, and

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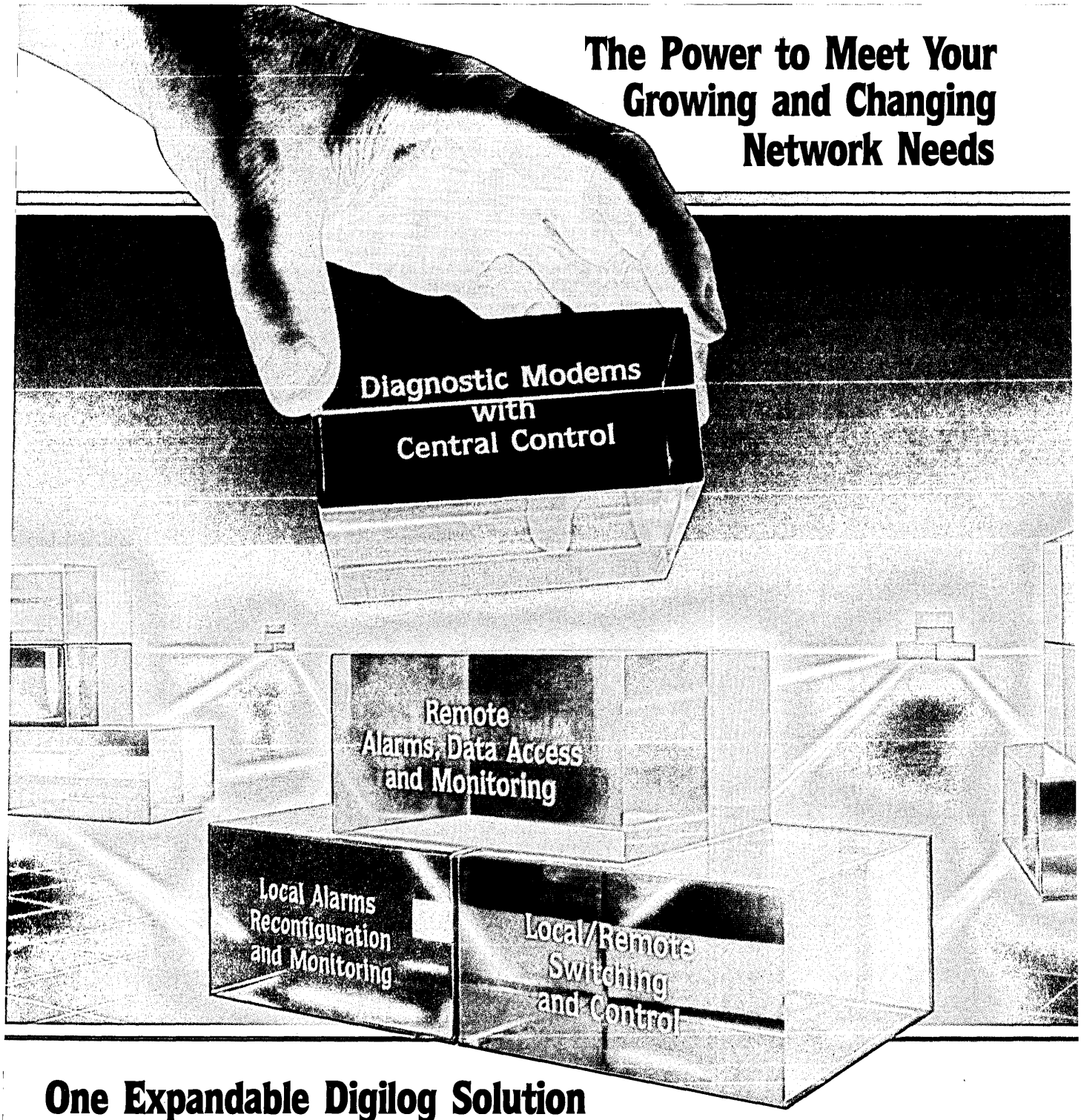

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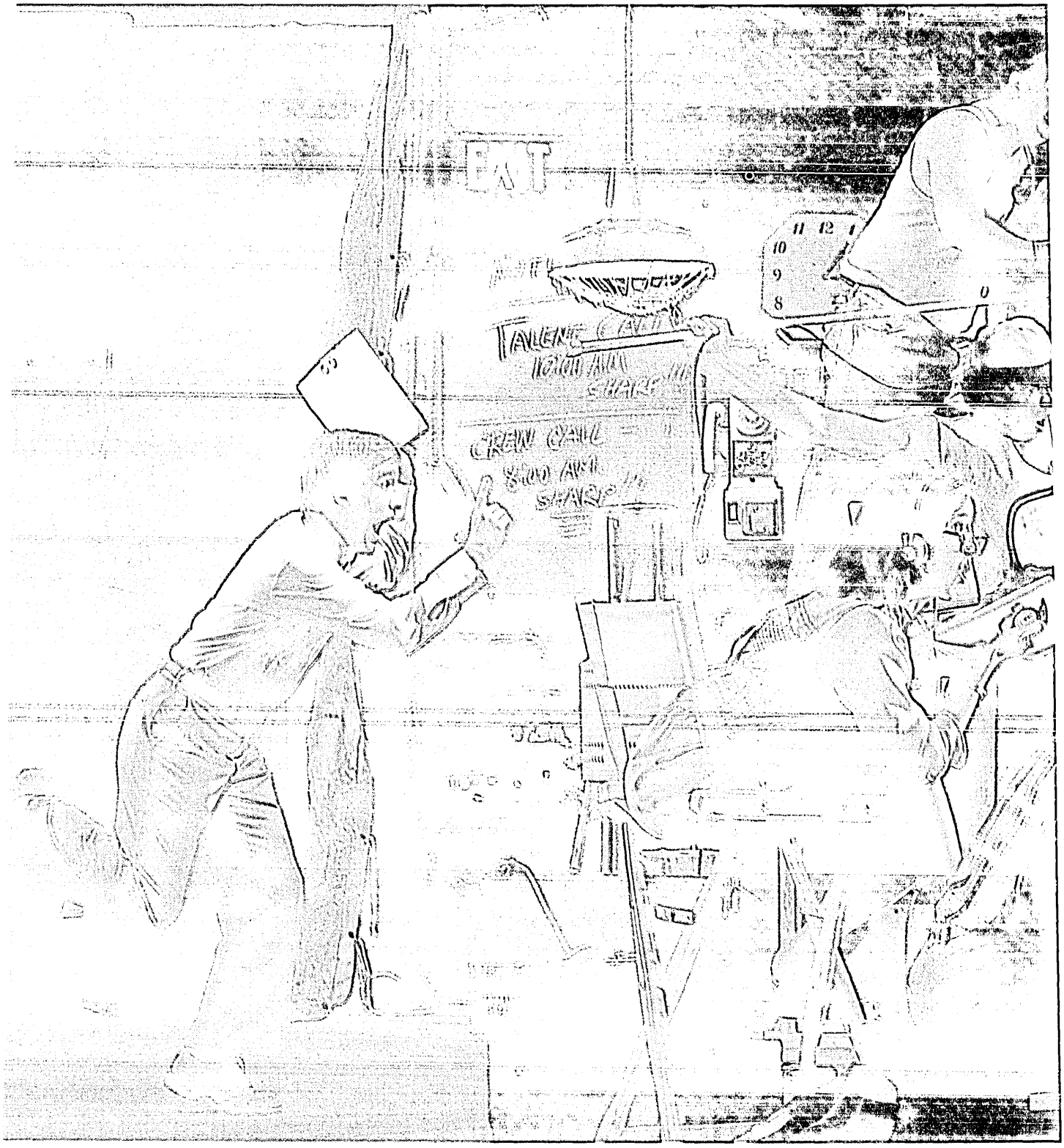

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6303 Ivy Lane
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CIRCLE 169 ON READER CARD

government units. MSA products are supported on IBM medium- and large-scale systems and a number of other leading mainframes. The company's nine basic program packages, which perform such standard business functions as accounts receivable, payroll, and forecasting, are directed to two functional areas—financial management and human resources. 1981 was a record year for the company—revenues increased 36% to $73.1 million (with net income of $5.5 million or 83 cents per share, up 88% over 1980). This performance follows a doubling of sales in the previous three years and a tripling of earnings in 1981. Industry observers think MSA's sales could top $500 million by 1986 if the company continues to pursue acquisitions and expand its product line.

Two major acquisitions took place in 1981. MSA acquired Peachtree Software, Inc., which provides financial application and word processing software for microcomputers and was chosen by IBM as a supplier of software for its new personal computer. The other acquisition, completed this year, was Xerox Corp.'s Arista Manufacturing Systems division, a struggling vendor of IBM-oriented manufacturing software packages. MSA plans to beef up marketing and expand Arista's product line. New product releases for 1981 included several interactive accounting and planning packages and System 43, a business application software package for the new IBM 4321 and the SSX operating system for IBM 4321/4331 computers.

MSA operates four U.S. regional offices, district offices in several major U.S. cities, and several Canadian and overseas facilities, totaling 23 sales offices around the world. In 1981 MSA launched an aggressive advertising campaign through major metropolitan newspapers to heighten its visibility.

86 COMPUTER AUTOMATION INC.

4890 Sterling Drive
Boulder, CO 80301
(303) 444-8748

Computer Automation's poor showing in the second half of 1980 continued through 1981. Revenues for this manufacturer of diversified minicomputer products went down from $81.3 million in 1980 to $71.8 million, an 11% decrease. The company attributes this to price competition and, as in the previous year, to the recessionary influences on order rates. CA managed to reduce its long-term bank debt, from $10.4 million at the end of 1980 to $4 million as of last September.

The company, which derives half of its revenues from oem sales and 28% from foreign sources, has three divisions. At the heart of its operations is the Naked Mini Division, which produces and markets a full line of minicomputers from board-level micros and entry-level minis to large-scale integrated systems.

The Commercial Systems Division offers the SyFA distributed data processing system (which allows users to utilize up to 24 remote terminals connected to a minicomputer); and the Industrial Products Division produces minicomputer-based automatic testing equipment (ATE). Of CA's shipments, 65% are minicomputers, 20% peripherals, and 15% software.

A major factor contributing to the company's loss of market share in the Naked Mini Division has been the competitiveness of the market. Naked Mini, which has competed at the low-end mini market, has not introduced a new product since the late 1970s, and its minis are not up-to-date technologically. The company plans to rectify this with the introduction late this year of a new family of micros as well as a new line of minis.

Sales in both the Commercial Systems Division and the Industrial Products Division at least equaled 1980 sales (SyFA sales were particularly strong in England), but orders for ATE products declined in the last quarter. The ATE division recently introduced the Marathon Testsharing System, however, designed to automate a broad spectrum of testing procedures for manufacturers of electronic equipment, which CA hopes will increase the division's sales.

CA's corporate headquarters were moved from Irvine, Calif., to Boulder, Colo., in an effort to combat recruitment difficulties due to a tight housing market in California. The company maintains a research center in Austin, Texas. R&D expenditures for 1981 were $7.25 million, 5% higher than in the previous year.

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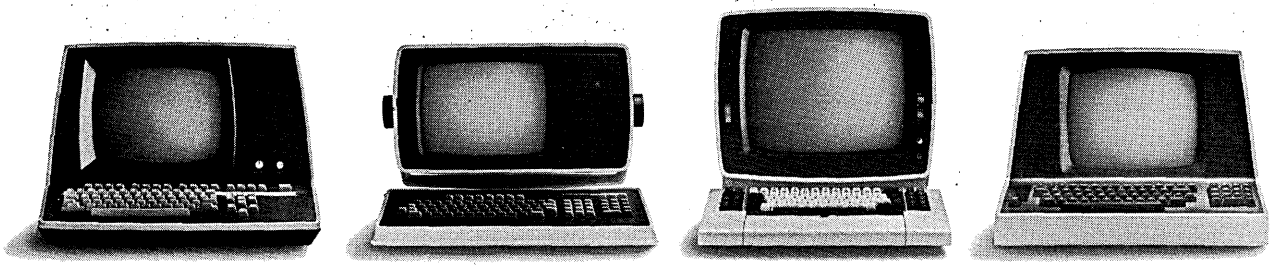

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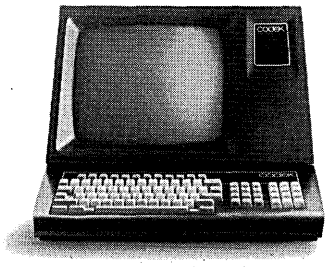

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87 VERBATIM CORPORATION

323 Soquel Way
Sunnyvale, CA 94086
(408) 245-4400

Verbatim Corp., a manufacturer of magnetic data storage media, increased its revenues by 41.7% to $68.6 million. Though it had only a modest increase over the previous year, the company seems to have bounced back from a number of problems that adversely affected sales in 1980, among them difficulties in production, problems in materials and product durability, and the discontinuance of its rigid disk program in favor of the development of new flexible media products.

The company—whose markets for flexible disks, data cassettes, and data cartridges are growing more than 40% a year—responded to these problems with a number of changes.

To start the year, Malcolm Northrup (formerly of Rockwell International) was named president and ceo. The Quality and Inspection Departments were both expanded and improved. In addition, all R&D activities were combined into a single group.

These changes were noticed on Wall Street, and, as a result, Verbatim's stock price began to rise. The company took advantage of this increase in September, issuing 350,000 new common shares and then using the proceeds to pay off bank debts. This new offering didn't halt the stock price rise, and Verbatim ended the year trading at $46, placing first on our table on p.122, "The Year of the Bear—The 10 Biggest Winners." (More recently, the company split its outstanding stock 2 for 1, increasing the number of shares outstanding to 5.2 million.)

In the management arena, Henry Fekkes, previously in management marketing positions at IBM and Memorex, was hired as the new senior vp of marketing. To keep on its current course, Verbatim named Charles E. Wilson, formerly of Dysan, as senior vp of operations in January of this year.

The introduction of the higher quality Datalife floppy disk line in the latter part of 1980 generated higher order rates in 1981, and sales of flexible disks accounted for 81% of total sales (13% for data cassettes, 5% for data cartridges).

Verbatim estimates its share of the worldwide market for flexible disks to be about 30%. Its newest product, introduced last September, is a diskette for cleaning magnetic recording heads on 5½-in. and 8-in. diskette drives.

In an effort to reduce expenses, Verbatim decreased R&D expenditures in 1981 by 4% to $2.1 million (4% of sales). Verbatim expects to increase expenditures to 6% of sales within the next three years.

The company, which recently completed the construction of a large manufacturing facility in Ireland, has begun construction of a large plant on a 37-acre site in Charlotte, N.C.

88 CADO SYSTEMS CORPORATION

2771 Toledo Boulevard
Torrance, CA 90503
(213) 320-9660

Cado's total revenues were up 34.7% last year to $68.2 million. While food for 1981, these results follow banner years for net sales increases in 1979 and 1980 (112% and 60%, respectively); 1981 net sales rose 34.5%. The slowing growth rate was attributed to prevailing economic conditions, high interest rates, and a vast increase in available competitive products along with lower than expected sales for Cado's low-end C.A.T. I product line, marketed exclusively through the firm's dealer network. Sales of this line were hindered by Cado's underestimation of the training required to make the dealer network an effective marketing force. Still, Cado increased its installed base in 1981 with the delivery of its 8,500th system (the number is now nearly 10,000).

Cado's C.A.T. turnkey systems are geared for small businesses. All five models package the system processor, the disk drives, and the master terminal electronics in the video display/keyboard unit. The only two hardware elements are the terminal and the printer. The Cado Systems 20/24 and 20/28 incorporate processor and disk storage devices in a separate package.

New for 1981 was the Cado C.A.T. II, a four-port system with a 48KB dynamic processor capable of supporting up to two additional terminals and one printer, or one additional terminal and two printers. The full range of Cado's communications products can be added to this system, which, like the other models, is capable of multitasking.

A variety of vertical applications software was also introduced, including packages for financial modeling, banking, medical practice, property management, publishers' fulfillment, and additional packages for bus companies and grain dealers.

Further software development can be expected from Interactive Management Systems, the Boston software house acquired by Cado in 1981.

89 APPLICON, INC.

(SCHLUMBERGER LTD.)
32 Second Avenue
Burlington, MA 01803
(607) 272-7070

Applicon's revenues in 1981 hit $64 million, up from $54.4 million in 1980. This represents a slowing of growth for the company, which had increased its sales about 50% the year before. Sales contributed $54.4 million to the total, while service and maintenance revenue was $9.6 million. Profits rose slightly, to $4.1 million in 1981 from $3.8 million in 1980.

In January 1982, Applicon was acquired by Schlumberger Ltd., the $6 billion technology conglomerate. It will now be considered part of Schlumberger's Computer Aided Systems division, where its CAD/CAM software will be combined with that of Manufacturing Data Systems, another Schlumberger acquisition. During 1981, Applicon grew to 1,149 employees from 785. About 30% of Applicon's business now comes from overseas.

Applicon's forte is displaying complex physical structures, both planar and solid, on video screens. The display is derived from mathematical depictions of physical reality stored in a computer. Perhaps the must notable work at Applicon has been the company's development of a three-dimensional modeling package that allows users to describe, design, and manipulate solids represented on full-color displays, but revenue comes largely from sales of turnkey graphics systems and related services.

Applicon's equipment figures prominently in printed circuit board design. Applicon's systems run on DEC minicomputers, which are connected to proprietary 32-bit processors. Most of the company's sales are direct, although Applicon does use some representatives outside prime markets in the U.S. and Europe.

The company also makes a four-color plotter using ink jet technology that it markets through various distributors.

90 DATACROWN, INC.

650 McNicoll Avenue
Willow Dale, Ontario
Canada McH2E1
(416) 499-1012

Datacrown, the largest Canadian timesharing company, had a 26% increase in revenues for 1981, to $63.1 million. The company provides its 1,000 clients with a fully integrated mix of on-line interactive processing and remote batch data processing services. Its equipment is all IBM, including the new superfast 3081 processor.

While primarily Canadian, Datacrown has served clients on both sides of the border for years, with a branch office system in six Canadian and six U.S. cities. Some U.S. customers are General Foods and Olivetti.

In early 1982, the company took a giant step and opened its first processing center in the U.S. The $10 million facility, located in Silver Spring, Md. (10 miles from Washington), has about 60 employees. The new center is linked to a transcontinental data communications network, enabling information from clients throughout the U.S. to be processed at the facility.

Datacrown was formed in 1971 by Crown Life, a Canadian insurance company that owns about 85% of the company.

91 AMERICAN MANAGEMENT SYSTEMS

1777 North Kent Street
Arlington, VA 22209
(703) 841-6000

American Management Systems spent 1981 trying to climb out of the hole that it dug for itself in 1980. The professional services and software company tried to expand its turnkey

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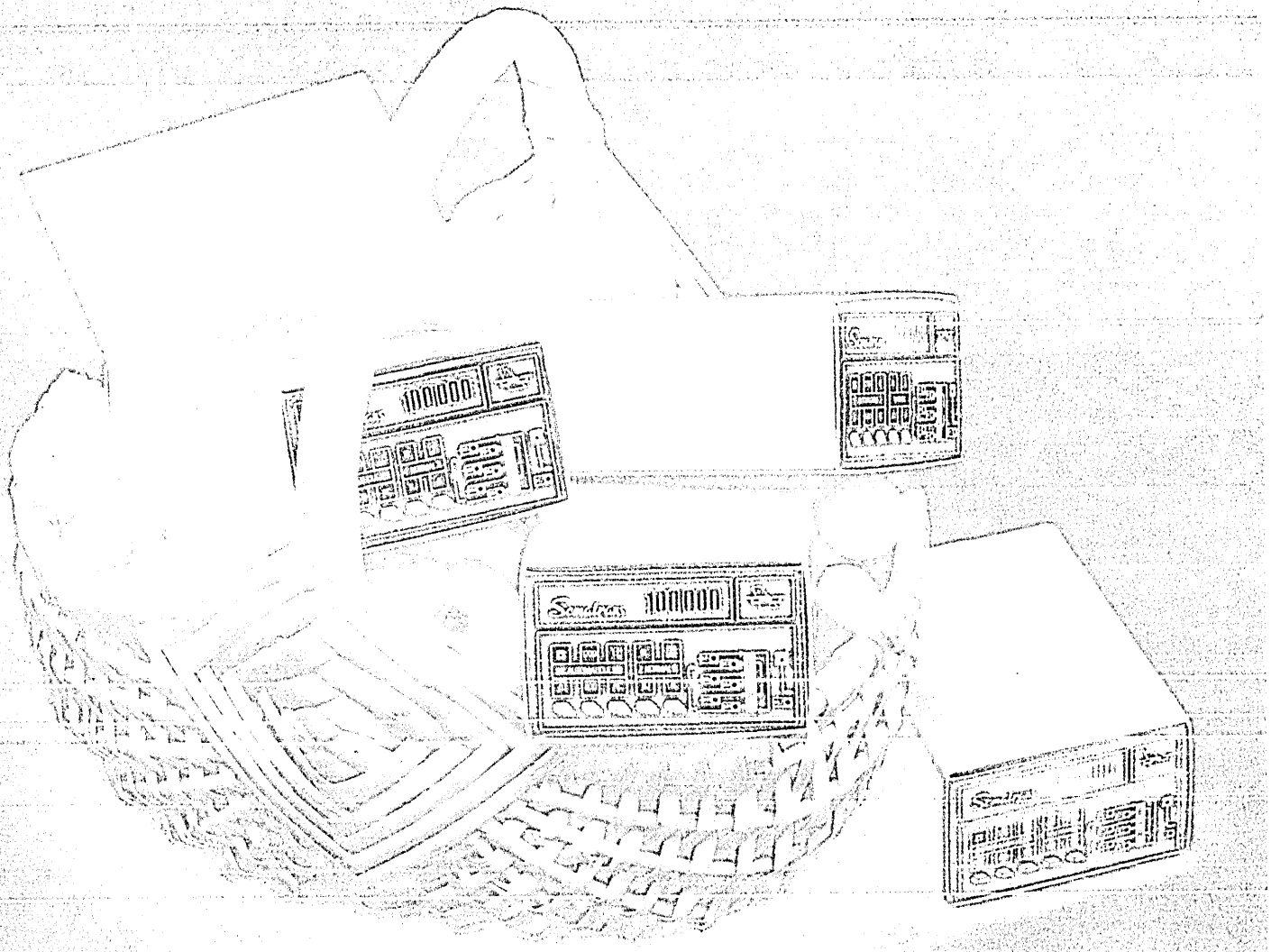

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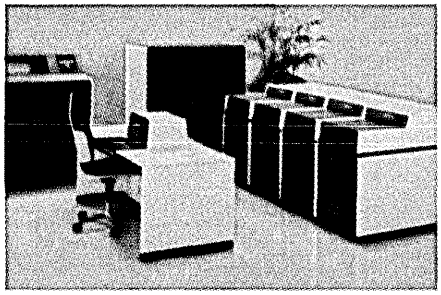

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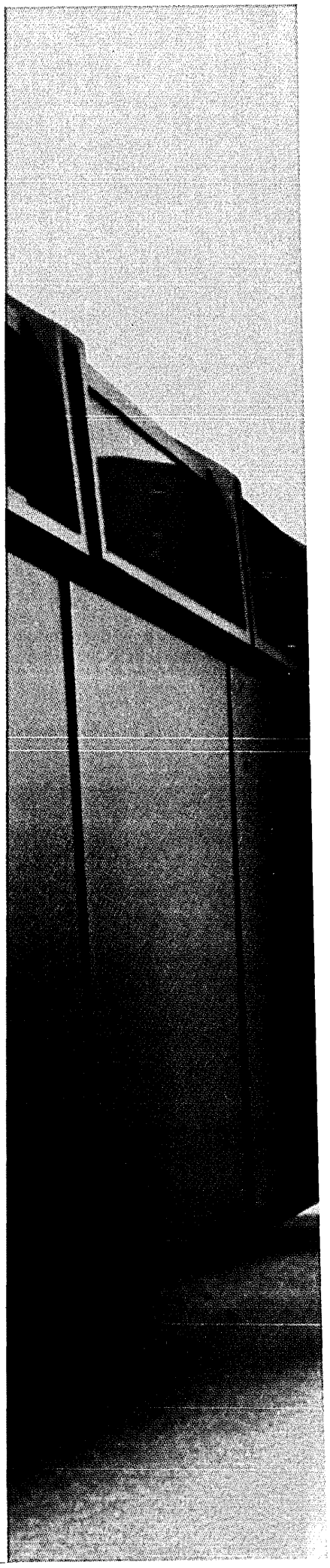

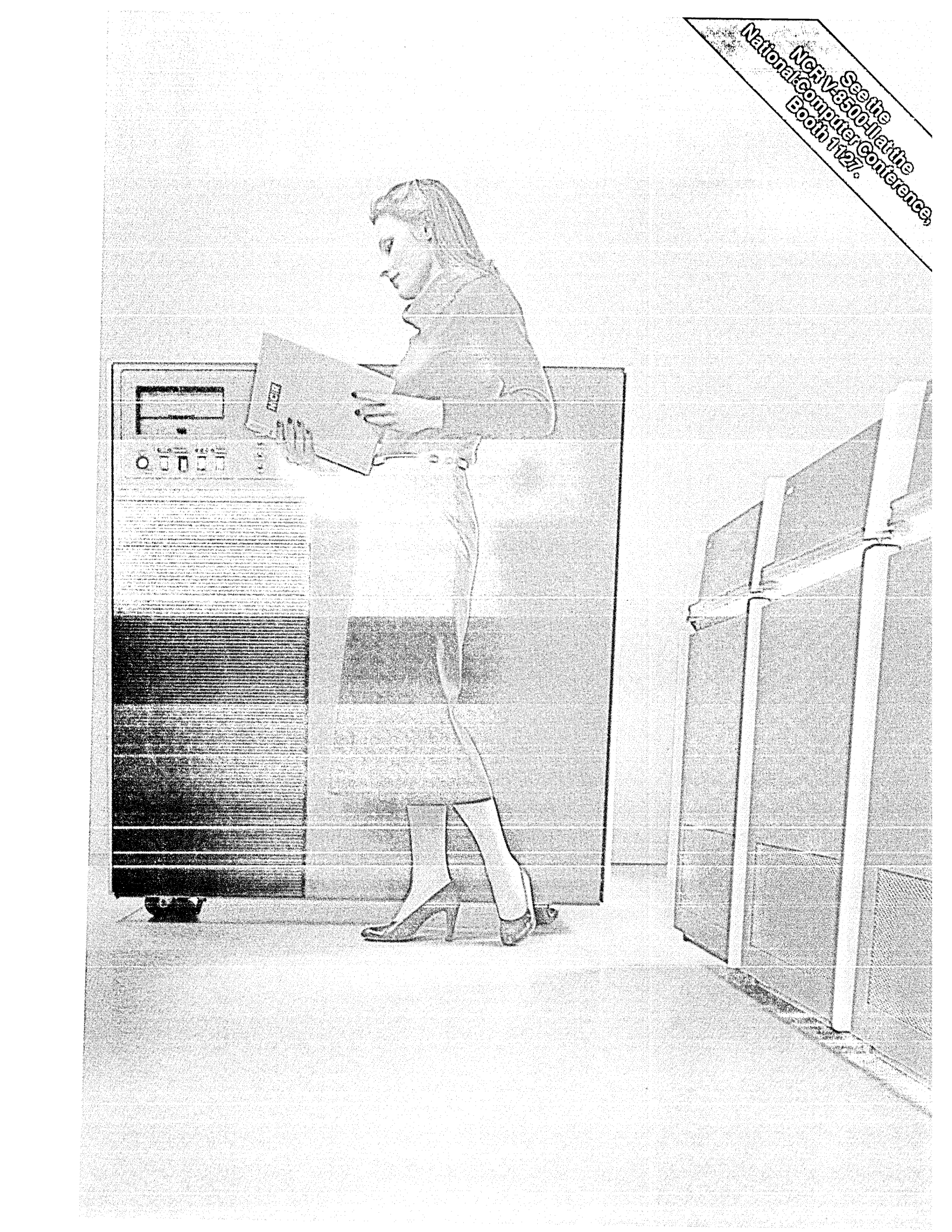
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CIRCLE 174 ON READER CARD

systems and package businesses too rapidly at the same time as it was plowing money into the construction of an expensive new headquarters building. The result: some bad financial news.

In 1981, the company lost $750,000 compared to the profit of $2.1 million that it showed in 1980. Revenues for the year were up 10% to $62.1 million, from $56.2 million a year earlier.

AMS appears to have learned from its mistakes. The company has slimmed down its ambitious growth plans. It is no longer actively marketing a turnkey system for industrial distributors, for instance. Instead, it seems to have decided to concentrate on selling its systems and services to the financial and energy markets that it knows best. The company has had reasonable success with a package called the Local Government Financial System, a product addressed to the small marketplace that AMS already knows well through its services business.

As has traditionally been the case, AMS derived most of its revenues from its custom system and services businesses last year. $25 million in sales came from developing custom systems, while another $25.8 million came from services. Both of those businesses were relatively flat for the year. AMS's efforts to move into packaged systems did meet with some success, though. Sales of packages climbed 70% to $6.8 million, from $4 million in 1980.

Next year may be better for the software company. It has a good reputation in the financial and energy markets on which it has decided to concentrate and should be able to drum up enough business to take it back into the black in 1982.

A minor uncertainty on the horizon is Anacomp. That company, which is notorious for acquiring companies after buying small stakes in their stock, now owns about 10% of AMS's stock.

92 SUN INFORMATION SERVICES COMPANY

The Sun Company, Inc.
280 King of Prussia Road
Radnor, PA 19087
(215) 293-6000

Sun Information Services Co., a subsidiary of The Sun Company that provides dp and telecommunications services, had a year of steady growth with revenues up 22% to $61 million. For our survey, internal sales are removed; in Sun's case, total revenues approached $122 million, but half are to other corporate divisions of Sun Co., and therefore discounted. Of SIS revenues, 95% are generated by software sales, which were up in 1981 to $8.4 million, a 60% increase. Service and maintenance revenues, which account for the remaining 5%, were up 20% over 1980 to $57 million. Revenues for 1982 are projected at $15 million.

SIS's primary markets are manufacturing (70% of revenues) and financial institutions (23%). The remaining 7% is accounted for by smaller markets such as utilities.

The company's principal products are industrywide project management software systems. In 1981, SIS introduced a new management information system called Suneco. Designed for companies that manufacture ecologically sensitive products that affect the environment (chemical companies, for instance), Suneco is a management reporting system that helps the organization keep track of those effects, government regulations, and compliance.

SIS also provides the Sungard Recovery Services—it offers complete facilities for computer disaster backup and recovery. SIS has two sites located in Philadelphia and another—a 38,700 square foot midwest site opened in 1981—in Chicago. Plans for a West Coast facility are under way.

SIS also offers remote computing and timesharing services—with its own software or a customer's proprietary software—through its computer center in Dallas.

93 PRINTRONIX, INC.

17421 Derian Avenue
Irvine, CA 92714
(714) 549-7700

Printronix continues to grow, although its 1981 performance was well below the high-flying pace the eight-year-old company is used to. Revenues from its line of matrix printers grew 23.2% to $60.2 million in cal-

GLITCH HUNTERS

The story continues. Introducing Maxichek III with breakout adaptor—the newest addition to the Maxichek family. It's the latest development in hand-held, microprocessor-based data analyzer technology now being offered by Astrocom. Continuing in the highly regarded tradition of Minichek, Astrocom's original pocket-sized BERT test kit, Maxichek takes the state of the art one step further. With Maxichek III, a built-in breakout adaptor has been added to enhance Maxichek's comprehensive error tracing capability for installing and servicing terminals, multiplexers and modems. And now it can be used as a terminal exerciser and data monitor. All three testers are battery operated, human engineered for easy use and, within their range of problem-solving parameters, are probably the simplest, least expensive glitch hunters on the market. For more information write or call: Astrocom Corporation, 120 West Plato Boulevard, St. Paul, MN 55107. (612) 227-8651.

astrocom corporation
Delivering solutions in data communications.

CIRCLE 175 ON READER CARD

endar 1981, compared to 49% in 1980. Earnings increased 16.6% to $4.9 million.

Printronix competes in the medium-speed line printer market against band printers made by Dataproducts, Data Printer, Centronics, and Control Data.

High-volume sales continued for its most popular product, the P-300, a 300-line-per-minute printer it has sold since 1975. Last year the company unveiled a newly modified version of its P-600 printer, designed to eliminate a problem in the hammer bank. By the last quarter, the company reported high-volume shipments of that product. The third member of its product line, the P-150, accounts for less than 5% of company sales, reflecting the stiff competition at the low end.

Funds allocated for research and development increased a hefty 31% to $1.5 million. The company said it will begin production this year of its latest printer, the Taskmaster MVP 2, capable of operating at speeds of 80, 150, or 200 lpm. The MVP will be priced competitively to appeal to users of small computer systems.

Printronix printers have graphics capabilities that are used by about 20% of the company's customers, mainly in factory automation to make bar codes and large labels. The printers also produce characters that can be read by optical scanning devices.

Oem sales account for about 60% of revenues. Texas Instruments was added last year to its list of top customers, which also includes Prime, MicroData, DEC, and Management Assistance.

In September, fire destroyed a large part of inventory at the company's newly established foreign subsidiary in The Netherlands. The firm expects it to be rebuilt this year. Although sales increased slightly in Germany, the firm's largest foreign market, revenues from abroad remained static at $12.6 million.

94 LEAR SIEGLER, INC.

Data Products Division
714 North Brookhurst Street
Anaheim, CA 92803
(714) 774-1010

Lear Siegler, one of the leading independent terminal makers, spent much of 1981 coping with the severe price reductions and declining margins in that competitive market. Lear turned to cost cutting at home and more offshore procurement to point margins in a healthier direction and maintain market share.

In February of this year, Philip Shires took over as president of the dp division, replacing William Terry.

Lear, a diversified manufacturer, does not break out individual division revenues, but DATAMATION estimates a 9% increase in terminal revenues to $60 million, from $55 million the year before.

Lear's big seller continues to be the ADM-3A dumb terminal, which sells for $595 (down from $995 three years ago) and is being shipped at a rate of 2,000 units a month. Lear discontinued its ADM-3A+, an interim product that was replaced with the more enhanced ADM-5, which now sells for $645.

In 1981, Lear introduced two new smart terminals: the ADM-21, a low-end version of its ADM-32, with a smaller memory and no polling capability; and a DEC-compatible ADM-36, priced at $1,195 and designed to compete with DEC's VT-100 line. It also added two new extras for the ADM-32 and 36 smart terminals: an integrated modem and a 15-inch display.

Lear sells through some 600 dealers and distributors, including Hamilton Avnet and the Two-Pi subsidiary of Four-Phase. New customers in 1981 included Diablo and Colt Computers in Britain and Satlecom in France. In 1981, Lear more than doubled its on-site field service group to some 225 reps and expanded its EXPRESS DEPOT service to 37 cities. Service is also available through Dow Jones, Sorbus, and American Teledata.

95 CROMEMCO, INC.

290 Bernardo Avenue
Mountain View, CA 94043
(415) 964-6400

One of the largest manufacturers of microcomputers, Cromemco enjoyed better than a 31% increase in revenues to $59 million in 1981. Foreign markets generated 49% of the total. Cromemco can be expected to remain strong in foreign sales, helped by the 1981 opening of a new wholly owned European subsidiary, Cromemco A/S, in Copenhagen. Twelve percent of total revenues were oem sales, another area where Cromemco continues to show a strong commitment. Cromemco runs a comprehensive oem/dealer training program to continually build up support for its systems. Third-party service is provided by TRW Inc.

Still privately held by its cofounders, Cromemco declined to provide breakdowns for expenditures such as research and development, but the company is acknowledged as a leader in bringing to market microcomputer products that incorporate state-of-the-art technology. Cromemco was the first to market such advanced products as a 4 MHz Z-80A microprocessor-based cpu and various powerful systems software offerings.

Cromemco's products are designed for the high end of the microcomputer market. The major new hardware offering during 1981 was the System One, a Z-80-based desktop computer system designed for business and professional applications, including engineering, science, medicine, and education. New software included wp and spelling dictionary packages, financial planning, and color graphics preparation packages.

96 NASHUA CORPORATION

44 Franklin Street
Nashua, NH 03061
(603) 880-2323

Sales of Nashua Corp.'s disk media products were up 8.4% to $58 million, the smallest revenue increase since the company's Computer Products Division returned to profitability in 1978.

The modest growth rate was attributed to the competitive pricing in the disk market and the strengthening of the dollar against foreign currencies. Nashua sells about one third of its computer products through eight foreign subsidiaries.

Nashua, which is primarily a marketer and distributor of office copy machines, offers a full line of disk products. About 70% of revenues are derived from its line of disk packs and disk cartridges. This year it plans to introduce a new 8 inch removable cartridge that is compatible with Control Data's Lark Module Drive. Single disks account for about 18% of sales while the remaining 12% comes from sales of 8 inch and 5¼ inch floppy diskettes.

Nashua has implemented an extensive quality control program that was responsible for a slight earnings increase in the Computer Products Division. By applying statistical methods to improve process yield, change work methods, and increase productivity, the company reported savings of $350,000 a month in the Computer Products Division.

Overall revenues at Nashua, including sales of office copy machines, supplies, and photo products, were down 2.5% to $653.9 million, while earnings were off 56% to $9.4 million. The losses were primarily due to Nashua's three-year-old effort to develop and sell its own copy machine in the U.S. After reporting losses of $22 million in 1981 for this effort, the company announced it was disbanding its copy machine manufacturing operations, but would continue to make the machines in Mexico and Brazil.

97 FLOATING POINT SYSTEMS, INC.

P.O. Box 23489
Portland, OR 97225
(503) 641-3151

Floating Point Systems, Inc. markets a line of array processors for scientific and engineering applications. Revenues of this 10-year-old company increased by 36.3% to $57.8 million in 1981 and corporate earnings jumped 69% to $6.4 million. Fifty percent of Floating Point's revenues are from oem sales.

Founded in 1972 by president Norman Winningstad, the company went public in 1978. In October, Floating Point sold another public offering of 1.3 million shares (at $23 a share) and raised $24 million and was then listed on the New York Stock Exchange.

Designed for computationally intensive applications, Floating Point's processors are used for image and signal processing and by the seismic industry and medical fields; applications include structural analysis, chemistry modeling, and flight simulation.

The company has developed two product families geared to the supermini and mainframe environments. Its 38 bit processor line, which interfaces with the VAX and PDP-11, ranges from the least expensive entry level FPS-100 to the AP 190L, which is generally

Xerox interactive software for Digital hardware.

Xerox Computer Services is now marketing Praxa Software—proven applications software for manufacturers and distributors specifically designed to run on in-house Digital PDP-11 and VAX hardware.

Praxa has a wide range of integrated applications. Inventory Control, Purchase Order, Order Entry and Invoicing, Sales Analysis, Material Requirements Planning, Capacity Planning and Scheduling, Factory Order Control and Cost, Engineering Data Control, General Ledger, Accounts Receivable, Accounts Payable, and Payroll.

And the applications can be used independently or together to form a complete system.

Praxa is flexible, easily expandable, and simple to use.

The interactive systems immediately update all files affected by each transaction. And data input at terminals can be promptly edited for total accuracy. It's perfect for distributed data processing at multi-location companies. And the software is menu-driven so specialized training isn't required.

Applications are written in ANSI Cobol and run on PDP-11 and in native mode on VAX.

But software is only as good as the people who stand behind it. And at Xerox, we have over eleven years experience installing and supporting interactive systems. Our branch offices are in major cities nationwide. And in Europe, too. So we're there when you need us.

For more information about Praxa Software, call toll-free (800) 323-2818. In Illinois call (800) 942-1166, or send in this coupon.

And see how much Digital hardware can do with Xerox software.

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Xerox Computer Services D6/82

c/o Ron Rich, 5310 Beethoven St., Los Angeles, CA 90066.
I want to know more. Please send me your brochure about Praxa Software.

Name/Title_____

Company_____

Address_____

City/State/Zip_____

Telephone_____

XEROX

CIRCLE 176 ON READER CARD

larger and faster. Introduced a few months ago was the FPS 164—a 64 bit extended memory and extended precision processor that interfaces with the DEC 1178 and 750 series, and all MVS, VM, and CMS-based IBM equipment. The company has high hopes for this new product.

Much of Floating Point's R&D activity is conducted in university environments as the result of grants given by the company, and recently a great deal of emphasis has been placed in the area of nuclear magnetic resonance systems. R&D expenditures in 1981 went up to $8.8 million, 92% higher than the previous year.

98 MSI DATA CORPORATION

340 Fischer Avenue
Costa Mesa, CA 92626
(714) 549-6000

MSI Data Corp., a manufacturer of electronic field data entry systems, had revenues of $56.9 million, up 7% from 1980.

The company's principal markets are food, drug, and hardware retailers and distributors that use MSI's systems primarily for inventory control and to transmit transactional information to a central processing center. MSI sells portable data entry systems that use programmable terminals; the systems are called the Omega generation and were introduced in 1979.

The introduction of these programmable terminals prompted the company to try new applications and markets such as manufacturing (inventory control, quality control), and more recently, utilities.

As a result, MSI has become increasingly software-oriented, and products and developments in 1981 supported that effort.

MSI introduced several new products in 1981 including two program generators. The AppGen, for example, permits a user to create a program on an Apple microcomputer and then download it onto the MSI programmable terminal. This product also reflects MSI's attmept to address a segment of the personal computer market—including both present and potential customers. AutoGen, the other program generator, allow users who are not technically oriented to create customized application programs for MSI's portable systems. Both of these products represent MSI's efforts to get away from its Application Development System, which was introduced with the first programmable terminals and which requires a good deal of customer training.

Other new products include a Field Service Reporting program, designed for organizations that have a network of service people in the field. MSI is also exploring the utilities applications area with a Meter-Reading program.

In addition, the company introduced a new route sales accounting system for the beverage, bakery, and snack food industries. Designed to fit in an attaché case, it provides route salespeople with on-the-road sales documentation and electronically records route information for transmission to a central computer.

Another system, called RAMS (Retail Administrative and Merchandising System), was introduced in 1981. It is a multipurpose terminal system that combines an advanced terminal (MSI/88) with a set of application programs that can be used by department, variety, or specialty store chains.

MSI also introduced the MSI/fsr, a new recorder/transmitter, and the MSI/2743 and 2741, two new data communications devices used as interfaces between the company's portable data entry terminals and the customer's mainframe or cpu.

Changes in the management arena also occurred. Richard Rager, with a strong background in software development, was brought in as vice president of engineering. Charles Tucker was appointed to the newly created position of vice president of corporate planning and development.

99 TRIAD SYSTEMS CORPORATION

1252 Orleans Drive
Sunnyvale, CA 94086
(408) 734-9720

Triad System's 1981 revenues grew by 56.3% to $56.6 million for calendar 1981, up from $36.2 million in 1980. Income kept pace with revenues, and reached $1.35 per share vs. 81 cents the year prior.

Triad has long prided itself on selecting a market where computers weren't in general use, and then working with users in the market to develop a computer and program to meet the users' specific needs and problems. The company did very well in its first choice of an industry: auto parts dealers. Triad now has over 3,000 systems sold to auto parts dealers, but in late 1981, as a result of the recession, that dependency was beginning to become a liability. In fact, for the company's fiscal year first quarter ending Dec. 31, sales had barely improved, inching up to $16 million from $15.2 million in 1980. Net income was also adversely affected by the economy, and the resulting difficulties in the auto parts market. Earnings per share for the fiscal year's first quarter were only 6 cents vs. 27 cents in 1980.

A diversification plan was started back in 1979, but the fruits have been slow in coming. A new system for retail hardware store owners, for example, was put on the market in 1979, but only 62 systems had been installed by fiscal year ending Sept. 30, 1981.

The next step in branching out was to develop a system for warehouse distributors. This system was on the market in late 1980, and by the fiscal year ending Sept. 30, 1981, only 17 systems had been installed. The final diversification move, aimed at independent tire dealers, was started in March 1981, and by fiscal year ending Sept. 30, only 13 systems had been installed.

Triad systems are marketed directly to end users through a sales and service staff in 125 branch offices throughout the country.

100 GENERAL DATACOMM INDUSTRIES

One Kennedy Avenue
Danbury, CT 06810
(203) 797-0711

The changing data communications industry caught up with General DataComm in 1981, and while revenues rose (only 5.5%) for the 11th year in a row, earnings plunged. Revenues for the year reached $55.6 million, with earnings of $1.8 million vs. the $4.4 million in 1980. General DataComm had expected the common carrier business to change, but was caught off guard by the severity and the suddenness of the decline. The company reported orders were off 57% from the telephone companies, mainly because of the changing regulatory environment.

To combat this loss of sales, GDC doubled the size of its business systems sales and service staff and divided the Business Systems field organization into eight regions. But these moves were not enough to counter the loss of the common carrier business.

New products were introduced that the company hopes will fill the gap. The new products were for the most part network oriented and addressed the needs of the user with high-speed, complex network requirements. This was part of the company's intentions to shift to the high end of the business systems sector. Some of the new products are directed at portions of the market that are relatively new, such as minicomputer and distributed processing.

The company sells modems ranging in speed from 300 bits per second to 19.2 KBps. Multiplexors, which accept multiple digital data signals for consolidation at one end and then separate them back into multiple signals at the other end, are sold in over 15 varieties.

General DataComm has two control systems—NETCON-2 and NETCON-5. NETCON-2 has a control unit at the central site and a diagnostic unit within each modem. It can test up to 31 stations. NETCON-5 is a more sophisticated system using "out of band" signaling techniques, and can test without interrupting data transmission.

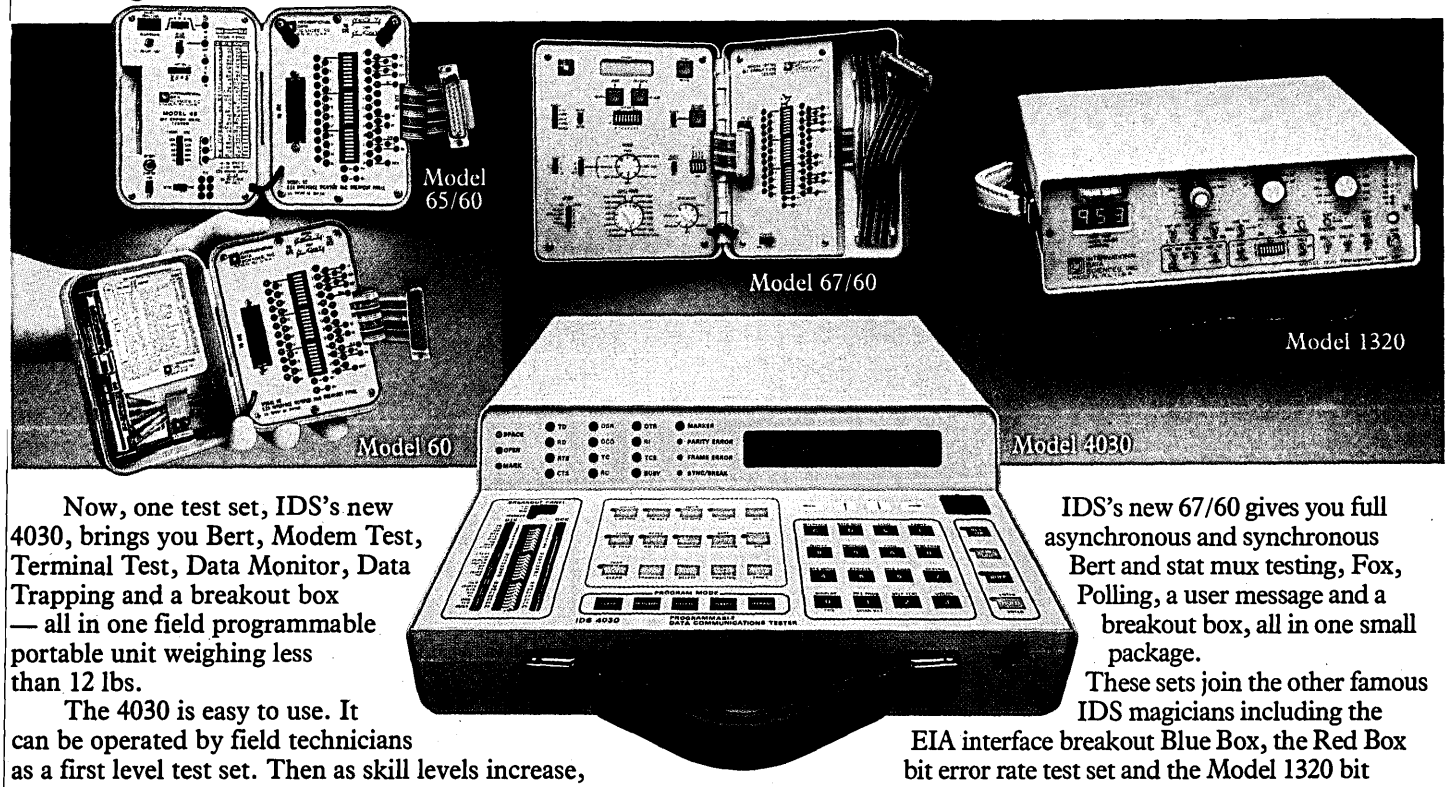
The company markets its equipment primarily through its own sales and service organizations. It maintains eight overseas offices. During 1981, the company purchased a 207,000 square foot manufacturing facility in Connecticut, and plans to expand into this facility early in 1982.

As 1981 closed, GDC signed a distribution agreement with Plessey Telecommunications and Office Systems, Ltd. of England, which gives GDC exclusive sales rights in the U.S. and Canada and sole sales rights in the United Kingdom for distribution of the high-speed 16Kb Data Modem manufactured by Plessey. This machine is GDC's first entry into the very high speed range, and will add a new dimension to its product line.

This report was prepared by the DATAMATION staff under Pamela Archbold's direction.

Houdini revolutionized the art of magic

IDS just revolutionized datacomm network testing.



Now, one test set, IDS's new 4030, brings you Bert, Modem Test, Terminal Test, Data Monitor, Data Trapping and a breakout box — all in one field programmable portable unit weighing less than 12 lbs.

The 4030 is easy to use. It can be operated by field technicians as a first level test set. Then as skill levels increase, the advanced, programmable features can be utilized.

The 4030 enables you to write your own testing programs, store them in plug-in ROM-packs and make multiple copies so that they can be used throughout your network.

IDS's new 67/60 gives you full asynchronous and synchronous Bert and stat mux testing, Fox, Polling, a user message and a breakout box, all in one small package.

These sets join the other famous IDS magicians including the EIA interface breakout Blue Box, the Red Box bit error rate test set and the Model 1320 bit error rate modem test set.

If your network field service can use a little magic, give us a call. Our test sets can do the trick.

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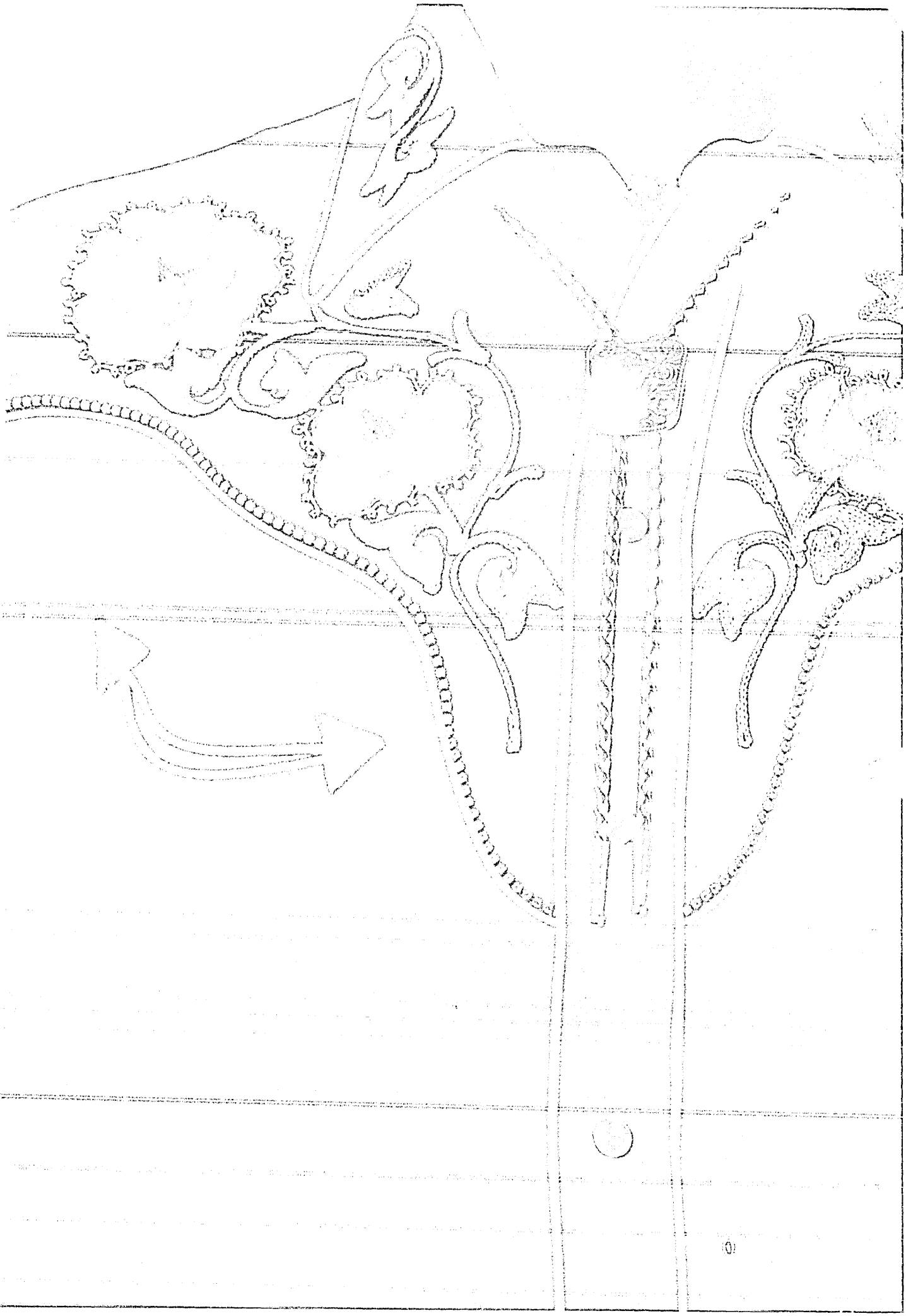
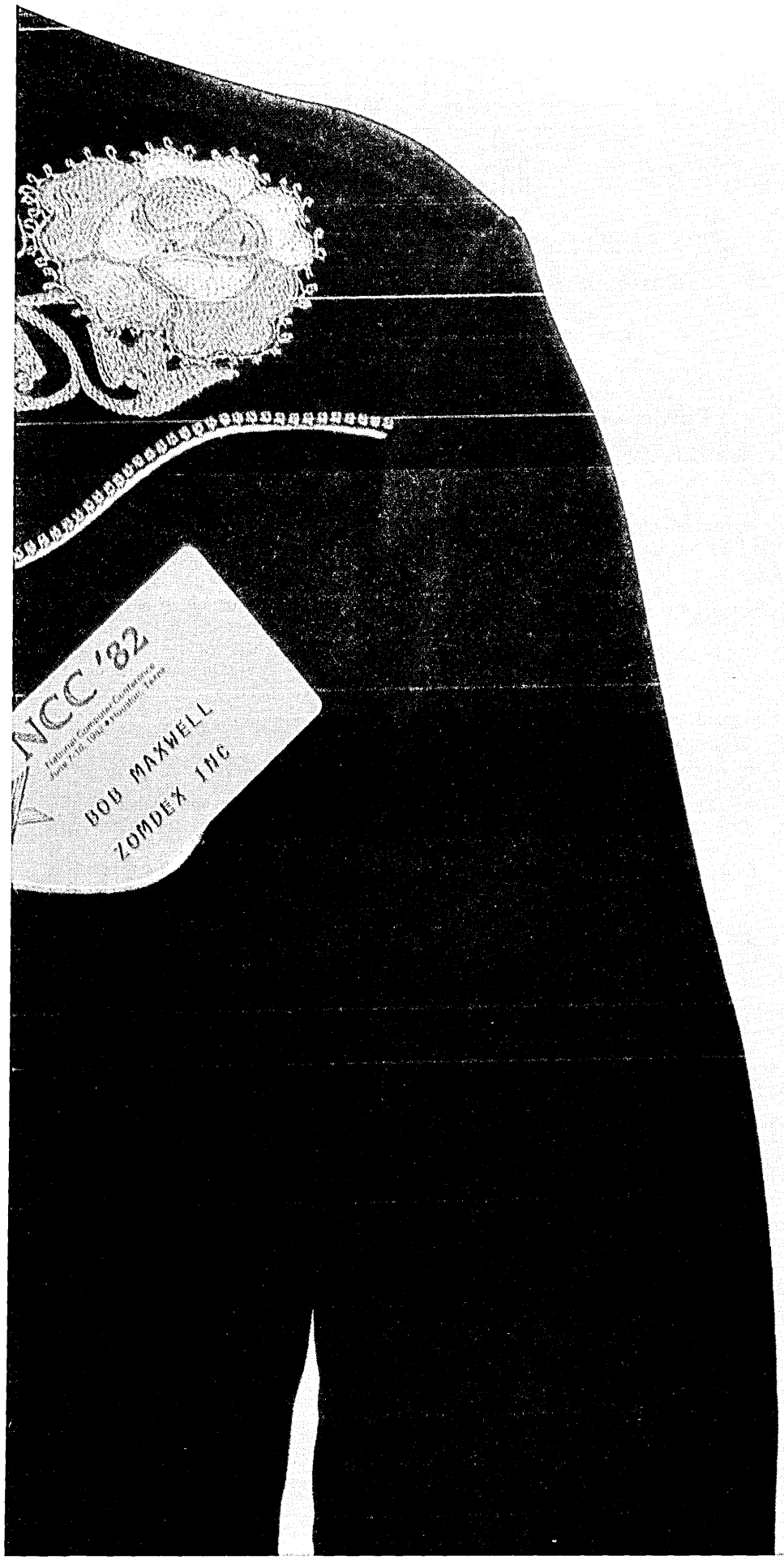
There's a touch of magic in everything we make.

INTERNATIONAL DATA SCIENCES, INC.

7 Wellington Road, Lincoln, RI 02865 Tel. 401-333-6200 TWX 710-384-1911



THE BEST LITTLE COMPUTER CONFERENCE IN TEXAS



Houston: city of humidity and heart transplants, six-shooters and spaceflight, urban cowboys and snazzy architecture, home of the Astrodome—the 931st wonder of the world—and the finest air-conditioning equipment anywhere. From June 7 to 10 the Oz that hydrocarbons built will boast yet another attraction as the computer industry's biggest trade show, rendezvous, and general jamboree, the National Computer Conference, takes place in the fabled Astrodomain.

Why should 70,000 people want to attend? For the same reasons they always do: to tipple and hobnob, to backslap and gape, to talk, and to listen, and see. They'll see products they've only read about, and get up to speed on developments they've only heard about. Some will go to check out the competition; others will do some comparison shopping. A few will find new jobs, and a few more will be looking to hire new people.

Most of all, says program chairman Howard Morgan (a professor at Wharton and at the Moore School at the University of Pennsylvania), it's a general conference. "This is the one place where you're exposed to a broad cross section of the industry."

Morgan recommends using the diverse program schedule with such an attitude. There are nine subject tracks this year, including two—Office Systems and Personal Computing—that are presented this way for the first time. The other tracks are Hardware/Computer Architecture, Software Engineering, Social and Organizational Implications, Management Issues/Decision Support Systems, Language and Database Processing, Applications of Computing, and the always popular Pioneer Day, which falls on Wednesday, June 9.

Though attendance was good at sessions in Chicago last year, their number has been reduced from 105 to 86. That's to keep the quality high, says chairman Morgan. But no matter how good the sessions and how fascinating the vendor exhibits, you may find yourself suffering from information overload after a few dozen hours. If that proves to be the case, AFIPS is offering tours of the LBJ Manned Spacecraft center, the cities of Houston and Galveston, and Gilley's, the famous honky-tonk.

For more information about the tours or about any other part of the NCC, contact AFIPS, 1815 N. Lynn St., Arlington, VA 22209, (703) 558-3612. For some randomly selected program highlights, turn the page.

—K.K. & J.V.

PHOTOGRAPH BY AARON REZNY

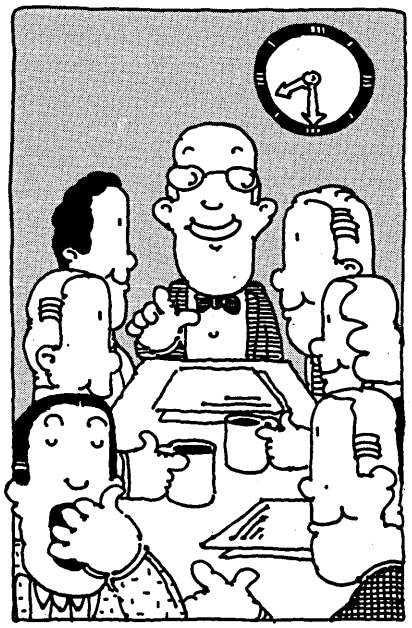
NCC 1982: HOUSTON, TEXAS

A TEXAS JOKE

Two agriculturalists, a Kentuckian and a Texan, were attending the National Agriculturalists' Conference in Chicago. They met in the Fern Lounge of the Holiday Inn where both were staying, and they got to talking.

"Shoot," said the Texan, "I can get up at dawn, grab a cuppa coffee, get in my car and drive all day, and I still won't come to the end of *my* property."

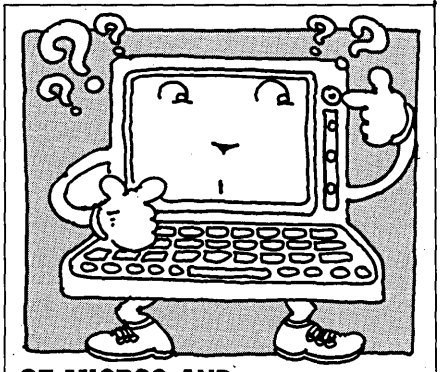
"Mmmm-hmmm," said the Kentuckian. "I used to have a car like that."



VULNERABILITY AND RESILIENCE

The vulnerability of information-intensive societies has been the focus of a study by AFIPS in recent months. A panel of think-tank heavies such as computer crime guru Donn Parker of SRI International in Menlo Park, Calif., and W.H. Ware of the Rand Corp. in Santa Monica, Calif., will discuss the study's findings on Thursday at an 8:30 a.m. session in room 307. In case you don't want to get up that early, the word is that AFIPS found "modern societies tend to be quite resilient," a finding that contrasts with similar research in Sweden that found that country's vulnerability "unacceptably high."

At 10:15 a.m. in the same room, professor Lance Hoffman of George Washington University will lead a session examining the other side of the coin. Hoffman says the vulnerability debate is currently where the debate on privacy was in 1965.



OF MICROS AND MULTINATIONALS

- Which is a wiser use of capital, 100 Apples or a VAX?
- What do you say to the guy who's used Visicalc to arrive at budget numbers different from those the dp center put out?
- What happens to the personal computer when the guy who was using it quits? Does it belong to the job, the department, or to anyone who can figure what to do with it?
- How does Citicorp control a TRS-80 in Caracas?
- To what extent should the dp center try to control the use of personal computers?

These and other questions about small computers in large organizations will be raised on Wednesday at 3:30 p.m. in room 311. Irene Nesbit, a consultant from Princeton, N.J., will lead the session, and expects her five panelists to express a good cross section of opinion.

BIG FIGHT

The latest round of the local networking battles—pitched primarily between baseband ers and broadbanders, as illuminated last March in these pages—will continue in the public arena at a session to be held in room 300 at 10:15 a.m. Wednesday. Session leader Dale Kutnick, a Yankee Group researcher, promises to "stir up the pot, halt fights," and make appropriate comments as a three-way debate is held among leading office automation vendors. Wang Labs will defend its Wangnet, Xerox will push Ethernet, and another unidentified "large vendor" will come forth with its networking scheme. Functional advantages, cost considerations, and other factors will be on center stage as the discussion evolves around what has certainly been one of the most hotly debated topics on computing in the past two years. Special cheering sections will be roped off for those who care enough to root for a favorite network. But please, no betting on NCC premises.

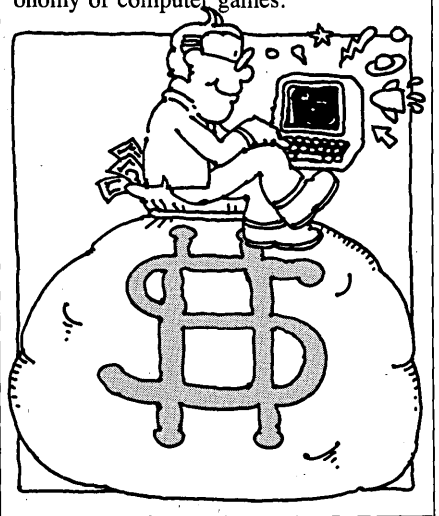
WORKING

Workstations, workstations, workstations. Those are the various devices that are going to be interconnected by all those local networks you've been hearing about. One of the key factors in the success of office workstations will be the so-called user interface. How will users interact with their equipment? What effect will such arts as presentation, writing, filmmaking, and salesmanship have on the user's perception of his system? How are different manufacturers approaching the problem of making computers easier for general office workers to use?

These and other issues will be the focus of a double session beginning Wednesday at 10:15 a.m. in room 311. Among other panelists, Xerox PARC's Dave Smith will discuss the star workstation, IBM researcher Moshe Zloof will elaborate on his Office-by-Example (OBE) scheme, and Larry Tessler will share Apple Computer's thinking on easy-to-use personal computers. With a break for lunch at 11:45 and resumption at 1:45, this session may give the curious a unique look into the future of office automation systems.

FUN AND GAMES

Designing computer games is hard work but there's plenty of money in it. Of the 20 best-selling software packages, the majority are games. On Wednesday at 8:30 in the morning in room 311, Fred Thorlin of Atari will lead a session on the legal, business, technical, and international aspects of the computer games business. This is your chance to meet the people who've taken user friendliness a step further, and made it user compulsion. The session will present the world's first taxonomy of computer games.

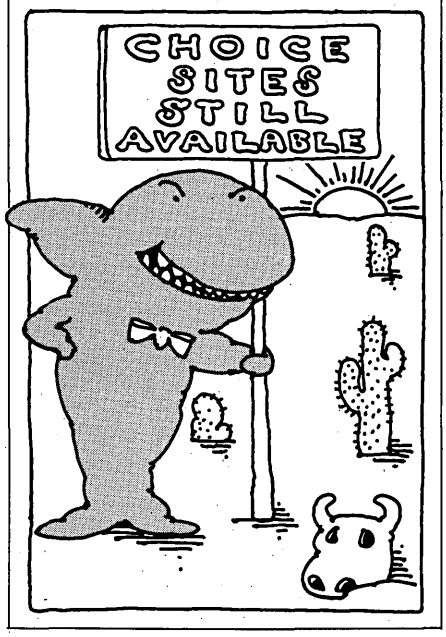


ILLUSTRATIONS BY KIMBLE MEAD

DID YOU KNOW?

• Houston was founded in 1832 by accident. Augustus C. and John K. Allen, two New York City land sharks, traveled to Texas intending to start a city where Galveston is today, but encountered legal problems and had to settle for the site of modern Houston. The early city was beset by fire and yellow fever, but in 1836 the Allens were advertising it as "beyond all doubt the greatest interior commercial emporium of Texas."

• At the age of 15, Virginia-born Sam Houston went off to live with Cherokee Indians. He later served with Andrew Jackson and became governor of Tennessee, but he resigned the governorship to return to the Cherokees. He turned up in Texas in 1833.



BUILDING THEM BETTER

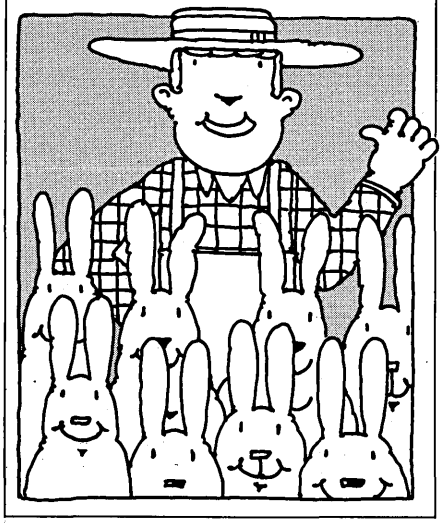
Innovation in computer architectures has always been a means for improving performance in computers and adapting machines to specific commercial application areas. The development of VLSI microprocessors, imbedded database systems, and microcoded processors are just some of the ways designers have been able to squeeze the last drop of oomph from their systems. In a Tuesday 10:15 a.m. session in room A, several leading hardware firms will show off their wares with an emphasis on architectural details. Manufacturers IBM, Texas Instruments, Apollo Computer, Intel, and Digital Equipment are scheduled to tell what they've learned from new architectures and what may be expected in the future.

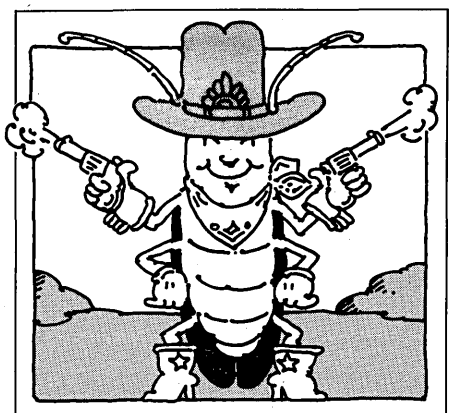
APPLICATIONS ANODYNE

Application generators seem to be one of the more promising ways of chopping away at the huge backlog of programs user departments want performed. Essentially, generators help relatively untrained personnel get applications up and running quickly by translating very high level languages to traditional languages such as COBOL or assembly. The current use and future prospects of application generators will be the focus of a Wednesday session at 1:45 p.m. in room C. Jerrold M. Grochow of American Management Systems, Inc., Arlington, Va., will lead the session at which users, independent vendors, and hardware makers will speak. Among them: Aaron M. Goodman of IBM, discussing that firm's systems, and James H. Waldrop of Hamilton Brothers Oil Co., Denver, presenting a case study.

RABBIT FARMING

Personal computers may be small, but they mean big business to the host of firms that have set their sights on the fast-growing market for them. On Tuesday at 3:30 p.m., several leading manufacturers will meet in room 311 to trade views on the merging of the computer and consumer electronics business. Among those scheduled to show up are Mike Markkula, president and chief executive of Apple Computer, and Don Estridge, who heads up IBM's personal computer line. Also on hand will be the man who runs Sears, Roebuck and Co.'s small business systems effort, John Purtell Jr. While no blockbusting insights are expected from the two-hour session, leader Portia Isaacson of Future Computing, Inc. in Richardson, Texas, is sure to do her best to stir things up and get some sparks flying.





SAVE THE ROACHES

Software bugs won't be the only kind of insects you'll be hearing about in Houston. Besides its tremendous oil wealth, sweltering weather, and the space program, the city is known for its big bugs. Texas-sized bugs, wearing boots, 10-gallon hats, and carrying six-shooters. Well, not quite, but it's true that thanks to the city's heat and humidity, Houston's insects are probably the biggest and healthiest in the country. Cockroaches there have been measured in inches, large enough to snack on the miniroaches New Yorkers are so familiar with. Also infesting the inland city are some mighty tough chiggers that tend to populate suburbanites' front lawns by the thousands. They can be seen leaping their way from green patch to green patch with ease. Why else do you think AstroTurf was invented?

CONCEPTUAL STORIES

One of the main tracks in this year's NCC sessions is a series of panel discussions on the history of computing. Among the most promising of the sessions is one scheduled for 10:15 a.m. Wednesday in room 307, when computing historian Nancy Stern will lead a discussion of the "stored program concept." Essential to computers as we now know them, the concept was developed in the 1940s and has been surrounded by controversy ever since. Nobody quite agrees as to who first came up with the idea of storing programs and data in the same memory of a computer. Trading memories and insights will be some noted computing pioneers, including Dr. Presper Eckert Jr., now a vice president of Sperry Univac; Herman H. Goldsteine of the Institute of Advanced Study in Princeton, N.J.; Dr. Maurice Wickes, now at Digital Equipment; and Dr. Richard Clippinger, from Jamaica Plain, Mass. All are said to have been directly involved with developing the first stored programming machines.

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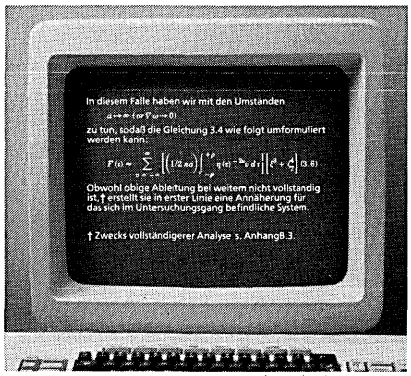
Because the world is

Until now, if a business needed a printer with a wide range of scientific or multilingual characters, the choices were severely limited. And so was the print quality. Prices for these machines are high. And reliability is low.



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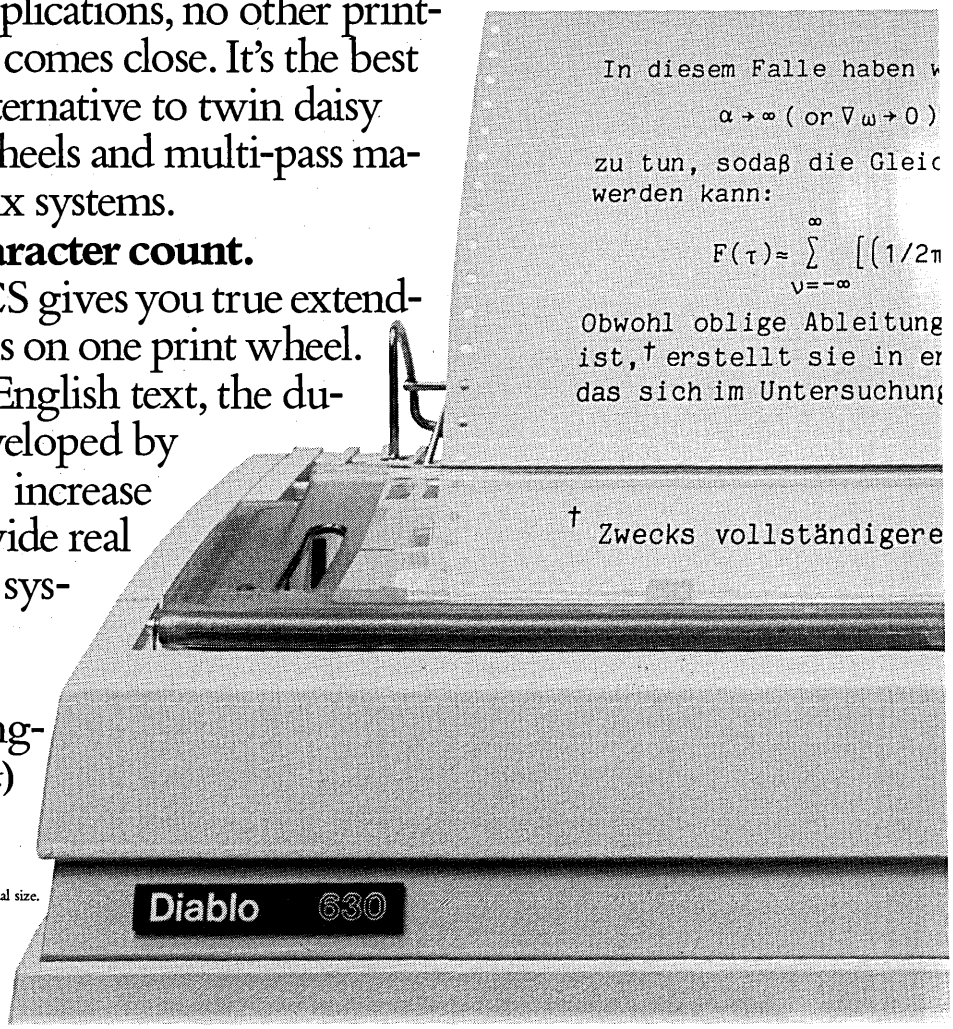

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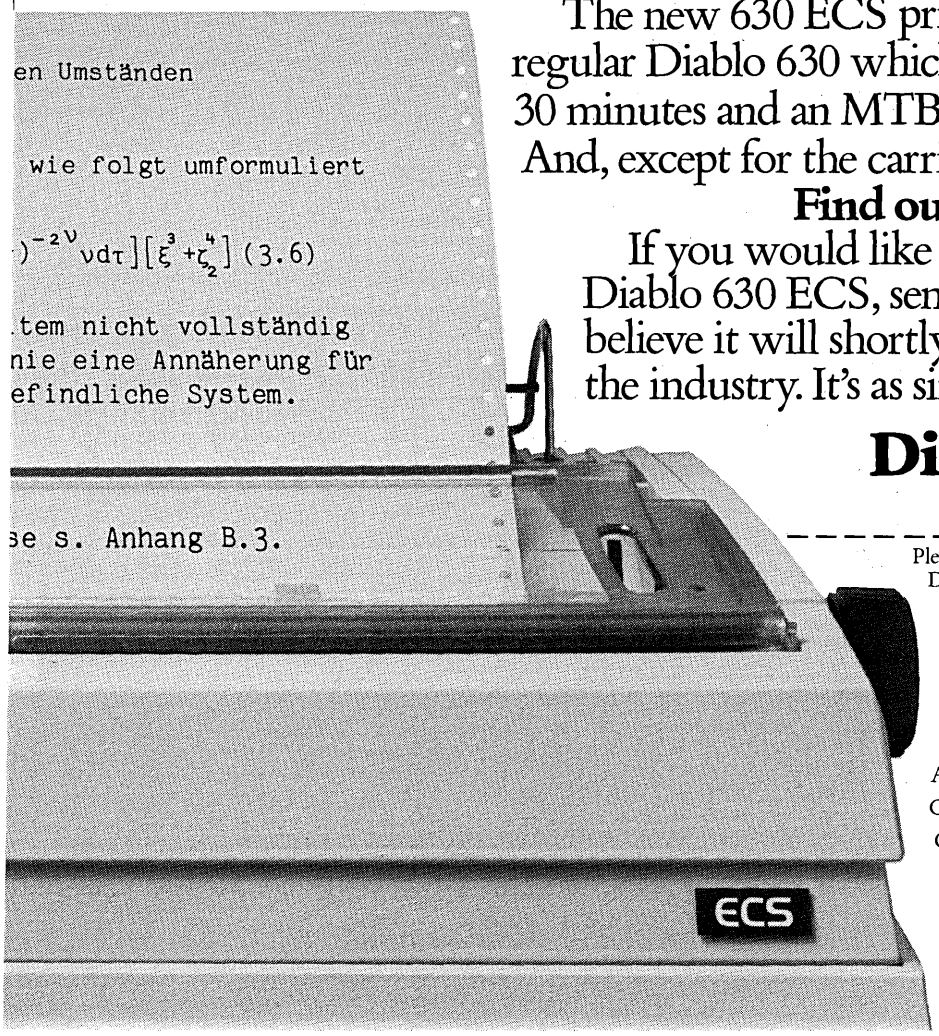

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CIRCLE 178 ON READER CARD

When a company switches to an in-house phone system, it may have trouble keeping track of costs. Here are some of the problems—and solutions.

METERING COMPANY CALLS

by Mary Lou Morella

The sophisticated telephone switching computers of the '80s are giving companies the opportunity to gain in-house control over their telecommunications systems. But they are also producing new types of data—called SMDR (station message detail recording), CDR (call detail recording), or LMDR (local message detail recording)—that are causing problems for the companies' programming departments.

As more companies take on telephone company functions, dp dpartments are facing the task of reducing SMDR data—magnetic tape recordings of phone calls—into something resembling the purified, priced telephone bill that the telephone company used to give them. But it's a task easier said than done, since the nature of SMDR data defies the programmers' traditional and tested methods of analysis. The problems relate to many factors. Among them:

- An underestimation of the technical intricacies of telecommunications
- "Communications gap" between the telecommunications and dp departments
- Data design problems
- The data production environment itself

This aticle points out what to be aware of when switching over to in-house data reduction of SMDR, why the problems arise, and how to avoid them when processing SMDR for the first time.

Consider this typical scenario:

The Megabuck Conglomerate Corp., with 127 locations across the country, has announced the installation of a private telephone system that will carry all intracompany calls. The system will have three hubs: at headquarters in Atlanta, at the regional distribution center in Denver, and at the operations center in Chicago. The system will "switch" all calls from the 127 locations to other hubs, locations, or out into the Bell System.

As a side product of this network, magnetic tape recordings of all phone calls will be produced at each hub. The manufacturer of the telephone system has assured the company's telecommunications department that these tapes can be processed by the dp department to produce its own billing reports.

Shortly after Megabuck has made its announcement, Mr. Bellhead, the director of telecommunications for the company, is talking to his brash young protégé, Stanley.

Mr. Bellhead: "Stanley, we've checked with Fred from our data processing department concerning the telephone billing reports. Fred seems to think there's a fairly straightforward cost allocation system involved, and that with only minor modification, the current reporting system can handle the new tapes. Of course, I alerted him that the tapes will include calls from the entire corporation and not just headquarters. I want you and him to work out the details. The new phone system will cut over in four months, so get cracking."

One week later:

The scene is the data processing department. Stanley, Mr. Bellhead's protégé, and Fred from the dp department are discussing the upcoming cutover.

Stanley: "Fred, I'm Stanley from the telecommunications department, and I'm here to help you with anything you need for the new telephone billing system. What do you need?"

Fred: "Hi, Stanley. I guess the main thing I need is the phone numbers of people in our other locations so we can add them to our current directory. Also, when can I get one of these new tapes to practice on?"

Stanley: "Well, Fred, I don't know. The equipment won't even be installed until April. I'll give you the phone number of their technical guy and maybe you can work it out with him. Okay?"

And so Stanley and Fred embark together down the garden path, each carrying a bag of misconceptions about each other's job, the problem at hand, and the dangers that lurk ahead. Let's look at what awaits them.

TELECOM LINGO PROBLEMS

Every technical specialty has its own lingo, and telecommunications is no exception. For example, the list of corporate phone numbers Fred requested is a much more complicated matter than he appears to think. The system the company currently uses probably "saves" extension numbers only on the call recording, since everyone is in the same building and has the same main number. So how do you differentiate calls from the various locations?

The systems analyst will probably decide it is necessary to save a seven-digit number in order to make sense out of the information. However, he probably doesn't know about something called an RNX (restricted numeric exchange)—an "exchange" native to a single location in a multiple-location network. When a company installs its own telephone network and starts acting as its own internal phone company, it can reassign these exchanges. The result: every phone in the company can be reached two ways: by dialing its "phone company" normal number, which consists of area code, exchange, and extension; or if the call is being made inside the company, by dialing the location's RNX and extension.

Along these lines, it should also be pointed out that the configuration of the network will continually evolve. As usage patterns change and new branches are added or deleted, so will network locations be added and deleted. Any software that relies on a static table of RNXs is subject to frequent modifications.

When Fred finally meets with the technical representative from the telephone system manufacturer, and gets his hands on a tape format, he may encounter another problem. The layouts for most of these tape formats appear to be designed by engineers who worry only about the length of tape, rather than the consistency of the data recorded.

Since most of the data recorded are numeric, the engineers generally choose BCD (binary coded decimal) so they can put a number into four bits. But what about digits not dialed—the "blanks"? Examples of confusing formats are: 1) F=O, O=b; 2) A=O, O=b; and 3) B=O, C=b, and so on. It makes more sense to have O=O (and any alpha character for blank).

Another problem is variable record formats. If someone dials a seven-digit rather than a 10-digit number, the engineers make the call recording three nibbles shorter, so

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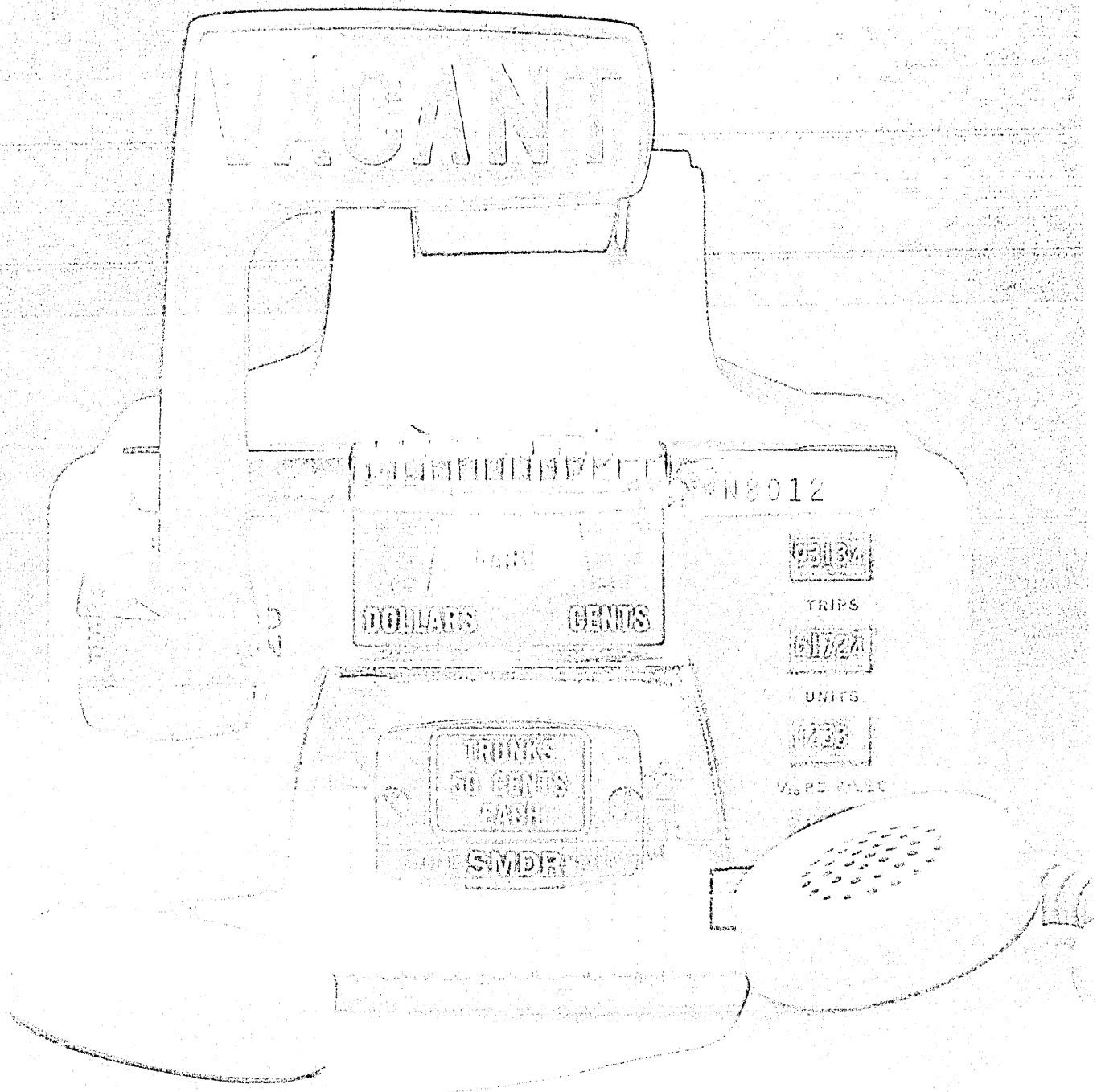
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Tape format engineers seem to worry only about length of tape, rather than consistency of recorded data.

you have different lengths of records on the same tape. Fixed-length records would make the situation simpler.

One of the worst-designed formats is variable-length spanned-block records. This design can create nightmares about wading through enormous blocks of data, hoping against hope of finding a winning combination of beginning and ending characters just the right number of bytes apart to be a valid call. One format like this was also accompanied by poor error checking, so that 15% of the records were missing several bytes. What can a systems analyst do about this? The manufacturer's technical representative offered this advice: "Just take the area code from the previous call if you get a bad one—that's what we do."

Another data problem relates to dates. Some formats repeat the date of the calls with regularity, for example, every 30th call. Other formats give a date once a day. This approach makes it almost impossible to retrieve date-of-call information.

Call recording tapes are generally produced anywhere on the company's premises, rather than exclusively in the antiseptic confines of a computer room. Not only does this unregulated, uncontrolled environment itself lead to "bad data" being recorded, but the personnel responsible for tape drive operations are generally not dp personnel. A mistake in unloading a tape can range from no ending-tape mark (if the operator didn't hit the UNLOAD button) to multiple ending-tape marks (if the operator hit it a hundred times before remembering what comes next in the tape-changing sequence).

On one occasion an operator noticed that the tape wasn't moving and consequently forced the take-up reel to turn, producing a tape with a badly stretched middle.

And what about physical "labeling" of tapes? The tapes generally do not contain IBM standard labels or any internal label. In our mythical company described earlier, this would result in at least 12 unlabeled "raw" tapes a month. How would Fred know whether the tapes contained calls from Atlanta or from Chicago? The data give few clues.

THE WELL-DESIGNED SYSTEM

To compensate for poor data, the well-designed system that processes SMDR should contain date-validity checks with defaults to input dates on parameters, and some exception reporting to signal missing days and blocks of time.

The well-designed system should also introduce a way of indicating the source of the calls—one of the first steps in processing them correctly. Having the date and source right after the first step will help minimize bad data problems.

Some problems are unavoidable. Here are a few of them.

Answer supervision. Because of the nature of the application, much inconsequential data must be weeded out before reports are produced. For example, call records usually don't indicate whether a call was actually answered ("answer supervision"). Calls that received a busy signal or were terminated by the dialer after only two or three digits were dialed are recorded along with completed calls. To circumvent this problem it is wise to set a time limit—30 seconds, for example—as the minimum duration of a valid call.

The system should also be able to distinguish between a seven-digit number to a local area and a seven-digit network call. Usually, local calls, as opposed to network calls, are distinguished by a dialed "access code"—a code of one digit before the actual dialed number. The access code may be recorded in a separate field in the call record or may be part of the dialed number field.

Station identification. It is necessary to identify correctly the source of the recording as a preliminary step in establishing an accounting system, and this can prove tricky because a particular extension may exist at multiple company locations.

Many call records have no identification of the extension that originated the call; instead, an "incoming trunk group" is recorded. An entire company division may be sitting at the end of that telephone line, but all you have in the call recording is the line number. In AT&T's Dimension System, the trunk group is a three-digit number, while the extension is four digits, and they're recorded in the same field. But it's also possible for Dimension to record only three-digit extensions, so you have to look at the first digit to tell if it's an incoming trunk group or an extension that placed the call.

Tariffing. How do you assign costs to calls? Since the call recording tapes are produced by the PBX that switched the call and not by the telephone company that would price the call, there are no costs recorded. (A comprehensive system will generally take in both types of tapes, since certain calls such as third party will not be recorded at the PBX.) A system originally designed to handle a prebilled record must be expanded to calculate this cost.

The easiest way is to add up all the minutes of the calls; to do this, take the $2 million a month charged to the company by the local phone companies and AT&T and come up with a cost per minute appreciable to all calls across the board. The only snag is that it will cost as much to call California from New York as to call Brooklyn from New York.

USING THE BELL METHOD

Then there's the "Bell" way: here you calculate the distance of the call and apply a rate per minute based on the distance. There are a few approximate ways to calculate distance—and one precise way: subscribe to a service (or develop in-house) a magnetic tape containing the vertical and horizontal coordinate of every area code and exchange in North America. The tape can also contain the city and state name which can then appear on your report. The Pythagorean theorem, using the call's origin coordinates, will give you the mileage. A simple table look-up (using duration) will give the rate.

Once you've figured the basic Bell rate for a call, it can be adjusted downward to reflect the actual cost of the network. The adjusted call cost will then be a bargain for all users of the network.

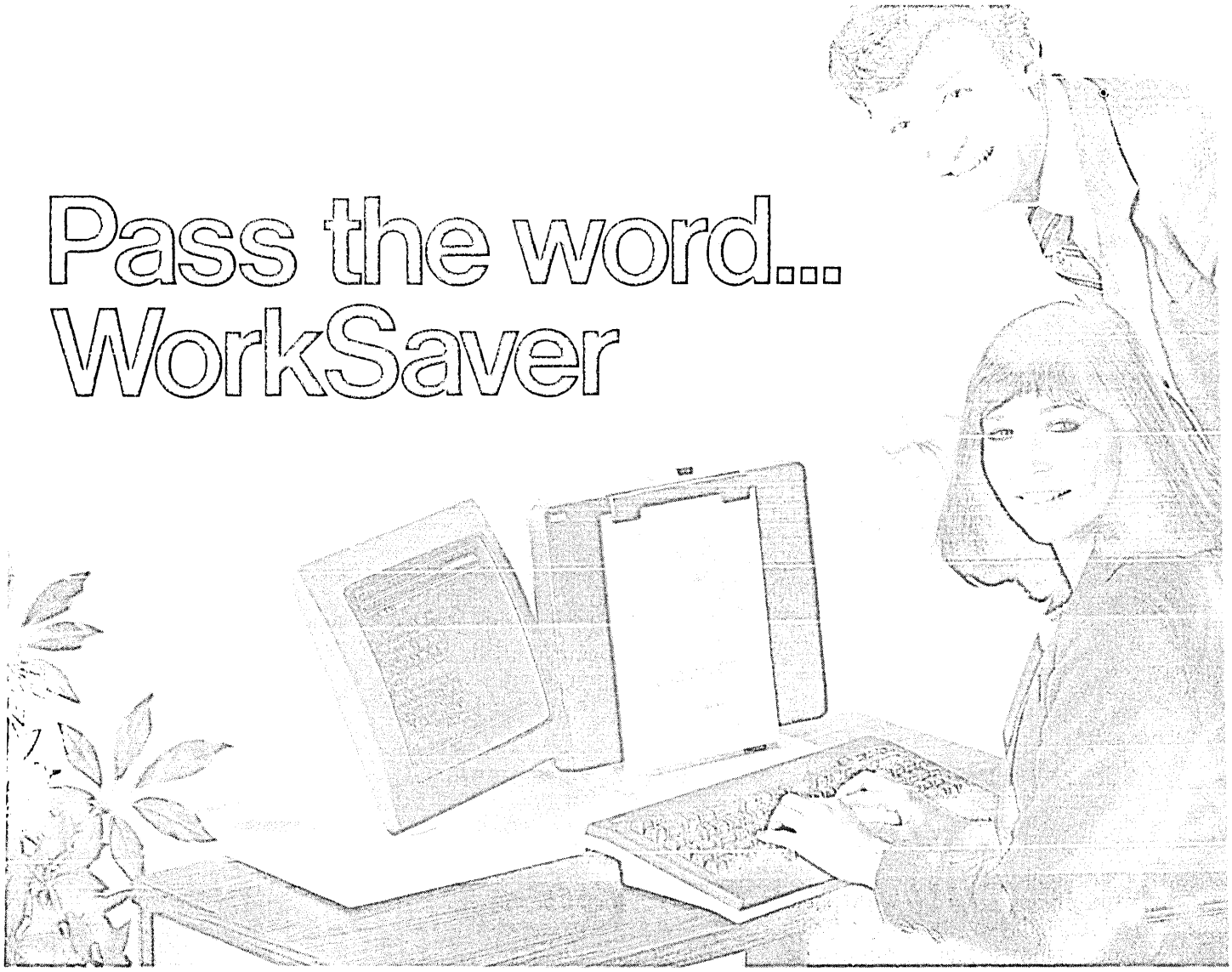
You can also include intrastate tariff for your hubs, local per-minute rates, and

"Okay, Connie. Send them in."

© DATAMATION

CARTOON BY STEVE ATTOE

Pass the word... WorkSaver



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CIRCLE 179 ON READER CARD

The well-designed system should introduce a way of indicating the source of the calls—one of the first steps in processing them correctly.

international tariffs (which are trickier, but not impossible). Avoid tariffs based on facility used (with the possible exception of INWATS). Since the caller no longer decides the route of call, it isn't fair to charge extra if all the WATS lines were busy and the computer "switched" his call over a normal long-distance line. There are some rate structures you'd probably rather not even think about writing a program for, such as charging for a tie line that cost the telecommunications manager $350 a month but carried only five calls.

It's useful to keep the tariffing method flexible. At the very least, the rates themselves must be external to the program.

Intermachine Trunks. A last problem inherent in a network of multiple-call recording devices is duplicate recordings of the same call. When a call is routed from Atlanta to Denver to Oklahoma, it leaves its spoor at every recording device. Your first temptation will be to match the call recordings against each other. Resist it! The first recording will give you all the information you need, so you only need to identify and discard the second and third call recordings. This can be accomplished by identifying all intermachine trunks (IMTs) and discarding all calls incoming on those trunks, since they are coming from another recording machine. (*Note*: You'll want to keep these discarded calls for a second application—network usage analysis.)

Because the network will continually evolve, you should expect trunk groups to be added, changed, and deleted with great regularity as the network manager decides—based on your traffic analysis reports. Suppose, for example, the FX line to Baltimore is only carrying three calls a month.

There are many problems that haven't been covered in this article, but the experienced systems analyst is likely to take those into consideration as a matter of course. The point is that the magnitude of the SMDR data reduction problem is easy to underestimate.

To adequately prepare yourself for SMDR, three courses of action are advisable:

- Become familiar with the forms of data to be recorded. The technical representatives from the equipment manufacturers are the best sources of information.
- Question the telecommunications staff about how people will actually use the network. What people dial is what gets recorded. So find out how to make a local call, a long distance call, and a network call. Will everyone dial the same way, or are there differences in locations? Do people have to dial authorization or account codes for certain types of calls?
- Caution the telecommunications people not to expect the phone bill four weeks after cutover. You can, however, present a trial bill. Too many things can go wrong in the beginning, and it is better to present the first bill as a test run and invite their comments. When people are not actually charged for a 14-hour call they didn't make to a city they've never heard of, they're more likely to point out the error in a calm, reasonable manner.

A possible fourth course of action is to purchase a software package that solves the problems detailed here. Knowing potential problems in advance, as well as being aware of your company's own telecommunications needs, will prepare you to judge the effectiveness of available software versus your ability to develop a program in-house.

Mary Lou Morella is director of operations/services for Commercial Software Inc., a New York-based telecommunications software firm.

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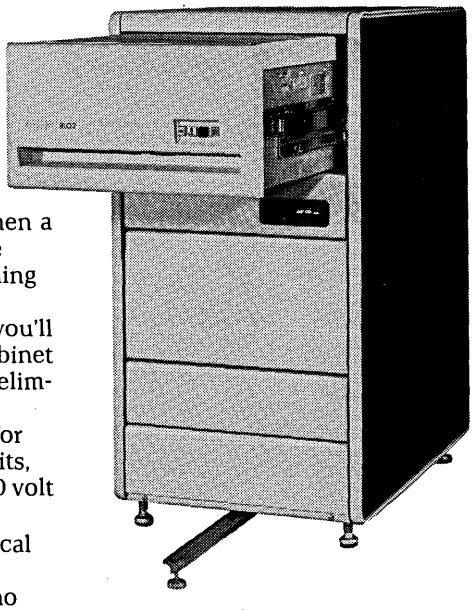

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CIRCLE 180 ON READER CARD

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CIRCLE 182 ON READER CARD

PEOPLE

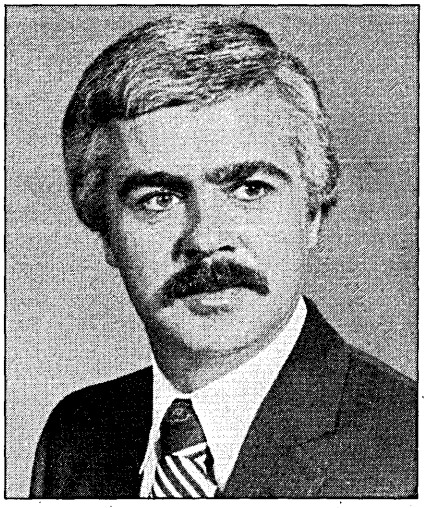
CHIP OFF THE OLD BLOCH

Question: how many people does it take to be Howard Aiken's programmer, John von Neumann's coinventor, the designer and builder of one of the first computers, the salesman of the largest commercial computer order, the architect of the most successful IBM knockoff machine, the designer of the broadest line of computers ever conceived, the inventor of parity checking, the developer of the bar code concept, a successful venture capitalist, and a computer company startup entrepreneur?

The logical answer to that question would be six or seven people—all of them quite talented in different areas. But in this specific case, the answer is one person: Richard M. Bloch.

Bloch has slowed down in the past couple of years, which means that he has only five or six major efforts under way at the present time. Most recently, he was chairman and chief executive officer of Artificial Intelligence Corp., a pioneering firm in adapting artificial intelligence concepts to commercial applications. Bloch is also an intermediary for a variety of companies—most of them in the computer business—which are involved in acquiring or divesting companies and operations. He's a director of highly successful Cullinane Database Systems Inc. and a director of Intertec Development Corp., a West Coast market research firm. "I like to think I've had so much luck in the computer business," says Bloch, "because I've been able to understand the leading edge of technology and yet seek practical solutions."

Bloch got off to an early start in compiling his long list of activities, and no one has ever accused him of wasting time. At the age of three he had learned to play chess in his home town of Rochester, N.Y. In school he was something of a mathematics prodigy, and by the time he finished high school, he logged the highest score ever in New York State's Regents exams. That led to a scholarship to Harvard, where he majored in mathematics, physics, and economics.



RICHARD M. BLOCH: "We had quietly built a commercial version of the Raydac that we called the Raycom, but top management wasn't interested."

The Harvard old boy network stood him in good stead sooner than he expected. "I was a Navy officer assigned to the Naval Research Laboratory in Washington," Bloch recalls. "In January of 1944, Howard Aiken visited our project. We struck up a conversation and he found out I had been to Harvard."

Soon thereafter, the inevitable happened: "Would you like to come back to Harvard and work on my computing machines?" the computing pioneer asked Bloch.

He would indeed. Bloch eventually became Aiken's programmer for Harvard's famed Mark I calculator. Bloch remembers well the arrival at Harvard of the huge machine from IBM. "It was a mess," said Bloch. "It had cables the size of an elephant's trunk and the main shaft was 44 feet long."

But it was just about the most powerful computing instrument around at the time—the ENIAC was still under construction at the University of Pennsylvania—and therein lies the tale of how Bloch came to be a coinventor with the famous John von Neumann.

As a leading wartime weapons consultant to various U.S. government agencies (one of many assignments was the Manhattan Project atomic bomb effort), von Neumann was always looking around for more powerful calculating instruments. After he learned of the Harvard-IBM machine, he and Bloch worked out a long and detailed mathematical solution to determine the blast effect of atomic explosions. Bloch and von Neumann shared the patent with two other scientists.

After the war, in the late 1940s, Bloch moved to Raytheon and designed and built the Raydac, one of the first digital electronic computers. In the process, Bloch dreamed up an ingenious method of checking errors in computers. He called it parity checking. He patented the scheme, and the technique subsequently was picked up by all computer manufacturers and, of course, became a fundamental building block of all modern computers.

In those days, the electronic digital computing field was dominated by the Eckert-Mauchly Computer Corp. and Raytheon. IBM still didn't have much faith in the new contraptions. Unhappily for Bloch, though, Raytheon wasn't much interested in pursuing its early lead in the computer business. After it finished the Raydac for the Office of Naval Research, the company tried to figure out what to do with its computer operation. "Raytheon was an all government-sponsored company in those days," Bloch recalls. "We had quietly built a commercial version of the Raydac that we called the Raycom, but top management wasn't interested."

And so began Raytheon's decades of indecision with the computer, alternately committing and decommitting to the instrument over the years. In 1955, the Datamatic Corporation was formed, with Honeywell and Raytheon as partners. It was a wonderful investment for Honeywell, which took over the entire company in 1957 for $4 million. Bloch and his team refurbished the Raycom, and the Datamatic Corporation had its first computer.

In a sales role at Honeywell-Datamatic, Bloch functioned as a salesman par excellence because he believed in his prod-

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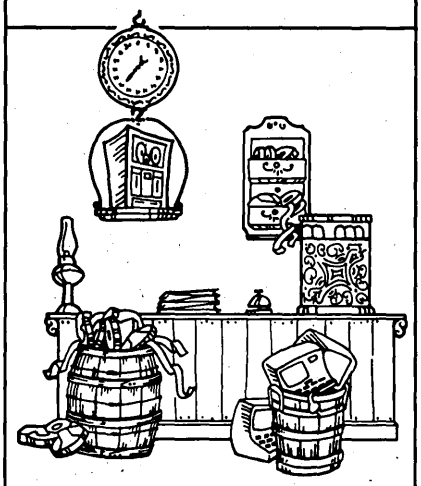

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PEOPLE

BLOCH-BUSTERS: Richard Bloch (front left) was part of Howard Aiken's (front center) team at the Naval Research Laboratory. The lone female in the bunch is none other than Grace Hopper.

uct with a zeal that was almost missionary. That shouldn't have taken anyone by surprise, given the fact that Bloch had designed and constructed the computers. Nevertheless, when he attempted to displace Univac IIs at Metropolitan Life Insurance Co.'s installation—the largest commercial computer site at the time—even Honeywell top management doubted that Univac could be dislodged. Bloch proved them wrong, selling his Datamatic 800 to Metropolitan Life and, along the way, collecting a salesman's spoils: Honeywell gave him and his wife a trip around the world.

It was at Honeywell, where Bloch was vice president of product development, that he began working with bar codes, drawn to the concept in large part because he didn't have much faith in optical character recognition, which was then greatly in vogue in research and development circles. He felt that the bar code concept was the way to go because of what he believed would be its great reliability. The basic bar code concept was patented in Bloch's name while he worked at Honeywell.

In the early 1960s, Bloch's product development team at Honeywell designed the Series 200, a novel knockoff machine aimed at IBM's highly successful 1400 machines. The 200 featured programming conversion aids that enabled IBM users to move their software over to the Honeywell machine with relative ease. The 200 was so successful that it was a key factor in pushing IBM to come up with its 360 Series in the mid-1960s.

While his business life has been devoted to computing, Bloch's private life has been garnished with a gambler's love of chance; his mathematical leanings attracted him to playing the odds. For relaxation, he and his wife Ruth hit the blackjack tables at Las Vegas or Puerto Rico. "Both of us have won over the years," says Bloch. "My wife wins by intuition, but I'm more scientific about it. I get my satisfaction out of beating a system."

Bloch, however, hasn't beaten all the systems he has encountered. When he was general manager of General Electric's Advanced Development and Resources Planning Division in 1969, he was in charge of designing a broadbased product line that would rival IBM's product line, which ranged from terminals and small computers to supercomputers. It was the most comprehensive line of computing equipment ever conceived. But GE's top management shot the project down, deciding to concentrate instead on its nuclear power and jet engine operations. To this day, Bloch believes the GE computer product plan would have succeeded. Neither GE's nuclear power operation nor its jet engine effort could be called successful.

Since 1979, Bloch has been a partner in a San Francisco-based investment fund for which he has prepared a complicated mathematical model for making stock and options investments. In essence, the company, Equity Option Fund, purchases stock and then purchases put and call options against the stock. Bloch says the fund isn't "riskless," but he boasts it has been very profitable since its start, and even last year—a generally bad year for stock and options investment funds—Equity Option logged a profit of more than 21%. The average investment fund last year lost money. Bloch says the principals in the fund, including himself, have invested substantially in the fund themselves. "We don't do unto others," says Bloch, "what we don't do to ourselves."

—W. David Gardner

Smith-Corona introduces the only daisy wheel printer for under $900.*

You're putting together a desktop computer system for your office or home. And you want to add a letter quality printer so you can do word processing, too. But you don't want to spend a fortune.

Until now, you really had little choice but to settle for dot matrix printers. True, dot matrix doesn't produce letter-perfect printing, but daisy wheel printers just cost too much. That is, they did.

Now, Smith-Corona® offers a daisy wheel printer at such an incredibly low price, you can't afford *not* to get it. (The fact is, you won't find a daisy wheel printer *anywhere* at a price so low.)

The Smith-Corona TP-I™ printer operates with microprocessor controlled daisy wheel technology, and is available with either standard serial or parallel data interface. It is compatible with most microcomputers currently on the market. And, unlike many printers, it's made in America.

Best of all, the TP-I produces results identical to those of our very finest office typewriters—printing with real character. So it can be used to send out letters that have to look perfect. As well as financial statements, inventory reports, direct mail campaigns, manuscripts. Even a letter to your son in college! Anything at all you need printed.

The basic TP-I will handle letter or legal sized paper. An option that will be available soon will enable it to handle either fanfold or single sheet paper.

The TP-I is easy-to-use—just turn the power on, load the paper, and away it goes. There are drop-in ribbon cassettes and a choice of easy-to-change, snap-on daisy print wheels for a variety of fonts.

So stop thinking you can't afford a daisy wheel printer. Because, thanks to Smith-Corona, a printer with real character is no longer expensive. **Smith-Corona**

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CIRCLE 185 ON READER CARD

HARDWARE

OFF-LINE

Streaming tape as an inexpensive backup never took off, due to lagging support technology. That's going to change, says Control Data's peripherals company. Support technology has caught up and CDC expects streaming tape to take off in the second half of this year. To better position itself in that market, CDC has extended its line of half-inch streamer-tape units and is announcing them at NCC.

Prices haven't been firmed up on a series of IBM-compatible disk drives formally unveiled Mar. 30 by Ibis Systems of Duarte, Calif., but indications are Ibis will not be undercutting IBM prices. "We're looking at aggressive pricing," says Ibis president Jack Jones. But then, the company is promising twice the capacity of IBM's elusive 3380 with its top-of-the-line Ibis 5000.

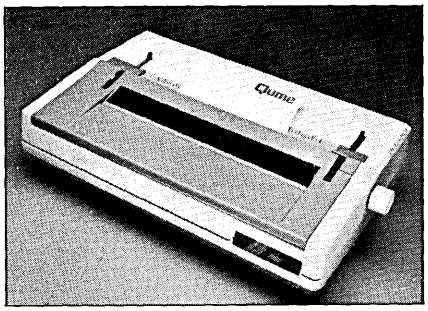
The new high-speed thermal II-D from NEC America combines "for the first time" a printer and a facsimile machine. It can transmit a page in 40 seconds, reduce reports to standard letter size, and receive data from a communicating word processor, telex, or computer terminal. NEC's III-C combines facsimile and an intelligent copier, has 400 by 400 resolution, transmits halftones and fingerprints, and prints a detailed activity log.

Basic Four of Tustin, Calif., which last month got into the microcomputer system business with the introduction of its S/10, a dual Z80-based system, got there via one of its dealers, RCO Inc., Phoenix, which originally developed the system and asked Basic Four to modify its software for it. The MAI subsidiary liked the system so much it bought the rights to the S/10.

DAISYWHEEL PRINTERS

Qume has two new Sprint daisywheel printers, the Sprint 10 for the small business computer market, and an oem version, the Sprint 8, for word processing.

They print at 35 characters per second, use single-board electronics, and have



selectable input voltage ranges for domestic and European requirements.

With 30% fewer mechanical and 50% fewer electronic components, they are said to be among the most reliable daisywheel printers available and are offered with a 3,000-hour MTBF at a 25% duty cycle. A ribbed carriage-drive belt eliminates steel cables and pulleys. Other features of the printers include cases that dampen sound to a maximum of 63 dbA, an RS232C interface with three user-selectable communication protocols, and a snap-in ribbon cartridge.

In quantities of 50, the Sprint 10 is $1,271, while the Sprint 8 is slightly less. QUME CORP., San Jose, Calif.

FOR DATA CIRCLE 301 ON READER CARD

MINIS

A new family of minicomputer systems, geared for users requiring between 25 and 275 terminals, has been introduced by Billings Computer Corp. The 6000 Series is a "complete implementation" of the recently introduced Billings Distributed Processing Network using functionally structured distribution.

According to Billings, the main advantage of a functionally structured system is that an unlimited number of terminals and mass storage devices can be connected into a distributed processing network without the organizational management and programming problems traditionally experienced in setting up large networks.

The system is said to be ideally suited for applications such as electronic mail, remote access of common databases, and distributed accounting functions.

Several 6000 cpus can be stacked on the same system, which can include 30 and 60 megabyte Winchester drives with a streaming tape as the Winchester backup. The detachable keyboard has a numeric pad, 16 user-programmable function keys, and cursor movement keys. Prices for the 6000 series start at $6,000 for the basic system. BILLINGS COMPUTER CORP., Independence, Mo.

FOR DATA CIRCLE 302 ON READER CARD

OCR SYSTEM

The Hendrix Typereader OCR unit has been combined with a new Tele-Typereader display terminal to create a new standalone message preparation system for reading, editing, and transmitting typewritten correspondence "up to 10 times faster" than traditional message communication methods.

The system is said to eliminate typographical errors due to rekeyboarding. The Tele-Typereader system supports two ports

for either on-line connection to multiport communications systems, message switching computers, and modems, or, along with a paper tape punch, for off-line preparation of Telex and TWX messages.

Messages may be edited with the system's word processing features, which include insert/delete, automatic word wrap, and reformatting. Message header and trailer formats are automatically inserted by the system or recalled and inserted by the operator.

Two models are offered. The TTR-2, at $14,995, reads and processes messages prepared in OCR fonts. The $18,995 TTR-3 reads and processes messages prepared in various Courier, elite, and pica fonts. Options include multiple font capability, underscoring, and dual OCR output. Users of Typereader models TR2 and TR3 may field-upgrade to the Tele-Typereader system capability for $5,000. HENDRIX, Manchester, N.H.

FOR DATA CIRCLE 303 ON READER CARD

SPEECH SYNTEHSIZER

Described as "the first professional voice quality text-to-speech synthesizer," the Intex-Talker from Intex Micro Systems Corp. was developed primarily for business and oem applications.

Available as a standalone peripheral or as a circuit board, Intex-Talker provides a real-time audio interface for data processing, telecommunications, automation, education, and the handicapped. It can enunciate data transmitted at high speed over telephone lines, or serve as an unlimited vocabulary audio interface for telephone transactions. Intex-Talker's 64 digitally programmable levels of inflection provide what is said to be a unique high fidelity professional voice quality.

Equipped with a keyboard, Intex-Talker can function as a typewriter for the blind, or as a communicator for the vocally impaired. It can recognize every ASCII character, including punctuation, as it is typed, and can echo each character automatically. The 6K algorithm provides a text-to-phone translation accuracy "unmatched by any other system."

Priced at $295, Intex-Talker has RS323C and parallel connectors, plus handshaking, which permit it to interface with all major computers and smart terminals. It can also be used as a dedicated controller, and has user-expandable programmed memory with 16K ROM and 8K RAM capacity. INTEX MICRO SYSTEMS CORP., Bloomfield Hills, Mich.

FOR DATA CIRCLE 304 ON READER CARD

CAD/CAM SYSTEMS

Applicon's new generation of modular 16 and 32 bit CAD/CAM systems, the Series 4000, is designed to be "easily and economically" upgraded from one system to another as requirements change.

The heart of the 4000 family consists of three Graphics Processing Facilities (GPFs)—the 4225, 4245, and 4275—and two ergonomically designed workstations. The 4225 and 4245 GPFs are based on the DEC 16 bit PDP-11/34 minicomputer and include the RSX-11M operating system. The 4275 is based on DEC's 32 bit VAX-11/751 and includes the VMS operating system and virtual memory architecture for fast retrieval of database information.

Built around the DEC operating system is Applicon's Graphics Applications System, which supports concurrent 2-D and 3-D graphics generation and manipulation. Over 100 software packages are available for tasks such as 2-D and 3-D design, NC programming, electronic-circuit placement and routing, and generating detail drawings.

A new software capability is the Distributed Graphics Network, which allows users to establish graphics information networks within their engineering and manufacturing organizations. A new database management capability helps users create and maintain an engineering database to link the many activities that occur during product development.

Prices for complete turnkey Series 4000 configurations, including hardware, software, and workstation, start at $99,500. APPLICON, Burlington, Mass.

FOR DATA CIRCLE 305 ON READER CARD

WIDE-VIEW VIDEO TERMINAL

With more and more computer owners displaying financial spreadsheets and modeling programs, Datavue Corp. offers a wide-screen video terminal designed to simplify such "space consuming" applications. The Datavue 132-C terminal features a 132-column format that displays 65% more columns than the conventional 80-column terminals.

The extra width of the 132-C permits displaying 12 calendar months of data using a columnar spreadsheet, along with totals and descriptions columns on one 11¾-inch screen.

Other features of the Datavue 132-C include nonglare glass, a detached keyboard with numeric keypad, advanced editing features and a nonvolatile memory for storing frequently used terminal attributes and emulations, and 16 programmable function keys (32 with shift) for quick access of repetitive control codes.

The $1,995 Datavue 132-C includes a Z80 microprocessor that can store five pages of 132-column data or nine pages of 80-column data. The Z80 also permits advanced editing functions such as inserting and deleting characters and lines, erasing portions of the screen, and sending and printing portions of the screen.

Options include a field attribute board that permits reverse video, half intensity, blinking, blanking, underline, and alternate character set, all on a field-by-field basis. DATAVUE CORP., Seattle, Wash.

FOR DATA CIRCLE 306 ON READER CARD

LASER PAGE PRINTER

The 9280 is the latest member of the DatagraphiX laser-printer series, a high-speed off-line page printer designed to accept print-data sets on magnetic tape from a wide range of host computers, including most IBM, IBM compatible, Burroughs, NCR, Honeywell, and Univac medium- to large-scale computers.

The 9820 prints up to 21,000 lines a minute, and can print combinations of page formats of 6, 8, or 12 lines per inch, and 10, 12, or 15 characters per inch. The user can select character styles from 34 standard fonts, with any four fonts intermixed within a report.

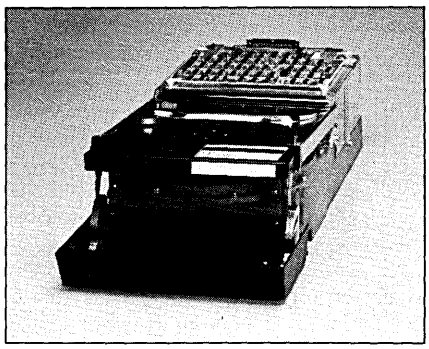
The 9820's font editor permits creating new fonts, changing existing fonts, as well as designing special characters or lo-

HARDWARE SPOTLIGHT

INTELLIGENT DISK DRIVE

Billed as the world's first intelligent disk drive, the Cynthia D145 will make its North American debut June 7 at NCC 1982. It was first introduced at the 1982 Hanover Fair in Germany and is marketed in the United States by Cynthia Peripheral Corp., a Cii-Honeywell Bull company.

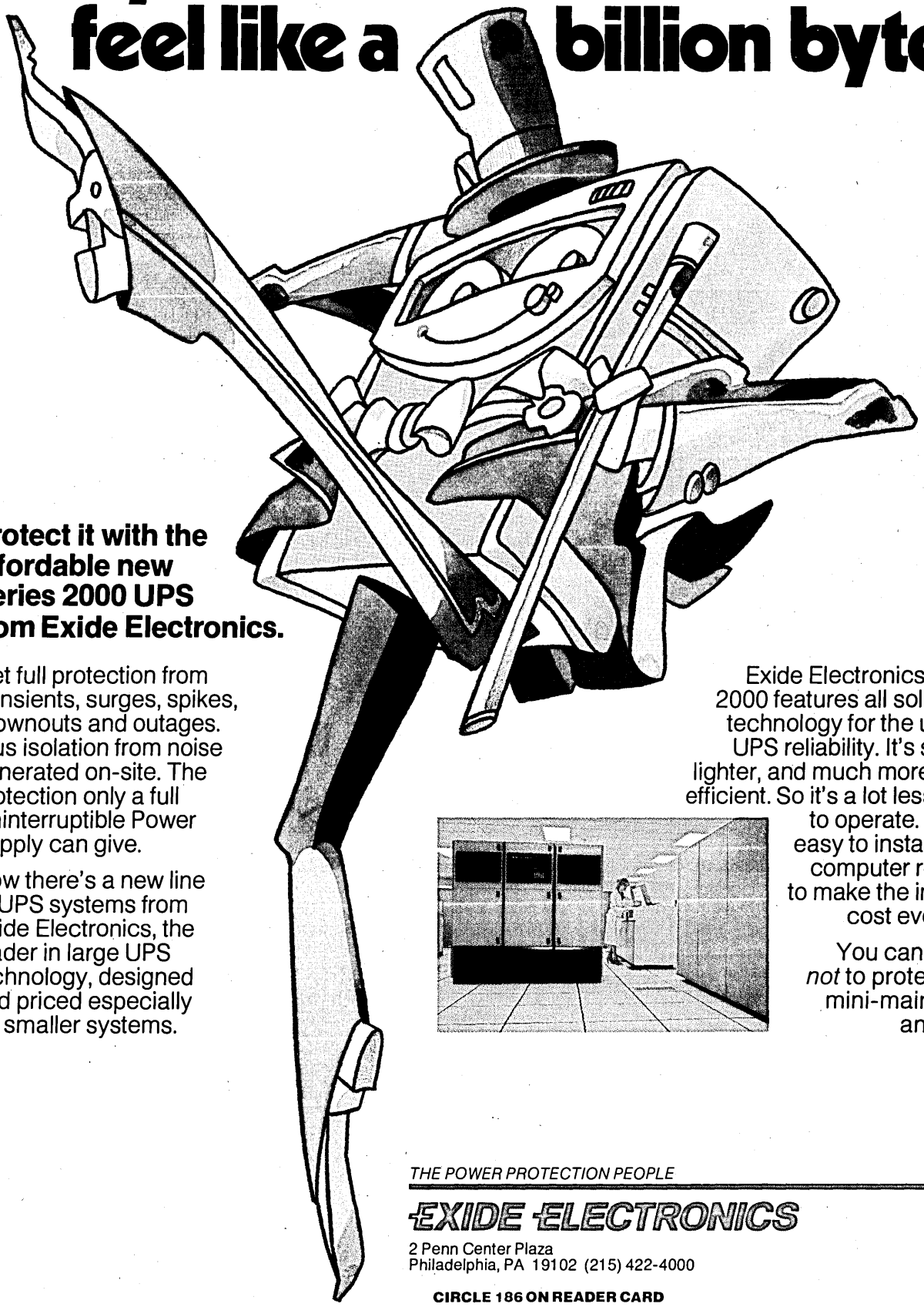
The D145 combines 12 megabytes of hard-disk data storage and 12 megabytes of disk-to-disk backup, plus a Shugart-compatible intelligent controller built into the drive. The drive is said to perform all error-handling and protocol-interface functions, without separate hardware interfacing or applications software changes. All seeks, verifications, error recovery, and disk control and data transactions are automatically handled in the drive without cpu or bus interaction.



Priced at $3,390 in oem quantities of 100, the Cynthia D145 incorporates many of the housekeeping functions associated with disk drives into the drive itself rather than using the cpu. CYNTHIA PERIPHERAL CORP., Palo Alto, Calif.

FOR DATA CIRCLE 300 ON READER CARD

How to make your mini-mainframe feel like a billion bytes.



Protect it with the affordable new Series 2000 UPS from Exide Electronics.

Get full protection from transients, surges, spikes, brownouts and outages. Plus isolation from noise generated on-site. The protection only a full Uninterruptible Power Supply can give.

Now there's a new line of UPS systems from Exide Electronics, the leader in large UPS technology, designed and priced especially for smaller systems.

Exide Electronics' Series 2000 features all solid-state technology for the ultimate UPS reliability. It's smaller, lighter, and much more power efficient. So it's a lot less costly to operate. And it's easy to install in any computer room . . . to make the installed cost even less.

You can't afford *not* to protect your mini-mainframe, anymore.

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CIRCLE 186 ON READER CARD

gos for personalized letterheads, forms, and mailing labels.

Priced starting at $300,000, the 9820 offers many features of on-line printers, such as using job-accounting software to record information on each specific job by name, with I/O counts as well as start and end times. The 9820 will also process setup information formatted for an IBM 3800 off-line printer.

For ease of operation, the 9820's menu-driven English language instructions are displayed on a DatagraphiX 132-1 Video Display Terminal. The messages guide the operator through a sequence of job setup routines, reducing the amount of training required. DATAGRAPHIX, San Diego, Calif.

FOR DATA CIRCLE 307 ON READER CARD

ENTRY-LEVEL COMPUTER

The 1100/61 B1 is a new "economically priced" model in the Sperry Univac 1100/60 family of computers. It is field-upgradable to any of the 1100/60 models, and can thus grow in power up to 11 times through 15 models in the family, with total object-code compatibility.

The 1100/61 B1 is said to offer price/performance competitiveness with the IBM 4331-G2 system; Sperry Univac estimates it performs 25% better than the IBM system.

The 1100/61 B1 central processor unit contains an I/O unit with one block mux and one word-channel module (four channels), an integrated main storage unit with 524,000 words of storage, a system support processor, and a system console with printer. Main storage can be expanded with an additional 262,000 words, with a maximum of two additional storage units, allowing for a total internal memory capacity of 1,048,000 words.

A basic 1100/61 B1 system has a purchase price of $236,519, or can be leased on a five-year plan for $5,463 a month, including maintenance. SPERRY UNIVAC, Blue Bell, Pa.

FOR DATA CIRCLE 308 ON READER CARD

PRINTER FOR IBM P.C.

NEC Information Systems has announced "the first" letter-quality printer that's plug compatible with the IBM Personal Computer. The Spinwriter 3550, attached to the P.C.'s parallel printer port, operates at up to 35 characters a second for both data processing and word processing applications.

The 3550 printer, which has a suggested retail price of $2,250, can use over 50 print thimbles designed for word and text processing, scientific, and foreign language applications. The thimbles come in constant-pitch and proportional-spaced fonts, and some can print up to 203 columns on a 13.6-inch print line. The 3350 takes paper up to 16 inches wide.

For word-processing applications, the 3350 provides automatic proportional spacing, bold and shadow printing, automatic underscore, bidirectional printing, centering, justification, superscripting, and subscripting.

Forms handlers available from NEC include a single-input cut-sheet feeder with dual-bin and envelope-feeding adapters, a bidirectional forms tractor, a bottom-feed guide, a demand document tractor, a manual document inserter, and a cut-sheet guide. NEC INFORMATION SYSTEMS INC., Lexington, Mass.

FOR DATA CIRCLE 309 ON READER CARD

DOT-MATRIX PRINTER

Greater throughput for less cost is claimed by Data General for the tabletop 4422 microprocessor-controlled printer, a new addition to its Commercial Systems family of systems and peripherals.

The 150 characters-per-second 4422 is said to offer higher performance at less cost than printers previously offered on the Commercial Systems product line. Comparatively, the current 60cps printer costs nearly 7% more, and the current 180cps printer more than 75%.

The 4422 is logic seeking and bidirectional. It features a 9-by-9 dot matrix, four print formats (normal, compressed, elongated, and compressed-elongated), self-test capability, and a four-million-impression ribbon cartridge. Priced at $2,290, the 4422 can print up to six forms, and has eight resident language fonts that are switch selectable, with 96 uppercase and lowercase characters. The printer interfaces with Commercial Systems models CS/10, CS/50, and CS/70 configured with DASHER D200 terminals. DATA GENERAL, Westboro, Mass.

FOR DATA CIRCLE 310 ON READER CARD

LINE DRIVER

Because local area networks often don't need modems and can use line drivers, Micom System's Micro400 model 420 has been designed for supporting terminals that may be a few hundred feet or even several miles from their host computer system.

Operating at up to 19,200 bits per second, the 420 is a fast synchronous line driver said to be unusual because it is equally appropriate for point-to-point or multidrop configurations.

The 420's fast synchronization time—at 8 msec, it is said to be about a

third that of conventional 4800- or 9600bps modems—permits high network throughput and short response time in multidrop applications. The short sync time is said to permit using the 420 configurations with up to 16 terminals on a single multidrop line. The line drivers operate at any of several data rates within their range, rather than being limited to a single speed, as with conventional modems.

The 420 is switch selectable between two-wire and four-wire links, and its design is said to allow for do-it-yourself installation and troubleshooting.

Micom offers the new unit as a replacement for an earlier version, which was limited to four-wire, point-to-point operation only, but at the same price of the earlier model, $290. MICOM SYSTEMS INC., Chatsworth, Calif.

FOR DATA CIRCLE 311 ON READER CARD

MINIS

General Automation's new 900 family of minicomputers consists of five systems said to offer up to 48% price/performance improvements over the firm's previous offerings, running standard applications.

The 16 bit 900 series offers bit-slice technology, gate-array logic chips, and cache memory, and runs with GA's CONTROL operating system. The series is software, I/O controller, and peripheral compatible with previous generations.

Users can select from 14 configurations of the five basic models (910, 920, 930, 940, and 950). Systems can be expanded with additional main memory, cache memory, and cabinetry. The processor chassis provides room for up to two megabytes of main memory, cache memory, GA's memory management system, I/O slots, and an I/O expansion driver.

The 910, featuring 64 kilobytes of GA's HYPAK memory, is said to provide 1.2 times more processing power than the present GA 16/200 series of processors. Models 933 and 935 include error correcting HYPAK memory and a high-speed cache memory said to improve performance up to 2.6 times that of the 16/200 series.

The single bay 940 and dual bay 950 series include the 930 processor and feature cabinetry meeting FCC requirements for RFI.

Series 900 single quantity prices range from $6,995 for the 910 oem chassis-only configuration, to $20,950 for a 256 kilobyte 950 with cache memory. GENERAL AUTOMATION INC., Anaheim, Calif.

FOR DATA CIRCLE 312 ON READER CARD

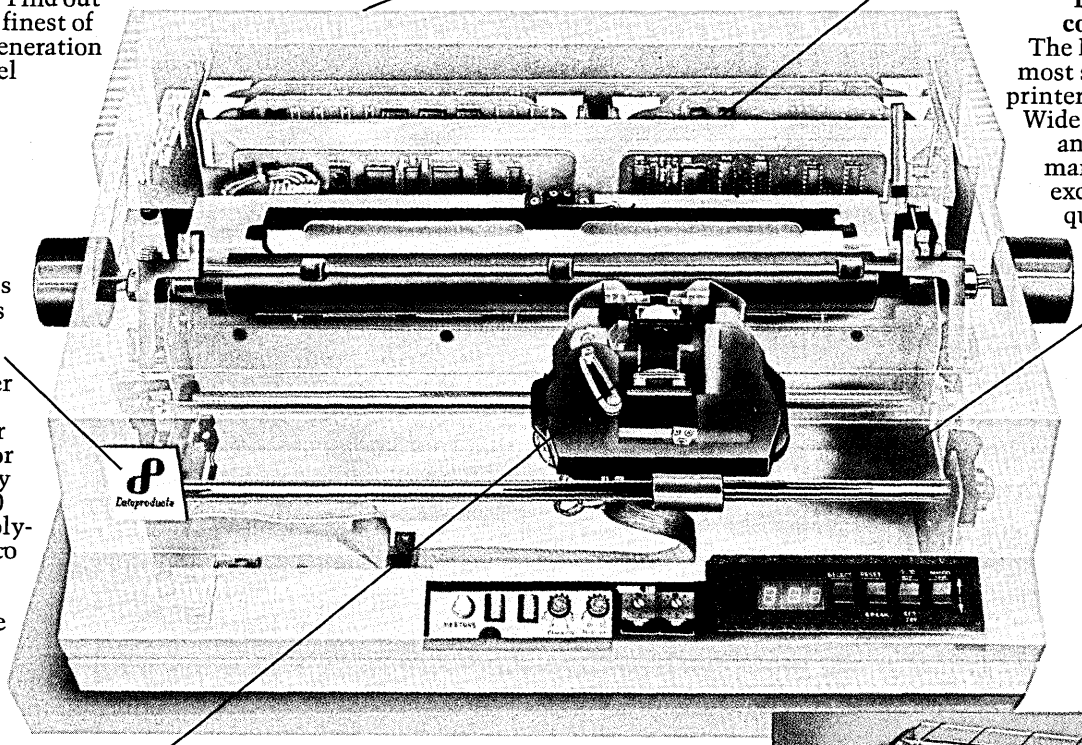
IT TAKES GUTS TO OFFER A 365 DAY WARRANTY.

Dataproducts' new daisywheel printer is built not just for high performance, but also for long-term reliability. Designed from the ground up, the DP-55 prints at 55cps with an MTBF of over 3,000 hours. And we've added printing with either metal or plastic print-wheels, user diagnostics, a print-head mechanism which tilts 90 degrees for easy print-wheel changing, and more. Find out about the finest of the new generation daisywheel printers.

Heavy duty 5½-amp power supply. Conservative specking builds in a safety factor of over 50%. It also leaves a full 2½-amp reserve for function expandability and custom interfaces.

Heat-reducing electronic design. By separating analog and digital circuitry, we eliminated a major source of heat build-up. The DP-55 runs so cool, it doesn't even need a fan.

Extra-sturdy construction. The DP-55 is the most solidly built printer in its class. Wide mechanical and electronic margins ensure excellent print quality over a long life for high-use customers.

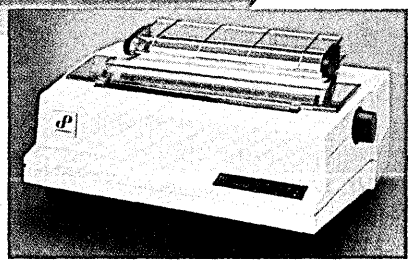


A name you can trust. Dataproducts is the world's largest independent manufacturer of computer printers. Our reputation for dependability is built on 20 years of supplying printers to the most demanding OEM's in the industry.

Single-action sealed hammer. With only one moving part, the DP-55 hammer is significantly more dependable than conventional 3-piece designs. The sealed housing locks out contaminants, extending life and ensuring consistent performance.

365 Day Warranty. When you build a daisywheel with guts like this, you can back it with a full 365 day OEM warranty.

Write our Marketing Department at: 6200 Canoga Avenue, Woodland Hills, CA 91365. Or phone us at: (213) 887-8057 (Western); (617) 237-4711 (North Eastern); (215) 293-1810 (Eastern/Southeastern); (612) 835-2066 (Central).



DP-55 DAISYWHEEL PRINTER

DATAPRODUCTS

Dataproducts

CIRCLE 156 ON READER CARD

"Oh no! Somebody got into the computer room last night."

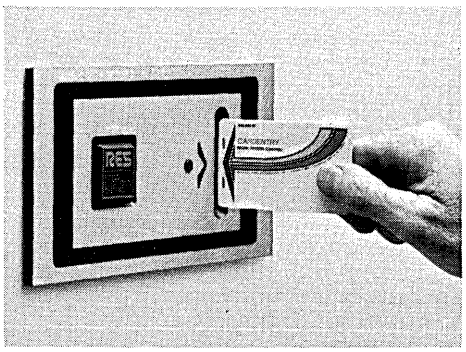
"I don't know who was madder – our data processing manager, our controller or our auditors. But they all came into my office and complained that anyone could get into the computer room – at any time. So we installed an RES CARDENTRY® system, and now we control who uses the computer room. And our smart machines are protected by some other pretty smart machines."

As well they should be.

Without an RES CARDENTRY system to protect your data processing facility, it can be subject to information security breaches, as well as damage to your expensive computers.

An RES CARDENTRY system solves the problem of securing your data processing equipment. It also does away with employee keys (and the possibility of duplicating them), and lack of personnel accountability.

When we install a CARDENTRY system, we give each employee a RUSCARD™ with a personalized code. The cards are virtually impossible to duplicate. Your computer or DP room has a single, compact CARDENTRY reader. You tell your system who's allowed in and when. Then, if an unauthorized person tries to enter the room the door won't open.



What's more, a central printer immediately tells your security guard where and when an unauthorized entry has been attempted – in easy-to-read English text.*

It's that easy to account for (and control) unauthorized access and activities. And it's that easy to save money.

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RES RUSCO ELECTRONIC SYSTEMS

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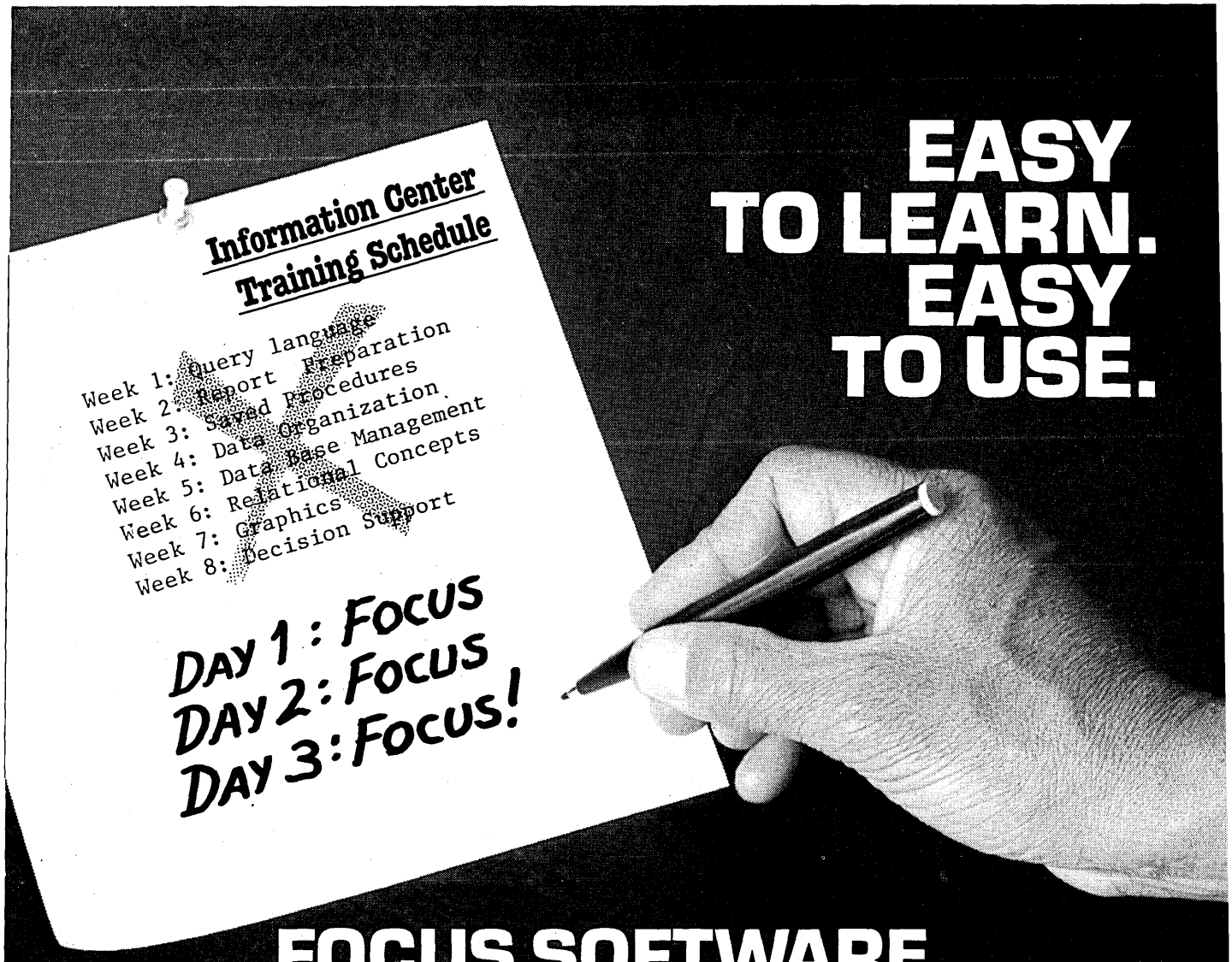
*Also available in French, German or Italian.



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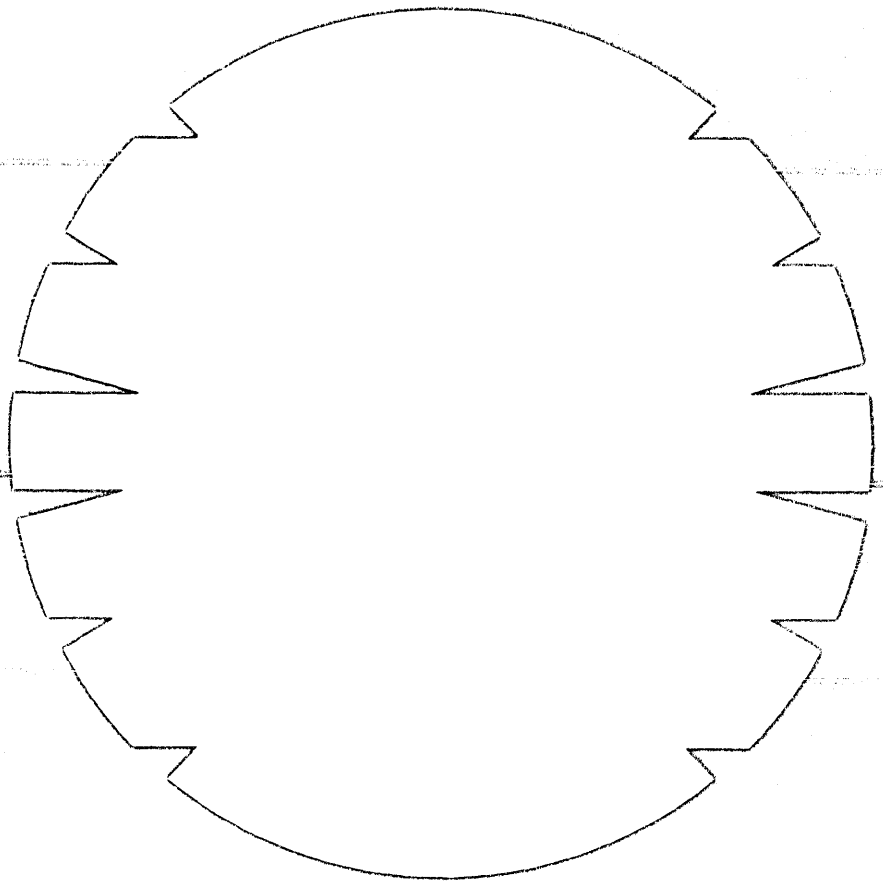

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SOFTWARE AND SERVICES

UPDATES

Take an electronic spreadsheet such as VisiCalc, add four-window graphics (with six types of charts), word processing, a database management system, and telecommunications, integrate the mix, and you've got Context MBA, written in Pascal by Context Management Systems of Torrence, Calif., for the IBM Personal Computer. Context MBA is $695. A key feature: as data are changed, the graphs update accordingly. Also, tables and charts are easily incorporated into letters and memos. Forthcoming are versions for Xerox, Apple, Fortune, and Sirius/Victor 9000 machines. Context will provide training via The Source network.

A full implementation of the C language has been written for the IBM Personal Computer by Francis Lynch of Lattice Inc., Hoffman Estates, Ill., and will be marketed at $500 by Lifeboat Associates, New York; no object-license fee is required. Lattice had already written a C compiler for General Automation's Series 16 minis and was able to implement the same compiler on the IBM P.C. in only four months, under IBM's DOS.

Reader's Digest Educational Division will develop and market educational software for the Apple personal computer. Just released: a math assessment and reinforcement package for grades 1 through 7.

A Spanish language version of its Spectra-Text word processing system has been brought out by Intelligent Systems, Norcross, Ga., for its CP/M color graphics micro. The entire package was converted to Spanish, including documentation, system menus and prompts, and system commands. System prices: $9,245 up, including printer.

FINANCIAL ACCOUNTING

Dp managers who want to account and charge for computer-resource usage on their large-scale IBM computer systems can do it with the Financial Accounting Systems (FACTS) from Boeing Computer Services.

FACTS is a generalized system for financial accounting and reporting of dp activities. It identifies users of dp resources and services, and computes the charges for these services. FACTS can track charges at organizational, project, and subproject levels. The system reports both computer charges (batch and on-line) and noncomputer charges. FACTS is table-driven and supports user interfacing by offering a variety of user exits.

FACTS can establish both a cost and a price value for resource usage. Cost coefficients may be used to reflect the cost to deliver the resource or service; price coefficients may reflect changing considerations such as urgency, time of day and day of week of execution, and user. The package automatically reallocates charges to selected users to ensure full zero-balancing of accrued charges versus data center costs.

Depending upon the options selected, FACTS costs from $8,000 to $15,000. BOEING COMPUTER SERVICES CO., Vienna, Va.

FOR DATA CIRCLE 326 ON READER CARD

ACCOUNTING FOR IBM P.C.

Count/Up, a general ledger, accounts payable, and accounts receivable system originally written for the 6800 microprocessor, will be available this month on the IBM Personal Computer.

Count/Up consists of 24 programs and five menus, and permits 53 individual report records and up to 750 account numbers. A user can define up to 20 character fields in a journal transaction, where the length of each field can consist of up to 24 characters.

On the IBM P.C., Count/Up uses 64K of RAM and two disk drives and costs $1,700. Portions of the package are available in various groupings.

Count/Up is "one of the few" accounting systems that allows the user complete freedom in designing ledgers. The system has automatic record-keeping together with a video or printed display of a company's records. SQUIRE, BURESH ASSOCIATES INC., Auburn, Mass.

FOR DATA CIRCLE 327 ON READER CARD

PROGRAM DEVELOPMENT SYSTEM

Three Applied Data Research products are now available for use under IBM's SSX/VSE operating system: Vollie (an on-line program development system), Look (a real-time performance-measurement package), and Librarian (a source program management system).

Vollie, originally written for DOS/VS and also operating under DOS/VS(E), is a replacement for IBM's ICCF. ADR expects Vollie to replace ICCF as the primary command system for VSE operating systems within the next three years.

Look, which helps diagnose system problems, now operates under MVS, VSI, and DOS/VS(E). Librarian is said to be the most widely installed product from an independent vendor, and operates in OS and DOS environments.

Permanent license fees under SSX/VSE are $12,800 for Vollie, $4,100 for Look, and $6,000 for Librarian. APPLIED DATA RESEARCH, Princeton, N.J.

FOR DATA CIRCLE 328 ON READER CARD

PROJECT MANAGEMENT SYSTEM

Interactive Logic's Scheduling and Resource Management System (SRMS) is now available under VM/CMS and will run on IBM 370/158, 3033, and 4300 computers or plug-compatibles.

Using English-like commands, the user inputs project requirements directly to the system. SRMS has three modes of operation: Novice, Infrequent, and Expert. Full-screen menus in the Novice mode guide the new or casual user through the system. In Expert mode, experienced users can access SRMS through its "simple but powerful" command language.

All of the many reports available can be tailored to the user environment. Also, any number of reports can be defined on both an ad hoc and production basis.

Unlimited multiple project and interproject networks can be set up, with multiple start and end dates, CPM analysis, forward and backward target-date seeking, resource distribution curves to customize allocation, alternate-event ranking, tiering of management control, and a built-in skills inventory.

A perpetual lease for SRMS is $46,200; monthly lease is $1,735. SRMS supports scenario testing, policy decisions, alternate project structuring, and impact analysis. Multiple models can be created from the primary database or from other models. All the facilities of the standard system can be used in the simulation mode. INTERACTIVE LOGIC INC., New York, N.Y.

FOR DATA CIRCLE 329 ON READER CARD

16-BIT SYMBOLIC DEBUGGER

Programmers don't have to go through listings when debugging 16-bit programs written under the CP/M family of operating systems if they use SID-16, a symbolic debugger from Digital Research.

With the standard DDT-86 debugger that comes with Digital Research 16-bit operating systems, programmers have to figure out the addresses of items to be examined or modified, either from a program listing or a symbol-table listing. And when the program is changed, those addresses may change. SID-86 keeps track of those locations, and thus saves time and effort by allowing programmers to refer to items by name.

SID-86, which has an end-user price of $150, can read a final, compiled, machine-readable program written in any high- or low-level language running under CP/M-86, Concurrent CP/M-86 or MP/M-86. DIGITAL RESEARCH, Pacific Grove, Calif.

FOR DATA CIRCLE 347 ON READER CARD

EVALUATING MINERAL DEPOSITS

Programs that automate the many tasks involved in evaluating large mineral deposits have been developed by Control Data Corp.

SEAMSYS collects and analyzes drillhole data, develops models of the property for graphic display in cross-section and plan view, provides reports on geologic and mineable reserves, and facilitates mine planning.

Priced at $180,000 for a paid-up license or $4,200 per month on a lease, SEAMSYS operates on all Control Data Cyber 170 computers and is available on the Control Data Cybernet Services data processing network. CONTROL DATA CORP., Minneapolis, Minn.

FOR DATA CIRCLE 348 ON READER CARD

32 BIT CAD/CAM SYSTEM

Announced as the first integrated 32 bit system of its kind, the GS-32 CAD/CAM system is based on the VAX family of processors from Digital Equipment Corp. Auto-Trol Technology defines integrated in this case as meaning that both graphics and applications use a common database and run on the same processor.

Designed as a total product development tool for manufacturing companies, GS-32 permits products to be completely designed and analyzed on the system. The resulting data can be accessed by manufacturing personnel for designing machinery, tooling, and assemblies, and in developing flat patterns, nesting layouts, and numerical-control parts programs.

Auto-Trol offers the GS-32 software alone at prices starting at $50,000 for a system with one workstation. Complete systems are also available, built around a VAX computer and using Auto-Trol's human-engineered graphic workstations. AUTO-TROL TECHNOLOGY CORP., Denver, Colo.

FOR DATA CIRCLE 331 ON READER CARD

WORD PROCESSING FOR IBM P.C.

Expecting a large demand for software by users of the IBM Personal Computer, MicroPro is formatting its family of products, including the WordStar word processing program, to run on the P.C. This will be the first 16 bit version of WordStar, which carries a suggested retail price of $495.

Other MicroPro family members that will be formatted for the IBM Personal Computer include WordMaster, a text editor; CalcStar, a CP/M-based financial planning package; DataStar, a ready-to-run package for data entry and retrieval; SuperSort, a data-handling utility for DataStar and other file structures; and SpellStar, a spelling checker for WordStar.

MicroPro is also converting its products for use with other operating systems such as CP/M-86 and Unix. MICROPRO INTERNATIONAL CORP., San Rafael, Calif.

FOR DATA CIRCLE 332 ON READER CARD

3-D CADAM INTERFACE

A software interface from Mathematical Applications Group, Inc. (MAGI) enables the output of MAGI's SynthaVision 3-D solids-modeling process to double the productivity of draftsmen using Lockheed Corp.'s automated CADAM drafting and design system.

The MAGI solids-modeling process is said to be the only one of its kind with a 3-D database that can interface with the CADAM system to reduce significantly the time needed to create engineering drawings.

The MAGI interface, which is $80,000 to $125,000, depending on the options selected, enables the SynthaVision output to be passed to CADAM, which in turn processes the data as if they had been originally produced by CADAM itself. The SynthaVision output enables CADAM users to automatically create any view desired, including planar or nonplanar cross sections from any angle, partial cutaways, and exploded views, all with hidden lines removed automatically by the computer.

The MAGI output can also be used to produce technical illustrations and realistic shaded pictures, and also compute mass properties and generate finite elements for stress analysis. MATHEMATICAL APPLICATIONS GROUP, INC., Elmsford, N.Y.

FOR DATA CIRCLE 333 ON READER CARD

MICROCODE GENERATOR

Using the Automatic Microcode Generation System (AMGS) from JRS Research Laboratories, a VAX 11/780 user can program computationally intense algorithms in a FORTRAN-like high-level language and then

SOFTWARE SPOTLIGHT

DIBOL FOR VAX-11

DEC's latest implementation of its DIBOL programming language is for its VAX-11 family and DEC Datasystem 700 series of 32 bit superminicomputers. DIBOL was developed for writing business and commercial programs. VAX-11 DIBOL runs under the VAX/VMS operating system and is compatible with the PDP-11 DIBOL used on DEC Datasystems configured around PDP-11 minicomputers. It allows users to run DIBOL-11 programs on VAX-11 computers without having to translate the programs to another form. Adding VAX-11 DIBOL extends the range of computers that can run business programs from the microcomputer-based DEC Datasystem 315 through the superminicomputer-based DEC Datasystem 780.

Licensed at $7,900, VAX-11 DIBOL takes advantage of the VAX/VMS operating system's services and common run-time library. It also uses virtual memory support, permitting large programs to be executed without overlaying or segmentation.

Compared to the performance of DIBOL-11 on the top of the PDP-11 minicomputer line, VAX-11 DIBOL is said to achieve up to 50% greater throughput in many cases. DIGITAL EQUIPMENT CORP., Maynard, Mass.

FOR DATA CIRCLE 325 ON READER CARD

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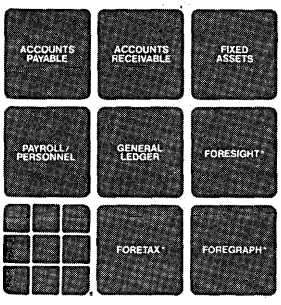

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automatically compile the programs into microcode that executes at the microengine level of the machine. The microcode executes from the User Writeable Control Store option available from DEC.

The AMGS can be used in developing high-performance algorithms for time-critical applications, speeding up existing bottleneck routines, and as an educational tool in microprogramming and machine architectures.

JRS says the value of microcoding on the VAX is application-dependent, and that performance improvements have ranged from about 30% to a factor of 10 more.

The licensing fee for AMGS is $15,000. It is written in Pascal and is hosted on the VAX; it compiles and executes the compiled microcode under VMS. JRS RESEARCH LABORATORIES INC., Orange, Calif.

FOR DATA CIRCLE 334 ON READER CARD

DISPLAY

Software that allows an Apple computer to function like a slide projector with a carousel is available from Business & Professional Software. Screen Director is used with another BPS package, Apple Business Graphics, and lets the user move from image to image with a Kodak handheld remote controller that plugs into the game slot.

Screen Director, which is $150 for the Apple II and $250 for the Apple III, can also be used with other programs that produce graphic images on an Apple computer, such as Apple Pilot or VisiPlot.

Using Apple Business Graphics, graphic images are created on the Apple's console and stored on a diskette. The data can then be accessed from the Screen Director program and the images arranged in sequence. The user types in a descriptive name for each image and tells the computer whether one image should cut or dissolve into the next.

The user may move forward or backward from one image to another with the remote controller, or set up the program to run automatically with a preselected timing interval. Each diskette holds from 15 to 20 screens.

The displays created with Screen Director may be shown on an unlimited number of video monitors simultaneously, and the monitors may be of any size. Screen Director also permits creating hardcopy from a "tray" of screen images on various dot matrix printers. BUSINESS & PROFESSIONAL SOFTWARE INC., Cambridge, Mass.

FOR DATA CIRCLE 335 ON READER CARD

REPORT WRITER

Report Writer II allows nonprogrammer users to design and produce complex reports by filling out forms on a crt. It is a $750 option that can be added to the $995 User Real-Time Data Manager; both are products of Interactive Technology and are compatible with operating systems such as RT11, TSX-Plus, RSX-11, and RST/E.

Basic math can be performed by Report Writer II for subtotaling, totaling, or calculating percentages while a report is being printed. It also performs utility functions such as generating a diagnostic listing of the report sequences, useful for tracing errors.

Examples of the report-writing capability include columnar reports, such as inventories showing current quantities of each item in stock. Also, mail label reports can be set up so that each label is one page of the report, or it can be reduced to mailing label size.

The Real-Time Data Manager, or RDM, is based on filling out forms that describe the format and data to be printed, thus cutting development time for information storage and retrieval applications. An RDM demo package is available for $25. INTERACTIVE TECHNOLOGY INC., Portland, Ore.

FOR DATA CIRCLE 336 ON READER CARD

TIME MANAGER FOR TRS-80

Radio Shack's Time Manager package is a timesaving tool for organizing people, projects, schedules, priorities, and other elements of the working day. Time Manager, for the TRS-80 models I and III, is $99.95.

Time Manager organizes daily schedules, summarizes and displays appointments, "to do" tasks, and project information. It can keep records of expenses or mileage for income tax reports or other purposes, document important dates, monitor projects and deadlines, and provide time and expense accounting information (such as hours worked) as an aid to billing or internal reports.

A scan feature searches forward or backward to summarize entries. Time Manager can also provide information selected by key word, category, priority level, or by a combination of the three. It can also provide running accounting totals for up to nine separate user-defined categories. Eight "note pad" screens are provided.

Time Manager requires a 48K two-disk TRS-80 model I or III. Future items in the Manager series will be Project Manager and Personnel Manager; all three will be able to work together, reading and updating information. RADIO SHACK, Fort Worth, Texas.

FOR DATA CIRCLE 339 ON READER CARD

FILE MANAGEMENT FOR HP-85/83

Using Hewlett-Packard's File Manager, users of the HP-83 and HP-85 personal computers can perform electronic filing. With File Manager, users create forms for entering data into the filing system. The data can be updated, searched, sorted, or even translated into a string data file for use with other software packages, such as VisiCalc PLUS, using soft keys to select from a menu of operations.

File Manager is $200, and also has report and graphics capabilities. With a printer and plotter, it can generate full-page reports, mailing labels, and graphics. HEWLETT-PACKARD CO., Palo Alto, Calif.

FOR DATA CIRCLE 337 ON READER CARD

COMMUNICATIONS FOR MICROS

LogOn, a desktop computer communications package from Ferox Microsystems, converts the IBM Personal Computer, Apple II or III, or TRS-80 model II computer into an auto-dial, auto-answer intelligent terminal for communications with other computers. LogOn features self-explanatory menus and allows users to send and receive text or binary files. Users can also exchange messages, electronic mail, program files, or graphic images at 30 to 120 characters per second. Users can build a permanent directory of frequently called numbers and computer configurations. The user then selects a computer from a menu and LogOn does the rest, automatically redialing if busy and performing automatic retransmission of blocks of data if an error occurs.

LogOn, priced at $150 suggested retail, is written in UCSD Pascal, so files are directly usable by other Pascal programs. A run-time Pascal is available for $50.

LogOn features a 19K work space buffer that allows users to capture on-line sessions while displaying data to the crt or printer, as well as store data on diskette. FEROX MICROSYSTEMS, Arlington, Va.

FOR DATA CIRCLE 338 ON READER CARD

GRAPHICS FOR HP-3000

Precision Visuals has tailored its DI-3000 and Grafmaker packages to run on the complete line of Hewlett-Packard HP-3000 computers.

Written in 1966 ANSI FORTRAN IV, DI-3000 includes 160 user-callable subroutines that provide color, 3-D, and a graphics

CIRCLE 193 ON READER CARD

data structure. Individual device drives are said to reduce host execution time by allowing DI-3000 to take full advantage of the particular hardware features of the display devices being used.

Grafmaker, which operates in conjunction with DI-3000, consists of user-callable subroutines for high-level data presentation, including line graphs, bar graphs, and pie charts. Precision Visual says it has taken great care to segment both packages logically into overlay structures to minimize paging and to provide a more efficient use of system resources.

A perpetual license for DI-3000 starts at $8,000, and for Grafmaker, at $4,000. PRECISION VISUALS, Boulder, Colo.

FOR DATA CIRCLE 341 ON READER CARD

DATA COMMUNICATIONS FOR VECTOR GRAPHIC

A new data communications package allows Vector Graphic microcomputers to communicate with other Vector systems and with larger mini and mainframe computers, and to access timesharing devices, electronic mail systems, and a variety of public databases.

The Vector Graphic software, called Conect, runs on all Vector single-user and multi-user systems, and provides asynchronous data communications in any one of four basic operating modes: send/receive, link, terminal, and interactive.

In the send/receive mode, data files can be transmitted between any two Vector systems equipped with Conect. The link mode allows transfer of files or programs between computers, has the support for remote diagnostics, and permits implementing bulletin boards on Vector systems.

The terminal mode configures the system to emulate either the LSI ADM3A or Hazeltine 1500 dumb terminal. In the interactive mode, a Vector microcomputer can communicate with minicomputers or larger mainframe systems without any special software at the host end of the link. The interactive mode also permits access to public databases. Conect software is $150.

A specially configured version of Conect is used in the Vector DealerNet electronic mail system which connects Vector corporate headquarters in California with all 450 Vector dealers in the U.S. VECTOR GRAPHIC, Thousand Oaks, Calif.

FOR DATA CIRCLE 340 ON READER CARD

DPPX APL FOR IBM 8100

Users of the IBM Information System can now work with the APL language on a local 8100 at a remote distributed data processing site, instead of interacting with the host computer.

IBM's new 8100 DPPX APL supports application program development and personal computing in the distributed data processing environment, and complements VSAPL on the host with local APL processing of local data. Local APL processing provides access to local databases and data sets for APL users, enables APL applications that already run on the host 370 or 4300 to run on an 8100, and frees the host computer for other jobs.

The basic license fee is $2,100 for DPPX APL, which is compatible with VSAPL Release 4 and includes the primitive functions and operators provides by VSAPL, and the system commands, variables, and functions provided by VSAPL, with a few exceptions. IBM CORP., White Plains, N.Y.

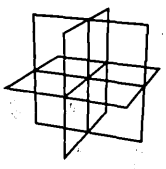
FOR DATA CIRCLE 342 ON READER CARD

VSAM ERROR HANDLER

An error handler that intercepts run-time VSAM errors without the help of the COBOL programmer has been developed by the Davidsohn Group.

VSEXIT operates in a COBOL DOS/VS(E) environment and is incorporated in a user program at linkage-editor time by an INCLUDE statement; the program source remains unchanged. The 3K module is selectable for test or production use.

When a VSAM error is detected, VSEXIT automatically signals the operator with the hex error-code, accepts an operator



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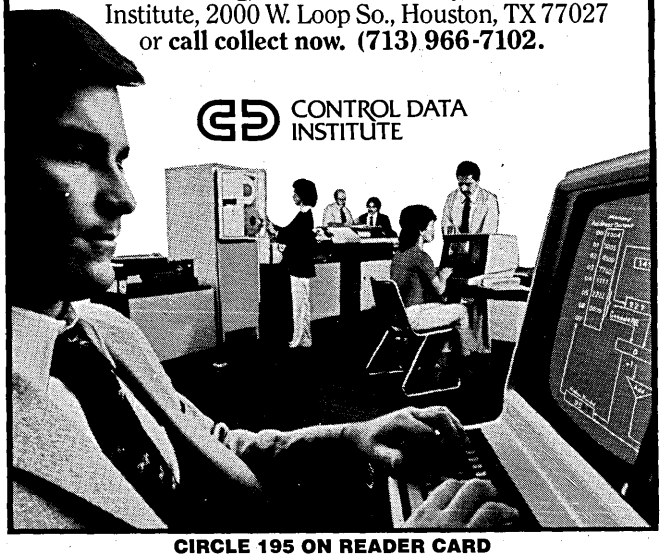

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reply to RETRY the OPEN of unavailable files, or accepts an operator CANCEL to flush the remaining job steps, after first closing all open VSAM files in the program.

When the test-mode version of VSEXIT is used, messages contain COBOL status key and verb displacement, and CANCEL is automatic without operator reply. A one-time license fee for VSEXIT is $1,950, which includes 12 months of maintenance support. A two-year lease/purchase plan is $100 a month. THE DAVIDSOHN GROUP, New York, N.Y.

FOR DATA CIRCLE 343 ON READER CARD

COBOL PRODUCTIVITY AID

A tool said to improve COBOL program maintenance is available from Arkay Computer. COBOL programmers who use Excheck will need "significantly less time" for program analysis, coding, and debugging. Excheck is available on various computers and operating systems, including IBM OS, MVS, DOS, and Wang VS.

Excheck prints the COBOL in a way that helps the programmer analyze a program's functions. A cross-reference is shown on the same line as the COBOL statement. In the data division, every use of a data item is printed to the right of the data name, and the type of procedure division statement is visible in the data division.

While looking at the procedure division, the programmer can see where items have been originally defined. Paragraph names are also cross-referenced to the extent of showing when they are objects of PERFORM, GO TO, and ALTER statements.

Excheck is useful when used to analyze the processing sequence of a program, to determine file layouts, and to debug dumps. Its optional sorted cross-reference allows programmers to locate data names and paragraph names without flipping back and forth between different sorted listings.

The permanent license fee for Excheck ranges from $2,900 to $4,900. A free 30-day trial is available. ARKAY COMPUTER INC., Newton Centre, Mass.

FOR DATA CIRCLE 344 ON READER CARD

LONG DOCUMENT PROCESSING

A software package for handling long document processing on the Xerox 860 information processing system is available from Xerox. The package enhances text processing with features such as footnoting within documents, paragraph numbering, leaders, and line numbering. The footnote program automatically merges or deletes footnotes and renumbers. The line-numbering program numbers consecutively or at operator-selected intervals at the left or right margin.

Paragraph-numbering software offers Harvard standard outline and decimal specification formats. The table of contents and dot-leading programs compile chapter headings and titles along with corresponding page numbers and leadering symbols.

The one-time license fee for the 860 long documents package is $500. XEROX CORP., Dallas, Texas.

FOR DATA CIRCLE 345 ON READER CARD

FINANCIAL PLANNING

A financial modeling package for the Apple II has been released by Osborne/McGraw-Hill. MicroFinesse, a modeling, forecasting, and decision-making program, was originally developed by the P-E Consulting Group of England and is now being offered by Osborne/McGraw-Hill in the U.S. and Canada.

MicroFinesse enables the user to create investment models, accounting statements, and sales productivity or profitability forecasts. It features targeting and sensitivity analyses that allow the user to answer "what if" questions. MicroFinesse also provides color graphics, model consolidations, and report generation.

A menu-driven package, MicroFinesse runs on the Apple II 48K microcomputer supplied with a Pascal card, and is $495. OSBORNE/MCGRAW-HILL, Berkeley, Calif.

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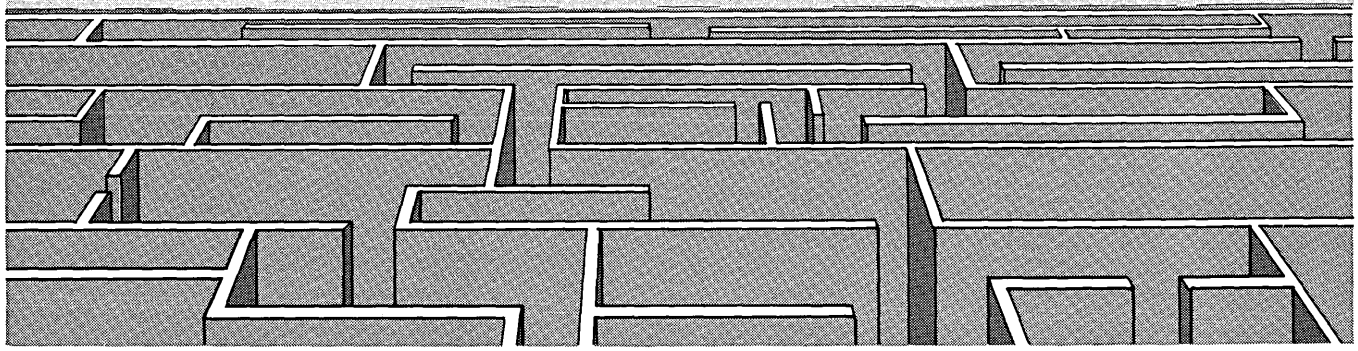

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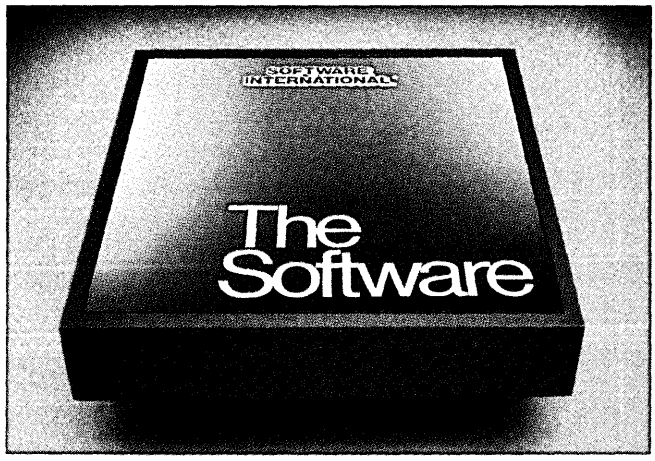

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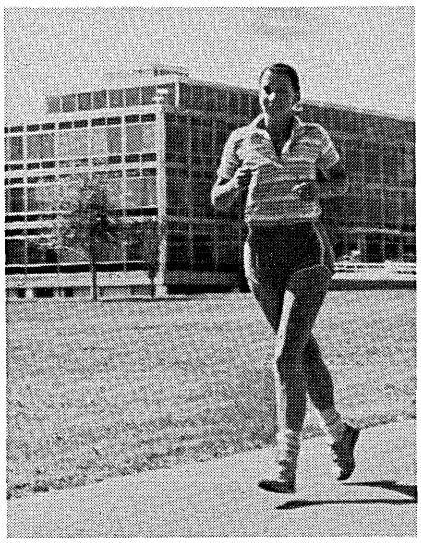

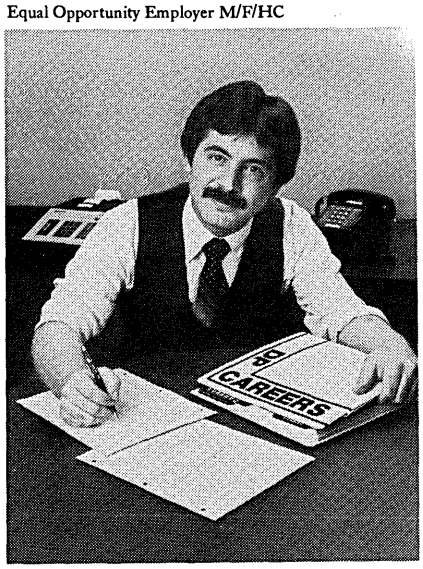

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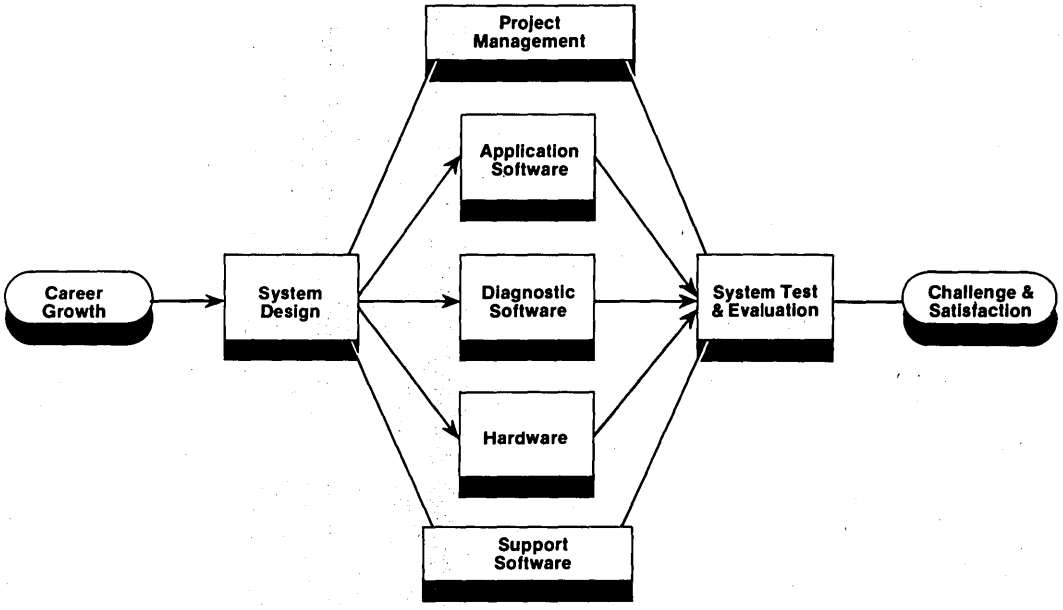

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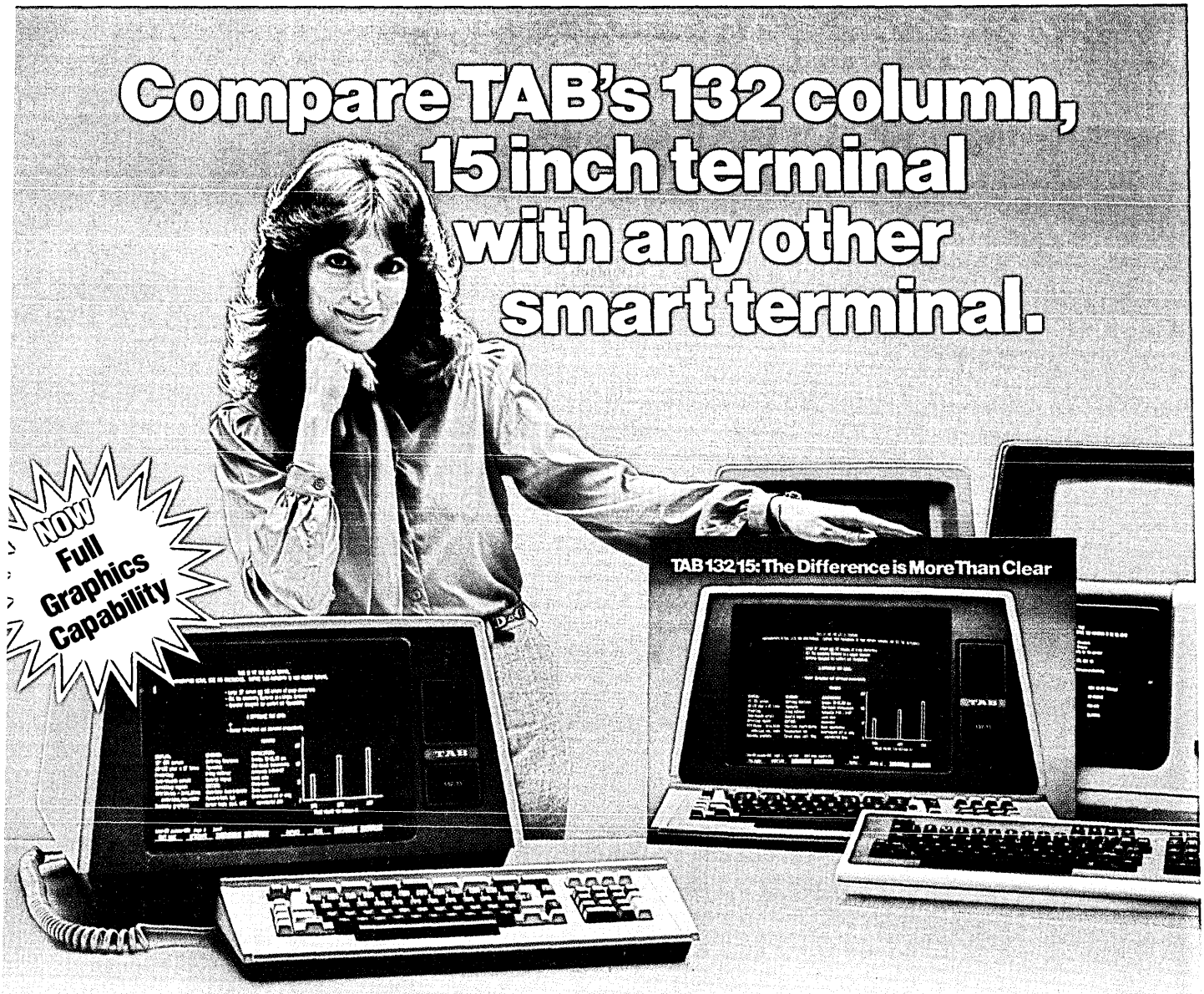

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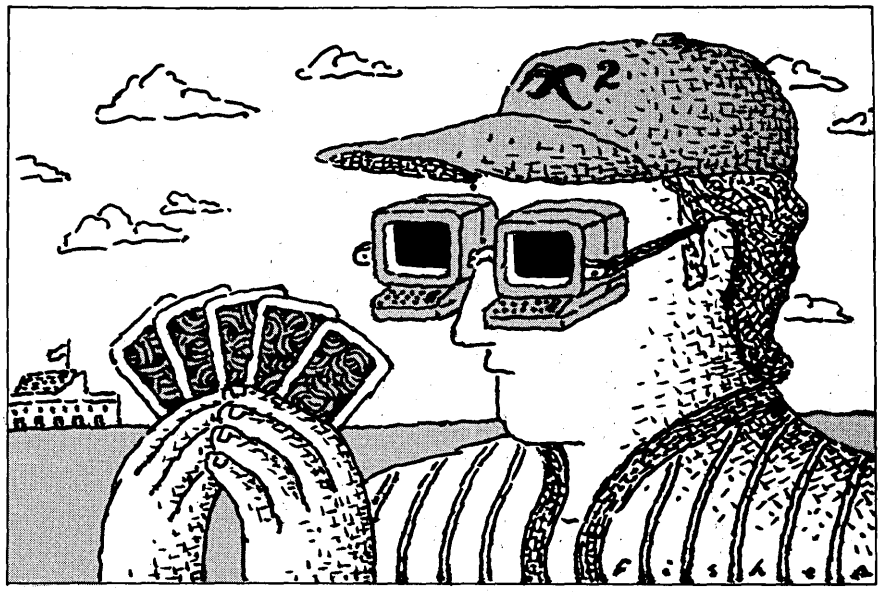
SOURCE DATA

BOOKS

BASIC BETTING: THE MICRO-COMPUTER EDGE
by James Jasper



Considering the current popularity of sports wagering and home microcomputers, it's not too surprising that someone has come up with a book combining the two topics. How many microgamblers are out there? Apparently quite a few, and James Jasper's *Basic Betting: The Micro-Computer Edge* offers to help them make better bets.

Jasper, who uses Integer BASIC on his 48K Apple II with one disk drive, should first of all be congratulated for finding something useful to do with a home computer. Although this book touts itself rather stiffly, it does offer a possible advantage to the scrupulous bettor. If the reader ignores some of the more grandiose claims (" . . . gambling is being revolutionized. We micro owners are in a position to be the biggest beneficiaries of this revolution"), it's also an enjoyable effort.

As a former director of data processing for the National Opinion Research Center, Jasper has computer credentials. Hailing from Chicago, he brings some of that city's verbal directness to his book, which makes the text coherent and readable. The actual programs are not so cleanly written, but these are works-in-progress and subject to fine-tuning and adjustment. Jasper offers programs for handicapping horse racing, football, baseball, basketball, and blackjack. A pretty fair bibliography is supplied, and a good appendix details the rules of wagering for the gambling neophyte.

The author quickly—and correctly—dispenses with games of chance. There is no way to win consistently (and fairly) with craps, say, or at roulette. Jasper prefers pari-mutuel betting, where the gambler attempts to beat popular opinion. If the bettor can use the micro to keep enough data, Jasper reckons, he'll possess an information edge, and hence an advantage.

Playing the horses is a remarkably complex gamble. One need only consider the amount of information contained in a *Daily Racing Form* to understand the difficulty of adapting past performance, pace, trainer's motive, or workout speeds to a home micro. It means a lot of input and most likely a substantial amount of frustration, but the author claims to have had some success with his program. One hopes he has; he's been coding the horses since Lyndon Johnson's presidency. Jasper's rewards, however, have not been purely pecuniary. He clearly savors sitting out at Arlington Park on a summer afternoon, watching the ponies bear down the stretch.

Handicapping the thoroughbreds requires a fair amount of intuition and inference, so one must wonder about the effectiveness of any system. But the author does not fall prey to the common snare of rigid and intractable system wagering. He relies instead on "synergistic combinations," where horses run better than expected in terms of money returned and beaten lengths. These combinations are used to give the wagerer an edge over the computerless betting public.

Football betting absorbs a great deal of money these days. There are currently quite a few computer-driven football programs, all, of course, claiming to be winners. Most hard-core football bettors are aware of the Dunkel ratings, or Bud Goode's or Carl Cooper's work. Jasper naturally claims that his football system works, and considering the labor involved, one must figure he's at least partially correct. Otherwise, why would he bother?

There are consistent and systematic errors in a bookie's point spread, and these can be played to the bettor's advantage. In order to enhance the play so that a bookie can cover all bets, the betting line occasionally favors a town that does not bet much. There is also a psychology affecting the betting line. A 15-point spread might seem high for wagerers, even though it truly reflects the balance of two teams. Jasper hopes to pick up such anomalies, where the betting line does not correspond to the actual chances. But 1980 was a good year for the football linemakers, meaning the line was very close to the actual results. This would suggest that those making the odds are wising up and beginning to use some sort of computer-rating system themselves. If that proves to be the case, it would make things a bit more difficult for the legion of football bettors. But if the linemaker uses the computer, wouldn't it suggest that computer rating is efficacious? Are bookies worrying about their disk drive capabilities these days?

ILLUSTRATION BY DAVID FISHER

Mr. Jasper is a stubborn White Sox fan, and it is in his baseball programs that one recognizes the work of a true devotee. This is refreshing, and makes the baseball section of *Basic Betting* the most compelling. The author has constructed a baseball program to simulate 13 daily games a thousand times each in a little over three hours. The results of these simulated games are then applied to a wager on an actual game.

There are some curious determinations in Jasper's baseball. He figures baserunning outs at about 115 per season, which seems quite high. Even allowing for a clumsy number of pickoffs, overrun bases, and a lot of strong, accurate arms in the outfield, this suggests a very high number of runners caught stealing (the 1980 major league season average was 62 per team). Any team caught stealing 70 times should have over 200 stolen bases (67% of all attempts are successful); otherwise a manager wouldn't bother running his players. Also, Jasper refuses to wager on rookie starters, which means last year his system would have excluded Fernando Valenzuela.

Jasper's factor for the effect of a park upon hitting is also peculiar. His list of ball parks that have a "drastic" effect on run production is puzzling and incomplete. Some parks, like Wrigley Field in Chicago, favor the hitter. Others, like the Astrodome or Candlestick Park in San Francisco, favor the pitcher. But windy Candlestick is not included. County Stadium in Milwaukee, a pitcher's park, is considered neutral. Jasper lists St. Louis's Busch Stadium as a pitcher's park, but a look at the Cardinal team batting average would suggest otherwise. And where are the Kingdome, Veteran's Stadium in Philadelphia, or Exhibition Stadium in Toronto? These are parks that are not, as Jasper purports, neutral. Jasper does defend his baseball simulation as in progress, and admits that a fair amount of tinkering remains to be done.

The remaining sections on blackjack, basketball, and money management don't have the interest the baseball section does. One wishes that Jasper had applied himself more to the Great American Pastime and less to some of these other sports. The basketball section has a promising program for betting the over-under line in the NBA, which could conceivably make some dough for the conscientious bettor.

Computer use in betting is increasing, but a great deal of work remains to be done before it can compete with something as enjoyable as a strong hunch. Why buy this book if it doesn't give you an edge? One reason would be to use Jasper's efforts as a starting point. With further refinements, these micro programs might offer an advantage.

As a tout, or as a handicapper, Jasper isn't bad. His affable style and his regular common sense come through in his writing. One hopes that he'll continue his work, particularly in baseball. Given the nature of most gamblers, he probably will. Over a million home computers were sold in 1981. Jasper's book should encourage some of these micro owners to try their hands at the track or the ball game. Any takers? St. Martin's Press, New York City (1982, 283 pp., $9.95).

—Lee Froehlich

REPORTS & REFERENCES

SUPERBUREAU

The Yankee Group has released a report, "The Super Service Bureau," profiling the 10 leading service bureaus in the U.S. According to the Yankee Group, service bureaus that provide the following five items are destined to do very well: 1) query languages, 2) report generators, 3) database management systems, 4) graphics, and 5) access to a variety of public databases.

Service bureaus have become a major industry; they now comprise a $15 billion market, and the annual 20% to 25% growth rate is expected to continue. The report cites the market segments that offer the best opportunities for service bureaus, and what the bureaus will have to do to capture those markets. Robert Paolucci, the Yankee Group, has more information on the report: P.O. Box 43, Harvard Sq., Cambridge, MA 02138, (617) 542-0100.

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DATACOM HELP

"Data Communications for the First Time User" is a series of proceedings from recent DCM (Data Com Marketing) Associates' seminars. These proceedings will help people who are considering installing terminals or printers at locations remote from their computer. Beginning with the definition of modem, the proceedings proceed to current trends in networking. Typical hardware prices, line charges, and price/performance criteria are also described in the proceedings—available free from DCM Associates. For more information or a copy of the proceedings, contact Leon Dall, DCM Associates, 7009 Owensmouth Ave., Suite 212, Canoga Park, CA 91303, (213) 710-0344.

WHO'S BUYING?

Most owners of word processors also have other types of office equipment in place. Over 90% have typewriters, 80% have copiers, seven out of 10 have dictating equipment, and two thirds have automated typewriters. In "The Word Processor Industry: A Strategic Analysis," a Venture Development Corp. report, current owners and future users of word processors were surveyed. Some other characteristics considered by VDC were journals read most often, sources of information, applications, and selection criteria. For more information contact Karen Horowitz, Market Research Analyst, VDC, One Washington St., Wellesley, MA 02181, (617) 237-5080.

LET'S GET LITERATE

The International Council for Computers in Education is a nonprofit organization founded by educators who wish to advance the use of computers at the precollege levels. ICCE recently published two booklets designed to show precollege teachers what computer literacy is, why it is important, and how computers can be used in schools. The first booklet, "Precollege Computer Literacy: A Personal Computing Approach," defines computer literacy and points out how computers do and will affect students. The booklet contains 25 pages of text and sells for $1.50. "Introduction to Computers in Education for Elementary and Middle School Students" is geared toward the needs of teachers who have had no experience with computers. It contains activities for both teachers and students in its 93 pages and sells for $7. For more information on ICCE or to order their booklets, contact them at the University of Oregon, Dept. of Computer and Information Science, Eugene OR 97403.

SEMINARS

PERSONAL WP

WPS '82 is the third annual meeting of the International Association of Word Processing Specialists, Inc. (WPS) The conference features an exhibit of word processing equipment, and a panel discussion and seminars on the concept of the integrated office, ergonomics, conpetency and credibility, stress management, and career enhancement. WPS is a nonprofit organization, established in 1979, with the goal of "addressing the professional needs of all people involved in word processing." The conference is scheduled for July 28-31 in Oklahoma City. For more information, contact the International Association of Word Processing Specialists, 1660 S. Voss, Suite 100, Houston, TX 77023.

YOUNGER GENERATION

"The Fifth Generation: Dawn of the Second Computer Age" is a three-day conference examining Japanese plans for a fifth generation of computers, due to emerge during the second half of the '80s. Speakers from all over the world will discuss the Japanese plans, European and American response to those plans, the state of the art and

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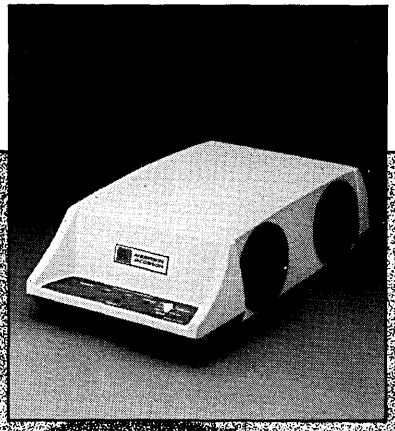

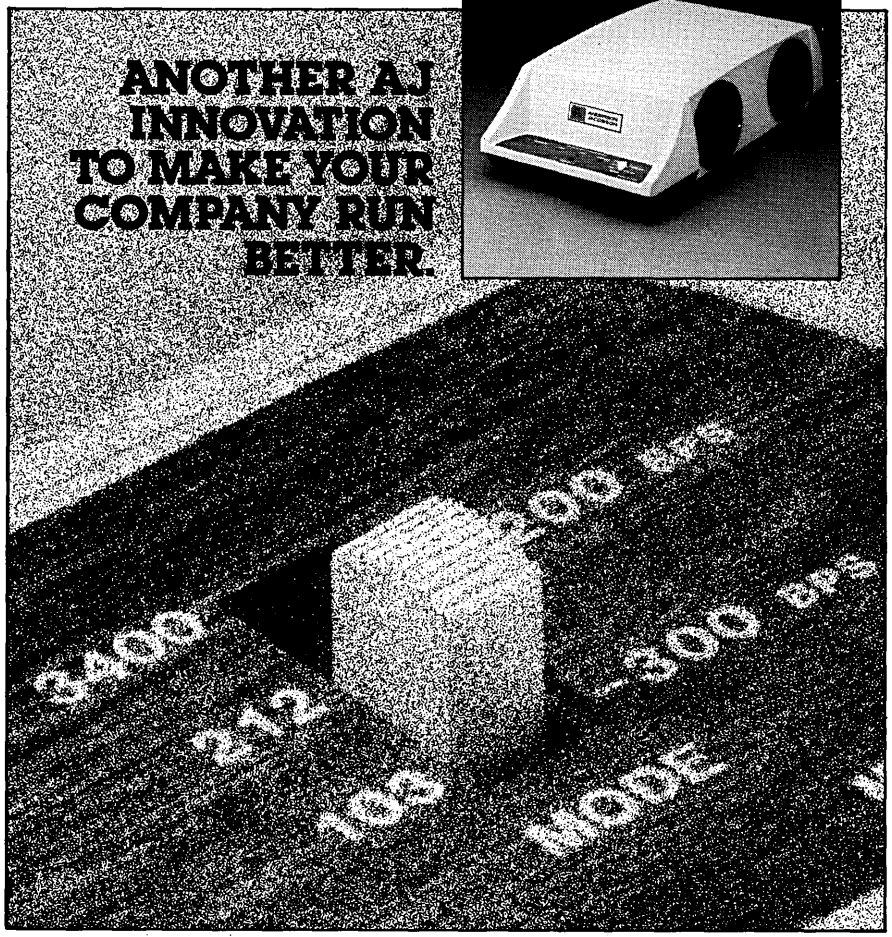

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SOURCE DATA

developments in specific areas targeted by Japan, new fifth generation computer applications, and the implications for hardware and software vendors and government and research institutes. The conference itself takes place July 7-9; on July 6 there will be an Executive Briefing on Expert Systems. Both events are sponsored by SPL International in connection with several computing organizations in the U.K., Europe, the U.S., and Japan. Details are available from The Fifth Generation Project, SPL International Research Centre, The Charter, Abingdon, Oxfordshire (telephone: 0235 24112; telex: 83164).

A WEEK OF GRAPHICS

Harvard Computer Graphics Week, 1982, is set for July 25-30 at the Hyatt Regency Hotel in Cambridge, Mass. The event is sponsored each year by the Laboratory for Computer Graphics and Spatial Analysis Graduate School of Design at Harvard University. This year, Graphics Week will focus on computer mapping, image processing, graphic communication, and information resources. Presentations will be directed toward individuals at three levels: 1) persons with no prior computer graphics experience, 2) users of computer graphics capabilities, and 3) professionals within the focus disciplines listed above. For additional information on the fifth annual graphics week, contact Ann Quenin, Conference Manager, Harvard University, Graduate School of Design, 48 Quincy St., Cambridge, MA 02138, (617) 495-2578.

ASK AN EXPERT

Expert Systems, according to the American Association for Artificial Intelligence, are "computer programs with a vast store of specialized knowledge. They solve complex problems, mimicking the decision-making process of human experts, and, in some instances, they out-perform humans." The association also claims that the systems are presently being used in business, medical, and geological applications. In the near future, they expect Expert Systems to be available for home computer use to assist with such things as tax forms and car maintenance and repair. Does this sound farfetched? There's more. Expert Systems answer and ask questions in plain English. The reasoning process used is also explained in English. Expert Systems, robotics, computational vision, programmable automation, game-playing, and knowledge representation are some of the topics to be discussed at this year's National Conference on Artificial Intelligence, Aug. 16-20 at Carnegie-Mellon University and the University of Pittsburgh. For more information on the tutorials or the week-long exhibition, contact the American Association for Artificial Intelligence at 445 Burgess Dr., Menlo Park, CA 94025, (415) 328-3123.

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Troubleshooting	**3.0**	2.8	2.8	3.3	2.8	2.6
Documentation	**3.1**	2.8	2.8	3.1	2.8	2.7
Education	**3.3**	2.8	3.0	3.3	2.6	2.8
Maintenance	**3.2**	2.9	3.1	3.2	2.9	2.8

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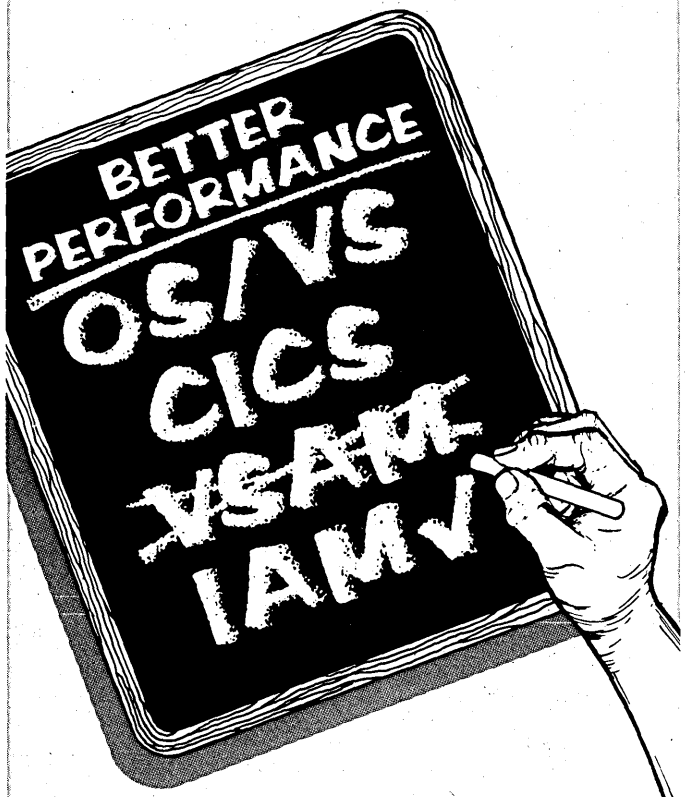

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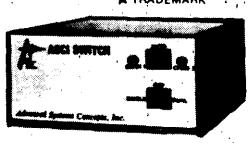

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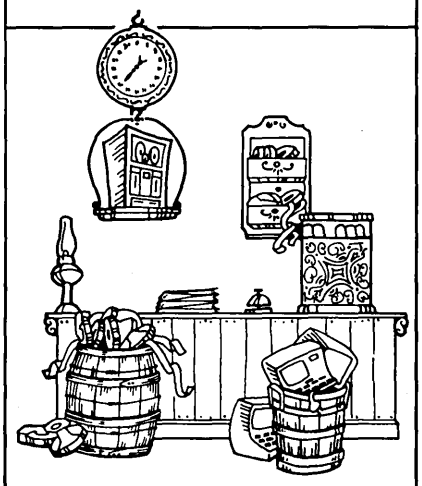

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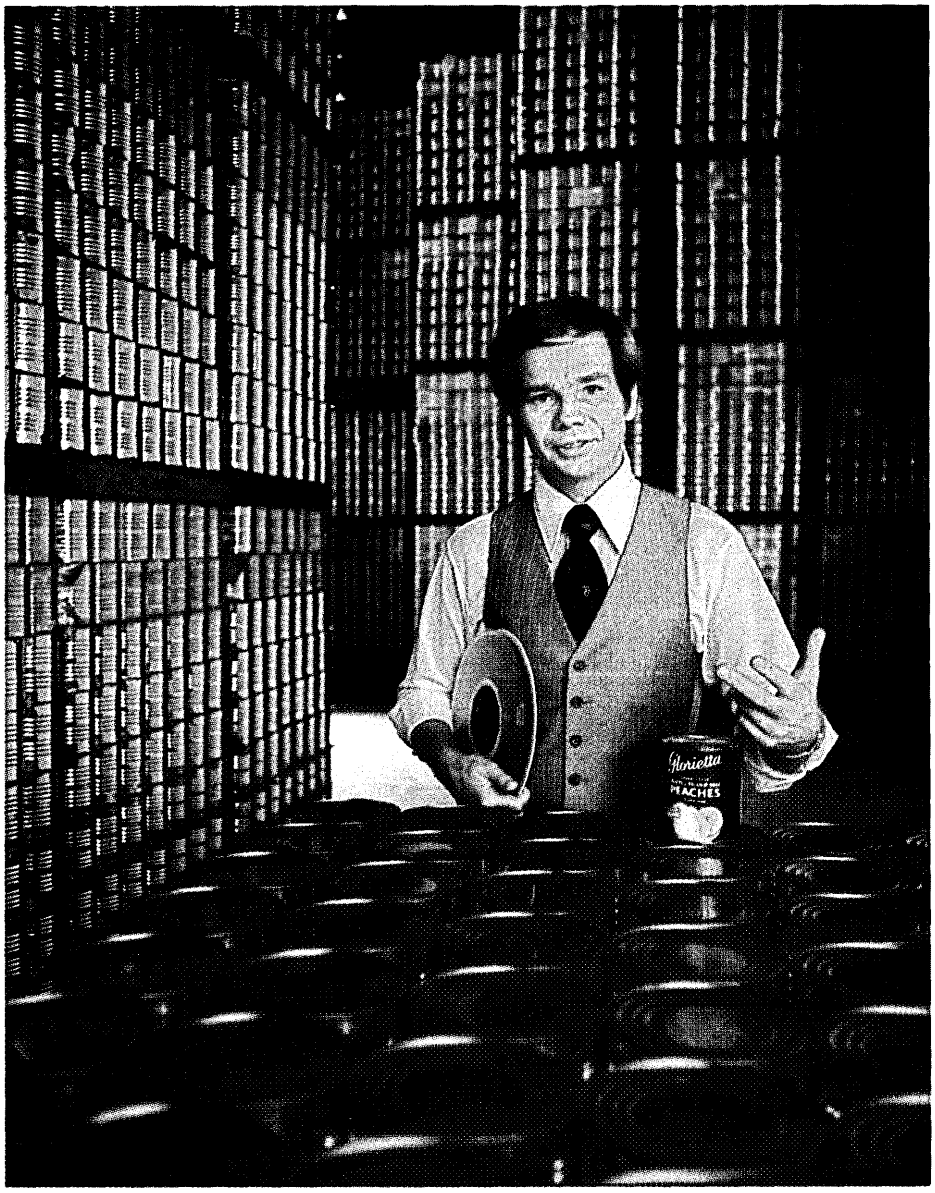

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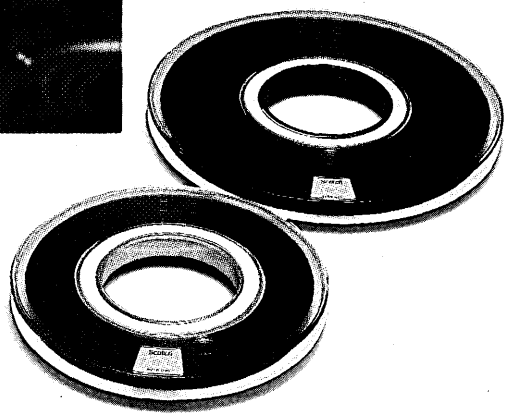

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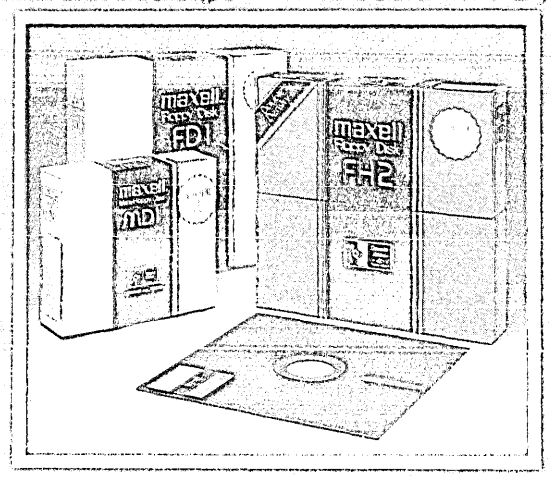

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CIRCLE 240 ON READER CARD

An exchange of readers' ideas and experiences. Your contributions are invited.

READERS' FORUM

WHERE'S THE MONEY?

There's a lot of loose talk going around about so-called electronic money, which we're told is going to revolutionize banking, bill paying, shopping, traveling, and eating out. We expect to lead a life of leisure with an access code and the urge to acquire. The day is foreseen when checks and greenbacks won't exist at all, when Washingtons and Lincolns won't be available at any price. Instead, your fortune will exist as magnetic bubbles in an electric bath, gurgling from spigot to drain with never a fold, wad, or jingle. You'll go through life with nothing but your hands in your pockets and a voiceprint on your lips.

Well, if you think the specie in today's purse is worth next to nothing, just wait until they get the money machines up and running. Anyone with a credit card knows what a dangerous lie electronic money is, and it's only going to get worse. The credit card, or more properly the debit card, is just a way station on the long trail of delusion that began when some Babylonian first got the idea of separating numbers from the things they were invented to count.

"Three," he is said to have announced.

"Three what?" inquired his colleagues. "Three camels? Three ziggurats?"

"Just three," he insisted.

They had no idea what he was talking about; we still don't. But the concept seemed clever so they congratulated him and invented accounting. From there it was a short leap to the even more slippery terrain of zeros and negative numbers, which are the sine qua non, if you stop to think about it, of electronic money. Electric dollars are an exponential improvement in the business of getting us to work harder and harder for something that doesn't exist.

Why is this necessary? Because there just isn't much money left in the world. It started to run thin a long time ago; the Roman Empire wrote the book on Chapter XI and, according to some historians, that's why it disappeared. In the Dark Ages, everyone was broke. During the early Renaissance, some Italians found a supply of money that dead Romans had left behind, but when that was gone they started up with scrip that represented money they had already spent.

Where does money actually come from? You get paid by your boss, he gets paid by his boss, and so on and so on. All 200 million of us can trace our wages back to some fiscal Big Bang, which is commonly believed to have taken place in Washington. But stop and think. What were you doing on the night of April 15? You were writing out a whopping check. Or anyway, writing out a whopper. You were pumping the juice into their tank, not stopping by for a fill-up. Some naive persons like to point out that when the government spends, that money goes into the system and increases the supply. Wrong. Say Uncle Sam buys a submarine. Out of the $20 billion for the sub, maybe a few million goes for wages. The rest is lying on the bottom of the Mariana Trench, looking for Russians.

Most money has never existed. You see from history that most of the movers and shakers were up to their saddle horns in debt, right from the get-go. Caesar and Pompey were always putting the touch on Crassus; Columbus put the arm on Isabella, who hocked the ice with God knows whom. The great figures of history mortgaged the future to put on chariot races and died out before the note came due. You see this with Charlemagne, the Medicis, Louis XIV, Lee Iacocca, et al. As long as the monuments are in place, who cares? The past is full of bad debts, and the only possible explanation is that there never was enough bread for the circuses. Clearly, finance was always propaganda; a snare for the unwary.

The ruse of electronic money is a pathetic latter-day attempt to keep the myth alive. The whole world supply occupies virtually no space. To measure it or count it you need a machine that speaks electronic talk. These are so-called smart machines. And who do these smart machines work for? The direct descendants of the people who brought you zeros and negative numbers, that's who. They know which side the imaginary bread is buttered on.

But what the hell: it's an abstract age we live in, and there's not much we can do about it. Seeing that cash never carried the past, today's convenient fiction of electronic money probably does deserve some credit. After all, it's one of the Three Great Modern Lies, along with Detroit Makes Great Cars and No Salesman Will Call.

And the people who sell home computers do paint a pretty picture of your life of ease once you have a cute little micro clattering away in the den. They'll save you so much time you can take a second job. Just plug it in, and it will do your taxes, plan your meals, take you shopping, pick horses, and diagnose whooping cough. Never pay another bill, etc., etc. A couple of angstroms down the road are machines that will interface directly with the banking system. Keep your ear to the ground for get-rich-quick banking programs: flop a mechanical Morgan on your drive and you're ready to cook. In one step you can access your account, hit the GIMME button, and fill your purse-analog. In no time whatever you can abstract yourself right into the leisure class. Just write for details. No salesman will call.

—Bud Miller
New York, N.Y.

THE PLAY'S THE THING

". . . the play's the thing
Wherein I'll catch the conscience of the King."

—*Hamlet*

It was Clemenceau, the statesman who led France to victory in the World War I, who said that war is too serious a business to be left to the generals. This leads me to the thought that perhaps software is too serious a business to be left to systems analysts and programmers. The reason in both cases is the same: experts are short on imagination and therefore on strategy. The expert tends to view his problem in too narrow a context and to rely on a limited range of skills. Just as a general might survey the battlefield but not the whole geopolitical and economic environment, so the software designer often considers only the logical and technical aspects of his task and neglects the people and institutions that will have to mesh with it. All this is commonplace. What is not so obvious is that the designer of business application software often has not practiced the basic skills that would be most helpful to him. In this respect he is behind the designer of educational and recreational games.

Further analogies may help clarify this thought. The designer of business application software tries to write the lines of a play that will be performed by computers as well as human actors. These lines must be written in such a way that neither the cast nor the audience will think of the action as forced or unnatural. The designer is a teacher seeking to instill appropriate behavior in a pupil who has been taught certain complicated patterns entirely by rote. He is a legal draftsman striving to frame laws without loopholes, and a renderer of such legal texts into one or more languages or dialects. Let us leave aside the fact that he often has to be a prophet and a missionary, for we are not yet ready to canonize him.

In this article we shall consider the first point: that software literally has to play a role. While it would be unreasonable to ask software designers to become dramatists as proficient as Eugene O'Neill or Tennessee Williams, we can expect them to possess a certain gift for imagining the scenarios under which their products will play their parts. If a designer has a flair for writing drama, this ought to be at least as useful to him as his ability to write in PL/1. Maybe he should use ghosts to write the programs while he concentrates on such literary exercises as this:

SOFTWARE TO THE RESCUE
A One Act Play

It is noon of a bright October Tuesday in the City of London. MR. AUGUSTUS DENARIUS, *Syndicated Loans Manager of Foremost Financial Unlimited, is considering taking off for a weekend of golf when a red light blinks on his hot line. The voice of his secretary,* JENNIFER JITTERS, *grates on his ear as he presses the intercom button.*

JITTERS: It's Mr. Impetuoso speaking from Mexico and he says it's terribly urgent. Please don't leave him to me, Mr. Denarius.

DENARIUS: Damn! Tell him I've just left and that I'll phone him over the weekend from the club.

JITTERS: You promised you wouldn't leave me alone with him. I'm going to have one of my spasms.

DENARIUS: No, not that! Tell you what. Let's try SUCCOR on him. Put him on. (*Speaking into phone:*) Hello there, Amando. Now, before you start to ruin my weekend, let me first make a guess and then a suggestion. My guess is that you want to get out of redeeming four million dollars of Tinta Colorada Eurobonds now that interest rates are coming down. Right? Now here's my suggestion: have you got our SUCCOR software package installed on your computer?

IMPETUOSO: You mean SOCORRO? How did you know about her? Yes, I had it installed immediately with special two-pedal controls. My people worked all night Friday and on Saturday and. . .

DENARIUS: Yes, I imagine you stood over them the whole time. Well, here is my suggestion: use it, switch on your terminal. I'm asking Jennifer to switch on hers and connect you to our network. We'll log the dialog and the conclusions. Now, if you don't mind I have an urgent. . .

IMPETUOSO: Augustus, how can you do this to me! On Tuesday the 13th of October! I need your personal attention to my many problems. You know this is the month when I have to repay the first—how do you say?—crunch of Last Idiosyncratic and then I have to renegotiate Latin Bonanza's notes, which fall due on the 17th. A machine can't help me at this juncture. I need every penny, Denny! Above all I need human sympathy.

DENARIUS: I think you'll find SUCCOR is understanding enough and Jenny will make up for any lack of warmth, won't you Jenny? (*Jenny whimpers.*) Now I've had a very hard week, Amando, and if you'll excuse me I'll say good-bye. Regards to your charming wife and daughters. (*Click.*)

JITTERS: Please switch on your terminal, Mr. Impetuoso.

IMPETUOSO: Come on, Jenny, call me Amando. When are you going to Acapulco with me? Did you get the plane ticket? And the little intimate gift?

JITTERS: Yes I did. What will your wife say if she finds out? Switch your terminal on, you horrible macho, or I'll tell her!

IMPETUOSO: Ha! Ha! Ha! I adore you when you are angry. Your cheeks must be two shades of red like the sunrise I can see now over Popocatepetl.

JITTERS: (*Quietly desperate.*) I promise to go to Acapulco if you will switch on your terminal now. I shall count to three. One. . .

IMPETUOSO: Okay, okay. (*Click.*) And thank you, mi vida.

(*Two large screens rise backstage, one against the background of the Bank of England and the other against the dawn breaking behind the twin volcanos of Popocatepetl and Ixtaccíhuatl. The words of* SUCCOR *[or* SOCORRO*] appear on one screen in English and on the other in Spanish. The English version is given here.*)

OPSYS: Account number and password please.

IMPETUOSO: Do it for me, mi cielo. I have no secrets from you.

JITTERS: (*Operates keyboard.*)

OPSYS: At your service.

JITTERS: RUN SUCCOR

SUCCOR: Good afternoon. It's 12:13 on Tuesday, Oct. 13, 1987, and a fine, crisp day it is too. I'm here to help you. I know about most of your problems in the financial area, but I still need a little guidance. Before we start, do you feel relaxed? Did you sleep well and is your mind fresh and ready to concentrate on the business of the day?

IMPETUOSO: ¡*&/*! ACCELERATOR PEDAL

SUCCOR: Thank you. We will proceed to Urgent Decision Support. I'm printing out what you have to decide on.

(*Giant printouts cascade down beside the screens. English version follows.*)

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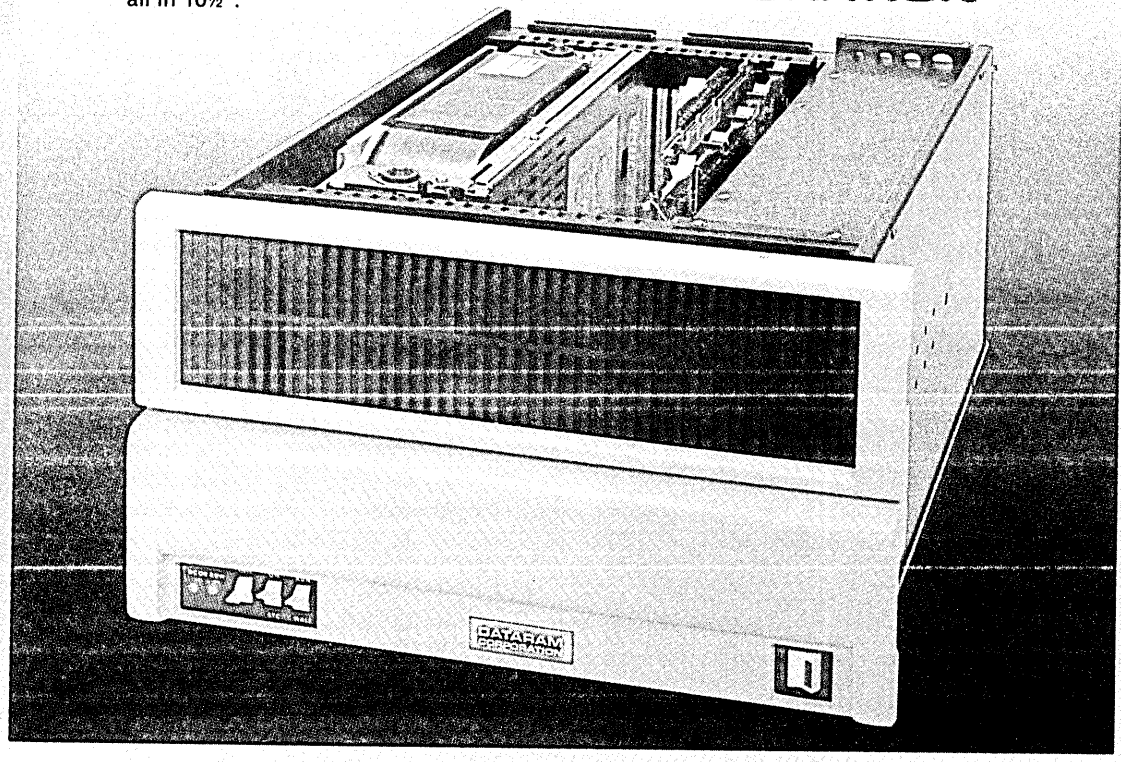

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millions in U.S. $

TINTA COLORADA CASH	:	−0.2
IMPETUOSO CASH & MARKETABLE SEC.	:	113.2 (not printed in London)
NORMAL CASH FLOW TO NOV 13 1987	:	−10.6
DISASTER AVERSION CASH FLOW	:	2.1

DATE OCT. 1987	PAYMENT SITUATION	AMOUNT DUE	AMOUNT SETTLED REMARKS	STATUS
2	Delayed collections week 35	1.1	1.0	0.1 overdue
	Collections week 40	4.2	3.8	Notes signed for 0.4. See Table 1
	Delayed week 33	−2.0	−1.4	0.6 delayed one week
	Week 40	−4.7	−3.5	1.2 delayed See Table 2
7	Last Idiosyncratic tranche 1 repayment	−2.8	−2.8	OK
9	Delayed collections week 35	0.1		0.1 overdue
	Collections week 41	5.6	5.0	0.6 overdue
	Delayed week 33	−0.6	−0.1	0.5 delayed one week
	Delayed week 40	−0.3	−0.2	0.1 delayed one week
	Week 41	−3.7	−3.3	0.4 delayed one week
10	Transfer to Impetuoso hoard	−3.0	−3.0	OK
13	YOU ARE HERE NOW, FASTEN SEAT BELT.			
15	Foremost Eurobounds 2nd redemption	−3.9	Analysis required Code FE	? *
16	Delayed collections week 35	0.1	Threaten legal action against Y	?
	Delayed collections week 41	0.6	Dunning phone calls except X and Z (0.2)	?
	Collections week 42	6.0	No mercy	
	Delayed week 33	−0.5	Legal action threat by DryCo. Disregard with low risk (0.4) Rest safe	?
	Delayed week 40	−0.3	FlyCo supply cutoff imminent	? ****
	Delayed week 41	−0.4	Some risk SlyCo cutoff (0.1). Rest safe	? **
	Delayable week 42	−1.0	Delay risky with WilyCo (0.2) Rest safe	?
	Bedrock week 42	−3.4		
17	Latin Bonanza Variable Rate Notes due	−6.0	Take 3 days grace, renegotiation feasible, default serious but not fatal	?

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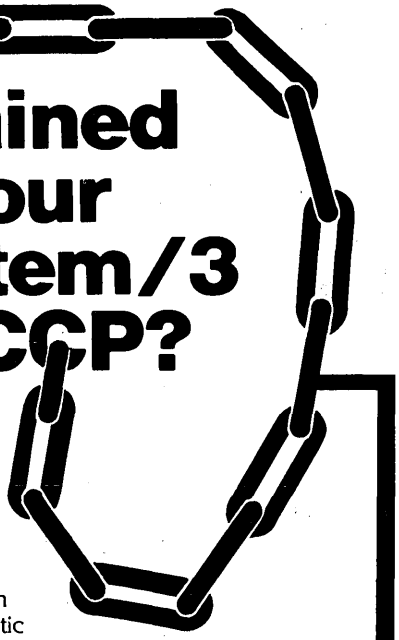
CIRCLE 214 ON READER CARD

Chained to your System/3 by CCP?



Convert to CICS... Automatically.

Break the chains with DASD's new automatic translator. Automatically converts your System/3 CCP RPG programs to standardized, modularized CICS/VS Command Level COBOL.

It also converts all screen references to CICS RECEIVE-MAP/SEND-MAP and converts all file references to READ/READ-NEXT/WRITE/REWRITE and DELETE instructions. Generates complete routines for MAPFAIL, IOERR, END FILE, DUPKEY and others. And converts screen definitions from DFF to BMS... automatically adjusting for attribute byte differences between CCP and CICS, producing either CICS/VS Version 1.4 or 1.5 output, plus printed diagnostics.

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Conversion Programs Available

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CIRCLE 215 ON READER CARD

NEAT/3 to COBOL
CIRCLE 216 ON READER CARD

DIBOL to COBOL
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COBOL to COBOL
CIRCLE 218 ON READER CARD

FORTRAN to FORTRAN
CIRCLE 219 ON READER CARD

DOS ALC to OS ALC
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MAP to COBOL
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READERS' FORUM

IMPETUOSO: BRAKE PEDAL

SUCCOR: (*On screen and printout.*) OK. Remember −0.4 **** on Nov.6.

(*End of printout. Impetuoso tears it off, crumples it into a huge ball, and hurls it at his assistant offstage.*)

JITTERS: FE

SUCCOR: The following is an analysis of your options with regard to Foremost Eurobonds, second redemption. I am going to print it out so that you can analyze it at your leisure. Before proceeding, please tell me if you wish to give me any further information not included in the previous printout. You see I am trying to be as hel. . .

IMPETUOSO: ACCELERATOR PEDAL

SUCCOR: Printout analysis Foremost Eurobonds, second redemption follows.

(*Printout:*)

TINTA COLORADA FOREMOST EUROBONDS SECOND REDEMPTION DUE OCT. 15, 1987

OPTION	DESCRIPTION	CONSEQUENCES
1	Use Clause 7, Section III, Subsection (ii): postpone redemption on account of fall below threshold U.S. dollar against special Eurocurrency basket	Must redeem when rate rises above floor Economic forecast: 3 to 5 weeks.
2	Renegotiate redemption date with main bondholder, BruteCo	Prohibited by Agency Bank agreement; could lead to forced redemption of all bonds; probable cost 10% if successful

JITTERS: How could you, Amando!

IMPETUOSO: Everything I do and think is above board, mi tesoro. I could have kept that confidential.

(*Printout:*)

3	Conclude deal with Last Lifeline Trust and force redemption of all Foremost bonds	Blacklisting in financial circles. Highly advantageous

JITTERS: Really, Amando!

IMPETUOSO: (*Heavy pause.*) Well, I guess that one just slipped in.

(*Printout:*)

4	Ask Foremost to renegotiate redemption date with BruteCo as per Agency Bank agreement.	Probable cost 3% plus Agent Bank commission of 2.75%

IMPETUOSO: Wonderful machine! I'm sure I can leave the decision to you Jennifer, mi corazón. See you in Acapulco. (*Click.*)

JITTERS: (*On phone:*) Brute Force Company? Could I speak to Mr. Grabit? Mr. Denarius's secretary. Mr. Grabit, I wonder if I could arrange an urgent meeting with Mr. Denarius. It's about. . . Oh, I see, you're playing golf with him this afternoon. Well, I wonder if you could mention that. . . Oh, I see, you've already. . .

(*Curtain.*)

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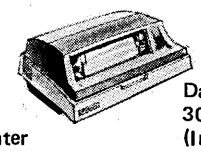

MTI

Dataproducts B-300
300 lpm Band Printer
(Includes DEC interface board, cable & universal power supply.)

$6,715

DEC LP11-EA or
LPV11-EA
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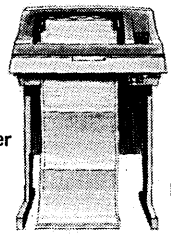

Dataproducts B-600
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CIRCLE 107 ON READER CARD

READERS' FORUM

Apart from being an amusing diversion, the writing of scenarios such as the foregoing is a useful form of "thought experiment" whereby we can attempt to divine just how comfortably our system is likely to fit into its environment. It will help us to abandon bad ideas and make good ones better. When we are able to write several scenarios with happy endings, we may have the makings of a good design. I say "may have" because the design still has to win the acceptance of the people who will use it and—here's the rub—be capable of being executed at an affordable cost. But, as any movie director knows, if you can't sell the script, you can't sell the production.

—Edward R. Lawrence
Monterrey, Mexico

PLAYING THE NAME GAME

So you've started a New Venture,
They've accepted your debenture,
And you've gotten all the money you could borrow;

Your staff is tried and seasoned,
And the analysts have reasoned,
You'll be the toast of Wall Street on the morrow.

Your product runs on solar power,
Unloads freight trains in an hour,
And will sell despite the prime rate or recessions;

It's unique among its peers,
And guaranteed for 50 years,
It can even sing and dance and do impressions.

Now to find a corporate name
That will promulgate your fame,
We recommend a method tried and true;

Choose first from column one,
And last from column three,
And in between from column number two.

I	II	III
0 International	0 Systems	0 Company
1 Data	1 Information	1 Associates
2 Analog	2 Logic	2 Corp.
3 Applied	3 Control	3 Division
4 Interactive	4 Design	4 Limited
5 Modular	5 Research	5 Services
6 Digital	6 Graphics	6 Inc.
7 Process	7 General	7 Consultants
8 Distributed	8 Resource	8 Group
9 _____(Your Name)	9 Communication	9 Consolidated

—Edward C. McManus
Marlborough, Mass.

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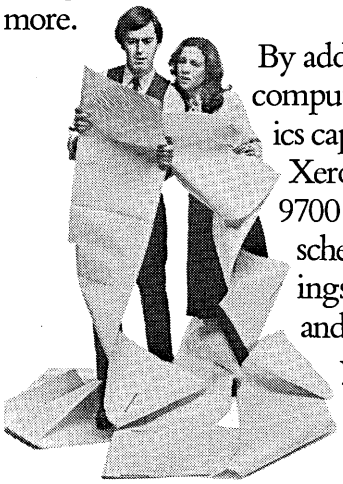

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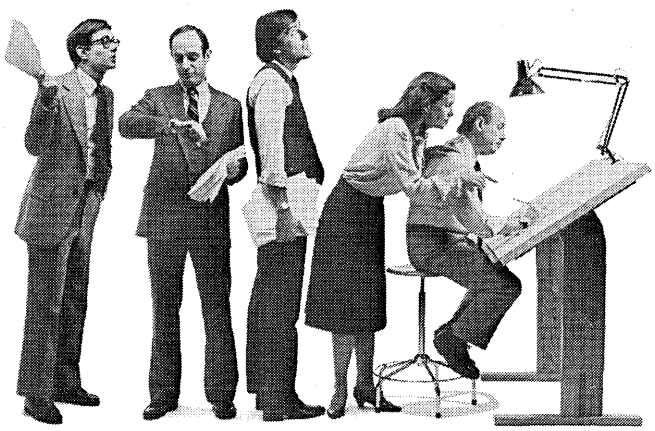

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Into the hands of your people.

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CIRCLE 3 ON READER CARD

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CIRCLE 4 ON READER CARD